

**SANYO**

No.3244

**LA5691D, 5691S****Voltage Regulator Driver with Watchdog Timer  
(with Output ON/OFF Function)**

The LA5691 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. Since the LA5691 is capable of exercising output ON/OFF controls it is especially suited for use in battery-powered equipment.

**Applications**

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

**Functions**

- Output voltage 5V control
- Watchdog timer
- Reset generation at power-ON mode
- The enable pin can be used to exercise output ON/OFF control. (Active-low)

**Features**

- An external PNP transistor can be used to provide a low-saturation voltage regulator.
- Capable of reducing of power dissipation at standby mode ( $I_{Q\ OFF} = 300\text{mA typ}$ )
- CK input with edge detector
- Variable detection voltage

**Maximum Ratings at  $T_a = 25^\circ\text{C}$** 

			unit
Control Pin Voltage	$V_{\text{CONT max}}$	1sec	60 V
Control Pin Voltage	$V_{\text{CONT max}}$		41 V
Control Pin Current	$I_{\text{CONT max}}$	$*V_{\text{CC}} \geq 6\text{V}$	11 mA
Enable Pin Voltage	$V_{\text{EN max}}$		41 V
CK Input Voltage	$V_{\text{CK max}}$		25 V
Reset Pin Voltage	$V_{\text{RES max}}$		41 V
Allowable Power Dissipation	$P_d \text{ max}$		500 mW
Operating Temperature	$T_{\text{opr}}$		-40 to +85 °C
Storage Temperature	$T_{\text{stg}}$		-55 to +150 °C

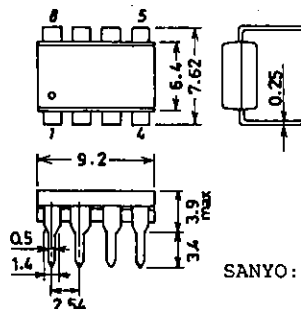
\*: A PNP transistor is connected to the LA5691D, 5691S externally to provide a low-saturation voltage regulator. Therefore,  $I_{\text{CONT}} = 100\text{mA}$  will flow, as starting current, in the  $V_{\text{CC}}$  range where the output cannot be regulated.

**Operating Conditions at  $T_a = 25^\circ\text{C}$** 

			unit
Control Pin Voltage	$V_{\text{CONT}}$		6 to 40 V
Control Pin Current	$I_{\text{CONT max}}$		10 mA
Reset Output Current	$I_{\text{RES max}}$	External R pull-up (with pull-up R 10k $\Omega$ )	8 mA
Reset Detection Voltage	$V_{\text{S min}}$		4 V

**Package Dimensions  
(unit: mm)**

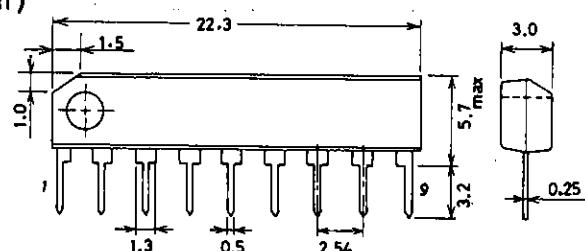
3001B



SANYO: DIP8

**Package Dimensions  
(unit: mm)**

3017B



SANYO: SEP9

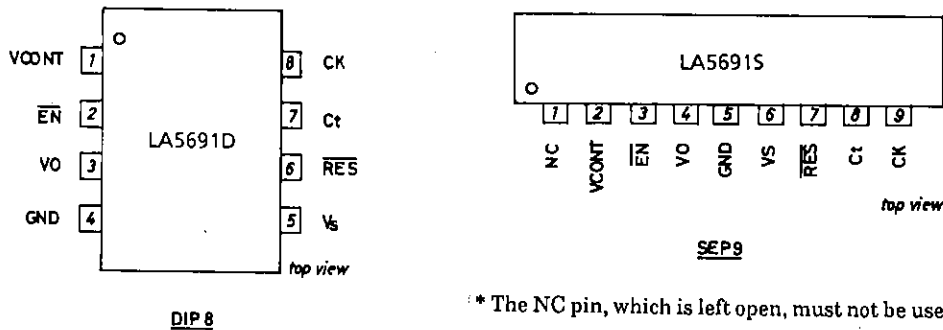
**SANYO Electric Co., Ltd. Semiconductor Business Headquarters**  
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

## LA5691D,5691S

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

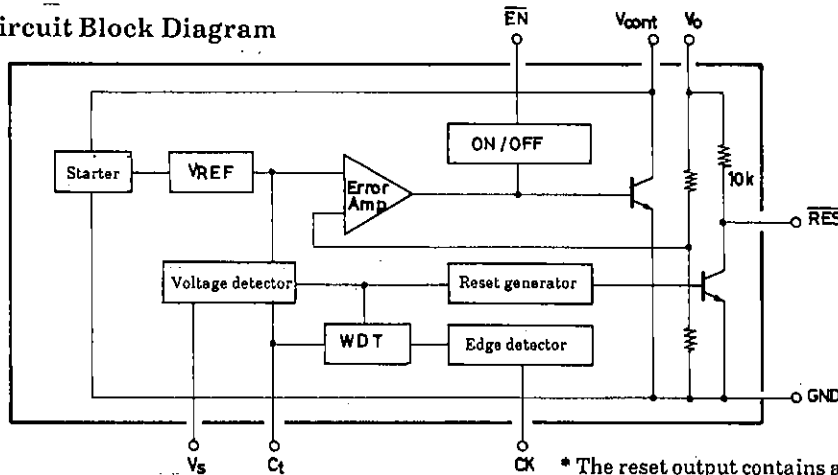
		See specified Test Circuit.		min	typ	max	unit
Output Voltage	$V_O$			4.8	5.0	5.2	V
Line Regulation	$\Delta V_{OLN1}$	$9\text{V} \leq V_{CC} \leq 16\text{V}$			2	10	mV
	$\Delta V_{OLN2}$	$6\text{V} \leq V_{CC} \leq 40\text{V}$			4	30	mV
Load Regulation	$\Delta V_{OLD}$	$1\text{mA} \leq I_O \leq 50\text{mA}$			4	30	mV
Current Dissipation	$I_{CC}$	$I_O = 0$			4.1	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	0.7	mA
"L"-Level CK Input Current	$I_{IL}$	$V_{CK} = 0$		-1.0	-0.1		$\mu\text{A}$
"H"-Level Reset Output Voltage	$V_{ORH}$			4.8	5.0	5.2	V
"L"-Level Reset Output Voltage 1	$V_{ORL1}$				40	200	mV
"L"-Level Reset Output Voltage 2	$V_{ORL2}$	$I_{RES} = 8\text{mA}$			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
"L"-Level Output Voltage	$V_{O\text{OFF}}$	$V_{EN} = 5\text{V}$			150	300	mV
Quiescent Current	$I_{Q\text{OFF}}$	$V_{EN} = 5\text{V}$			300	600	$\mu\text{A}$
Output OFF Control Voltage	$V_{ENH}$	Output OFF		2			V
Output ON Control Voltage	$V_{ENL}$	Output ON				0.8	V

### Pin Assignment



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

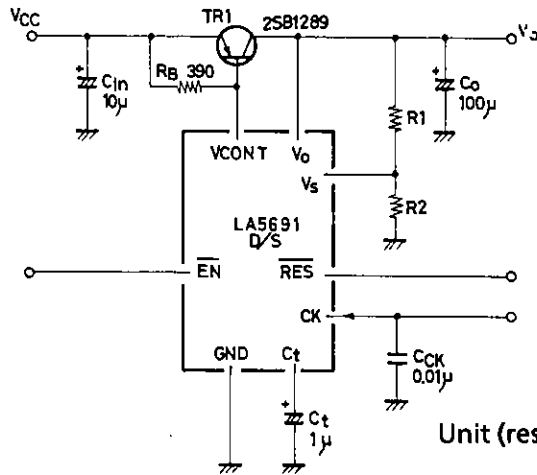
### Equivalent Circuit Block Diagram



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

Unit (resistance:  $\Omega$ )

Test Circuit

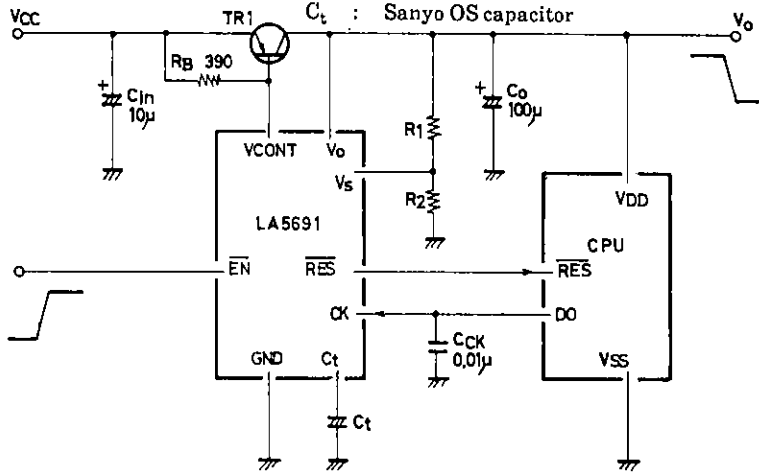


Unit (resistance:  $\Omega$ , capacitance: F)

Sample Application Circuit

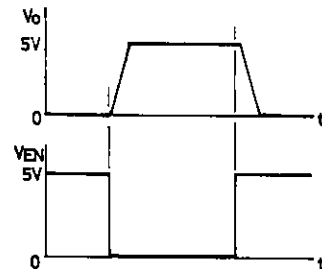
Q1 : 2SA1289 (60V/5A, TO-220)

Ct : Sanyo OS capacitor



Function Table

VEN	Vo
L	H
H	L



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

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

$$t_d = 10 \cdot C_t \text{ (}\mu\text{F) (ms)}$$

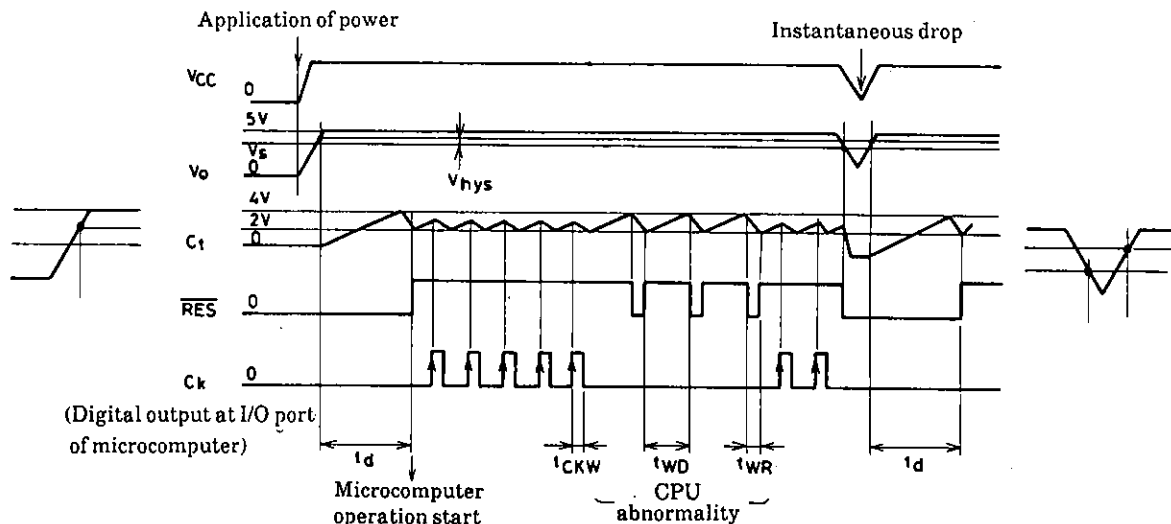
$$t_{WD} = 5 \cdot C_t \text{ (}\mu\text{F) (ms)}$$

$$t_{WR} = 0.25 \cdot C_t \text{ (}\mu\text{F) (ms)}$$

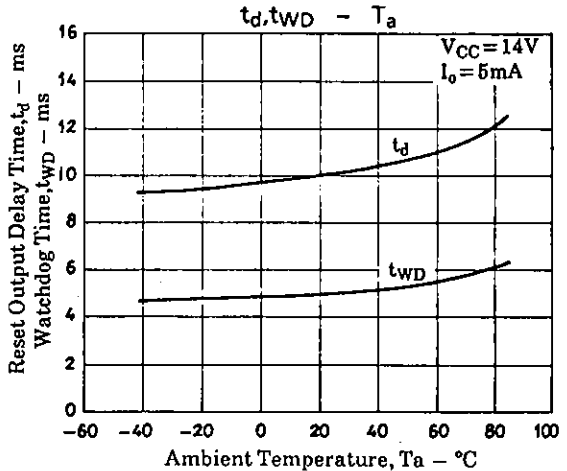
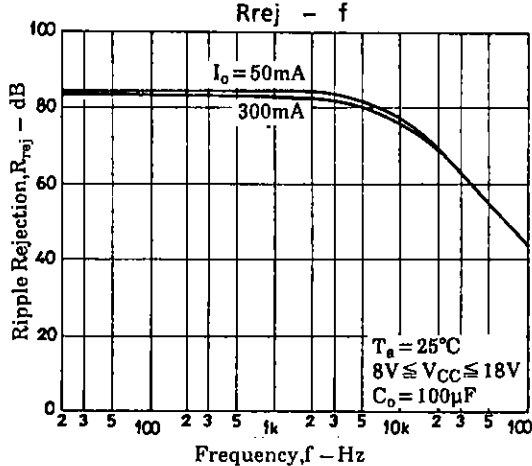
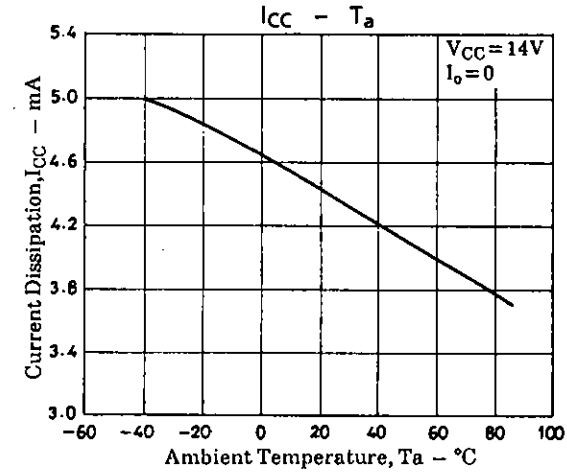
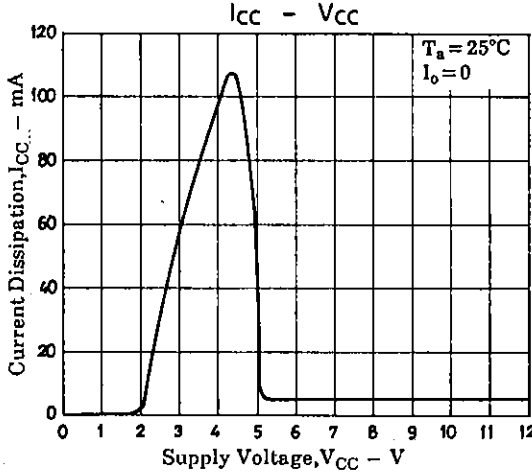
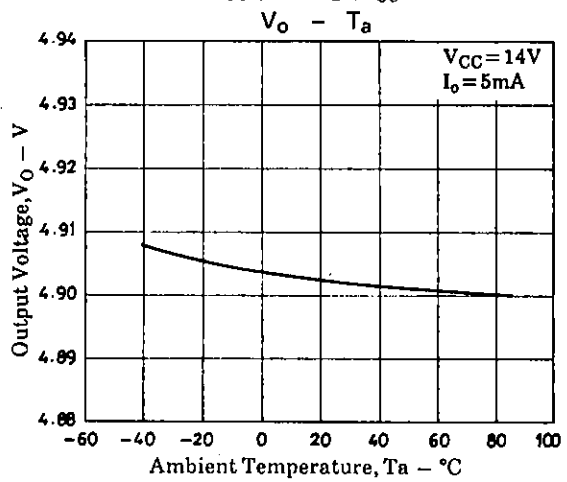
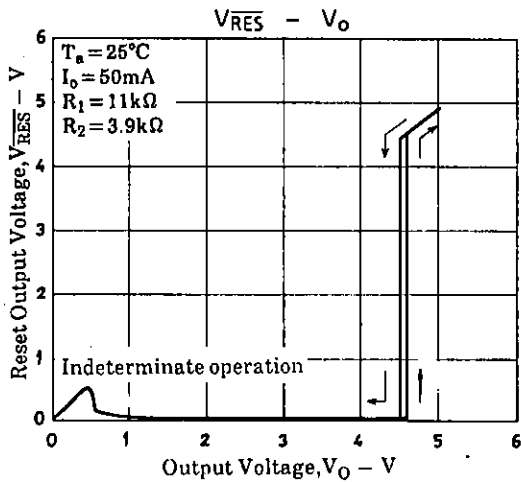
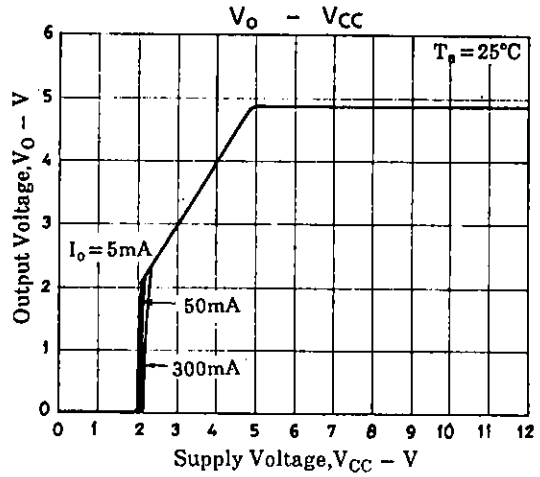
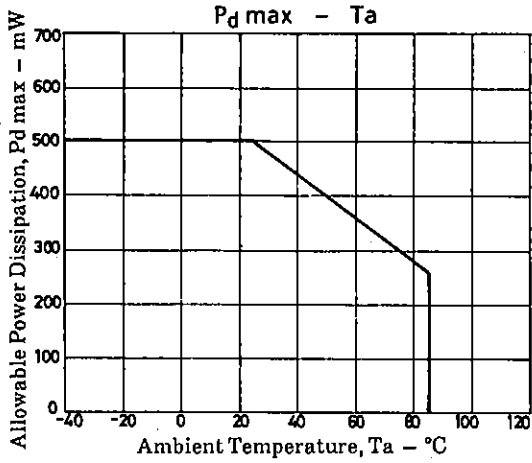
Unit (resistance:  $\Omega$ , capacitance: F)

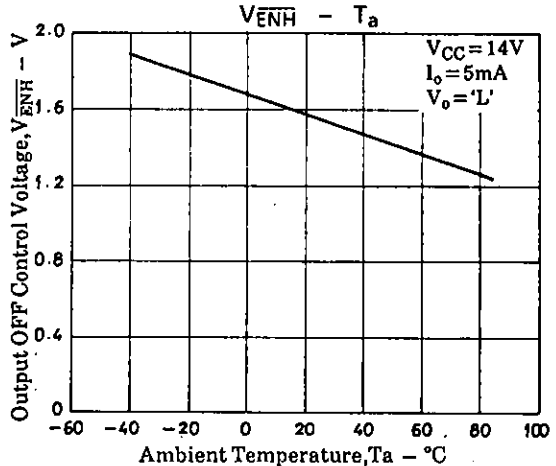
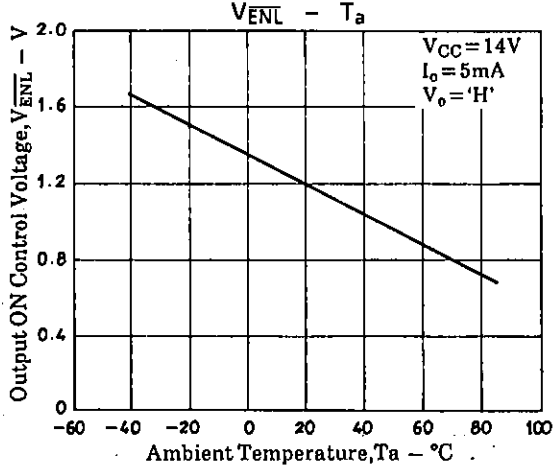
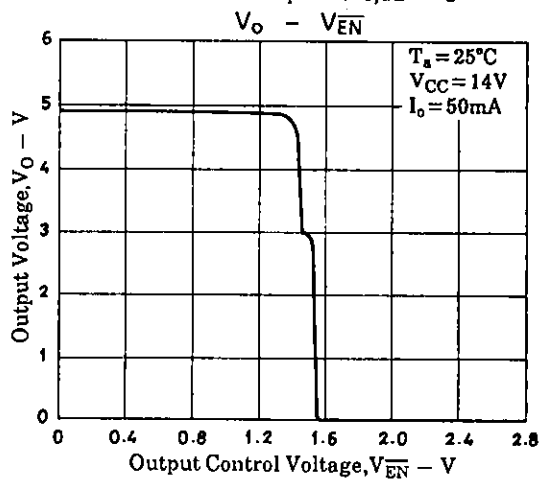
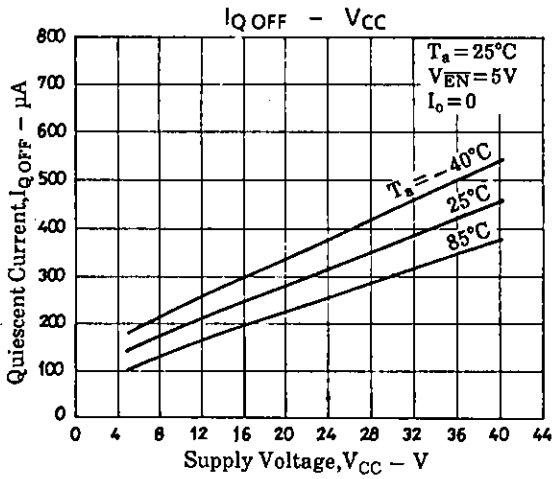
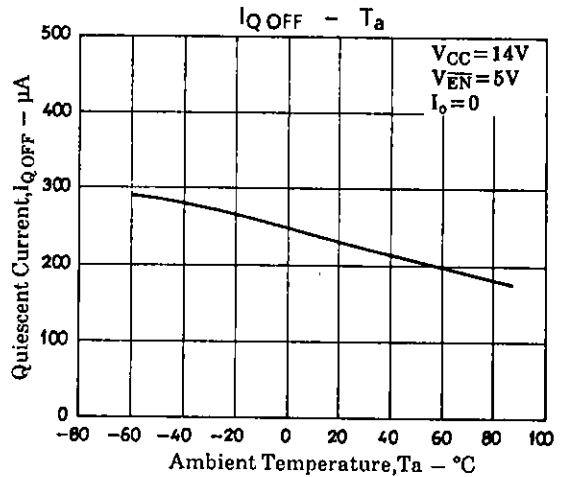
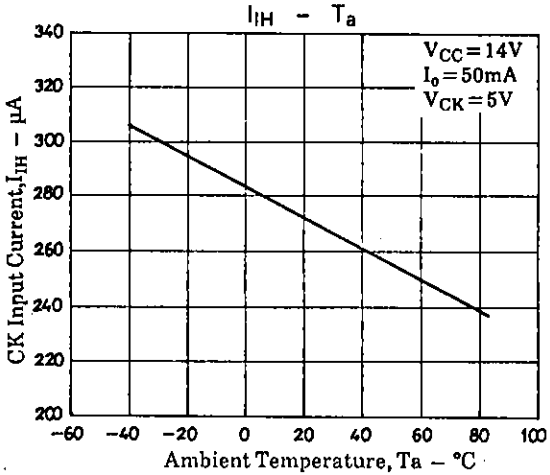
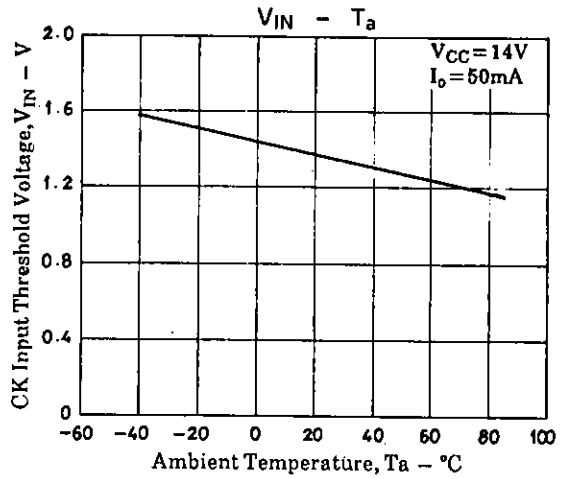
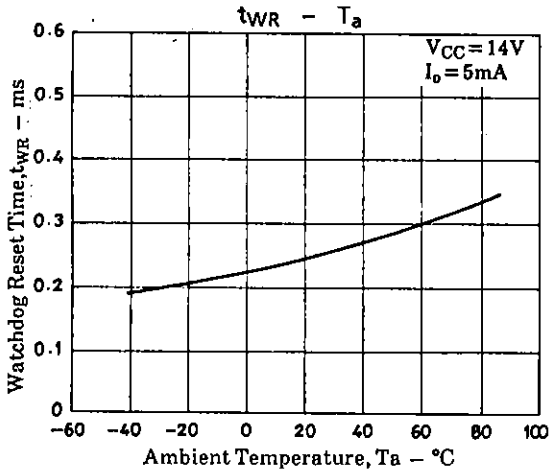
- $C_t, C_o$  : Capacitors whose value does not vary with temperature very much.
- $C_{CK}$  : Must be used to eliminate noise in the reset output.

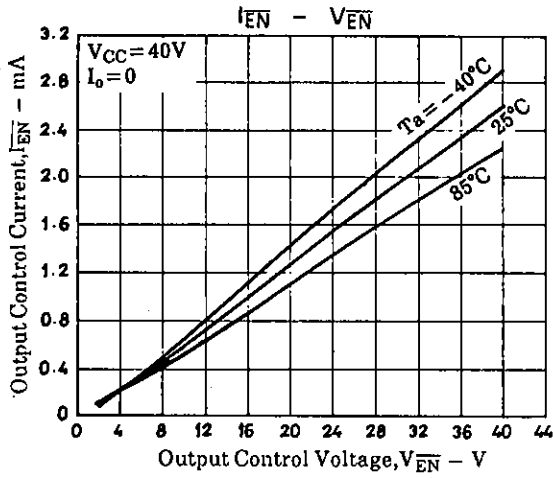
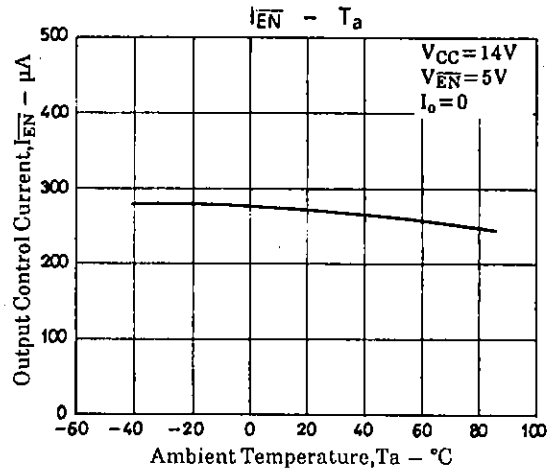
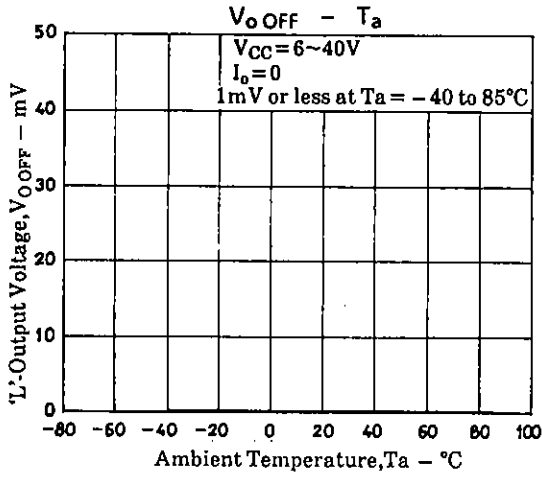
Timing Chart



Note : Edge-triggered at the point indicated by the arrow of  $C_K$  signal.







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