M51957A,B/M51958A,B

Voltage Detecting, System Resetting IC Series

REJ03D0778-0100
Rev.1.00
Sep 14, 2005

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 fined 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 (td ≈ 100 ms, at 0.33 µF) (M51957, M51958)
- Low threshold operating voltage (Supply voltage to keep low-state at low supply voltage): 0.6 V (Typ) at R_L = 22 kΩ
- Wide supply voltage range: 2 V to 17 V
- Wide operation range of detecting input pin: Narrower ranges of –0.3 V to V_{CC} or –0.3 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. (M519575B, M51958B)
- Wide application range

Application

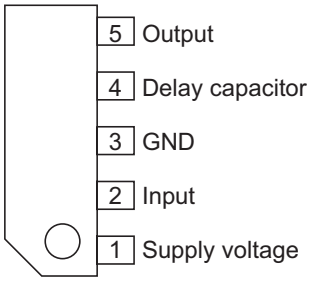
- Reset circuit of Pch, Nch, CMOS, microcomputer, CPU and MCU, Reset of logic circuit, Battery check circuit, switching circuit back-up voltage, level detecting circuit, waveform shaping circuit, delay waveform generating circuit, DC/DC converter, over voltage protection circuit

Recommended Operating Condition

- Supply voltage range: 2 V to 17 V

Pin Arrangement

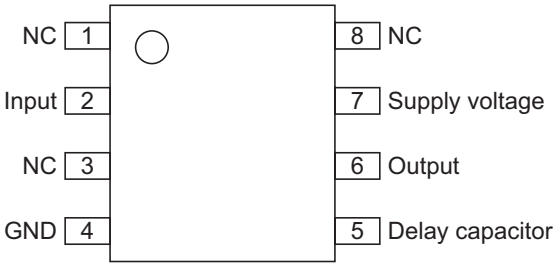
M51957AL/BL
M51958AL/BL



(Top view)

Package: 5P5T

M51957AFP/BFP
M51958AFP/BFP

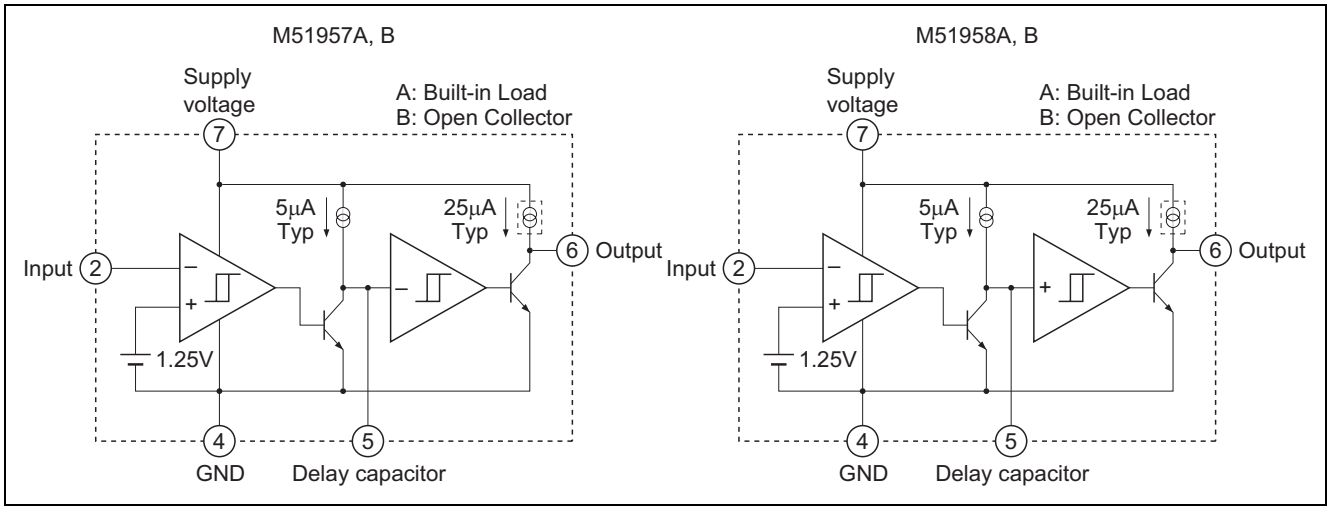


(Top view)

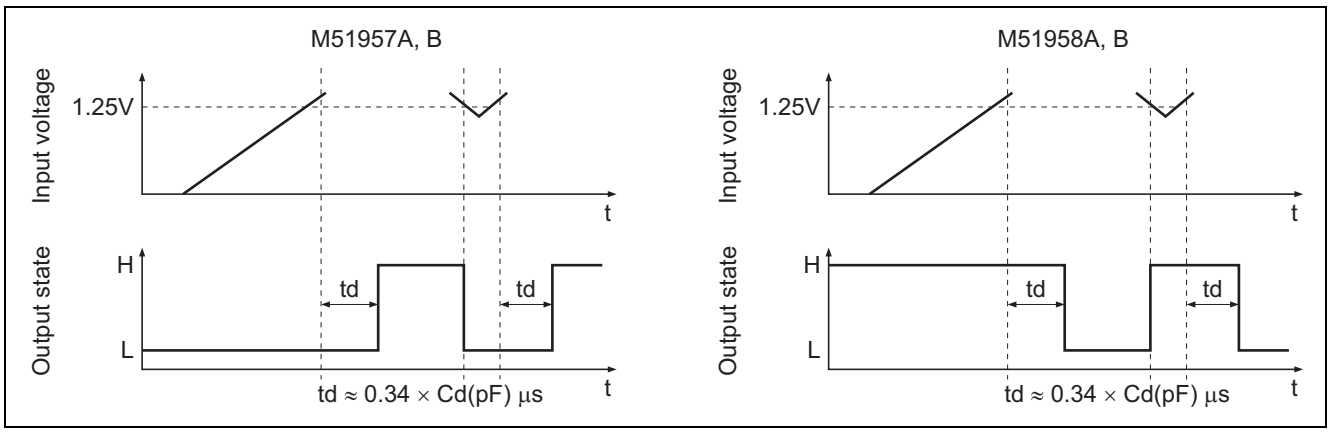
NC: No Connection

Package: PRSP0008DA-A (8P2S-A)

Block Diagram



Operating Waveform



Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

Item	Symbol	Ratings	Unit	Conditions	
Supply voltage	V_{CC}	18	V		
Output sink current	Isink	6	mA		
Output voltage	V_O	V_{CC}	V	Type A (output with constant current load)	
		18		Type B (open collector output)	
Power dissipation	Pd	450	mW	5-pin SIP	
		300		8-pin SOP	
Thermal derating	Kθ	4.5	mW/°C	Ta ≥ 25°C	5-pin SIP
		3			8-pin SOP
Operating temperature	Topr	–30 to +85	°C		
Storage temperature	Tstg	–40 to +125	°C		

Electrical Characteristics

(Ta = 25°C, unless otherwise noted)

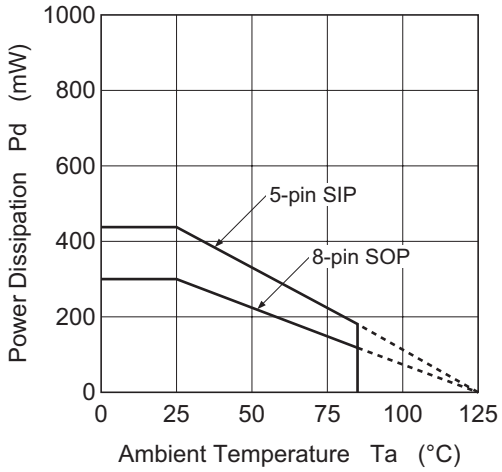
- "L" reset type M51957A, M51957B
- "H" reset type M51958A, M51958B

Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
Detecting voltage	V_S	1.20	1.25	1.30	V		
Hysteresis voltage	ΔV_S	9	15	23	mV	V_{CC} = 5V	
Detecting voltage temperature coefficient	$V_S/\Delta T$	—	0.01	—	%/°C		
Supply voltage range	V_{CC}	2	—	17	V	Ta = –30 to +85°C	
Input voltage range	V_{IN}	–0.3	—	V_{CC}	V	Ta = –30 to +85°C, $V_{CC} \leq$ 7V	
		–0.3	—	7		Ta = –30 to +85°C, V_{CC} > 7V	
Input current	I_{IN}	—	100	500	nA	V_{IN} = 1.25V	
Circuit current	I_{CC}	—	390	590	μA	Type A, V_{CC} = 5V	
		—	360	540		Type B, V_{CC} = 5V	
Delay time	t_{pd}	1.6	3.4	7	ms	Ta = –30 to +85°C, Cd = 0.01μF *	
Output saturation voltage	Vsat	—	0.2	0.4	V	L reset type, V_{CC} = 5V, V_{IN} < 1.2V, Isink = 4mA	
		—	0.2	0.4		H reset type, V_{CC} = 5V, V_{IN} > 1.35V, Isink = 4mA	
Threshold operating voltage	V_{OPL}	—	0.67	0.8	V	L reset type minimum supply voltage for IC operation	R_L = 2.2kΩ, Vsat ≤ 0.4V
		—	0.55	0.7			R_L = 100kΩ, Vsat ≤ 0.4V
Output leakage current	I_{OH}	—	—	30	nA	Type B	
		—	—	1	μA	Type B, Ta = –30 to +85°C	
Output load current	I_{OC}	–40	–25	–17	μA	Type A, V_{CC} = 5V, V_O = 1/2 × V_{CC}	
Output high voltage	V_{OH}	V_{CC}–0.2	V_{CC}–0.06	—	V	Type A	

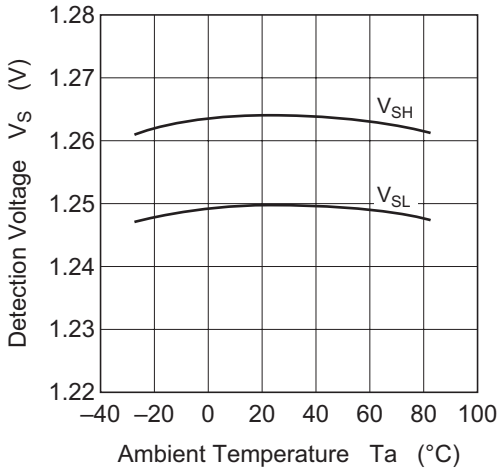
Note: Delay time can be changed by changing delay capacitor for external capacitor types.
(Please refer to typical characteristics)

Typical Characteristics

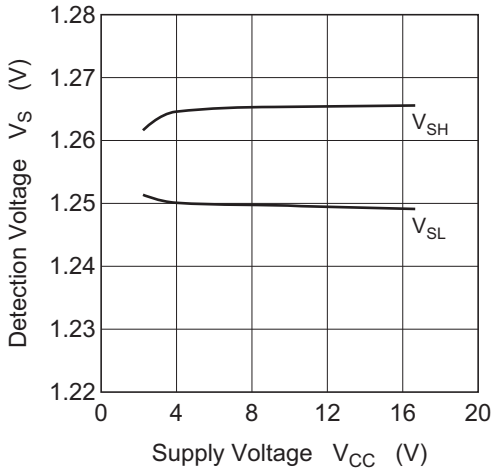
Thermal Derating
(Maximum Rating)



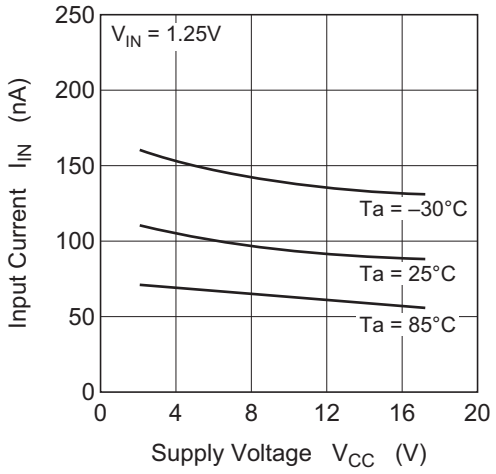
Detection Voltage vs. Ambient Temperature
(Input voltage detection series)



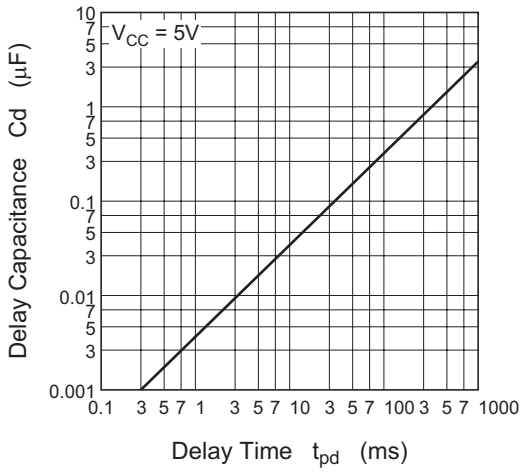
Detection Voltage vs. Supply Voltage
(Input voltage detection series)



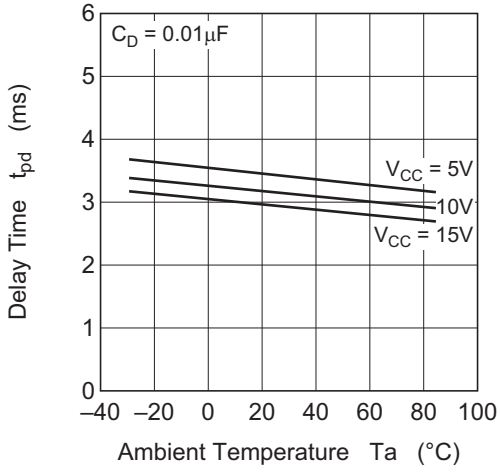
Input Current vs. Supply Voltage
(Input voltage detecting series)



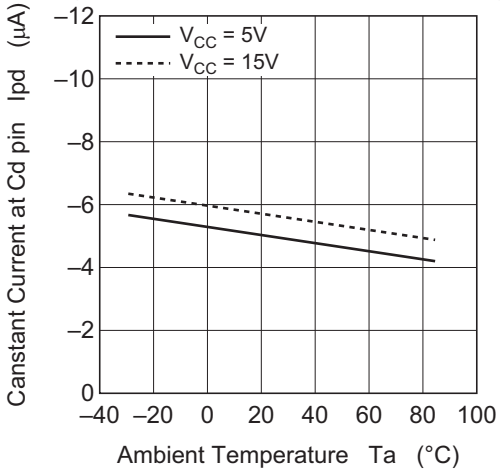
Delay Capacitance vs. Delay Time
(M5195xx, External delay capacitor type)



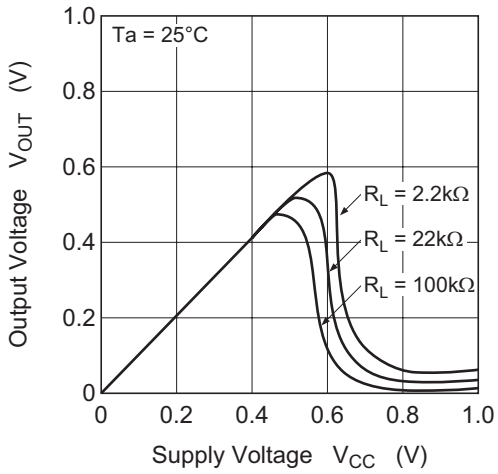
Delay Time vs. Ambient Temperature
(M5195xx, External delay capacitor type)



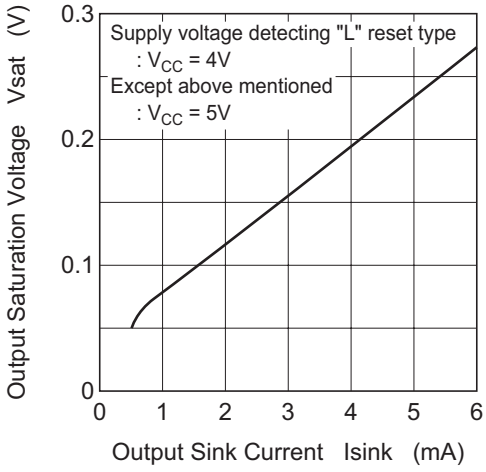
Canstant Current at Cd pin vs. Ambient Temperature
(M5195xx, External delay capacitor type)



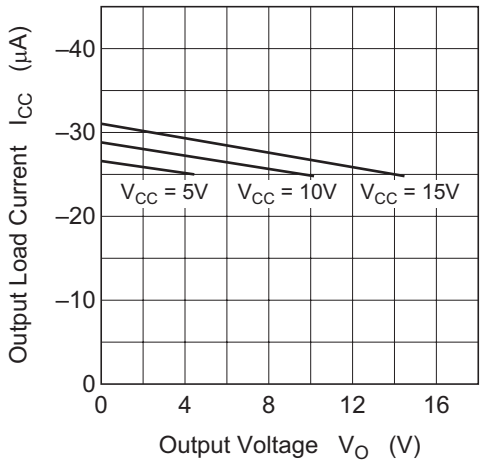
Threshold Operating Voltage
([L] reset type)



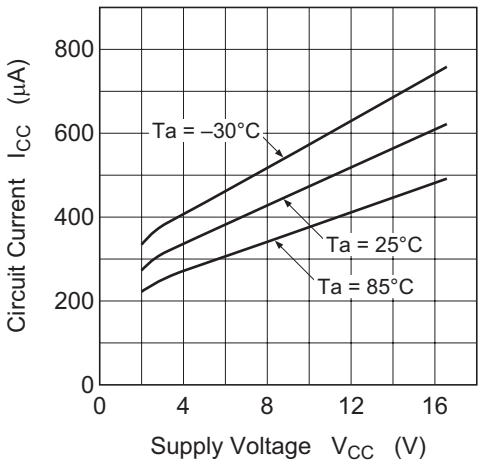
Output Saturation Voltage vs. Output Sink Current



Output Load Current vs. Output Voltage
(M5195xA)



Circuit Current vs. Supply Voltage
(M51957B, M51958B)



Example of Application Circuit

Reset Circuit of M5195xx Series

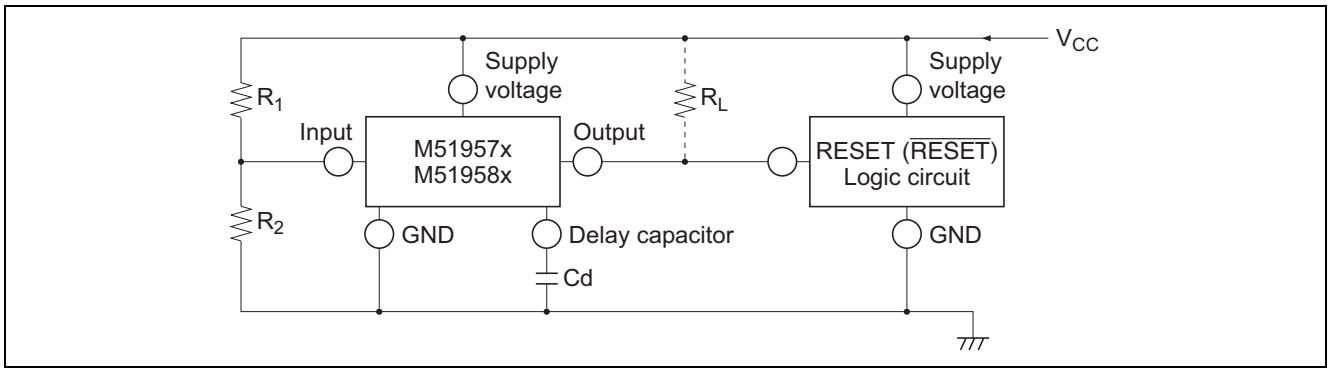


Figure 1 Reset Circuit of M5195xx Series

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 µs.
If a longer delay time is necessary, M51953, M51954, M51957 and M51958 are used. In this case, the delay time is about $0.34 \times$ Cd (pF) µs.
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

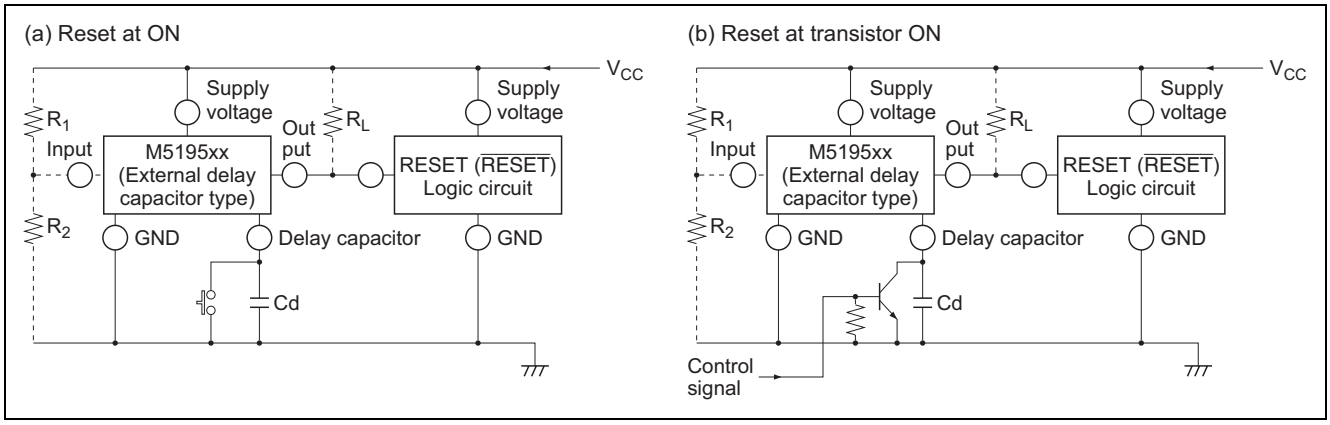


Figure 2 Case of Using Reset Signal except Supply Voltage in the M5195xx Series

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.

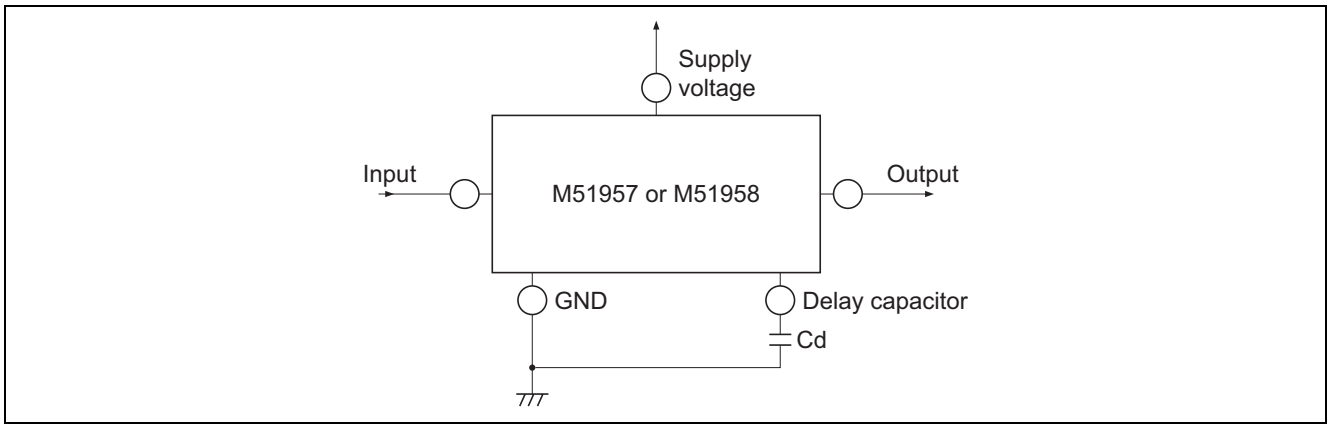


Figure 3 Delay Waveform Generating Circuit

Operating Waveform

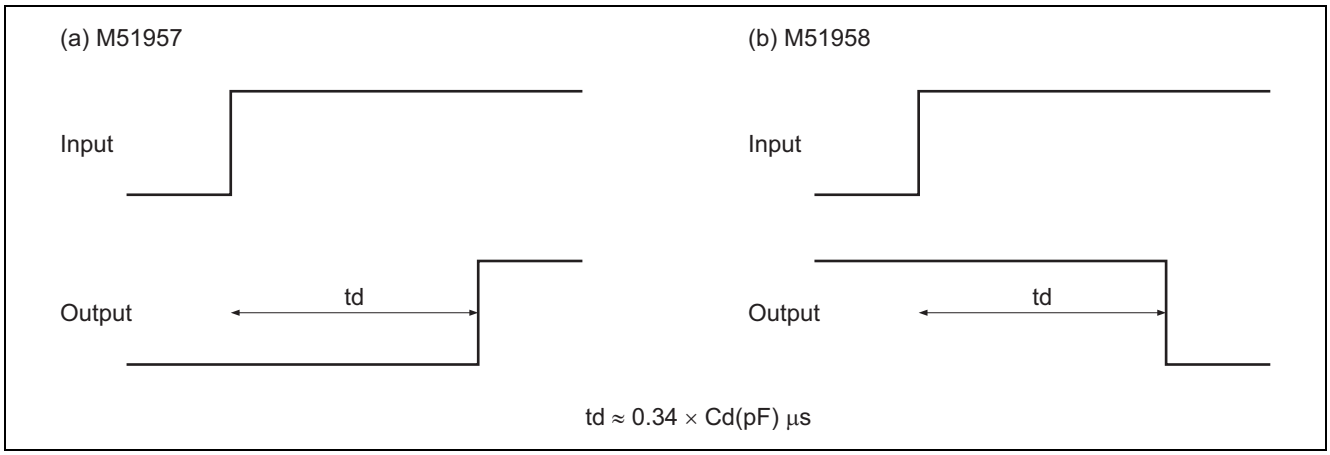


Figure 4 Operating Waveform

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.

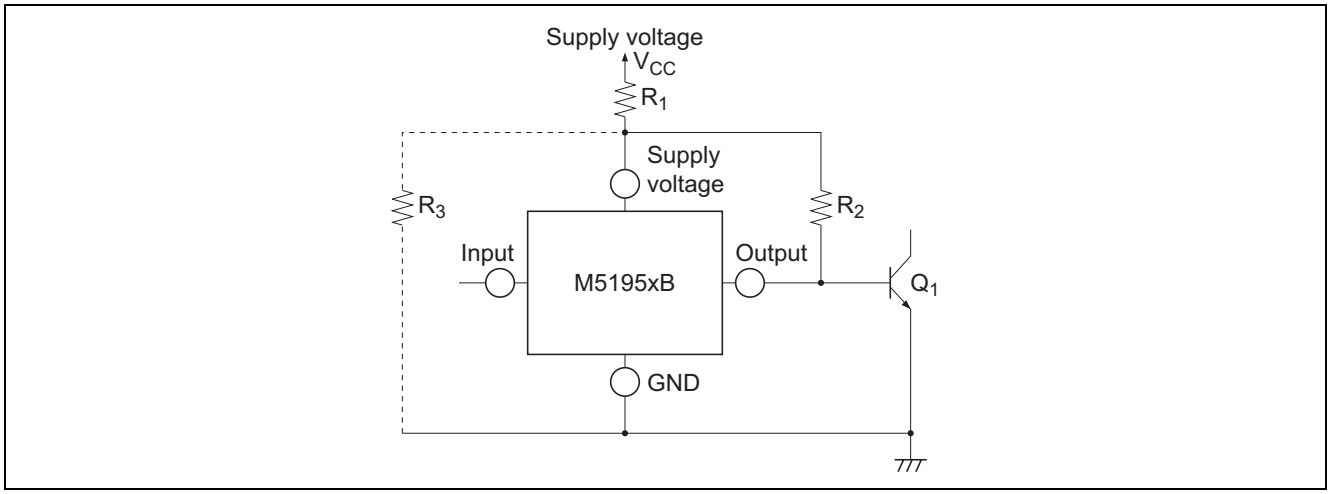


Figure 5 Application to High Supply Voltage Circuit

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

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

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

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

I_{CC} : Circuit current of M5195xB

V_{BEI} : Base-emitter voltage ≈ 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.

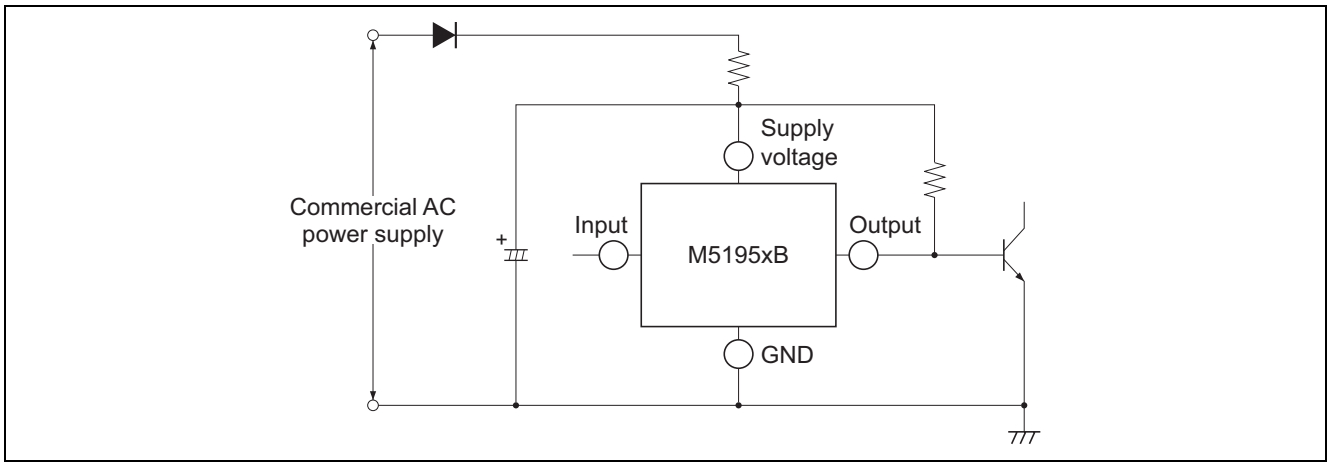


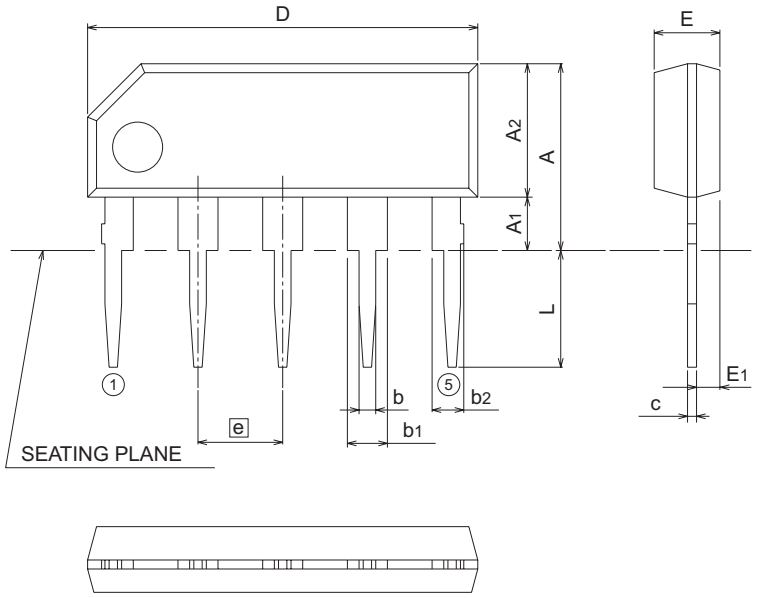
Figure 6

Package Dimensions

5P5T

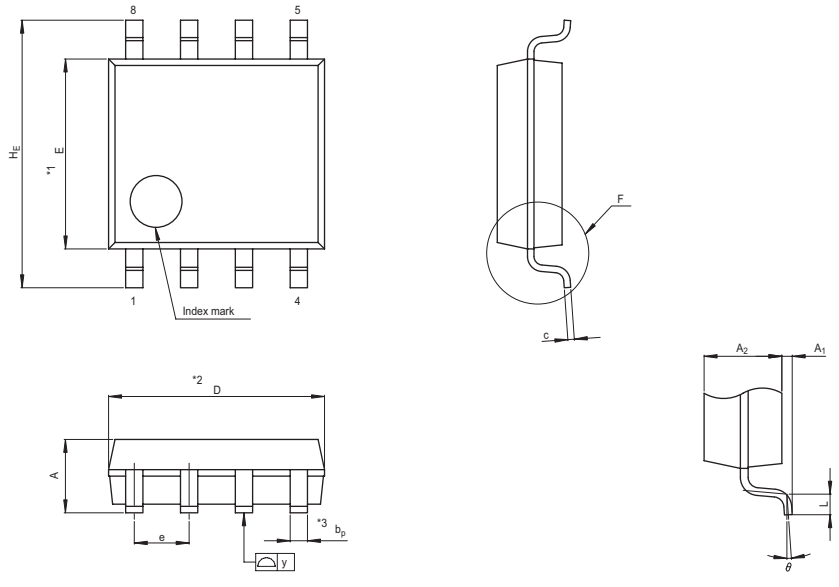
Plastic 5pin 240mil SIP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SIP5-P-240-2.54	–	0.22	Cu Alloy



Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	–	–	6.1
A_1	1.4	–	–
A_2	–	4.0	–
b	0.4	0.5	0.6
b_1	1.1	1.2	1.5
b_2	0.75	0.85	1.15
c	0.22	0.27	0.34
D	11.5	11.7	11.9
E	1.77	1.97	2.17
E_1	0.6	0.7	0.8
e	–	2.54	–
L	3.0	–	–

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-4.4x5-1.27	PRSP0008DA-A	8P2S-A	0.07g



NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	4.8	5.0	5.2
E	4.2	4.4	4.6
A_2	——	1.5	——
A_1	0.05	——	——
A	——	——	1.9
b_p	0.35	0.4	0.5
c	0.13	0.15	0.2
θ	0°	——	10°
H_E	5.9	6.2	6.5
e	1.12	1.27	1.42
y	——	——	0.1
L	0.2	0.4	0.6

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