OKI semiconductor

MSM5104RS

4096-BIT (4096 x 1) CMOS STATIC RAM

GENERAL DESCRIPTION

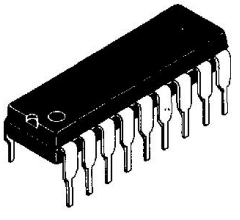
The Oki MSM5104 is a 4096-bit static Random Access Memory organized as 4096 words by 1 bit using Oki's reliable Silicon Gate CMOS technology. Microwatt power dissipation typical of all CMOS is exhibited in all static state. Directly TTL compatible inputs, output, operation from a single +5 V supply and on-chip address-data registers simplify system designs.

The MSM5104 series is offered in an 18-pin plastic (RS suffix) package. The series is guaranteed for operation from 0°C to 70°C and over a 4 V to 6 V power supply range.

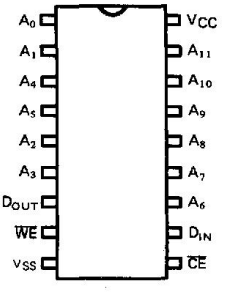
FEATURES

- Low Power Dissipation
  40μW Max. Standby Power
  33mW/MHz Max. Operating Power
- Data Retention to V_{CC}=2V
- Single 4 ~ 6V Power Supply
- High Density 300-mil 18-Pin Package
- On-Chip Address and Data Registers
- Separate Data Input and Output
- Three-State Ouput
- Directly TTL/CMOS Compatible
- Silicon Gate CMOS Technology
- Pin-compatible with Mostek 4104, Interchangeable with Harris 6504

	5104-2	5104-3
Max. Access Time (NS)	200	300
Max. Operating Power (MW/MHz)	33	33
Max. Standby Power (μ)	40	40

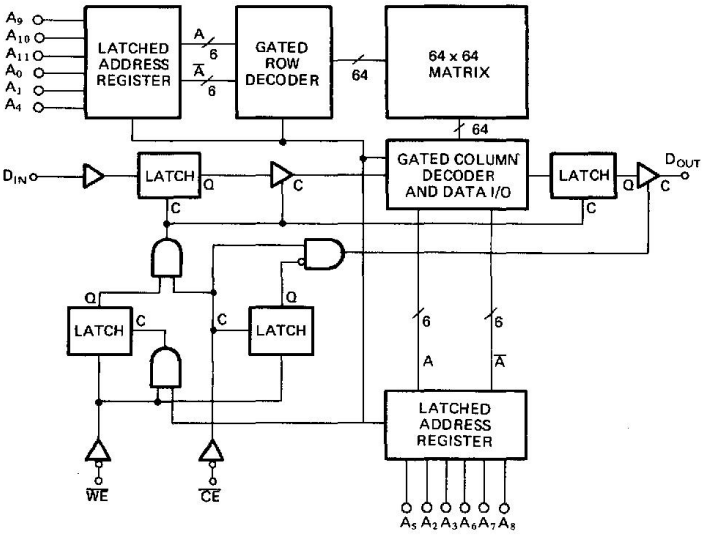


PIN CONFIGURATION



A_0 To A_{11}: Address Inputs
$\overline{WE}$: Write Enable
$\overline{CE}$: Chip Enable
D_{IN}: Data Input
D_{OUT}: Data Output
V_{CC}: +5V Supply
V_{SS} : Ground

FUNCTIONAL BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	−0.3 to 7.0	V
Input Voltage	V_{IN}	−0.3 to V_{CC} + 0.3	V
Output Voltage	V_{OUT}	0 to V_{CC}	V
Storage Temperature	T_{stg}	−55 to 150	°C

Note: Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	V_{CC}	4	5	6	V	5V ± 20%
Input Signal Level	V_{IH}	2.4	5	V_{CC}	V	Respect to V_{SS}
	V_{IL}	−0.3	0	0.8	V	
Operating Temperature	T_{opr}	0		70	°C	

DC CHARACTERISTICS

(V_{CC} = 5V ± 10%; Ta = 0°C to +70°C, unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input Load Current	I_{LI}	−1		1	μA	V_{IN} = 0 to V_{CC}
Output Leakage Current	I_{LO}	−1		1	μA	$V_{I/O}$ = 0 to V_{CC}
Output High Voltage	V_{OH}	4.2			V	I_{OUT} = −40μA
Output Low Voltage	V_{OL}			0.4	V	I_{OUT} = 1.6mA
Output High Current	I_{OH}	−1.0			mA	V_{OUT} = 2.4V
Standby Supply Current	I_{CCS}		0.2	50	μA	V_{IN} = 0 or V_{CC}
Operating Supply Current	I_{CC}			6	mA	V_{IN} = 0 or V_{CC}, t_{RC} = 1 μs

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AC CHARACTERISTICS

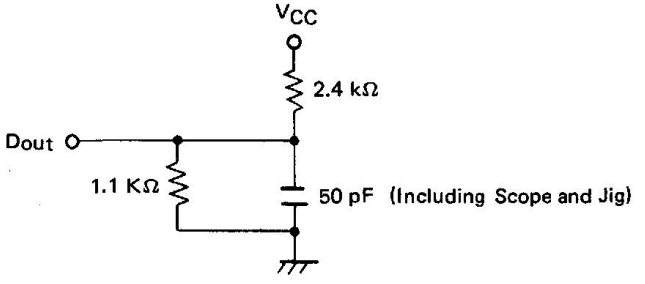
(V_{CC}=5V±10%, T_a = 0°C to +70°)

Parameter	Symbol	5104-2		5104-3		Unit
		Min.	Max.	Min.	Max.	
Read/Write Cycle Time	t_{RC}, t_{WC}	300		420		ns
Chip Enable Access Time	t_{AC}		200		300	ns
Chip Enable Pulse Width	t_{CE}	200		300		ns
Chip Enable Off Time	t_{CC}	100		120		ns
Address Hold Time	t_{AH}	40		50		ns
Address Setup Time	t_{AS}	0		0		ns
Output Disable Time	t_{OFF}	0	70	0	100	ns
Write Enable Pulse Width	t_{WP}	100		130		ns
Write Enable Setup Time	t_{WS}	0		0		ns

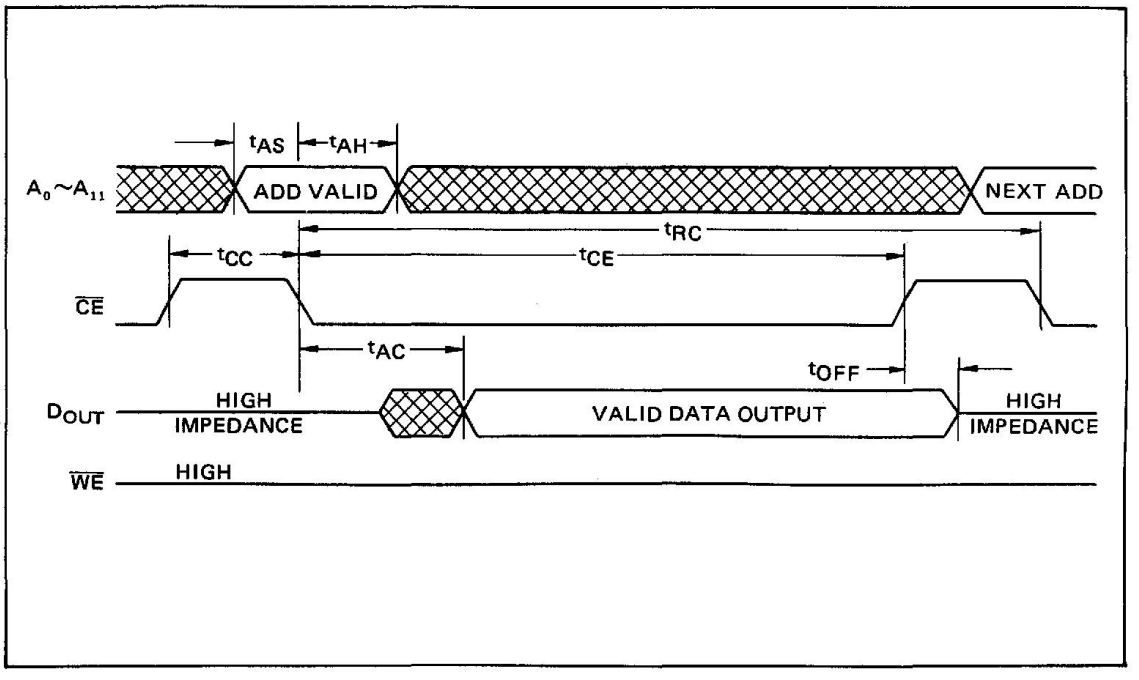
Parameter	Symbol	5104-2		5104-3		Unit
		Min.	Max.	Min.	Max.	
Write Enable Hold Time	t_{WH}	120		150		ns
Data Setup Time	t_{DS}	0		0		ns
Data Hold Time	t_{DH}	60		80		ns
Data Valid Time to Write Pulse	t_{DV}	0		0		ns
Write Enable Read Time	t_{WCL}	150		200		ns

AC TEST CONDITIONS

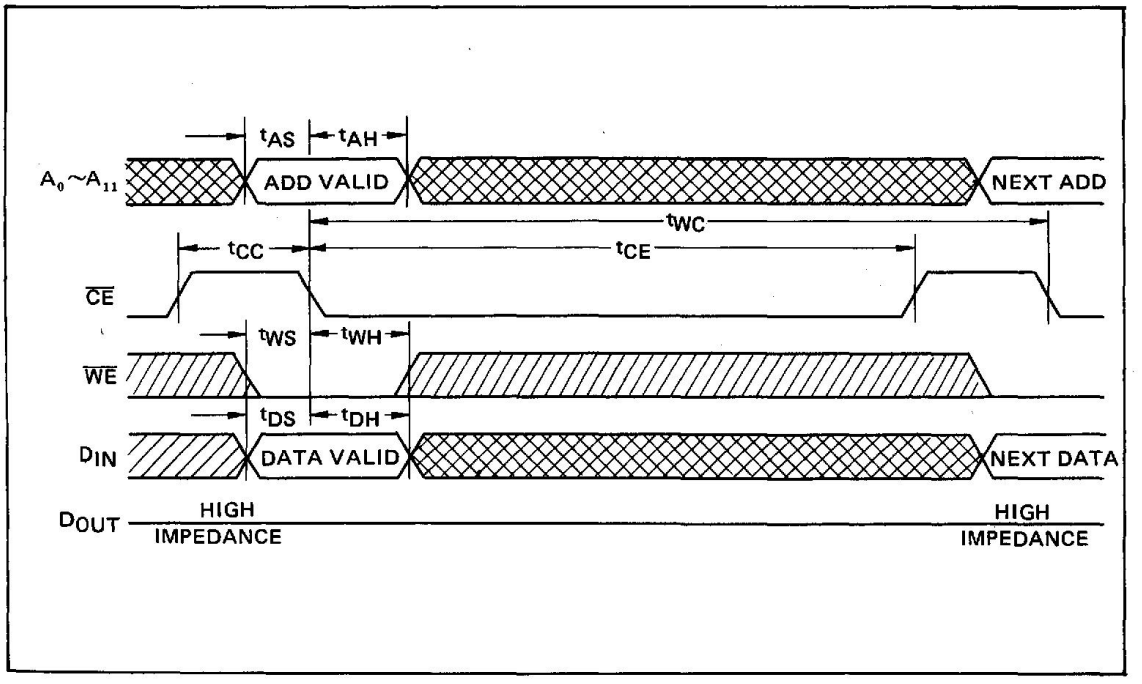
Input Pulse Levels: 0.8V to 2.4V
Timing Measurement Reference Levels: 1.5V
Input Rise and Fall Time: 10 ns



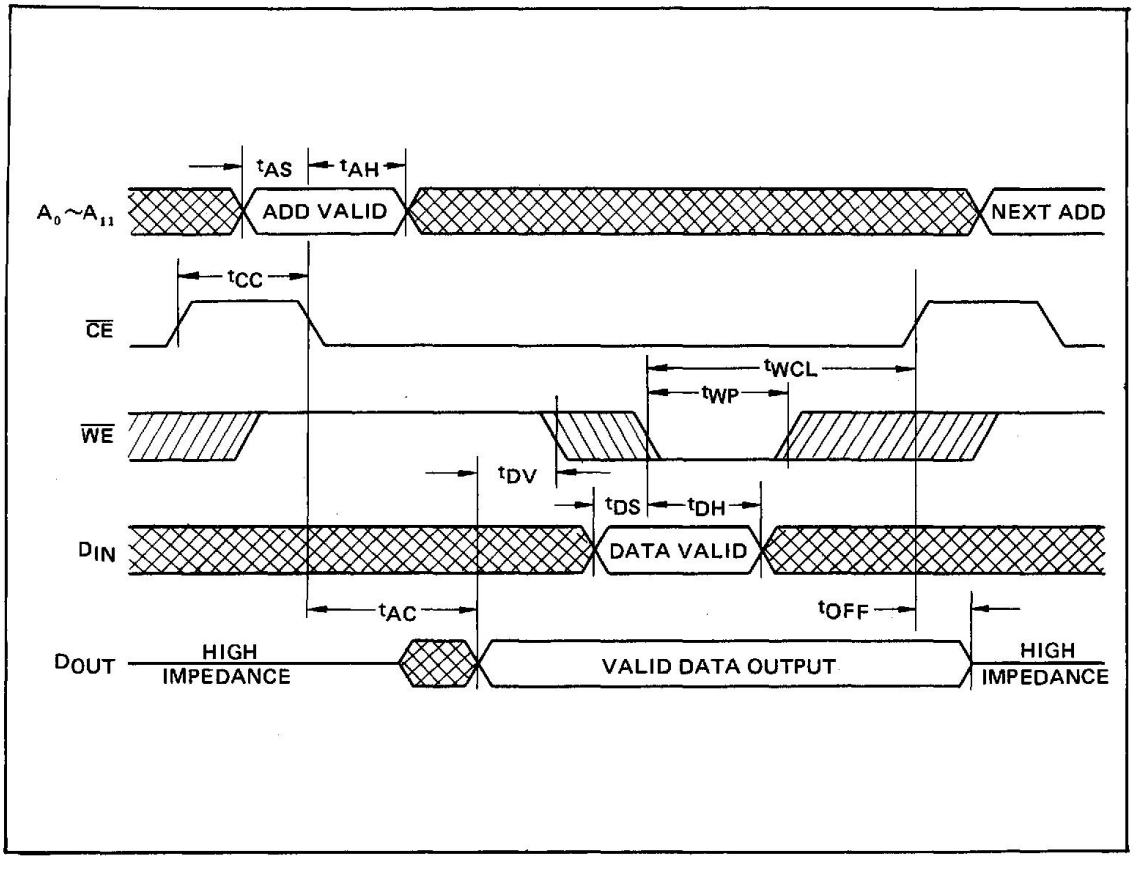
READ CYCLE



EARLY WRITE CYCLE



READ MODIFY WRITE CYCLE



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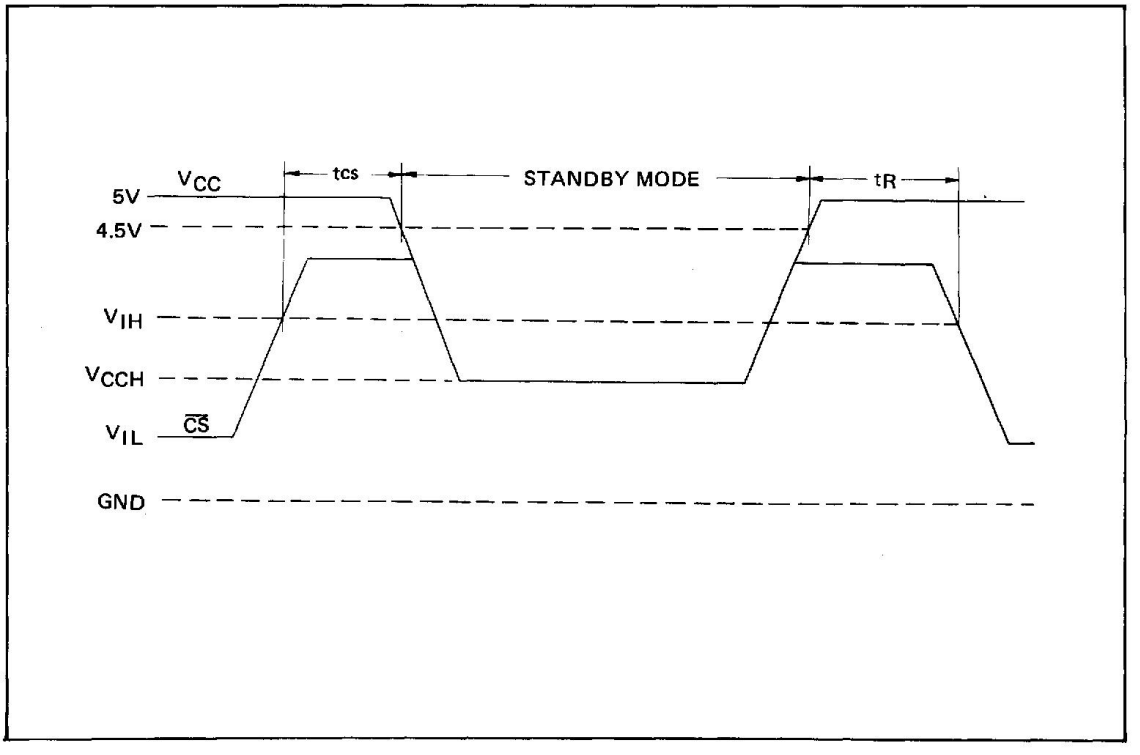
LOW V_{CC} DATA RETENTION CHARACTERISTICS

(Ta = 0°C to +70°C, unless otherwise noted.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
V_{CC} for Data Retention	V_{CCH}	2			V	V_{IN} = 0V or V_{CC}
Data Retention Current	I_{CCH}		0.1	20	μA	V_{CC} = 2V $V_{\overline{CE}}$ = V_{CC} V_{IN} = 0V or V_{CC}
$\overline{CE}$ to Data Retention Time	t_{SU}	0			ns	
Operation Recovery Time	t_R	t_{RC}			ns	

LOW V_{CC} DATA RETENTION WAVEFORM



CAPACITANCE

(Ta = 25°C, f = 1 MHz)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input/Output Capacitance	$C_{I/O}$			10	pF
Input Capacitance	C_{IN}			8	pF

Note: This parameter is periodically sampled and not 100% tested.