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April 1st, 2010
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: $V_{CC(max)} = 7\text{ V}$

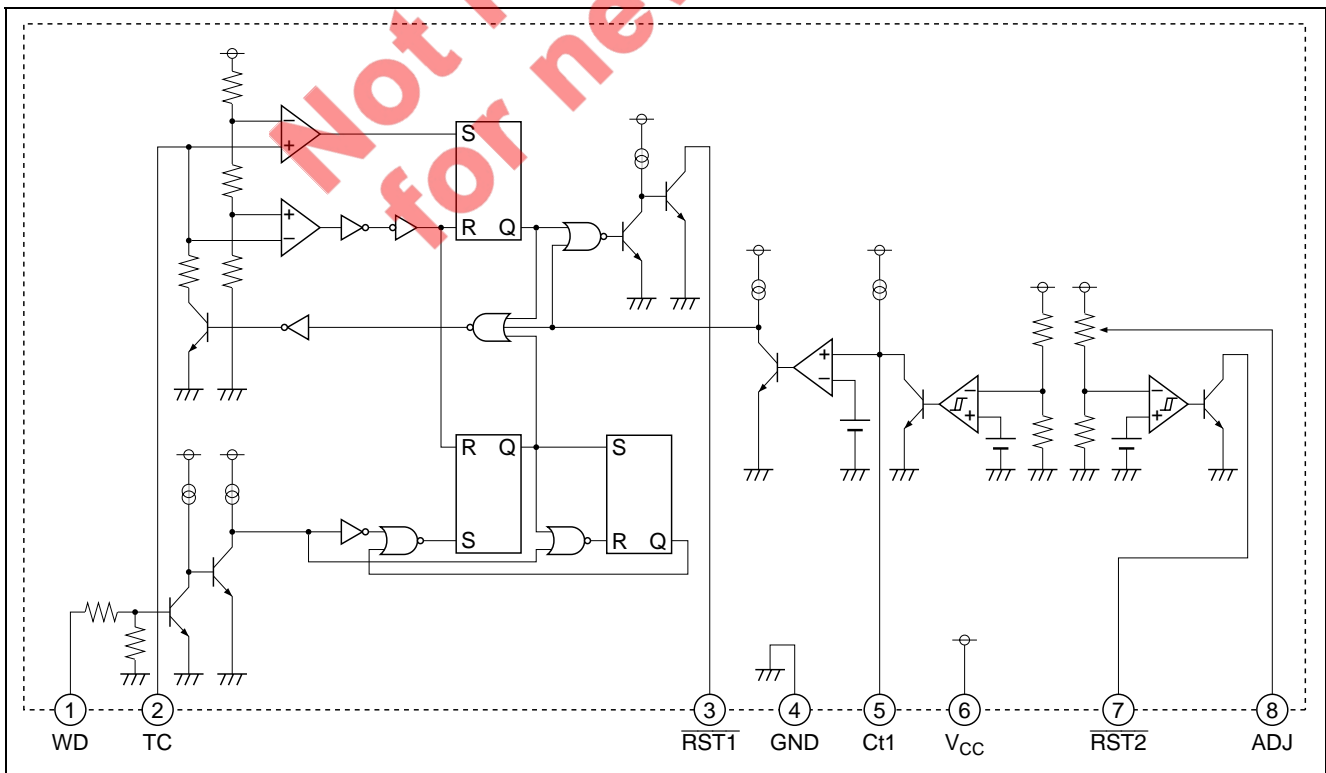
Application

- Supervisor for microcontroller systems

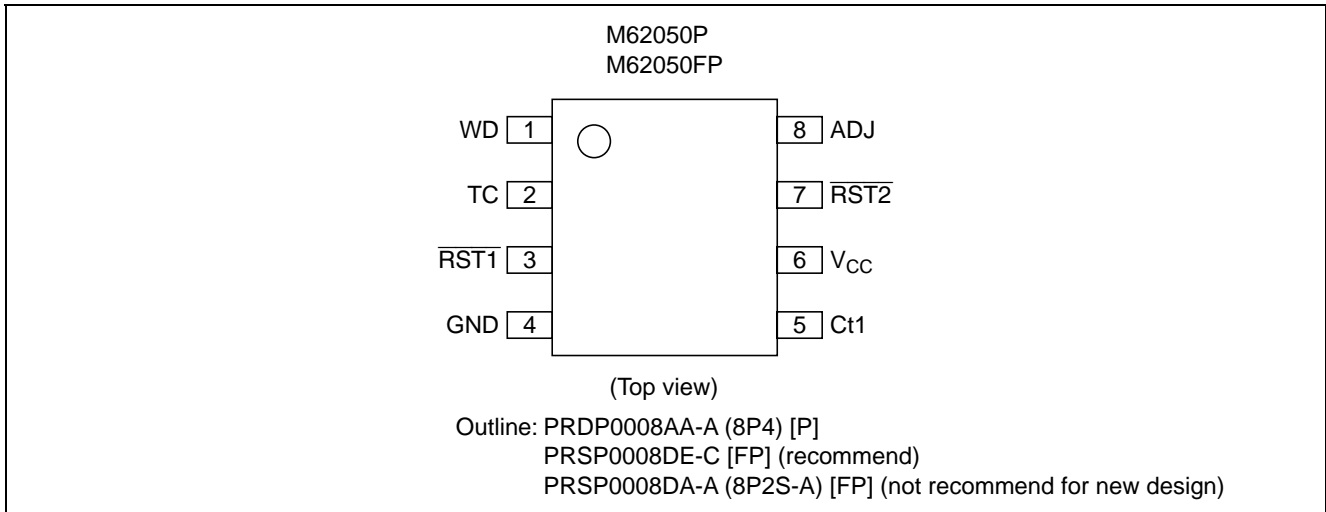
Recommended Operating Condition

- 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 _{CC} | 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 _{CC} | 7 | V | |
| Input voltage | V _{IN} | -0.3 to +7 | V | |
| Output voltage | V _{OUT} | 15 | V | |
| Output current | I _{OUT} | 10 | mA | |
| Power dissipation | Pd | 625 | mW | 8-pin DIP |
| | | 440 | | 8-pin SOP |
| Thermal derating | K θ | 6.25 | mW/°C | Ta \geq 25°C |
| | | 4.4 | | |
| Operating temperature | T _{opr} | -20 to +75 | °C | |
| Storage temperature | T _{stg} | -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 | Pin | Test Conditions |
|----------------------------------|------------------|------|------|------|---------------|-------------|--|
| | | | | | | | |
| WD input current | I_{WD} | 60 | 140 | 250 | μA | 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 | μA | 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 | μA | 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 | | | $V_{CC(H)} \rightarrow L$ |
| | ΔV_{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 | | | $V_{CC(H)} \rightarrow L$ |
| | ΔV_{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 | | | $V_{CC(H)} \rightarrow L$ |
| | ΔV_{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 | μA | V_{CC} | |

AC Characteristics

| Item | Symbol | Min | Typ | Max | Unit | Pin | Test Conditions |
|------------------------|---------------|--------------------------------|-----|-----|---------------|------|---|
| | | | | | | | |
| 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 | μs | | |
| 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 | μs | | |
| Input pulse width | t_{WDIN} | 3 | — | — | μs | WD | |
| Propagation delay | t_{d1} | — | 4 | — | μs | 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)

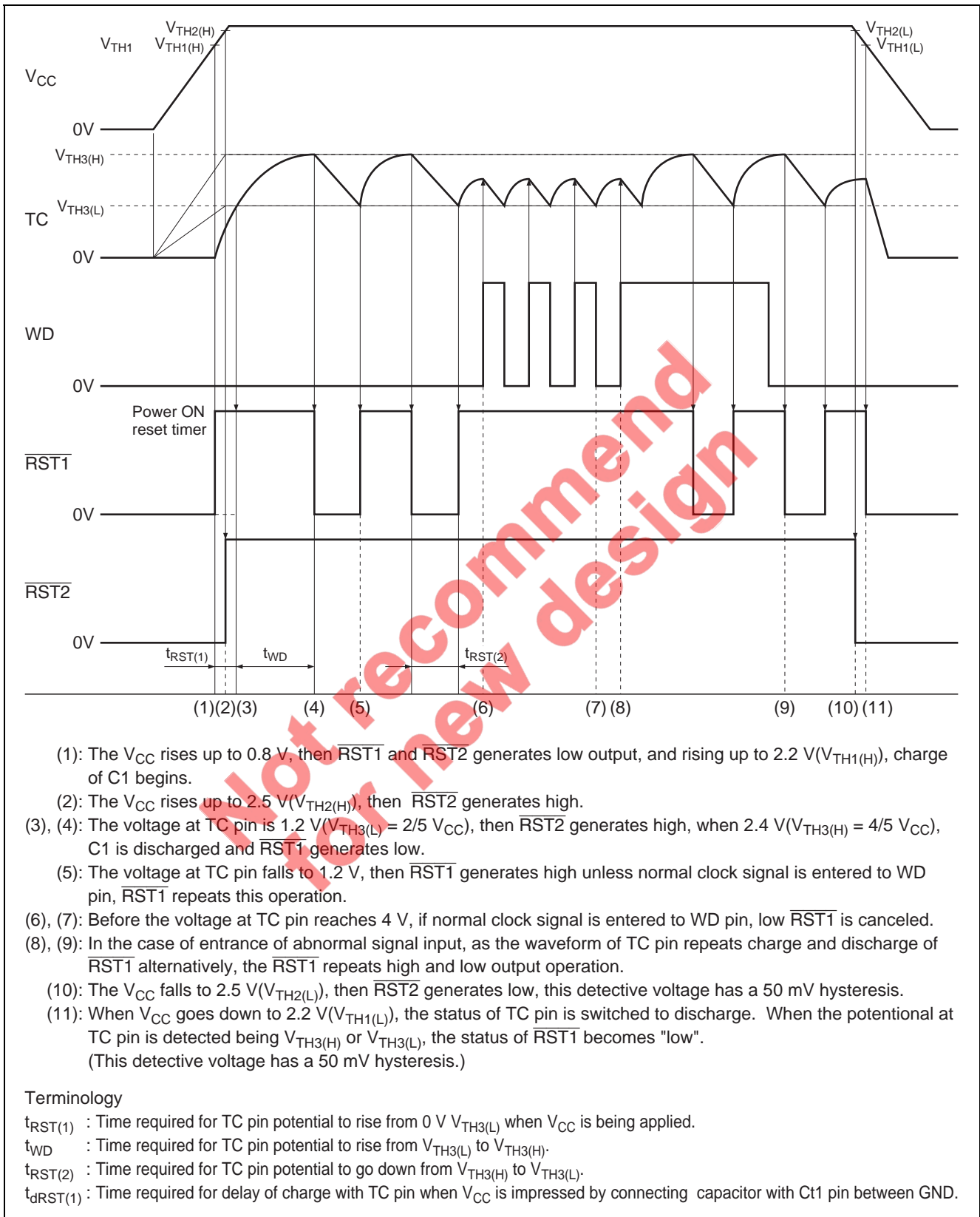


Figure 1 Timing Chart 1

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

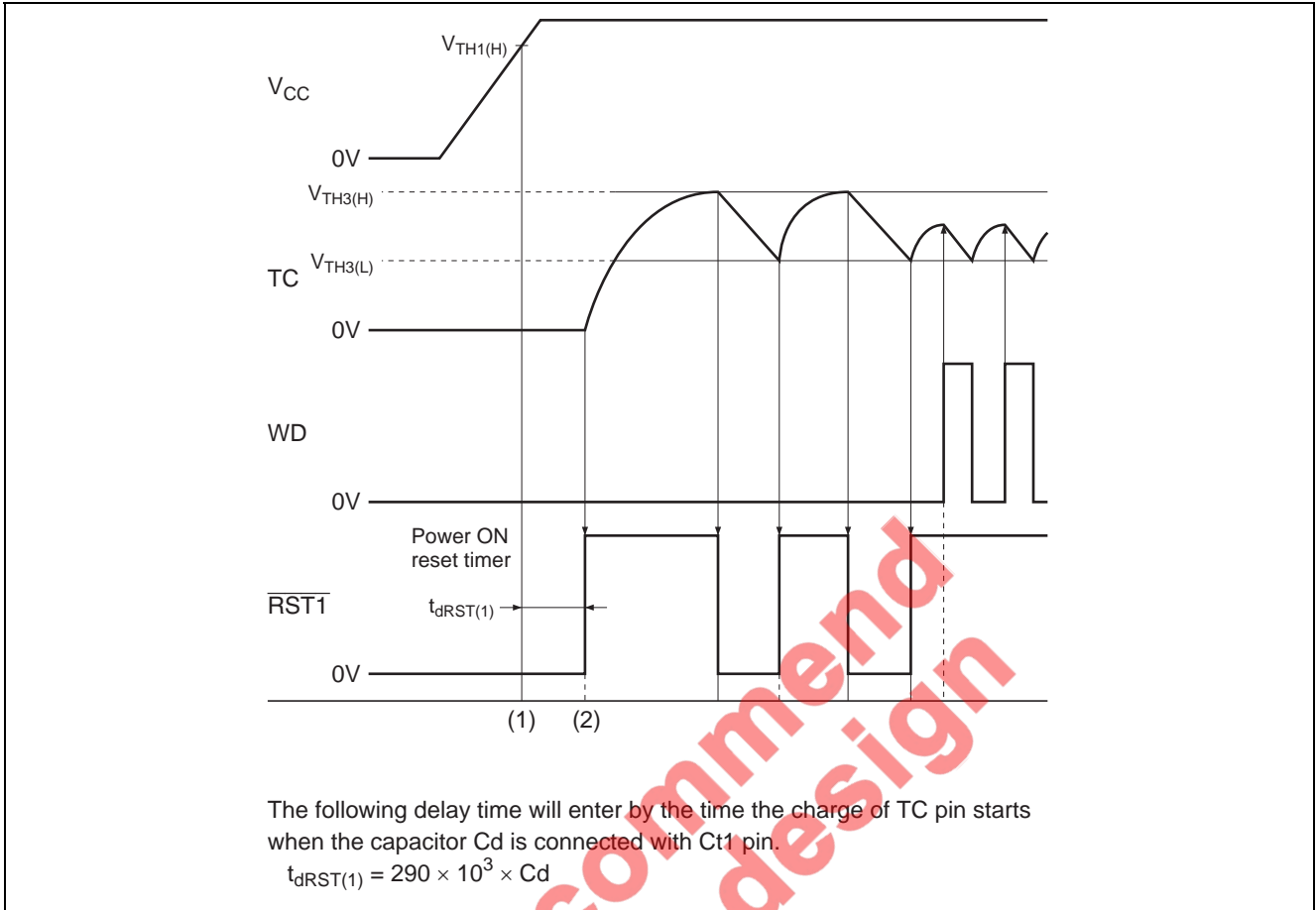


Figure 2 Timing Chart 2

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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:

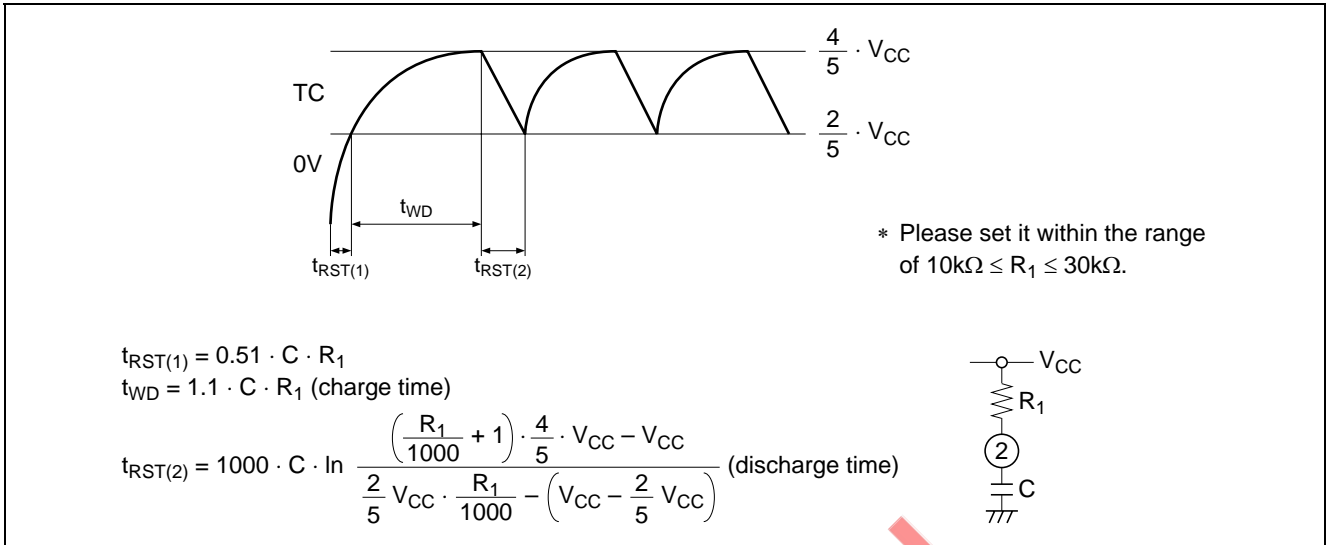


Figure 3

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

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

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

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:

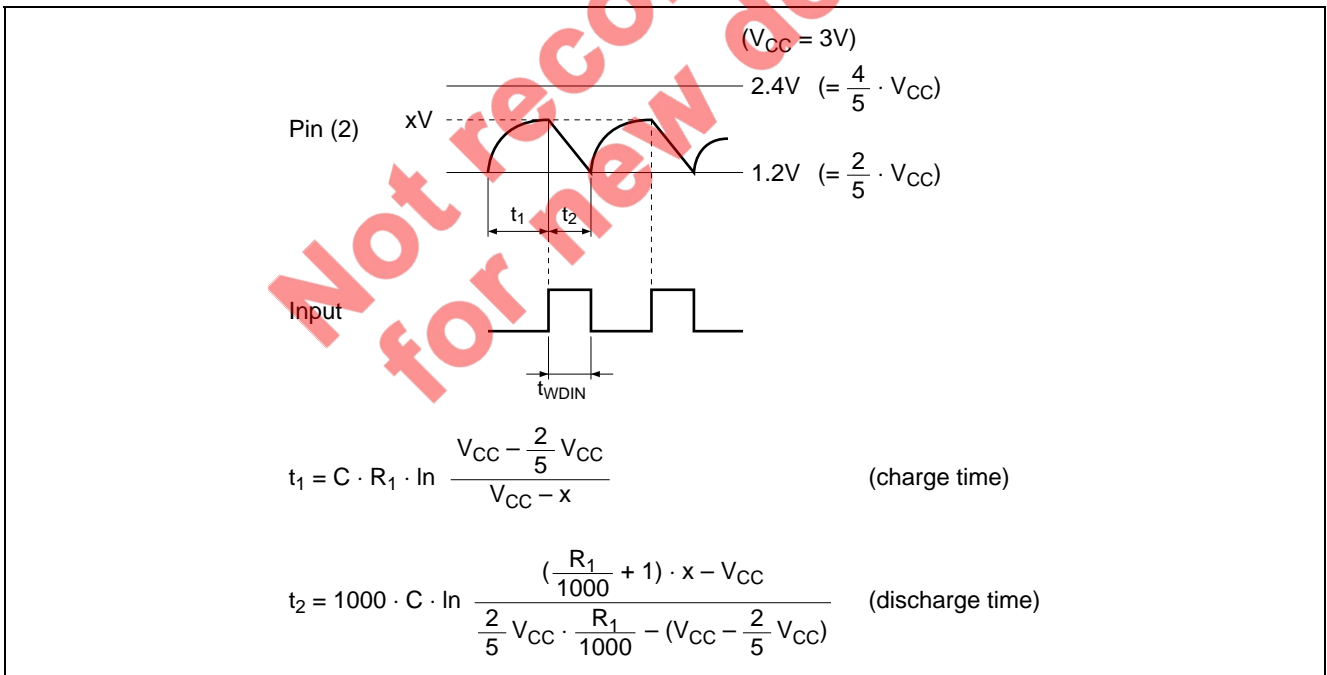


Figure 4

- 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

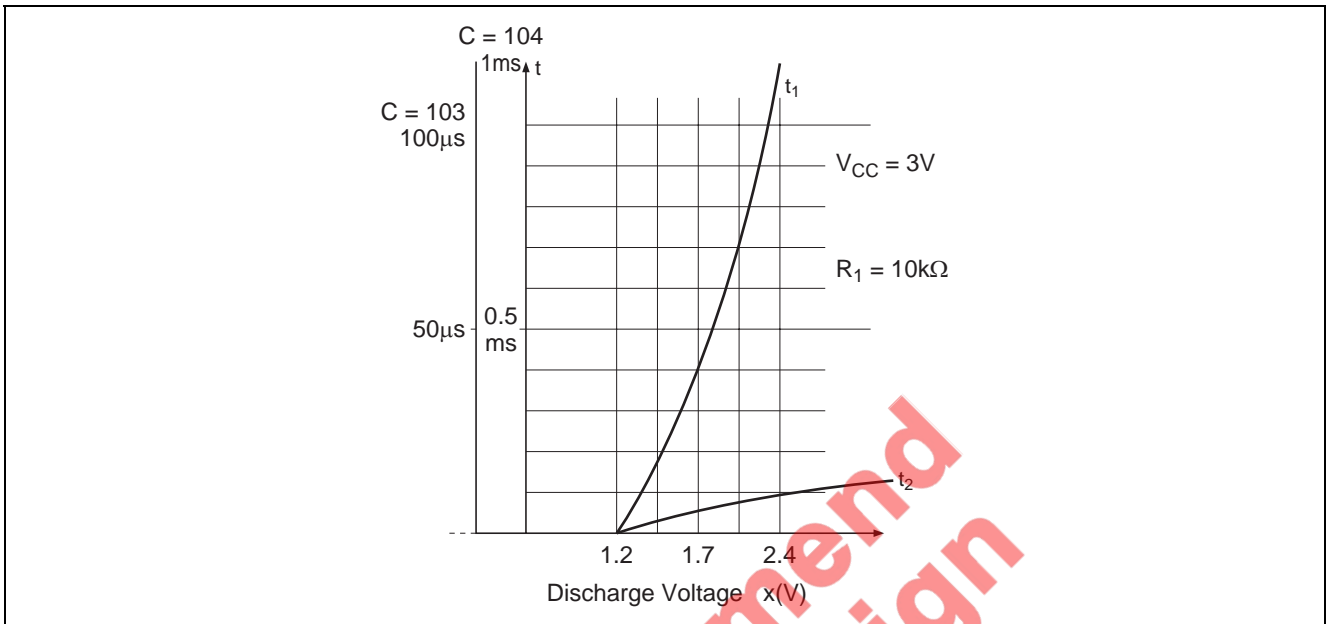


Figure 5

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 |

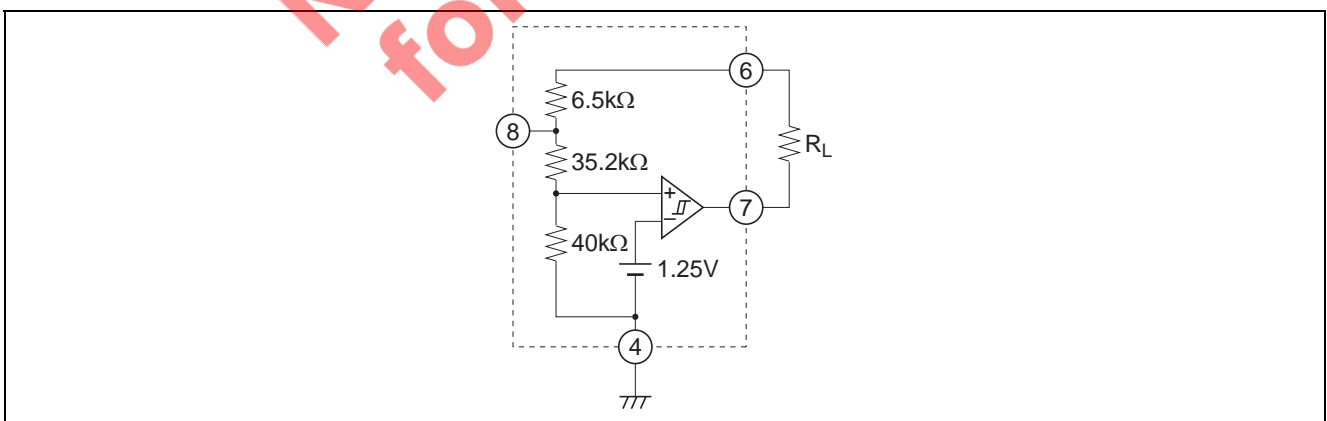


Figure 6

Application Example

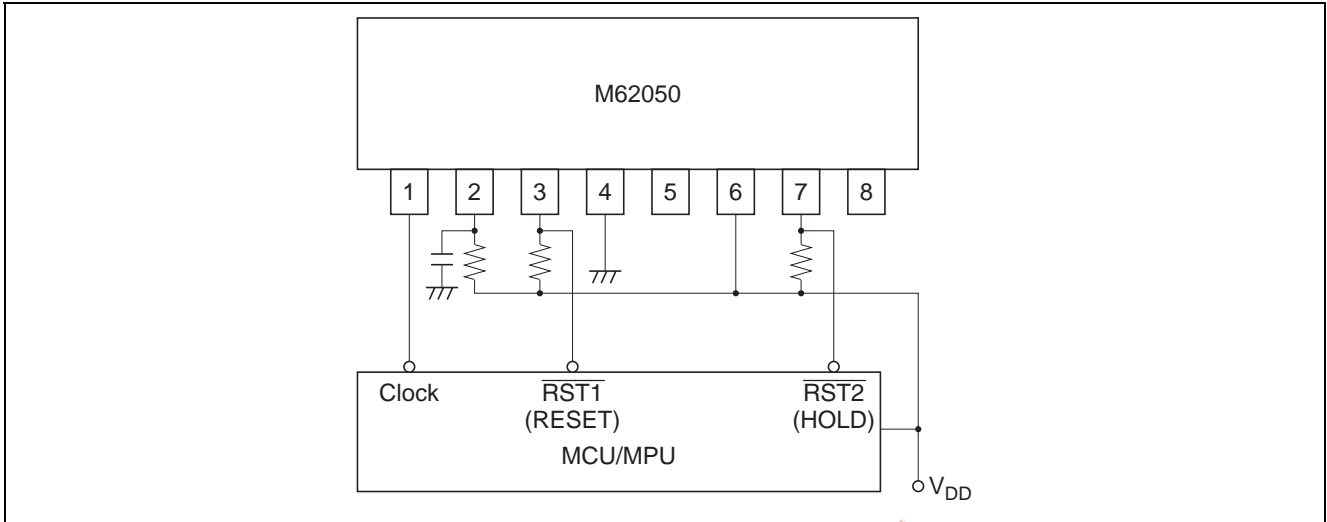
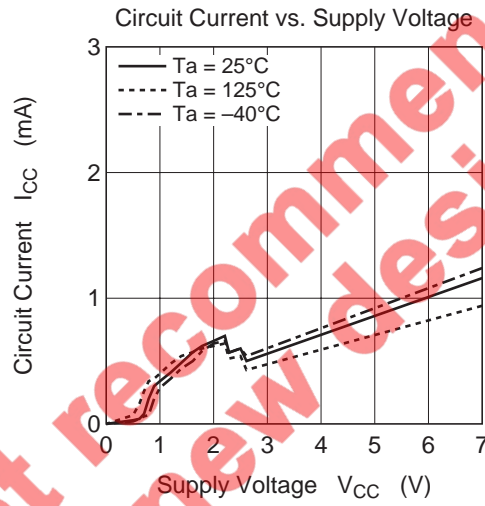
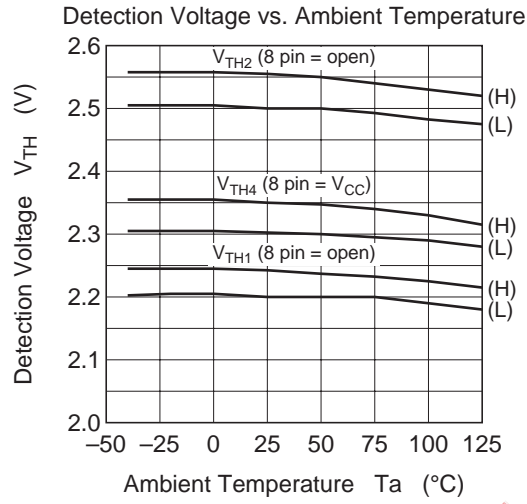


Figure 7 Application Example

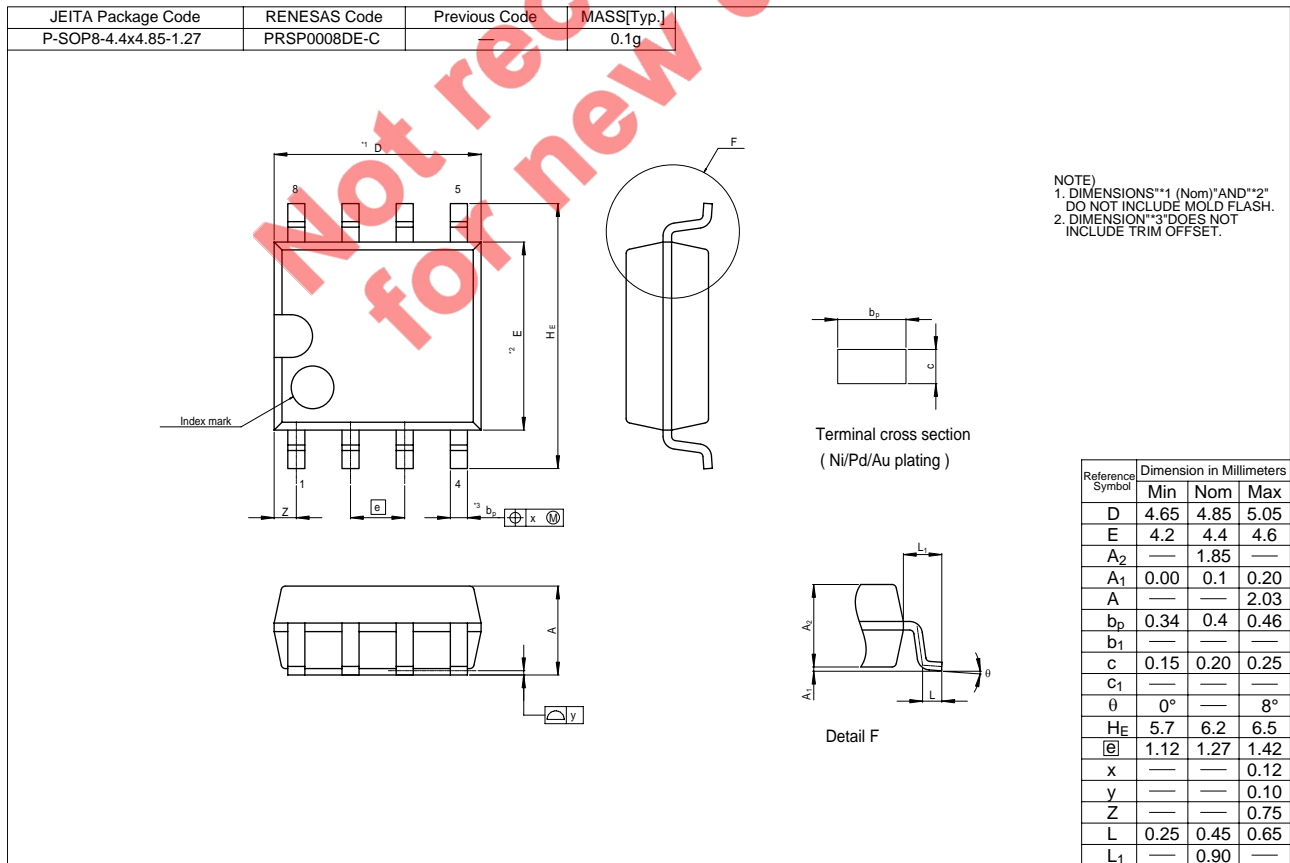
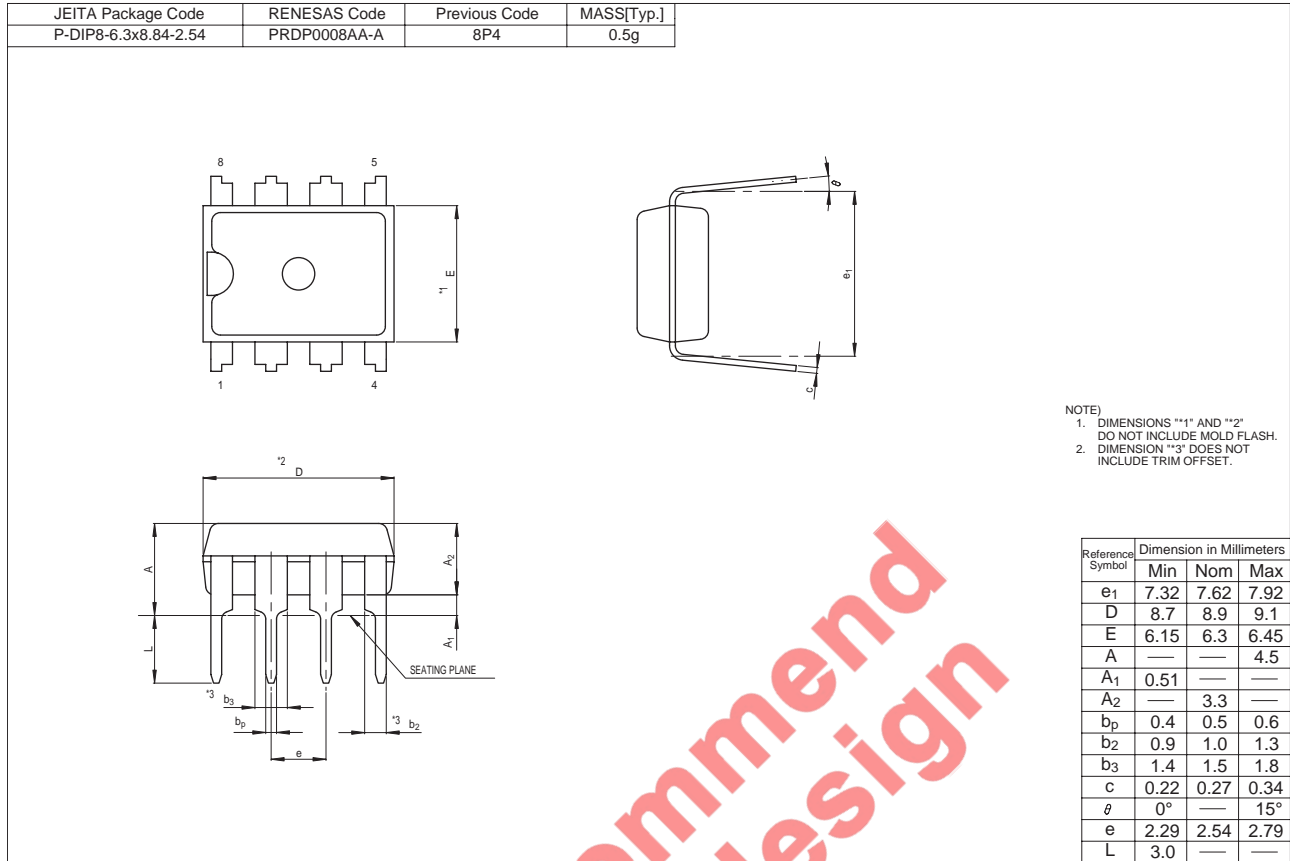
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Typical Characteristics

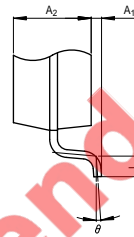
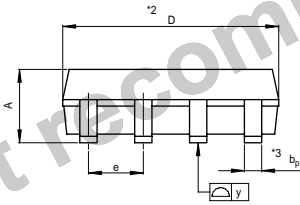
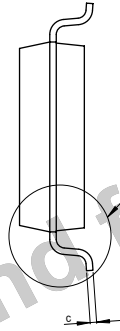
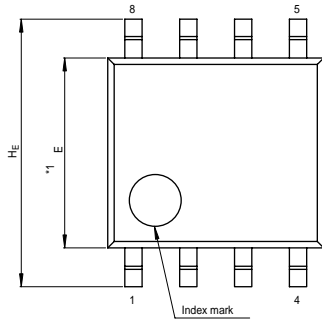


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Package Dimensions



| | | | |
|--------------------|--------------|---------------|------------|
| 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 |

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