

# M51957A,B/M51958A,B

## Voltage Detecting, System Resetting IC Series

REJ03D0778-0100

Rev.1.00

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### Description

M51957A,B/M51958A,B are semiconductor integrated circuits designed for detecting input voltage and resetting all types of logic circuits such as CPUs.

They include a built-in delay circuit to provide the desired retardation time simply by adding an external capacitor.

They find extensive applications, including battery checking circuit, level detecting circuit and waveform shaping circuit.

### Features

- Few external parts
- Large delay time with a capacitor of small capacitance ( $t_d \approx 100$  ms, at  $0.33 \mu\text{F}$ ) (M51957, M51958)
- Low threshold operating voltage (Supply voltage to keep low-state at low supply voltage):  
0.6 V (Typ) at  $R_L = 22 \text{ k}\Omega$
- Wide supply voltage range: 2 V to 17 V
- Wide operation range of detecting input pin:  
Narrower ranges of  $-0.3 \text{ V}$  to  $V_{CC}$  or  $-0.3 \text{ V}$  to 7 V (input voltage detecting type)
- Suitable for high supply voltage circuit with simple circuit structure (M51957B, M51958B)
- Permits easy configuration of a circuit for protection against reverse connection or surges. (M51957B, M51958B)
- Wide application range

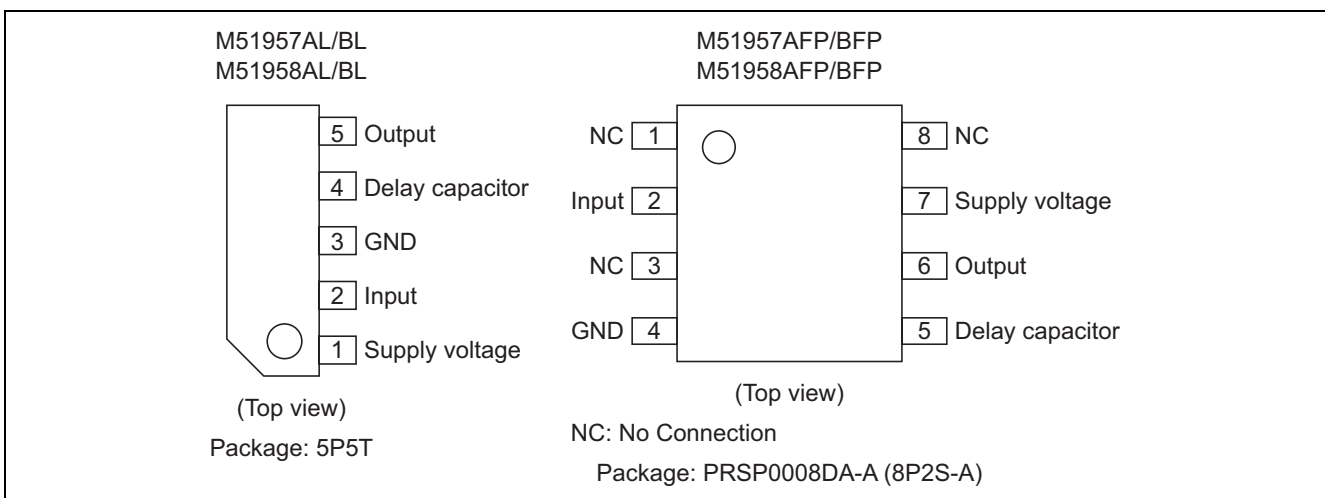
### Application

- Reset circuit of Pch, Nch, CMOS, microcomputer, CPU and MCU, Reset of logic circuit, Battery check circuit, switching circuit back-up voltage, level detecting circuit, waveform shaping circuit, delay waveform generating circuit, DC/DC converter, over voltage protection circuit

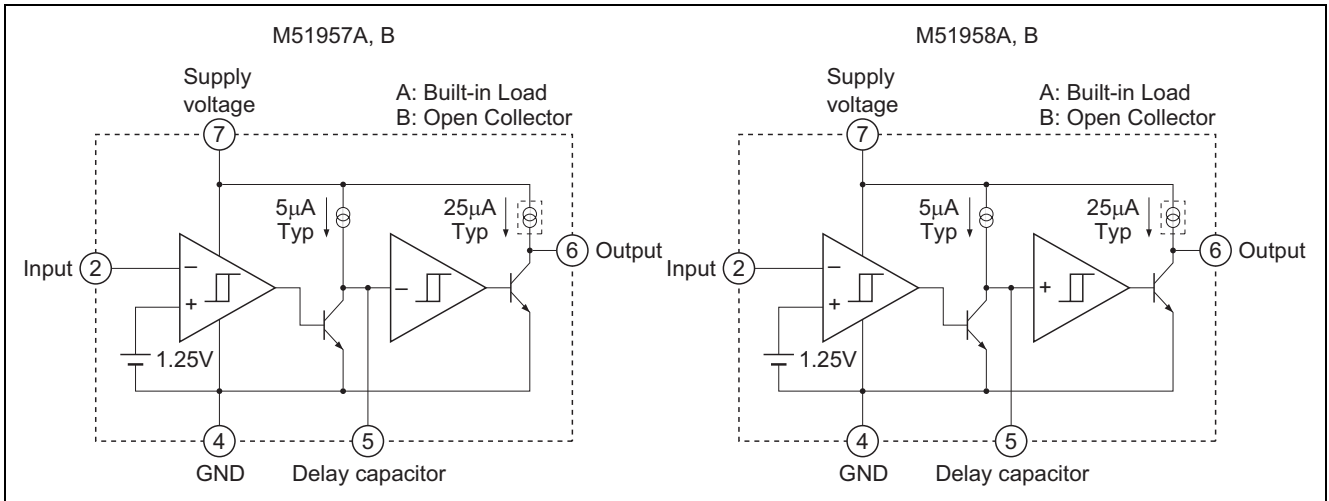
### Recommended Operating Condition

- Supply voltage range: 2 V to 17 V

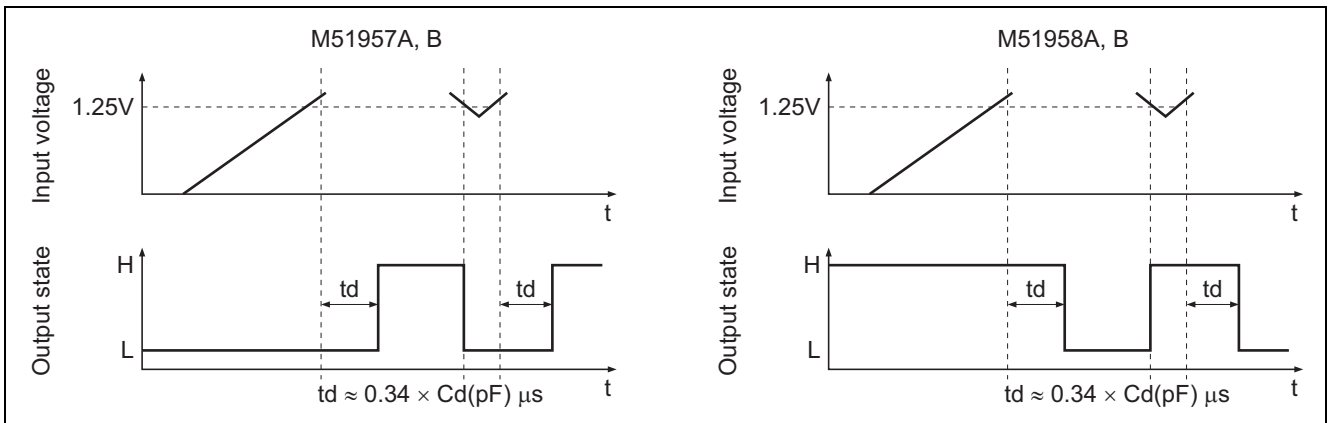
### Pin Arrangement



## Block Diagram



## Operating Waveform



## Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

Item	Symbol	Ratings	Unit	Conditions	
Supply voltage	V <sub>CC</sub>	18	V		
Output sink current	I <sub>sink</sub>	6	mA		
Output voltage	V <sub>O</sub>	V <sub>CC</sub>	V	Type A (output with constant current load)	
		18		Type B (open collector output)	
Power dissipation	P <sub>d</sub>	450	mW	5-pin SIP	
		300		8-pin SOP	
Thermal derating	K <sub>θ</sub>	4.5	mW/°C	Ta ≥ 25°C	5-pin SIP
		3			8-pin SOP
Operating temperature	T <sub>opr</sub>	-30 to +85	°C		
Storage temperature	T <sub>stg</sub>	-40 to +125	°C		

## Electrical Characteristics

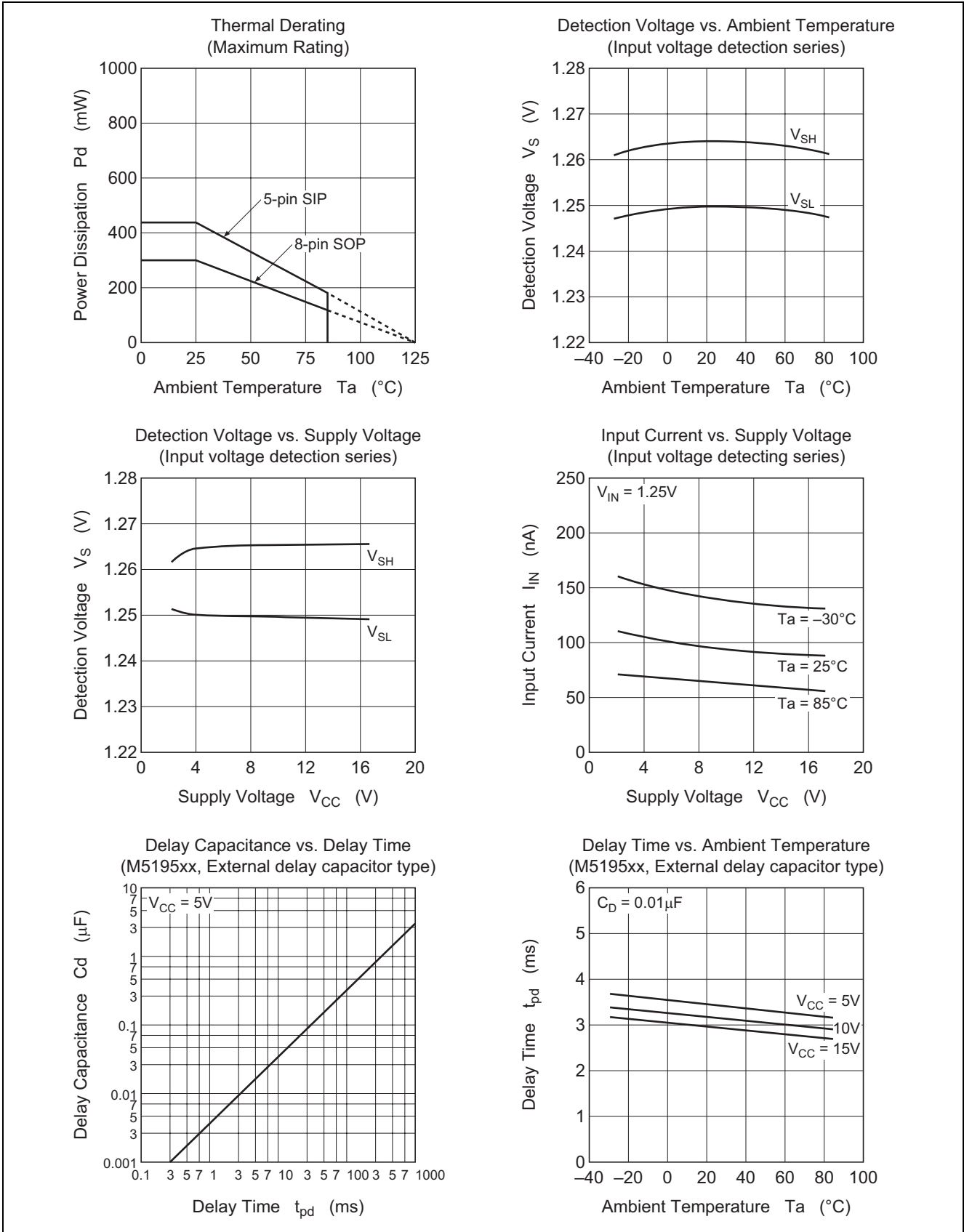
(Ta = 25°C, unless otherwise noted)

- “L” reset type M51957A, M51957B
- “H” reset type M51958A, M51958B

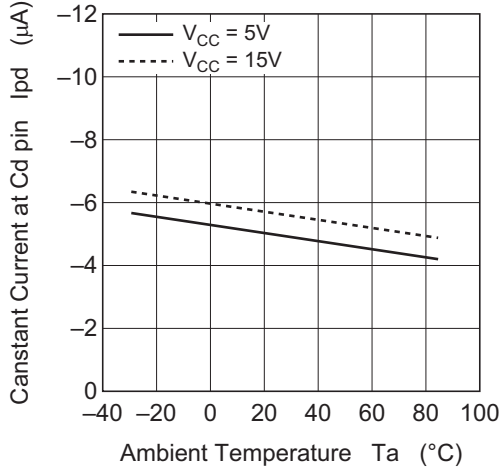
Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
Detecting voltage	V <sub>S</sub>	1.20	1.25	1.30	V		
Hysteresis voltage	ΔV <sub>S</sub>	9	15	23	mV	V <sub>CC</sub> = 5V	
Detecting voltage temperature coefficient	V <sub>S</sub> /ΔT	—	0.01	—	%/°C		
Supply voltage range	V <sub>CC</sub>	2	—	17	V	Ta = -30 to +85°C	
Input voltage range	V <sub>IN</sub>	-0.3	—	V <sub>CC</sub>	V	Ta = -30 to +85°C, V <sub>CC</sub> ≤ 7V	
		-0.3	—	7		Ta = -30 to +85°C, V <sub>CC</sub> > 7V	
Input current	I <sub>IN</sub>	—	100	500	nA	V <sub>IN</sub> = 1.25V	
Circuit current	I <sub>CC</sub>	—	390	590	μA	Type A, V <sub>CC</sub> = 5V	
		—	360	540		Type B, V <sub>CC</sub> = 5V	
Delay time	t <sub>pd</sub>	1.6	3.4	7	ms	Ta = -30 to +85°C, Cd = 0.01μF *	
Output saturation voltage	V <sub>sat</sub>	—	0.2	0.4	V	L reset type, V <sub>CC</sub> = 5V, V <sub>IN</sub> < 1.2V, I <sub>sink</sub> = 4mA	
		—	0.2	0.4		H reset type, V <sub>CC</sub> = 5V, V <sub>IN</sub> > 1.35V, I <sub>sink</sub> = 4mA	
Threshold operating voltage	V <sub>OPL</sub>	—	0.67	0.8	V	L reset type minimum supply voltage for IC operation	R <sub>L</sub> = 2.2kΩ, V <sub>sat</sub> ≤ 0.4V
		—	0.55	0.7			R <sub>L</sub> = 100kΩ, V <sub>sat</sub> ≤ 0.4V
Output leakage current	I <sub>OH</sub>	—	—	30	nA	Type B	
		—	—	1		μA	Type B, Ta = -30 to +85°C
Output load current	I <sub>OC</sub>	-40	-25	-17	μA	Type A, V <sub>CC</sub> = 5V, V <sub>O</sub> = 1/2 × V <sub>CC</sub>	
Output high voltage	V <sub>OH</sub>	V <sub>CC</sub> -0.2	V <sub>CC</sub> -0.06	—	V	Type A	

Note: Delay time can be changed by changing delay capacitor for external capacitor types.  
(Please refer to typical characteristics)

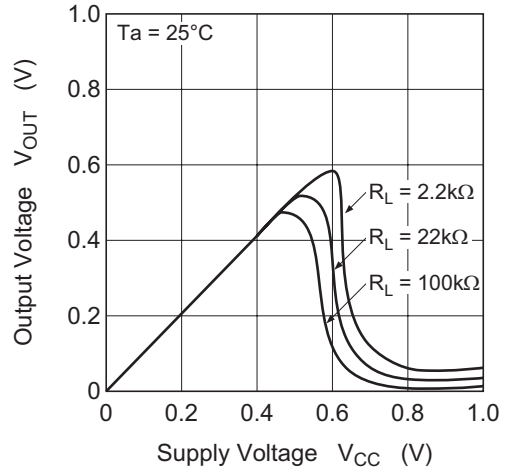
Typical Characteristics



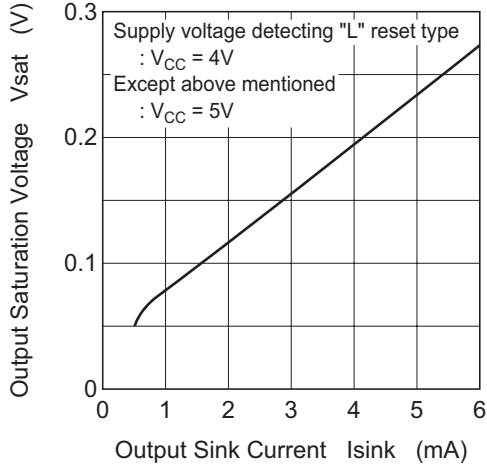
Constant Current at Cd pin vs. Ambient Temperature  
(M5195xx, External delay capacitor type)



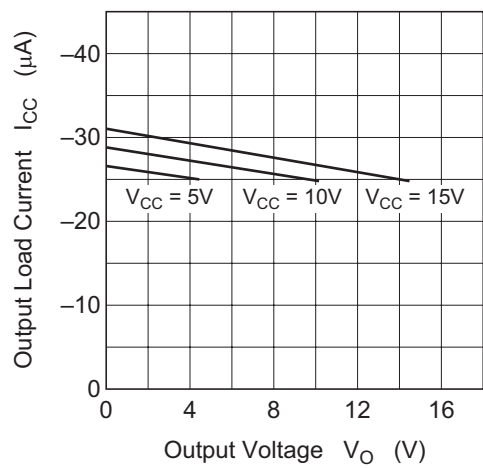
Threshold Operating Voltage  
([L] reset type)



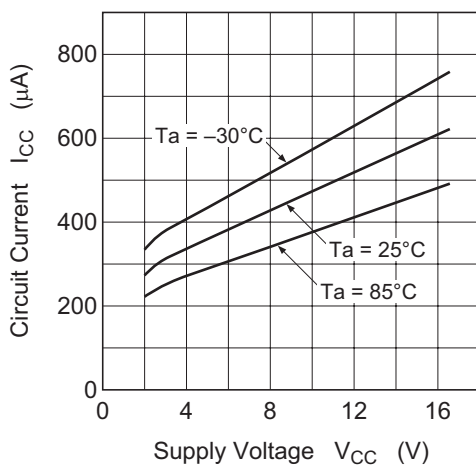
Output Saturation Voltage vs. Output Sink Current



Output Load Current vs. Output Voltage  
(M5195xA)

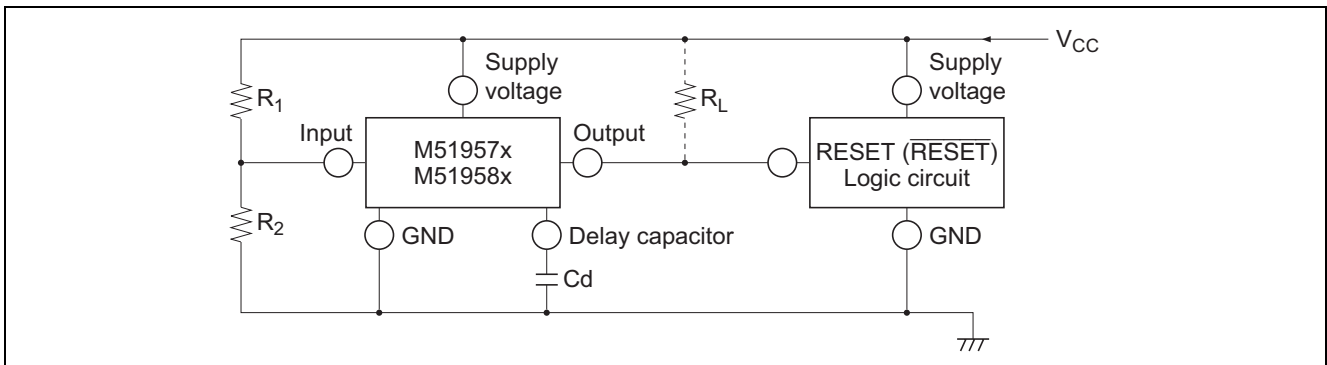


Circuit Current vs. Supply Voltage  
(M51957B, M51958B)



## Example of Application Circuit

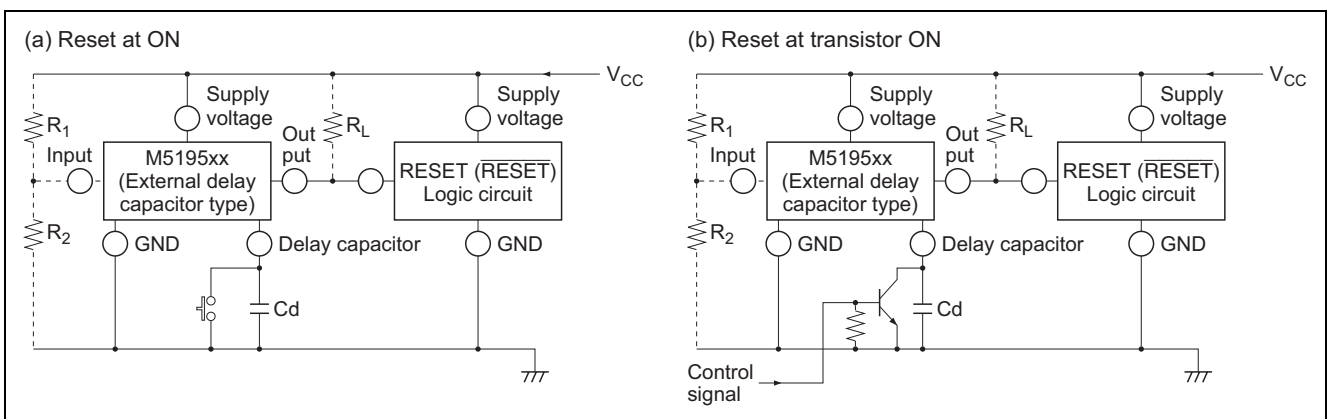
### Reset Circuit of M5195xx Series



**Figure 1 Reset Circuit of M5195xx Series**

- Notes:
1. When the detecting supply voltage is 4.25 V, M51951, M51952, M51953 and M51954 are used. In this case,  $R_1$  and  $R_2$  are not necessary. When the voltage is anything except 4.25 V, M51955, M51956, M51957 and M51958 are used. In this case, the detecting supply voltage is  $1.25 \times (R_1 + R_2)/R_2$  (V) approximately. The detecting supply voltage can be set between 2 V and 15 V.
  2. When the delay time is short, M51951, M51952, M51955 and M51956 are available. These ICs have a delay capacity and the delay time is about 200  $\mu$ s. If a longer delay time is necessary, M51953, M51954, M51957 and M51958 are used. In this case, the delay time is about  $0.34 \times C_d$  (pF)  $\mu$ s.
  3. If the M5195xx and the logic circuit share a common power source, type A (built-in load type) can be used whether a pull-up resistor is included in the logic circuit or not.
  4. The logic circuit preferably should not have a pull-down resistor, but if one is present, add load resistor  $R_L$  to overcome the pull-down resistor.
  5. When the reset terminal in the logic circuit is of the low reset type, M51951, M51953, M51955 and M51957 are used and when the terminal is of the high reset type, M51952, M51954, M51956 and M51958 are used.
  6. When a negative supply voltage is used, the supply voltage side of M5195xx and the GND side are connected to negative supply voltage respectively.

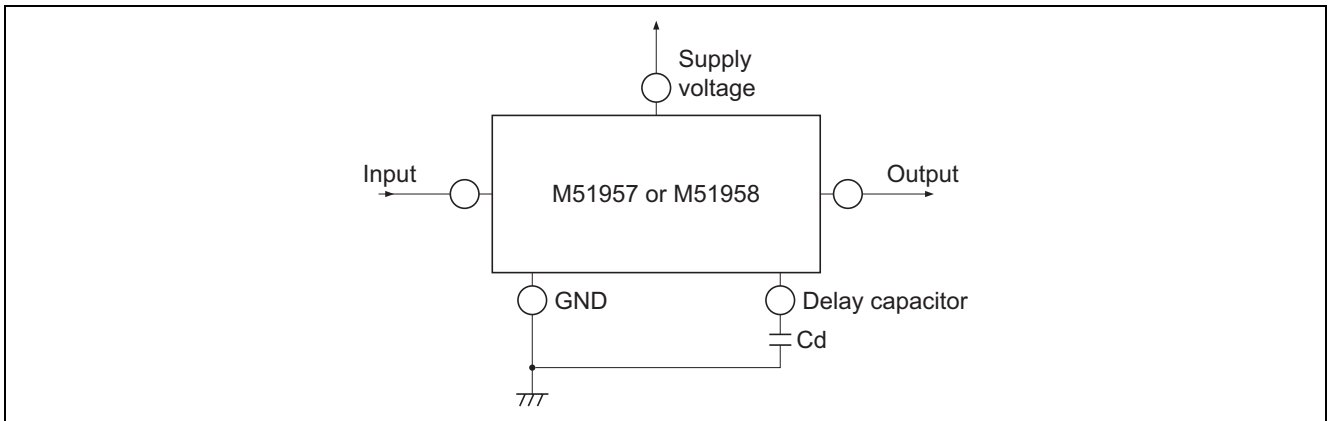
### Case of Using Reset Signal except Supply Voltage in the M5195xx Series



**Figure 2 Case of Using Reset Signal except Supply Voltage in the M5195xx Series**

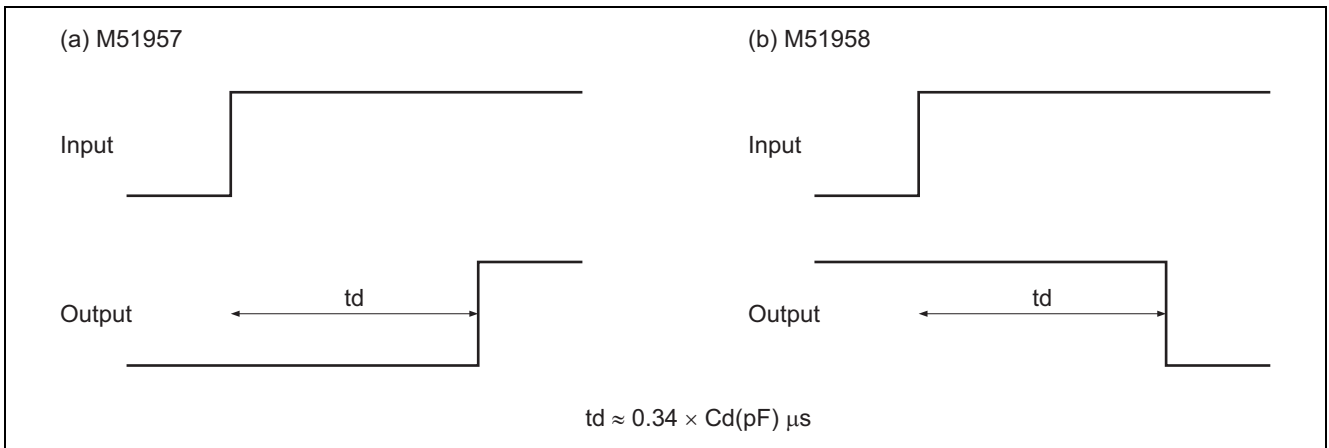
**Delay Waveform Generating Circuit**

When M51957 and M51958 are used, a waveform with a large delay time can generate only by adding a small capacitor.



**Figure 3 Delay Waveform Generating Circuit**

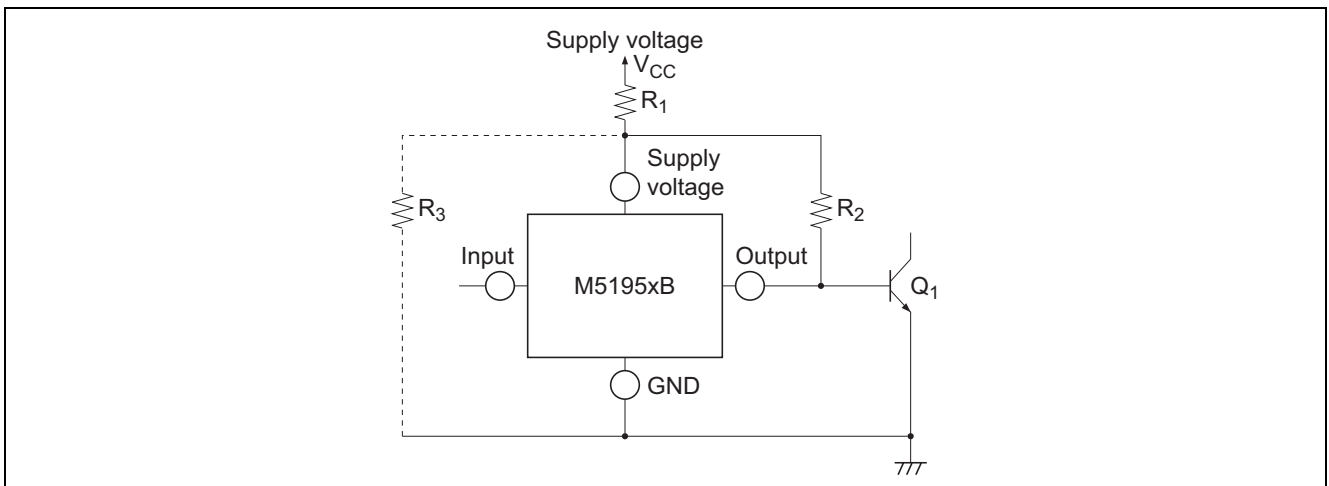
**Operating Waveform**



**Figure 4 Operating Waveform**

**Application to High Supply Voltage Circuit**

The absolute maximum rating of supply voltage for M51957B, M51958B is 18 V. By dividing supply voltage using resistors, these ICs can be used in high supply voltage circuit.



**Figure 5 Application to High Supply Voltage Circuit**

In the above figure, the voltage applied to M5195xB is as follows. The voltage range is set between 2 V and 17 V.

$$\text{at } Q_1 \text{ ON: } \frac{R_2 \cdot \left\{ \frac{R_3}{(R_1 + R_3)} \cdot V_{CC} - (R_1 // R_3) \cdot I_{CC} \right\} + (R_1 // R_3) \cdot V_{BEI}}{R_2 + (R_1 // R_3)}$$

$$\text{at } Q_1 \text{ OFF: } \frac{R_2 \cdot \left\{ \frac{R_3}{(R_1 + R_3)} \cdot V_{CC} - (R_1 // R_3) \cdot I_{CC} \right\}}{R_2 + (R_1 // R_3)}$$

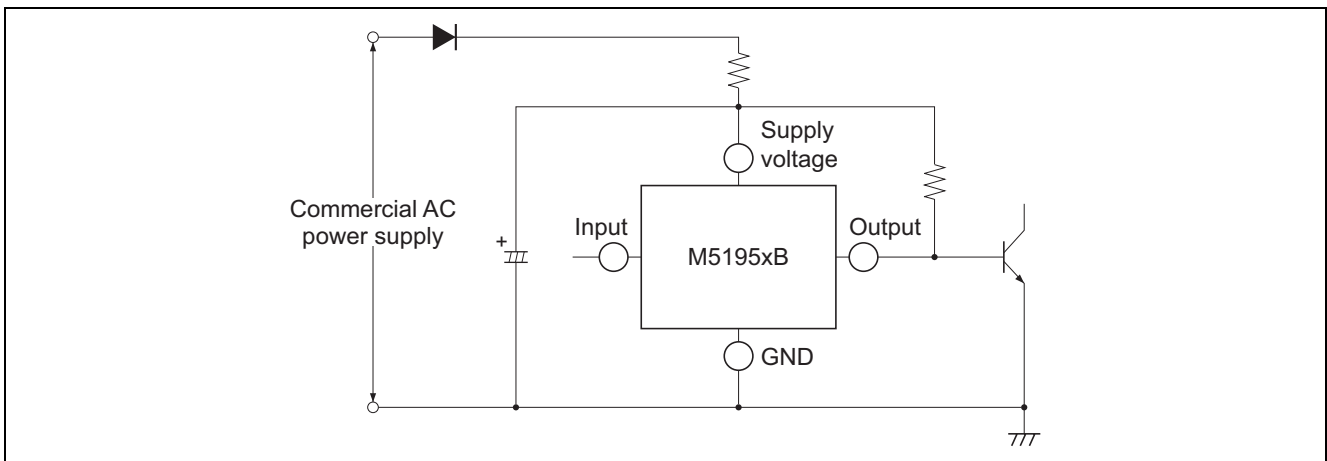
Where,  $R_1 // R_3 \equiv \frac{R_1 \cdot R_3}{R_1 + R_3}$

$I_{CC}$  : Circuit current of M5195xB

$V_{BEI}$  : Base-emitter voltage  $\approx 0.7V$  (Transistor  $Q_1$ )

This circuit provides reverse protection (in case of reverse connection of power supply) and surge protection.

Using this application circuit, the directly rectified or smoothing commercial voltage can be applied as shown below.



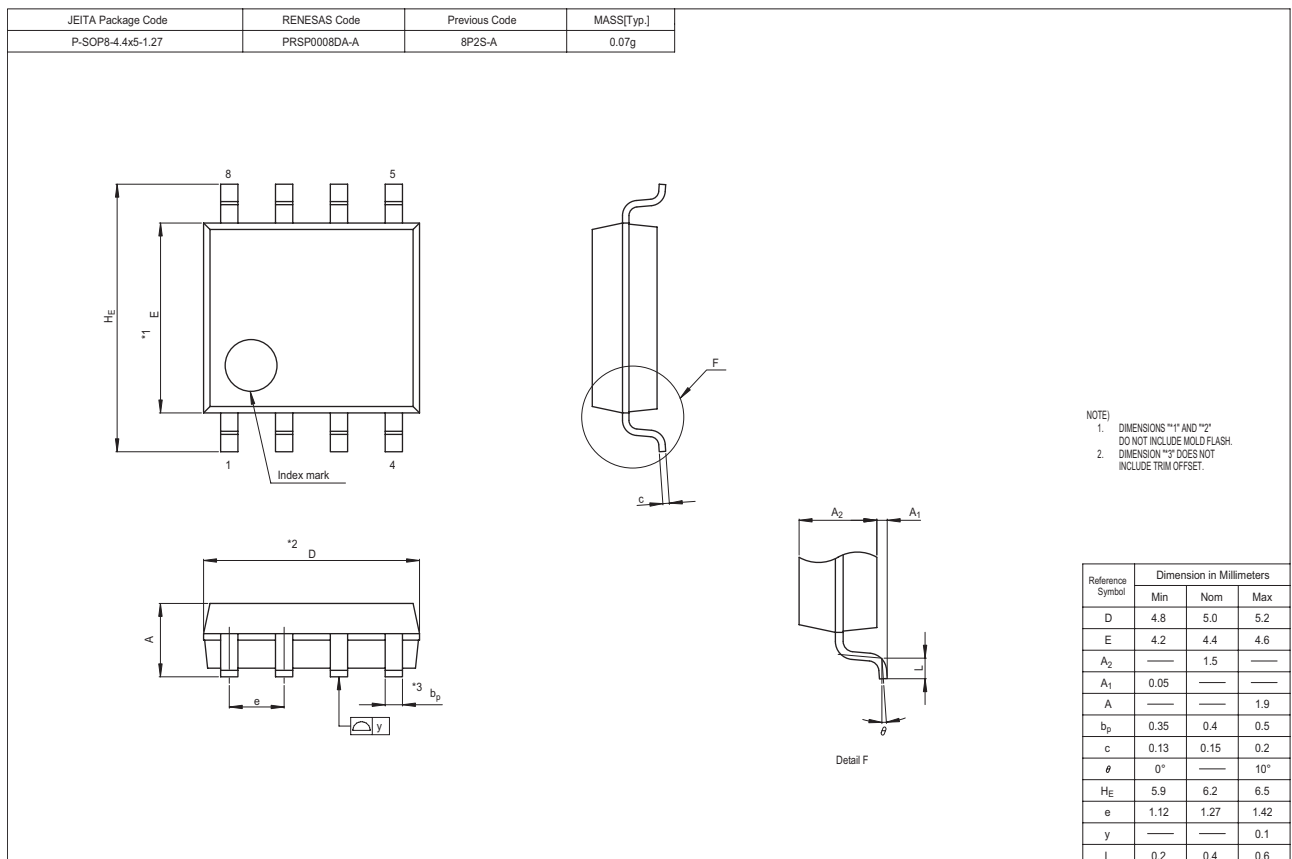
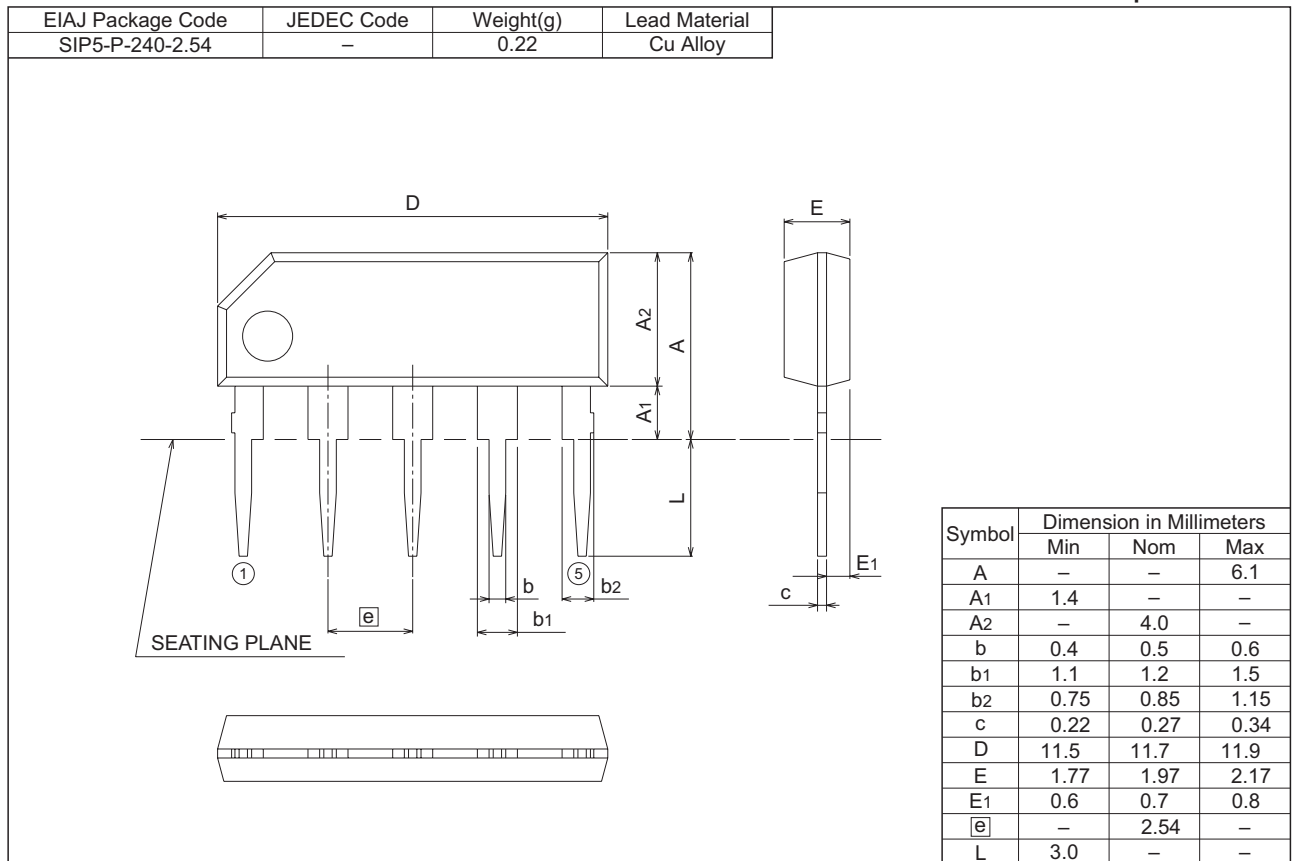
**Figure 6**



### Package Dimensions

#### 5P5T

Plastic 5pin 240mil SIP



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