

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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M51953A,B/M51954A,B

Voltage Detecting, System Resetting IC Series

REJ03D0776-0300

Rev.3.00

Sep 18, 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 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 $0.33 \mu\text{F}$) (M51953, M51954)
- 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 application range

Application

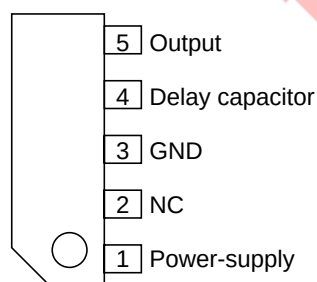
- Reset circuit of Pch, Nch, CMOS, microcomputer, CPU and MCU, Reset of logic circuit, Battery check circuit, switching circuit back-up voltage, level detecting circuit, waveform shaping circuit, delay waveform generating circuit, DC/DC converter, over voltage protection circuit

Recommended Operating Condition

- Supply voltage range: 2 V to 17 V

Pin Arrangement

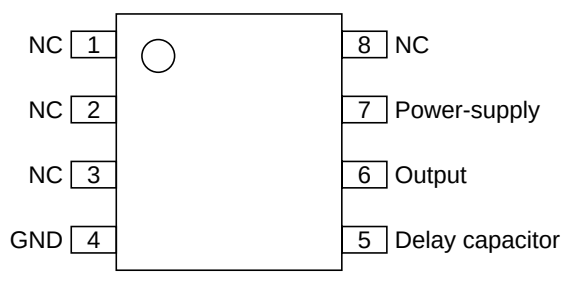
M51953AL/BL
M51954AL/BL



(Top view)

Outline: 5P5T

M51953AFP/BFP
M51954AFP/BFP



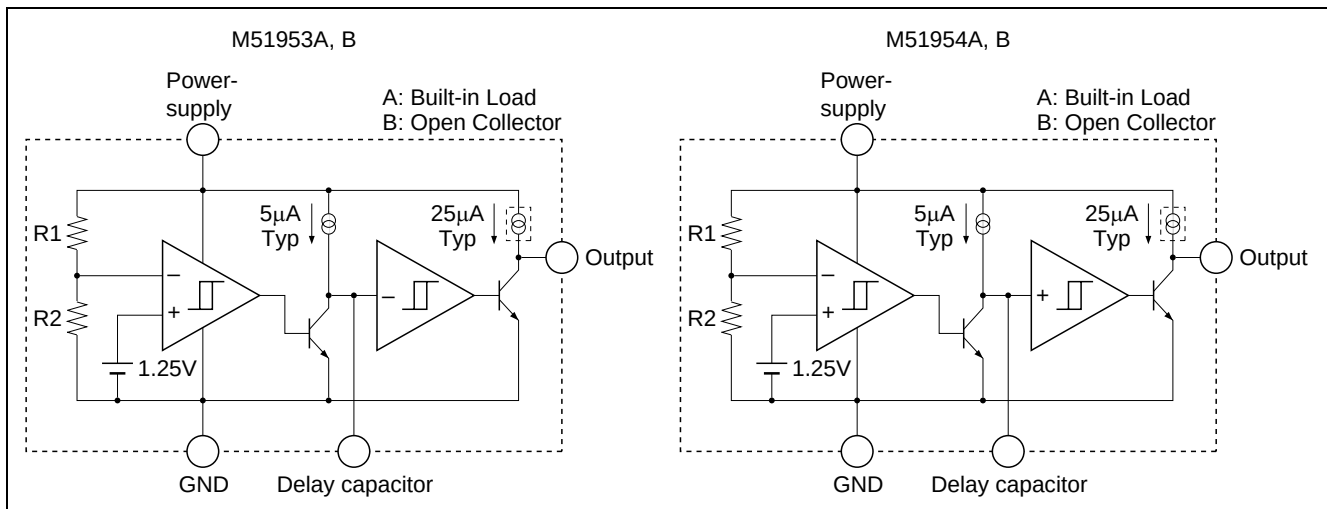
(Top view)

NC: No Connection

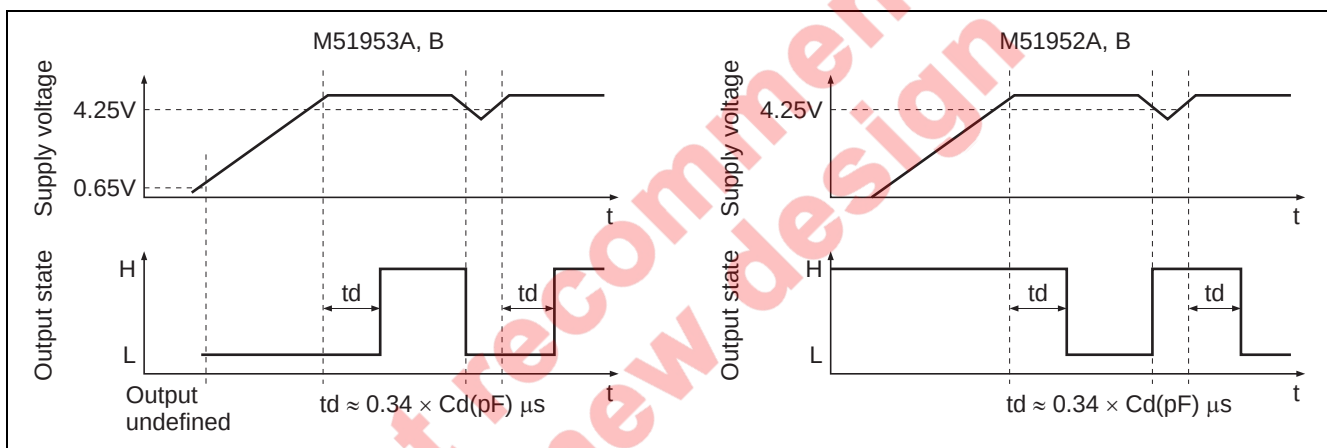
Outline: PRSP0008DE-C (recommend)

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	I _{sink}	6	mA	
Output voltage	V _O	V _{CC} 18	V	Type A (output with constant current load) Type B (open collector output)
Power dissipation	P _d	450 400 300	mW	5-pin SIP 8-pin SOP (PRSP0008DE-C): recommend 8-pin SOP (PRSP0008DA-A): not recommend
Thermal derating	K _θ	4.5 4.4 3	mW/°C	Refer to the thermal derating curve. 5-pin SIP 8-pin SOP (PRSP0008DE-C): recommend 8-pin SOP (PRSP0008DA-A): not recommend
Operating temperature	Topr	−30 to +85	°C	
Storage temperature	Tstg	−40 to +125	°C	

Electrical Characteristics

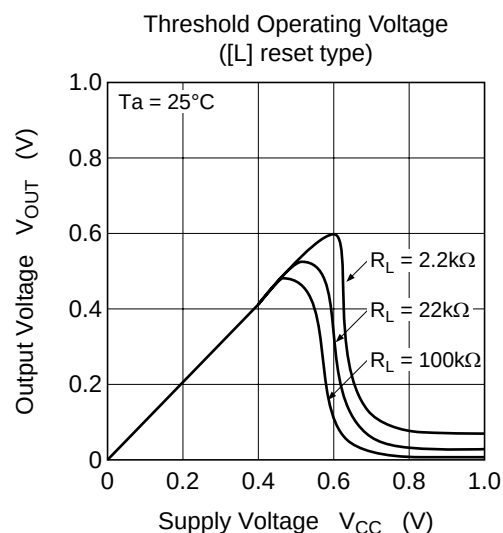
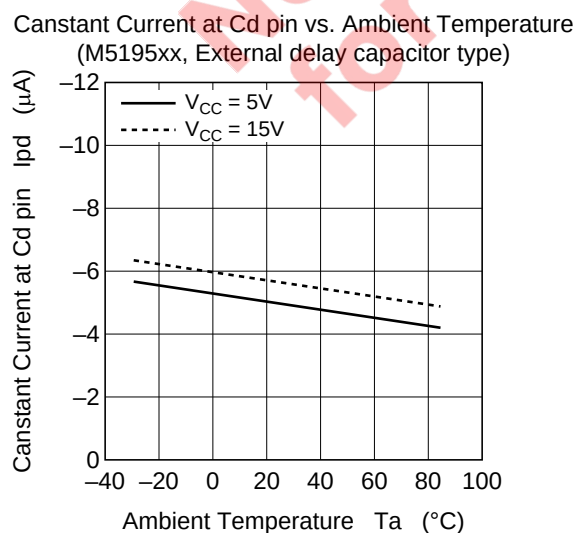
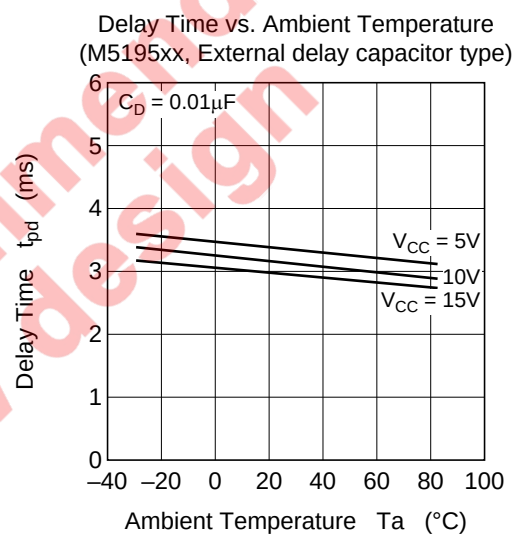
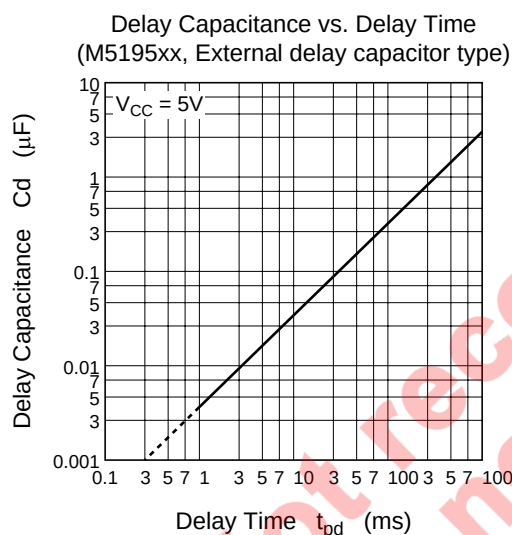
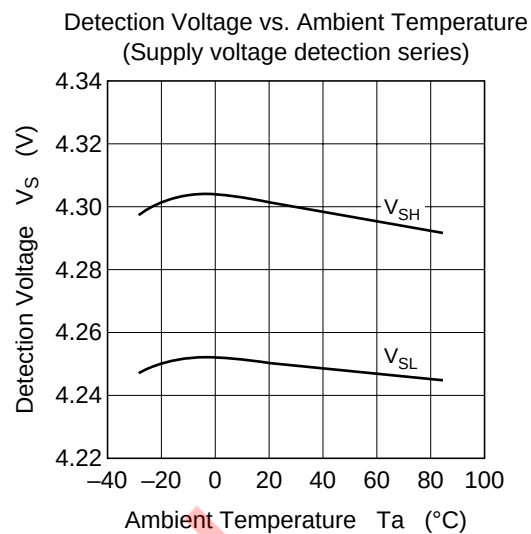
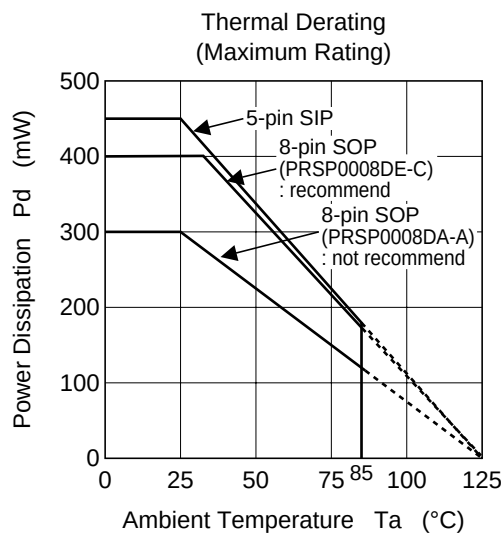
(Ta = 25°C, unless otherwise noted)

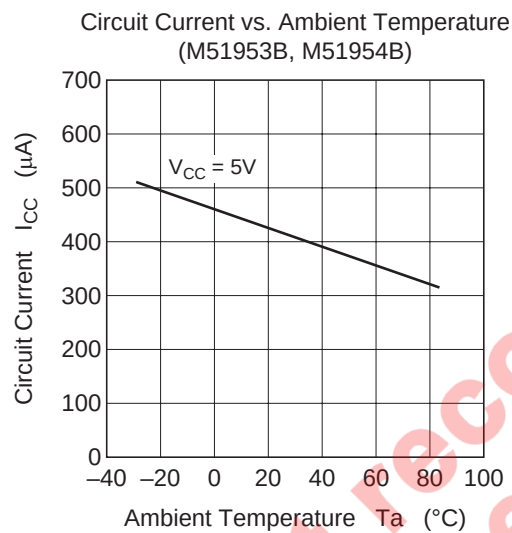
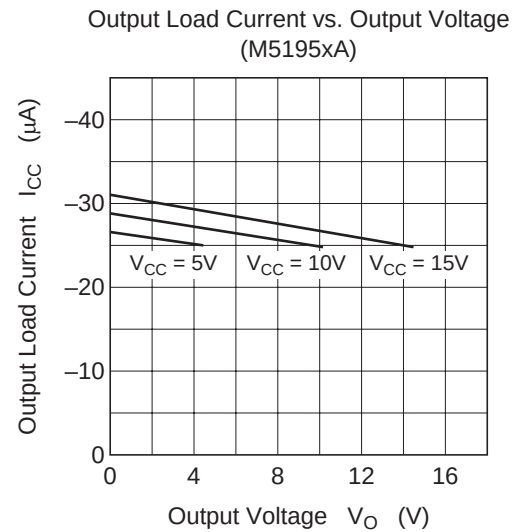
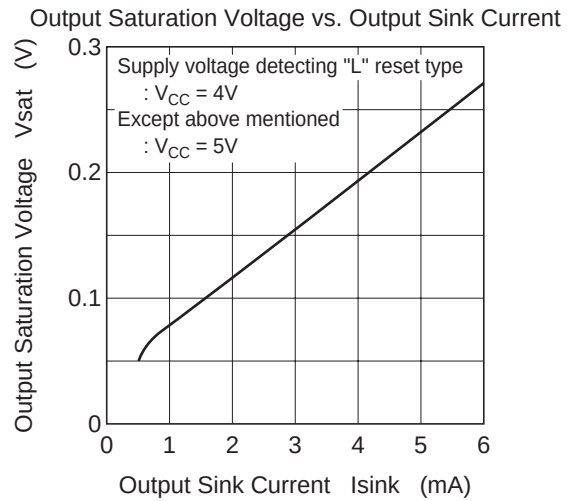
- “L” reset type M51953A, M51953B
- “H” reset type M51954A, M51954B

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 /ΔT	—	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	I _{pd}	−8	−5	−3	μA	V _{CC} = 5V
Output saturation voltage	V _{sat}	—	0.2	0.4	V	L reset type, V _{CC} = 4V, I _{sink} = 4mA
		—	0.2	0.4		H reset type, V _{CC} = 5V, I _{sink} = 4mA
Threshold operating voltage	V _{OPL}	—	0.67	0.8	V	L reset type minimum supply voltage for IC operation
		—	0.55	0.7		R _L = 2.2kΩ, V _{sat} ≤ 0.4V R _L = 100kΩ, V _{sat} ≤ 0.4V
Output leakage current	I _{OH}	—	—	30	nA	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





Example of Application Circuit

Reset Circuit of M5195xx Series

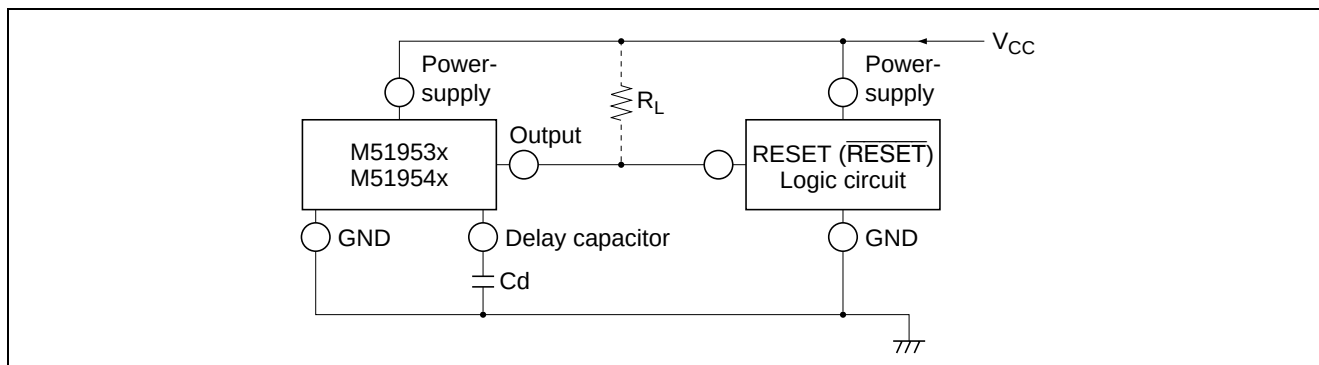


Figure 1 Reset Circuit of M5195xx Series

- 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 μ 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) μ 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

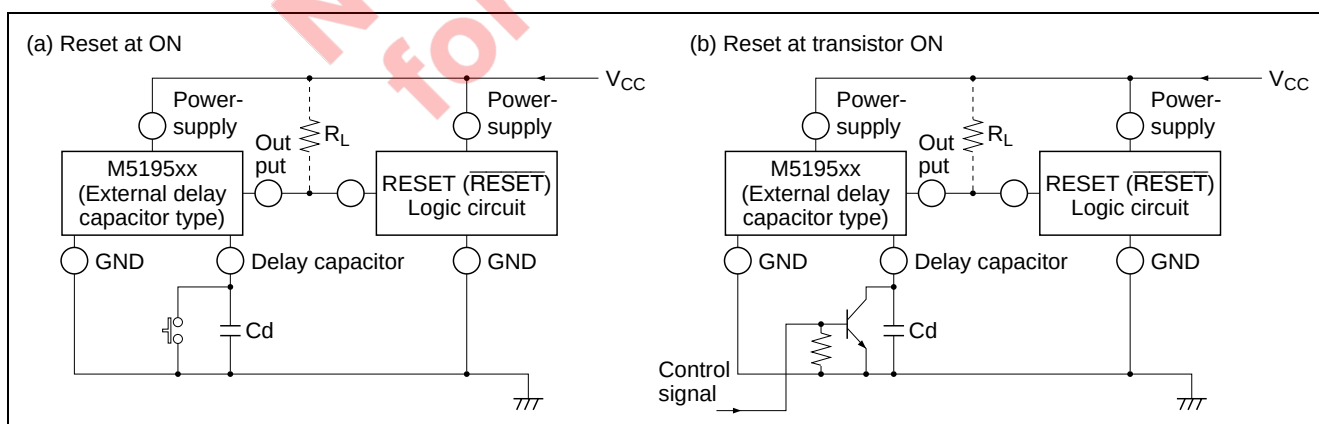


Figure 2 Case of Using Reset Signal except Supply Voltage in the M5195xx Series

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.

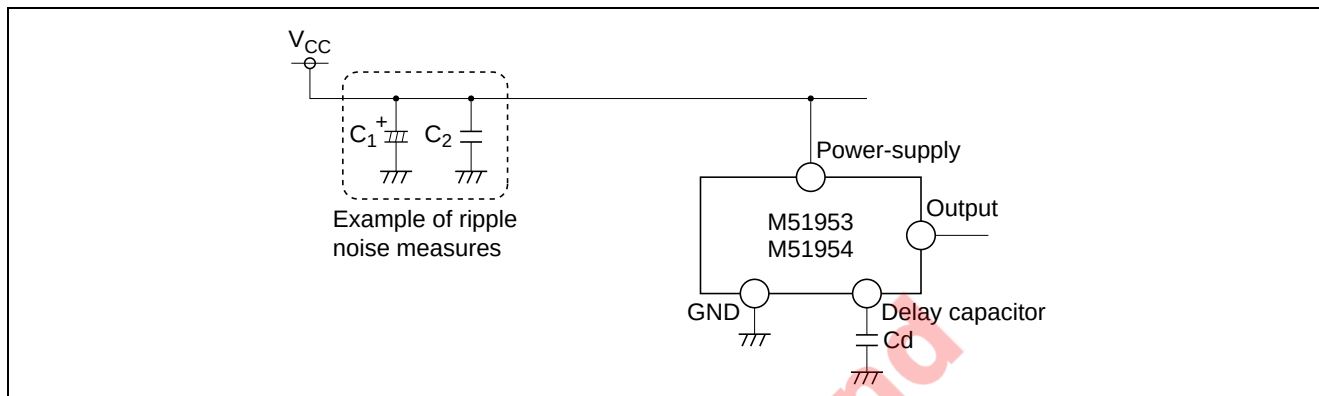


Figure 3 Example of Ripple Noise Measures

Setting of Delay Capacity

Please use capacitor C_d for the delay within the range of 10 μ F or less.

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

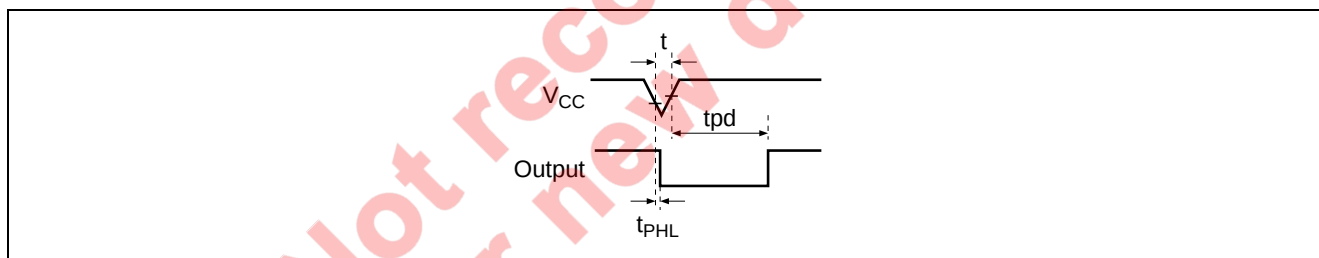


Figure 4 Time Chart at Momentary Voltage-Decrease

(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 $0.47 \times t_{pd}$ to $2.05 \times t_{pd}$. For instance, 34 seconds can be calculated at 100 μ F. 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 μ s when delay capacitor $C_d = 0.1 \mu$ F.

The momentary voltage-decrease that is longer than such t_{PHL} occurs, the detection becomes possible. When the delay capacitance is enlarged, t_{PHL} also becomes long. For instance, it becomes about 100 to 200 μ s in case of circuit constant $C_1 = 100 \mu$ F.

(Characteristic graph 1 is used and extrapolation in case of $C_d = 100 \mu$ F.)

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)

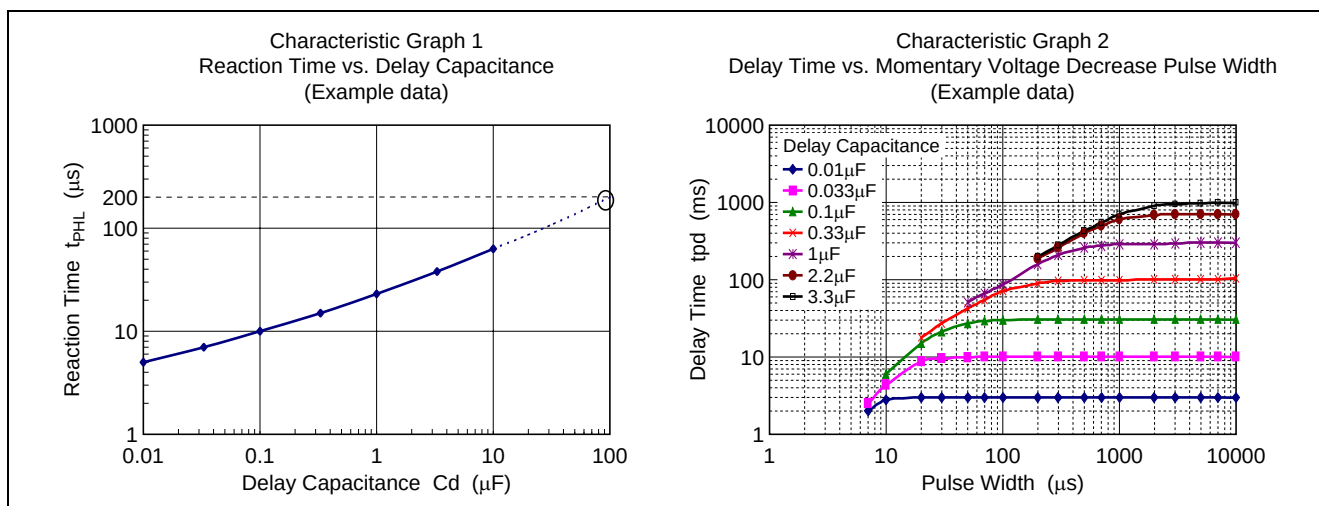
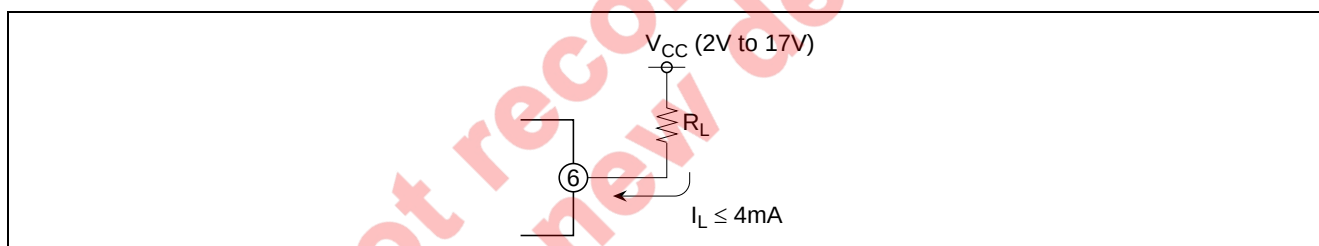


Figure 5 Characteristic Graph

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

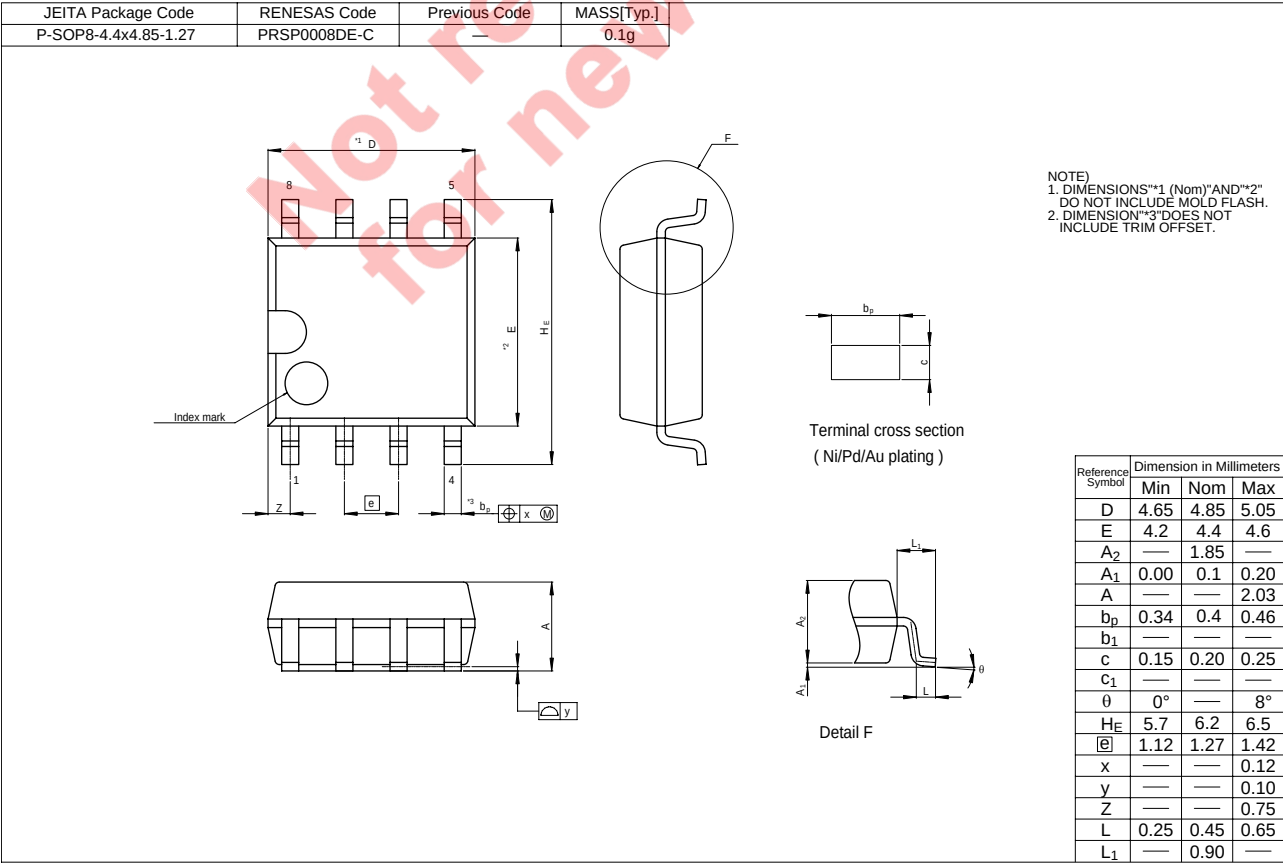
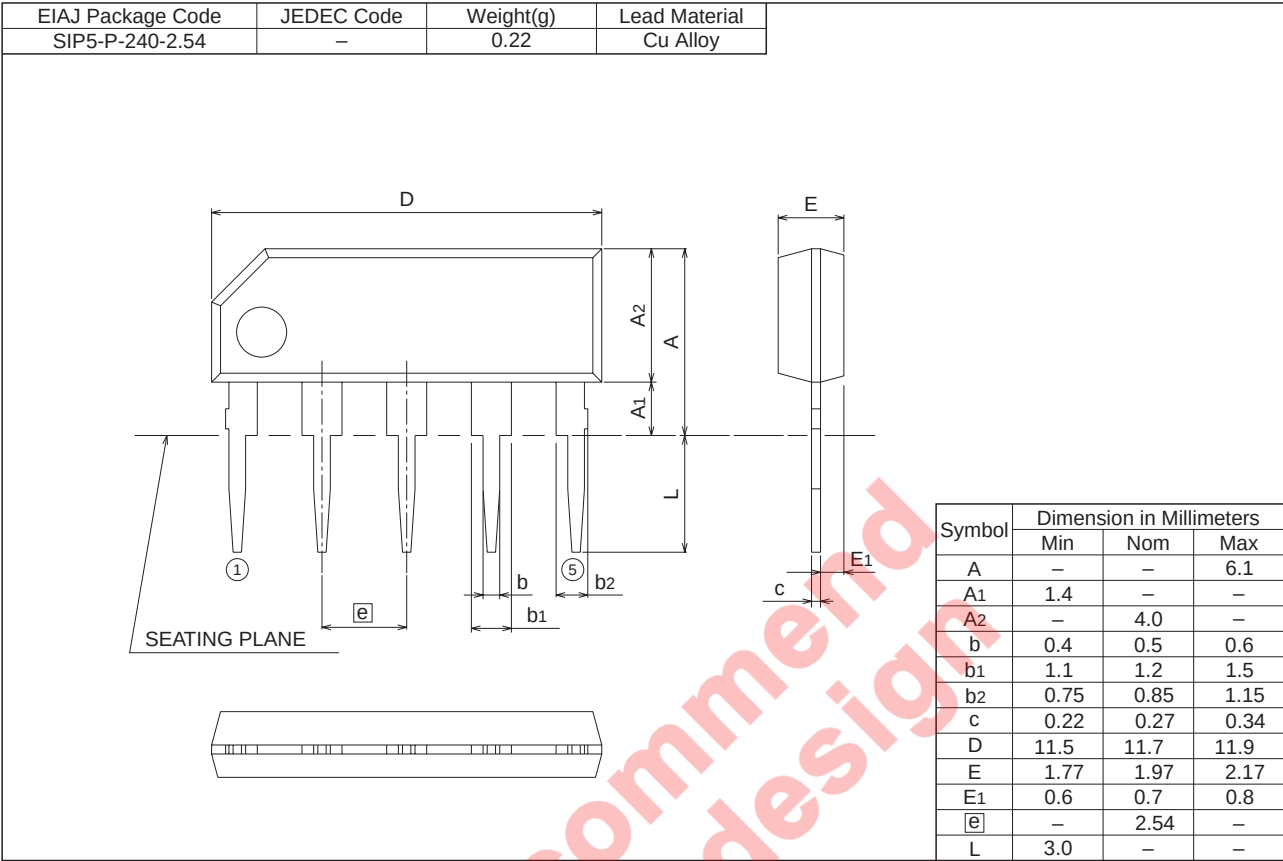
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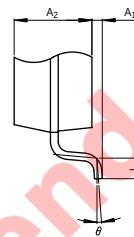
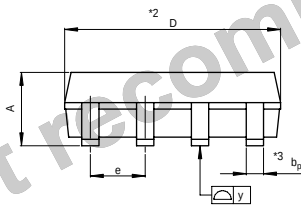
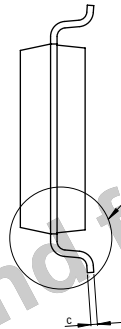
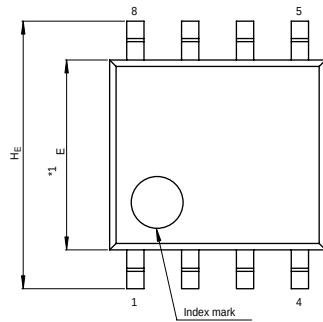
Package Dimensions

5P5T

Plastic 5pin 240mil SIP



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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