

M5295AL/AP/AFP

Watchdog Timer

REJ03D0780-0200
Rev.2.00
Jun 15, 2007

Description

M5295A is a semiconductor integrated circuit which is designed for system reset to detect +5 V power supply.

This IC keeps the operation microcomputer watching. When the system is abnormal, it generates reset output until the system returns to normal states of the system.

It is possible to vary the two detective voltage by connecting the resistor, so it is suitable to high quality and high performance system.

Features

- Watchdog timer
- Power on reset timer
- Low circuit current: 0.8 mA (Typ, $V_{CC} = 5\text{ V}$)
- Wide supply voltage range: $V_{CC(max)} = 15\text{ V}$

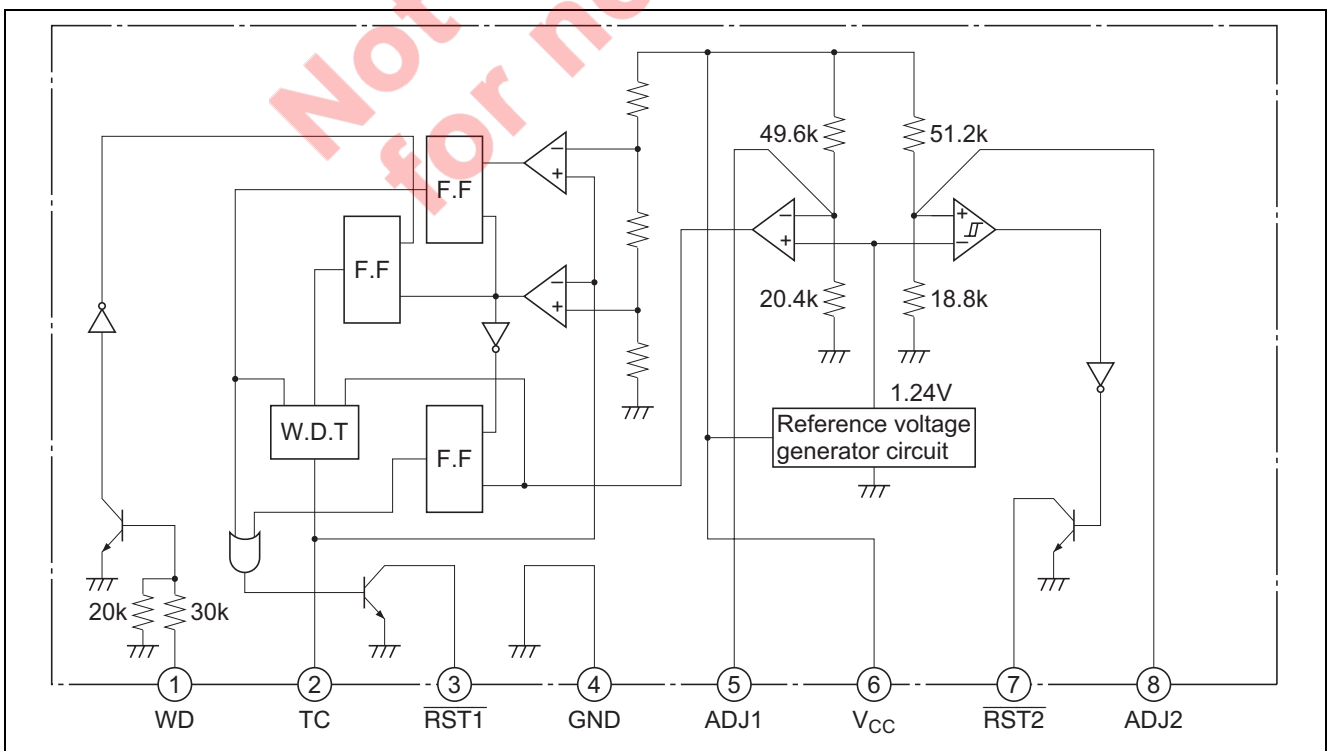
Application

- Microcomputer system

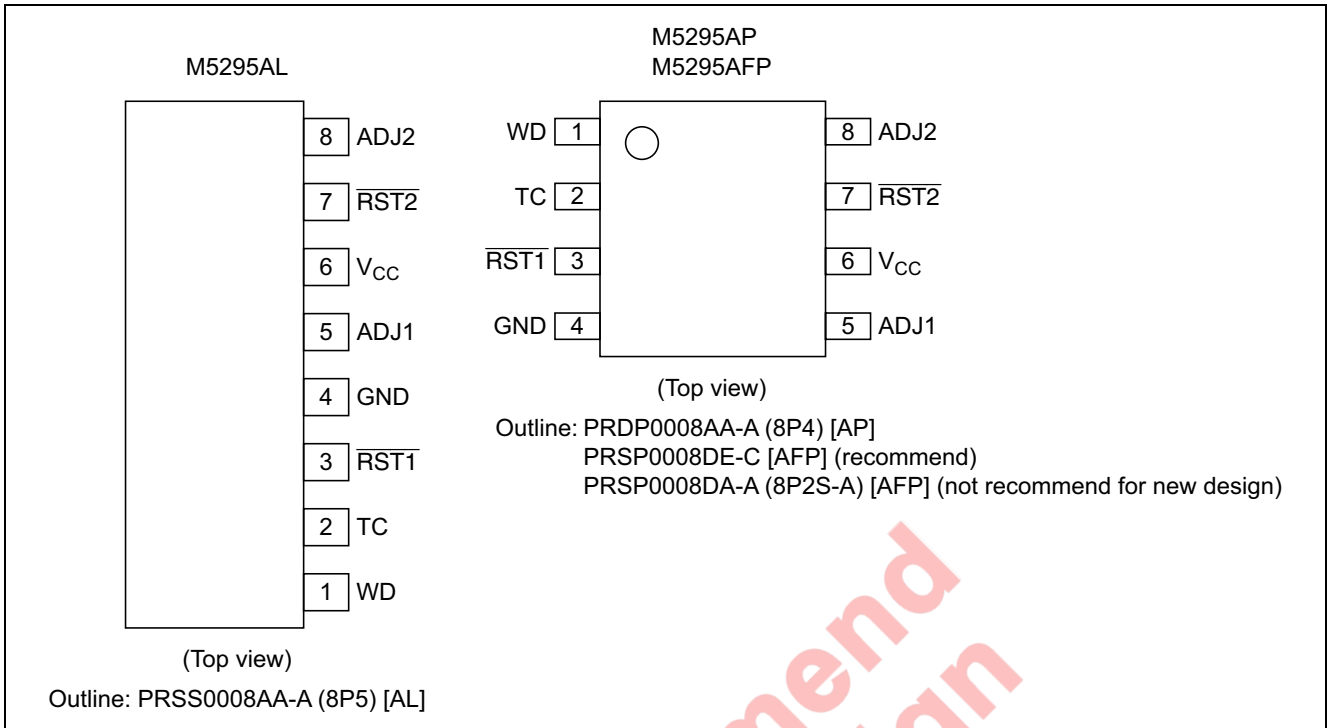
Recommended Operating Condition

- Supply voltage range: 4 V to 15 V
- Rated supply voltage: 5 V

Block Diagram



Pin Arrangement



Not recommend
for new design

Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

Item	Symbol	Ratings	Unit
Supply voltage	V _{CC}	15	V
Input voltage	V _{IN}	-10 to +10	V
Output voltage	V _{OUT}	15	V
Output current	I _{OUT}	10	mA
Power dissipation	P _d	800(AL)/625(AP)/440(AFP)	mW
Thermal derating	K _θ	8.0(AL)/6.25(AP)/4.4(AFP)	mW/°C
Operating temperature	T _{opr}	-20 to +75	°C
Storage temperature	T _{stg}	-55 to +125	°C

Electrical Characteristics

(Ta = 25°C, unless otherwise noted)

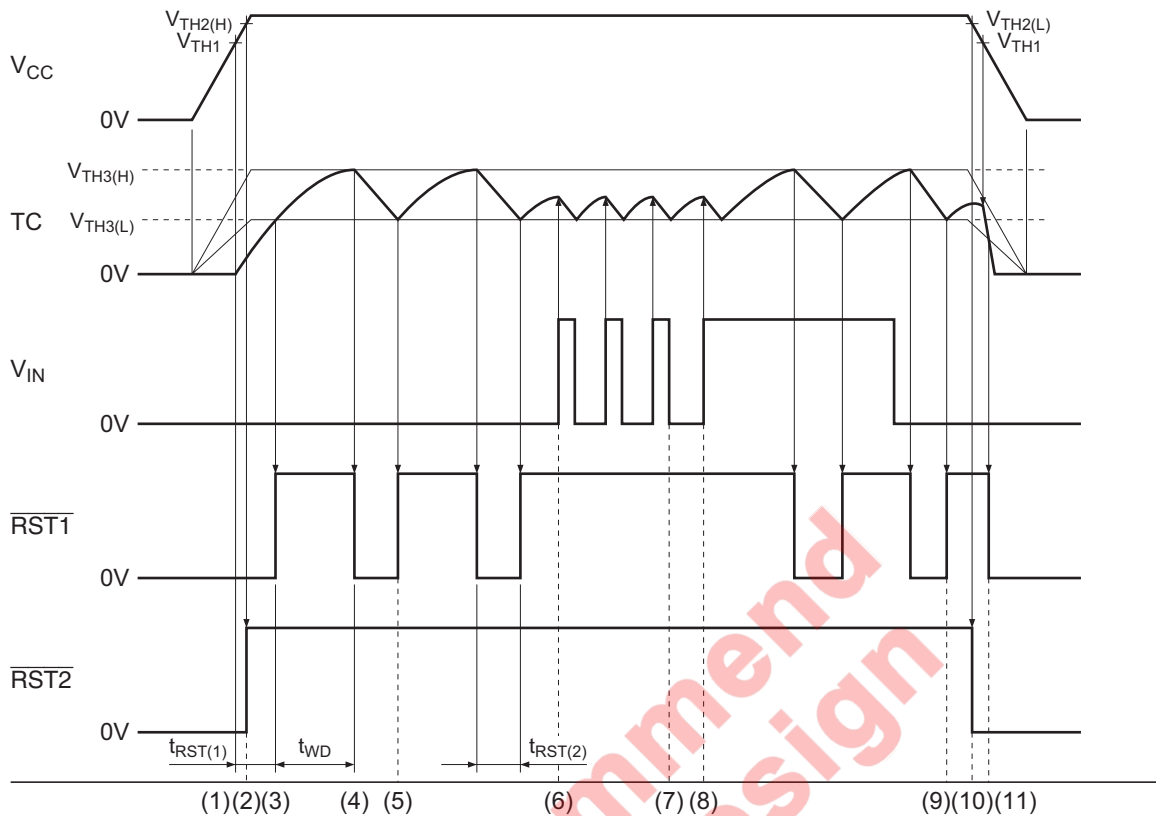
DC Characteristics

Item	Symbol	Min	Typ	Max	Unit	Pin	Test Conditions
WD input current	I _{IH}	0.06	0.15	0.25	mA	WD	V _{IN} = 5V
	I _{IL}	-0.05	-0.1	-0.15			V _{IN} = -5V
WD input voltage	V _{IH}	2	—	—	V	WD	
	V _{IL}	—	—	0.8			
TC output current	I _{OUT}	—	—	-1	μA	TC	V _{IN} = 1.5V
TC input current	I _{IN}	—	3.3	—	mA	TC	V _{OUT} = 4.2V
Threshold voltage of watchdog timer	V _{TH3(H)}	3.7	4	4.3	V	TC	
	V _{TH3(L)}	1.7	2	2.3			
Output voltage	V _{OL}	—	0.1	0.5	V	RST1	I _{OUT} = 1mA
Output leakage current	I _{leak}	—	—	5	μA	RST2	V _{OUT} = 15V
V _{CC} detective voltage (1)	V _{TH1}	4.05	4.25	4.45	V	V _{CC}	
V _{CC} detective voltage (2)	V _{TH2(H)}	4.5	4.7	4.9	V	V _{CC}	
	V _{TH2(L)}	4.45	4.6	4.75			
	ΔV _{TH2}	0.05	0.1	0.2			
ADJ1 voltage	V ₅	1.17	1.46	1.75	V	ADJ1	
ADJ2 voltage	V ₈	1.07	1.34	1.61	V	ADJ2	
RST1 on voltage	RST1	—	—	0.5	V	RST1	V _{CC} = 1.2V, R _L = 4.7kΩ
RST2 on voltage	RST2	—	—	0.5	V	RST2	V _{CC} = 1.2V, R _L = 4.7kΩ
Circuit current	I _{CC}	—	0.8	1.5	mA	V _{CC}	

DC Characteristics

Item	Symbol	Min	Typ	Max	Unit	Pin	Test Conditions
Watchdog timer	T _{WD}	—	1.1·C·R ₁	—	s	RST1	
		0.5	1.1	1.7	ms		C = 0.1μF, R ₁ = 10kΩ
Reset timer (1)	t _{RST(1)}	—	0.5·C·R ₁	—	s	RST1	
		0.2	0.5	1.1	ms		C = 0.1μF, R ₁ = 10kΩ
Reset timer (2)	t _{RST(2)}	—	830·C	—	s	RST1	R ₁ = 10kΩ
		40	83	220	μs		C = 0.1μF, R ₁ = 10kΩ
Input pulse watch	t _{WDIN}	3	—	—	μs	WD	
Transmittal delay time	t _{d1}	—	20	—	μs	RST1	
	t _{d2}	—	10	—	μs	RST2	

Operating Description



- (1): The V_{CC} rises up to 0.8 V, then $\overline{RST1}$ and $\overline{RST2}$ generates low output, and rising up to 4.25 V, charge of C1 begins.
- (2): The V_{CC} rises up to 4.7 V, then $\overline{RST2}$ generates high.
- (3), (4): The voltage at TC pin is 2 V, then $\overline{RST2}$ generates high, when 4 V, C1 is discharged and $\overline{RST1}$ generates low.
- (5): The voltage at TC pin falls to 2 V, then $\overline{RST1}$ generates high unless normal clock signal is entered to WD pin, $\overline{RST1}$ repeats this operation.
- (6), (7): Before the voltage at TC pin reaches 4 V, if normal clock signal is entered to WD pin, low $\overline{RST1}$ is canceled.
- (8), (9): In the case of entrance of abnormal signal input, as the waveform of TC pin repeats charge and discharge of $\overline{RST1}$ alternatively from 2 V to 4 V, the $\overline{RST1}$ repeats high and low output operation.
- (10): The V_{CC} falls to 4.6 V, then $\overline{RST2}$ generates low, this detective voltage has a 100 mV hysteresis.
- (11): When V_{CC} goes down to 4.25 V (V_{TH1}), the status of TC pin is switched to discharge. When the potential at TC pin is detected being $V_{TH3(H)}$ or $V_{TH3(L)}$, the status of $\overline{RST1}$ becomes "low".

Terminology

$t_{RST(1)}$: Time required for TC pin potential to rise from 0 V $V_{TH3(L)}$ when V_{CC} is being applied.

t_{WD} : Time required for TC pin potential to rise from $V_{TH3(L)}$ to $V_{TH3(H)}$.

$t_{RST(2)}$: Time required for TC pin potential to go down from $V_{TH3(H)}$ to $V_{TH3(L)}$.

Figure 1 Operating Waveform

1. Pin(2) (TC pin) charge time and discharge time

When input to WD pin is abnormal, TC pin output waveform is as shown below:

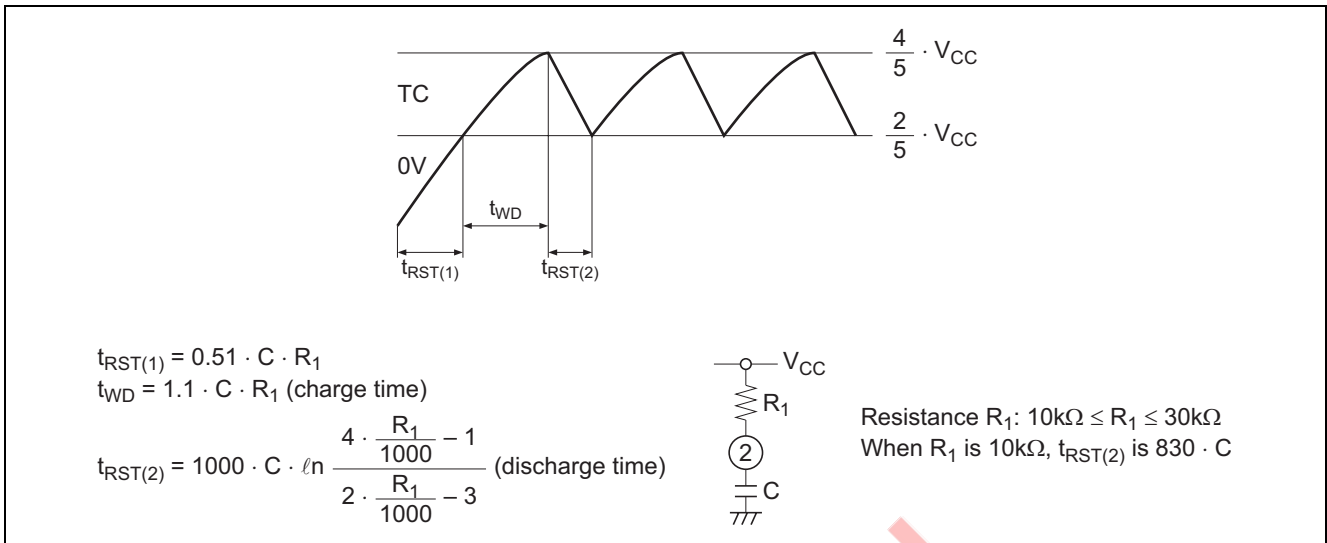


Figure 2

2. Pin (1) (WD pin) input frequency, input pulse width, charge time and discharge time

When input to WD pin is normal, TC pin output waveform is as shown below:

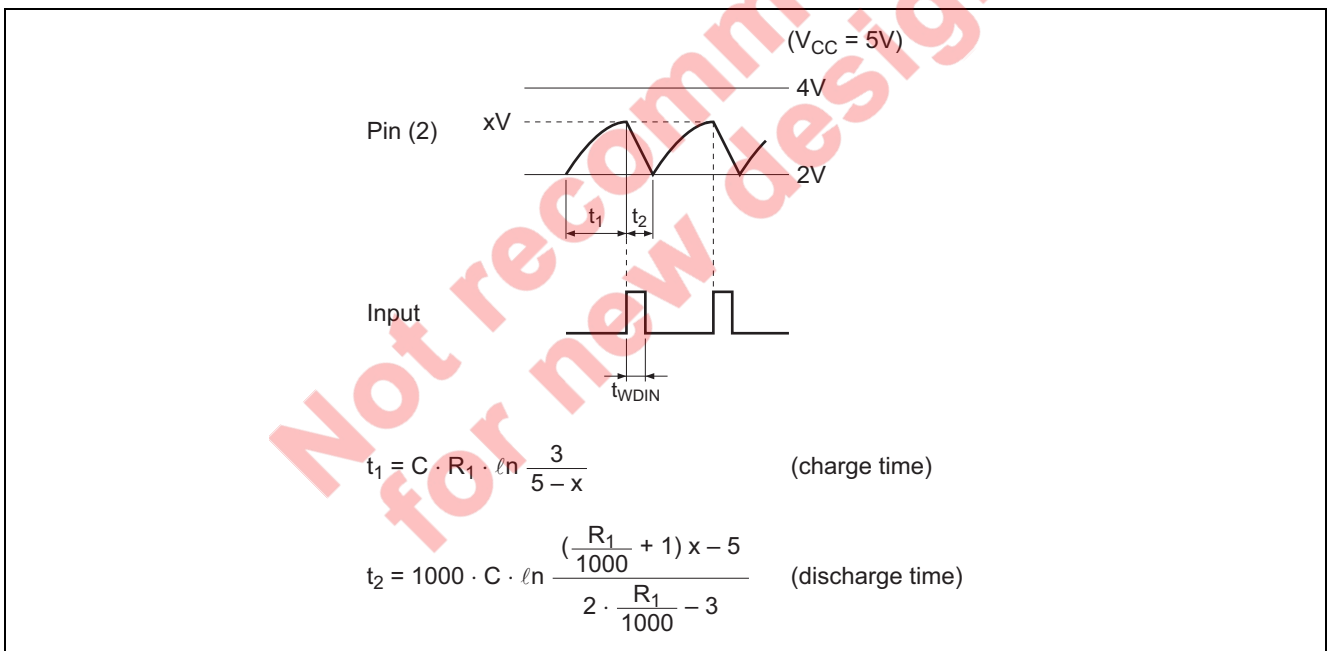


Figure 3

- Pin (1) (WD pin) input requirements
 - Connect capacitor between WD pin and voltage input. (refer to section 3)
 - Input cycle: t_{WD} or less (discharge should start before voltage at WD pin reaches 4 V.)

$$\frac{1}{1.1 \cdot C \cdot R_1} < f$$
 - Input pulse width t_{WDIN} : t_2 or less

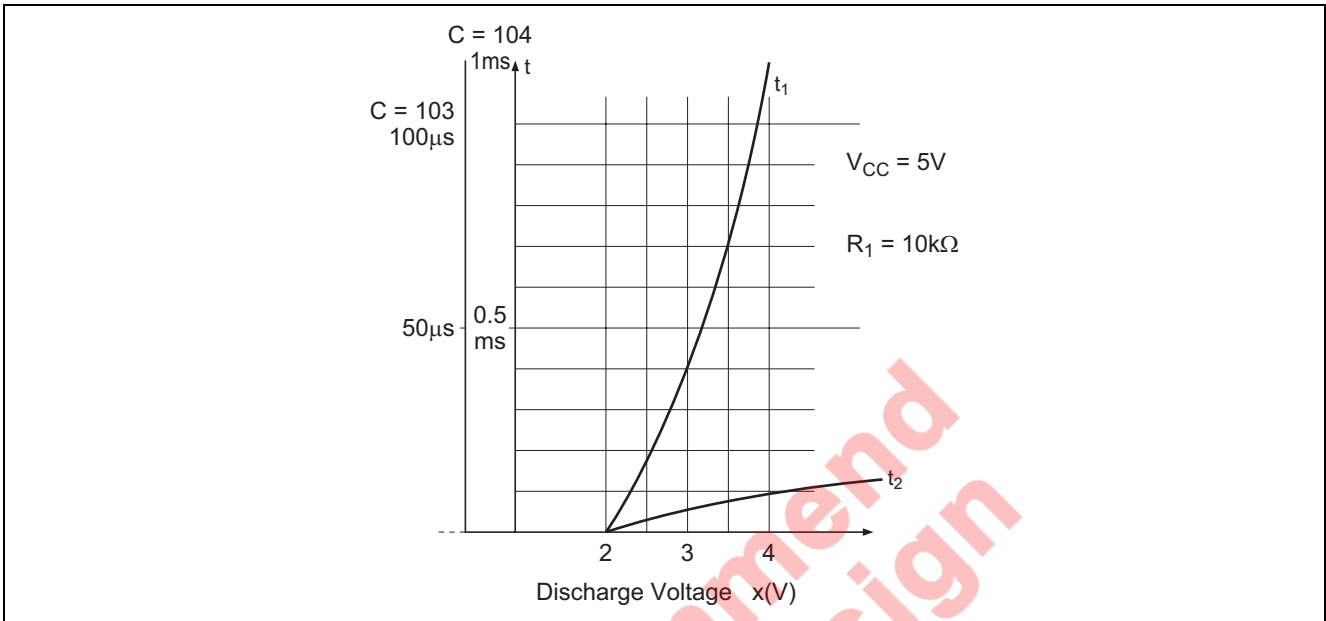


Figure 4

- Relationship between input pulse width and input capacitance C_{in}
 When input to pin (1) is 1.5 V or more, TC pin discharges electricity. Determine pulse width and input capacitance C_{in} with reference to the diagram shown in figure 5.

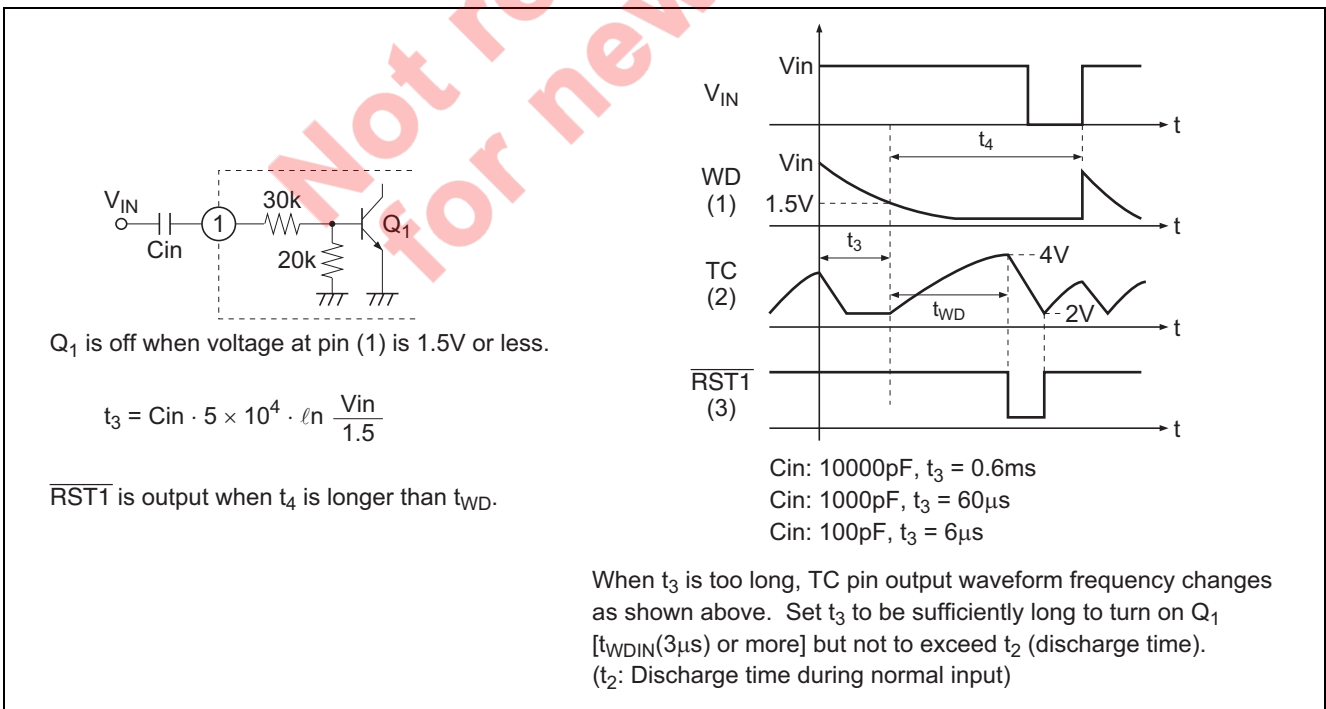


Figure 5

4. V_{CC} detection voltage adjustment

(1) Detection voltage 1 (V_{TH1}) adjustment

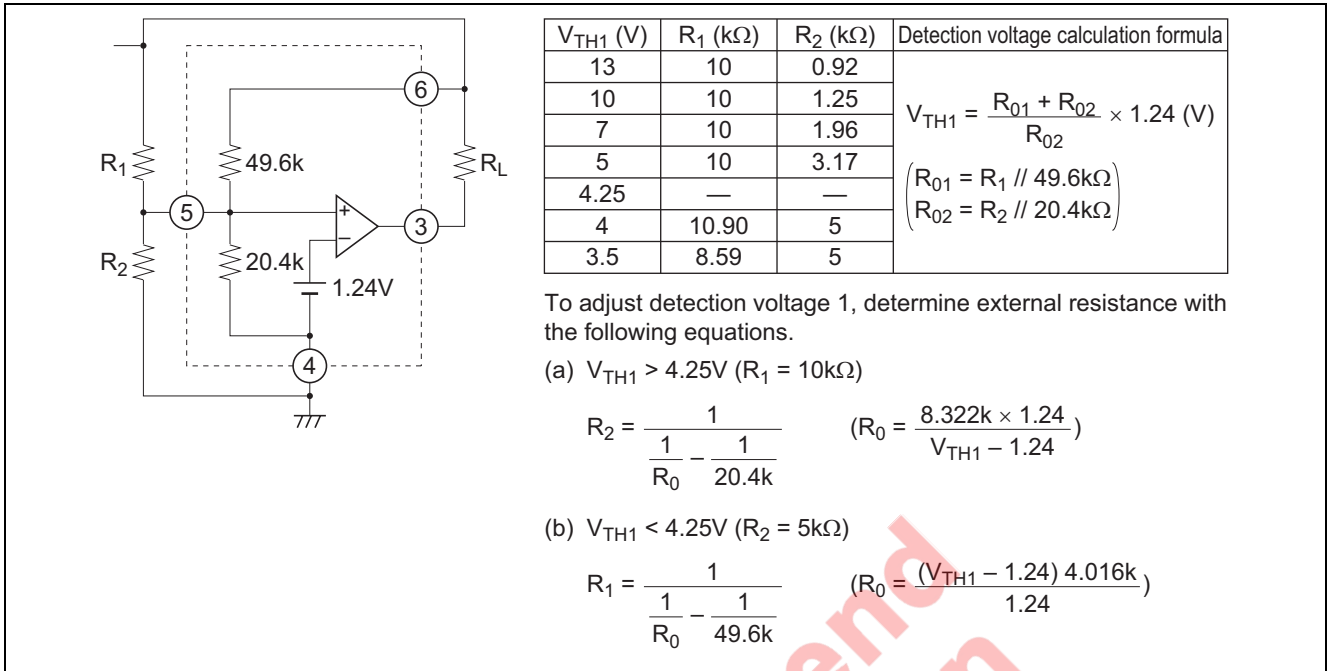


Figure 6 Detection Voltage 1 (V_{TH1}) Adjustment

(2) Detection voltage 2 (V_{TH2(L)}) adjustment

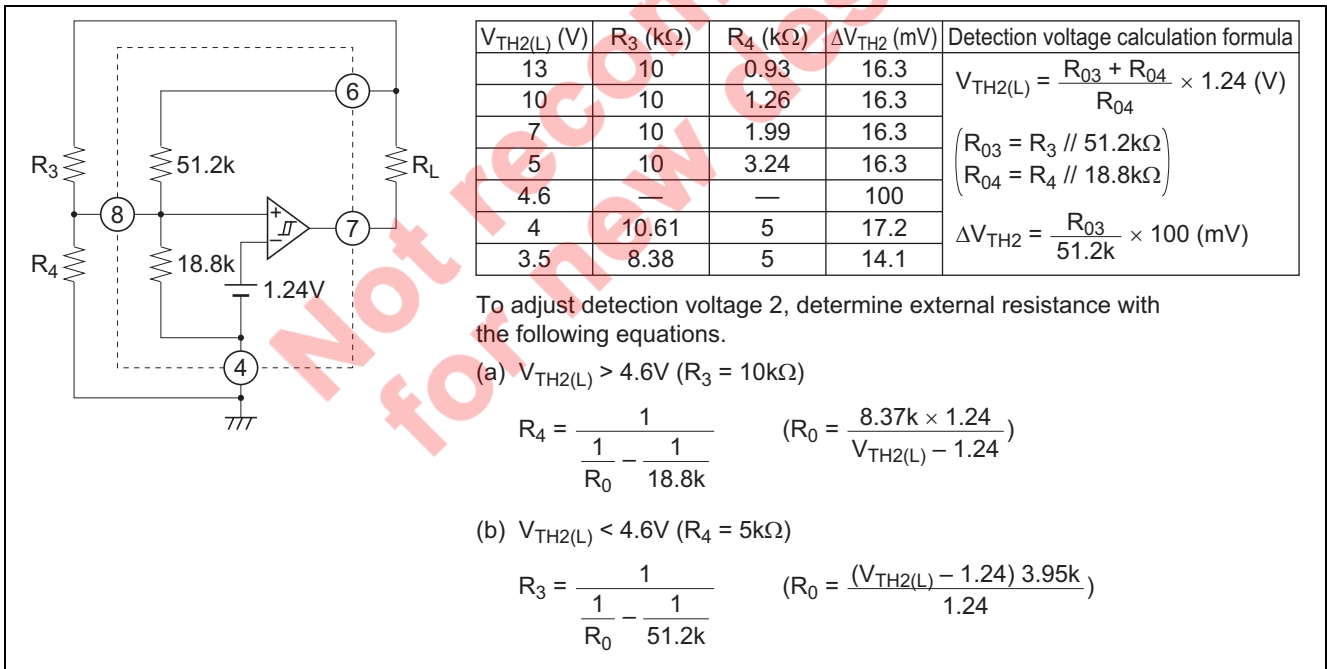


Figure 7 Detection Voltage 2 (V_{TH2(L)}) Adjustment

Application Example

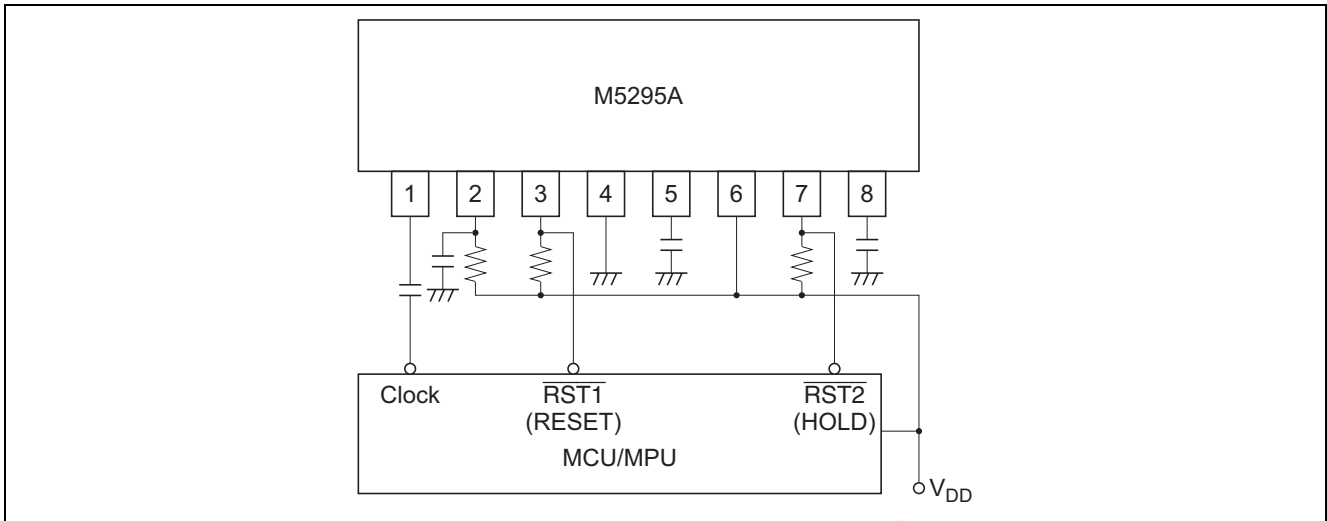


Figure 8 Application Example

Notice for Use

1. When malfunction occurs due to noise or order related trouble, connect capacitance of approximately 1000 pF between pin (5) and GND as well as pin (8) and GND to stabilize operation.
2. To adjust detection voltage, add resistance of 15 kΩ or less to both V_{CC} and GND via adjusting pins. (Set detection voltage to no less than 3 V.)
3. Set t_{WD} and t_{RST(2)} as shown below:

$$110 \mu\text{s} \leq t_{\text{WD}} \leq 1.1 \text{ s}$$

$$8.3 \mu\text{s} \leq t_{\text{RST(2)}} \leq 83 \text{ ms}$$

$$10 \text{ k}\Omega \leq R_1 \leq 30 \text{ k}\Omega$$
4. Input clock pulses to pin (1) via capacitor. To determine capacitance, refer to “Relationship between input pulse width and input capacitance C_{in}”.

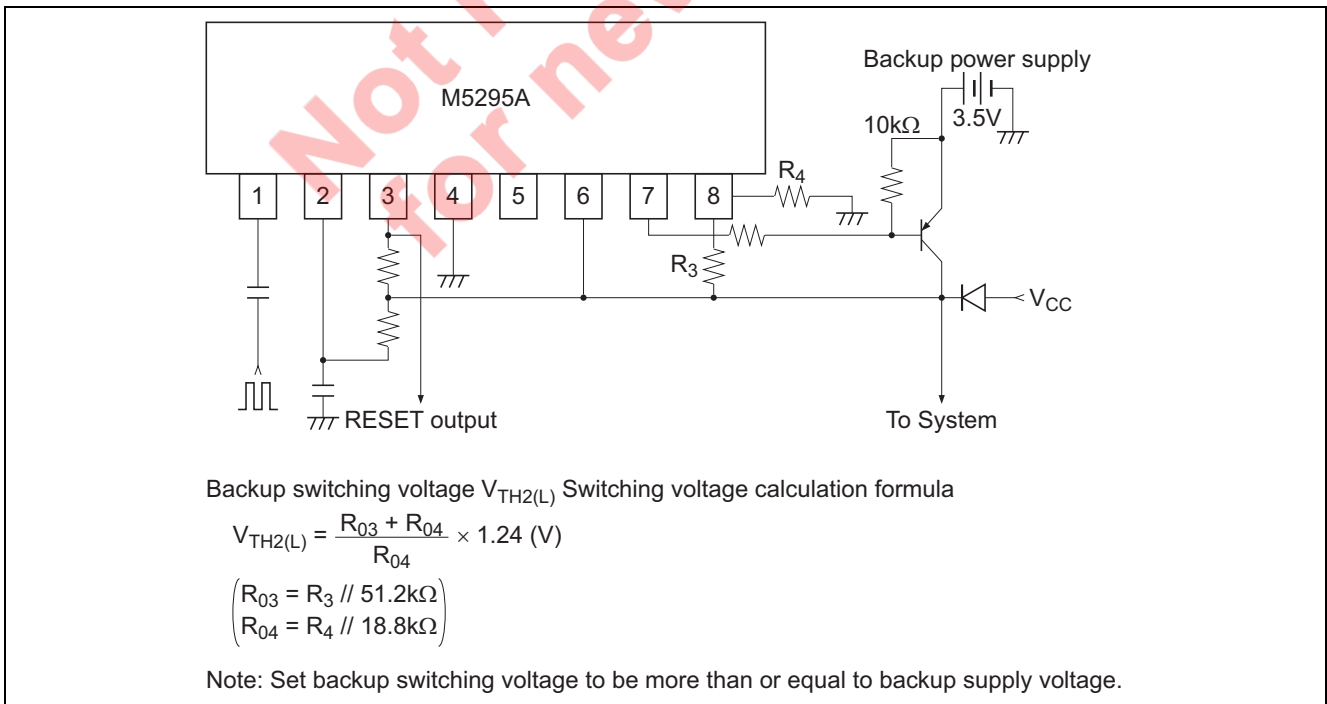
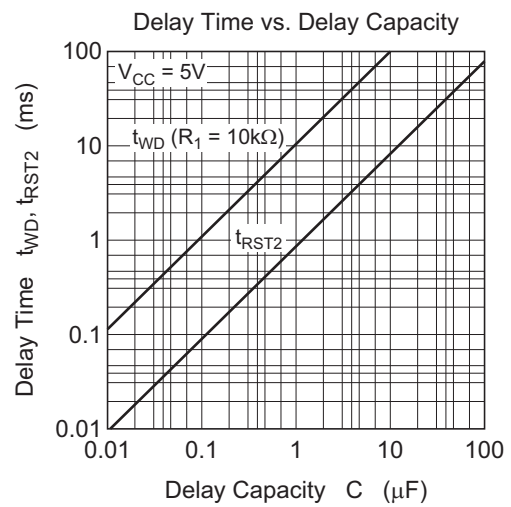
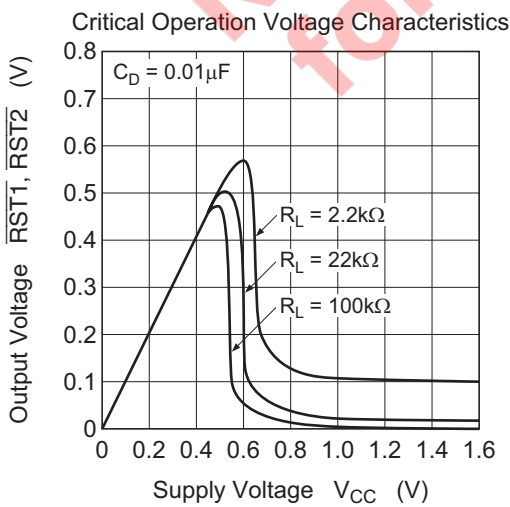
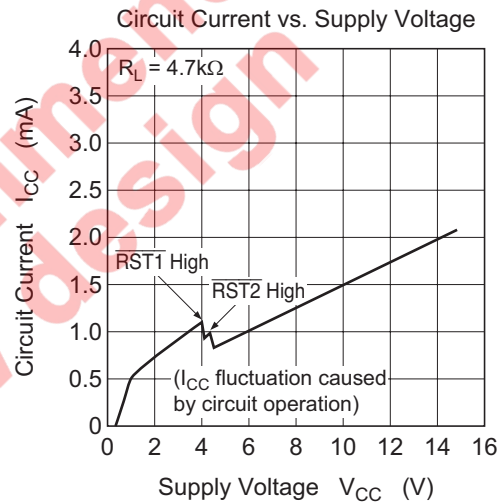
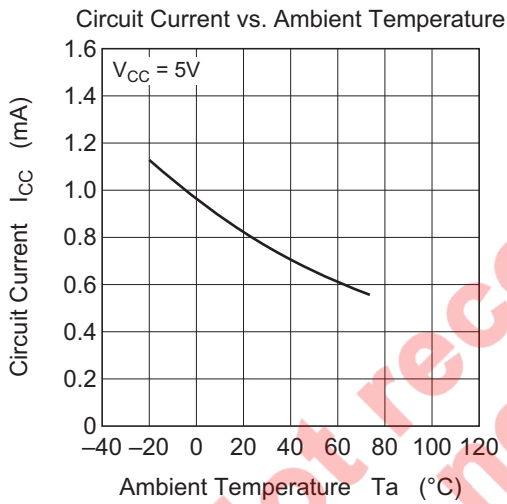
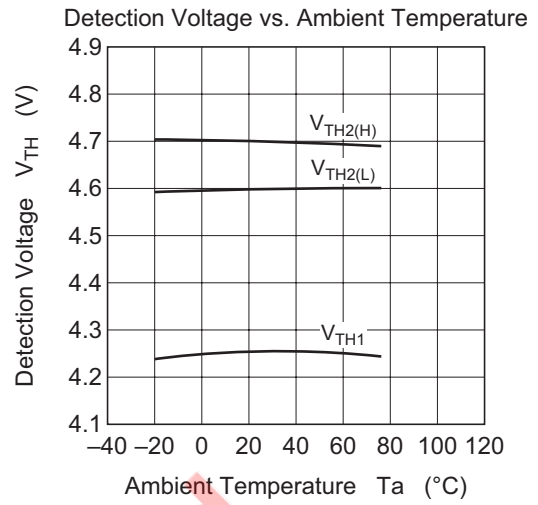
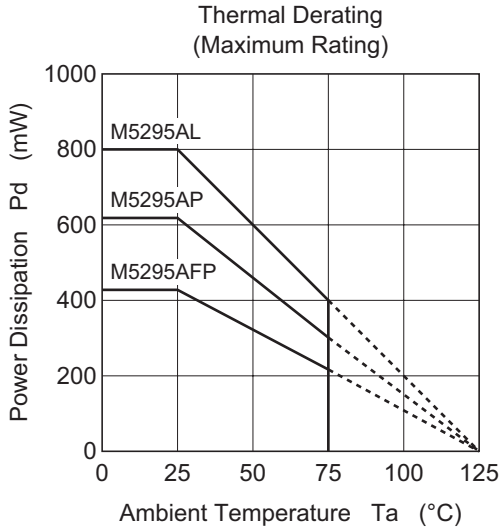
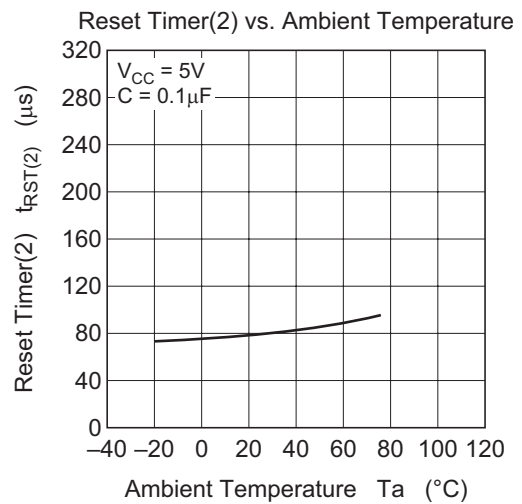
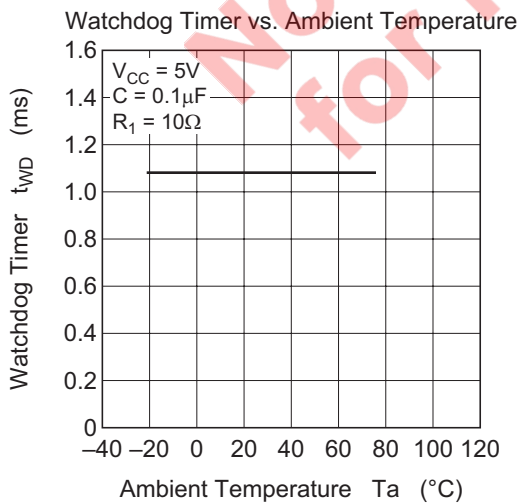
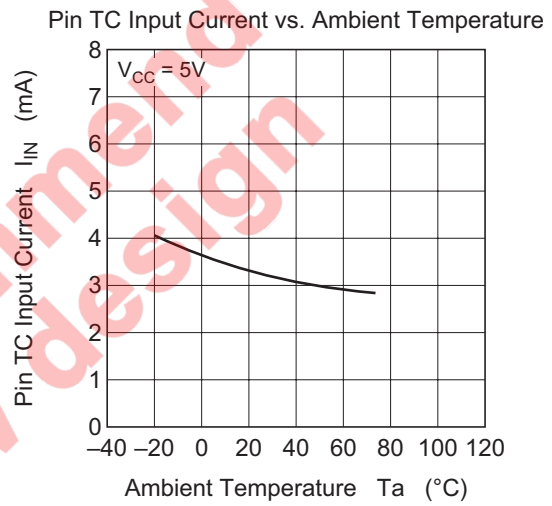
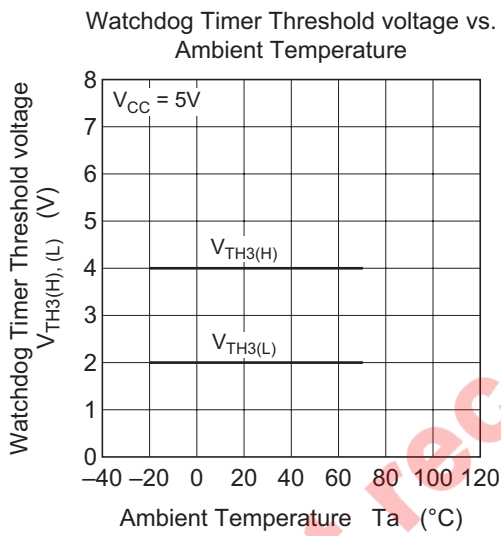
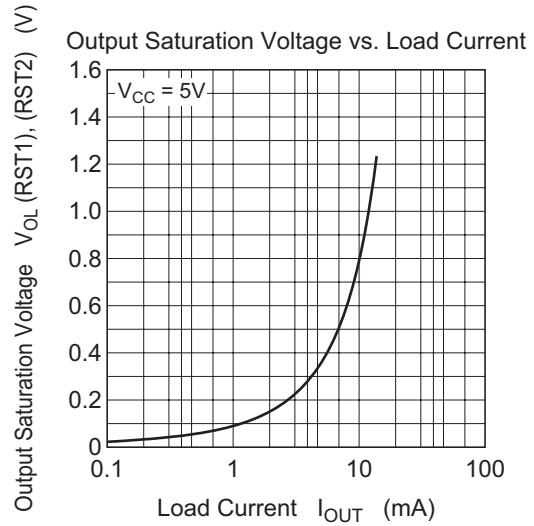
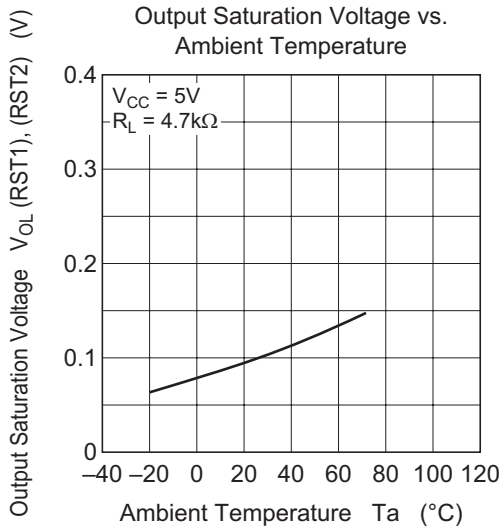


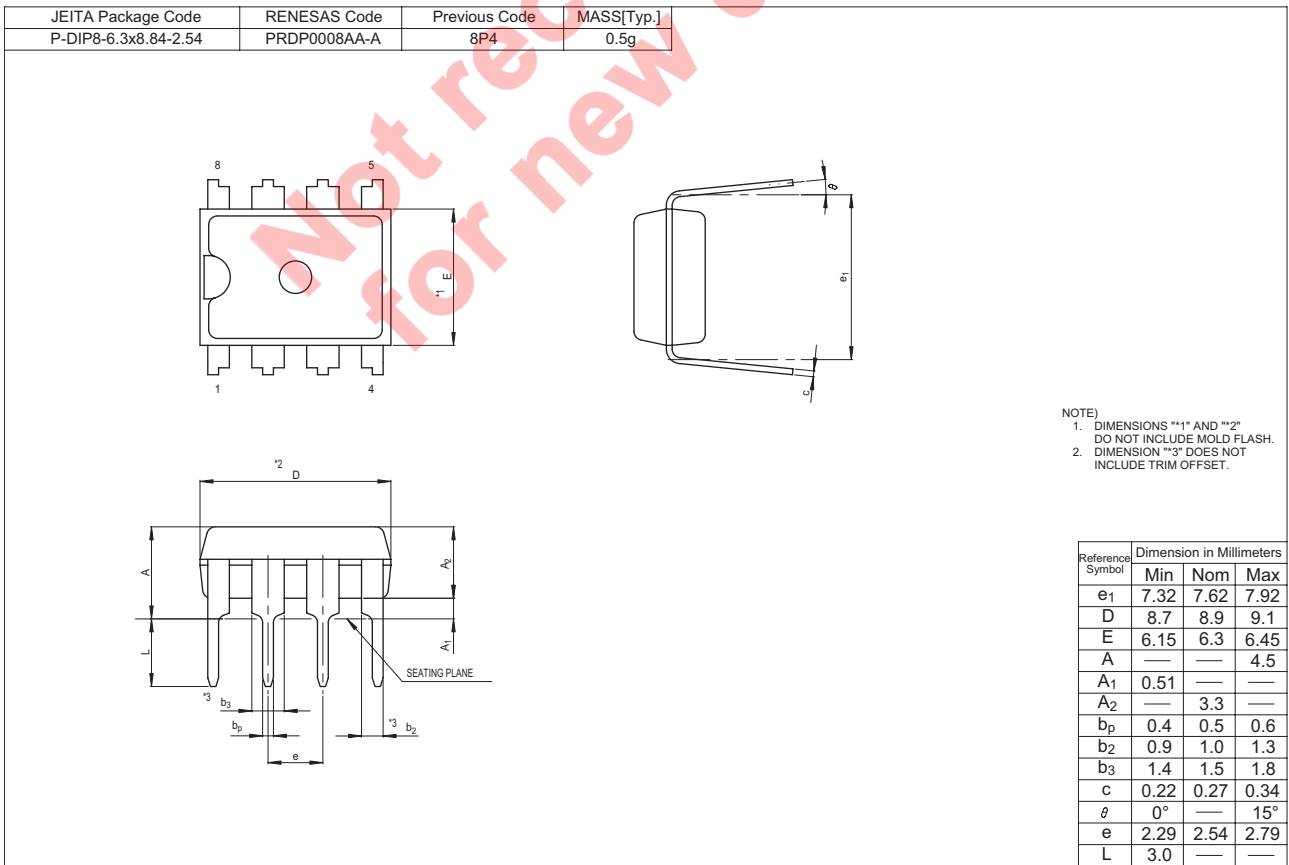
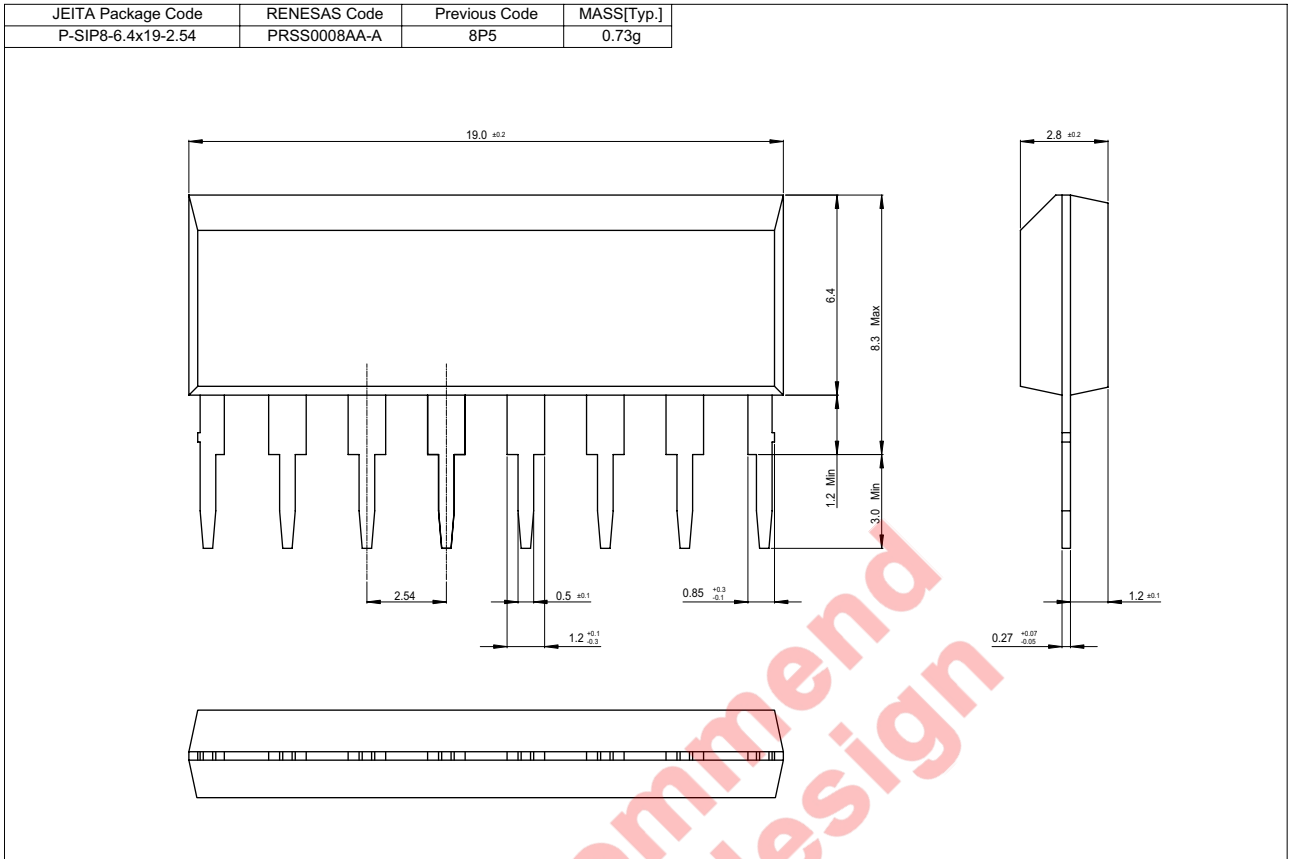
Figure 9 Example of Backup Circuit with M5295AL

Typical Characteristics



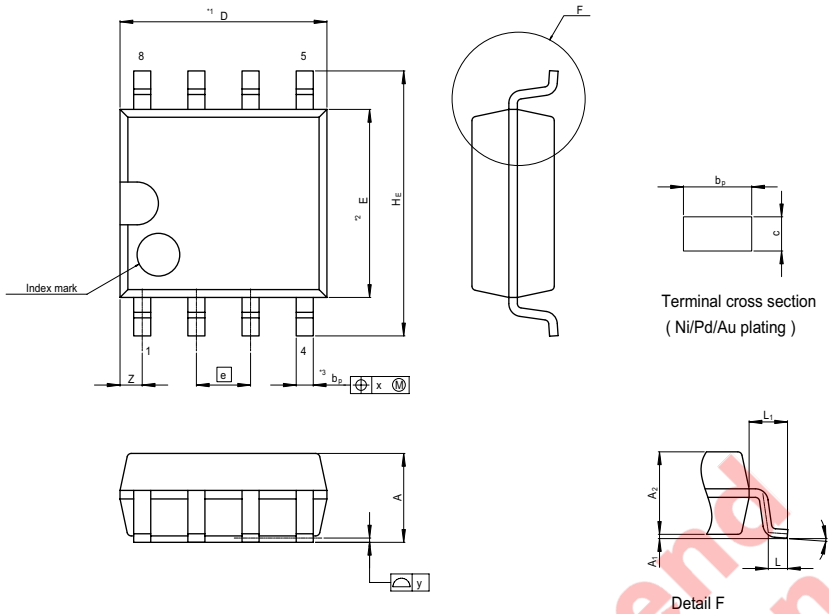


Package Dimensions



M5295AL/AP/AFP

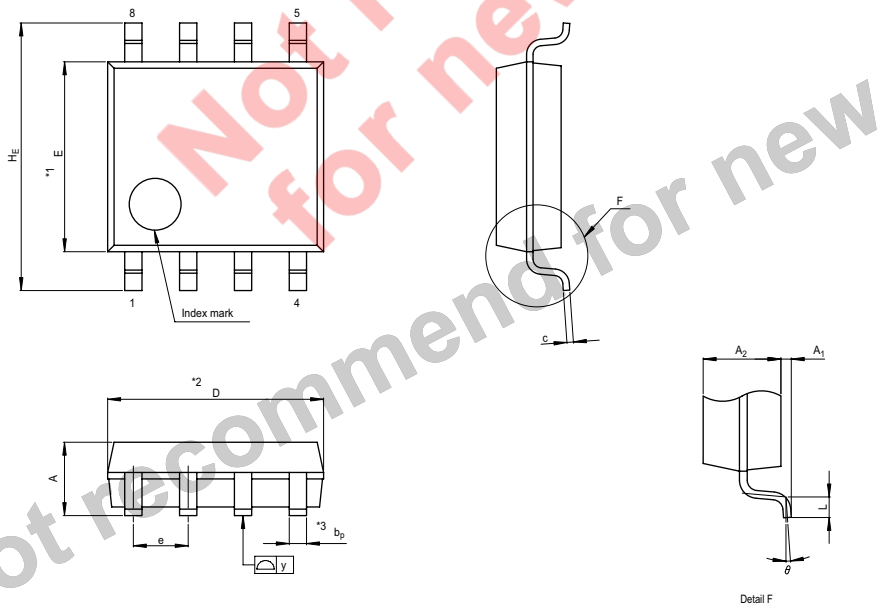
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-4.4x4.85-1.27	PRSP0008DE-C	—	0.1g



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
Ⓧ	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



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

Notes:

1. This document is provided for reference purposes only so that Renesas customers may select the appropriate Renesas products for their use. Renesas neither makes warranties or representations with respect to the accuracy or completeness of the information contained in this document nor grants any license to any intellectual property rights or any other rights of Renesas or any third party with respect to the information in this document.
2. Renesas shall have no liability for damages or infringement of any intellectual property or other rights arising out of the use of any information in this document, including, but not limited to, product data, diagrams, charts, programs, algorithms, and application circuit examples.
3. You should not use the products or the technology described in this document for the purpose of military applications such as the development of weapons of mass destruction or for the purpose of any other military use. When exporting the products or technology described herein, you should follow the applicable export control laws and regulations, and procedures required by such laws and regulations.
4. All information included in this document such as product data, diagrams, charts, programs, algorithms, and application circuit examples, is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas products listed in this document, please confirm the latest product information with a Renesas sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas such as that disclosed through our website. (<http://www.renesas.com>)
5. Renesas has used reasonable care in compiling the information included in this document, but Renesas assumes no liability whatsoever for any damages incurred as a result of errors or omissions in the information included in this document.
6. When using or otherwise relying on the information in this document, you should evaluate the information in light of the total system before deciding about the applicability of such information to the intended application. Renesas makes no representations, warranties or guaranties regarding the suitability of its products for any particular application and specifically disclaims any liability arising out of the application and use of the information in this document or Renesas products.
7. With the exception of products specified by Renesas as suitable for automobile applications, Renesas products are not designed, manufactured or tested for applications or otherwise in systems the failure or malfunction of which may cause a direct threat to human life or create a risk of human injury or which require especially high quality and reliability such as safety systems, or equipment or systems for transportation and traffic, healthcare, combustion control, aerospace and aeronautics, nuclear power, or undersea communication transmission. If you are considering the use of our products for such purposes, please contact a Renesas sales office beforehand. Renesas shall have no liability for damages arising out of the uses set forth above.
8. Notwithstanding the preceding paragraph, you should not use Renesas products for the purposes listed below:
 - (1) artificial life support devices or systems
 - (2) surgical implantations
 - (3) healthcare intervention (e.g., excision, administration of medication, etc.)
 - (4) any other purposes that pose a direct threat to human lifeRenesas shall have no liability for damages arising out of the uses set forth in the above and purchasers who elect to use Renesas products in any of the foregoing applications shall indemnify and hold harmless Renesas Technology Corp., its affiliated companies and their officers, directors, and employees against any and all damages arising out of such applications.
9. You should use the products described herein within the range specified by Renesas, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas shall have no liability for malfunctions or damages arising out of the use of Renesas products beyond such specified ranges.
10. Although Renesas endeavors to improve the quality and reliability of its products, IC products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Please be sure to implement safety measures to guard against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas 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 applicable measures. Among others, since the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
11. In case Renesas products listed in this document are detached from the products to which the Renesas products are attached or affixed, the risk of accident such as swallowing by infants and small children is very high. You should implement safety measures so that Renesas products may not be easily detached from your products. Renesas shall have no liability for damages arising out of such detachment.
12. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written approval from Renesas.
13. Please contact a Renesas sales office if you have any questions regarding the information contained in this document, Renesas semiconductor products, or if you have any other inquiries.



RENESAS SALES OFFICES

<http://www.renesas.com>

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

Renesas Technology America, Inc.

450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.

Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.

7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.

10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.

1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.

Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd

Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510