M51945A,B/M51946A,B

Voltage Detecting, System Resetting IC Series

REJ03D0774-0200
Rev.2.00
Aug 20, 2007

Description

M51945A,B/M51946A,B are semiconductor integrated circuits for resetting of all types of logic circuits such as CPUs, and has the feature of setting the detection voltage by adding external resistance.

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

Features

- Few external parts
- 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

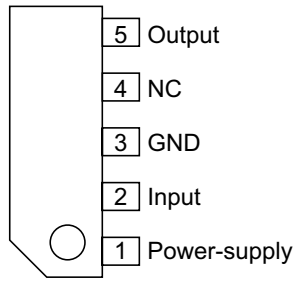
- Reset circuit of Pch, Nch, CMOS, microcomputer, CPU and MCU, Reset of logic circuit, Battery check circuit, switching circuit back-up voltage, level detecting circuit, waveform shaping circuit, delay waveform generating circuit, DC/DC converter, over voltage protection circuit

Recommended Operating Condition

- Supply voltage range: 2 V to 17 V

Pin Arrangement

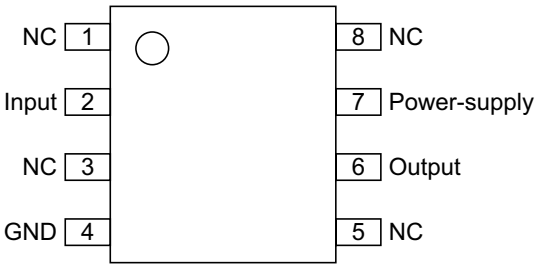
M51945AL/BL
M51946AL/BL



(Top view)

Outline: 5P5T

M51945AFP/BFP
M51946AFP/BFP

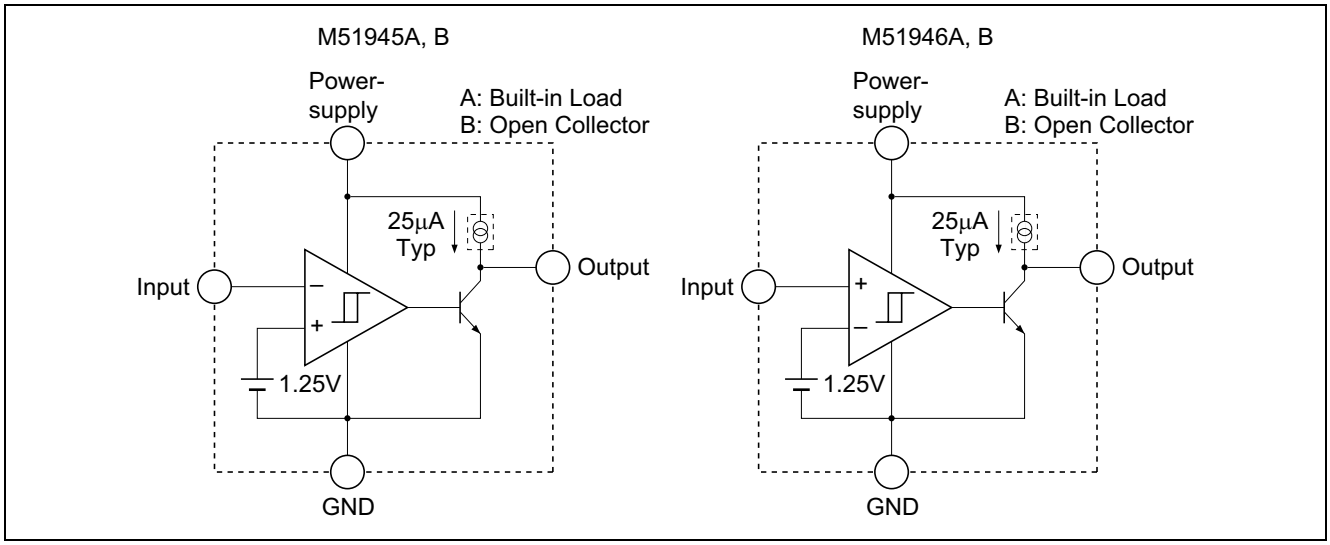


(Top view)

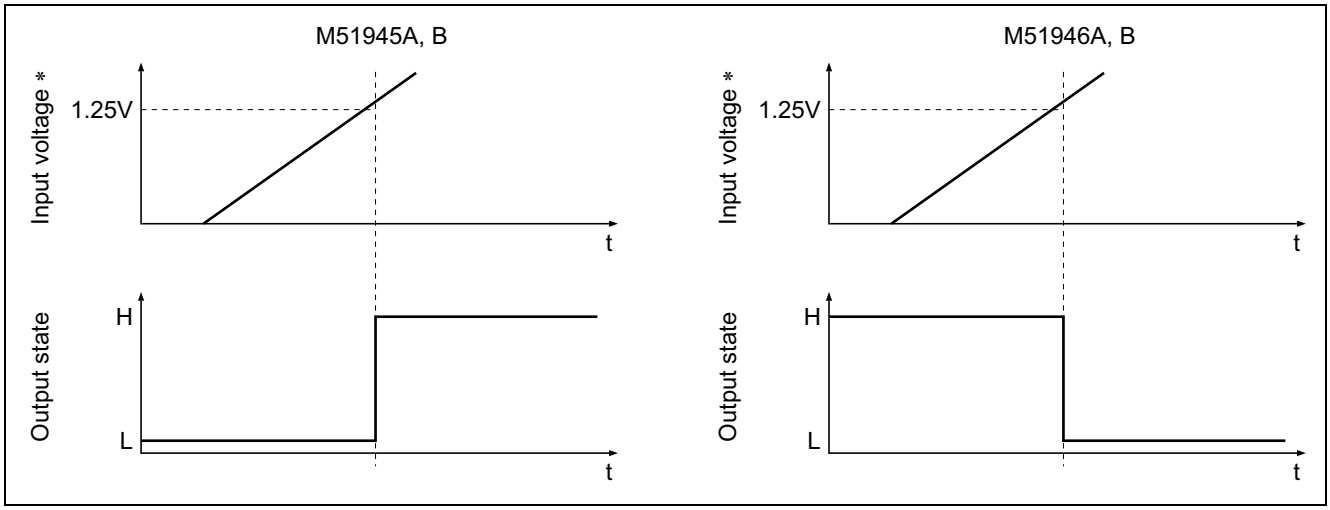
NC: No Connection

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		
Input voltage range	V_{IN}	–0.3 to V_{CC}	V	$V_{CC} \leq 7$ V	
		–0.3 to +7		$V_{CC} > 7$ V	

Electrical Characteristics

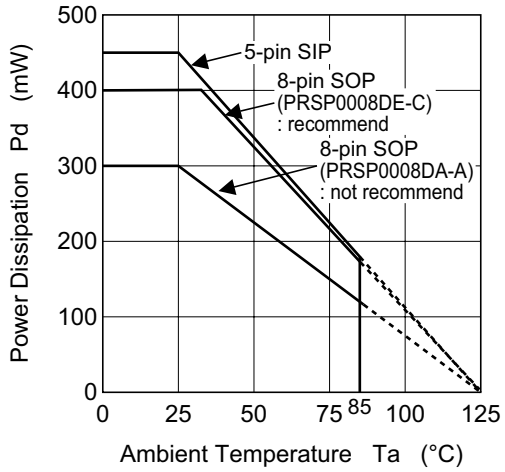
(Ta = 25°C, unless otherwise noted)

- "L" reset type M51945A, M51945B
- "H" reset type M51946A, M51946B

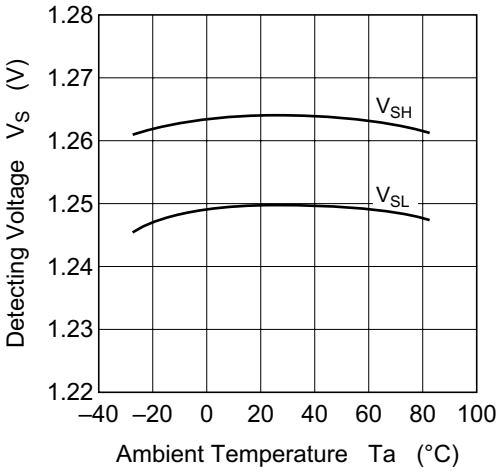
Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
Detecting voltage	V_S	1.20	1.25	1.30	V		
Hysteresis voltage	ΔV_S	9	15	23	mV		
Detecting voltage temperature coefficient	$V_S/\Delta T$	—	0.01	—	%/°C		
Supply voltage range	V_{CC}	2	—	17	V		
Input current	I_{IN}	—	100	500	nA	V_{IN} = 1.25V	
Circuit current	I_{CC}	—	310	470	μA	Type A, V_{CC} = 5V	
		—	280	420		Type B, V_{CC} = 5V	
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}	—	—	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	
Propagation delay time	t_{PHL}	—	4	—	μs	Response time when V_{CC} changes H → L	
	t_{PLH}	—	2	—		Response time when V_{CC} changes L → H	

Typical Characteristics

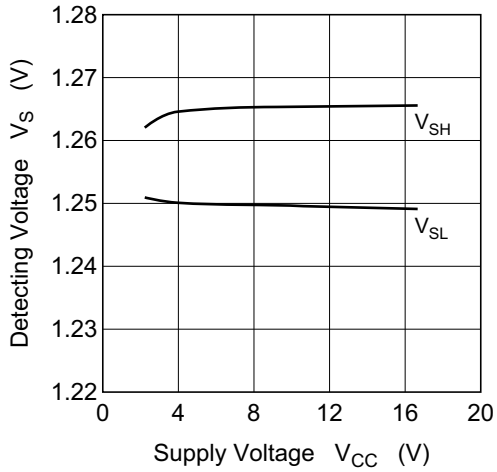
Thermal Derating
(Maximum Rating)



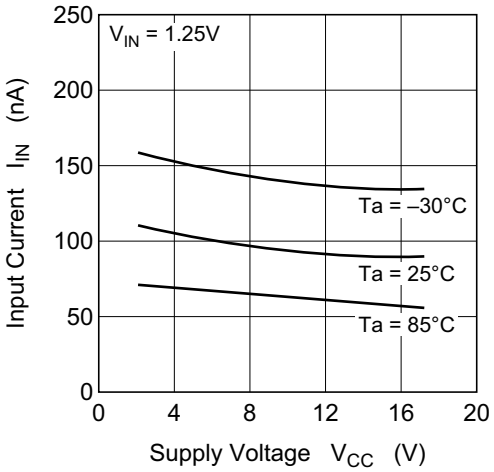
Detection Voltage vs. Ambient Temperature
(Input voltage detection series)



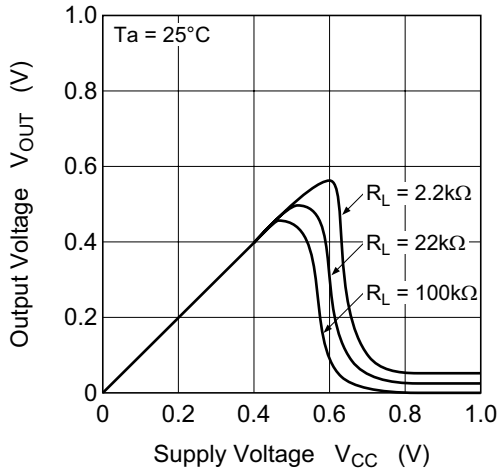
Detection Voltage vs. Supply Voltage
(Input voltage detection series)



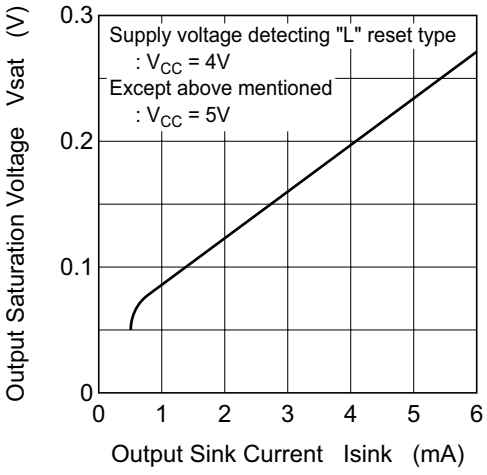
Input Current vs. Supply Voltage
(Input voltage detection series)

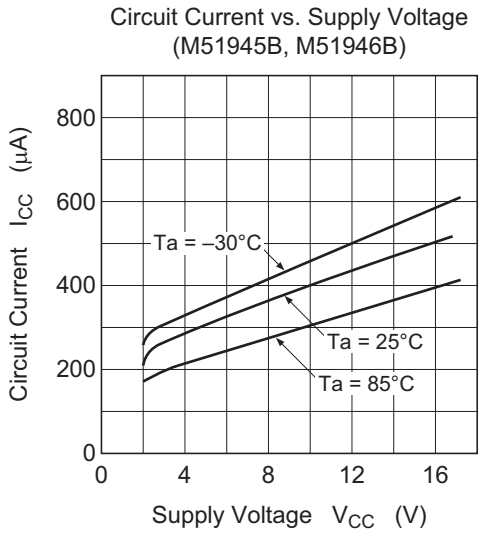


Threshold Operating Voltage
([L] reset type)



Output Saturation Voltage vs. Output Sink Current





Example of Application Circuit

Reset Circuit of M5194xx Series

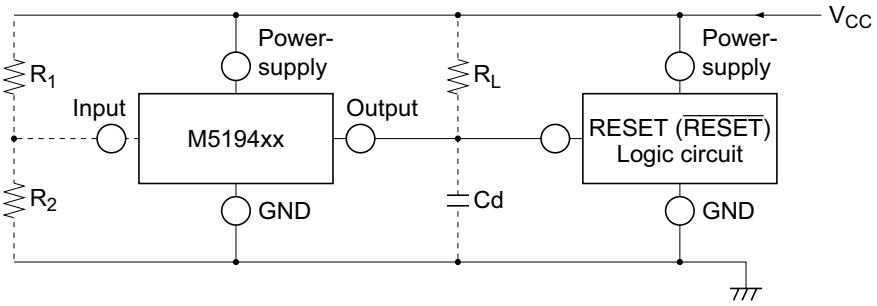


Figure 1 Reset Circuit of M5194xx Series

Notes: 1. When the detecting supply voltage is 4.25 V, M51943 and M51944 are used and R_1 and R_2 are not necessary. When the voltage is anything except 4.25 V, M51945 and M51946 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. If the M5194xx 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.
3. 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.
4. It is better to use the M5195xx series to cause a delay, but if the delay is caused by the M5194xx series, the delay capacitor Cd is applied between the output and GND.
5. When the reset terminal in the logic circuit is of the low reset type, M51943 and M51945 are used and when the terminal is of the high reset type, M51944 and M51946 are used.
6. When a delay is necessary at both rise time and fall time, M51945 and M51946 are used and the series resistors (R_{11}, R_{12}) are applied between the output and GND or instead of R_1, and these connect the capacitor between the connection point and GND. The connection point of the capacitor is fixed according to the ratio of delay at fall/rise time.
7. When a negative supply voltage is used, the supply voltage side of M5194xx and the GND side are connected to GND and the negative supply voltage respectively.

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 2.

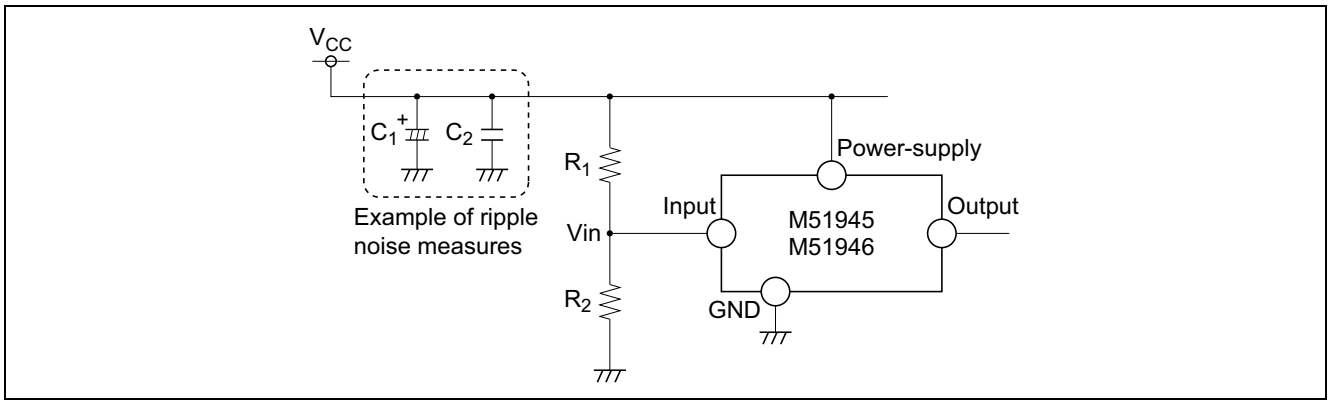


Figure 2 Example of Ripple Noise Measures

2. The sequence of voltage impression
   Please do not impress the voltages to the input terminals earlier than the power supply terminal. Moreover, please do not open the power supply terminal with the voltage impressed to the input terminal.
   (The setting of the bias of an internal circuit collapses, and a parasitic element might operate.)

About the Input Terminal

1. Setting range of input voltage
   The following voltage is recommended to be input to the input terminal (pin 2).

   about 0.8 (V) < Vin < V_{CC} – 0.3 (V) .... at $V_{CC} \leq 7$ V

   about 0.8 (V) < Vin < 6.7 (V) ..... at $V_{CC} > 7$ V

2. About using input terminal
   Please do an enough verification to the transition characteristic etc. of the power supply when using independent power supply to input terminal (pin 2).

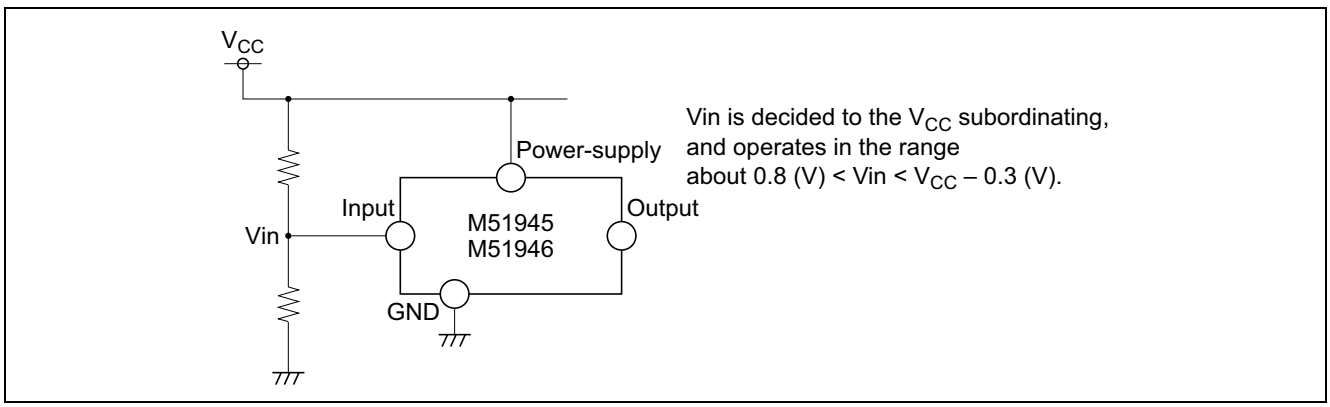
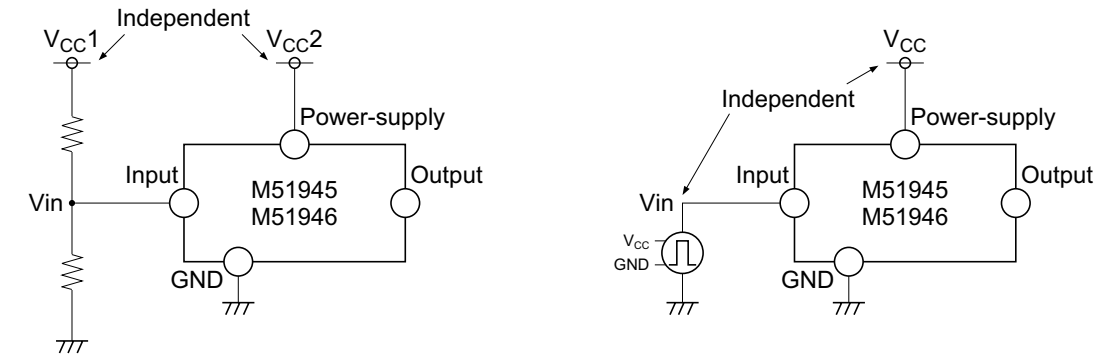


Figure 3 Recommended Example



Example 1. Independent power supply system
Please do enough verifying about transition characteristic of $V_{CC}1$ and $V_{CC}2$.

Example 2. Logic pulse input (not recommended)

Figure 4

3. Calculation of detecting voltage
   Detecting voltage Vs can be calculated by the following expression.
   However, the error margin is caused in the detecting voltage because input current Iin (standard 100 nA) exists if it sets too big resistance.
   Please set the constant to disregard this error margin.

$$V_S = 1.25 \times \left(\frac{R_1 + R_2}{R_2} \right) + \underbrace{Iin \times R_1}_{\text{error margin}}$$

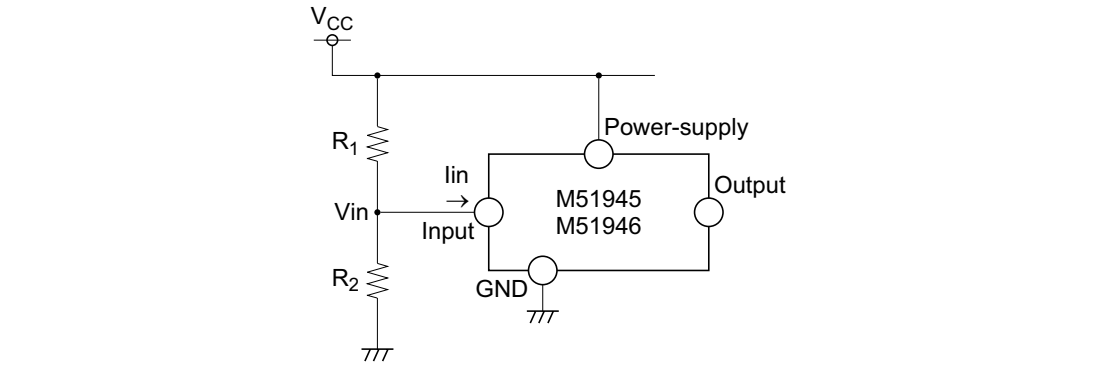


Figure 5 Influence of Input Current

4. About the voltage input outside ratings
   Please do not input the voltage outside ratings to the input terminal.
   An internal protection diode becomes order bias, and a large current flows.

Setting of Output Load Resistance (M51945B/M51946B)

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).

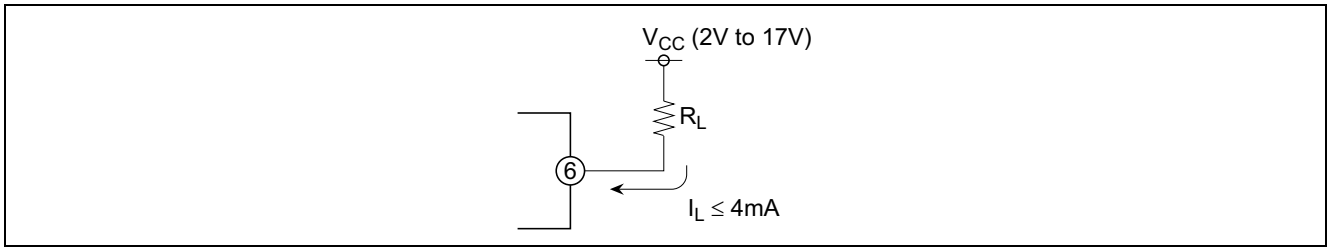


Figure 6 Output Load Resistance R_L

Others

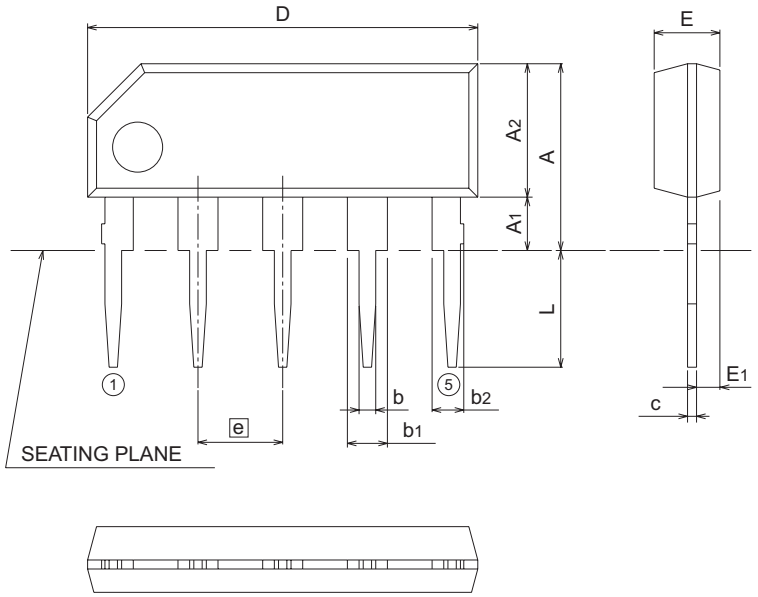
1. Notes when IC is handled are published in our reliability handbook, and please refer it. The reliability handbook can be downloaded from our homepage (following URL). http://www.renesas.com/fmwk.jsp?cnt=reliability_root.jsp&fp=/products/common_info/reliability
2. Additionally, please inquire of our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

Package Dimensions

5P5T

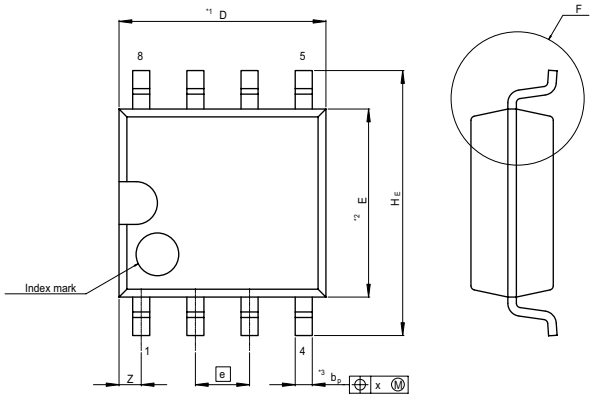
Plastic 5pin 240mil SIP

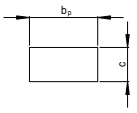
EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SIP5-P-240-2.54	–	0.22	Cu Alloy



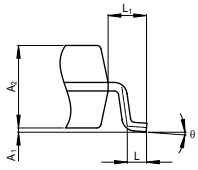
Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	–	–	6.1
A_1	1.4	–	–
A_2	–	4.0	–
b	0.4	0.5	0.6
b_1	1.1	1.2	1.5
b_2	0.75	0.85	1.15
c	0.22	0.27	0.34
D	11.5	11.7	11.9
E	1.77	1.97	2.17
E_1	0.6	0.7	0.8
e	–	2.54	–
L	3.0	–	–

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)

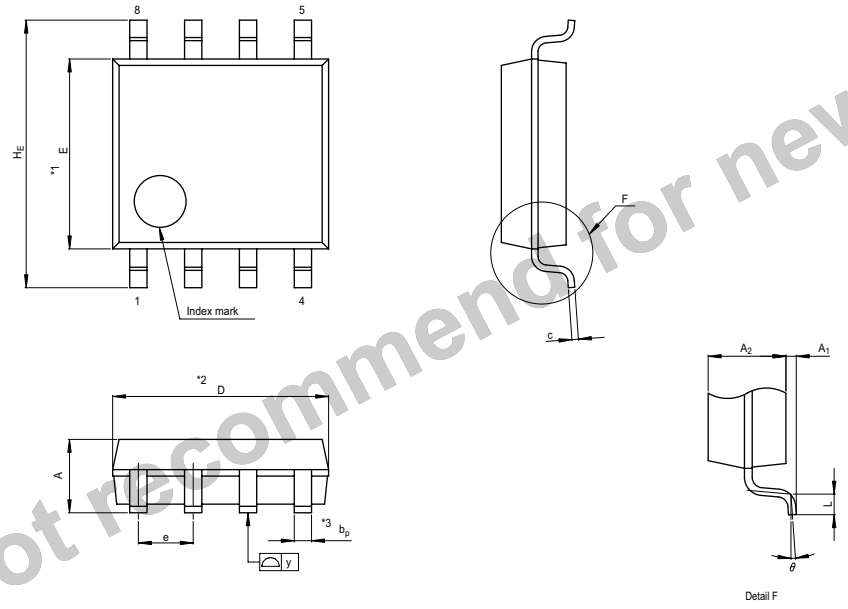


Detail F

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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