

REAR56957A, REAR56957B

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 found 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

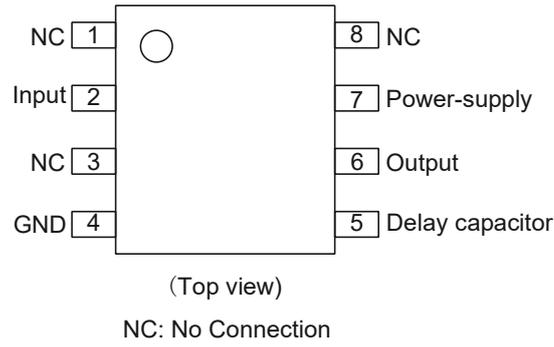
PRODUCT LINEUP

Package Type	SOP	
Part Name	REAR56957AGSM	REAR56957BGSM
Outline	Unit : mm	

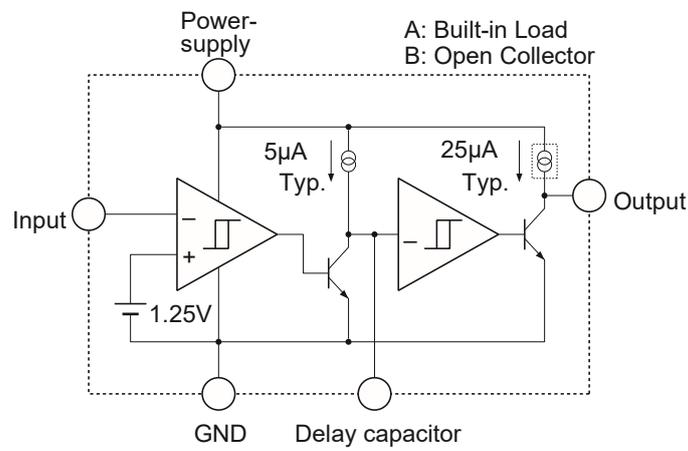
ORDERING INFORMATION

Order Name	Quality Level	Package
REAR56957AGSM#HCA	Normal Quality Level	8-Pin plastic SOP (5.72 mm (225))
REAR56957BGSM#HCA	Normal Quality Level	8-Pin plastic SOP (5.72 mm (225))

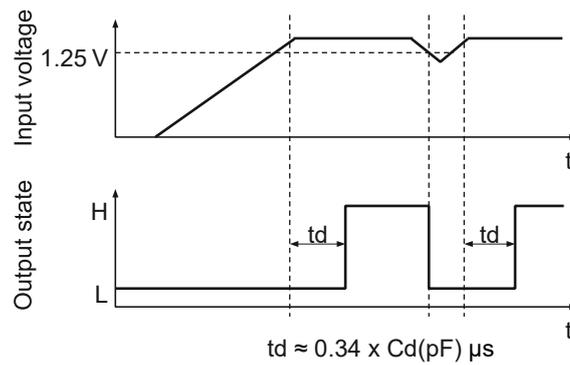
Pin Arrangement



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

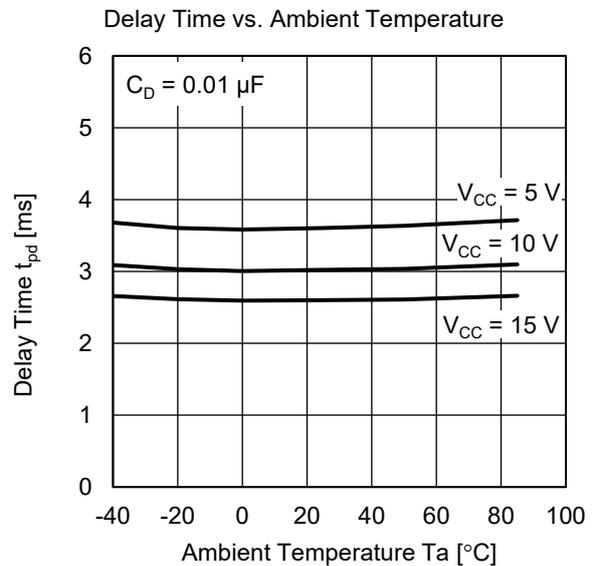
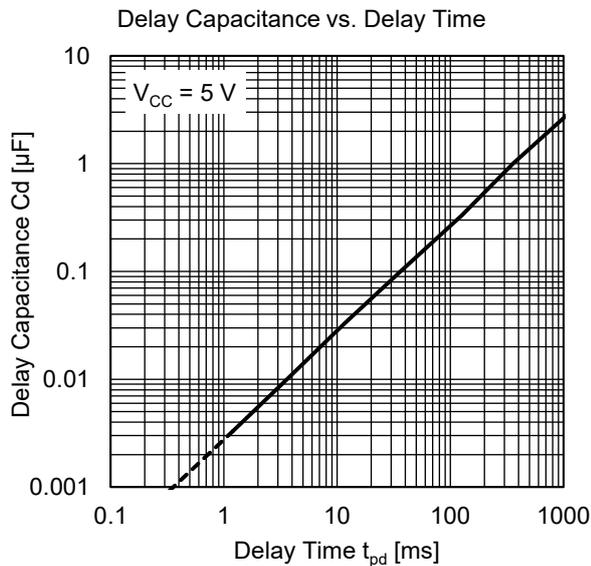
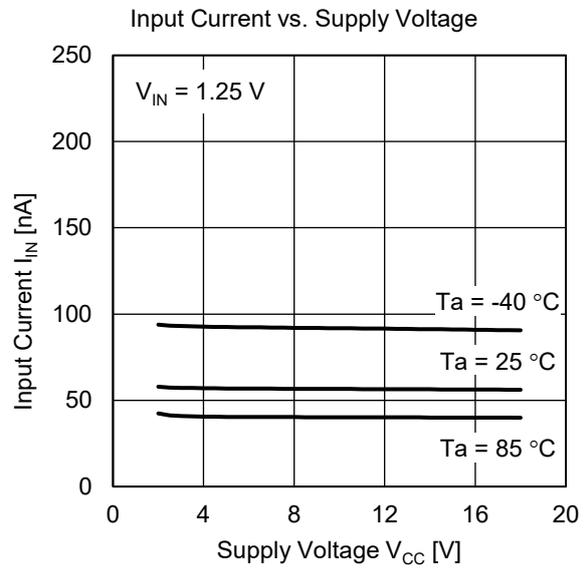
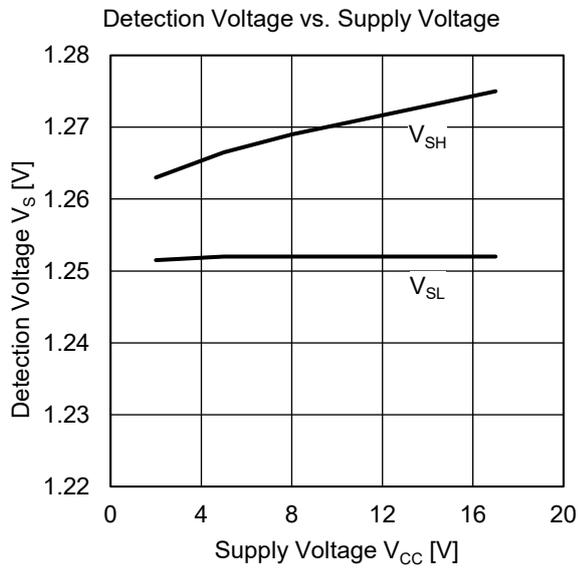
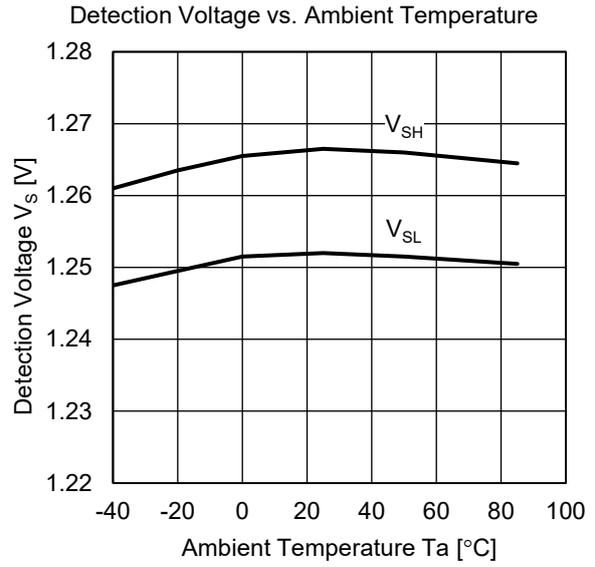
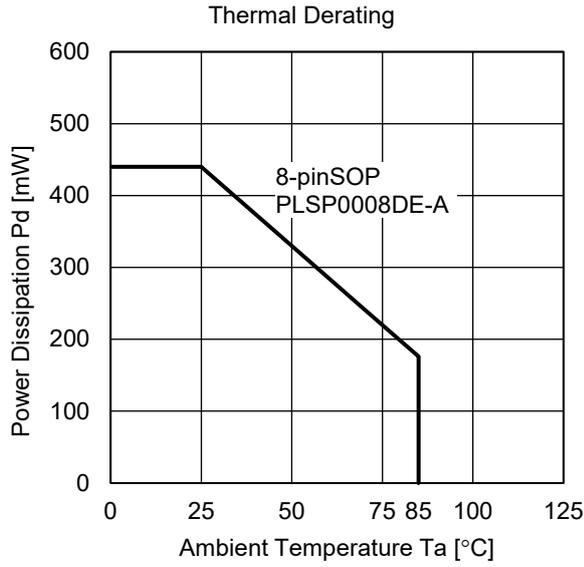
ELECTRICAL CHARACTERISTICS(T_a = 25°C, unless otherwise noted)

“L” Reset Type

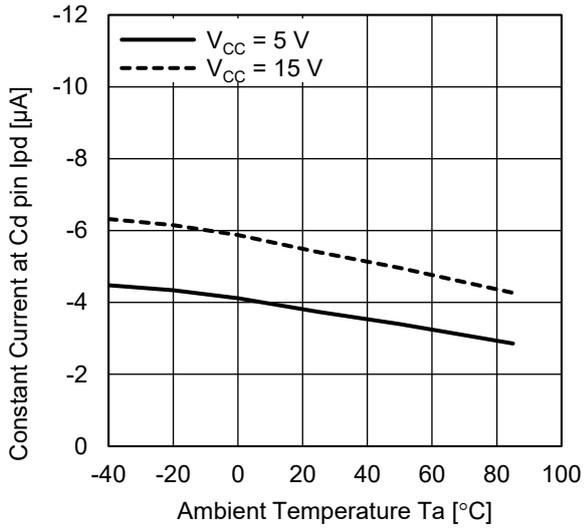
Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Detecting Voltage	V _S	1.20	1.25	1.30	V	
Hysteresis Voltage	ΔV _S	9	15	23	mV	V _{CC} = 5V
Detecting Voltage Temperature Coefficient	V _S /ΔT		0.01		%/°C	
Supply Voltage Range	V _{CC}	2		17	V	
Input Voltage Range	V _{IN}	-0.3		V _{CC}	V	V _{CC} ≤ 7V
		-0.3		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.

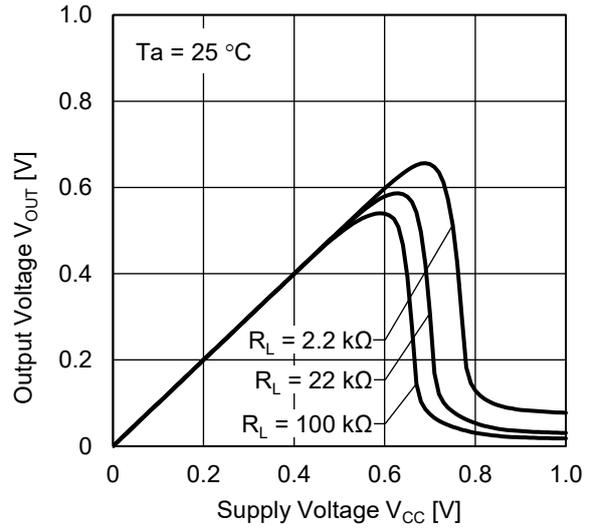
TYPICAL CHARACTERISTICS



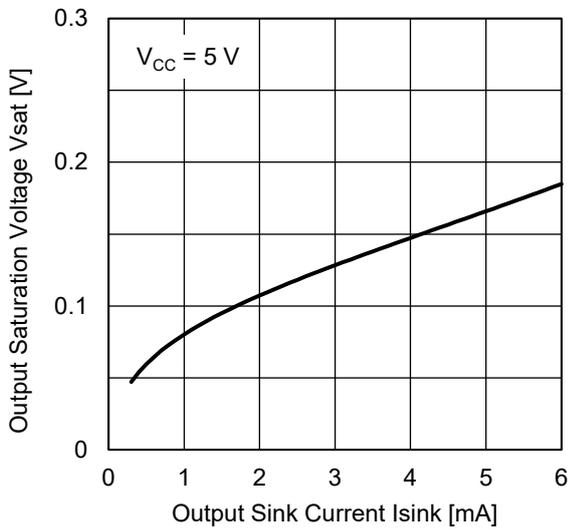
Constant Current at Cd pin vs. Ambient Temperature



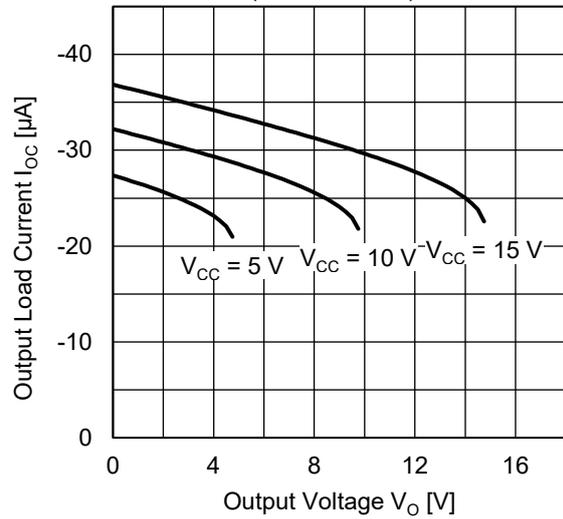
Threshold Operating Voltage



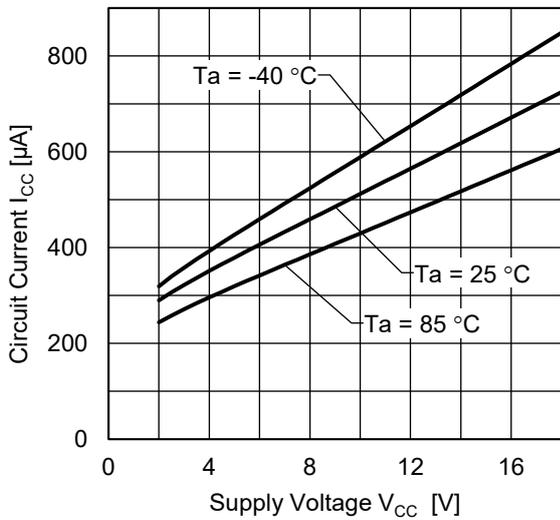
Output Saturation Voltage vs. Output Sink Current



Output Load Current vs. Output Voltage (REAR56957A)



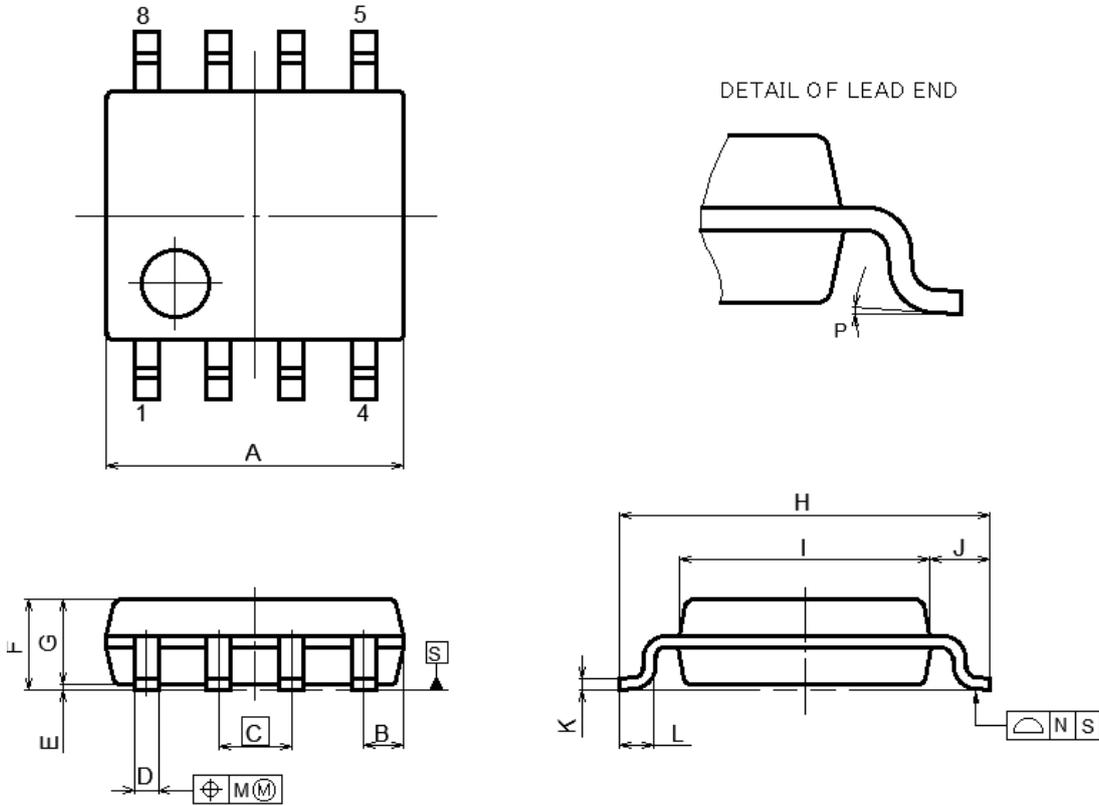
Circuit Current vs. Supply Voltage (REAR56957B)



PACKAGE DRAWINGS

8-PIN PLASTIC SOP

JEITA Package code	RENESAS code	MASS (TYP.) [g]
P-LSOP8-4.4×5.2-1.27	PLSP0008DE-A	0.09[g]



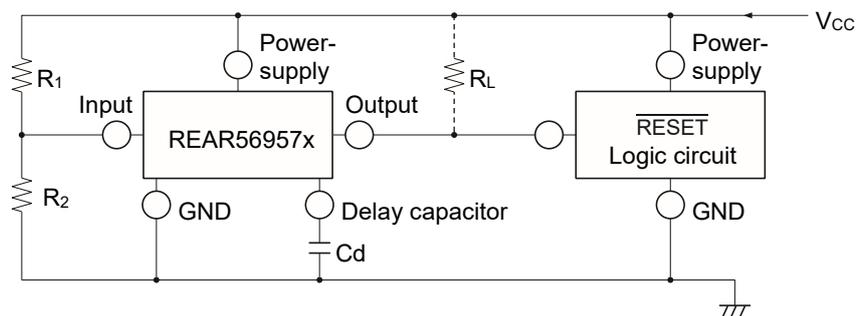
NOTE
 EACH LEAD CENTERLINE IS LOCATED WITHIN 0.12 MM OF
 ITS TRUE POSITION(T.P.) AT MAXIMUM MATERIAL CONDITION.

(UNIT:mm)

ITEM	DIMENSIONS
A	5.2±0.17
B	0.78MAX
C	1.27(T.P)
D	0.40±0.05
E	0.1±0.1
F	1.59±0.21
G	1.49
H	6.5±0.3
I	4.4±0.1
J	1.05±0.15
K	0.2±0.07
L	0.6±0.20
M	0.1MAX
N	0.1MAX
P	4°±4°

EXAMPLE OF APPLICATION CIRCUIT

Reset Circuit of REAR56957



Reset Circuit of REAR56957

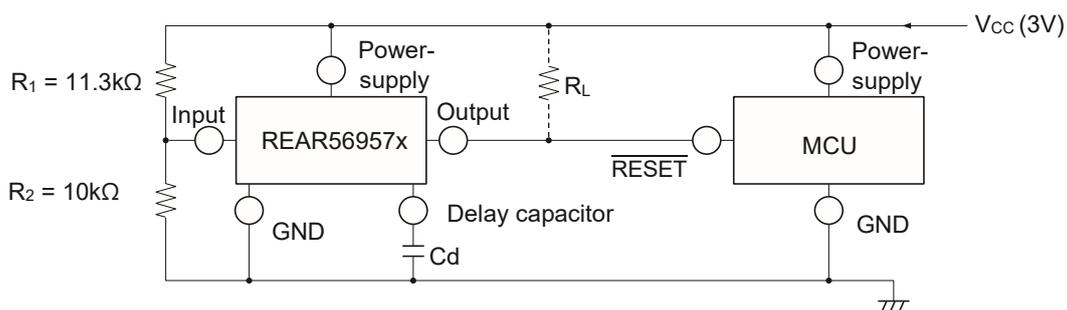
- Notes :
1. The detecting supply voltage is $V_s \times (R_1 + R_2)/R_2$ (V) approximately. $V_s = 1.25$ V (Typ.)
The detecting supply voltage can be set between 2 V and 15 V
 2. The delay time is about $0.34 \times C_d$ (pF) μ s.
 3. If the REAR56957 and the logic circuit share a common power source,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

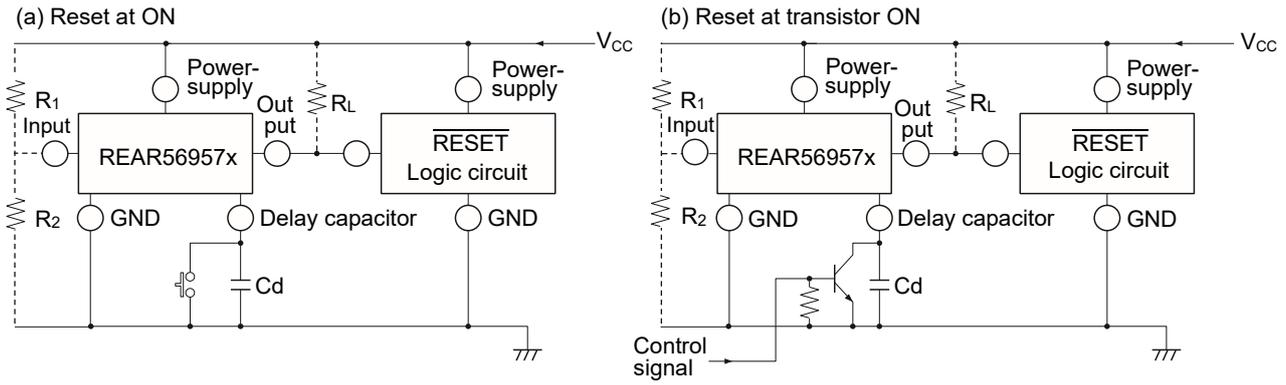
The constant in Figure sets the detection voltage to 2.66V (TYP.). However, the detection voltage can be adjusted by changing R_1 or R_2 .

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



Application Example on 3V Microcontroller System

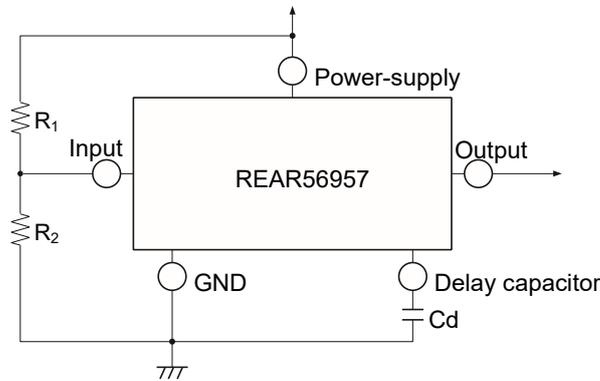
Case of Using Reset Signal except Supply Voltage in the REAR56957



Case of Using Reset Signal except Supply Voltage in the REAR56957

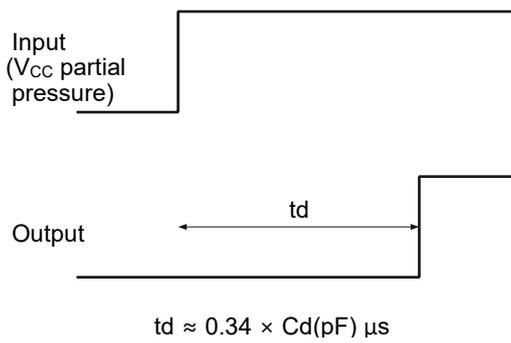
Delay Waveform Generating Circuit

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

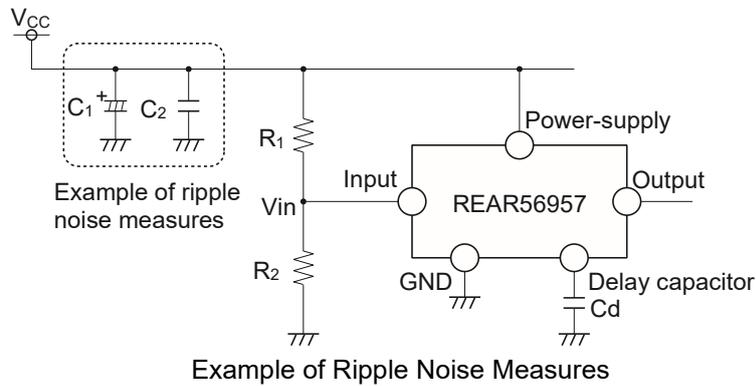
NOTICE FOR USE

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 C₁ and C₂ for the low frequency and for the high frequency between the power supply line and the GND line as shown in following figure.



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

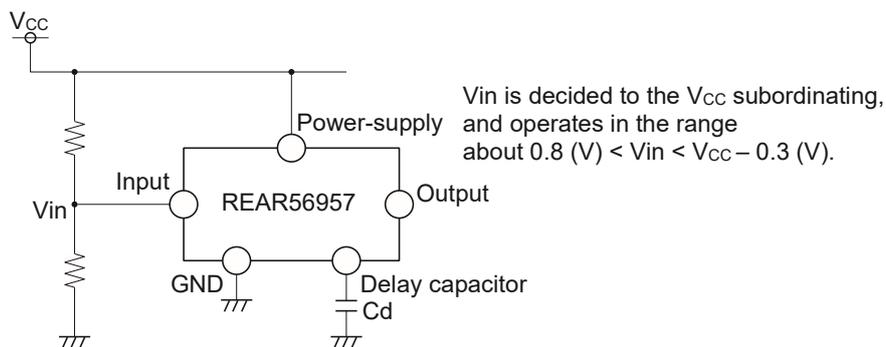
The following voltage is recommended to be input to the input terminal (pin 2).

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

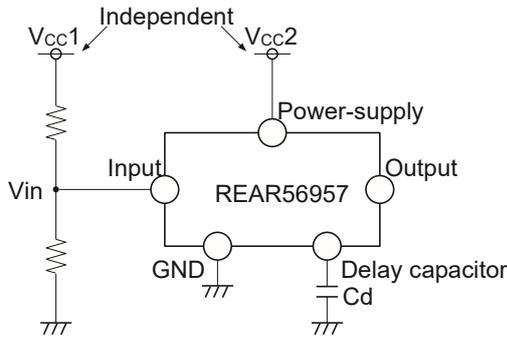
$$\text{about } 0.8 \text{ (V)} < V_{in} < 6.7 \text{ (V)} \dots \text{ at } V_{CC} > 7 \text{ V}$$

2. About using input terminal

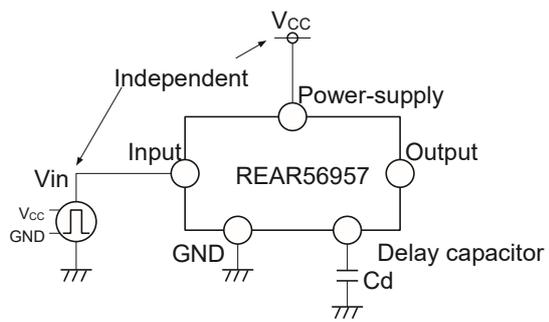
Please do an enough verification to the transition characteristic etc. of the power supply when using independent power supply to input terminal (pin 2).



V_{in} is decided to the V_{CC} subordinating, and operates in the range about 0.8 (V) < V_{in} < V_{CC} - 0.3 (V).



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



Example 2. Logic pulse input
(not recommended)

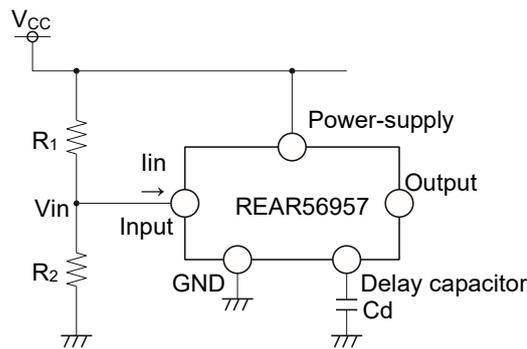
3. Calculation of detecting voltage

Detecting voltage Vs can be calculated by the following expression.

However, the error margin is caused in the detecting voltage because input current I_{in} (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

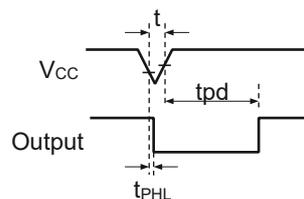
Please do not input the voltage outside ratings to the input terminal.

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 $0.47 \times tpd$ to $2.05 \times tpd$. 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 $C_d = 0.1 \mu\text{F}$.

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

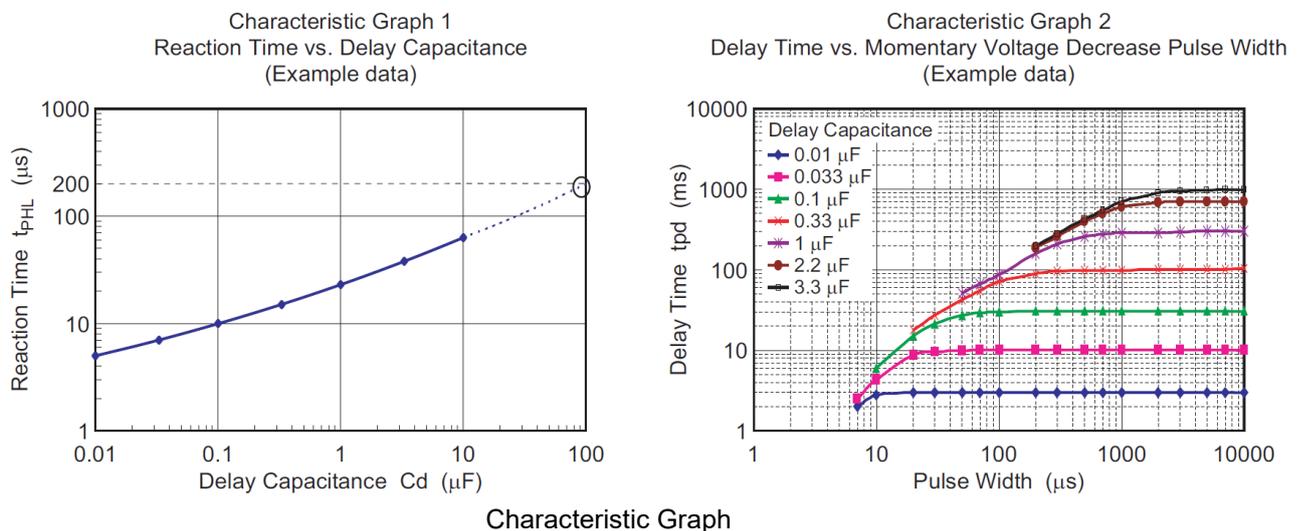
(Characteristic graph 1 is used and extrapolation in case of $C_d = 100 \mu\text{F}$.)

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 tpd is not obtained.

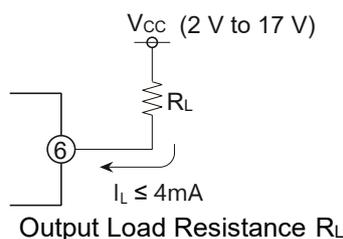
Please refer to characteristic graph 2. (Delay time versus input pulse width)



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).



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