M51953A,B/M51954A,B

Voltage Detecting, System Resetting IC Series

REJ03D0776-0200
Rev.2.00
Aug 20, 2007

Description

M51953A,B/M51954A,B are semiconductor integrated circuits designed for detecting supply 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) (M51953, M51954)
- 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 application range

Application

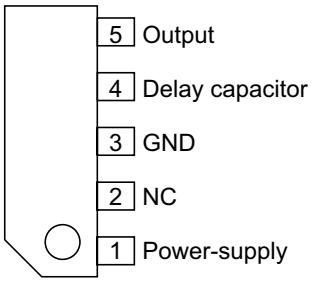
- Reset circuit of Pch, Nch, CMOS, microcomputer, CPU and MCU, Reset of logic circuit, Battery check circuit, switching circuit back-up voltage, level detecting circuit, waveform shaping circuit, delay waveform generating circuit, DC/DC converter, over voltage protection circuit

Recommended Operating Condition

- Supply voltage range: 2 V to 17 V

Pin Arrangement

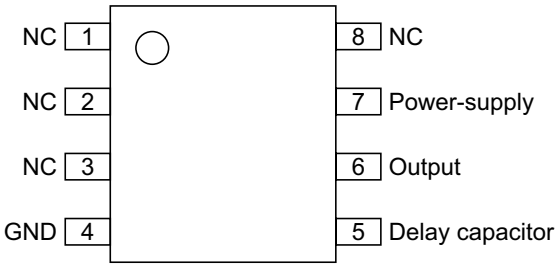
M51953AL/BL
M51954AL/BL



(Top view)

Outline: 5P5T

M51953AFP/BFP
M51954AFP/BFP

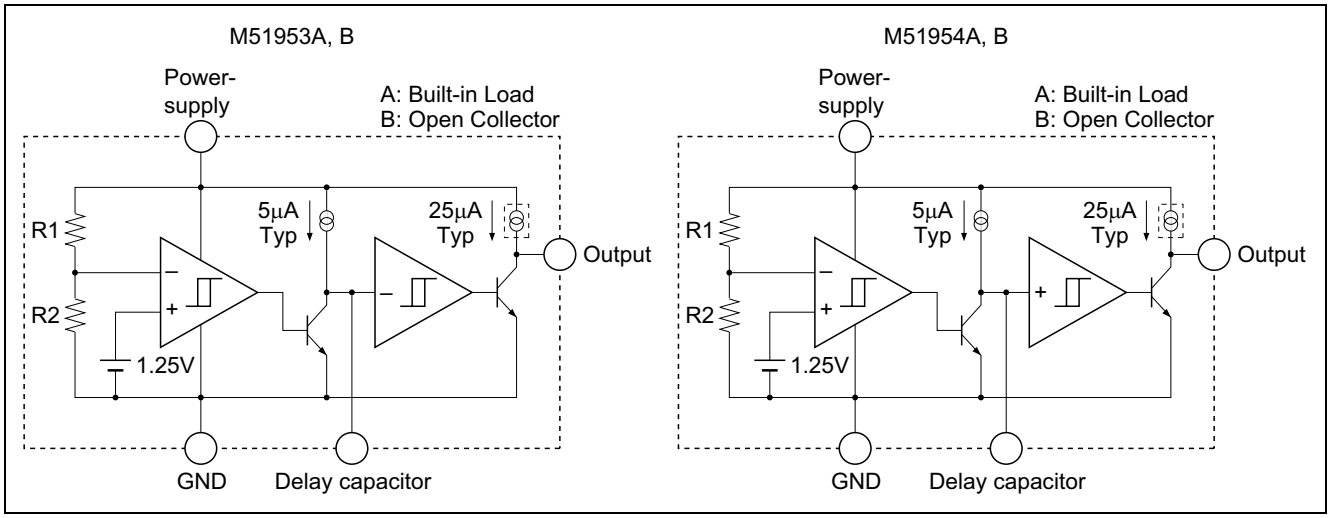


(Top view)

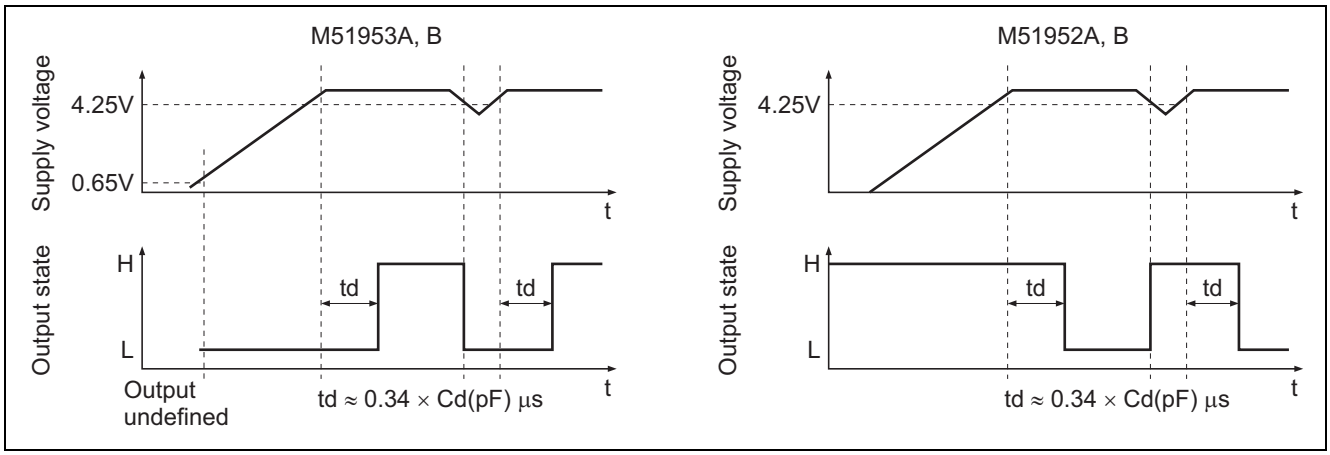
NC: No Connection

Outline: PRSP0008DE-C (recommend)
PRSP0008DA-A (8P2S-A) (not recommend for new design)

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	
		400		8-pin SOP (PRSP0008DE-C): recommend	
		300		8-pin SOP (PRSP0008DA-A): not recommend	
Thermal derating	Kθ	4.5	mW/°C	Refer to the thermal derating curve.	5-pin SIP
		4.4			8-pin SOP (PRSP0008DE-C) : recommend
		3			8-pin SOP (PRSP0008DA-A) : not recommend
Operating temperature	Topr	–30 to +85	°C		
Storage temperature	Tstg	–40 to +125	°C		

Electrical Characteristics

(Ta = 25°C, unless otherwise noted)

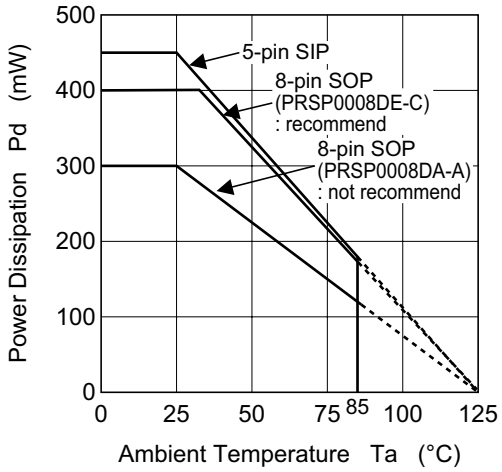
- "L" reset type M51953A, M51953B
- "H" reset type M51954A, M51954B

Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
Detecting voltage	V_S	4.05	4.25	4.45	V		
Hysteresis voltage	ΔV_S	30	50	80	mV		
Detecting voltage temperature coefficient	$V_S/\Delta T$	—	0.01	—	%/°C		
Circuit current	I_{CC}	—	450	680	μA	Type A, V_{CC} = 5V	
		—	420	630		Type B, V_{CC} = 5V	
Delay time	t_{pd}	1.6	3.4	7	ms	Cd = 0.01μF *	
Constant current	Ipd	–8	–5	–3	μA	V_{CC} = 5V	
Output saturation voltage	Vsat	—	0.2	0.4	V	L reset type, V_{CC} = 4V, Isink = 4mA	
		—	0.2	0.4		H reset type, V_{CC} = 5V, 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}	—	—	1	μA	Type B	
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	

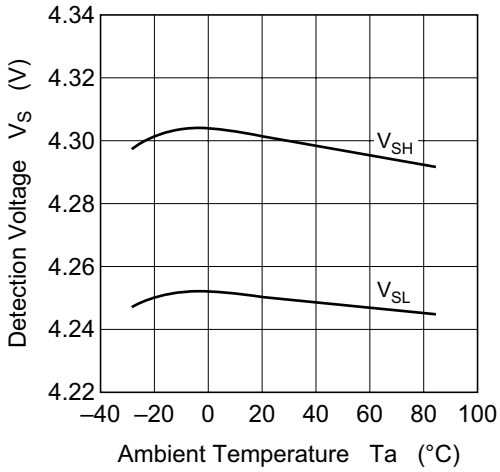
Note: Please set the desired delay time by attaching capacitor of the range between 4700 pF and 10 μF.

Typical Characteristics

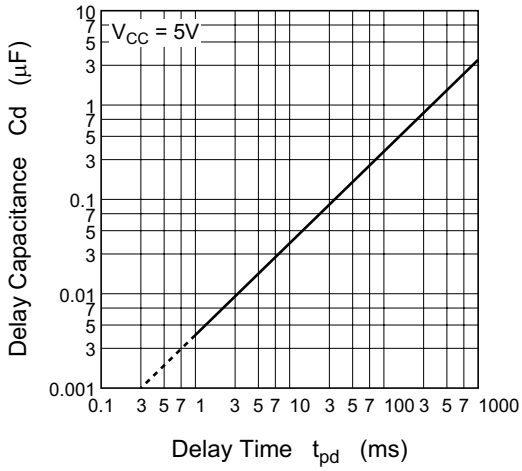
Thermal Derating
(Maximum Rating)



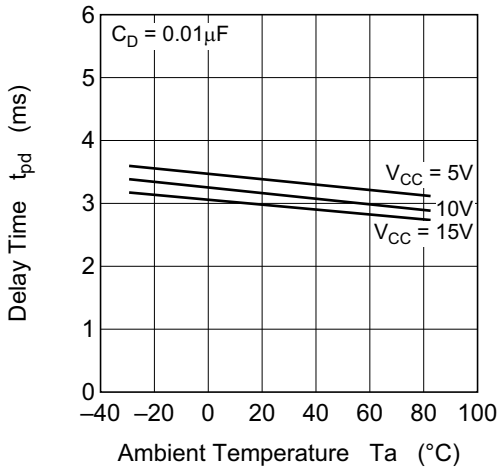
Detection Voltage vs. Ambient Temperature
(Supply voltage detection series)



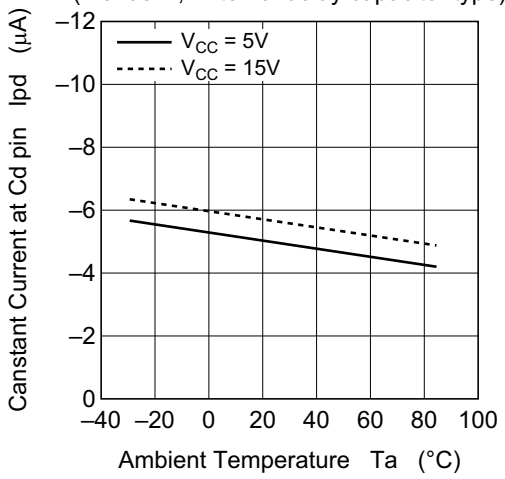
Delay Capacitance vs. Delay Time
(M5195xx, External delay capacitor type)



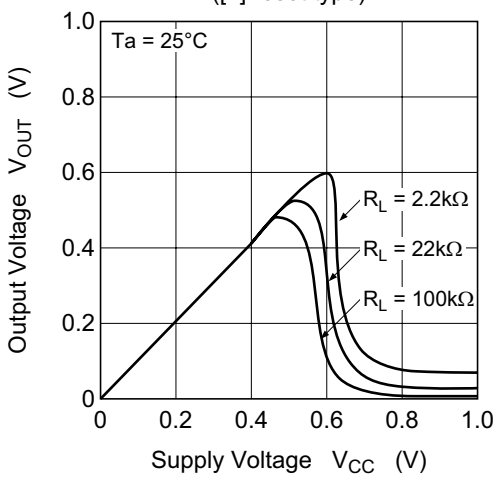
Delay Time vs. Ambient Temperature
(M5195xx, External delay capacitor type)



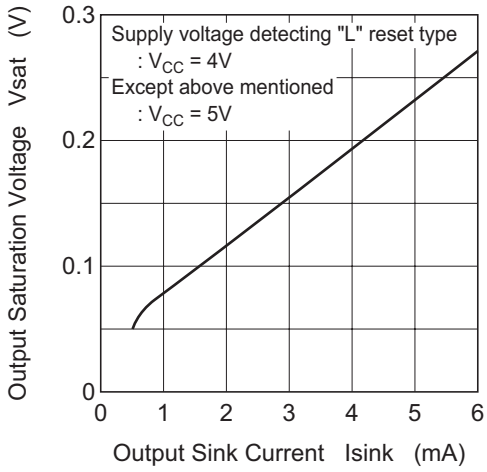
Canstant Current at Cd pin vs. Ambient Temperature
(M5195xx, External delay capacitor type)



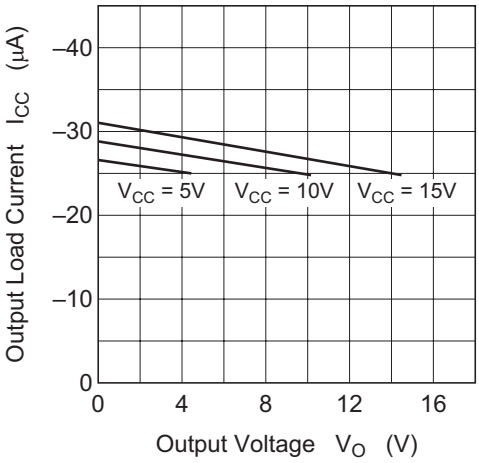
Threshold Operating Voltage
([L] reset type)



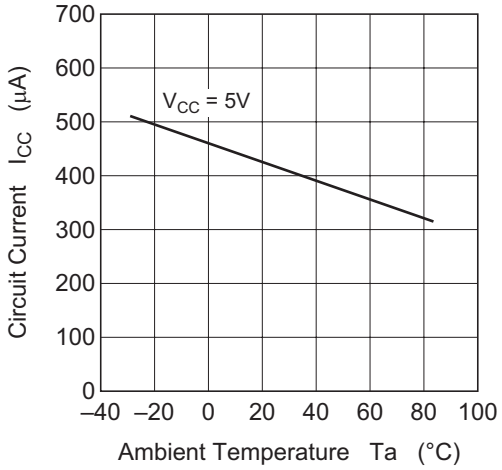
Output Saturation Voltage vs. Output Sink Current



Output Load Current vs. Output Voltage
(M5195xA)



Circuit Current vs. Ambient Temperature
(M51953B, M51954B)



Example of Application Circuit

Reset Circuit of M5195xx Series

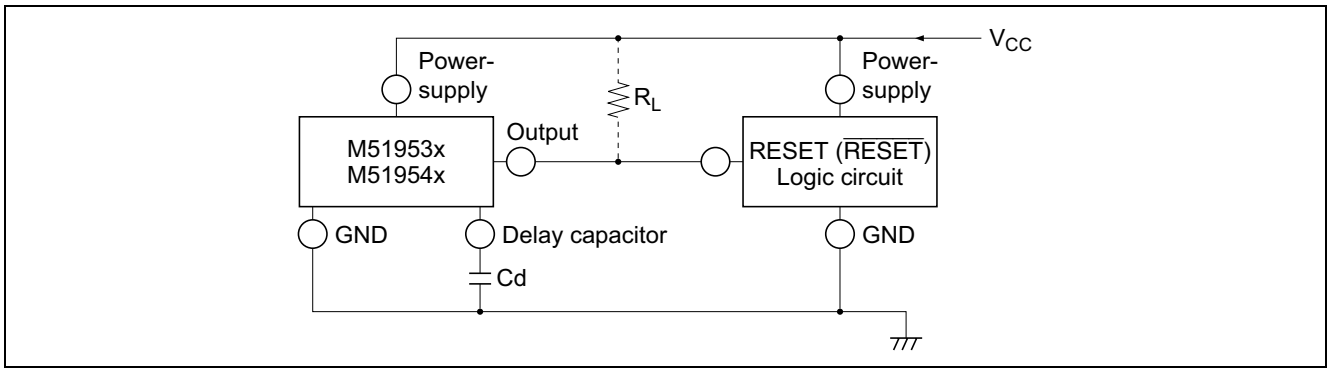


Figure 1 Reset Circuit of M5195xx Series

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

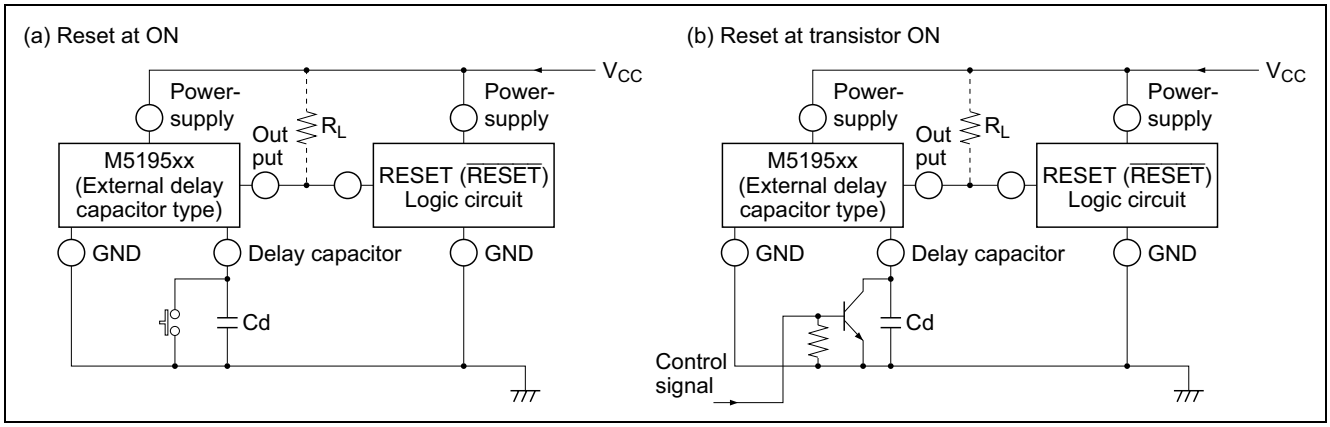


Figure 2 Case of Using Reset Signal except Supply Voltage in the M5195xx Series

Notice for use

About the Power Supply Line

1. About bypass capacitor
   Because the ripple and the spike of the high frequency noise and the low frequency are superimposed to the power supply line, it is necessary to remove these.
   Therefore, please install C_1 and C_2 for the low frequency and for the high frequency between the power supply line and the GND line as shown in following figure 3.

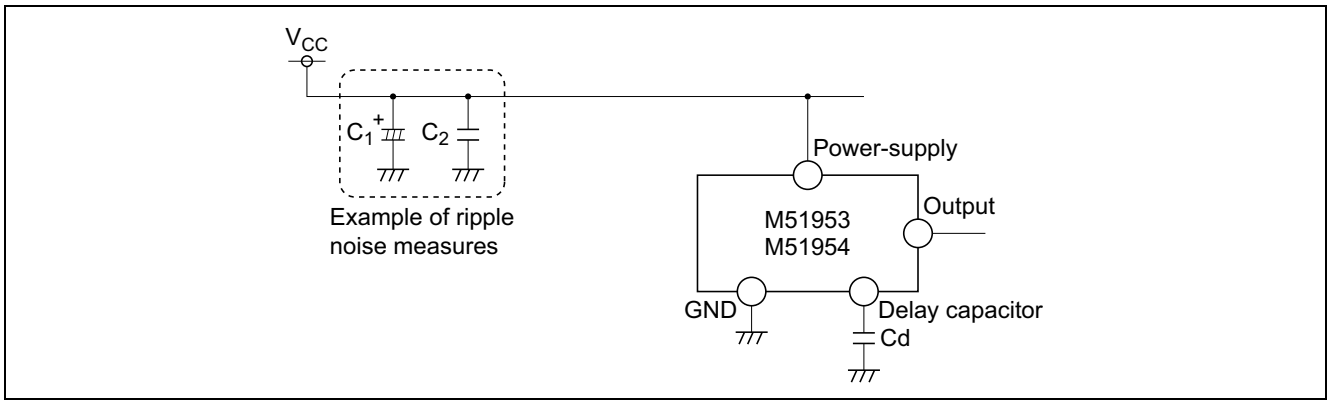


Figure 3 Example of Ripple Noise Measures

Setting of Delay Capacity

Please use capacitor Cd for the delay within the range of 10 µF or less.

When a value that is bigger than this is set, the problem such as following (1), (2), and (3) becomes remarkable.

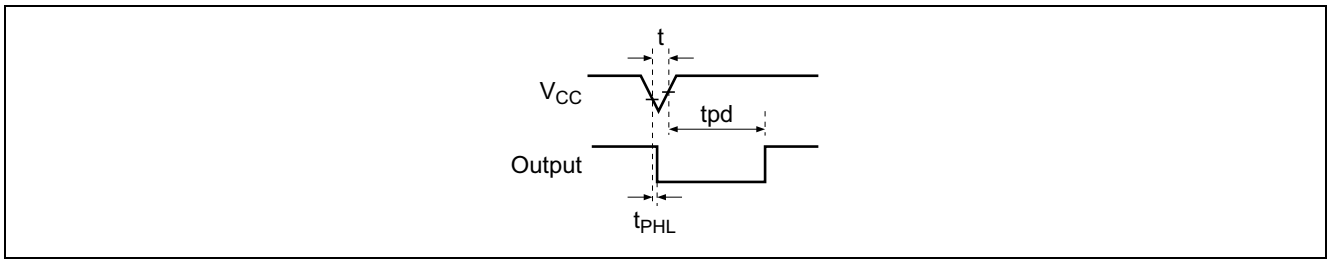


Figure 4 Time Chart at Momentary Voltage-Decrease

(1) The difference at delay time becomes remarkable.
   A long delay setting of tens of seconds is fundamentally possible. However, when set delay time is lengthened, the range of the difference relatively grows, too. When a set value is assumed to be 'tpd', the difference occurs in the range from 0.47 × tpd to 2.05 × tpd. For instance, 34 seconds can be calculated at 100 µF. However, it is likely to vary within the ranges of 16-70 seconds.

(2) Difficulty to react to a momentary voltage decrease.
   For example, the reaction time t_{PHL} is 10 µs when delay capacitor Cd = 0.1 µF.
   The momentary voltage-decrease that is longer than such t_{PHL} are occurs, the detection becomes possible. When the delay capacitance is enlarged, t_{PHL} also becomes long. For instance, it becomes about 100 to 200 µs in case of circuit constant C1 = 100 µF.
   (Characteristic graph 1 is used and extrapolation in case of Cd = 100 µF.)
   Therefore, it doesn't react to momentary voltage-decrease that is shorter than this.

(3) Original delay time is not obtained.
   When the momentary voltage-decrease time 't' is equivalent to t_{PHL}, the discharge becomes insufficient and the charge starts at that state. This phenomenon occurs at large capacitance. And, original delay time tpd is not obtained.
   Please refer to characteristic graph 2. (Delay time versus input pulse width)

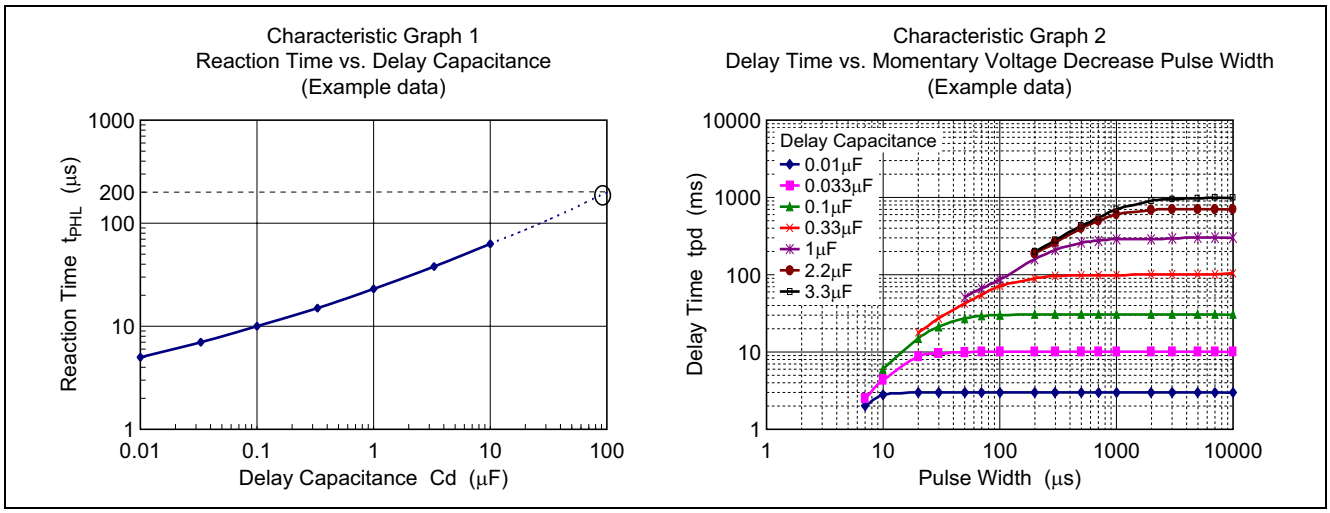


Figure 5 Characteristic Graph

Setting of Output Load Resistance (M51953B/M51954)

High level output voltage can be set without depending on the power-supply voltage because the output terminal is an open collector type. However, please guard the following notes.

1. Please set it in value (2 V to 17 V) within the range of the power-supply voltage recommendation. Moreover, please never impress the voltage of maximum ratings 18 V or more even momentarily either.
2. Please set output load resistance (pull-up resistance) R_L so that the output current (output inflow current I_L) at L level may become 4 mA or less. Moreover, please never exceed absolute maximum rating (6 mA).

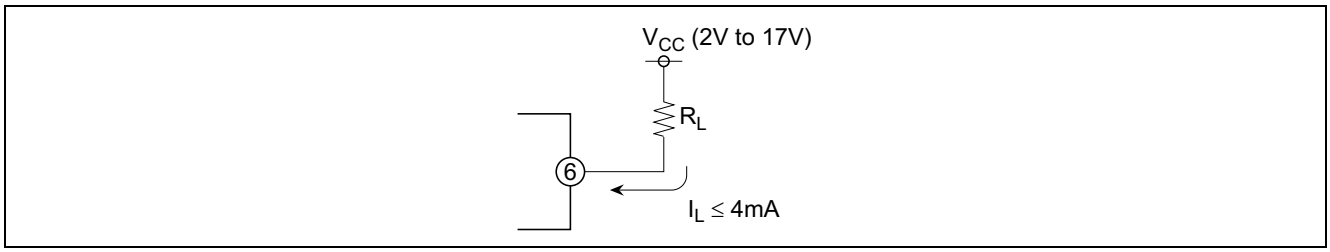


Figure 6 Output Load Resistance R_L

Others

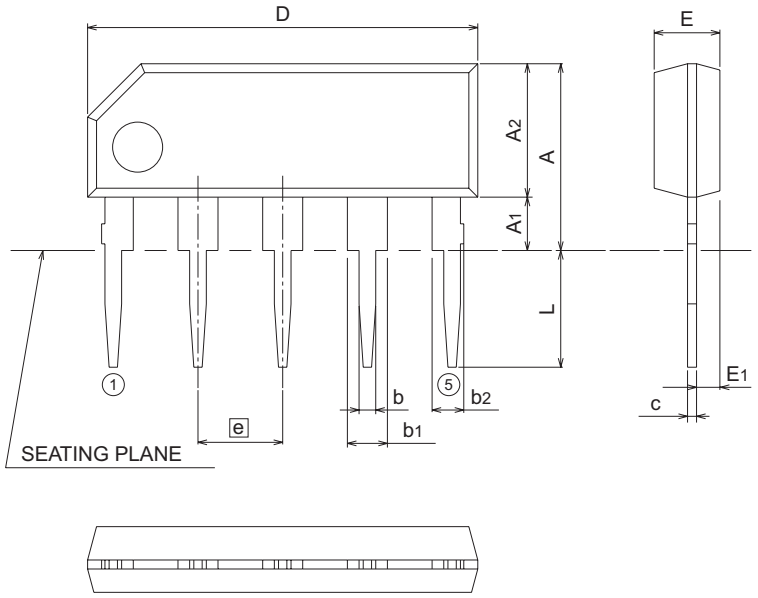
1. Notes when IC is handled are published in our reliability handbook, and please refer it. The reliability handbook can be downloaded from our homepage (following URL). http://www.renesas.com/fmwk.jsp?cnt=reliability_root.jsp&fp=/products/common_info/reliability
2. Additionally, please inquire of our company when there is an uncertain point on use.

Package Dimensions

5P5T

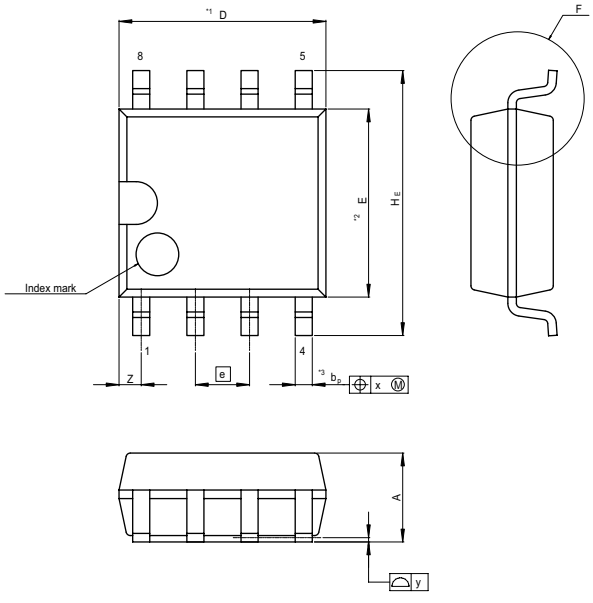
Plastic 5pin 240mil SIP

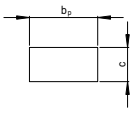
EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SIP5-P-240-2.54	–	0.22	Cu Alloy



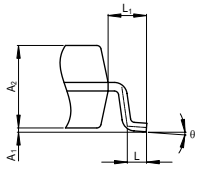
Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	–	–	6.1
A_1	1.4	–	–
A_2	–	4.0	–
b	0.4	0.5	0.6
b_1	1.1	1.2	1.5
b_2	0.75	0.85	1.15
c	0.22	0.27	0.34
D	11.5	11.7	11.9
E	1.77	1.97	2.17
E_1	0.6	0.7	0.8
e	–	2.54	–
L	3.0	–	–

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-4.4x4.85-1.27	PRSP0008DE-C	—	0.1g





Terminal cross section
(Ni/Pd/Au plating)

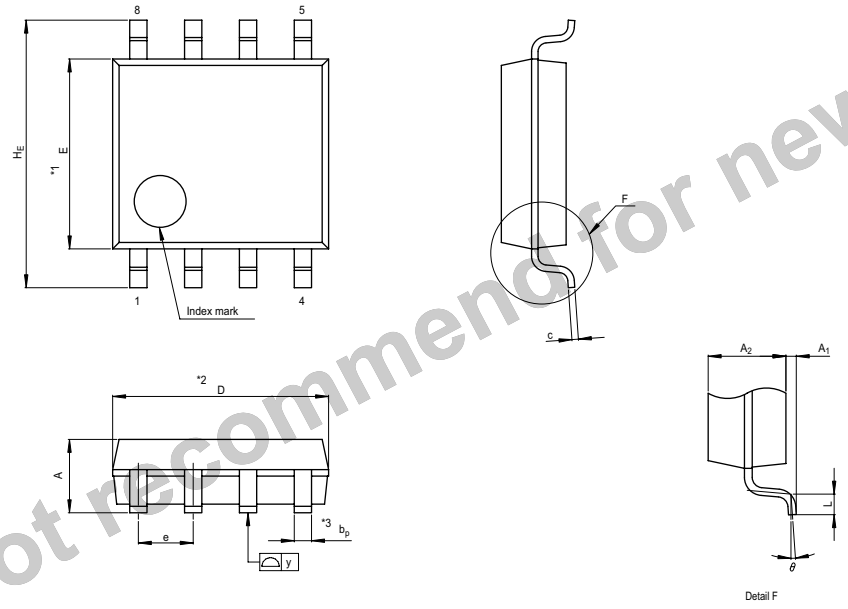


Detail F

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

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	4.65	4.85	5.05
E	4.2	4.4	4.6
A_2	—	1.85	—
A_1	0.00	0.1	0.20
A	—	—	2.03
b_p	0.34	0.4	0.46
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	5.7	6.2	6.5
e	1.12	1.27	1.42
x	—	—	0.12
y	—	—	0.10
Z	—	—	0.75
L	0.25	0.45	0.65
L_1	—	0.90	—

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



not recommended for new design

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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Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.
Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510

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