RNA51958A, B

Voltage Detecting, System Resetting IC Series

R03DS0011EJ0400
Rev.4.00
Jun 19, 2012

Description

RNA51958A,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 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)
- Wide supply voltage range: 2 V to 17 V
- Wide application range
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)	Surface Treatment
RNA51958AFPH0	SOP-8 pin	PRSP0008DE-C	FP	H (2,500 pcs / Reel)	0 (Ni/Pd/Au)
RNA51958APT0	DIP-8 pin	PRDP0008AF-B	P	T (1,000 pcs / Box)	0 (Ni/Pd/Au)
RNA51958BFPH0	SOP-8 pin	PRSP0008DE-C	FP	H (2,500 pcs / Reel)	0 (Ni/Pd/Au)
RNA51958BPT0	DIP-8 pin	PRDP0008AF-B	P	T (1,000 pcs / Box)	0 (Ni/Pd/Au)

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

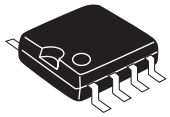
Recommended Operating Condition

- Supply voltage range: 2 V to 17 V

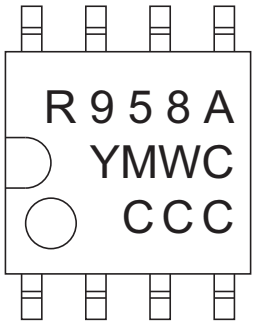
Downloaded from Arrow.com.

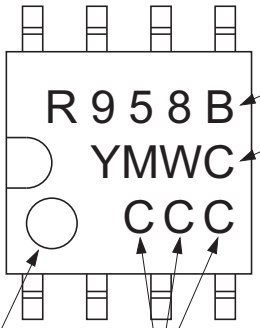
Outline and Article Indication

• RNA51958A, B

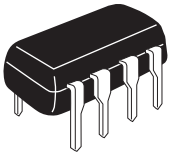


SOP-8

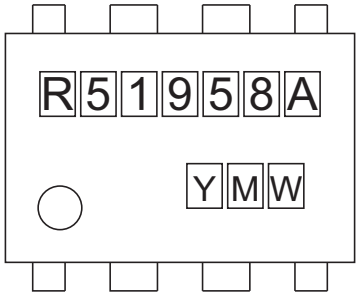


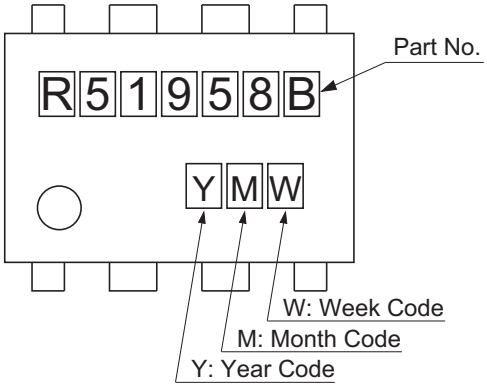


Y: Year Code
(the last digit of year)
M: Month Code
W: Week Code
C: Control Code



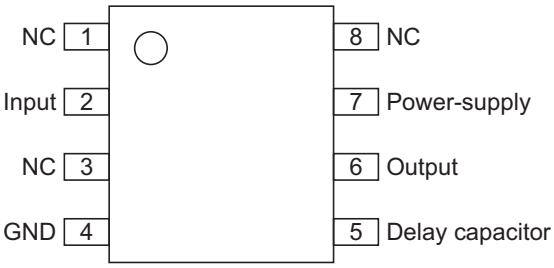
DIP-8





Pin Arrangement

RNA51958A, B



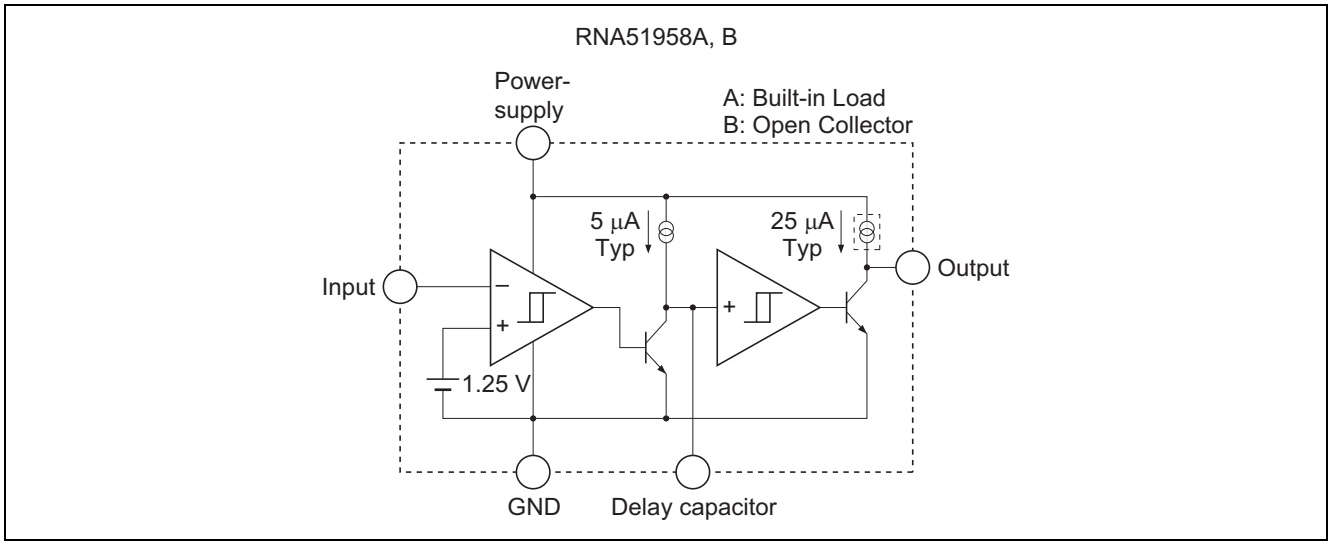
(Top view)

NC: No Connection

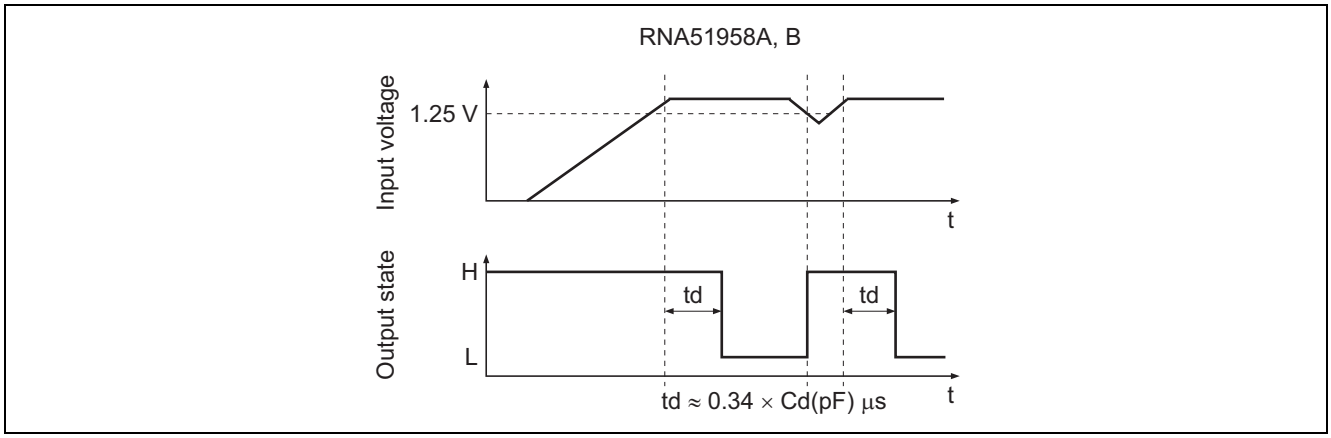
Outline: PRSP0008DE-C (SOP-8)
PRDP0008AF-B (DIP-8)

Downloaded from Arrow.com.

Block Diagram



Operating Waveform



Downloaded from Arrow.com.

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	400	mW	8-pin SOP (PRSP0008DE-C)	
		570		8-pin DIP (PRDP0008AF-B)	
Thermal derating	Kθ	4.4	mW/°C	8-pin SOP (PRSP0008DE-C)	Refer to the thermal derating curve.
		8.3		8-pin DIP (PRDP0008AF-B)	
Operating temperature	Topr	–40 to +85	°C		
Storage temperature	Tstg	–55 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)

- "H" reset type

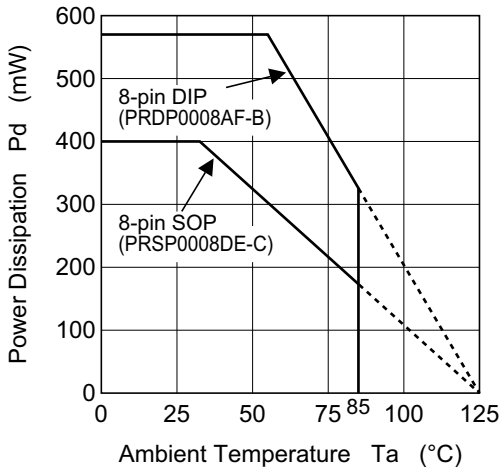
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Detecting voltage	V_S	1.20	1.25	1.30	V	
Hysteresis voltage	ΔV_S	9	15	23	mV	V_{CC} = 5V
Detecting voltage temperature coefficient	$V_S/\Delta T$	—	0.01	—	%/°C	
Supply voltage range	V_{CC}	2	—	17	V	
Input voltage range	Vin	–0.3	—	V_{CC}	V	$V_{CC} \leq 7$V
		–0.3	—	7.0		$V_{CC} > 7$V
Input current	Iin	—	100	500	nA	Vin = 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	Cd = 0.01μF *
Constant current	Ipd	–8	–5	–3	μA	V_{CC} = 5V
Output saturation voltage	Vsat	—	0.2	0.4	V	V_{CC} = 5V, Vin < 1.35V, Isink = 4mA
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.

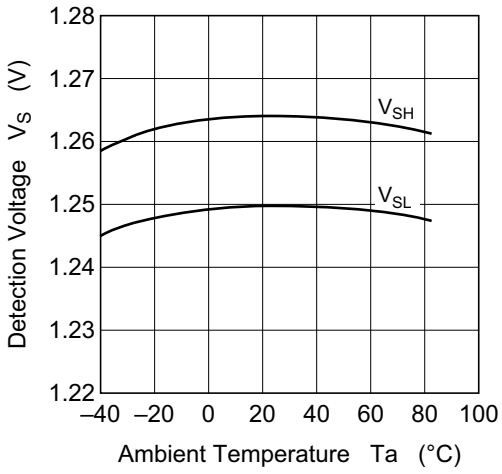
Downloaded from Arrow.com.

Typical Characteristics

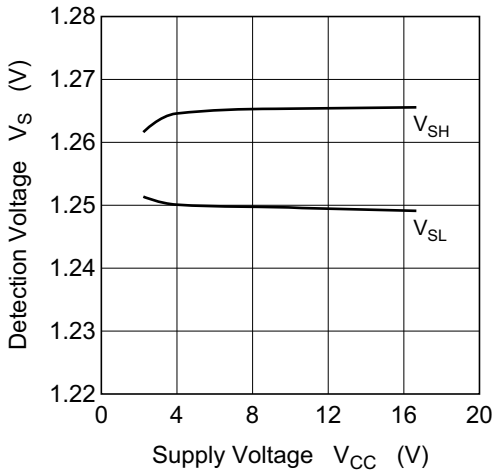
Thermal Derating



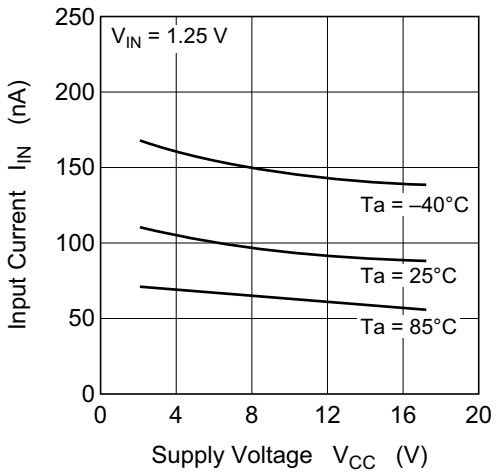
Detection Voltage vs. Ambient Temperature



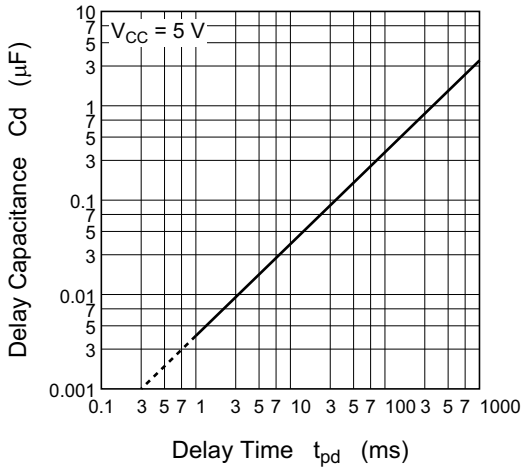
Detection Voltage vs. Supply Voltage



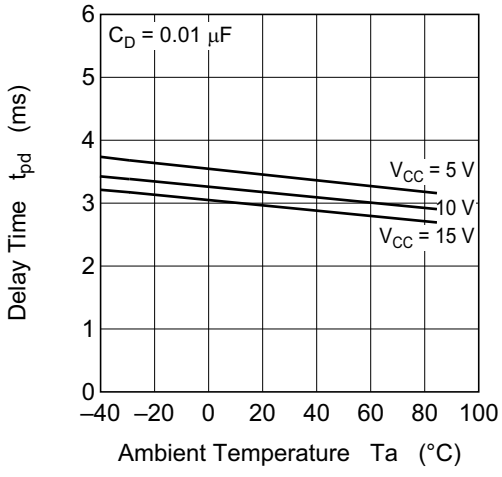
Input Current vs. Supply Voltage



Delay Capacitance vs. Delay Time

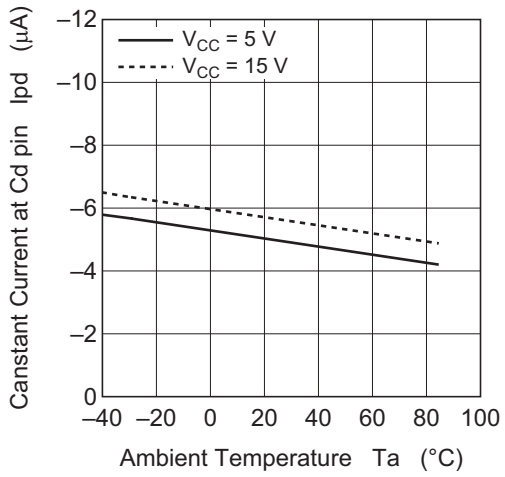


Delay Time vs. Ambient Temperature

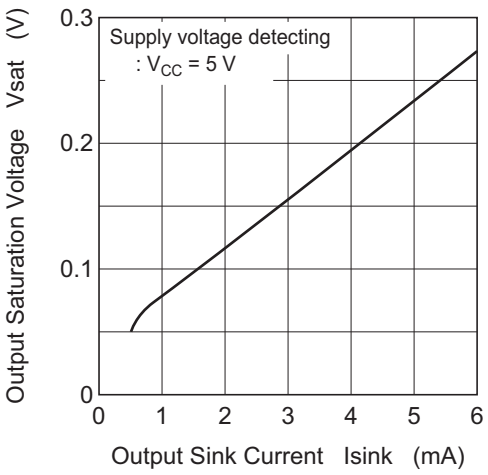


Downloaded from Arrow.com.

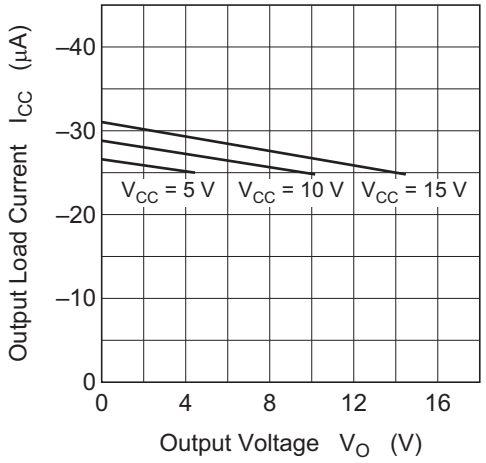
Canstant Current at Cd pin vs. Ambient Temperature



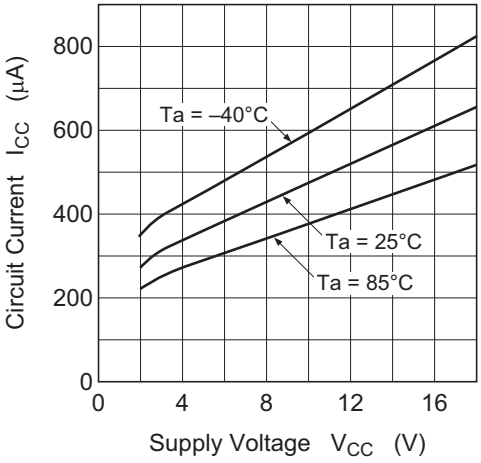
Output Saturation Voltage vs. Output Sink Current



Output Load Current vs. Output Voltage
(RNA51958A)



Circuit Current vs. Supply Voltage
(RNA51958B)



Downloaded from Arrow.com.

Example of Application Circuit

Reset Circuit of RNA51958

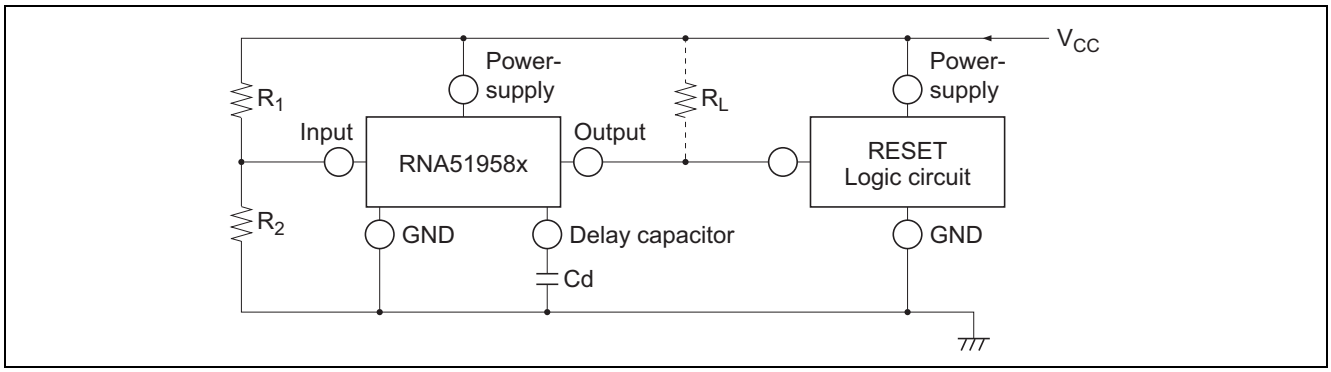


Figure 1 Reset Circuit of RNA51958

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. If a longer delay time is necessary, RNA51953, RNA51957, RNA51958 are used. In this case, the delay time is about 0.34 × Cd (pF) µs.
3. If the RNA51958 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 RNA51958 and the GND side are connected to negative supply voltage respectively.

Case of Using Reset Signal except Supply Voltage in the RNA51958

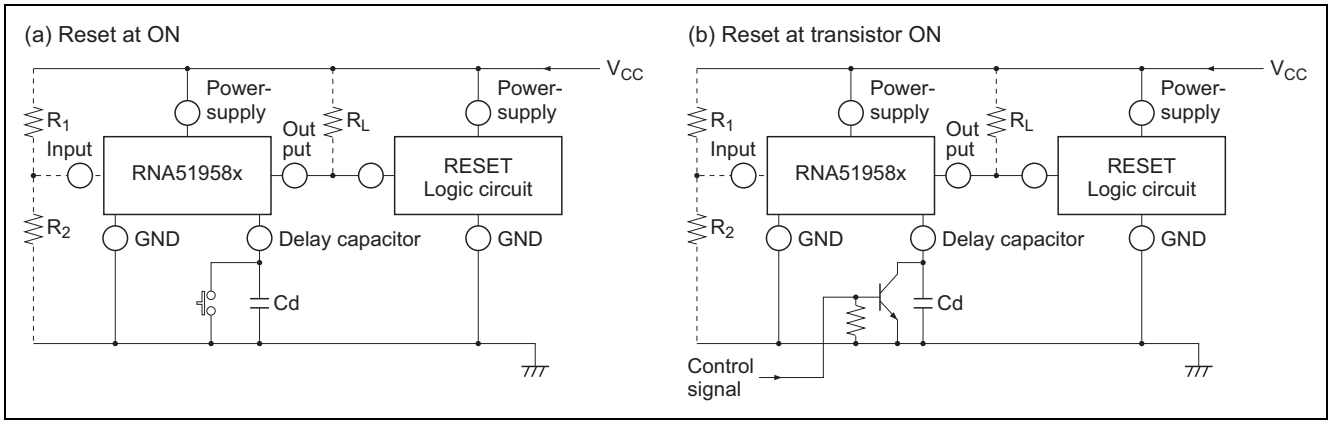


Figure 2 Case of Using Reset Signal except Supply Voltage in the RNA51958

Downloaded from Arrow.com.

Delay Waveform Generating Circuit

When RNA51958 are used, a waveform with a large delay time can generate only by adding a small capacitor.

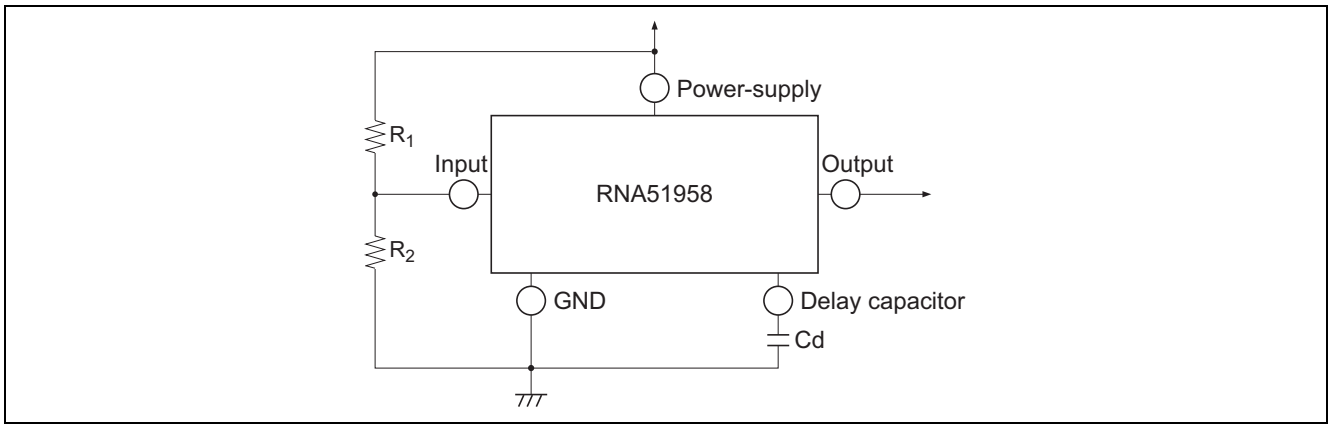


Figure 3 Delay Waveform Generating Circuit

Operating Waveform

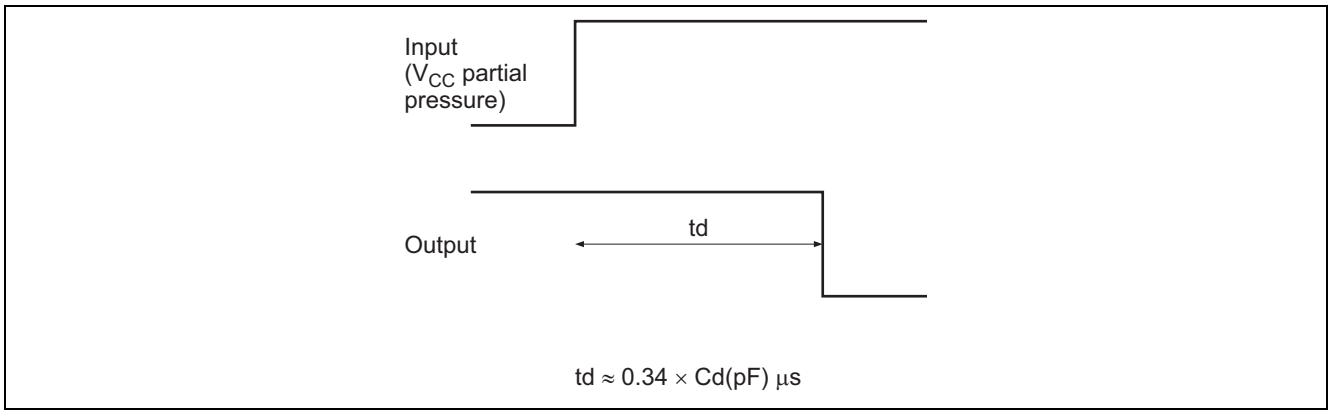


Figure 4 Operating Waveform

Downloaded from Arrow.com.

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 5.

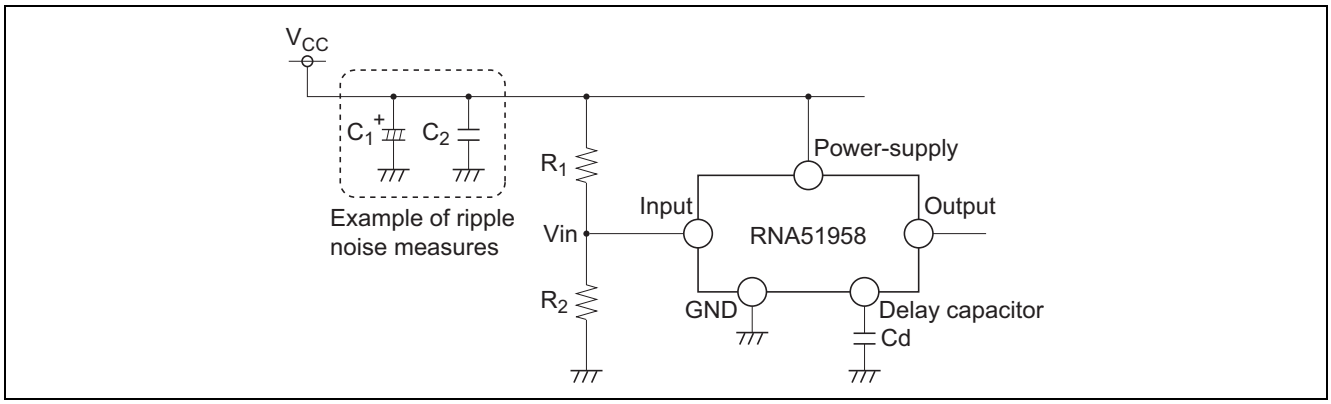


Figure 5 Example of Ripple Noise Measures

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).

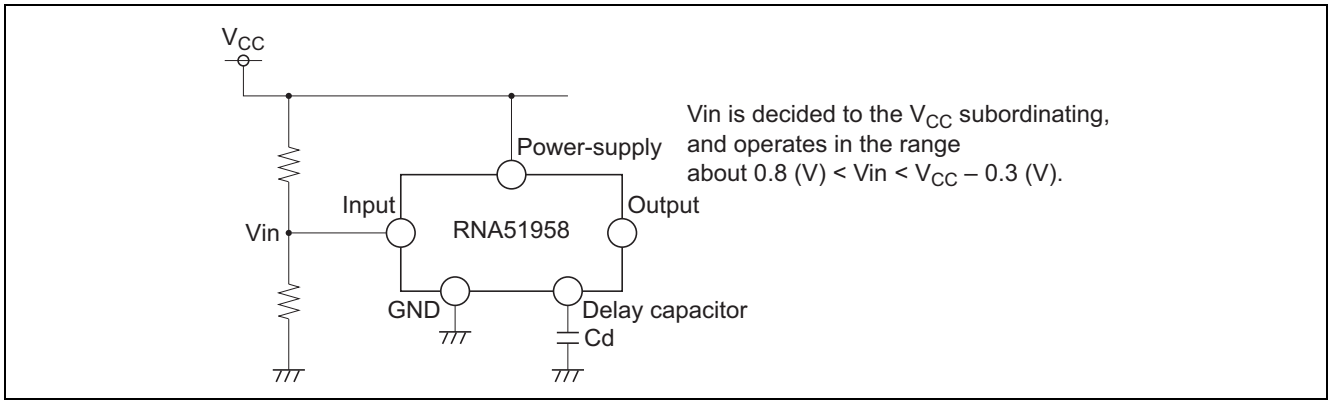
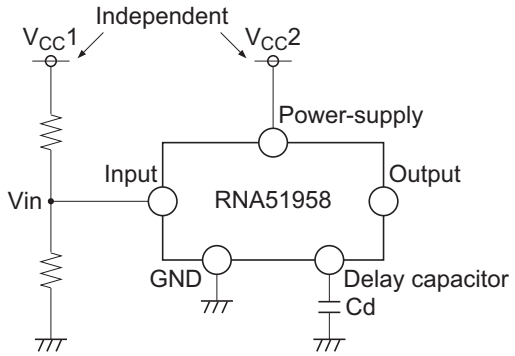
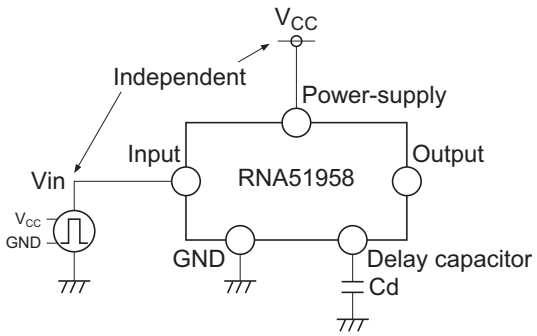


Figure 6 Recommended Example

Downloaded from Arrow.com.



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 7

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.

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

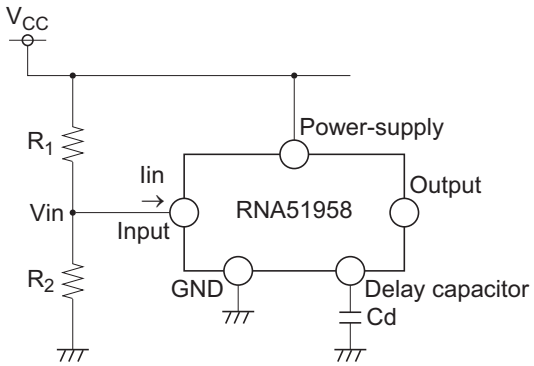


Figure 8 Influence of Input Current

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.

Downloaded from Arrow.com.

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.

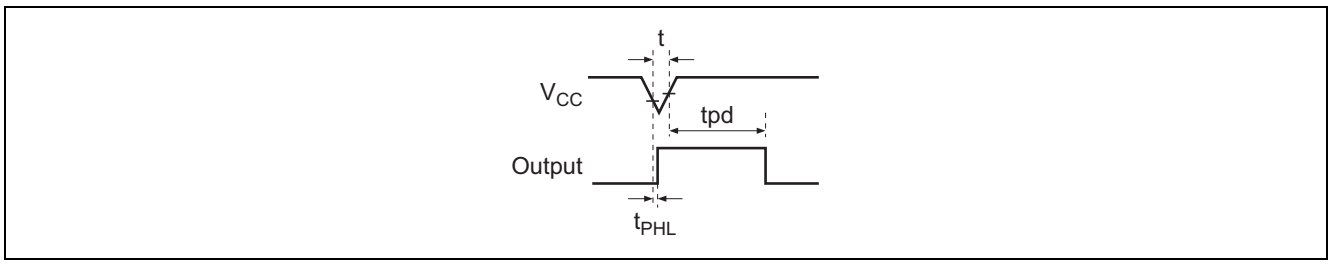


Figure 9 Time Chart at Momentary Voltage-Decrease

(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)

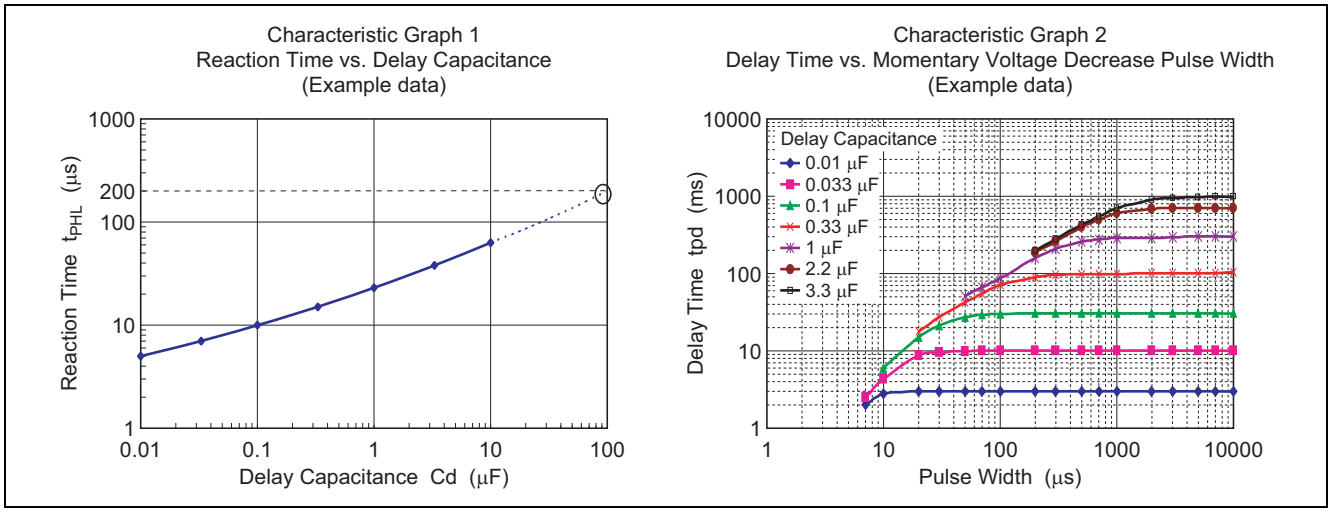


Figure 10 Characteristic Graph

Downloaded from Arrow.com.

Setting of Output Load Resistance (RNA51958B)

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).

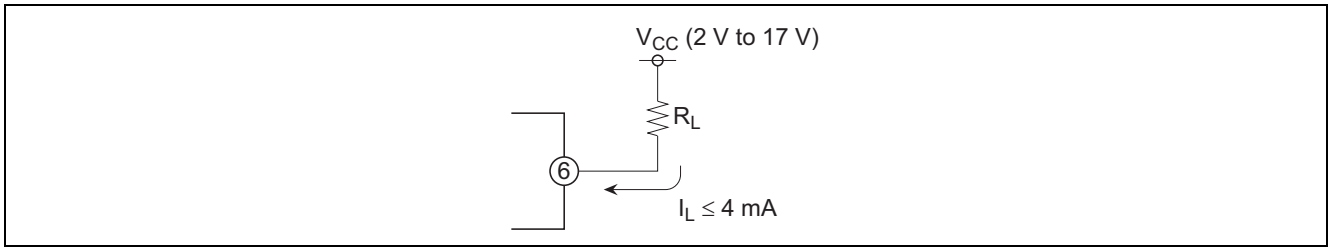


Figure 11 Output Load Resistance R_L

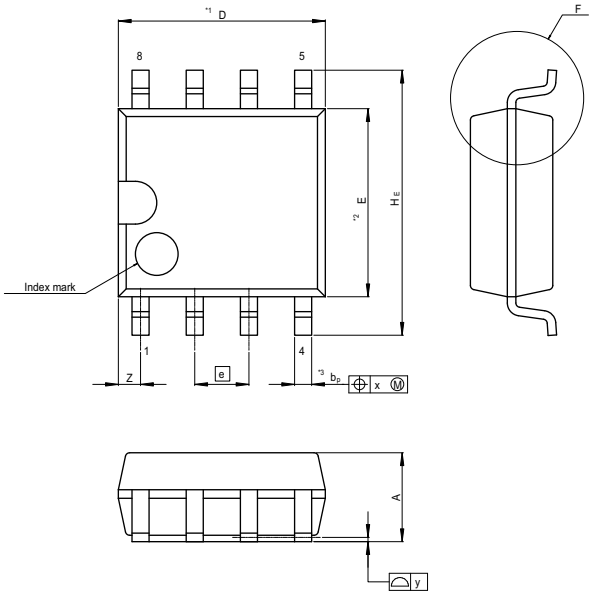
Others

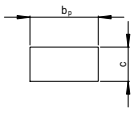
1. Notes when IC is handled are published in our reliability handbook, and please refer it. The reliability handbook can be downloaded from our homepage (following URL). http://www.renesas.com/products/common_info/reliability/index.jsp
2. Additionally, please inquire of our company when there is an uncertain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

Downloaded from Arrow.com.

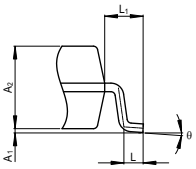
Package Dimensions

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)

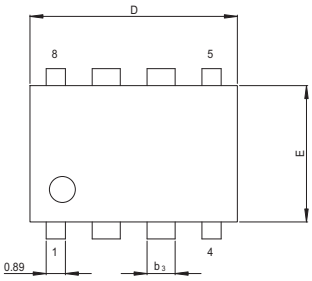


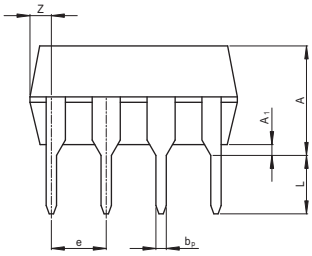
Detail F

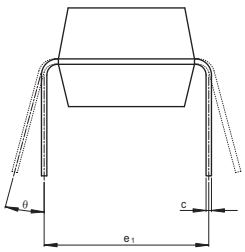
NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

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-DIP8-6.3x9.6-2.54	PRDP0008AF-B	DP-8FV	0.54g







(Ni/Pd/Au plating)

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e_1	—	7.62	—
D	—	9.60	10.6
E	—	6.30	7.4
A	—	—	5.06
A_1	0.5	—	—
b_p	0.40	0.48	0.56
b_3	—	1.30	—
c	0.19	0.25	0.31
θ	0°	—	15°
e	2.29	2.54	2.79
Z	—	—	1.27
L	2.54	—	—

Downloaded from Arrow.com.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.
   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.
   Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

RENESAS

SALES OFFICES

Renesas Electronics Corporation

http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

© 2012 Renesas Electronics Corporation. All rights reserved.

Colophon 2.0

Downloaded from Arrow.com.