M51957A,B/M51958A,B

VOLTAGE DETECTING, SYSTEM RESETTING IC SERIES

DESCRIPTION

M51957A,B/M51958A,B are semiconductor integrated circuits ideal 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.

Applications are extensive, including circuits for battery checking, level detecting and waveform shaping.

FEATURES

- Few external parts
- Large delay time with a capacitor of small capacitance ($t_d \approx 100$ms, at 0.33μF) (M51957, M51958)
- Low threshold operating voltage (Supply voltage to keep low-state at low supply voltage) . . . . . 0.6V (TYP.) at $R_L = 22k\Omega$
- Wide supply voltage range. . . . . 2 ~ 17V
- Sudden change in power supply has minimal effect on the ICs
- Wide operation range of detecting input pin . . . Narrower ranges of $-0.3V \sim V_{CC}$ or $-0.3V \sim 7V$ (Input voltage detecting type)
- Suitable for high supply voltage circuit with simple circuit structure (M51957B, M51958B)
- Permits easy configuration of circuit for protection against reverse connection or surges. (M51957B, M51958B)
- Wide application range
- SIL package of the same height as DIP (5-pin SIP)

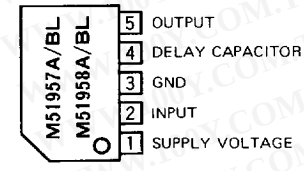
APPLICATION

Reset circuit of Pch, Nch, CMOS, microcomputer, CPU and microcomputer, 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.

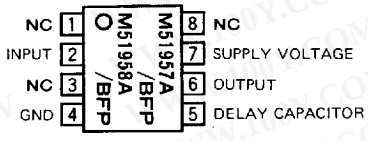
RECOMMENDED OPERATING CONDITION

Supply voltage range . . . . . 2 ~ 17V

PIN CONFIGURATION (TOP VIEW)



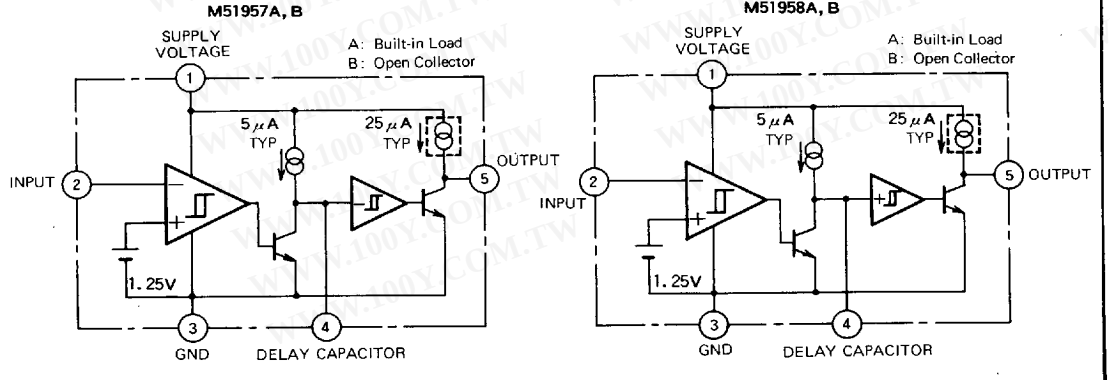
Outline 5P5T



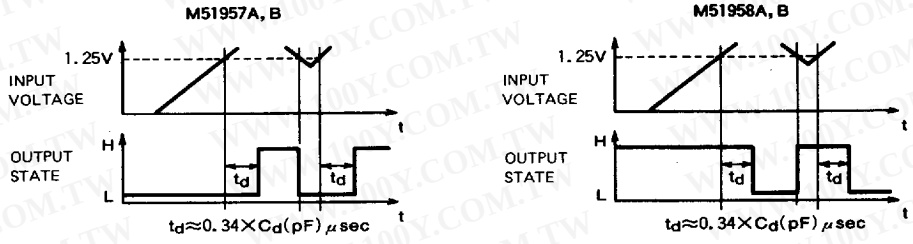
Outline 8P2S-A

NC: NO CONNECTION

BLOCK DIAGRAM



FUNCTION DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25℃, unless otherwise noted)

Symbol	Parameter	Conditions		Ratings	Unit
V_{CC}	Supply voltage			18	V
Isink	Output Sink Current			6	mA
V_O	Output voltage	A Type (Output with constant current load)		V_{CC}	V
		B Type (Open collector output)		18	
Pd	Power dissipation	5P SIL		450	mW
		8P FLAT		300	
K_θ	Thermal Derating	Ta≧25℃	5P SIL	4.5	mW/℃
			8P FLAT	3	
Topr	Operating temperature			−30～+85	℃
Tstg	Storage temperature			−40～+125	℃

ELECTRICAL CHARACTERISTICS (Ta=25℃, unless othewise noted)

"L" reset type	"H" reset type
M51957A	**M51958A**
M51957B	**M51958B**

Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ	Max	
V_S	Detecting voltage			1.20	1.25	1.30	V
ΔV_S	Hysterisis voltage	V_{CC}=5V		9	15	23	mV
$V_S/\Delta T$	Detecting Voltage Temperature Coefficient			—	0.01	—	%/℃
V_{CC}	Supply Voltage Range	Ta=−30～+85℃		2	—	17	V
V_{IN}	Input voltage Range	Ta=−30～+85℃, V_{CC}≦7V		−0.3	—	V_{CC}	V
		Ta=−30～+85℃, V_{CC}>7V		−0.3	—	7	
I_{IN}	Input Current	V_{IN}=1.25V		—	100	500	nA
I_{CC}	Circuit Current	Type A V_{CC}=5V		—	390	590	μA
		Type B V_{CC}=5V		—	360	540	
tpd	Delay Time	Ta=−30～+85℃, Cd=0.01μF (Note)		1.6	3.4	7	ms
Ipd	Constant Current at Cd pin	V_{CC}=5V		−8	−5	−3	μA
Vsat	Output Saturation Voltage	L reset type V_{CC}=5V, V_{IN}<1.2V, Isink=4mA		—	0.2	0.4	V
		H reset type V_{CC}=5V, V_{IN}<1.35V, Isink=4mA					
V_{OPL}	Threshold Operating Voltage	L reset type minimum supply voltage for IC operation	R_L=2.2kΩ, Vsat≦0.4V	—	0.67	0.8	V
			R_L=100kΩ, Vsat≦0.4V	—	0.55	0.7	
I_{OH}	Output Leakage Current	Type B		—	—	30	nA
		Type B, Ta=−30～+85℃		—	—	1	μA
I_{OC}	Output Load Current	Type A V_{CC}=5V, V_O=1/2 V_{CC}		−40	−25	−17	μA
V_{OH}	Output High Voltage	Type A		V_{CC}−0.2	V_{CC}−0.06	—	V

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

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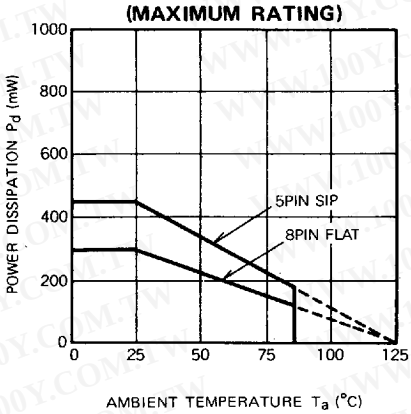
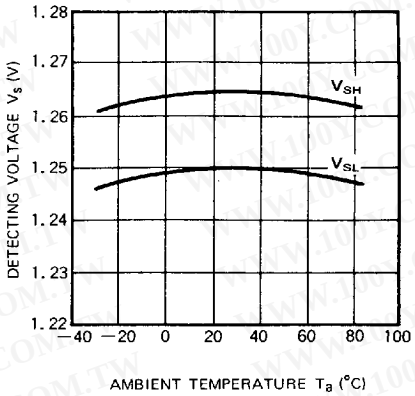
TYPICAL CHARACTERISTICS

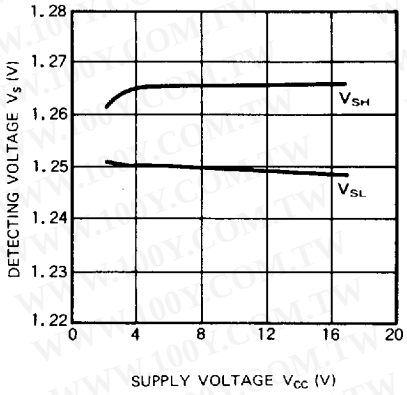
TYPICAL CHARACTERISTICS THERMAL DERATING (MAXIMUM RATING)



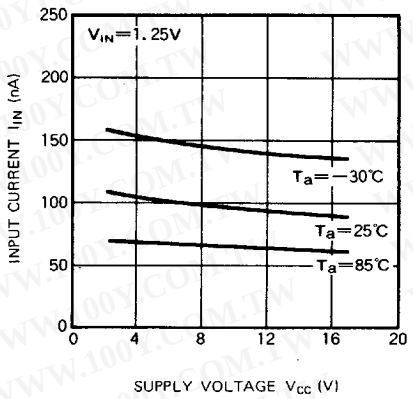
DETECTING VOLTAGE VS. AMBIENT TEMPERATURE (Input voltage detecting series)



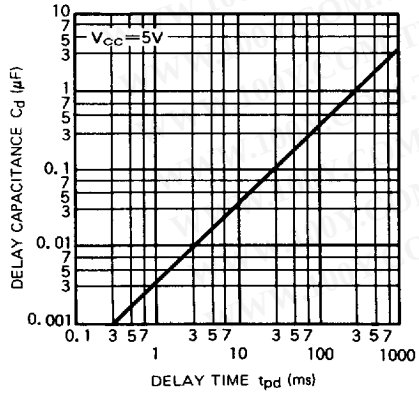
DETECTION VOLTAGE VS. SUPPLY VOLTAGE (Input voltage detection series)



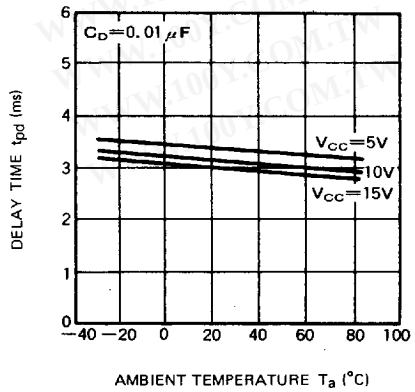
INPUT CURRENT VS. SUPPLY VOLTAGE (Input voltage detecting series)



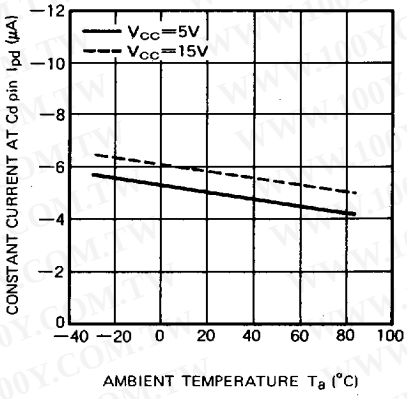
DELAY CAPACITANCE VS. DELAY TIME (M5195XX, External delay capacitor type)



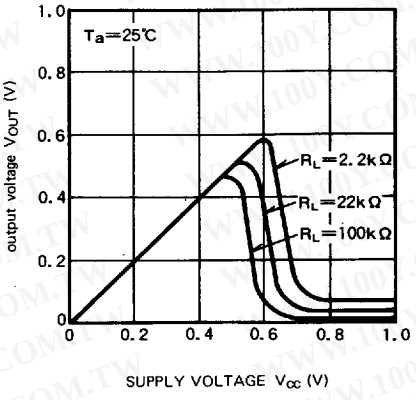
DELAY TIME VS. AMBIENT TEMPERATURE (M5195XX, External delay capacitor type)



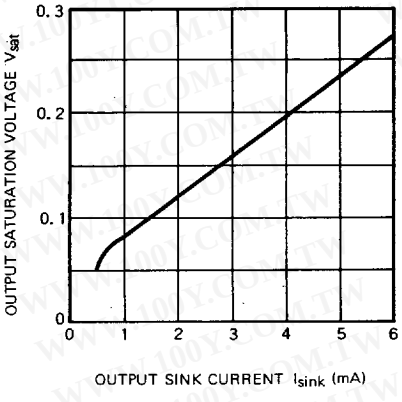
CONSTANT CURRENT AT Cd PIN VS. AMBIENT TEMPERATURE
(M5195XX, External delay capacitor type)



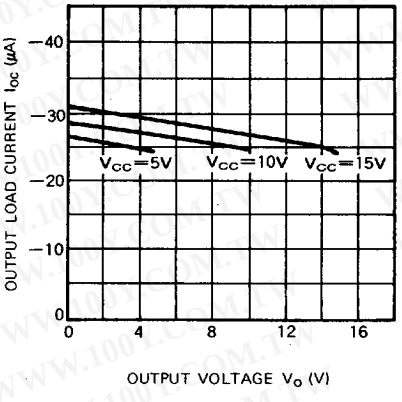
THRESHOLD OPERATING VOLTAGE
([L] reset type)



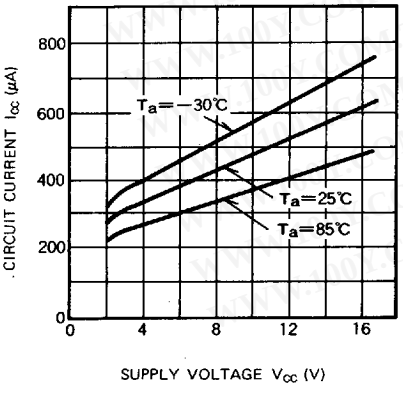
OUTPUT SATURATION VOLTAGE VS. OUTPUT SINK CURRENT



OUTPUT LOAD CURRENT VS. OUTPUT VOLTAGE
(M519XXA)

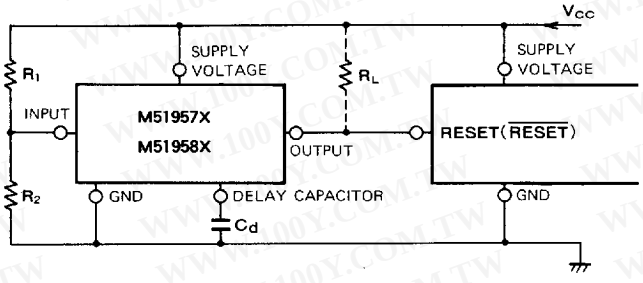


CIRCUIT CURRENT VS. SUPPLY VOLTAGE
(M51957B, M51958B)



EXAMPLE OF APPLICATION CIRCUIT

M5195XX Series Reset Circuit



Note 1. When the detecting supply voltage is 4.25V, M51951, M51952, M51953 and M51954 are used. In the case, R_1 and R_2 are not necessary.
When the voltage is anything except 4.25V, M51955, M51956, M51957 and M51958 are used. In this case, the detecting supply voltage is $1.25 \times \frac{R_1 + R_2}{R_2}$ (V) approximately. The detecting supply voltage can be set between 2V and 15V.

Note 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 200μs.
If a longer delay time is necessary, M51953, M51954, M51957 and M51958 are used. In the case, the delay time is about 0.34 x Cd(pF)μsec.

Note 3. If M5195XX and the logic circuit have a common power supply, type A (built-in load type) can be applied whether a pull-up resister is included in the logic circuit or not.

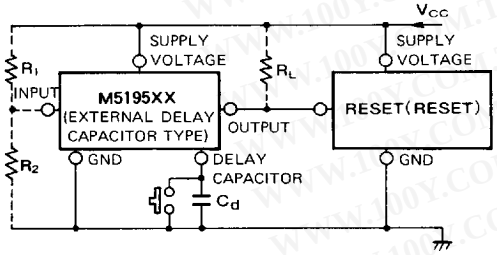
Note 4. The logic circuit preferably should not have a pull-down resistor, but if one is present, add load resistor R_L to overcome the pull-down resistor.

Note 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.

Note 6. When a negative supply voltage is used, supply voltage side of M5195XX and the GND side are connected to negative supply voltage respectively.

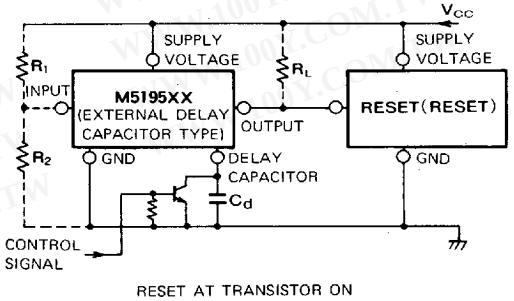
Case of Using Other Reset Signal except Supply Voltage in the M5195XX Series

(a) Reset at ON



RESET AT ON

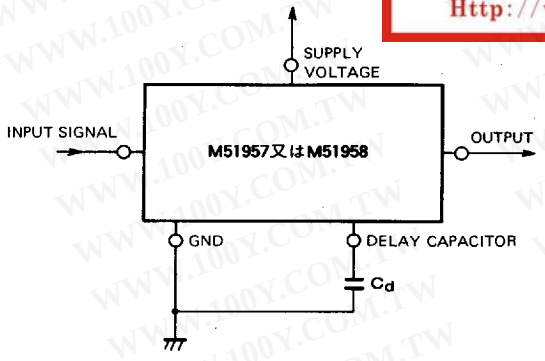
(b) Reset at transistor ON



RESET AT TRANSISTOR ON

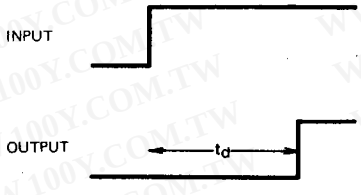
Delay Waveform Generating Circuit

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

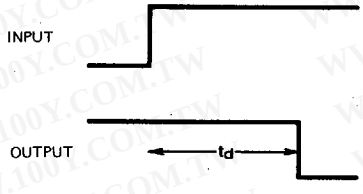


Operating Waveform

(a) M51957



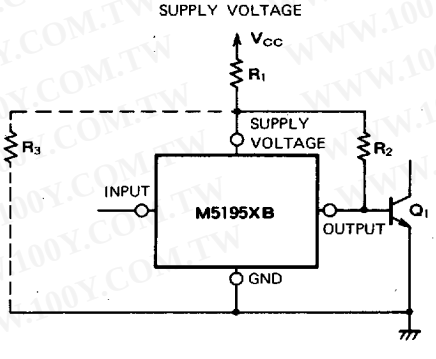
(b) M51958



$t_d \approx 0.34 \times C_d(pF)\ \mu sec$

Application to High Supply Voltage Circuit

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



In the above figure, the voltage applied to M5195XB is as follows. The voltage range is set.between 2V and 17V.

at Q_1 ON:

$$\frac{R_2 \cdot [\frac{R_3}{(R_1+R_3)} \cdot V_{CC} - (R_1 // R_3) \cdot I_{CC}] + (R_1 // R_3) \cdot V_{BE1}}{R_2 + (R_1 // R_3)}$$

at Q_1 OFF:

$$\frac{R_2 \cdot \{\frac{R_3}{(R_1+R_3)} \cdot V_{CC} - (R_1 // R_3) \cdot I_{CC}\}}{R_2 + (R_1 // R_3)}$$

$$R_1 // R_3 \equiv \frac{R_1 \cdot R_3}{R_1 + R_2}$$

V_{CC}: Circuit current of M5195XB
V_{BE1}: 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 the application circuit, the directly rectified or smoothing commercial voltage can be applied as shown below.