

**SANYO**

No.2895A

**LA5690D, 5690S****Voltage Regulator Driver  
with Watchdog Timer**

The LA5690 is a single-chip voltage regulator for microcomputer system monitor use that performs the functions of 5V output voltage control, watchdog timer, and voltage detector. The LA5690 uses a minimum number of parts to provide the basic functions.

**Applications**

- Microcomputer system for car equipment, refrigeration/heating equipment, office automation equipment

**Functions**

- Output voltage 5V<sub>control</sub>
- Watchdog timer
- Power-ON reset function
- Positive/negative logic output for reset

**Features**

- An external PNP transistor can be used to provide a low-saturation voltage regulator.
- CK input with edge detector
- Variable detection voltage
- Reset output with pull-up resistor of 10k $\Omega$

**Maximum Ratings at Ta = 25°C**

|                             | unit                                       |                            | unit           |
|-----------------------------|--------------------------------------------|----------------------------|----------------|
| Control Pin Voltage         | V <sub>CONT</sub> max                      | 1sec                       | 60 V           |
| Control Pin Voltage         | V <sub>CONT</sub> max                      |                            | 41 V           |
| Control Pin Current         | I <sub>CONT</sub> max                      | *V <sub>CC</sub> $\geq$ 6V | 11 mA          |
| CK Input Voltage            | V <sub>CK</sub> max                        |                            | 25 V           |
| Reset Pin Voltage           | V <sub>RES</sub> max, V <sub>RES</sub> max |                            | 41 V           |
| Allowable Power Dissipation | P <sub>d</sub> max                         |                            | 500 mW         |
| Operating Temperature       | T <sub>opr</sub>                           |                            | -40 to +85 °C  |
| Storage Temperature         | T <sub>stg</sub>                           |                            | -55 to +150 °C |

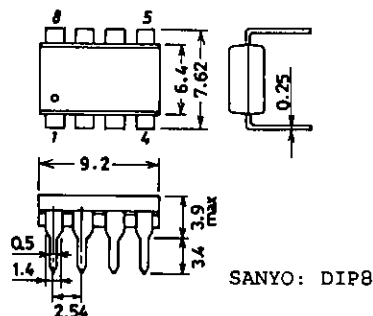
\*: A PNP transistor is connected to the LA5690D, 5690S externally to provide a low-saturation voltage regulator. Therefore, I<sub>CONT</sub> = 100mA will flow, as starting current, in the V<sub>CC</sub> range where the output cannot be regulated.

**Operating Conditions at Ta = 25°C**

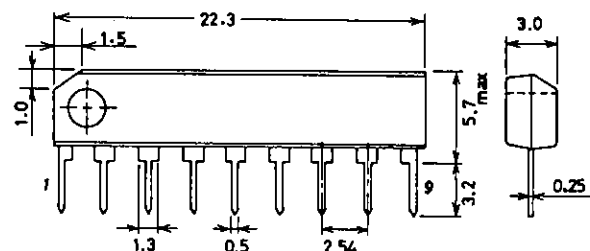
|                         |                                            | unit      |
|-------------------------|--------------------------------------------|-----------|
| Control Pin Voltage     | V <sub>CONT</sub>                          | 6 to 40 V |
| Control Pin Current     | I <sub>CONT</sub> max                      | 10 mA     |
| Reset Output Current    | I <sub>RES</sub> max, I <sub>RES</sub> max | 8 mA      |
| Reset Detection Voltage | V <sub>S</sub> min                         | 4 V       |

**Package Dimensions  
(unit: mm)****3001B**

[LA5690D]

**Package Dimensions  
(unit: mm)****3017B**

[LA5690S]



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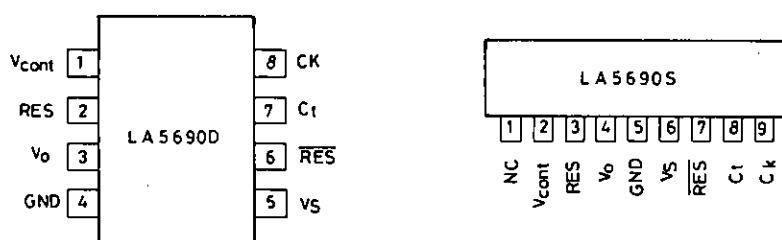
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# LA5690D,5690S

Operating Characteristics at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 14\text{V}$ ,  $I_O = 50\text{mA}$ , unless otherwise specified

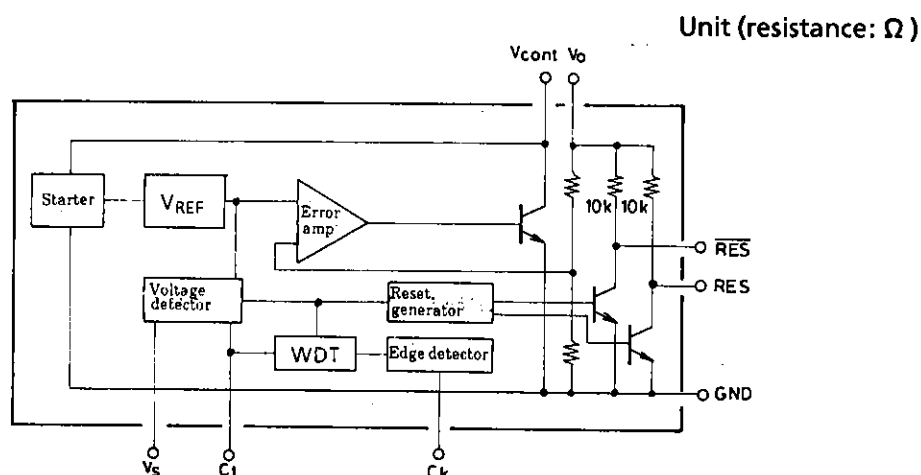
|                                           |                           |                                                                          | min       | typ  | max  | unit                       |
|-------------------------------------------|---------------------------|--------------------------------------------------------------------------|-----------|------|------|----------------------------|
| Operating Voltage                         | $V_O$                     |                                                                          | 4.8       | 5.0  | 5.2  | V                          |
| Line Regulation                           | $\Delta V_{OLN1}$         | $9\text{V} \leq V_{CC} \leq 16\text{V}$                                  |           | 2    | 10   | mV                         |
|                                           | $\Delta V_{OLN2}$         | $6\text{V} \leq V_{CC} \leq 40\text{V}$                                  |           | 4    | 30   | mV                         |
| Load Regulation                           | $\Delta V_{OLD}$          | $1\text{mA} \leq I_O \leq 50\text{mA}$                                   |           | 4    | 30   | mV                         |
| Current Dissipation                       | $I_{CC}$                  | $I_O = 0$                                                                |           | 4.9  | 6.5  | mA                         |
| Output Noise Voltage                      | $V_{NO}$                  | $10\text{Hz} \leq f \leq 100\text{kHz}$ , $V_{CK} = 0$                   |           | 200  |      | $\mu\text{V}$              |
| Temperature Coefficient of Output Voltage | $\Delta V_O / \Delta T_a$ | $I_O = 5\text{mA}$ , $-40^\circ\text{C} \leq T_a \leq +85^\circ\text{C}$ | $\pm 0.2$ |      |      | $\text{mV}/^\circ\text{C}$ |
| Reference Voltage                         | $V_{REF}$                 |                                                                          | 1.13      | 1.18 | 1.23 | V                          |
| "H"-Level CK Input Voltage                | $V_{IH}$                  |                                                                          | 2         |      |      | V                          |
| "L"-Level CK Input Voltage                | $V_{IL}$                  |                                                                          |           |      | 0.8  | V                          |
| "H"-Level CK Input Current                | $I_{IH}$                  | $V_{CK} = 5\text{V}$                                                     |           | 0.3  |      | mA                         |
| "L"-Level CK Input Current                | $I_{IL}$                  | $V_{CK} = 0$                                                             | -1.0      | -0.1 |      | $\mu\text{A}$              |
| "H"-Level Reset Output Voltage            | $V_{ORH}/V_{ORH}$         |                                                                          | 4.8       | 5.0  | 5.2  | V                          |
| "L"-Level Reset Output Voltage            | $V_{ORL1}/V_{ORL1}$       |                                                                          |           | 40   | 200  | mV                         |
| "L"-Level Reset Output Voltage            | $V_{ORL2}/V_{ORL2}$       | $I_{RES} = I_{RES} = 8\text{mA}$                                         |           | 0.16 | 0.8  | V                          |
| CK Input Pulse Width                      | $t_{CKW}$                 | $V_{CK} = 5\text{V}$                                                     | 3         |      |      | $\mu\text{s}$              |
| Reset Output Delay Time                   | $t_d$                     | $C_t = 1\mu\text{F}$                                                     | 7.5       | 10   | 12.5 | ms                         |
| Watchdog Time                             | $t_{WD}$                  | $C_t = 1\mu\text{F}$                                                     | 3.8       | 5.0  | 6.2  | ms                         |
| Watchdog Reset Time                       | $t_{WR}$                  | $C_t = 1\mu\text{F}$                                                     | 0.1       | 0.25 | 0.4  | ms                         |
| Reset Hysteresis Voltage                  | $V_{hys}$                 | $V_S = 4.5\text{V}$                                                      | 100       | 200  | 300  | mV                         |

## Pin Assignment



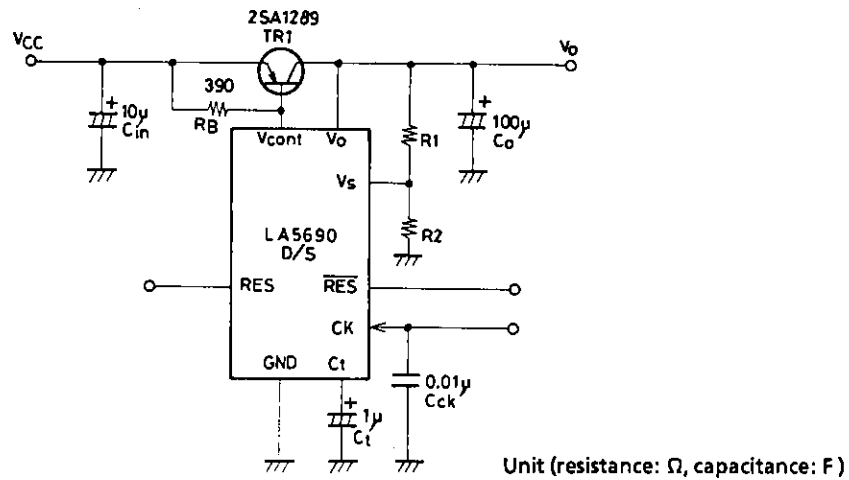
The NC pin, which is left open, must not be used for wiring.

## Equivalent Circuit Block Diagram

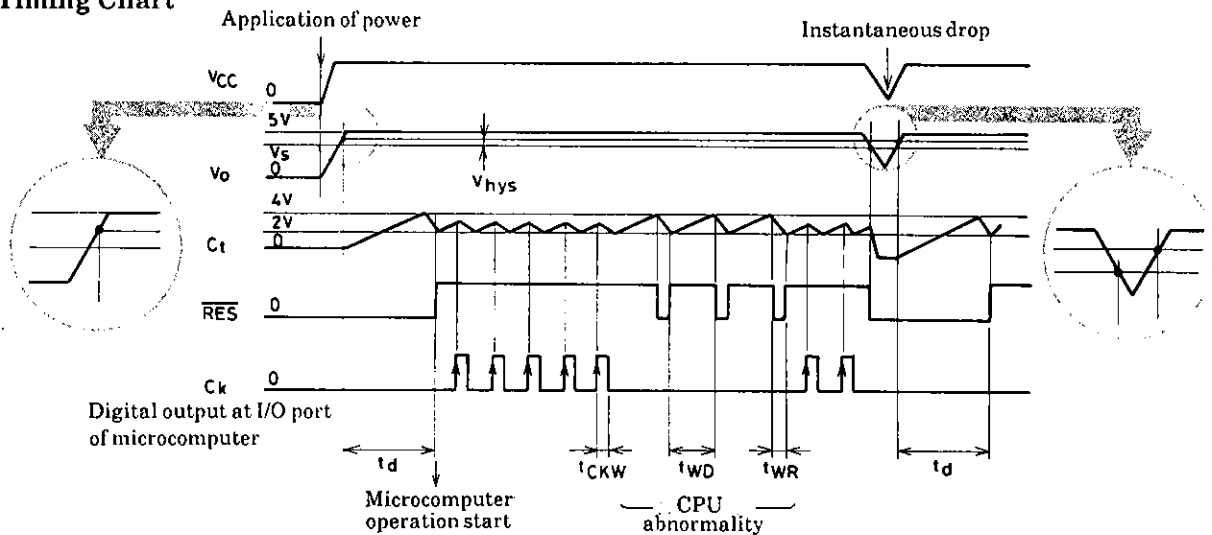


The reset output contains a pull-up resistor of  $10\text{k}\Omega$ .

# Test Circuit

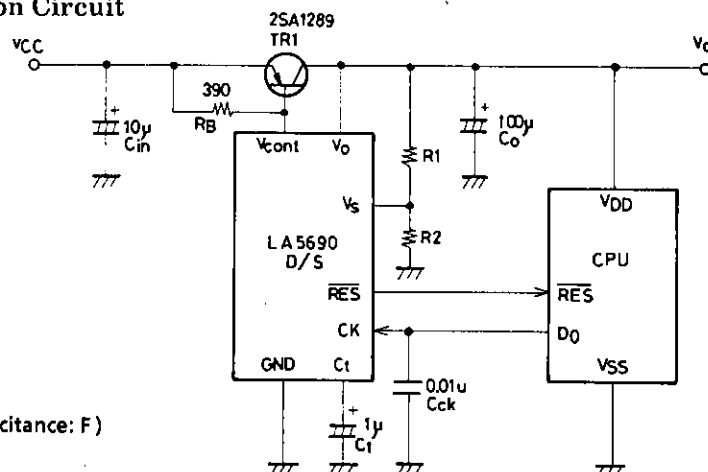


# Timing Chart



Note : Edge-triggered at the point indicated by the arrow of C<sub>K</sub> signal.

# Sample Application Circuit



Unit (resistance: Ω, capacitance: F)

TR1 : 2SA1289 (60V/5A, TO-220)

C<sub>t</sub> : Sanyo OS capacitor

$$V_S = V_{REF} \times \left( \frac{R_1}{R_2} + 1 \right)$$

$$V_{REF} \approx 1.18(V)$$

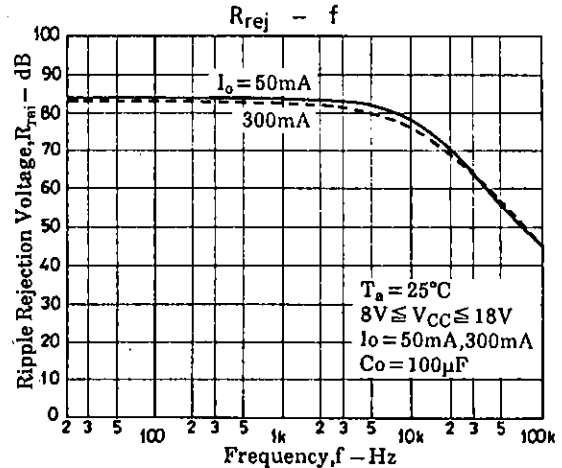
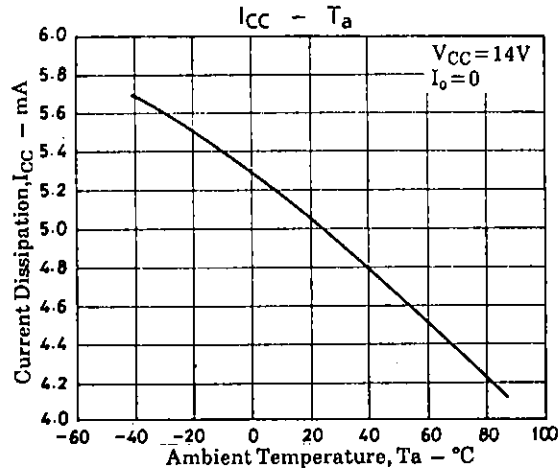
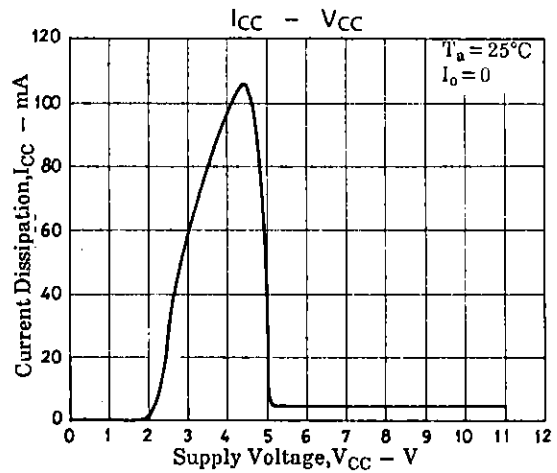
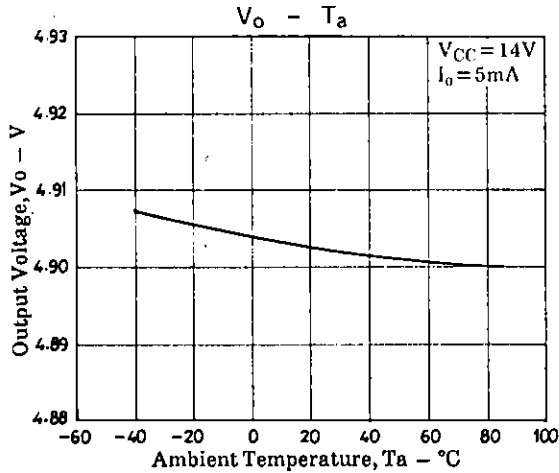
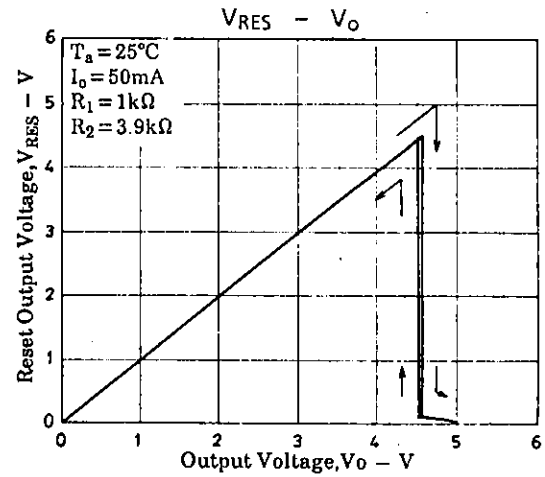
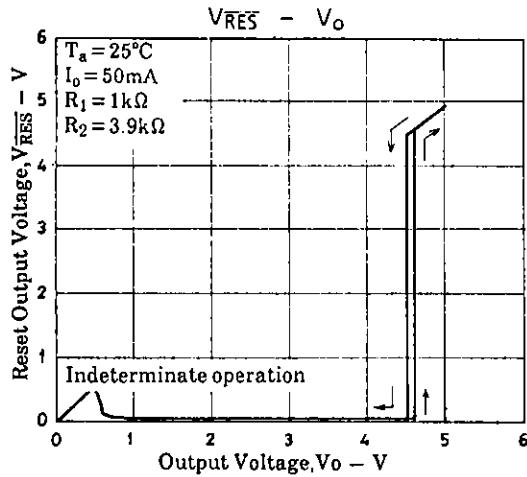
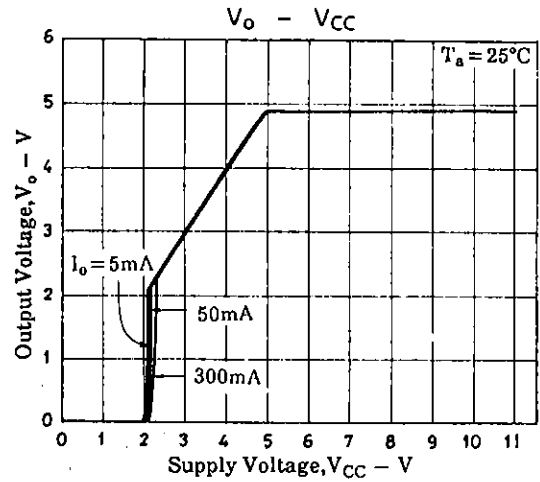
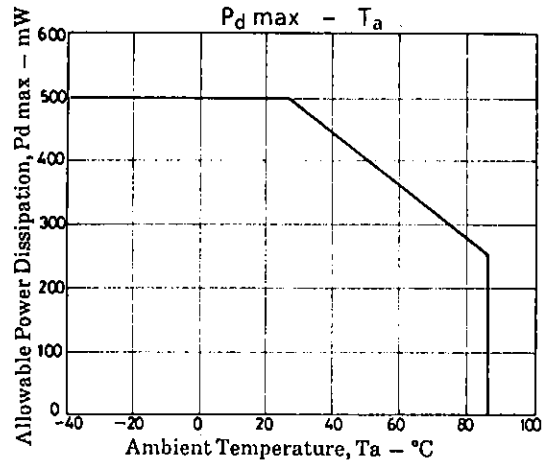
$$t_d = 10 \times C_t (\mu F) [ms]$$

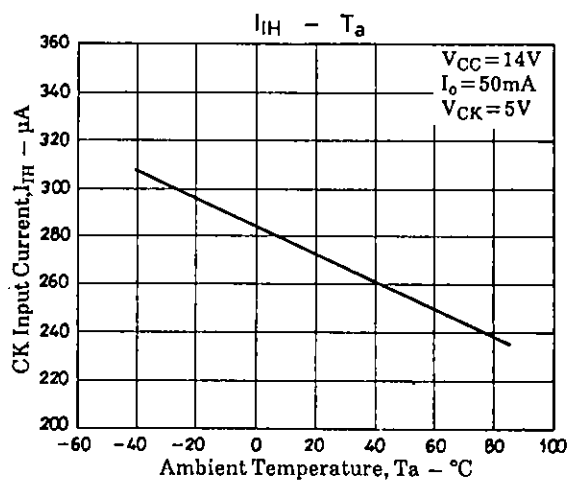
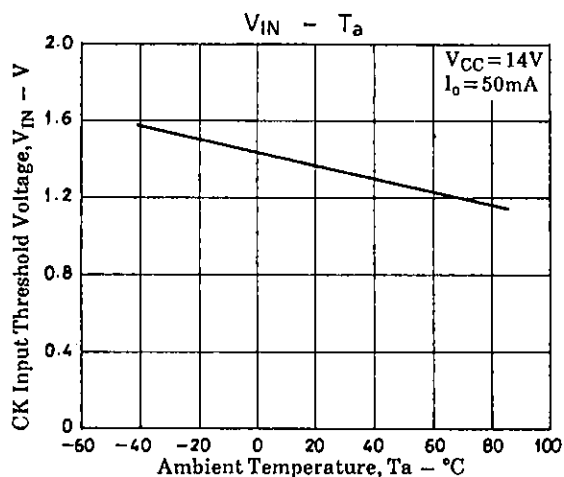
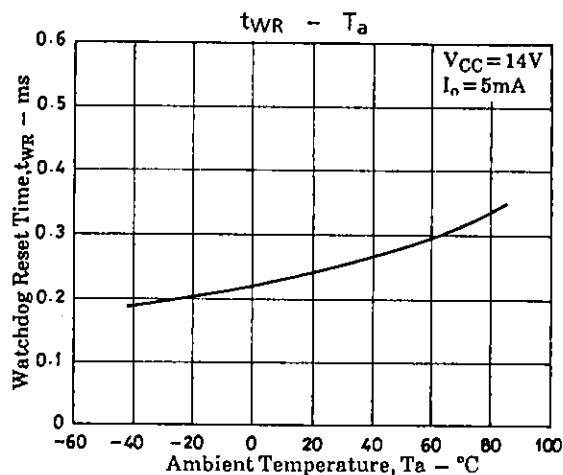
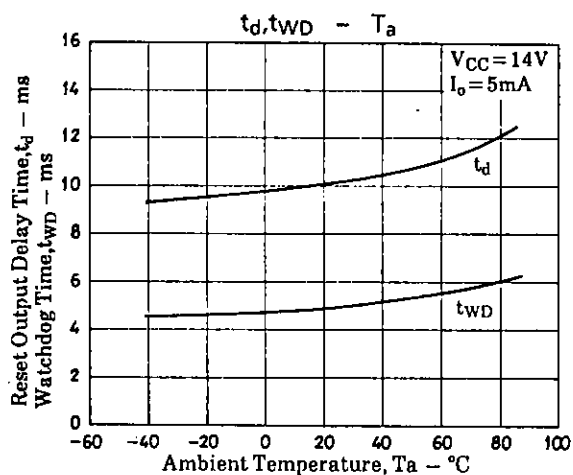
$$t_{WD} = 5 \times C_t (\mu F) [ms]$$

$$t_{WR} = 0.25 \times C_t (\mu F) [ms]$$

•C<sub>t</sub>,C<sub>0</sub> : Capacitors whose value does not vary with temperature very much.

•C<sub>CK</sub> : Must be used to eliminate noise in the reset output.





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