

To our customers,

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Renesas Electronics Corporation

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# M62050P/FP

## 3 V Supply System Reset with Watchdog Timer

REJ03D0786-0200

Rev.2.00

Jun 15, 2007

### Description

The M62050P/FP is a voltage threshold detector designed for detection of 3 V supply voltage and generation of a system reset pulse. It is suitable for microcontroller systems.

The IC, a supervisor of the MCU operations, dissipates low current of 0.6 mA (Typ) during normal operations of the MCU systems.

It has two selectable threshold voltages, which allows applying it to a high precision system design.

### Features

- Watchdog timer (supervisor for two system voltages)
- Power-on reset timer
- Low current consumption: 0.6 mA (Typ,  $V_{CC} = 3\text{ V}$ )
- Wide supply voltage range:  $V_{CC(max)} = 7\text{ V}$

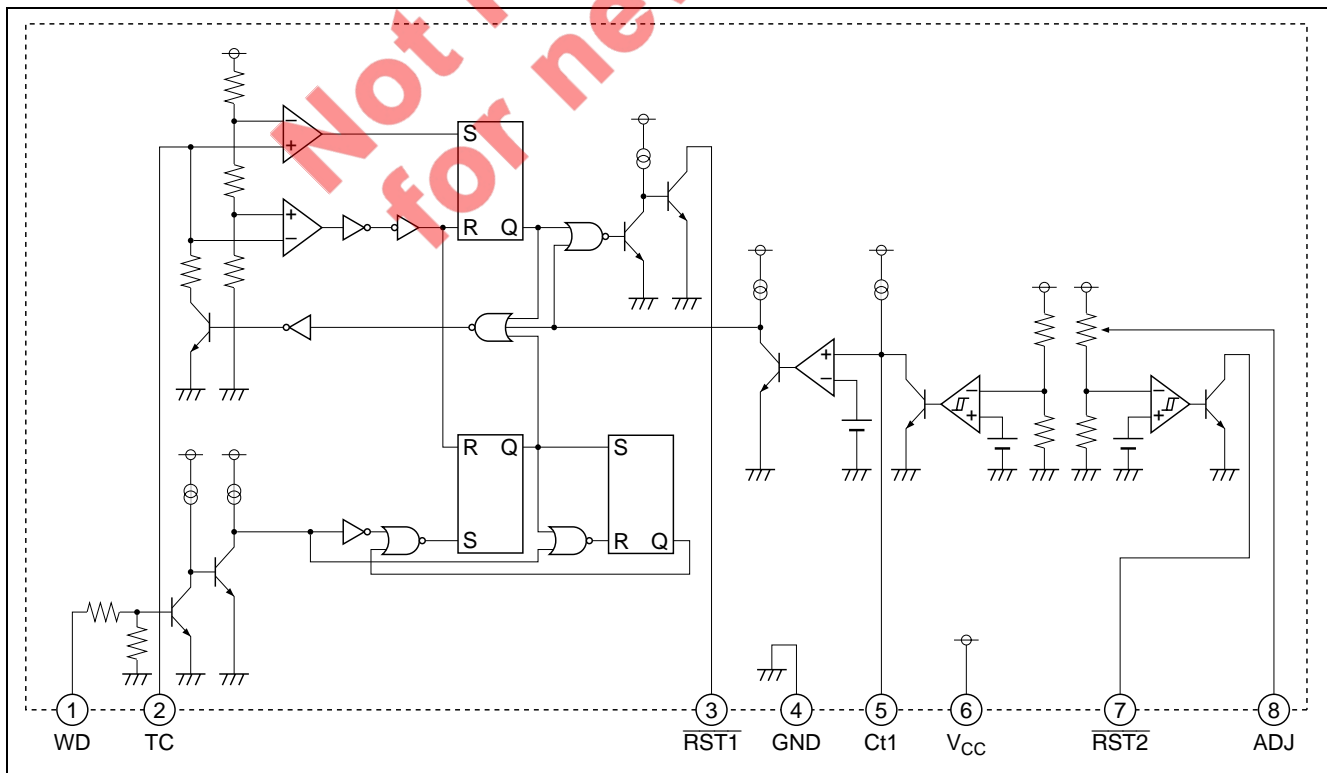
### Application

- Supervisor for microcontroller systems

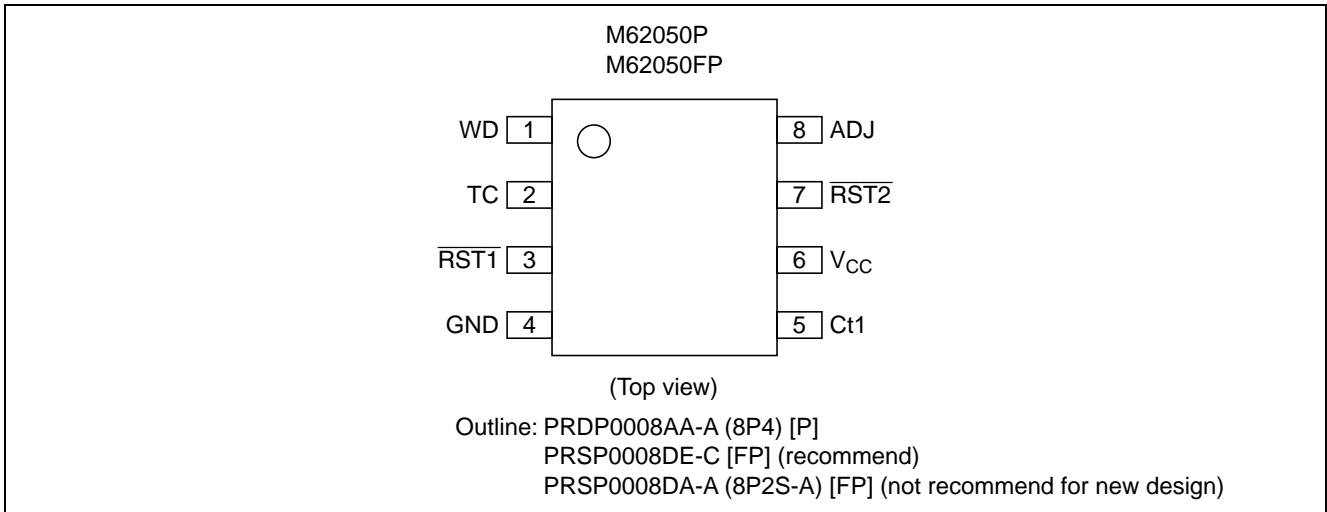
### Recommended Operating Condition

- Recommended supply voltage: 3 V

### Block Diagram



## Pin Arrangement



## Pin Description

Pin No.	Symbol	Functional Description
1	WD	Input for watchdog timer
2	TC	Time set for reset timer and watchdog timer
3	$\overline{\text{RST1}}$	Pin that outputs reset signal when abnormal signal is input to WD pin
4	GND	GND
5	Ct1	Capacitor installation pin for delay time setting
6	V <sub>CC</sub>	Power supply
7	$\overline{\text{RST2}}$	Pin that outputs reset signal when power supply voltage becomes abnormal
8	ADJ	Selection between two detection voltages

## Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

Item	Symbol	Rating	Unit	Conditions	
Supply voltage	V <sub>CC</sub>	7	V		
Input voltage	V <sub>IN</sub>	-0.3 to +7	V		
Output voltage	V <sub>OUT</sub>	15	V		
Output current	I <sub>OUT</sub>	10	mA		
Power dissipation	Pd	625	mW	8-pin DIP	
		440		8-pin SOP	
Thermal derating	K $\theta$	6.25	mW/°C	Ta $\geq$ 25°C	8-pin DIP
		4.4			8-pin SOP
Operating temperature	Topr	-20 to +75	°C		
Storage temperature	Tstg	-55 to +125	°C		

## Electrical Characteristics

( $T_a = -25^\circ\text{C}$ ,  $V_{CC} = 3\text{ V}$ , unless otherwise noted)

### DC Characteristics

Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
						Pin	
WD input current	$I_{WD}$	60	140	250	$\mu\text{A}$	WD	$V_{IN} = 3\text{V}$
WD input voltage	$V_{IH}$	1.5	—	3.0	V	WD	
	$V_{IL}$	-0.3	—	0.8			
TC output current	$I_{OUT}$	—	—	-1	$\mu\text{A}$	TC	$V_{IN} = 1.0\text{V}$
TC input current	$I_{IN}$	—	2.5	3.5	mA	TC	$V_{OUT} = 2.6\text{V}$
Watchdog timer threshold voltage	$V_{TH3(H)}$	—	2.4	—	V	TC	
	$V_{TH3(L)}$	—	1.2	—			
Output voltage	$V_{OL}$	—	0.2	0.5	V	RST1	$I_{OUT} = 1\text{mA}$
Output leakage current	$I_{leak}$	—	—	5.0	$\mu\text{A}$	RST2	$V_{OUT} = 3\text{V}$
$V_{CC}$ detection voltage (1)	$V_{TH1(H)}$	2.13	2.25	2.42	V	$V_{CC(1)}$	$V_{CC}L \rightarrow H$
	$V_{TH1(L)}$	2.10	2.20	2.30			$V_{CC}H \rightarrow L$
	$\Delta V_{TH1}$	30	50	120			$\Delta V_{TH1} = V_{TH1(H)} - V_{TH1(L)}$
$V_{CC}$ detection voltage (2)	$V_{TH2(H)}$	2.43	2.55	2.72	V	$V_{CC(2)}$	$V_{CC}L \rightarrow H$
	$V_{TH2(L)}$	2.40	2.50	2.60			$V_{CC}H \rightarrow L$
	$\Delta V_{TH2}$	30	50	120			$\Delta V_{TH2} = V_{TH2(H)} - V_{TH2(L)}$
$V_{CC}$ detection voltage (4)	$V_{TH4(H)}$	2.23	2.35	2.52	V	$V_{CC(4)}$	$V_{CC}L \rightarrow H$
	$V_{TH4(L)}$	2.20	2.30	2.40			$V_{CC}H \rightarrow L$
	$\Delta V_{TH4}$	30	50	120			$\Delta V_{TH4} = V_{TH4(H)} - V_{TH4(L)}$
RST1 ON voltage	RST1	—	—	0.5	V	RST1	$V_{CC} = 1.2\text{V}$ , $R_L = 4.7\text{k}\Omega$
RST2 ON voltage	RST2	—	—	0.5	V	RST2	$V_{CC} = 1.2\text{V}$ , $R_L = 4.7\text{k}\Omega$
Circuit current	$I_{CC}$	—	600	950	$\mu\text{A}$	$V_{CC}$	

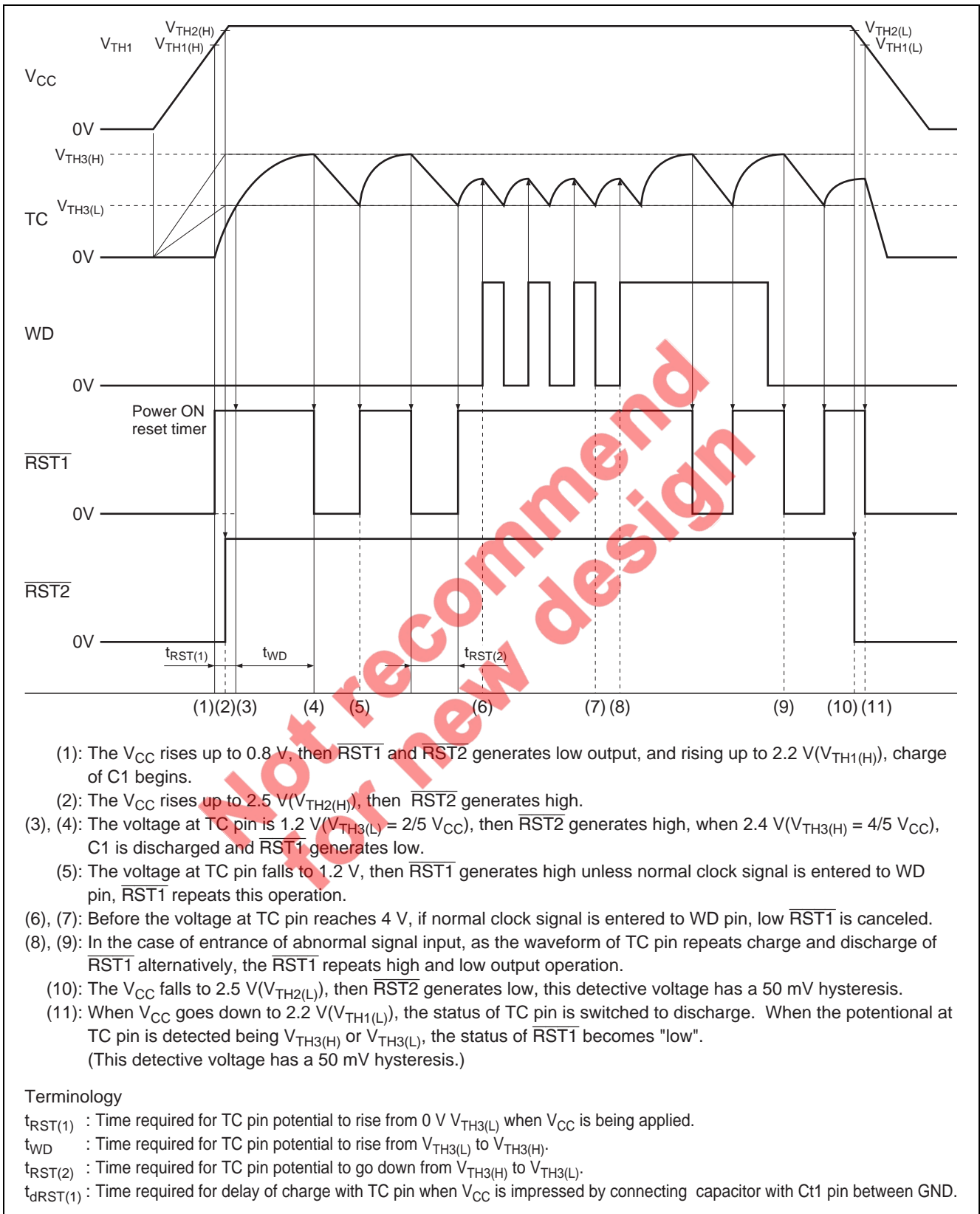
### AC Characteristics

Item	Symbol	Min	Typ	Max	Unit	Test Conditions	
						Pin	
Watchdog timer	$t_{WD}$	$C \times 1.1 \times R_1$			s	RST1	$C = 0.1\mu\text{F}$ , $R_1 = 10\text{k}\Omega$
		0.5	1.1	1.7	ms		
Reset timer (1)	$t_{RST(1)}$	$C \times 0.5 \times R_1$			s	RST1	$C = 0.1\mu\text{F}$ , $R_1 = 10\text{k}\Omega$
		0.2	0.5	1.1	ms		
Reset timer (2)	$t_{RST(2)}$	$830 \times C$			s	RST1	$C = 0.1\mu\text{F}$ , $R_1 = 10\text{k}\Omega$
		40	83	220	$\mu\text{s}$		
Reset timer delay time	$t_{dRST(1)}$	$290 \times 10^3 \times C_d^*$			s	RST1	$C_d = 0.001\mu\text{F}$
		140	290	790	$\mu\text{s}$		
Input pulse width	$t_{WDIN}$	3	—	—	$\mu\text{s}$	WD	
Propagation delay	$t_{d1}$	—	4	—	$\mu\text{s}$	RST1	
	$t_{d2}$	—	2	—		RST2	

Note: \*  $C_d$ : Delay capacitor connected with Ct1 pin

## Operating Description

**Timing Chart 1** (When the delay capacitor is not connected with Ct1 pin)



**Figure 1 Timing Chart 1**

Timing Chart 2 (When the delay capacitor is connected with Ct1 pin)

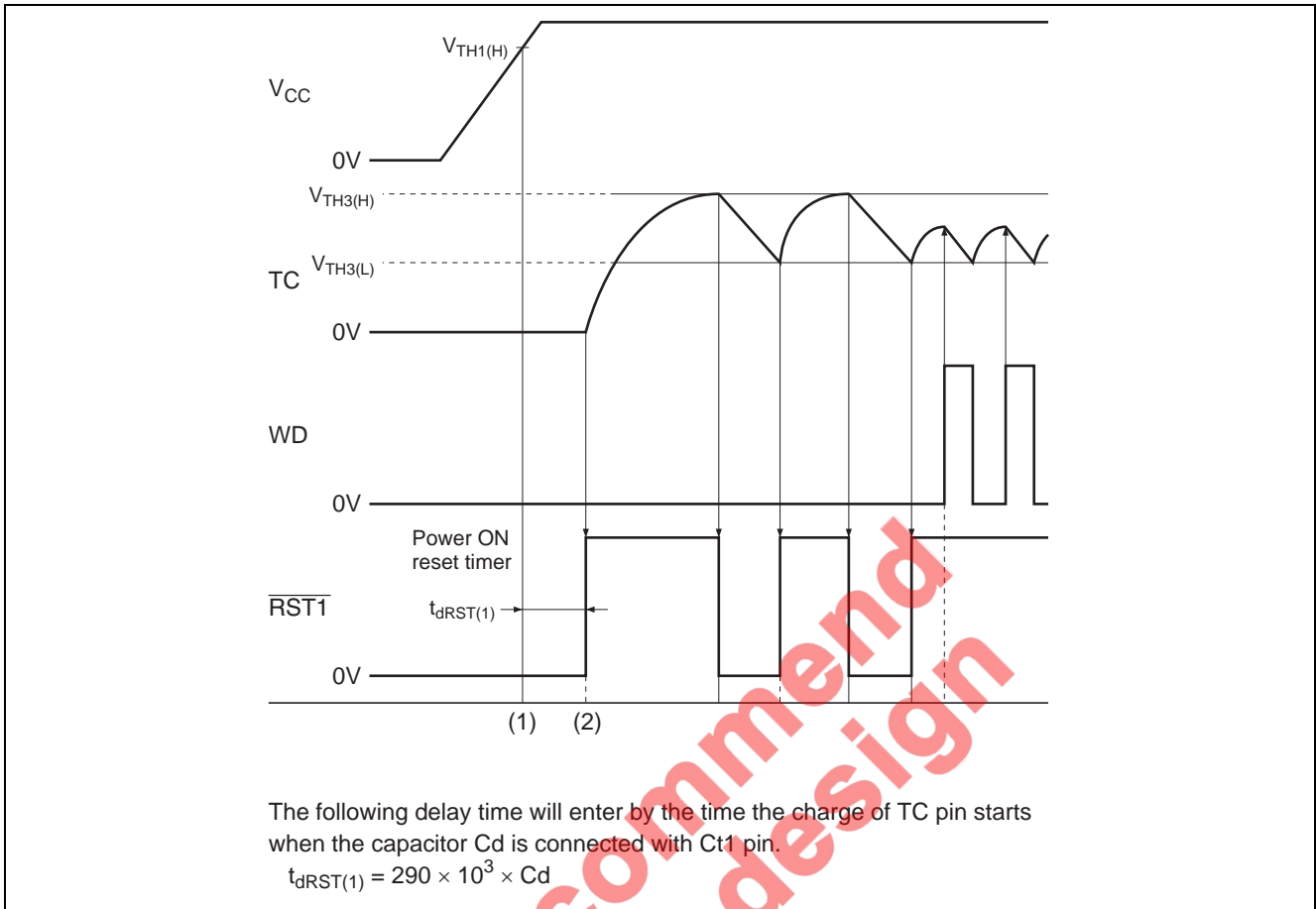


Figure 2 Timing Chart 2

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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:

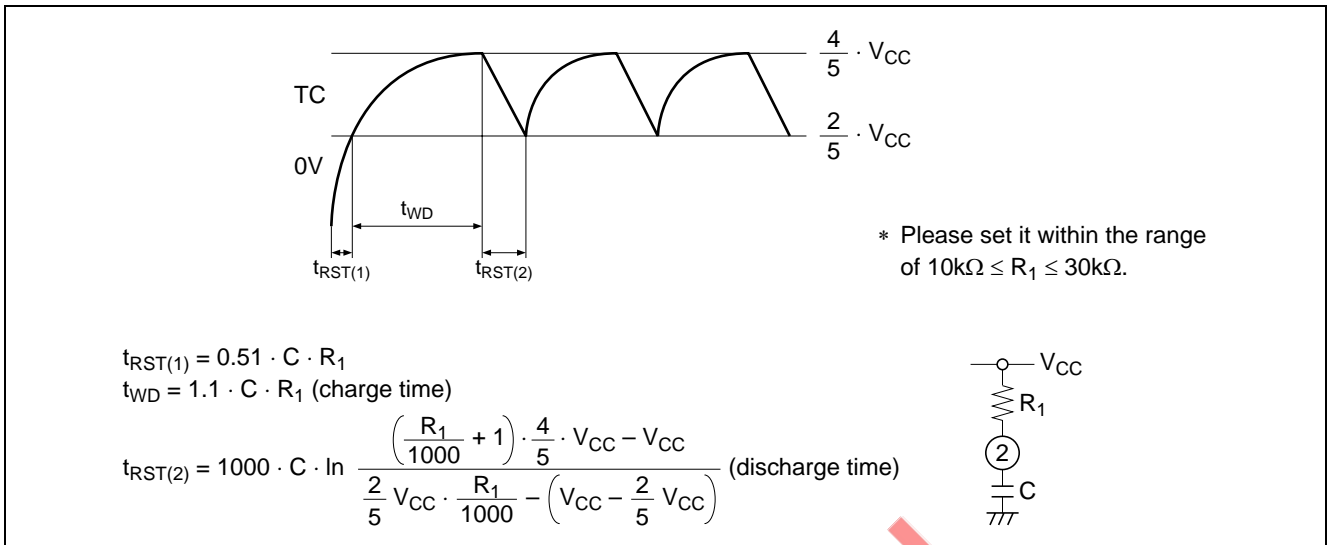


Figure 3

Please set the time of  $t_{WD}$  and  $t_{RST(2)}$  within the following range.

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

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

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:

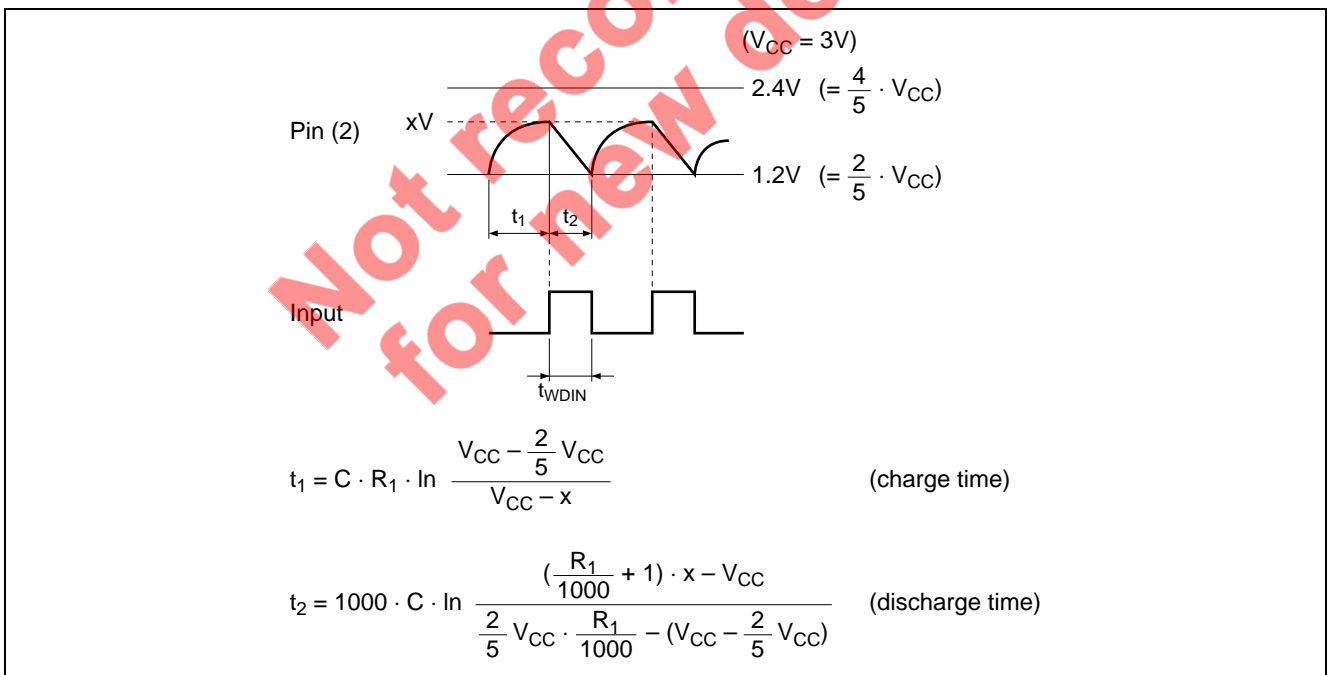


Figure 4



• Pin (1) (WD pin) input requirements

(1) Input cycle:  $t_{WD}$  or less (discharge should start before voltage at WD pin reaches 2.4 V.)

$$\frac{1}{1.1 \cdot C \cdot R_1} < f$$

(2) Input pulse width  $t_{WDIN}$ :  $t_2$  or less

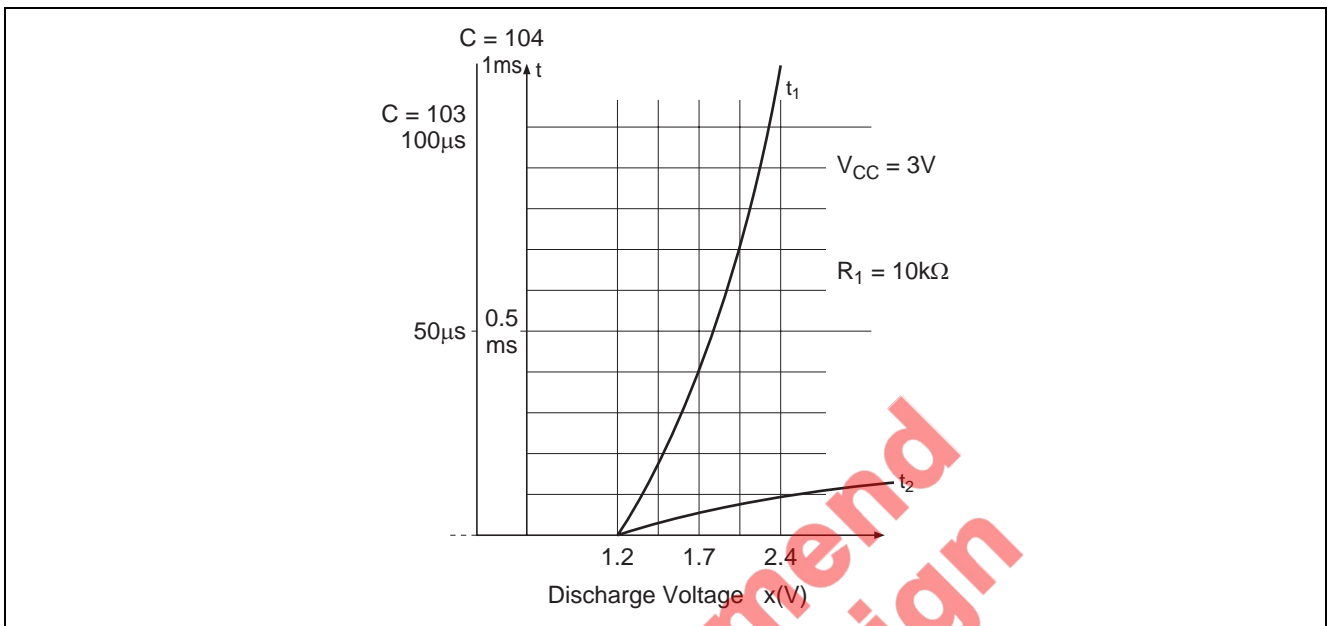


Figure 5

3.  $V_{CC}$  detection voltage adjustment

The detection voltage 2 ( $V_{TH2}$ ) can be set as shown in Table 1 by connecting ADJ pin with opening or  $V_{CC}$ .

Table 1 Detection Voltage 2 (ADJ pin)

Detection Voltage 2	at Opening (V)	at $V_{CC}$ (V)
$V_{TH2(H)}$	2.55	2.35
$V_{TH2(L)}$	2.50	2.30

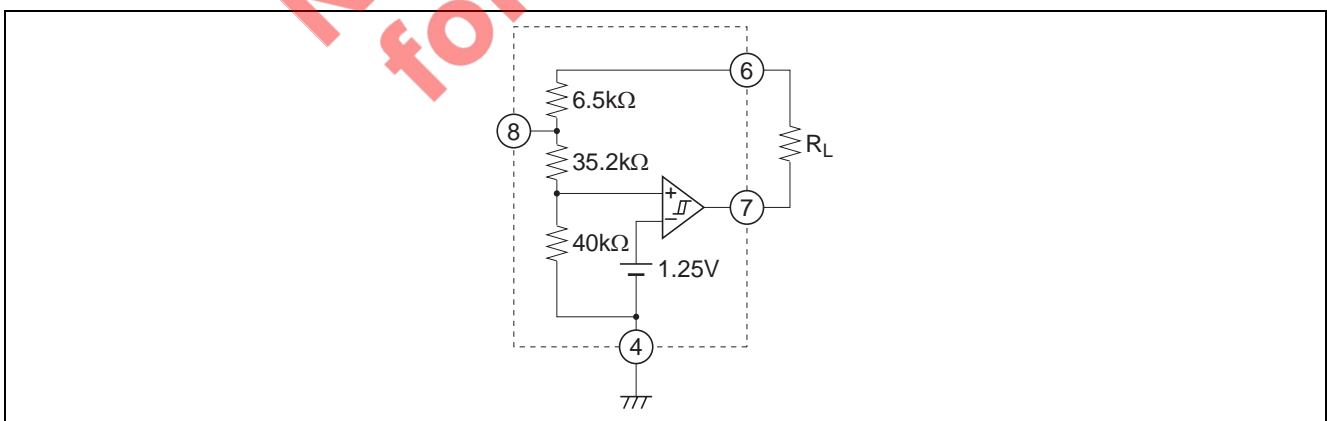


Figure 6

### Application Example

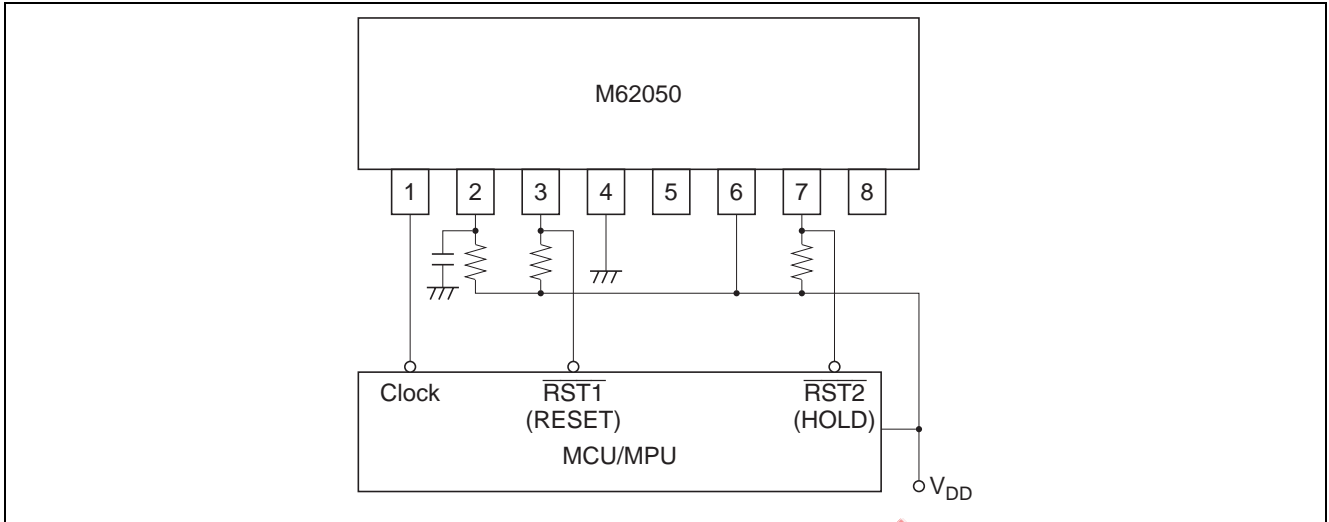
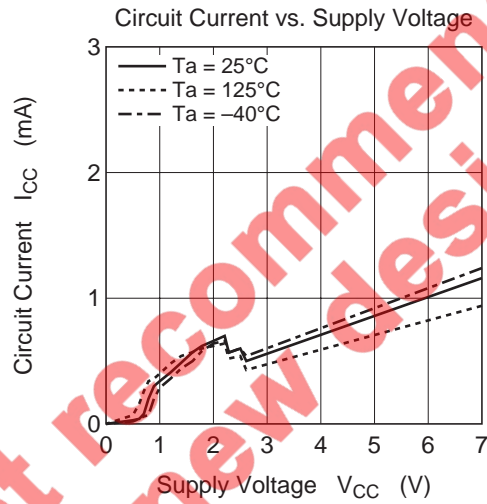
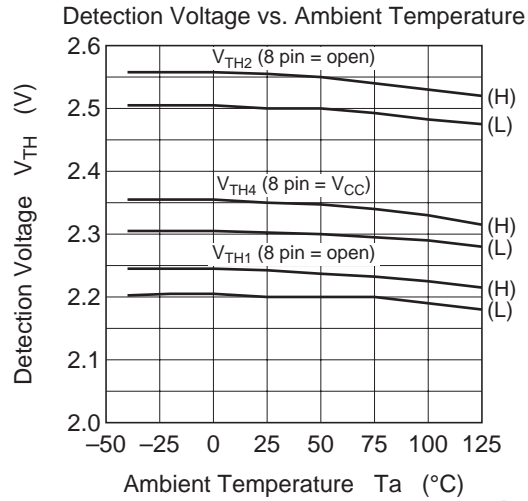


Figure 7 Application Example

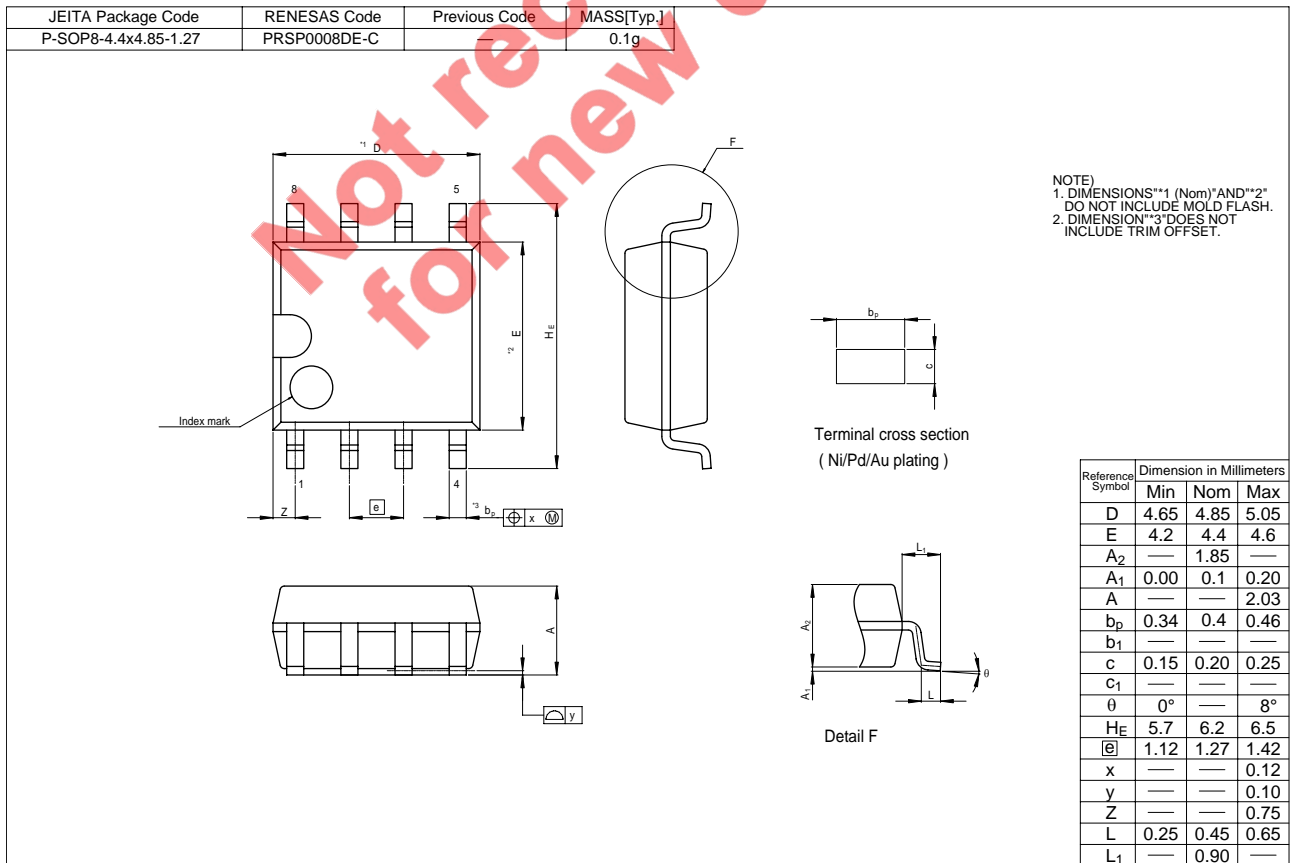
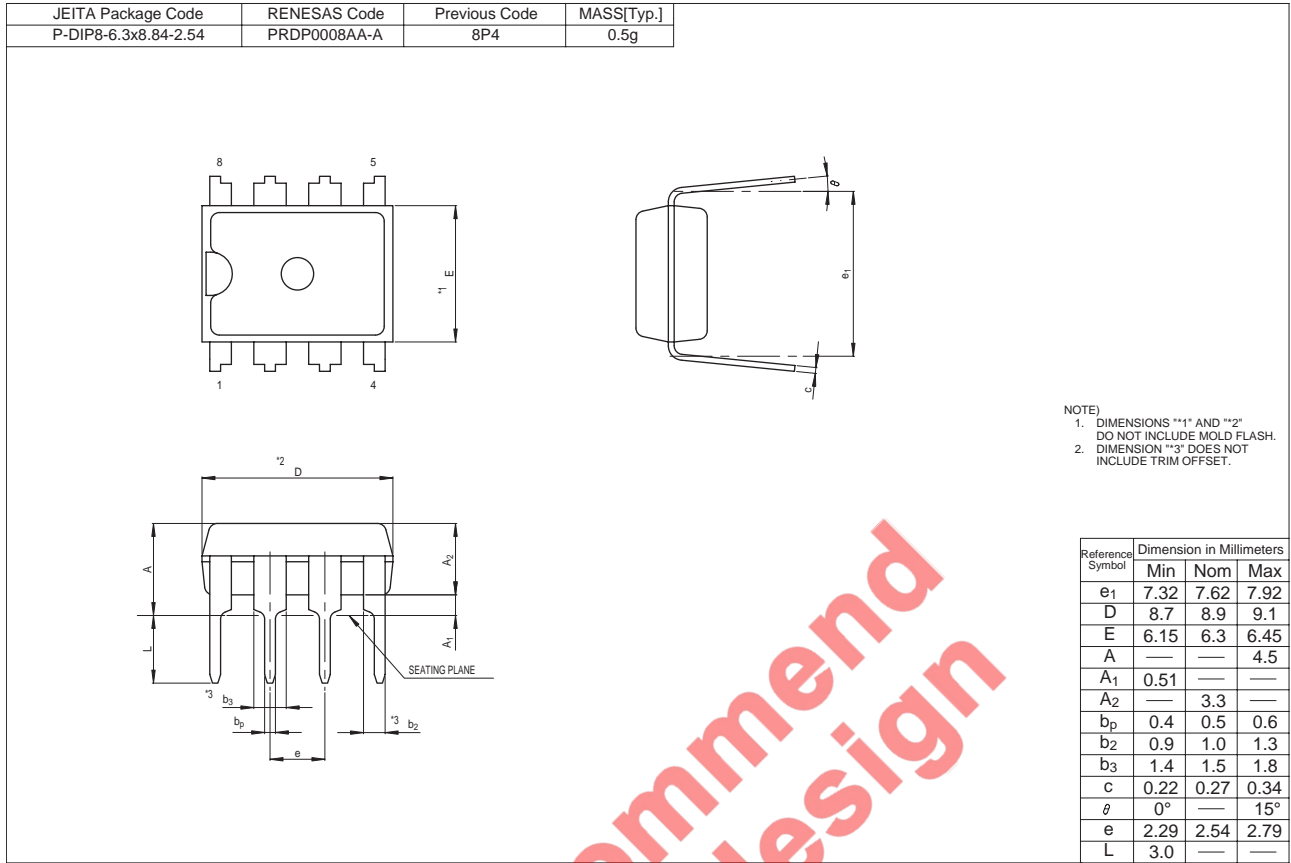
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Typical Characteristics



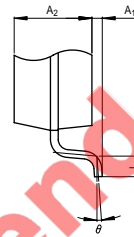
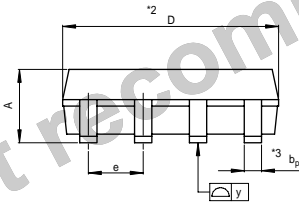
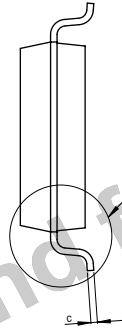
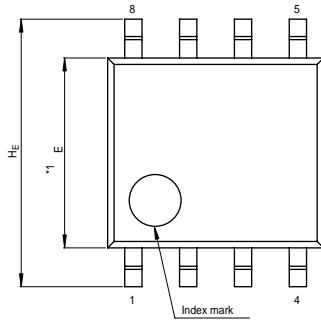
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Package Dimensions



M62050P/FP

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
$\theta$	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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