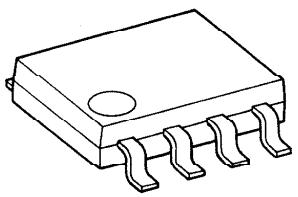
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA8030F

# WATCHDOG TIMER

The TA8030F is a system reset IC for 5V supply voltage system. It is specially designed for microcomputer systems. It incorporates a watchdog timer for monitoring microcomputer operation and has many reset functions, including a reset timer output which will be given at power-on and another reset output which will be given when the supply voltage drops. With these functions, it helps build up a reliable system.



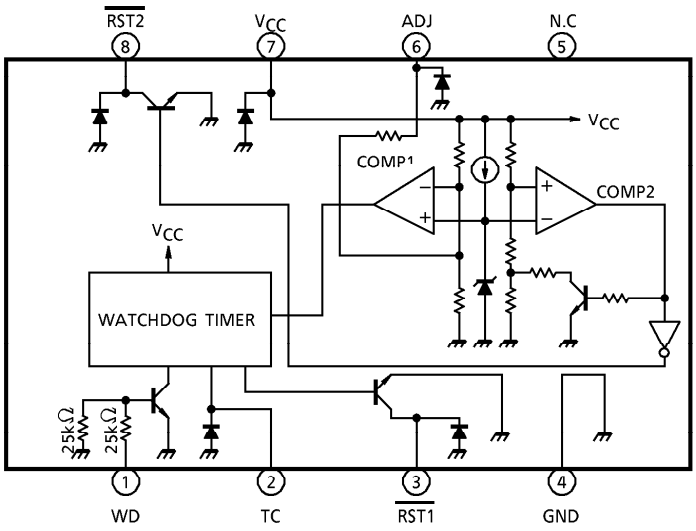
SOP8-P-225-1.27

Weight : 0.08g (Typ.)

## FEATURES

- Watchdog timer
- Power-on reset timer
- Dual-reset output
- Small SOP-8 pin

## BLOCK DIAGRAM AND PIN LAYOUT

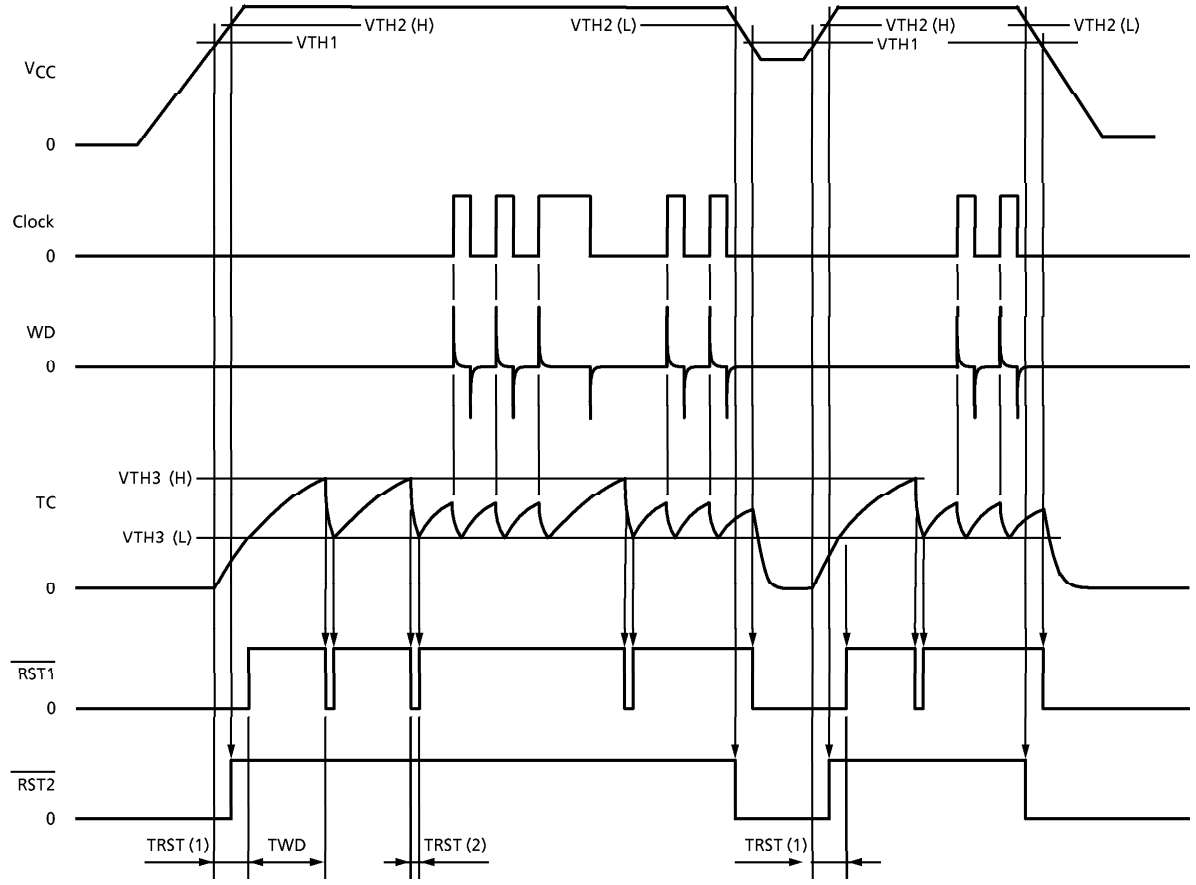



961001EBA2

**PIN DESCRIPTION**

| PIN No. | SYMBOL | DESCRIPTION |
|---|---|---|
| 1 | WD | Clock input pin for watchdog timer. If this IC is only used as a power-on reset timer, this pin is connected to $\overline{RST1}$. |
| 2 | TC | Time setting pin for the reset and watchdog timers. $R_1$ leads to $V_{CC}$, and $C_1$ leads to GND. |
| 3 | $\overline{RST1}$ | Supplies an NPN transistor open-collector output.<br>● Generates a reset signal determined by the CR combination connected to the TC pin.<br>● Supplies reset pulses intermittently if no clock is given to the WD pin. |
| 4 | GND | Grounded |
| 6 | ADJ | $V_{CC}$ detect voltage (1) adjusting pin. The detection voltage is 4.6V when this pin is grounded ; it is 3.5V when this pin is directly connected to $V_{CC}$. |
| 7 | $V_{CC}$ | Power supply pin for internal circuit. The output voltage can also be detected at this pin. |
| 8 | $\overline{RST2}$ | Supplies an NPN transistor open-collector output. It is the output pin for $V_{CC}$ detect voltage (2) . The detect voltage has a hysteresis of 0.17V. |
| 5 | NC | Not connected pin |

**TIMING CHART**



**MAXIMUM RATINGS** (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 17 | V |
| Input Voltage | $V_{IN}$ | −7 to 7 | V |
| Output Voltage | $V_{OUT}$ | 7 | V |
| Output Current | $I_{OUT}$ | 10 | mA |
| Power Dissipation | $P_D$ | 280 | mW |
| Operating Temperature | $T_{opr}$ | −40 to 85 | °C |
| Storage Temperature | $T_{stg}$ | −55 to 150 | °C |
| Lead Temperature-time | $T_{sol}$ | 260 (10s) | °C |

**ELECTRICAL CHARACTERISTICS** ($V_{CC}$ = 5V, Ta = −40 to 85°C)

(1) DC CHARACTERISTICS

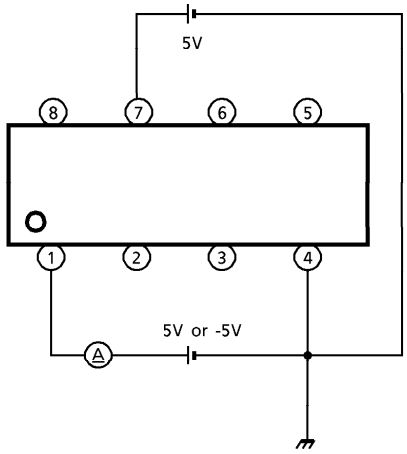
| CHARACTERISTIC | SYMBOL | PIN | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| Input Current | $I_{IH}$ | WD | 1 | $V_{IN}$ = 5V | 0.1 | 0.17 | 0.35 | mA |
| | $I_{IL}$ | | 1 | $V_{IN}$ = −5V | −0.06 | −0.1 | −0.2 | |
| Input Voltage | $V_{IH}$ | WD | 2 | — | 2.2 | — | — | V |
| | $V_{IL}$ | | 2 | — | — | — | 0.6 | |
| Input Current | $I_{IN}$ | TC | 4 | $V_{IN}$ = 1.5V | −2 | — | 2 | μA |
| Output Current | $I_{OUT}$ | TC | 4 | $V_{OUT}$ = 4.2V | 2.4 | 4 | 7.7 | mA |
| Watchdog Timer Threshold Voltage | $V_{TH3\ (H)}$ | TC | 3 | — | 3.5 | 4 | 4.5 | V |
| | $V_{TH3\ (L)}$ | | 3 | — | 1.75 | 2 | 2.25 | |
| Output Voltage | $V_{OL}$ | $\overline{RST1}$ | 5 | $I_{OUT}$ = 2mA | — | — | 0.5 | V |
| Output Leakage Current | $I_{LEAK}$ | $\overline{RST2}$ | 6 | $V_{OUT}$ = 7V | — | — | 5 | μA |
| $V_{CC}$ Detect Voltage (1) | $V_{TH1}$ | $V_{CC}$ | — | — | 4.0 | 4.25 | 4.5 | V |
| | $V_{TH1\ (H)}$ | | 3 | ADJ = GND | 4.3 | 4.6 | 4.9 | |
| | $V_{TH1\ (L)}$ | | 3 | ADJ = $V_{CC}$ | 3.25 | 3.5 | 3.75 | |
| $V_{CC}$ Detect Voltage (2) | $V_{TH2\ (H)}$ | $V_{CC}$ | 3 | — | 4.4 | 4.65 | 4.9 | V |
| | $\Delta V_{TH2}$ | | 3 | — | — | 0.17 | 0.3 | |
| Current Consumption | $I_{CC}$ | $V_{CC}$ | 7 | — | — | 2.5 | 4.5 | mA |

(2) AC CHARACTERISTICS

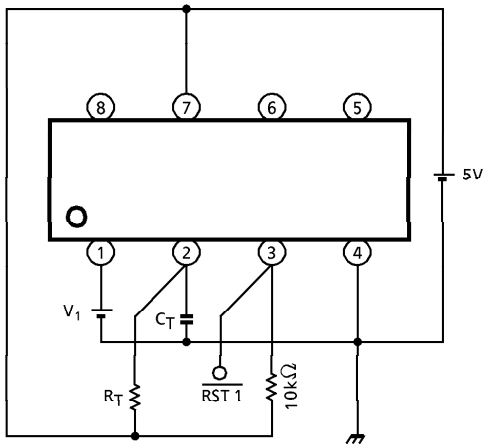
| CHARACTERISTIC | SYMBOL | PIN | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| Watchdog Timer | $T_{WD}$ | $\overline{RST1}$ | 3 | — | $0.9 \times C_1R_1$ | $1.1 \times C_1R_1$ | $1.3 \times C_1R_1$ | s |
| Reset Timer (1) | $T_{RST\ (1)}$ | $\overline{RST1}$ | 3 | — | $0.4 \times C_1R_1$ | $0.5 \times C_1R_1$ | $0.6 \times C_1R_1$ | s |
| Reset Timer (2) | $T_{RST\ (2)}$ | $\overline{RST1}$ | 3 | — | $350 \times C_1$ | $750 \times C_1$ | $1500 \times C_1$ | s |
| Input Pulse Width | $T_W$ | $W_D$ | 3 | — | 3 | — | — | μs |
| Transfer Delay Time | $t_{d1}$ | $\overline{RST1}$ | 3 | $t_{dHL}$ ($C_1$ = 0μF) | — | 3 | 10 | μs |
| | $t_{d2}$ | $\overline{RST2}$ | 3 | $t_{dHL}$, $t_{dLH}$ | — | 3 | 10 | μs |

**TEST CIRCUIT**

1. $I_{IH}$, $I_{IL}$ (WD)

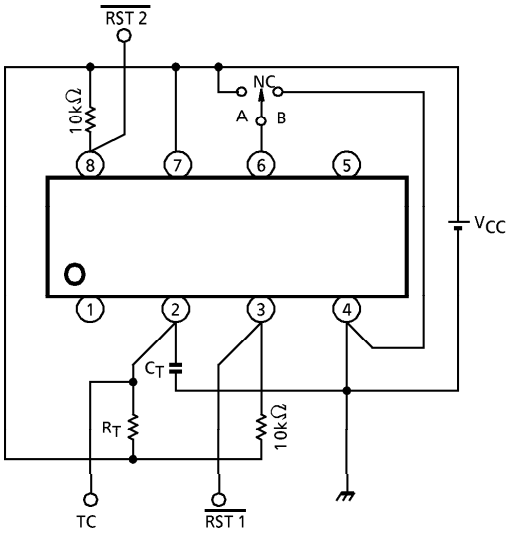



2. $V_{IH}$, $V_{IL}$ (WD)



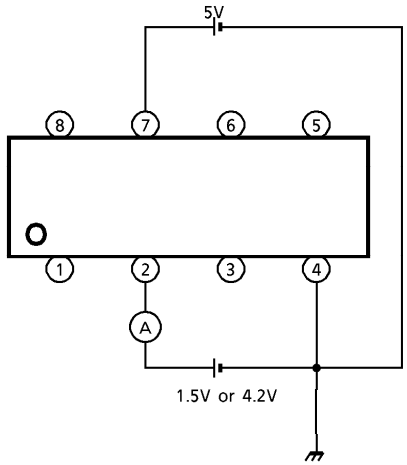

$\overline{RST1}$ should be 5V when $V_1 = 2.2V$.
$\overline{RST1}$ should be a pulse signal when $V_1 = 0.6V$.

3. $V_{TH3}$ (H), (L) (TC), $V_{TH1}$ (H) (L)
   $\Delta V_{TH2}$ (H), AC CHARACTERISTICS

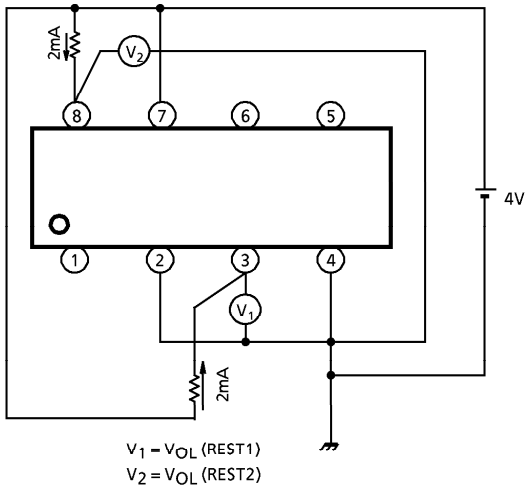



∴ See TIMING CHART.
$\Delta V_{TH2} = V_{TH2}$ (H) − $V_{TH2}$ (L)

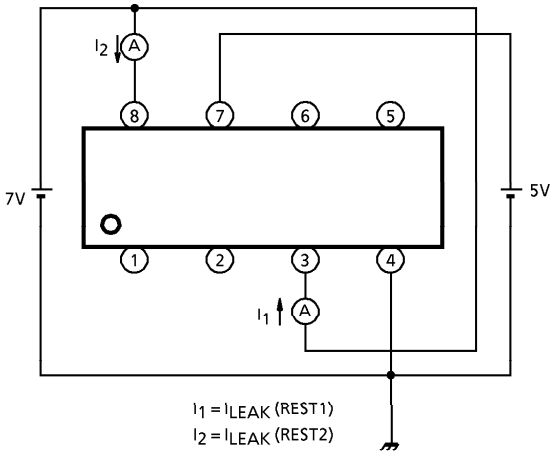
4. $I_{IN}$, $I_{OUT}$ (TC)



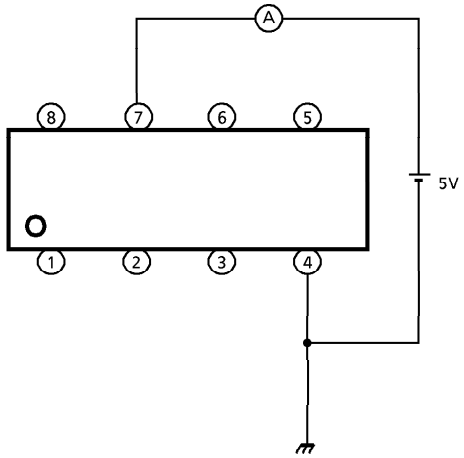
5. $V_{OL}$ ($\overline{RST1}$) ($\overline{RST2}$)



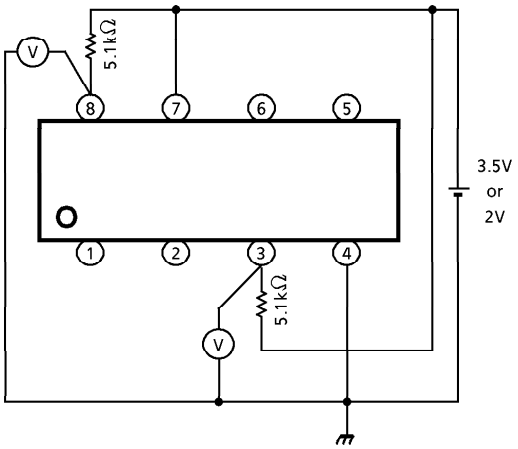

6. $I_{LEAK}$ ($\overline{RST1}$) ($\overline{RST2}$)




7. $I_{CC}$

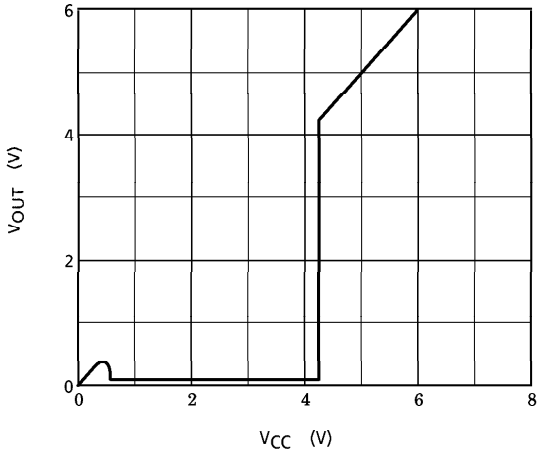



8. $V_{OL}$ (1), (2) ($\overline{RST1}$) ($\overline{RST2}$)

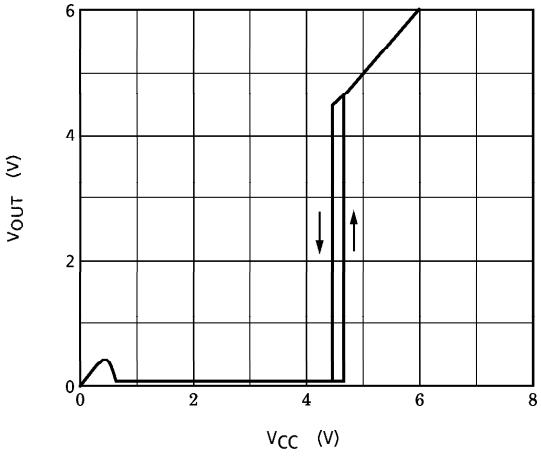


## RESET OUTPUT STANDARD CHARACTERISTICS

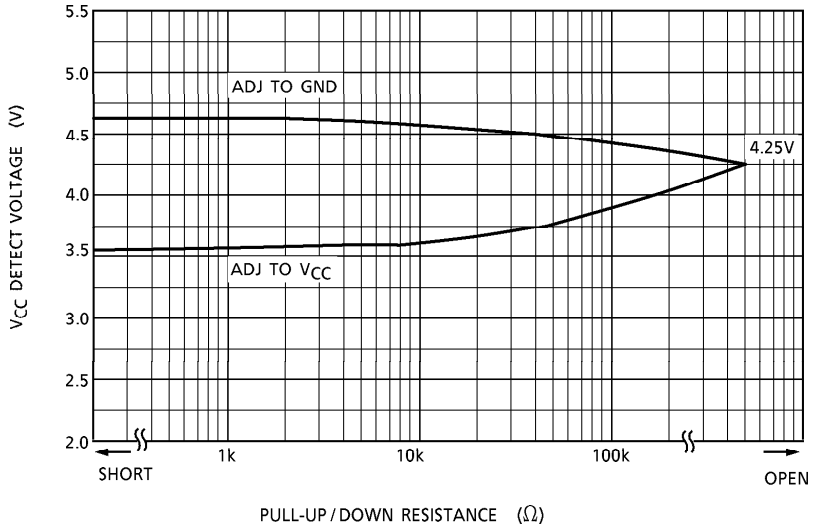
1. $\overline{RST1}$



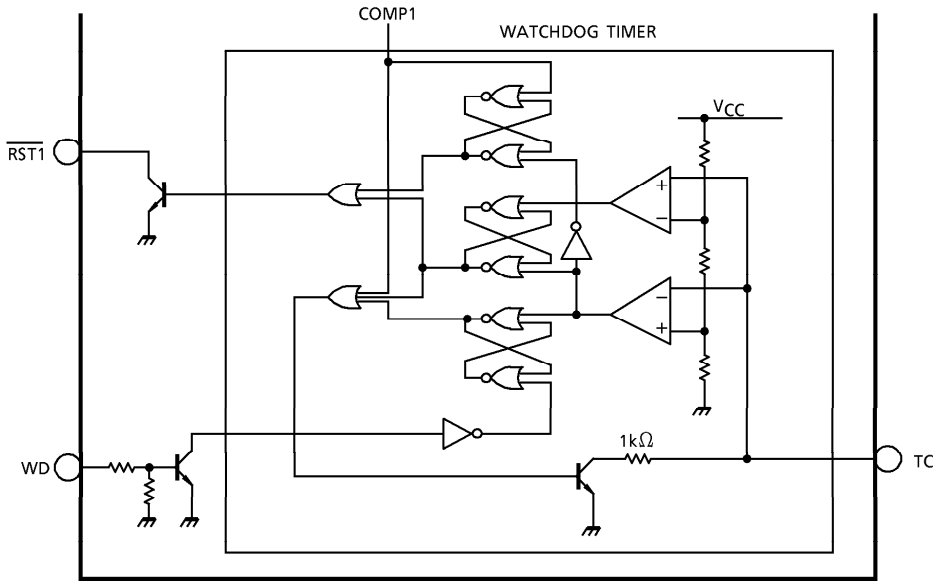

2. $\overline{RST2}$



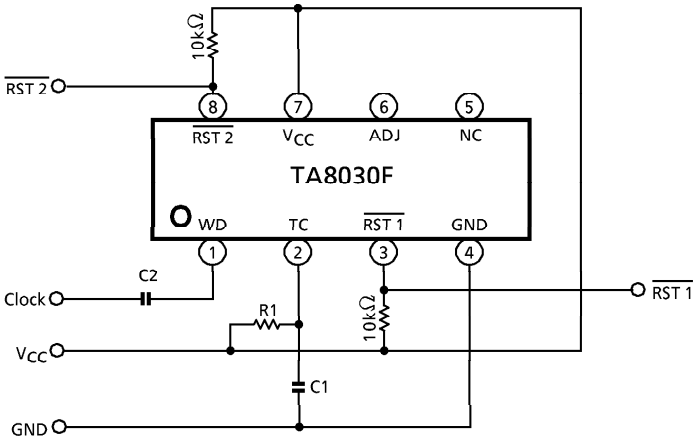

## ADJ PIN PULL-UP / DOWN RESISTANCE VS $V_{CC}$ DETECT VOLTAGE



**EQUIVALENT CIRCUIT DIAGRAM** (WATCHDOG TIMER)




**EXAMPLE OF APPLICATION CIRCUIT**



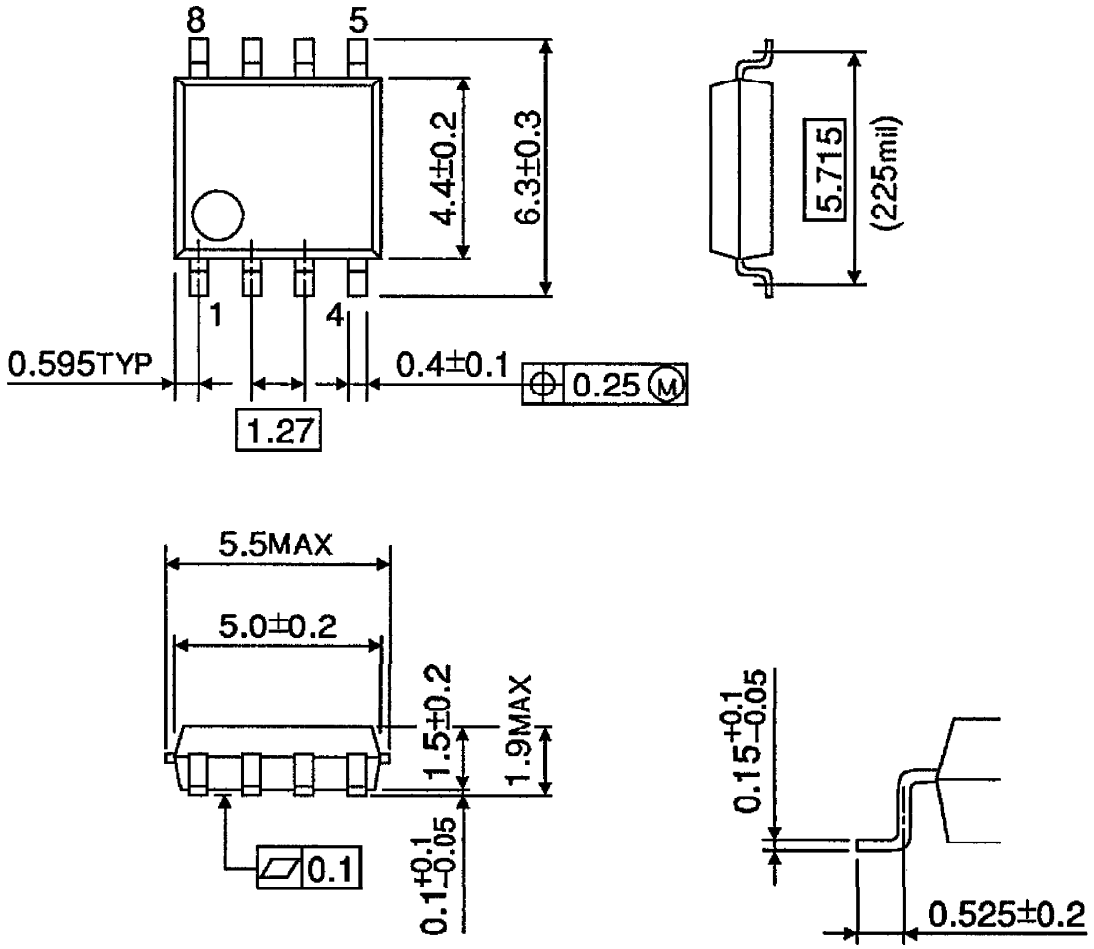

**RECOMMENDED CONDITIONS**

| PART NAME | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|
| $C_1$ | 0.01 | — | 100 | μF |
| $R_1$ | 10 | — | 100 | kΩ |
| $C_2$ | — | 2200 | — | pF |

**OUTLINE DRAWING**

SOP8-P-225-1.27

Unit : mm




Weight : 0.08g (Typ.)