

REAR56957A,BG

R03DS0170EJ0100
Rev.1.00
2021.10.4

Voltage Detecting, System Resetting IC Series

Description

REAR56957A,B are semiconductor integrated circuits for resetting of all types of logic circuit such as CPUs, and have the feature of setting the detection voltage by adding external resistance.

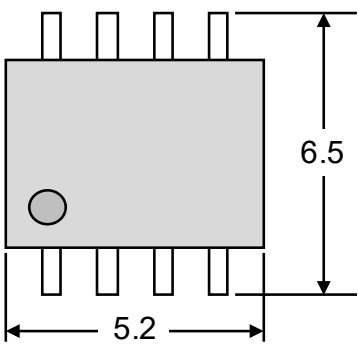
They include a built-in delay circuit to provide the desired retardation time simply by adding an external capacitor.

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

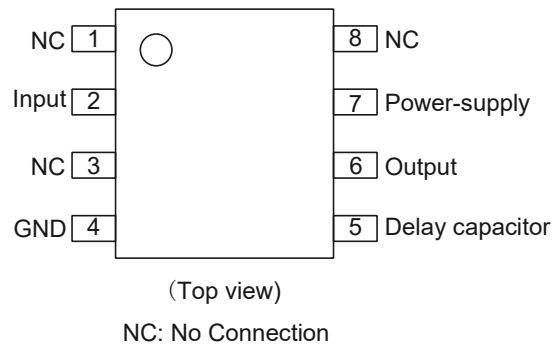
Features

- Few external parts
- Large delay time with a capacitor of small capacitance ($t_d \approx 100\text{ms}$, at $0.33\mu\text{F}$)
- Low threshold operating voltage (Supply voltage to keep low-state at low supply voltage):
0.6V (Typ.) at $R_L = 22\text{k}\Omega$
- Wide supply voltage range: 2V to 17V
- Wide application range

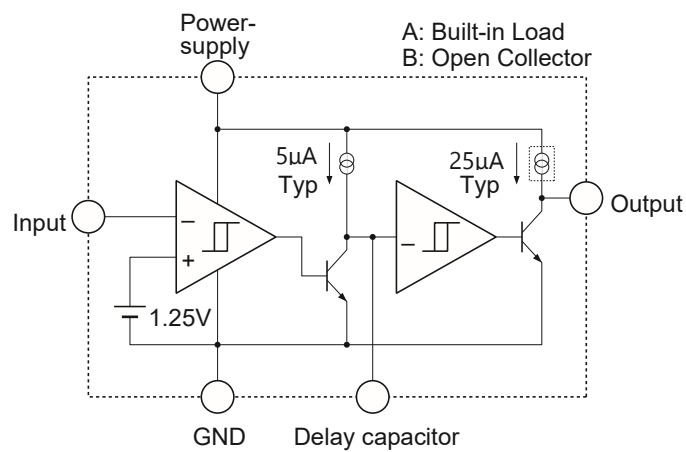
Ordering Information

Package Type	SOP	
Part Name	REAR56957AGSM	REAR56957BGSM
Product Type Quality Level	Normal Quality Level	
Outline	<p style="text-align: right;">Unit : mm</p> 	

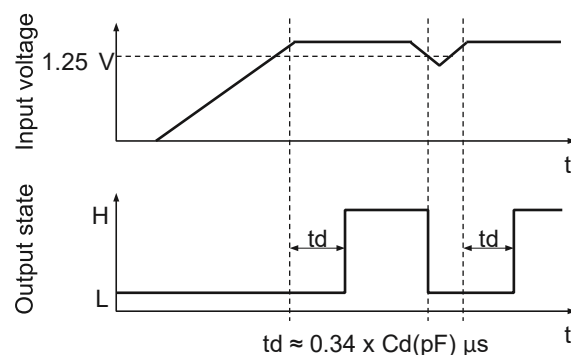
Pin Arrangement



Block Diagram



Operating Waveform



Absolute Maximum Ratings

(T_a=25°C, unless otherwise noted)

Item	Symbol	Ratings	Unit	Conditions
Supply Voltage	V _{CC}	-0.3 to +18	V	
Output Sink Current	I _{SINK}	6	mA	
Output Applied Voltage	V _O	-0.3 to V _{CC}	V	Type A (output with constant current load)
		-0.3 to +18		Type B (open collector output)
Total Power Dissipation	P _d	440	mW	
Thermal Derating	K _θ	4.4	mW/°C	Refer to the thermal derating curve.
Operating Temperature	T _{opr}	-40 to +85	°C	
Storage Temperature	T _{stg}	-55 to +125	°C	
Input Voltage Range	V _{IN}	-0.3 to V _{CC}	V	V _{CC} ≤ 7V
		-0.3 to +7		V _{CC} > 7V

Recommended Operating Condition

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{CC}	2		17	V

Electrical Characteristics

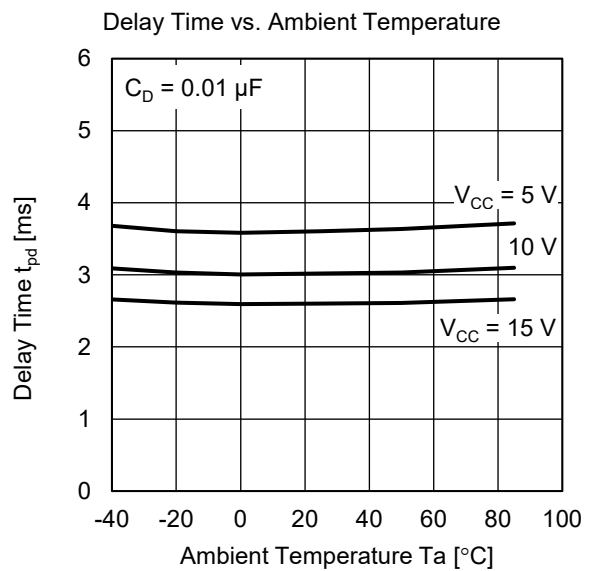
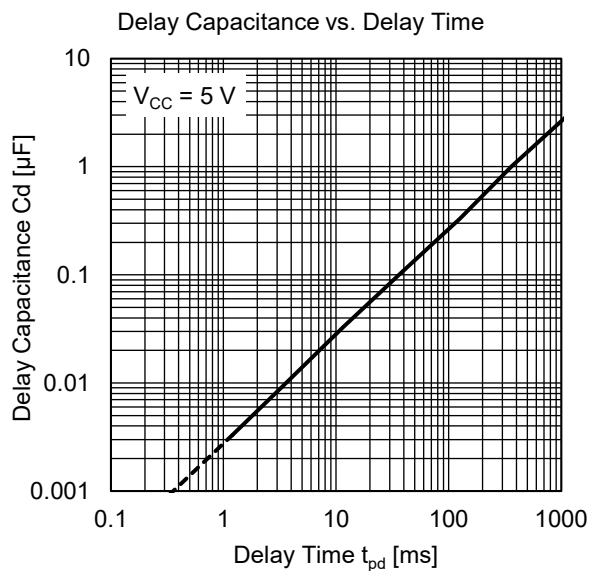
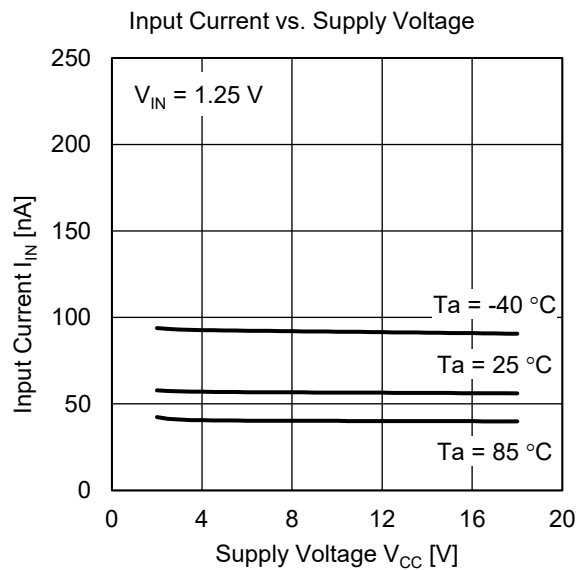
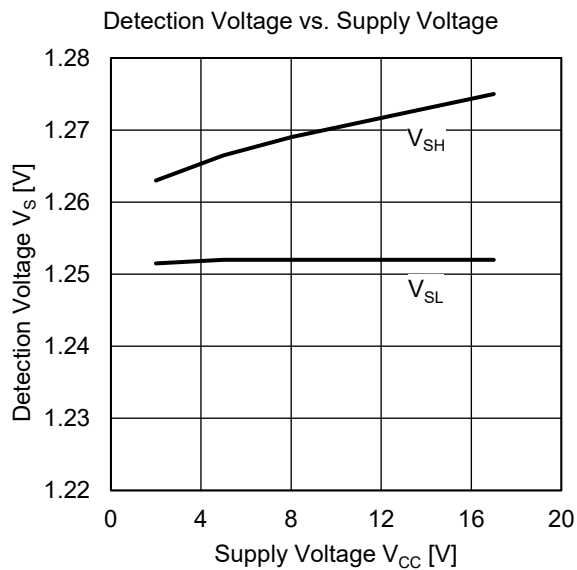
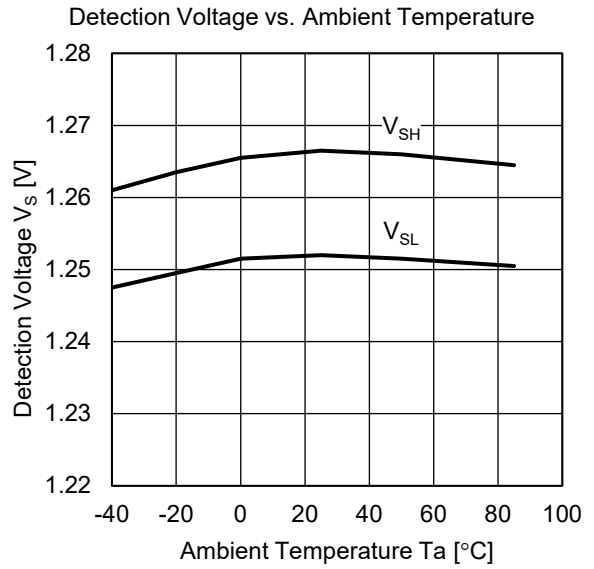
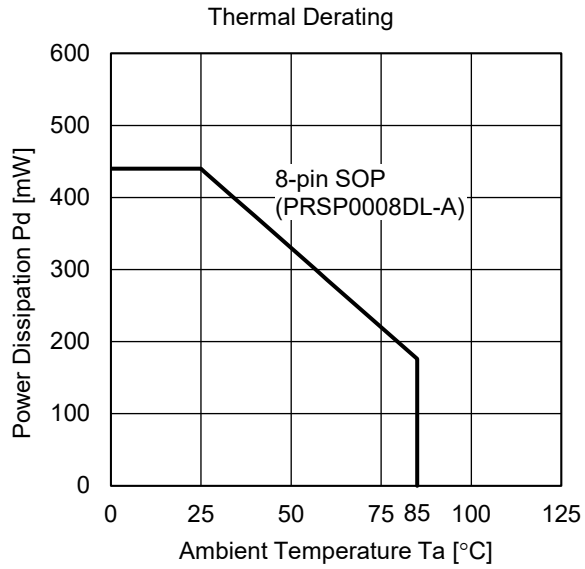
(T_a=25°C, unless otherwise noted)

● “L” reset type

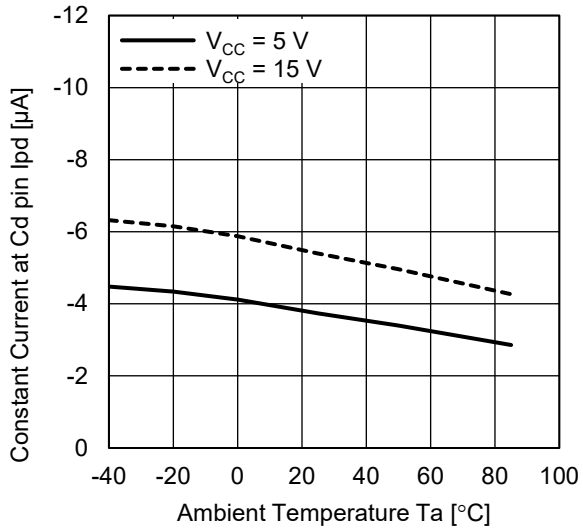
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Detecting Voltage	V _S	1.20	1.25	1.30	V	
Hysteresis Voltage	ΔV _S	9	15	23	mV	V _{CC} = 5V
Detecting Voltage Temperature Coefficient	V _S /ΔT		0.01		%/°C	
Supply Voltage Range	V _{CC}	2		17	V	
Input Voltage Range	V _{IN}	-0.3		V _{CC}	V	V _{CC} ≤ 7V
		-0.3		7.0		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	7.0	ms	C _d = 0.01μF ^{Note.1}
Constant Current	I _{pd}	-8	-5	-3	μA	V _{CC} = 5V
Output Saturation Voltage	V _{sat}		0.2	0.4	V	V _{CC} = 5V, V _{IN} < 1.2V, I _{SINK} = 4mA
Threshold Operating Voltage	V _{OPL}		0.67	0.9	V	L reset type minimum supply voltage for IC operation
			0.55	0.8		R _L = 2.2kΩ, V _{sat} ≤ 0.4V R _L = 100kΩ, V _{sat} ≤ 0.4V
Output Leakage Current	I _{OH}			30	nA	Type B, V _{out} ≤ 17V
Output Load Current	I _{OC}	-40	-25	-17	μA	Type A, V _{CC} =5V, V _{IN} > 1.35V, V _O =1/2 × V _{CC}
Output High Voltage	V _{OH}	V _{CC} -0.2	V _{CC} -0.06		V	Type A

[Note] 1. Please set the desired delay time by attaching capacitor of the range between 4700pF and 10μF

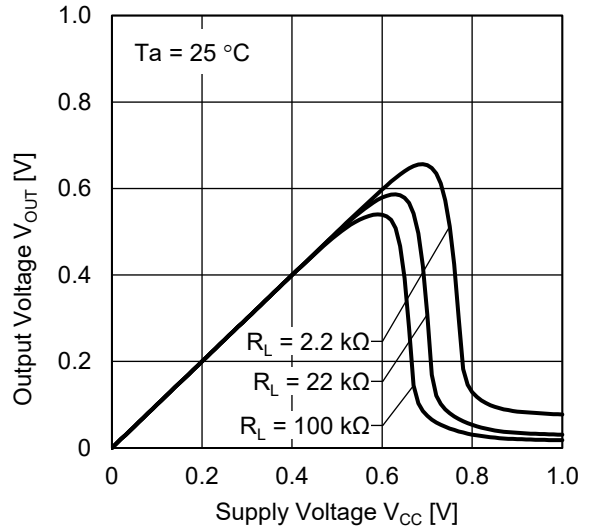
Typical Characteristics



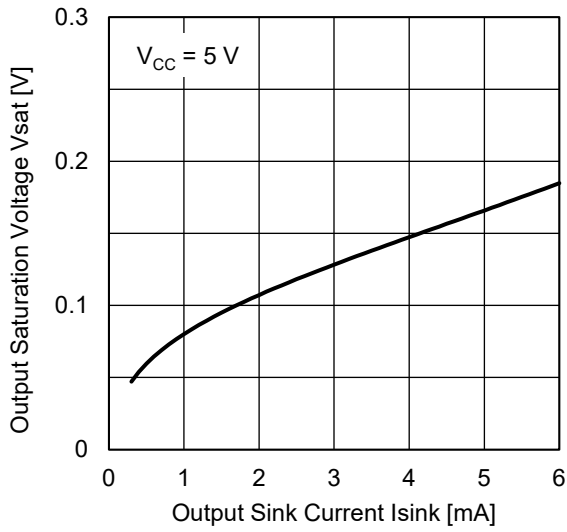
Constant Current at Cd pin vs. Ambient Temperature



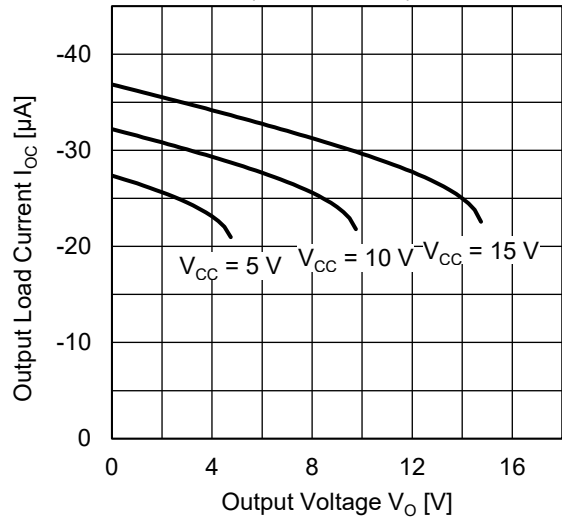
Threshold Operating Voltage



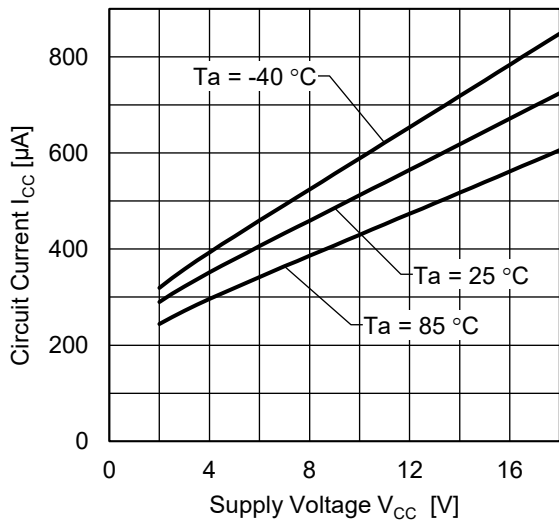
Output Saturation Voltage vs. Output Sink Current



Output Load Current vs. Output Voltage (REAR56957A)



Circuit Current vs. Supply Voltage (REAR56957B)

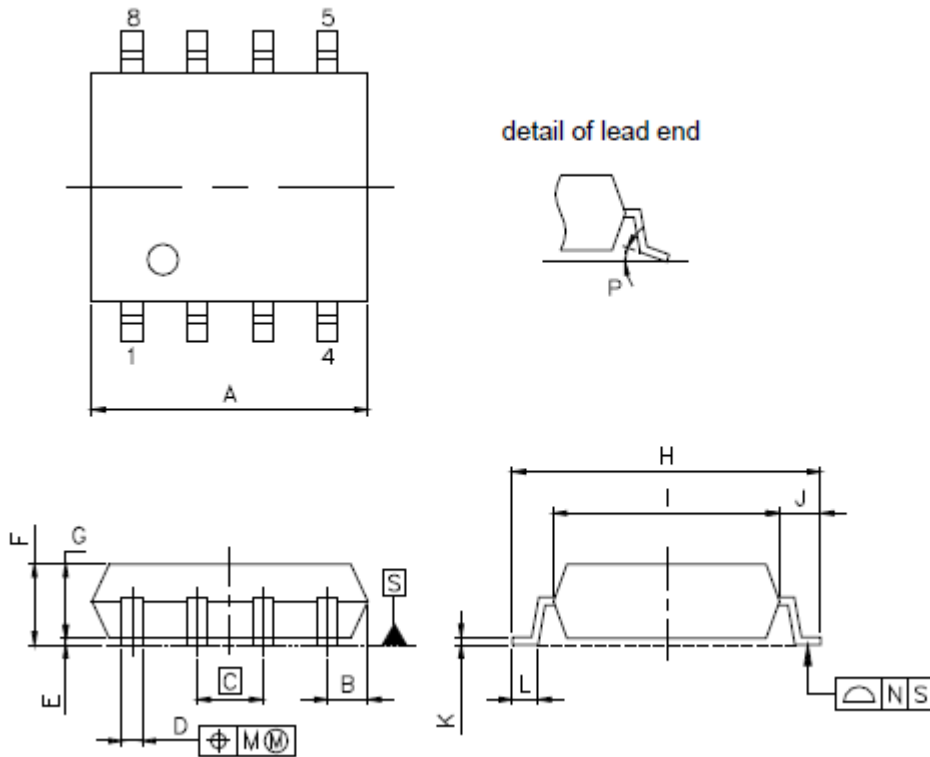


Package Drawing

8-PIN PLASTIC SOP

JEITA Package code	RENESAS code	Previous code	MASS (TYP.) [g]
P-SOP8-0225-1.27	PRSP0008DL-A	S8GM-50-225B	0.08

Unit: mm



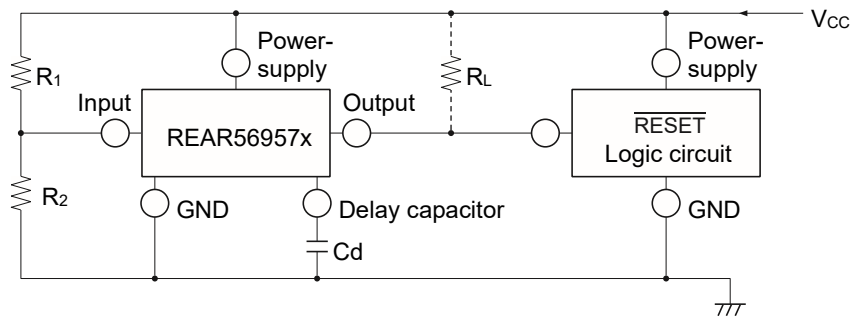
NOTE

Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	5.2 ^{+0.17} _{-0.20}
B	0.78 MAX
C	1.27 (T.P)
D	0.42 ^{+0.08} _{-0.07}
E	0.1 ±0.1
F	1.59 ±0.21
G	1.49
H	6.5 ±0.3
I	4.4 ±0.15
J	1.1 ±0.2
K	0.17 ^{+0.08} _{-0.07}
L	0.6 ±0.2
M	0.12
N	0.10
P	3° ^{+7°} _{-3°}

Example of Application Circuit

Reset Circuit of REAR56957



Reset Circuit of REAR56957

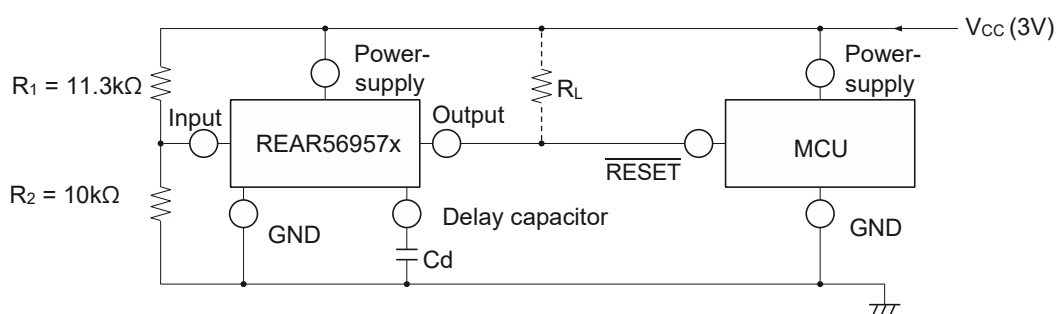
- Notes :
1. The detecting supply voltage is $V_S \times (R_1 + R_2)/R_2$ (V) approximately. $V_S = 1.25$ V (Typ)
The detecting supply voltage can be set between 2 V and 15 V
 2. The delay time is about $0.34 \times C_d$ (pF) μ s.
 3. If the REAR56957 and the logic circuit share a common power source, 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 a negative supply voltage is used, the supply voltage side of REAR56957 and the GND side are connected to negative supply voltage respectively.

Application Example on 3V Microcontroller System

The input voltage detection type can be used for voltage monitoring of 3V microcontroller system as shown on Figure .

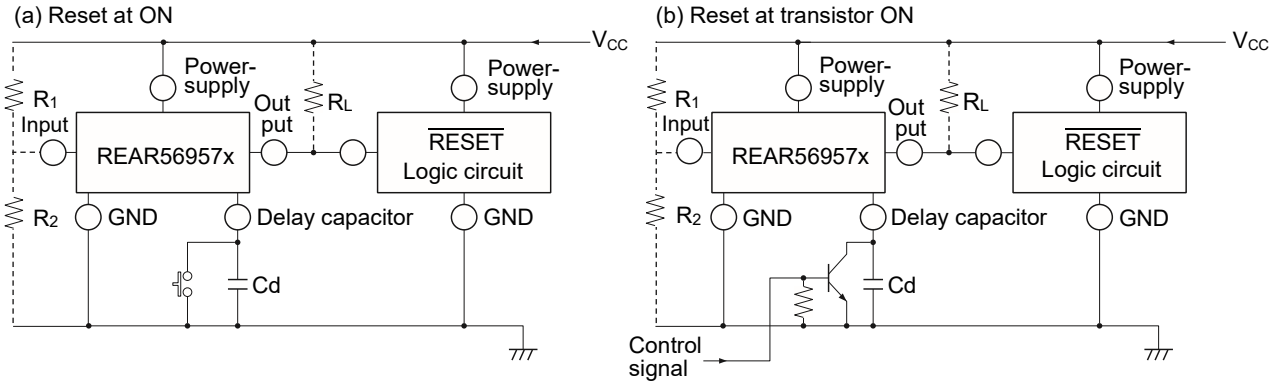
The constant in Figure sets the detection voltage to 2.66V (TYP). However, the detection voltage can be adjusted by changing R_1 or R_2 .

The detection accuracy of the IC alone is $\pm 4\%$.



Application Example on 3V Microcontroller System

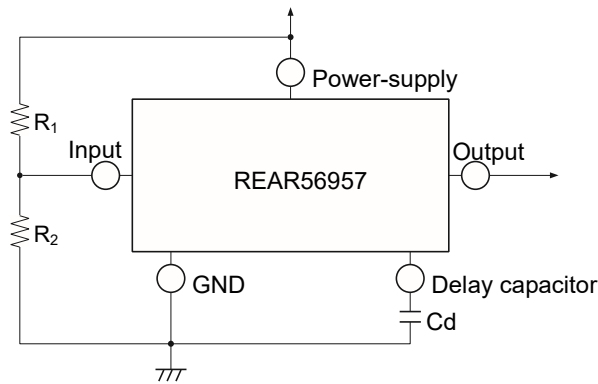
Case of Using Reset Signal except Supply Voltage in the REAR56957



Case of Using Reset Signal except Supply Voltage in the REAR56957

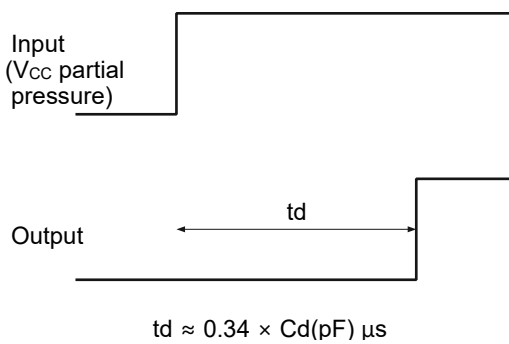
Delay Waveform Generating Circuit

When REAR56957 are used, a waveform with a large delay time can generate only by adding a small capacitor.



Delay Waveform Generating Circuit

Operating Waveform



Operating Waveform

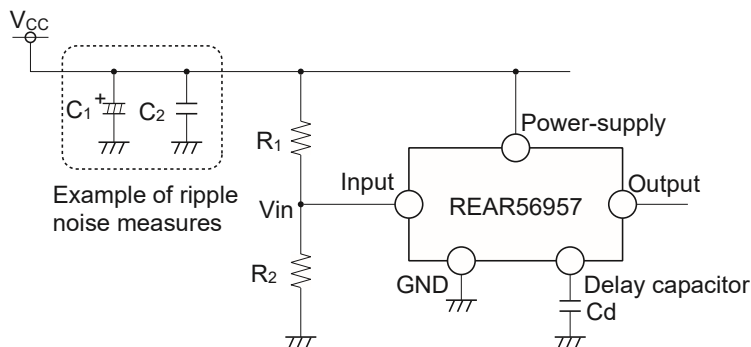
Notice for use

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.



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

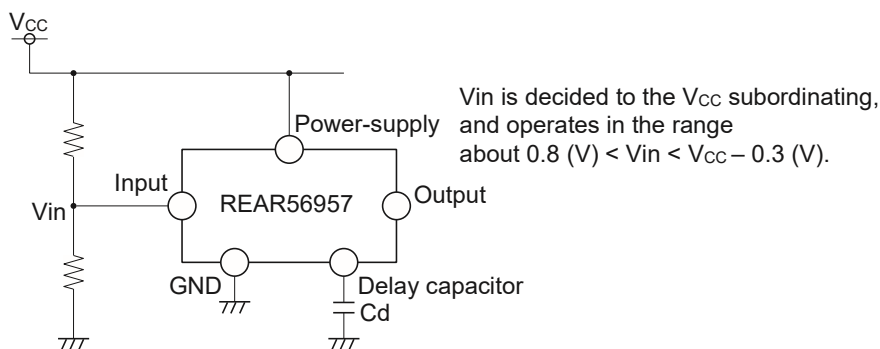
The following voltage is recommended to be input to the input terminal (pin 2).

$$\text{about } 0.8 \text{ (V)} < V_{in} < V_{CC} - 0.3 \text{ (V)} \dots \text{ at } V_{CC} \leq 7 \text{ V}$$

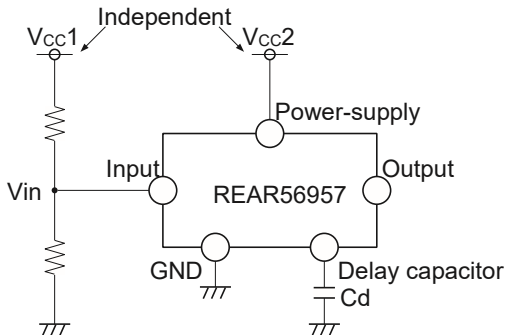
$$\text{about } 0.8 \text{ (V)} < V_{in} < 6.7 \text{ (V)} \dots \text{ at } V_{CC} > 7 \text{ V}$$

2. About using input terminal

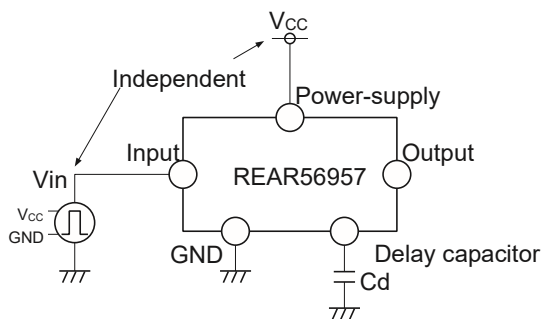
Please do an enough verification to the transition characteristic etc. of the power supply when using independent power supply to input terminal (pin 2).



Recommended Example of Circuit



Example 1. Independent power supply system
Please do enough verifying about transition characteristic of Vcc1 and Vcc2



Example 2. Logic pulse input (not recommended)

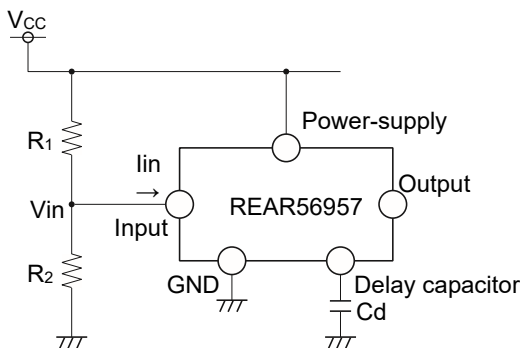
3. Calculation of detecting voltage

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.

$$V_s = 1.25 \times \left(\frac{R_1 + R_2}{R_2} \right) + \frac{I_{in} \times R_1}{\text{error margin}}$$



Influence of Input Current

4. About the voltage input outside ratings

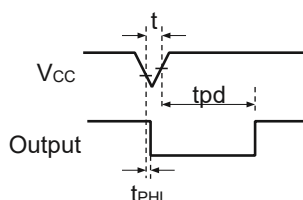
Please do not input the voltage outside ratings to the input terminal.

An internal protection diode becomes order bias, and a large current flows.

Setting of 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.



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 $100 \mu\text{F}$. 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 $10 \mu\text{s}$ when delay capacitor $C_d = 0.1 \mu\text{F}$.

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 $C_1 = 100 \mu\text{F}$.

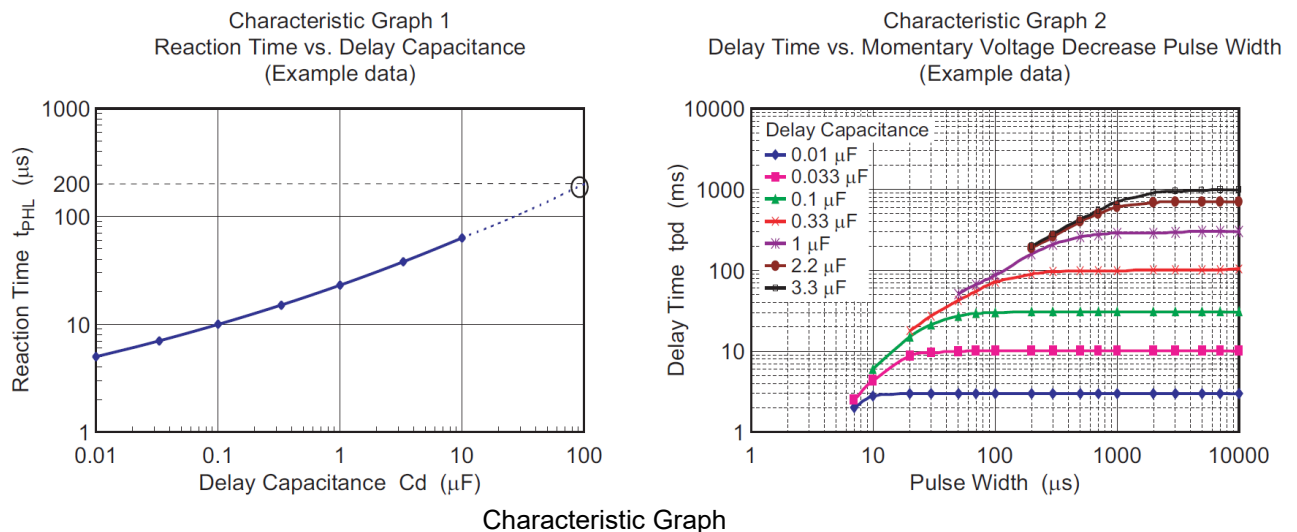
(Characteristic graph 1 is used and extrapolation in case of $C_d = 100 \mu\text{F}$.)

Therefore, it doesn't react to momentary voltage-decrease that is shorter than this.

(3) Original delay time is not obtained.

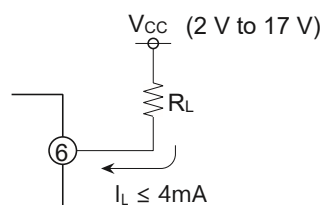
When the momentary voltage-decrease time 't' is equivalent to t_{PHL} , the discharge becomes insufficient and the charge starts at that state. This phenomenon occurs at large capacitance. And, original delay time t_{pd} is not obtained.

Please refer to characteristic graph 2. (Delay time versus input pulse width)

**Setting of Output Load Resistance (REAR56957B)**

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).



Output Load Resistance R_L

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除非瑞萨电子产品数据表或其他瑞萨电子文档中明确指定为高可靠性产品或用于恶劣环境的产品，否则瑞萨电子产品不能用于、亦未授权用于可能对人类生命造成直接威胁的产品或系统及可能造成人身伤害的产品或系统（人工生命维持装置或系统、植入体内的装置等）中，或者可能造成重大财产损失的产品或系统（太空系统、海底增音机、核能控制系统、飞机控制系统、关键装置系统、军用设备等）中。对于用户或任何第三方因使用不符合瑞萨电子产品数据表、使用说明书或其他瑞萨电子文档的瑞萨电子产品而遭受的任何损害或损失，瑞萨电子不承担任何责任。
- 使用瑞萨电子产品时，请参阅最新产品信息（数据表、使用说明书、应用指南、可靠性手册中的“半导体元件处理和使用一般注意事项”等），并确保使用条件在瑞萨电子指定的最大额定值、电源工作电压范围、散热特性、安装条件等范围内使用。对于在上述指定范围之外使用瑞萨电子产品而产生的任何故障、失效或事故，瑞萨电子不承担任何责任。
- 虽然瑞萨电子一直致力于提高瑞萨电子产品的质量和可靠性，但是，半导体产品有其自身的具体特性，如一定的故障发生率以及在某些使用条件下会发生故障等。除非瑞萨电子产品数据表或其他瑞萨电子文档中指定为高可靠性产品或用于恶劣环境的产品，否则瑞萨电子产品未进行防辐射设计。用户负责执行安全保护措施，以避免因瑞萨电子产品失效或发生故障而造成身体伤害、火灾导致伤害或损害和/或其他对公众构成危险事故。例如进行软硬件安全设计（包括但不限于冗余设计、防火控制以及故障预防等）、适当的老化处理或其他适当的措施等。由于对微机电软件单独进行评估非常困难且并不实际，所以请用户自行负责对最终产品或系统进行安全评估。
- 关于环境保护方面的详细内容，例如每种瑞萨电子产品的环境兼容性等，请与瑞萨电子的营业部门联系。用户负责仔细并充分查阅对管制物质的使用或含量进行管理的所有适用法律法规（包括但不限于《欧盟RoHS指令》），并在使用瑞萨电子产品时遵守所有适用法律法规。对于因用户未遵守相应适用法律法规而导致的损害或损失，瑞萨电子不承担任何责任。
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