# SYSTEM RESET IC

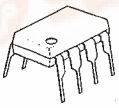
## ■ GENERAL DESCRIPTION

The NJM2102 Possesses two functions. One is to detect a voltage which decays from the desired voltage and generate a warning signal. And also, the NJM2102 holds the warning signal for a certain term after the specified voltage is obtained or recovered. The other one (Watch Dog Timer) is to identify missing clocks of microprocessors. Therefore, it should be said that the NJM2102 is ideal to protect any microprocessors from the fales operations induced by undesired condition.

## ■ FEATURES

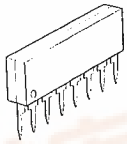
- Internal Watch Dog Timer
- Precise Detection of Supply Voltage Down (4.2V±2.5%)
- Package Outline DIP8, DMP8, SIP8
- Bipolar Technology

## ■ PACKAGE OUTLINE



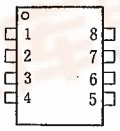
NJM2102D

NJM2102M

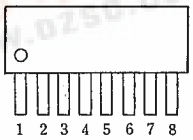


NJM2102L

## ■ PIN CONFIGURATION




NJM2102D
NJM2102M

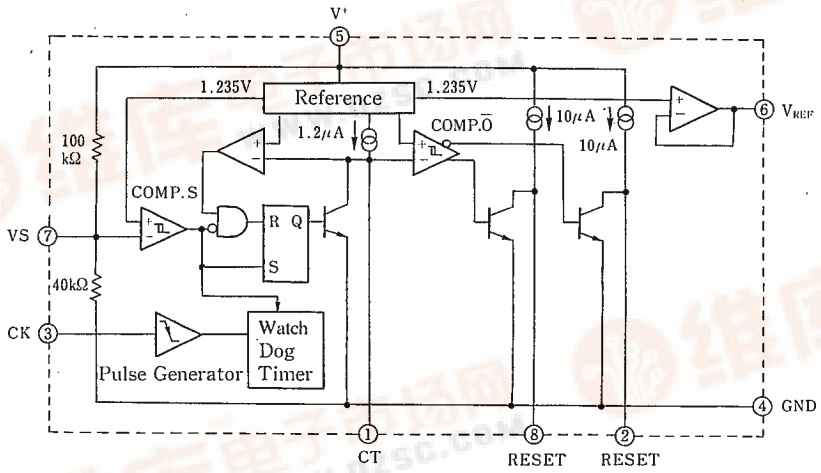



NJM2102L

PIN FUNCTION

1. CT
2. RESET
3. CK
4. GND
5. $V^+$
6. $V_{REF}$
7. $V_S$
8. $\overline{RESET}$

## ■ BLOCK DIAGRAM

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## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+_1$ | 13.5 | V |
| Input Voltage | $V_S$ | $V^+$+0.3(<20) | V |
| Input Voltage | $V_{CK}$ | 20 | V |
| Power Dissipation | $P_D$ | (DIP8) 500 | mW |
| | | (SIP8) 600 | mW |
| | | (DMP8) 300 | mW |
| Operating Temperature Range | $T_{opr}$ | −40～+85 | ℃ |
| Storage Temperature Range | $T_{stg}$ | −40～+125 | ℃ |

## ■ ELECTRICAL CHARACTERISTICS

($V^+$=5V, Ta=25℃)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Operating Current | $I_{cc}$ | Full Function | — | 0.65 | 1.00 | mA |
| Threshold Voltage 1 | $V_{SL}$ | Falling Down Input | 4.10 | 4.20 | 4.30 | V |
| Threshold Voltage 2 | $V_{SH}$ | Rising Up Input | 4.20 | 4.30 | 4.40 | V |
| Hysteresis Width | $V_{HYS}$ | $V_{SL}-V_{SH}$ | 50 | 100 | 150 | mV |
| Reference Voltage | $V_{RFF}$ | | 1.217 | 1.235 | 1.253 | V |
| Operating Voltage Regulation | $\Delta V_{REF1}$ | $V_{CC}$=3.5V～18V | −10 | +3 | +10 | mV |
| Load Regulation | $\Delta V_{REF2}$ | $I_{OUT}=-200\mu A \sim +5\mu A$ | −5 | — | +5 | mV |
| CK Input Threshold Voltage | $V_{TH}$ | | 0.70 | 1.24 | 1.90 | V |
| CK Input Current 1 | $I_{IH}$ | $V_{CK}$=5.0V | — | 0 | 1.0 | μA |
| CK Input Current 2 | $I_{IL}$ | $V_{CK}$=0.0V | −1.0 | −0.1 | — | μA |
| $C_T$ Charge Current 1 | $I_{CTC1}$ | (Note 1) | 20 | 50 | 110 | μA |
| $C_T$ Charge Current 2 | $I_{CTC2}$ | $V_{CK}$=0.0V | 0.6 | 1.4 | 3.0 | μA |
| Capacitor Discharge Current 1 | $I_{CTD1}$ | (Note 1) | 6 | 9 | 13 | μA |
| Capacitor Discharge Current 2 | $I_{CTD2}$ | $V_{CK}$=0.0V | 100 | 600 | — | μA |
| Output Voltage (High) 1 | $V_{OH1}$ | $V_S$=Open. $I_{\overline{RESET}}=-5\mu A$ | 4.5 | 4.9 | — | V |
| Output Voltage (High) 2 | $V_{OH2}$ | $V_S$=0V,$I_{RESET}=-5\mu A$ | 4.5 | 4.9 | — | V |
| Output Voltage (Low) 1 | $V_{OL1}$ | $V_S$=0V,$I_{\overline{RESET}}$=3mA | — | 0.2 | 0.4 | V |
| Output Voltage (Low) 2 | $V_{OL2}$ | $V_S$=0V,$I_{\overline{RESET}}$=10mA | — | 0.3 | 0.5 | V |
| Output Voltage (Low) 3 | $V_{OL3}$ | $V_S$ =Open. $I_{RESET}$=3mA | — | 0.2 | 0.4 | V |
| Output Voltage (Low) 4 | $V_{OL4}$ | $V_S$ =Open. $I_{RESET}$=10mA | — | 0.3 | 0.5 | V |
| Output Sink Current 1 | $I_{OL1}$ | $V_S$ =0V $V_{\overline{RESET}}$=1.0V | 20 | 70 | — | mA |
| Output Sink Current 2 | $I_{OL2}$ | $V_S$ =Open. $V_{RESET}$=1.0V | 20 | 70 | — | mA |
| Minimum Operating Voltage 1 | $V_{CCL1}$ | $V_{\overline{RESET}}$=0.4V, $I_{\overline{RESET}}$=0.2mA | — | 0.8 | 1.2 | V |
| Minimum Operating Voltage 2 | $V_{CCL2}$ | $V_{RESET}=V^+-0.1V$, $R_L$=1MΩ | — | 0.8 | 1.2 | V |

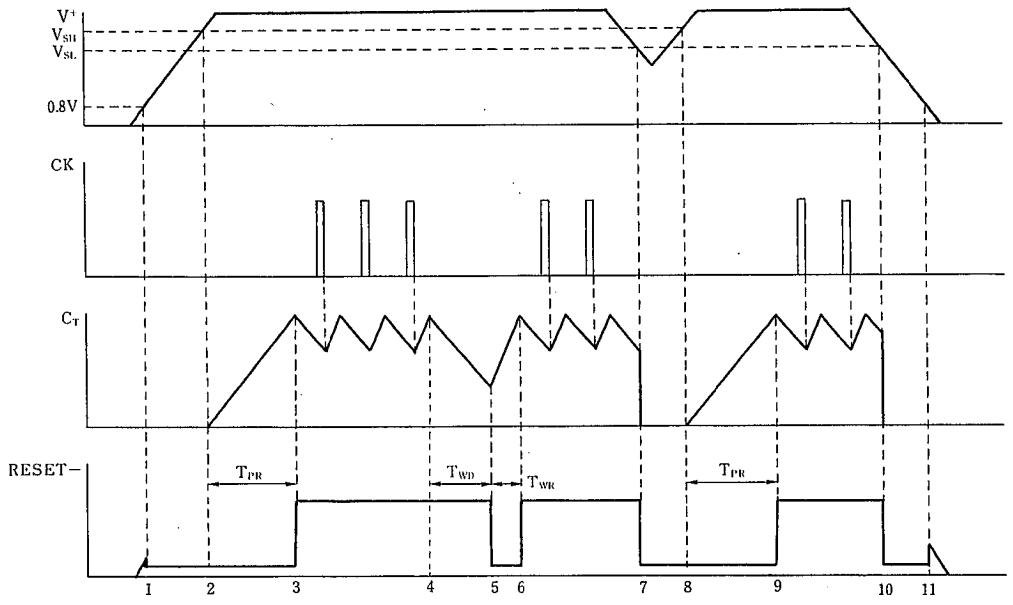
## AC CHARACTERISTICS

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $V^+$ Input Pulse Width | $T_{PI}$ | $V_{CC}$ 5V / 4V (Note 2) | — | 10 | — | μS |
| CK Input Pulse Width | $T_{CKW}$ | CK ⎍ or ⎍ (Note 2) | — | 1.8 | — | mS |
| CK Input Period | $T_{CK}$ | (Note 2) | — | 12 | — | mS |
| Watch Dog Timer Warning Threshold Time | $T_{WD}$ | $C_T$=0.1μF | — | 10 | — | mS |
| Watch Dog Timer Reset Pulse Width | $T_{WR}$ | $C_T$=0.1μF | — | 2 | — | mS |
| Reset Signal Hold Time | $T_{PR}$ | $C_T$=0.1μF | — | 100 | — | mS |
| Propagation Delay ($\overline{RESET}$ Terminal) | $T_{PD1}$ | $R_L$=2.2kΩ, $C_L$=100pF | — | 2 | — | μS |
| ($RESET$ Terminal) | $T_{PD2}$ | $R_L$=2.2kΩ, $C_L$=100pF | — | 3 | — | μS |
| Output Rise Time | $t_R$ | $R_L$=2.2kΩ, $C_L$=100pF | — | 1.0 | — | μS |
| Output Fall Time | $t_F$ | $R_L$=2.2kΩ, $C_L$=100pF | — | 0.1 | — | μS |

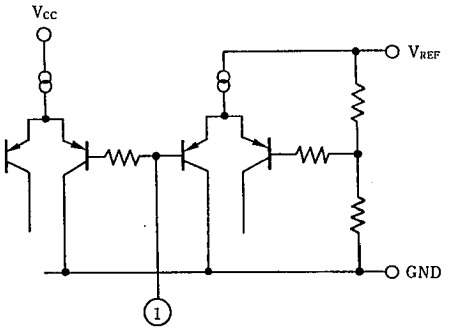
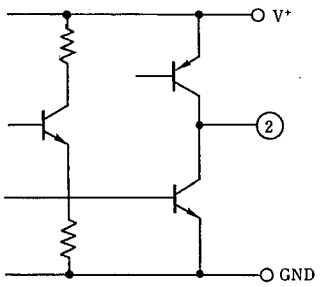
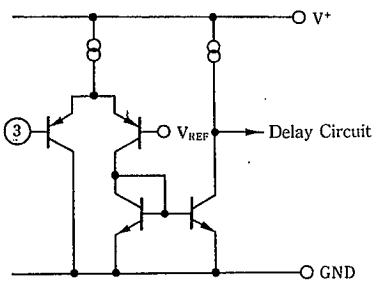
(Note1) : The specified pulses (Refer to AC Characteristics) are applied to CK-pin.

(Note2) : This characteristics is guaranteed within the design.

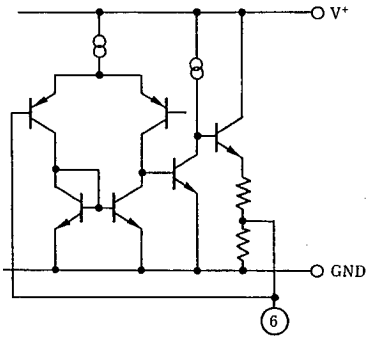
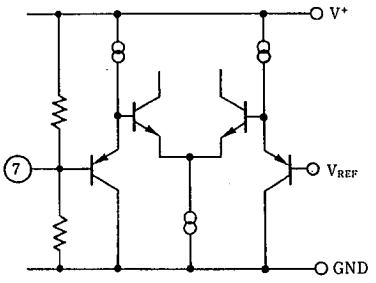
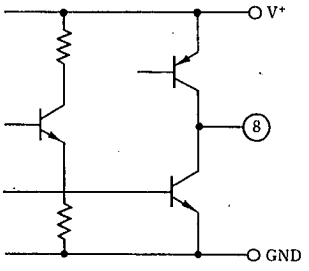
## ■ TIMING CHART



## ■ TERMINAL FUNCTION

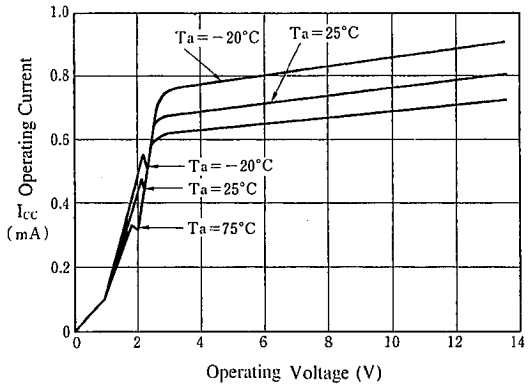
| PIN NO. | SYMBOL | FUNCTION | INSIDE EQUIVALENT CIRCUIT |
|---|---|---|---|
| 1 | $C_T$ | Pin Connection to Capacitor, Set the reset holding time |   |
| 2 | RESET | Reset Output |   |
| 3 | CK | Crock Input |   |

## ■ TERMINAL FUNCTION

| PIN NO. | SYMBOL | FUNCTION | INSIDE EQUIVALENT CIRCUIT |
|---|---|---|---|
| 4 | GND | Ground | |
| 5 | $V^+$ | Operating Voltage | |
| 6 | $V_{REF}$ | Ref Amp Output |   |
| 7 | $V_S$ | Comparator S Input |   |
| 8 | $\overline{RESET}$ | Reset Output<br>Internal pull up resistor |   |

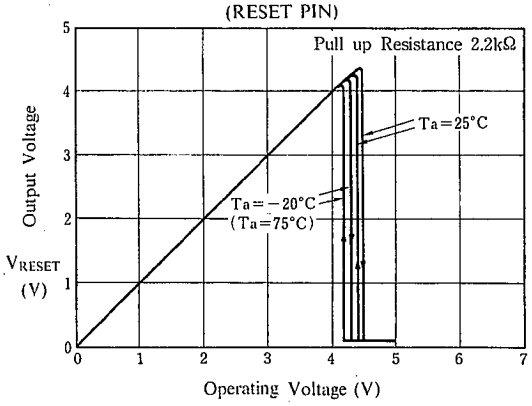
## ■ TYPICAL CHARACTERISTICS

### Operating Current vs. Operating Voltage



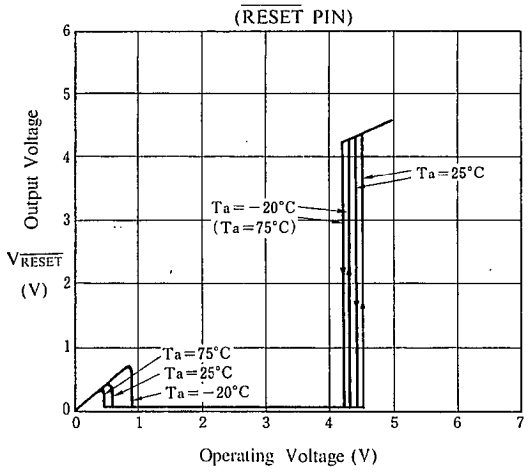

### Output Voltage vs. Operating Voltage

(RESET PIN)

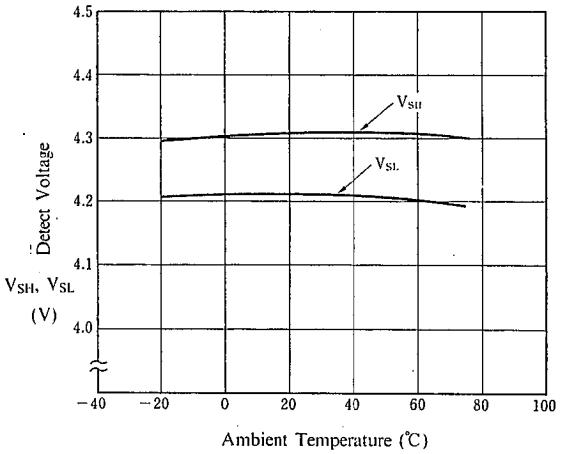



### Output Voltage vs. Operating Voltage

($\overline{\text{RESET}}$ PIN)

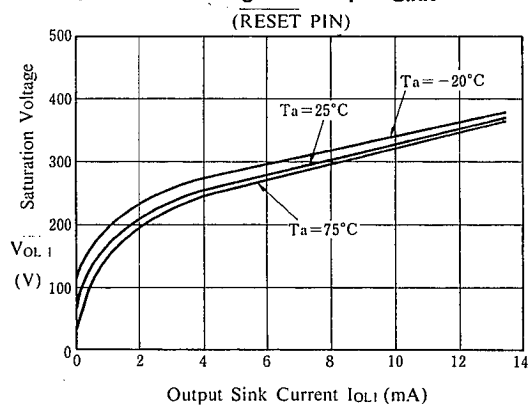



### Detect Voltage vs. Ambient Temperature



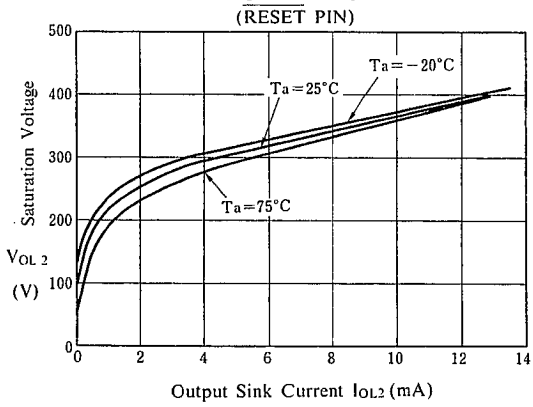

### Saturation Voltage vs. Output Sink Current

($\overline{\text{RESET}}$ PIN)




### Saturation Voltage vs. Output Sink Current

($\overline{\text{RESET}}$ PIN)

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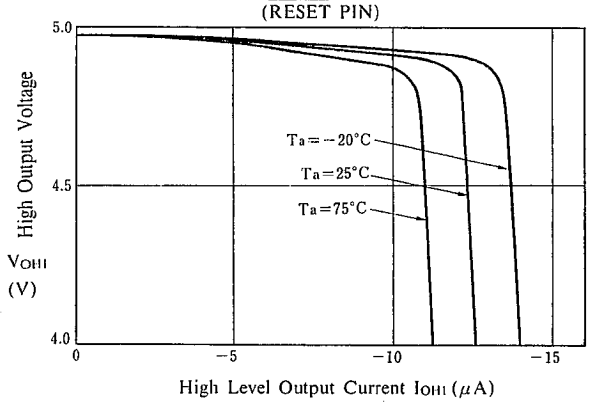
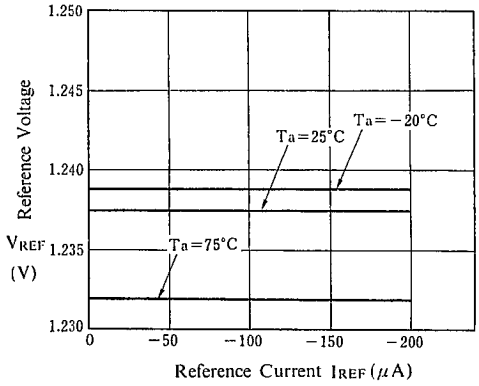
## ■ TYPICAL CHARACTERISTICS

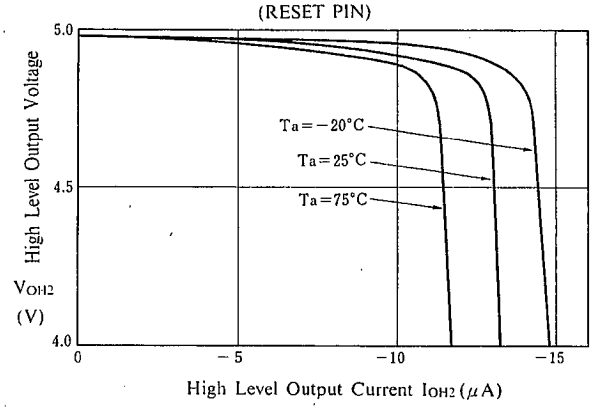
### High Level Output Voltage vs. High Level Output Current



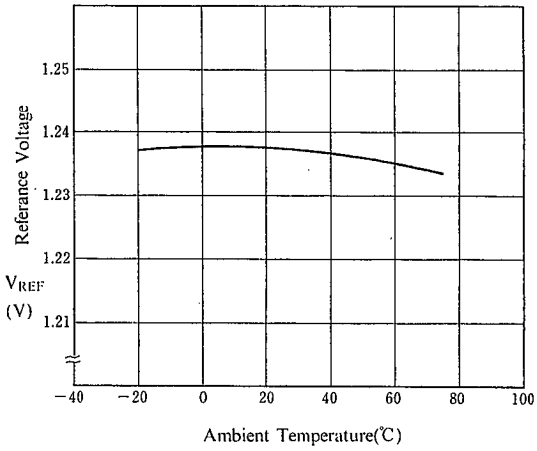

### Reference Voltage vs. Reference Current



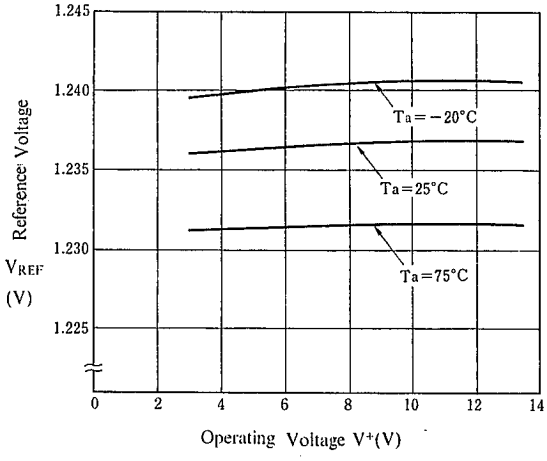

### High Output Voltage vs. High Level Output Current




### Reference Voltage vs. Amvient Temperature




### Reference Voltage vs. Operating Voltage

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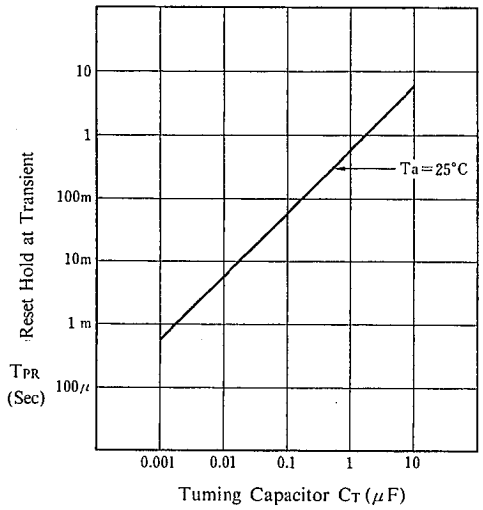
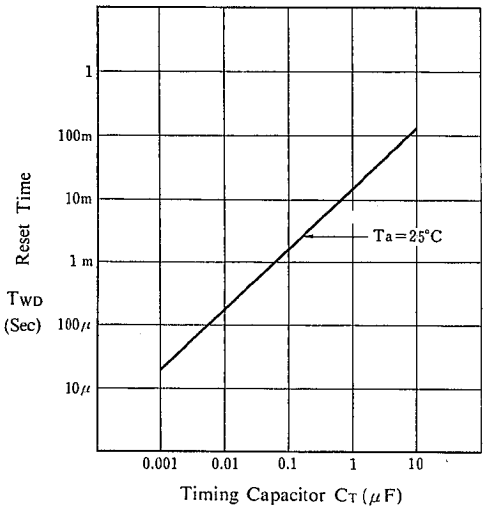
## ■ TYPICAL CHARACTERISTICS

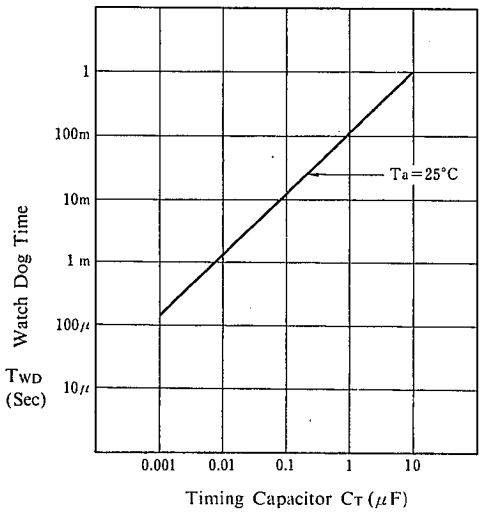
### Reset Hold Time at Transient



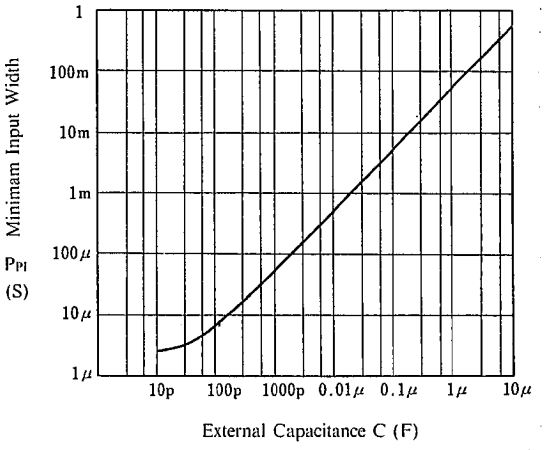

### Reset Time




### Watch Dog Timer observation time




### Minimam Input Pulse Width vs. CT

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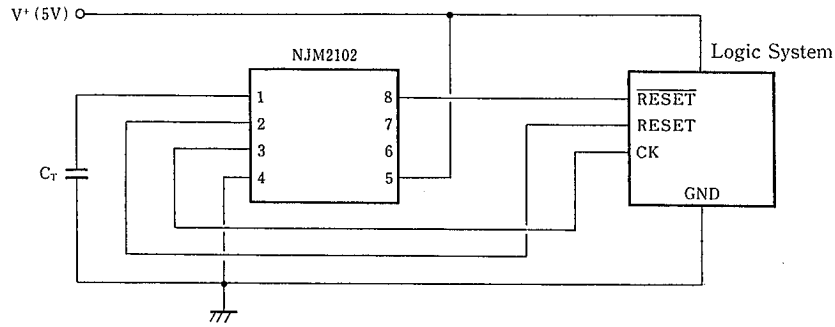
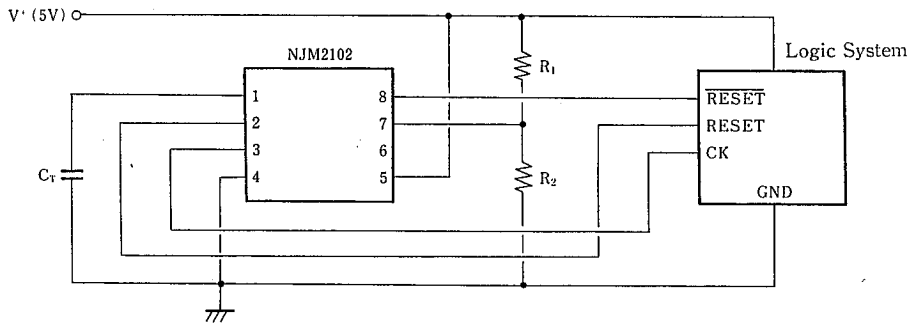
## ■ APPLICATION CIRCUIT

1. 5V Supply Voltage Supervisory and Watch-dog-timer




- Voltage Supply is detected through Vs. Detected Voltage is $V_{SH}$, $V_{SL}$.

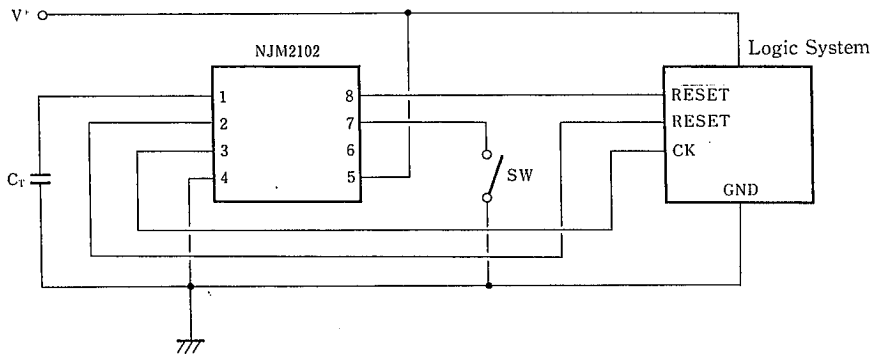
2. 5V Supply Voltage Supervisiory (Externally fine tunning type)



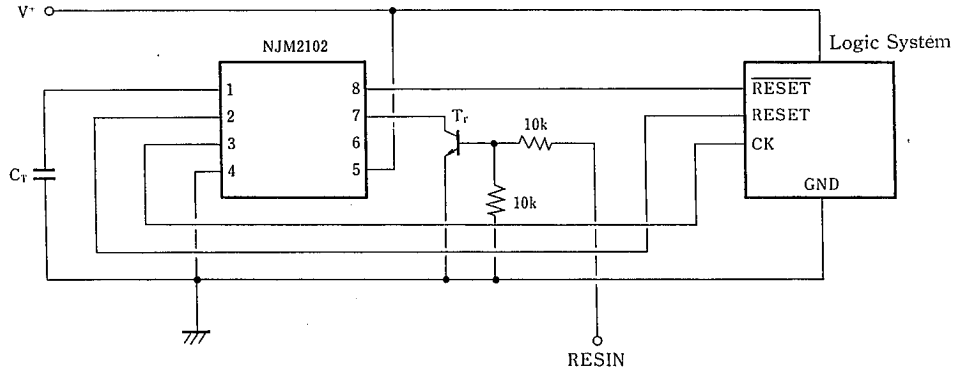

- Vs detecting Voltage can be externally adjusted.
- Detecting Voltage can be decided by divider resistor of IC inside.
  Detecting Voltage can be set by external R1, R2.
  The external resisitor R1, R2 are required to be set in value less than 1/10 in comparing to divideing resistor of IC inside.
  Please refere to following Table.

| $R_1$(kΩ) | $R_2$(kΩ) | Detecting Voltage: $V_{SL}$(V) | Detecting Voltage: $V_{SH}$(V) |
|---|---|---|---|
| 10 | 3.9 | 4.34 | 4.44 |
| 9.1 | 3.9 | 4.08 | 4.18 |

3. Compulsory Resetting attached (Reset Hold attached)




- *Pin 7 to be grounded when SW. ON. RESET(8pin) become Low: RESET(pin2) become HIGH.




- By putting signal in the RESET pin, and Tr swich ON $\overline{\text{RESET}}$ pin become LOW and RESET pin High.

MEMO