

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

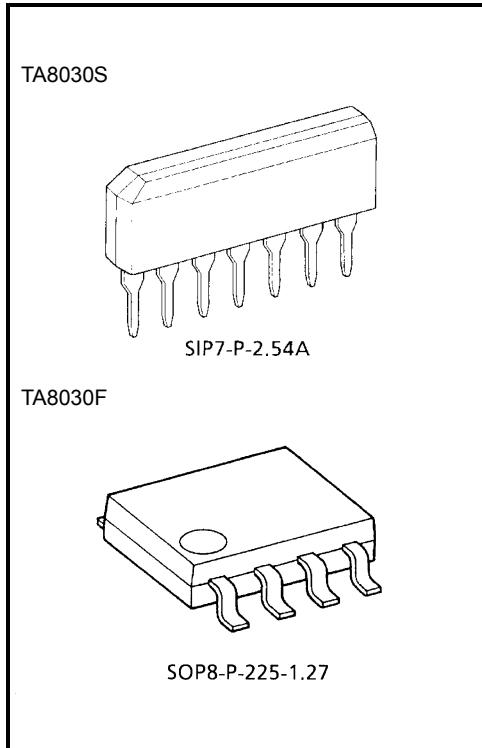
TA8030S,TA8030F

WATCHDOG TIMER

The TA8030S 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.

FEATURES

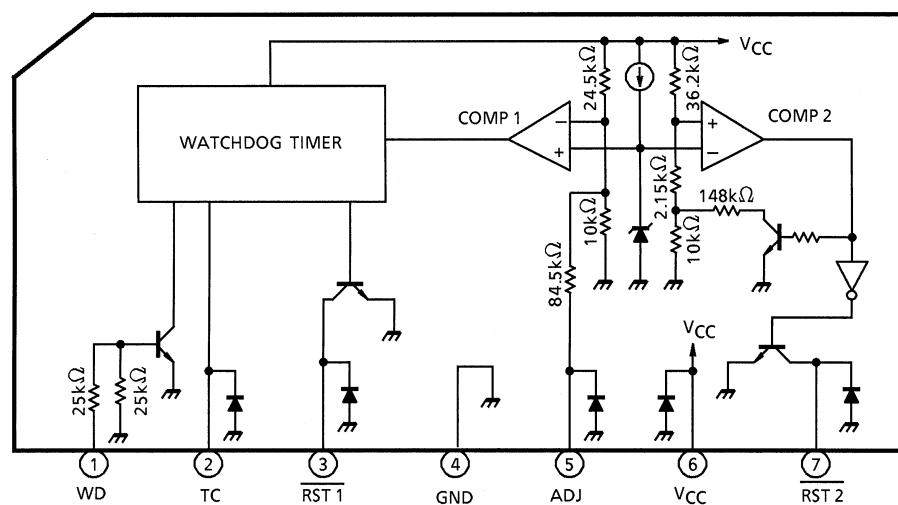
- Watchdog timer
- Power-on reset timer
- Dual-reset output
- SIP7 PIN (TA8030S)
SOP8 PIN (TA8030F)



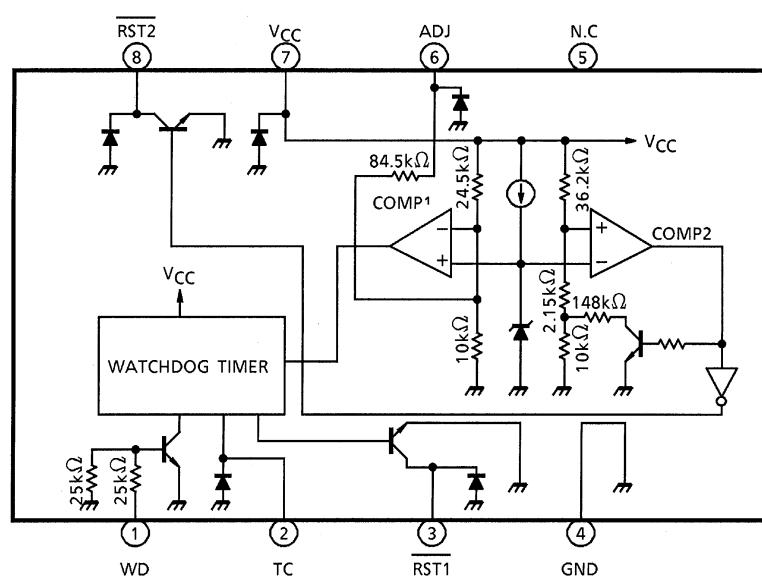
Weight
SIP7- P-2.54A : 0.7g (typ.)
SOP8- P-225-1.27 : 0.08g (typ.)

BLOCK DIAGRAM AND PIN LAYOUT

TA8030S



TA8030F



Note: The TA8030S and TA8030F are the same chip; only the packages are different.

PIN DESCRIPTION

| PIN No. | | SYMBOL | DESCRIPTION |
|---------|---------|-------------|---|
| TA80305 | TA8030F | | |
| 1 | 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 <u>RST1</u> . |
| 2 | 2 | TC | Time setting pin for the reset and watchdog timers. R_1 leads to V_{CC} , and C_1 leads to GND. |
| 3 | 3 | <u>RST1</u> | Supplies an NPN transistor open-collector output. • Generates a reset signal determined by the CR combination connected to the TC pin. • Supplies reset pulses intermittently if no clock is given to the WD pin. |
| 4 | 4 | GND | Grounded |
| 5 | 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} . |
| 6 | 7 | V_{CC} | Power supply pin for internal circuit. The output voltage can also be detected at this pin. |
| 7 | 8 | <u>RST2</u> | 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.(Electrically, this pin is completely open.) |

FUNCTIONAL DESCRIPTION

About reset timer operation (See the timing chart)

The following explains the TA8030S/F's voltage monitoring and reset timer operations and how to use these functions.

(1) Voltage monitoring function (1)

The power input VCC pin of this IC also serves as a voltage detection pin. When the VCC voltage exceeds 4.25V after the IC is powered on, the power-on reset timer starts operating from that point in time. When the IC is powered off and VCC drops below 4.25V, TC starts discharging and a reset signal is output when the voltage drops below 40% of VCC. Also, if VCC goes down for some reason during normal operation, a reset signal is output in the same way as described above, and when VCC is up again and exceeds 4.25V, the power-on reset timer starts operating from that point in time.

The reset signal is forwarded to the $\overline{\text{RST1}}$ pin.

(2) Voltage monitoring function (2)

The $\overline{\text{RST2}}$ pin outputs a high when the VCC voltage rises above 4.65V and outputs a low when it falls below 4.48V. This function only monitors the voltage operating independently of Voltage monitoring function (1) and the reset timer function. Since when the voltage drops the $\overline{\text{RST2}}$ output is inverted before a system reset signal is output from $\overline{\text{RST1}}$, this function can be used to inhibit writing to memory.

Also, this voltage detection has $3 \mu\text{s}$ of response delay, td2 , to prevent a reset from being generated inadvertently by minute noise. (For td2 , refer to AC Electrical Characteristics.)

(3) Power-on reset timer function

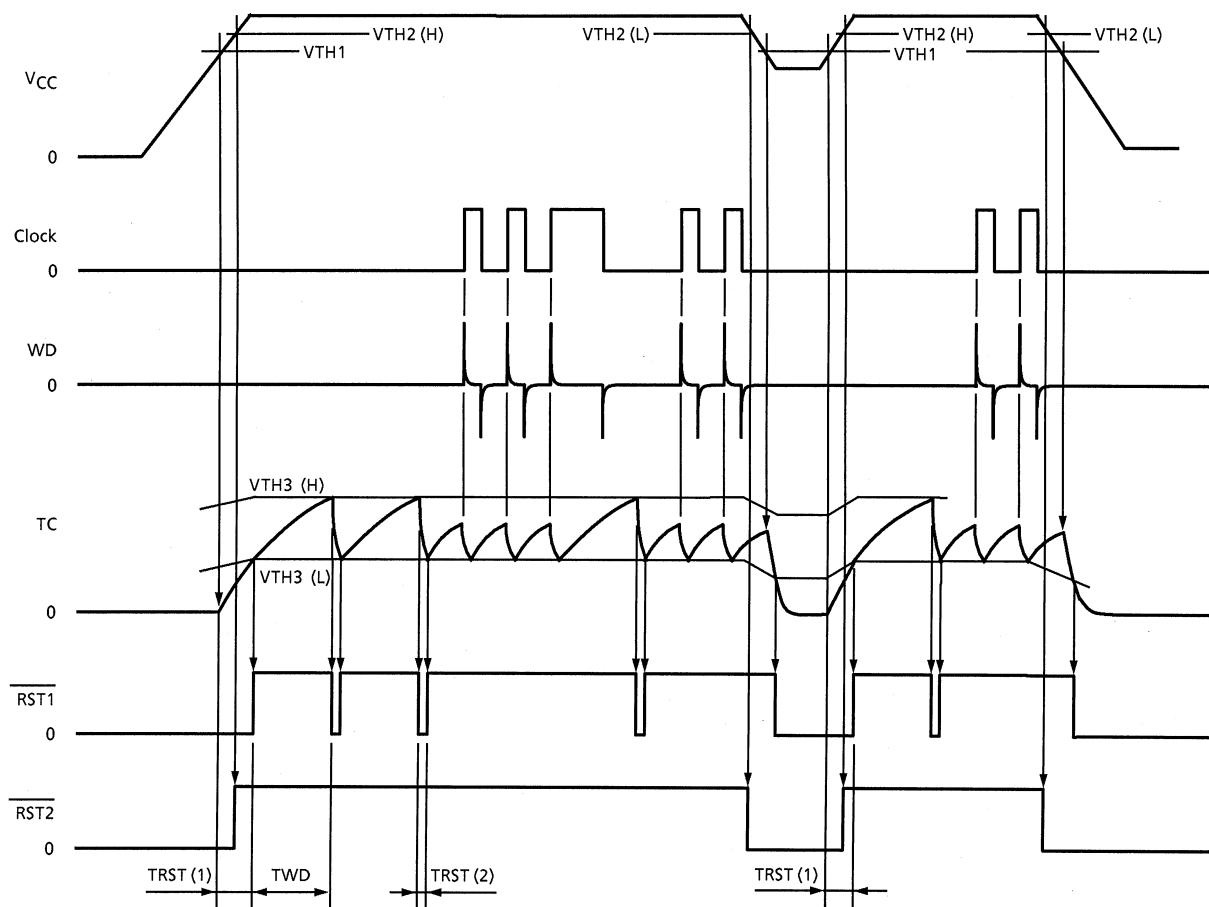
The device is held in a reset state for a predetermined time until the 5V constant voltage stabilizes at power-on and until the oscillating clock of the CPU, etc. stabilizes before being freed from the reset state. This time can be set to any desired duration by using the appropriate resistor and capacitor values connected external to the TC pin.

When the VCC voltage exceeds 4.25V, the system starts charging the capacitor and when this charging voltage exceeds 2V, the reset signal is inverted to deactivate the reset.

(4) Watchdog timer function

The WD pin between the CPU system and this IC is connected with a differential circuit. This is to ensure that when a failure occurs in the CPU system, a low signal is input to the WD pin no matter whether the clock output has stopped in the high or the low state. When the WD pin is fixed high, the watchdog timer stops operating.

If only the power-on reset timer is needed in your system, connect the WD pin to $\overline{\text{RST1}}$.

TIMING CHART

Note : See Electrical Characteristics for symbols in the timing chart.

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|-----------------------|----------------------|------------|------|
| Supply Voltage | V _{CC} | 17 | V |
| Input Voltage | V _{IN} (CK) | -7~7 | V |
| Output Voltage | V _{OUT} | 7 | V |
| Output Current | I _{OUT} | 10 | mA |
| Power Dissipation | P _D | 300/280 | 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 |

Note: P_D : TA8030S/TA8030FELECTRICAL 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} | <u>RST1</u> | 5 | I _{OUT} = 2mA | — | — | 0.5 | V |
| Output Leakage Current | I _{LEAK} | <u>RST2</u> | 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 | AJD = 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 |
| | ΔV _{TH2} | | 3 | — | — | 0.17 | 0.3 | |
| Current Consumption | I _{CC} | V _{CC} | 7 | — | — | 2.5 | 4.5 | mA |

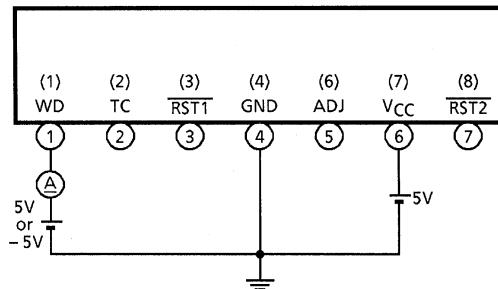
(2) AC CHARACTERISTICS

| CHARACTERISTIC | SYMBOL | PIN | TEST CIR-CUIT | TEST CONDITION | MIN | TYP. | MAX | UNIT |
|---------------------|----------------------|-------------|---------------|-------------------------------------|------------|------------|------------|------|
| Watchdog Timer | T _{WD} | <u>RST1</u> | 3 | | 0.9 × C1R1 | 1.1 × C1R1 | 1.3 × C1R1 | ms |
| Reset Timer (1) | T _{RST} (1) | <u>RST1</u> | 3 | | 0.4 × C1R1 | 0.5 × C1R1 | 0.6 × C1R1 | ms |
| Reset Timer (2) | T _{RST} (2) | <u>RST1</u> | 3 | | 0.35 × C1 | 0.75 × C1 | 1.5 × C1 | ms |
| Input Pulse Width | T _W | WD | 3 | | 3 | — | — | μs |
| Transfer Delay Time | t _{d1} | <u>RST1</u> | 3 | t _{dHL} (C1 = 0 μF) | — | 3 | 10 | μs |
| | t _{d2} | <u>RST2</u> | 3 | t _{dHL} , t _{dLH} | — | 3 | 10 | |

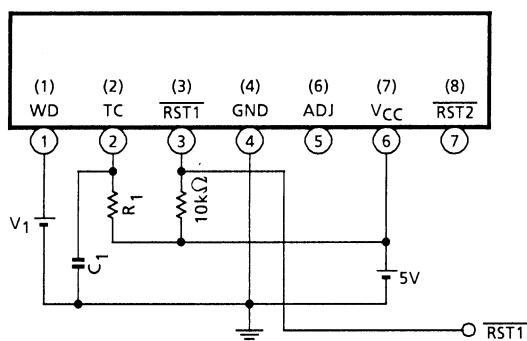
Note: The unit for the C1 is μ F, the unit for R1 is kΩ.

TEST CIRCUIT (Number in **O** show pin number of the TA8030S, those in **()** show pin number of the TA8030F.)

1. I_{IH} 、 I_{IL} (WD)

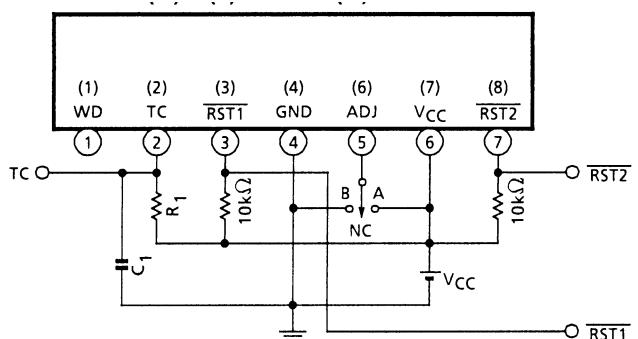


2. V_{IH} 、 V_{IL} (WD)



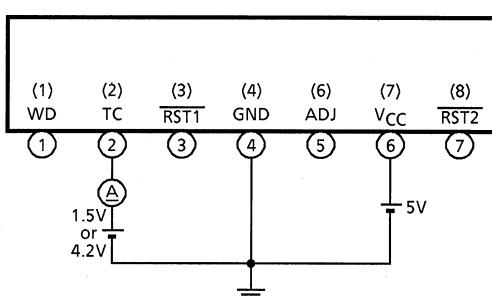
At $V_1 = 2.2V$, $\overline{RST1}$ must be 5V.
At $V_1 = 0.6V$, $\overline{RST1}$ must generate a Pulse signal.

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

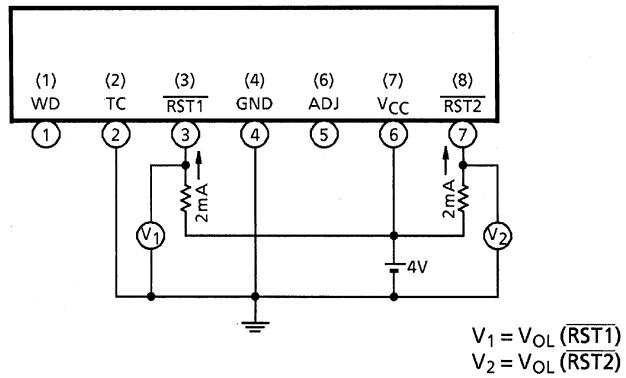


∴ See Timing Chart
 $\Delta V_{TH2} = V_{TH2(H)} - V_{TH2(L)}$

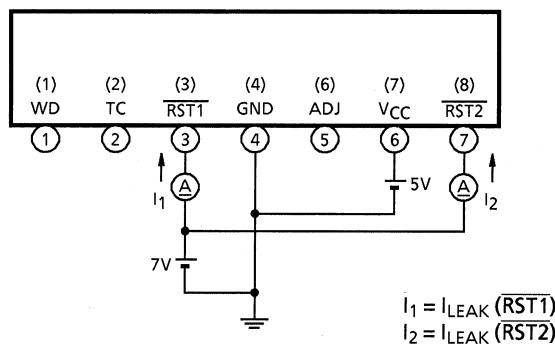
4. I_{IN} 、 I_{OUT} (TC)



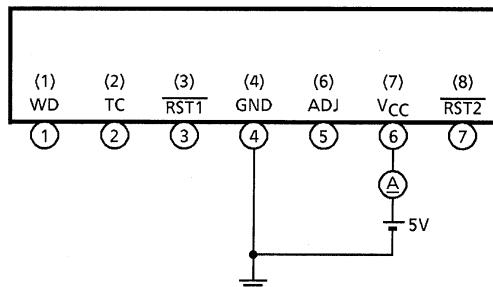
5. $V_{OL}(\overline{RST1})(\overline{RST2})$



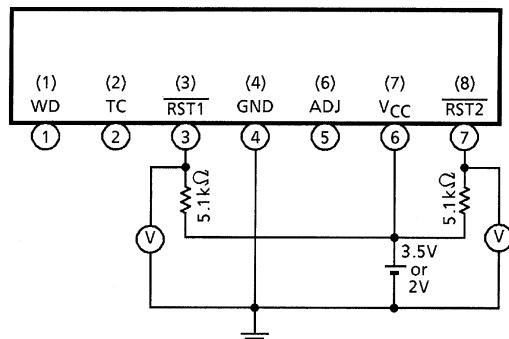
6. $I_{LEAK}(\overline{RST1})(\overline{RST2})$

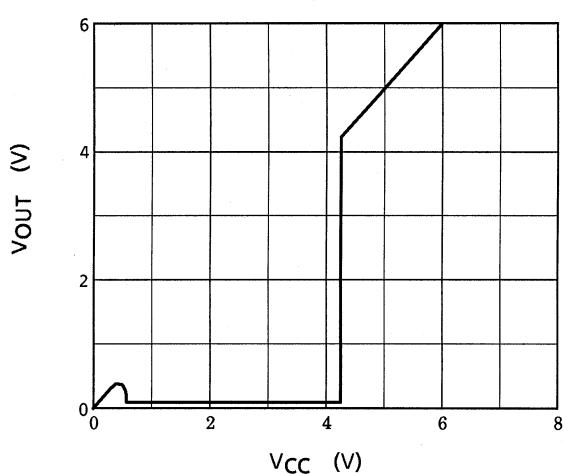
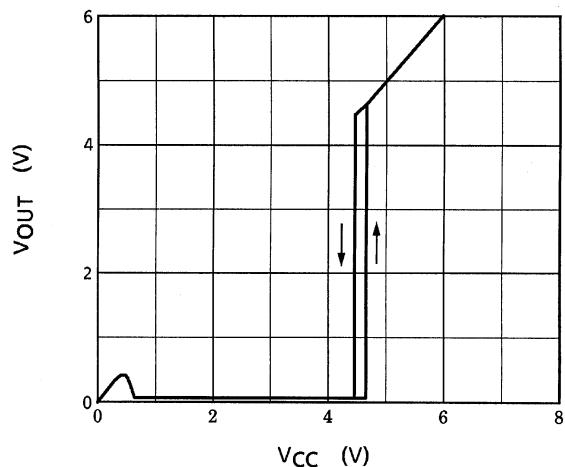
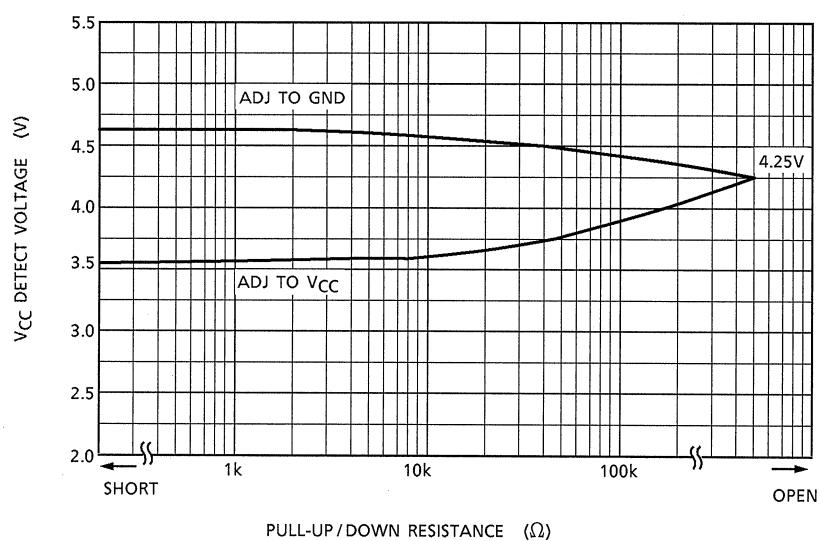


7 I_{CC}

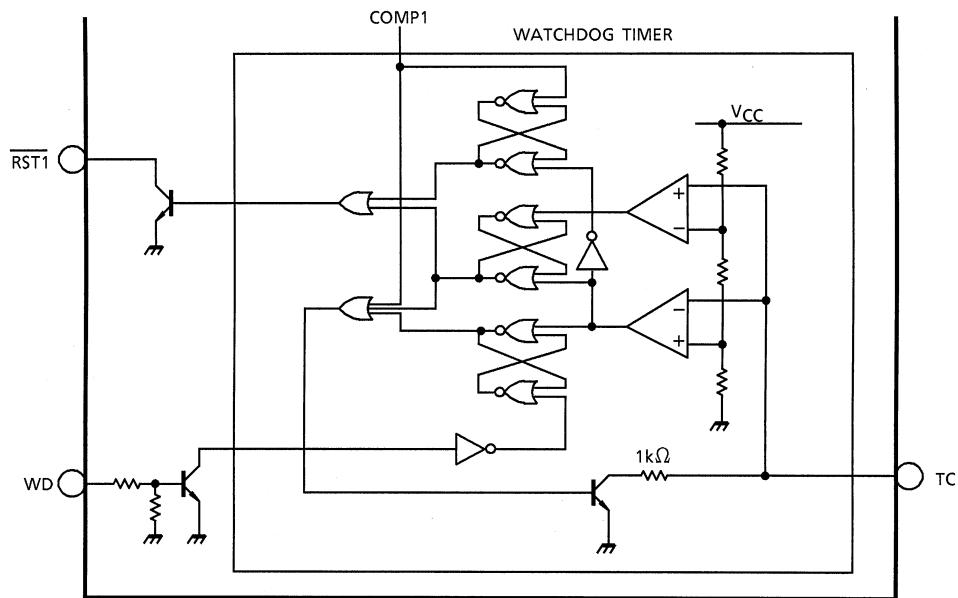


8. $V_{OL}(1) \sim (2)(\overline{RST1})(\overline{RST2})$

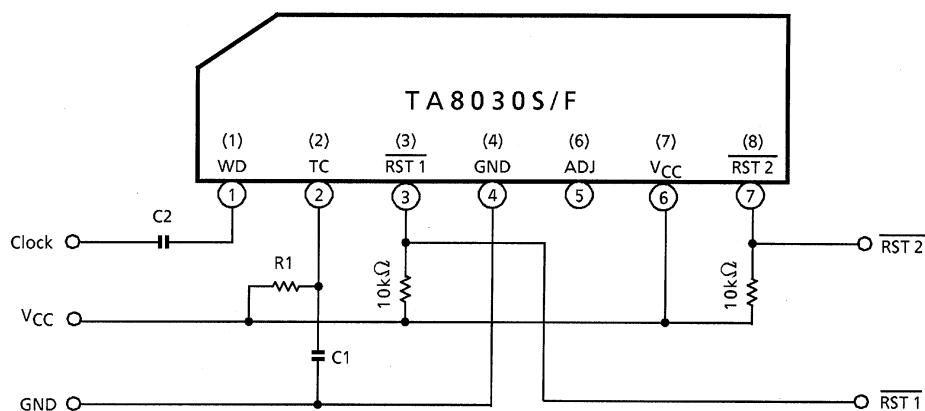


RESET OUTPUT STANDARD CHARACTERISTICS**1. $\overline{\text{RST1}}$** **2. $\overline{\text{RST2}}$** **ADJ PIN PULL-UP / DOWN RESISTANCE VS VCC DETECT VOLTAGE**

EQUIVALENT CIRCUIT DIAGRAM (WATCHDOG TIMER)



EXAMPLE OF APPLICATION CIRCUIT



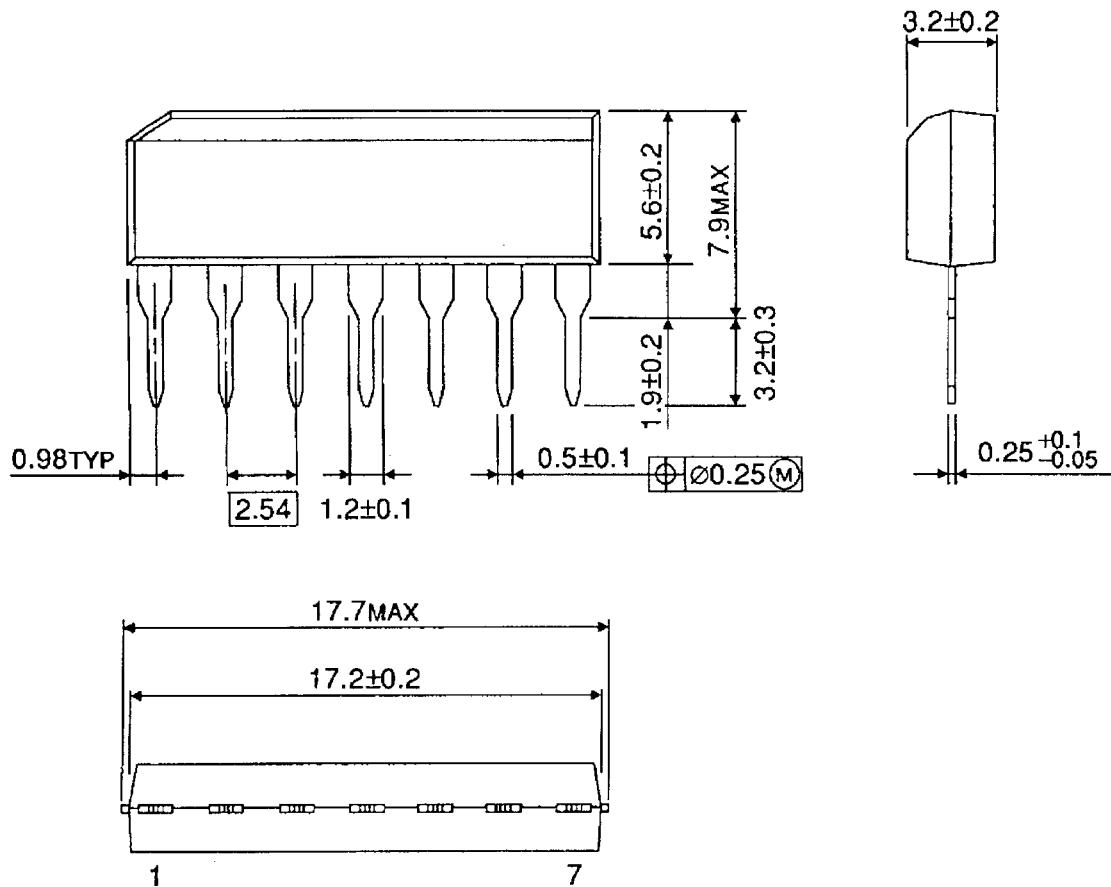
RECOMMENDED CONDITIONS

| PART NAME | MIN | TYP. | MAX | UNIT |
|----------------|------|------|-----|------|
| C ₁ | 0.01 | | 100 | μF |
| R ₁ | 10 | | 100 | kΩ |
| C ₂ | | 2200 | | pF |

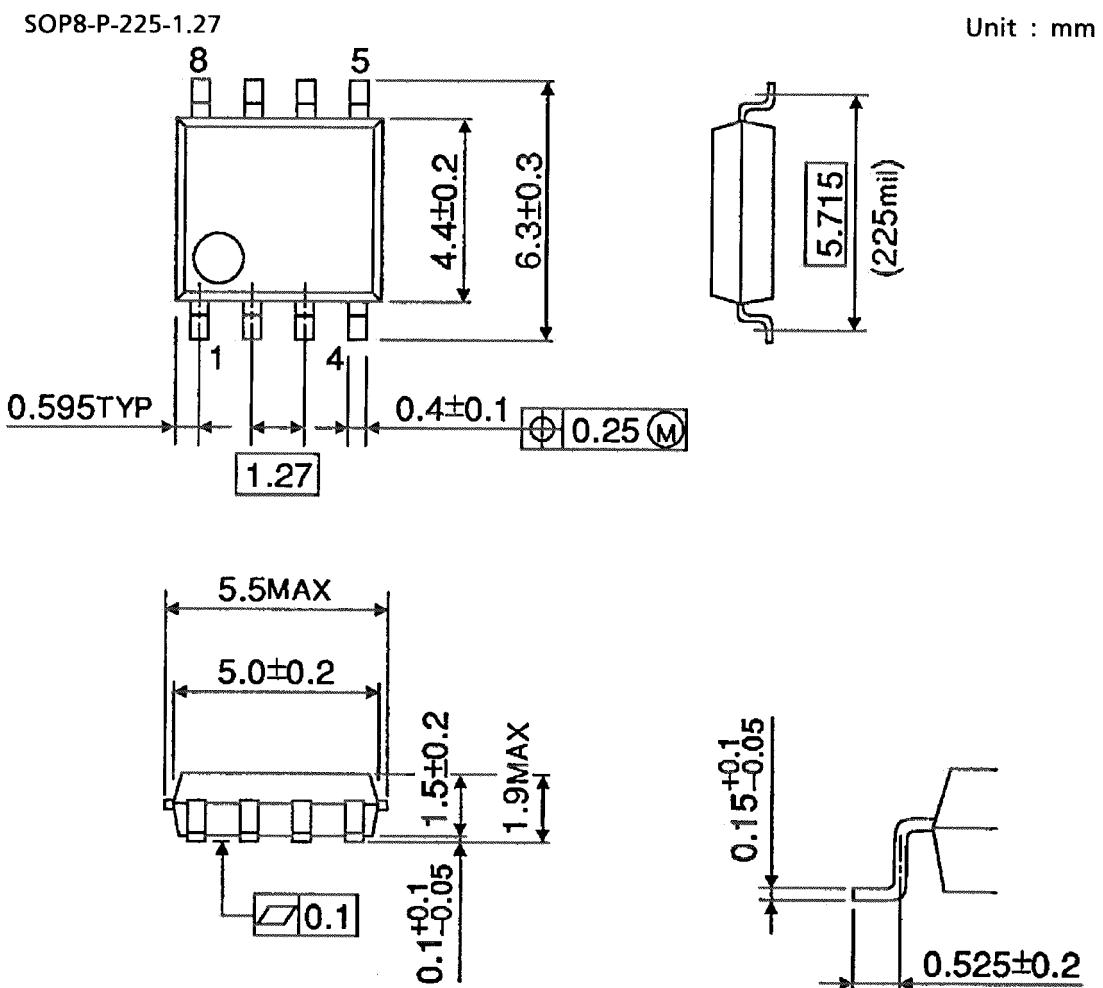
Package Dimensions

SIP7-P-2.54A

Unit : mm



Weight: 0.7g (Typ.)

Package Dimensions

Weight: 0.08g (Typ.)

RESTRICTIONS ON PRODUCT USE

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