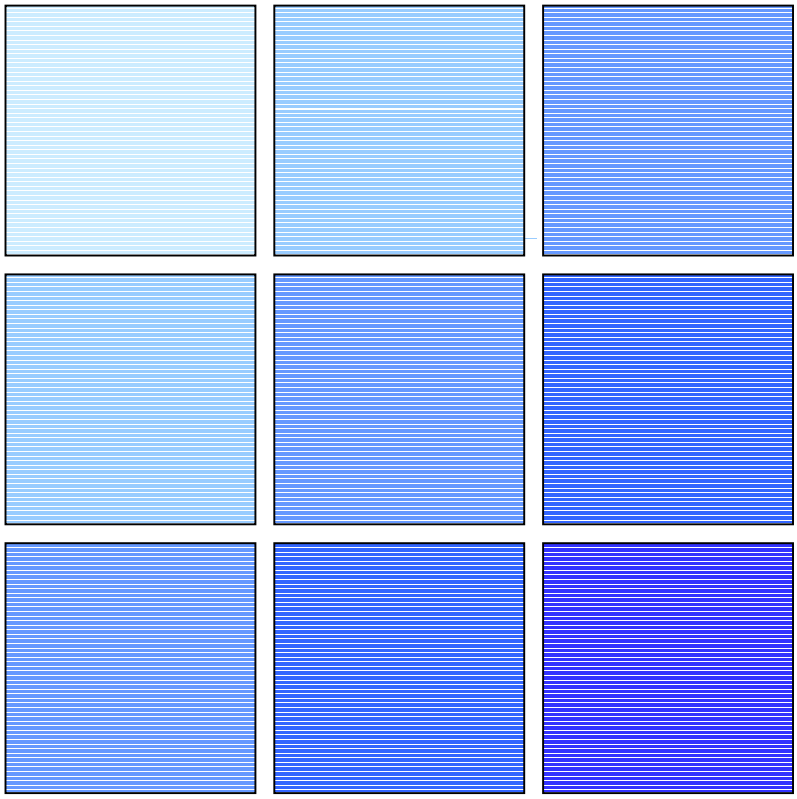
FUJITSU SEMICONDUCTOR
PRODUCT GUIDE

PG00-00022-1E

2002.1

Product Guide

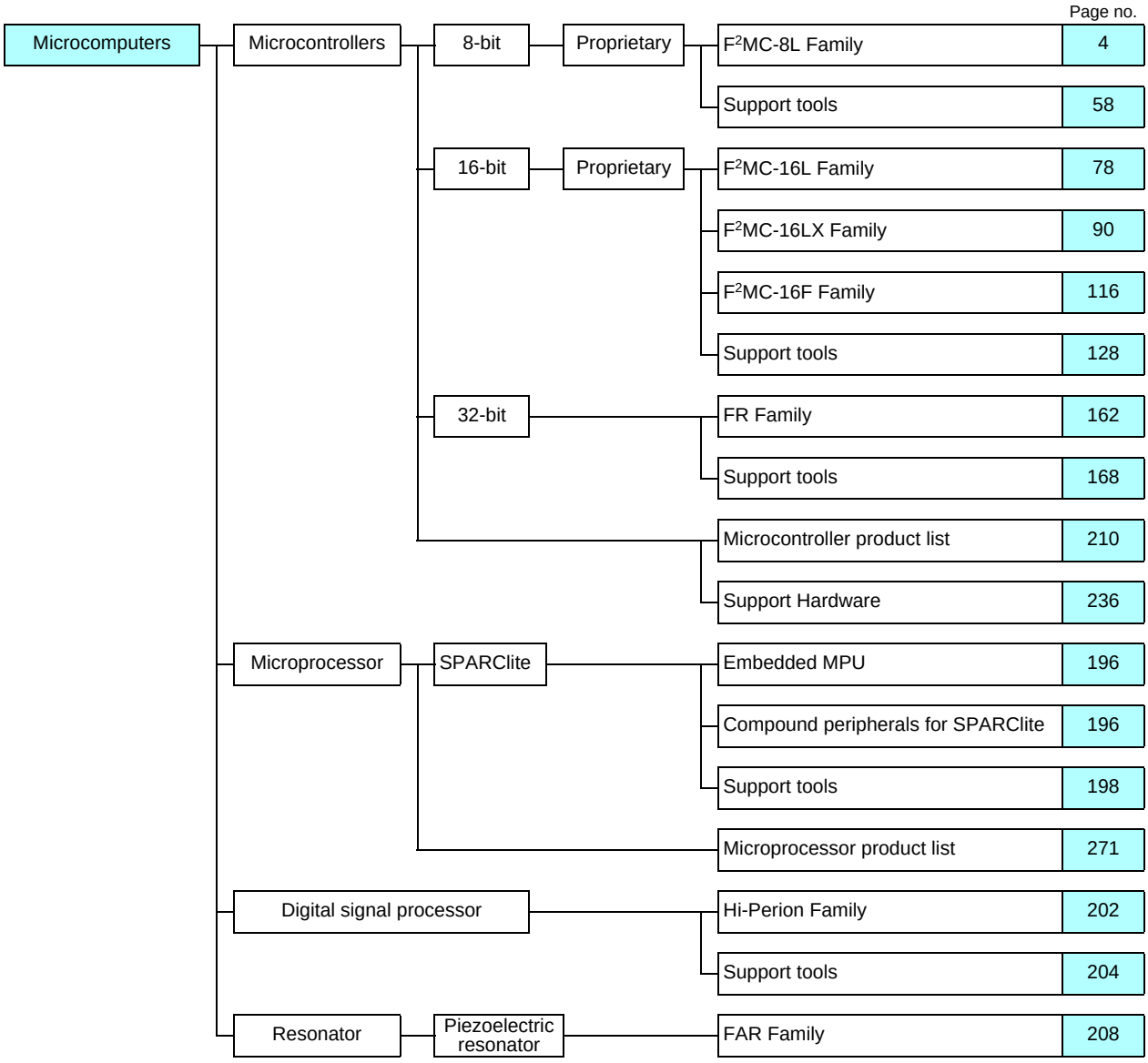
[Microcomputer]



FUJITSU

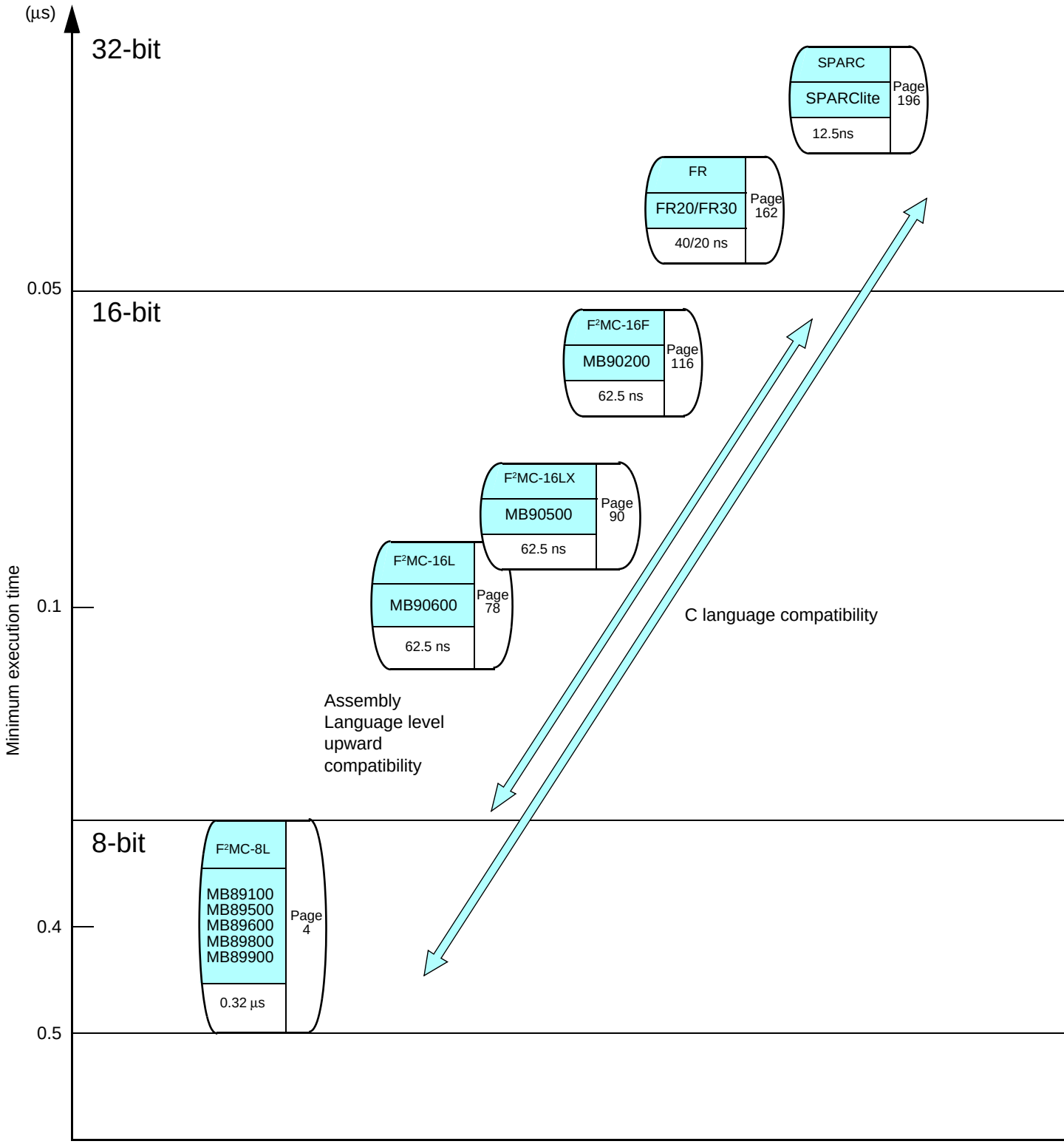
THE POSSIBILITIES ARE INFINITE

Product Line-up



Microcomputer Range

Microcomputer Migration Path



32-bit Microprocessor

- SPARClite

  A 32-bit RISC microprocessor aimed at embedded applications and based on the SPARC architecture

32-bit Microcontrollers

- FR (FR20 series, FR30 series)

  A proprietary Fujitsu product developed for embedded applications

  A microcontroller with a 32-bit RISC architecture

16-bit Microcontrollers

- F²MC-16L (MB90600 series)

  Features: Low voltage (+2.7V to +5.5V), low price

  Applications: For applications including information consumer products, communications, and OA

- F²MC-16LX (MB90500 series)

  Features: Supports high-performance, low-power consumption, large memory space

  Applications: For applications including consumer information products and telecommunications instruments

- F²MC-16F (MB90200 series)

  Features: Provides high-speed signed instructions and C language real time operating system instructions

  Applications: For high-speed real time control

8-bit Microcontrollers

- F²MC-8L (MB89100 series, MB89500 series, MB89600 series, MB89800 series, and MB89900 series)

  Features: Low voltage (+2.2V to +6.0V), low-power consumption

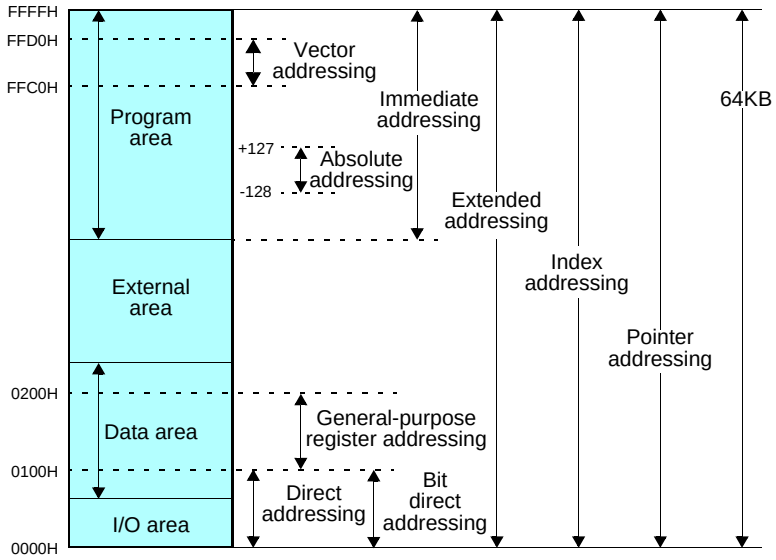
  Applications: 8-bit microcontrollers for consumer markets

8-bit Proprietary F²MC-8L Family Features

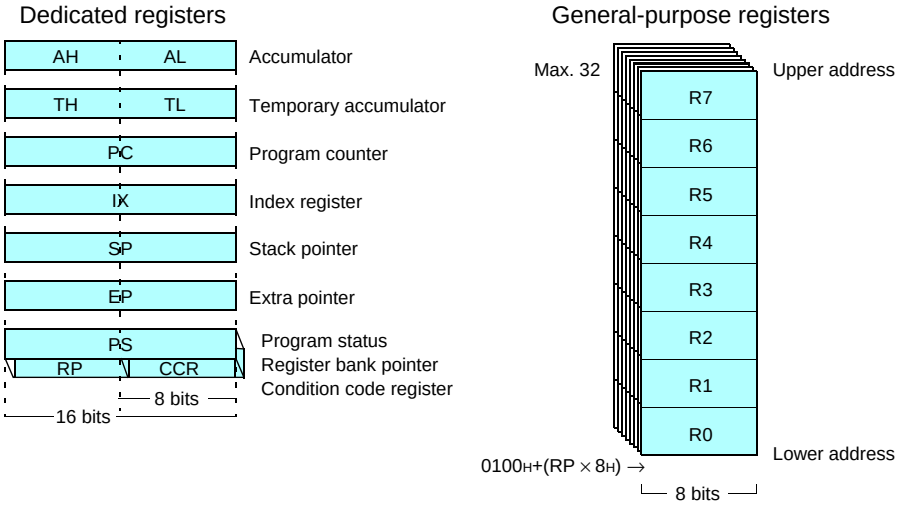
F²MC-8L Family Features

- Minimum execution time: 0.32µs/12.5MHz, 0.4 µs/10MHz, 0.95 µs/4.2 MHz
- Operating voltage: +2.2 V to +6.0 V, operating frequency: 1 MHz to 10 MHz
- Software-switchable instruction cycle (4 speeds) provides low voltage, low-power comsumption operation (clock gear function)
- Backup voltage in stop mode (voltage required to maintain RAM data): Min. +1.5 V
- Bitwise selectable pull-up resistors for each I/O port
- One-time PROM products support (by programming data) the same option settings as mask ROM products (the option settings are mask options for some products).
- Memory space: Max. 64 Kbytes

Memory space



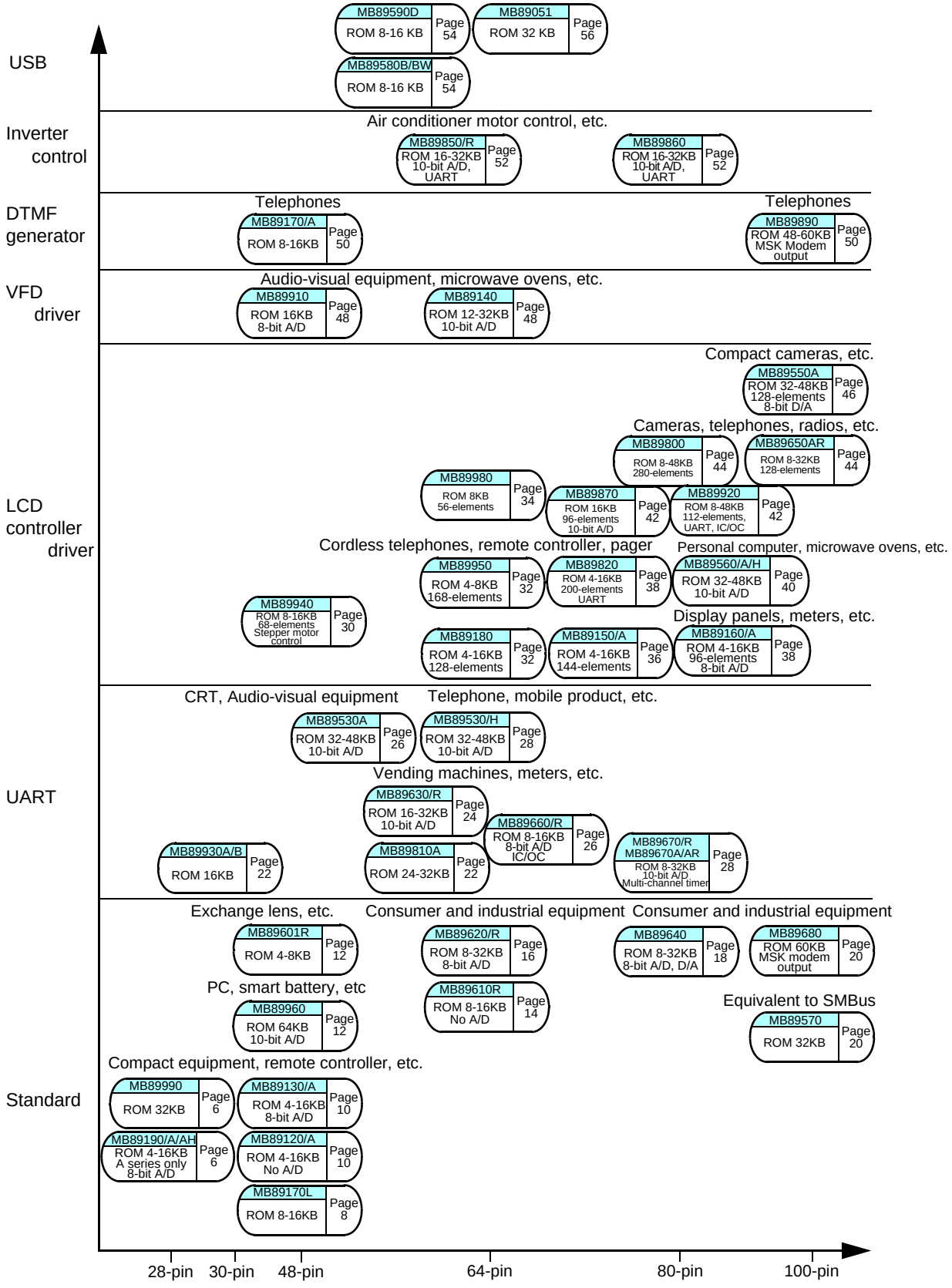
- Memory mapped I/O
- Registers
  Dedicated registers
  General-purpose registers: 8 × 8-bit per bank, Max. 32 banks



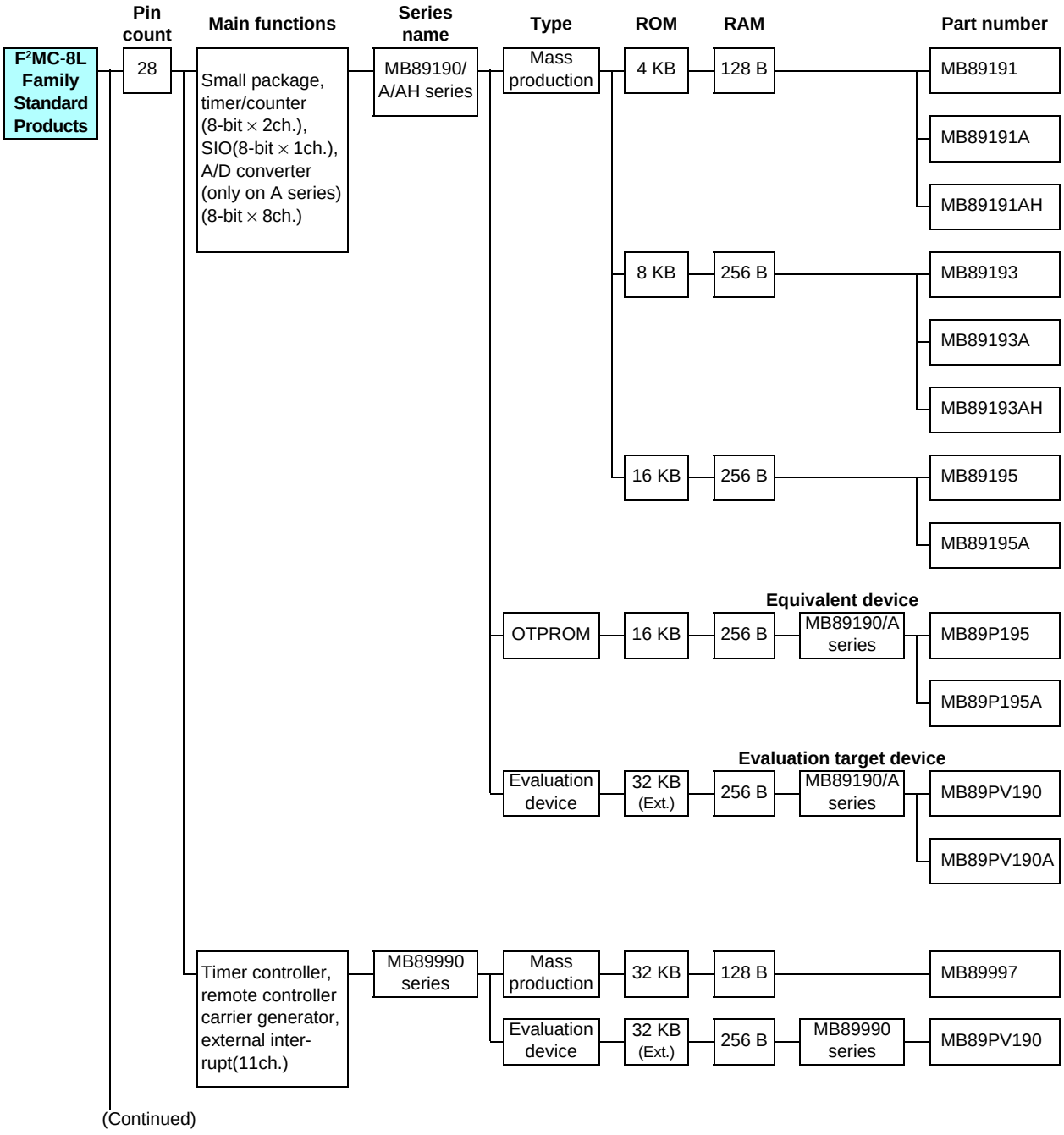
- Enhanced interrupt function (prioritized multiple interrupts)
- Powerful operation and transfer functions
  Multiplication and division instructions: 8-bit × 8-bit = 16-bit (7.6µs/10MHz), 16-bit ÷ 8-bit = 8-bit (8.4µs/10MHz)
  Data transfer: Max. 16-bit
- Number of instructions: 136

8-bit Proprietary F²MC-8L Family Product Range

F²MC-8L Family Product Range



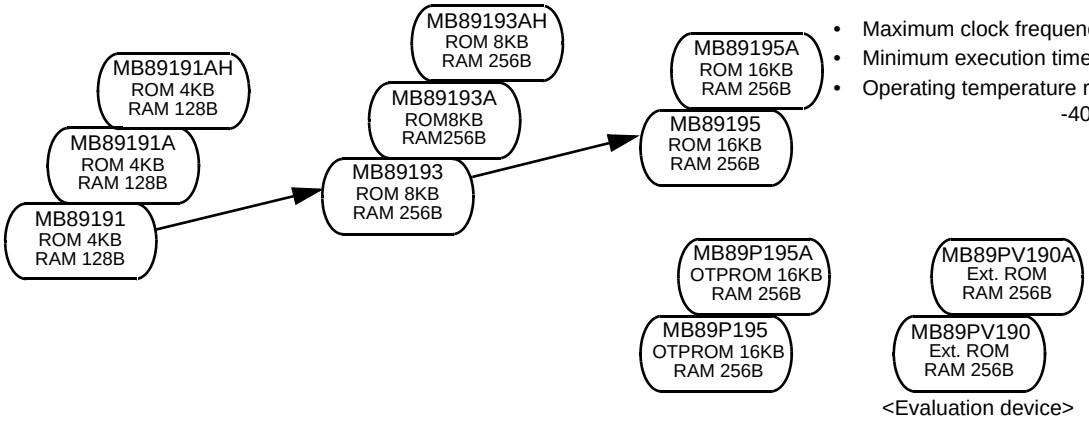
8-bit Proprietary F²MC-8L Family Standard Products



F²MC-8L Family Standard Products

MB89190/190A/190AH Series

Standard products (small package)



<Evaluation device>

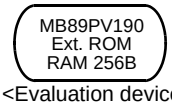
- Maximum clock frequency:4.2 MHz
- Minimum execution time:0.95 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package				Functions
		SH-DIP	DIP	SOP	MQFP	
MB89191	+2.2 to +6.0	28P	28P	28P	–	I/O ports: 22 (20 on MB89190A series) Timebase timer (WDT): 20-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) A/D converter: 8-bit × 8ch. (MB89190A series only) Remote controller carrier generator SIO : 8-bit × 1ch. Buzzer output Interrupts: 5 internal, 11 external Low-power consumption (standby functions)modes: Sleep, stop
MB89191A		28P	28P	28P	–	
MB89191AH		28P	28P	28P	–	
MB89193		28P	28P	28P	–	
MB89193A		28P	28P	28P	–	
MB89193AH		28P	28P	28P	–	
MB89195		28P	28P	28P	–	
MB89195A		28P	28P	28P	–	
MB89P195	+2.7 to +6.0	–	28P	28P	–	
MB89P195A		–	28P	28P	–	
MB89PV190		–	–	–	48C	
MB89PV190A		–	–	–	48C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

MB89990 Series

Standard products (remote controller, etc.)

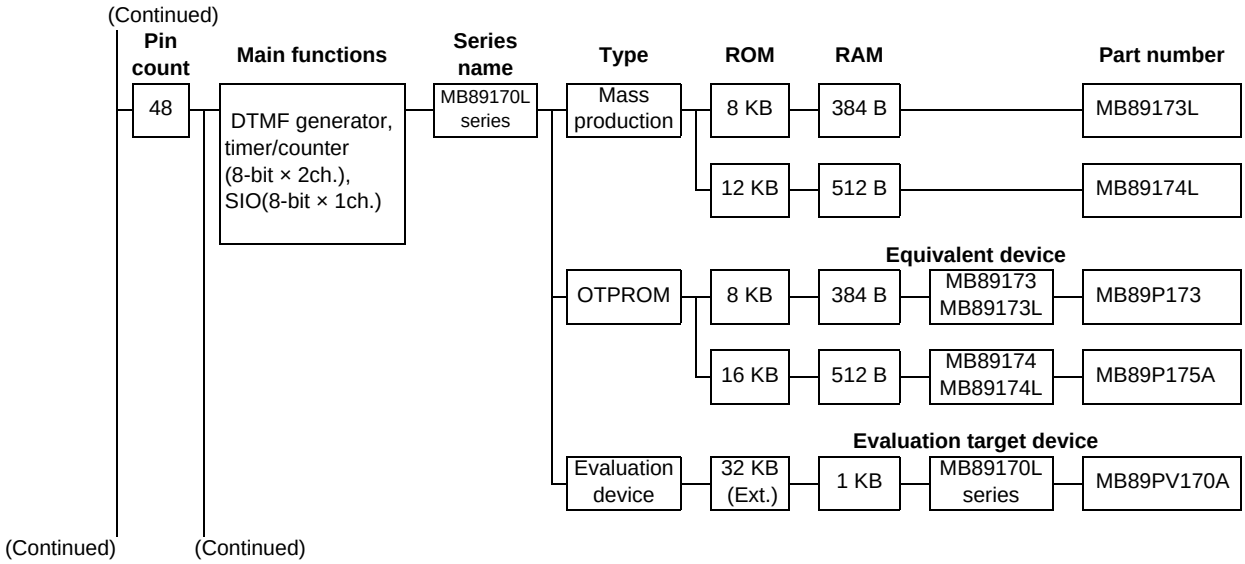


<Evaluation device>

- Maximum clock frequency:4.2 MHz
- Minimum execution time:0.95 µs
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage(V)	Package			Functions
		SH-DIP	SOP	MQFP	
MB89997	+2.2 to +6.0	28P	28P	–	I/O ports: 22 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 1ch. Remote controller carrier generator Interrupts: 3 internal,11 external Low-power consumption (standby functions)modes: Sleep, stop
MB89PV190	+2.7 to +6.0	–	–	48C	

Packages: P - plastic, C - ceramic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Pin count
Main functions
Series name
Type
ROM
RAM
Part number
48
DTMF generator, timer/counter (8-bit × 2ch.), SIO(8-bit × 1ch.)
MB89170L series
Mass production
8 KB
384 B
MB89173L
12 KB
512 B
MB89174L
Equivalent device
OTPROM
8 KB
384 B
MB89173 MB89173L
MB89P173
16 KB
512 B
MB89174 MB89174L
MB89P175A
Evaluation target device
Evaluation device
32 KB (Ext.)
1 KB
MB89170L series
MB89PV170A
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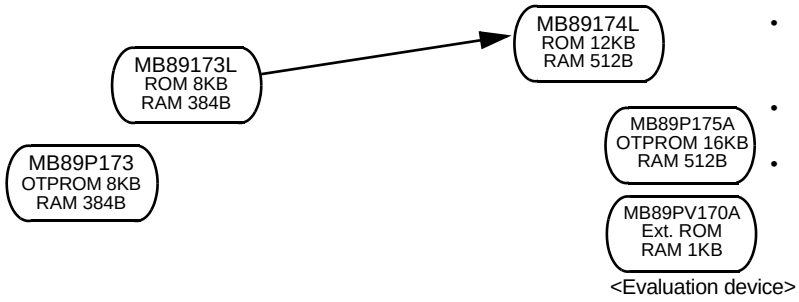
MB89170L Series

Standard products (low cost)



- Maximum clock frequency:
  3.58 MHz: MB89P173
  7.16 MHz: MB89173L/174L/P175A/PV170A
- Minimum execution time:
  0.6 µs to 17.6 µs
- Operating temperature range:
  -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	MQFP	
MB89173L	+2.2 to +6.0	48P	–	I/O ports: 37 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can also operate as 16-bit × 1ch.) SIO : 8-bit × 1ch. Clock prescaler: 15-bit Interrupts: 4 internal,11 external Low-power consumption (standby functions) modes:Sleep,stop
MB89174L		48P	–	
MB89P173	+2.7 to +6.0	48P	–	
MB89P175A		48P	–	
MB89PV170A		–	48C	

Packages: P - plastic, C - ceramic

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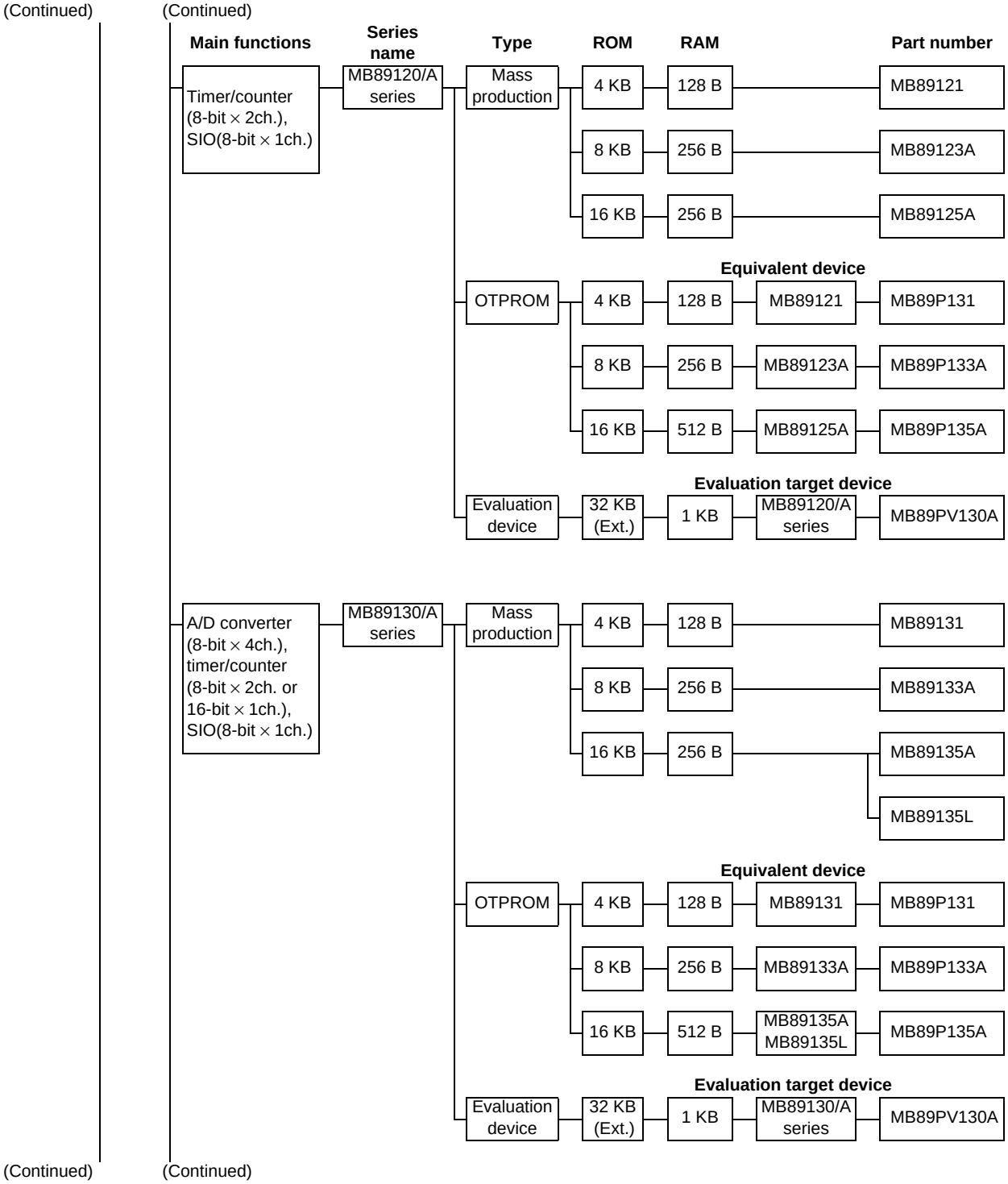

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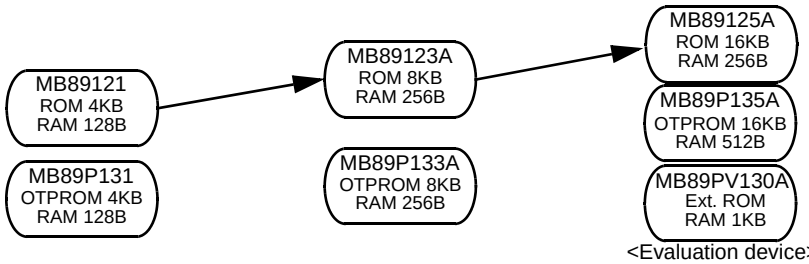
MB89120/120A Series

Standard products (low cost)



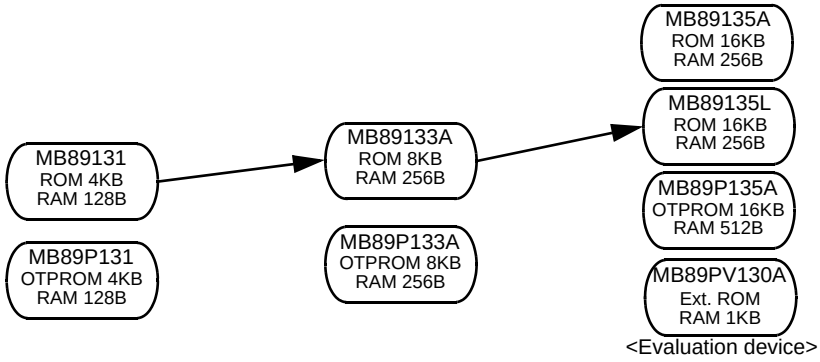
- Maximum clock frequency: 4.2 MHz (32.768 kHz)
- Minimum execution time: 0.95 µs to 1.53 µs (61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	MQFP	
MB89121	+2.2 to +6.0	48P	–	I/O ports: 36 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) Remote control carrier generator (on MB89123A/125A/P133A, not included on MB89121/P131) SIO : 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 4 internal, 3 external (MB89121/P131) 4 internal, 11 external (MB89123A/125A/ P133A) Low-power consumption (standby functions)modes:Sleep, watch, stop, sub
MB89123A		48P	–	
MB89125A		48P	–	
MB89P131	+2.7 to +6.0	48P	–	
MB89P133A		48P	–	
MB89P135A		48P	–	
MB89PV130A		–	48C	

Packages: P - plastic, C - ceramic

MB89130/130A Series

Standard products (built-in A/D converter, low cost)



- Maximum clock frequency: 8MHz (MB89135L) 4.2 MHz (32.768 kHz)
- Minimum execution time: 0.5µs(MB89135L) 0.95 µs to 1.53 µs(61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package			Functions
		SH-DIP	QFP	MQFP	
MB89131	+2.2 to +6.0	–	48P	–	I/O ports: 36 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) A/D converter: 8-bit × 4ch. Remote control carrier generator (on MB89133A/135A/135L/ P133A, not included on MB89131/P131) SIO : 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 5 internal, 3 external (MB89131/P131) 5 internal, 11 external (MB89133A/135A/135L/ P133A) Low-power consumption (standby functions)modes:Sleep, watch, stop, sub
MB89133A		48P	48P	–	
MB89135A		–	48P	–	
MB89135L	+1.8 to +6.0	–	48P	–	
MB89P131	+2.7 to +6.0	–	48P	–	
MB89P133A		48P	48P	–	
MB89P135A		–	48P	–	
MB89PV130A		–	–	48C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

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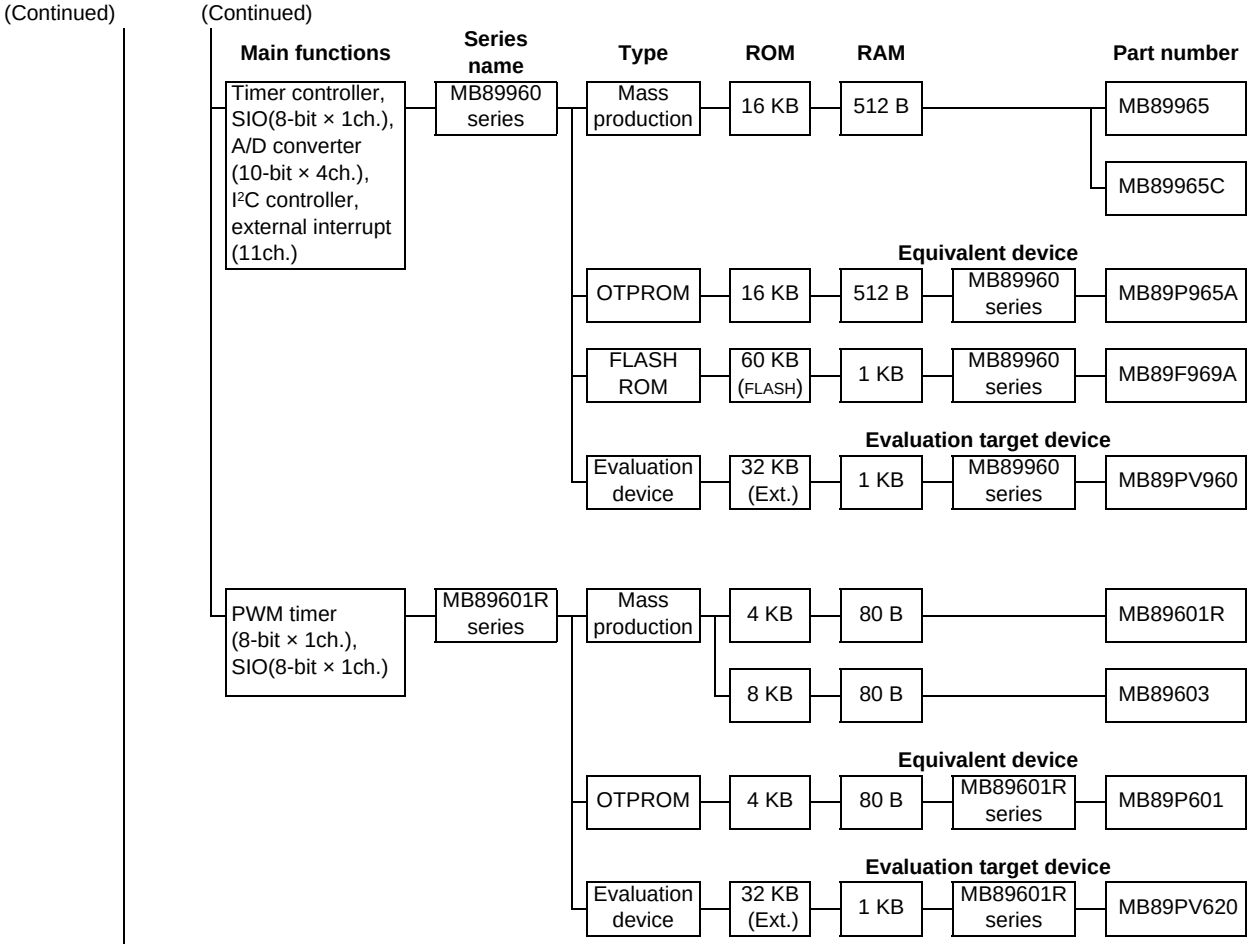

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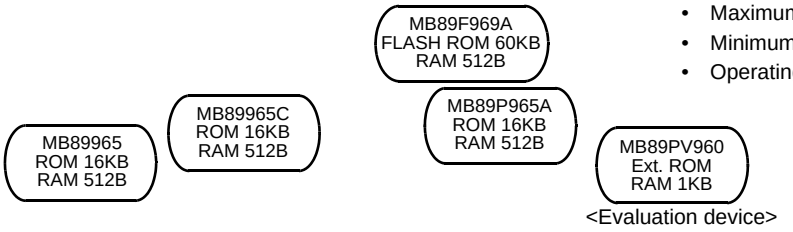
MB89960 Series

Standard products (built-in A/D converter, low cost)



<Evaluation device>

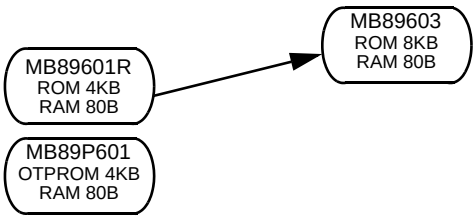
- Maximum clock frequency: 10 MHz (32.768kHz)
- Minimum execution time: 0.4 µs (61µs)
- Operating temperature range:-40°C to +85°C

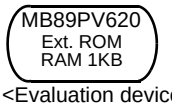
Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	MQFP	
MB89965	+3.5 to +5.5	48P (□ 7 × 7mm)	48P (□ 10 × 10mm, □ 12 × 12mm)	–	I/O ports: 35 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. SIO : 8-bit × 1ch. A/D converter: 10-bit × 4ch. I²C bus interface: (built into MB89965C/P965A/ F969A /PV960, equivalent to SMBus Rev 1.0) Interrupts: 7 internal, 11 external Low-power consumption (standby functions) modes : Sleep,watch,stop,sub
MB89965C		48P (□ 7 × 7mm)	48P (□ 10 × 10mm, □ 12 × 12mm)	–	
MB89P965A	+3.5 to +5.5	48P (□ 7 × 7mm)	48P (□ 10 × 10mm, □ 12 × 12mm)	–	
MB89F969A		64P (□ 12 × 12mm)	–	–	
MB89PV960		–	–	48C	

Packages: P - plastic, C - ceramic

MB89601R Series

Standard products (small package)



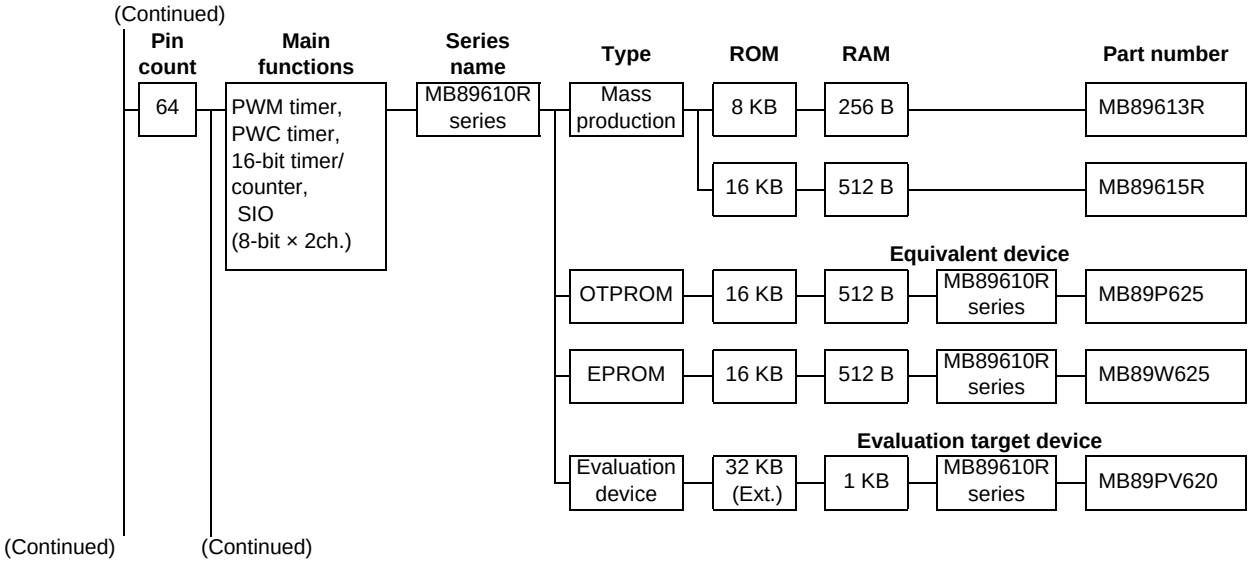


<Evaluation device>

- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	MDIP	MQFP	
MB89601R	+2.2 to +6.0	48P	–	–	I/O ports: 33 Timebase timer (WDT): 20-bit × 1ch. PWM timer: 8-bit × 1ch. SIO : 8-bit × 1ch. Interrupts: 3 internal, 1 external Low-power consumption (standby functions)modes: Sleep,stop
MB89603		48P	–	–	
MB89P601	+2.7 to +6.0	48P	–	–	
MB89PV620		–	64C	64C	

Packages: P - plastic, C - ceramic


(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
64
PWM timer, PWC timer, 16-bit timer/ counter, SIO (8-bit × 2ch.)
MB89610R series
Mass production
8 KB
256 B
MB89613R
16 KB
512 B
MB89615R
Equivalent device
OTPROM
16 KB
512 B
MB89610R series
MB89P625
EPROM
16 KB
512 B
MB89610R series
MB89W625
Evaluation target device
Evaluation device
32 KB (Ext.)
1 KB
MB89610R series
MB89PV620
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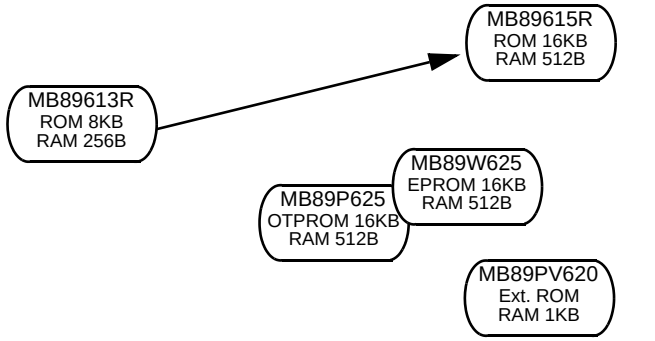
MB89610R Series

Standard products (general-purpose type)



<Evaluation device>

- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package					Functions
		DIP	QFP	LQFP	MDIP	MQFP	
MB89613R	+2.2 to +6.0	64P	64P	64P (0.5 mm pitch, 0.65mm pitch)	–	–	I/O ports: 53 Timebase timer (WDT): 20-bit × 1ch. Timer/counter: 16-bit × 1ch. PWM timer: 8-bit × 1ch. PWC timer: 8-bit × 1ch. SIO : 8-bit × 2ch. Buzzer output Interrupts: 6 internal, 4 external Low-power consumption (standby functions) modes: Sleep, stop
MB89615R		64P	64P		–	–	
MB89P625	+2.7 to +6.0	64P	64P	64P (0.65 mm pitch)	–	–	
MB89W625		64C	–	–	–	–	
MB89PV620		–	–	–	64C	64C	

Packages: P - plastic, C - ceramic

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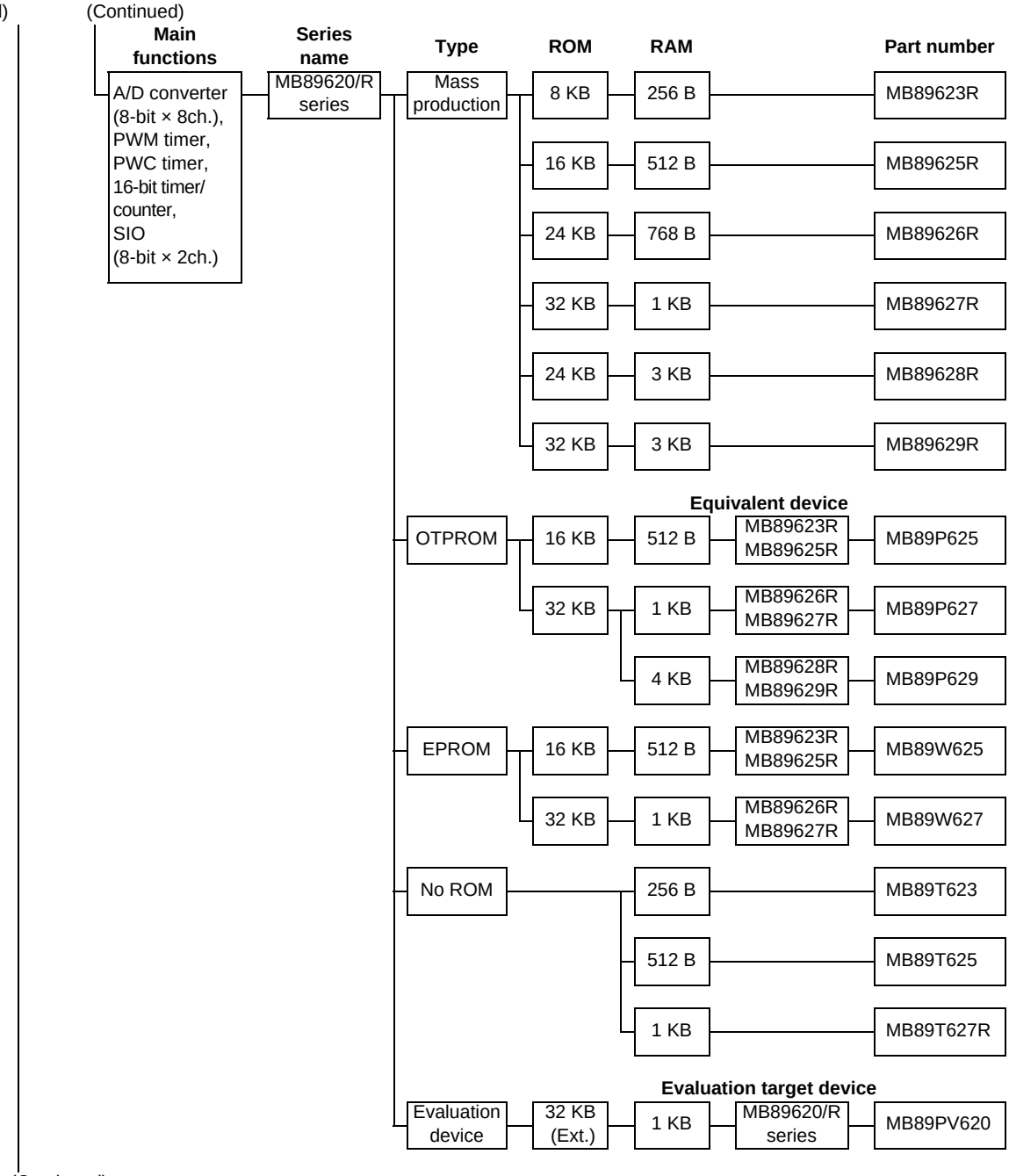

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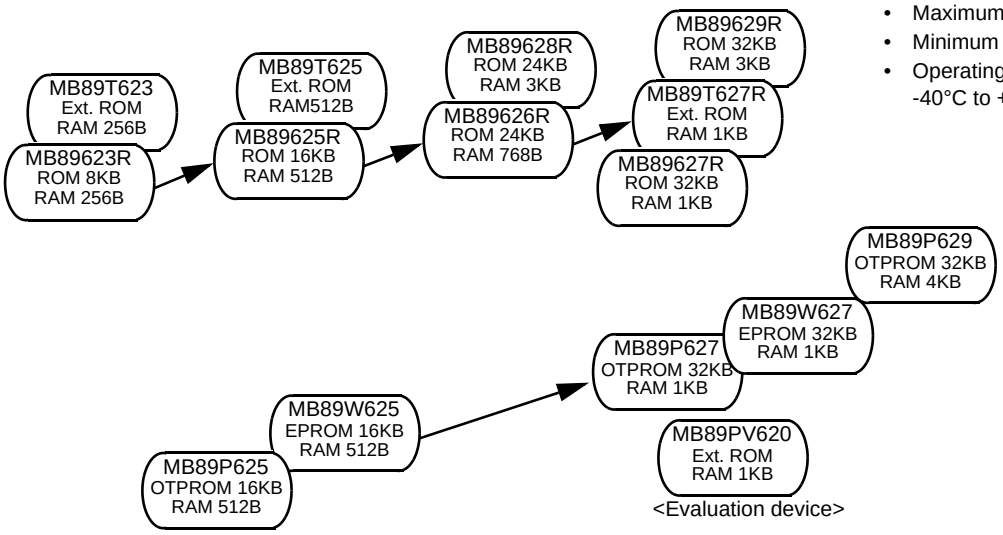
MB89620/620R Series

Standard products (built-in A/D converter)



- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package					Functions
		SH-DIP	QFP	LQFP	MDIP	MQFP	
MB89623R	+2.2 to +6.0	64P	64P	64P (0.5 mm pitch)	–	–	I/O ports: 53 Timebase timer(WDT): 20-bit × 1ch. Timer/counter: 16-bit × 1ch. PWM timer: 8-bit × 1ch. PWC timer: 8-bit × 1ch. A/D converter: 8-bit × 8ch. SIO : 8-bit × 2ch. Buzzer output Interrupts: 7 internal, 4 external Low-power consumption (standby functions) modes: Sleep, stop
MB89625R		64P	64P		–	–	
MB89626R		64P	64P	64P (0.65 mm pitch)	–	–	
MB89627R		64P	64P		–	–	
MB89628R		64P	64P	–	–	–	
MB89629R		64P	64P	–	–	–	
MB89T623	+2.7 to +6.0	64P	64P	64P	–	–	
MB89T625		64P	64P	64P	–	–	
MB89T627R		64P	64P	64P (0.65 mm pitch)	–	–	
MB89P625		64P	64P		–	–	
MB89P627		64P	64P		–	–	
MB89P629		64P	64P	–	–	–	
MB89W625		64C	–	–	–	–	
MB89W627		64C	–	–	–	–	
MB89PV620		–	–	–	64C	64C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

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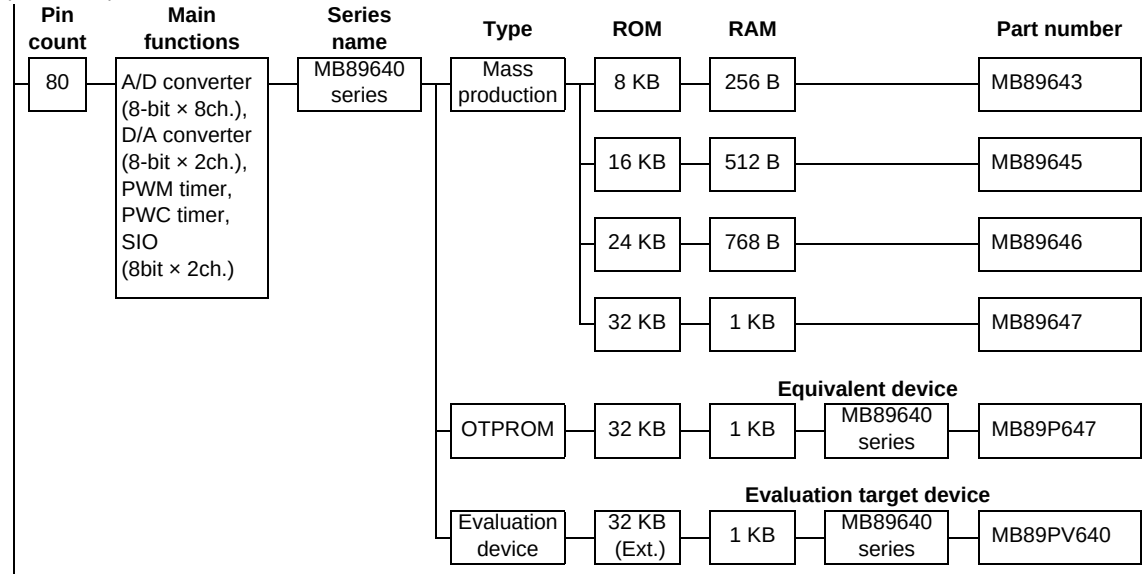

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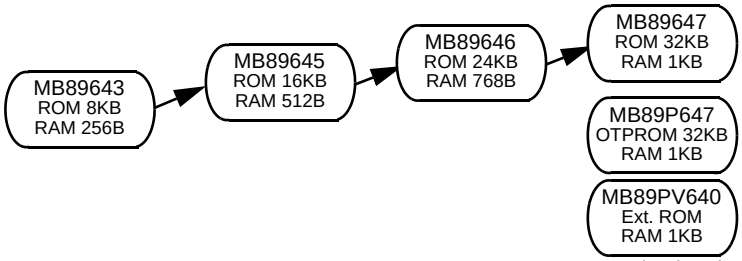
MB89640 Series

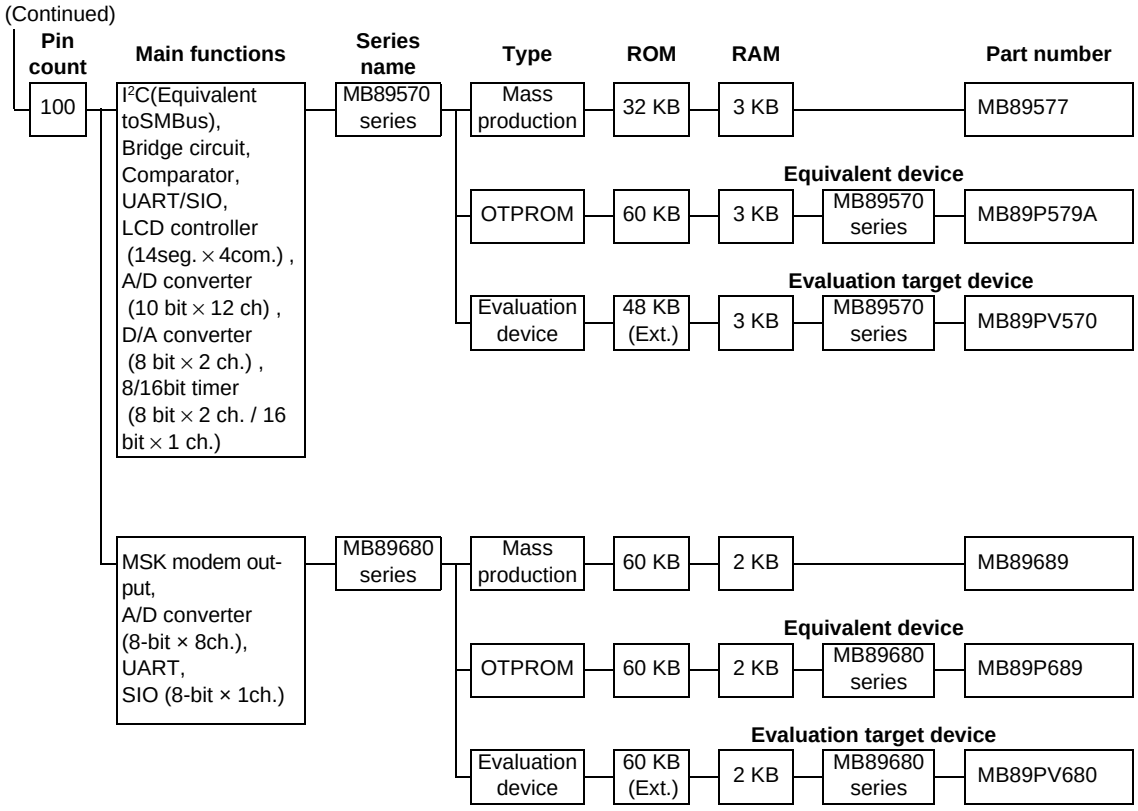
Standard products (built-in A/D, D/A converter)



- Maximum clock frequency: 10 MHz (32.768 kHz)
- Minimum execution time: 0.4 µs to 6.4 µs (61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package			Functions
		QFP	LQFP	MQFP	
MB89643	+2.2 to +6.0	80P	80P	–	I/O ports: 65 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 16-bit × 1ch. PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. A/D converter: 8-bit × 8ch. D/A converter: 8-bit × 2ch. SIO : 8-bit × 2ch. Clock prescaler: 15-bit Buzzer output function Interrupts: 9 internal, 9 external Low-power consumption (standby functions) modes: Sleep, watch,stop,sub
MB89645		80P	80P	–	
MB89646		80P	80P	–	
MB89647		80P	80P	–	
MB89P647	+2.7 to +6.0	80P	80P	–	
MB89PV640		–	–	80C	

*: A/D = D/A = 3.5V to 6.0V
Packages: P - plastic, C - ceramic


(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
100
I²C(Equivalent toSMBus), Bridge circuit, Comparator, UART/SIO, LCD controller (14seg. × 4com.) , A/D converter (10 bit × 12 ch) , D/A converter (8 bit × 2 ch.) , 8/16bit timer (8 bit × 2 ch. / 16 bit × 1 ch.)
MB89570 series
Mass production
32 KB
3 KB
MB89577
Equivalent device
OTPROM
60 KB
3 KB
MB89570 series
MB89P579A
Evaluation target device
Evaluation device
48 KB (Ext.)
3 KB
MB89570 series
MB89PV570
MSK modem out-put, A/D converter (8-bit × 8ch.), UART, SIO (8-bit × 1ch.)
MB89680 series
Mass production
60 KB
2 KB
MB89689
Equivalent device
OTPROM
60 KB
2 KB
MB89680 series
MB89P689
Evaluation target device
Evaluation device
60 KB (Ext.)
2 KB
MB89680 series
MB89PV680

MB89570 Series

Standard products

<Evaluation device>

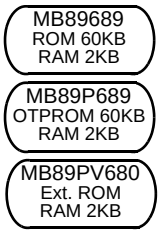
- Maximum clock frequency:10 MHz (32.768 kHz)
- Minimum execution time:0.40 µs
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage(V)	Package			Functions
		QFP	LQFP	MQFP	
MB89577	+2.7 to +3.7	100P	100P	–	I/O ports: 82 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) I²C(Equivalent toSMBus): 1ch. SIO/UART: 1ch. A/D converter: 10-bit × 12ch. D/A converter: 8-bit × 2ch. LCD controller: 56 elements, 10 to 14 segments, 2 to 4 common 7 × 8-bit LCD display RAM Comparator Interrupts: 4 external Low-power consumption (standby functions) modes: Sleep, watch,stop,sub
MB89P579A		100P	100P	–	
MB89PV570		–	–	100C	

Packages: P - plastic, C - ceramic

MB89680 Series

Standard products (100-pin, MSK modem output)



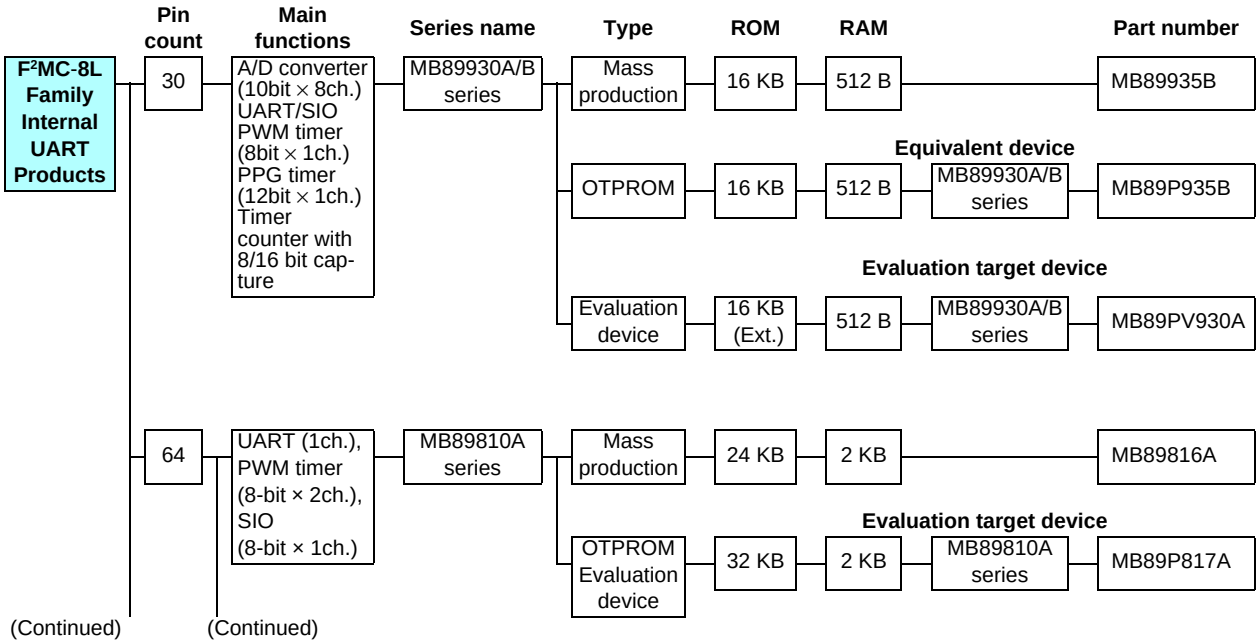
<Evaluation device>

- Maximum clock frequency:
  8 MHz (32.768 kHz)
- Minimum execution time:
  0.5 µs to 8.0 µs (61 µs)
- Operating temperature range:
  -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package		Functions
		QFP	MQFP	
MB89689	+2.2 to +6.0	100P	–	I/O ports: 85 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) PWM timer: 8-bit × 1ch. A/D converter: 8-bit × 8ch. SIO : 8-bit × 1ch. UART: 6-bit to 9-bit × 1ch. MSK software modem output: 1200 bps, 2400 bps MSK software modem timer: 1ch. (built-in noise reduction circuit) Clock prescaler: 15-bit Interrupts: 10 internal, 16 external Low-power consumption (standby functions) modes:Sleep, watch, stop, sub
MB89P689	+2.7 to +6.0	100P	–	
MB89PV680		–	100C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

8-bit Proprietary F²MC-8L Family Internal UART Products



F²MC-8L Family UART Products

MB89930A/B Series

Standard products (built-in UART, compact type)

MB89935B
ROM 16KB
RAM 512B

MB89P935B
OTPROM 16KB
RAM 512B

MB89PV930A
Ext. ROM
RAM 512B
<Evaluation device>

- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		SSOP	MQFP	
MB89935B	+2.2 to +5.5	30P	–	I/O ports: 21 A/D converter: 10bit × 8ch. UART/SIO: 1ch. PWM timer: 8-bit × 1ch. PPG timer: 12bit × 1ch. Timer counter with 8/16 bit capture Timebase timer: 21bit × 1ch. Interrupts: 11 external Low-power consumption (standby functions) modes: Sleep, stop
MB89P935B	+3.0 to +5.5	30P	–	
MB89PV930A	+2.7 to +5.5	–	48C	

Packages: P - plastic

MB89810A Series

Standard products (built-in UART, large memory 8-bit microcontroller)

MB89816A
ROM 24KB
RAM 2KB

MB89P817A
OTPROM 32KB
RAM 2KB

- Maximum clock frequency: 5 MHz (32.768 kHz)
- Minimum execution time: 0.8 µs (61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package	Functions
		QFP	
MB89816A	+2.2 to +6.0	64P	I/O ports: 53 Timebase timer (WDT): 20-bit × 1 ch. Timer/counter: 16-bit × 1ch. PWM timer: 8-bit × 2ch. SIO: 8-bit × 1ch. UART: 5-, 7- or 8-bit × 1 ch. Clock prescaler: 12-bit Interrupts: 7 internal, 8 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89P817A	+2.7 to +6.0	64P	

Packages: P - plastic

(Continued)

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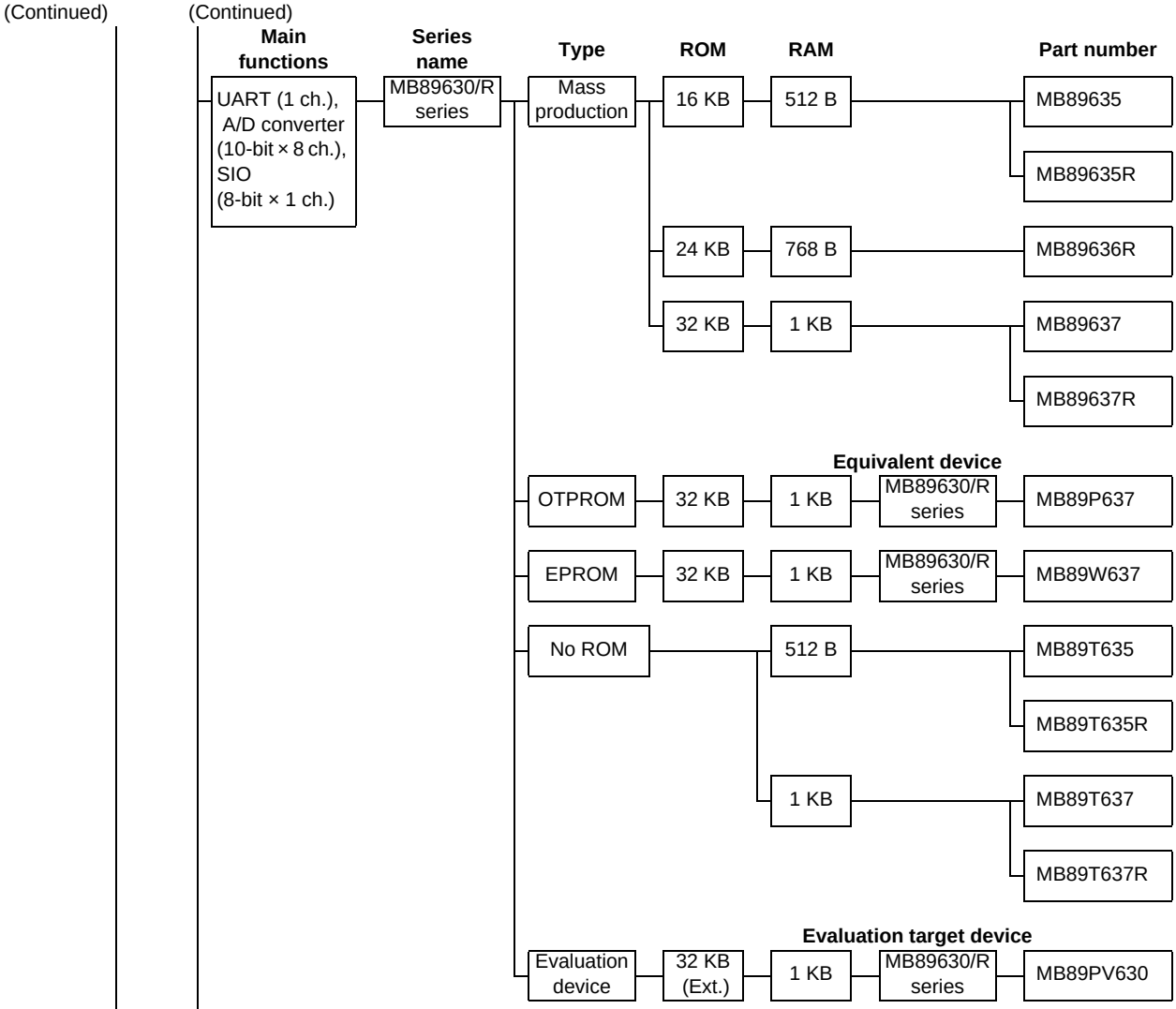

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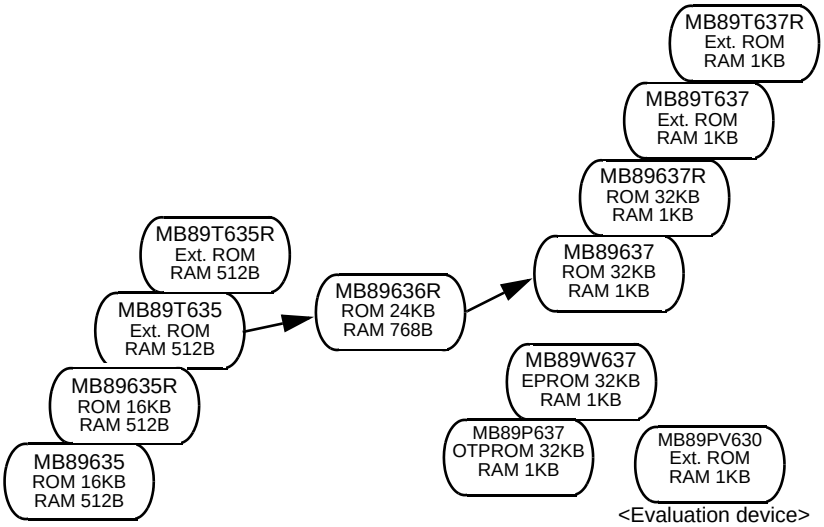
MB89630/630R Series

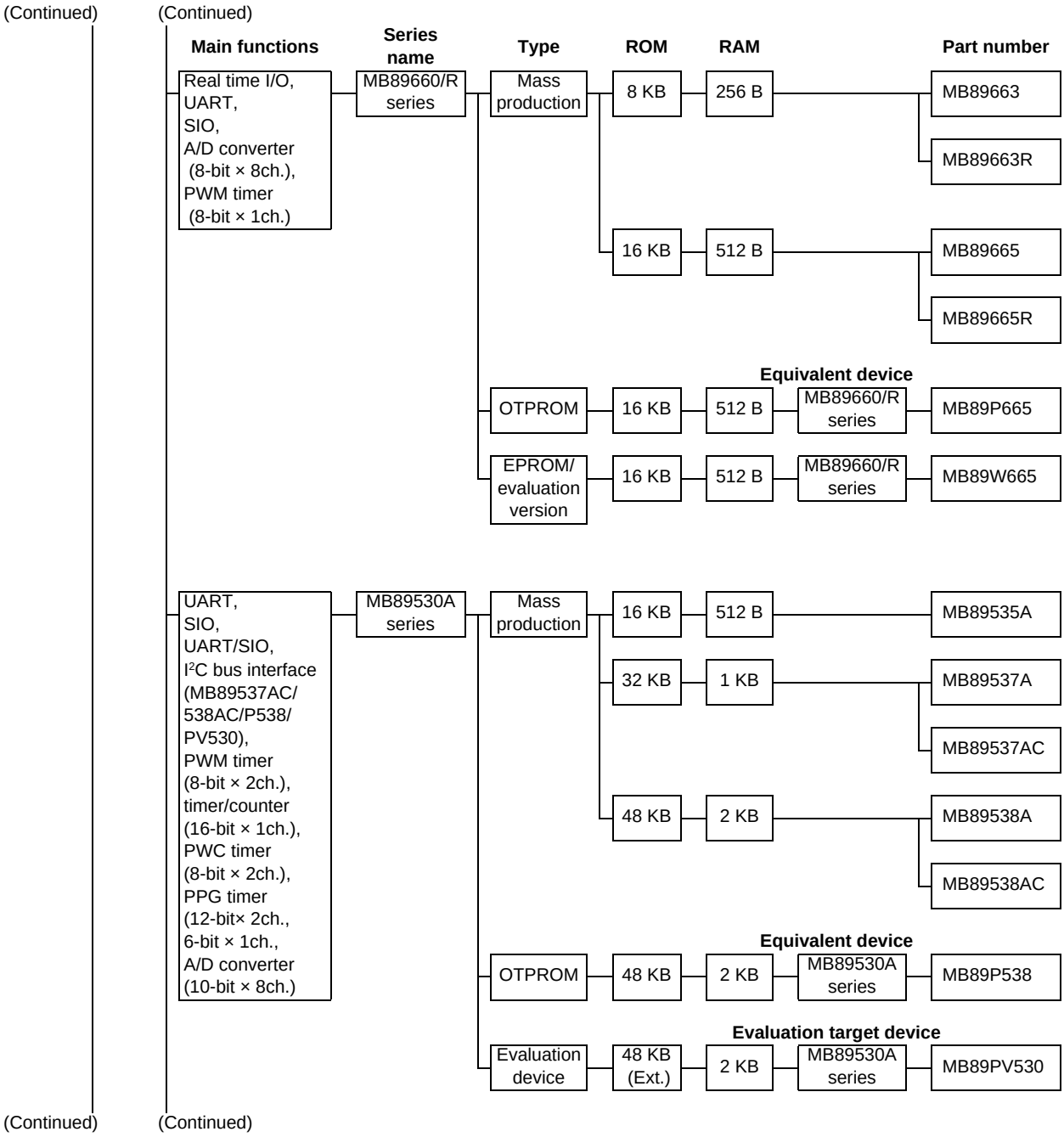
Standard products (A/D converter, built-in UART)



- Maximum clock frequency: 10 MHz (32.768 kHz)
- Minimum execution time: 0.4 µs to 6.4 µs (61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package					Functions
		SH-DIP	QFP	LQFP	MDIP	MQFP	
MB89635	+2.2 to +6.0	64P	64P	64P	–	–	I/O ports: 53 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 16-bit × 1ch. PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. A/D converter: 10-bit × 8ch. SIO: 8-bit × 1ch. UART: 8-bit × 1ch. (switchable between two I/O ports) Clock prescaler: 15-bit Buzzer output Interrupts: 10 internal, 4 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89635R		64P	64P	64P	–	–	
MB89636R		64P	64P	64P	–	–	
MB89637		64P	64P	64P	–	–	
MB89637R		64P	64P	64P	–	–	
MB89P637	+2.7 to +6.0	64P	64P	–	–	–	
MB89W637		64C	–	–	–	–	
MB89T635		64P	64P	64P	–	–	
MB89T635R		64P	64P	64P	–	–	
MB89T637		64P	64P	64P	–	–	
MB89T637R		64P	64P	64P	–	–	
MB89PV630		–	–	–	64C	64C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic


(Continued)
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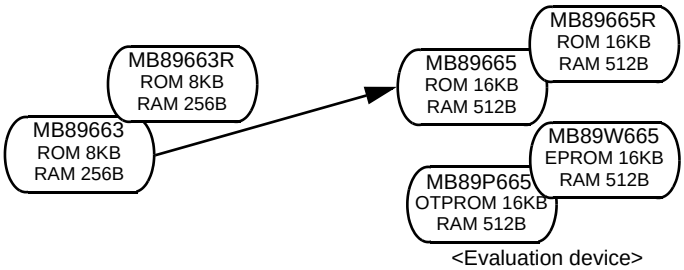
Main functions
Series name
Type
ROM
RAM
Part number
Real time I/O, UART, SIO, A/D converter (8-bit × 8ch.), PWM timer (8-bit × 1ch.)
MB89660/R series
Mass production
8 KB
256 B
MB89663
MB89663R
16 KB
512 B
MB89665
MB89665R
Equivalent device
OTPROM
16 KB
512 B
MB89660/R series
MB89P665
EPROM/ evaluation version
16 KB
512 B
MB89660/R series
MB89W665
UART, SIO, UART/SIO, I²C bus interface (MB89537AC/ 538AC/P538/ PV530), PWM timer (8-bit × 2ch.), timer/counter (16-bit × 1ch.), PWC timer (8-bit × 2ch.), PPG timer (12-bit× 2ch., 6-bit × 1ch., A/D converter (10-bit × 8ch.)
MB89530A series
Mass production
16 KB
512 B
MB89535A
32 KB
1 KB
MB89537A
MB89537AC
48 KB
2 KB
MB89538A
MB89538AC
Equivalent device
OTPROM
48 KB
2 KB
MB89530A series
MB89P538
Evaluation target device
Evaluation device
48 KB (Ext.)
2 KB
MB89530A series
MB89PV530
(Continued)
(Continued)

MB89660/660R Series

Standard products (for real-time pulse I/O control)



<Evaluation device>

- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs
- Operating temperature range: -40°C to +85°C

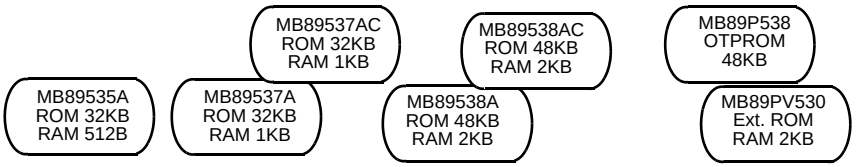
Part number	Operating power supply voltage* (V)	Package		Functions
		SH-DIP	QFP	
MB89663	+2.2 to +6.0	64P	64P	I/O ports: 52 Timebase timer (WDT): 20-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) PWM timer: 8-bit × 1ch. A/D converter: 8-bit × 8ch. SIO: 8-bit × 1ch. Real time I/O 16-bit timer: Operating clock frequency (0.4, 0.8, 1.6, or 3.2 µs), Overflow interrupt Input capture: 16-bit × 2ch. (external trigger edge selection) Output compare: 16-bit × 2ch. UART: 7-bit to 9-bit × 1ch. Interrupts: 11 internal, 4 external Low-power consumption (standby functions) modes: Sleep, stop, hardware standby
MB89663R		64P	64P	
MB89665		64P	64P	
MB89665R		64P	64P	
MB89P665	+2.7 to +6.0	64P	64P	
MB89W665		64C	–	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

MB89530A Series

Standard products (telephones, mobileproducts, etc.)

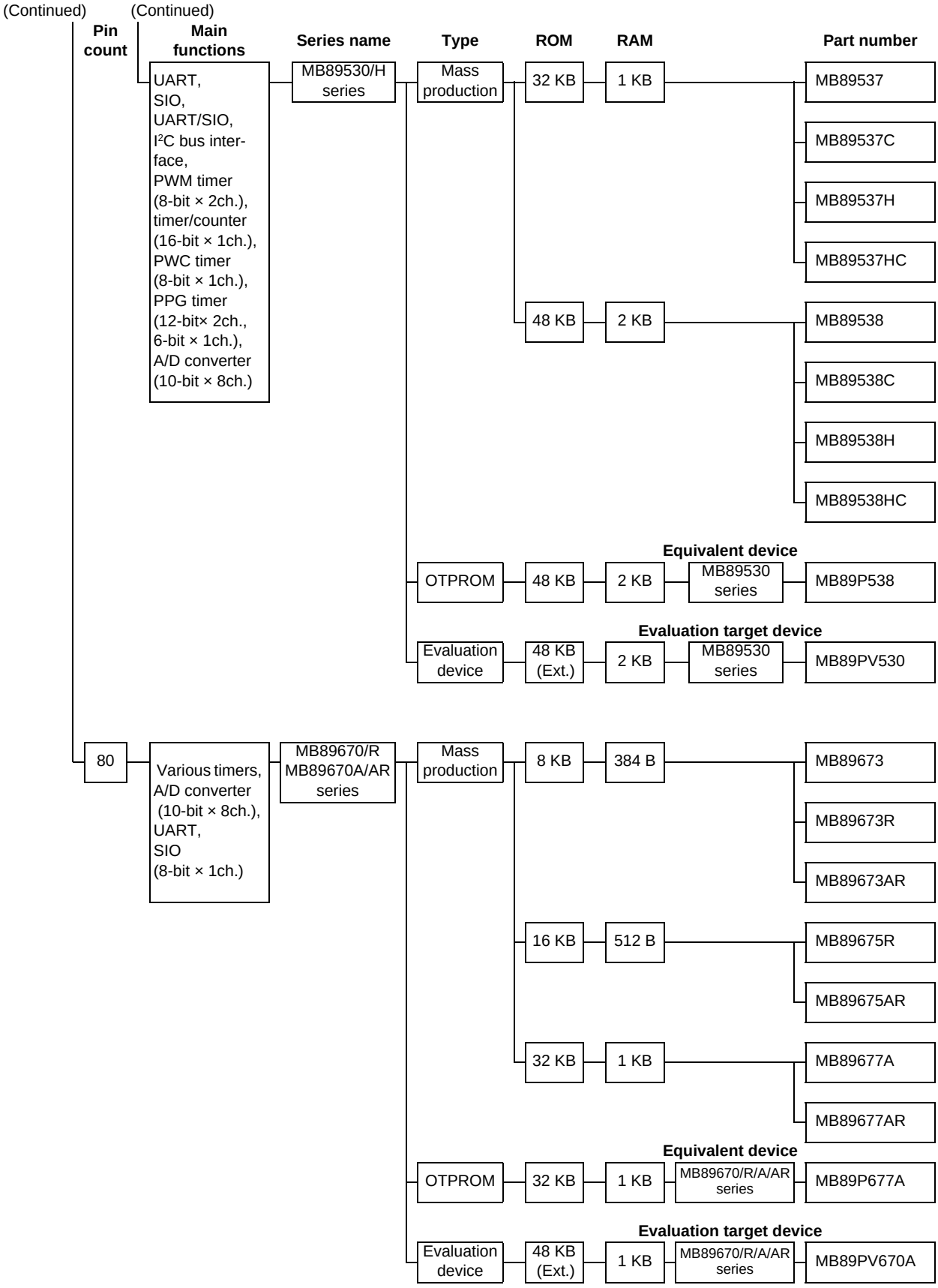
- Maximum clock frequency : 12.5 MHz (32.768 kHz)
- Minimum execution time : 0.32 µs (61µs)
- Operating temperature range : -40°C to +85°C



<Evaluation device>

Part number	Operating power supply voltage (V)	Package				Functions
		SDIP	QFP	LQFP	MQFP	
MB89535A	+2.2 to +5.5	64P	64P	64P (0.5 mm pitch, 0.65 mm pitch)	–	I/O ports: 53 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 16bit × 1ch. PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. PPG timer: 12-bit × 2ch. , 6-bit × 1ch. A/D converter: 10-bit × 8ch. I²C bus interface (built into MB89537AC/538AC/P538/PV530) SIO/UART × 1ch., SIO × 1ch., UART × 1ch UART/Serial interface Interrupts: 12 external Low-power consumption (standby functions) modes: Sleep, stop, watch, sub
MB89537A		64P	64P		–	
MB89537AC		64P	64P		–	
MB89538A		64P	64P		–	
MB89538AC		64P	64P		–	
MB89P538	+2.7 to +5.5	64P	64P	64P (0.65 mm pitch)	–	
MB89PV530		64C	–	–	64C	

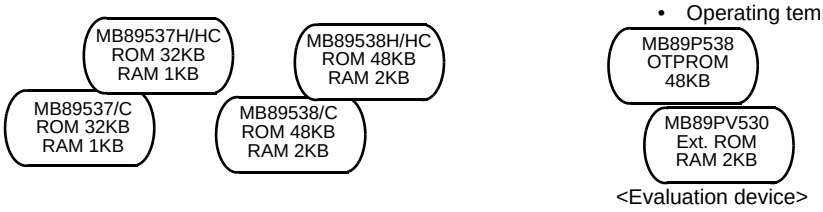
Packages:P - plastic, C - ceramic


(Continued)
(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
UART, SIO, UART/SIO, I²C bus interface, PWM timer (8-bit × 2ch.), timer/counter (16-bit × 1ch.), PWC timer (8-bit × 1ch.), PPG timer (12-bit× 2ch., 6-bit × 1ch.), A/D converter (10-bit × 8ch.)
MB89530/H series
Mass production
32 KB
1 KB
MB89537
MB89537C
MB89537H
MB89537HC
48 KB
2 KB
MB89538
MB89538C
MB89538H
MB89538HC
Equivalent device
OTPROM
48 KB
2 KB
MB89530 series
MB89P538
Evaluation target device
Evaluation device
48 KB (Ext.)
2 KB
MB89530 series
MB89PV530
80
Various timers, A/D converter (10-bit × 8ch.), UART, SIO (8-bit × 1ch.)
MB89670/R MB89670A/AR series
Mass production
8 KB
384 B
MB89673
MB89673R
MB89673AR
16 KB
512 B
MB89675R
MB89675AR
32 KB
1 KB
MB89677A
MB89677AR
Equivalent device
OTPROM
32 KB
1 KB
MB89670/R/A/AR series
MB89P677A
Evaluation target device
Evaluation device
48 KB (Ext.)
1 KB
MB89670/R/A/AR series
MB89PV670A

MB89530/530H Series

Standard products (telephones, mobileproducts, etc.)

- Maximum clock frequency: 12.5 MHz (32.768 kHz)
- Minimum execution time: 0.32 µs (61µs)
- Operating temperature range: -40°C to +85°C



<Evaluation device>

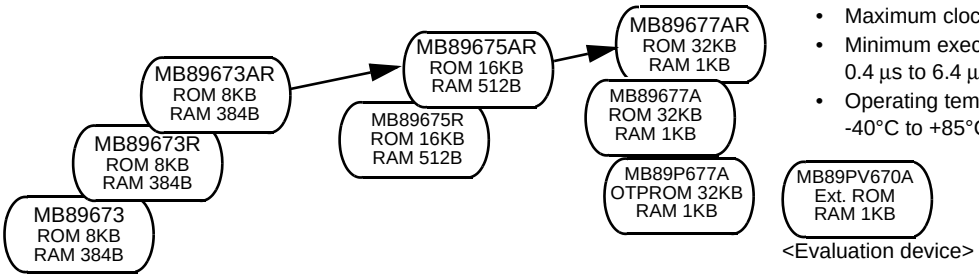
Part number	Operating power supply voltage (V)	Package				Functions
		SDIP	QFP	LQFP	MQFP	
MB89537	+2.2 to +3.6	64P	64P	64P (0.5 mm pitch, 0.65 mm pitch)	–	I/O ports: 51 Timebase timer (WDT): 21-bit × 1 ch. Timer/counter: 16bit × 1ch. PWM timer: 8-bit × 2 ch. PWC timer: 8-bit × 1 ch. PPG timer: 12-bit × 2ch. , 6-bit × 1 ch. A/D converter: 10-bit × 8 ch. I²C bus interface (built into MB89537C/537HC/538C/538HC/P538/PV530) UART: 1 ch. SIO: 1 ch. UART/SIO: 1 ch. Interrupts: 10 internal, 12 external Low-power consumption (standby functions) modes : Sleep, stop, watch, sub
MB89537C		64P	64P		–	
MB89537H	+3.5 to +5.5	64P	64P		–	
MB89537HC		64P	64P		–	
MB89538	+2.2 to +3.6	64P	64P		–	
MB89538C		64P	64P		–	
MB89538H	+3.5 to +5.5	64P	64P		–	
MB89538HC		64P	64P		–	
MB89P538	+2.7 to +5.5	64P	64P	64P (0.65 mm pitch)	–	
MB89PV530		64C	–	–	64C	

Packages:P - plastic, C - ceramic

MB89670/670R/670A/670AR Series

Standard products (multi function timer)

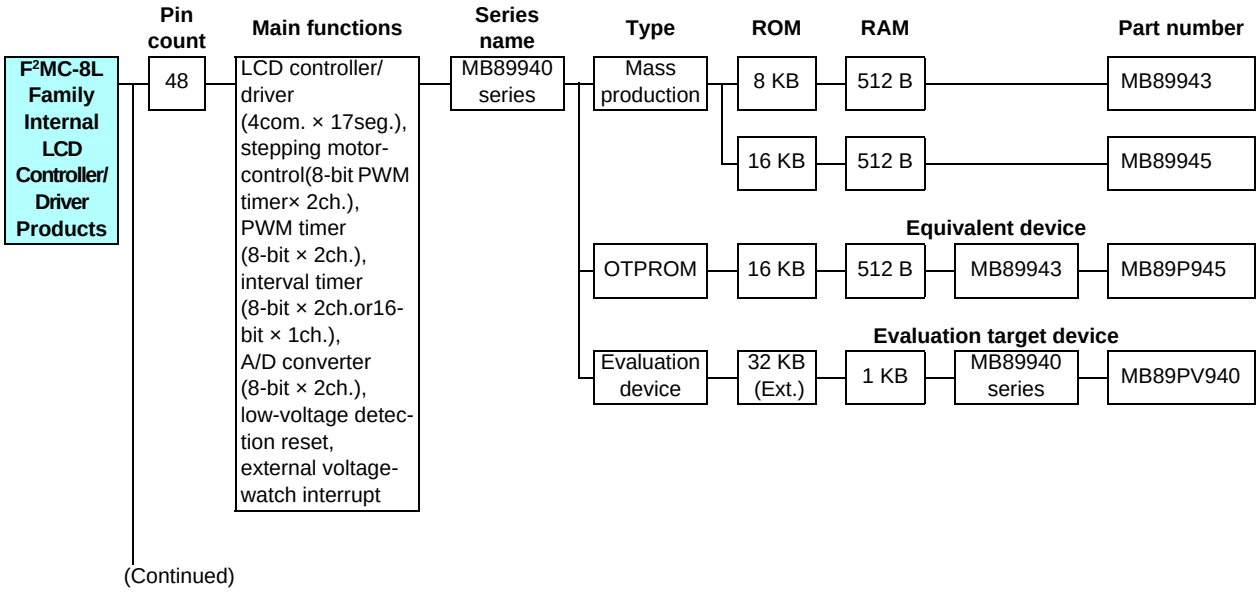
- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs to 6.4 µs
- Operating temperature range: -40°C to +85°C



<Evaluation device>

Part number	Operating power supply voltage* (V)	Package			Functions
		QFP	LQFP	MQFP	
MB89673	+2.2 to +6.0	80P	80P	–	I/O ports: 69 Timebase timer (WDT): 21-bit × 1ch. Timer/counter:16-bit × 2ch. (16-bit × 1ch. + 8-bit × 2ch.) Buzzer output PWM timer: 8-bit × 3ch. (MB89673/673R/675R) 8-bit × 6ch. (MB89677A/PV670A/673AR/675AR/P677A) Up/down counter: 8-bit × 2ch. (16-bit × 1ch.) A/D converter: 10-bit × 8ch. SIO: 8-bit × 1ch. UART: 8-bit × 1ch. (switchable between two I/O ports) Interrupts: 10 internal, 8 external Low-power consumption (standby functions) modes: Sleep, stop
MB89673R		80P	80P	–	
MB89673AR		80P	80P	–	
MB89675R		80P	80P	–	
MB89675AR		80P	80P	–	
MB89677A		80P	80P	–	
MB89677AR		80P	80P	–	
MB89P677A	+2.7 to +6.0	80P	80P	–	
MB89PV670A		–	–	80C	

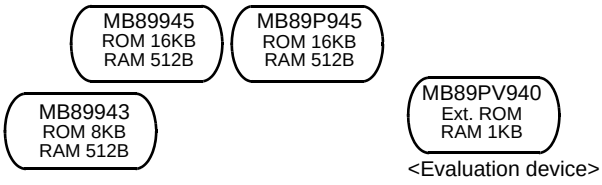
*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic


F²MC-8L Family Internal LCD Controller/ Driver Products
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
48
LCD controller/ driver (4com. × 17seg.), stepping motor-control(8-bit PWM timer× 2ch.), PWM timer (8-bit × 2ch.), interval timer (8-bit × 2ch.or16-bit × 1ch.), A/D converter (8-bit × 2ch.), low-voltage detection reset, external voltage-watch interrupt
MB89940 series
Mass production
8 KB
512 B
MB89943
16 KB
512 B
MB89945
Equivalent device
OTPROM
16 KB
512 B
MB89943
MB89P945
Evaluation target device
Evaluation device
32 KB (Ext.)
1 KB
MB89940 series
MB89PV940
(Continued)

F²MC-8L Family Internal LCD Controller/Driver Products

MB89940 Series

Standard products (LCD controller/driver, built-in stepping motor controller)

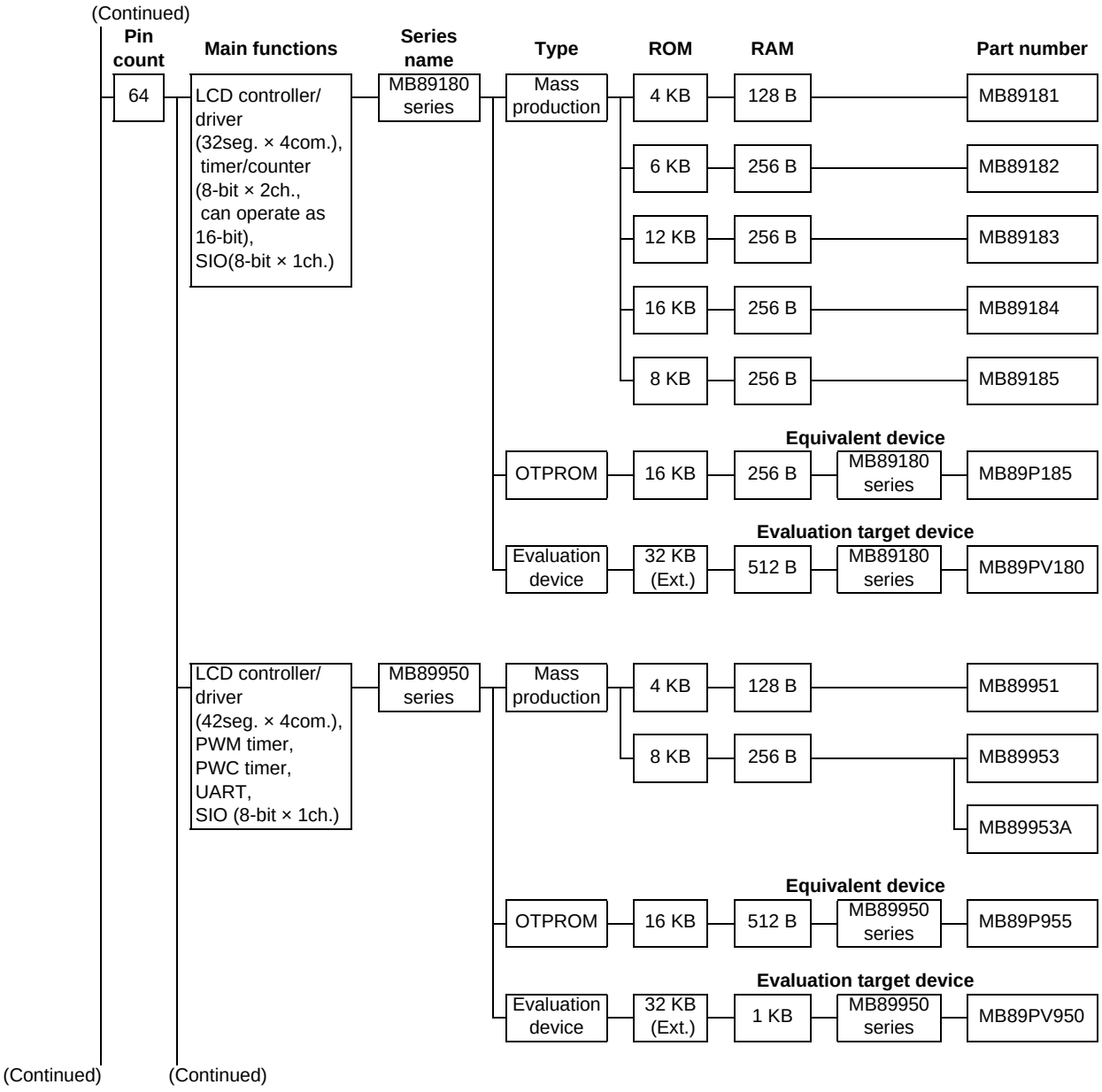


<Evaluation device>

- Maximum clock frequency: 8 MHz
- Minimum execution time: 0.5 µs
- Operating temperature range:-40°C to +85°C

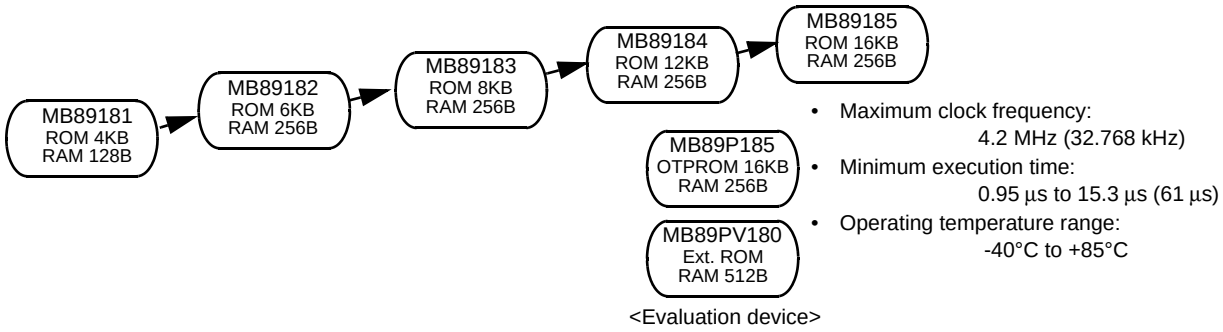
Part number	Operating power supply voltage (V)	Package		Functions
		QFP	MQFP	
MB89943	+3.5 to +5.5	48P	–	I/O ports: 37 Timebase timer (WDT): 21-bit × 1ch. Interval timer: 8-bit × 2ch. (can operate as 16-bit × 1ch.) PWM timer: 8-bit × 2ch. Stepping motor control: 8-bit PWM timer × 2ch. A/D converter: 8-bit × 2ch. LCD controller/driver: 68 elements, 2 to 4 common, 10 to 17 segments 17 × 4-bit LCD display RAM Low-voltage detection reset External voltage watch interrupt Interrupts: 5 internal, 3 external Low-power consumption (standby functions) modes: Sleep, stop
MB89945		48P	–	
MB89P945		48P	–	
MB89PV940		–	48C	

Packages: P - plastic, C - ceramic


(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
64
LCD controller/ driver (32seg. × 4com.), timer/counter (8-bit × 2ch., can operate as 16-bit), SIO(8-bit × 1ch.)
MB89180 series
Mass production
4 KB
128 B
MB89181
6 KB
256 B
MB89182
12 KB
256 B
MB89183
16 KB
256 B
MB89184
8 KB
256 B
MB89185
Equivalent device
OTPROM
16 KB
256 B
MB89180 series
MB89P185
Evaluation target device
Evaluation device
32 KB (Ext.)
512 B
MB89180 series
MB89PV180
LCD controller/ driver (42seg. × 4com.), PWM timer, PWC timer, UART, SIO (8-bit × 1ch.)
MB89950 series
Mass production
4 KB
128 B
MB89951
8 KB
256 B
MB89953
MB89953A
Equivalent device
OTPROM
16 KB
512 B
MB89950 series
MB89P955
Evaluation target device
Evaluation device
32 KB (Ext.)
1 KB
MB89950 series
MB89PV950
(Continued)
(Continued)

MB89180 Series

Standard products (built-in LCD controller/driver)

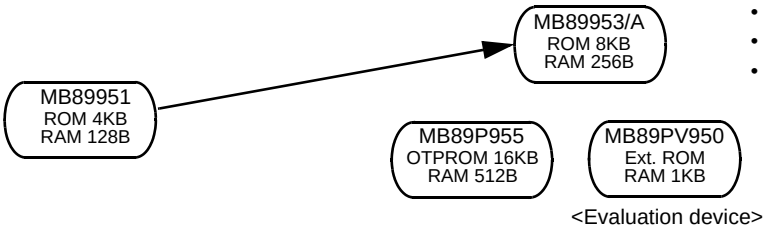


Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	MQFP	
MB89181	+2.2 to +6.0	64P	64P	–	I/O ports: 43 Timebase timer (WDT): 21-bit × 1ch. Timer/counter:8-bit×2ch (can operate as 16-bit×1ch.) LCD controller/driver: 128 elements, 2 to 4 common, 8 to 32 segments, 3 bias power terminal, 16 × 8-bit LCD display RAM SIO: 8-bit × 1ch. Clock prescaler: 15-bit Remote control carrier generator Buzzer output Interrupts: 4 internal, 12 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89182		64P	64P	–	
MB89183		64P	64P	–	
MB89184		64P	64P	–	
MB89185		64P	64P	–	
MB89P185	+2.7 to +6.0	64P	64P	–	
MB89PV180		–	–	64C	

Packages: P - plastic, C - ceramic

MB89950 Series

Standard products (built-in LCD controller/driver)



- Maximum clock frequency: 5 MHz
- Minimum execution time: 0.8 µs to 4.0 µs
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	MQFP	
MB89951	+2.2 to +6.0	64P	–	I/O ports: 33 Timebase timer (WDT): 21-bit × 1ch. PWM timer: 8-bit × 1ch. PWC timer: 8-bit × 1ch. LCD controller/driver: 168 elements, 2 to 4 common, 20 to 42 segments, 4 bias power terminal, 21 × 8-bit LCD display RAM SIO: 8-bit × 1ch. UART: 8-bit × 1ch. Interrupts: 4 internal, 2 external Low-power consumption (standby functions) modes: Sleep, stop
MB89953		64P	–	
MB89953A		64P	–	
MB89P955	+2.7 to +6.0	64P	–	
MB89PV950		–	64C	

Packages: P - plastic, C - ceramic

(Continued)

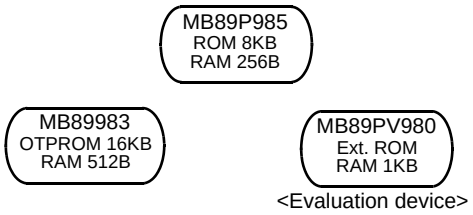
(Continued)

Main functions	Series name	Type	ROM	RAM		Part number
LCD controller/ driver(14seg. × 4com.), A/D converter (8-bit × 4ch.), Buzzer output, Timer/counter (8-bit× 2ch.) (16-bit× 1ch.), PWM timer, (8-bit× 2ch.), Remote con-troled carrier gen-erator	MB89980 series	Mass production	8 KB	256 B		MB89983
					Equivalent device	
		OTPROM	16 KB	512 B	MB89980 series	MB89P985
					Evaluation target device	
		Evaluation device	32 KB (Ext.)	512 B	MB89980 series	MB89PV980

(Continued)

MB89980 Series

Standard products (built-in LCD controller/driver)

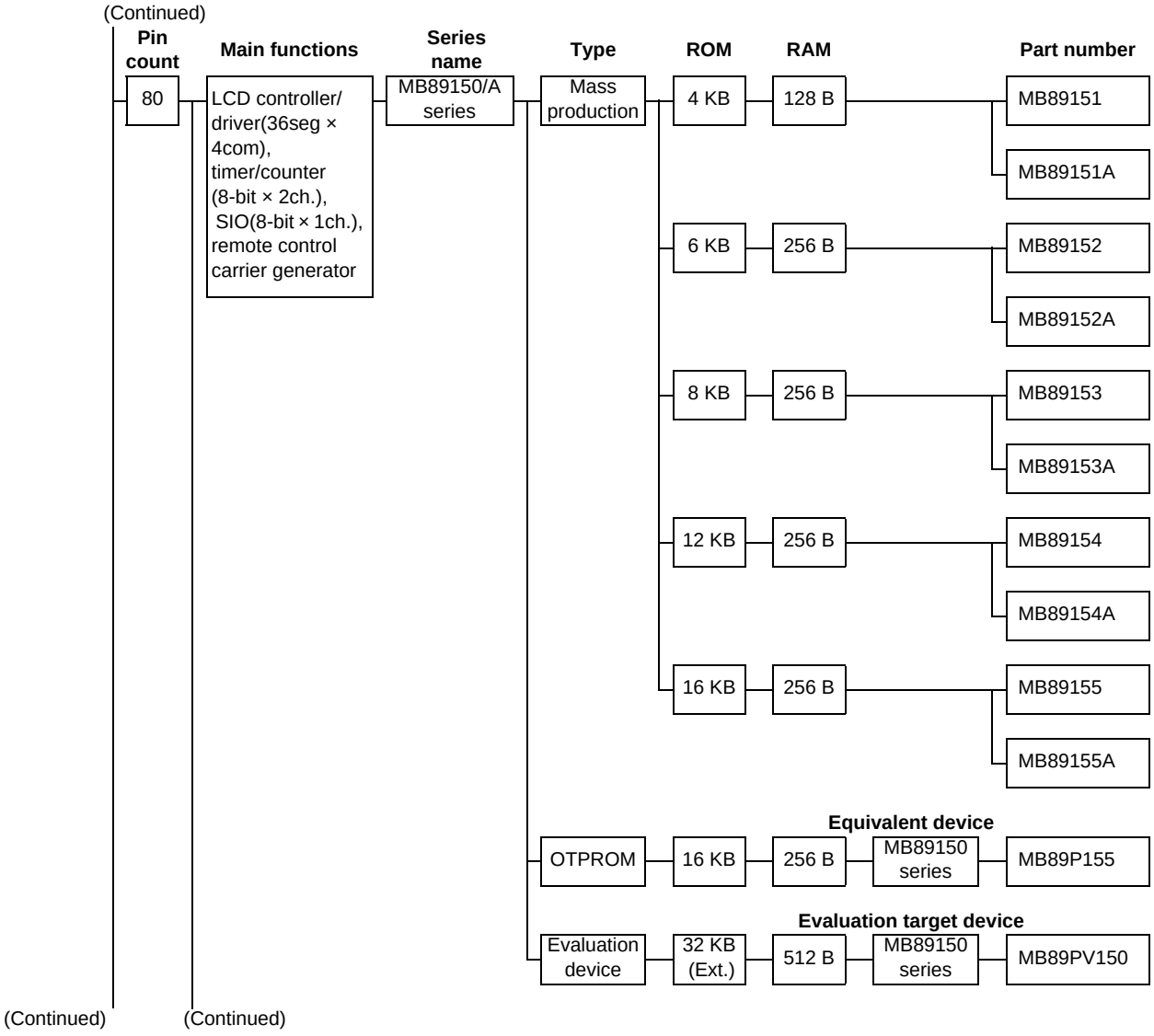


<Evaluation device>

- Maximum clock frequency: 4.2 MHz (32.768 kHz)
- Minimum execution time: 0.95 µs
- Operating temperature range: – 40°C to +85 °C

Part number	Operating power supply voltage * (V)	Package		Functions
		LQFP	MQFP	
MB89983	+2.2 to +6.0	64P	–	I/O ports: 47 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch.(can operate as 16-bit × 1ch.) PWM timer: 8-bit × 2ch. Buzzer output Remote controled carrier generator LCD controller/driver:56 elements, 2 to 4 common, 4 to 14segments 7 × 8-bit LCD display RAM Interrupts: 12 external Low-power consumption (standby functions) modes:Sleep, watch, stop, sub
MB89P985	+2.7 to +6.0	64P	–	
MB89PV980		–	64C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic


(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
80
LCD controller/ driver(36seg × 4com), timer/counter (8-bit × 2ch.), SIO(8-bit × 1ch.), remote control carrier generator
MB89150/A series
Mass production
4 KB
128 B
MB89151
MB89151A
6 KB
256 B
MB89152
MB89152A
8 KB
256 B
MB89153
MB89153A
12 KB
256 B
MB89154
MB89154A
16 KB
256 B
MB89155
MB89155A
Equivalent device
OTPROM
16 KB
256 B
MB89150 series
MB89P155
Evaluation target device
Evaluation device
32 KB (Ext.)
512 B
MB89150 series
MB89PV150
(Continued)
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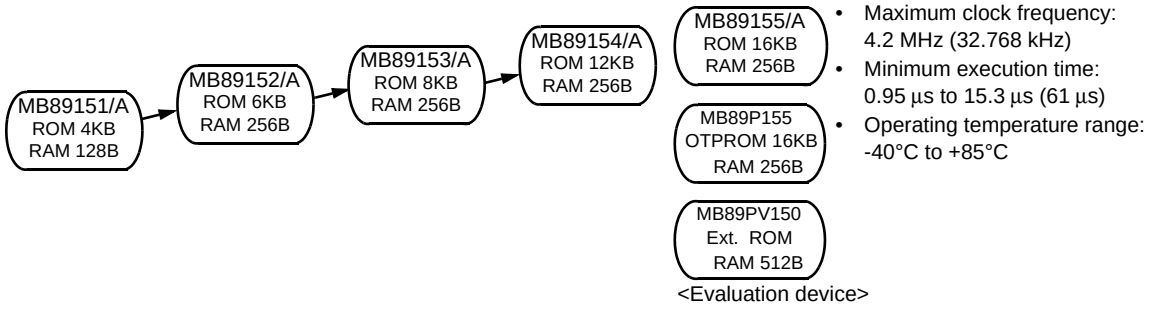
MB89150/150A Series

Standard products (built-in LCD controller/driver)



Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	MQFP	
MB89151	+2.2 to +6.0	80P	80P	–	I/O ports: 43 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch.(can operate as 16-bit × 1ch.) Buzzer output LCD controller/driver: 144 elements, 2 to 4 common, 20 to 36 segments, 4 bias power supplies, 18 × 8-bit LCD display RAM Booster circuit (MB89151A/152A/153A/154A/155A) No booster circuit (MB89151/152/153/154/PV150, Selectable as a mask option on the MB89P155) SIO: 8 bit × 1ch. Remote control carrier generator Clock prescaler: 15-bit Interrupts: 4 internal, 12 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89151A		80P	80P	–	
MB89152		80P	80P	–	
MB89152A		80P	80P	–	
MB89153		80P	80P	–	
MB89153A		80P	80P	–	
MB89154		80P	80P	–	
MB89154A		80P	80P	–	
MB89155		80P	80P	–	
MB89155A		80P	80P	–	
MB89P155	+2.7 to +6.0	80P	80P	–	
MB89PV150		–	–	80C	

Packages: P - plastic, C - ceramic

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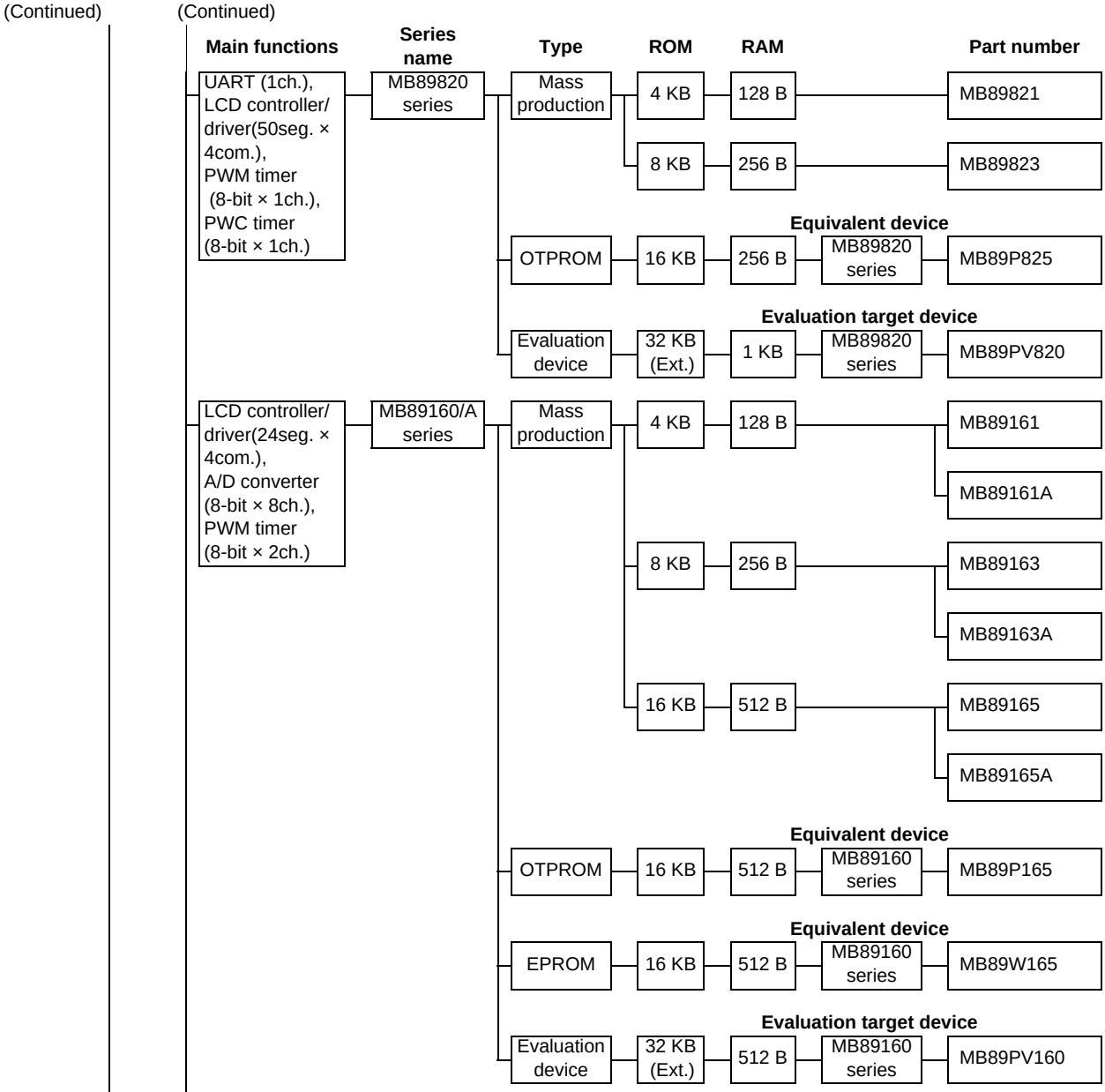

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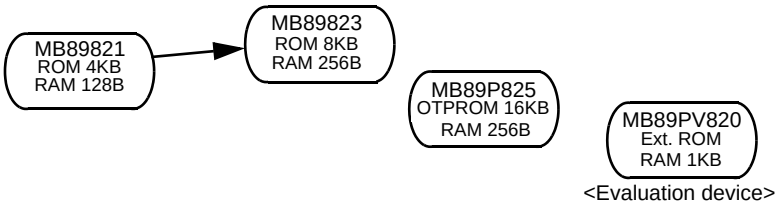
MB89820 Series

Standard products (LCD controller/driver, built-in UART)



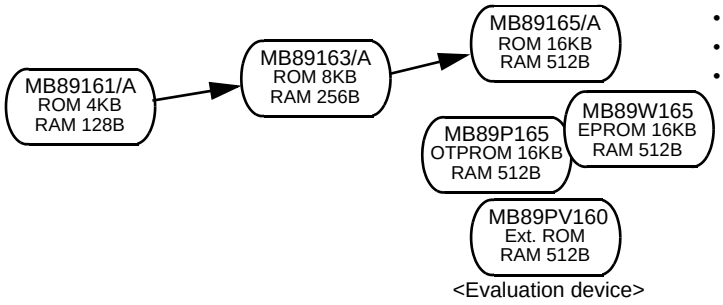
- Maximum clock frequency: 5 MHz
- Minimum execution time: 0.8 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	MQFP	
MB89821	+2.2 to +6.0	80P	–	I/O ports: 32 Timebase timer (WDT): 20-bit × 1ch. PWM timer: 8-bit × 1ch. PWC timer: 8-bit × 1ch. LCD controller/driver: 200 elements, 2 to 4 common, 34 to 50 segments, 3 bias power supplies, 8-bit×25 LCD display RAM SIO: 8-bit × 1ch. UART: 5-, 7-, 9-bit × 1ch. Interrupts: 5 internal, 2 external Low-power consumption (standby functions) modes: Sleep, stop
MB89823		80P	–	
MB89P825	+2.7 to +6.0	80P	–	
MB89PV820		–	80C	

Packages: P - plastic, C - ceramic

MB89160/160A Series

Standard products (LCD controller/driver, built-in A/D converter)

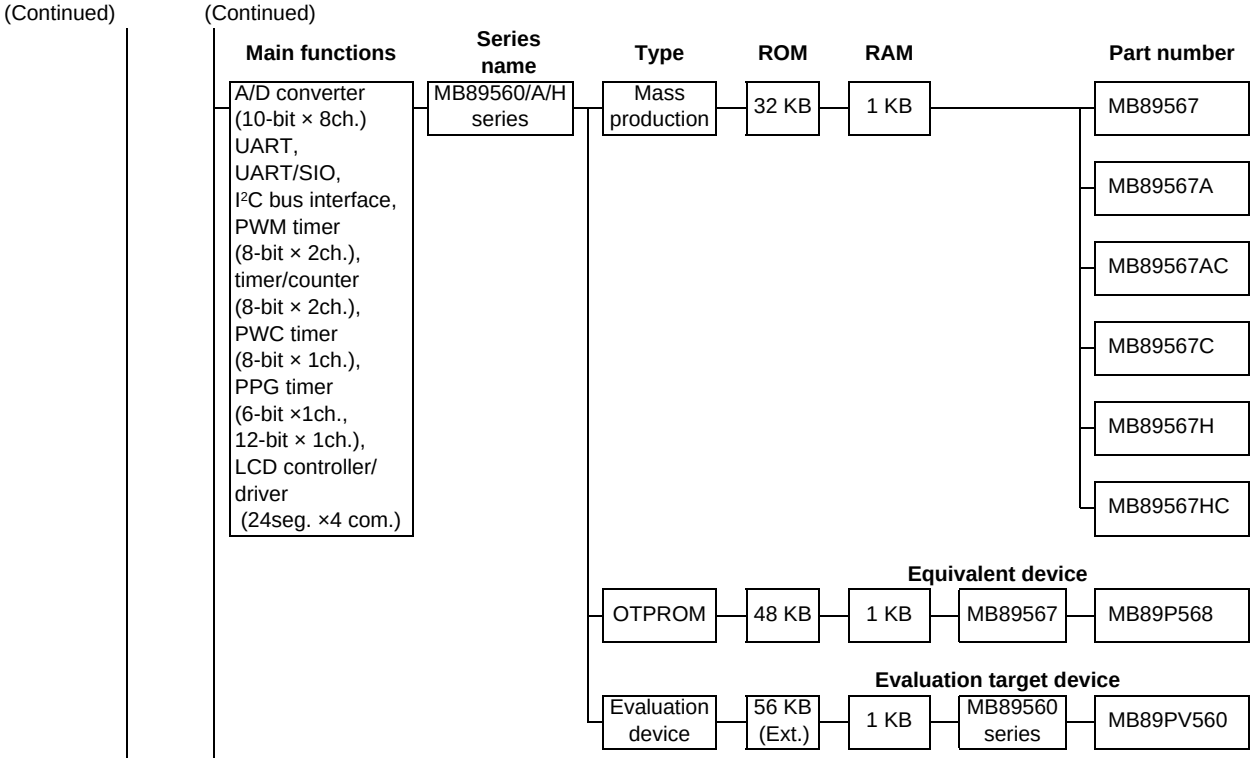


- Maximum clock frequency:4.2 MHz (32.768 kHz)
- Minimum execution time:0.95 µs to 15.3 µs (61 µs)
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage* (V)	Package			Functions
		QFP	LQFP	MQFP	
MB89161	+2.2 to +6.0	80P	80P	–	I/O ports: Max. 54(depends on the number of segments option) Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch.(can operate as 16-bit × 1ch. event) PWM timer: 8-bit × 2ch. A/D converter: 8-bit × 8ch. LCD controller/driver: 96 elements, 2 to 4 common, 8 to 24 segments, 4 bias power supplies, 8-bit × 12 LCD display RAM, Booster circuit (MB89161A/163A/165A) No booster circuit (MB89161/163/165/PV160) (Selectable as a mask option on the MB89P165 and MB89W165) SIO: 8-bit × 1ch. Clock prescaler: 15-bit Remote control carrier generator Buzzer output (7 sources) Interrupts: 7 internal, 12 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89161A		80P	80P	–	
MB89163		80P	80P	–	
MB89163A		80P	80P	–	
MB89165		80P	80P	–	
MB89165A		80P	80P	–	
MB89P165	+2.7 to +6.0	80P	80P	–	
MB89W165		80C	–	–	
MB89PV160		–	–	80C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

(Continued) (Continued)



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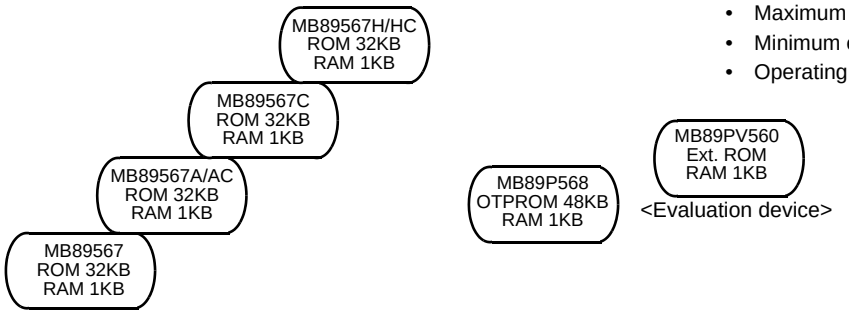
MB89560/560A/560H Series

Standard products (personal computer, microwave ovens, etc.)



- Maximum clock frequency: 12.5 MHz (32.768kHz)
- Minimum execution time: 0.32 µs (61µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package				Functions
		QFP	LQFP (0.5 mm, □12 × 12 mm)	LQFP (0.65 mm, □14 × 14 mm)	MQFP	
MB89567	+2.2 to +3.6	80P	80P	80P	–	I/O ports: 50 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit) PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. PPG timer: 6-bit × 1ch. ,12-bit × 1ch. A/D converter: 10-bit × 8ch. I²C bus interface (built into MB89567C/567HC/P568/PV560) UART: 6, 7, 8-bit × 1ch. SIO: 8-bit × 1 ch. UART/SIO: 1 ch. LCD controller/driver: 96 elements, 2 to 4 common, 8 to 24 segments, 12 × 8-bit LCD display RAM, static, duty Booster circuit (Selected as an option) (MB89560/560A) No booster circuit (MB89560H) Interrupts: 10 internal, 12 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89567A	+2.2 to +5.5	80P	80P	80P	–	
MB89567AC		80P	80P	80P	–	
MB89567C	+2.2 to +3.6	80P	80P	80P	–	
MB89567H	+3.5 to +5.5	80P	80P	80P	–	
MB89567HC		80P	80P	80P	–	
MB89P568	+2.7 to +5.5	80P	80P	80P	–	
MB89V560		–	–	–	80C	

Packages: P - plastic, C - ceramic

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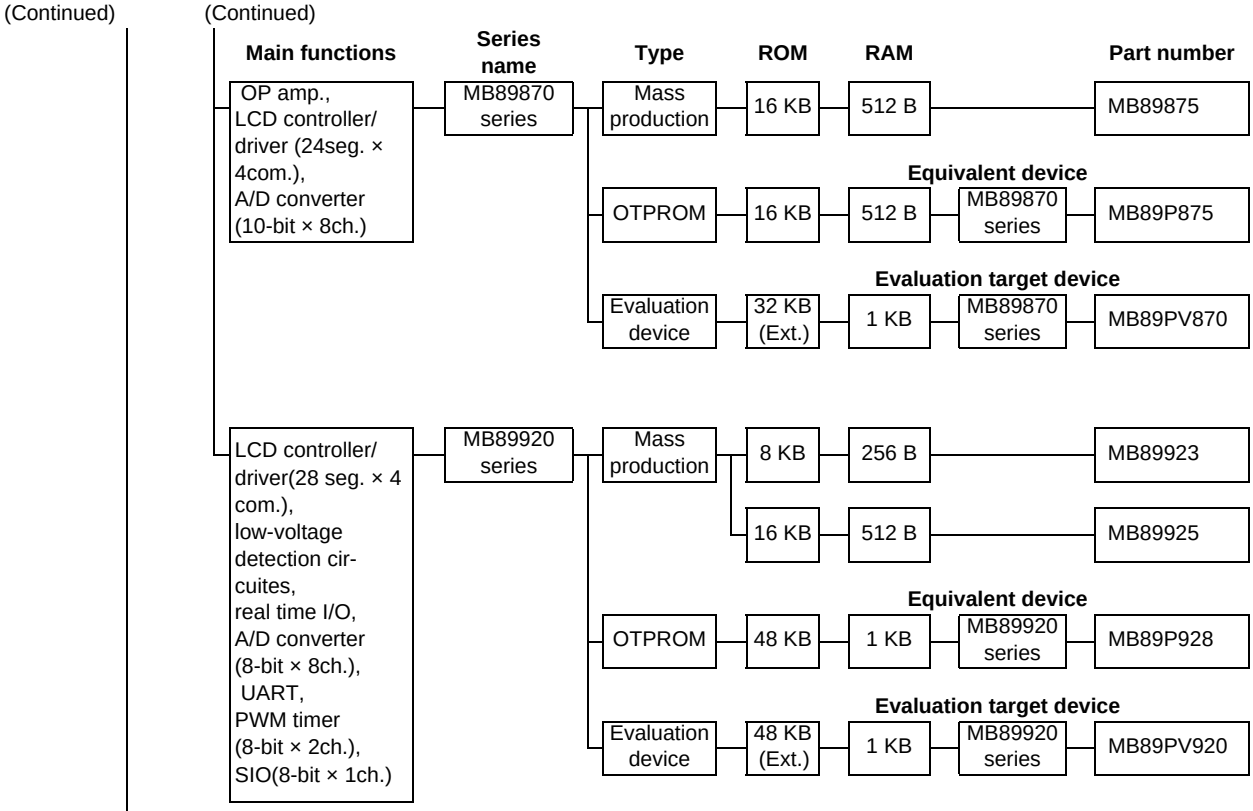

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MB89870 Series

Standard products (LCD controller/driver, OP-AMP, built-in A/D converter)

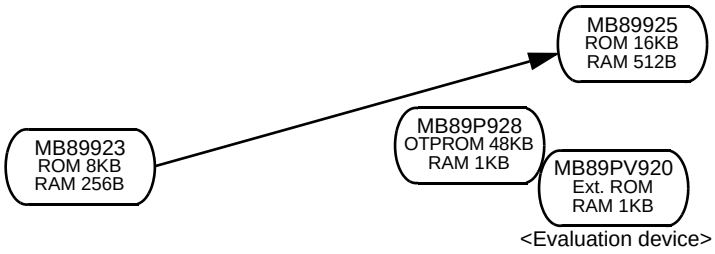
- Maximum clock frequency:10 MHz (32.768 kHz)
- Minimum execution time: 0.4 µs to 6.4 µs (61 µs)
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage* (V)	Package			Functions
		LQFP	QFP	MQFP	
MB89875	+2.2 to +6.0	80P	80P	–	I/O ports: 45 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (16-bit × 1ch.) PWM timer: 8-bit × 1ch. A/D converter: 10-bit × 8ch. LCD controller/driver:96 elements, 2 to 4 common, 16 to 24 segments, 4 bias power supplies, 8-bit × 12 LCD display RAM OP-AMP.: 4 SIO: 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 6 internal, 8 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89P875	+2.7 to +6.0	80P	80P	–	
MB89PV870		–	–	80C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic C - ceramic

MB89920 Series

Standard products (LCD controller/driver, built-in A/D converter)

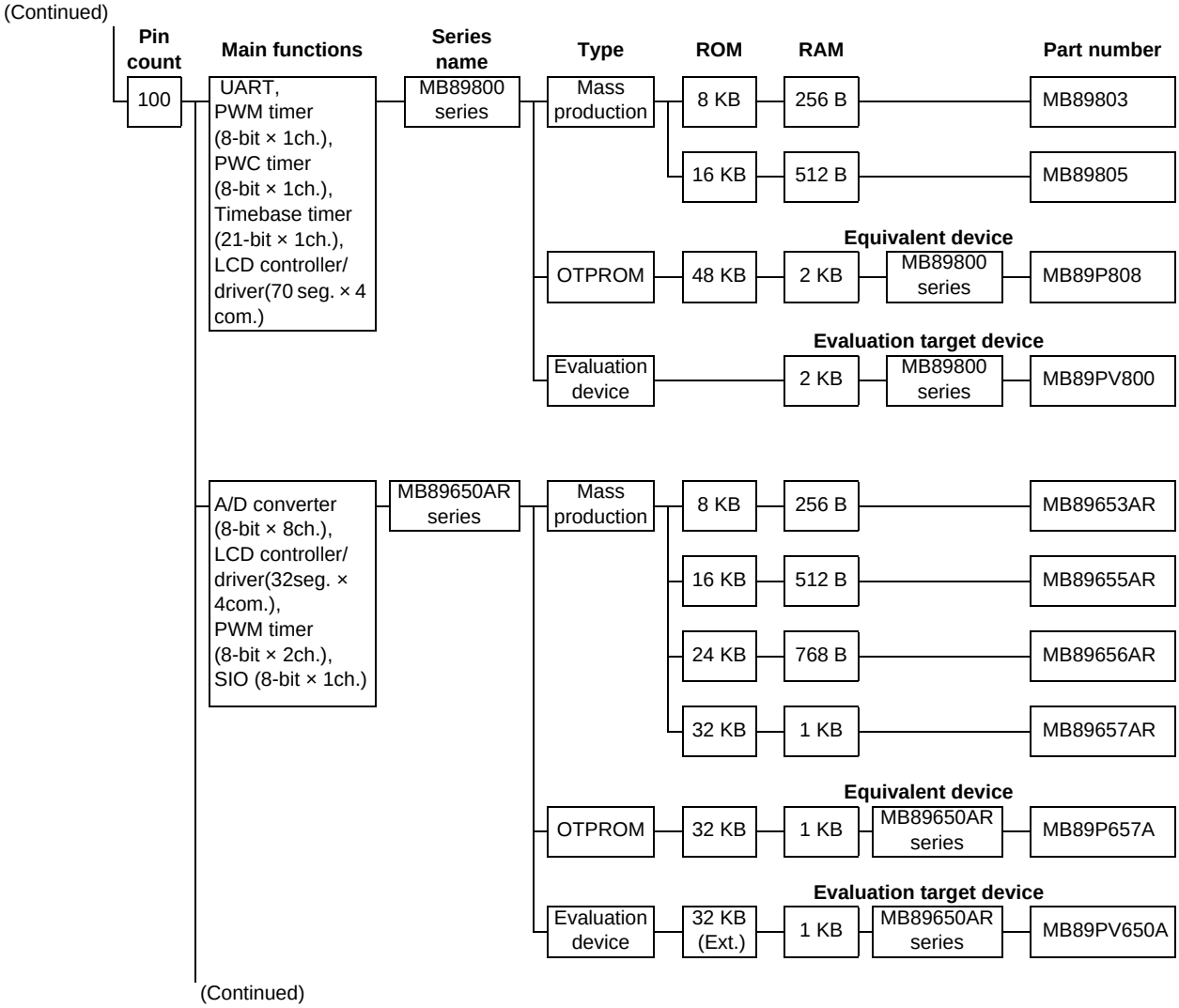


- Maximum clock frequency: 8 MHz
- Minimum execution time: 0.5 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package		Functions
		QFP	MQFP	
MB89923	+2.2 to +6.0	80P	–	I/O ports: 69 Timebase timer (WDT): 20-bit × 1ch. PWM timer: 8-bit × 2ch. A/D converter: 10-bit × 8ch. LCD controller/driver: 112 elements, 2 to 4 common, 16 to 28 segments, 3 bias power supplies, 8-bit × 14 LCD display RAM UART: 7 to 8-bit × 1ch. Low-voltage detection reset SIO: 8-bit × 1ch. Buzzer output Interrupts: 10 internal, 4 external Low-power consumption (standby functions) modes: Sleep, stop
MB89925		80P	–	
MB89P928	+2.7 to +6.0	80P	–	
MB89PV920		–	80C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic C - ceramic

(Continued)



(Continued)

MB89800 Series

Standard products (LCD controller/driver)

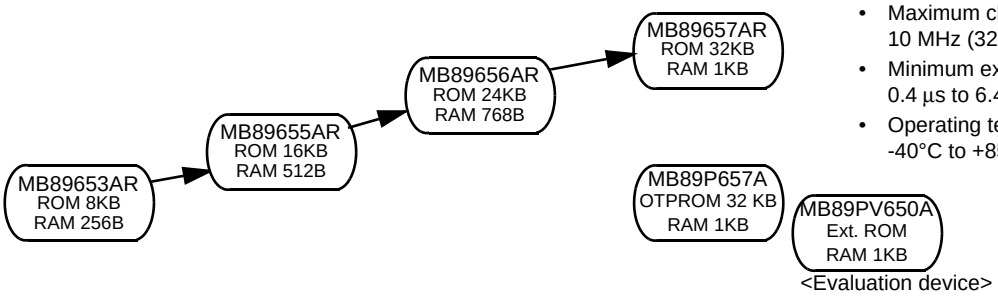
- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs/5V
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	MQFP	
MB89803	+2.2 to +6.0	100P	100P	–	I/O ports: 32 Timebase timer (WDT): 21-bit × 1ch. PWM timer: 8-bit × 1ch. PWC timer: 8-bit × 1ch. UART: 1ch. LCD controller/driver: 280 elements, 4 common, 70 segments, 4-bit × 70 LCD display RAM Interrupts: 5 external Low-power consumption (standby functions) modes: Sleep, stop
MB89805		100P	100P	–	
MB89P808	+2.7 to +6.0	100P	100P	–	
MB89PV800		–	–	100C	

Packages: P - plastic C - ceramic

MB89650AR Series

Standard products (LCD controller/driver, built-in A/D converter)



- Maximum clock frequency: 10 MHz (32.768 kHz)
- Minimum execution time: 0.4 µs to 6.4 µs (61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package		Functions
		QFP	MQFP	
MB89653AR	+2.2 to +6.0	100P	–	I/O ports: 64 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 4ch. (16-bit × 2ch.) PWM timer : 8-bit × 2ch. (4 outputs) A/D converter: 8-bit × 8ch. LCD controller/driver: 128 elements, 2 to 4 common,16 to 32 segments, 4 bias power supplies, 16 × 8-bit LCD display RAM Booster circuit (selected as an option) (MB89653AR/655AR/656AR/657AR) No booster circuit (MB89P657A/PV650A) SIO: 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 8 internal, 16 external Low-power consumption (standby functions) modes:Sleep, watch, stop
MB89655AR		100P	–	
MB89656AR		100P	–	
MB89657AR		100P	–	
MB89P657A	+2.7 to +6.0	100P	–	
MB89PV650A		–	100C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

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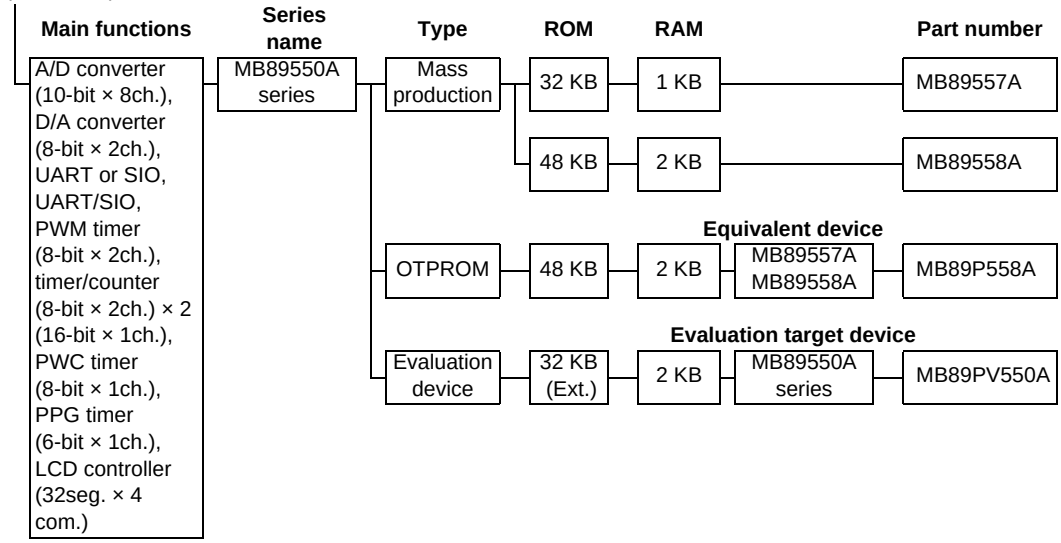
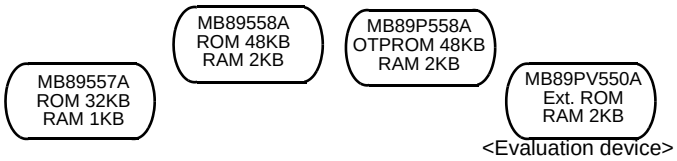

Main functions
Series name
Type
ROM
RAM
Part number
A/D converter (10-bit × 8ch.), D/A converter (8-bit × 2ch.), UART or SIO, UART/SIO, PWM timer (8-bit × 2ch.), timer/counter (8-bit × 2ch.) × 2 (16-bit × 1ch.), PWC timer (8-bit × 1ch.), PPG timer (6-bit × 1ch.), LCD controller (32seg. × 4 com.)
MB89550A series
Mass production
32 KB
1 KB
MB89557A
48 KB
2 KB
MB89558A
Equivalent device
OTPROM
48 KB
2 KB
MB89557A MB89558A
MB89P558A
Evaluation target device
Evaluation device
32 KB (Ext.)
2 KB
MB89550A series
MB89PV550A

MB89550A Series

Standard products (compact camera, etc.)

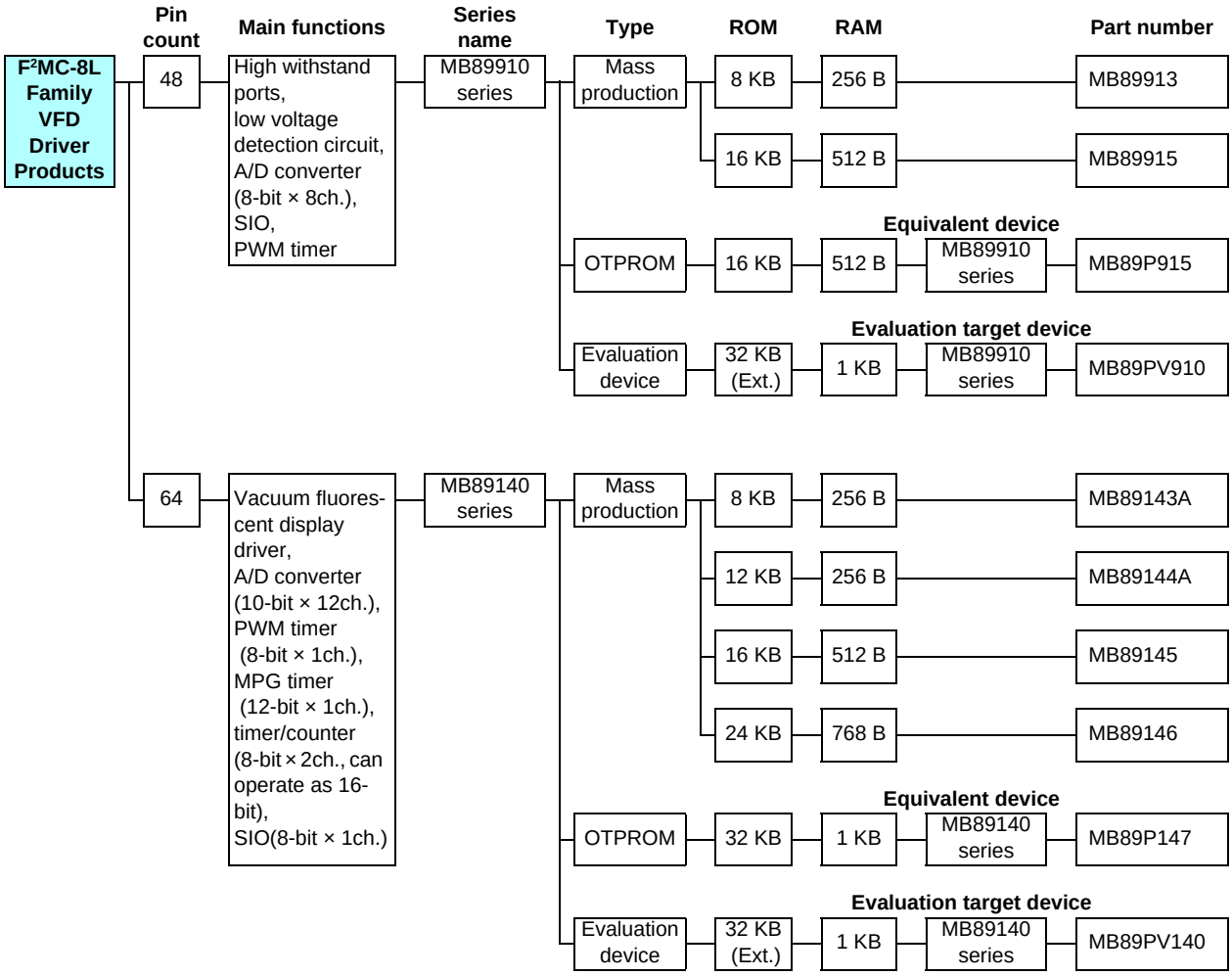


- Maximum clock frequency: 12.5 MHz (32.768kHz)
- Minimum execution time: 0.32 µs (61µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	TQFP	MQFP	
MB89557A	+2.2 to +3.6*1 +2.2 to +5.5*2	100P	100P	–	I/O ports: 66 Timebase timer (WDT): 21-bit × 1ch. Timer/counter:8-bit×4ch.(16-bit × 2ch.),16-bit×1ch. PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. PPG timer: 6-bit × 1ch. A/D converter: 10-bit × 8ch. D/A converter: 8-bit × 2ch. LCD controller/driver: 128 elements, 2 to 4 common, 8 to 32 segments, 1/2, 1/3 bias power supplies, 32 × 4-bit LCD display RAM, booster circuit (selected as an option), static, duty UART/SIO: 8-bit × 2ch. Interrupts: 10 internal, 5 external Low-power consumption (standby functions) modes: Sleep, watch, sub
MB89558A		100P	100P	–	
MB89P558A	+2.7 to +5.5	100P	100P	–	
MB89PV550A		–	–	100C	

*1: Power supply for logic at Vcc1
*2: Power supply for I/O at Vcc2
Packages: P - plastic, C - ceramic

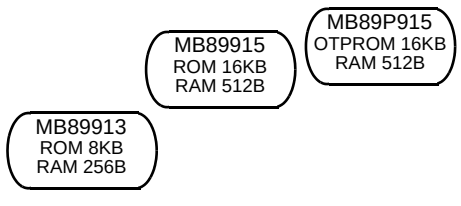
8-bit Proprietary F²MC-8L Family VFD Driver Products



F²MC-8L Family VFD Driver Products

MB89910 Series

Standard products (vacuum fluorescent display driver, compact 8-bit microcontroller)



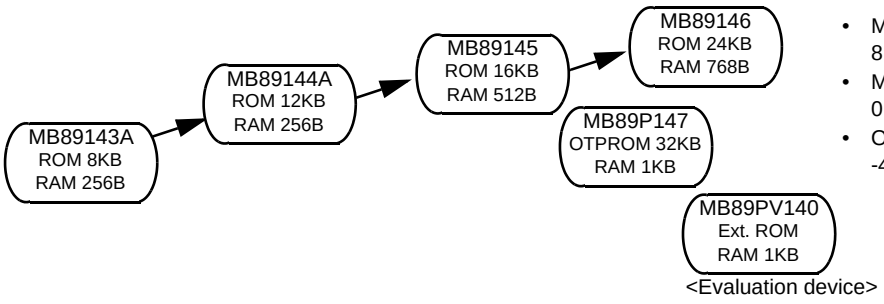
- Maximum clock frequency: 8 MHz (32.768 kHz)
- Minimum execution time: 0.5 µs to 8.0 µs (61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		SDIP	QFP	MDIP	
MB89913	+3.8 to +5.5	48P	48P	–	I/O ports: 39 High withstand voltage ports: 8 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 16-bit × 1ch. PWM timer: 8-bit × 1ch. A/D converter: 8-bit × 8ch. SIO: 8-bit × 1ch. Clock prescaler: 15-bit Low-voltage detection reset (selectable from 4.3V to 3.7V, 3.9V to 3.3V, or 3.6V to 3.0V) Interrupts: 6 internal, 2 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89915		48P	48P	–	
MB89P915		48P	48P	–	
MB89PV910	+4.5 to +5.5	–	–	64C	

Packages: P - plastic, C - ceramic

MB89140 Series

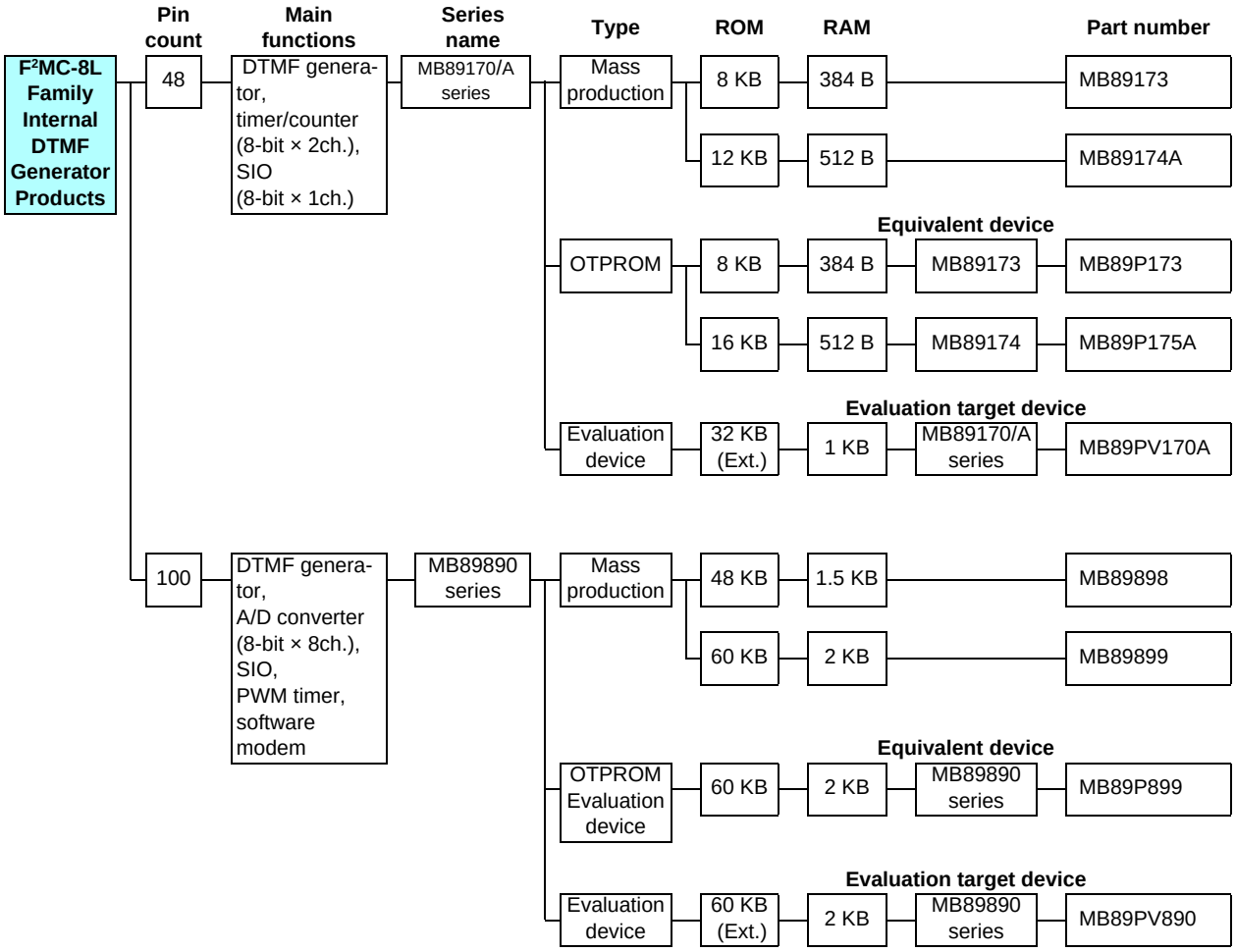
Standard products (vacuum fluorescent display driver, 10-bit A/D converter, built-in inverter macro)



- Maximum clock frequency: 8 MHz (32.768 kHz)
- Minimum execution time: 0.5 µs to 8.0 µs (61 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage(V)	Package				Functions
		SDIP	QFP	MDIP	MQFP	
MB89143A	+4.0 to +6.0	64P	64P	–	–	I/O ports: 55 High withstand voltage ports: 25 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (16-bit × 1ch.) PWM timer: 8-bit × 1ch.(MB89143 except) MPG timer: 12-bit × 1ch.(MB89143 except) A/D converter: 10-bit × 12ch.(MB89143: 8-bit × 8ch.) SIO: 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 10 internal, 2 external Low-power consumption (standby functions) modes: Sleep, watch, stop, sub
MB89144A		64P	64P	–	–	
MB89145	+2.7 to +6.0 *	64P	64P	–	–	
MB89146		64P	64P	–	–	
MB89P147		64P	64P	–	–	
MB89PV140		–	–	64C	64C	

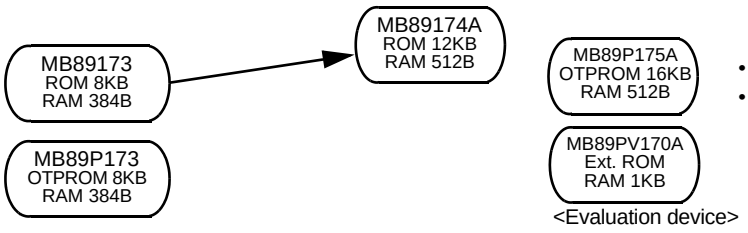
*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic


F²MC-8L Family Internal DTMF Generator Products
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
48
DTMF generator, timer/counter (8-bit × 2ch.), SIO (8-bit × 1ch.)
MB89170/A series
Mass production
8 KB
384 B
MB89173
12 KB
512 B
MB89174A
Equivalent device
OTPROM
8 KB
384 B
MB89173
MB89P173
16 KB
512 B
MB89174
MB89P175A
Evaluation target device
Evaluation device
32 KB (Ext.)
1 KB
MB89170/A series
MB89PV170A
100
DTMF generator, A/D converter (8-bit × 8ch.), SIO, PWM timer, software modem
MB89890 series
Mass production
48 KB
1.5 KB
MB89898
60 KB
2 KB
MB89899
Equivalent device
OTPROM Evaluation device
60 KB
2 KB
MB89890 series
MB89P899
Evaluation target device
Evaluation device
60 KB (Ext.)
2 KB
MB89890 series
MB89PV890

F²MC-8L Family DTMF Generator Products

MB89170/170A Series

Standard products (built-in DTMF generator, low cost)



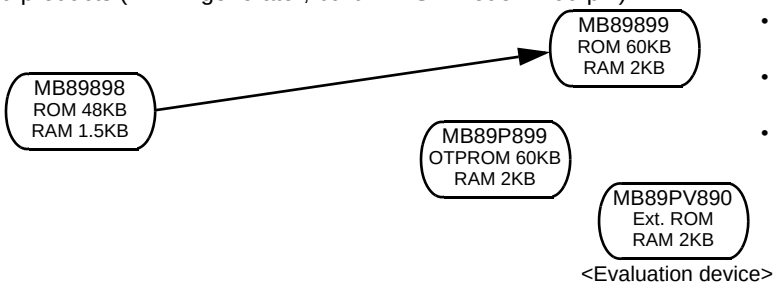
- Maximum clock frequency:
  3.58 MHz (32.768 kHz):MB89170 series
  7.16 MHz (32.768 kHz):MB89170A series
- Minimum execution time: 0.6 µs to 17.6 µs (61 µs)
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	MQFP	
MB89173	+2.2 to +6.0	48P	–	I/O ports: 37 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can also operate as 16-bit × 1ch.) DTMF generator: All tone output for CCITT SIO: 8-bit × 1ch. Clock prescaler: 15-bit Interrupts: 4 internal,11 external Low-power consumption (standby functions) modes:Sleep,watch,stop,sub
MB89174A		48P	–	
MB89P173	+2.7 to +6.0	48P	–	
MB89P175A		48P	–	
MB89PV170A		–	48C	

Packages: P - plastic, C - ceramic

MB89890 Series

Standard products (DTMF generator, built-in MSK modem 100-pin)

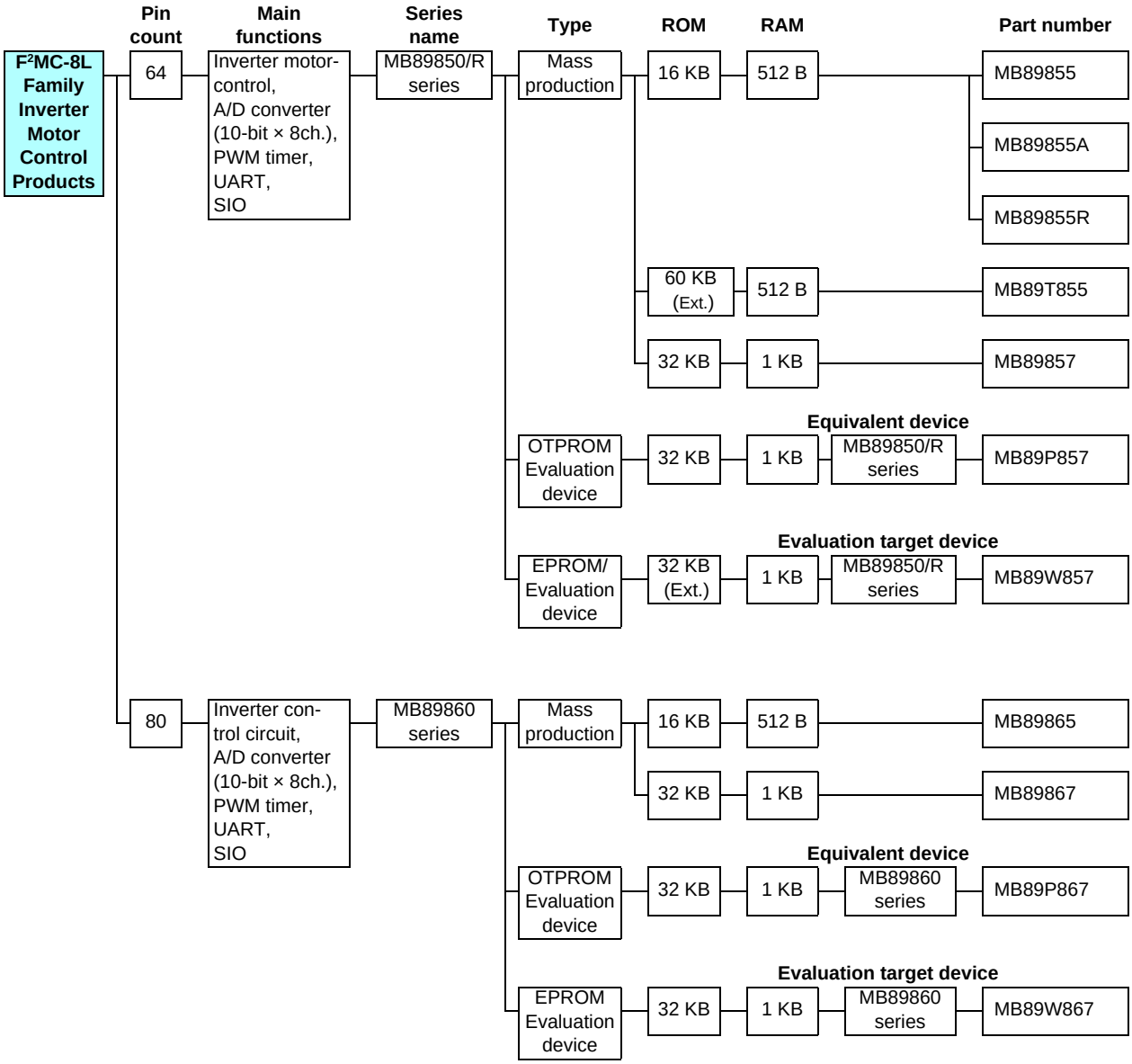


- Maximum clock frequency:
  8 MHz (32.768 kHz)
- Minimum execution time:
  0.5 µs to 8.0 µs (61 µs)
- Operating temperature range:
  -20°C to +85°C

Part number	Operating power supply voltage *(V)	Package		Functions
		QFP	MQFP	
MB89898	+2.2 to +6.0	100P	–	I/O ports: 85 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can also operate as 16-bit × 1ch.) PWM timer: 8-bit × 1ch. A/D converter: 8-bit × 8ch. DTMF generator: All tone output for CCITT SIO: 8-bit × 1ch + serial with 1-byte buffer × 1ch. MSK software modem output: 1200, 2400bps MSK software modem timer: 1ch. (built-in noise reduction circuit) Clock prescaler: 15-bit Buzzer output (7 tones) Interrupts: 9 internal, 16 external (4 × edge interrupts, 12 × level interrupts) Low-power consumption (standby functions) modes:Sleep,watch,stop
MB89899		100P	–	
MB89P899	+2.7 to +6.0	100P	–	
MB89PV890		–	100C	

*: A/D = 3.5V to 6.0V
Packages: P - plastic, C - ceramic

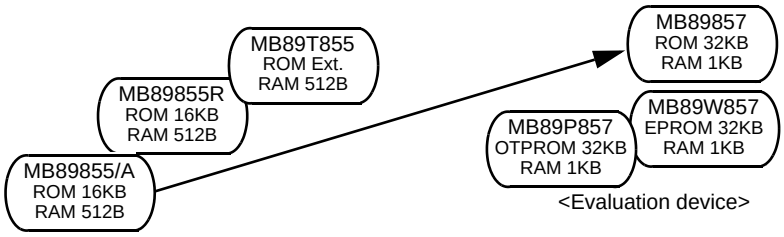
8-bit Proprietary F²MC-8L Family Inverter Motor Control Products



F²MC-8L Family Inverter Motor Control Products

MB89850/850R Series

ASMC (1) (inverter motor control, built-in high-speed pulse output)



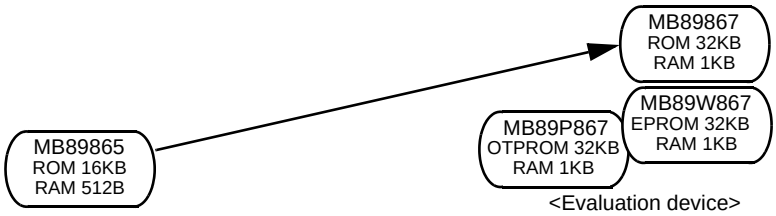
- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		SH-DIP	QFP	
MB89855	+2.7 to +6.0 *1	64P	–	I/O ports: 53 Timebase timer (WDT): 20-bit × 1 ch. PWM timer:8-bit × 2 ch. (with reload timer function) Timer unit: 10-bit up/down count timer × 1 ch. , output compare register × 4 ch.(with buffer) (0.4µs min resolution), real time waveform output pins × 7 ch. Deadtime timer: 4-bit load timers × 3ch. (non-overlap 3-phase waveform output for timer unit output), includes a function to disable output on detection of over-current (edge or level input) A/D converter: 10-bit × 8 ch. SIO: 8-bit × 1ch. UART: 8-bit × 1 ch. Interrupts: 9 internal, 4 external Low-power consumption (standby functions) modes: Sleep, stop
MB89855A		64P	–	
MB89855R		64P	64P	
MB89T855	+2.7 to +5.5 *2	64P	–	
MB89857	+2.7 to +6.0 *1	64P	–	
MB89P857	+2.7 to +5.5 *2	64P	64P	
MB89W857		64C	64C	

*1 : A/D = 3.5 V to 6.0 V
*2 : A/D = 3.5 V to 5.5 V
Package: P - plastic, C - ceramic

MB89860 Series

ASMC (1) (inverter motor control, built-in high-speed pulse output)

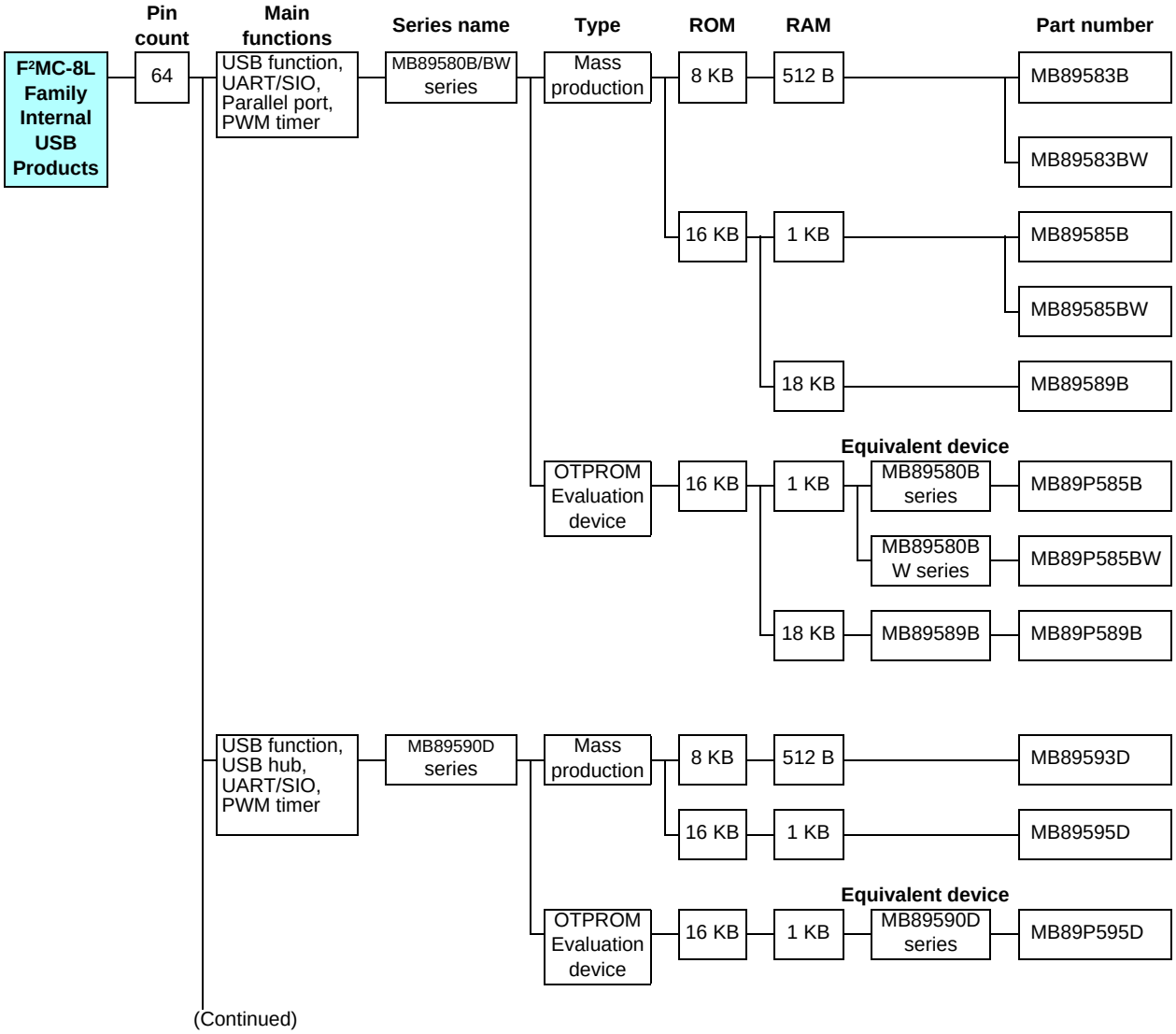


- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 µs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package	Functions
		QFP	
MB89865	+2.7 to +6.0 *1	80P	I/O ports:68 Timebase timer (WDT): 20-bit × 1ch. PWM timer: 8-bit × 2ch. (with reload timer function) Timer unit:10-bit up/down count timer × 1ch., output compare registers × 4 (with buffer), (0.4µs min. resolution), real time waveform output pins × 7ch. Deadtime timer:4-bit load timers × 3ch. (non-overlap 3-phase waveform output for AC inverter motor control.), includes a function to disable output on detection of over-current (edge or level input) A/D converter: 10-bit × 8ch. SIO: 8-bit × 1ch. UART: 8-bit × 1ch. Interrupts: 9 internal, 4 external Low-power consumption (standby functions) modes:Sleep, stop
MB89867		80P	
MB89P867	+2.7 to +5.5 *2	80P	
MB89W867		80C	

*1 : A/D = 3.5 V to 6.0 V
*2 : A/D = 3.5 V to 5.5 V
Package: P - plastic, C - ceramic

8-bit Proprietary F²MC-8L Family Internal USB Products



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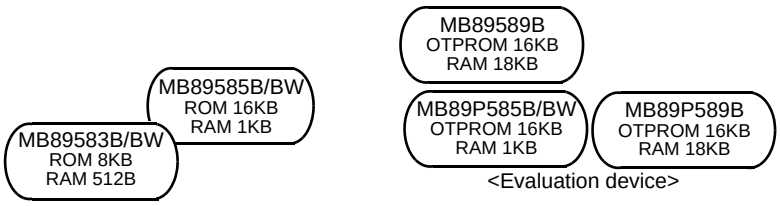
F²MC-8L Family Internal USB Products

MB89580B/580BW Series

Standard products (Internal USB function)



- Maximum clock frequency: 12 MHz
- Minimum execution time: 0.33 µs
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage* (V)	Package		Functions
		LQFP (0.5 mm pitch)	LQFP (0.65 mm pitch)	
MB89583B	+3.0 to +5.5	64P	–	I/O ports : 53 Timebase timer : 21-bit × 1ch. PWM timer : 8-bit × 2ch. (also used as PPG timer × 1ch.) USB function UART/SIO : 1ch. Parallel port State of terminal RPVP(D+) and RPVM(D–) until starting USB connection : High-Z : MB89593B/595B/P595B Low-level output : : MB89593BW/595BW/P595BW Interrupts : 8 external Low-power consumption (standby functions) modes : Sleep, stop
MB89583BW		64P	–	
MB89585B		64P	–	
MB89585BW		64P	–	
MB89589B		–	64P	
MB89P585B		64P	–	
MB89P585BW		64P	–	
MB89P589B		–	64P	

Package : P - plastic

MB89590D Series

Standard products (Internal USB function, USB hub)

- Maximum clock frequency: 12 MHz
- Minimum execution time: 0.33 µs
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB89593D	+3.0 to +5.5	64P	I/O ports: 45 Timebase timer : 21-bit × 1ch. PWM timer:8-bit × 2ch. (also used as PPG timer × 1ch.) USB function USB hub UART/SIO: 1ch. State of terminal RPVP(D+) and RPVM(D–) until starting USB connection : High-Z : MB89593B/595B/P595B Low-level output : : MB89593BW/595BW/P595BW Interrupts: 8 external Low-power consumption (standby functions) modes: Sleep, stop
MB89595D		64P	
MB89P595D		64P	

Package : P - plastic

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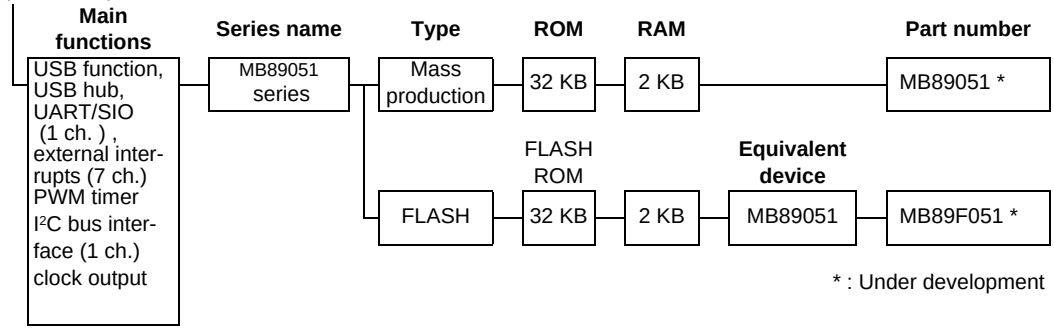
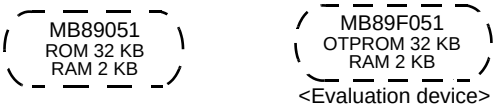


* : Under development

MB89051 Series

Standard products (Internal USB function, USB hub)



- Maximum clock frequency: 12 MHz
- Minimum execution time: 0.33 µs
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
◎MB89051	+3.0 to +5.5	64P	I/O ports: 41 USB function (endpoint : 4) USB hub (down port : 5, one is only for internal functions. Timebase timer : 21-bit × 1 ch. PWM timer : 8-bit × 2 ch. UART/SIO : 1 ch. Interrupts: 7 external I²C bus interface (1 ch.) Clock output : 6 MHz, 12 MHz Low-power consumption (standby functions) modes: Sleep, stop
◎MB89F051		64P	

Package : P - plastic
◎ : Under development

Environment Development Features

(1) Development efficiency enhancement

- Provides integrated total environment
  SOFTUNE V3 Workbench (Manager + Debugger) Windows98/Me/NT 4.0/2000 version
  SOFTUNE V3 Workbench (Manager + Debugger) integrates language tools and debugger tools, further facilitating the repeated process of coding, compiling and debugging.
- High programming efficiency
  C compiler support
  Structured assembly language support
- High programming development efficiency
  Provides C library
  Supports C language and assembly source debugging function
- Easy operation by multi windows (Windows98/Me/NT 4.0/2000 version)
  SOFTUNE V3 Workbench (manager + debugger)
  SOFTUNE V3 C checker
  SOFTUNE V3 C analyzer

(2) Efficient system development tools

- Provides realtime debugging using real target board
  Evaluation tool + SOFTUNE V3 Workbench emulator debugger
- Provides software debugging without target board

(3) Total development environment

- Personal computer (IBM-PC)
- ICE tool (MB2140A series, personal emulator)

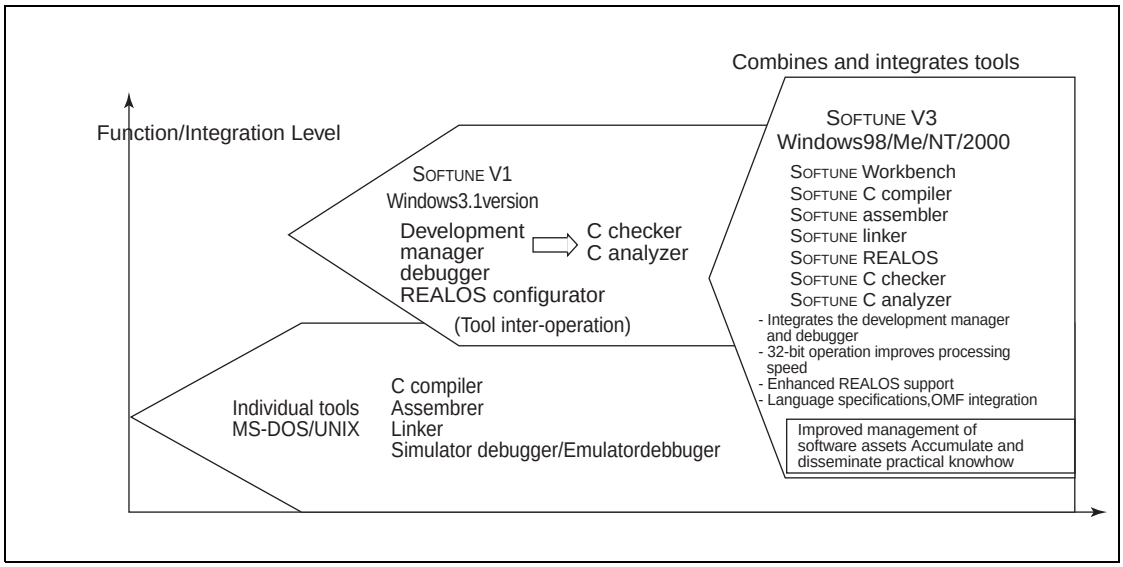
(4) Conformity with standards

Improves versatility and portability of software resources

- C language: Conforms to ANSI standard
- C library: Conforms to ANSI standard

SOFTUNE V3

1. The SOFTUNE Integrated Development Environment



2. SOFTUNE V3 Features and Structure

Workbench integrated project manager and two debugger modules

Errors can be corrected on the "fly", as they are discovered, and the resulting code can be debugged on the spot.

A variety of tools to support C-language coding are available

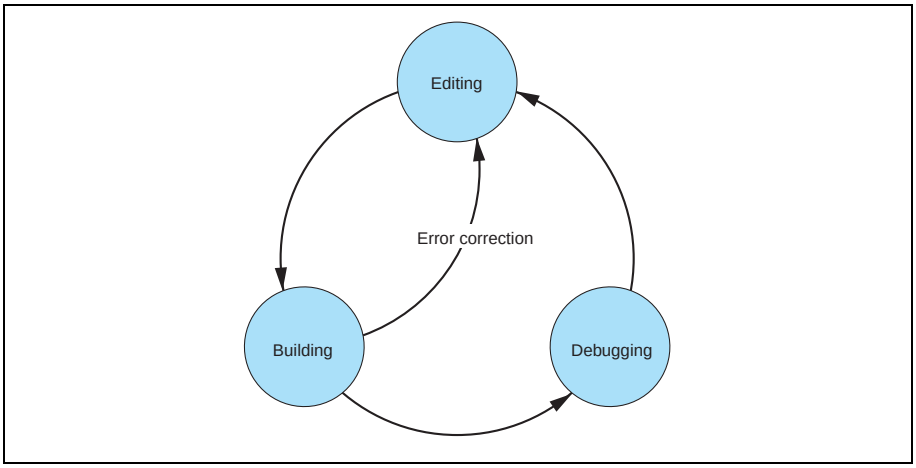
"C Checker" confirms code operation and "C Analyzer" analyzes the code's structure.

(1) Removing the Annoying Settings which are Part of Program Development

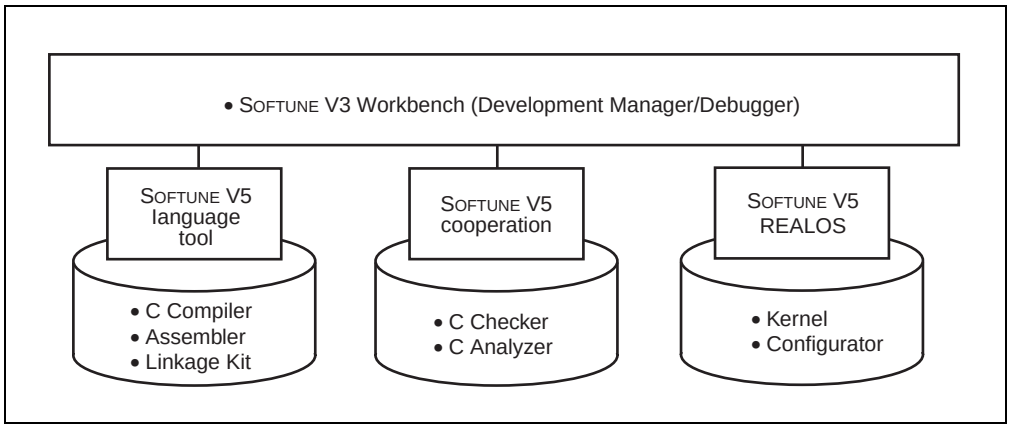
Developing programs for different systems requires the programmer to edit source code, perform actual builds and confirm program operations (debug). Finally, the programmer returns to the editing process to incorporate necessary changes, as indicated by debugging results.

SOFTUNE V3 is an integrated developing environment which is designed to perform such repetitive processes smoothly and efficiently. It is the third generation of SOFTUNE, which has evolved to meet various needs of our customers.

(2) Program Flow



(3) Structure of SOFTUNE V3

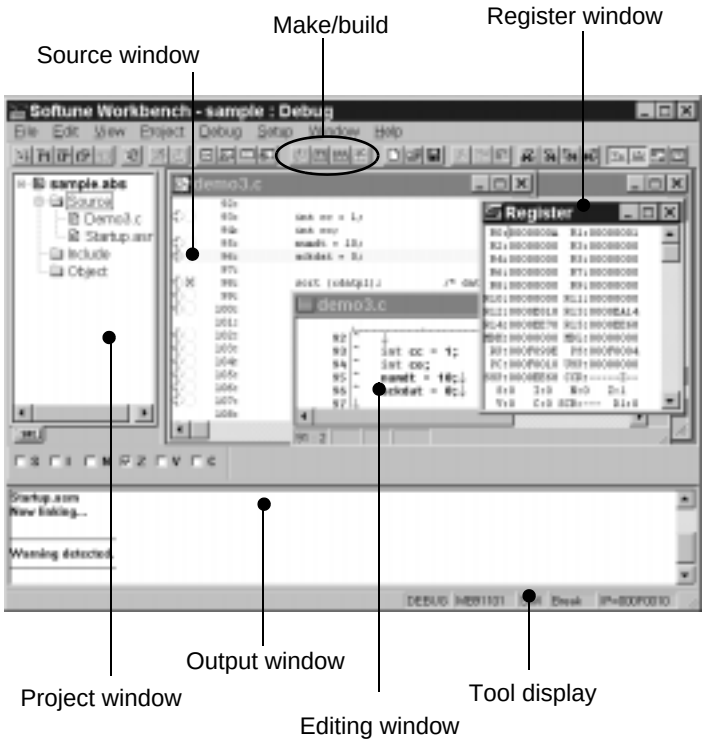


(4) Environment with SOFTUNE V3

The Efficient and Easy-to-Use Integrated Developing Environment.

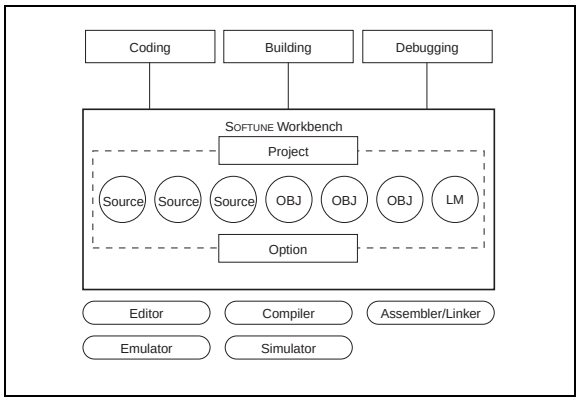
Program development requires repeated editing, make/build, and debugging operations. Performing these functions smoothly and effectively contributes to improved efficiency.

The SOFTUNE V3 integrated developing system is designed to meet program developers' numerous demands, while ensuring ease of use.



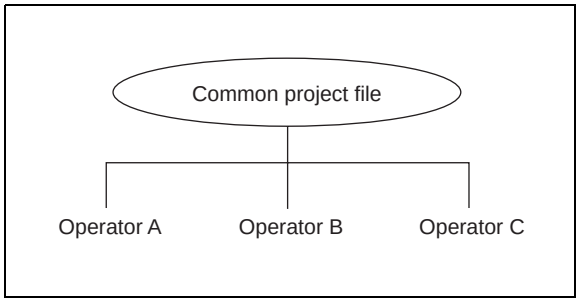
3. Manager Functions

Software programming proceeds according to the "project file", which contains all the information needed for program development.



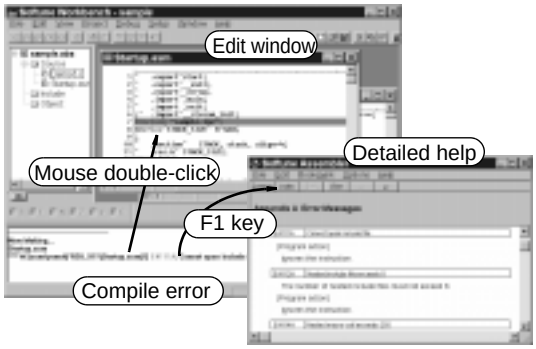
(1) Effective Project Usage

Whether working alone on several projects simultaneously or developing a project as a group, project files can be used to create a simple developing environment.



(2) Extremely Easy to Use

- Built-in Editor
  The built-in editor comes complete with many useful functions, such as visual keyword emphasis and auto-indent.
- Error Jump and On-line Help
  Errors that occur during builds are displayed in the output window at the bottom of the screen.
  To make a "Tag-jump" Double-click Mouse.Once on the error press "F1 key" for a more detailed error display.
- Cooperation with Commercially Available Editors
  To meet developers' requests to use editors to which they are accustomed, SOFTUNE can be configured to use the following commercially available editors:(Codewright32, TextPAD32 and others)

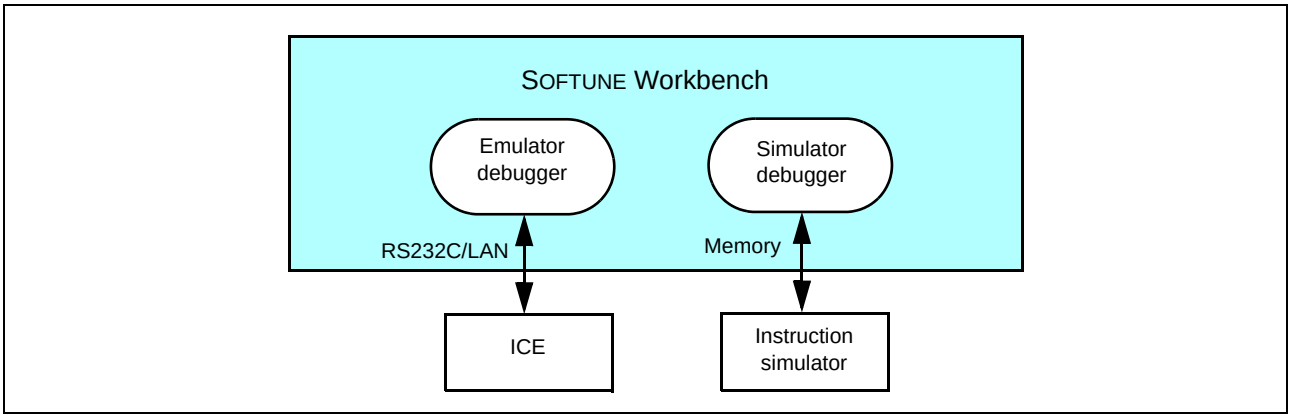


(3) Customizable Environment

When sharing files, cooperation with source generation management tools is assured, and file type conversion tools are called up, so that each person can operate in his or her own customized developing environment.

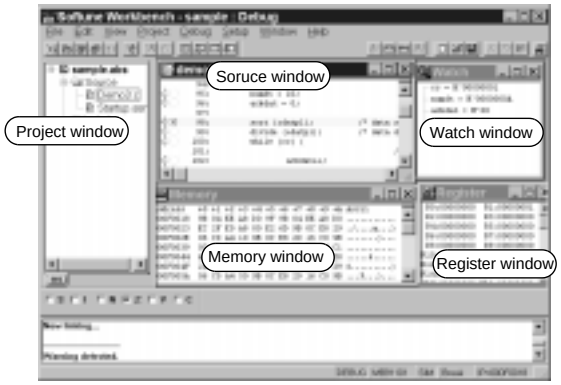
4. Debugger Function

SOFTUNE Workbench supports two debuggers that are needed at various stages of development. The appropriate debugger environment can be selected to match the situation.



(1) Easy-to see Screen Information

The user can freely change the screen layout by selecting the necessary windows. In addition, the displayed information can be selected to provide only the infomation that is necessary.



(2) Simple Environment Setting

- Debugging Environment: Setup "Wizard"

  The setup "wizard" supports the selection of communication lines with emulation pods and boards, as well as window settings.
- MCU Operating Environment

  The so-called “CPU information file,” which contains the information required to support all MCUs, is provided as standard. Necessary information such as I/O port locations, ROM/RAM capacity and initial addresses can be set automatically.
- Saving and Restoring the Debugging Environment

  Previous debugging environment specification, such as window locations, breakpoint settings, and memory mapping information, are saved, so that these settings are restored the next time the program is initiated.

5. Cooperation

In cooperation with SOFTUNE Workbench, the following SOFTUNE components help improve the quality of C-language programming, which greatly increases reviewing and documentation efficiency.

1)SOFTUNE V3 C Checker

Designed to meet the following requests from beginners through to advanced users:

- Eliminate all coding mistakes.
- Review programs quickly and efficiently.
- Enable even C-language beginners to create quality code.
- Maximize coding skills.
- Use software assets on Fujitsu CPUs.

The SOFTUNE C Checker checks code for maintainability, methods of expanding specifications and transportability; indicates areas where quality and performance could be improved, and reports these results to the user. The user can then review the C-language code.

(1) Outline

Recently software for embedded microcontrollers has been developed in the C language. However, it is difficult to understand the message output from a compiler unless the language specifications are well known.
This development support tool checks C-source programs to display and print advice for better quality and performance. It also has a facility for selecting necessary advice carefully.

(2) Features

- Outputs advised to be suitable for these objectives: Portability, coding errorperformance, porting to Fujitsu CPU's.
- Allows customization according to the programmers level.
- Works with C compilers (fcc911/fcc911s, cc907/fcc907s, fcc896s) for Fujitsu microcontrollers (FR family, F²MC-16 family, and F²MC-8L family).
- Provides easy operation and simple display over a GUI.

(3) Advising Function

The following pieces of advice are given. "Reason of check", "Example of program", "Suggestion of correction", and "One-point advice" are displayed and explained for each check item.

- Portability

  This tool makes a close check on the items "processing-definded operation" and "undefined operation" which can be problems in portability within the ANSI standard.
  It also gives an explanation of the operation of C compilers (Fcc911, Fcc907 and Fcc896) for Fujitsu microcontrollers.

  For example, the tool gives the user proper advice on many problems (such as a data type acceptable to a structure, code, and its arrangement) at the time of porting.

- Coding error

  This tool indicates the items which are not wrong in the language specifications but may cause an error and the items which are logically inconsistent.

  For example, the equivalent expression "**`if (a==0)`**" in the if statement is likely to be typed as the assignment expression "**`if (a=0)`**" by mistake. Most compilers cannot detect such an error.

- Performance

  This tool indicates the items generally providing better performance and the items essential and effective for the FR family, F²MC-16 family and F²MC-8L family.
  Stress is especially, put on the detection of object size reduction which can be a problem in software for embedded microcontrollers.

  For example, if a function return value is structure of the double type, an area is reserved for the return value and an object which is to be transferred to the area is output.

  This tool advises the user to transfer the function return value by a pointer and largely reduce the object size.

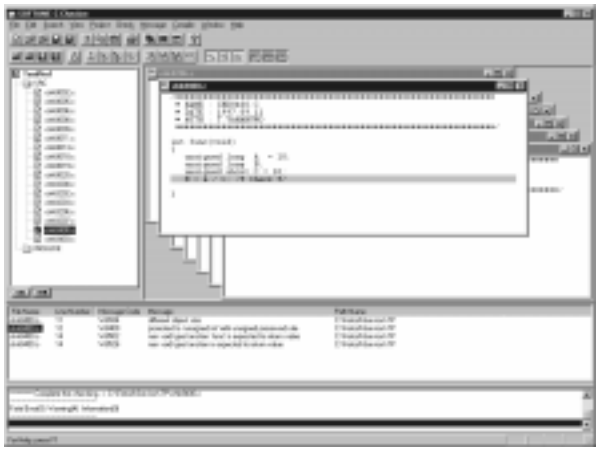
- Porting to Fujitsu CPU

  This tool advises the user what to consider in porting exsting software from other makers' CPU to Fujitsu CPU in the FR family, F²MC-16 family and F²MC-8L family.

  For example, in porting software resources created for the F²MC-16 family to the FR family, this tool advises the user to delete the expansion specifications (**`__far, __near, and __direct etc.`**) inherent to the F²MC-16 family.

8-bit Proprietary F²MC-8L Family Support Tools

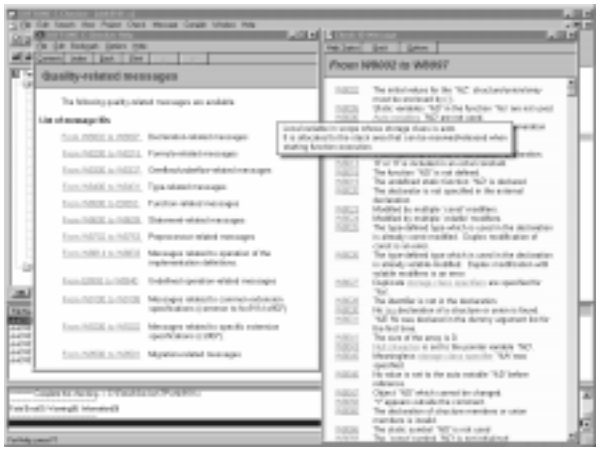
•Indicated messages output



• Coding error indicated and advice displayed

• Advice of porting to Fujitsu C compilers displayed

• Quality-related massages listed



2) SOFTUNE V3 C Analyzer

Designed to meet the following user situations:

- One wishes to examine a program's structure or processing, but the programmer is absent or documentation is unavailable.
- During program development, one wishes to create a structural program while taking into account structure and processing.
- One wishes to examine the range of effects caused by program modification.
- One wishes to create a program's internal documentation.
- One wishes to explore the possibilities of a more efficient program.

The structure and usage of data in a C-language source program are displayed visually, and the internal data structure, functional tree, stack usage and other infomation can be acquired and stored in a file.

(1) Outline

Recent software (ROM) for embedded microcontrollers is increasingly extending its development scale. This situation is created from development by many programmers, diversion of exsting resources, and use of package programs. This development support tool statically analyzes the C-source program to visually display and print the function-to-function structure, reference data, and statistical data. In addition to generating the information required for design and maintenance, the development support tool also provides functions for development aimed at embedded applications. These functions (maximum stack size calculation) are specific to the C compilers (fcc911s, fcc907s, fcc896s) used for Fujitsu microcontrollers (FR family, F²MC-16 family, and F²MC-8L family).

(2) Features

- Displays and prints the function-to-function structure, reference data, and statistical data.
- Supports the embedded capability of C compilers (fcc911/fcc911s, cc907/fcc907s, and fcc 896s)for Fujitsu microcontrollers (FR family, F²MC-16 family and F²MC-8L family).
- Provides easy operation and simple display over a GUI.

(3) Explanation of Features

The following data is enabled for development, maintenance, and higher porting efficiency.

- Graphic flow

  This feature displays the "call" function in the block structure way. It also allows the display of the entire function and calls from any function and the retrieval of functions.
- Logic flow

  This feature visually displays the internal structure of the C-source program.
  For example, it shapes the control structure of **`for`** and **`switch`** statements and structure declarations. A jump feature for retrieval by functions, variable, tag, and macro names is also provided.
- Displaying statistical data

  This feature displays the complexity and line count of a programs every function, the source of destination function name, and the count of appearances of **`if`**, **`for`** and **`asm`** statements, etc.
- Displaying argument data

  This feature displays data about the function-called file name and line number, the return value of the declared function, and the type of argument. It also checks the adjustability of dummy arguments with actual arguments.
- Displaying cross-reference data

  This feature displays functions, variables, tag and macro declarations in its function and its line number.
- Displaying global data

  This feature displays the functions using global variables. It also detects unused global variables.
- Program checking

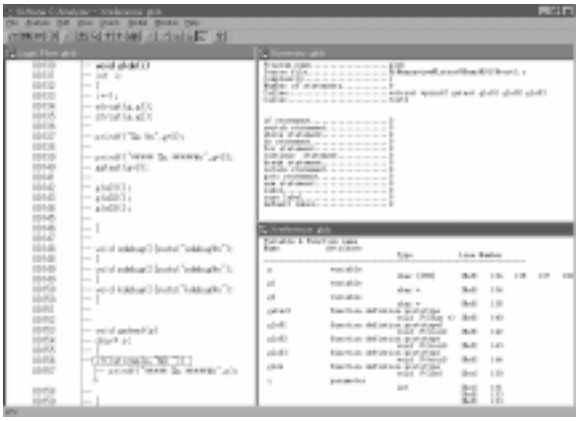
  This feature checks and displays the adjustabiltiy of dummy arguments with actual arguments.
- Calculating the maximum amount of stacks used

  This feature calculates and displays the amount of stacks used in the entire function, as well as in any other functions. This calculation is made on the basis of the output of C compilers (fcc911/fcc911s, fcc907/fcc907s, and fcc896s) for Fujitsu microcontrollers (FR family, F²MC-16 family and F²MC-8L family).

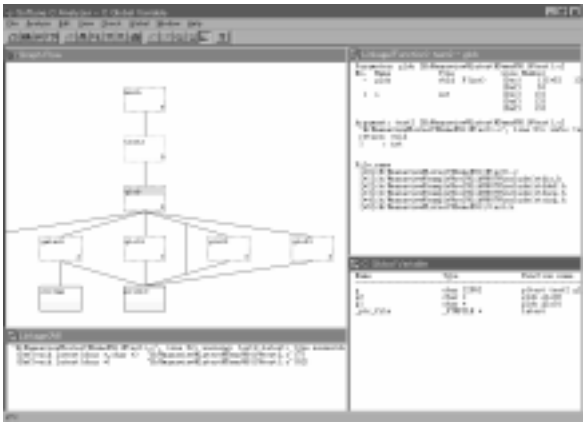
8-bit Proprietary F²MC-8L Family Support Tools

•Displaying graphic flow

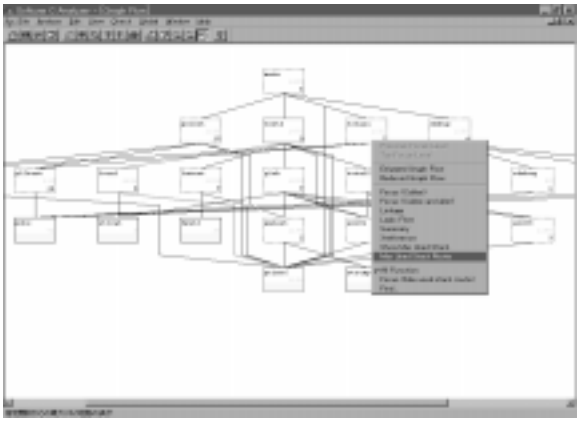
• Displaying logic flow, statistical and cross-reference data



• Displaying logic flow (focus), argument and global data



• Displays stack use volume (green numbers) and largest stack configuration (orange numbers)



SOFTUNE V3 Support Software Product List (F²MC-8L Family)

Software		Part number *1	Remarks
PackProducts	SOFTUNE V3 Professional Pack	SP3603Z008-P01	SOFTUNE V3 workbench SOFTUNE V3 C compiler SOFTUNE V3 assembler pack SOFTUNE V3 analyser SOFTUNE V3 checker
Individual Products	SOFTUNE V3 workbench	SP3603W008-P01	Integrated Manager,Simulator debugger and Emulator debugger functions
	SOFTUNE V3 C compiler	SP3603C008-P01	ANSI standard conforming
	SOFTUNE V3 assembler pack	SP3603K008-P01	Assembler, linker, librarian,Object format converter
	SOFTUNE V3 analyzer	SP3691X008-P01	For the FR, F²MC-16, and F²MC-8L
	SOFTUNE V3 C checker	SP3691Y008-P01	For the FR, F²MC-16, and F²MC-8L
Compatible emulator hardware (ICE)		MB2140 series - MB2141A/B - MB2144-505/508	–
Personal computers *2	Operating machine	FMV and similar IBM compatibles	–
	Operating OS	Windows98 WindowsMe WindowsNT4.0 Windows2000	–
	Media	CD-ROM *3	–

*1: The product code suffix (Pxx) indicates the number of licenses.
*2: Pentium or higher CPU recommended. 48 to 64MB or more memory recommended. 70MB of a disk capacity is required.
*3: An electronic manual (PDF format) is provided with each product (Japanese and English).
Printed manuals are sold separately. Licensing of each product is available in a number of forms (3, 5 or 10 copies).

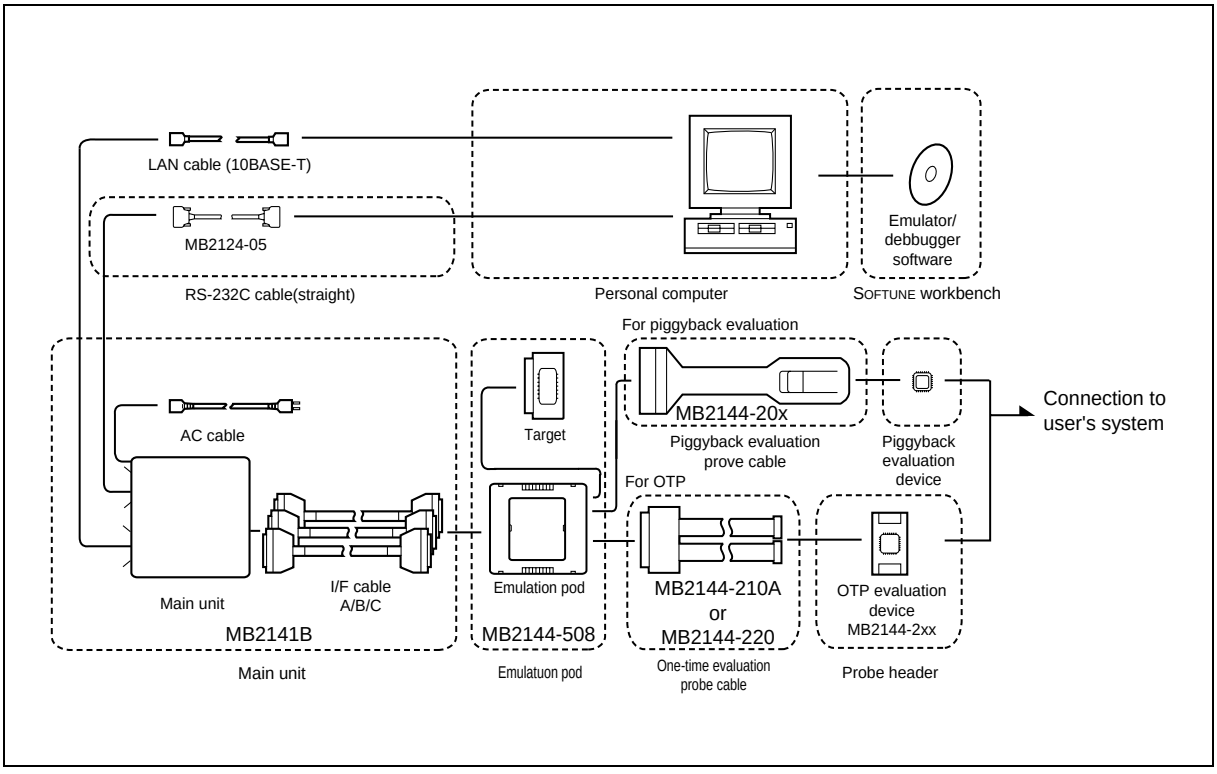
Support Hardware and F²MC-8L Family Evaluation Tools

MB2140 Series

- Power supply voltage : AC100V or AC200 V
- Microcontroller operating voltage : +2.7V to +5.5V
  The range (Max. and Min.) of Microcontroller operating voltage and operating freqency depend on each Microcontroller.
  See the document including Data Sheet and check the range of Microcontroller operating voltage and operating freqency.
- Supports debugging of source level (in assembly, C languages, a mixed indicaton)
- Simplified GUI operation using pull-down menu and buttons
- On-The-FLY function (commands can be run during microcontroller execution and reference memory)
- Powerful real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Event trigger allows a wide range of conditions to be specified (× 8)
- Sequential control in 8 conditions and 8 levels
- Performance measurement function (measurement of execution speed between two points, iteration count measurement)
- C0 coverage measurement function (program execution coverage rate measurement)
- Host I/F (standard accessories) : RS-232C straight (max 115 Kbps) , LAN (10BASE-T)

System Overview

System configuration



Name	Part number	Remarks
Main unit	MB2141B	Power supply voltage : 100 V or 200 V. Host I/F : RS-232C(115 Kbps)) , LAN (10BASE-T)
Emulation pod *6	MB2144-508	Dimensions :158mm(with) × 126mm(depth) × 38mm(height), Weight : 0.5kg, Includes target (MB89T625)
Piggyback/evaluation (PV) probe cable	MB2144-201	For DIP-28, piggyback/evaluation package: MDIP-64C-P02
	MB2144-202	For LCC-32 rectangular, piggyback/evaluation package: MQP-64C-P01, MQP-80C-P01, MQP-100C-P02
	MB2144-203	For LCC-32 square, piggyback/evaluation package: MQP-48C-P01, MQP-100C-P02
One-time evaluation probe cable	MB2144-210A or MB2144-220	Use in conjunction with the probe header for each product type.
One-time evaluation probe header	MB2144-211-01A *1	For the MB89860 series (QFP-80), standard options are mounted on MB89P867
	MB2144-212-01A *3	For the MB89850 series (SH-DIP-64), standard options are mounted on MB89P857
	MB2144-214-01A *2	For the MB89810A series (QFP-64), default options are mounted on MB89P817A
	MB2144-215-01 *2	For the MB89660 series (QFP-64), default options are mounted on MB89P665
	MB2144-216-01 *3	For the MB89660 series (SH-DIP-64), default options are mounted on MB89P665
	MB2144-217-01 *4	For the MB89P585B (LQFP-64), default options are mounted on MB89P585B
	MB2144-218-01 *5	For the MB89R905 (QFP-48) ,FPT-48P-M16 (0.8 mm pitch, □ 12 × 12 mm)
	MB2144-224-01 *7	For the MB89P589B (LQFP-64), default options are mounted on MB89P589B
	MB2144-225-01 *4	For the MB89P585BW (LQFP-64) , default options are mounted on MB89P585BW
	MB2144-226-01 *8	For the MB89R907A (QFP-48), FPT-48P-M13 (0.8 mm pitch, □ 10 × 10 mm)
RS-232C cable (straight)	MB2124-05	Straight modem cable, DSUB25 - DSUB9P, for FMV or IBM-PC

*1 : Includes one Q-pack for QFP-80 (model : TQPACK080RA: made by Tokyo Eletech Ltd.)
Note : Care is required in printed circuit board pattern design because the position of the board connector part (the flat section at the pin tips) of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).
Includes one Q-socket for QFP-80 (model : TQSOCKET080RAG: made by Tokyo Eletech Ltd.)

*2 : Includes one Q-pack for QFP-64 (model : TQPACK064RZ: made by Tokyo Eletech Ltd.)
Note : Care is required in printed circuit board pattern design because the position of the board connector part (the flat section at the pin tips) of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).
Includes one Q-socket for QFP-64 (model : TQSOCKET064RZG: made by Tokyo Eletech Ltd.)

*3 : Includes one IC socket for SH-DIP-64 (model : IC83-64075-GS4: made by Yamaichi Electronics Inc.)

*4 : Includes one Q-pack for LQFP-64 (model : TQPACK064SD : made by Tokyo Eletech Ltd.)
Note : Care is required in printed circuit board pattern design because the size of the foot pattern of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).
Includes one Q-socket for LQFP-64 (model : TQSOCKET064SDW : made by Tokyo Eletech Ltd.)

*5 : Includes one Q-pack for QFP-64 (model : TQPACK064SA : made by Tokyo Eletech Ltd.)
Includes one Q-socket for QFP-64 (model : TQSOCKET064SAW : made by Tokyo Eletech Ltd.)
Note : Care is required in printed circuit board pattern design because the size of the foot pattern of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).

*6 : Interchangeability to MB2114-505.

*7 : Includes one NQ-pack for LQFP-64 (model : NQPACK064SB : made by Tokyo Eletech Ltd.)
Includes one HQ-pack for LQFP-64 (model : HQPACK064SB140 : made by Tokyo Eletech Ltd.)
Note : Care is required in printed circuit board pattern design because the size of the foot pattern of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).

*8 : Includes a pair of Q-pack and Q-socket for QFP-48 (model: TQPACK048SA, TQSOCKET048SAW: by Tokyo Eletech Ltd.)
Note: The dimension of foot patterns is somewhat different between Q-pack and mass production IC packages.
Be careful in designing patterns of print-circuit boad.

Contact for details:

*1, *2, *4, *5, *7,*8

- •USA: Daimaru New York Co. TEL(212)575-0820/0821
  OESS Co. Head Office TEL(201)288-4422
  OESS Co. Los Angeles Office TEL(714)220-1878
  OESS Co. San Jose Office TEL(408)441-1855
- •Europe Germany: OESS GmbH TEL(06106)75013
- •Asia Hong Kong: Daimaru Kogyo, Ltd. Hong Kong Office TEL(852)8939457/8939108
  Singapore: Daimaru Kogyo, Ltd. Singapore Office TEL(65)2251636

*3

- •USA: Yamaichi Electronics Inc. TEL(408)4520797
- •Europe Denmark : Elmatok A.S. TEL(65)351446
  England : Radiatron Components Ltd. TEL(01)8911221
  AB Connector Ltd. TEL(0604)712000
  Finland : Dualtek Oy TEL(80)8019911
  France : Manudax-France TEL(1)4342-2050
  Germany: Macrotron AG TEL(089)4208148
  Glyn GmbH TEL(49)61278077
  Connector Service GmbH TEL(089)429277
  Italy : Eurosab International s.r.l TEL(02)93169781
  Spain : S.A Generalde Imporciones Electronicas TEL(1)416-92-61
  Sweden : Bexab Electronics TEL(08)7680560
  Switzerland : Slcovend AG TEL(01)8303161
- •Asia Singapore : Yamco Electronics Pte Ltd. TEL(336)6522
  Korea : Asia Yamaichi Electronics, Inc. TEL(02)482-7263
  Taiwan : Sing Way Co. TEL(02)718-5971
  Joung Lai Trading Co. Ltd. TEL(02)754-1022

- •Select the probe cable to match the microcontroller being evaluated.
- •Use this evaluation tool by connecting to the user system or to the evaluation device on the user system.
- •When using a piggyback/evaluation (PV) device, obtain the piggyback/evaluation (PV) device separately.
- •A one-time evaluation or EPROM evaluation type evaluation device is mounted in the one-time evaluation or EPROM evaluation probe cable.

Emulator specification for F²MC-8L

Emulator series		MB2140 series emulator	
Main unit		Main unit : MB2141B	
Pod		MB2144-508	MB2144-505
Target microcontroller		F²MC-8L	F²MC-8L
Evaluation device	Old	Yes	Yes
	New	Yes	No
Operating power supply voltage of micro-controller *		2.7 to 5.5 V	2.7 to 5.5 V
Operating frequency of microcontroller *		Internal : 32 kHz to 20 MHz External : 8 kHz to 5 MHz	Internal : 32 kHz to 16 MHz External : 8 kHz to 4 MHz
Debugger / OS		SOFTUNE V3 Workbench Windows98/Me/NT4.0/2000	SOFTUNE V3 Workbench Windows98/Me/NT4.0/2000
Simple target		Attachment (MB89T625)	No
Memory area		- User's memory area - Emulation memory area - Undefined area	
User's memory area		- Max 20 area - Unrestricted of area size - READ, WRITE : an access attribute setup is possible.	
Emulation area	Size	64 Kbyte	
	Mapping unit	1 byte unit, 20area	
	Access attribute	READ, WRITE, GUARD, NOGUARD	
Mirror area : It is used at on-the-fly.		It is 5 area in all about copy area of user's memory area and emulation memory area.	
Execution control		- Continuous execution- The automatic change by sauce display - Step execution- 1 step execution of a sub routine and a function - Machine language command unit- Permission/prohibition of interrupt - C language sauce line unit- Permission/prohibition of a watch dog reset function	
Break		- Instruction execution break : 64 K point - Data access break : 64 K point - Sequential end break - Garded access break - Trace buffer full break - Performance buffer full break - Forced break	
Trace capacity		- Single trace : 32 K cycles (ON/OFF of trace by the event trigger and the sequencer is possible.) - Multi trace : 2 K blocks (1 block is 8 cycles before and after an event trigger.)	
Trace data		- Address - Data - Status Access status : READ, WRITE, CODE Inside status of a device : reset, a hold, and data are effective/invalid. - External probe data - The execution level of a sequencer	
Display form oftrace data		- Machine cycle - Instruction mnemonic - Sauce line	
Event trigger con-dition setup	The number of points	8	
	Trigger conditions	- The AND conditions of address, data, external probe and status. - All conditions can be specified of don't care per 1 bit.	
	Sequential level	8	
	Trigger path	Max 16M time	

(Continued)

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Emulator series		MB2140 series emulator	
Main unit		**Main unit : MB2141B**	
Pod		**MB2144-508**	**MB2144-505**
Target microcontroller		**F²MC-8L**	**F²MC-8L**
On-the-fly function (Command execution at the MCU operation)		Yes	
Execution time measurement		- Performance measurement function : 4 domains - Measurement domain : event trigger condition setting domain - Measurement of the minimum, the maximum, and average time is possible. - It is 1µs unit (initial value) is a maximum of 70 minutes. - It is 100 ns unit and is a maximum of 7 minutes.	
Co coverage (Rate measurement of program execution complete coverage)		The range of a debugging domain setup : A maximum of 32 domain An access attribute (R/W) setup is possible.	
External probe sampling		8 signals	
Host computer		Personal computer	
Host interface		- RS-232C (115 Kbps) - LAN (10BASE-T)	
Dimensions, weight (A projection part and a cable part remove.)	Main unit	W210 × D297 × H78 mm, 2.9 kg	
	Pod	W160 × D128 × H40 mm, 0.5 kg	
Power supply for emulator : MB2141B		AC 100-120 V and AC 200-220 V are switched automatically.	

* : The range (Max. and Min.) of Microcontroller operating voltage and operating freqency depend on each Microcontroller. See the document including Data Sheet and check the range of Microcontroller operating voltage and operating freqency.

F²MC-8L Family Adaptors

(1)Programming Adaptors for F²MC-8L One-Time PROM Microcontrollers and EPROM Microcontrollers

OTPROM	Package (lead pitch, body size)		Package code	Adaptor socket
MB89P131PFM MB89P133APFM MB89P135APFM	QFP-48	(0.80 mm, □10×10 mm)	FPT-48P-M13(new) FPT-48P-M04	ROM-48QF2-28DP-8L *1
MB89P147-V1P-SH MB89P147-V2P-SH	SH-DIP-64	(1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L4 *1
MB89P147-V1PF MB89P147-V2PF	QFP-64	(1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L4 *1
MB89W147-V1C-SH MB89W147-V2C-SH	SH-DIP-64	(1.778 mm, □56.9×18.75 mm)	DIP-64C-A06	ROM-64SD-28DP-8L4 *1
MB89P155-10XPF MB89P155-20XPF	QFP-80	(0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L3 *1
MB89P155-10XPFM MB89P155-20XPFM	LQFP-80	(0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L2 *1
MB89P155-10XPFV MB89P155-20XPFV	LQFP-80	(0.50 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-28DP-8L *1
MB89P165-10XPF MB89P165-20XPF	QFP-80	(0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L3 *1
MB89P165-10XPFM MB89P165-20XPFM	LQFP-80	(0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L2 *1
MB89P165-10XPFV MB89P165-20XPFV	LQFP-80	(0.50 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-28DP-8L *1
MB89P173-xxxPF MB89P175APF	QFP-48	(0.80 mm, □12×12 mm)	FPT-48P-M16	ROM-48QF-28DP-8L *1
MB89P185-xxxPF	QFP-64	(1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L3 *1
MB89P185-xxxPFM	LQFP-64	(0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-28DP-8L2 *1
MB89P195-xxxPF	SOP-28	(1.27 mm, □17.75×8.6 mm)	FPT-28P-M17	ROM-28SOP-28DP-8L* 3
MB89P195-xxxP	DIP-28	(2.54 mm, □35.73×13.8 mm)	DIP-28P-M05	ROM-28DP-28DP-8L *3
MB89P195A-xxxPF	SOP-28	(1.27 mm, □17.75×8.6 mm)	FPT-28P-M17	ROM-28SOP-28DP-8L *3
MB89P195A-xxxP	DIP-28	(2.54 mm, □35.73×13.8 mm)	DIP-28P-M05	ROM-28DP-28DP-8L *3
MB89P538P-SH	SH-DIP-64	(1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-32DP-8LA2* 2
MB89P538PF	QFP-64	(1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-32DP-8LA2 *2
MB89P538PFM	LQFP-64	(0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-32DP-8LA *2
MB89P558APFV	LQFP-100	(0.5 mm, □14×14 mm)	FTP-100P-M05	ROM-100SQF-32DP-8LA2*2
MB89P558APFT	TQFP-100	(0.4 mm, □12 × 12 mm)	FTP-100-M18	ROM-100TQF-32DP-8LA*2
MB89P568PF	QFP-80	(0.8 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-32DP-8LA2 *2
MB89P568PFM	LQFP-80	(0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-32DP-8LA2
MB89P568PFV	LQFP-80	(0.5 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-32DP-8LA *2
MB89P579APFV	LQFP-100	(0.5 mm, □14×14 mm)	FPT-100P-M05	ROM2-100LQF-32DP-8LA *4
MB89P579APFT	TQFP-100	(0.4 mm, □12×12 mm)	FPT-100P-M18	ROM2-100TQF2-32DP-8LA *4
MB89P585B/BW MB89P595D	LQFP-64	(0.5 mm, □10×10 mm)	FPT-64P-M03	ROM-64LQF-32DP-8LA *4
MB89P589B	LQFP-64	(0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-32DP-8LA *4
MB89P601PFV	LQFP-48	(0.5 mm, □7×7 mm)	FPT-48P-M05	ROM-48SQF-28DP-8L *1
MB89P625P-SH	SH-DIP-64	(1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L *1
MB89P625PF	QFP-64	(1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L *1
MB89P625PFM	LQFP-64	(0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-28DP-8L *1
MB89P627P-SH MB89P629P-SH	SH-DIP-64	(1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L *1
MB89P627PF MB89P629PF	QFP-64	(1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L *1
MB89W625C-ES-SH MB89W627C-ES-SH	SH-DIP-64	(1.778 mm, □56.9×18.75 mm)	DIP-64C-A06	ROM-64SD-28DP-8L* 1
MB89P637-xxxP-SH	SH-DIP-64	(1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L *1
MB89P637-xxxPF	QFP-64	(1.00 mm, □14× 20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L *1

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OTPROM microcontrollers	Package (lead pitch, body size)		Package code	Adaptor socket
MB89W637C-ES-SH	SH-DIP-64	(1.778 mm, □57×18 mm)	DIP-64C-A06	ROM-64SD-28DP-8L *1
MB89P647PF	QFP-80	(0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L2*1
MB89P647PFM	LQFP-80	(0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L*1
MB89P657APF	QFP-100	(0.65 mm, □14×20 mm)	FPT-100P-M06	ROM-100QF-28DP-8L2*1
MB89P657APFV	LQFP-100	(0.50 mm, □14×14 mm)	FPT-100P-M05	ROM-100SQF-28DP-8L
MB89P665P-SH	SH-DIP-64	(1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L*1
MB89P665PF	QFP-64	(1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L*1
MB89W665C-ES-SH	SH-DIP-64	(1.778 mm, □56.9×18.75 mm)	DIP-64C-A06	ROM-64SD-28DP-8L*1
MB89P677APF	QFP-80	(0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L2*1
MB89P677APFM	LQFP-80	(0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L*1
MB89P689PF	QFP-100	(0.65 mm, □14×20 mm)	FPT-100P-M06	ROM-100QF-32DP-8LA*2
MB89P689PFV	LQFP-100	(0.50 mm, □14×14 mm)	FPT-100P-M05	ROM-100SQF-32DP-8LA*2
MB89P808PF	QFP-100	(0.65 mm, □14×20 mm)	FPT-100P-M06	ROM-100QF-32DP-8LA2*2
MB89P808PFV	LQFP-100	(0.50 mm, □14×14 mm)	FPT-100P-M05	ROM-100SQF-32DP-8LA3*2
MB89P817APF	QFP-64	(1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L*1
MB89P825PFM	LQFP-80	(0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L3*1
MB89P857P-G	SH-DIP-64	(1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L*1
MB89W857C-ES-SH	SH-DIP-64	(1.778 mm, □56.9×18.75 mm)	DIP-64C-A06	ROM-64SD-28DP-8L*1
MB89P867PF	QFP-80	(0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L2*1
MB89W867CF-ES	QFP-80	(0.80 mm, □14×20 mm)	FPT-80C-A02	ROM-80QF-28DP-8L2*1
MB89P875PF	QFP-80	(0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L3*1
MB89P875PFV	LQFP-80	(0.50 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-28DP-8L*1
MB89P899PF	QFP-100	(0.65 mm, □14×20 mm)	FPT-100P-M06	ROM-100QF-32DP-8LA*2
MB89P915-xxxP-SH	SH-DIP-48	(1.778 mm, □43.69×13.8 mm)	DIP-48P-M01	ROM-48SD-28DP-8L*3
MB89P915PF	QFP-48	(0.8 mm, □12×12 mm)	FPT-48P-M15	ROM-48QF-28DP-8L2*3
MB89P928PF	QFP-80	(0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-32DP-8LA*2
MB89P935BPFV	SSOP-30	(0.65 mm, □9.7×5.6 mm)	FPT-30P-M02	ROM3-FPT30M02-8L*5
MB89P945PF	QFP-48	(0.80 mm, □12×12 mm)	FPT-48P-M16	ROM-48QF-28DP-8L3*1
MB89P955PFM	LQFP-64	(0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-28DP-8L3*1
MB89P965APF	QFP-48	(0.80 mm, □12×12 mm)	FPT-48P-M16	ROM2-48QF-32DP-8LA*4
MB89P965APFM	QFP-48	(0.80 mm, □10×10 mm)	FPT-48P-M13	ROM2-48QF2-32DP-8LA*4
MB89P965APFV	LQFP-48	(0.50 mm, □7×7 mm)	FPT-48P-M05	ROM2-48LQF-32DP-8LA*4
MB89F969APFM	LQFP-64	(0.65 mm, □12×12 mm)	FPT-64P-M09	FLASH-64QF2-32DP-8LF*6
MB89P979PFV	Under planning LQFP-80	(0.50 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-32DP-8LA2*2
MB89P985PFM	LQFP-64	(0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-28DP-8L4*1
MB89P985PFV	LQFP-64	(0.50 mm, □10×10 mm)	FPT-64P-M03	ROM-64SQF-28DP-8L3*1

Contact for details:Tokyo Japan : Sun Hayato Co. Ltd. FAX (81) 3-5396-9106
Advanced Interconnectics : http://advintcorp.com

Notes:Use a general-purpose EPROM programmer that is able to program a MBM27C256A or MBM27C1000.
A gang EPROM programmer is not recommended. Also, contact Fujitsu for programming mounted devices.
The recommended screening practice before mounting is high-temperature aging (+150°C, 48H).

*1:MBM27C256A equivalent.
Recommended EPROM programmer : UNISITE, 3900, 2900 (Data I/O FAX (81) 3-3779-2203)
1890A, 1891 (Minato Electronics FAX (81) 45-591-6451)
R4945, R4949A (Advantest FAX (81) 44-888-1387)

*2:MBM27C1000 equivalent.
Recommended EPROM programmer : same as *1

*3:MODEL 1890A (Ver. 2.1) + MOS unit OU-910 (Ver. 4.07) : Minato Electronics FAX (81) 45-591-6451
AF9708 (Ver. 1.40 or higher) , AF9709 (Ver. 1.40 or higher) , AF9723 (Ver 1.50 or higher) : Ando Electric Co., Ltd.

*4:MODEL 1890A + MOS unit (Ver. 4.32r) + 3V board (ML01-781) : Minato Electronics FAX (81) 45-591-6451
AF9708 (Ver. 1.20 or higher) , AF9709 (Ver. 1.20 or higher) , AF9723 (Ver 1.60 or higher)+AF9833(Ver 1.50 or higher : Ando Electric Co., Ltd.

*5:Serial programming mode only : Yokogawa Digital Computer Co.

*6:MODEL 1890A + OU-910 (Ver 4.32b or higher) : Minato Electronics
AF9708 (Ver. 1.60 or higher) , AF9709 (Ver. 1.60 or higher) : Ando Electric Co., Ltd.

(2)EPROM Programming Adaptor Sockets for Piggyback Device

Target EPROM	Package	Adaptor socket model
MBM27C512, MBM27C256A, MBM27C64	LCC-32 (rectangular)	ROM-32LC-28DP-YG
	LCC-32 (square)	ROM-32LC-28DP-S

Contact for details: Tokyo Japan: Sun Hayato Co. Ltd. FAX (81) 3-5396-9106

(3)IC Package Conversion Adaptors for the F²MC-8L Family

Target microcontroller	Package conversion (up → down)	IC package conversion adaptor model
MB89610 series MB89620 series MB89630 series MB89530 series	SH-DIP-64 → QFP-64 (1.00 mm pitch)	64SD-64QF-8L
	SH-DIP-64 → QFP-64 (0.65 mm pitch)	64SD-64QF2-8L
	SH-DIP-64 → SQFP-64 (0.5 mm pitch)	64SD-64SQF-8L
MB89120/A series MB89130/A series MB89960/A series	QFP-48 (0.80 mm pitch) → SQFP-48 (0.50 mm pitch)	48QF-48SQF-8L-UP 48QF-48SQF-8L-DWN
MB89190/A series	QFP-48 (0.80 mm pitch)→ SOP-28	48QF-28SOP-8L
	QFP-48 (0.80 mm pitch)→ DIP-28 (2.54 mm pitch)	48QF-28DP-8L
	QFP-48 (0.80 mm pitch)→ SHDIP-28 (1.778 mm pitch)	48QF-28SD-8L
MB89150/A series MB89160/A series MB89560A series MB89640 series MB89670/A series	QFP-80 (0.80 mm pitch) → QFP-80 (0.65 mm pitch)	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN
MB89150/A series MB89160/A series MB89560/A series	QFP-80 (0.80 mm pitch) → LQFP-80 (0.5 mm pitch)	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN
MB89550A series MB89570 series	LQFP-100 (0.50 mm pitch) → TQFP-100 (0.4 mm pitch)	100SQF-100TQF-8L
MB89650A series	LQFP-100 (0.50 mm pitch) → QFP-100 (0.65 mm pitch)	100SQF-100QF-8L
MB89863	SH-DIP-64 → QFP-48(0.80 mm pitch)	64SD-48QF-8L
MB89910 series	SH-DIP-64 → SH-DIP-48	64SD-48SD-8L2
MB89930 series	QFP-48 (0.8 mm pitch) → SSOP-30 (0.65 mm pitch)	48QF-30SOP-8L

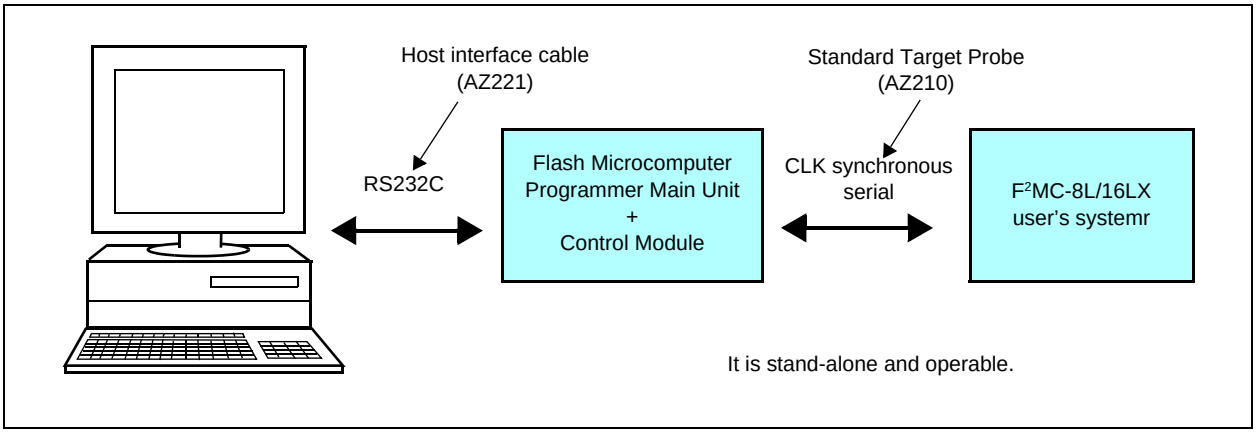
Contact for details: Tokyo Japan: Sun Hayato Co. Ltd. FAX (81) 3-5396-9106
Advanced Interconnections Corp.: http://www.advintcorp.com/

Serial on board programmer

The serial on board programming (Fujitsu standard) in FLASH memory of the F²MC-16LX family or OTPROM of the F²MC-8L family is supported as the following programmer.

1. AF220/AF210/AF120/AF110 (FLASH microcontroller programmer) : Yokogawa Digital Computer

(1)System configuration



(2) Product configuration

Product name	Part number	Description
Flash Microcontroller Programmer Main Unit	AF220/AC4P	with Ethernet(10Base-T) Interface /100V to 220V Power supply adaptor
	AF210/AC4P	Basic Model /100V to 220V Power supply adaptor
	AF120/AC4P	Single Operation Model with Ethernet Interface /100V to 220V Power supply adaptor
	AF110/AC4P	Single Operation Model /100V to 220V Power supply adaptor
Host Interface Cable	AZ221	Writer exclusive use. RS232C cable for PC/AT
Standard Target Probe	AZ210	Standard Target Probe (a) : 1 m
Control Modules	FF002 or FF004A	Controll modules for F²MC-8L OTP microcontroller made by Fujitsu.
Remote Controller	AZ290	Remote Controller
Memory card	/P2	2 MB PC Card
	/P4	4 MB PC Card

Contact for detailes : Yokogawa Digital Computer Corporation
Although AF200 (Yokogawa Digital Computer) has ceased, the conventional system configuration is also possible for serial onboard writing (a standard for FUJITSU) .

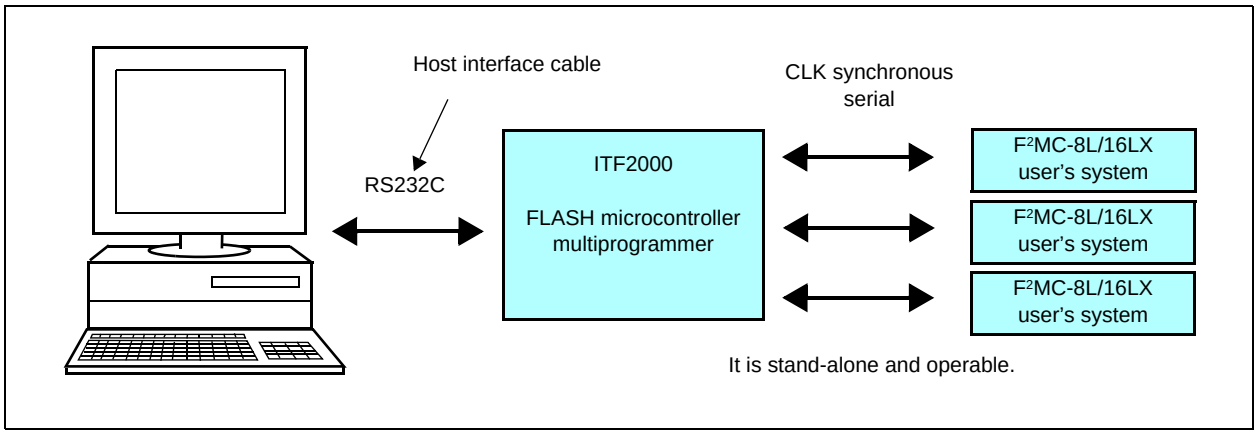
(3) OTPROM microcontroller for programming

OTPROM microcontroller (OTPROM size)		Control Module	Status
MB89P558A	(48 KB)	FF002	Correspondence
MB89P935B	(16 KB)	FF004A	Correspondence
MB89P585B/BW	(16 KB)	FF004A	Correspondence
MB89P595D	(16 KB)	FF004A	Correspondence

* : In control module FF004A, AF200 (cereal programmer of an old version) is available.

2. ITF2000 (Serial Gang programmer) : Interface

(1)System configuration



(2) Product configuration

Product	Function
ITF2000	Main unit of FLASH microcontroller multiprogrammer (with remote software)
ISP2000	Adaptor for on board programming (with main cable)
CF002(for F²MC-8L family)	Control software
WF001/F001(for MB89P935A)	Microcontroller module

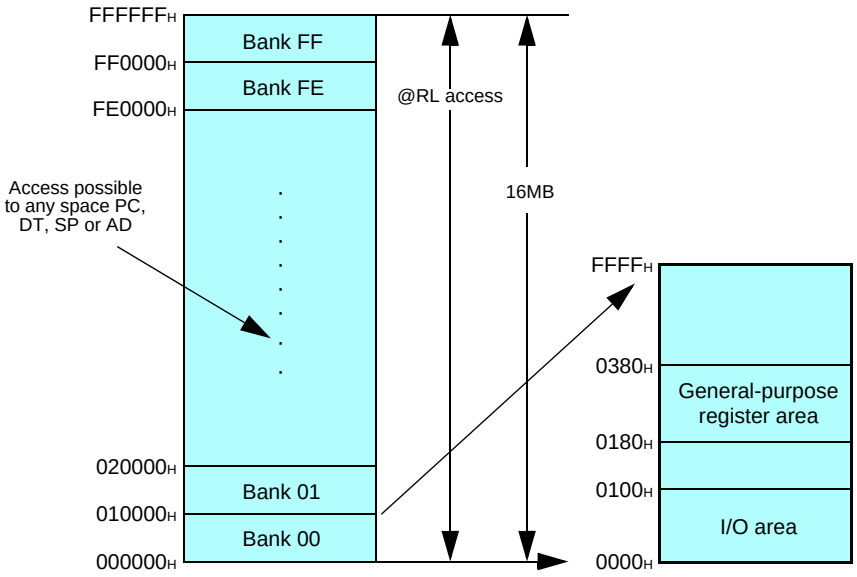
(3)Programming adaptor

Part number	Package	Programming adaptor
MB89P935B	SSOP-30	TOP2000/SSOP30TP1/P1 (single) TOP2000/SSOP30TP1/P10 (10 sets)

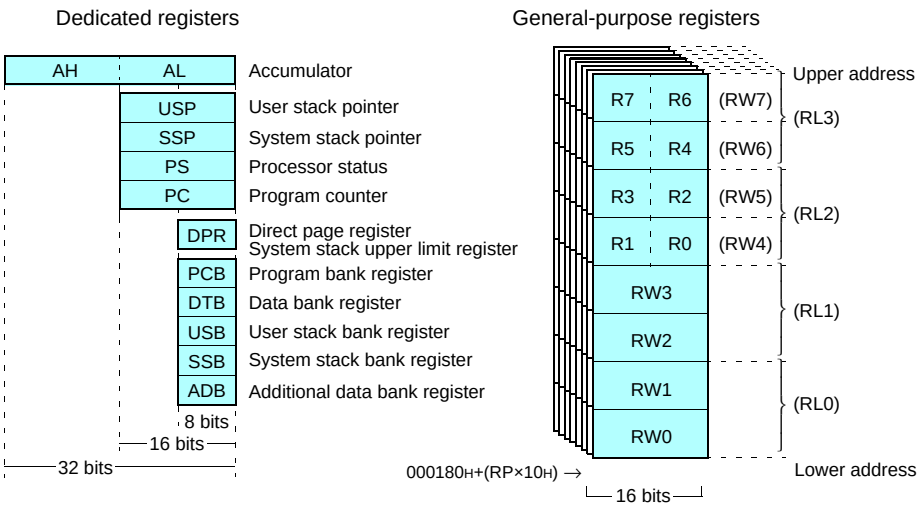
F²MC-16L Family Features

- Faster version of the F²MC-16 (MB90700 series) with object code compatibility and also allows low voltage operation.
- Easy programming with plenty of data types, including bit (1-bit), nibble (4-bit), byte (8-bit), word (16-bit), and long word (32-bit), and 23 types of addressing.
- Bank and linear support of 16Mbytes memory space makes easy migration from external memory sizes to singlechip systems.

Memory space



- Registers
  Dedicated registers
  General-purpose registers: 10 × 16-bit per bank, 32 banks Max.



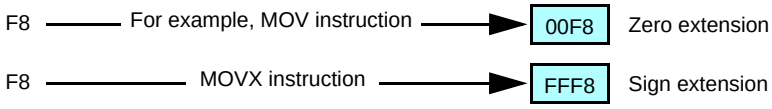
- Pipeline processing using 4 bytes cue (minimum instruction execution time: 62.5 ns/16 MHz)
- Powerful real time processing using 8-level hardware support priority interrupts and extended intelligent I/O service functions.
- Extended C language and real time operating system instructions (SP indirect addressing, etc.)
- Can utilize external 4 MHz oscillator to run at 16 MHz internally by using a built-in clock multiplier circuitry.
- Number of basic instructions: 340 (fully compatible with the F²MC-16/16H)

Main Addressing Modes (can be used by transfer and arithmetic instructions)

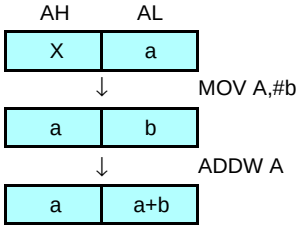
- Bit addressing
  Direct bit: I/O area (2 Kbits) + area inside DPR page (2 Kbits)
  Any bit within 64 Kbytes may be specified.
- Indirect addressing
  @RWi, @RWi+, @RWi+disp16, @RLi+disp8, @RWj+disp8 (i = 0 to 3), (j = 0 to 7)
  @RW0+RW7
  @RW1+RW7
  @PC+disp16
  @A
- Direct addressing
  R0 to R7, RW0 to RW7, RL0 to RL3
  dir, addr16, io, addr24

Super Accumulator

- 32-bit accumulator using AH:AL (16 bits:16 bits) as a pair.
- Data precision verification function

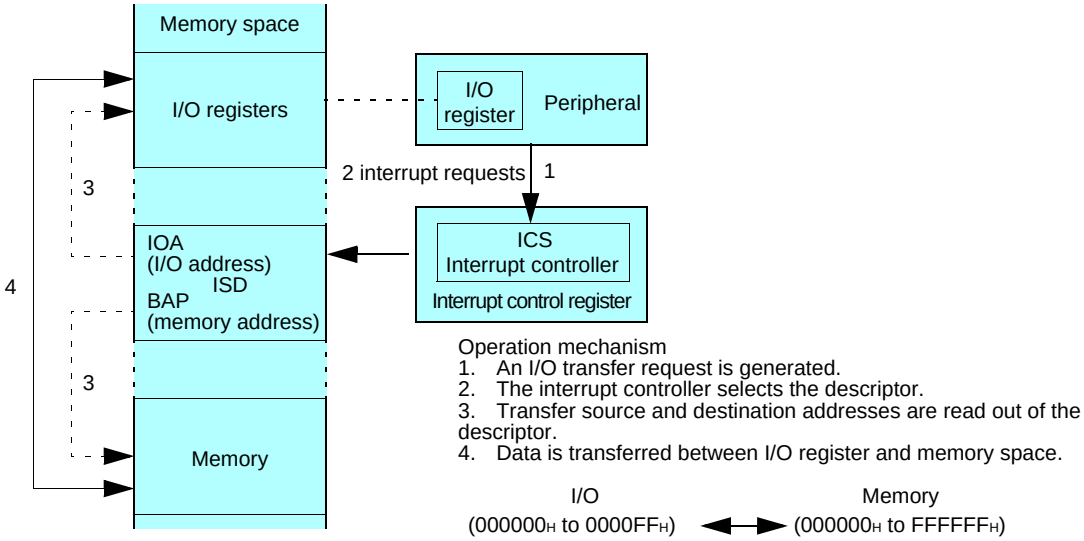


- Data keep function (available for data types of 16-bit word length and less)



Extended Intelligent I/O Service (EI²OS)

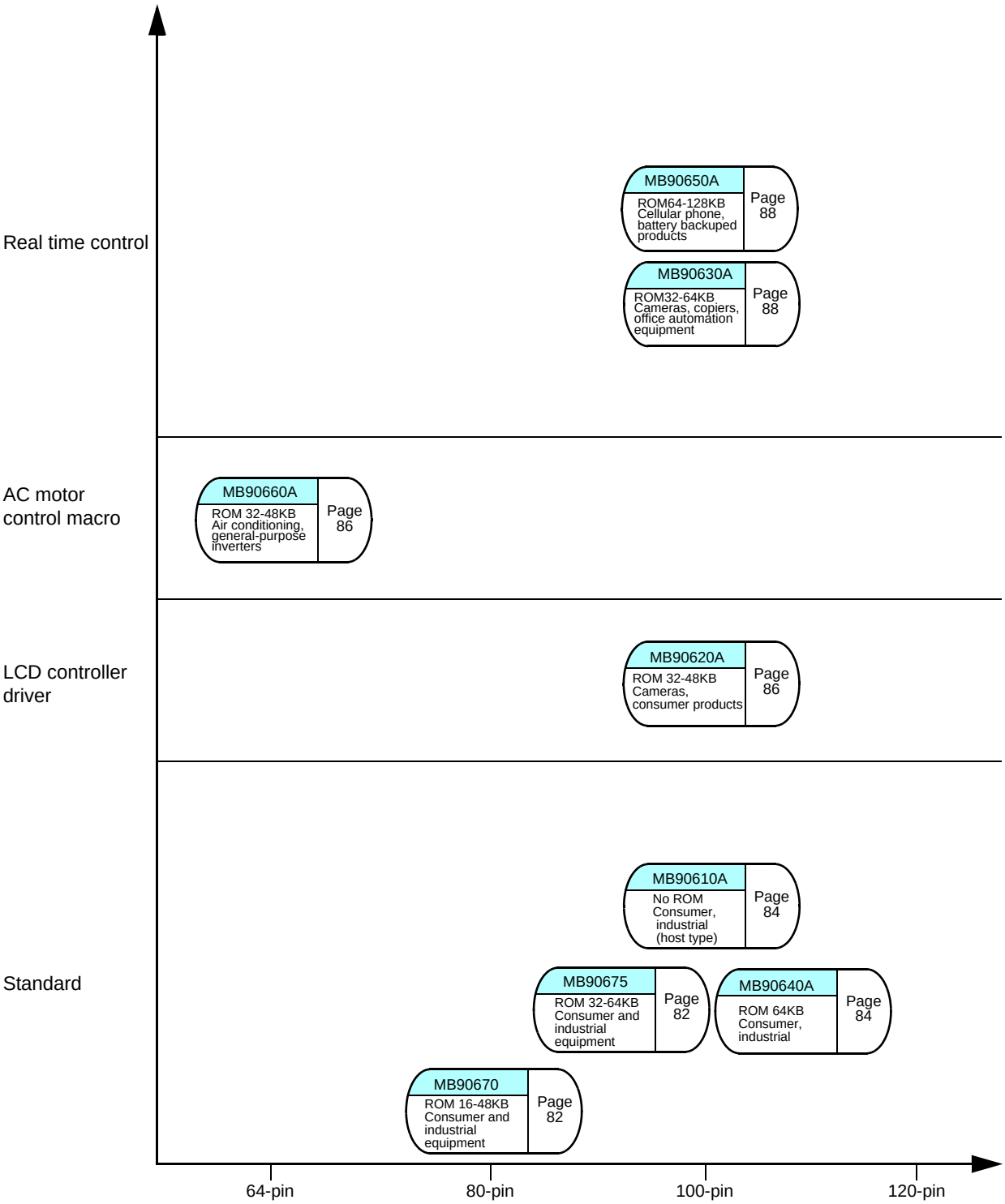
- In addition to programing being made easier because htere is no need to execute unnecessary program transfers, higher speeds for transfer, service response and overall system controls are realized.
- Since CPU micro-instructions executs transfer functions, multi-channel systems can be realized at no extra cost.
- Since I/O transfers can be stopped when a condition is generated such as when invalid data is received, performance loss due to transferring unnecessary data can be avoided because there is no programming load.
- It is possible to specify incrementing or decrementing of buffer address and I/O register address.
- It is possible to specify the entire 00 banks I/O register addresses, the data counter can be set up to 64000.



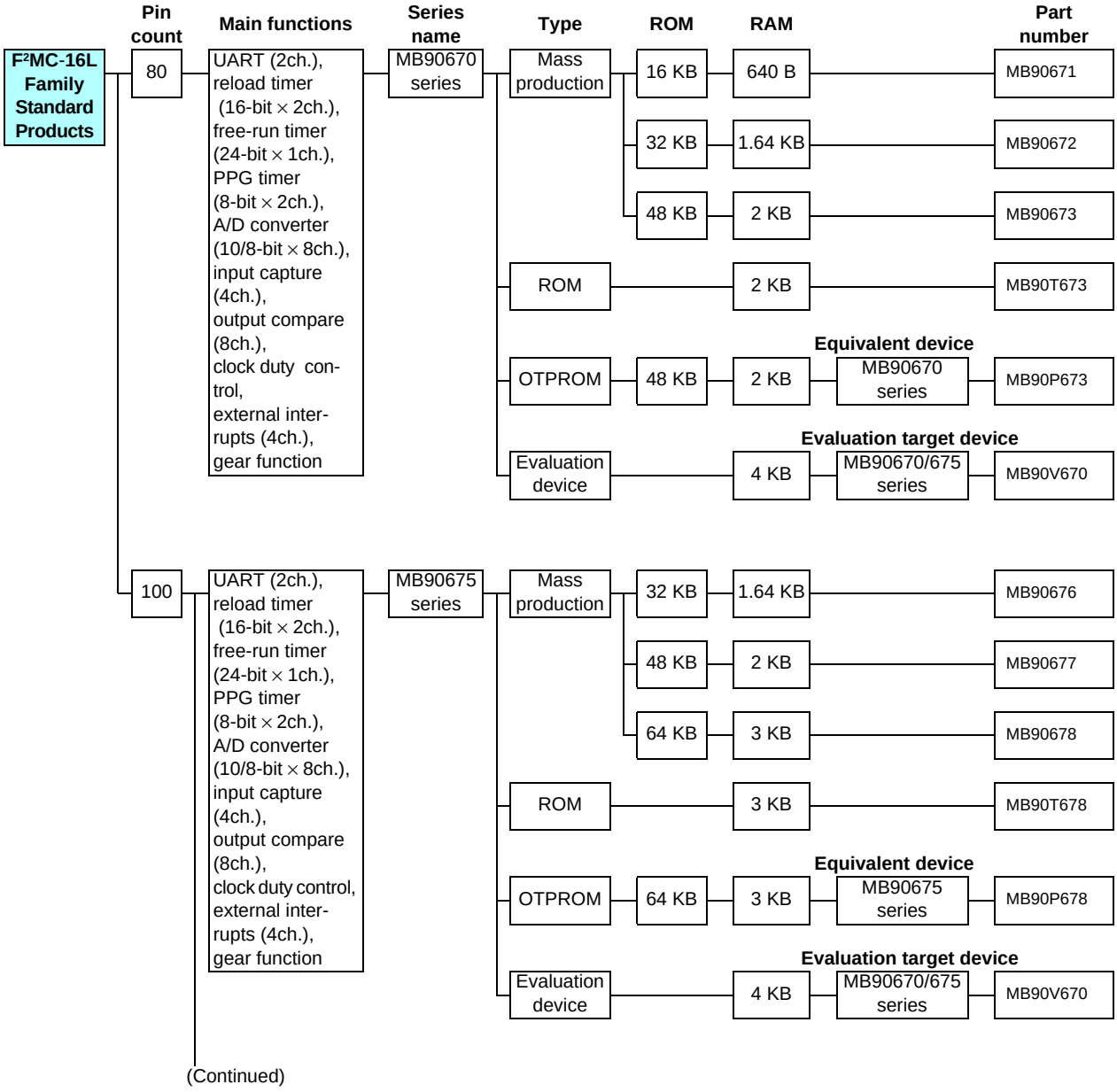
- Execution speed

  From request, to completion of transfer: 32 cycles = 2.00 µs (@16 MHz)

F²MC-16L Family Product Range



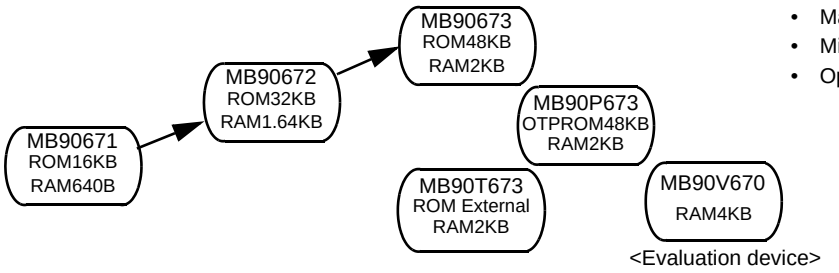
16-bit Proprietary F²MC-16L Family Standard Products



F²MC-16L Family Standard Products

MB90670 Series

For mechanical electronics control, automobile ABS control, AV equipment, high level home appliances etc.



<Evaluation device>

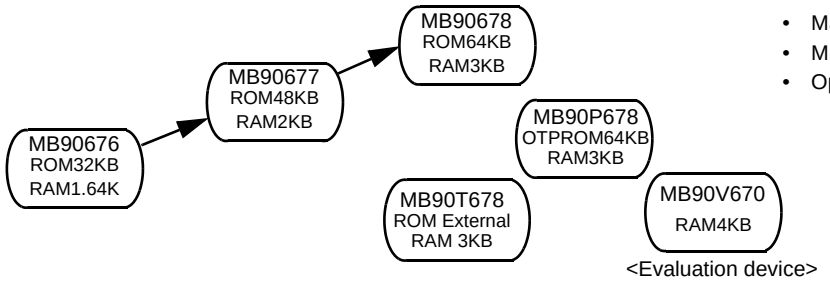
- Maximum internal clock frequency:16 MHz
- Minimum execution time:62.5 ns
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90671	+2.7 to +5.5	80P	80P	–	I/O ports: 65 Max. Timer/counter: 16-bit × 2ch. Timebase timer (WDT): 18-bit × 1ch. PPG timer: 8-bit × 2ch. (16-bit × 1ch.) UART: 2ch. Real time I/O: 24-bit input capture unit (ICU) × 4ch. 24-bit output compare unit (OCU) × 8ch. Analog section:10/8-bit A/D converter × 8ch. External interrupts: 4 Low-power consumption modes:Sleep, stop, pseudo-timer, CPU intermittent operation
MB90672		80P	80P	–	
MB90673		80P	80P	–	
MB90T673		80P	80P	–	
MB90P673		80P	80P	–	
MB90V670		–	–	256C	

Packages: P - plastic, C - ceramic

MB90675 Series

For mechanical electronics control, automobile ABS control, AV equipment, high level home appliances etc.



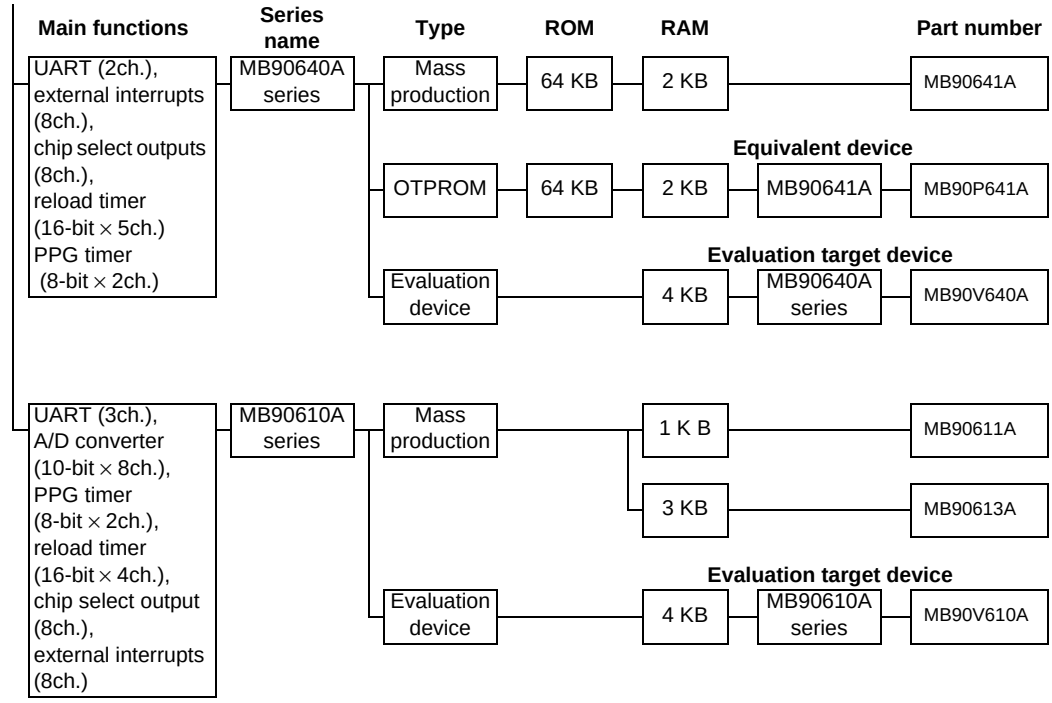
<Evaluation device>

- Maximum internal clock frequency:16 MHz
- Minimum execution time:62.5 ns
- Operating temperature range:-40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90676	+2.7 to +5.5	100P	100P	–	I/O ports: 84 Max. Timer/counter: 16-bit × 2ch. Timebase timer (WDT):18-bit × 1ch. PPG timer: 8-bit × 2ch. (16-bit × 1ch.) UART: 2ch. I²C bus interface: 1ch. Real time I/O: 24-bit input capture unit (ICU) × 4ch. 24-bit output compare unit (OCU) × 8ch. Analog section: 10/8-bit A/D converter × 8ch. External interrupts: 4 Low-power consumption modes:Sleep, stop,pseudo-timer, CPU intermittent operation
MB90677		100P	100P	–	
MB90678		100P	100P	–	
MB90T678		100P	100P	–	
MB90P678		100P	100P	–	
MB90V670		–	–	256C	

Packages: P - plastic, C - ceramic

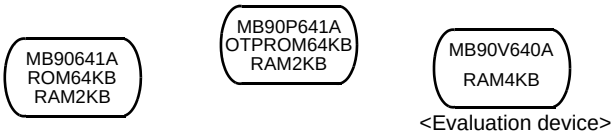
(Continued)


Main functions
Series name
Type
ROM
RAM
Part number
UART (2ch.), external interrupts (8ch.), chip select outputs (8ch.), reload timer (16-bit × 5ch.) PPG timer (8-bit × 2ch.)
MB90640A series
Mass production
64 KB
2 KB
MB90641A
Equivalent device
OTPROM
64 KB
2 KB
MB90641A
MB90P641A
Evaluation target device
Evaluation device
4 KB
MB90640A series
MB90V640A
UART (3ch.), A/D converter (10-bit × 8ch.), PPG timer (8-bit × 2ch.), reload timer (16-bit × 4ch.), chip select output (8ch.), external interrupts (8ch.)
MB90610A series
Mass production
1 K B
MB90611A
3 KB
MB90613A
Evaluation target device
Evaluation device
4 KB
MB90610A series
MB90V610A

MB90640A Series

For industrial applications, OA equipment etc.

- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C



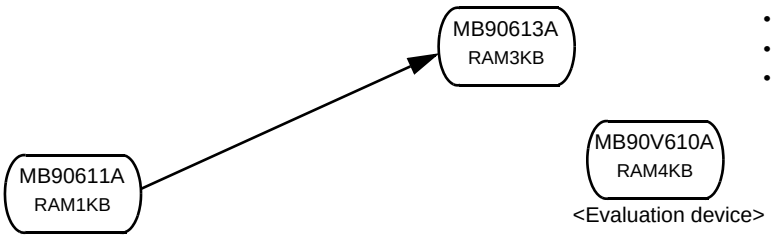
Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90641A	+4.5 to +5.5	100P	100P	–	I/O ports: 83 Max. Timebase timer (WDT): 18bit × 1ch. PPG timer: 8-bit × 2ch. (16-bit × 1ch.) UART: 2ch. Reload timer: 16-bit × 5ch. External interrupts: 8ch. Chip select output pin: 8 External bus interface: selective between non-multiplex and multiplex Low-power consumption modes: Sleep, stop, pseudo-timer, CPU intermittent operation
MB90P641A		100P	100P	–	
MB90V640A		–	–	256C	

Packages: P - plastic, C - ceramic

MB90610A Series

For industrial applications, OA equipment control, process control, etc.

- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

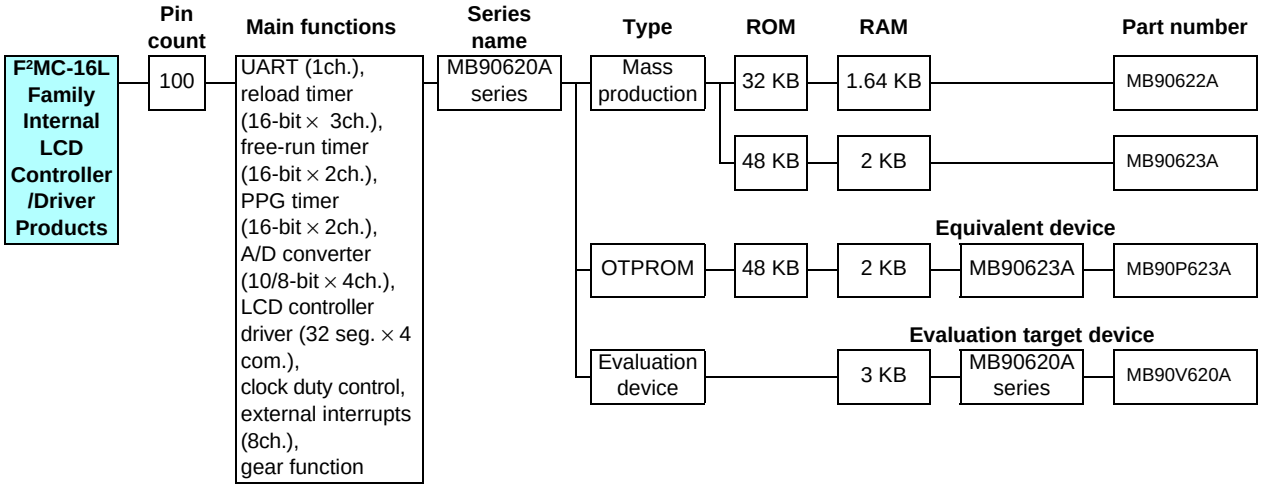


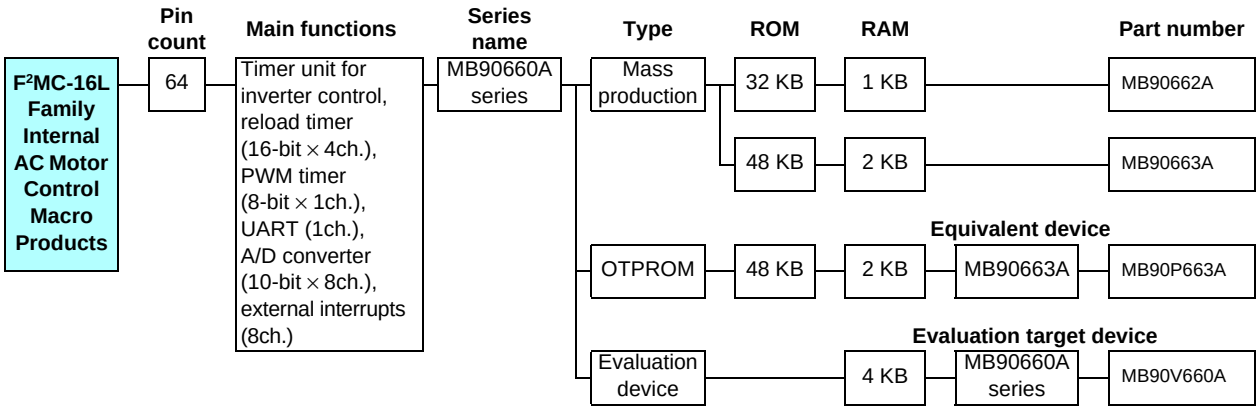
Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90611A	+2.7 to +5.5	100P	100P	–	I/O ports: 57 max. (8, 16-bit multiplexed mode) 41 max. (16-bit non-multiplexed mode) 49 max. (8-bit non-multiplexed mode) Timer/counter: 16-bit × 2ch. Timebase timer (WDT): 18-bit × 1ch. PPG timer: 8-bit × 2ch. (16-bit × 1ch.) UART: 3ch. Analog section: 10-bit A/D converter × 8ch. External interrupts: 8ch. Chip select output pin: 8 External bus interface: selective between non-multiplex and multiplex Low-power consumption modes: Sleep, stop, pseudo-timer, CPU intermittent operation
MB90613A		100P	100P	–	
MB90V610A		–	–	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16L Family

Internal LCD Controller/Driver Products
Internal AC Motor Control Macro Products

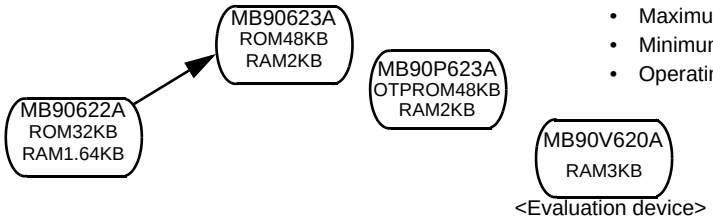




F²MC-16L Family Internal LCD Controller/Driver Products

MB90620A Series

Internal LCD controller/driver, for AV equipment, high level home appliances, etc.



- Maximum internal clock frequency: 12 MHz (32.768 kHz)
- Minimum execution time: 83.3 ns (122.1 µs)
- Operating temperature range: -40°C to +85°C

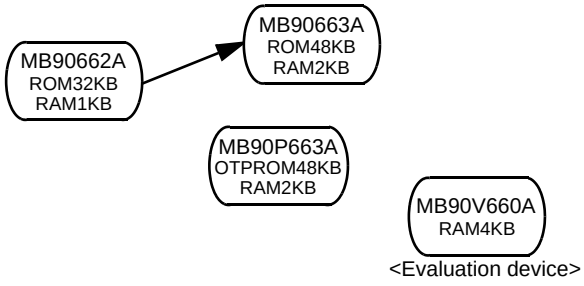
Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90622A	+4.0 to +5.5	100P	–	I/O ports: 59 Max. Timer/counter: 16-bit × 3ch. (reload), 16-bit × 2ch. (free-run) Timebase timer (WDT): 18-bit × 1ch. PPG timer: 16-bit × 2ch. UART: 1ch. SIO: 1ch. Analog section: 8/10-bit A/D converter × 4ch. LCD controller/driver: 128 elements, 2 to 4common, 16 to 32 segments, 16 × 8-bit LCD display RAM External interrupts: 8 Low-power consumption modes: Sleep, stop, CPU intermittent operation, watch, pseudo-timer mode
MB90623A		100P	–	
MB90P623A		100P	–	
MB90V620A		–	256C	

Packages: P - plastic, C - ceramic

F²MC-16L Family Internal AC Motor Control Macro Products

MB90660A Series

For industrial applications, OA equipment control, process control, etc.

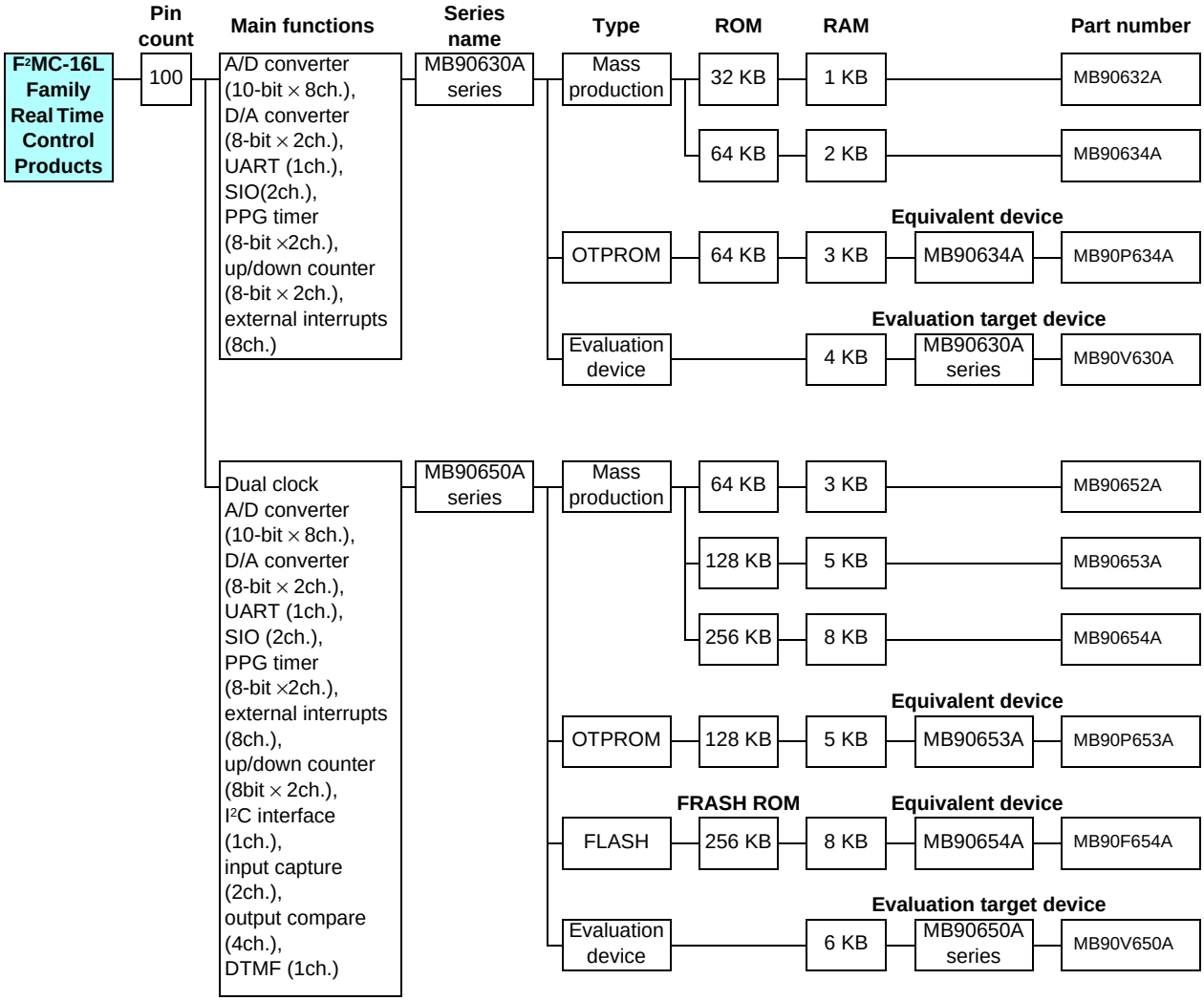


- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	SDIP	PGA	
MB90662A	+2.7 to +5.5	64P	64P	–	I/O ports: 51 Max. Timer/counter: 16-bit × 4ch. Timebase timer (WDT):18-bit × 8ch. PWM timer: 8-bit × 1ch. UART: 1ch. Analog section: 8/10-bit A/D converter × 8ch. External interrupts: 8 Low-power consumption modes: Sleep, stop, CPU intermittent operation, pseudo-timer mode
MB90663A		64P	64P	–	
MB90P663A		64P	64P	–	
MB90V660A		–	–	256C	

Packages: P - plastic, C - ceramic

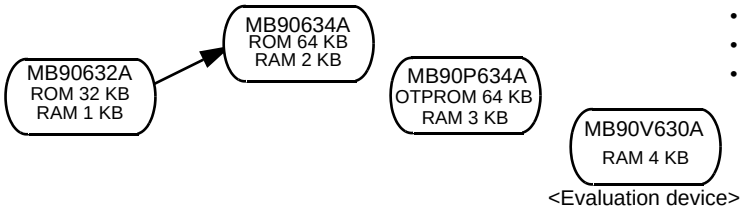
16-bit Proprietary F²MC-16L Family Real Time Control Products



F²MC-16L Real Time Control Products

MB90630A Series

For consumer products, etc.



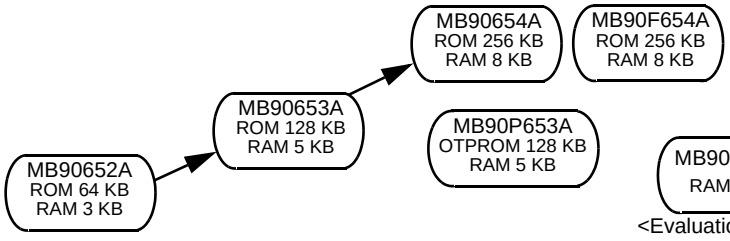
- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	PGA	
MB90632A	+2.7 to +5.5	100P	100P	–	I/O ports: 82 Max. Timebase timer (WDT): 18-bit × 1 ch. PPG timer: 8-bit × 2ch. (16-bit × 1 ch.) UART: 1 ch. SIO: 2 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free running timer × 1 ch. Analog section: 10-bit A/D converter × 8 ch. 8-bit D/A converter × 2 ch. Encoder macro: 8-bit up/down counter × 2 ch. (16-bit × 1 ch.) External interrupts: 8 Low-power consumption modes:Sleep, stop, pseudo-timer mode
MB90634A		100P	100P	–	
MB90P634A		100P	100P	–	
MB90V630A		–	–	256C	

Packages: P - plastic, C - ceramic

MB90650A Series

For cellular phones, battery backuped products, etc.



- Maximum internal clock frequency
  16 MHz (32.768 kHz) : MB90652A/653A/654A
  8 MHz (32.768 kHz) : MB90P653A/V650A
- Minimum execution time: 62.5 ns (122.1 µs)
- Operating temperature range: -40°C to +85°C

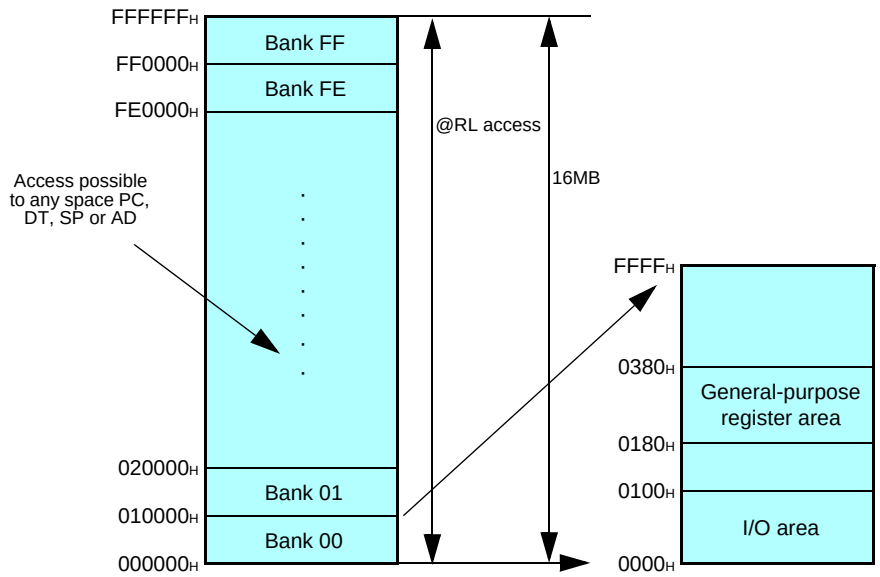
Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90652A	+2.2 to +3.6	100P	100P	–	I/O ports: 79 Max. Dual clock Timebase timer (WDT): 18-bit × 1 ch. PPG timer: 8-bit × 2 ch. (16-bit × 1 ch.) UART: 1 ch. I²C interface: 1 ch. SIO: 2 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU).× 4 ch. Analog section: 10-bit A/D converter × 8 ch. 8-bit D/A converter× 2 ch. Encoder macro: 8-bit up/down counter × 2 ch. (16-bit × 1 ch.) DTMF: 1 ch. External interrupts: 8 When a dual power supply is used, a part of I/O is 5V pin. Low-power consumption modes:Sleep, stop, watch, CPU intermittent operation, pseudo-timer mode
MB90653A		100P	100P	–	
MB90654A		100P	100P	–	
MB90P653A	+2.7 to +3.6	100P	100P	–	
MB90F654A	+2.4 to +3.6	100P	100P	–	
MB90V650A	+2.7 to +3.6	–	–	256C	

Packages: P - plastic, C - ceramic

F²MC-16LX Family Features

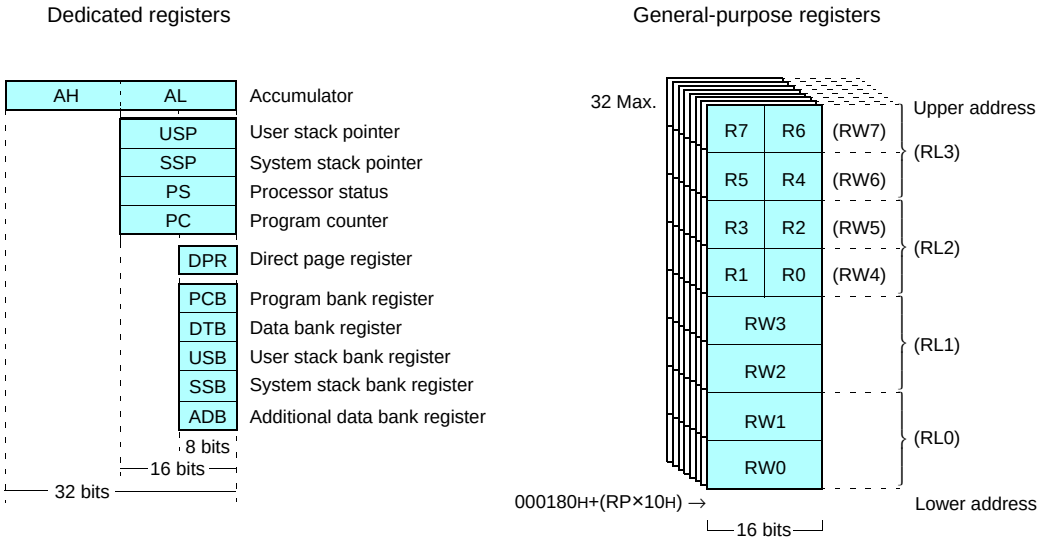
- F²MC-16LX family is a high-performance 16-bit microcomputer having the upward compatibility with the F²MC-16L family.
- Supporting 16-Mbyte memory space.

Memory space



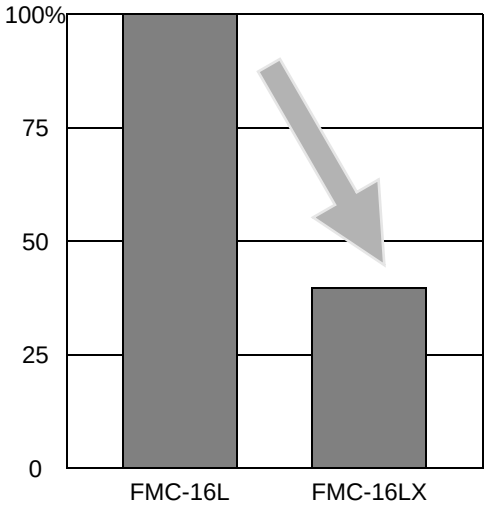
- Registers

Dedicated registers
General-purpose registers: 10 × 16-bit per bank, 32 banks Max.

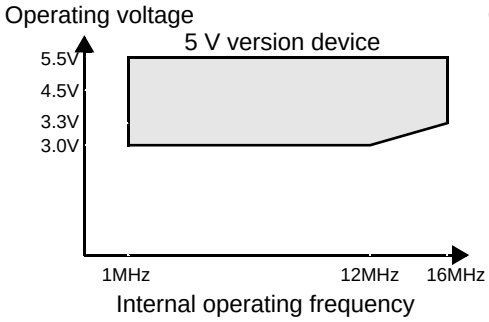


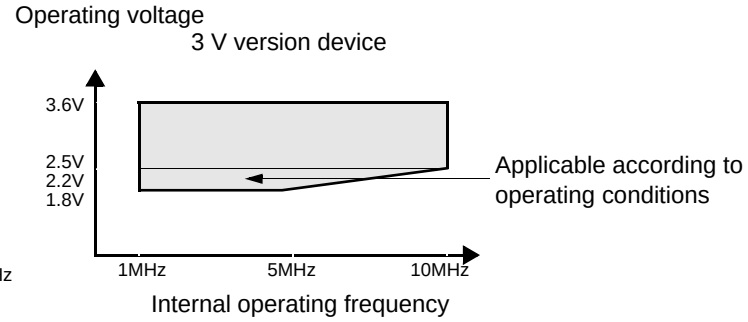
- Clock multiplier circuit (×1/2, ×2, ×3, and ×4) to protect your surrounding environment
  Reducing the radiation interference
  High-speed operation using the inexpensive low-speed oscillator (external 4 MHz; internal 16 MHz max.)
- Power management capabilities to contribute to the conservation of energy:
  STOP, SLEEP, subclock, hardware standby
- AL 2 layers 0.5 µm (reducing the chip footprint)
- Low-voltage, low-power voltage dissipation
  Supporting large memory (up to 256 Kbytes for ROM; up to 10 Kbytes for RAM)
- Power dissipation reduced by 60 % as compared to the earlier product (5 V compatible product)

- **Reduced power dissipation (5 V compatible products)**



- Noise protection
  Adoptation of multiplier circuit
  Circuit optimization
  Built-in noise filters for all pins
- Bus control
  Bus sizing function: 8-bit or 16-bit bus width selectable
  Software switching between non-multibus and multibus (device)
  Supporting 8 ch. chip select (device)
- Built-in extended intelligent I/O service function (simple DMA function)
- Program patch processing function
  Avoiding bugs by applying patches on a masked ROM
- Addition of signed multiplication and division instruction
- High-speed interrupt transition
  High-speed transition achieved at the time of multiple interrupts
  Expansion achieved to low-voltage and high-speed operation
  5.0 V: Minimum machine clock of 62.5 ns/16 MHz
  2.2 V: Minimum machine clock of 100 ns/10 MHz



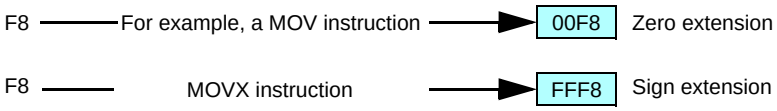


Main Addressing Modes (Can be used by transfer and arithmetic instructions)

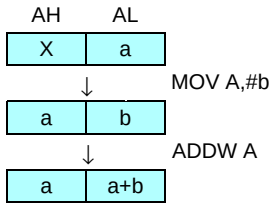
- Bit addressing
  Direct bit: I/O area (2Kbits) + area inside DPR page (2Kbits)
  Any bit within 64 Kbytes may be specified.
- Indirect addressing
  @RWi, @RWi+, @RWi+disp16, @RLi+disp8, @RWj+disp8 (i = 0 to 3), (j = 0 to 7)
  @RW0+RW7
  @RW1+RW7
  @PC+disp16
  @A
- Direct addressing
  R0 to R7, RW0 to RW7, RL0 to RL3
  dir, addr16, io

Super Accumulator

- 32-bit accumulator using AH:AL (16 bits:16 bits) as a pair.
- Data precision verification function



- Data keep function (available for data types of 16-bit word length and less)



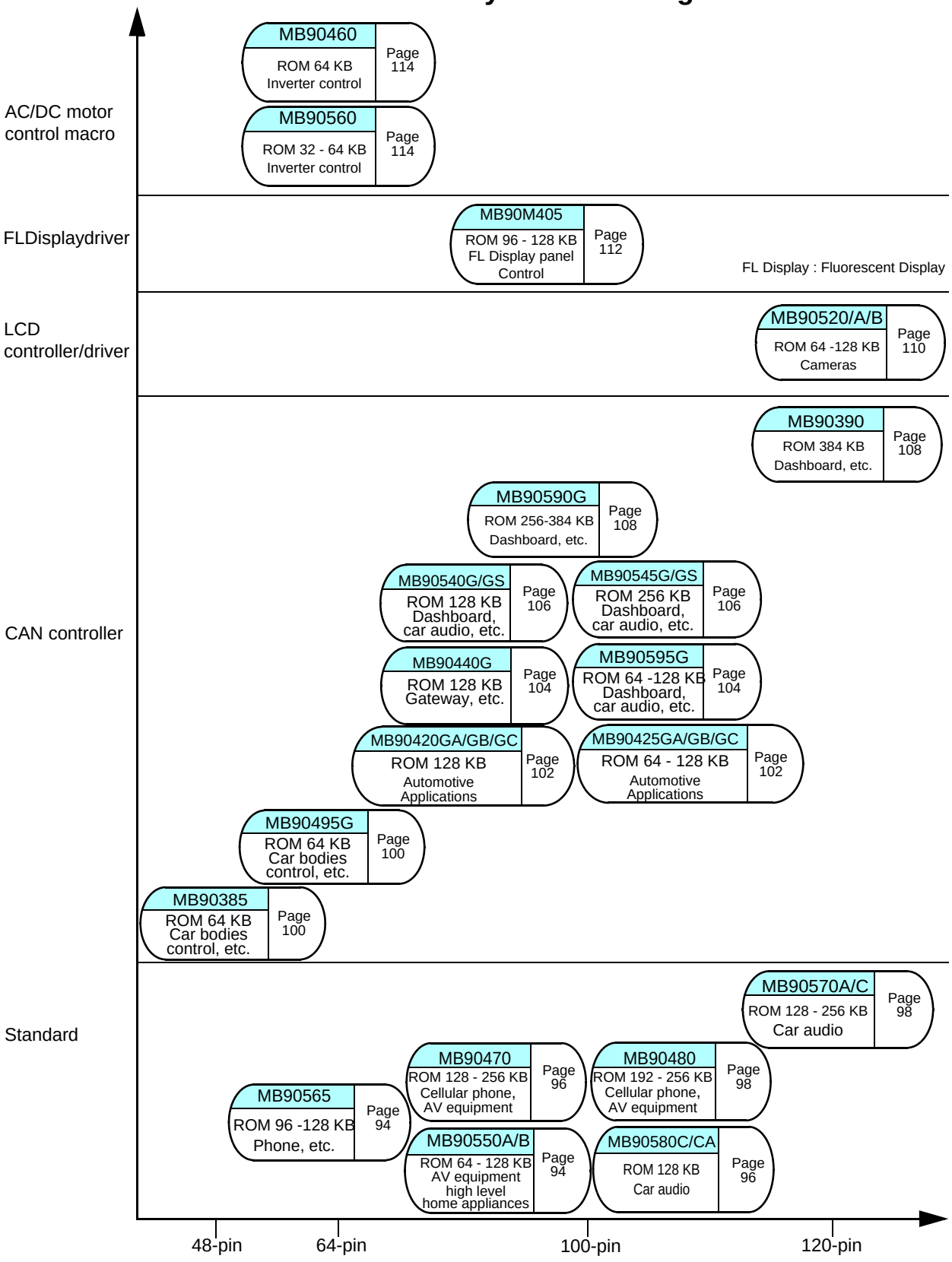
Fields for Product Expansion

Applicable to the following fields:

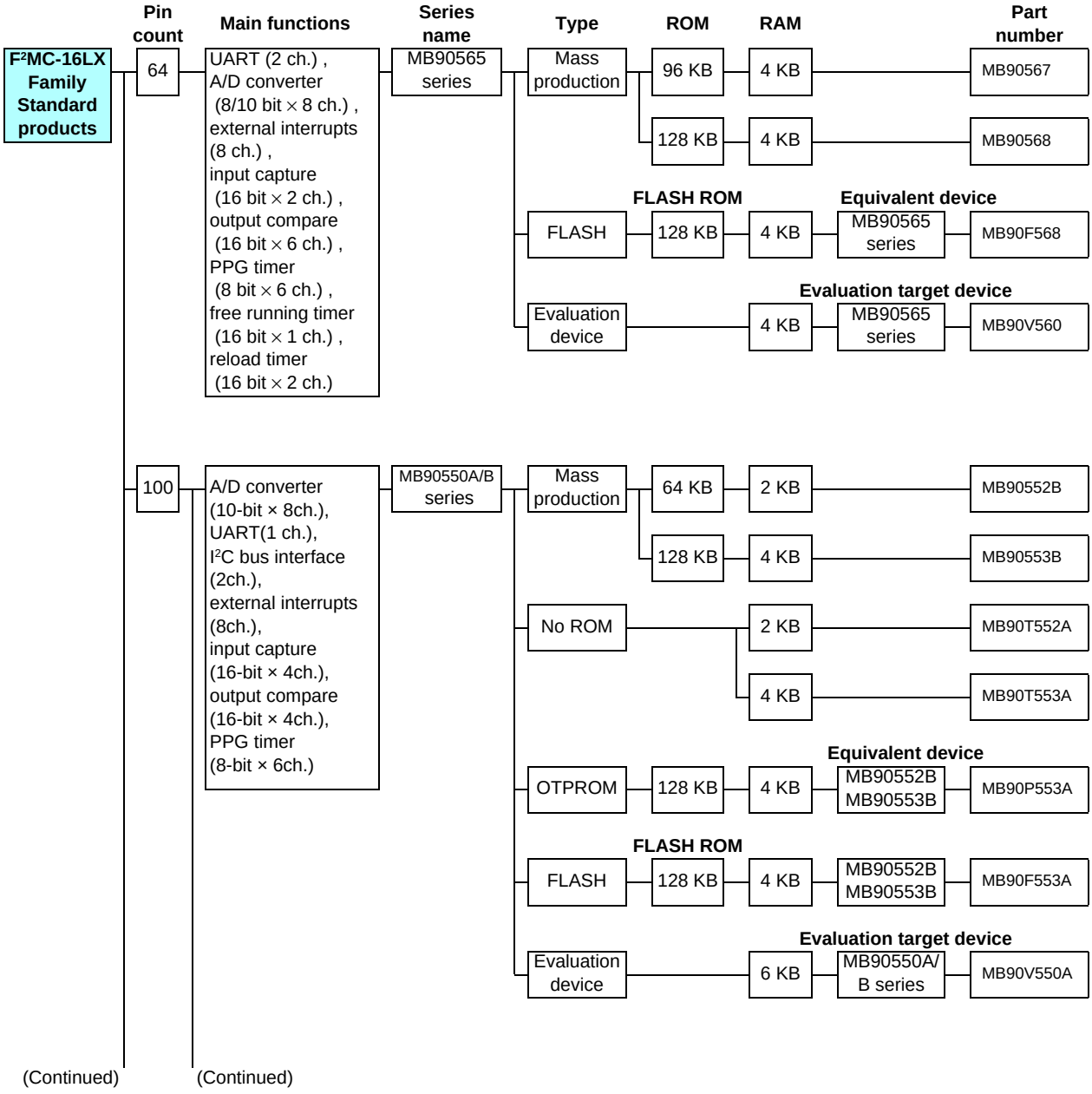
- Digital AV system→ (Serial communication enhancement, large size)
- Mobile equipment system→ (Low-power dissipation)
- File-related system→ (Signal processing enhancement)
- Network system→ (Telecommunication macro enhancement)

16-bit Proprietary F²MC-16LX Family Product Range

F²MC-16LX Family Product Range



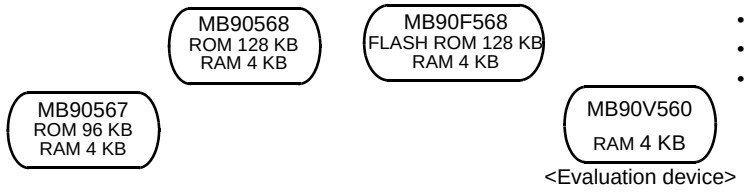
16-bit Proprietary F²MC-16LX Family Standard Products



F²MC-16LX Family Standard Products

MB90565 Series

For phone, etc.



- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

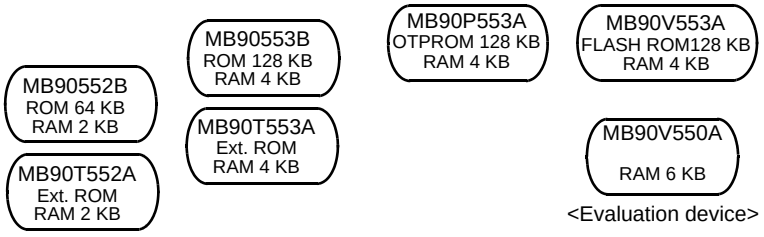
Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90567	+2.7 to +3.6	64P (14 × 20 mm)	64P (12 × 12 mm)	–	I/O ports: 51 Max. Timebase timer (WDT): 18-bit × 1ch. Reload timer: 16-bit × 2 ch. PPG timer: 8-bit × 6ch. (16-bit × 3ch.) Analog section: 8/10-bit A/D converter × 8ch. Real time I/O: 16-bit input capture unit (ICU) × 4ch. 16-bit output compare unit (OCU) × 4ch. 16-bit free running timer × 1 ch. UART: 2ch. External interrupts: 8 Low-power consumption modes: Sleep, hardwarestandby, pseudo-timer mode, CPU intermittent operation
MB90568		64P (14 × 20 mm)	64P (12 × 12 mm)	–	
MB90F568		64P (14 × 20 mm)	64P (12 × 12 mm)	–	
MB90V560	+3.0 to +5.5	–	–	256C	

Packages: P - plastic, C - ceramic

◎:Under development

MB90550A/550B Series

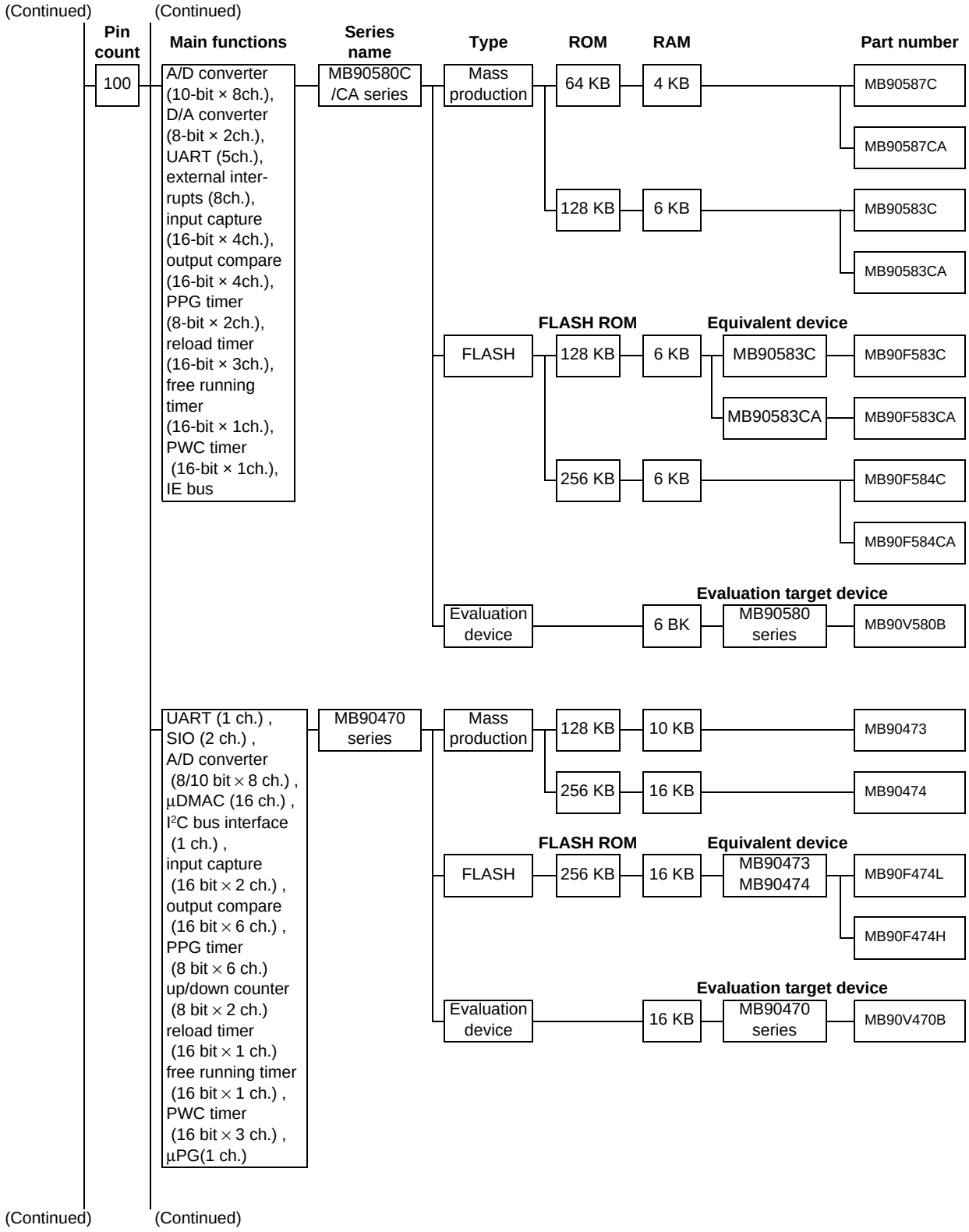
For AV equipment, high level home appliances, industrial applications, etc.



- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90552B	+3.5 to +5.5	100P	100P	–	I/O ports: 83 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 1 ch. SIO: 1 ch. I²C bus interface: 2 ch. Analog section: 10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free running timer × 1 ch. PPG timer: 8-bit × 6 ch. (16-bit × 3 ch.) Reload timer : 16-bit × 2 ch. External interrupts: 8 Low-power consumption modes: Sleep,pseudo-timer, stop, CPU intermittent operation
MB90T552A		100P	100P	–	
MB90553B		100P	100P	–	
MB90T553A		100P	100P	–	
MB90P553A	+4.5 to +5.5	100P	100P	–	
MB90F553A		100P	100P	–	
MB90V550A		–	–	256C	

Packages: P - plastic, C - ceramic


(Continued)
(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
100
A/D converter (10-bit × 8ch.), D/A converter (8-bit × 2ch.), UART (5ch.), external interrupts (8ch.), input capture (16-bit × 4ch.), output compare (16-bit × 4ch.), PPG timer (8-bit × 2ch.), reload timer (16-bit × 3ch.), free running timer (16-bit × 1ch.), PWC timer (16-bit × 1ch.), IE bus
MB90580C /CA series
Mass production
64 KB
4 KB
MB90587C
MB90587CA
128 KB
6 KB
MB90583C
MB90583CA
FLASH ROM
Equivalent device
FLASH
128 KB
6 KB
MB90583C
MB90F583C
MB90583CA
MB90F583CA
256 KB
6 KB
MB90F584C
MB90F584CA
Evaluation target device
Evaluation device
6 BK
MB90580 series
MB90V580B
UART (1 ch.), SIO (2 ch.), A/D converter (8/10 bit × 8 ch.), µDMAC (16 ch.), I²C bus interface (1 ch.), input capture (16 bit × 2 ch.), output compare (16 bit × 6 ch.), PPG timer (8 bit × 6 ch.) up/down counter (8 bit × 2 ch.) reload timer (16 bit × 1 ch.) free running timer (16 bit × 1 ch.), PWC timer (16 bit × 3 ch.), µPG(1 ch.)
MB90470 series
Mass production
128 KB
10 KB
MB90473
256 KB
16 KB
MB90474
FLASH ROM
Equivalent device
FLASH
256 KB
16 KB
MB90473 MB90474
MB90F474L
MB90F474H
Evaluation target device
Evaluation device
16 KB
MB90470 series
MB90V470B
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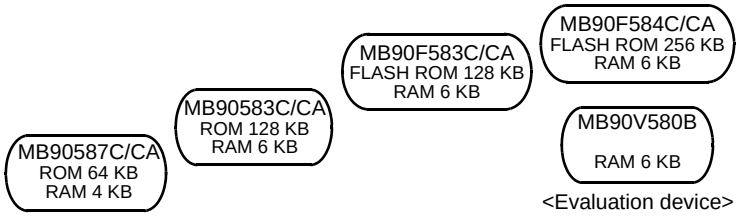
MB90580C/580CA Series

For car audio, etc.



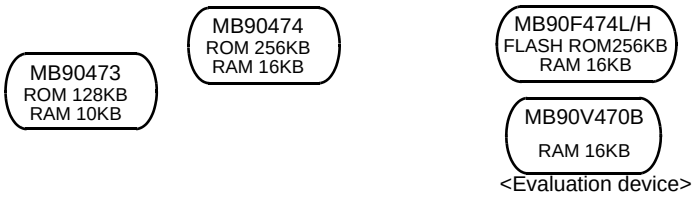
- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90583C	+3.0 to +5.5	100P	100P	–	I/O ports: 77 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 5 ch. Analog section: 10-bit A/D converter × 8 ch. 8-bit D/A converter × 2 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 2 ch. 16-bit free running timer × 1 ch. PPG timer: 8-bit × 2ch. (16-bit × 1 ch.) PWC timer: 16-bit × 1 ch. Reload timer:16-bit × 3 ch. IE bus (MB90583C/CA, MB90F583C/CA,MB90V580B) For clock two systems : MB90583C/587C/F583C/F584C/V580B For clock one system : MB90583CA/587CA/F583CA/F584CA External interrupts: 8 Low-power consumption modes: Sleep, stop, watch, sub, pseudo-timer CPU intermittent operation mode
MB90583CA		100P	100P	–	
MB90587C		100P	100P	–	
MB90587CA		100P	100P	–	
MB90F583C	+4.5 to +5.5	100P	100P	–	
MB90F583CA		100P	100P	–	
MB90F584C		100P	100P	–	
MB90F584CA		100P	100P	–	
MB90V580B	+3.0 to +5.5	–	–	256C	

Packages: P - plastic, C - ceramic

MB90470 Series

For AV equipment, high level home appliances, industrial applications, etc.



- Maximum internal clock frequency: 20 MHz(32.768 kHz)
- Minimum execution time: 50 ns(122.1 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90473	+1.8 to +3.6	100P	100P	–	I/O ports: 84 Max. Timebase timer (WDT): 18 bit × 1 ch. Up/down counter: 8 bit × 2 ch. (16bit × 1 ch.) PPG timer: 8 bit × 6 ch. (16bit × 3 ch.) SIO: 2 ch. Analog section: 8/10bit A / D converter × 8 ch. I²C bus interface :1 ch. Real time I/O : 16-bit input capture unit (ICU) × 2 ch 16-bit output compare unit (OCU) × 6 ch 16-bit free running timer × 1 ch. UART: 1 ch. Reload timer: 16 bit × 1 ch. PWC timer: 16 bit × 3 ch. µDMAC : 16 ch.(Request for DTP input × 8 ch.) µPG: 1 ch. External interrupts: 8 When a dual power supply is used, a part of I/O is 5V pin. Low-power consumption modes:Sleep,stop(hardware),watch, sub, CPU intermittent operation, pseudo-timer mode
MB90474		100P	100P	–	
MB90F474L *1	+2.4 to +3.6	100P	100P	–	
MB90F474H *2	+2.7 to +3.6	100P	100P	–	
MB90V470B		–	–	256C	

Packages: P - plastic, C - ceramic
*1 : Low voltage type (maximum clock frequency : 12MHz, Vcc = 2.5V to 3.6V)
*2 : High speed type (maximum clock frequency : 20MHz, Vcc = 3.13V to 3.6V)

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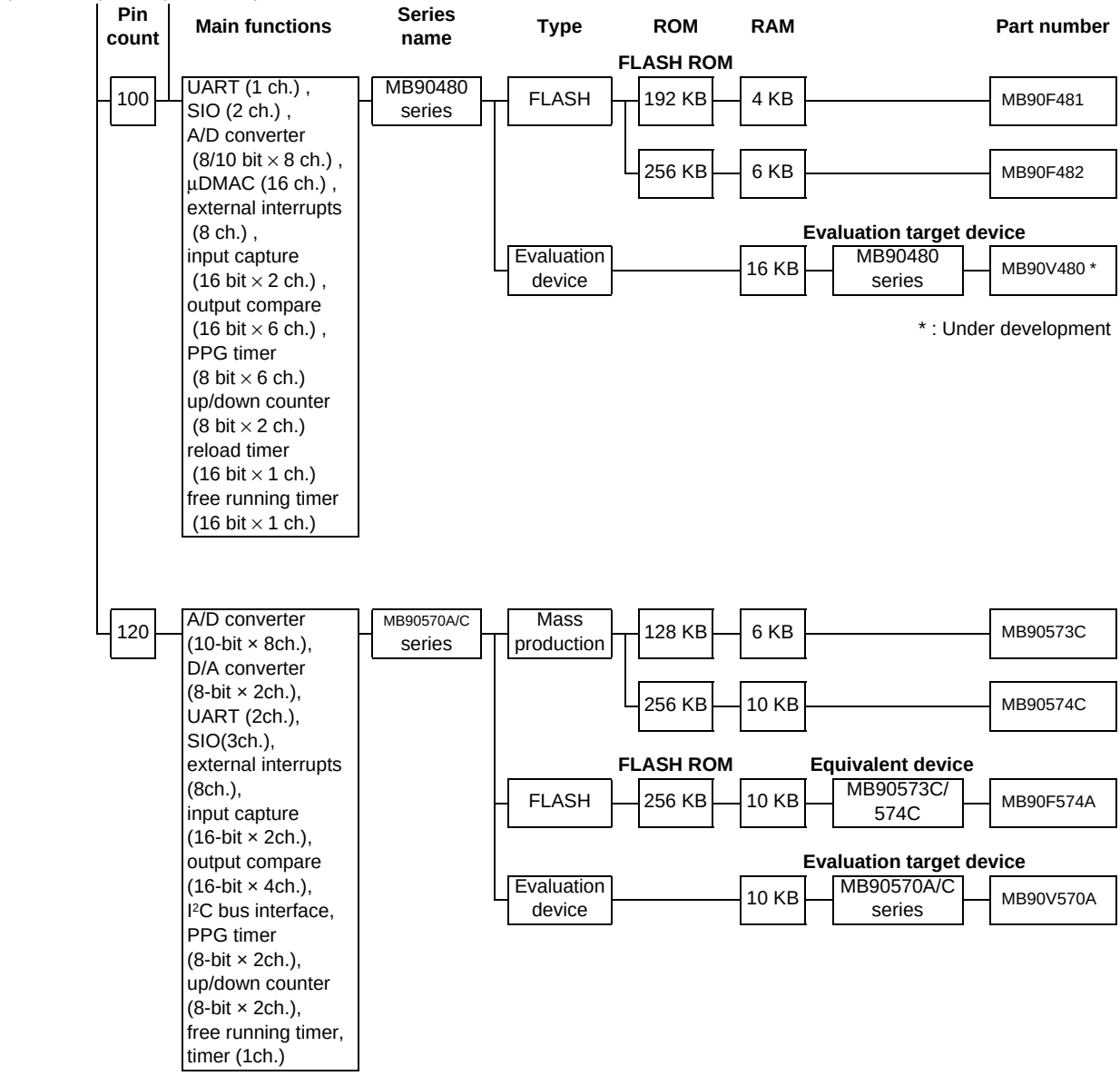
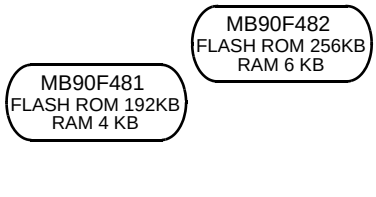


MB90480 Series

For AV equipment, high level home appliances, industrial applications, etc.



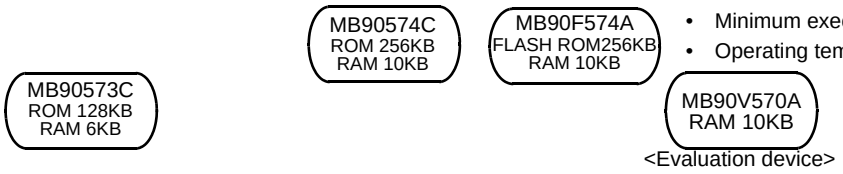
- Maximum internal clock frequency: 25 MHz(32.768 kHz)
- Minimum execution time: 40 ns(125 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90F481	+2.7 to +3.6	100P	100P	–	I/O ports: 84 Max. Timebase timer (WDT): 18 bit × 1 ch. Up/down counter: 8 bit × 2 ch. (16bit × 1 ch.) PPG timer: 8 bit × 6 ch. (16bit × 3 ch.) SIO: 2 ch. Analog section: 8/10bit A / D converter × 8 ch. Real time I/O : 16-bit input capture unit (ICU) × 2 ch 16-bit output compare unit (OCU) × 6 ch 16-bit free running timer × 1 ch. UART: 1 ch. Reload timer: 16 bit × 1 ch. µDMAC : 16 ch. External interrupts: 8 ch. Low-power consumption modes:Sleep,stop(hardware),watch, sub, CPU intermittent operation, pseudo-timer mode
MB90F482		100P	100P	–	
◎MB90V480	+2.7 to +3.6	–	–	299C	

Packages: P - plastic, C - ceramic
◎: Under development

MB90570A/570C Series

For car audio

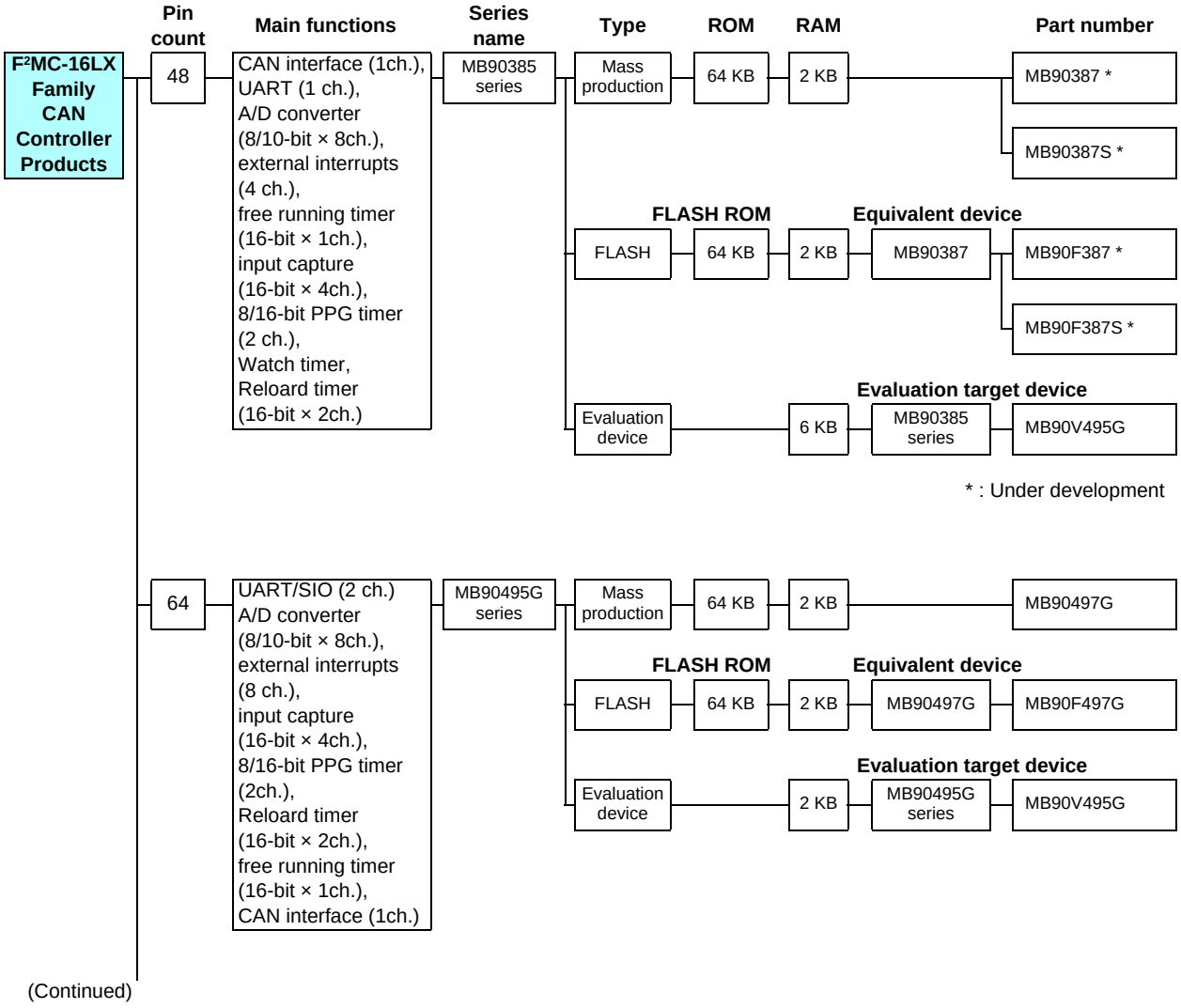


- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90573C	+3.0 to +5.5	120P (16 × 16 mm)	120P	–	I/O ports: 97 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 2ch. Analog section: 10-bit A/D converter × 8 ch. 8-bit D/A converter × 2 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free running timer × 1 ch. PPG timer: 8-bit × 2 ch. (16-bit × 1 ch.) I²C bus interface Up/down counter: 8-bit × 2ch.(16-bit × 1 ch.) SIO: 3 ch. External interrupts: 8 Clock timer: 1 ch. Low-power consumption modes :Sleep, stop, sub, pseudo-timer, watch, CPU intermittent operation mode
MB90574C		120P (16 × 16 mm)	120P (20 × 20 mm)	–	
MB90F574A	+4.5 to +5.5	120P (16 × 16 mm) (18 × 18 mm)	120P (20 × 20 mm)	–	
MB90V570A	+3.0 to +5.5	–	–	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family CAN Controller Products



F²MC-16LX Family CAN Controller Products

MB90385 Series

For car bodies control, etc.

MB90387/S
ROM 64 KB
RAM 2 KB
Under development

MB90F387/S
FLASH ROM 64 KB
RAM 2 KB
Under development

MB90V495G
RAM 6 KB
<Evaluation device>

- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 µs)
- Operating temperature range: –40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
◎MB90387	+3.5 to +5.5	48P	–	I/O ports : 36 Max. (MB90387S/F387S) 34 Max. (MB90387/F387/V495G) CAN interface : 1ch. Timebase timer (WDT): 18-bit × 1 ch. Watch timer, PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) A/D converter: 8/10-bit × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1 ch. UART : 1 ch. Reload timer : 16-bit × 2 ch. For clock two systems : MB90387S/F387S For clock one system : MB90387/F387/V495G External interrupts : 4ch. Low-power consumption modes:Sleep, stop, sub, watch, pseudo-timer, CPU intermittent operation mode
◎MB90387S		48P	–	
◎MB90F387		48P	–	
◎MB90F387S		48P	–	
MB90V495G		–	256C	

Packages: P - plastic, C - ceramic
◎: Under development

MB90495G Series

For car bodies control, etc.

MB90497G
ROM 64 KB
RAM 2 KB

MB90F497G
FLASH ROM 64 KB
RAM 2 KB

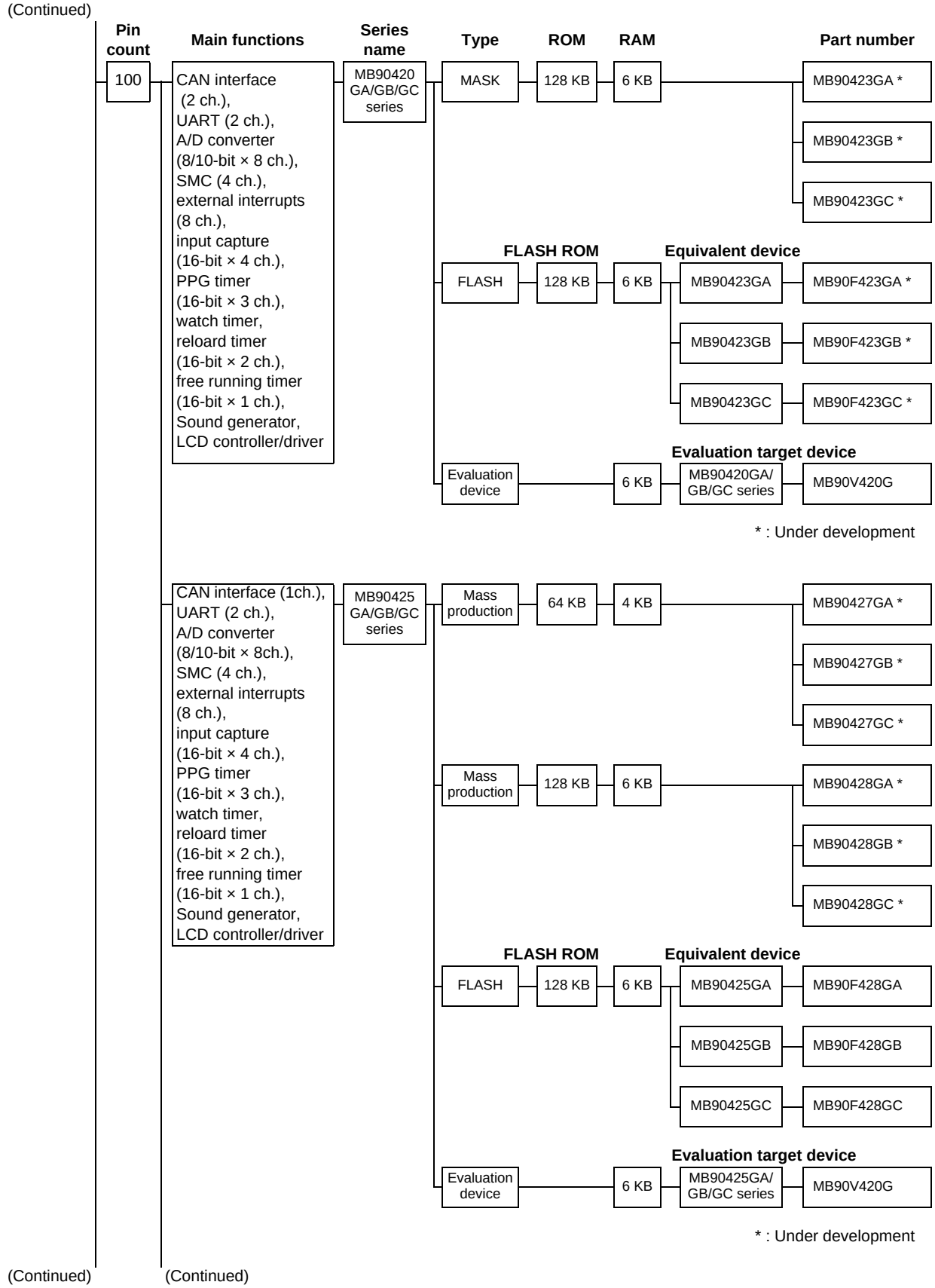
MB90V495G
RAM 2 KB
<Evaluation device>

- Maximum clock frequency: 16 MHz(32.768 kHz)
- Minimum execution time: 62.5 ns(122.1 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90497G	+4.5 to +5.5	64P	64P	–	I/O ports : 49 Max. Timebase timer (WDT) : 18-bit × 1 ch. 8/16-bit PPG timer : 2ch. (can oprate as 8-bit × 2 ch. at 1 ch.) UART/SIO : 1ch. Analog section : 8/10-bit A/D converter × 8 ch. Real time I/O : 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1 ch. Reload timer : 16-bit × 2 ch. CAN interface : 1 ch. Watch timer External interrupt: 8ch. Low-power consumption modes: Sleep, stop, sub, watch, CPU intermittent operation, pseudo-timer mode
MB90F497G		64P	64P	–	
MB90V495G		–	–	256C	

Packages: P - plastic, C - ceramic
SMC: Stepper motor controller

(Continued)



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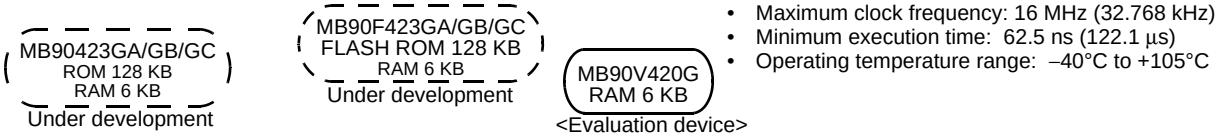
MB90420GA/420GB/420GC Series

Automotive Aplications, etc.



- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 µs)
- Operating temperature range: –40°C to +105°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
◎MB90423GA	+4.5 to +5.5	100P	100P	–	I/O ports : 58 Max. CAN interface : 2ch. Timebase timer (WDT): 18-bit × 1 ch. Watch timer, Sound generator PPG timer : (16-bit × 3 ch.) Analog section : 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1 ch. UART : 2 ch., Reload timer : 16-bit × 2 ch. Stepper motor controller : 4 ch. LCD controller/driver: 96 elements, 2 to 4 common, 12 to 24 segments, 16 × 8-bit LCD display RAM For clock one system : MB90423GA/F423GA For clock two systems : MB90423GB/GC/F423GB/GC/V420G External interrupts : 8ch. Low-voltage detection reset (MB90423GA/GB/F423GA/GB) Low-power consumption modes:Sleep, stop, sub, watch, pseudo-timer, CPU intermittent operation mode
◎MB90423GB		100P	100P	–	
◎MB90423GC		100P	100P	–	
◎MB90F423GA		100P	100P	–	
◎MB90F423GB		100P	100P	–	
◎MB90F423GC		100P	100P	–	
MB90V420G		–	–	256C	

Packages: P - plastic, C - ceramic
◎: Under development

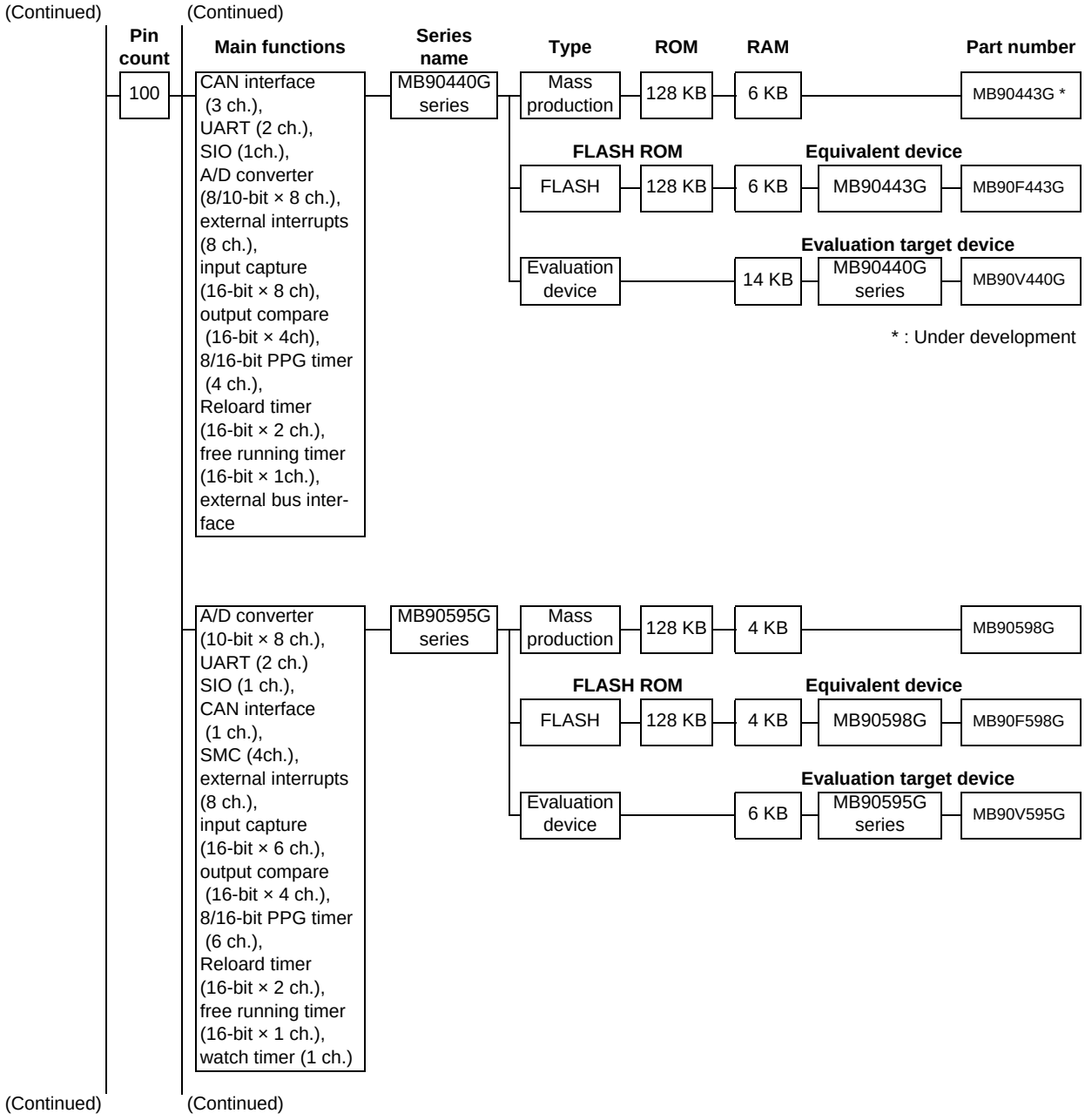
MB90425GA/425GB/425GC Series

Automotive Aplications, etc.

- Maximum clock frequency: 16 MHz(32.768 kHz)
- Minimum execution time: 62.5 ns(122.1 µs)
- Operating temperature range: -40°C to +105°C

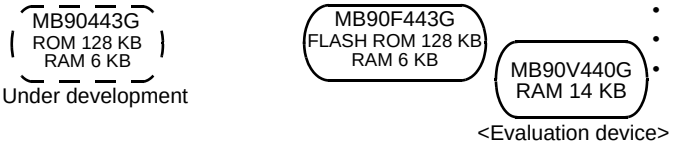
Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
◎MB90427GA	+4.5 to +5.5	100P	100P	–	I/O ports: 58 Max. CAN interface : 1ch. (2ch. : MB90V420) Timebase timer (WDT): 18-bit × 1ch. Watch timer (main clock) Sound generator PPG timer : 16-bit × 3 ch. Analog section : 8/10-bit A/D converter × 8ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1ch. UART : 2 ch. Reload timer : 16-bit × 2 ch. Stepper motor controller : 4 ch. LCD controller/driver: 96 elements, 2 to 4 common, 12 to 24 segments, 16 × 8-bit LCD display RAM For clock one system : MB90427GA/428GA/F428GA For clock two systems : MB90427GB/GC/428GB/GC /F428GB/GC/V420G External interrupts : 8 ch. Low-voltage detection reset (MB90427GA/GB/428GA/GB/F428GA/GB) Low-power consumption modes:Sleep, stop, sub, watch, pseudo-timer, CPU intermittent operation mode
◎MB90427GB		100P	100P	–	
◎MB90427GC		100P	100P	–	
◎MB90428GA		100P	100P	–	
◎MB90428GB		100P	100P	–	
◎MB90428GC		100P	100P	–	
MB90F428GA		100P	100P	–	
MB90F428GB		100P	100P	–	
MB90F428GC		100P	100P	–	
MB90V420G		–	–	256C	

Packages: P - plastic, C - ceramic
◎: Under development


(Continued)
(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
100
CAN interface (3 ch.), UART (2 ch.), SIO (1ch.), A/D converter (8/10-bit × 8 ch.), external interrupts (8 ch.), input capture (16-bit × 8 ch), output compare (16-bit × 4ch), 8/16-bit PPG timer (4 ch.), Reload timer (16-bit × 2 ch.), free running timer (16-bit × 1ch.), external bus interface
MB90440G series
Mass production
128 KB
6 KB
MB90443G *
FLASH ROM
Equivalent device
FLASH
128 KB
6 KB
MB90443G
MB90F443G
Evaluation target device
Evaluation device
14 KB
MB90440G series
MB90V440G
* : Under development
A/D converter (10-bit × 8 ch.), UART (2 ch.) SIO (1 ch.), CAN interface (1 ch.), SMC (4ch.), external interrupts (8 ch.), input capture (16-bit × 6 ch.), output compare (16-bit × 4 ch.), 8/16-bit PPG timer (6 ch.), Reload timer (16-bit × 2 ch.), free running timer (16-bit × 1 ch.), watch timer (1 ch.)
MB90595G series
Mass production
128 KB
4 KB
MB90598G
FLASH ROM
Equivalent device
FLASH
128 KB
4 KB
MB90598G
MB90F598G
Evaluation target device
Evaluation device
6 KB
MB90595G series
MB90V595G
(Continued)
(Continued)

MB90440G Series

For gateway, etc.



- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (125 µs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
◎MB90443G	+4.5 to +5.5	100P	–	I/O ports: 81 CAN interface: 3 ch. Timebase timer (WDT): 18-bit × 1 ch. 8/16-bit PPG timer: 4 ch. Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O:16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. UART: 2 ch. SIO: 1 ch. Reload timer: 16-bit × 2 ch. External interrupts: 8 ch. external bus interface Low-power consumption modes: Sleep, stop, sub, watch, CPU intermittent operation, pseudo-timer mode
MB90F443G		100P	–	
MB90V440G		–	256C	

Packages: P - plastic, C - ceramic

◎: Under development

MB90595G Series

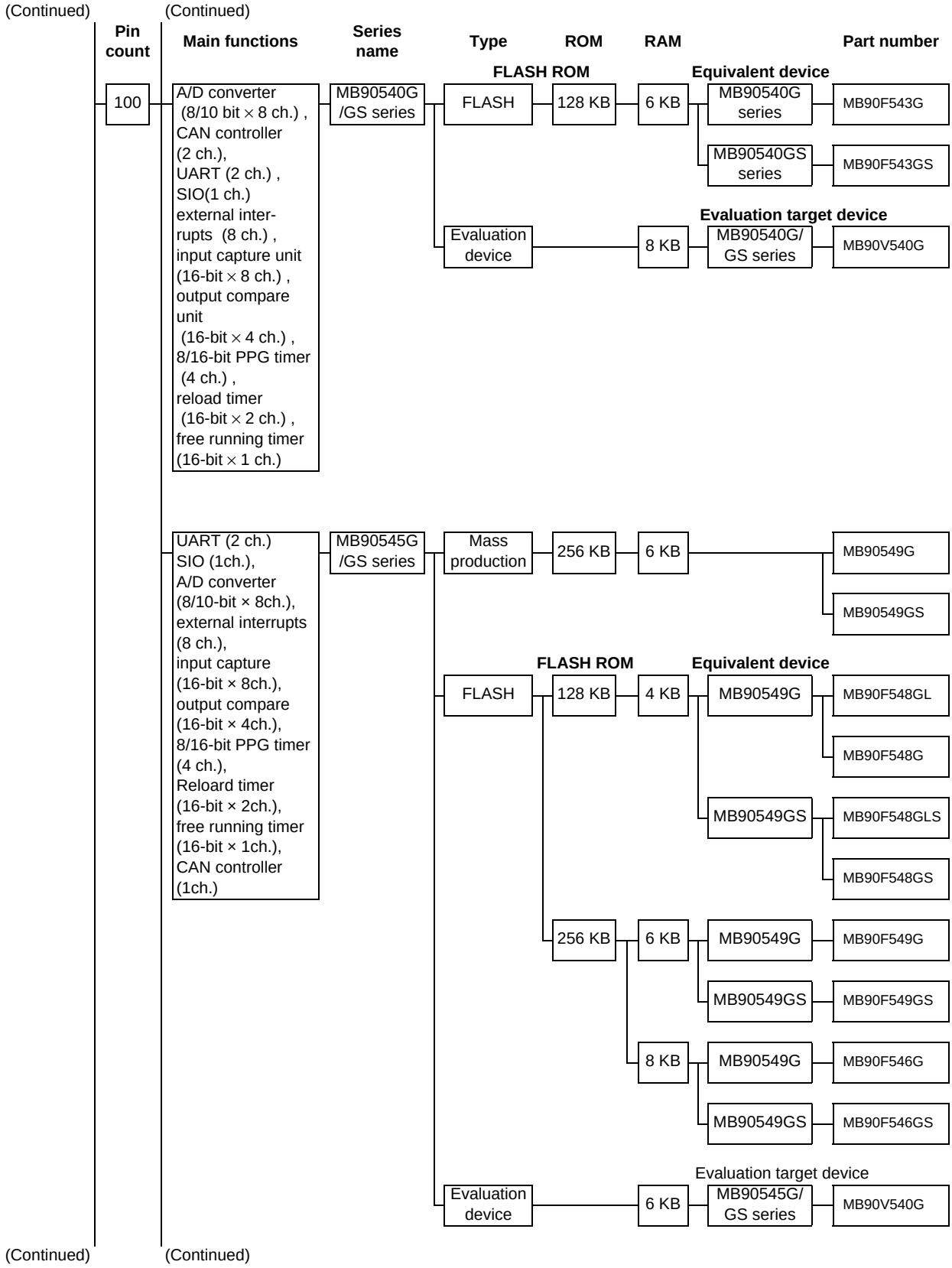
For dashboard, car audio, etc.

- Maximum clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90598G	+4.5 to +5.5	100P	–	I/O ports: 78 Timebase timer (WDT): 18-bit × 1 ch. UART: 2 ch. Analog section:10-bit A/D converter × 8ch. Real time I/O:16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. 8/16-bit PPG timer: 6 ch. SIO: 1 ch. Reload timer: 16-bit × 2 ch. CAN interface: 1 ch. SMC: 4 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, pseudo-timer, CPU intermittent operation mode
MB90F598G		100P	–	
MB90V595G		–	256C	

Packages: P - plastic, C - ceramic

SMC: Stepper motor controller


(Continued)
(Continued)
Pin count
Main functions
Series name
Type
ROM
RAM
Part number
FLASH ROM
Equivalent device
100
A/D converter (8/10 bit × 8 ch.), CAN controller (2 ch.), UART (2 ch.), SIO(1 ch.) external interrupts (8 ch.), input capture unit (16-bit × 8 ch.), output compare unit (16-bit × 4 ch.), 8/16-bit PPG timer (4 ch.), reload timer (16-bit × 2 ch.), free running timer (16-bit × 1 ch.)
MB90540G /GS series
FLASH
128 KB
6 KB
MB90540G series
MB90F543G
MB90540GS series
MB90F543GS
Evaluation target device
Evaluation device
8 KB
MB90540G/ GS series
MB90V540G
UART (2 ch.) SIO (1ch.), A/D converter (8/10-bit × 8ch.), external interrupts (8 ch.), input capture (16-bit × 8ch.), output compare (16-bit × 4ch.), 8/16-bit PPG timer (4 ch.), Reload timer (16-bit × 2ch.), free running timer (16-bit × 1ch.), CAN controller (1ch.)
MB90545G /GS series
Mass production
256 KB
6 KB
MB90549G
MB90549GS
FLASH ROM
Equivalent device
FLASH
128 KB
4 KB
MB90549G
MB90F548GL
MB90F548G
MB90549GS
MB90F548GLS
MB90F548GS
256 KB
6 KB
MB90549G
MB90F549G
MB90549GS
MB90F549GS
8 KB
MB90549G
MB90F546G
MB90549GS
MB90F546GS
Evaluation target device
Evaluation device
6 KB
MB90545G/ GS series
MB90V540G
(Continued)
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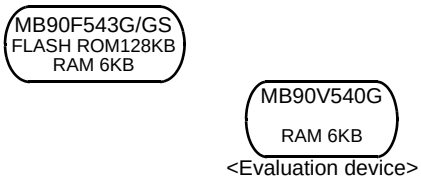
MB90540G/540GS Series

For dashboard, car audio, etc.



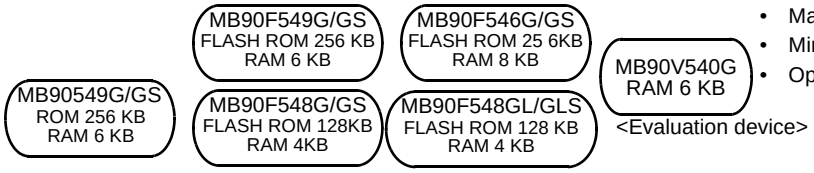
- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90F543G	+4.5 to +5.5	100P	100P	–	I/O ports : 81 Max. Timebase timer (WDT) : 18-bit × 1 ch. CAN controller : 2 ch. 8/16-bit PPG timer : 4 ch. SIO : 1 ch. Analog section : 8/10-bit A/D converter × 8 ch. Real time I/O : 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free running timer × 1 ch. UART : 2 ch. Reload timer : 16-bit × 2 ch. For clock one system : MB90F543GS For clock two systems : MB90F543G/V540G External interrupts : 8 ch. Low-power consumption modes : Sleep, stop, sub, CPU intermittent operation, watch, pseudo-timer mode
MB90F543GS		100P	100P	–	
MB90V540G		–	–	256C	

Packages: P - plastic, C - ceramic

MB90545G/545GS Series

For dashboard, car audio, etc.



- Maximum clock frequency: 16 MHz(32.768 kHz)
- Minimum execution time: 62.5 ns(122.1 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90549G	+4.5 to +5.5	100P	100P	–	I/O ports: 80 Max. Timebase timer (WDT): 18-bit × 1 ch. CAN controller : 1 ch. 8/16-bit PPG timer : 4 ch. SIO : 1ch. Analog section : 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. UART : 2 ch. Reload timer : 16-bit × 2 ch. For clock one system : MB90549GS/F546GS/F548GS/F548GLS/F549GS For clock two systems : MB90549G/F546G/F548G/F548GL/F549G/V540G External interrupts : 8 ch. Low-power consumption modes: Sleep, stop, sub, CPU intermittent operation, watch, pseudo-timer mode
MB90549GS		100P	100P	–	
MB90F546G		100P	100P	–	
MB90F546GS		100P	100P	–	
MB90F548G		100P	100P	–	
MB90F548GS		100P	100P	–	
MB90F548GL	+3.5 to +5.5	100P	100P	–	
MB90F548GLS		100P	100P	–	
MB90F549G	+4.5 to +5.5	100P	100P	–	
MB90F549GS		100P	100P	–	
MB90V540G		–	–	256C	

Packages: P - plastic, C - ceramic

(Continued)

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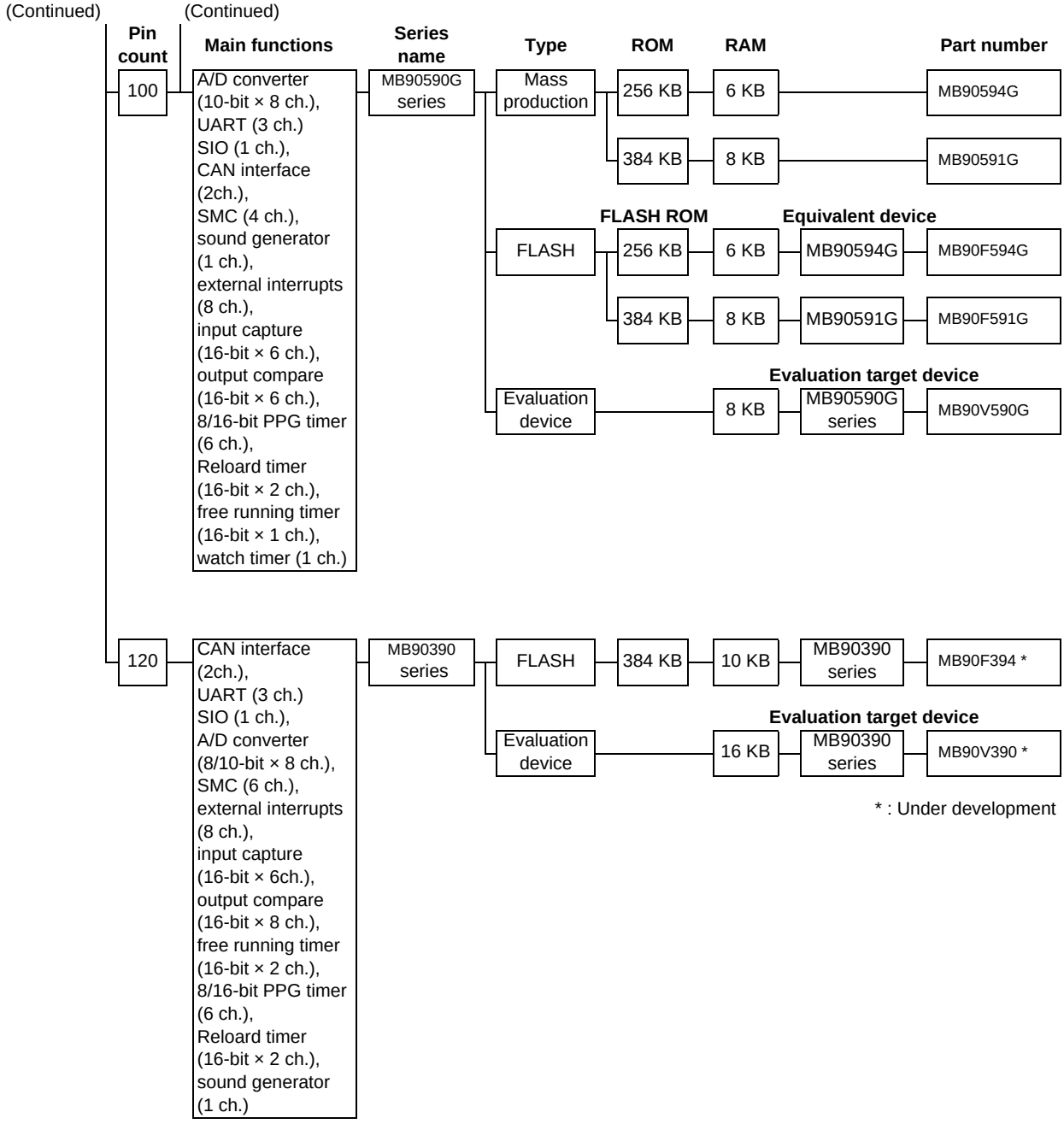
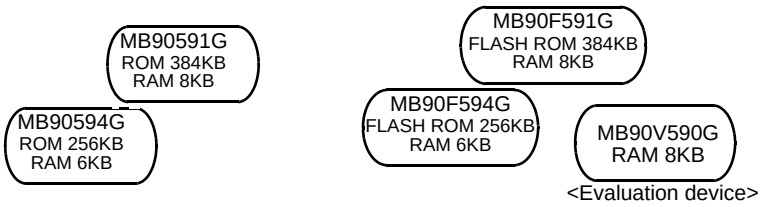


* : Under development

MB90590G Series

For dashboard, etc.



<Evaluation device>

- Maximum clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90591G	+4.75 to +5.25	100P	–	I/O ports: 78 MAX. Timebase timer (WDT): 18-bit × 1 ch. UART: 3ch. Analog section:10-bit A/D converter × 8 ch. Real time I/O:16-bit input capture unit (ICU) × 6 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free-run timer × 1 ch. 8/16-bit PPG timer : 6 ch. SIO: 1 ch. Reload timer: 16-bit × 2 ch. CAN interface: 2 ch. SMC: 4ch Sound generator: 1 ch. Watch timer: 1 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, pseudo-timer, CPU intermittent operation mode
MB90594G	+4.5 to +5.5	100P	–	
MB90F591G	+4.75 to +5.25	100P	–	
MB90F594G	+4.5 to +5.5	100P	–	
MB90V590G		–	256C	

Packages: P - plastic, C - ceramic
SMC: Stepper motor controller

MB90390 Series

For dashboard, etc.

Under development

<Evaluation device>
Under development

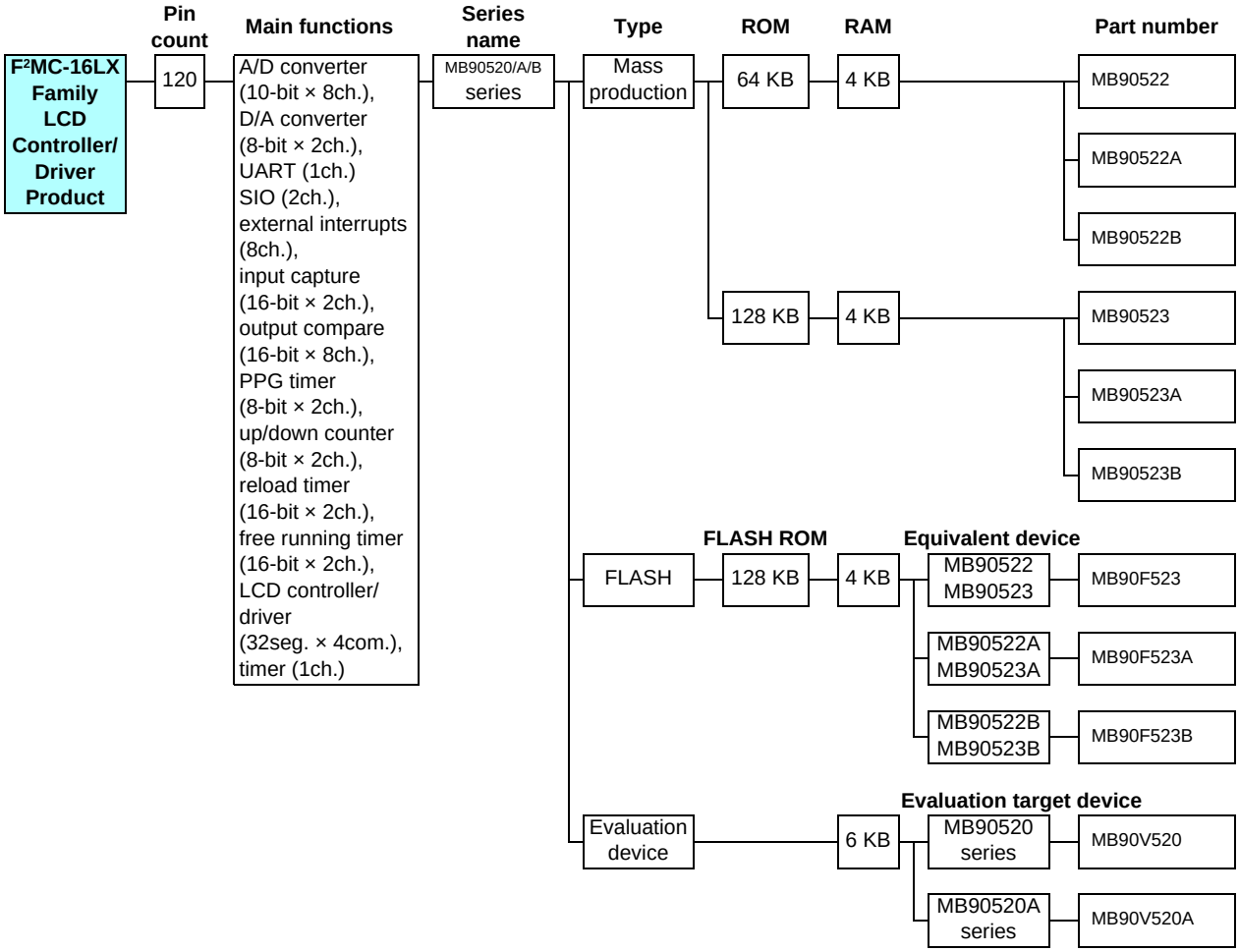
- Maximum clock frequency: 20 MHz
- Minimum execution time: 50 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
◎MB90F394	+4.5 to +5.5	120P	–	I/O ports: 96 MAX. CAN interface: 2 ch. Timebase timer (WDT): 18-bit × 1 ch. Real time watch timer: 1 ch. Sound generator: 1 ch. 8/16-bit PPG timer : 6 ch. Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O:16-bit input capture unit (ICU) × 6 ch. 16-bit output compare unit (OCU) × 8 ch. 16-bit free-run timer × 2 ch. UART: 3 ch. Reload timer: 16-bit × 2 ch. SIO: 1 ch. SMC: 6 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, pseudo-timer, CPU intermittent operation mode
◎MB90V390	+4.5 to +5.5	–	299C	

Packages: P - plastic, C - ceramic
SMC: Stepper motor controller

◎: Under development

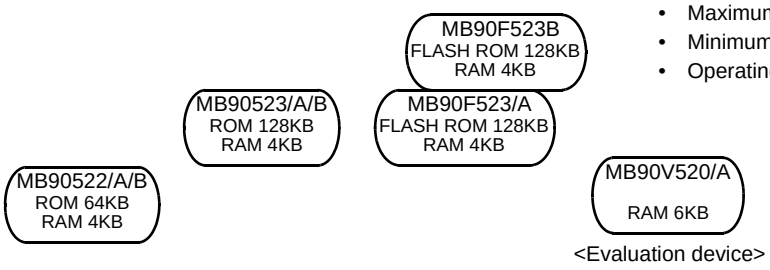
16-bit Proprietary F²MC-16LX Family LCD Controller/Driver Products



F²MC-16LX Family LCD Controller/Driver Products

MB90520/520A/520B Series

For cameras



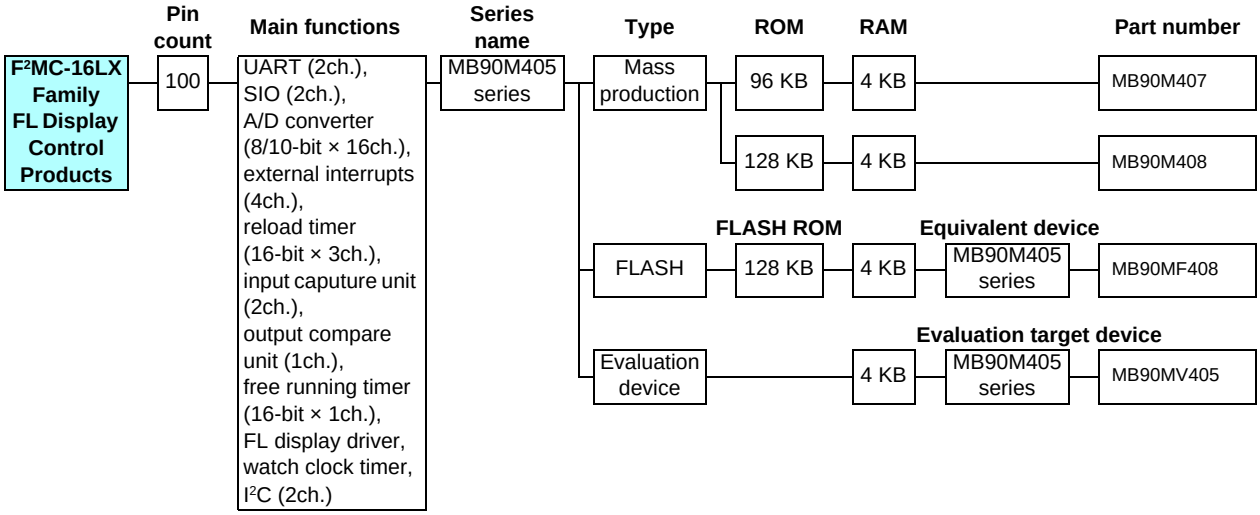
<Evaluation device>

- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 µs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90522	+3.0 to +5.5	120P	–	–	I/O ports: 85 Max. Timebase timer (WDT): 18-bit × 1ch. UART: 1ch. Analog section: 10-bit A/D converter × 8ch. 8-bit D/A converter × 2ch. Real time I/O: 16-bit input capture unit (ICU) × 2ch. 16-bit output compare unit (OCU) × 8ch. 16-bit free running timer × 2ch. Up/down counter: 8-bit × 2ch. (16-bit × 1ch.) PPG timer: 8-bit × 2ch. (16-bit × 1ch.) SIO: 2ch. Reload timer:16-bit × 2ch. LCD controller/driver: 128 elements, 2 to 4 common, 8 to 32 segments, 16 × 8-bit LCD display RAM Timer: 1ch. External interrupts: 8 Low-power consumption modes: Sleep, stop, watch, pseudo-timer, sub, CPU intermittent operation mode
MB90522A		120P	–	–	
MB90522B		120P	–	–	
MB90523		120P	120P	–	
MB90523A		120P	120P	–	
MB90523B		120P	120P	–	
MB90F523	+4.0 to +5.5	120P	120P	–	
MB90F523A		120P	120P	–	
MB90F523B	+3.0 to +5.5	120P	120P	–	
MB90V520		–	–	256C	
MB90V520A		–	–	256C	

Packages : P - plastic, C - ceramic

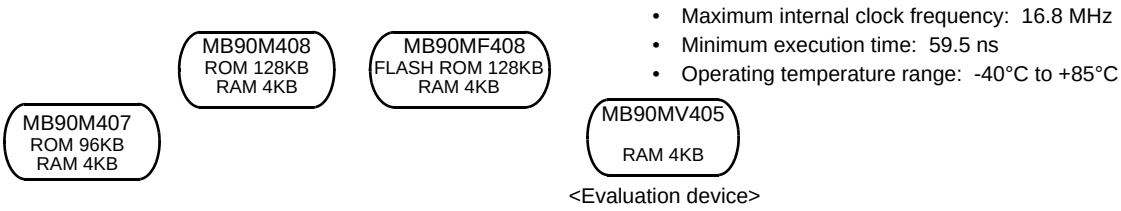
16-bit Proprietary F²MC-16LX Family FL Controller Products



F²MC-16LX Family FL (Fluorescent) Display Controller Products

MB90M405 Series

FL display panel control



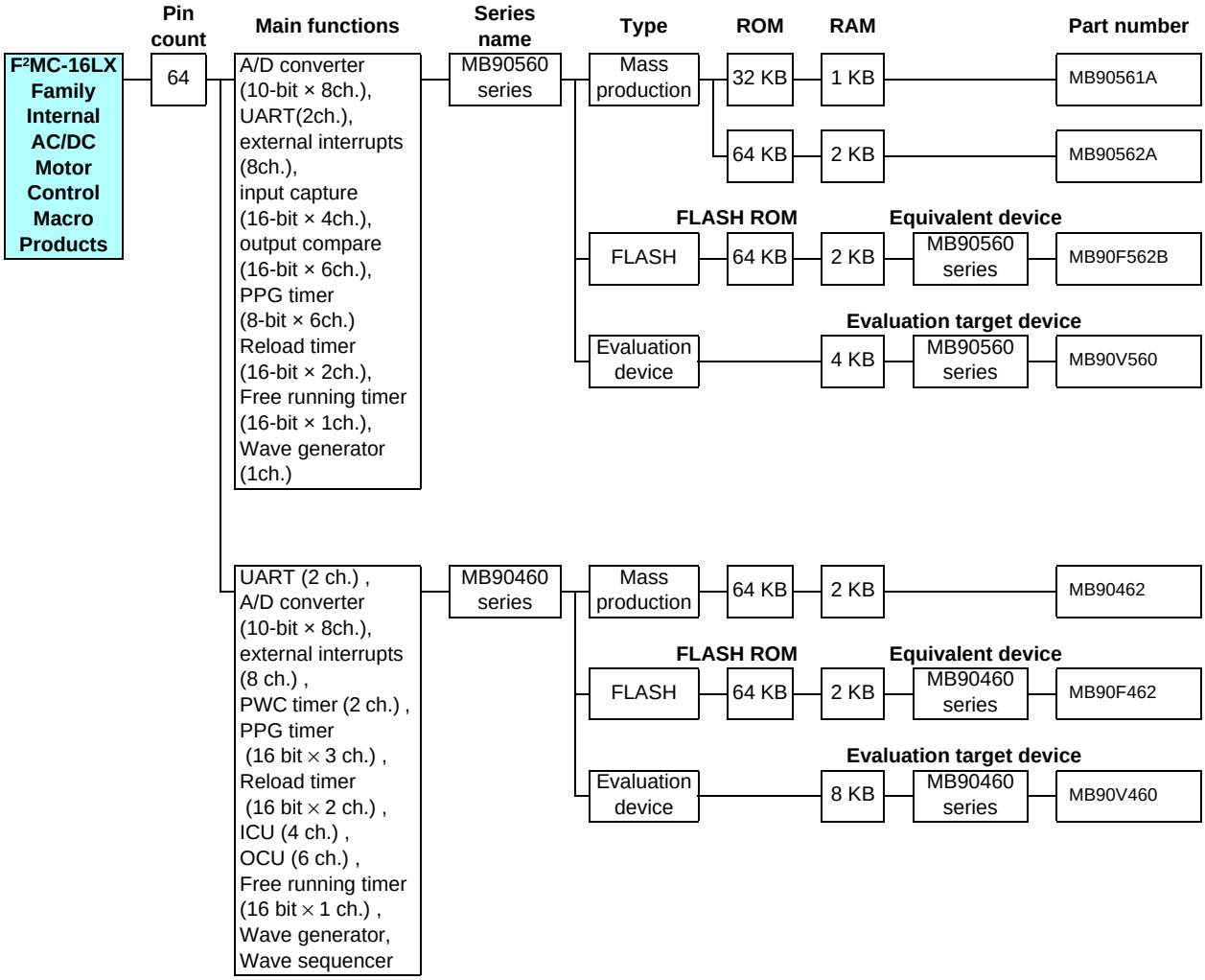
- Maximum internal clock frequency: 16.8 MHz
- Minimum execution time: 59.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90M407	+3.0 to +3.6	100P	–	I/O ports: 26 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 2 ch. Analog section: 8/10-bit A/D converter × 16 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 1 ch. 16-bit free running timer × 1 ch. SIO: 2 ch. I²C interface: 1 ch. FL display driver controller Reload timer: 16-bit × 3 ch. Watch clock timer External interrupts: 4 Low-power consumption modes: Sleep, stop, pseudo-timer, CPU intermittent operation mode
MB90M408	+3.0 to +3.6	100P	–	
MB90MF408	+3.0 to +3.6	100P	–	
MB90MV405	+3.0 to +3.6	–	256C	

Packages : P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family

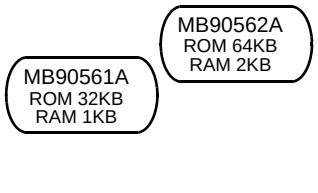
Internal AC/DC Motor Control Macro Products

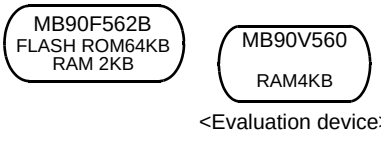


F²MC-16LX Family Internal AC/DC Motor Control Macro Products

MB90560 Series

For inverter control, etc.





<Evaluation device>

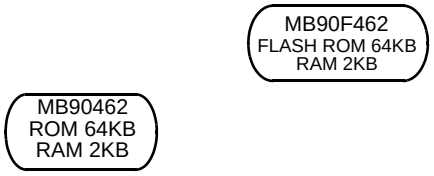
- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

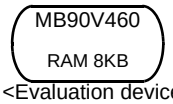
Part number	Operating power supply voltage (V)	Package				Functions
		QFP	LQFP	SH-DIP	PGA	
MB90561A	+3.0 to +5.5	64P (14 × 20 mm)	64P (12 × 12 mm)	64P	–	I/O ports: 51 Max. Timebase timer (WDT): 18-bit × 1ch. UART: 2ch. Analog section: 10-bit A/D converter × 8ch. Real time I/O: 16-bit input capture unit (ICU) × 4ch. 16-bit output compare unit (OCU) × 6ch. 16-bit free running timer × 1ch. PPG timer: 8-bit × 6ch. (16-bit × 3ch.) Reload timer: 16bit × 2ch. Wave generator: 1 ch. External interrupts: 8 ch. Low-power consumption modes:Sleep, stop, CPU intermittent operation mode
MB90562A		64P (14 × 20 mm)	64P (12 × 12 mm)	64P	–	
MB90F562B	+4.5 to +5.5	64P (14 × 20 mm)	64P (12 × 12 mm)	64P	–	
MB90V560	+3.0 to +5.5	–	–	–	256C	

Packages: P - plastic, C - ceramic

MB90460 Series

For inverter control, etc.





<Evaluation device>

- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

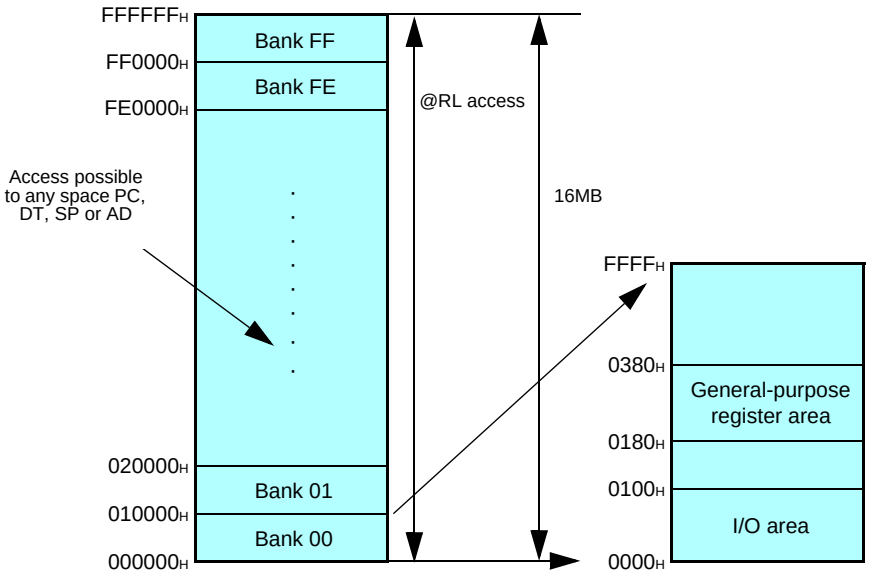
Part number	Operating power supply voltage (V)	Package				Functions
		QFP	LQFP	SH-DIP	PGA	
MB90462	+4.5 to +5.5	64P (14 × 20 mm)	64P (12 × 12 mm)	64P	–	I/O ports: 51 Max. Timebase timer (WDT): 18-bit × 1ch. Analog section: 10-bit A/D converter × 8ch. UART: 2 ch. PWC timer: 2 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free running timer × 1 ch. PPG timer: 16 bit × 3 ch. Reload timer: 16 bit × 2 ch. Wave generator Wave sequencer External interrupts: 8 ch. Low-power consumption modes:Sleep, stop, CPU intermittent operation mode, pseudo-timer mode
MB90F462		64P (14 × 20 mm)	64P (12 × 12 mm)	64P	–	
MB90V460		–	–	–	256C	

Packages: P - plastic, C - ceramic

F²MC-16F Family Features

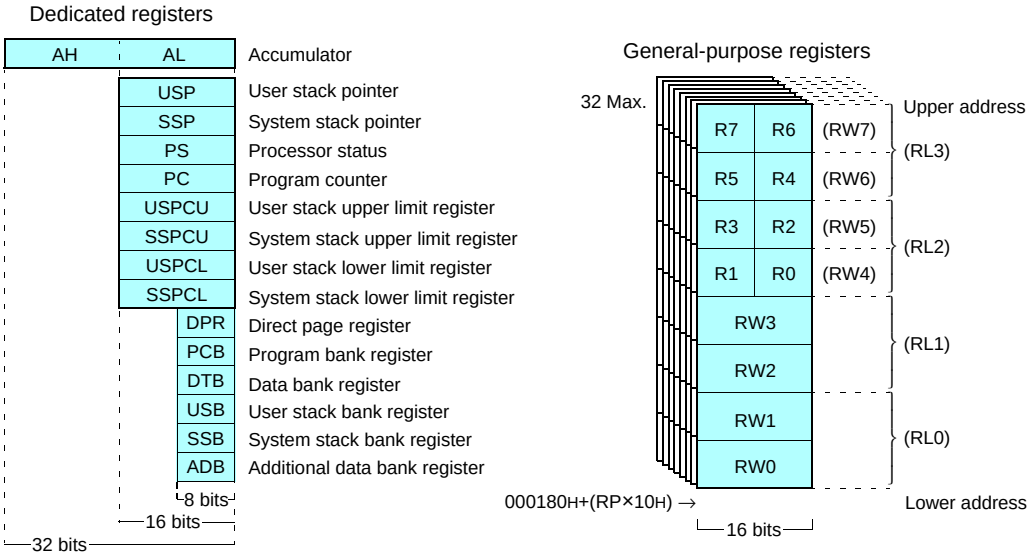
- About 3 times faster version of the F²MC-16 (MB90700 series) with object code upward compatibility
- Various extended instructions including signed division
- Easy programming with plenty of data types, bit (1 bit), nibble (4 bits), byte (8 bits), word (16 bits), and long word (32-bit), and 25 different addressing
- Bank and linear support of 16Mbytes large memory space makes migration
  From external large memory space to single chip systems easy

Memory space



- Registers

Dedicated registers
General-purpose registers: 8 × 16-bit per bank, 32 banks Max.



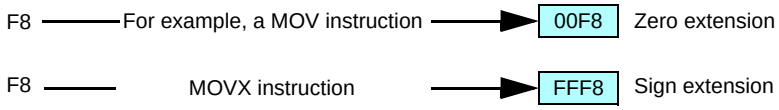
- Pipeline processing using 8-byte cue (minimum instruction execution time: 62.5ns/16MHz)
- Function for checking stack area in real time.
- Powerful real time processing using 8-level hardware support priority interrupts and extended intelligent I/O service functions.
- Enhanced C language and real time operating system instructions (in SP indirect addressing, RETIQ, etc.)
- Number of basic instructions: 412

Main Addressing Modes (Can be used by transfer and arithmetic)

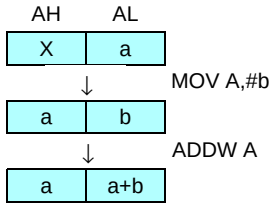
- Bit addressing
  Direct bit: I/O area (2Kbits) + area inside DPR page (2Kbits)
  Any bit within 64Kbytes may be specified.
- Indirect addressing
  @RWi, @RWi+, @RWi+disp16, @RLi+disp8, @RWj+disp8 (i = 0 to 3), (j = 0 to 7)
  @RW0+RW7
  @RW1+RW7
  @PC+disp16
  @A
  @SP+disp8
- Direct addressing
  R0 to R7, RW0 to RW7, RL0 to RL3
  dir, addr16, io, addr24

Super Accumulator

- 32-bit accumulator using AH:AL (16 bits:16 bits) as a pair.
- Data precision verification function



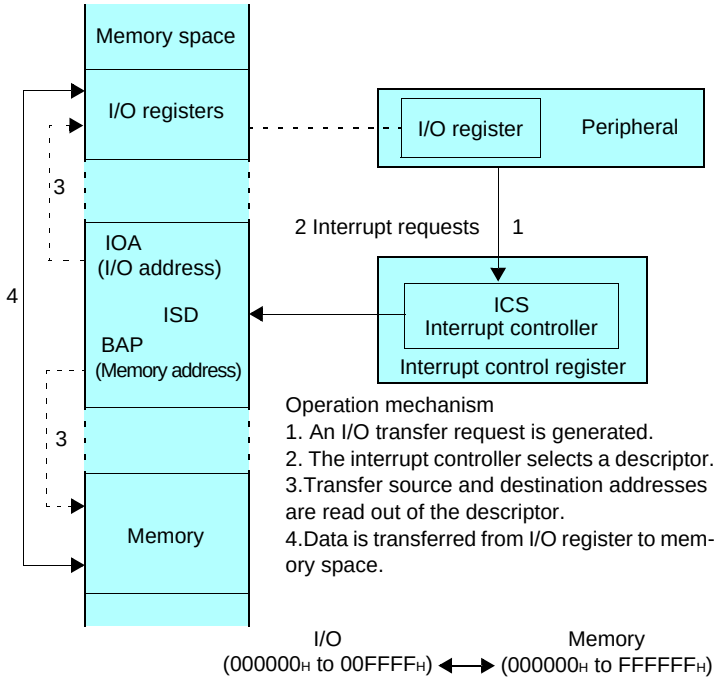
- Data keep function (available for data types of 16-bit word length and less)



Extended Intelligent I/O Service (EI²OS)

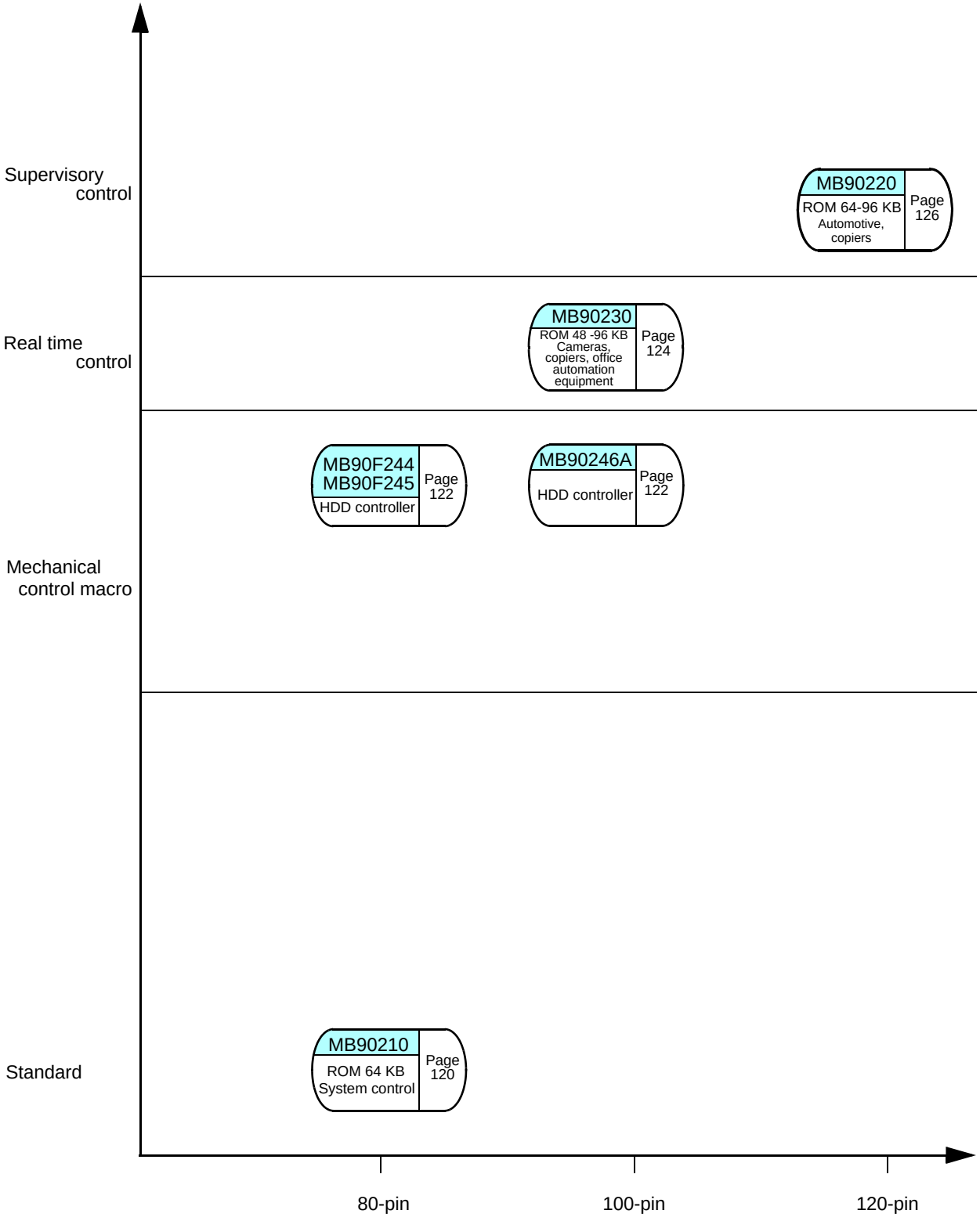
- In addition to programming being made easier, because there in no need to execute unnecessary program transfers higher speeds for transfer service response and overall system control are realized.
- Since CPU micro-instructions execute transfer functions, multi-channel systems can be realized at no extra cost.
- Since I/O transfers can be stopped when a condition is generated such as when invalid data is received, performance loss due to transfering unnecessary data can be avoided because there is no programming load.
- It is possible to specify incrementing or decrementing of buffer addresses and I/O register addresses can be specified.
- It is possible to specify the entire 00 bank as I/O register addresses.
- It is possible to specify the data counter to count up to 64K.
- Execution speed

  From request to completion of transfer: 28 cycles = 1.75µs (@16 MHz)

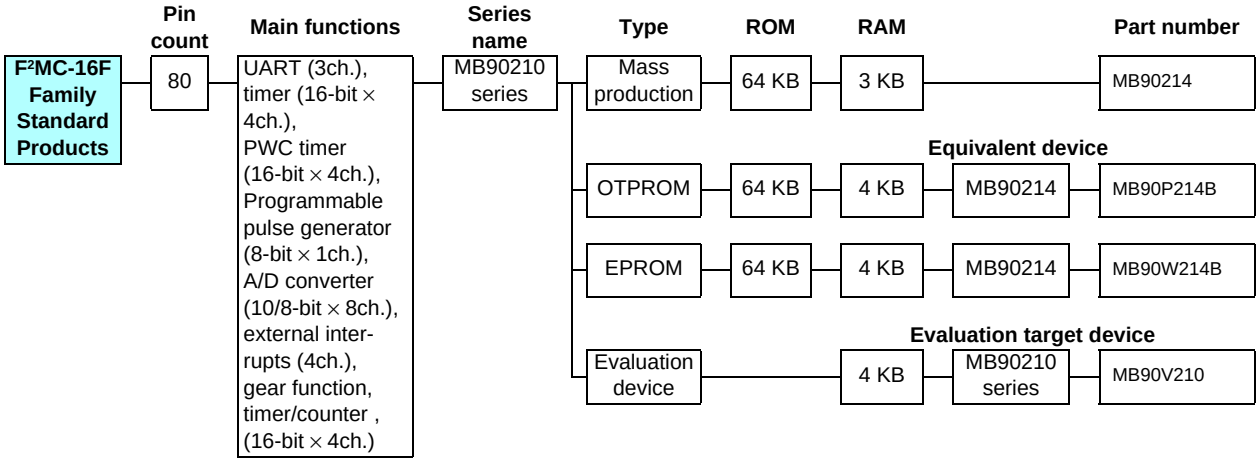


Operation mechanism
1. An I/O transfer request is generated.
2. The interrupt controller selects a descriptor.
3.Transfer source and destination addresses are read out of the descriptor.
4.Data is transferred from I/O register to memory space.

F²MC-16F Family Product Range



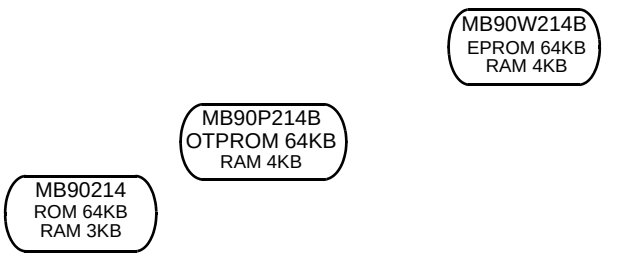
16-bit Proprietary F²MC-16F Family Standard Products



F²MC-16F Family Standard Products

MB90210 Series

For mechatronical electronics control, etc.

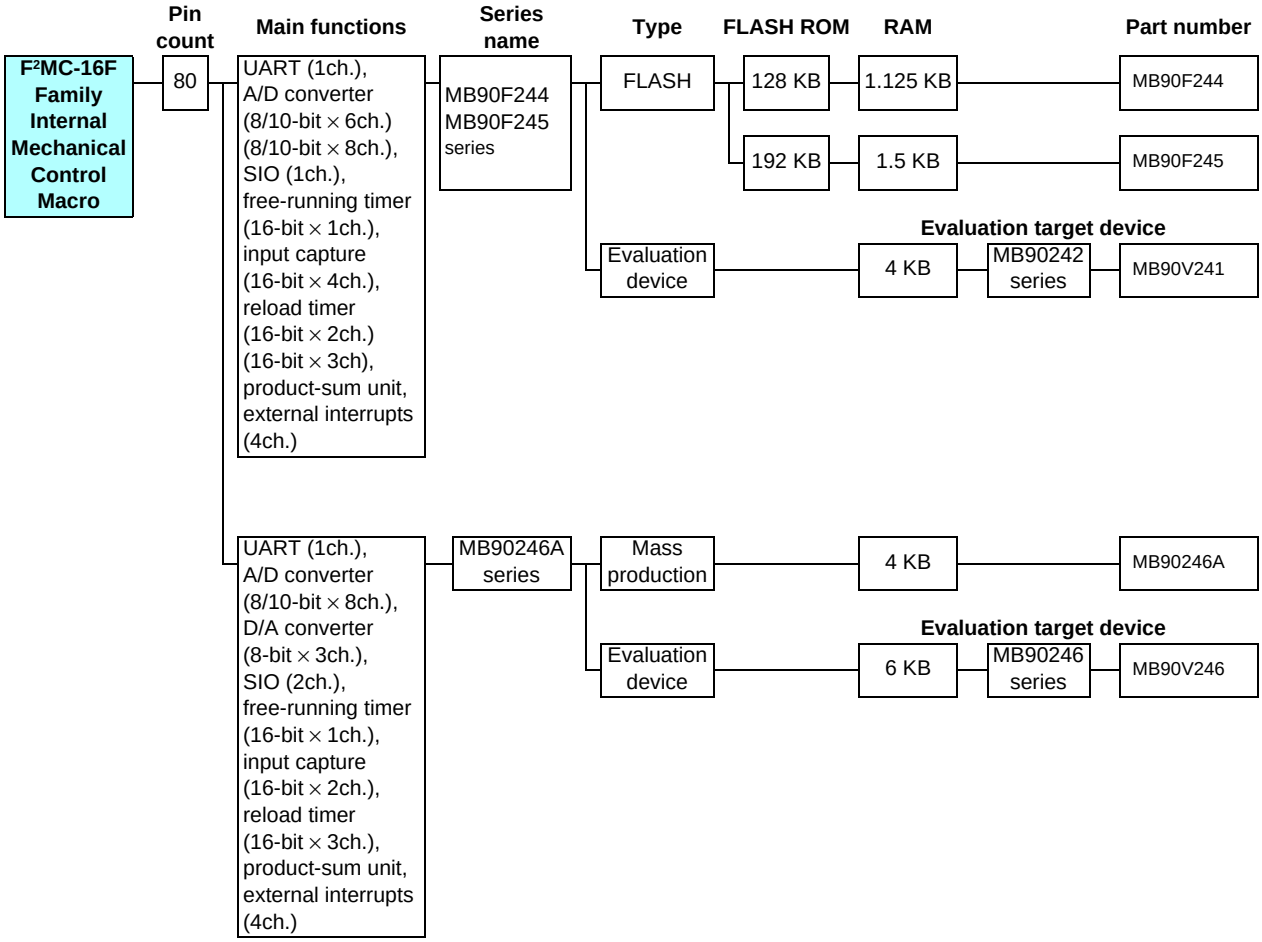


<Evaluation device>

- Maximum clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +105°C
  In external bus mode: -40°C to +70°C
  Only MB90P214A and MB90W214A: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90214	+5 ±10%	80P	–	I/O ports: 65 Max. Timer/counter: 16-bit × 4ch. Timebase timer (WDT): 18-bit × 1ch. PPG timer: 8-bit × 1ch. PWC timer: 16-bit × 4ch. UART: 3ch. Analog section: 10-bit A/D converter × 8ch. Programming-protected RAM: 256 bytes External interrupts: 4 Low-power consumption modes: Gear function, sleep, stop
MB90P214B		80P	–	
MB90W214B		80C	–	
MB90V210		–	256C	

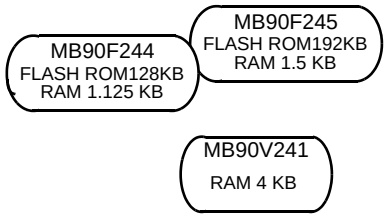
Packages: P - plastic, C - ceramic


F²MC-16F Family Internal Mechanical Control Macro
Pin count
Main functions
Series name
Type
FLASH ROM
RAM
Part number
80
UART (1ch.), A/D converter (8/10-bit × 6ch.) (8/10-bit × 8ch.), SIO (1ch.), free-running timer (16-bit × 1ch.), input capture (16-bit × 4ch.), reload timer (16-bit × 2ch.) (16-bit × 3ch), product-sum unit, external interrupts (4ch.)
MB90F244 MB90F245 series
FLASH
128 KB
1.125 KB
MB90F244
192 KB
1.5 KB
MB90F245
Evaluation target device
Evaluation device
4 KB
MB90242 series
MB90V241
UART (1ch.), A/D converter (8/10-bit × 8ch.), D/A converter (8-bit × 3ch.), SIO (2ch.), free-running timer (16-bit × 1ch.), input capture (16-bit × 2ch.), reload timer (16-bit × 3ch.), product-sum unit, external interrupts (4ch.)
MB90246A series
Mass production
4 KB
MB90246A
Evaluation target device
Evaluation device
6 KB
MB90246 series
MB90V246

F²MC-16F Family Internal Mechanical Control Macro

MB90F244, MB90F245 Series

For HDD controller



<Evaluation device>

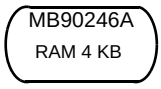
- Maximum clock frequency
  MB90V241: 32 MHz
  MB90F244: 50MHz
  MB90F245: 64MHz
- Minimum execution time
  MB90V241: 62.5 ns
  MB90F244: 40ns
  MB90F245: 31.25ns
- Operating temperature range:
  MB90F244/F245: 0°C to +70°C

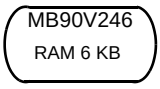
Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	TQFP	PGA	
MB90F244	+3.3 ±0.3 +5 ±0.5	–	80P	–	I/O ports: 63 Max. (MB90F244) 58 Max. (MB90F245) Timebase timer (WDT): 18-bit × 1ch. UART: 1ch. SIO: 1ch. Real time I/O: 16-bit input capture (ICU) × 4ch. 16-bit free-run timer × 1ch. Reload timer: 16-bit × 2ch.(MB90F245) 16-bit × 3ch (MB90F244/V241) Analog section: 8/10-bit A/D converter × 6ch.(MB90V241), 8ch. (MB90F244/F245) External interrupts: 4 Low-power consumption modes: Sleep, stop
MB90F245	+3.3 ±0.3	–	80P	–	
MB90V241	+5 ±10%	–	–	256C	

Packages: P - plastic, C - ceramic

MB90246A Series

For HDD controller





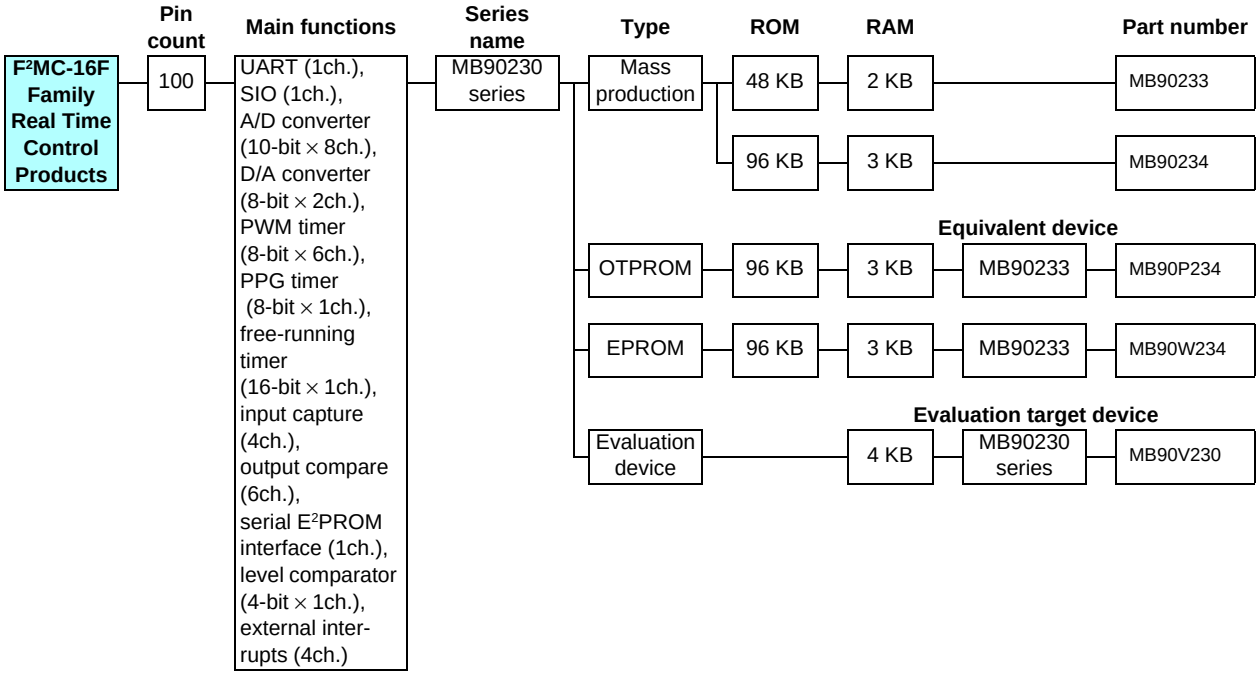
<Evaluation device>

- Maximum clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -30°C to +70°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90246A	+5 ±10%	100P	–	I/O ports: 57 Max. Timebase timer (WDT): 18-bit × 1ch. UART: 1ch. SIO: 2ch. Real time I/O: 16-bit input capture (ICU) × 2ch. 16-bit free running timer × 1ch. Reload timer: 16-bit × 3ch. Analog section: 8/10-bit A/D converter × 8ch. 8-bit D/A converter × 3ch. Product-sum unit External interrupts: 4 Low-power consumption modes: Sleep, stop
MB90V246		–	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16F Family Real Time Control Products



F²MC-16F Family Real Time Control Products

MB90230 Series

Standard products (extended analog, camera control, copier control, etc.)

MB90234
ROM 96KB
RAM 3KB

MB90P234
OTPROM 96KB
RAM 3KB

MB90W234
EPROM 96KB
RAM 3KB

- Maximum clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +70°C
  (in external bus mode: 0°C to +70°C)

MB90233
ROM 48KB
RAM 2KB

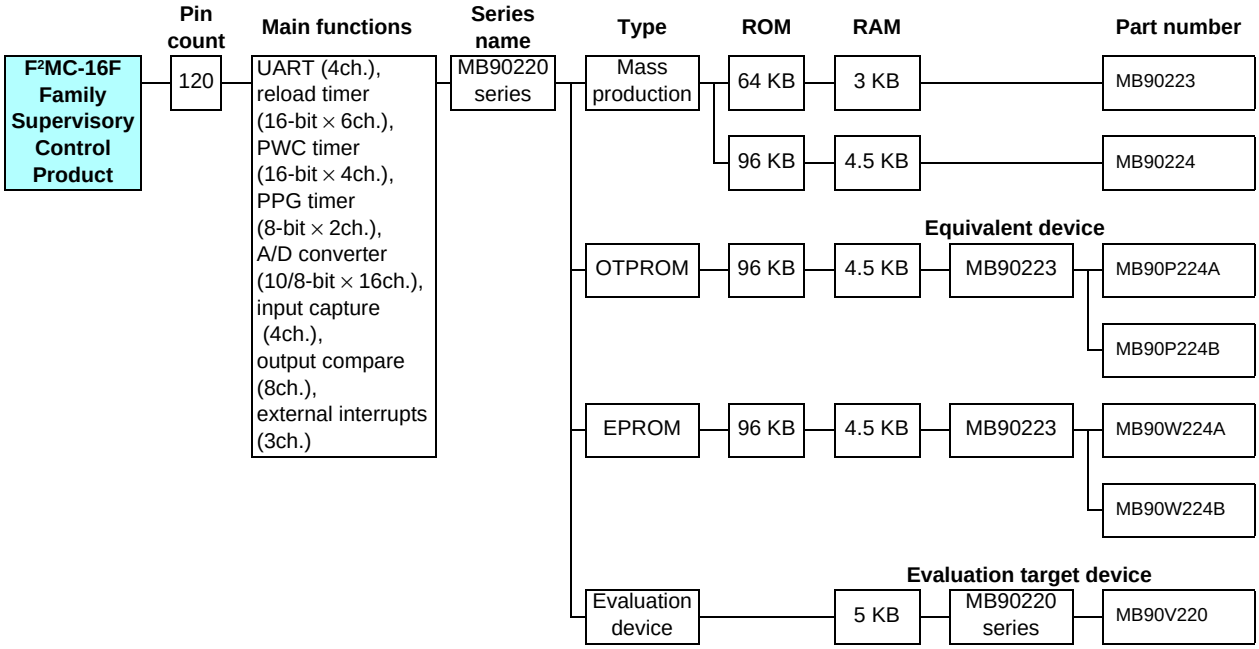
MB90V230
RAM 4KB

<Evaluation device>

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90233	+5 ±5%	100P	–	I/O ports: 84 Max. Timebase timer (WDT): 18-bit × 1ch. PWM timer: 8-bit × 6ch. PPG timer: 8-bit × 1ch. UART: 1ch. SIO: 1ch. Serial E²PROM interface: 1ch. Communications prescaler: 1ch. Real time I/O: 16-bit timer × 1ch. input capture unit (ICU) × 4ch. output compare unit (OCU) × 6ch. Analog section: 10/8-bit A/D converter × 8ch. 8-bit D/A converter × 2ch. level comparator × 1ch.(with internal 4-bit D/A converter) External interrupts: 4 Low-power consumption modes: Gear function, sleep, stop started by hardware/software
MB90234		100P	–	
MB90P234		100P	–	
MB90W234		100C	–	
MB90V230		–	256C	

Packages: P - plastic, C - ceramic

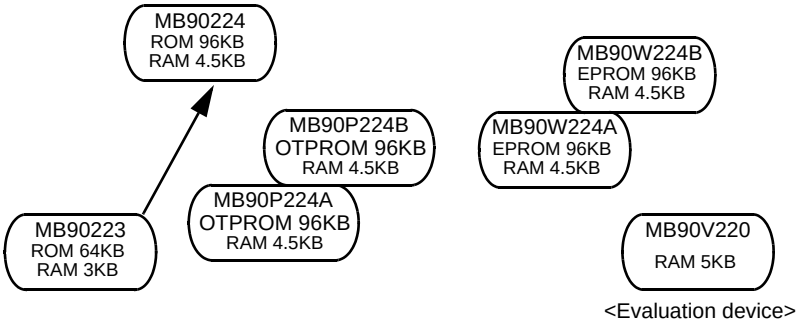
16-bit Proprietary F²MC-16F Family Supervisory Control Products



F²MC-16F Family Supervisory Control Products

MB90220 Series

For mechanical electronics control



<Evaluation device>

- Maximum clock frequency: 16 MHz
  (Only MB90223: 12 MHz)
- Minimum execution time: 62.5 ns
- Operating temperature range:
  -40°C to +105°C
  In external bus mode: -40°C to +70°C
  Only MB90P224A and MB90W224A:
  -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90223	+5 ±10%	120P	–	I/O ports: 102 Max. Timer/counter: 16-bit × 6ch. Timebase timer (WDT): 18-bit × 1ch. PPG timer: 16-bit × 2ch. PWC timer: 16-bit × 4ch. UART: 4ch. Real time I/O: 24-bit timer × 1ch. input capture unit (ICU) × 4ch. output compare unit (OCU) × 8ch. Analog section: 10-bit A/D converter × 16ch. Programming-protected RAM: 512 bytes External interrupts: 8 Low-power consumption modes: Gear function, sleep, stop started by hardware/software
MB90224		120P	–	
MB90P224A		120P	–	
MB90P224B		120P	–	
MB90W224A		120C	–	
MB90W224B		120C	–	
MB90V220		–	256C	

Packages: P - plastic, C - ceramic

Development Environment Features

(1) Enhancement of development efficiency

- Provides integrated total environment
  SOFTUNE V3 Workbench (Manager + Debugger) Windows98/Me/NT 4.0/2000 version
  SOFTUNE V3 Workbench (Manager + Debugger) integrates programming language and debugging tools to improve the efficiency of the code-compile-debug cycle.
- High programming efficiency
  C compiler support
  SOFTUNE C checker and C analyzer support
  Structured assembly language support
- High programming development efficiency
  Provides real time OS (SOFTUNE REALOS/907)
  Provides C library
  Support C language and assembly source debugging function
- Easy operation by multi windows (Windows98/Me/NT 4.0/2000 version)
  SOFTUNE V3 Workbench (manager + debugger)
  SOFTUNE C checker
  SOFTUNE C analyzer
  SOFTUNE V3 REALOS/907 configurator

(2) Efficient system development tools

- Provides real time debugging using real target board
  Evaluation tool + SOFTUNE V3 Workbench emulator debugger
- Provides software debugging without target board
  SOFTUNE V3 Workbench simulator debugger

(3) Total development environment

- Personal computer (IBM-PC)
- ICE tool (MB2140A series)

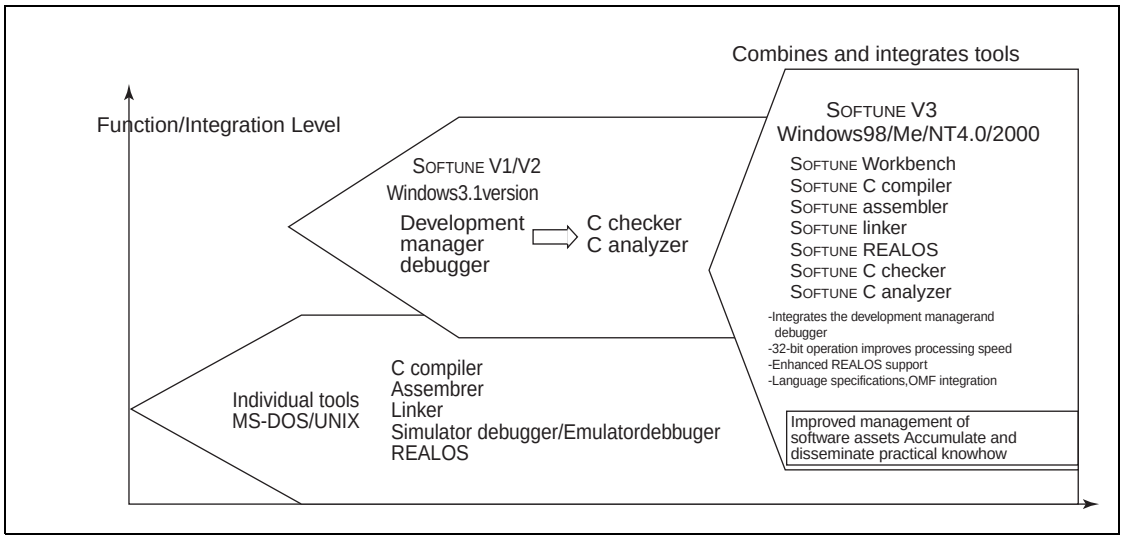
(4) Conformity with standards

Improves versatility and portability of software resource

- C language: conforms to ANSI standard
- C library: conforms to ANSI standard
- Real time OS: conforms to µITRON specification

SOFTUNE V3

1. The SOFTUNE Integrated Development Environment



2. SOFTUNE V3 Structure and Features

Workbench Integrated project manager and debugger modules

Errors can be corrected on the fly, as they are discovered, and the resulting code can be debugged on the spot.

A variety of tools to support C-language coding

"C Checker" confirms code operation and "C Analyzer" analyzes the code's structure.

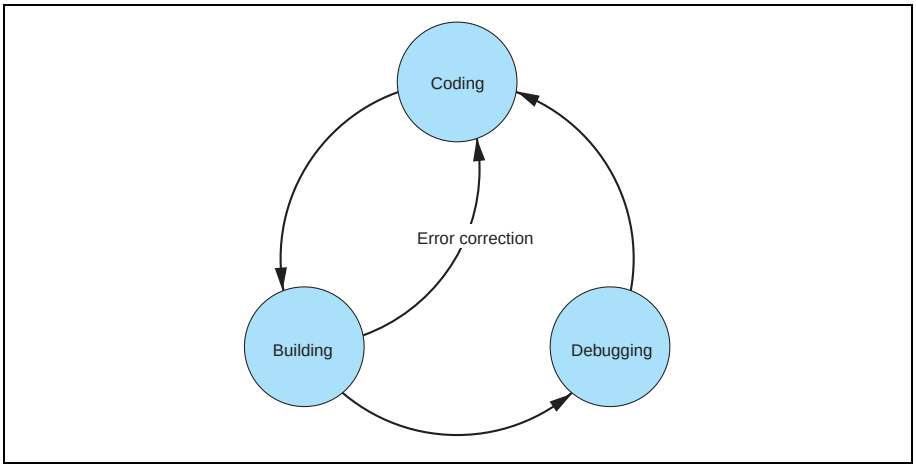
Includes such tools as Configurator and Analyzer to facilitate the use of REALOS, which conforms to the µITRON specifications(Analyzer:under development).

(1) Removing the Annoying Settings which are Part of Program Development

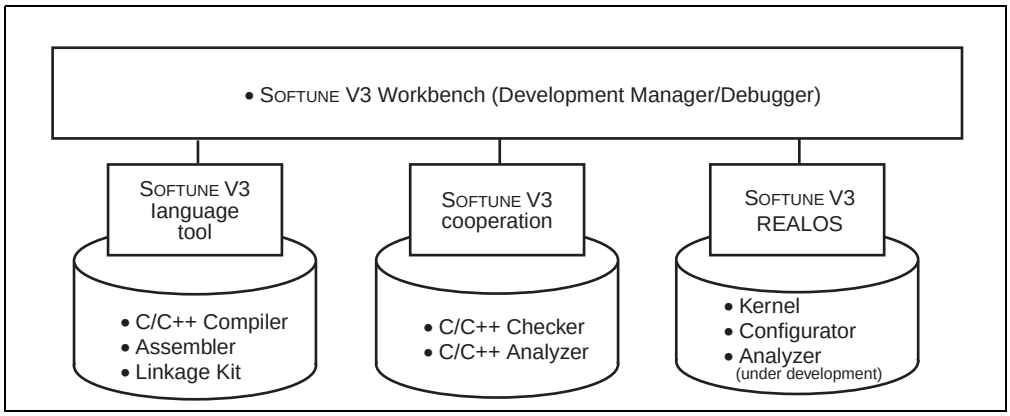
Developing programs for different systems requires the programmer to edit source code, perform actual builds and confirm program operation (debug). Finally, the programmer returns to the editing process to incorporate necessary changes, as indicated by debugging results.

SOFTUNE V3 is an integrated developing environment which is designed to perform such repetitive processes smoothly and efficiently. It is the third generation of SOFTUNE, which has evolved to meet various needs of our customers.

(2) Program Flow



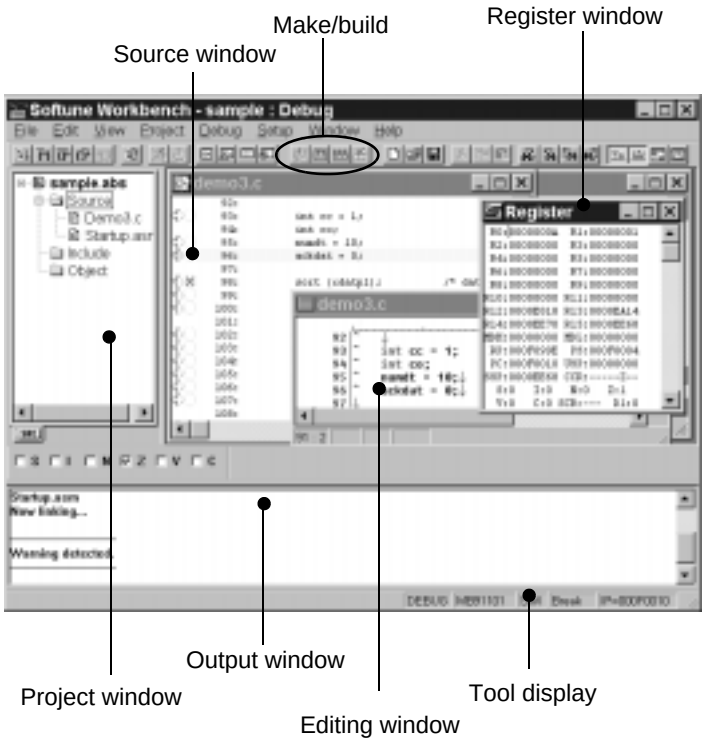
(3) Structure of SOFTUNE V3



(4) Environment with SOFTUNE V3

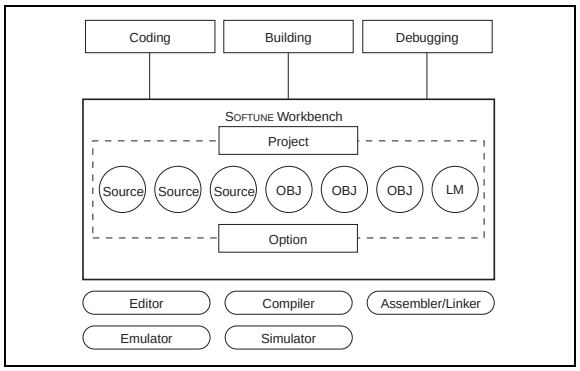
The Efficient and Easy-to-Use Integrated Developing Environment

Program development requires repeated editing, make/build, and debugging operations. Performing these functions smoothly and effectively contributes to improved efficiency.
The SOFTUNE V3 integrated developing system is designed to meet program developers' numerous demands, while ensuring ease of use.



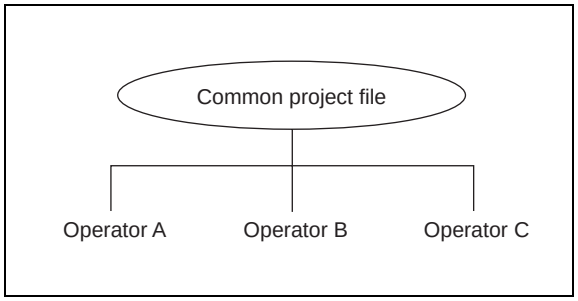
3. Manager Functions

Software programming proceeds according to the "project file, " which contains all the information needed for program development.



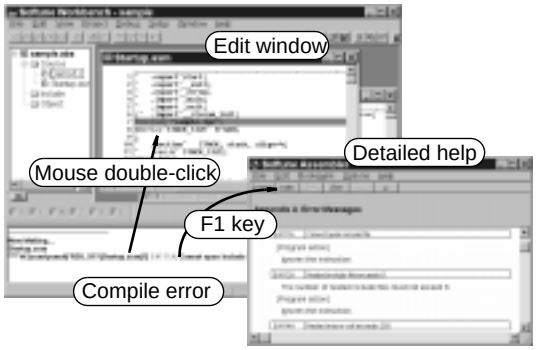
(1) Effective Project Usage

Whether working alone on several projects simultaneously or developing a project as a group, project files can be used to create a simple developing environment.



(2) Extremely Easy to Use

- Built-in Editor
  The built-in editor comes complete with many useful functions, such as visual keyword emphasis and auto-indent.
- Error Jump and On-line Help
  Errors that occur during builds are displayed in the output window at the bottom of the screen.
  To make a "Tag-jump" Double-click Mouse.Once on the error press "F1 key" for a more detailed error display.
- Cooperation with Commercially Available Editors
  To meet developers' requests to use editors to which they are accustomed, SOFTUNE can be configured to use the following commercially available editors:(Codewright32, TextPAD32 and others)

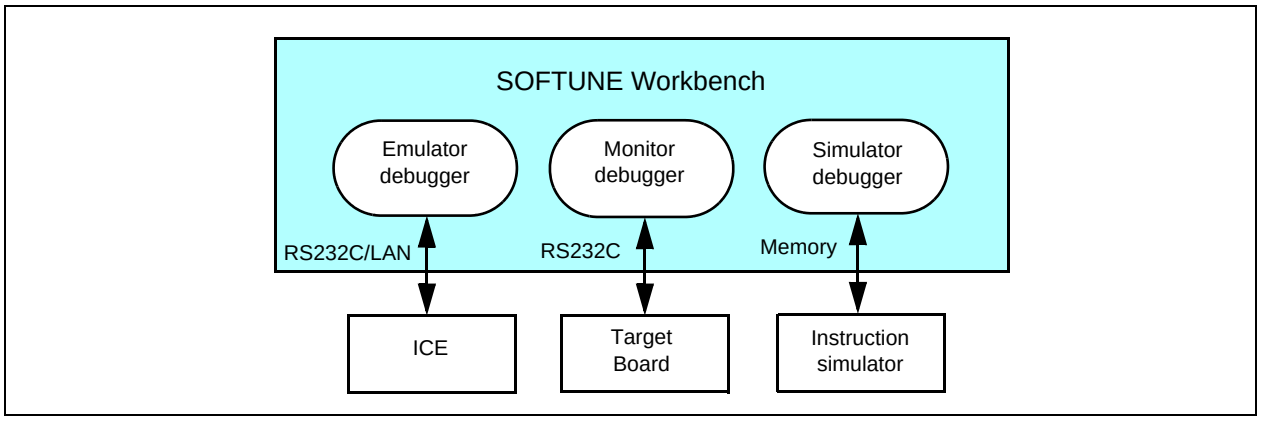


(3) Customizable Environment

When sharing files, cooperation with source generation management tools is assured, and file type conversion tools are called up, so that each person can operate in his or her own customized developing environment.

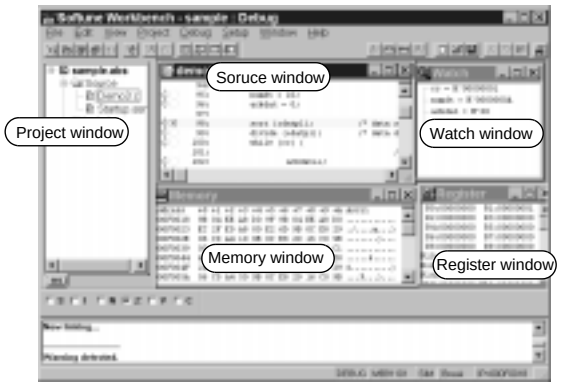
4. Debugger Function

SOFTUNE Workbench supports three debuggers that are needed at various stages of development. The appropriate debugger environment can be selected to match the situation.



(1) Easy-to see Screen Information

The user can freely change the screen layout by selecting the necessary windows. In addition, the displayed information can be selected to provide only the infomation that is necessary.



(2) Simple Environment Setting

- Debugging Environment: Setup Wizard

  The setup wizard supports the selection of communication lines with emulation pods and boards, as well as window settings.

- MCU Operating Environment

  The so-called “CPU information file,” which contains the information required to support all MCUs, is provided as standard. Necessary information such as I/O port locations, ROM/RAM capacity and initial addresses can be set automatically.

- Saving and Restoring the Debugging Environment

  Previous debugging environment specifications, such as window locations, breakpoint settings, and memory mapping information, are saved, so that these settings are restored the next time the program is initiated.

5. Cooperation

In cooperation with SOFTUNE Workbench, the following SOFTUNE components help improve the quality of C-language programming, which greatly increases reviewing and documentation efficiency.

1) SOFTUNE C Checker

Designed to meet the following requests from beginners through advanced users:

- Eliminate all coding mistakes.
- Review programs quickly and efficiently.
- Enable even C-language beginners to create quality code.
- Maximize coding skills.
- Use software assets on Fujitsu CPUs.

The SOFTUNE C Checker checks code for maintainability, methods of expanding specifications and transportability; indicates areas where quality and performance could be improved; and reports these results to the user. The user can then review the C-language code.

(1) Outline

Recent software for embedded microcontrollers has been developed in the C language. However, it is difficult to understand messages output from a compiler unless the language specifications are well known.
This development support tool checks C-source programs to display and print advice for better quality and performance. It also has a facility for selecting necessary advice carefully.

(2) Features

- Outputs advice suitable for objectives: Portability, coding error, performance, porting to Fujitsu CPU
- Allows customization to a programmer level.
- Works with C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

(3) Advising Function

The following pieces of advice are given. “Reason of check”, “Example of program”, “Suggestion of correction”, and “One-point advice” are displayed and explained for each check item.

- Portability

  This tool makes a close check on the items “processing-definded operation” and “undefined operation” which can be a problem in portability in the ANSI standard.
  It also gives an explanation of the operation of C compilers (Fcc911, Fcc907 and Fcc896) for Fujitsu microcontrollers.

  For example, the tool gives the user proper advice on many problems (such as a data type acceptable to a structure, code, and its arrangement at the time of porting).

- Coding error

  This tool indicates the items which are not wrong in the language specifications but may cause an error and the items which are logically inconsistent.

  For example, the equivalent expression "**`if`** (**`a==0`**)" in the if statement is likely to be typed as the assignment expression "**`if`** (**`a=0`**)" by mistake. Most compilers cannot detect such an error.

- Performance

  This tool indicates the items which generally provide better performance and the items which are essential and effective for the FR family and F²MC-16 family.
  Stress is especially, put on the detection of object size reduction which can be a problem in software for embedded microcontrollers.

  For example, if a function return value is a structure of the double type, an area is reserved for the return value and an object to be transferred to the area is output.

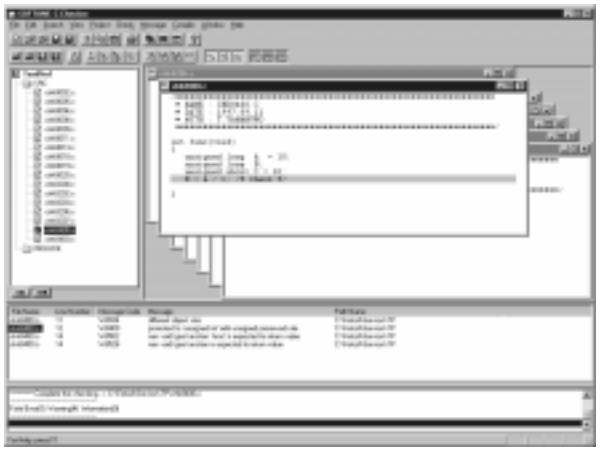
  This tool advises the user to transfer the function return value by a pointer and largely reduce the objects size.

- Porting to Fujitsu CPU’s

  This tool advises the user what to consider in porting exsting software from other makers’ CPU to Fujitsu CPU in the FR family and F²MC-16 family.

  For example, in porting software resources created for the F²MC-16 family to the FR family, this tool advises the user to delete the expansion specifications (**`__far, __near, and __direct etc.`**) inherent to the F²MC-16 family.

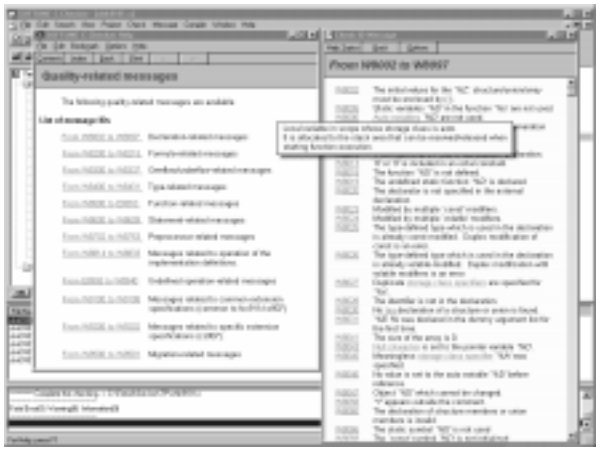
- Indicated messages output



- Coding error indicated and advice displayed

- Advice for porting to Fujitsu C compilers displayed

- Quality-related massages listed



2) SOFTUNE C Analyzer

Designed to meet the following user situations:

- One wishes to examine a program's structure or processing, but the programmer is absent or documentation is unavailable.
- During program development, one wishes to create a structural program while taking into account structure and processing.
- One wishes to examine the range of effects caused by program modification.
- One wishes to create a program's internal documentation.
- One wishes to explore the possibilities of a more efficient program.

The structure and usage of data in a C-language source program are displayed visually, and the internal data structure, functional tree, stack usage and other infomation can be acquired and stored in a file.

(1) Outline

Recent software (ROM) for embedded microcontrollers is increasingly extending its development scale. This situation is created from development by many programmers, diversion of exsting resources, and use of package programs.
This development support tool statically analyzes the C-source program to visually display and print the function-to-function structure, reference data, and statistical data. This tool creates data necessary for design and maintenance, as well as having a feature peculiar to C compilers for Fujitsu microcontrollers (a feature of calculating the maximum amount of stacks used), considering its embedded feature.

(2) Features

- Displays and prints the function-to-function structure, reference data, and statistical data.
- Supports the embedded capability of C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

(3) Explanation of Features

The following data is enabled for development, maintenance, and higher porting efficiency.

- Graphic flow

  This feature diplays the "call" function in the block structure way. It also allows the display of the entire function and calls from any function and the retrieval of functions.
- Logic flow

  This feature visually displays the internal structure of the C-source program.
  For example, it shapes the control structure of **`for`** and **`switch`** statements and structure declarations. A jump feature for retrieval by functions, variable, tag, and macro names is also provided.
- Displaying statistical data

  This feature displays the complexity and line count of a programs every function, the source of destination function name, and the count of appearances of **`if`**, **`for`** and **`asm`** statements, etc.
- Displaying argument data

  This feature displays data about the function-called file name and line number, the return value of the declared function, and the type of argument. It also checks the adjustability of dummy arguments with actual arguments.
- Displaying cross-reference data

  This feature displays functions, variables, tag and macro declarations in its function and its line number.
- Displaying global data

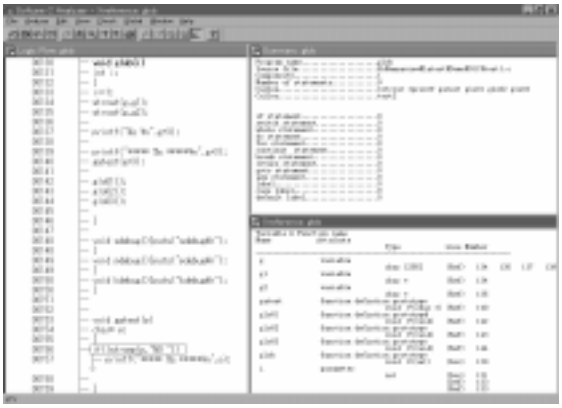
  This feature displays the function using global variables. It also detects unused global variables.
- Program checking

  This feature checks and displays the adjustabiltiy of dummy arguments with actual arguments.
- Calculating the maximum amount of stacks used

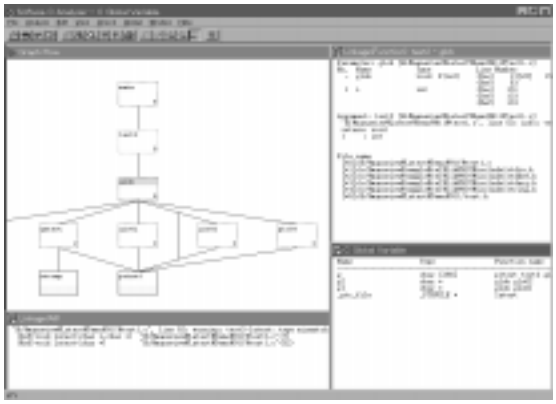
  This feature calculates and displays the amount of stacks used in the entire function, as well as in any function. This calculation is made on the basis of the output of C compilers (Fcc911s, Fcc907s and Fcc896s) for Fujitsu microcontrollers (FR family, F²MC-16 family and F²MC-8L family).

- Displaying graphic flow

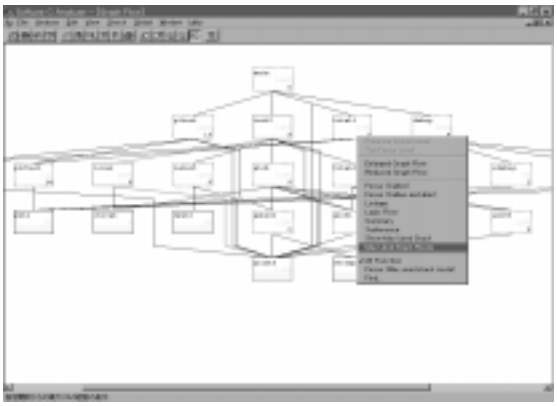
- Displaying logic flow, statistical and cross-reference data



- Displaying logic flow (focus), argument and global data



- Displays stack use volume (green numbers) and largest stack configuration (orange numbers)

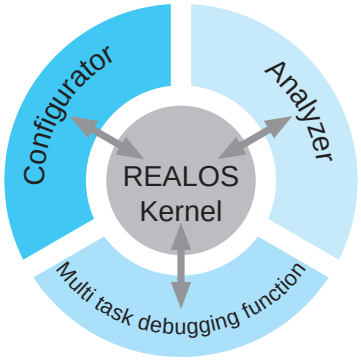


6. µITRON-Compliant Real Time OS for F²MC-16L/16LX/16F Family(SOFTUNE REALOS/907)

(1) Overview

REALOS/907 is the real time OS for the F²MC-16L/16LX/16F family of Fujitsu proprietary 16-bit MCUs, conforming to the µITRON 2.01 specifications.

- Features
  µITRON 2.01 compliant
  System design customized for 16-bit MCUs for control purposes
  In-line expansion of system call functions
  High-speed interrupt processing
  Support for REALOS configurator
  Providing a sample program
  Support for multi task debugger function
  REALOS analyzer



- **REALOS/907 specifications**

Name	Description
Target CPU	F²MC-16L/16LX/16F family
Maximum number of task	255
Maximum number of priority levels	16
Scheduling method	Priority-base, event-driven type
Number of system calls	46
Complying specifications	µITRON 2.01 specifications
Kernel coding	Assembly language
Application coding	C and assembly languages
Kernel size	About 0.8 KB (resident) to about 5.9 KB (maximum configuration)

(2) Configuration

- Kernel

  The kernel of the real time OS provides its basic functions. It is an event-driven, multitasking real time OS. The functions to be used by application programs can be selected as system calls.

- System calls

Function	Instruction	Description
Task management functions	**sta_tsk**	Start task
	ext_tsk	Exit local task successfully
	ter_tsk	Terminate remote task forcibly
	chg_pri	Change task priority
	rot_rdq	Rotate task ready queue
	get_tid	Get local task ID
	tsk_sts	Reference for task status
Task-supplied synchronization functions	**sus_tsk**	Move the task to the suspended state
	rsm_tsk	Resume the task in the suspended state
	frsm_tsk	Forcibly resume the task in the suspended state
	slp_tsk	Move the task into the wait state
	wai_tsk	Move the task into the wait state for a given time
	wup_tsk	Wake up the task in the wait state
	can_wup	Cancel the wakeup request of the task
Synchronization/transmission functions	**set_flg**	Set a single-bit event flag
	set_flg	Set a single-word event flag
	clr_flg	Clear a single-bit event flag
	clr_flg	Clear a single-word event flag
	wai_flg	Wait for a single-bit event flag (no clear)
	wai_flg	Wait for a single-word event flag
	cwai_flg	Wait for a single-bit event flag (clear)
	pol_flg	Poll a single-bit event flag (no clear)
	pol_flg	Poll a single-word event flag
	cpol_flg	Poll a single-bit event flag (clear)
	flg_sts	Reference event flag status
	sig_sem	Signal operation to the semaphore (V instruction)
	wai_sem	Wait operation to the semaphore (P instruction)
	preq_sem	Poll and request the semaphore resources
	sem_sts	Reference the semaphore status
	snd_msg	Send data to the mailbox
	rcv_msg	Wait for the receive from the mailbox
	prcv_msg	Poll and receive message from the mailbox
	mbx_sts	Reference the mailbox status
Interrupt management function	**ret_int**	Return from interrupt handler
	ret_wup	Return to the interrupt processing for task wakeup
	chg_ilv	Change the interrupt level
	ilv_sts	Reference the interrupt level status
Memory pool management functions	**get_blk**	Wait for the receiving of the fixed length memory block
	pget_blk	Poll and get fixed length memory block
	rel_blk	Release the fixed length memory block
	mpl_sts	Reference the memory pool status
Time management functions	**set_tim**	Set system clock
	get_tim	Reference system clock
	def_cyc	Define cyclic handler
	act_cyc	Activate/control cyclic handler
	cyh_sts	Reference cyclic handler status
	def_alm	Define alarm handler
	alh_sts	Reference alarm handler status
	ret_tmr	Return from timer handler
System management function	**get_ver**	Get version number

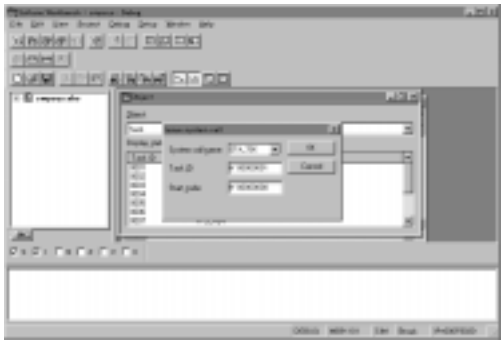
(3) REALOS Configurator

The configurator helps when setting conditions for creating the REALOS kernel, Necessary settings are made according to the display on the configurator screen, simplifying kernel configuration.

(4) Multitask Debugging Function

The following debugging functions are supported, which are necessary for configuring a system using REALOS.

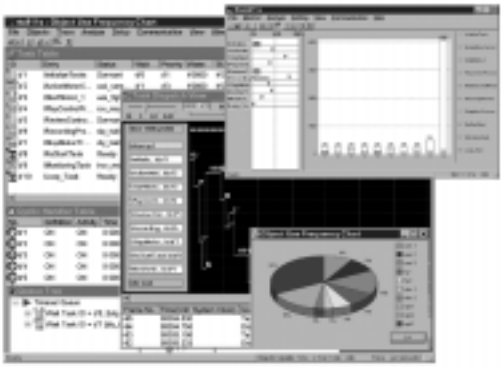
- Displaying object conditions
- Issuing a system call
- Track trace function
- Breaking a system call
- Breaking a task dispatch



(5) REALOS Analyzer

The performance of the system by which REALOS is built in and the state transition of the tasks are analyzed and displayed to Graphically.

- Task transition flow, transition tree
- Task status, stack monitor
- Analyzed o fexecution time
- Object or cue list



SOFTUNE V3 Support Software Product List

Software		Part number *1			Remarks
PackProducts	SOFTUNE V3 Professional Pack	SP3607Z008-P01	—	—	SOFTUNE V3 workbench SOFTUNE V3 C compiler SOFTUNE V3 assembler pack SOFTUNE V3 analyzer set SOFTUNE V3 checker
Individual Products	SOFTUNE V3 workbench	SP3607W008-P01	—	—	Integrated Manager, Simulator debugger, Emulator debugger and Monitor debugger functions
	SOFTUNE V3 C compiler	SP3607C008-P01	SP2707C018	SP3607C008-P01	ANSI standard conforming
	SOFTUNE V3 assembler pack	SP3607K008-P01	SP2707K018	SP3607K008-P01	Object format converter Assembler, linker, librarian,
	SOFTUNE V3 analyzer	SP3691X008-P01	—	—	For the FR, F²MC-16, and F²MC-8L
	SOFTUNE V3 C checker	SP3691Y008-P01	—	—	For the FR, F²MC-16, and F²MC-8L
	Real time OS SOFTUNE V3 REALOS/907 basic	SP3607M008BA	SP2707M018BA	SP3607M008BA	Kernel (source code provided) Configurator, analyzer
	Real time OS SOFTUNE V3 REALOS/907 evaluation	SP3607M008EV	—	—	Kernel (no source code) Configurator For evaluation
Compatible emulator hardware (ICE)		MB2140 series - MB2141A/B - MB2145-506/507	—	—	—
Personal computers *2	Operating machine	FMV and similar IBM compatibles	Workstation SunSPARC	Workstation HP90000/7000	—
	Operating OS *4	Windows98 WindowsMe WindowsNT4.0 Windows2000	Solaris2.5 or higher	HP-UX10.0 or higher	—
	Media	CD-ROM *3			—

*1: The product code suffix (Pxx) indicates the number of licenses.
*2: Pentium or higher CPU recommended. 48 to 64MB or more memory recommended.70MB of a disk capacity is required.
*3: An electronic manual (PDF format) is provided with each product (Japanese and English). Printed manuals are sold separately. Licensing of each product is available in a number of forms (3, 5 or 10 copies).
*4: Operating OS corresponds to Japanese and English.

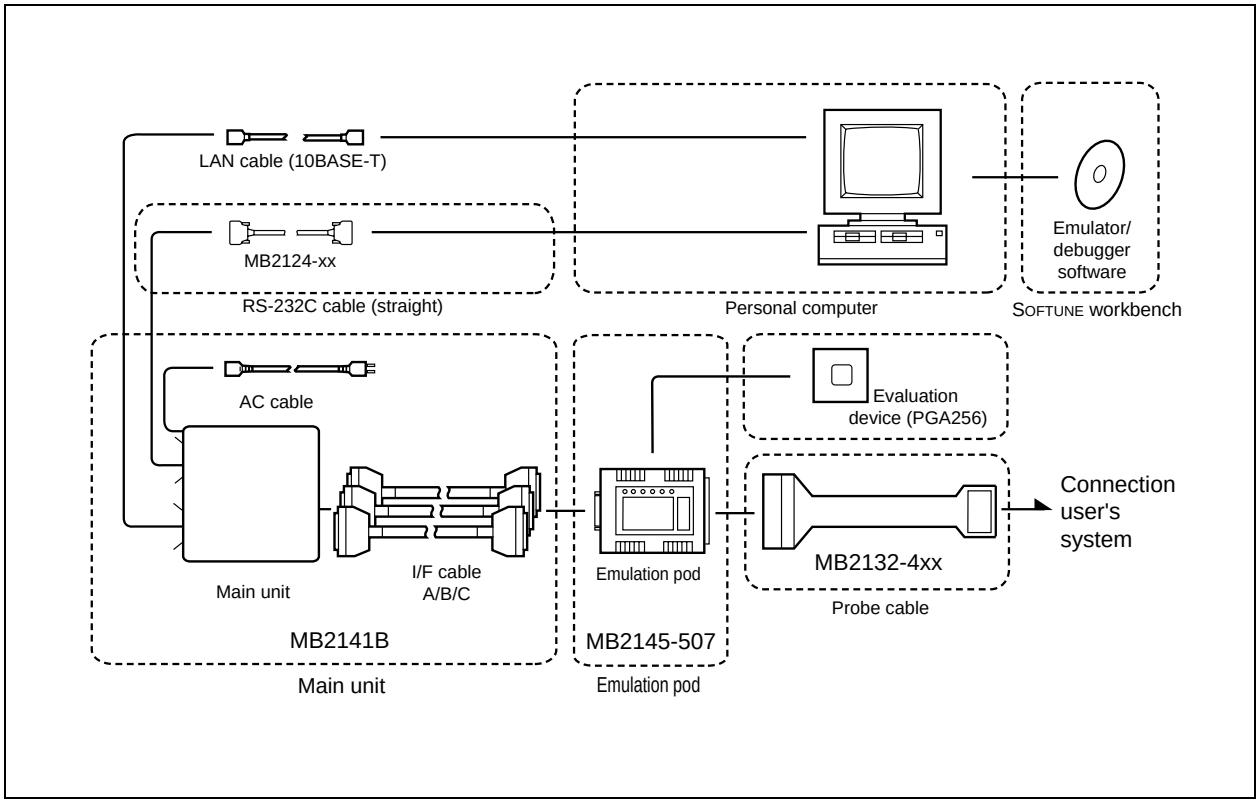
F²MC-16L/16LX/16F Family Evaluation Tools (MB2141B)

Features

- Power supply voltage : AC100V or AC200V
- Microcontroller operating voltage : +2.7V to +5.5V
  The range (Max. and Min.) of Microcontroller operating voltage and operating freqency depend on each Microcontroller.
  See the document including Data Sheet and check the range of Microcontroller operating voltage and operating freqency.
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- On-The-Fly function (commands can be run during microcontroller execution)
- Powerful real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Event trigger allows a wide range of conditions to be specified (× 8)
- Seguential control in 8 conditions and 8 levels
- Performance measurement function(measurement of execution speed between two points, iteration count measurement)
- C0 coverage measurement function (program execution coverage rate measurement)
- Host I/F (standard accessories) : RS-232C straight (115 Kbps) , LAN (10BASE-T)

System Overview

System configuration

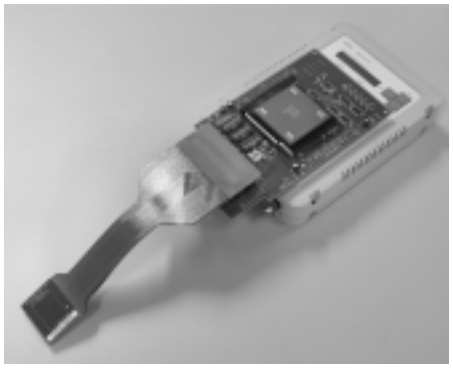


F²MC-16L/16LX/16F Family Evaluation Tools (MB2147-01 High speed version)

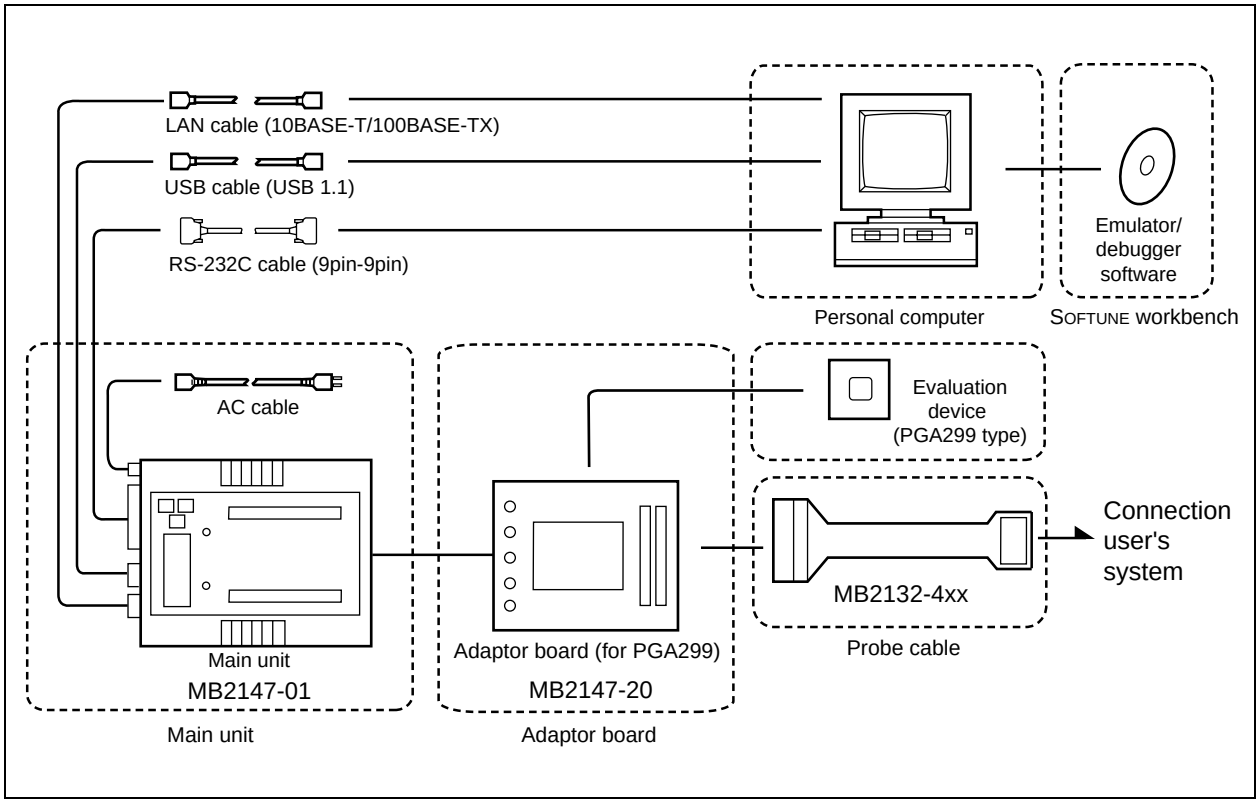
Features

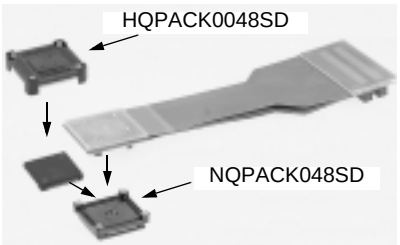
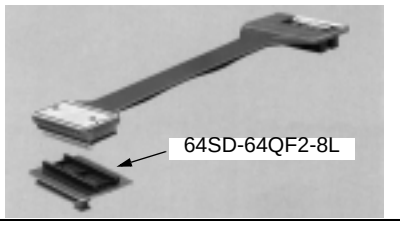
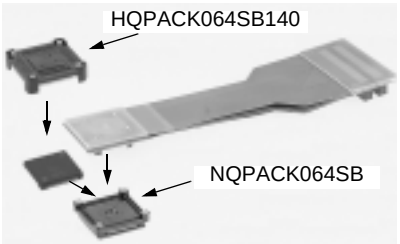
- Microcontroller operating frequency : max 25 MHz
- Emulation memory : 1 M × 4 area
- Microcontroller operating voltage : +2.7V to +5.5V
  The range (Max. and Min.) of Microcontroller operating voltage and operating freqency depend on each Microcontroller.
  See the document including Data Sheet and check the range of Microcontroller operating voltage and operating freqency.
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- On-The-Fly function (commands can be run during microcontroller execution)
- Powerful real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Event trigger allows a wide range of conditions to be specified (code × 8 / data × 8)
- Seguential control in 4 conditions and 3 levels
- Performance measurement function(measurement of execution speed between two points, iteration count measurement)
- C0 coverage measurement function (program execution coverage rate measurement)
- Host I/F (standard accessories) : RS-232C (max 115 Kbps) , LAN (10BASE-T, 100BASE-TX) , USB 1.1

System Overview



System configuration



Name		Part	Remarks	Cable
Main unit		MB2141B	Same for all F²MC-16L/16LX/16F family. (evaluation device : for PGA256) Dimensions : 210mm (width) × 297mm (depth) × 77mm (height) Weight : 2.9 kg	
Emulation pod *4		MB2145-507	For the F²MC-16L/16LX/16F family. Dimensions : 158mm (width) × 126mm (depth) × 38mm (height) Weight : 0.5 kg	
Adaptor for MB90M405		MB2145-910	For MB90M405 series.	
High speed version main unit		MB2147-01	For F²MC-16LXfamily high speed type (MB90390series, MB90480series) Power supply voltage : AC100V or AC200V Host I/F : RS-232C (9pin closs) , LAN (10BASE-T, 100BASE-TX) , USB 1.1 Dimensions : W210 × D150 × H46 mm Weight : 1.0 kg	
High speed version adaptor board (PGA299-EVA)		MB2147-20	For F²MC-16LXfamily high speed type (MB90390series, MB90480 series)	
Probe cable	For LQFP-48 0.5mm pitch □7 × 17 mm	MB2132-466	For MB90385 series. Package code:FPT-48P-M26 NQPACK048SD and HQPACK048SD are included. *3 NQPACK048SD enables ICE probe cable connection and mounted IC evaluation.	
	For SH-DIP-64	MB2132-433	For MB90660A series. Package code:DIP-64P-M01	
		MB2132-434	For MB90460/560 series. Package code:DIP-64P-M01	
	For LQFP-64 0.65mm pitch □12 × 12 mm	MB2132-433	For MB90660A series. Package code:FPT-64P-M09 Conversion adapter (64SD-64QF2-8L) is separately required.*2 Made by Sun Hayato Co. Ltd.	
		MB2132-461	For MB90460/495/560/565 series. Package code:FPT-64P-M09 NQPACK064SB and HQPACK064SB140 are included. *3 NQPACK064SB enables ICE probe cable connection and mounted IC evaluation.	

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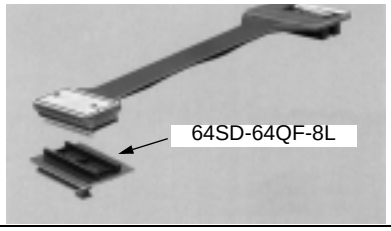
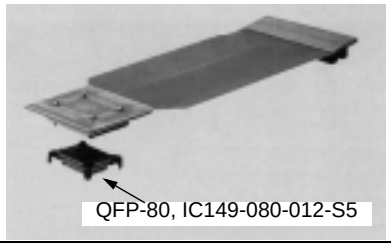
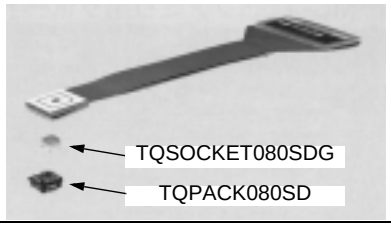
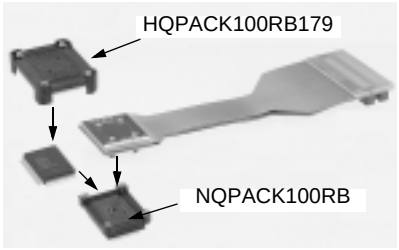
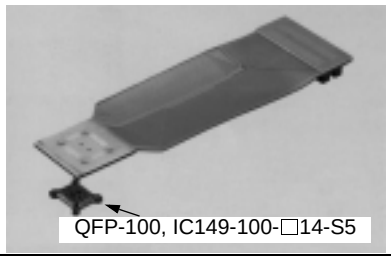
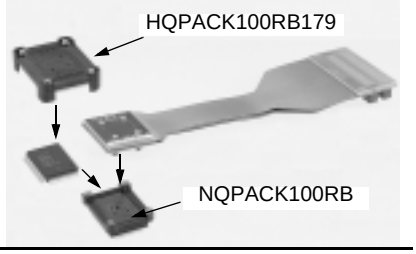
Name		Part	Remarks	Cable
Probe cable	For QFP-64 1.0mm pitch □14 × 20mm	MB2132-434	For MB90460/495G/560/565 series. Package code:FPT-64P-M06 Conversion adapter (64SD-64QF-8L) is separately required. *2 Made by Sun Hayato Co. Ltd.	
	For QFP-80 0.8mm pitch □14 × 20mm	MB2132-454	For MB90670 series. Package code:FPT-80P-M06 IC149-080-012-S5 is separately required. *1 Made by Yamaichi Electronics Inc.	
	For LQFP-80 0.5mm pitch □12 × 12mm	MB2132-444	For MB90670 series. Package code:FPT-80P-M05 TQPACK080SD and TQSOCKET080SDG are separately required. *3 Made by Tokyo Eletech Ltd.	
	For QFP-100 0.65mm pitch □14 × 20mm	MB2132-464	For MB902xx/4xx/5xx/6xx/7xx series. Package code:FPT-100P-M06 NQPACK100RB and HQPACK100RB179 are included. *3 NQPACK100RB enables ICE probe cable connection and mounted IC evaluation. Support power supply one system and two systems.	
		MB2132-457	For MB902xx/4xx/5xx/6xx/7xx series. Package code:FPT-100P-M06 IC149-100-□14-S5 is separately required. *1 Support power supply one system . Not support power supply two systems. Made by Yamaichi Electronics Inc.	
		MB2132-465	For MB90320 series. Package code:FPT-100P-M06 NQPACK100RB and HQPACK100RB179 are included. *3 NQPACK100RB enables ICE probe cable connection and mounted IC evaluation.	

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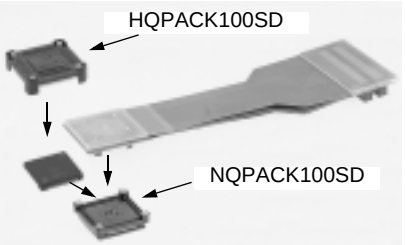
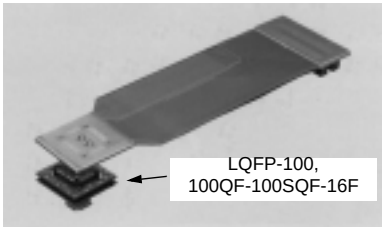
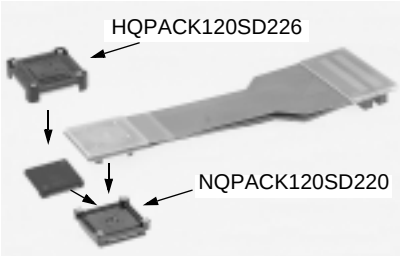
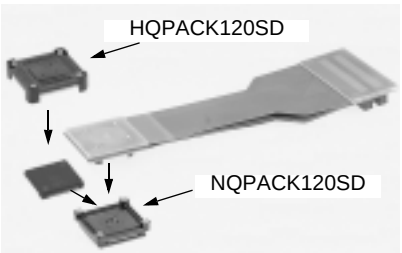
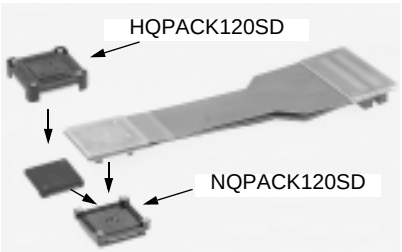
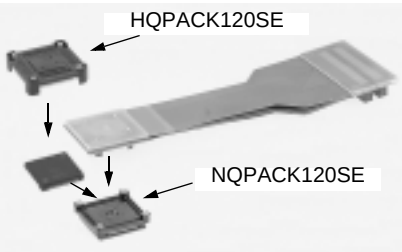
Name		Part number	Remarks	Cable
Probe cable	For LQFP-100 0.5mm pitch □14 × 14mm	MB2132-496	For MB902xx/4xx/5xx/6xx/7xx series. Package code:FPT-100P-M05 NQPACK100SD and HQPACK100SD are included. *3 NQPACK100SD enables ICE probe cable connection and mounted IC evaluation.	
		MB2132-457	For MB902xx/4xx/5xx/6xx/7xx series. Package code:FPT-100P-M05 Conversion adapter (100QF-100SQF-16F) is separately required.*2 Support power supply one system . Not support power supply two systems. Made by Sun Hayato Co. Ltd.	
	For QFP-120 0.8mm pitch □28 × 28mm	MB2132-458	For MB90220/260 series. Package code:FPT-120P-M03 IC149-120K-13449-B0 is separately required.*1 Made by Yamaichi Electronics Inc.	
	For QFP-120 0.5mm pitch □20 × 20mm	MB2132-468	For MB90520/570 series. Package code:FPT-120P-M13 NQPACK120SD220 and HQPACK120SD226 are included. *3 NQPACK120SD220 enables ICE probe cable connection and mounted IC evaluation.	
		MB2132-448	For MB90520/570 series. Package code:FPT-120P-M13 TQSOCKET120/144SDP and TQPACK120/144SD are included. *3 Connected exclusive use with ICE probe cable. Mounted IC evaluation cannot be done.	

(Continued)

(Continued)

Name		Part number	Remarks	Cable
Probe cable	For QFP-120 0.5mm pitch □16 × 16mm	MB2132-497	For MB90570 series. Package code:FPT-120P-M21 NQPACK120SD and HQPACK120SD are included.*3 NQPACK120SD enables ICE probe cable connection and mounted IC evaluation.	
		MB2132-469	For MB90390 series. Package code:FPT-120P-M21 NQPACK120SD and HQPACK120SD are included.*3 NQPACK120SD enables ICE probe cable connection and mounted IC evaluation.	
	For LQFP-120 0.4mm pitch □14 × 14mm	MB2132-498	For MB90520/570 series. Package code:FPT-120P-M05 NQPACK120SE and HQPACK120SE are included. *3 NQPACK120SE enables ICE probe cable connection and mounted IC evaluation.	
RS-232C cable (straight)		MB2124-03	Straight modem cable, DSUB25 (both sides) , for FMR or PC-98	
		MB2124-04	Straight modem cable, DSUB25 - DSUB25P, for IBM-PC	
		MB2124-05	Straight modem cable, DSUB25 - DSUB9P, for FMV or IBM-PC	

*1: The probe cable requires an IC socket from Yamaichi Electronics Inc.
For QFP-80 (lead pitch: 0.8 mm, body size: 14 × 20 mm): IC149-080-012-S5
For QFP-100 (lead pitch: 0.65 mm, body size: 14 × 20 mm): IC149-100-□14-S5
(□ = "0": No positioning post, □ = "1": positioning post provided)
For QFP-120 (lead pitch: 0.8 mm, body size: 28 × 28 mm): IC149-120K-13449-□
(□ = "0": No positioning post, □ = "1": positioning post provided)

Contact for details:

•USA:		Yamaichi Electronics Inc. TEL(408)4520797
•Europe	Denmark:	Elmatok A.S. TEL(65)351446
	England:	Radiatron Components Ltd. TEL(01)8911221
		AB Connector Ltd. TEL(0604)712000
	Finland:	Dualtek Oy TEL(80)8019911
	France:	Manudax-France TEL(1)4342-2050
	Germany:	Macrotran AG TEL(089)4208148
		Glyn GmbH TEL(49)61278077
		Connector Service GmbH TEL(089)429277
	Italy:	Eurosab International s.r.l TEL(02)93169781
	Spain:	S.A Generalde Imporciones Electronicas TEL(1)416-92-61
	Sweden:	Bexab Electronics TEL(08)7680560
	Switzerland:	Slcovend AG TEL(01)8303161
•Asia	Singapore:	Yamco Electronics Pte Ltd. TEL(336)6522
	Korea:	Asia Yamaichi Electronics, Inc. TEL(02)482-7263
	Taiwan:	Sing Way Co. TEL(02)718-5971
		Joung Lai Trading Co. Ltd. TEL(02)754-1022

*2:The probe cable requires a conversion adapter from Sun Hayato Co. Ltd.
Conversion adapter for LQFP-100: QFP-100 (0.65 mm, 14 × 20 mm) → LQFP-100 (0.5 mm, 14 × 14 mm, product no. 100QF-100SQF-16F)
Conversion adapter for LQFP-64: SH-DIP-64 → LQFP-64 (0.65 mm, 12 × 12 mm, product no. 64SD-64QF2-8L)
Conversion adapter for QFP-64 (lead pitch : 1.0 mm): SH-DIP-64→ QFP-64 (1.0 mm, 14 × 20 mm, product no. 64SD-64QF-8L)
Contact for details:Tokyo Japan: Sun Hayato Co. Ltd. FAX(81)3-5396-9106

*3:The probe cable requires TQ-pack or NQ-pack.
Note: Care is required in printed circuit board pattern design because the position of the board connector part (the flat section at the pin tips) of the TQ-pack differs from the mass production product package (the NQ-pack pins are shifted a few millimeters inwards).
Contact for details:

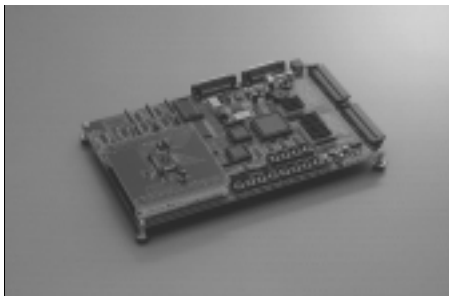
•USA:		Daimaru New York Co. TEL(212)575-0820/0821
		OESS Co. Head Office TEL(201)288-4422
		OESS Co. Los Angeles Office TEL(714)220-1878
		OESS Co. San Jose Office TEL(408)441-1855
•Europe	Germany:	OESS GmbH TEL(06106)75013
•Asia	Hong Kong:	Daimaru Kogyo, Ltd. Hong Kong Office TEL(852)8939457/8939108
	Singapore:	Daimaru Kogyo, Ltd. Singapore Office TEL(65)2251636
Tokyo Eletech Co. Ltd.		TEL(81)3-5295-1661
		Osaka office TEL(81)6-244-6675

*4:Fujitsu has stopped manufacturing the conventional emulation pod MB2145-506 and developed the MB2145-507 as succeeding version in it's place.
The emulation memory for the MB2145-507 has been enhanced to 3.5 Mbytes (64 Kbytes × 56 banks) from the conventional MB2145-506 (448 Kbytes: 64 Kbytes × 7 banks).
The MB2145-507 allows the emulation memory, which enables high-speed emulation of internal ROM to be expanded up to 512 KB(64 KB × 8 bank). The conventional MB2145-506 only allowed up to 256 Kbytes (64 Kbytes × 4 banks) for high-speed emulation.

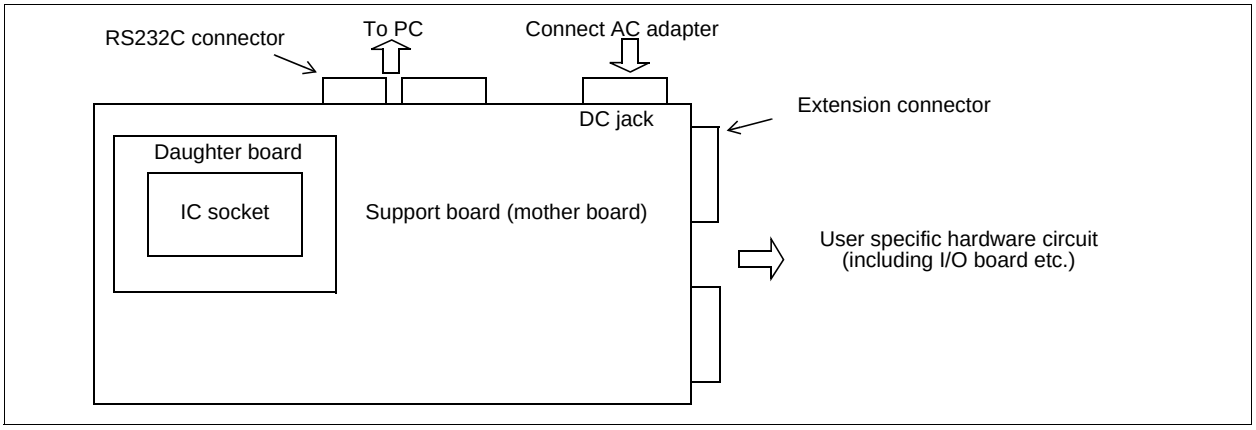
Support Board for the F²MC-16LX Family

- Evaluation of the F²MC-16LX Family can be performed in both single chip and external bus modes using the MB2141A emulator/debugger.
- User specific hardware circuits can be incorporated via the connectors on the support board.
- The configuration when used with the MB2141A emulator/debugger is:

  MB2141A + MB2145-507 + Evaluation device(MB90V550A) + MB2132-457 + support boad



- **Support board for connection**



Compatible MCU	Support board(mother board)	Daughter board	Hardware configuration
F²MC-16LX family MB90550A	MB2176-01E (AC adapter is not attached)	MB2176-10	FLASH memory SRAM LED RS-232C connector I/O connector

Note :Unlike the support board for MB2173/75 series (for F²MC-16H/16F family) , the support board for FM-16LX does not have a simple debugging function in a simple substance.
The support board (MB2174-01) for F²MC-16L (MB90675) ceased.

- **Specifications of support board (mother board)**

Item	Description	Remarks
MCU	F²MC-16LX family MB90550A	-
Memory	Flash memory : 1MB	256 K × 16 × 2
	SRAM : 256KB	128 K × 8 × 2
	EEPROM : 1024 bits	1 K × 1 × 1
Connector	96-pin DIN connector × 2	For connection to daughter board
	D-SUB 25 pins × 2	External UART × 1, UART for internal MCU × 1
	96-pin half pitch × 2	For extension bus
Switch	Rotary switch × 12	For memory bank select
	8-bit DIP switch × 2	For functional switching
	Push switch × 2	For Reset/external interrupt
	Slide switch x 1	For turning on power
Buzzer	Separate excitation type × 1	Connect to reload timer output
LED	Status display Orange × 1, Red × 1, Green × 1	Settable for enable/disable for green/red LEDs
Land	Signal line monitor land	Available for each signal line
Power supply	Supplied by AC adapter	Generated for +5V, +3V, being on-board regulated

MB2000 : CAN FLASH EVALUATION BOARD

The Flash/CAN100 board was developed, in order to allow a fast software design start for customers wishing to use Fujitsu Flash and / or CAN MCUs in the 100-pin QFP package. Since Fujitsu in-circuit emulators require a target system that provides Vcc and Gnd, as well as an oscillation circuit, that enables customers to start development or evaluation work straight away without having to wait for their own target hardware.

Features

- 100-pin socket adaptor for device or emulator connection
- On-board regulator allows for a 7-14V unstabilised external DC power supply
- 5V and 3.7V internal power supply available for emulator
- Two high-speed CAN drivers
- RS232 interface
- All MCU pins brought out twice to external connectors
- Optional sub-clock
- RST, HST push-button
- 8 test LEDs
- External reset via RS232

The Flash/CAN100 is supplied with the MB90F598 single-CAN and 128 KByte flash microcontroller. It is capable of supporting all of the following device types:

- MB90540 = MB90V540, MB90F543, MB90543
- MB90545 = MB90V540, MB90F549, MB90F548, MB90548
- MB90550A = MB90V550A, MB90F553A, MB90553A
- MB90580 = MB90V580, MB90F583B, MB90583B
- MB90590 = MB90V590, MB90F594A,MB90594, MB90F591, MB90591
- MB90595 = MB90V595, MB90F598, MB90598

The order code for the kit is FLASH-CAN2-100P-M06 and it is delivered with:

- The Flash/CAN100 board itself
- Two 50-pin socket connectors
- Power supply connector
- MB90F598 - 128kB Flash microcontrollers
- 11 Jumpers
- 1 socket adapter cover
- English documentation

F²MC-16L/16LX/16F Family Adaptors

- **Programming adaptors for one-time PROM microcontrollers and EPROM microcontrollers**

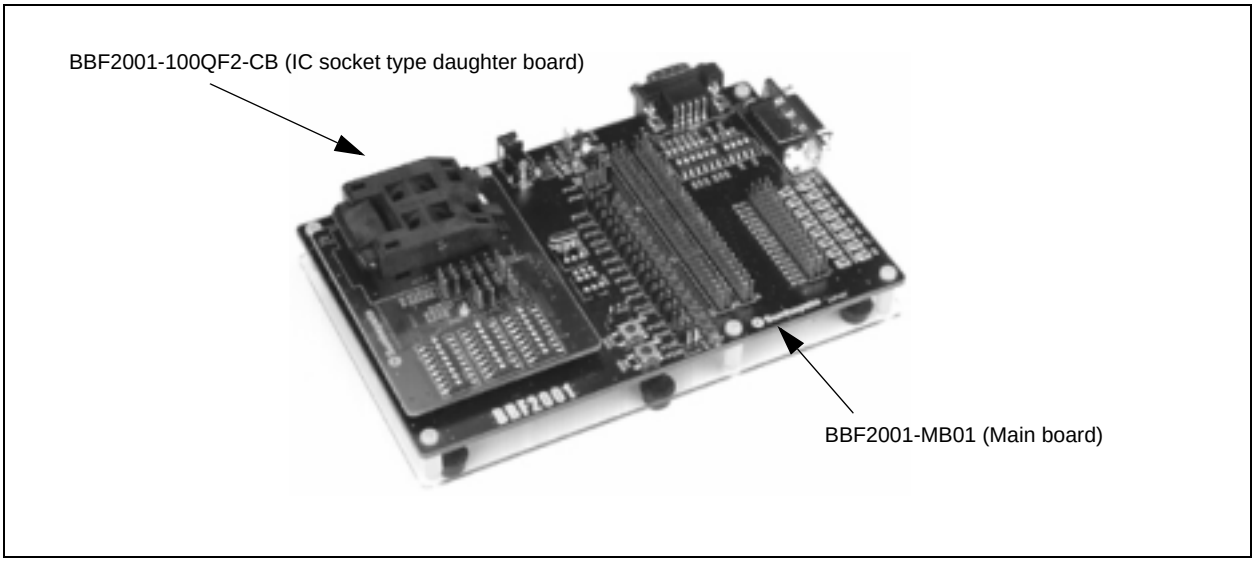
OTPROM/FLASH microcontrollers	Package (leadpitch, body size) (mm)		Package code	Adaptor socket
MB90P214BPF	QFP-80	(0.80 mm, □14 × 20 mm)	FPT-80P-M06	ROM-80QF-32DP-16F *1
MB90W214BZF	QFP-80	(0.80mm, □14 × 20 mm)	FPT-80C-C02	ROM-80QF-32DP-16F *1
MB90P224APF	QFP-120	(0.80 mm, □28 × 28 mm)	FPT-120P-M03	ROM-120QF-32DP-16F *1
MB90W224BZF	QFP-120	(0.80 mm, □28 × 28 mm)	FPT-120C-C02	ROM-120QF-32DP-16F *1
MB90P234PF	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100P-M06	ROM-100QF-32DP-FMC16F *1
MB90P234PFV	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100P-M05	ROM-100SQF-32DP-FMC16F *1
MB90W234CF *2	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100C-A02	ROM-100QF-32DP-FMC16F *1
MB90W234ZFV	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100C-C01	ROM-100SQF-32DP-FMC16F *1
MB90F243	LQFP-80	(0.50 mm, □12 × 12 mm)	FPT-80P-M05	FLASH-80SQFP-32DP-16L *4
	TQFP-80	(0.50 mm, □12 × 12 mm)	FPT-80P-M15	
MB90P263PF	QFP-120	(0.80 mm, □28 × 28 mm)	FPT-120P-M03	ROM-120QF-32DP-16F
MB90P263PFV	QFP-120	(0.50 mm, □20 × 20 mm)	FPT-120P-M13	ROM-120QF/CAR-32DP-16F
MB90W263ZF *2	QFP-120	(0.80 mm, □28 × 28 mm)	FPT-120C-C02	ROM-120QF-32DP-16F
MB90P553APF	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100P-M06	ROM-100QF-32DP-16L *1
MB90P623APFV	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100P-M05	ROM-100SQF-32DP-16L *1
MB90P634APF	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100P-M06	ROM-100QF-32DP-16L *1
MB90P634APFV	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100P-M05	ROM-100SQF-32DP-16L *1
MB90P641APF	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100P-M06	ROM-100QF-32DP-FMC16F *1
MB90P641APFV	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100P-M05	ROM-100SQF-32DP-FMC16F *1
MB90P653APF	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100P-M06	ROM-100QF-32DP-16L *1
MB90P653APFV	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100P-M05	ROM-100SQF-32DP-16L *1
MB90P663AP-SH	SH-DIP-64	(1.778 mm, □58 × 17 mm)	DIP-64P-M01	ROM-64SD-32DP-16L *1
MB90P663APFM	LQFP-64	(0.65 mm, □12 × 12 mm)	FPT-64P-M09	ROM-64QF-32DP-16L *1
MB90P673PF	QFP-80	(0.80 mm, □14 × 20 mm)	FPT-80P-M06	ROM-80QF-32DP-16L *1
MB90P673PFV	LQFP-80	(0.50 mm, □12 × 12 mm)	FPT-80P-M05	ROM-80SQF-32DP-16L *1
MB90P678PF	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100P-M06	ROM-100QF-32DP-16L *1
MB90P678PFV	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100P-M05	ROM-100SQF-32DP-16L *1
MB90W678ZF *2	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100C-A02	ROM-100QF-32DP-16L *1
MB90W678ZFV *2	LQFP-100	(0.50 mm, □14 × 14 mm)	FPT-100C-C01	ROM-100SQF-32DP-16L *1

*1:Use a general-purpose EPROM programmer that is able to program a MBM27C1000.
The above adaptor sockets can be purchased from Sun Hayato Co. Ltd.
Contact for details : Tokyo Japan: Sun Hayato Co. Ltd. FAX (81)3-5396-9106
*2:Under planning
*3:Under development
*4:Recommended EPROM programmer : model 1890A + OU910 (Ver 4.32B)
Contact for details : MINATO ELECTRONICS INC. FAX (81)45-591-6451)

Notes:
A signal-socket ROM programmer is recommended. Also, contact Fujitsu for programming mounted devices.
Take care to avoid bending the leads when programming QFP packages.
The recommended screening practice before mounting is high temperature aging (+150°C, 48H).

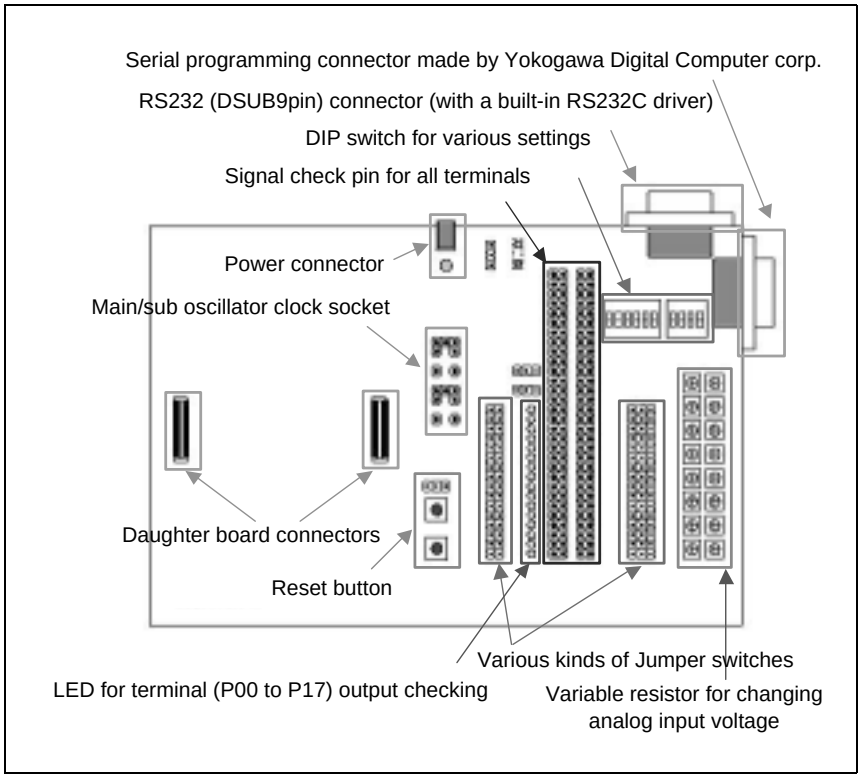
F²MC-16LXFamily Evaluation Board (BBF2001) : Sun Hayato

This is an evaluation board made by Sunhayato corp. in correspondence with Fujitsu F2 MC-16LX families. It can be used to verify the operating status of F2 MC-16LX families before they are actually embedded into a customer's system. As a consequence, development efficiency is accelerated.
This board consists of a mainboard and a daughterboard. By changing the daughterboard, it can be used for debugging with the (ICE) tool combined with the MB2141A emulator debugger, evaluating a microcomputer with built-in flash memory and a serial programming. The board is adaptable to various series by changing the daughterboard, while the mainboard is common to each part.

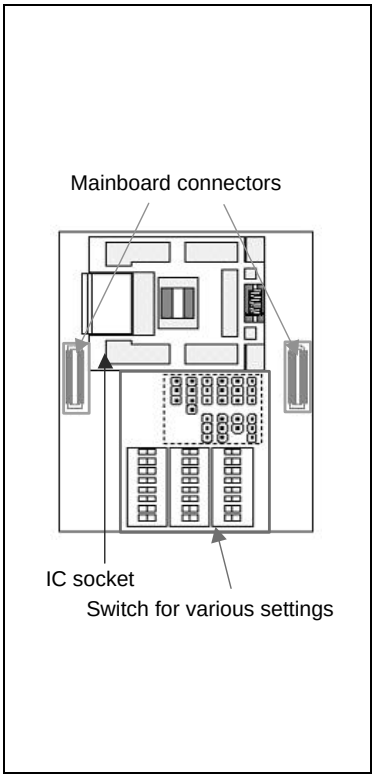


- **Evaluation board configuration**

Main board (BBF2001-MB01)



IC socket type daughter board (BBF2001-100QF2-CB)



- **Product configuration**

Main board

Part number	Description
BBF2001-MB01	- Locating signal check pin to all terminals - Capability of changing input voltage to analog input terminal (by variable resistor) - Function of LED lightning for output port (P00 to P17) - Evaluate the capability of communication between PC and microcomputer with UART (mounted DSUB 9pin) - With serial programming connector made by Yokogawa Digital Computer corp.

Daughter board

Part number	Description	Target microcontroller	Usage
BBF2001-64QF2-NB	NQPACK type (0.65mm pitch, Å†12mm × 12mm)	MB90560series MB90565series MB90460series MB90495series	Evaluation board connectable with (ICE) tool.
BBF2001-100QF2-NB	NQPACK type (0.65mm pitch, □14mm × 20mm)	MB90540series MB90545series MB90550Aseries MB90580Cseries MB90580CAseries MB90590Gseries MB90595Gseries MB90M405series MB90420Gseries MB90425Gseries MB90470series MB90650Aseries	
BBF2001-120TQF2-NB	NQPACK type (0.40mm pitch, □14mm × 14mm)	MB90520Aseries MB90570series	
BBF2001-48CAN2-NB *	NQPACK type (0.50mm pitch, □7mm × 7mm)	MB90385series	
BBF2001-64QF2-CB	IC socket type (0.65mm pitch, □12mm × 12mm)	MB90560series MB90565series MB90460series MB90495series	Board for writing and evaluating a microcontroller with a built-in flash memory.
BBF2001-100QF2-CB	IC socket type (0.65mm pitch, □14mm × 20mm)	MB90540series MB90545series MB90550Aseries MB90580Cseries MB90580CAseries MB90590Gseries MB90595Gseries MB90M405series MB90420Gseries MB90425Gseries MB90470series MB90650Aseries	
BBF2001-120TQF2-CB	IC socket type (0.40mm pitch, □14mm × 14mm)	MB90520Aseries MB90570series	
BBF2001-48CAN2-CB *	IC socket type (0.50mm pitch, □7mm × 7mm)	MB90385series	

* : Includes CAN transceiver

Main board + Daughter board

Part number	Description	Target microcontroller	Usage
BBF2001-64QF2-NS	Main board + NQPACK type (0.65mm pitch, □12mm × 12mm)	MB90560series MB90565series MB90460series MB90495series	Evaluation board connectable with ICE) tool.
BBF2001-100QF2-NS	Main board + NQPACK type (0.65mm pitch, □14mm × 20mm)	MB90540series MB90545series MB90550Aseries MB90580Cseries MB90580CAseries MB90590Gseries MB90595Gseries MB90M405series MB90420Gseries MB90425Gseries MB90470series MB90650Aseries	
BBF2001-120TQF2-NS	Main board + NQPACK type (0.40mm pitch, □14mm × 14mm)	MB90520Aseries MB90570series	
BBF2001-48CAN2-NS *	Main board + NQPACK type (0.50mm pitch, □7mm × 7mm)	MB90385series	
BBF2001-64QF2-CS	Main board + IC socket type (0.65mm pitch, □12mm × 12mm)	MB90560series MB90565series MB90460series MB90495series	Board for writing and evaluating a microcomputer with a built-in flash memory.
BBF2001-100QF2-CS	Main board + IC socket type (0.65mm pitch, □14mm × 20mm)	MB90540series MB90545series MB90550Aseries MB90580Cseries MB90580CAseries MB90590Gseries MB90595Gseries MB90M405series MB90420Gseries MB90425Gseries MB90470series MB90650Aseries	
BBF2001-120TQF2-CS	Main board + IC socket type (0.40mm pitch, □14mm × 14mm)	MB90520Aseries MB90570series	
BBF2001-48CAN2-CS *	Main board + IC socket type (0.50mm pitch, □7mm × 7mm)	MB90385series	

* : The doughter board includes CAN transceiver .

Target microcontroller

Series name	Package (leadpitch, body size) (mm)	
MB90385series *	LQFP-48	(0.5 mm pitch, □7 mm × 7 mm)
MB90M405series	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90420G/425Gseries	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90460series	LQFP-64	(0.65 mm pitch, □12 mm × 12 mm)
MB90470series	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90495Gseries	LQFP-64	(0.65 mm pitch, □12 mm × 12 mm)
MB90520Aseries	LQFP-120	(0.40 mm pitch, □14 mm × 14 mm)
MB90540/545series	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90550Aseries	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90560/565series	LQFP-64	(0.65 mm pitch, □12 mm × 12 mm)
MB90570series	LQFP-120	(0.40 mm pitch, □14 mm × 14 mm)
MB90580C/CAseries	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90590/Gseries	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90595Gseries	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)
MB90650Aseries	QFP-100	(0.65 mm pitch, □14 mm × 20 mm)

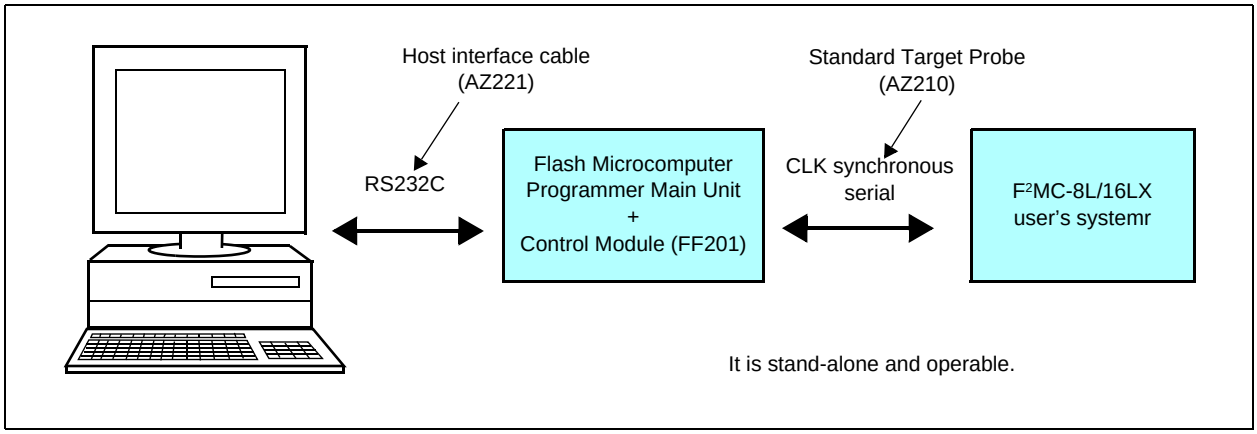
* : The doughter board for MB90385 series includes CAN transceiver.
Contact for details: Sun Hayato Co,. td.

Serial on board programmer

The serial on board programming (Fujitsu standard) in FLASH memory of the F²MC-16LX family or OTPROM of the F²MC-8L family is supported as the following programmer.

AF220/AF210/AF120/AF110 (FLASH microcontroller programmer) Yokogawa Digital Computer Corporation

- **System configuration**



- **Product configuration**

Product name	Part number	Description
Flash Microcontroller Programmer Main Unit	AF220/AC4P	with Ethernet(10Base-T) Interface /100V to 220V Power supply adaptor
	AF210/AC4P	Basic Model /100V to 220V Power supply adaptor
	AF120/AC4P	Single Operation Model with Ethernet(10Base-T) Interface /100V to 220V Power supply adaptor
	AF110/AC4P	Single Operation Model /100V to 220V Power supply adaptor
Host Interface Cable	AZ221	Writer exclusive use. RS232C cable for PC/AT
Standard Target Probe	AZ210	Standard Target Probe (a) : 1 m
Control Modules	FF201	Controll modules for F²MC-16LX OTP or FLASH microcontroller made by Fujitsu (High-speed version) .
Remote Controller	AZ290	Remote Controller
Memory card	/P2	2MB PC Card
	/P4	4MB PC Card

Contact for detailes : Yokogawa Digital Computer Corporation

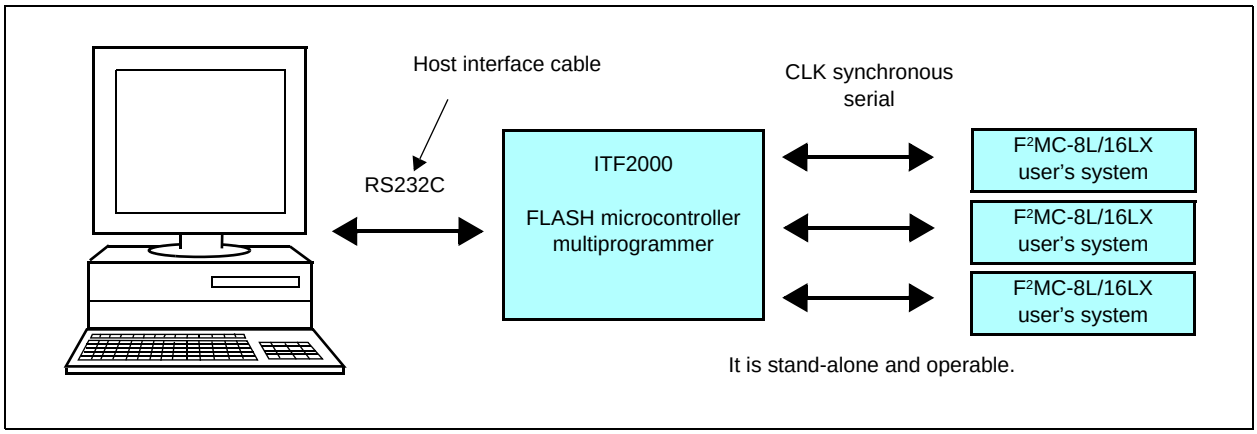
- **FLASH microcontroller for programming**

FLASH microcontroller (FLASH memory size)		Control Module *1	Status
MB90F387/S	(256KB)	FF201	Under development
MB90F394	(384KB)	FF201	Under development
MB90MF408	(128KB)	FF201	Supporting *2
MB90F428G/GA	(128KB)	FF201	Supporting
MB90F443G	(128KB)	FF201	Supporting
MB90F462	(64KB)	FF201	Supporting
MB90F474L/H	(256KB)	FF201	Supporting *2
MB90F481	(192KB)	FF201	Supporting *2
MB90F482	(256KB)	FF201	Supporting *2
MB90F497G	(64KB)	FF201	Supporting
MB90F523/A	(128KB)	FF201	Supporting
MB90F523B	(128KB)	FF201	Supporting
MB90F543G(S)/F548G(S)/F548GL(S)	(128KB)	FF201	Supporting
MB90F546G(S)/F549G(S)	(256KB)	FF201	Supporting
MB90F553A	(128KB)	FF201	Supporting
MB90F562B	(64KB)	FF201	Supporting
MB90F568	(128KB)	FF201	Supporting *2
MB90F574A	(256KB)	FF201	Supporting
MB90F583C/CA	(128KB)	FF201	Supporting
MB90F584C/CA	(256KB)	FF201	Supporting
MB90F591G	(384KB)	FF201	Supporting
MB90F594G	(256KB)	FF201	Supporting
MB90F598G	(128KB)	FF201	Supporting
MB90F654A	(256KB)	FF201	Supporting *2

*1 : In control module FF201, AF200 (cereal programmer of an old version) is available.
*2 : needs optional adapter AZ264 (3V Conversion Adapter).

ITF2000 (Serial Gang programmer) : Interface

- **System configuration**



- **Product configuration**

Product	Function
ITF2000	Main unit of FLASH microcontroller multiprogrammer (with remote software)
ISP2000	Adaptor for on board programming (with main cable)
CF001(for F²MC-16LX family)	Control software
WF001/F001(for MB90P553A)	Microcontroller module

- **Programming adaptor**

Part number	Package	Programming adaptor
MB90F553A	QFP-100	TOP2000/QFP100TP1/P1 (single) TOP2000/QFP100TP1/P10 (10 sets)
	LQFP-100	TOP2000/LQFP100TP1/P1 (single) TOP2000/LQFP100TP1/P10 (10 sets)

Parallel programmer for FLASH microcontroller

The parallel programmer in FLASH memory of the F2MC-16L/LX family is supported as the following programmer.

Ando Electric Co., Ltd.

- **Flash Programmer**

  AF9708 (Ver 1.10 or more) , AF9709 (Ver 1.10 or more) : 3 V-products , 5 V-products.

AF9708 AF9709

- **Gang programmer**

  AF9723 (Ver 1.10 or more) : 3 V-products , 5 V-products

MINATO ELECTRONICS INC.

- **Universal Programmer**

  MODEL 1890A + OU910 (Ver. 4.32b or more)

Notes :
This programmer ended in September, 2000. It is a schedule of correspondence with MODEL1881 (The current state uncorresponds) for the future. Please confirm to MINATO ELECTRONICS INC. when you buy.
MODEL1890A is scheduled to be done in the future to support.

- **Gang Programmer**

  MODEL 1893 (Ver. 1.10L or more) , MODEL 1931 (Ver 1.10L or more)
  MODEL 1930 + SU3000LX (Ver. 4.10L or more)

MODEL 1893

- **Gang programmer**

  MODEL1940 (Ver. 1.32C or more)

MODEL 1940

Data I/O Corporation

- **Universal Programmer**

  OPTIMA, Dual-Package

OPTIMA

Dual-Package

- **Gang Programmer**

  OCTAL, QUAD

OCTAL

Adaptor socket for Flash Microcomputer (5 V-products)

Flash Microcontrollers	Package (leadpitch, body size) (mm)	Package code	Ando Electric Co., Ltd.	MINATO ELECTRONICS INC.		Data I/O Corporation
			AF9708 AF9709 AF9723	MODEL 1890A MODEL 1930 MODEL 1931 MODEL 1893	MODEL 1940	OPTIMA Dual-Packge OCTAL QUAD
MB90F387 MB90F387S	LQFP-48 (0.5 mm, 7 × 7 mm)	FPT-48P-M26	TE110-387F15AP	—	—	—
MB90F428GPF MB90F428GAPF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F428GPFV MB90F428GAPFV	LQFP-100 (0.5 mm, 14 × 14 mm)	FPT-100P-M05	TE110-580F03AP	MF00-709	MF05-709	Undecidedness
MB90F443GPF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F462P	SH-DIP-64	DIP-64P-M01	TE110-562F05AP	MF13-287	Correspondence	Undecidedness
MB90F462PF	QFP-64 (1.0 mm, 14 × 20 mm)	FPT-64P-M06	TE110-562F06AP	MF13-785		
MB90F462PFM	QFP-64 (0.65 mm, 12 × 12 mm)	FPT-64P-M09	TE110-562F07AP	MF13-786		
MB90F497GPF	QFP-64 (1.0 mm, 14 × 20 mm)	FPT-64P-M06	TE110-562F06AP	MF13-785	MF05-785	Undecidedness
MB90F497GPFM	QFP-64 (0.65 mm, 12 × 12 mm)	FPT-64P-M09	TE110-562F07AP	MF13-786	MF05-786	
MB90F523BPFV	QFP-120 (0.5 mm, □20 × 20 mm)	FPT-120P-M13	TE110-574F02AP	MF00-23	MF05-23	S5024
MB90F523BPFF	LQFP-120 (0.4 mm, □14 × 14 mm)	FPT-120P-M05	TE110-523F08AP	MF00-22	MF05-22	Undecidedness
MB90F543GPF MB90F543GSPF MB90F546GPF MB90F546GSPF MB90F548GPF MB90F548GSPF MB90F548GLPF MB90F548GLSPF MB90F549GPF MB90F549GSPF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F543GPFV MB90F543GSPFV MB90F546GPFV MB90F546GSPFV MB90F548GPFV MB90F548GSPFV MB90F548GLPFV MB90F548GLSPFV MB90F549GPFV MB90F549GSPFV	LQFP-100 (0.5 mm, 14 × 14 mm)	FPT-100P-M05	TE110-580F03AP	MF00-709	Correspondence	Undecidedness
MB90F553APF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F553APFV	LQFP-100 (0.5 mm, 14 × 14 mm)	FPT-100P-M05	TE110-580F03AP	MF00-709	MF05-709	Undecidedness
MB90F562BP	SH-DIP-64	DIP-64P-M01	TE110-562F05AP	MF13-787	MF05-787	Undecidedness
MB90F562BPF	QFP-64 (1.0 mm, 14 × 20 mm)	FPT-64P-M06	TE110-562F06AP	MF13-785	Correspondence	
MB90F562BPFM	QFP-64 (0.65 mm, 12 × 12 mm)	FPT-64P-M09	TE110-562F07AP	MF13-786	MF05-786	

(Continued)

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Flash Microcontrollers	Package (leadpitch, body size) (mm)	Package code	Ando Electric Co., Ltd.	MINATO ELECTRONICS INC.		Data I/O Corporation
			AF9708 AF9709 AF9723	MODEL 1890A MODEL 1930 MODEL 1931 MODEL 1893	MODEL 1940	OPTIMA Dual-Packge OCTAL QUAD
MB90F574APFV	QFP-120 (0.5 mm, □20 × 20 mm)	FPT-120P-M13	TE110-574F02AP	MF00-23	MF05-23	S5024
MB90F574APFF	LQFP-120 (0.4 mm, □14 × 14 mm)	FPT-120P-M05	TE110-523F08AP	MF00-22	Correspondence	Undecidedness
MB90F574APMT	QFP-120 (0.5 mm, □16 × 16 mm)	FPT-120P-M21	TE110-574AF04AP	MF00-729	MF05-729	
MB90F583CPF MB90F583CAPF MB90F584CPF MB90F584CAPF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F583CPFV MB90F583CAPFV MB90F584CPFV MB90F584CAPFV	LQFP-100 (0.5 mm, 14 × 14 mm)	FPT-100P-M05	TE110-580F03AP	MF00-709	MF05-709	Undecidedness
MB90F591APF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989 *	Undecidedness	S5023
MB90F594GPF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F598GPF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023

* : MODEL1890A support only.

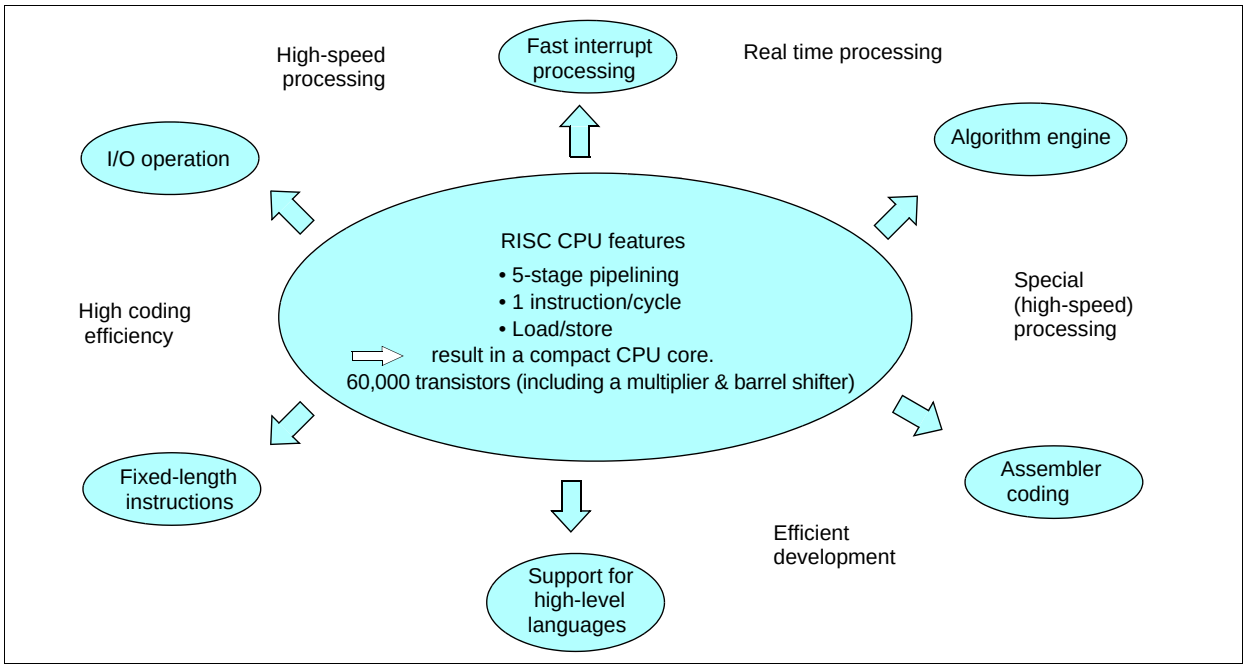
Adaptor socket for Flash Microcontrollers (3 V-products)

Flash Microcontrollers	Package (leadpitch, body size) (mm)	Package code	Ando Electric Co., Ltd.	MINATO ELECTRONICS INC.		Data I/O Corporation
			AF9708 AF9709 AF9723	MODEL 1890A MODEL 1930 MODEL 1931 MODEL 1893	MODEL 1940	OPTIMA Dual-Packge OCTAL QUAD
MB90F654APF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F654APFV	LQFP-100 (0.5 mm, 14 × 14 mm)	FPT-100P-M05	TE110-580F03AP	MF00-709	MF05-709	Undecidedness
MB90F474LPF MB90F474HPF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F474LPFV MB90F474HPFV	LQFP-100 (0.5 mm, 14 × 14 mm)	FPT-100P-M05	TE110-580F03AP	MF00-709	MF05-709	Undecidedness
MB90F481PF MB90F482PF	QFP-100 (0.65 mm, 14 × 20 mm)	FPT-100P-M06	TE110-553F01AP	MF00-989	MF05-989	S5023
MB90F481PFV MB90F482PFV	LQFP-100 (0.5 mm, 14 × 14 mm)	FPT-100P-M05	TE110-580F03AP	MF00-709	MF05-709	Undecidedness
MB90F568PF	QFP-64 (1.0 mm, 14 × 20 mm)	FPT-64P-M06	TE110-562F06AP	MF13-785	MF05-785	Undecidedness
MB90F568PFM	QFP-64 (0.65 mm, 12 × 12 mm)	FPT-64P-M09	TE110-562F07AP	MF13-786	MF05-786	

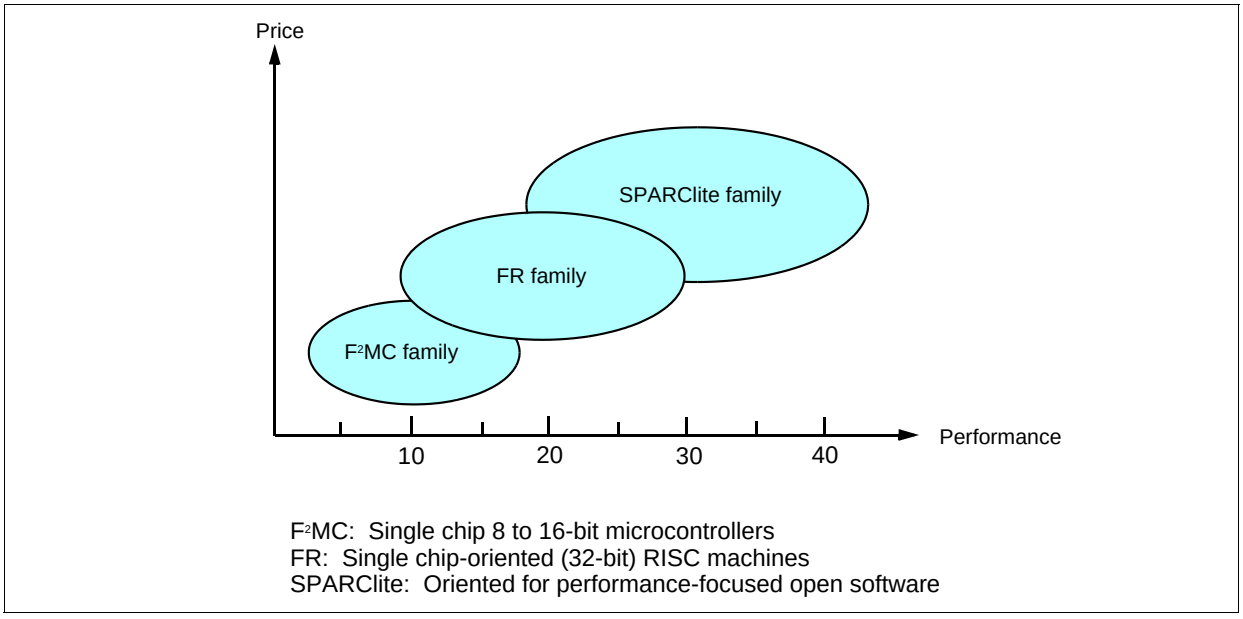
FR Family Features

- CPU core capable of running at a peak rate of 64 VAX MIPS (CPU core performance) at 50 MHz while featuring its compactness equivalent to 16-bit microcontrollers
- 5-stage pipelining and harvard-bus architecture, allowing efficient execution
- Implementation of, basically, 16-bit fixed length commands, providing high object code efficiency
- The command group enhanced for controllers and an algorithm engine, resulting in faster execution of instructions
- A variety of resources including the sum-of-product units
- Many kinds of internal peripheral devices

- **FR architecture features**



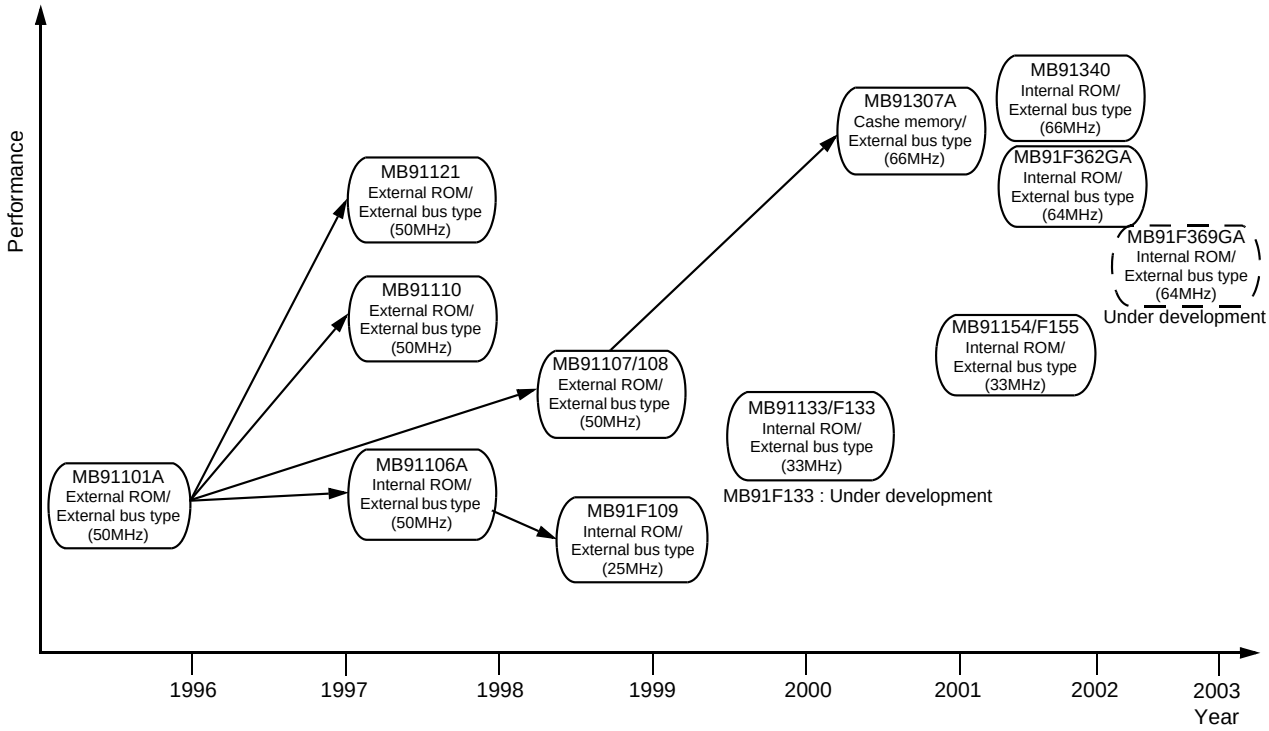
- **Fujitsu embedded RISC controller**
  The FR family is designed for optimum use in control systems while the SPARClite is suitable for data processing systems.

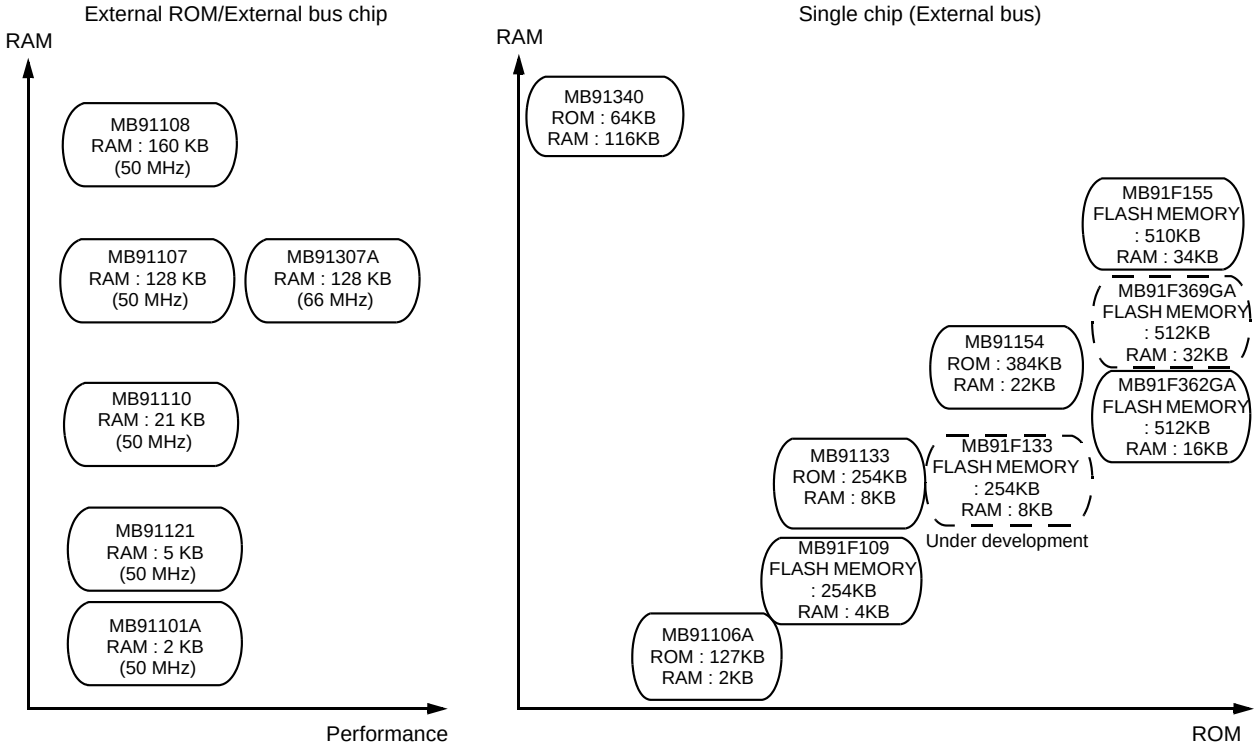


F²MC: Single chip 8 to 16-bit microcontrollers
FR: Single chip-oriented (32-bit) RISC machines
SPARClite: Oriented for performance-focused open software

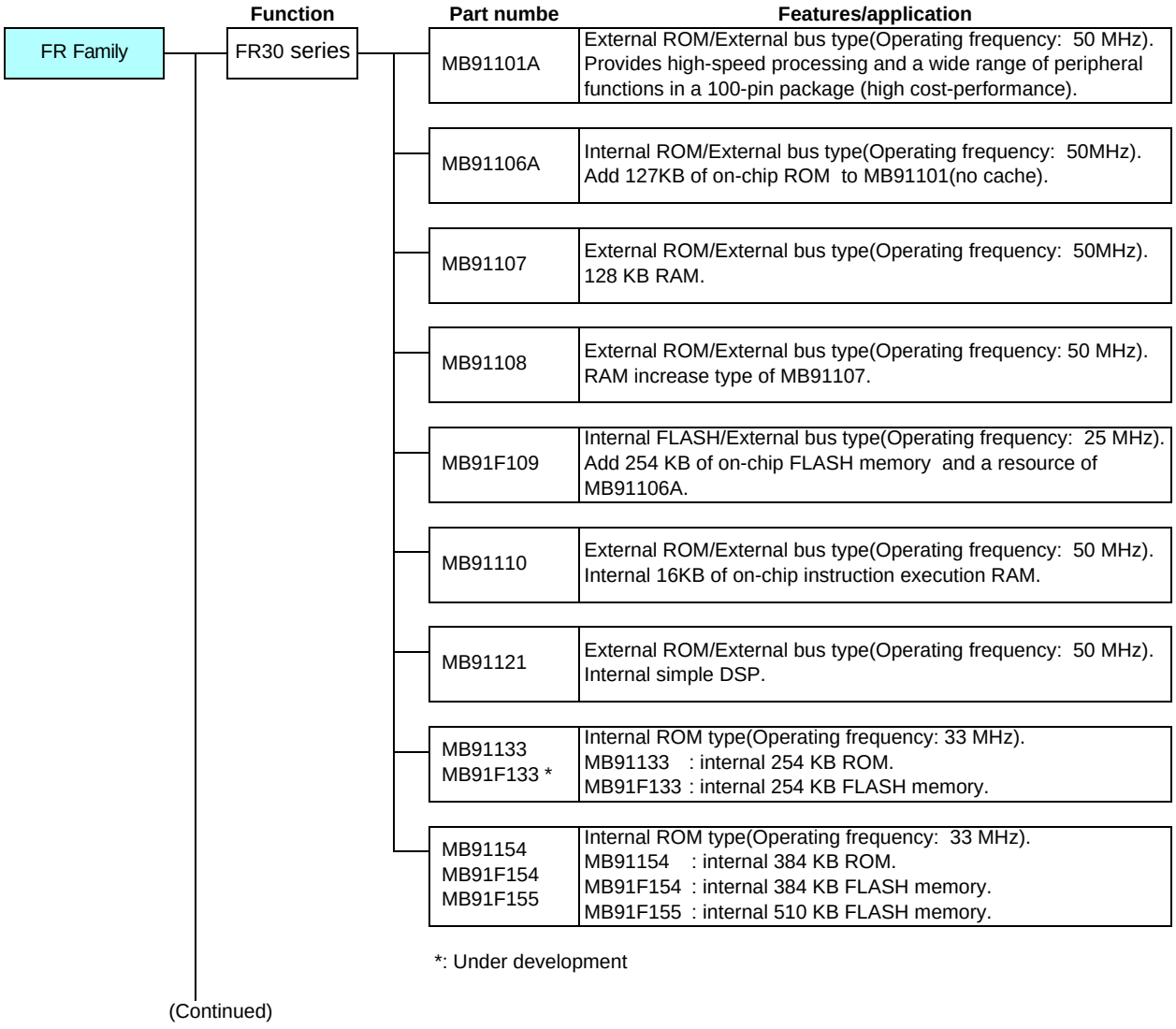
FR Family Product Range

FR30 Series/FR50 Series/FR65E Series





32-bit FR Family

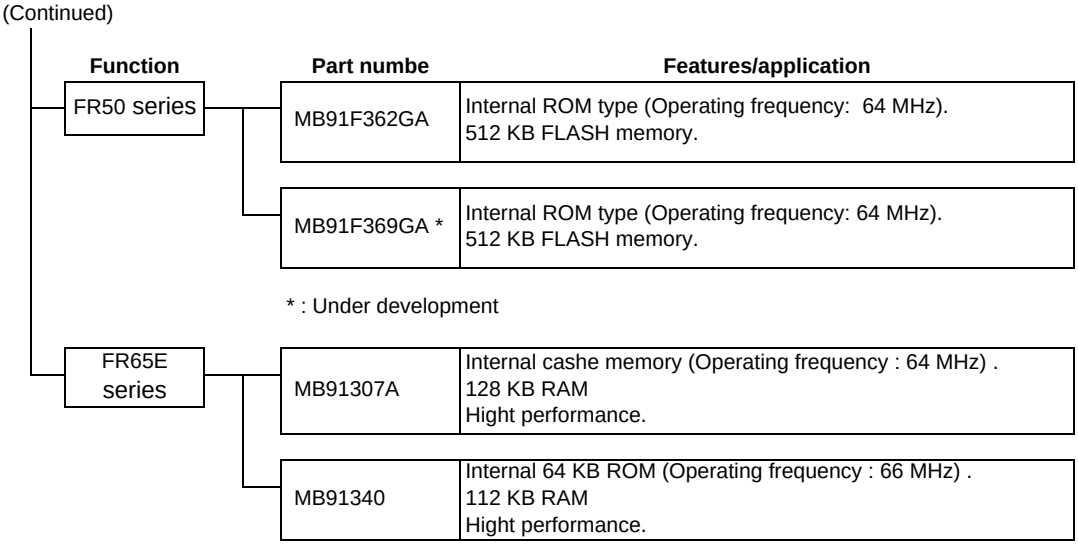


FR30 Series

Part number	Operating power supply voltage (V)	Package			Functions
		QFP (0.65mm pitch)	LQFP (0.5mm pitch)	BGA	
MB91101A	+5 ±10% or +3.3(or +3.0) ±10%	100P	100P	—	Operating frequency : 50 MHz(MB91101A/106A) 25 MHz (MB91F109) RAM : 2 KB(MB91101A/106A) 4 KB(MB91F109) 128 KB (MB91107) 160 KB (MB91108) ROM : 127KB(MB91106A) FLASH memory : 254 KB(MB91F109) Instruction cache : 1 KB (MB91101A/107/108) DRAM controller : 2 banks DMA controller : 8 ch. (external 3 ch.) UART/baud rate timer : 3 ch./3 ch. Successive approximation A/D converter : 10-bit × 4 ch. PWM timer : 4ch. Reload timer : 16-bit × 3 ch. Bit search module : 1 ch. External interrupt input : 4ch. + NMI I/O ports : 54 ports (multiplex with other signals)
MB91106A	+3.0 ±0.3	100P	100P	—	
MB91107		—	120P	—	
MB91108		—	120P	—	
MB91F109		100P	100P	—	
MB91110	+5 ±10% +3.3 ±5%	—	144P	—	Operating frequency : 50 MHz RAM : 5 KB Instruction execution RAM : 16KB Instruction cache : 1KB DRAM controller : 2 banks DMA controller : DMA 5 ch. UART/baud rate timer : 1 ch./1 ch. Successive approximation A/D converter : 10-bit × 8 ch. PPG timer : 16-bit × 6 ch. Reload timer : 16-bit × 2 ch. Bit search module : 1 ch. External interrupt input : 8 ch.
MB91121	+3.3 ±0.3	—	120P	—	Operating frequency : 50 MHz RAM : 4 KB Instruction cache : 1 KB Simple DSP : 16-bit fixed point operations DMA controller : DMA 8 ch. UART/baud rate timer : 3 ch./3 ch. Successive approximation A/D converter : 10-bit × 8 ch. PWM timer : 16-bit × 4 ch. Reload timer : 16-bit × 3 ch.
MB91133	+5 ±10% +3.0 to +3.6	—	144P	144P	Operating frequency : 33 MHz ROM : 254 KB (MB91133) FLASH memory : 254 KB (MB91F133) RAM : 8 KB DMA controller : DMA 8 ch. Up/down counter : 8-bit × 2 ch. Successive approximation A/D converter : 10-bit × 8 ch. (with level comparator : 1 ch.) UART : 1 ch. Reload timer : 16-bit × 5 ch. D/A converter : 8-bit × 3 ch. PPG timer : 16-bit × 6 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 8 ch. Free running counter : 16-bit × 1 ch.
◎MB91F133		—	144P	144P	
MB91154	+3.15 to +3.6	—	144P	—	Operating frequency : 33 MHz ROM : 312 KB (MB91154) FLASH memory : 510 KB (MB91F155) RAM : 34 KB (MB91F155) 22 KB (MB91154) DMA controller : DMA 8 ch. Successive approximation A/D converter : 10-bit × 8 ch. UART : 4 ch. Reload timer : 16-bit × 4 ch. D/A converter : 8-bit × 3 ch. PPG timer : 16-bit × 6 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 8 ch. Free running timer : 16-bit × 1 ch. I^2C : 1 ch. RTC : 1 ch. Up/down counter : 8-bit × 2 ch.
MB91F154		—	144P	—	
MB91F155		—	144P	—	

Package: P-plastic
◎:Under development

(Continued)



Function	Part numbe	Features/application
FR50 series	MB91F362GA	Internal ROM type (Operating frequency: 64 MHz). 512 KB FLASH memory.
	MB91F369GA *	Internal ROM type (Operating frequency: 64 MHz). 512 KB FLASH memory.
FR65E series	MB91307A	Internal cashe memory (Operating frequency : 64 MHz) . 128 KB RAM Hight performance.
	MB91340	Internal 64 KB ROM (Operating frequency : 66 MHz) . 112 KB RAM Hight performance.

* : Under development

FR50 Series

Part number	Operating power supply voltage (V)	Package QFP (0.5 mm pitch)	Functions	
MB91F362GA	+5.0 ± 0.25	208P	Operating frequency : 64 MHz FLASH memory : 512 KB RAM : 4 KB Instruction execution RAM : 4 KB Data RAM : 12 KB DMA controller : DMA 2 ch. CAN controller : 3 ch. Stepping motor contoroller : 4 ch. Up/down counter : 8-bit × 2 ch. A/D converter :10-bit × 16 ch. D/A converter : 10-bit × 2 ch.	SIO : 2 ch. UART : 3 ch. I²C : 1 ch. External interrupt input : 8 ch. Input capture : 4 ch. Output compare : 4 ch. Free running timer : 2 ch. PPG timer : 16-bit × 6 ch. Reload timer : 16-bit × 6 ch. Wach dog timer U-timer : 3 ch. Real time clock : 1 ch.
◎MB91F369GA	+4.25 to +5.25	160P	Operating frequency : 64 MHz FLASH memory : 512 KB RAM : 16 KB Instruction execution RAM : 4 KB Data RAM : 16 KB DMA controller : DMA 5 ch. CAN controller : 2 ch. A/D converter : 10-bit × 10 ch.	SIO : 2 ch. UART/U-timer: 1 ch. I²C : 1 ch. External interrupt input : 8 ch. Reload timer : 16-bit Â~ 6 ch. Wach dog timer Real time clock : 1ch Sound generator : 1 ch PPG : 4 ch.

Package: P-plastic

◎:Under development

FR65E Series

Part number	Operating power supply voltage (V)	Package LQFP	Functions
MB91307A	+3.3 ± 0.3	120P	Operating frequency : 66 MHz RAM : 128 KB Instruction cashe : 1 KB UART : 3 ch. External interrupt input : 9 ch. I²C : 1 ch. U-timer : 3 ch. Reload timer : 16-bit × 3 ch. A/D converter : 10-bit × 4 ch. Watch dog timer DMA controller : 5 ch. (External 3 ch.)
MB91340	+3.3 ± 0.3 +2.5 ± 0.2	176P	Operating frequency : 66 MHz RAM : 112 KB ROM : 64 KB Data RAM : 4 KB UART : 3 ch. External interrupt input : 9 ch. I²C : 1 ch. A/D converter : 10-bit × 8 ch. D/A converter : 8-bit × 3 ch DMA controller : 5 ch. (External 3 ch.) Input capture : 4 ch. Output compare : 8 ch. Watch dog timer Reload timer : 16-bit × 4 ch. Up counter : 8-bit × 1 ch. Free running timer : 1 ch. Up/doun counter : 8-bit × 4 ch. (16-bit × 2 ch.)

Package: P-plastic

Features of Support Environments

(1) Comprehensive Development Environments (Softune Workbench) around C language

- Achieving effective development environments
- Enhancing the concerted use of independent development tools, allowing all tools to behave as if they were a single tool
- Support in collaboration with source generation management tools
- Made available both in Japan and Britain simultaneously

(2) Supporting the tools for quality, performance, analysis of source programs

- Softune C/C++ Checker
  Investigating the description form of a source to display the information to enhance portability/maintainability
- Softune C/C++ Analyzer
  Analyzing the source description; displaying the overall hierarchical organization; effective for maintainability/portability

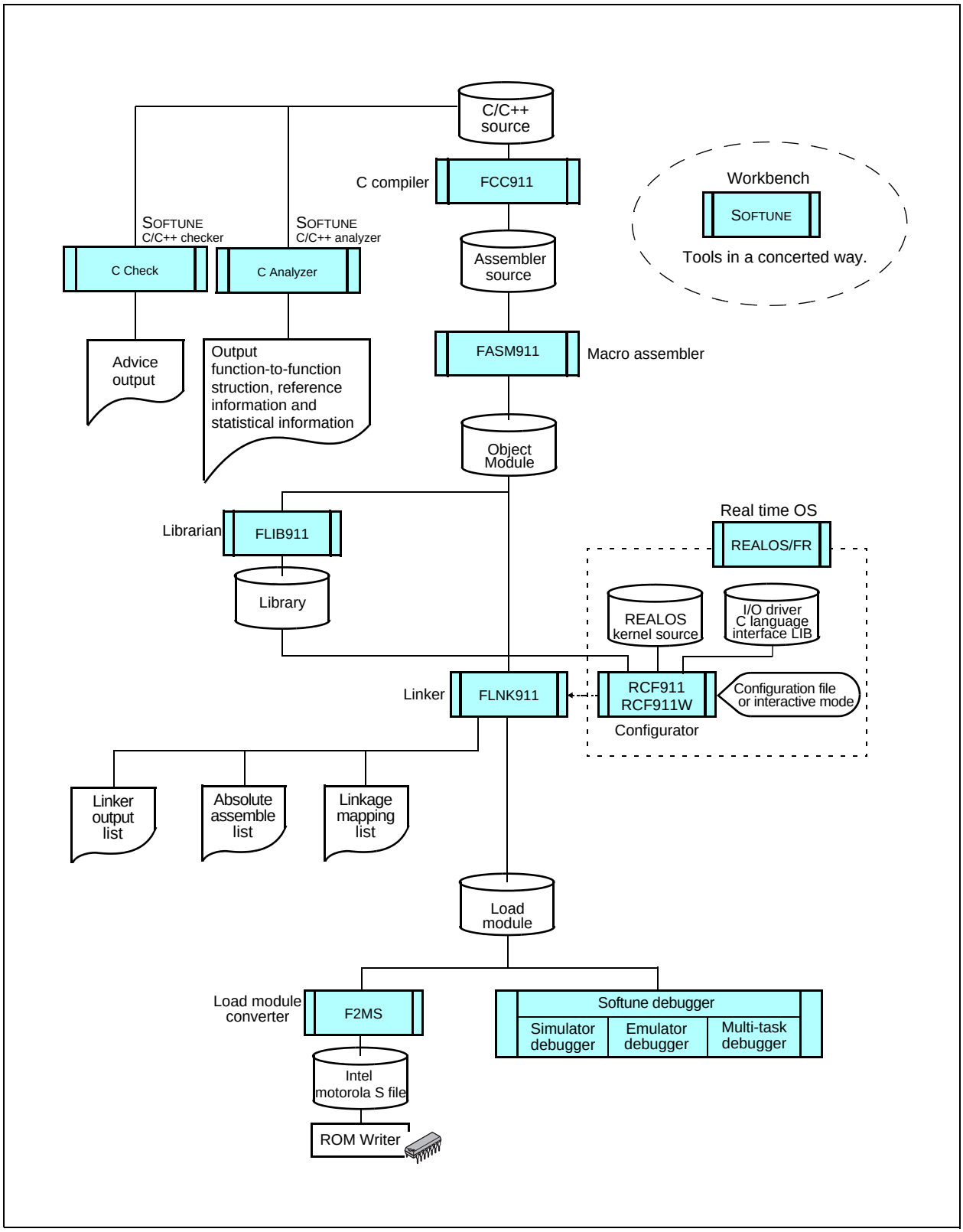
(3) Embedded type Real-time OS being provided

- Real-time OS in conformance with µITRON 3.0
- Conformance with the national industry standard µITRON specifications
- Level R (Required), Level S (Standard), part of Level E (Extended) (including memory pool, timer handler)
- Building block scheme
  Kernel code size: 2.7 KB (min.) to 8.4 KB (max.)
- High-speed task switch with delayed interrupt capability
- Fast task schedule with the bit search module

(4) Robust support of development using REALOS

- REALOS Configurator (REALOS/FR, SOFTUNE REALOS/FR):Easy-to-configure parameters for kernel generation
- REALOS debugger
- Supporting the in-line deployment options for C compiler REALOS system call
- REALOS Analyzer (SOFTUNE REALOS/FR): Analyzing the transition of task states to visually display the results

Development Procedure (When Fujitsu product is used.)



SOFTUNE V5 Support Software Product List (For FR Family)

Software		Software Product number (SP number) *2			Remarks
PackProducts	SOFTUNE V5 Professional Pack	SP3650Z058-P01	—	—	SOFTUNE V3 workbench SOFTUNE V3 C compiler SOFTUNE V3 assembler SOFTUNE V3 analyzer pack SOFTUNE V3 checker
Individual Products	SOFTUNE V5 workbench	SP3650W058-P01	—	—	Manager Simulator debugger Emulator debugger Monitor debugger
	SOFTUNE V5 C/C++ compiler	SP3650C058-P01	SP2750C058	SP2650C058	ANSI standard conforming
	SOFTUNE V5 assembler pack	SP3650K058-P01	SP2750K058	SP2650K058	Assembler, linker, librarian, Object format converter
	SOFTUNE V5 C/C++ analyzer	SP3650X008-P01	—	—	For the FR, F²MC-16, and F²MC-8L
	SOFTUNE V5 C checker	SP3650Y008-P01	—	—	For the FR, F²MC-16, and F²MC-8L
	Real time OS SOFTUNE V5 REALOS/FR basic	SP3650M058BA	—	—	Kernel (source code provided), Configurator and REALOS Analyzer
	Real time OS SOFTUNE V5 REALOS/FR evaluation	SP3650M058EV	—	—	Kernel (no source code), Configurator and For evaluation
Compatible emulator hardware (ICE)		MB2197 series	—	—	—
Operating Environment	Operating machine	Personal computers *1 FMV and similar IBM compatibles	Workstasion SunSPARC	Workstasion HP9000/700	—
	Operating OS (English,Japanese)	Windows98 WindowsMe WindowsNT4.0 Windows2000	Solaris 2.6	HP-UX10.0	—
	Media	CD-ROM *3			—

*1:Pentium or higher CPU recommended. 48 to 64MB or more memory recommended.70MB of a disk capacity is required.
*2:The product code suffix (Pxx) indicates the number of licenses.
*3:An electronic manual (PDF format) is provided with each product (Japanese and English). Printed manuals are sold separately. Licensing of each product is available in a number of forms (3, 5 or 10 copies).

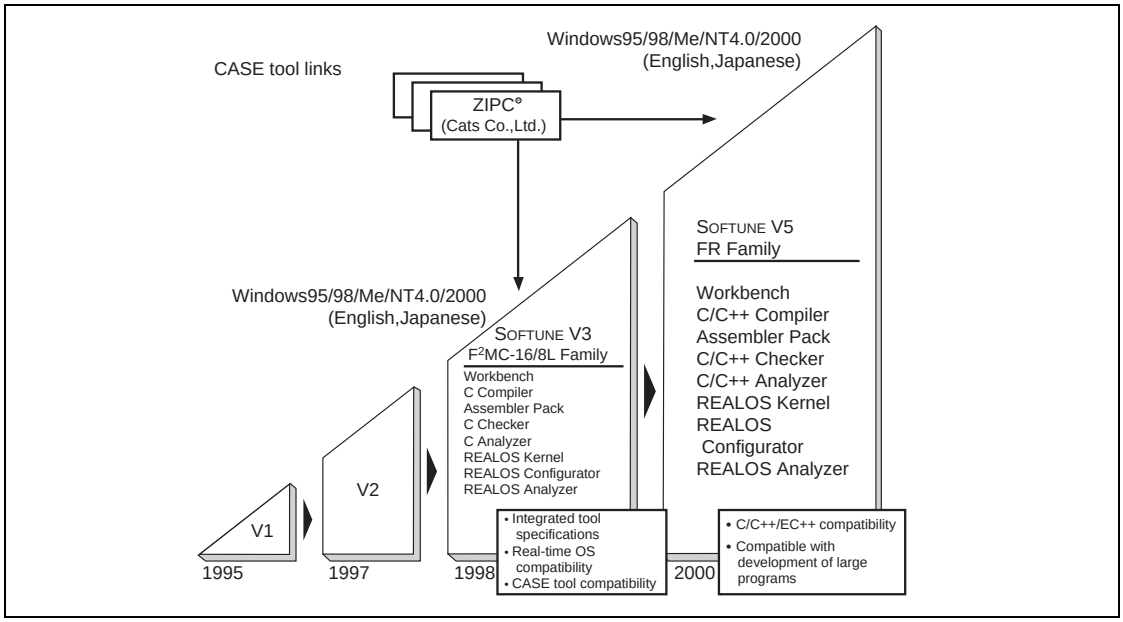
Third party Support Software Product List (For FR Family)

Software	Yokogawa Digital Computer Corporation	GAIO TECHNOLOGY CO., LTD.	GHS
Operating machine	PC98, DOS/V, SunSPARC, HP9000/700	Sun, HP, DEC, IBM, PC	PC, EWS
Operating OS	DOS, Windows, SunOS, Solaris, HP-UX	SunOS, Solaris, HP-UX, WindowsNT	Windows, UNIX
Media	3.5FD, DDS	CMT, DAT, 3.5FDD, etc.	CMT, DAT, 3.5FDD, etc.
C compiler	Fujitsu or GAIO TECHNOLOGY	XCC-V + definition for FR Family	ccfr20
Assembler pack		XASS-V, XLNK-V, XLIB-V, XOUT-V, XABS-V + definition for FR Family	asfr20 lx ax elf2sr
Linkage kit Linker Librarian Load module converter			
Absolute assemble list preparation tool			
Simulator debugger	—	XDEB-V + definition for FR Family	MULTI
Emulator debugger	microVIEW-G Debugger data converter	XDDI-V + definition for FR Family	
ICE	advice (Yokogawa Digital Computer)		—

<Contact>
Yokogawa Digital Computer Corporation TEL: 81-423-33-6222
GAIO TECHNOLOGY CO., LTD. TEL: 81-3-3662-3041
Advanced Data Controls, Corp. TEL: 81-3-3576-5351 (GHSêª (Green Hills Software))

SOFTUNE

1. The SOFTTUNE Integrated Development Environment



2. SOFTUNE Structure and Features

Integrated manager and debugger modules

Errors can be corrected on the fly, as they are discovered, and the resulting code can be debugged on the spot.

A variety of tools to support C/C++-language coding

"C/C++ Checker" confirms code operation and "C/C++ Analyzer" analyzes the code's structure.

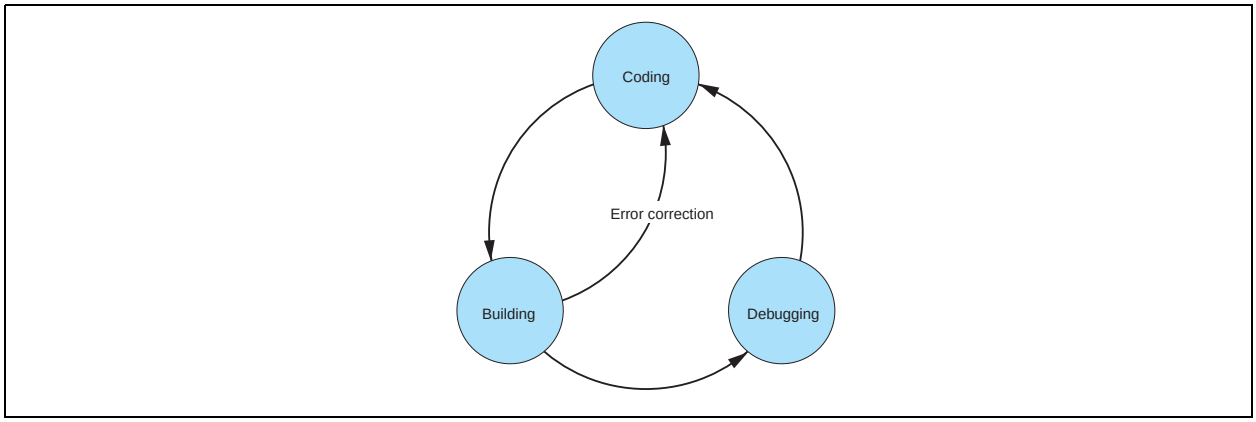
Includes such tools as Configurator and Analyzer to facilitate the use of REALOS, which conforms to the µITRON specifications.

(1) Removing the Annoying Settings which are Part of Program Development

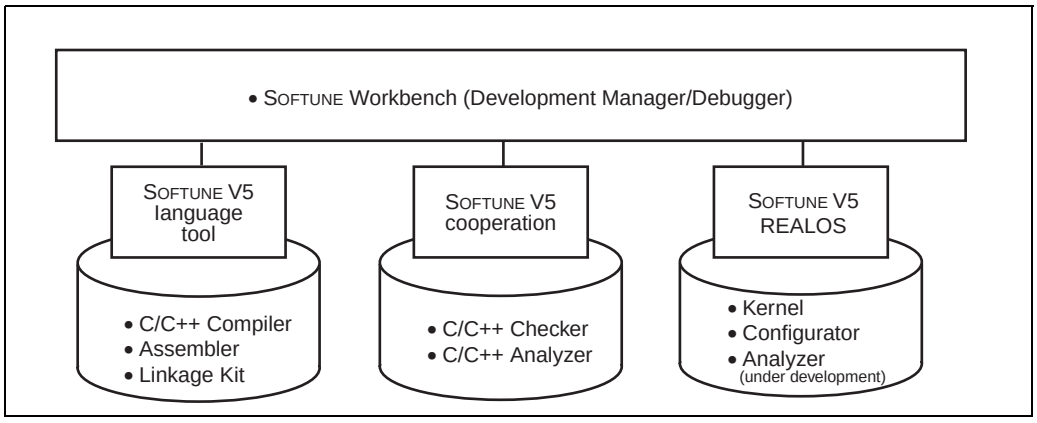
Developing programs for different systems requires the programmer to edit source code, perform actual builds and confirm program operation (debug). Finally, the programmer returns to the editing process to incorporate necessary changes, as indicated by the debugging results.

SOFTUNE is an integrated developing environment which is designed to perform such repetitive processes smoothly and efficiently. It is the next generation of SOFTUNE, which has evolved to meet various needs of our customers.

(2) Program Flow



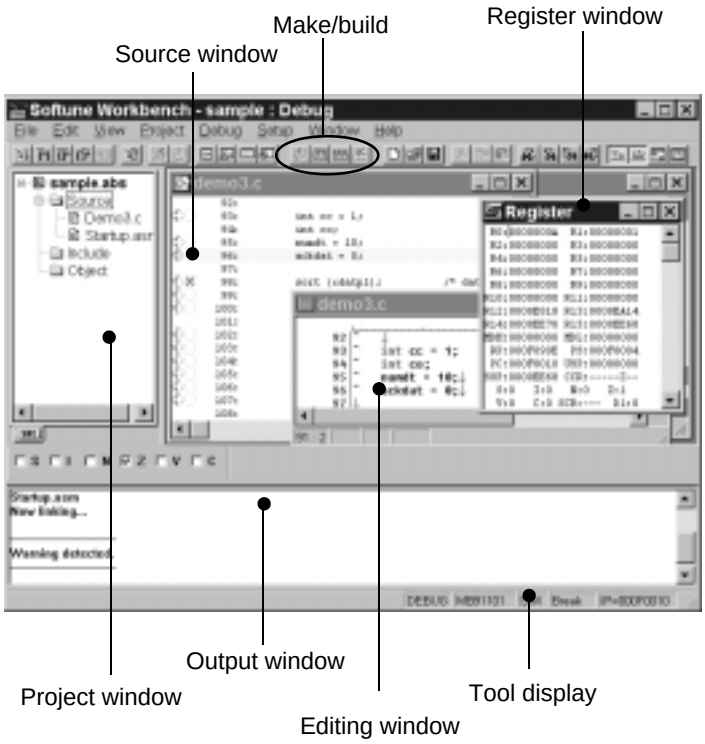
(3) Structure of SOFTUNE



(4) Environment with SOFTUNE

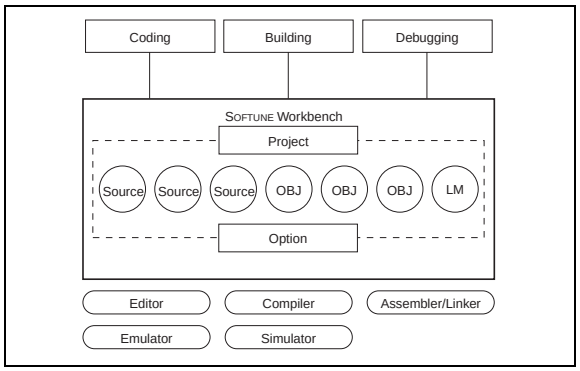
The Efficient and Easy-to-Use Integrated Developing Environment

Program development requires repeated editing, make/build, and debugging operations. Performing these functions smoothly and effectively contributes to improved efficiency.
The SOFTUNE integrated developing system is designed to meet program developers' numerous demands, while ensuring ease of use.



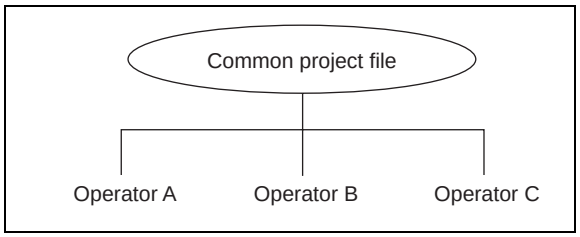
3. Manager Functions

Software programming proceeds according to the “project file, ” which contains all the information needed for programdevelopment.



(1) Effective Project Usage

Whether working alone on several projects simultaneously or developing a project as a group, project files can be used to create a simple developing environment.



(2) Extremely Easy to Use

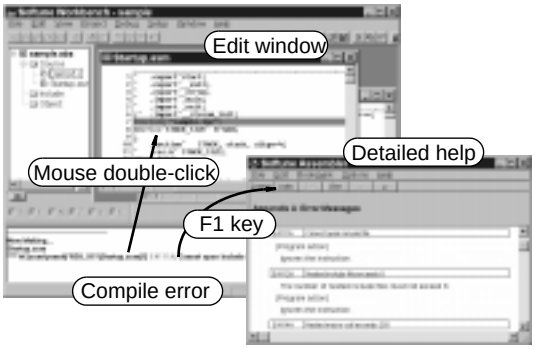
- Built-in Editor

  The built-in editor comes complete with many useful functions, such as visual keyword emphasis and auto-indent.
- Error Jump and On-line Help

  Errors that occur during builds are displayed in the output window at the bottom of the screen.
  To make a "Tag-jump" Double-click Mouse.Once on the error press "F1 key" for a more detailed error display.
- Cooperation with Commercially Available Editors

  To meet developers’ requests to use editors to which they are accustomed, SOFTUNE can be configured to use the following commercially available editors:

  Codewright32, TextPAD32 and others.

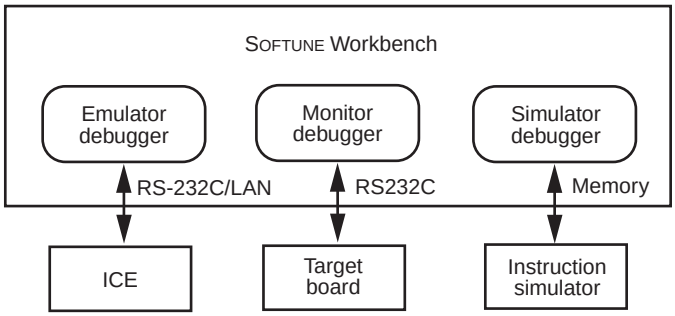


(3) Customizable Environment

When sharing files, cooperation with source generation management tools is assured, and file type conversion tools are called up, so that each person can operate in his or her own customized developing environment.

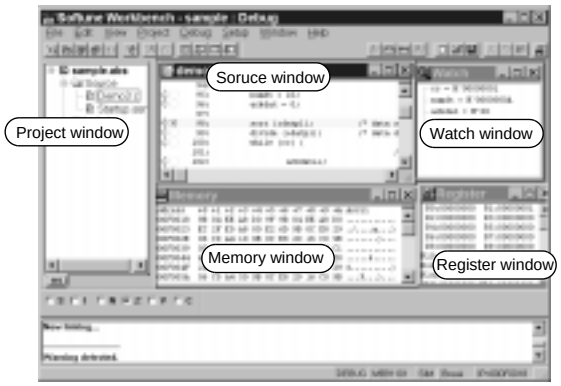
4. Debugger Function

SOFTUNE Workbench supports three debuggers that are needed at various stages of development. The appropriate debugger environment can be selected to match the situation.



(1) Easy-to see Screen Information

The user can freely change the screen layout by selecting the necessary windows. In addition, the displayed information can be selected to provide only the infomation that is necessary.



(2) Simple Environment Setting

- Debugging Environment: Setup Wizard

  The setup wizard supports the selection of communication lines with emulation pods and boards, as well as window settings.
- MCU Operating Environment

  The so-called “CPU information file,” which contains the information required to support all MCUs, is provided as standard. Necessary information such as I/O port locations, ROM/RAM capacity and initial addresses can be set automatically.
- Saving and Restoring the Debugging Environment

  Previous debugging environment specification, such as window locations, breakpoint settings, and memory mapping information, are saved, so that these settings are restored the next time the program is initiated.

5.Cooperation

In cooperation with SOFTUNE Workbench, the following SOFTUNE components help improve the quality of C-language programming, which greatly increases reviewing and documentation efficiency.

1) SOFTUNE C/C++ Checker

Designed to meet the following requests from beginners through to advanced users:

- Eliminate all coding mistakes.
- Review programs quickly and efficiently.
- Enable even C-language beginners to create quality code.
- Maximize coding skills.
- Use software assets on Fujitsu CPUs.

The SOFTUNE C Checker checks code for maintainability, methods of expanding specifications and transportability; indicates areas where quality and performance could be improved; and reports these results to the user. The user can then review the C-language code.Outline

Recent software (ROM) for embedded microcontrollers has been developed in the C language. However, it is difficult to understand messages which are output from a compiler unless the language specifications are well known. This development support tool checks C-source programs to display and print advice for better quality and performance. It also has the facility for selecting necessary advice carefully.

(1) Features

- Outputs advice suitable for objectives: Portability, coding error performance, porting to Fujitsu CPU's
- Allows customization to a programmers level.
- Works with C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

(2) Advising Function

The following pieces of advice are given. "Reason of Check", "Example of Program", "Suggestion of Correction", and "One-point Advice" are displayed and explained for each check item.

- Portability

  This tool makes a close check on the items "processing-definded operation" and "undefined operation" which can be problems in portability in the ANSI standard.
  It also gives an explanation of the operation of C compilers (fcc911 and cc907) for Fujitsu microcontrollers.

  For example, the tool gives the user proper advice on many problems (such as a data type acceptable to a structure, code, and its arrangement) at the time of printing.

- Coding error

  This tool indicates the items which are not wrong in the language specifications but may cause an error and the items which are logically inconsistent.

  For example, the equivalent expression "**`if (a==0)`**" in the if statement is likely to be typed as the assignment expression "**`if (a=0)`**" by mistake. Most compilers cannot detect such an error.

- Performance

  This tool indicates the items which generally provide better performance and the items which are essential and effective for the FR family and F²MC-16 family.
  Stress is especially, put on the detection of object size reduction which can be a problem in software for embedded microcontrollers.

  For example, if a function return value is a structure of the double type, an area is reserved for the return value and an object to be transferred to the area is output.

  This tool advises the user to transfer the function return value by a pointer and largely reduce the objects size.

- Porting to Fujitsu CPU's

  This tool advises the user what to consider in porting exsting software from other makers' CPU to Fujitsu CPU in the FR family and F²MC-16 family.

  For example, in porting software resources created for the F²MC-16 family to the FR family, this tool advises the user to delete the expansion specifications (**`__far, __near, and __direct etc.`**) inherent to the F²MC-16 family.

- Indicated messages output

- Coding error indicated and advice displayed

- Advice for porting to Fujitsu C compilers displayed

- Massages indicated on quality listed

2) SOFTUNE C/C++ Analyzer

Designed to meet the following user situations:

- One wishes to examine a program's structure or processing, but the programmer is absent or documentation is unavailable.
- During program development, one wishes to create a structural program that takes into account structure and processing.
- One wishes to examine the range of effects that altering a program will create.
- One wishes to create a program's internal documentation.
- One wishes to explore the possibilities of a more efficient program.

The structure and usage of data in a C-language source programs are displayed visually, and the internal data structure, functional tree, stack usage and other infomation can be acquired and stored in a file.

(1) Outline

Recent software(ROM) for embedded microcontrollers is increasingly extending its development scale. This situation is created from development by many programmers, diversion of exsting resources, and use of package programs.
This development support tool statically analyzes the C-source program to visually display and print the function-to-function structure, reference data, and statistical data. This tool creates data necessary for design and maintenance, as well as having a feature peculiar to C compilers for Fujitsu Microcontrollers (a feature of calculating the maximum amount of stacks used), considering its embedded feature.

(2) Features

- Displays and prints the function-to-function structure, reference data, and statistical data.
- Supports the embedded capability of C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

(3) Explanation of Features

The following data is enabled for development, maintenance, and higher porting efficiency.

- Graphic flow

  This feature block-structures function calls for visual display. It also allows the display of the entire function and calls from any function and the retrieval of functions.
- Logic flow

  This feature visually displays the internal structure of the C-source program.
  For example, it shapes the control structure of **`for`** and **`switch`** statements and structure declarations. A jump feature for retrieval by functions, variable, tag, and macro names is also provided.
- Displaying statistical data

  This feature displays the complexity and line count of a programs every function, the source of destination function name, and the count of appearance of (**`if`**, **`for`** and **`asm`** statements etc.).
- Displaying argument data

  This feature displays data about the function-called file name and line number, the return value of the declared function, and the type of argument. It also checks the adjustability of dummy argument with actual argument.
- Displaying cross-reference data

  This feature displays data about the functions and variables that a function is using, tag and macro declarations, and the appearing line number.
- Displaying global data

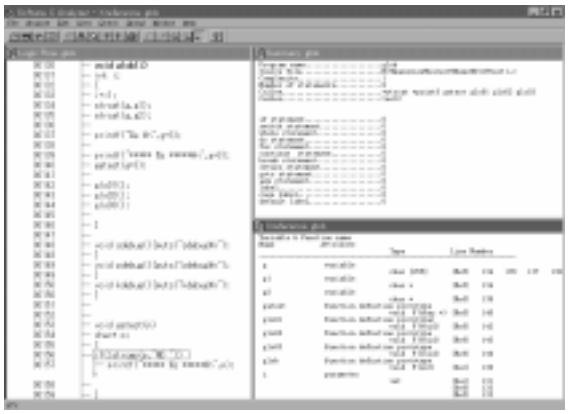
  This feature displays the function using global variables. It also detects unused global variables.
- Program checking

  This feature checks and displays the adjustability of dummy argument with actual argument.
- Calculating the maximum amount of stacks used

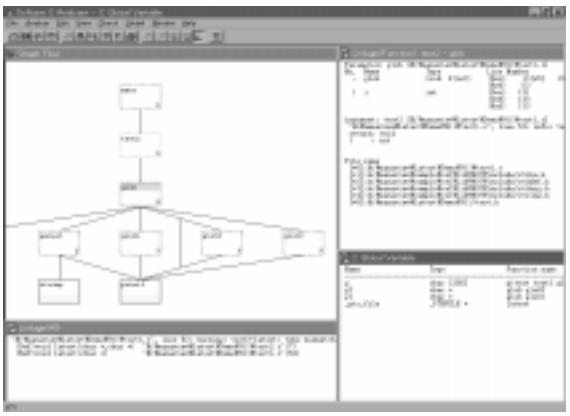
  This feature calculates and displays the amount of stacks used in the entire function, as well as in any function. This calculation is made on the basis of the output of C compilers (fcc911 and cc907) for Fujitsu microcontrollers (FR family and F^{2}MC-16 family).

- Displaying graphic flow

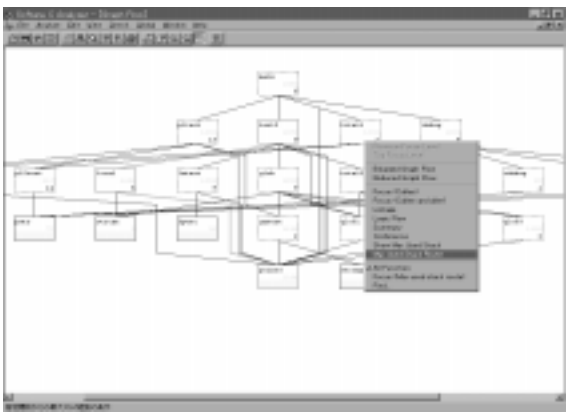
- Displaying logic flow, statistical and cross-reference data



- Displaying logic flow (focus), argument and global data



- Displays stack use volume (green numbers) and largest stack configuration (orange numbers)



3) SOFTUNE C/C++ Compiler

The C/C++ compiler supports C/C++/EC++ and three language modes.

(1) C++ Mode

This mode is compatible with ANSI/ISO-compliant C++ language, allowing code to remain highly transferable.

(2) EC++ * Mode

This mode removes C++ language specifications that can cause the object efficiency of built-in programs to deteriorate. Developing in EC++ mode allows the creation of applications that meet stringent object size and speed limitations on built-in programs, resulting in efficient code.

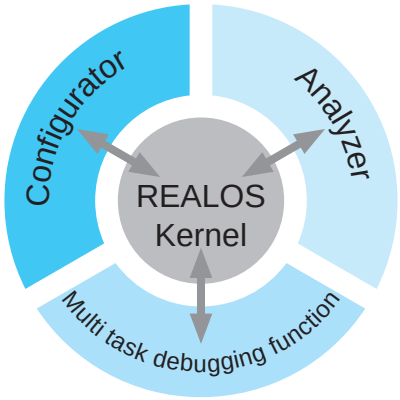
(3) C Mode

This mode is a C-language specification mode that supports ANSI/ISO-compliant code. C Mode permits the use of existing C-language program assets, and allows development to be divided into C-language and C++ language codes.
In addition, these three modes all continue to support embedded extended language specifications (assembler description function, interception description function, I/O area access description function, etc.), allowing the specification of highly efficient MCU-specific programs.
Furthermore, the compiler and linker automatically generate C++ language templates themselves, allowing users to generate templates having minimal object size without complicated procedures.

* : EC++ (Embedded C++) Language Specifications: A subset of ISO/ANSI C++ language specifications including those specifications pertaining to embedding.

6. SOFTUNE REALOS/FR

The real time OS (REALOS) kernel, which conforms to the industry standard µITRON specification, has been combined with a configurator, a multitask debugging function and analyzer. These support tools improve application program development efficiency, using the REALOS kernel.



(1) REALOS Configurator

The configurator helps when setting conditions for creating the REALOS kernel, Necessary settings are made according to the display on the configurator screen, simplifying kernel configuration.

(2) Multitask Debugging Function

The following debugging functions are supported, which are necessary for configuring a system using REALOS.

- Displaying object conditions
- Issuing a system call
- Task trace function
- Breaking a system call
- Breaking a task dispatch

(3) REALOS Analyzer

The performance of the system by which REALOS is built in and the state transition of the task are analyzed and displayed by Graphic.

- Task transition flow, transition tree
- Task status, stack monitor
- Analyzed of execution time
- List of object or cue

7. Language Tools

(1) Highly Efficient Language-Related Tools Integrated with the Compiler

Coding and developing are perfomed with consistent language-related tools that have identical specifications for the FR, F²MC-16 and F²MC-8L families. This also improves the C compiler's code generation efficiency.

µITRON-Compliant Real Time OS for FR Family(SOFTUNE REALOS/FR)

(1) Overview

REALOS/FR is the real time OS for the FR Family of Fujitsu proprietary 32-bit MCUs, conforming to the µITRON 3.0 specifications.

- **Features**

µITRON 3.0 compliant
System design customized for 32-bit MCUs for control purposes
High-speed dispatch and interrupt processing
Support for a multi window configurator
In-line expansion of system call functions
Providing a sample I/O driver
Support for debugger macros which enable task debugging using an ordinary debugger
Support for a REALOS dedicated, multi window debugger

- **REALOS/FR Specifications**

Name	Description
Target CPU	FR20/FR30 series
Maximum number of task	32, 767
Maximum number of priority levels	32
Scheduling method	Priority-base, event-driven type
Number of system calls	SOFTUNE REALOS/FR:58, REALOS/FR20:50
Complying specifications	µITRON 3.0 specifications
Kernel coding	Assembly language
Application coding	C and assembly languages
Kernel size	About 2.7 KB (resident) to About 7.2 KB (maximum configuration)

(2) Configuration

- **Kernel**

The kernel provides the basic functions of the real time OS. It is an event-driven, multitasking real time OS. The functions to be used by application programs can be selected as system calls.

- **System calls**

Function	Instruction	Description
Task management functions	**sta_tsk**	Start task
	ext_tsk	Exit local task
	ter_tsk	Terminate remote task
	dis_dsp	Disable dispatch
	ena_dsp	Enable dispatch
	chg_pri	Change task priority
	rot_rdq	Rotate task ready queue
	rel_wai	Release remote task from wait state
	get_tid	Get local task ID
	tsk_sts	Reference task status
Task-supplied synchronization functions	**sus_tsk**	Force remote task into wait state
	rsm_tsk	Resume task in forced wait state
	frsm_tsk	Force task in forced wait state to resume execution
	slp_tsk	Put local task into sleep state
	tslp_tsk	Put local task into sleep state (to sleep until timeout)
	wup_tsk	Wake up remote task
	can_wup	Cancel task wakeup request

(Continued)

(Continued)

Function	Instruction	Description
Synchronization/transmission functions	**sig_sem**	Return semaphore resource
	wai_sem	Poll semaphore resource
	preq_sem	Poll semaphore resource (polling)
	ref_sem	Reference semaphore status
	set_flg	Set event flag
	clr_flg	Clear event flag
	wai_flg	Wait for event flag
	pol_flg	Wait for event flag (polling)
	twai_flg	Wait for event flag (with timeout)
	ref_flg	Reference event flag status
	snd_msg	Send data to mailbox
	rcv_msg	Receive data from mailbox
	prcv_msg	Poll and receive message from mailbox (polling)
	trcv_msg	Receive data from mailbox (with timeout)
	ref_mbx	Reference mailbox status
Variable length memory pool	**get_blk**	Get variable length memory block
	pget_blk	Get variable length memory block (polling)
	rel_blk	Return variable length memory block
	ref_mpl	Reference variable length memory block
Fixted length memory pool	**get_blf**	Get fixed length memory block
	pget_blf	Get fixed length memory block (polling)
	tget_blf	Get fixed length memory block (with timeout)
	rel_blf	Return fixed length memory block
	ref_mpl	Reference fixed length memory block status
Interrupt mqnqgement function	**ret_int**	Return from interrupt handler
	loc_cpu	Disable interrupt and dispatch
	uni_cpu	Enable interrupt and dispatch
	chg_ilm	Change interrupt level
	ref_ilm	Reference interrupt level status
Time management functions	**set_tim**	Set system clock
	get_tim	Reference system clock
	dly_tsk	Delay task
	def_cyc	Define cyclic handler
	act_cyc	Activate/control cyclic handler
	ref_cyc	Reference cyclic handler status
	def_alm	Define alarm handler
	ref_alm	Reference alarm handler status
	ret_tmr	Return from timer handler
System management function	**get_ver**	Get version number
	ref_sys	Reference system status

- **Configurator**

  The multi window configurator produces executable programs optimized in the operating environment for the kernel and application programs.
  SOFTUNE V3 enhances the inter-operability of the Configurator and Workbench (Manager) for improved ease-of-use.
- **Sample programs**

  Sample programs are provided as practical coding examples for user training purposes.
- **Debugger macros**

  Debugger macroses are provided as the functions for ordinary debuggers (such as an emulator and a simulator) to carry out µITRON task debugging.
- **Multitask debugger**

  The multitask debugger is a multi window debugger allowing debugging at the C language level. It consists of the debugger target part on the target and the debugger host part on the host computer.
- **REALOS Analyzer(Corresponds by SOFTUNE REALOS/FR)**

  The performance of the system by which REALOS is built in and the state transition of the task are displayed by Graphic.

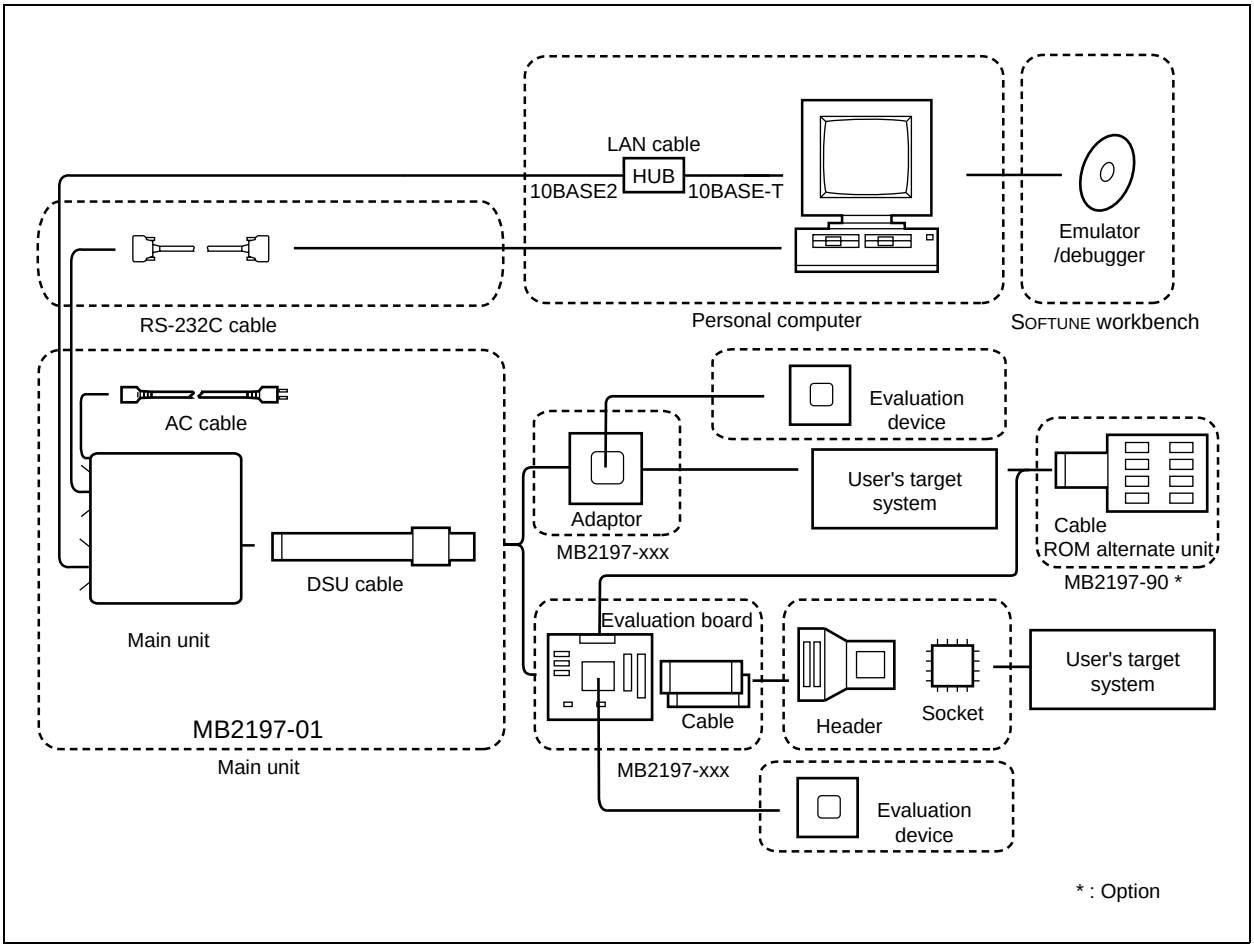
Evaluation Tools for Support Hardware FR families (MB2197 emulator)

Features

- Linear power supply voltage support from +2.7V to +5.5V
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- Real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Hardwear break × 5, softwear break × 8192, code event × 2, data event × 2
- Operation cycle measurement function
- Host I/F (standard accessories) : RS-232C straight (max 19.2 Kbps) , LAN (10BASE-2)

System Overview

System configuration

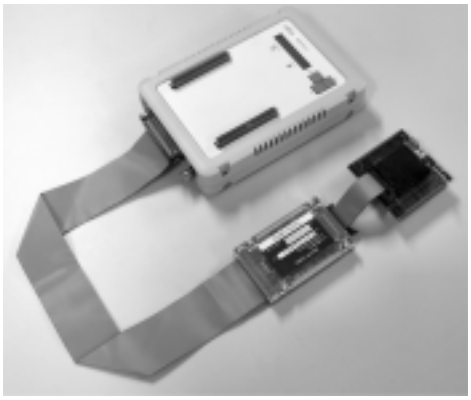


Evaluation Tools for Support Hardware FR families (MB2198 emulator)

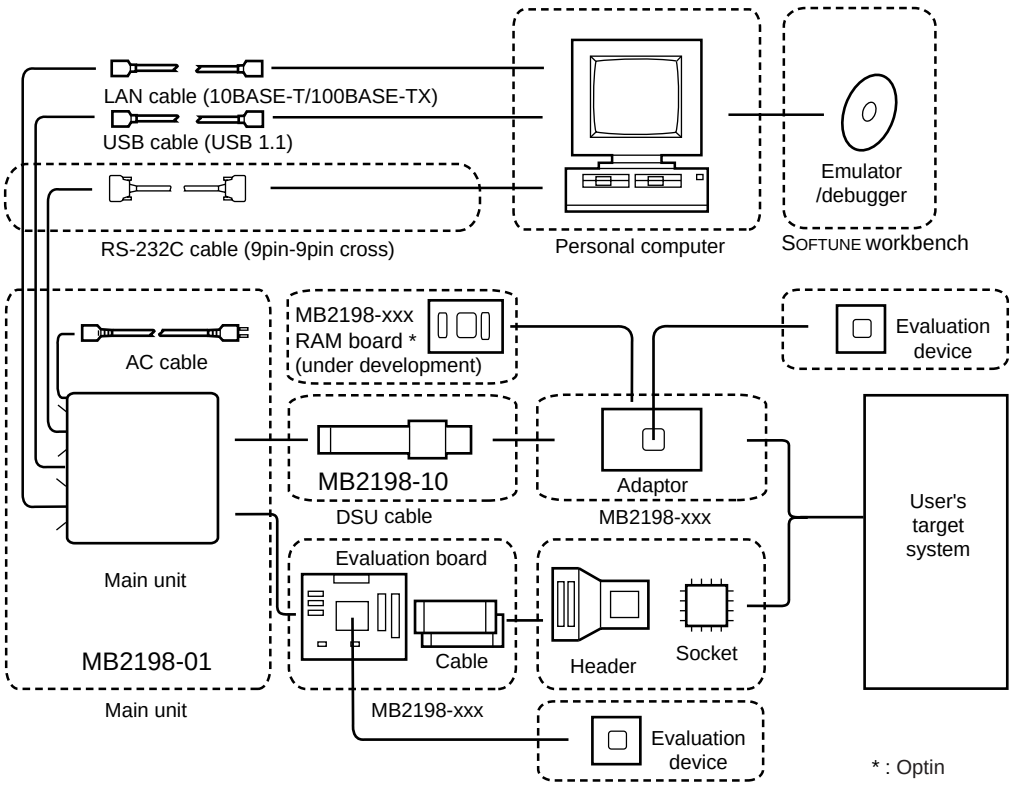
Features

- Linear power supply voltage support from +2.7V to +5.5V
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- Real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Hardwear break × 5, softwear break × 8192, code event × 2, data event × 2
- Operation cycle measurement function
- Host I/F (standard accessories) : RS-232C cross cable (max 115 Kbps) , LAN (10BASE-T, 100BASE-TX) , USB 1.1

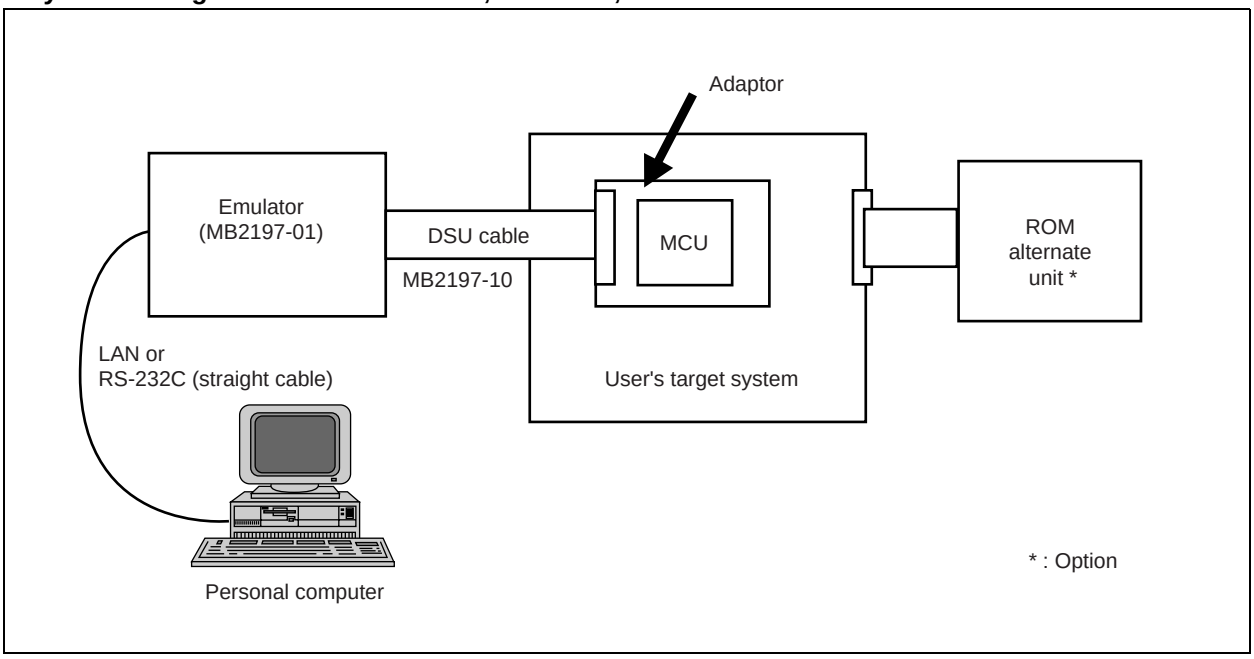
System Overview



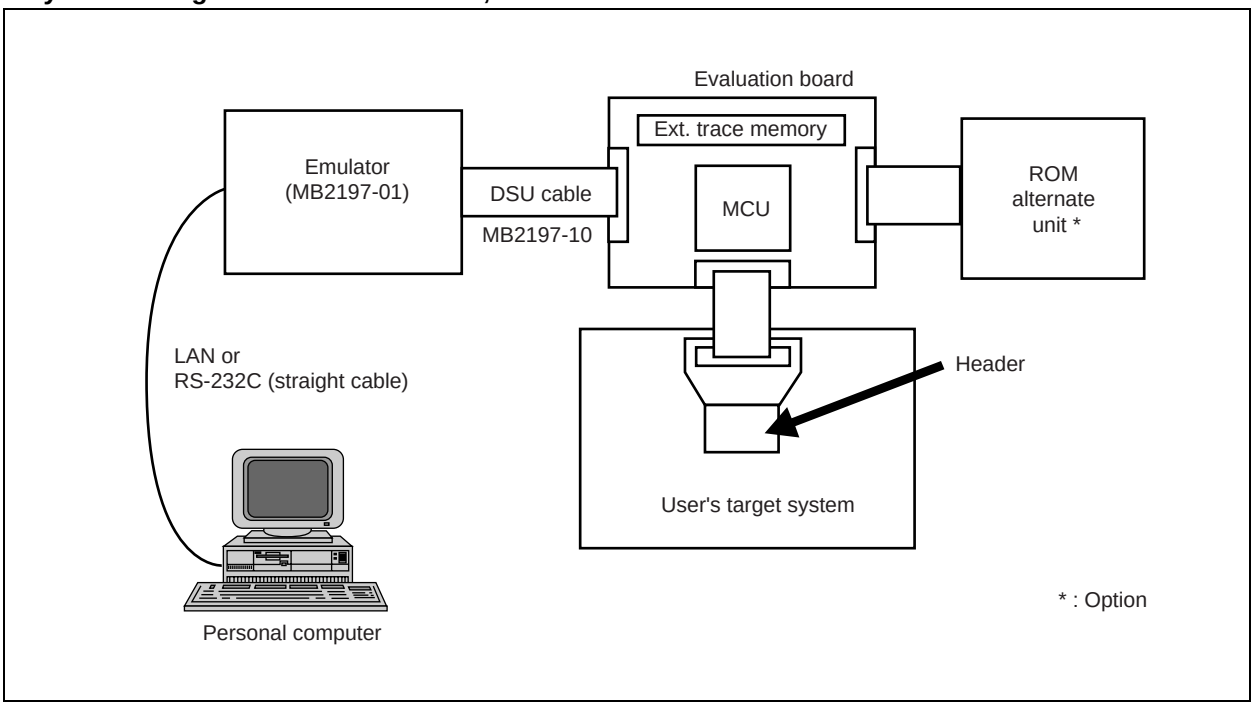
System configuration



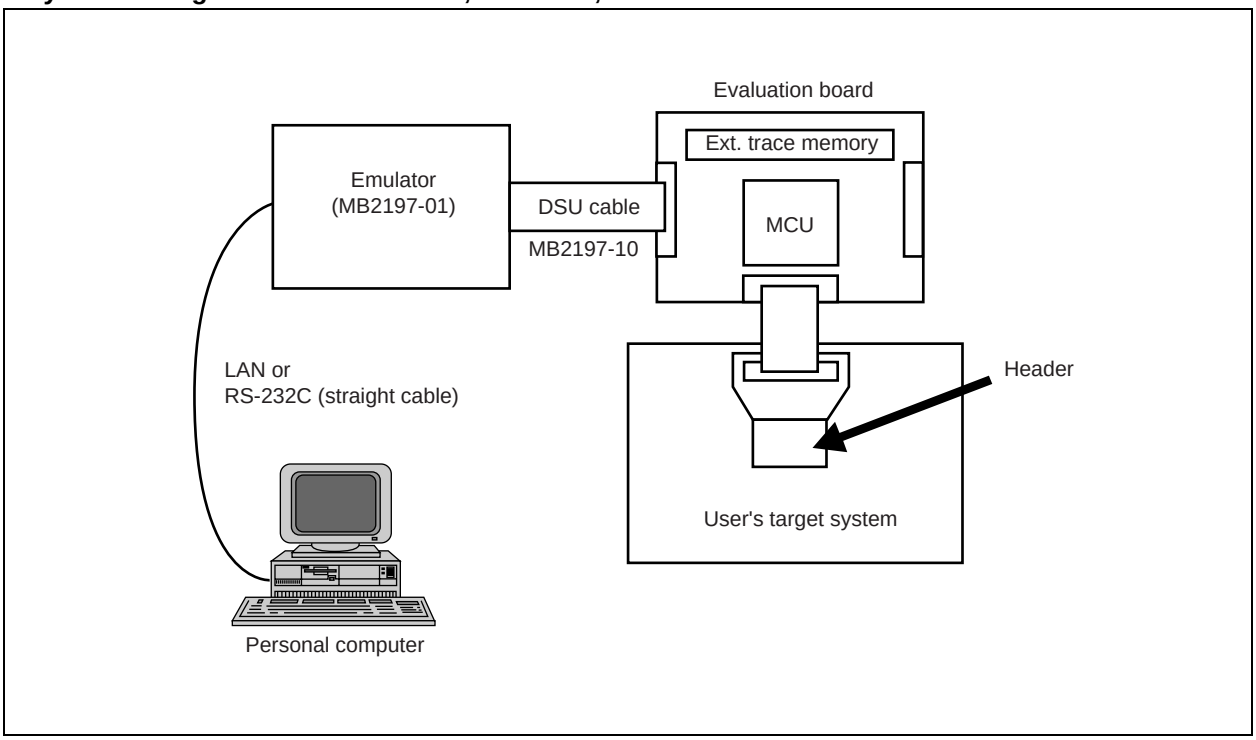
- **System configuration for MB91101A, MB91107, MB91121**



- **System configuration for MB91106A, MB91110**



- **System configuration for MB91130, MB91150, MB91340**



- **FR (DSU2/3)**

Name	Model type	Remarks
Emulator main unit for FR (DSU2/3)	MB2197-01	Dimensions : 210 mm (width) × 297 mm (depth) × 87 mm (height) Weight : 2.7 kg With MB2197-10 (DSU2/3 cable)
DSU2/3 cable	MB2197-10	Used to connect the emulator main unit to the adaptor or the evaluation board.
ROM alternate unit *	MB2197-90 (with 100-V AC adapter)	Option for FR family Memory board: Capable of substituting the memory on the target board Memory size: 4 Mbytes Data bus size: Selectable from among 8, 16, and 32-bit configurations Write protect function

*: The ROM alternate unit is directly connected to the CPU bus. To use the unit, therefore, the target board must be designed so that the unit can be connected on the board.

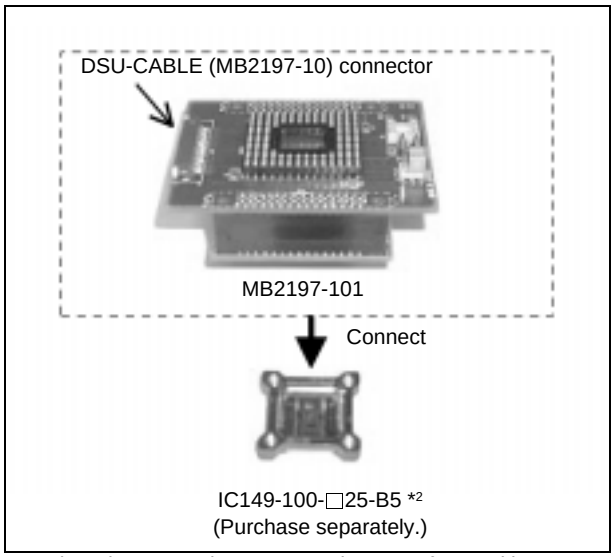
- **FR (DSU4)**

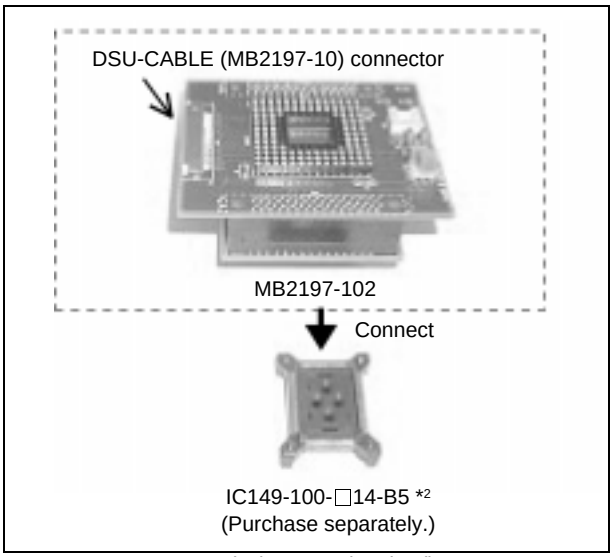
Name	Model type	Remarks
Emulator main unit for FR (DSU4)	MB2198-01	The systems development support tool which used MCU for evaluating FR and builds in DSU interface. The MB2198-01 is required separately.
DSU4 cable	MB2198-10	Used to connect the MB2198-01 to the evaluation board.

Adaptor

- **For MB91101A**

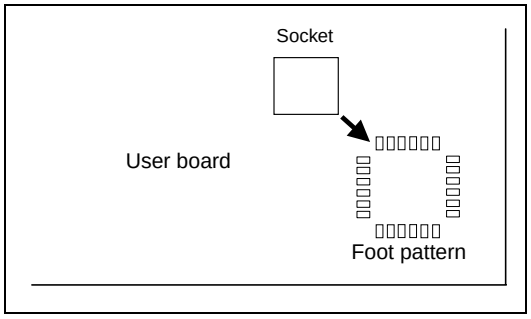
Name	Model type	Note
Adapter (LQFP-100)	MB2197-101	Adapter unit to connect the user system using an LQFP100. IC149-100-□25-B5 for MB91101A *1. The MB91V101A is required separately.
Adapter (QFP-100)	MB2197-102	Adapter unit to connect the user system using a QFP100. IC149-100-□14-B5 for MB91101A *1. The MB91V101A is required separately.





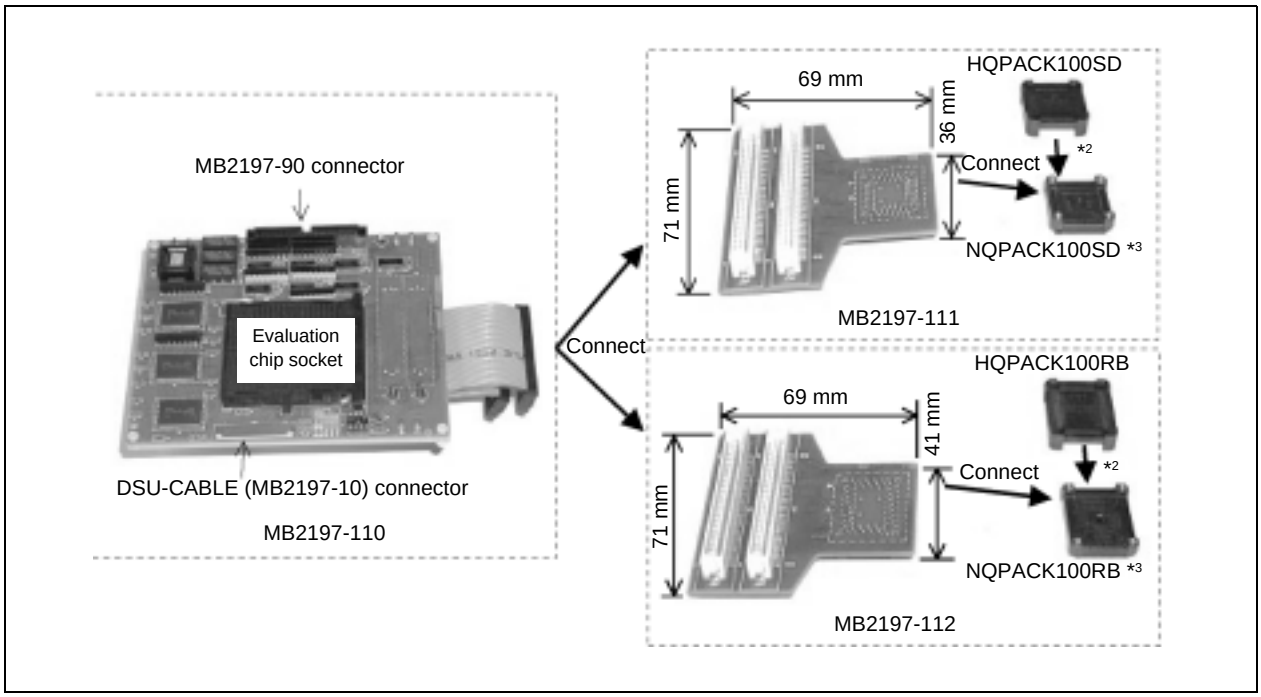
*1 : The adapter requires an IC socket manufactured by YAMAICHI ELECTRONICS Co., Ltd. (Separately priced)
<Contact> Yamaichi Electric Mfg.TEL: 81-3-3778-6121

*2 : The IC socket is mounted on the foot pattern on the user board.

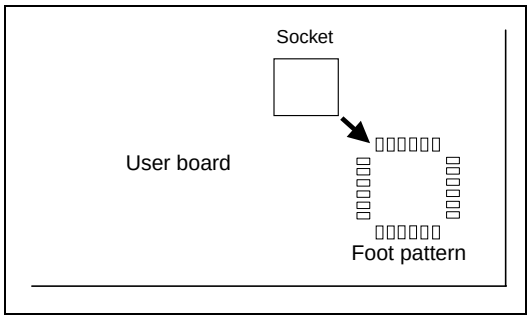


- **For MB91106A/MB91F109**

Name	Model type	Note
PGA299P evaluation board for FR-DSU3	MB2197-110	Connected with the MB2197-10. Used along with the MB2197-111 or MB2197-112. Capable of connection to the ROM overlay unit (MB2197-90). A header cable is bundled. The MB91V106A is required separately.
LQFP100P header for MB2197-110	MB2197-111	LQFP100 header board for MB2197-110. Used to connect the evaluation board to the user board. The NQPACK100SD and HQPACK100SD are bundled. *1 The pin spacing is 0.5 mm.
QFP100P header for MB2197-110	MB2197-112	QFP100 header board for MB2197-110. Used to connect the evaluation board to the user board. The NQPACK100RB and HQPACK100RB179 are bundled. *1 The pin spacing is 0.65 mm.

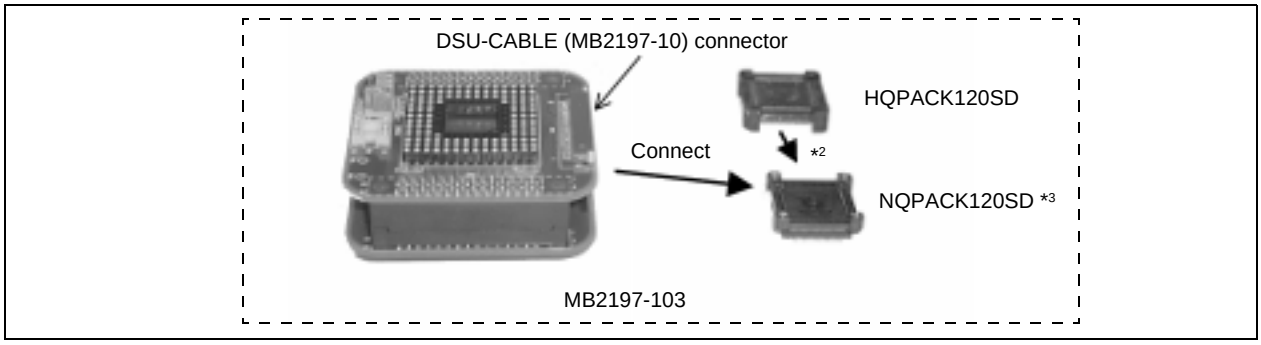


*1 : The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661
*2 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.
*3 : The IC socket is mounted on the foot pattern on the user board.



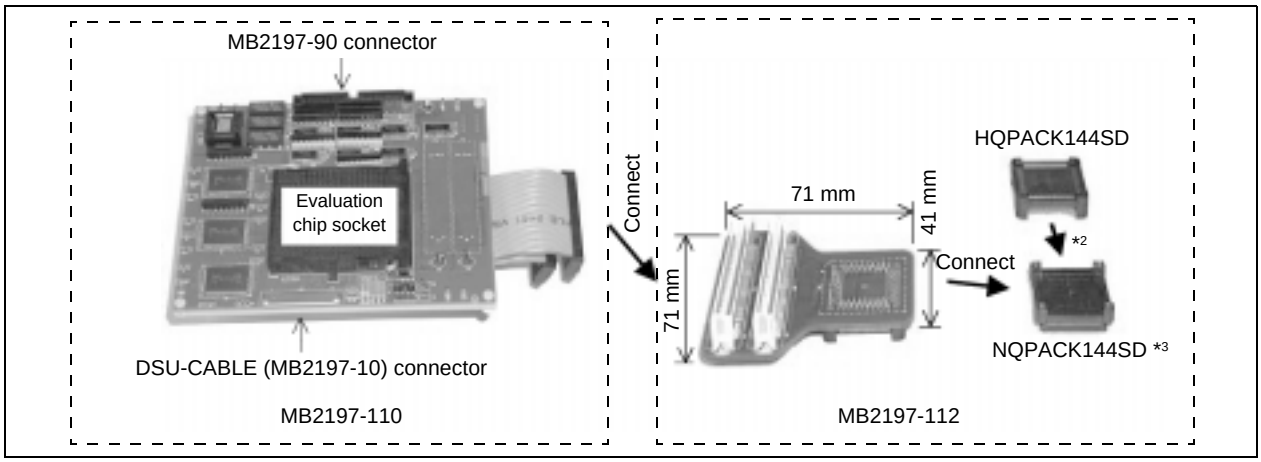
- **For MB91107/MB91108**

Name	Model type	Note
Adapter (LQFP-120)	MB2197-103	Adapter unit to connect the user system using an LQFP120. The NQPACK120SD and HQPACK120SD are bundled. *1 The MB91V108 is required separately.



- **For MB91110**

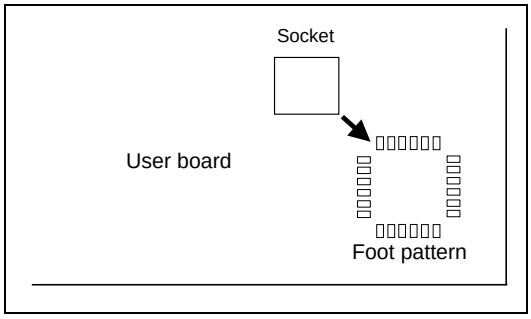
Name	Model type	Note
PGA299P evaluation board for FR-DSU3	MB2197-110	Connected with the MB2197-10. Used along with the MB2197-115. Capable of connection to the ROM overlay unit (MB2197-90). A header cable is bundled. The MB91V110 is required separately.
LQFP-144 header for MB2197-110	MB2197-115	LQFP144 header board for MB2197-110. Used to connect the evaluation board to the user board. The NQPACK144SD and HQPACK144SD are bundled. *1



*1 : The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661

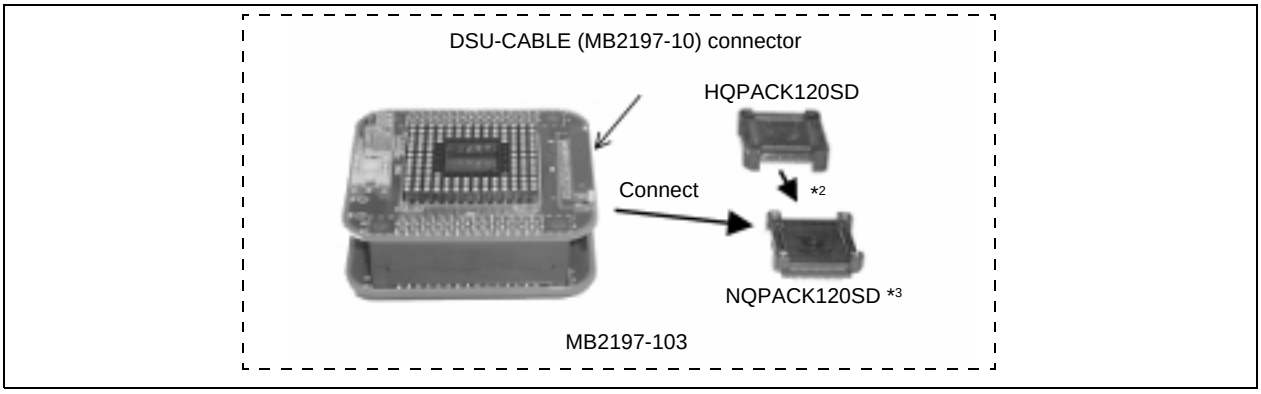
*2 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*3 : The IC socket is mounted on the foot pattern on the user board.



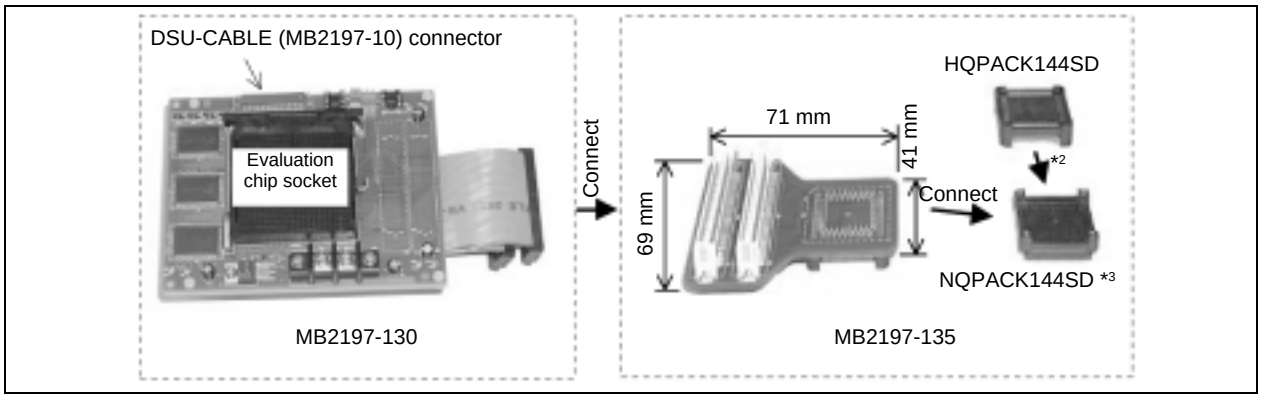
- **For MB91121**

Name	Model type	Note
Adapter (LQFP-120)	MB2197-103	Adapter unit to connect the user system using an LQFP120. The NQPACK120SD and HQPACK120SD are bundled. *1 The MB91V121 is required separately.



- **For MB91133/MB91F133**

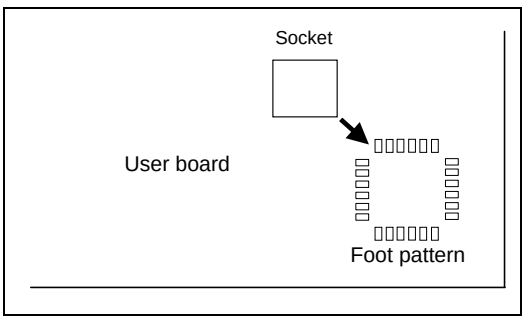
Name	Model type	Note
PGA299P evaluation board type 2 for FR-DSU3	MB2197-130	Connected with the MB2197-10. Used along with the MB2197-135. A header cable is bundled. The MB91FV130 is required separately.
LQFP-144 header type 2	MB2197-135	LQFP144 header board for MB2197-130. Used to connect the evaluation board to the user board. The NQPACK144SD and HQPACK144SD are bundled. *1



*1 : The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661

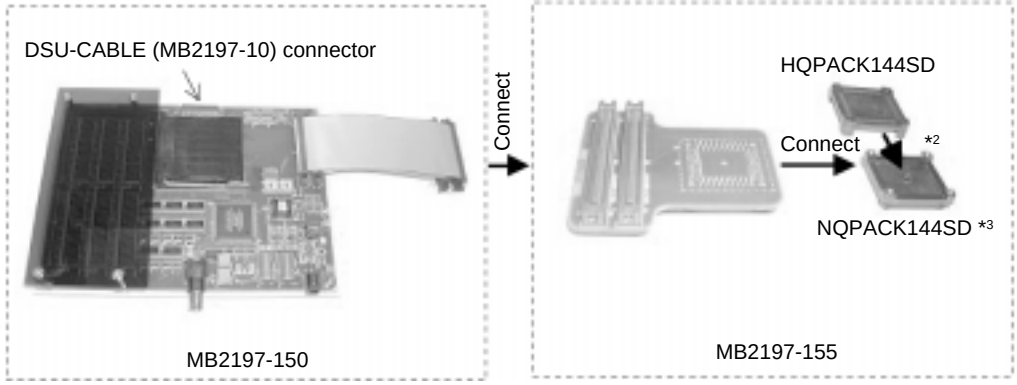
*2 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*3 : The IC socket is mounted on the foot pattern on the user board.

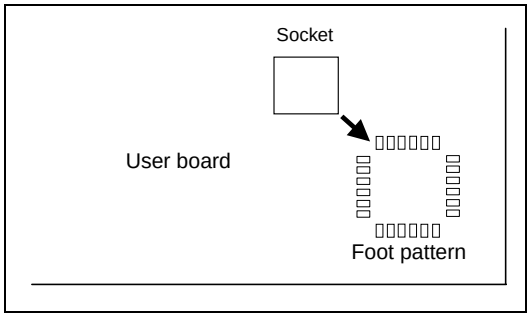


- **For MB91154 and MB91F155**

Name	Model type	Note
Adapter unit for MB91FV150	MB2197-150	Connected with the MB2197-10. Capable of real-time display of internal RAM (6 points). Built-in function for measuring two-point execution time. Allowing the evaluation board to run freely without an emulator. Used along with the MB2197-155. The MB91FV150 is required separately.
LQFP-144 header	MB2197-155	Header board for MB2197-150. Used to connect the evaluation board to the user board. The NQPACK144SD and HQPACK144SD are bundled. *1



*1 : The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661
*2 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.
*3 : The IC socket is mounted on the foot pattern on the user board.

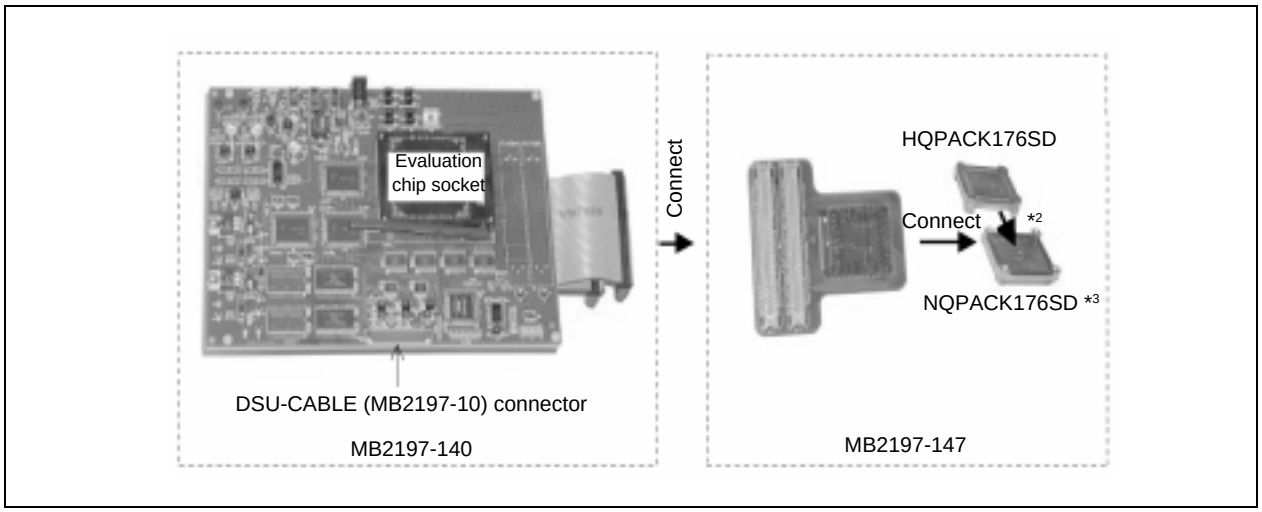


- **For MB91307**

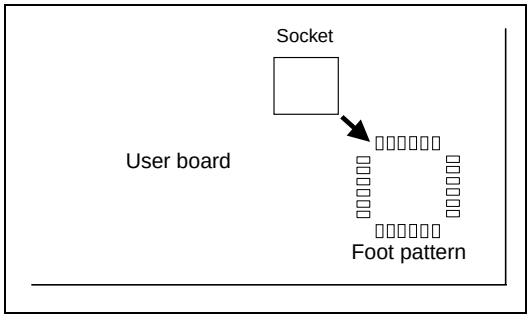
Contact : Yokogawa Digital Computer Corporation
TEL: 81-42-333-6222 (Key No.) FAX: 81-42-352-6107
URL http://www.ydc.co.jp/advice

- **For MB91340**

Name	Model type	Note
Evaluation board for MB91340	MB2197-140	Connected with the MB2197-10. Used along with the MB2197-147. A header cable is bundled. The MB91V340 is required separately.
LQFP-176 header	MB2197-147	Header board for MB2197-140. Used to connect the evaluation board to the user board. The NQPACK176SD and HQPACK176SD are bundled. *1

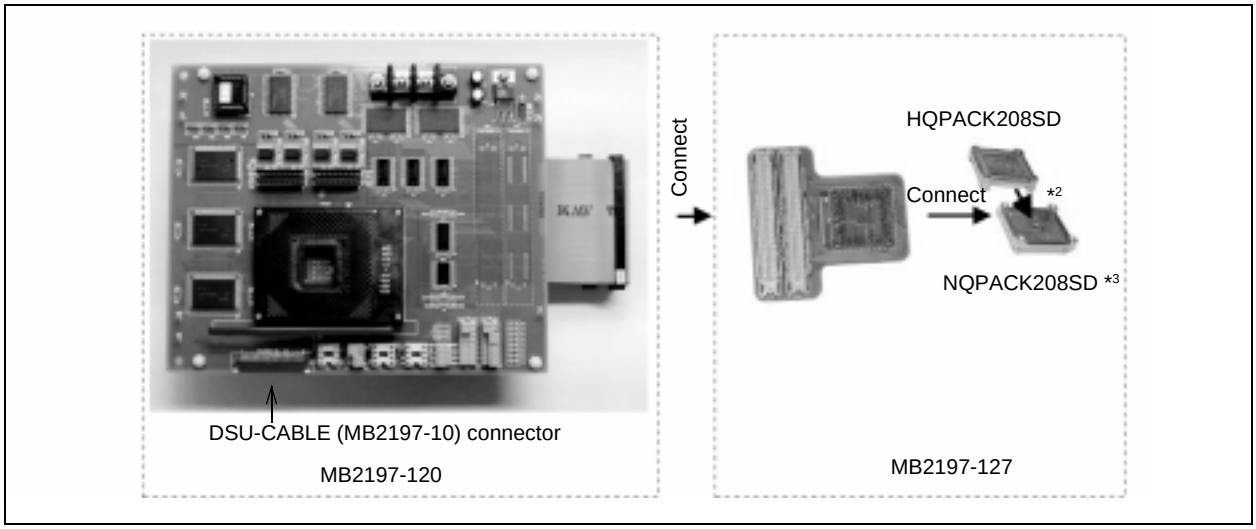


*1 : The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661
*2 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.
*3 : The IC socket is mounted on the foot pattern on the user board.

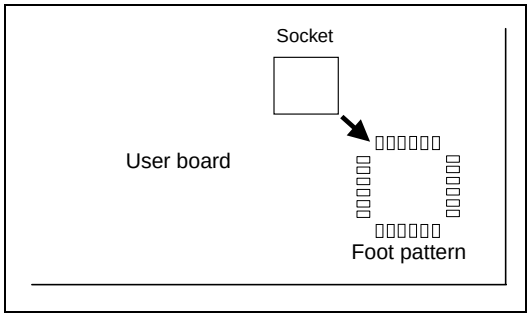


- **For MB91360**

Name	Model type	Note
PGA401P evaluation board for MB91360	MB2197-120	Connected with the MB2197-10. Equipped with an external trace for evaluation device and user overlay memory. The MB91FV360 is required separately.
QFP208P header	MB2197-127	QFP208 header board for MB2197-120. Connected to the user board. The NQPACK208SD and HQPACK208SD are bundled. *1



*1 : The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661
*2 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.
*3 : The IC socket is mounted on the foot pattern on the user board.



FLASH Adaptor unit for FR families

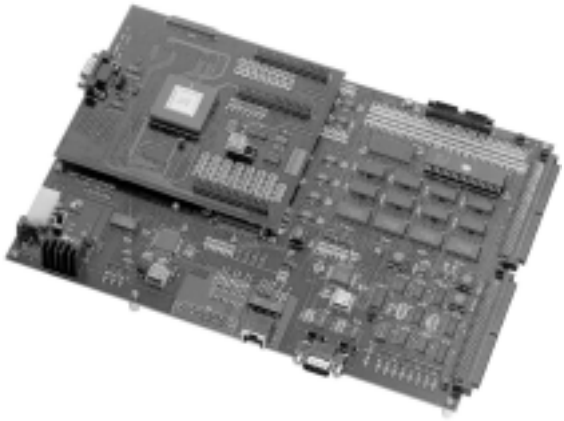
Part number	Package (leadpitch, body size)		Package code	Adaptor unit *1, *2
MB91F109PF	QFP-100	(0.65 mm, □14 × 20 mm)	FPT-100P-M06	MF00-783
MB91F109PFV	LQFP-100	(0.65 mm, □14 × 14 mm)	FPT-100P-M05	MF00-782
MB91F133PMT2	LQFP-144	(0.5 mm, □20 × 20 mm)	FPT-144P-M08	MF00-871
MB91F133PBT	BGA-144	(0.8 mm, □12 × 12 mm)	BGA-144P-M01	MF00-870
MB91F155PMT2	QFP-144	(0.5mm , □20 × 20mm)	FPT-144P-M08	MF13-1003
MB91F362GAPFVS	QFP-208	(0.5mm , □28 × 28mm)	FPT-208P-M04	MF00-892

*1: Recommended EPROM programer: Minato Electronics MODEL 1890A + OU910 later than ver. 4.32q.
TEL (81)45-591-5611 FAX (81)45-591-6451
*2: Adapter socket was supply from Minato Electronics

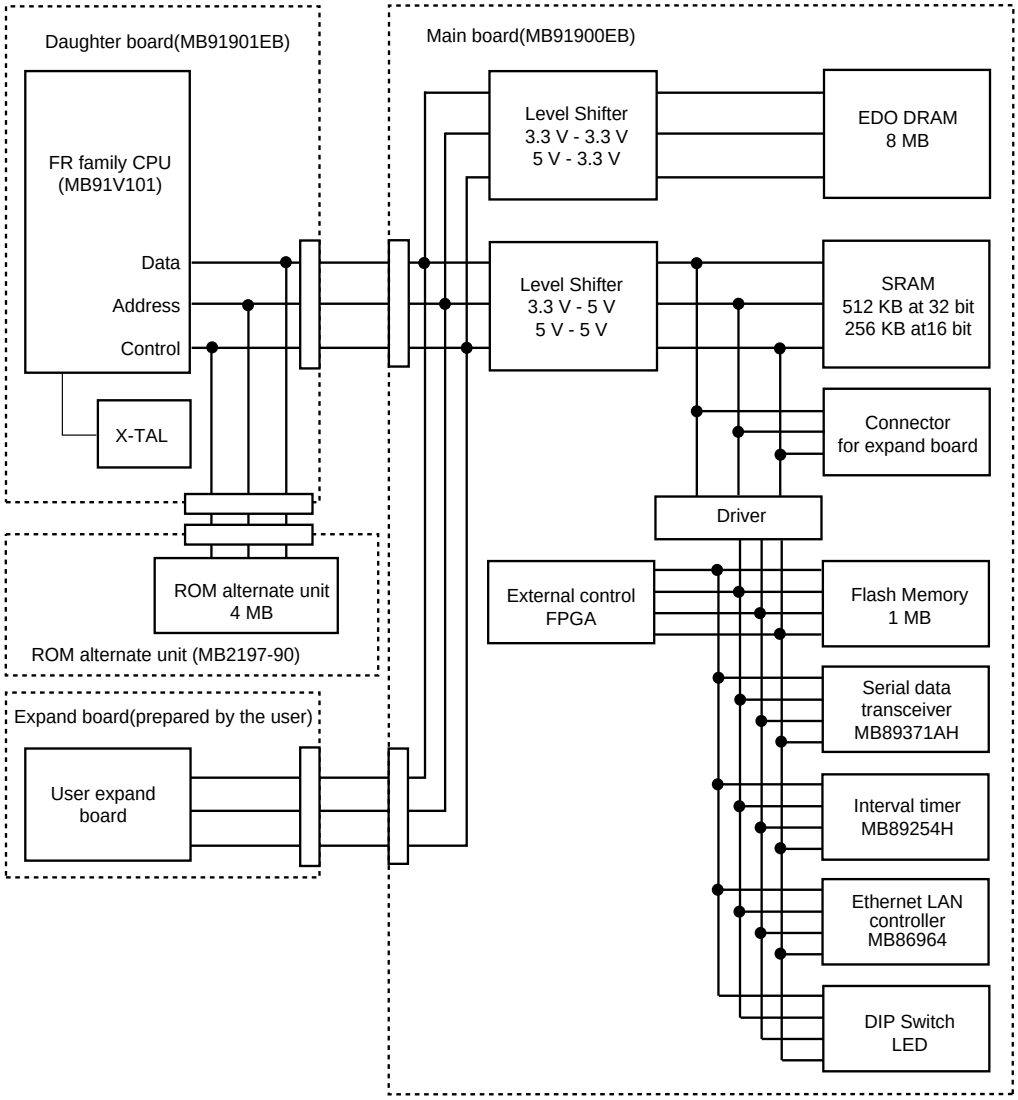
FR families Evaluation Board

- The FR30 series evaluation board can be used as a target board for running the emulator.
  The board consists of a main board and a daughter board. The main board can be used commonly for the FR30 series of microcontrollers.
- Since the evaluation board has SDRAM, DRAM, and FLASH memory mounted, it can be used to test CPU performance or to configure a hardware circuit using the extension board connector on the main board.
- The ROM alternate unit (MB2197-90) can be connected to the evaluation board.
- The evaluation board can be used in combination with the MB2197-01 (emulator), for example, in the following configuration:
  MB2197-01 + MB2197-10 + MB91906EB (main board) + MB91901EB (daughter board)

System overview



Evaluation board block diagram



Main Board

Name	Part number	Remarks
Evaluation board for FR families (NEW MAIN BOARD)	MB91906EB	With 100-V AC adapter. It is available according to the combination of daughter board as the target board of FR family for 3V or 5V power supply voltage (MB91130 is excluded). The capacity of Flash ROM or DRAM is increased. The succeeding model of MB91900EB (the evaluation board for FR family) .

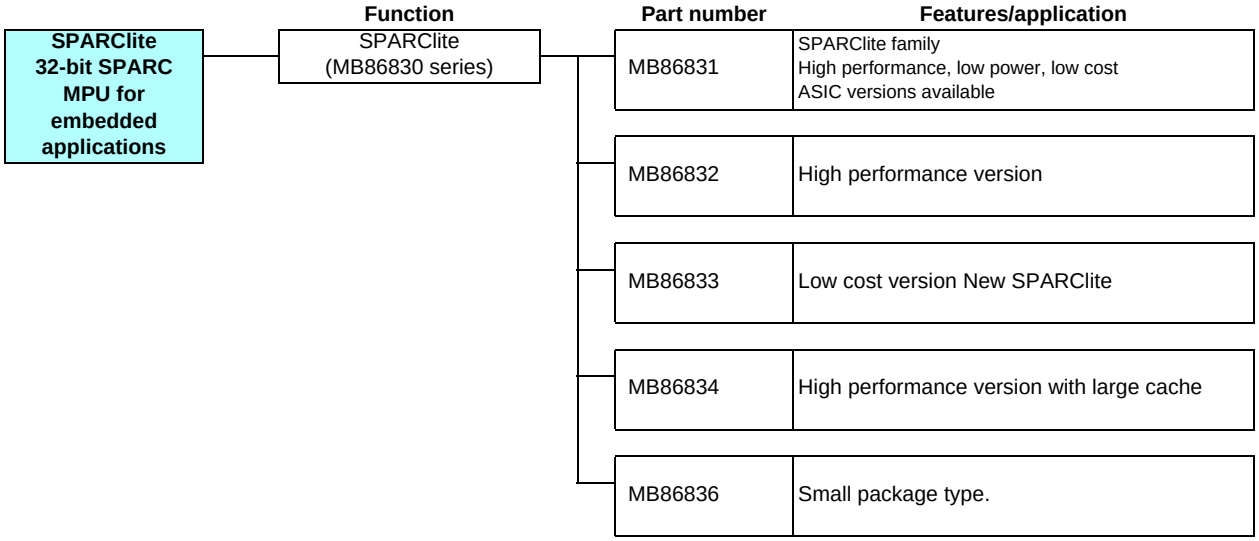
Daughter Board

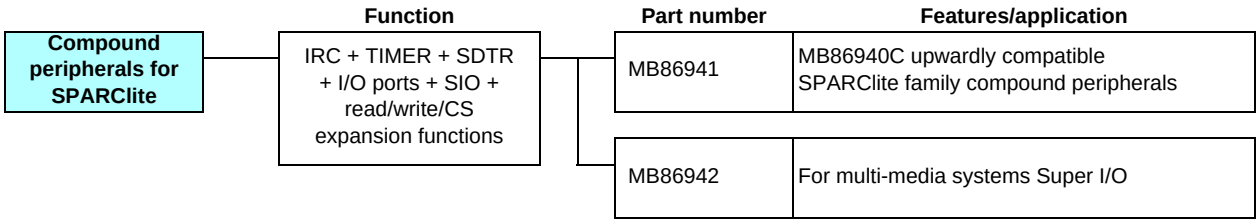
Name	Part number	Remarks
Daughter board for MB91101A	MB91901EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available. MB91V101A premounted. Connectable with ICE made by Fujitsu.
	MB91902EB	Connectable with ICE for MB91101A made by Yokogawa Digital Computer Corporation.
Daughter board for MB91106/F109	MB91910EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91107/108/121	MB91907EB	Connectable with ICE made by Fujitsu. It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91110	MB91904EB	Connectable with ICE for MB91110 made by Fujitsu.
Daughter board for MB91F130	MB91908EB	Connectable with ICE made by Fujitsu by using the evaluation board.
Daughter board for MB91150 series	MB91911EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91307A	Under development	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91340 series	MB91912EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91362GA	MB91913EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.

Simple Target Board

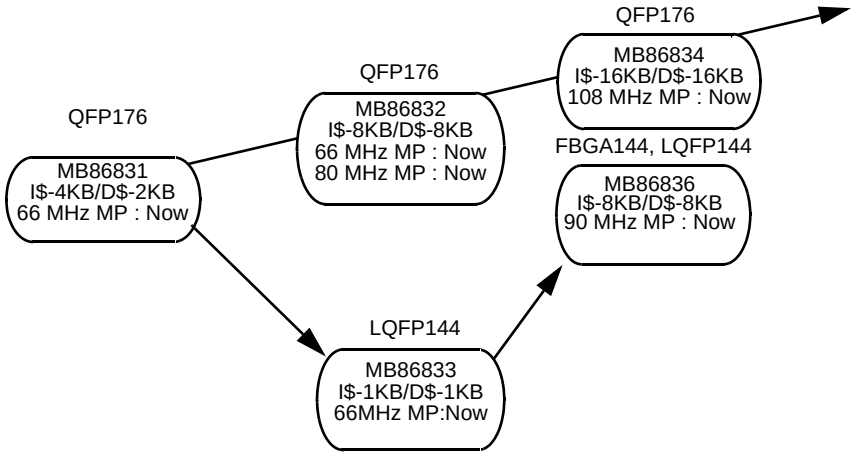
Name	Part number	Remarks
Simple target board for ICE connection for MB91101A (FR30 SRAM board)	MB91903EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + simple target board and available. MB91V101A premounted. Connectable with ICE for MB91101A made by Fujitsu.

32-bit SPARC Family SPARClite





SPARClite 32-bit MPU for Embedded Applications



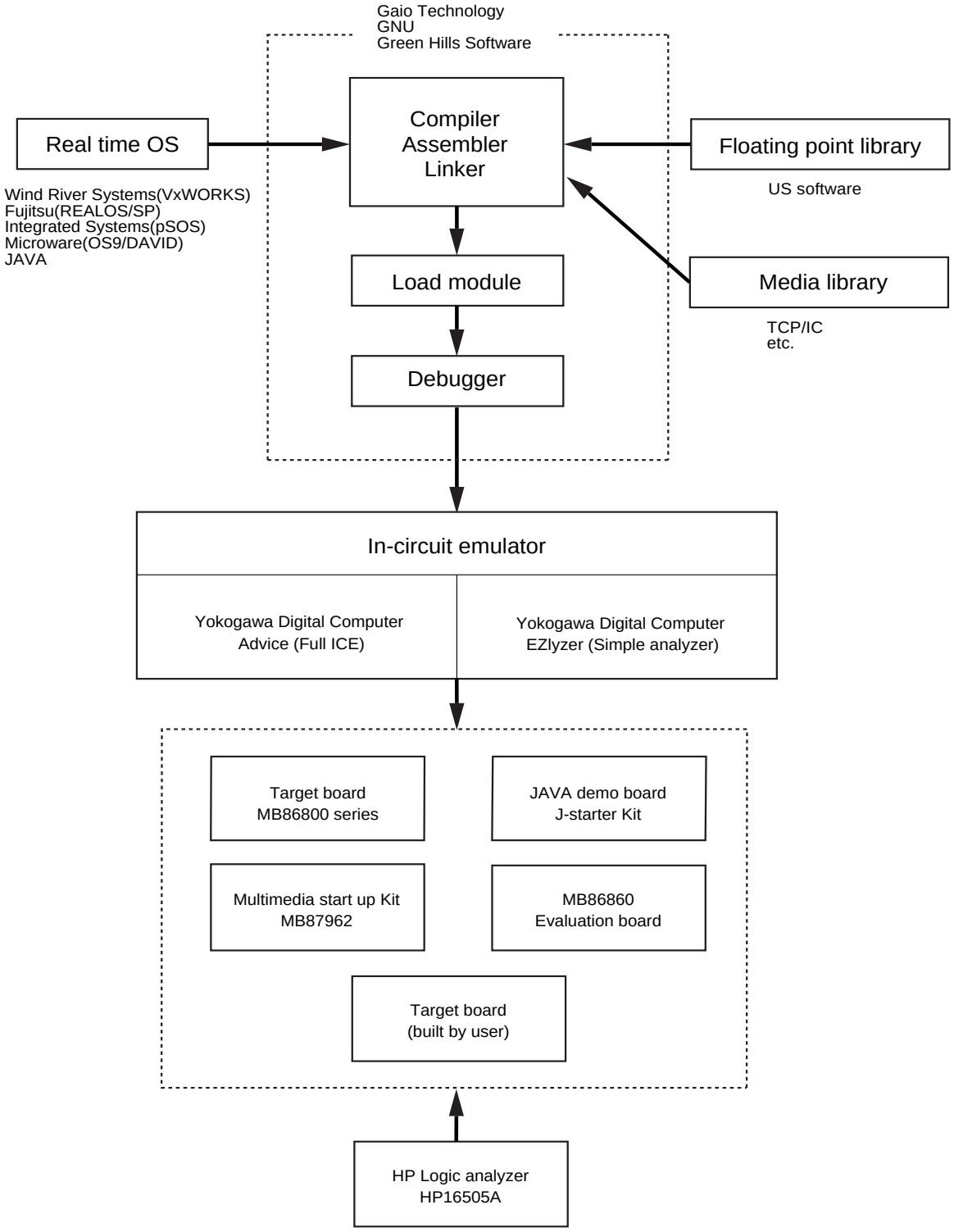
Part number	Operating power supply voltage (V)	Maximum Operating Frequency	Package			Functions								
			QFP	LQFP	BGA	Internal FPU	Clock doubler	Internal cache (instruction/data)	DMAC	DRAM controller	SDRAM controller	Interrupt controller	Timer	JTAG
MB86831	+5±0.25/ +3.3±0.15 *3	66MHz (33MHz external)	176P*1	—	—	—	○	4K/2K	—	○	—	8 ch	—	—
MB86832		80MHz (40MHz external)	176P*1	—	—	—		8K/8K						
MB86833		66MHz (33MHz external)	—	144P*2	—	—		1K/1K						
MB86834	+3.3±0.15 +2.5±0.1 *4	108MHz (36MHz external)	176P*1	—	—	—		16K/16K						
MB86836	+3.3±0.15 *4	90MHz (40MHz external)	—	144P*2	144P	—		8K/8K		—			○	○

*1: 0.5mm pitch QFP
*2: 0.5mm pitch LQFP
*3: When an external 3.3V interface used = 3.3V single power supply is required.
When an external 5V interface used = 3.3V/5V dual power supplys are required.
*4: 2.5(± 0.1)V/3.3V dual power supplys are required.
Package: P - Plastic, C - Ceramic

Compound Peripherals for SPARClite

Part number	Operating power supply voltage (V)	Maximum Operating Frequency	Package	Functions
MB86941	+5 ± 5%	40 MHz	QFP-144P (0.5 mm pitch)	IRC + TIMER + SDTR + I/O ports + SIO + read/write/CS expansion functions
MB86942	+3.3 ± 0.15%	50 MHz	QFP-144P (0.5 mm pitch)	RC + TIMER + SDTR + I/O ports + SIO + read/write/CS expansion functions

SPARClite Development Procedure



Global Contact

The contacts only in North America and Japan are listed here. See "CONTACT" website for the contacts in other countries.

• Green Hills Software Inc.
WEBSITE: http://www.ghs.com/
CONTACT: http://www.ghs.com/html/sales.html

North America
Ada Sales
TEL: +1-813-781-4909 FAX: +1-813-781-3915
EMAIL: adasales@ghs.com

Japan
Advanced Data Controls
WEBSITE: http://www.adac.co.jp/
TEL: +81-3-3576-5351 FAX: +81-3-3576-1772

• Cygnus Solutions
WEBSITE: http://www.cygnus.com/
CONTACT: http://www.cygnus.com/contact/

North America
Corporate Headquarters
TEL: +1-408-542-9600 800-cygnus-1(toll free in USA)
FAX: +1-408-542-9699
EMAIL: info@cygnus.com

Japan
Nihon Cygnus Solutions
WEBSITE: http://www.cygnus.co.jp/
TEL: +81-3-3234-3896 FAX: +81-3-3239-3300
EMAIL: info@cygnus.co.jp

• US Software
WEBSITE: http://www.ussoftware.com/
CONTACT: http://www.ussoftware.com/

North America
TEL: +1-503-844-6614 800-356-7097(toll free in USA)
FAX: +1-503-844-6480
EMAIL: info@ussw.com

Japan
A.I.Corporation
WEBSITE: www.aicp.co.jp
TEL: +81-3-3493-7981 FAX: +81-3-3493-7993
EMAIL: sales@aicp.co.jp

• Wind River systems
WEBSITE: http://www.wrs.com/
CONTACT: http://www.wrs.com/corporate/html/wrintoff.html

North America
TEL: +1-510-748-4100 800-545-WIND(toll free in USA)
FAX: +1-510-749-2010
EMAIL: inquiries@wrs.com

Japan
TEL: +81-03-5467-5900 FAX: +81-03-5467-5877

• Integrated Systems Inc.
WEBSITE: http://www.isi.com/
CONTACT: http://www.isi.com/AboutISI/Contacts/

North America
TEL: +1-408-542-1500 800-543-pSOS(toll free in USA)
FAX: +1-408-542-1950
EMAIL: info@isi.com

Japan
Tachibana (pSOSystem)
TEL: +81-3-3791-1511 FAX: +81-3-3791-1516
EMAIL: tactomo@magical.egg.or.jp

• Microware Systems Corporation
WEBSITE: http://www.microware.com/index.html
CONTACT: http://www.microware.com/html/contact.html

North America
TEL: +1-515-223-8000 800-475-9000(toll free in USA)
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E-mail: info@microware.com

Japan
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E-mail:info@microware.co.jp

• Accelerated Technology Incorporated
WEBSITE: http://www.nucleus.com/
CONTACT: http://www.atinucleus.com/intro.htm

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Toll Free in USA: 1-800-468-6853
TEL: +1-334-661-5770 FAX: +1-334-661-5788
EMAIL: info@atinucleus.com

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Grape Systems, Inc.
TEL: +81-45-323-6541 FAX: +81-45-323-6545
EMAIL: nakajo@yokahama.grape.co.jp

• Synopsys
WEBSITE: http://www.synopsys.com/home.html
CONTACT: http://www.synopsys.com/company/locations/japan.html

North America
TEL: +1-602-468-6900 FAX: +1-602-468-9055
http://www.synopsys.com/company/locations/us.html

Japan
Nihon Synopsys Co., Ltd
TEL: +81-3-3346-7030 FAX: +81-3-3346-7050

• Yokogawa Digital Computer Corporation

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Orion Instruments Inc.
WEBSITE: http://www.oritools.com
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Ashling Microsystems Limited
WEBSITE: http://www.ashling.com
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Yokogawa Digital Computer Corporation
WEBSITE:http://www.ydc.co.jp
TEL: +81-42-333-6222 FAX: +81-42-352-6107

• Yokogawa Electric Corporation
WEBSITE: http://www.yokogawa.co.jp/
CONTACT: http://www.yokogawa.co.jp/Eda/ceeds/contact_e/contact_e.htm

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EMAIL:sam.yoshikawa@webjapan.com

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EDA Cente, Yokogawa Electric Corporation
TEL: +81-422-52-5589 FAX: +81-422-52-4892
EMAIL: edainfo@mls.yokogawa.co.jp

µITRON Specification Real Time OS for SPARClite (REALOS/SP)

(1) Product Overview

REALOS/SP is a real time OS for the SPARClite (MB86930) series. The SPARClite series is a 32-bit RISC chip from Fujitsu that uses the SPARC architecture and is aimed at embedded applications.
REALOS/SP complies with the µITRON 3.0 specifications.

- Features
  Complies with the µITRON 3.0 specifications
  System design suitable for use with 32-bit MCUs in control applications
  High speed dispatch and interrupt processing
  Configurator support uses a multi-window system
  Supports modular loading
  Sample I/O drivers are provided
- REALOS/SP Specifications

Item	Description
Target CPU	SPARClite series (MB86930 series)
Maximum number of tasks	65 or 535
Maximum number of priorities	32
Scheduling method	Priority-based, event-driven
Number of system calls	50
Standards compliance	Complies with µITRON 3.0 specifications
Kernel programming language	Assembly language
Application programming languages	C, assembly languages
Kernel size	Approximately 5.0KB (resident) to approximately 10.0KB (maximum configuration)

(2) Product Structure

- Kernel

  Provides the basic functions of the real time OS. This is an event-driven, multi-tasking, real time OS. You can selectively incorporate only those system calls that are used by the application.

- System Calls

Function	Instruction	DescriptionDescription
Task management	**sta_tsk**	Start task
	ext_tsk	Terminate own task
	ter_tsk	Forcibly terminate other task
	dis_dsp	Disable dispatching
	ena_dsp	Enable dispatching
	chg_pri	Change task priority
	rot_rdq	Rotate task ready queue
	rel_wai	Release other task from wait
	get_tid	Get own task ID
	ref_tsk	Get task state
Task synchronization	**sus_tsk**	Forcibly set other task to wait state (suspend)
	rsm_tsk	Restart suspended task
	frsm_tsk	Forcibly restart suspended task
	slp_tsk	Set own task to wait for wakeup
	tslp_tsk	Set own task to wait for wakeup (with timeout)
	wup_tsk	Wakeup other task
	can_wup	Cancel task wakeup request
Synchronization and communications	**sig_sem**	Signal a semaphore
	wai_sem	Wait on a semaphore
	preq_sem	Wait on a semaphore (polling)
	ref_sem	Get semaphore state
	set_flg	Set event flag
	clr_flg	Clear event flag
	wai_flg	Wait on an event flag
	pol_flg	Wait on an event flag (polling)
	ref_flg	Get event flag state
	snd_msg	Send to mailbox
	rcv_msg	Receive from mailbox
	prcv_msg	Receive from mailbox (polling)
	ref_mbx	Get mailbox state
Interrupt management	**ret_int**	Return from interrupt handler
	loc_cpu	Disable interrupts and dispatching
	uni_cpu	Enable interrupts and dispatching
	chg_ipl	Change interrupt level
	ref_ipl	Get interrupt level
Memory pool management	**get_blk**	Get memory block
	pget_blk	Get memory block (polling)
	rel_blk	Release memory block
	ref_mpl	Get memory pool state
Time management	**set_tim**	Set system clock
	get_tim	Read system clock
	dly_tsk	Delay task
	def_cyc	Define cyclic handler
	act_cyc	Control/activate cyclic handler
	ref_cyc	Get state of cyclic handler
	def_alm	Define alarm handler
	ref_alm	Get state of alarm handler
	ret_tmr	Return from timer handler
System management	**get_ver**	Get version number
	ref_sys	Get system state

- Configurator

  A configurator program with a multi-window user interface is provided to generate executable programs with an optimized execution environment for the kernel and application.

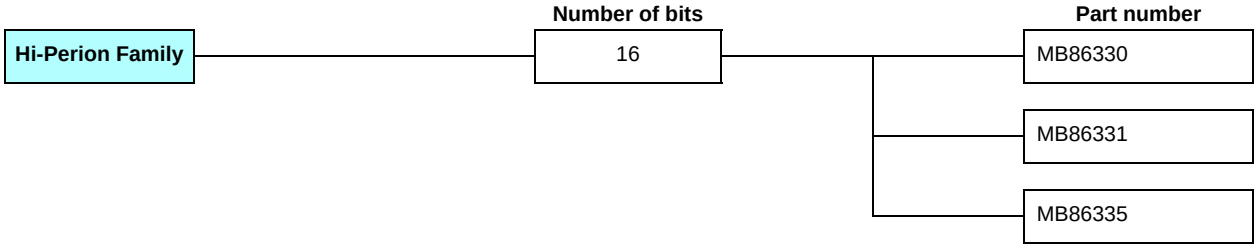
- Sample I/O drivers

  Source code is provided for sample I/O drivers.

- Sample programs

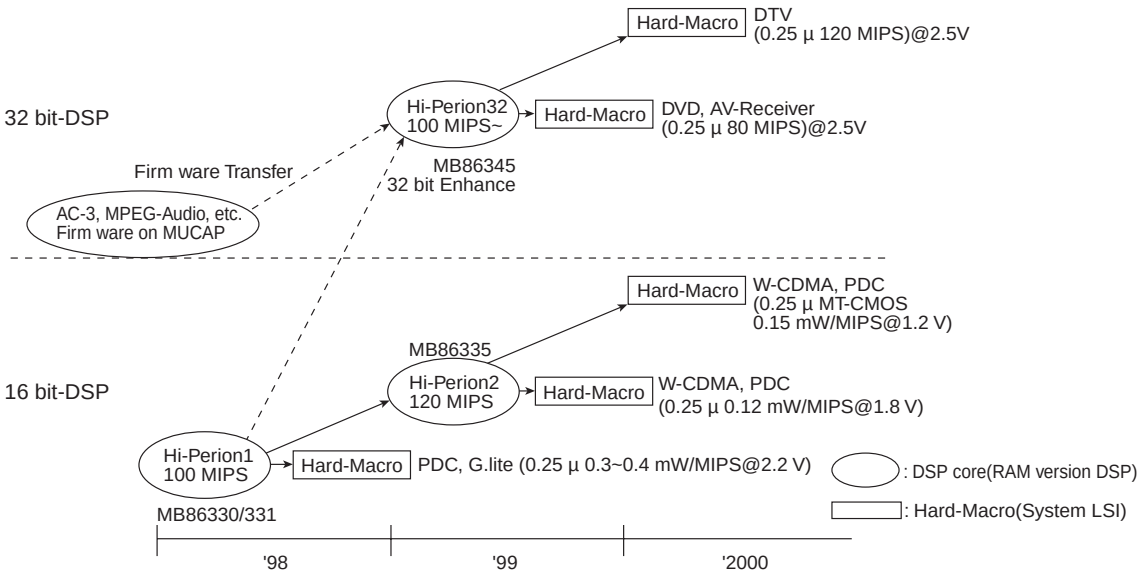
  These provide practical programming examples for user training.

Digital Signal Processor Hi-Perion Family



Digital Signal Processor Hi-Perion Family

Hi-Perion Family



Part Number	Operating Power Supply Voltage(V)	Package		Features
		QFP	PGA	
MB86330	3.3 single	—	256C	Fixed point operations: Multiplication 16bit × 16bit → 31bit Addition 40bit + 40bit → 40bit Sum of products 40bit ± 16bit × 16 bit → 40bit Processing performance 100MIPS max. Data RAM: dual-port simultaneous access structure Supports external RAM (ERAM) Uses memory-mapped I/O (I/O is assigned to addresses in the memory space.) Instruction RAM ← 48KW x 16-bit Table RAM ← 16KW x 16-bit Addressing: Two independent addressing units Eight general-purpose registers Register-update addressing Circular addressing Two address update registers
MB86331	3.3 single	208P	—	Fixed point operations: Multiplication 16bit × 16bit → 31bit Addition 40bit + 40bit → 40bit Sum of products 40bit ± 16bit × 16bit → 40bit Processing performance 80MIPS max.@2.5 V Data RAM: dual-port simultaneous access structure Supports external RAM (ERAM) Uses memory-mapped I/O (I/O is assigned to addresses in the memory space.) Instruction RAM ← 62KW x 16-bit Table RAM ← 20KW x 16-bit Addressing: Two independent addressing units Eight general-purpose registers Register-update addressing Circular addressing Two address update registers
MB86335	3.3 single	208P	—	Fixed point operations: Multiplication 16bit × 16bit → 31bit Addition 40bit + 40bit → 40bit Sum of products 40bit ± 16bit × 16bit → 40bit Processing performance 120MIPS max.@2.5 V Data RAM: dual-port simultaneous access structure Supports external RAM (ERAM) Uses memory-mapped I/O (I/O is assigned to addresses in the memory space.) Instruction RAM ← 62KW x 16-bit Table RAM ← 32KW x 16-bit Addressing: Two independent addressing units Eight general-purpose registers Register-update addressing Circular addressing Two address update registers

Packages: P - plastic, C - ceramic

Hi-Perion Family Development Tools

(1) C compiler

ANSI C compliant XCC-V C compiler from GAIO.

Runs on Windows and UNIX operating systems.

(2) Analyzer

XASS-V series from GAIO.

Full support for Hi-Perion assembly mnemonics.

Supports user-defined structure macros using XMAC-V.

Link using XLNK-V.

User libraries can be created using the XLIB-V librarian.

Runs on Windows and UNIX operating systems.

(3) Simulator

XDBX-V simulator debugger from GAIO.

Full support for Hi-Perion assembly code.

Supports source level debugging.

Runs on Windows and UNIX operating systems.

(4) Emulator 1

XDDI-V ICE debugger from GAIO

Supports source level debugging.

Runs on Windows and UNIX operating systems.

(5) Emulator 2

MicroVIEW-G ICE debugger from Yokogawa Digital Computer.

Supports source level debugging.

Runs on Windows operating system.

(6) ICE

Full emulation using ADVICE (ICE pod) from Yokogawa Digital Computer.

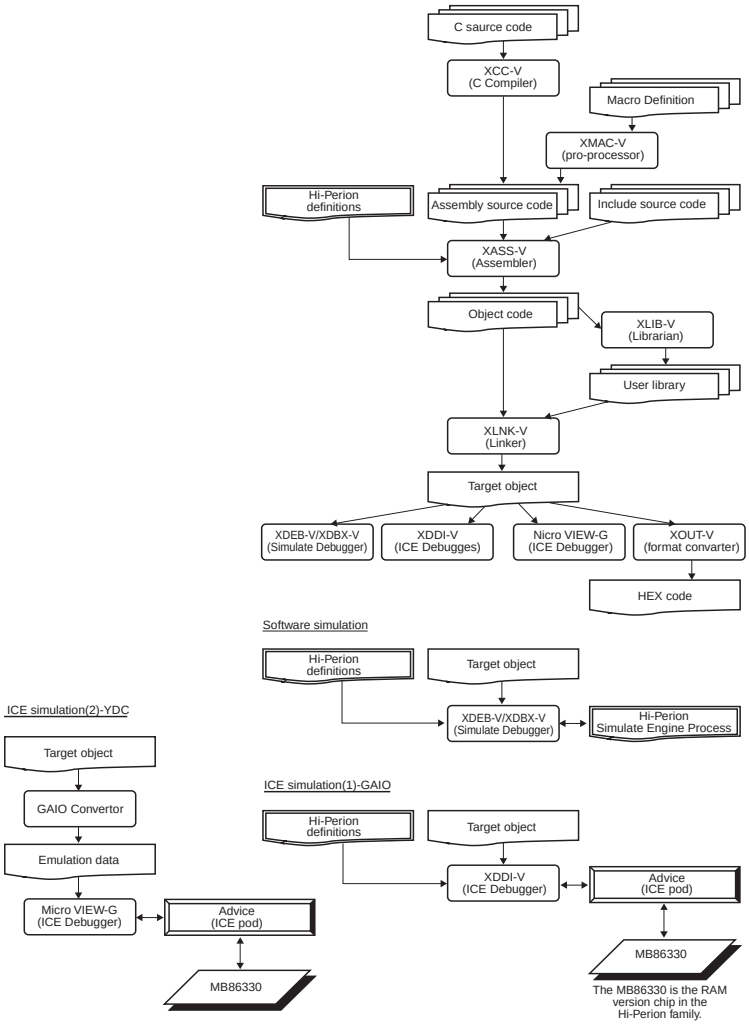
Supports 10Base-T interface

Max. 100MHz operation

(7) System Simulator

DSP model (Cadence SPW™)

I.S.S. (Instruction set Simulator) model



<Contact for development environment>

Gaio Technology Co. Ltd.
TEL: 03-3662-3041
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1376 Borregas Avenue Sunnyvale, California 94089-1004
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Fax. 408-747-0688
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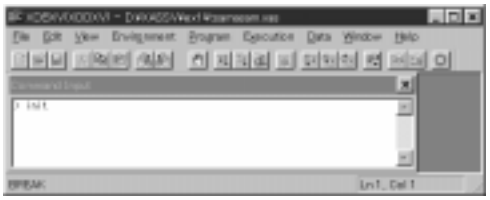
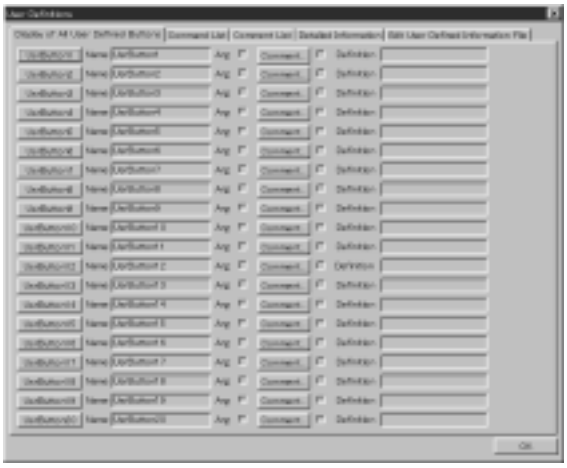
Keith Potter
Tel. 01256-811998
Fax. 01256-811761
Email: sales@ash-uk. demon. co. uk
http://www.ashling.com
YD Systems Co. Ltd.

- Gaio Technology Co. Ltd. XASS-V series Assembler/XDBX-V Sofrware Simulator

Command Window



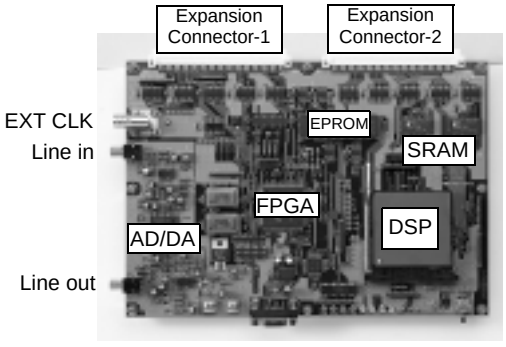
Command Button Panel



Output Window

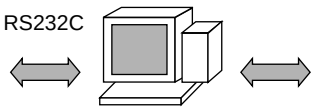
Source Window

- Evaluation Board

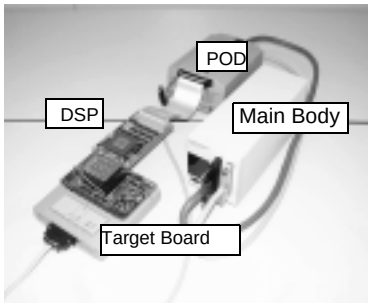


MB86331
Adaptor boad

- Advice



RS232C Control via Ethernet

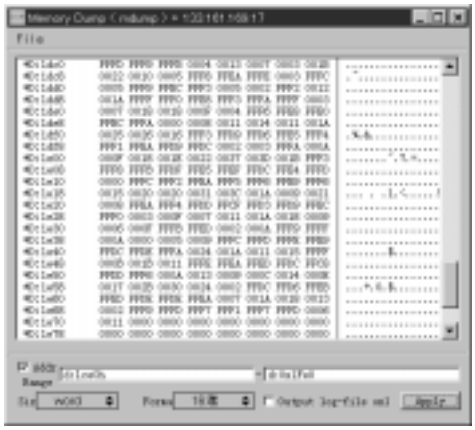


Digital Processor Support Tools

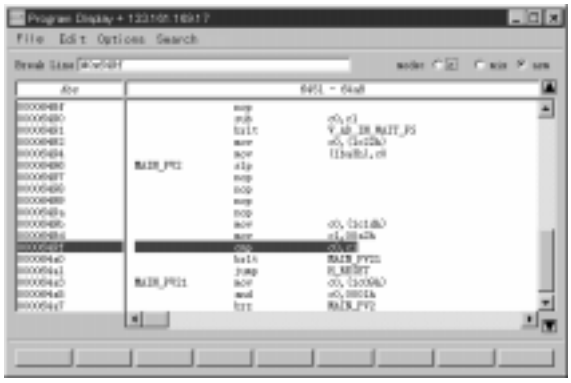
- Yokogawa Digital Computer Corporation advice/micro VIEW-G

Source Window

Memory Dump Window



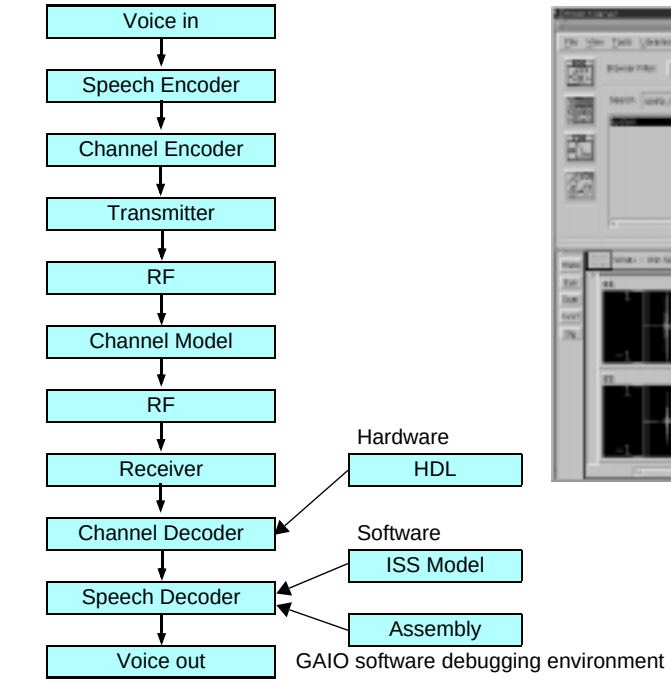
Main Window



Register Window

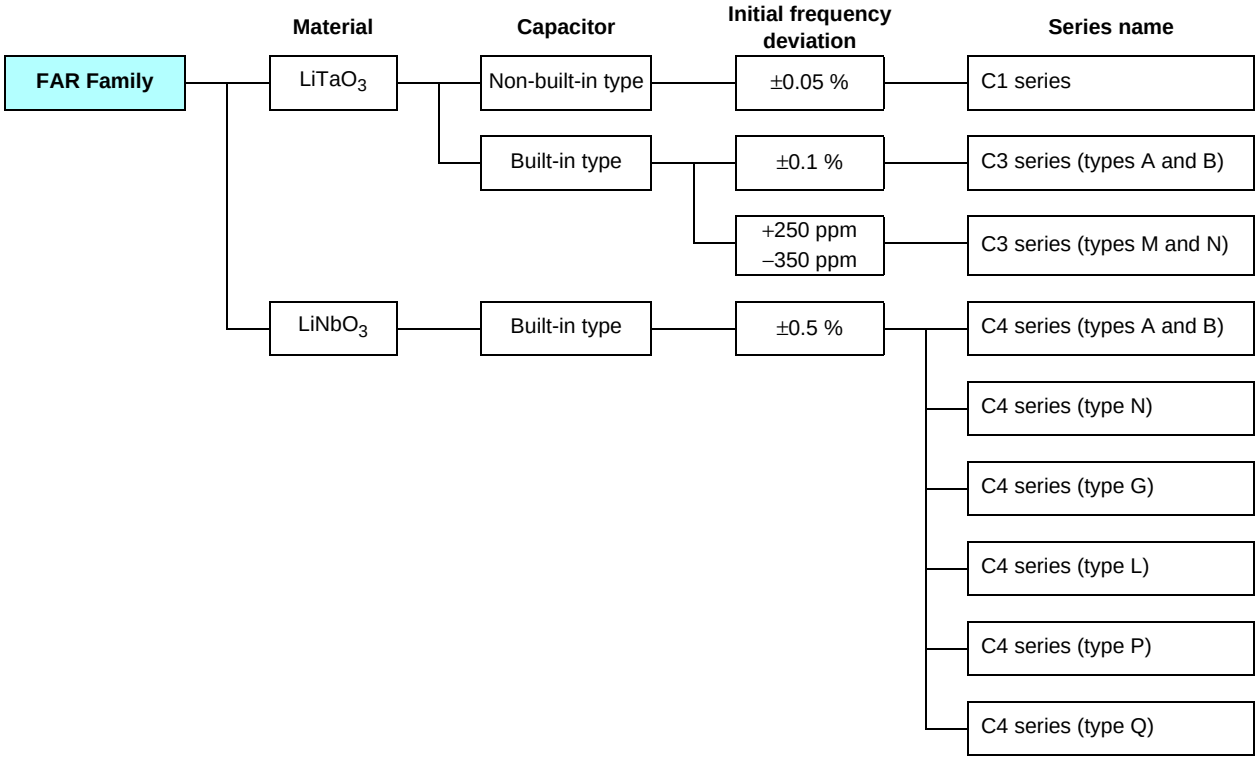
- Cadence Design Systems, Inc. Signal Processing Worksystem ™ (SPW)

SPW system design and verification environment



GAIO software debugging environment

Piezoelectric Resonator for FAR Family



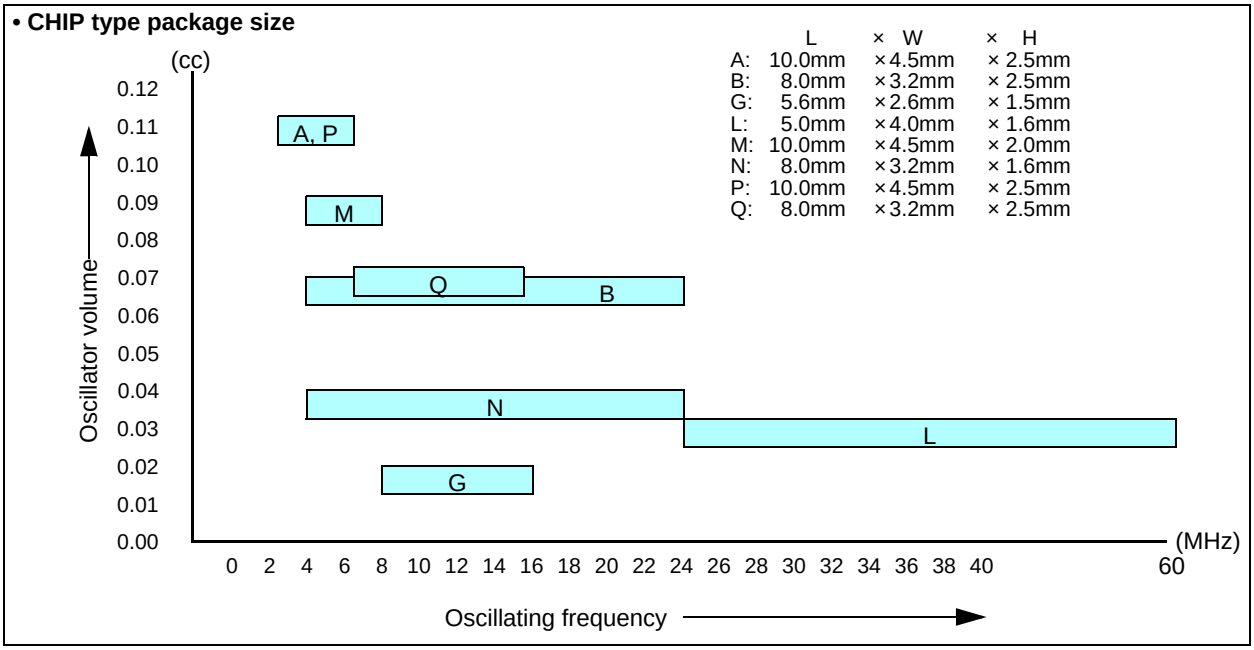
Product of FUJITSU MEDIA DEVICE LIMITED.

FAR Family

Series Name	Features	Frequency (MHz)	Initial Frequency tolerance (%)	Temperature Characteristics (%)	Capacity of built-in capacitor (pF)	Operating Temperature (°C)	Aging stability (%)	Package	
								CHIP	SIP
C1 series	High precision Available in tape packaging	3.58 to 16	±0.05	±0.02 *1	—	-30 to +85	Within ±0.1	○	○
C3 series (types A and B)	Specifically for microcontroller clocks Reduce internal capacitor Available in tape packaging		±0.1	±0.05 *1	20±8 (typ.)			○	○
C3 series (types M and N)	Internal capacitor High precision	4 to 20	+ 0.025 - 0.035	+ 0.035 - 0.025			Within ±0.04	○	×
C4 series (types A and B)	Specifically for microcontroller clocks Internal capacitor Available in tape packaging	3 to 23.9	±0.5 *3	±0.5 *1			Within ±0.1	○	○
C4 series (type N)		4 to 23.9						○	×
C4 series (type G)		8 to 16						○	×
C4 series (type L)		24 to 60		±0.5 *2				○	×
C4 series (type P)	PCT guaranteed for automobile use Specifically for microcontroller clocks	4 to 5.9		+0.9 *4 -1.0		-40 to +105		○	×
C4 series (type Q)	Using of an internal capacitor reduces the number of components, Available in tape packaging	6 to 20						○	×

*1 : For a temperature characteristics of -20°C to +60°C.
*2 : For a temperature characteristics of -30°C to +85°C.
*3 : ±1.0% for frequency ranges of 17 MHz or above and below 24 MHz.
*4 : For a temperature characteristics of -40°C to +105°C

• CHIP type package size



Microcontrollers (8-bit Proprietary F²MC-8L Family)

8-bit Proprietary F²MC-8L Family

F²MC-8L		ROM (KB)	RAM (B)	Instruction Cycle (µs)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
051 series	MB89051 *	32	2K	0.33	41	LQFP-64P	+3.0 to +5.5	-40 to +85	7	1	Yes	1 ch.	-	-
	MB89F051 *	32	2K	0.33	41	LQFP-64P	+3.0 to +5.5	-40 to +85	7	1	Yes	1 ch.	-	-
120 series	MB89121	4	128	0.95	36	QFP-48P *1	+2.2 to +6.0	-40 to +85	3	2	-	-	1 ch.	-
	MB89123A	8	256	0.95	36	QFP-48P *1	+2.2 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89125A	16	256	0.95	36	QFP-48P *1	+2.2 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
130 series	MB89131	4	128	0.95	36	QFP-48P *1	+2.2 to +6.0	-40 to +85	3	2	-	-	1 ch.	-
	MB89P131	4	128	0.95	36	QFP-48P *1	+2.7 to +6.0	-40 to +85	3	2	-	-	1 ch.	-
	MB89133A	8	256	0.95	36	QFP-48P *1 SDIP-48P	+2.2 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89P133A	8	256	0.95	36	QFP-48P *1 SDIP-48P	+2.7 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89135A	16	256	0.95	36	QFP-48P *1	+2.2 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89135L	16	256	0.95	36	QFP-48P *1	+1.8 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89P135A	16	512	0.95	36	QFP-48P *1	+2.7 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
140 series	MB89143A	8	256	0.5	55	DIP-64P	+4.0 to +6.0	-40 to +85	2	2	-	-	1 ch.	-
	MB89144A	12	256	0.5	55	DIP-64P	+4.0 to +6.0	-40 to +85	2	2	-	-	1 ch.	-
	MB89145	16	512	0.5	55	DIP-64P, QFP-64P *2	+2.7 to +6.0	-40 to +85	2	2	-	-	1 ch.	-
	MB89146	24	768	0.5	55	DIP-64P, QFP-64P *2	+2.7 to +6.0	-40 to +85	2	2	-	-	1 ch.	-
	MB89P147	32	1024	0.5	55	DIP-64P, QFP-64P *2	+2.7 to +6.0	-40 to +85	2	2	-	-	1 ch.	-
150 series	MB89151/A	4	128	0.95	43	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	36seg x 4com
	MB89152/A	6	256	0.95	43	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	36seg x 4com
	MB89153/A	8	256	0.95	43	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	36seg x 4com
	MB89154/A	12	256	0.95	43	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	36seg x 4com
	MB89155/A	16	256	0.95	43	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	36seg x 4com
	MB89P155	16	256	0.95	43	QFP-80P, LQFP-80P	+2.7 to +6.0	-40 to +85	12	2	-	-	1 ch.	36seg x 4com
160 series	MB89161/A	4	128	0.95	54	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	24seg x 4com
	MB89163/A	8	256	0.95	54	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	24seg x 4com
	MB89165/A	16	512	0.95	54	QFP-80P, LQFP-80P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	24seg x 4com
	MB89P165	16	512	0.95	54	QFP-80P LQFP-80P	+2.7 to +6.0	-40 to +85	12	2	-	-	1 ch.	24seg x 4com

* : Under development

*1 : QFP-48P(Leadpitch 0.8 mm, body size □10 × 10 mm)

*2 : QFP-64P(Leadpitch 1.00 mm, body size □14 × 20 mm)

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Buzzer output	Output Compare	Input Capture	MPG / PPG	PWM timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Watch Prescaler	Special Features	F²MC-8L	Page
-	-	-	-	2 ch.	-	-	-	-	-	USB Function + Hub	MB89051 *	56
-	-	-	-	2 ch.	-	-	-	-	-	USB Function + Hub	MB89F051 *	
Yes	-	-	-	-	-	-	(2)	1	Yes		MB89121	10
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89123A	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89125A	
Yes	-	-	-	-	-	8 bit x 4ch.	(2)	1	Yes		MB89131	10
Yes	-	-	-	-	-	8 bit x 4ch.	(2)	1	Yes		MB89P131	
Yes	-	-	-	-	-	8 bit x 4ch.	(2)	1	Yes	Remote control carrier generator	MB89133A	
Yes	-	-	-	-	-	8 bit x 4ch.	(2)	1	Yes	Remote control carrier generator	MB89P133A	
Yes	-	-	-	-	-	8 bit x 4ch.	(2)	1	Yes	Remote control carrier generator	MB89135A	
Yes	-	-	-	-	-	8 bit x 4ch.	(2)	1	Yes	Remote control carrier generator	MB89135L	
Yes	-	-	-	-	-	8 bit x 4ch.	(2)	1	Yes	Remote control carrier generator	MB89P135A	
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	Yes	VFD Driver, Clock Timer	MB89143A	48
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	Yes	VFD Driver, Clock Timer	MB89144A	
Yes	-	-	Yes	Yes	-	10 bit 12ch.	(2)	1	Yes	VFD Driver, Clock Timer	MB89145	
Yes	-	-	Yes	Yes	-	10 bit 12ch.	(2)	1	Yes	VFD Driver, Clock Timer	MB89146	
Yes	-	-	Yes	Yes	-	10 bit 12ch.	(2)	1	Yes	VFD Driver, Clock Timer	MB89P147	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89151/A	36
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89152/A	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89153/A	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89154/A	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89155/A	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89P155	
Yes	-	-	-	Yes	-	8 bit x 8ch.	(2)	1	Yes	Remote control carrier generator	MB89161/A	38
Yes	-	-	-	Yes	-	8 bit x 8ch.	(2)	1	Yes	Remote control carrier generator	MB89163/A	
Yes	-	-	-	Yes	-	8 bit x 8ch.	(2)	1	Yes	Remote control carrier generator	MB89165/A	
Yes	-	-	-	Yes	-	8 bit x 8ch.	(2)	1	Yes	Remote control carrier generator	MB89P165	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, Clock Gear

(Continued)

The meaning of (x): It serve as both UART and 8-bit serial,or 8-bit Timer and 16-bit Timer.

Microcontrollers (8-bit Proprietary F²MC-8L Family)

F²MC-8L		ROM (KB)	RAM (B)	Instruction Cycle (µs)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
170 series	MB89173	8	384	1.1	37	QFP-48P	+2.2 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89174A	12	512	0.6	37	QFP-48P	+2.2 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89P173	8	384	1.1	37	QFP-48P	+2.7 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
	MB89P175A	16	512	0.6	37	QFP-48P	+2.7 to +6.0	-40 to +85	11	2	-	-	1 ch.	-
170L series	MB89173L	8	384	1.1	37	QFP-48P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89174L	12	512	1.1	37	QFP-48P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
180 series	MB89181	4	128	0.95	43	QFP-64P LQFP-64P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	32seg x 4com
	MB89182	6	256	0.95	43	QFP-64P LQFP-64P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	32seg x 4com
	MB89183	8	256	0.95	43	QFP-64P LQFP-64P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	32seg x 4com
	MB89184	12	256	0.95	43	QFP-64P LQFP-64P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	32seg x 4com
	MB89185	16	256	0.95	43	QFP-64P LQFP-64P	+2.2 to +6.0	-40 to +85	12	2	-	-	1 ch.	32seg x 4com
	MB89P185	16	256	0.95	43	QFP-64P LQFP-64P	+2.7 to +6.0	-40 to +85	12	2	-	-	1 ch.	32seg x 4com
190 series	MB89191	4	128	0.95	22	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89193	8	256	0.95	22	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89195	16	256	0.95	22	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89P195	16	256	0.95	22	SOP-28P DIP-28P	+2.7 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
190A series	MB89191A	4	128	0.95	20	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89191AH	4	128	0.95	20	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89193A	8	256	0.95	20	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89193AH	8	256	0.95	20	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89195A	16	256	0.95	20	SOP-28P, SDIP-28P	+2.2 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
	MB89P195A	16	256	0.95	20	SOP-28P SDIP-28P	+2.7 to +6.0	-40 to +85	11	1	-	-	1 ch.	-
530 series	MB89537	32	1024	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+2.2 to +3.6	-40 to +85	12	2	-	2 ch.	1 ch.	-
	MB89537C	32	1024	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+2.2 to +3.6	-40 to +85	12	2	Yes	2 ch.	1 ch.	-
	MB89537H	32	1024	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+3.5 to +5.5	-40 to +85	12	2	-	2 ch.	1 ch.	-
	MB89537HC	32	1024	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+3.5 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	-
	MB89538	48	2048	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+2.2 to +3.6	-40 to +85	12	2	-	2 ch.	1 ch.	-
	MB89538C	48	2048	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+2.2 to +3.6	-40 to +85	12	2	Yes	2 ch.	1 ch.	-

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Buzzer output	Output Compare	Input Capture	MPG / PPG	PWM timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Watch Prescaler	Special Features	F²MC-8L	Page
Yes	-	-	-	-	-	-	(2)	1	Yes	DTMF Generator	MB89173	50
Yes	-	-	-	-	-	-	(2)	1	Yes	DTMF Generator	MB89174A	
Yes	-	-	-	-	-	-	(2)	1	Yes	DTMF Generator	MB89P173	
Yes	-	-	-	-	-	-	(2)	1	Yes	DTMF Generator	MB89P175A	
Yes	-	-	-	-	-	-	(2)	1	Yes		MB89173L	8
Yes	-	-	-	-	-	-	(2)	1	Yes		MB89174L	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89181	32
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89182	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89183	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89184	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89185	
Yes	-	-	-	-	-	-	(2)	1	Yes	Remote control carrier generator	MB89P185	
Yes	-	-	-	-	-	-	(2)	1	-	Remote control carrier generator	MB89191	6
Yes	-	-	-	-	-	-	(2)	1	-	Remote control carrier generator	MB89193	
Yes	-	-	-	-	-	-	(2)	1	-	Remote control carrier generator	MB89195	
Yes	-	-	-	-	-	-	(2)	1	-	Remote control carrier generator	MB89P195	
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	-	Remote control carrier generator	MB89191A	6
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	-	Remote control carrier generator	MB89191AH	
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	-	Remote control carrier generator	MB89193A	
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	-	Remote control carrier generator	MB89193AH	
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	-	Remote control carrier generator	MB89195A	
Yes	-	-	-	-	-	8 bit x 8ch.	(2)	1	-	Remote control carrier generator	MB89P195A	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89537	28
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89537C	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89537H	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89537HC	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89538	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89538C	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, Clock Gear

(Continued)

The meaning of (x): It serve as both UART and 8-bit serial,or 8-bit Timer and 16-bit Timer.

Microcontrollers (8-bit Proprietary F²MC-8L Family)

F²MC-8L		ROM (KB)	RAM (B)	Instruction Cycle (µs)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
530 series	MB89538H	48	2048	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+3.5 to +5.5	-40 to +85	12	2	-	2 ch.	1 ch.	-
	MB89538HC	48	2048	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+3.5 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	-
	MB89P538	48	2048	0.32	51	QFP-64P, LQFP-64P, SDIP-64P	+2.7 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	-
530A series	MB89535A	16	512	0.32	53	QFP-64P, LQFP-64P, SDIP-64P	+2.7 to +5.5	-40 to +85	12	2	-	2 ch.	1 ch.	-
	MB89537A	32	1024	0.32	53	QFP-64P, LQFP-64P, SDIP-64P	+2.7 to +5.5	-40 to +85	12	2	-	2 ch.	1 ch.	-
	MB89537AC	32	1024	0.32	53	QFP-64P, LQFP-64P, SDIP-64P	+2.7 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	-
	MB89538A	48	2048	0.32	53	QFP-64P, LQFP-64P, SDIP-64P	+2.7 to +5.5	-40 to +85	12	2	-	2 ch.	1 ch.	-
	MB89538AC	48	2048	0.32	53	QFP-64P, LQFP-64P, SDIP-64P	+2.7 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	-
550 series	MB89557A	32	1024	0.32	66	TQFP-100P, LQFP-100P	Vcc1=+2.2 to +3.6 Vcc2=+2.7 to +5.5	-40 to +85	16	2	-	2 ch.	(1 ch.)	32seg x 4com
	MB89558A	48	2048	0.32	66	TQFP-100P, LQFP-100P	Vcc1=+2.2 to +3.6 Vcc2=+2.7 to +5.5	-40 to +85	16	2	-	2 ch.	(1 ch.)	32seg x 4com
	MB89P558A	48	2048	0.32	66	TQFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	16	2	-	2 ch.	(1 ch.)	32seg x 4com
560 series	MB89567	32	1024	0.32	50	QFP-80P, LQFP-80P	+2.2 to +3.6	-40 to +85	12	2	-	2 ch.	1 ch.	24seg x 4com
	MB89567A	32	1024	0.32	50	QFP-80P, LQFP-80P	+2.2 to +5.5	-40 to +85	12	2	-	2 ch.	1 ch.	24seg x 4com
	MB89567AC	32	1024	0.32	50	QFP-80P, LQFP-80P	+2.2 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	24seg x 4com
	MB89567C	32	1024	0.32	50	QFP-80P, LQFP-80P	+2.2 to +3.6	-40 to +85	12	2	Yes	2 ch.	1 ch.	24seg x 4com
	MB89567H	32	1024	0.32	50	QFP-80P, LQFP-80P	+3.5 to +5.5	-40 to +85	12	2	-	2 ch.	1 ch.	24seg x 4com
	MB89567HC	32	1024	0.32	50	QFP-80P, LQFP-80P	+3.5 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	24seg x 4com
	MB89P568	48	1024	0.32	50	QFP-80P, LQFP-80P	+2.7 to +5.5	-40 to +85	12	2	Yes	2 ch.	1 ch.	24seg x 4com
570 series	MB89577	32	3072	0.4	82	LQFP-100P, TQFP-100P	+2.2 to +3.7	-40 to +85	4	2	1 ch.	1 ch.	1 ch.	14seg x 4com
	MB89P579A	60	3072	0.4	82	LQFP-100P, TQFP-100P	+2.2 to +3.7	-40 to +85	4	2	1 ch.	1 ch.	1 ch.	14seg x 4com

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Buzzer output	Output Compare	Input Capture	MPG / PPG	PWM timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Watch Prescaler	Special Features	F²MC-8L	Page
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89538H	28
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89538HC	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89P538	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89535A	26
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89537A	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89537AC	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89538A	
-	-	-	3 ch.	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes		MB89538AC	
-	-	-	1 ch.	2 ch.	1 ch.	10 bit x 8ch.	(4)	3	Yes	DAC: 8bit x 2ch	MB89557A	46
-	-	-	1 ch.	2 ch.	1 ch.	10 bit x 8ch.	(4)	3	Yes	DAC: 8bit x 2ch	MB89558A	
-	-	-	1 ch.	2 ch.	1 ch.	10 bit x 8ch.	(4)	3	Yes	DAC: 8bit x 2ch	MB89P558A	
-	-	-	2 ch.	2 ch.	1 ch.	10 bit x 8ch.	(2)	1	Yes	16bit timer=2 x 8 bit timer	MB89567	40
-	-	-	2 ch.	2 ch.	1 ch.	10 bit x 8ch.	(2)	1	Yes	16bit timer=2 x 8 bit timer	MB89567A	
-	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	(2)	1	Yes	16bit timer=2 x 8 bit timer	MB89567AC	
-	-	-	2 ch.	2 ch.	1 ch.	10 bit x 8ch.	(2)	1	Yes	16bit timer=2 x 8 bit timer	MB89567C	
-	-	-	2 ch.	2 ch.	1 ch.	10 bit x 8ch.	(2)	1	Yes	16bit timer=2 x 8 bit timer	MB89567H	
-	-	-	2 ch.	2 ch.	1 ch.	10 bit x 8ch.	(2)	1	Yes	16bit timer=2 x 8 bit timer	MB89567HC	
-	-	-	2 ch.	2 ch.	1 ch.	10 bit x 8ch.	(2)	1	Yes	16bit timer=2 x 8 bit timer	MB89P568	
-	-	-	-	-	-	10 bit x 12ch.	(2)	-	Yes	DAC: 8bit x 2ch.	MB89577	20
-	-	-	-	-	-	10 bit x 12ch.	(2)	-	Yes	DAC: 8bit x 2ch.	MB89P579A	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, Clock Gear

The meaning of (x): It serve as both UART and 8-bit serial,or 8-bit Timer and 16-bit Timer.

(Continued)

Microcontrollers (8-bit Proprietary F²MC-8L Family)

F²MC-8L		ROM (KB)	RAM (B)	Instruction Cycle (µs)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
580B/BW series	MB89583B	8	512	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89583BW	8	512	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89585B	16	1024	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89585BW	16	1024	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89P585B	16	1024	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89P585BW	16	1024	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89589B	16	18K	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89P589B	16	18K	0.33	53	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
590D series	MB89593D	8	512	0.33	45	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89595D	16	1024	0.33	45	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB89P595D	16	1024	0.33	45	LQFP-64P	+3.0 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
600 series	MB89601R	4	80	0.5	33	LQFP-48P	+2.2 to +6.0	-40 to +85	1	1	-	-	1 ch.	-
	MB89P601	4	80	0.5	33	LQFP-48P	+2.7 to +6.0	-40 to +85	1	1	-	-	1 ch.	-
	MB89603	8	80	0.5	33	LQFP-48P	+2.7 to +6.0	-40 to +85	1	1	-	-	1 ch.	-
610 series	MB89613R	8	256	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89615R	16	512	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
620 series	MB89T623	Ext.	256	0.4	34	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89623R	8	256	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89T625	Ext.	512	0.4	34	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89625R	16	512	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89P625	16	512	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89626R	24	768	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89P627	32	1024	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89T627R	Ext.	1024	0.4	34	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89627R	32	1024	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89628R	24	3072	0.4	53	SH-DIP-64P, QFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89629R	32	3072	0.4	53	SH-DIP-64P, QFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	-	2 ch.	-
	MB89P629	32	4096	0.4	53	SH-DIP-64P, QFP-64P	+2.7 to +6.0	-40 to +85	4	1	-	-	2 ch.	-

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Buzzer output	Output Compare	Input Capture	MPG / PPG	PWM timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Watch Prescaler	Special Features	F²MC-8L	Page
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89583B	54
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89583BW	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89585B	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89585BW	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89P585B	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89P585BW	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89589B	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function	MB89P589B	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function + Hub	MB89593D	54
-	-	-	-	2 ch.	-	-	-	-	-	USB Function + Hub	MB89595D	
-	-	-	-	2 ch.	-	-	-	-	-	USB Function + Hub	MB89P595D	
-	-	-	-	1 ch.	-	-	-	-	-		MB89601R	12
-	-	-	-	1 ch.	-	-	-	-	-		MB89P601	
-	-	-	-	1 ch.	-	-	-	-	-		MB89603	
Yes	-	-	-	1 ch.	1 ch.	-	-	Yes	-	External bus	MB89613R	14
Yes	-	-	-	1 ch.	1 ch.	-	-	Yes	-	External bus	MB89615R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89T623	16
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89623R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89T625	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89625R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89P625	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89626R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89P627	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89T627R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-	External bus	MB89627R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-		MB89628R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-		MB89629R	
Yes	-	-	-	1 ch.	1 ch.	8 bit x 8ch.	-	Yes	-		MB89P629	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, Clock Gear *(Continued)*

Microcontrollers (8-bit Proprietary F²MC-8L Family)

F²MC-8L		ROM (KB)	RAM (B)	Instruction Cycle (µs)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
630 series	MB89635	16	512	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89635R	16	512	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89T635	Ext.	512	0.4	34	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89T635R	Ext.	512	0.4	34	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89636R	24	768	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89637	32	1024	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89637R	32	1024	0.4	53	SH-DIP-64P, QFP-64P, LQFP-64P	+2.2 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89T637	Ext.	1024	0.4	34	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89T637R	Ext.	1024	0.4	34	SH-DIP-64P, QFP-64P, LQFP-64P	+2.7 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
	MB89P637	32	1024	0.4	53	SH-DIP-64P, QFP-64P	+2.7 to +6.0	-40 to +85	4	2	-	1 ch.	1 ch.	-
640 series	MB89643	8	256	0.4	65	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	9	2	-	-	2 ch.	-
	MB89645	16	512	0.4	65	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	9	2	-	-	2 ch.	-
	MB89646	24	768	0.4	65	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	9	2	-	-	2 ch.	-
	MB89647	32	1024	0.4	65	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	9	2	-	-	2 ch.	-
	MB89P647	32	1024	0.4	65	QFP-80P LQFP-80P	+2.7 to +6.0	-40 to +85	9	2	-	-	2 ch.	-
650 series	MB89653AR	8	256	0.4	64	QFP-100P, LQFP-100P	+2.2 to +6.0	-40 to +85	16	2	-	-	1 ch.	32seg x 4com
	MB89655AR	16	512	0.4	64	QFP-100P, LQFP-100P	+2.2 to +6.0	-40 to +85	16	2	-	-	1 ch.	32seg x 4com
	MB89656AR	24	768	0.4	64	QFP-100P, LQFP-100P	+2.2 to +6.0	-40 to +85	16	2	-	-	1 ch.	32seg x 4com
	MB89657AR	32	1024	0.4	64	QFP-100P, LQFP-100P	+2.2 to +6.0	-40 to +85	16	2	-	-	1 ch.	32seg x 4com
	MB89P657A	32	1024	0.4	64	QFP-100P, LQFP-100P	+2.7 to +6.0	-40 to +85	16	2	-	-	1 ch.	32seg x 4com
660 series	MB89663	8	256	0.4	52	SH-DIP-64P, QFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89663R	8	256	0.4	52	SH-DIP-64P, QFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89665	16	512	0.4	52	SH-DIP-64P, QFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89665R	16	512	0.4	52	SH-DIP-64P, QFP-64P	+2.2 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89P665	16	512	0.4	52	SH-DIP-64P, QFP-64P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Buzzer output	Output Compare	Input Capture	MPG / PPG	PWM timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Watch Prescaler	Special Features	F²MC-8L	Page
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89635	24
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89635R	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89T635	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89T635R	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89636R	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89637	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89637R	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89T637	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89T637R	
Yes	-	-	-	2 ch.	1 ch.	10 bit x 8ch.	-	Yes	Yes	Clock Timer, External bus	MB89P637	
Yes	-	-	-	2 ch.	1 ch.	8 bit x 8ch.	-	Yes	Yes	DAC: 8bit x 2ch, Clock Timer, External bus	MB89643	18
Yes	-	-	-	2 ch.	1 ch.	8 bit x 8ch.	-	Yes	Yes	DAC: 8bit x 2ch, Clock Timer, External bus	MB89645	
Yes	-	-	-	2 ch.	1 ch.	8 bit x 8ch.	-	Yes	Yes	DAC: 8bit x 2ch, Clock Timer, External bus	MB89646	
Yes	-	-	-	2 ch.	1 ch.	8 bit x 8ch.	-	Yes	Yes	DAC: 8bit x 2ch, Clock Timer, External bus	MB89647	
Yes	-	-	-	2 ch.	1 ch.	8 bit x 8ch.	-	Yes	Yes	DAC: 8bit x 2ch, Clock Timer, External bus	MB89P647	
Yes	-	-	-	2 ch.	-	8 bit x 8ch.	(4)	2	Yes		MB89653AR	44
Yes	-	-	-	2 ch.	-	8 bit x 8ch.	(4)	2	Yes		MB89655AR	
Yes	-	-	-	2 ch.	-	8 bit x 8ch.	(4)	2	Yes		MB89656AR	
Yes	-	-	-	2 ch.	-	8 bit x 8ch.	(4)	2	Yes		MB89657AR	
Yes	-	-	-	2 ch.	-	8 bit x 8ch.	(4)	2	Yes		MB89P657A	
-	2ch	2ch	-	1 ch.	-	8 bit x 8ch.	(2)	1	-		MB89663	26
-	2ch	2ch	-	1 ch.	-	8 bit x 8ch.	(2)	1	-		MB89663R	
-	2ch	2ch	-	1 ch.	-	8 bit x 8ch.	(2)	1	-		MB89665	
-	2ch	2ch	-	1 ch.	-	8 bit x 8ch.	(2)	1	-		MB89665R	
-	2ch	2ch	-	1 ch.	-	8 bit x 8ch.	(2)	1	-		MB89P665	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, Clock Gear

(Continued)

The meaning of (x): It serve as both UART and 8-bit serial,or 8-bit Timer and 16-bit Timer.

Microcontrollers (8-bit Proprietary F²MC-8L Family)

(Continued)

F²MC-8L		ROM (KB)	RAM (B)	Instruction Cycle (µs)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
670 series	MB89673	8	384	0.4	69	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
	MB89673R	8	384	0.4	69	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
	MB89673AR	8	384	0.4	69	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
	MB89675R	16	512	0.4	69	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
	MB89675AR	16	512	0.4	69	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
	MB89677A	32	1024	0.4	69	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
	MB89677AR	32	1024	0.4	69	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
	MB89P677A	32	1024	0.4	69	QFP-80P LQFP-80P	+2.7 to +6.0	-40 to +85	8	1	-	1 ch.	1 ch.	-
680 series	MB89689	60	2048	0.5	85	QFP-100P	+2.2 to +6.0	-40 to +85	16	2	-	1 ch.	1 ch.	-
	MB89P689	60	2048	0.5	85	QFP-100P	+2.7 to +6.0	-40 to +85	16	2	-	1 ch.	1 ch.	-
800 series	MB89803	8	256	0.4	32	QFP-100P, LQFP-100P	+2.2 to +6.0	-40 to +85	5	1	-	1 ch.	-	70seg x 4com
	MB89805	16	512	0.4	32	QFP-100P, LQFP-100P	+2.2 to +6.0	-40 to +85	5	1	-	1 ch.	-	70seg x 4com
	MB89P808	48	2048	0.4	32	QFP-100P, LQFP-100P	+2.2 to +6.0	-40 to +85	5	1	-	1 ch.	-	70seg x 4com
810 series	MB89816A	24	2048	0.8	53	QFP-64P	+2.2 to +6.0	-40 to +85	8	2	-	1 ch.	1 ch.	-
	MB89P817A	32	2048	0.8	53	QFP-64P	+2.7 to +6.0	-40 to +85	8	2	-	1 ch.	1 ch.	-
820 series	MB89821	4	128	0.8	32	LQFP-80P	+2.2 to +6.0	-40 to +85	2	1	-	1 ch.	1 ch.	50seg x 4com
	MB89823	8	256	0.8	32	LQFP-80P	+2.2 to +6.0	-40 to +85	2	1	-	1 ch.	1 ch.	50seg x 4com
	MB89P825	16	256	0.8	32	LQFP-80P	+2.7 to +6.0	-40 to +85	2	1	-	1 ch.	1 ch.	50seg x 4com
850 series	MB89855	16	512	0.4	53	SH-DIP-64P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89855A	16	512	0.4	53	SH-DIP-64P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89T855	Ext.	512	0.4	53	SH-DIP-64P	+2.7 to +5.5	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89855R	16	512	0.4	53	QFP-64P SH-DIP-64P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89857	32	1024	0.4	53	SH-DIP-64P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89P857	32	1024	0.4	53	QFP-64P SH-DIP-64P	+2.7 to +5.5	-40 to +85	4	1	-	1 ch.	1 ch.	-
860 series	MB89865	16	512	0.4	68	QFP-80P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89867	32	1024	0.4	68	QFP-80P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	-
	MB89P867	32	1024	0.4	68	QFP-80P	+2.7 to +5.5	-40 to +85	4	1	-	1 ch.	1 ch.	-

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Buzzer output	Output Compare	Input Capture	MPG / PPG	PWM timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Watch Prescaler	Special Features	F²MC-8L	Page
Yes	-	-	-	3 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89673	28
Yes	-	-	-	3 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89673R	
Yes	-	-	-	6 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89673AR	
Yes	-	-	-	3 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89675R	
Yes	-	-	-	6 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89675AR	
Yes	-	-	-	6 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89677A	
Yes	-	-	-	6 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89677AR	
Yes	-	-	-	6 ch.	-	10 bit x 8ch.	(2)	1	-	Up/Down counter, External bus	MB89P677A	
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	(2)	1	Yes	MSK Software Modem Output	MB89689	20
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	(2)	1	Yes	MSK Software Modem Output	MB89P689	
-	-	-	-	1 ch.	1 ch.	-	-	-	-		MB89803	44
-	-	-	-	1 ch.	1 ch.	-	-	-	-		MB89805	
-	-	-	-	1 ch.	1 ch.	-	-	-	-		MB89P808	
-	-	-	-	2 ch.	-	-	-	1	Yes		MB89816A	22
-	-	-	-	2 ch.	-	-	-	1	Yes		MB89P817A	
-	-	-	-	1 ch.	1 ch.	-	-	-	-	DTMF Generator	MB89821	38
-	-	-	-	1 ch.	1 ch.	-	-	-	-	DTMF Generator	MB89823	
-	-	-	-	1 ch.	1 ch.	-	-	-	-	DTMF Generator	MB89P825	
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89855	52
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89855A	
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89T855	
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89855R	
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89857	
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89P857	
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89865	52
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89867	
-	-	-	-	2 ch.	-	10 bit x 8ch.	-	-	-	Inverter control circuit, External bus	MB89P867	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, Clock Gear
The meaning of (x): It serve as both UART and 8-bit serial,or 8-bit Timer and 16-bit Timer.
* : Timer / counter with 8-bit capture + 8-bit timer.

Microcontrollers (8-bit Proprietary F²MC-8L Family)

F²MC-8L		ROM (KB)	RAM (B)	Instruction Cycle (µs)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
870 series	MB89875	16	512	0.4	45	QFP-80P LQFP-80P	+2.2 to +6.0	-40 to +85	8	2	-	-	1 ch.	24seg x 4com
	MB89P875	16	512	0.4	45	QFP-80P LQFP-80P	+2.7 to +6.0	-40 to +85	8	2	-	-	1 ch.	24seg x 4com
890 series	MB89898	48	1536	0.5	85	QFP-100P	+2.2 to +6.0	-20 to +85	16	2	-	-	2 ch.	-
	MB89899	60	2048	0.5	85	QFP-100P	+2.2 to +6.0	-20 to +85	16	2	-	-	2 ch.	-
	MB89P899	60	2048	0.5	85	QFP-100P	+2.7 to +6.0	-20 to +85	16	2	-	-	2 ch.	-
910 series	MB89913	8	256	0.5	39	SH-DIP-48, QFP-48P	+3.8 to +5.5	-40 to +85	2	2	-	-	1 ch.	-
	MB89915	16	512	0.5	39	SH-DIP-48, QFP-48P	+3.8 to +5.5	-40 to +85	2	2	-	-	1 ch.	-
	MB89P915	16	512	0.5	39	SH-DIP-48, QFP-48P	+3.8 to +5.5	-40 to +85	2	2	-	-	1 ch.	-
920 series	MB89923	8	256	0.5	69	QFP-80P	+2.2 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	28seg x 4com
	MB89925	16	512	0.5	69	QFP-80P	+2.2 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	28seg x 4com
	MB89P928	48	1024	0.5	69	QFP-80P	+2.7 to +6.0	-40 to +85	4	1	-	1 ch.	1 ch.	28seg x 4com
930A/B series	MB89935B	16	512	0.4	21	SSOP-30P	+2.2 to +5.5	-40 to +85	11	1	-	1 ch.	1 ch.	-
	MB89P935B	16	512	0.4	21	SSOP-30P	+2.7 to +5.5	-40 to +85	11	1	-	1 ch.	1 ch.	-
940 series	MB89943	8	512	0.5	37	QFP-48P	+3.5 to +5.5	-40 to +85	3	1	-	-	-	17seg x 4com
	MB89945	16	512	0.5	37	QFP-48P	+3.5 to +5.5	-40 to +85	3	1	-	-	-	17seg x 4com
	MB89P945	16	512	0.5	37	QFP-48P	+3.5 to +5.5	-40 to +85	3	1	-	-	-	17seg x 4com
950 series	MB89951	4	128	0.8	33	LQFP-64P	+2.2 to +6.0	-40 to +85	2	1	-	1 ch.	1 ch.	42seg x 4com
	MB89953	8	256	0.8	33	LQFP-64P	+2.2 to +6.0	-40 to +85	2	1	-	1 ch.	1 ch.	42seg x 4com
	MB89953A	8	256	0.8	33	LQFP-64P	+2.2 to +6.0	-40 to +85	2	1	-	1 ch.	1 ch.	42seg x 4com
	MB89P955	16	512	0.8	33	LQFP-64P	+2.7 to +6.0	-40 to +85	2	1	-	1 ch.	1 ch.	42seg x 4com
960 series	MB89965	16	512	0.4	35	QFP-48P, LQFP-48P	+3.5 to +5.5	-40 to +85	11	2	-	-	1 ch.	-
	MB89965C	16	512	0.4	35	QFP-48P, LQFP-48P	+3.5 to +5.5	-40 to +85	11	2	Yes	-	1 ch.	-
	MB89P965A	16	512	0.4	35	QFP-48P, LQFP-48P	+3.5 to +5.5	-40 to +85	11	2	Yes	-	1 ch.	-
	MB89F969A	60	1024	0.4	35	LQFP-64P	+3.5 to +5.5	-40 to +85	11	2	Yes	-	1 ch.	-
980 series	MB89983	8	256	0.95	47	LQFP-64P	+3.5 to +6.0	-40 to +85	12	2	-	-	-	14seg x 4com
	MB89P985	16	512	0.95	47	LQFP-64P	+3.5 to +6.0	-40 to +85	12	2	-	-	-	14seg x 4com
990 series	MB89997	32	128	0.95	22	SH-DIP-28P, SOP-28P	+2.2 to +6.0	-40 to +85	8	1	-	-	-	-

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Buzzer output	Output Compare	Input Capture	MPG / PPG	PWM timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Watch Prescaler	Special Features	F²MC-8L	Page
Yes	-	-	-	1 ch.	-	10 bit x 8ch.	(2)	1	Yes		MB89875	42
Yes	-	-	-	1 ch.	-	10 bit x 8ch.	(2)	1	Yes		MB89P875	
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	(2)	1	Yes	DTMF Generator	MB89898	50
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	(2)	1	Yes	DTMF Generator	MB89899	
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	(2)	1	Yes	DTMF Generator	MB89P899	
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	-	Yes	Yes	VFD Driver, Low Voltage Detect Reset	MB89913	48
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	-	Yes	Yes	VFD Driver, Low Voltage Detect Reset	MB89915	
Yes	-	-	-	1 ch.	-	8 bit x 8ch.	-	Yes	Yes	VFD Driver, Low Voltage Detect Reset	MB89P915	
Yes	2 ch.	2 ch.	-	2 ch.	-	10 bit x 8ch.	-	-	-	Low Voltage Detect Reset	MB89923	42
Yes	2 ch.	2 ch.	-	2 ch.	-	10 bit x 8ch.	-	-	-	Low Voltage Detect Reset	MB89925	
Yes	2 ch.	2 ch.	-	2 ch.	-	10 bit x 8ch.	-	-	-	Low Voltage Detect Reset	MB89P928	
Yes	-	1 ch.	12 bit x 1ch	1 ch.	-	10 bit x 8ch.	1	1 *	-		MB89935B	22
Yes	-	1 ch.	12 bit x 1ch	1 ch.	-	10 bit x 8ch.	1	1 *	-		MB89P935B	
-	-	-	-	2 ch.	-	8 bit x 2ch.	(2)	1	-	Low Voltage Reset, Ext. Voltage Moniter	MB89943	30
-	-	-	-	2 ch.	-	8 bit x 2ch.	(2)	1	-	Low Voltage Reset, Ext. Voltage Moniter	MB89945	
-	-	-	-	2 ch.	-	8 bit x 2ch.	(2)	1	-	Low Voltage Reset, Ext. Voltage Moniter	MB89P945	
-	-	-	-	1 ch.	1 ch.	-	-	-	-		MB89951	32
-	-	-	-	1 ch.	1 ch.	-	-	-	-		MB89953	
-	-	-	-	1 ch.	1 ch.	-	-	-	-		MB89953A	
-	-	-	-	1 ch.	1 ch.	-	-	-	-		MB89P955	
-	-	-	-	-	-	10 bit x 4ch.	(2)	1	Yes		MB89965	12
-	-	-	-	-	-	10 bit x 4ch.	(2)	1	Yes		MB89965C	
-	-	-	-	-	-	10 bit x 4ch.	(2)	1	Yes		MB89P965A	
-	-	-	-	-	-	10 bit x 4ch.	(2)	1	Yes		MB89F969A	
Yes	-	-	-	2 ch.	-	8 bit x 4ch.	(2)	1	Yes	Remote-control Carrier Frequency	MB89983	34
Yes	-	-	-	2 ch.	-	8 bit x 4ch.	(2)	1	Yes	Remote-control Carrier Frequency	MB89P985	
-	-	-	-	-	-	-	(2)	1	-	Remote-control Carrier Frequency	MB89997	6

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, Clock Gear
The meaning of (x): It serve as both UART and 8-bit serial,or 8-bit Timer and 16-bit Timer.
* : Timer / counter with 8-bit capture + 8-bit timer.

16-bit Proprietary F²MC-16L Family

F²MC-16L		ROM (KB)	RAM (KB)	Instruction Cycle (ns)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
610 series	MB90611A	-	1	62.5	57	QFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	8	1	-	3 ch.	(3)	-
	MB90613A	-	3	62.5	57	QFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	8	1	-	3 ch.	(3)	-
620 series	MB90622A	32	1.64	83.3	59	LQFP-100P	4 to 5.5	-40 to +85	8	2	-	1 ch.	1 ch.	32seg × 4com
	MB90623A	48	2	83.3	59	LQFP-100P	4 to 5.5	-40 to +85	8	2	-	1 ch.	1 ch.	32seg × 4com
	MB90P623A	48	2	83.3	59	LQFP-100P	4 to 5.5	-40 to +85	8	2	-	1 ch.	1 ch.	32seg × 4com
630 series	MB90632A	32	1	62.5	82	LQFP-100P	+2.7 to +5.5	-40 to +85	8	1	-	2 ch.	2 ch.	-
	MB90634A	64	2	62.5	82	LQFP-100P	+2.7 to +5.5	-40 to +85	8	1	-	2 ch.	2 ch.	-
	MB90P634A	64	3	62.5	82	LQFP-100P	+2.7 to +5.5	-40 to +85	8	1	-	2 ch.	2 ch.	-
640 series	MB90641A	64	2	58.8	83	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	-
	MB90P641A	64	2	58.8	83	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	-
650 series	MB90652A	64	3	62.5	79	QFP-100P, LQFP-100P	+2.2 to +3.6	-40 to +85	8	2	Yes	1 ch.	2 ch.	-
	MB90653A	128	5	62.5	79	QFP-100P, LQFP-100P	+2.2 to +3.6	-40 to +85	8	2	Yes	1 ch.	2 ch.	-
	MB90P653A	128	5	62.5	79	QFP-100P, LQFP-100P	+2.7 to +3.6	-40 to +85	8	2	Yes	1 ch.	2 ch.	-
	MB90654A	256	8	62.5	79	QFP-100P, LQFP-100P	+2.2 to +3.6	-40 to +85	8	2	Yes	1 ch.	2 ch.	-
	MB90F654A	256	8	62.5	79	QFP-100P, LQFP-100P	+2.4 to +3.6	-40 to +85	8	2	Yes	1 ch.	2 ch.	-
660 series	MB90662A	32	1.64	62.5	51	SDIP-64P, LQFP-64P	+2.7 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB90663A	48	2	62.5	51	SDIP-64P, LQFP-64P	+2.7 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
	MB90P663A	48	2	62.5	51	SDIP-64P, LQFP-64P	+2.7 to +5.5	-40 to +85	8	1	-	1 ch.	-	-
670 series	MB90671	16	0.64	62.5	65	QFP-80P, LQFP-80P	+2.7 to +5.5	-40 to +85	4	1	-	2 ch.	-	-
	MB90672	32	1.64	62.5	65	QFP-80P, LQFP-80P	+2.7 to +5.5	-40 to +85	4	1	-	2 ch.	-	-
	MB90673	48	2	62.5	65	QFP-80P, LQFP-80P	+2.7 to +5.5	-40 to +85	4	1	-	2 ch.	-	-
	MB90T673	-	2	62.5	65	QFP-80P, LQFP-80P	+2.7 to +5.5	-40 to +85	4	1	-	2 ch.	-	-
	MB90P673	48	2	62.5	65	SDIP-80P, LQFP-80P	+2.7 to +5.5	-40 to +85	4	1	-	2 ch.	-	-
675 series	MB90676	32	1.64	62.5	84	QFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	4	1	Yes	2 ch.	-	-
	MB90677	48	2	62.5	84	QFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	4	1	Yes	2 ch.	-	-
	MB90678	64	3	62.5	84	QFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	4	1	Yes	2 ch.	-	-
	MB90T678	-	3	62.5	84	QFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	4	1	Yes	2 ch.	-	-
	MB90P678	64	3	62.5	84	QFP-100P, LQFP-100P	+2.7 to +5.5	-40 to +85	4	1	Yes	2 ch.	-	-

Microcontrollers (16-bit Proprietary F²MC-16L Family)

Up/down counter	Output Compare	Input Capture	PPG (2 × 8bit or 1 × 16bit)	PWM Timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Clock Prescaler	Special Features	F²MC-16L	Page
-	-	-	1ch	-	-	10 bit × 8ch	-	1ch	-	Multi/Non-multi Prexed Bus	MB90611A	84
-	-	-	1ch	-	-	10 bit × 8ch	-	1ch	-	Multi/Non-multi Prexed Bus	MB90613A	
-	-	-	16bit 2ch	-	-	10 bit × 4ch	-	3 ch.	-		MB90622A	86
-	-	-	16bit 2ch	-	-	10 bit × 4ch	-	3 ch.	-		MB90623A	
-	-	-	16bit 2ch	-	-	10 bit × 4ch	-	3 ch.	-		MB90P623A	
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	-	DAC: 8bit × 2ch	MB90632A	88
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	-	DAC: 8bit × 2ch	MB90634A	
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	-	DAC: 8bit × 2ch	MB90P634A	
-	-	-	1ch	-	-	-	-	1ch	-		MB90641A	84
-	-	-	1ch	-	-	-	-	1ch	-		MB90P641A	
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	Yes	DAC: 8bit × 2ch	MB90652A	88
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	Yes	DAC: 8bit × 2ch	MB90653A	
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	Yes	DAC: 8bit × 2ch	MB90P653A	
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	Yes	DAC: 8bit × 2ch	MB90654A	
Yes	4ch	2ch	1ch	-	-	10 bit × 8ch	-	Free Run Timer	Yes	DAC: 8bit × 2ch	MB90F654A	
-	-	-	-	8bit 1ch	-	10 bit × 8ch	-	4ch	-	Inverter Motor Control	MB90662A	86
-	-	-	-	8bit 1ch	-	10 bit × 8ch	-	4ch	-	Inverter Motor Control	MB90663A	
-	-	-	-	8bit 1ch	-	10 bit × 8ch	-	4ch	-	Inverter Motor Control	MB90P663A	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90671	82
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90672	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90673	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90T673	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90P673	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90676	82
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90677	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90678	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90T678	
-	8ch	4ch	1ch	-	-	10 bit × 8ch	-	2ch	-		MB90P678	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, PLL Clock Multiplier (or Clock Gear)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

16-bit Proprietary F²MC-16LX Family

F²MC-16LX		ROM (KB)	RAM (KB)	Instruction Cycle (ns)	I/O Port	Package	Operating Voltage (V)	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
385 series	MB90387 *	64	2	62.5	34	LQFP-48P	+3.5 to +5.5	-40 to +85	4	2	-	1 ch.	-	-
	MB90387S *	64	2	62.5	36	LQFP-48P	+3.5 to +5.5	-40 to +85	4	1	-	1 ch.	-	-
	MB90F387 *	64	2	62.5	34	LQFP-48P	+3.5 to +5.5	-40 to +85	4	2	-	1 ch.	-	-
	MB90F387S *	64	2	62.5	36	LQFP-48P	+3.5 to +5.5	-40 to +85	4	1	-	1 ch.	-	-
390 series	MB90F394 *	384	10K	50	96	LQFP-120P	+4.5 to +5.5	-40 to +85	8	1	-	3 ch.	1 ch.	-
M405 series	MB90M407	96	4	59.5	26	QFP-100P	+3.0 to +3.6	-40 to +85	4	1	1 ch.	2 ch.	2 ch.	-
	MB90M408	128	4	59.5	26	QFP-100P	+3.0 to +3.6	-40 to +85	4	1	1 ch.	2 ch.	2 ch.	-
	MB90MF408	128	4	59.5	26	QFP-100P	+3.0 to +3.6	-40 to +85	4	1	1 ch.	2 ch.	2 ch.	-
420G/GA series	MB90423GA *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	24seg × 4com
	MB90423GB *	641 28	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90423GC *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90F423GA *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	24seg × 4com
	MB90F423GB *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90F423GC *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
420G/GA series	MB90427GA *	64	4	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	24seg × 4com
	MB90427GB *	64	4	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90427GC *	64	4	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90428GA *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	24seg × 4com
	MB90428GB *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90428GC *	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90F428GA	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	24seg × 4com
	MB90F428GB	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
	MB90F428GC	128	6	62.5	58	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	-	24seg × 4com
440G series	MB90443G *	128	6	62.5	81	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +105	8	2	-	2 ch.	1 ch.	-
	MB90F443G	128	6	62.5	81	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +105	8	2	-	2 ch.	1 ch.	-
460 series	MB90462	64	2	62.5	51	QFP-64P LQFP-64P SH-DIP-64P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	-
	MB90F462	128	2	62.5	51	QFP-64P LQFP-64P SH-DIP-64P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	-

* : Under development

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Up/down counter	Output Compare	Input Capture	8/16 bit PPG	PWM Timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Clock Prescaler	Special Features	F²MC-16LX	Page
-	-	4 ch.	8 bit 4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90387 *	100
-	-	4 ch.	8 bit 4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90387S *	
-	-	4 ch.	8 bit 4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F387 *	
-	-	4 ch.	8 bit 4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F387S *	
-	8 ch.	6 ch.	8 bit 12 ch.	-	-	10 bit × 8 ch.	-	2 ch.	Yes	CAN	MB90F394 *	108
-	1 ch.	2 ch.	-	-	-	10 bit × 16 ch.	-	3 ch.	-	FL Controller	MB90M407	112
-	1 ch.	2 ch.	-	-	-	10 bit × 16 ch.	-	3 ch.	-	FL Controller	MB90M408	
-	1 ch.	2 ch.	-	-	-	10 bit × 16 ch.	-	3 ch.	-	FL Controller	MB90MF408	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90423GA *	102
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90423GB *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90423GC *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F423GA *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F423GB *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F423GC *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90427GA *	102
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90427GB *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90427GC *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90428GA *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90428GB *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90428GC *	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F428GA	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F428GB	
-	-	4 ch.	16 bit 3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F428GC	
-	4 ch.	8 ch.	8/16 bit 4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	Yes	CAN	MB90443G *	104
-	4 ch.	8 ch.	8/16 bit 4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	Yes	CAN	MB90F443G	
-	6 ch.	4 ch.	16 bit 3 ch.	-	2 ch.	10 bit × 8 ch.	-	2 ch.	-	Wave Generator	MB90462	114
-	6 ch.	4 ch.	16 bit 3 ch.	-	2 ch.	10 bit × 8 ch.	-	2 ch.	-	Wave Generator	MB90F462	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, PLL Clock Multiplier (or Clock Gear)

(Continued)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

F²MC-16LX		ROM (KB)	RAM (KB)	Instruction Cycle (ns)	I/O Port	Package	Operating Voltage (V)	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
470 series	MB90473	128	10	50	84	QFP-100P LQFP-100P	+1.8 to +3.6	-40 to +85	8	2	1 ch.	1 ch.	2 ch.	-
	MB90474	256	16	50	84	QFP-100P LQFP-100P	+1.8 to +3.6	-40 to +85	8	2	1 ch.	1 ch.	2 ch.	-
	MB90F474H	256	16	50	84	QFP-100P LQFP-100P	+2.7 to +3.6	-40 to +85	8	2	1 ch.	1 ch.	2 ch.	-
	MB90F474L	256	16	50	84	QFP-100P LQFP-100P	+2.4 to +3.6	-40 to +85	8	2	1 ch.	1 ch.	2 ch.	-
480 series	MB90F481	192	4	40	84	QFP-100P LQFP-100P	+2.7 to +3.6	-40 to +85	8	2	-	1 ch.	2 ch.	-
	MB90F482	256	6	40	84	QFP-100P LQFP-100P	+2.7 to +3.6	-40 to +85	8	2	-	1 ch.	2 ch.	-
495 series	MB90497G	64	4	62.5	85	QFP-64P LQFP-64P	+3.0 to +5.5	-40 to +85	8	2	-	1 ch.	-	-
	MB90F497G	128	4	62.5	85	QFP-64P LQFP-64P	+4.0 to +5.5	-40 to +85	8	2	-	1 ch.	-	-
520/A/B series	MB90522/A/B	64	4	62.5	85	QFP-120P	+3.0 to +5.5	-40 to +85	8	2	-	1 ch.	2 ch.	32seg × 4com
	MB90523/A/B	128	4	62.5	85	QFP-120P LQFP-120P	+3.0 to +5.5	-40 to +85	8	2	-	1 ch.	2 ch.	32seg × 4com
	MB90F523/A	128	4	62.5	85	QFP-120P, LQFP-120P	+4.0 to +5.5	-40 to +85	8	2	-	1 ch.	2 ch.	32seg × 4com
	MB90F523B	128	4	62.5	85	LQFP-120P	+3.0 to +5.5	-40 to +85	8	2	-	1 ch.	2 ch.	32seg × 4com
540G/GS series	MB90F543G	128	6	62.5	81	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	1 ch.	-
	MB90F543GS	128	6	62.5	81	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	1 ch.	-
545G series	MB90F546G	256	8	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	1 ch.	-
	MB90F546GS	256	8	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	1 ch.	-
	MB90F548G	128	4	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	1 ch.	-
	MB90F548GL	128	4	62.5	80	QFP-100P LQFP-100P	+3.5 to +5.5	-40 to +85	8	2	-	2 ch.	1 ch.	-
	MB90F548GLS	128	4	62.5	80	QFP-100P LQFP-100P	+3.5 to +5.5	-40 to +85	8	1	-	2 ch.	1 ch.	-
	MB90F548GS	128	4	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	1 ch.	-
	MB90549G	256	6	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	1 ch.	-
	MB90549GS	256	6	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	1 ch.	-
	MB90F549G	256	6	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	2 ch.	1 ch.	-
	MB90F549GS	256	6	62.5	80	QFP-100P LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	1 ch.	-
550A/B series	MB90552B	64	2	62.5	83	QFP-100P, LQFP-100P	+3.5 to +5.5	-40 to +85	8	1	2 ch.	1 ch.	2 ch.	-
	MB90553B	128	4	62.5	83	QFP-100P, LQFP-100P	+3.5 to +5.5	-40 to +85	8	1	2 ch.	1 ch.	2 ch.	-
	MB90P553A	128	4	62.5	83	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	2 ch.	1 ch.	2 ch.	-
	MB90F553A	128	4	62.5	83	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	2 ch.	1 ch.	2 ch.	-

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Up/down counter	Output Compare	Input Capture	8/16 bit PPG	PWM Timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Clock Prescaler	Special Features	F²MC-16LX	Page
Yes	6 ch.	2 ch.	3 ch.	-	-	10 bit × 8 ch.	-	1 ch.	-		MB90473	96
Yes	6 ch.	2 ch.	3 ch.	-	-	10 bit × 8 ch.	-	1 ch.	-		MB90474	
Yes	6 ch.	2 ch.	3 ch.	-	-	10 bit × 8 ch.	-	1 ch.	-		MB90F474H	
Yes	6 ch.	2 ch.	3 ch.	-	-	10 bit × 8 ch.	-	1 ch.	-		MB90F474L	
Yes	6 ch.	2 ch.	3 ch.	-	-	10 bit × 8 ch.	-	1 ch.	Yes	CAN	MB90F481	98
Yes	6 ch.	2 ch.	3 ch.	-	-	10 bit × 8 ch.	-	1 ch.	Yes	CAN	MB90F482	
-	-	4 ch.	1 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90497G	100
-	-	4 ch.	1 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F497G	
Yes	8 ch.	2 ch.	1 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90522/A/B	110
Yes	8 ch.	2 ch.	1 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	DAC: 8 bit × 2ch., Clock Timer	MB90523/A/B	
Yes	8 ch.	2 ch.	1 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	DAC: 8 bit × 2ch., Clock Timer	MB90F523/A	
Yes	8 ch.	2 ch.	1 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	DAC: 8 bit × 2 ch., Clock Timer	MB90F523B	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F543G	106
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F543GS	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F546G	106
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F546GS	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F548G	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F548GL	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F548GLS	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F548GS	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90549G	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90549GS	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F549G	
-	4 ch.	8 ch.	4 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	CAN	MB90F549GS	
-	4 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90552B	94
-	4 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90553B	
-	4 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90P553A	
-	4 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90F553A	

(Continued)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

(Continued)

F²MC-16LX		ROM (KB)	RAM (KB)	Instruction Cycle (ns)	I/O Port	Package	Operating Voltage (V)	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
560 series	MB90561A	32	1	62.5	51	QFP-64P, LQFP-64P, SH-DIP-64P	+3.0 to +5.5	-40 to +85	8	1	-	2 ch.	-	-
	MB90562A	64	2	62.5	51	QFP-64P, LQFP-64P, SH-DIP-64P	+3.0 to +5.5	-40 to +85	8	1	-	2 ch.	-	-
	MB90F562B	64	2	62.5	51	QFP-64P, LQFP-64P, SH-DIP-64P	+4.5 to +5.5	-40 to +85	8	1	-	2 ch.	-	-
565 series	MB90567	96	4	62.5	51	QFP-64P, LQFP-64P	+2.7 to +3.6	-40 to +85	8	1	-	2 ch.	-	-
	MB90568	128	4	62.5	51	QFP-64P, LQFP-64P	+2.7 to +3.6	-40 to +85	8	1	-	2 ch.	-	-
	MB90F568	128	4	62.5	51	QFP-64P, LQFP-64P	+2.7 to +3.6	-40 to +85	8	1	-	2 ch.	-	-
570/A/C series	MB90573C	128	6	62.5	97	QFP-120P, LQFP-120P	+3.0 to +5.5	-40 to +85	8	2	1 ch.	2 ch.	3 ch.	-
	MB90574C	256	10	62.5	97	QFP-120P, LQFP-120P	+3.0 to +5.5	-40 to +85	8	2	1 ch.	2 ch.	3 ch.	-
	MB90F574A	256	10	62.5	97	QFP-120P, LQFP-120P	+4.5 to +5.5	-40 to +85	8	2	1 ch.	2 ch.	3 ch.	-
580/C/CA series	MB90583C	128	6	62.5	77	QFP-100P, LQFP-100P	+3.0 to +5.5	-40 to +85	8	2	-	5 ch.	-	-
	MB90583CA	128	6	62.5	77	QFP-100P, LQFP-100P	+3.0 to +5.5	-40 to +85	8	1	-	5 ch.	-	-
	MB90F583C	128	6	62.5	77	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	5 ch.	-	-
	MB90F583CA	128	6	62.5	77	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	5 ch.	-	-
	MB90F584C	256	6	62.5	77	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	2	-	5 ch.	-	-
	MB90F584CA	256	6	62.5	77	QFP-100P, LQFP-100P	+4.5 to +5.5	-40 to +85	8	1	-	5 ch.	-	-
	MB90587C	64	4	62.5	77	QFP-100P, LQFP-100P	+3.0 to +5.5	-40 to +85	8	2	-	5 ch.	-	-
	MB90587CA	64	4	62.5	77	QFP-100P, LQFP-100P	+3.0 to +5.5	-40 to +85	8	1	-	5 ch.	-	-
590 series	MB90591G	384	8	62.5	78	QFP-100P	+4.5 to +5.5	-40 to +80	8	1	-	3 ch.	1 ch.	-
	MB90F591G	384	8	62.5	78	QFP-100P	+4.5 to +5.5	-40 to +80	8	1	-	3 ch.	1 ch.	-
	MB90594G	256	6	62.5	78	QFP-100P	+4.5 to +5.5	-40 to +80	8	1	-	3 ch.	1 ch.	-
	MB90F594G	256	6	62.5	78	QFP-100P	+4.5 to +5.5	-40 to +80	8	1	-	3 ch.	1 ch.	-
595 series	MB90598G	128	4	62.5	78	QFP-100P	+4.5 to +5.5	-40 to +80	8	1	-	2 ch.	1 ch.	-
	MB90F598G	128	4	62.5	78	QFP-100P	+4.5 to +5.5	-40 to +80	8	1	-	2 ch.	1 ch.	-

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Up/down counter	Output Compare	Input Capture	8/16 bit PPG	PWM Timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Clock Prescaler	Special Features	F²MC-16LX	Page
-	6 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	Wave Generator	MB90561A	114
-	6 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	Wave Generator	MB90562A	
-	6 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-	Wave Generator	MB90F562B	
-	6 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90567	94
-	6 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90568	
-	6 ch.	4 ch.	3 ch.	-	-	10 bit × 8 ch.	-	2 ch.	-		MB90F568	
Yes	4 ch.	2 ch.	1 ch.	-	-	10 bit × 8 ch.	-	-	-	DAC: 8 bit × 2 ch., Clock Timer	MB90573C	98
Yes	4 ch.	2 ch.	1 ch.	-	-	10 bit × 8 ch.	-	-	-	DAC: 8 bit × 2 ch., Clock Timer	MB90574C	
Yes	4 ch.	2 ch.	1 ch.	-	-	10 bit × 8 ch.	-	-	-	DAC: 8 bit × 2 ch., Clock Timer	MB90F574A	
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8 bit × 2ch.	MB90583C	96
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8 bit × 2ch.	MB90583CA	
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8 bit × 2ch.	MB90F583C	
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8 bit × 2ch.	MB90F583CA	
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8 bit × 2ch.	MB90F584C	
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8 bit × 2ch.	MB90F584CA	
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8bit × 2ch.	MB90587C	
-	2 ch.	4 ch.	1 ch.	-	1 ch.	10 bit × 8 ch.	-	3 ch.	-	IE Bus, DAC: 8bit × 2ch.	MB90587CA	
-	6 ch.	6 ch.	6 ch.	-	-	10 bit × 8 ch.	-	-	-	Stteper Motor Controller 4 ch., CAN 2 ch., Sound Generator	MB90591G	108
-	6 ch.	6 ch.	6 ch.	-	-	10 bit × 8 ch.	-	-	-	Stteper Motor Controller 4 ch., CAN 2 ch., Sound Generator	MB90F591G	
-	6 ch.	6 ch.	6 ch.	-	-	10 bit × 8 ch.	-	-	-	Stteper Motor Controller 4 ch., CAN 2 ch/, Sound Generator, 2 ch. Clock Timer	MB90594G	
-	6 ch.	6 ch.	6 ch.	-	-	10 bit × 8 ch.	-	-	-	Stteper Motor Controller 4 ch., CAN 2 ch., Sound Generator, 2 ch. Clock Timer	MB90F594G	
-	4 ch.	4 ch.	6 ch.	-	-	10 bit × 8 ch.	-	-	-	Stteper Motor Controller 4 ch., CAN 1 ch., 2 ch. Clock Timer	MB90598G	104
-	4 ch.	4 ch.	6 ch.	-	-	10 bit × 8 ch.	-	-	-	Stteper Motor Controller 4 ch., CAN 1 ch., 2 ch. Clock Timer	MB90F598G	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, PLL Clock Multiplier (or Clock Gear)

Microcontrollers (16-bit Proprietary F²MC-16F Family)

16-bit Proprietary F²MC-16F Family

F²MC-16F		ROM (KB)	RAM (KB)	Instruction Cycle (ns)	I/O Port	Package	Operating Voltage	Operating temperature range	Ext. Interrupts	Clock	I²C	UART	8-bit serial	LCD controller / driver
210 series	MB90214	64	3	62.5	65	QFP-80P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	4	1	-	3 ch.	-	-
	MB90P214B	64	4	62.5	65	QFP-80P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	4	1	-	3 ch.	-	-
	MB90W214B	64	4	62.5	65	QFP-80C	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	4	1	-	3 ch.	-	-
220 series	MB90223	64	3	83.4	102	QFP-120P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	8	1	-	4 ch.	-	-
	MB90224	96	4.5	62.5	102	QFP-120P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	8	1	-	4 ch.	-	-
	MB90P224A	96	4.5	62.5	102	QFP-120P	+5 ± 10 %	-40 to +85 (ext bus: -40 to +70)	8	1	-	4 ch.	-	-
	MB90P224B	96	4.5	62.5	102	QFP-120P	+5 ± 10 %	-40 to +85 (ext bus: -40 to +70)	8	1	-	4 ch.	-	-
	MB90W224A	96	4.5	62.5	102	QFP-120P	+5 ± 10 %	-40 to +85 (ext bus: -40 to +70)	8	1	-	4 ch.	-	-
	MB90W224B	96	4.5	62.5	102	QFP-120P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	8	1	-	4 ch.	-	-
230 series	MB90233	48	2	62.5	84	QFP-100P, LQFP-100P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	4	1	-	1 ch.	1 ch.	-
	MB90234	96	3	62.5	84	QFP-100P, LQFP-100P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	4	1	-	1 ch.	1 ch.	-
	MB90P234	96	3	62.5	84	QFP-100P, LQFP-100P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	4	1	-	1 ch.	1 ch.	-
	MB90W234	96	3	62.5	84	QFP-100P, LQFP-100P	+5 ± 10 %	-40 to +105 (ext bus: -40 to +70)	4	1	-	1 ch.	1 ch.	-
240 series	MB90F244	128	1.125	40	63	TQFP-80P	+3.3 ± 0.3, +5 ± 0.5	0 to +70	4	1	-	1 ch.	1 ch.	-
	MB90F245	192	1.5	31.25	58	TQFP-80P	+3.3 ± 0.3	0 to +70	4	1	-	1 ch.	1 ch.	-
	MB90246A	-	4	62.5	57	LQFP-100P	+5 ± 10 %, +3 ± 10 %	-30 to +70	4	1	-	1 ch.	2 ch.	-

Microcontrollers (16-bit Proprietary F²MC-16F Family)

Up/down counter	Output Compare	Input Capture	PPG (2 × 8bit or 1 × 16bit)	PWM Timer	PWC Timer	ADC	8-bit Timer	16-bit Timer	Clock Prescaler	Special Features	F²MC-16F	Page
-	-	-	1 ch.	-	4 ch.	10 bit × 8 ch.	-	4 ch.	-		MB90214	120
-	-	-	1 ch.	-	4 ch.	10 bit × 8 ch.	-	4 ch.	-		MB90P214B	
-	-	-	1 ch.	-	4 ch.	10 bit × 8 ch.	-	4 ch.	-		MB90W214B	
-	8 ch.	4 ch.	2 ch.	-	4 ch.	10 bit × 16 ch.	-	6 ch.	-		MB90223	126
-	8 ch.	4 ch.	2 ch.	-	4 ch.	10 bit × 16 ch.	-	6 ch.	-		MB90224	
-	8 ch.	4 ch.	2 ch.	-	4 ch.	10 bit × 16 ch.	-	6 ch.	-		MB90P224A	
-	8 ch.	4 ch.	2 ch.	-	4 ch.	10 bit × 16 ch.	-	6 ch.	-		MB90P224B	
-	8 ch.	4 ch.	2 ch.	-	4 ch.	10 bit × 16 ch.	-	6 ch.	-		MB90W224A	
-	8 ch.	4 ch.	2 ch.	-	4 ch.	10 bit × 16 ch.	-	6 ch.	-		MB90W224B	
-	6 ch.	4 ch.	1 ch.	6 ch.	-	10 bit × 8 ch.	-	-	-	E²PROM I/F 1 ch., DAC 8 bit × 2 ch., Level Comparator	MB90233	124
-	6 ch.	4 ch.	1 ch.	6 ch.	-	10 bit × 8 ch.	-	-	-	E²PROM I/F 1 ch., DAC 8 bit × 2 ch., Level Comparator	MB90234	
-	6 ch.	4 ch.	1 ch.	6 ch.	-	10 bit × 8 ch.	-	-	-	E²PROM I/F 1 ch., DAC 8 bit × 2 ch., Level Comparator	MB90P234	
-	6 ch.	4 ch.	1 ch.	6 ch.	-	10 bit × 8 ch.	-	-	-	E²PROM I/F 1 ch., DAC 8 bit × 2 ch., Level Comparator	MB90W234	
-	-	4 ch.	-	-	-	10 bit × 8 ch.	-	3 ch.	-		MB90F244	122
-	-	4 ch.	-	-	-	10 bit × 8 ch.	-	3 ch.	-		MB90F245	
-	-	2 ch.	-	-	4 ch.	10 bit × 8 ch.	-	3 ch.	-	Products-sum unit, DAC 8 bit × 3 ch.	MB90246A	

Standard Features : Power-on Reset, Standby Mode, Watchdog Timer Reset, PLL Clock Multiplier (or Clock Gear)

Microcontrollers (32-bit Proprietary FR Family)

32-bit FR Family

32-bit FR	ROM (KB)	RAM (KB)	Cashe (KB)	Instruction Cycle (ns)	I/O Port	Package	Operating Voltage (V)	Operating temperature range (°C)	Ext. Interrupts	Clock	PLL clock	Ext. bus	DRAM controller	I²C	UART	Serial	RTG	CAN	DMAC	Software DMA transfer	Sound generator	Up/down counter	Output Compare
MB91101A	-	2	1	20	50	QFP-100 SQFP-100	5.0 ± 10% 2.7 to 3.6	0 to 70	5	1	Yes	Yes	Yes	-	3	-	-	-	8	-	-	-	-
MB91106A	127	2	-	20	78	QFP-100 LQFP-100	3.0 to 3.6	0 to 70	5	1	Yes	Yes	Yes	-	3	-	-	-	8	-	-	-	-
MB91107	-	128	1	20	69	LQFP-120	3.0 to 3.6	0 to 70	9	1	Yes	Yes	Yes	-	3	-	-	-	8	-	-	-	-
MB91108	-	160	1	20	69	LQFP-120	3.0 to 3.6	0 to 70	9	1	Yes	Yes	Yes	-	3	-	-	-	8	-	-	-	-
MB91F109	254	4	-	40	78	QFP-100 SQFP-100	3.0 to 3.6	0 to 70	5	1	Yes	Yes	Yes	-	3	-	-	-	8	-	-	-	-
MB91110	-	21	1	20	68	LQFP-144	3.0 to 3.6	0 to 70	9	1	Yes	Yes	Yes	-	1	-	-	-	5	Yes	-	-	-
MB91121	-	5	1	20	64	LQFP-120	3.0 to 3.6	0 to 70	9	1	Yes	Yes	Yes	-	3	-	-	-	8	Yes	-	-	-
MB91133	254	8	-	31	116	LQFP-144 FBGA-144	5.0 ± 10% 2.7 to 3.6	0 to 70	24	2	Yes	Yes	-	-	5	-	-	-	8	-	-	2	8
MB91F133 *	254	8	-	31	116	LQFP-144 FBGA-144	5.0 ± 10% 3.0 to 3.6	0 to 70	24	2	Yes	Yes	-	-	5	-	-	-	8	-	-	2	8
MB91154	384	22	-	31	112	LQFP-144	3.15 to 3.6	0 to 70	16	2	Yes	Yes	-	1	4	-	-	-	8	-	-	2	8
MB91F154	384	22	-	31	112	LQFP-144	3.15 to 3.6	0 to 70	16	2	Yes	Yes	-	1	4	-	-	-	8	-	-	2	8
MB91F155	510	34	-	31	112	LQFP-144	3.15 to 3.6	0 to 70	16	2	Yes	Yes	-	1	4	-	-	-	8	-	-	2	8
MB91307A	-	128	1	16	69	LQFP-120	3.0 to 3.6	0 to 70	9	1	Yes	Yes	-	1	3	-	-	-	5	Yes	-	-	-
MB91340	64	116	-	16	107	LQFP-176	3.0 to 3.6 2.3 to 2.7	–10 to 70	9	1	Yes	Yes	-	1	3	-	-	-	5	Yes	-	4	8
MB91F362GA	512	12	4	16	102	QFP-208	4.25 to 5.25	–40 to 85	8	1	Yes	Yes	-	1	3	2	-	3	1	-	1	-	4
MB91F369GA *	512	16	4	16	75	QFP-160	4.25 to 5.25	–40 to 85	8	1	Yes	Yes	-	1	1	-	-	2	5	-	1	-	-

* : Under development

Microcontrollers (32-bit Proprietary FR Family)

Input Capture	FRC	Clock Prescaler	FG	Output waveform generator	Waveform data t ransmitter	Stepping motor controller	Level comparator	Alarm comparator	PPG	PWM timer	PWC timer	A/D converter	D/A converter	16-bit reload timer	Counter	Up counter	DSP	Watch Dog Timer	Watch timer	Bit search module	Power-on reset	Software reset	Standby mode	Evaluation device	Part number	Page
-	-	-	-	-	-	-	-	-	-	4	-	4	-	3	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91V101A	MB91101A	164
-	-	-	-	-	-	-	-	-	-	4	-	4	-	3	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91V106A	MB91106A	
-	-	-	-	-	-	-	-	-	-	4	-	4	-	3	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91V108	MB91107	
-	-	-	-	-	-	-	-	-	-	4	-	4	-	3	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91V108	MB91108	
-	-	-	-	-	-	-	-	-	-	4	-	4	-	3	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91V106A	MB91F109	
-	-	-	-	-	-	-	-	-	6	-	-	8	-	2	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91V110	MB91110	
-	-	-	-	-	-	-	-	-	-	4	-	8	-	3	-	-	Yes	Yes	-	Yes	Yes	Yes	Yes	MB91V121	MB91121	
4	-	-	-	Yes	-	-	Yes	-	6	-	-	8	-	-	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91FV130	MB91133	
4	-	-	-	Yes	-	-	Yes	-	6	-	-	8	-	-	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91FV130	MB91F133 *	
4	-	-	-	-	-	-	-	-	6	-	-	8	3	4	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes	MB91FV150	MB91154	
4	-	-	-	-	-	-	-	-	6	-	-	8	3	4	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes	MB91FV150	MB91F154	
4	-	-	-	-	-	-	-	-	6	-	-	8	3	4	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes	MB91FV150	MB91F155	
-	-	-	-	-	-	-	-	-	-	-	-	4	-	3	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91V307A	MB91307A	166
4	-	-	-	-	2	-	-	-	-	-	-	8	3	4	-	1	-	Yes	-	Yes	Yes	Yes	Yes	MB91V340	MB91340	
4	-	-	-	-	-	4	-	Yes	8	-	-	16	2	6	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes	MB91FV360	MB91F362GA	
-	-	-	-	-	-	-	-	Yes	4	-	-	10	-	6	-	-	-	Yes	-	Yes	Yes	Yes	Yes	MB91FV360	MB91F369GA *	

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89051	MB89051 *1 MB89F051 *1	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09	Cable MB2144-210A + Header *2, *5	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	Incompatible	• advice (main unit) : AD200 • Dummy target (option) : /DUT	*2
MB89120	MB89121	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV130A, QFP-48C (0.8mm, 15 × 15mm) *6
MB89120A	MB89123A	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13	MB2144-203		PF034 (operates 3 to 5V)		
	MB89125A	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13					
MB89130	MB89131 MB89135L	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13	MB2144-203		PF034 (operates 3 to 5V)		
	MB89P131 MB89P135A	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13					
MB89130A	MB89133A	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13	MB2144-203		PF034 (operates 3 to 5V)		
		SHDIP-48P DIP-48P-M01					
	MB89P133A	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13					
		SHDIP-48P DIP-48P-M01					
	MB89135A	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13					
	MB89P135A	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13					
MB89140 MB89140A	MB89143A MB89144A MB89145 MB89146 MB89147 MB89P147	SH-DIP-64P DIP-64P-M01	MB2144-201		PF031 (operates at 3 to 5V)		Piggyback and evaluation (separately available) MB89PV140, SH-DIP-64C
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV140 QFP-64C (1.0mm, 16 × 22mm) *6
	MB89W147	SH-DIP-64C DIP-64C-A06	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV140 SH-DIP-64C

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
Not required	MB89F051	Under planning	Under development	—	—	—	MB89051 *1 MB89F051 *1
Not required	MB89P131	General-purpose EPROM Programmer *7 (capable of programming to MBM27C256A)	ROM-48QF2-28DP-8L	MB89PV130A QFP-48C (0.8mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89121
Not required	MB89P133A		ROM-48QF2-28DP-8L				MB89123A
Not required	MB89P135A		ROM-48QF2-28DP-8L				MB89125A
Not required	MB89P131 MB89P135		ROM-48QF2-28DP-8L				MB89131 MB89135L
Not required	MB89P131 MB89P135		ROM-48QF2-28DP-8L				MB89P131 MB89P135A
Not required	MB89P133A		ROM-48QF2-28DP-8L				MB89133A
Incompatible	MB89P133A		ROM-48SD-28DP-8L2				
Not required	MB89P133A		ROM-48QF2-28DP-8L				MB89P133A
Incompatible	MB89P133A		ROM-48SD-28DP-8L2				
Not required	MB89P135A		ROM-48QF2-28DP-8L				MB89135A
Not required	MB89P135A		ROM-48QF2-28DP-8L				MB89P135A
Not required	MB89P147		ROM-64SD-28DP-8L4	MB89PV140 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89143A MB89144A MB89145 MB89146 MB89147 MB89P147
			ROM-64QF-28DP-8L4	MB89PV140 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	
	MB89P147		ROM-64SD-28DP-8L4	MB89PV140 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89W147

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89150	MB89151 MB89152 MB89153 MB89154 MB89155 MB89P155 -101 to 105	LQFP-80P (0.5mm, 12 × 12mm) FPT-80P-M05	MB2144-202	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	PF032 (operates 3 to 5V)	• advice (main unit) : AD200 • Dummy target (option) : /DUT	Piggyback and evaluation (separately available) MB89PV150-101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6
		LQFP-80P (0.65mm, 14 × 14mm) FPT-80P-M11					
		QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06					
MB89150A	MB89151A MB89152A MB89153A MB89154A MB89155A MB89P155 -201 to 205	LQFP-80P (0.5mm, 12 × 12mm) FPT-80P-M05	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV150-101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6
		LQFP-80P (0.65mm, 14 × 14mm) FPT-80P-M11					
		QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06					
MB89160	MB89161 MB89163 MB89165 MB89P165 -101 to 105	LQFP-80P (0.5mm, 12 × 12mm) FPT-80P-M05	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV160-101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6
		LQFP-80P (0.65mm, 14 × 14mm) FPT-80P-M11					
		QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06					
	MB89W165	QFP-80C (0.8mm, 14 × 20mm) FPT-80C-A02					
MB89160A	MB89161A MB89163A MB89165A MB89P165 -201 to 205	LQFP-80P (0.5mm, 12 × 12mm) FPT-80P-M05	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV160-101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6
		LQFP-80P (0.65mm, 14 × 14mm) FPT-80P-M11					
		QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06					
MB89170	MB89173 MB89173L MB89P173 MB89174A MB89174L MB89P175A	QFP-48P (0.8mm, 12 × 12mm) FPT-48P-M16	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV170A QFP-48C (0.8mm, 15 × 15mm) *6
MB89180	MB89181 MB89182 MB89183 MB89184 MB89185 MB89P185	LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV180 QFP-64C (1.0mm, 16 × 22mm) *6
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06					
MB89190	MB89191 MB89193 MB89195 MB89P195	SOP-28P (17.75 × 8.6 mm) FPT-28P-M17	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV190 QFP-48C (0.8mm, 15 × 15mm) *6
		SH-DIP-28P DIP-28P-M03					
		DIP-28P DIP-28P-M05					

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/ EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P155 -101 to 105	General-purpose EPROM Programmer *7 (capable of programming to MBM27C256A)	ROM-80SQF-28DP-8L	MB89PV150 -101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89151 MB89152 MB89153 MB89154 MB89155 MB89P155 -101 to 105
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN			ROM-80QF2-28DP-8L2				
Not required			ROM-80QF-28DP-8L3				
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P155 -201 to 205		ROM-80SQF-28DP-8L	MB89PV150 -101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89151A MB89152A MB89153A MB89154A MB89155A MB89P155 -201 to 205
			ROM-80QF2-28DP-8L2				
Not required			ROM-80QF-28DP-8L3				
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P165 -101 to 105		ROM-80SQF-28DP-8L	MB89PV160 -101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89161 MB89163 MB89165 MB89P165 -101 to 105
			ROM-80QF2-28DP-8L2				
Not required			ROM-80QF-28DP-8L3				
Not required	MB89W165		ROM-80QF-28DP-8L3				MB89W165
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P165 -201 to 205		ROM-80SQF-28DP-8L	MB89PV160 -101 to 105 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89161A MB89163A MB89165A MB89P165 -201 to 205
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN			ROM-80QF2-28DP-8L2				
Not required			ROM-80QF-28DP-8L3				
Not required	MB89P173 MB89P175A		ROM-48QF-28DP-8L	MB89PV170A QFP-48C (0.8mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89173 MB89173L MB89P173 MB89174A MB89174L MB89P175A
Incompatible	MB89P185		ROM-64QF2-28DP-8L2	MB89PV180 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89181 MB89182 MB89183 MB89184 MB89185 MB89P185
Not required			ROM-64QF-28DP-8L3				
48QF-28SOP-8L	MB89P195	General-purpose EPROM Programmer *8	ROM-28SOP-28DP-8L	MB89PV190 QFP-48C (0.8mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89191 MB89193 MB89195 MB89P195
48QF-28SD-8L			OTP product unprovided				
48QF-28DP-8L			ROM-28DP-28DP-8L				

Support Hardware for F²MC-8L Family

<table>
<tr><th colspan="7">Development Tools</th></tr>
<tr><th colspan="3">Target Microcontroller</th><th colspan="2">Fujitsu ICE (MB2140 Series)</th><th colspan="2">Yokogawa Digital Computer ICE *4</th><th rowspan="2">Evaluation Device (Lead pitch, body size)</th></tr>
<tr><th>Series name</th><th>Product name</th><th>Package (Lead pitch, body size)</th><th>Probe</th><th>Equipment common to series</th><th>Pod</th><th>Equipment common to series</th></tr>
<tr><td rowspan="3">MB89190A</td><td rowspan="3">MB89191A/H
MB89193A/H
MB89195A
MB89P195A</td><td>SOP-28P
(17.75 × 8.6 mm)
FPT-28P-M17</td><td rowspan="3">MB2144-203</td><td rowspan="15">• Main unit : MB2141B
• Pod : MB2144-508 (operates at 3 to 5V)
• Emulator debugger software : SOFTUNE
• RS-232C cable</td><td rowspan="3">PF034
(operates 3 to 5V)</td><td rowspan="15">• advice (main unit) : AD200
• Dummy target (option) : /DUT</td><td rowspan="3">Piggyback and evaluation (separately available)
MB89PV190A
QFP-48C
(0.8mm, 15 × 15mm) *6</td></tr>
<tr><td>SH-DIP-28P
DIP-28P-M03</td></tr>
<tr><td>DIP-28P
DIP-28P-M05</td></tr>
<tr><td rowspan="4">MB89530</td><td rowspan="4">MB89535A
MB89537
MB89537A
MB89537AC
MB89537C
MB89537H
MB89537HC
MB89538
MB89538A
MB89538AC
MB89538C
MB89538H
MB89538HC
MB89P538</td><td>SH-DIP-64P
DIP-64P-M01</td><td rowspan="3">MB2144-201</td><td rowspan="3">PF031
(operates 3 to 5V)</td><td rowspan="3">Piggyback and evaluation (separately available)
MB89PV530
SH-DIP-64C</td></tr>
<tr><td>LQFP-64P
(0.5mm, 10 × 10mm)
FPT-64P-M03</td></tr>
<tr><td>LQFP-64P
(0.65mm, 12 × 12mm)
FPT-64P-M09</td></tr>
<tr><td>QFP-64P
(1.0mm, 14 × 20mm)
FPT-64P-M06</td><td>MB2144-202</td><td>PF032
(operates 3 to 5V)</td><td>Piggyback and evaluation (separately available)
MB89PV530
QFP-64C (1.0mm, 16 × 22mm) *6</td></tr>
<tr><td rowspan="2">MB89550A</td><td rowspan="2">MB89557A
MB89558A
MB89P558A</td><td>TQFP-100P
(0.4mm, 12 × 12mm)
FPT-100P-M18</td><td rowspan="2">MB2144-203</td><td rowspan="2">PF034
(operates 3 to 5V)</td><td rowspan="2">Piggyback and evaluation (separately available)
MB89PV550A
LQFP-100C
(0.5mm, 15 × 15mm) *6</td></tr>
<tr><td>LQFP-100P
(0.5mm, 14 × 14mm)
FPT-100P-M05</td></tr>
<tr><td rowspan="2">MB89560</td><td rowspan="2">MB89567
MB89567A
MB89567AC
MB89567C
MB89567H
MB89567HC
MB89P568</td><td>LQFP-80P
(0.5mm, 12 × 12mm)
FPT-80P-M05</td><td rowspan="2">MB2144-202</td><td rowspan="2">PF032
(operates 3 to 5V)</td><td rowspan="2">Piggyback and evaluation (separately available)
MB89PV560
QFP-80
(0.8mm, 14 × 20mm) *6</td></tr>
<tr><td>QFP-80P
(0.8mm, 14 × 20mm)
FPT-80P-M06</td></tr>
<tr><td rowspan="2">MB89570</td><td rowspan="2">MB89577
MB89P579A</td><td>TQFP-100P
(0.4mm, 12 × 12mm)
FPT-100P-M18</td><td rowspan="2">MB2144-203</td><td>Incompatible</td><td rowspan="2">Piggyback and evaluation (separately available)
MB89PV570
MQFP-100C
(0.5mm, 15 × 15mm)</td></tr>
<tr><td>LQFP-100P
(0.5mm, 14 × 14mm)
FPT-100P-M05</td><td>Incompatible</td></tr>
<tr><td rowspan="2">MB89580B</td><td>MB89583B
MB89585B
MB89P585B</td><td>LQFP-64
(0.5mm, 10 × 10mm)
FPT-64P-M03</td><td>Cable only MB2144-210A
+
Header only *5 MB2144-217-01</td><td rowspan="2">Incompatible</td><td>OTP evaluation
MB89P585B
LQFP64
Inplemented in probe header</td></tr>
<tr><td>MB89589B
MB89P589B</td><td>LQFP-64
(0.65mm, 12 × 12mm)
FPT-64P-M09</td><td>Cable only MB2144-210A
+
Header only *5 MB2144-224-01</td><td>OTP evaluation
MB89P589B
LQFP64
Inplemented in probe header</td></tr>
</table>

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
48QF-28SOP-8L	MB89P195A	General-purpose EPROM Programmer *8	ROM-28SOP-28DP-8L	MB89PV190A QFP-48C (0.8mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89191A/H MB89193A/H MB89195A MB89P195A
48QF-28SD-8L			OTP product unprovided				
48QF-28DP-8L			ROM-28DP-28DP-8L				
—	MB89P538	General-purpose EPROM Programmer *7 (capable of programming to MBM27C1001)	ROM-64SD-32DP-8LA2	MB89PV530 SH-DIP-64C	MBM27C512-20CE (DIP-32)	Not required	MB89535A MB89537 MB89537A MB89537AC MB89537C MB89537H MB89537HC MB89538 MB89538A MB89538AC MB89538C MB89538H MB89538HC MB89P538
64SD-64SQF-8L			OTP product unprovided				
64SD-64QF2-8L			ROM-64QF2-32DP-8LA				
Not required			ROM-64QF-32DP-8LA2	MB89PV530 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C512-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	
100SQF-100TQF-8L	MB89P558A	General-purpose EPROM Programmer *7 (capable of programming to MBM27C1001)	ROM-100TQF-32DP-8LA	MB89PV550A LQFP-100C (0.5mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square) (ROM 60 KB compatible. EPROM is not available)	ROM-32LC-28DP-S	MB89557A MB89558A MB89P558A
Not required			ROM-100SQF-32DP-8LA2				
80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN	MB89P568	General-purpose EPROM Programmer *7 (capable of programming to MBM27C1001)	ROM-80SQF-32DP-8LA	MB89PV560 QFP-80C (0.8mm, 14 × 20mm) *6	MBM27C512-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89567 MB89567A MB89567AC MB89567C MB89567H MB89567HC MB89P568
Not required			ROM-80QF-32DP-8LA2				
100SQF-100TQF-8L	MB89P579A	*9	ROM2-100TQF2-32DP-8LA	MB89PV570 MQFP-100C (0.5mm, 15 × 15mm)	MBM27C256-20TVM (LCC-32 Square) (ROM 60 KB compatible. EPROM is not available)	ROM-32LC-28DP-S	MB89577 MB89P579A
Not required			ROM2-100LQF-32DP-8LA				
Not required	MB89P585B		ROM2-64LQF-32DP-8LA	—	—	—	MB89583B MB89585B MB89P585B
	MB89P589B		ROM2-64QF2-32DP-8LA2	—	—	—	MB89589B MB89P589B

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89580BW	MB89583BW MB89585BW MB89P585BW	LQFP-64 (0.5mm, 10 × 10mm) FPT-64P-M03	Cable only MB2144-210A + Header only *5 MB2144-225-01	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	Incompatible	• advice (main unit) : AD200 • Dummy target (option) : /DUT	OTP evaluation MB89P585BW LQFP64 Inplemented in probe header
MB89590D	MB89593D MB89595D MB89P595D	LQFP-64 (0.5mm, 10 × 10mm) FPT-64P-M03	Cable only MB2144-210A + Header only *2, *5		Incompatible		OTP evaluation MB89P595D LQFP64 Inplemented in probe header
MB89600/R	MB89601R MB89603 MB89P601	LQFP-48P (0.5mm, 7 × 7mm) FPT-48P-M05	MB2144-201 or MB2144-202		PF031 (operates 3 to 5V) or PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 SH-DIP-64C or MB89PV620 QFP-64 (1.0mm, 16 × 22mm) *6
MB89610/R	MB89613/R MB89615/R MB89P625	SH-DIP-64P DIP-64P-M01	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 SH-DIP-64C
	MB89613/R MB89615/R	LQFP-64P (0.5mm, 10 × 10mm) FPT-64P-M03					
	MB89613/R MB89615/R MB89P625	LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09					
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6
MB89620/R	MB89623 MB89623R MB89T623 MB89T623R MB89625 MB89625R MB89T625 MB89T625R	SH-DIP-64P DIP-64P-M01	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 SH-DIP-64C
		LQFP-64P (0.5mm, 10 × 10mm) FPT-64P-M03					
		LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09					
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
Not required	MB89P585BW	*9	ROM2-64LQF-32DP-8LA	—	—	—	MB89583BW MB89585BW MB89P585BW
Not required	MB89P595D		ROM2-64LQF-32DP-8LA	—	—	—	MB89593D MB89595D MB89P595D
Not provided	MB89P601	General-purpose EPROM Programmer *7 (capable of programming to MBM27C256A)	ROM-48SQF-28DP-8L	MB89PV620 SH-DIP-64C or MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20CZ (DIP-28) or MBM27C256A-20TV (LCC-32 rectangular)	Not required or ROM-32LC-28DP-YG	MB89601R MB89603 MB89P601
Not required	MB89P625 MB89W625	General-purpose EPROM Programmer *7 (capable of programming to MBM27C256A)	ROM-64SD-28DP-8L	MB89PV620 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89613/R MB89615/R MB89P625
64SD-64SQF-8L	—		—				MB89613/R MB89615/R
64SD-64QF2-8L	MB89P625		ROM-64QF2-28DP-8L				MB89613/R MB89615/R MB89P625
Not required	MB89P625 MB89P627		ROM-64QF-28DP-8L	MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	
Not required	MB89P625/7 MB89W625/7		ROM-64SD-28DP-8L	MB89PV620 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89623 MB89623R MB89T623 MB89T623R MB89625 MB89625R MB89T625 MB89T625R
64SD-64SQF-8L	—		—				
64SD-64QF2-8L	MB89P625		ROM-64QF2-28DP-8L				
Not required	MB89P625 MB89P627		ROM-64QF-28DP-8L	MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89620/R	MB89P625 MB89626 MB89626R MB89T626R MB89627 MB89627R MB89T627R	SH-DIP-64P DIP-64P-M01	MB2144-201	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	PF031 (operates 3 to 5V)	• advice (main unit) : AD200 • Dummy target (option) : /DUT	Piggyback and evaluation (separately available) MB89PV620 SH-DIP-64C
		LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09					
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6
	MB89P627 MB89P629 MB89628R MB89629R	QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6
		SH-DIP-64P DIP-64P-M01	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV620 SH-DIP-64C
	MB89W625 MB89W627 MB89W629	SH-DIP-64P DIP-64C-A06					
MB89630/R	MB89635 MB89635R MB89T635 MB89T635R MB89636 MB89636R MB89T636R MB89637 MB89637R MB89T637R	SH-DIP-64P DIP-64P-M01	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV630 SH-DIP-64C
		LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09					
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV630 QFP-64C (1.0mm, 16 × 22mm) *6
	MB89P637	SH-DIP-64P DIP-64P-M01	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV630 SH-DIP-64C
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV630 QFP-64C (1.0mm, 16 × 22mm) *6
	MB89W637	SH-DIP-64C DIP-64C-A06	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV630 SH-DIP-64C

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
Not required	MB89P625	General-purpose EPROM Programmer *7 (capable of programming to MBM27C256A)	ROM-64SD-28DP-8L	MB89PV620 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89P625 MB89626 MB89626R MB89T626R MB89627 MB89627R MB89T627R
64SD-64QF2-8L			ROM-64QF2-28DP-8L				
Not required			ROM-64QF-28DP-8L	MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	
Not required	MB89P627 MB89P629		ROM-64QF-28DP-8L	MB89PV620 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89P627 MB89P629 MB89628R MB89629R
			ROM-64SD-28DP-8L	MB89PV620 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	
	MB89W625 MB89W627 MB89W629		ROM-64SD-28DP-8L				MB89W625 MB89W627 MB89W629
Not required	MB89P637 MB89W637		ROM-64SD-28DP-8L	MB89PV630 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89635 MB89635R MB89T635 MB89T635R MB89636 MB89636R MB89T636R MB89637 MB89637R MB89T637R
64SD-64QF2-8L	—		—				
Not required	MB89P637		ROM-64QF-28DP-8L	MB89PV630 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	
Not required	MB89P637		ROM-64SD-28DP-8L	MB89PV630 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89P637
Not required			ROM-64QF-28DP-8L	MB89PV630 QFP-64C (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	
Not required	MB89W637		ROM-64SD-28DP-8L	MB89PV630 SD-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89W637

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89640	MB89643 MB89645 MB89646 MB89647 MB89P647	QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06	MB2144-202	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	PF032 (operates 3 to 5V)	• advice (main unit) : AD200 • Dummy target (option) : /DUT	Piggyback and evaluation (separately available) MB89PV640 QFP-80C (0.8mm, 16 × 22mm) *6
		LQFP-80P (0.65mm, 14 × 14mm) FPT-80P-M11					
MB89650A/ MB89650AR	MB89653A MB89653AR MB89655A MB89655AR MB89656A MB89656AR MB89657A MB89657AR MB89P657A	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV650A SQFP-100C (0.5mm, 15 × 15mm) *6
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05					
MB89660/R	MB89663/R MB89665/R MB89P665	SH-DIP-64P DIP-64P-M01	Cable only MB2144-210A + Header only MB2144-216-01		Incompatible		OTP evaluation MB89P665 SH-DIP-64P Inplemented in probe header
	MB89W665	SH-DIP-64C DIP-64C-A06					
	MB89663/R MB89665/R MB89P665	QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	Cable only MB2144-210A + Header only MB2144-215-01 *5 (for QFP-64P)		Incompatible		OTP evaluation MB89P665 QFP-64P Inplemented in probe header
	MB89W665	QFP-64C (1.0mm, 14 × 20mm) FPT-64C-A02					
MB89670/ MB89670A	MB89673 MB89673R MB89673AR MB89675R MB89675AR MB89677A MB89677AR MB89P677A	QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV670A QFP-80C (0.8mm, 16 × 22mm) *6
		LQFP-80P (0.65mm, 14 × 14mm) FPT-80P-M11					
MB89680	MB89689 MB89P689	LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV680 QFP-100C (0.65mm, 16 × 22mm) *6
		QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06					
	MB89W689	QFP-100C (0.65mm, 14 × 20mm) FPT-100C-A02					
MB89800	MB89803 MB89805 MB89P808	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV800 MQFP-100C (0.5mm, 15 × 15mm)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05					

Support Hardware for F²MC-8L Family

Development Tools		Equipment for Program to OTP/EPROM		Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/ EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
Not required	MB89P647	General-purpose EPROM Programmer (capable of programming to MBM27C256A)	ROM-80QF-28DP-8L2	MB89PV640 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89643 MB89645 MB89646 MB89647 MB89P647
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN			ROM-80QF2-28DP-8L				
100SQF-100QF-8L	MB89P657A		ROM-100QF-28DP-8L2	MB89PV650A SQFP-100C (0.5mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89653A/AR MB89655A/AR MB89656A/AR MB89657A/AR MB89P657A
Not required			ROM-100SQF-28DP-8L				
Not required	MB89P665		ROM-64SD-28DP-8L	—	—	—	MB89663/R MB89665/R MB89P665
	MB89W665		ROM-64SD-28DP-8L				MB89W665
Not required	MB89P665		ROM-64QF-28DP-8L				MB89663/R MB89665/R MB89P665
	MB89W665		ROM-64QF-28DP-8L5				MB89W665
Not required	MB89P677A		ROM-80QF-28DP-8L2	MB89PV670A QFP-80C (0.8mm, 14 × 20mm) *6	MBM27C512-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89673 MB89673R MB89673AR MB89675R MB89675AR MB89677A MB89677AR MB89P677A
80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN			ROM-80QF2-28DP-8L				
Incompatible	MB89P689 MB89W689	General-purpose EPROM Programmer *7 (capable of programming to MBM27C1001)	ROM-100SQF-32DP-8LA	MB89PV680 QFP-100C (0.65mm, 16 × 22mm) *6	MBM27C512-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89689 MB89P689
Not required			ROM-100QF-32DP-8LA				
			ROM-100QF-32DP-8LA				MB89W689
100SQF-100TQF-8L	MB89P808		ROM-100QF-32DP-8LA2	MB89PV800	MBM27C512-20TV (LCC-32 Square)	ROM-32LC-28DP-S	MB89803 MB89805 MB89P808
Not required			ROM-100SQF-32DP-8LA3	MQFP-100C (0.5mm, 15 × 15mm)			

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89810A	MB89816A MB89P817A	QFP-64P (1.0mm, 14 × 20mm) FPT-64C-M06	Cable only MB2144-210A + Header only MB2144-214-01A	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	Incompatible	• advice (main unit) : AD200 • Dummy target (option) : /DUT	OTP evaluation MB89P817 QFP-64P (1.00mm, 14 × 20mm) Inplemented in probe header
MB89820	MB89821 MB89823 MB89825 MB89P825	LQFP-80P (0.65mm, 14 × 14mm) FPT-80P-M11	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV820 QFP-80C (0.8mm, 16 × 22mm) *6
MB89850	MB89855/R MB89T855 MB89857 MB89P857	SH-DIP-64P DIP-64P-M01	Cable only MB2144-210A + Header only MB2144-212-01A		PF026		OTP evaluation MB89P857 SH-DIP-64C Inplemented in probe header
	MB89W857	SH-DIP-64C DIP-64C-A06					
MB89863	MB89863	QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M04	Cable only MB2144-210A + Header only MB2144-212-01A		PF026		OTP evaluation MB89P857 SH-DIP-64C Inplemented in probe header
MB89860	MB89865 MB89867 MB89P867	QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06	Cable only MB2144-210A + Header only MB2144-211-01A (for QFP-80 *5)		Incompatible		OTP evaluation MB89P867 QFP-80P (14 × 20mm) Inplemented in probe header
	MB89W867	QFP-80C (0.8mm, 14 × 20mm) FPT-80C-A02					
MB89870	MB89875 MB89P875	QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV870 QFP-80C (0.8mm, 16 × 22mm) *6
		LQFP-80P (0.5mm, 12 × 12mm) FPT-80P-M05					
MB89890	MB89898 MB89899 MB89P899	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV890 QFP-100C (0.65mm, 16 × 22mm) *6
MB89910	MB89913 MB89915 MB89P915	SH-DIP-48P (13.8 × 43.69mm) DIP-48P-M01	MB2144-201		PF031 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV910 SH-DIP-64C
		QFP-48P *2 (0.8mm, 12 × 12mm) FPT-48P-M15					

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
Not required	MB89P817A	General-purpose EPROM Programmer (capable of programming to MBM27C256A)	ROM-64QF-28DP-8L	—	—	—	MB89816A MB89P817A
Incompatible	MB89P825		ROM-80QF2-28DP-8L3	MB89PV820 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89821 MB89823 MB89825 MB89P825
Not required	MB89P857		ROM-64SD-28DP-8L	—	—	—	MB89855/R MB89T855 MB89857 MB89P857
	MB89P857 MB89W857						MB89W857
64SD-48QF-8L	MB89W857		ROM-64SD-28DP-8L	—	—	—	MB89863
Not required	MB89P867	General-purpose EPROM Programmer (capable of programming to MBM27C256A)	ROM-80QF-28DP-8L2	—	—	—	MB89865 MB89867 MB89P867
	MB89W867						MB89W867
Not required	MB89P875		ROM-80QF-28DP-8L3	MB89PV870 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89875 MB89P875
Incompatible			ROM-80SQF-28DP-8L				
Not required	MB89P899	General-purpose EPROM Programmer (capable of programming to MBM27C1001)	ROM-100QF-32DP-8LA	MB89PV890 QFP-100C (0.65mm, 16 × 22mm) *6	MBM27C512-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89898 MB89899 MB89P899
64SD-48SD-8L2	MB89P915	*8	ROM-48SD-28DP-8L	MB89PV910 SH-DIP-64C	MBM27C256A-20CZ (DIP-28)	Not required	MB89913 MB89915 MB89P915
Incompatible			ROM-48QF-28DP-8L2				

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89920	MB89923 MB89925 MB89928 MB89P928	QFP-80P (0.8mm, 14 × 20mm) FPT-80P-M06	MB2144-202	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	PPF032 (operates 3 to 5V)	• advice (main unit) : AD200 • Dummy target (option) : /DUT	Piggyback and evaluation (separately available) MB89PV920 QFP-80C (0.8mm, 16 × 22mm) *6
MB89930A/B	MB89935B MB89P935B	SSOP-30 (0.65mm, 5.6 × 9.7mm) FPT-30P-M02	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV930A QFP-48C (0.8mm, 15 × 15mm) *6
MB89940	MB89943 MB89945 MB89P945	QFP-48P (0.8mm, 12 × 12mm) FPT-48P-M16	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV940 QFP-48C (0.8mm, 15 × 15mm) *6
MB89950	MB89951 MB89953 MB89P955 MB89965	LQFP-64 (0.65mm, 12 × 12mm) FPT-64P-M09	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV950 QFP-64C (1.0mm, 16 × 22mm)
MB89960	MB89965 MB89965C MB89P965A	LQFP-48P (0.5mm, 7 × 7mm) FPT-48P-M05	MB2144-203		PF034 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV960 QFP-48C (0.8mm, 15 × 15mm) *6
		QFP-48P (0.8mm, 12 × 12mm) FPT-48P-M16					
		QFP-48P (0.8mm, 10 × 10mm) FPT-48P-M13					
	MB89F969A	LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09					
MB89980	MB89983 MB89P985	LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09	MB2144-202		PF032 (operates 3 to 5V)		Piggyback and evaluation (separately available) MB89PV980 MQF-64C (1.0mm, 16 × 22mm)
		LQFP-64P (0.5mm, 10 × 10mm) FPT-64P-M03					

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/ EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
Not required	MB89P928 QFP-80P (0.8)	General-purpose EPROM Programmer (capable of programming to MBM27C1001)	ROM-80QF-32DP-8LA	MB89PV920 QFP-80C (0.8mm, 16 × 22mm) *6	MBM27C512-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89923 MB89925 MB89928 MB89P928
48QF-30SOP-8L	MB89P935B	Serial writer : Yokogawa Digital Computer Corporation	ROM3-FPT30M02-8L	MB89PV930A QFP-48C	MBM27C256A-20TVM	ROM-32LC-28DP-S	MB89935B MB89P935B
Not required	MB89P945	General-purpose EPROM Programmer *7 (capable of programming to MBM27C256A)	ROM-48QF-28DP-8L3	MB89PV940 (0.8mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89943 MB89945 MB89P945
Incompatible	MB89P955		ROM-64QF2-28DP-8L3	MB89PV950 (1.0mm, 16 × 22mm) *6	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89951 MB89953 MB89P955 MB89965
48QF-48SQF-8L-UP + 48QF-48SQF-8L-DWN	MB89P965A	*9	ROM2-48LQF-32DP-8LA	MB89PV960 QFP-48C (0.8mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89965 MB89965C MB89P965A
Not required *6							
Not required *6							
Incompatible	MB89F969A	*10	FLASH-64QF2-32DP-8LF				MB89F969A
Incompatible	MB89P985	General-purpose EPROM Programmer (capable of programming to MBM27C256A)	ROM-64QF2-28DP-8L4	MB89PV980 MQF-64C (1.0mm, 16 × 22mm)	MBM27C256A-20TV (LCC-32 rectangular)	ROM-32LC-28DP-YG	MB89983 MB89P985
Incompatible			ROM-64SQF-28DP-8L3				

Support Hardware for F²MC-8L Family

Development Tools							
Target Microcontroller			Fujitsu ICE (MB2140 Series)		Yokogawa Digital Computer ICE *4		Evaluation Device (Lead pitch, body size)
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series	
MB89990	MB89995 MB89997 MB89P195/A	SOP-28P (18mm, 8.6mm) FPT-28P-M02	MB2144-203	• Main unit : MB2141B • Pod : MB2144-508 (operates at 3 to 5V) • Emulator debugger software : SOFTUNE • RS-232C cable	PF034 (operates 3 to 5V)	• advice (main unit) : AD200 • Dummy target (option) : /DUT	Piggyback and evaluation (separately available) MB89PV190 QFP-48C (0.8mm, 15 × 15mm)
	MB89995 MB89997	SH-DIP-28P DIP-28P-M03					

*1 : Under development
*2 : Being planned
*3 : The IC package conversion adapter is provided by Sunhayato Corp. Contact details
Sales Info:
Advanced Interconnectics: URL: http://advintcorp.com
*4 : Contact details: Yokogawa Digital Computer Corporation TEL(81-42)333-6222 FAX(81-42)352-6107
*5 : For QFP-48 : TQ-PACK048SA and TQ-SOCKET048SAG (each provided)
For QFP-64 : TQ-PACK060RZ and TQ-SOCKET064RZG (each provided)
For LQFP-64 : TQ-PACK064SD and TQ-SOCKET064SD (each provided)
For QFP-64 (MB89P589B) : NQPACK064SB and HQPACK064SB140 (each provided)
For QFP-80 : TQ-PACK080SA and TQ-SOCKET080RAZ (each provided)
It should be noted that there is a slight difference in footprint size between the Q pack and other mass-produced packages. therefore, caution is required in designing the footprint of the print board.
Sales Info:
• USA:Daimaru New York Co. TEL(212)575-0820/0821
OESS Co. Head Office TEL(201)288-4422
OESS Co. Los Angeles Office TEL(714)220-1878
OESS Co. San Jose Office TEL(408)441-1855
• Europe Germany: OESS GmbH TEL(06106)75013
• Asia Hong Kong: Daimaru Kogyo, Ltd. Hong Kong Office TEL(852)8939457/8939108
Singapore: Daimaru Kogyo, Ltd. Singapore Office TEL(65)2251636

Support Hardware for F²MC-8L Family

Development Tools	Equipment for Program to OTP/EPROM			Equipment for EPROM on Piggyback and evaluation Device			Target Microcontroller
IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program Product name	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/ EPROM)	Piggyback and Evaluation Device (lead pitch, body size)	Mounted EPROM on Piggyback-evaluation Device	IC Package Conversion Adapter *3 (for Program to EPROM)	Product name
48QF-28SOP-8L	MB89P195/A	*8	ROM-28SOP-28DP-8L	MB89PV190 QFP-48C (0.8mm, 15 × 15mm) *6	MBM27C256A-20TVM (LCC-32 square)	ROM-32LC-28DP-S	MB89995 MB89997 MB89P195/A
48QF-28SD-8L	—		—				MB89995 MB89997

*6 : It should be noted that there is a slight difference in footprint size of mass-produced packages. therefore, caution is required in designing the foot-print of the print board.

*7 : Recommended EPROM programmer for OTP/EPROM microcontroller
- •UNISITE, 3900, 2900; Contact detailes: Data I/O TEL(81-3)3779-2534
- • MODELs 1890A and 1891; Contact detailes: Minato Electronics Inc. TEL(81-45)591-5611
- • R4945, R4949A; Contact detailes: Advantest URL: http://www.advantest.co.jp/index-e.html

*8 : Recommended EPROM programmer for MB89P195/P195A, MB89P915
- • MODEL 1890A(Ver. 2.1 or higher)+OU910(Ver. 4.07 or higher); Contact detailes: Minato Electronics Inc. TEL(81-45)591-5611
- • UNISITE(Ver. 5.0 or higher), 3900(Ver. 2.8 or higher), 2900(Ver. 3.8 or higher); Contact detailes: Data I/O TEL(81-3)3779-2534

*9 : Recommended EPROM programmer for MB89P585B/BW, MB89P589B, MB89P595B/BW, MB89P965A
- • MODEL 1890A(Ver. 2.5 or higher)+OU-910(Ver. 4.32r or higher) is requited 3 V board (ML 01-781) ;Contact detailes: Minato Electronics Inc. TEL(81-45)591-5611
- • AF9708(Ver. 1.40 or higher), AF9709(Ver. 1.40 or higher), AF9723(Ver. 1.50 or higher); Contact detailes: Ando Eletric Co., Ltd. TEL(81-3)5733-1160

*10 : Recommended EPROM programmer for MB89F969A
- • MODEL 1890A+OU-910(Ver. 4.32r or higher); Contact detailes: Minato Electronics Inc. TEL(81-45)591-5611
- • AF9708(Ver. 1.60 or higher), AF9709(Ver. 1.60 or higher); Contact detailes: Ando Eletric Co., Ltd. TEL(81-3)5733-1160

Support Hardware for F²MC-16L Family

Development Tools				
Target Microcontroller			Fujitsu ICE (MB2140A Series)	
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series
MB90610A	MB90611A MB90613A	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5 or MB2132-457 *4	• Main unit : MB2141B • Pod : MB2145-507 (operable at 3 to 5V) • Evaluation device : (separately available) • Emulator debugger software : SOFTUNE • RS-232C cable
		LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5 or MB2132-457 + 100QF-100SQF-16F *3	
MB90620A	MB90622A MB90623A MB90P623A	LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5 or MB2132-457 + 100QF-100SQF-16F *3	
MB90630A	MB90632A MB90634A MB90P634A	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5 or MB2132-457 *4	
		LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5 or MB2132-457 + 100QF-100SQF-16F *3	
MB90640A	MB90641A MB90P641A	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5 or MB2132-457 *4	
		LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5 or MB2132-457 + 100QF-100SQF-16F *3	
MB90650A	MB90652A MB90653A MB90P653A MB90654A MB90F654A	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5	
		LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5	
MB90660A	MB90662A MB90663A MB90P663A	LQFP-64 (0.65mm, 12 × 12mm) FPT-64P-M9	MB2132-433 + 64SD-64QF2-8L *3	
		SHDIP-64 DIP-64P-M01	MB2132-433	
MB90670	MB90671 MB90672 MB90673 MB90T673 MB90P673	QFP-80 (0.8mm, 14 × 20mm) FPT-80P-M06	MB2132-454 *4	
		LQFP-80 (0.5mm, 12 × 12mm) FPT-80P-M05	MB2132-444 *5	
MB90675	MB90676 MB90677 MB90678 MB90T678 MB90P678	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5 or MB2132-457 *4	
		LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5 or MB2132-457 + 100QF-100SQF-16F *3	

Contact details for information on tool vender tools: Yokogawa Digital Computer Corporation;
TEL(81-423)33-6222; FAX(81-423)52-6107
Email: info@advice.ydc.co.jp Website: http : //www.ydc.co.jp/advice

*1 : Under development
*2 : Being planned
*3 : The IC package conversion adapter provided by Sunhayato is required for connecting the probe cable (separately available).
100QF-100SQF-16F : For QFP-100 (0.65mm, 14 × 20mm) to SQFP-100 (0.5mm, 14 × 14mm)
64SD-64QF2-8L : For SHDIP-64 to QFP-64
Sales Info: Advanced Interconnectics http://advintcorp.com
*4 : The Yamaichi Electronics IC socket is always required for connecting each probe cable (separately available).
IC149-080-012-S5 for QFP-80 (lead pitch : 0.8mm, body size : 14 × 20mm)
IC149-100-_14-S5 (_ = "0" positioning post unavailable, _ = "1" positioning post available) for QFP-100 (lead pitch : 0.65mm, body size : 14 × 20mm)
IC149-120K-13449-_ (_ = "0" positioning post unavailable, _ = "1" positioning post available) for QFP-120 (lead pitch : 0.8mm, body size : 28 × 28mm)
Sales Info:
• USA: Yamaichi Electronics Inc. TEL(408)4520797
• Europe Denmark: Wlmatok A.S. TEL(65)351446
England: Radiatron Components Ltd. TEL(01)8911221
AB Connector Ltd. TEL(0604)712000
Finland: Dualtek Oy TEL(80)8019911
France: Manudax-France TEL(1)4342-2050
Germany: Macrotron AG TEL(089)4208148
Glyn GmbH TEL:(49)61278077
Connector Service GmbH TEL:(089)429277
Italy: Eurosab International s.r.l TEL(02)93169781
Spain: S.A Generalde Imporciones Electronicas TEL(1)416-92-61

Development Tools				Equipment for program to OTP/EPROM			Target Microcontroller
Yokogawa Digital Computer ICE			Evaluation device	Microcontroller subject Program	EPROM programmer	IC Package Conversion Adapter (for program to OTP/EPROM)	
Pod	Conversion Adapter	Equipment common to series		Product name			Product name
PF455	QF455	• advice (main unit) : AD200 • Dummy target (option) : /DUT • Evaluation chip : attached	MB90V610A (PGA-256C)	—	General-purpose EPROM Programmer (capable of Programming to MBM27C1000)	—	MB90611A MB90613A
PF455	—					—	
PF453	—		MB90V620A (PGA-256C)	MB90P623A		ROM-100SQF-32DP-16L	MB90622A MB90623A MB90P623A
PF452	QF452		MB90V630A (PGA-256C)	MB90P634A		ROM-100QF-32DP-16L	MB90632A MB90634A MB90P634A
PF452	—					ROM-100SQF-32DP-16L	
PF456	QF456		MB90V640A (PGA-256C)	MB90P641A		ROM-100QF-32DP-FMC16F	MB90641A MB90P641A
PF456	—					ROM-100SQF-32DP-FMC16F	
PF457	QF457		MB90V650A (PGA-256C)	MB90P653A		ROM-100QF-32DP-16L	MB90652A MB90653A MB90P653A MB90654A MB90F654A
PF457	—					ROM-100SQF-32DP-16L	
PF454	—		MB90V660A (PGA-256C)	MB90P663A		ROM-64QF-32DP-16L	MB90662A MB90663A MB90P663A
PF454	F454					ROM-64SD-32DP-16L	
PF450A	—		MB90V670 (PGA-256C)	MB90P673		ROM-80QF-32DP-16L	MB90671 MB90672 MB90673 MB90T673 MB90P673
PF450A	QF450					ROM-80SQF-32DP-16L	
PF451	QF451		MB90V670 (PGA-256C)	MB90P678		ROM-100QF-32DP-16L	MB90676 MB90677 MB90678 MB90T678 MB90P678
PF451	—					ROM-100SQF-32DP-16L	

Sweden: Bexab Electronics TEL(08)7680560
Switzerland: Slcovend AG TEL(01)8303161
• Asia Singapore: Yamco Electronics Pte Ltd. TEL(336)6522
Korea: Asia Yamaichi Electronics,Inc. TEL(02)482-7263
Taiwan: Sing Way Co. TEL(02)718-5971
Joung Lai Trading Co. Ltd. TEL(02)754-1022

For IC sockets, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages. Therefore, caution is required in designing the footprint of the print board.

*5: TQPACK and NQPACK required for the connecting target of probe cable:
NQPACK064SB and HQPACK064SB140 (each provided) for QFP-64 (lead pitch: 0.65mm; body size: 12 × 12 mm)
TQPACK080SD and TQSOCKET080SDG (available separately) for LQFP-80 (lead pitch: 0.5 mm; body size: 12 × 12 mm)
NQPACK100RB and HQPACK100RB179 (each provided) for QFP-100 (lead pitch:0.65 mm; body size: 14 × 20 mm)
NQPACK100SD and HQPACK100SD (each provided) for LQFP-100 (lead pitch: 0.5mm; body size: 14 × 14 mm)
NQPACK120SD220 and HQPACK120SD226 (each provided) for QFP-120 (lead pitch:0.5 mm; body size: 20 × 20 mm)
TQPACK120/144SD and TQSOCKET120/144SDP (each provided) for QFP-120 (lead pitch: 0.5 mm; body size: 20 × 20 mm)
NQPACK120SD and HQPACK120SD (each provided) for QFP-120 (lead pitch: 0.5mm; body size: 16 × 16 mm)
NQPACK120SE and HQSOCKET120SE (provided) for LQFP-120 (lead pitch: 0.4 mm; body size: 14 × 14 mm)
Caution: For the TQPACK and NQPACK, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages.
Therefore,caution is required in designing the footprint of the print board.
Sales Info:
• USA: Daimaru New York Co. TEL(212)575-0820/0821
OESS Co. Head Office TEL(201)288-4422
OESS Co. Los Angeles Office TEL(714)220-1878
OESS Co. San Jose Office TEL(408)441-1855
• Europe Germany: OESS GmbH TEL(06106)75013
• Asia Hong Kong: Daimaru Kogyo,Ltd. Hong Kong Office TEL(852)8939457/8939108
Singapore: Daimaru Kogyo,Ltd. Singapore Office TEL(65)2251636

Support Hardware for F²MC-16LX Family

<table>
<tr><th colspan="7">Development Tools</th></tr>
<tr><th colspan="3">Target Microcontroller</th><th colspan="2">Fujitsu ICE
(MB2140A Series)</th><th colspan="2">Yokogawa Digital
Computer ICE (advice)</th></tr>
<tr><th>Series name</th><th>Product name</th><th>Package
(Lead pitch,
body size)</th><th>Probe</th><th>Equipment common to series</th><th>Pod</th><th>Equipment common to series</th></tr>
<tr><td>MB90385</td><td>MB90387
MB90387S
MB90F387
MB90F387S</td><td>LQFP-48P
(0.5mm, 7 × 7mm)
FPT-48P-M26</td><td>MB2132-466 *5</td><td>• Main unit : MB2141B
• Pod : MB2145-507
(operable at 3 to 5V)
• Evaluation device :
(separately available)
• Emulator debugger
software : SOFTUNE
• RS-232C cable</td><td>Incompatible</td><td rowspan="2">Incompatible</td></tr>
<tr><td>MB90390</td><td>MB90F394 *1</td><td>LQFP-120P
(0.5mm, 16 × 16mm)
FPT-120P-M21</td><td>MB2132-469 *5</td><td>• Main unit : MB2147-01
• Adaptor board :
MB2147-20
• Evaluation device :
(separately available)
• Host I/F cable
(RS-232C, USB, LAN)
• SOFTUNE</td><td>Incompatible</td></tr>
<tr><td>MB90M405</td><td>MB90M407
MB90M408
MB90MF408</td><td>QFP-100P
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
+ MB2145-910
(adapter)</td><td rowspan="5">• Main unit : MB2141B
• Pod : MB2145-507
(operable at 3 to 5V)
• Evaluation device :
(separately available)
• Emulator debugger
software : SOFTUNE
• RS-232C cable</td><td>Incompatible</td><td rowspan="5">• advice
(main unit) :
AD-250
or
AD200B-
S86/89
• Dummy tar-
get (option)
: /DUT
• Evaluation
chip
: attached
• Emulator
debugger
software :
Yokogawa
Digital
Computer
or
GAIO</td></tr>
<tr><td rowspan="2">MB90420G
MB90425G</td><td rowspan="2">MB90423GA
MB90423GB
MB90423GC
MB90F423GA
MB90F423GB
MB90F423GC
MB90427GA
MB90427GB
MB90427GC
MB90428GA
MB90428GB
MB90428GC
MB90F428GA
MB90F428GB
MB90F428GC</td><td>QFP-100P
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
or
MB2132-457 *4</td><td>PF503</td></tr>
<tr><td>LQFP-100P
(0.5mm, 14 × 14mm)
FPT-100P-M05</td><td>MB2132-496 *5
or MB2132-457
+ 100QF-
100SQF-16F</td><td>PF503-HS1</td></tr>
<tr><td>MB90440G</td><td>MB90443G *1
MB90F443G</td><td>QFP-100P
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
or
MB2132-457 *4</td><td>Incompatible</td></tr>
<tr><td rowspan="3">MB90460</td><td rowspan="3">MB90462
MB90F462</td><td>SH-DIP-64P
DIP-64P-M01</td><td>MB2132-434</td><td>PF509-HS1</td></tr>
<tr><td>QFP-64
(1.0mm, 14 × 20mm)
FPT-64P-M06</td><td>MB2132-434
+ 64SD-64QF-
8L</td><td>PF509-HS1
+
64SD-64QF-
8L *3</td></tr>
<tr><td>LQFP-64P
(0.65mm, 12 × 12mm)
FPT-64P-M09</td><td>MB2132-461 *5</td><td>PF509</td></tr>
<tr><td rowspan="2">MB90470</td><td rowspan="2">MB90473
MB90474
MB90F474L
MB90F474H</td><td>QFP-100P
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5</td><td rowspan="2">• Main unit : MB2141B
• Pod : MB2145-507
(operable at 3 to 5V)
• Evaluation device :
(separately available)
• Emulator debugger
software : SOFTUNE
• RS-232C cable</td><td>Incompatible</td></tr>
<tr><td>LQFP-100P
(0.5mm, 14 × 14mm)
FPT-100P-M05</td><td>MB2132-496 *5</td><td>Incompatible</td></tr>
</table>

Support Hardware for F²MC-16LX Family

Development Tools	Equipment for Program to FLASH/OTP/EPROM				Target Microcontroller
	Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Evaluation Device	Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90V495G (PGA-256C)	MB90F387 MB90F387S LQFP-48	Ando Electric	TE110-387F15AP *8	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90387 MB90387S MB90F387S MB90F387
MB90V390 (PGA-299C)	MB90F394 LQFP-120	Under planning	Under development		MB90MF394 *
MB90V405 (PGA-256C)	MB90MF405 QFP-100	Incompatible	—		MB90M407 MB90M408 MB90MF408
MB90V420G (PGA-256C)	MB90F428G MB90F428GA QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9		MB90423GA MB90423GB MB90423GC MB90F423GA MB90F423GB MB90F423GC MB90427GA MB90427GB MB90427GC MB90428GA MB90428GB MB90428GC MB90F428GA MB90F428GB MB90F428GC
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023		
	MB90F428G MB90F428GA LQFP-100	Minato Electronics	MF00-709 *6 MF05-709 *9		
		Ando Electric	TE110-580F03AP *8		
		Data I/O *2	Undecided		
MB90V440G (PGA-256C)	MB90F443G	Minato Electronics	MF00-989 *6 MF05-989 *6		MB90443G * MB90F443G
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023		
MB90V460 (PGA-256C)	MB90F462 SDIP-64	Minato Electronics	MF13-787 *6		MB90462 MB90F462
		Ando Electric	TE110-562F05AP *8		
		Data I/O *2	Undecided		
	MB90F462 QFP-64 (1.0mm pitch)	Minato Electronics	MF13-785 *6		
		Ando Electric	TE110-562F06AP *8		
		Data I/O *2	Undecided		
	MB90F462 QFP-64 (0.65mm pitch)	Minato Electronics	MF13-786 *6		
		Ando Electric	TE110-562F07AP *8		
		Data I/O *2	Undecided		
MB90V470B (PGA-256C)	MB90F474L MB90F474H QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9		MB90473 MB90474 MB90F474L MB90F474H
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023		
	MB90F474L MB90F474H LQFP-100	Minato Electronics	MF00-709 *6 MF05-709 *9		
		Ando Electric	TE110-580F03AP *8		
		Data I/O *2	Undecided		

Support Hardware for F²MC-16LX Family

<table>
<tr><th colspan="6">Development Tools</th></tr>
<tr><th colspan="3">Target Microcontroller</th><th colspan="2">Fujitsu ICE
(MB2140A Series)</th><th colspan="2">Yokogawa Digital
Computer ICE (advice)</th></tr>
<tr><th>Series name</th><th>Product name</th><th>Package
(Lead pitch,
body size)</th><th>Probe</th><th>Equipment common to series</th><th>Pod</th><th>Equipment common to series</th></tr>
<tr><td rowspan="2">MB90480</td><td rowspan="2">MB90F481
MB90F482
MB90F483 *1</td><td>QFP-100P
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5</td><td rowspan="2">• Main unit : MB2147-01
• Adaptor board :
MB2147-20
• Evaluation device :
(separately available)
• Host I/F cable
(RS-232C, USB, LAN)
• SOFTUNE</td><td>Incompatible</td><td rowspan="2">Incompatible</td></tr>
<tr><td>LQFP-100P
(0.5mm, 14 × 14mm)
FPT-100P-M05</td><td>MB2132-496 *5</td><td>Incompatible</td></tr>
<tr><td rowspan="2">MB90495G</td><td rowspan="2">MB90497G
MB90F497G</td><td>QFP-64
(1.0mm, 14 × 20mm)
FPT-64P-M06</td><td>MB2132-434
+ 64SD-64QF-8L *3</td><td rowspan="6">• Main unit : MB2141B
• Pod : MB2145-507
(operable at 3 to 5V)
• Evaluation device :
(separately available)
• Emulator debugger
software : SOFTUNE
• RS-232C cable</td><td>PF509-HS1
+
64SD-64QF-8L *3</td><td rowspan="6">• advice
(main unit) :
AD-250
or
AD200B-S86/89
• Dummy
target
(option) :
/DUT
• Evaluation
chip
: attached
• Emulator
debugger
software :
Yokogawa
Digital Com-
puter
or
GAIO</td></tr>
<tr><td>LQFP-64
(0.65mm, 12 × 12mm)
FPT-64P-M09</td><td>MB2132-461 *5</td><td>PF509</td></tr>
<tr><td rowspan="2">MB90520
MB90520 A
MB90520 B</td><td rowspan="2">MB90522
MB90522A
MB90522B
MB90523
MB90523A
MB90523B
MB90F523
MB90F523A
MB90F523B</td><td>QFP-120
(0.5mm, 20 × 20mm)
FPT-120P-M13</td><td>MB2132-468 *5
or
(MB2132-448 *5)</td><td>PF501-HS1</td></tr>
<tr><td>LQFP-120
(0.4mm, 14 × 14mm)
FPT-120P-M05</td><td>MB2132-498 *5</td><td>PF501</td></tr>
<tr><td rowspan="2">MB90540G</td><td rowspan="2">MB90F543G
MB90F543GS</td><td>QFP-100
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
or
MB2132-457 *4</td><td>PF504</td></tr>
<tr><td>LQFP-100
(0.5mm, 14 × 14mm)
FPT-100P-M05</td><td>MB2132-496 *5
or
MB2132-457
+ 100QF-100SQF-16F *3</td><td>PF504-HS1</td></tr>
<tr><td rowspan="2">MB90545G</td><td rowspan="2">MB90F546G
MB90F546GS
MB90F548G
MB90F548GL
MB90F548GLS
MB90F548GS
MB90549G
MB90549GS
MB90F549G
MB90F549GS</td><td>QFP-100
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
or
MB2132-457 *4</td><td>PF504</td></tr>
<tr><td>LQFP-100
(0.5mm, 14 × 14mm)
FPT-100P-M05</td><td>MB2132-496 *5
or
MB2132-457
+ 100QF-100SQF-16F *3</td><td>PF504-HS1</td></tr>
</table>

Support Hardware for F²MC-16LX Family

Development Tools	Equipment for Program to FLASH/OTP/EPROM				Target Microcontroller
	Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Evaluation Device	Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90V480 (PGA-299C)	MB90F481 MB90F482 MB90F483 QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90F481 MB90F482 MB90F483 *1
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023 *7		
	MB90F481 MB90F482 MB90F483 LQFP-100	Minato Electronics	MF00-709 *6 MF05-709 *9		
		Ando Electric	TE110-580F03AP *8		
		Data I/O *2	Undecided		
MB90V495G (PGA-256C)	MB90F497G QFP-64 (1.0mm pitch)	Minato Electronics	MF13-785 *6 MF05-785 *9		MB90497G MB90F497G
		Ando Electric	TE110-562F06AP *8		
		Data I/O *2	Undecided		
	MB90F497G QFP-64 (0.65mm pitch)	Minato Electronics	MF13-786 *6 MF05-786 *9		
		Ando Electric	TE110-562F07AP *8		
		Data I/O *2	Undecided		
MB90V520A (PGA-256C)	MB90F523A MB90F523B QFP-120	Minato Electronics	MF00-23 *6 MF05-23 *9		MB90522 MB90522A MB90522B MB90523 MB90523A MB90523B MB90F523 MB90F523A MB90F523B
		Ando Electric	TE110-574F02AP *8		
		Data I/O *2	S5024		
	MB90F523A MB90F523B LQFP-120	Minato Electronics	MF00-22 *6 MF05-22 *9		
		Ando Electric	TE110-523F08AP *8		
		Data I/O *2	Undecided		
MB90V540G (PGA-256C)	MB90F543G/GS QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9		MB90F543G MB90F543GS
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023		
	MB90F543G/GS LQFP-100	Minato Electronics	MF00-709 *6 MF05-709 *9		
		Ando Electric	TE110-580F03AP *8		
		Data I/O *2	Undecided		
	MB90F546G/GS MB90F548G/GS MB90F548GL/GLS MB90F549G/GS QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9		MB90F546G MB90F546GS MB90F548G MB90F548GL MB90F548GLS MB90F548GS MB90549G MB90549GS MB90F549G MB90F549GS
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023		
	MB90F546G/GS MB90F548G/GS MB90F548GL/GLS MB90F549G/GS LQFP-100	Minato Electronics	MF00-709 *6 MF05-709 *9		
		Ando Electric	TE110-580F03AP *8		
		Data I/O *2	Undecided		

Support Hardware for F²MC-16LX Family

Development Tools						
Target Microcontroller			Fujitsu ICE (MB2140A Series)		Yokogawa Digital Computer ICE (advice)	
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series
MB90550A MB90550B	MB90552A MB90552B MB90553A MB90553B MB90T553A MB90P553A MB90F553A	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5 or MB2132-457 *4	• Main unit : MB2141B • Pod : MB2145-507 (operable at 3 to 5V) • Evaluation device : (separately available) • Emulator debugger software : SOFTUNE • RS-232C cable	PF500	• advice (main unit) : AD-250 or AD200B-S86/89 • Dummy target (option) : /DUT • Evaluation chip : attached • Emulator debugger software : Yokogawa Digital Computer or GAIO
		LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5 or MB2132-457 + 100QF-100SQF-16F *3		PF500-HS1	
MB90560	MB90561A MB90562A MB90F562B	SH-DIP64 DIP-64P-M01	MB2132-434		PF510-HS1	
		LQFP-64 (0.65mm, 12 × 12mm) FPT-64P-M09	MB2132-461 *5		PF510	
		QFP-64 (1.0mm, 14 × 20mm) FPT-64P-M06	MB2132-434 + 64SD-64QF-8L *3		PF510HS1 + 64SD-64QF-8L *3	
MB90565	MB90567 MB90568 MB90F568	QFP-64 (1.0mm, 14 × 20mm) FPT-64P-M06	MB2132-434 + 64SD-64QF-8L		PF510HS1 + 64SD-64QF-8L *3	
		LQFP-64 (0.65mm, 12 × 12mm) FPT-64P-M05	MB2132-461 *5		PF510	
MB90570A MB90570C	MB90573C MB90574C MB90F574A	QFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	MB2132-497 *5		Incompatible	
		QFP-120 (0.5mm, 20 × 20mm) FPT-120P-M13	MB2132-468 *5 (or MB2132-448 *5)		PF502-HS1	
		LQFP-120 (0.4mm, 14 × 14mm) FPT-120P-M05	MB2132-498 *5		PF502	

Support Hardware for F²MC-16LX Family

Development Tools	Equipment for Program to FLASH/OTP/EPROM				Target Microcontroller
	Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Evaluation Device	Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90V550A (PGA-256C)	MB90P553A QFP-100	General-purpose EPROM Programmer capable of programming to MBM27C1000	ROM-100QF-32DP-16L *3	—	MB90552A MB90552B MB90553A MB90553B MB90T553A MB90P553A MB90F553A
	MB90F553A QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023		
	MB90F553A LQFP-100	Minato Electronics	MF00-709 *6 MF05-709 *9		
		Ando Electric	TE110-580F03AP *8		
		Data I/O *2	Undecided		
MB90V560 (PGA-256C)	MB90F562B SH-DIP-64	Minato Electronics	MF13-787 *6 MF05-787 *9		MB90561A MB90562A MB90F562B
		Ando Electric	TE110-562F05AP *8		
		Data I/O *2	Undecided		
	MB90F562B QFP-64 (0.65mm pitch)	Minato Electronics	MF13-786 *6 MF05-786 *9		
		Ando Electric	TE110-562F07AP *8		
		Data I/O *2	Undecided		
	MB90F562B QFP-64 (1.0mm pitch)	Minato Electronics	MF13-785 *6		
		Ando Electric	TE110-562F06AP *8		
		Data I/O *2	Undecided		
MB90V560 (PGA-256C)	MB90F568 QFP-64 (1.0mm pitch)	Minato Electronics	MF13-785 *6		MB90567 MB90568 MB90F568
		Ando Electric	TE110-562F06AP *8		
		Data I/O *2	Undecided		
	MB90F568 QFP-64 (0.65mm pitch)	Minato Electronics	MF13-786 *6 MF05-786 *9		
		Ando Electric	TE110-562F07AP *8		
		Data I/O *2	Undecided		
MB90V570A (PGA-256C)	MB90F574A QFP-120 (16 × 16 mm)	Minato Electronics	MF00-729 *6 MF05-729 *9		MB90573C MB90574C MB90F574A
		Ando Electric	TE110-574F04AP *8		
		Data I/O *2	Undecided		
	MB90F574A QFP-120 (20 × 20 mm)	Minato Electronics	MF00-23 *6 MF05-23 *9		
		Ando Electric	TE110-574F02AP *8		
		Data I/O *2	S5024 *7		
	MB90F574A LQFP-120	Minato Electronics	MF00-22 *6		
		Ando Electric	TE110-523F08AP *8		
		Data I/O *2	Undecided		

Support Hardware for F²MC-16LX Family

<table>
<tr><th colspan="6">Development Tools</th></tr>
<tr><th colspan="3">Target Microcontroller</th><th colspan="2">Fujitsu ICE
(MB2140A Series)</th><th colspan="2">Yokogawa Digital
Computer ICE (advice)</th></tr>
<tr><th>Series name</th><th>Product name</th><th>Package
(Lead pitch,
body size)</th><th>Probe</th><th>Equipment common to series</th><th>Pod</th><th>Equipment common to series</th></tr>
<tr><td rowspan="2">MB90580C
MB90580CA</td><td rowspan="2">MB90583C
MB90583CA
MB90F583C
MB90F583CA
MB90587C
MB90587CA</td><td>QFP-100
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
or
MB2132-457 *4</td><td rowspan="4">• Main unit : MB2141B
• Pod : MB2145-507
(operable at 3 to 5V)
• Evaluation device :
(separately available)
• Emulator debugger software : SOFTUNE
• RS-232C cable</td><td>PF505</td><td rowspan="4">• advice
(main unit) :
AD-250 or
AD200B-S86/
89
• Dummy target (option) :
/DUT
• Evaluation chip
: attached
• Emulator debugger software :
Yokogawa Digital Computer
or
GAIO</td></tr>
<tr><td>LQFP-100
(0.5mm, 14 × 14mm)
FPT-100P-M05</td><td>MB2132-496 *5
or
MB2132-457
+ 100QF-100SQF-16F *3</td><td>PF505-HS1</td></tr>
<tr><td>MB90590G</td><td>MB90591G
MB90F591G
MB90594G
MB90F594G</td><td>QFP-100
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
or
MB2132-457 *4</td><td>PF506</td></tr>
<tr><td>MB90595G</td><td>MB90598G
MB90F598G</td><td>QFP-100
(0.65mm, 14 × 20mm)
FPT-100P-M06</td><td>MB2132-464 *5
or
MB2132-457 *4</td><td>PF507</td></tr>
</table>

Contact details for information on tool vender tools:Yokogawa Digital Computer Corporation;
TEL(81-423)33-6222 FAX(81-423)52-6107
Email: info@advice.ydc.co.jp Website: http : //www.ydc.co.jp/advice

*1 : Under development
*2 : Being planned
*3 : The IC package conversion adapter provided by Sunhayato is required for connecting the probe cable (separately available).
100QF-100SQF-16F : For QFP-100 (0.65mm, 14 × 20mm) to SQFP-100 (0.5mm, 14 × 14mm)
64SD-64QF2-8L : For SHDIP-64 to QFP-64
Sales Info: Advanced Interconnectics http://advintcorp.com
*4 : The Yamaichi Electronics IC socket is always required for connecting each probe cable (separately available).
IC149-080-012-S5 for QFP-80 (lead pitch : 0.8mm, body size : 14 × 20mm)
IC149-100-_14-S5 (_ = "0" positioning post unavailable, _ = "1" positioning post available) for QFP-100 (lead pitch : 0.65mm, body size : 14 × 20mm)
IC149-120K-13449-_ (_ = "0" positioning post unavailable, _ = "1" positioning post available) for QFP-120 (lead pitch : 0.8mm, body size : 28 × 28mm)
Sales Info:
• USA: Yamaichi Electronics Inc. TEL(408)4520797
• Europe Denmark: Wlmatok A.S. TEL(65)351446
England: Radiatron Components Ltd. TEL(01)8911221
AB Connector Ltd. TEL(0604)712000
Finland: Dualtek Oy TEL(80)8019911
France: Manudax-France TEL(1)4342-2050
Germany: Macrotron AG TEL(089)4208148
Glyn GmbH TEL:(49)61278077
Connector Service GmbH TEL:(089)429277
Italy: Eurosab International s.r.l TEL(02)93169781
Spain: S.A Generalde Imporciones Electronicas TEL(1)416-92-61
Sweden: Bexab Electronics TEL(08)7680560
Switzerland: Slcovend AG TEL(01)8303161
• Asia Singapore: Yamco Electronics Pte Ltd. TEL(336)6522
Korea: Asia Yamaichi Electronics,Inc. TEL(02)482-7263
Taiwan: Sing Way Co. TEL:(02)718-5971
Joung Lai Trading Co. Ltd. TEL:(02)754-1022
For IC sockets, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages. Therefore, caution is required in designing the footprint of the print board.

Development Tools	Equipment for Program to FLASH/OTP/EPROM				Target Microcontroller
	Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Evaluation Device	Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90V580B (PGA-256C)	MB90F583C MB90F583CA QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90583C MB90583CA MB90F583C MB90F583CA MB90587C MB90587CA
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023 *7		
	MB90F583C MB90F583CA LQFP-100	Minato Electronics	MF00-709 *6 MF05-709 *9		
		Ando Electric	TE110-580F03AP *8		
		Data I/O *2	Undecided		
MB90V590G (PGA-256C)	MB90F591G MB90F594G QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9		MB90591G MB90F591G MB90594G MB90F594G
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023 *7		
MB90V595G (PGA-256C)	MB90F598G QFP-100	Minato Electronics	MF00-989 *6 MF05-989 *9		MB90598G MB90F598G
		Ando Electric	TE110-553F01AP *8		
		Data I/O *2	S5023 *7		

*5: TQPACK and NQPACK required for the connecting target of probe cable:
NQPACK064SB and HQPACK064SB140 (each provided) for QFP-64 (lead pitch: 0.65mm; body size: 12 × 12 mm)
TQPACK080SD and TQSOCKET080SDG (available separately) for LQFP-80 (lead pitch: 0.5 mm; body size: 12 × 12 mm)
NQPACK100RB and HQPACK100RB179 (each provided) for QFP-100 (lead pitch:0.65 mm; body size: 14 × 20 mm)
NQPACK100SD and HQPACK100SD (each provided) for LQFP-100 (lead pitch: 0.5mm; body size: 14 × 14 mm)
NQPACK120SD220 and HQPACK120SD226 (each provided) for QFP-120 (lead pitch:0.5 mm; body size: 20 × 20 mm)
TQPACK120/144SD and TQSOCKET120/144SDP (each provided) for QFP-120 (lead pitch: 0.5 mm; body size: 20 × 20 mm)
NQPACK120SD and HQPACK120SD (each provided) for QFP-120 (lead pitch: 0.5mm; body size: 16 × 16 mm)
NQPACK120SE (provided) for LQFP-120 (lead pitch: 0.4 mm; body size: 14 × 14 mm)
Caution: For the TQPACK and NQPACK, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages.
Therefore,caution is required in designing the footprint of the print board.
Sales Info:
• USA: Daimaru New York Co. TEL(212)575-0820/0821
OESS Co. Head Office TEL(201)288-4422
OESS Co. Los Angeles Office TEL(714)220-1878
OESS Co. San Jose Office TEL(408)441-1855
• Europe Germany: OESS GmbH TEL(06106)75013
• Asia Hong Kong: Daimaru Kogyo,Ltd. Hong Kong Office TEL(852)8939457/8939108
Singapore: Daimaru Kogyo,Ltd. Singapore Office TEL(65)2251636

*6: Compatible Minato Electronics ROM programmers: MODEL 1890A (Ver. 2.5 or later) + OU910 (Ver. 4.32r or later), MODEL 1893 (Ver. 1.10l or higher) , MODEL 1931 (Ver. 1.10l or higher) , MODEL 1930 + SU3000LX (Ver. 4.10l or higher) ;
Contact details: TEL (81-45) 591-5611; FAX (81-45) 592-2854

*7: Compatible Data I/O ROM programmers: OPTIMA, Dual-Package, OCTAL, QUAD: TEL(81-3) 3779-2534

*8: Compatible Ando Electric ROM programmers: AF9708 (Ver. 1.10 or higher) , AF9709 (Ver. 1.10 or higher) , AF9723 (Ver. 1.10 or higher) : TEL(81-3) 3733-1160; FAX(81-3) 3739-7390

*9: Adaptor for MODEL-1940

Support Hardware for F²MC-16F Family

Target Microcontroller			Development Tools			
			Fujitsu ICE(MB2140A Series)		Yokogawa Digital Computer ICE (advice)	
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series	Pod	Equipment common to series
MB90210	MB90214 MB90P214A/B MB90W214A/B	QFP-80 (0.8mm, 14 × 20mm) FPT-80P-M05 FPT-80C-C02	MB2132-454 *4	• Main unit : MB2141B • Pod : MB2145-507 (operable at 3 to 5V) • Evaluation device : (separately available) • Emulator debugger software : SOFTUNE • RS-232C cable	PF440	• advice (main unit) : AD-200 • Dummy target : /DUT • Evaluation chip : attached • Emulator debugger software : YokogawaDigital Computer Corporation or GAIO
MB90220	MB90223 MB90224 MB90P224A/B MB90W224A/B	QFP-120 (0.8mm, 28 × 28mm) FPT-120P-M03 FPT-120C-C02	MB2132-458 *4		PF441	
MB90230	MB90233 MB90234 MB90P234 MB90W234 *1	QFP-100 (0.65mm, 14 × 20mm)	MB2132-464 *5 or MB2132-457 *4		—	
		LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05 FPT-100C-C05	MB2132-457 + 100QF-100SQF-16F *3			
MB90246A	MB90246A	LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *1, *5 or MB2132-457 + 100QF-100SQF-16F *3		PF445	

Contact details for information on tool vender tools:
Yokogawa Digital Computer Corporation; TEL(81-423)33-6222; FAX(81-423)52-6107
Email: info@advice.ydc.co.jp Website: http : //www.ydc.co.jp/advice

*1 : Under development
*2 : Being planned
*3 : The IC package conversion adapter provided by Sunhayato is required for connecting the probe cable (separately available).
Conversion adapter for QFP-100 (0.65mm, 14 × 20mm) to SQFP-100 (0.5mm, 14 × 14mm) : Part No. : 100QF-100SQF-16F
Conversion adapter for SHDIP-64 to QFP-64: Part No. : 64SD-64QF2-8L
Sales Info: Advanced Interconnectics http://advintcorp.com
*4 : The Yamaichi Electronics IC socket is always required for connecting each probe cable (separately available).
IC149-080-012-S5 for QFP-80 (lead pitch : 0.8mm, body size : 14 × 20mm)
IC149-100-_14-S5 (_ = "0" positioning post unavailable, _ = "1" positioning post available) for QFP-100 (lead pitch : 0.65mm, body size : 14 × 20mm)
IC149-120K-13449-_ (_ = "0" positioning post unavailable, _ = "1" positioning post available) for QFP-120 (lead pitch : 0.8mm, body size : 28 × 28mm)
Sales Info:
• USA: Yamaichi Electronics Inc. TEL(408)4520797
• Europe Denmark: Wlmatok A.S. TEL(65)351446
England: Radiatron Components Ltd. TEL(01)8911221
AB Connector Ltd. TEL(0604)712000
Finland: Dualtek Oy TEL(80)8019911
France: Manudax-France TEL(1)4342-2050
Germany: Macrotron AG TEL(089)4208148
Glyn GmbH TEL:(49)61278077
Connector Service GmbH TEL:(089)429277
Italy: Eurosab International s.r.l TEL(02)93169781
Spain: S.A Generalde Imporciones Electronicas TEL(1)416-92-61
Sweden: Bexab Electronics TEL(08)7680560
Switzerland: Slcovend AG TEL(01)8303161
• Asia Singapore: Yamco Electronics Pte Ltd. TEL(336)6522
Korea: Asia Yamaichi Electronics,Inc. TEL(02)482-7263
Taiwan: Sing Way Co. TEL:(02)718-5971
Joung Lai Trading Co. Ltd. TEL:(02)754-1022
For IC sockets, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages. Therefore, caution is required in designing the footprint of the print board.

Development Tools	Equipment for Program to FLASH/OTP/EPROM			Target Microcontroller
Evaluation Device	Microcontroller Subject to Program	Programmer	IC Package Conversion Adapter *3 (for program to OTP/ EPROM)	Product name
MB90V210 (PGA-256C-A02)	MB90P214A/B MB90W214A/B	General-purpose EPROM Programmer capable of programming to MBM27C1000	ROM-80QF-32DP-16F	MB90214 MB90P214A/B MB90W214A/B
MB90V220 (PGA-256C-A02)	MB90P224A/B MB90W224A/B		ROM-120QF-32DP-16F	MB90223 MB90224 MB90P224A/B MB90W224A/B
MB90V230 (PGA-256C-A02)	MB90P234 MB90F243H		ROM-100QF-32DP-16F	MB90233 MB90234 MB90P234 MB90W234 *1
			ROM-100SQF-32DP-16F	
MB90V246 (PGA-256C-A02)	—	—	—	MB90246A

*5: TQPACK and NQPACK required for the connecting target of probe cable:
NQPACK064SB and HQPACK064SB140 (each provided) for QFP-64 (lead pitch: 0.65mm; body size: 12 × 12 mm)
TQPACK080SD and TQSOCKET080SDG (available separately) for LQFP-80 (lead pitch: 0.5 mm; body size: 12 × 12 mm)
NQPACK100RB and HQPACK100RB179 (each provided) for QFP-100 (lead pitch:0.65 mm; body size: 14 × 20 mm)
NQPACK100SD and HQPACK100SD (each provided) for LQFP-100 (lead pitch: 0.5mm; body size: 14 × 14 mm)
NQPACK120SD220 and HQPACK120SD226 (each provided) for QFP-120 (lead pitch:0.5 mm; body size: 20 × 20 mm)
TQPACK120/144SD and TQSOCKET120/144SDP (each provided) for QFP-120 (lead pitch: 0.5 mm; body size: 20 × 20 mm)
NQPACK120SD and HQPACK120SD (each provided) for QFP-120 (lead pitch: 0.5mm; body size: 16 × 16 mm)
NQPACK120SE and HQSOCKET120SE (provided) for LQFP-120 (lead pitch: 0.4 mm; body size: 14 × 14 mm)
Caution: For the TQPACK and NQPACK, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages.
Therefore,caution is required in designing the footprint of the print board.
Sales Info:
• USA: Daimaru New York Co. TEL(212)575-0820/0821
OESS Co. Head Office TEL(201)288-4422
OESS Co. Los Angeles Office TEL(714)220-1878
OESS Co. San Jose Office TEL(408)441-1855
• Europe Germany: OESS GmbH TEL(06106)75013
• Asia Hong Kong: Daimaru Kogyo,Ltd. Hong Kong Office TEL(852)8939457/8939108
Singapore: Daimaru Kogyo,Ltd. Singapore Office TEL(65)2251636

Support Hardware for FR Family

Target Microcontroller		Development Tools			
		Fujitsu ICE			Fujitsu
Product name	Package (Lead pitch, body size)	Adapter (Evaliation board, header)	Equipment common to series	Evaluation Device (Package)	Evaluation board
MB91101A	- LQFP-100 - 0.5mm, 14 x 14 mm - FPT-100P-M05	- Adapter : MB2197-101 *2 Note : Yamaichi Electronics IC socket is required separately (Option : IC149-100-□25-B5).	- ICE main unit : MB2197-01 - DSU2/3 cable : MB2197-10 - Evaluation device : Option - Option ROM alternate unit : MB2197-90 - debugger software : SOFTUNE Note : Please confirm the correspondence situation to each kind of debugger software.	MB91V101A (PGA135)	1)- Mother board : MB91906EB - Daughter board : MB91901EB * : Simple substance use is possible. (Evaluation device is with mounting. Connection use of ICE is possible (DSU) . 2)- Mother board : MB91906EB - Daughter board : MB91902EB * : Simple substance use is possible. (Option : MB91101A , Connection use of SOPHIA SYSTEMS or YDC ICE is possible. (NQPACK socket Note : Fujitsu ICE is not connectable (Yamaichi Electronics socket). 3)- Mother board : MB91906EB - Simple target for ICE : MB91903EB * : Simple substance use is possible. (Evaluation device is with mounting. Connection use of ICE is possible (DSU) .
	- QFP-100 - 0.65mm,14 x 20 mm - FPT-100P-M06	- Adapter : MB2197-102 *2 Note : Yamaichi Electronics IC socket is required separately (Option : IC149-100-□14-B5).			
MB91106A	- LQFP-100 - 0.5 mm,14 x 14 mm - FPT-100P-M05	- Evaluation board : MB2197-110 - header : MB2197-111 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled : NQPACK100SD, HQPACK100SD) .		MB91V106A (PGA299)	- Mother board : MB91906EB - Daughter board : MB91910EB * : Simple substance use is possible. (Option : MB91106A , Connection use of ICE is possible (NQPACK socket is used).
	- QFP-100 - 0.65 mm,14 x 20 mm - FPT-100P-M06	- Evaluation board : MB2197-110 - header : MB2197-112 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled. : NQPACK100RB, HQPACK100RB) .			
MB91107 MB91108	- LQFP-120 - 0.5mm,16x 16 mm - FPT-120P-M21	- Adapter : MB2197-103 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled. : NQPACK120SD, HQPACK120SD) .		MB91V108 (PGA135)	- Mother board : MB91906EB - Daughter board : MB91907EB * : Connection use of ICE is possible (NQPACK socket is used) .
MB91F109	- LQFP-100 - 0.5mm,14x14mm - FPT-100P-M05	- Evaluation board : MB2197-110 - header : MB2197-111 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled. : NQPACK100SD, HQPACK100SD) .		MB91V106A *1 (PGA299 Note : The emulation of built-in FLASH 254 KB of MB91F109 has restriction.	- Mother board : MB91906EB - Mother board : MB91906EB - Mother board : MB91906EB * : Simple substance use is possible (Option : MB91F109 , Connection use of ICE is possible (NQPACK socket is used) .
	- QFP-100 - 0.65mm,14x20mm - FPT-100P-M06	- Evaluation board : MB2197-110 - header : MB2197-112 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled. : NQPACK100RB, HQPACK100RB) .			
MB91110	- LQFP-144 - 0.5mm,20x20mm - FPT-144P-M08	- Evaluation board : MB2197-110 - header : MB2197-115 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled. : NQPACK144SD, HQPACK144SD) .		MB91V110 (PGA299	- Mother board : MB91906EB - Daughter board : MB91904EB * : Simple substance use is possible (Option : MB91110 , Connection use of ICE is possible. (NQPACK socket is used) .
MB91121	- LQFP-120 - 0.5mm,16x16mm - FPT-120P-M21	- Adapter : MB2197-103 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled : NQPACK120SD, HQPACK120SD).		MB91V121 (PGA135	- Mother board : MB91906EB - Daughter board : MB91907EB * : Simple substance use is possible (Option : MB911121 , Connection use of ICE is possible. (NQPACK socket is used) .

Support Hardware for FR Family

Development Tools				Equipment for Program to FLASH				Target Microcontroller
SOPHIA SYSTEMS ICE *4		Yokogawa Digital Computer ICE *5		Microcontroller Subject to Program	Parallel programmer		Serial programmer	
Adapter	Equipment common to series	Pod	Equipment common to series	Product name (Package)	Maker name	Programming adapter	Maker name Product name	Product name
CS2372A FR30-PB-QF100SD-AD CS2360B YQPACK100SD CS2360C NQPACK100SD	- Host I/F board - UniSTAC (US72000) - Evaluation device : Bundled - debugger software : WATCHPOINT	PF951	- advice (AD250) - Evaluation device : Bundled - debugger software : YDC microVIEW-G GAIO debugger GHS MULTI Note : Please confirm the correspondence situation to each kind of debugger software.	—	—	—	—	MB91101A
CS2372E FR30-PB-QF100RB-AD CS2360X YQPACK100RB CS2360Y NQPACK100RB		—		—	—	—	—	
Not required	Not required	Not required		—	—	—	—	MB91106A
Not required		Not required		—	—	—	—	
CS2373A FR TYPEáU-PB-QF120SD-AD CS2373B YQPACK120SD CS2373C NQPACK120SD	- Host I/F board - UniSTAC (US72001G) - Evaluation device : Bundled - debugger software : WATCHPOINT	PF953		—	—	—	—	MB91107 MB91108
Not required	Not required	Not required		MB91F109 (LQFP-100)	Minato Electronics *6	MF00-782	Yokogawa Digital Computer NETIMPRESS *8	MB91F109
Not required	Not required	Not required		MB91F109 (QFP-100)	Minato Electronics *6	MF00-783	okogawa Digital Computer NETIMPRESS *8	
Not required	Not required	Not required		—	—	—	—	MB91110
CS2373A FR TYPEáU-PB-QF120SD-AD CS2373B YQPACK120SD CS2373C NQPACK120SD	- Host I/F board - UniSTAC (US72001G) - Evaluation device : Bundled - debugger software : WATCHPOINT	Not required		—	—	—	—	MB91121

Support Hardware for FR Family

Target Microcontroller		Development Tools			
		Fujitsu ICE			Fujitsu
Product name	Package (Lead pitch, body size)	Adapter (Evaliation board, header)	Equipment common to series	Evaluation Device (Package)	Evaluation board
MB91F128 (Under development)	- LQFP-100 - 0.5mm,14x14mm - FPT-100P-M05	- Evaluation board : MB2197-160 - header : MB2197-162 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled : NQPACK100SD, HQPACK100SD269) .	- ICE main unit : MB2197-01 - DSU2/3 cable : MB2197-10 - Evaluation device : Option - Option ROM alternate unit : MB2197-90 - debugger software : SOFTUNE Note : Please confirm the correspondence situation to each kind of debugger software.	MB91FV129 (PGA299)	Not required
MB91133 MB91F133	- LQFP-144 - 0.5mm,20x20mm - FPT-144P-M08	- Evaluation board : MB2197-130 - header : MB2197-135 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled : NQPACK144SD, HQPACK144SD) .		MB91FV130 (PGA299)	- Mother board : MB91906EB - Daughter board : MB91908EB * : Simple substance use is possible. (Option : MB91F133 , Connection use of ICE is possible (NQPACK socket is used) .
MB91154 MB91F154 MB91F155	- LQFP-144 - 0.5mm,20x20mm - FPT-144P-M08	- Evaluation board : MB2197-150 - header : MB2197-155 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled : NQPACK144SD, HQPACK144SD) .		MB91FV150 (PGA299)	- Mother board : MB91906EB - Daughter board : MB91911EB * : Simple substance use is possible. (Option : MB91F154/F155 , Connection use of ICE is possible (NQPACK socket is used) .
MB91301 (Under development)	- LQFP-144 - 0.4mm,16x16mm - FPT-144P-M12	- Evaluation board : MB2198-100 - header : MB2198-101 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled : NQPACK144SE, HQPACK144SE) .	- ICE main unit : MB2198-01 - DSU4 cable : MB2198-10 - Evaluation device : Option - debugger software : SOFTUNE - RS232C cable : Commercial product(9pin-9pin closs) - USB1.1 cable : Commercial product	MB91V301 (PGA179) (Under development)	Under development
MB91307A	- LQFP-120 - 0.5mm,16x16mm - FPT-120P-M21	Not required	- ICE main unit : MB2197-01 - DSU2/3 cable : MB2197-10 - Evaluation device : Option - Option ROM alternate unit : MB2197-90 - debugger software : SOFTUNE Note : Please confirm the correspondence situation to each kind of debugger software.	MB91V307 (PGA135)	Under development
MB91340	- LQFP-176 - 0.5mm,24x24mm - FPT-176P-M02	- Evaluation board : MB2197-140 - header : MB2197-147 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled. : NQPACK176SD, HQPACK176SD) .		MB91V340 (PGA361)	- Mother board : MB91906EB - Daughter board : MB91912EB * : Connection use of ICE is possible (NQPACK socket is used) .
MB91F362GA	- QFP-208 - 0.5mm,28x28mm - FPT-208P-M04	- Evaluation board : MB2197-120 - header : MB2197-127 *3 Note : Tokyo EletechIC socket is required separately (1-set is bundled. : NQPACK208SD, HQPACK208SD) .		MB91FV360 (PGA401)	- Mother board : MB91906EB - Daughter board : MB91913EB * : Simple substance use is possible (Option : MB91F362GA , Connection use of ICE is possible (NQPACK socket is used).
MB91F369GA (Under development)	- QFP-160 - 0.65mm,28x28mm - FPT-160P-M15	- Evaluation board : MB2197-120 - header : Not required		MB91FV360 (PGA401)	Not required

*1 : The emulation function of built-in FLASH254K byte of MB91F109 has restriction in part.
Please ask for details the operating section in your duty or a support section.

*2 : A Yamaichi Electronics IC socket is required for connection of an adapter.
Contact details : TEL : (81-3)3778-6104, FAX : (81-3)3778-6171, http://www.yamaichi.co.jp/e/index.shtml

*3 : A Tokyo Eletech IC socket is required for connection of an adapter (side of user's board)
Contact details : TEL : (81-3)5295-1661, FAX : (81-3)5295-1663, http://www.tetc.co.jp/e_tet.htm

*4 : SOPHIA SYSTEMS CO.,LTD.
Contact details : TEL : (81-44)989-7253, FAX : (81-44)989-7014, http://www.sophia.com/

Support Hardware for FR Family

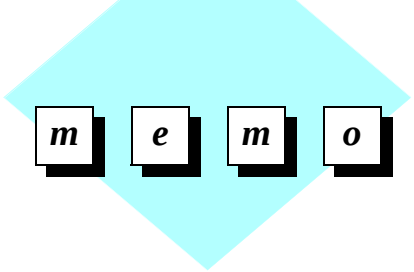
Development Tools				Equipment for Program to FLASH				Target Microcontroller
SOPHIA SYSTEMS ICE *4		Yokogawa Digital Computer ICE *5		Microcontroller Subject to Program	Parallel programmer		Serial programmer	
Adapter	Equipment common to series	Pod	Equipment common to series	Product name (Package)	Maker name	Programming adapter	Maker name Product name	Product name
Not required	Not required	Not required	- advice (AD250 - Evaluation device : Bundled - debugger software : YDC microVIEW-G GAIO debugger GHSêªMULTI Note : Please confirm the correspondence situation to each kind of debugger software.	MB91F128 (LQFP-100)	Ando Electric	TE110-123F14AP	Not required	MB91F128 (Under development)
Not required	Not required	PF960		MB91F133 (LQFP-144)	Minato Electronics *6	MF00-871	Yokogawa Digital Computer NETIMPRESS *8	MB91133 MB91F133
CS2374A FR TYPEáV-PB-QF144-AD CS2246B YQPACK144SD CS2246C NQPACK144SD	- Host I/F board - UniSTAC (US72003G) - Evaluation device : Bundled - debugger software : WATCHPOINT	Not required		MB91F154 MB91F155 (LQFP-144)	Minato Electronics *6	MF13-1003	Yokogawa Digital Computer NETIMPRESS *8	MB91154 MB91F154 MB91F155
					Ando Electric	TE110-155F10AP *7		
Not required	Not required	Not required	Not required	—	—	—	—	MB91301 (Under development)
Not required	Not required	PF961	- advice (AD250 - Evaluation device : Bundled - debugger software : YDC microVIEW-G GAIO debugger GHS MULTI Note : Please confirm the correspondence situation to each kind of debugger software.	—	—	—	—	MB91307A
Not required	Not required	Not required	Not required	—	—	—	—	MB91340
Not required	Not required	Not required	Not required	MB91F362GA (QFP-208)	Minato Electronics *6	MF00-892 *6	Not required	MB91F362GA
Not required	Not required	Not required	Not required	MB91F369GA (QFP-160)	Not required	Not required	Not required	MB91F369GA (Under development)

*5 : Yokogawa Digital Computer Coeporation
Contact details : TEL : (81-42)333-6222, FAX : 042-352-6107, http://www.ydc.co.jp/advice/advice-e/index.htm

*6 : MINATO ELECTRONICS INC.Contact details : TEL : (81-45)591-5611, FAX : 045-592-2854, http://www.minato.co.jp/indext_e.html

*7 : Ando ElectricContact details : TEL : (81-44)549-7300, http://info.tactnet.co.jp/ando-fsg/e/

*8 : Yokogawa Digital Computer Coeporation
Contact details : TEL : (81-42)333-6224, FAX : (81-42)352-6107, http://www.ydc.co.jp/micom/index_E.htm


m e m o

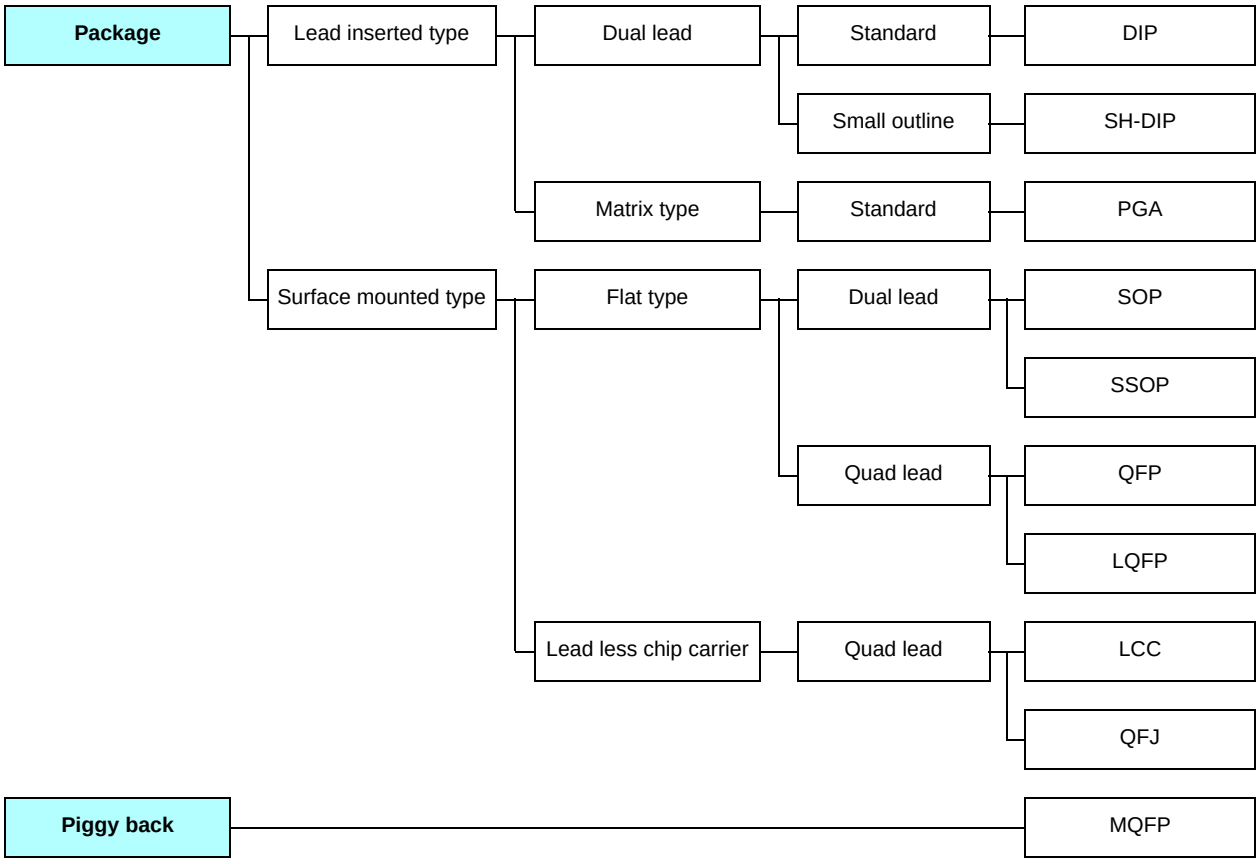
Microprocessor List (32-bit SPARClite)

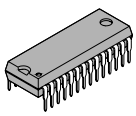
32-bit SPARClite

Part Number		MB86831	MB86832	MB86833	MB86834	MB86836
Processor functions	Performance [VAXMIPS]	80 (66 MHz)	97 (80 MHz)	80 (66 MHz)	130 (108 MHz)	109 (90 MHz)
	Internal supply voltage [V]	3.3	3.3	3.3	2.5	3.3
	External supply voltage [V]	3.3/5	3.3/5	3.3/5	3.3	3.3/5
	Internal FPU	66	80	66	108	90
	FPU performance (peak) [MFLOPS]	○	○	○	○	○
	Operating frequency [MHz]	256M	256M/ (4G)	16M/ (256M)	256M/ (4G)	256M
	PLL	16	16/ (1)	16/ (1)	16/ (1)	16
	Address space [B]	136 (32 bit)	136 (32 bit)	136 (32 bit)	136 (32 bit)	136 (32 bit)
	Number of address spaces [space]	8	8	8	8	8
	Number of internal general-purpose registers	4K/2K	8K/8K	1K/1K	1K/1K	8K/8K
	Number of register windows	○	○	—	○	○
	Internal cache (instruction/data) [B]	○	○	○	○	○
	Cache function (2-way set associative)	—	—	—	—	—
	Cache function (burst mode)	—	—	—	—	—
	Number of interrupt channels (channels/levels)	8/15	8/15	8/15	8/15	8/15
	Process (gate width/number of Al wiring layers)	0.35 µm/2layer	0.35 µm/2layer	0.35 µm/2layer	0.25 µm/2layer	0.35 µm/2layer
	Package	QFP-176P	QFP-176P	QFP-144P	QFP-176P	BGA-144P
Internal peripheral devices	Chip select generation [lines]	6	6	6	6	6
	Wait state generation	○	○	○	○	○
	Page mode DRAM support	○	○	○	○	○
	DRAM refresh counter	○	○	○	○	○
	Clock generation	—	—	—	—	—
	8/16-bit boot ROM interface	○	○	○	○	○
	8/16-bit bus interface	○	○	○	○	○
	SRAM interface	—	—	—	—	—
	DRAM controller (direct connection of DRAM)	○	○	○	○	—
	SDRAM controller	—	—	—	—	—
	Interrupt controller (number of interrupt channels)	8	8	8	8	8
	Emulator (ICE) support	—	○	—	—	—
	Other	—	—	—	—	—
	Performance	—	—	—	—	JTAG

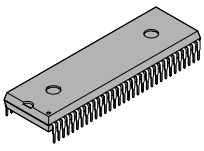
Page	196

Package Line-up





DIP-28P



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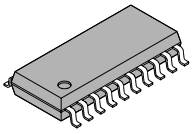
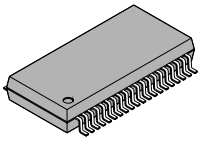
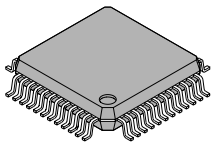


SOP-20P



SSOP-40P

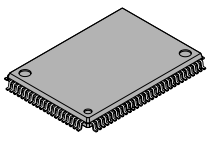


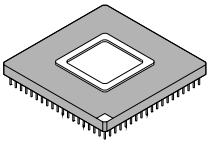
QFP-48P

Package Line-up

Name of package	Description	Lead pitch (mm)
DIP	Dual In-line Package	2.54
SH-DIP *	Shrink Dual In-line Package	70
PGA	Pin Grid Array Package	100
SOP	Small Outline Package (straight lead) Small Outline L-Leaded Package (gull wing lead)	50
SSOP	Shrink Small Outline L-Leaded Package	0.65mm/0.80mm/1.00mm
QFP	Quad Flat Package (straight lead), Quad Flat L-Leaded Package (gull wing lead)	0.5mm/0.65mm/0.80mm/ 1.00mm
LQFP *	Low-Profile Quad Flat L-Leaded Package	0.40mm/0.50mm/0.65mm/ 0.80mm
LCC	Leadless Chip Carrier	50/40
QFJ	Quad Flat J-Leaded Package	50

* : Package name by Fujitsu.
Note: Plastic surface mount packages have some limitations regarding mounting conditions. Please check before using


LQFP-100P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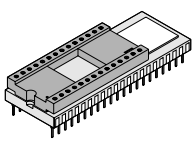
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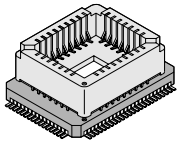

MQFP-80C

Index

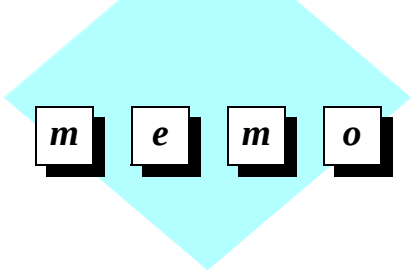
*: Under development

Index

Index

*: Under development

*: Under development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