



# LA5690D, 5690S

## Voltage Regulator Driver with Watchdog Timer

### Overview

The LA5690 is a single-chip voltage regulator for micro-computer 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 control.
- Watchdog timer.
- Power-ON reset function.
- Positive/negative logic output for reset.

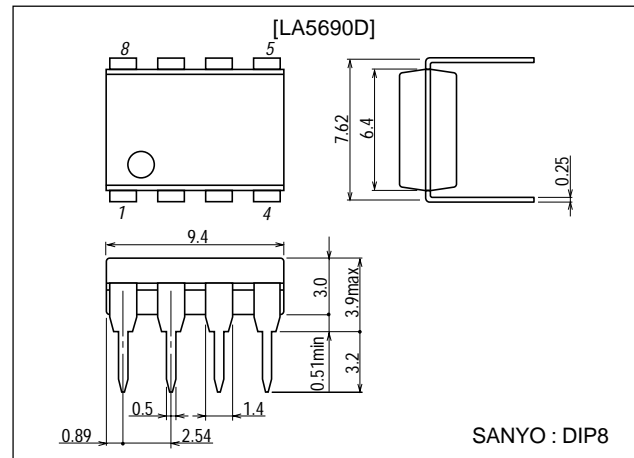
### Features

- 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 $\Omega$ .

### Package Dimensions

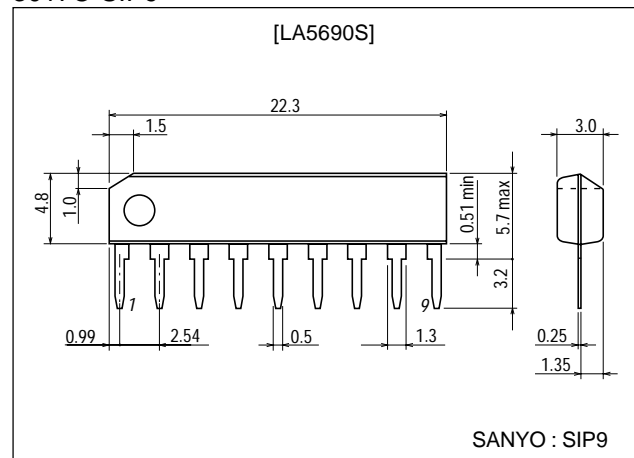
unit:mm

3001B-DIP8



unit:mm

3017C-SIP9



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# LA5690D, 5690S

## Specifications

### Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Control pin voltage	V <sub>CONT</sub> max	1s	60	V
Control pin voltage	V <sub>CONT</sub> max		41	V
Control pin current	I <sub>CONT</sub> max	*V <sub>CC</sub> ≥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	Pd max		500	mW
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-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.

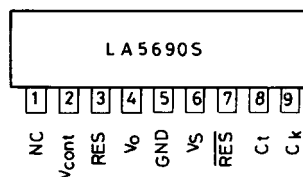
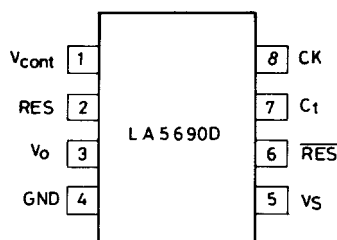
### Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	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	External R pull-up	8	mA
Reset detection voltage	V <sub>S</sub> min		4	V

### Operating Characteristics at Ta = 25°C, V<sub>CC</sub>=14V, I<sub>O</sub>=50mA, unless otherwise specified.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V <sub>O</sub>		4.8	5.0	5.2	V
Line regulation	ΔV <sub>OLN1</sub>	9V≤V <sub>CC</sub> ≤16V		2	10	mV
	ΔV <sub>OLN2</sub>	6V≤V <sub>CC</sub> ≤40V		4	30	mV
Load regulation	ΔV <sub>OLD</sub>	1mA≤I <sub>O</sub> ≤50mA		4	30	mV
Current drain	I <sub>CC</sub>	I <sub>O</sub> =0		4.9	6.5	mA
Output noise voltage	V <sub>NO</sub>	10Hz≤f≤100kHz, V <sub>CK</sub> =0		200		μV
Temperature coefficient of output voltage	ΔV <sub>O</sub> /ΔTa	I <sub>O</sub> =5mA, -40°C≤Ta≤+85°C		±0.2		mV/°C
Reference voltage	V <sub>REF</sub>		1.13	1.18	1.23	V
H-level CK input voltage	V <sub>IH</sub>		2			V
L-level CK input voltage	V <sub>IL</sub>				0.8	V
H-level CK input current	I <sub>IH</sub>	V <sub>CK</sub> =5V		0.3	0.7	mA
L-level CK input current	I <sub>IL</sub>	V <sub>CK</sub> =0	-1.0	-0.1		μA
H-level reset output voltage	V <sub>ORH</sub> / V <sub>ORH</sub>		4.8	5.0	5.2	V
L-level reset output voltage	V <sub>ORL1</sub> / V <sub>ORL1</sub>			40	200	mV
L-level reset output voltage	V <sub>ORL2</sub> / V <sub>ORL2</sub>	I <sub>RES</sub> =I <sub>RES</sub> =8mA		0.16	0.8	V
CK input pulse width	t <sub>CKW</sub>	V <sub>CK</sub> =5V	3			μs
Reset output delay time	t <sub>d</sub>	C <sub>t</sub> =1μF	7.5	10	12.5	ms
Watchdog time	t <sub>WD</sub>	C <sub>t</sub> =1μF	3.8	5.0	6.2	ms
Watchdog reset time	t <sub>WR</sub>	C <sub>t</sub> =1μF	0.1	0.25	0.4	ms
Reset hysteresis voltage	V <sub>hys</sub>	V <sub>S</sub> =4.5V	100	200	300	mV

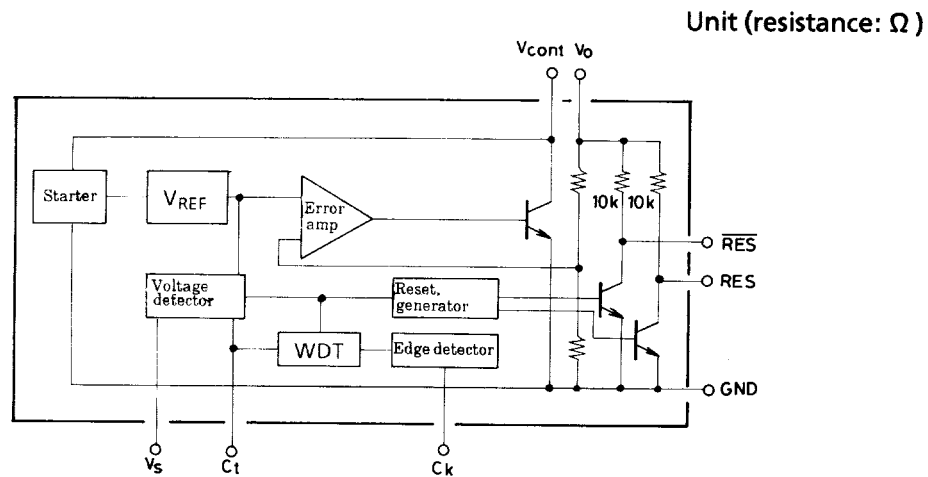
## Pin Assignments



Top view

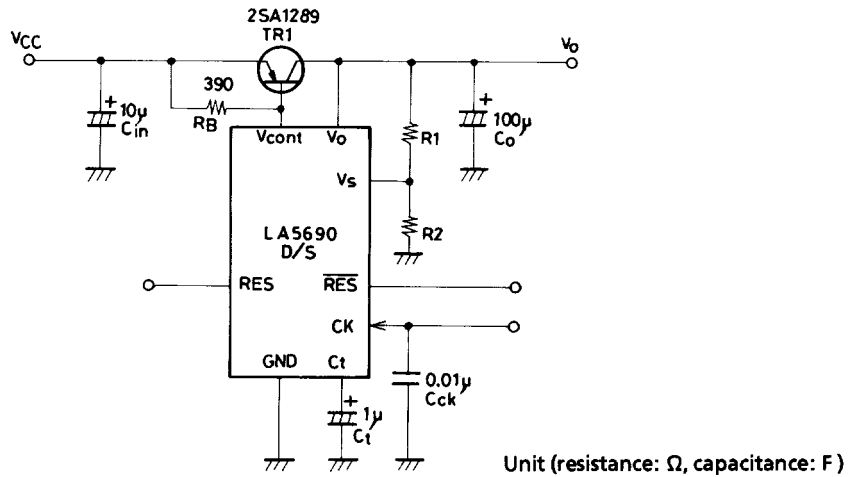
The NC pin, which is left open, must not be used for wiring.

Equivalent Circuit Block Diagram

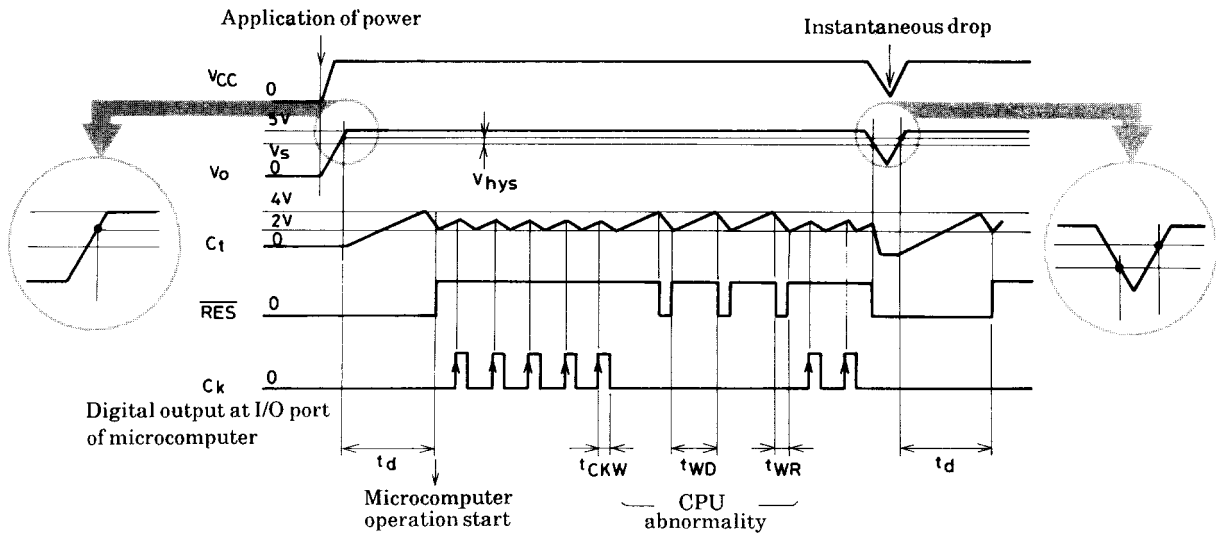


The reset output contains a pull-up resistor of 10kΩ.

Test Circuit



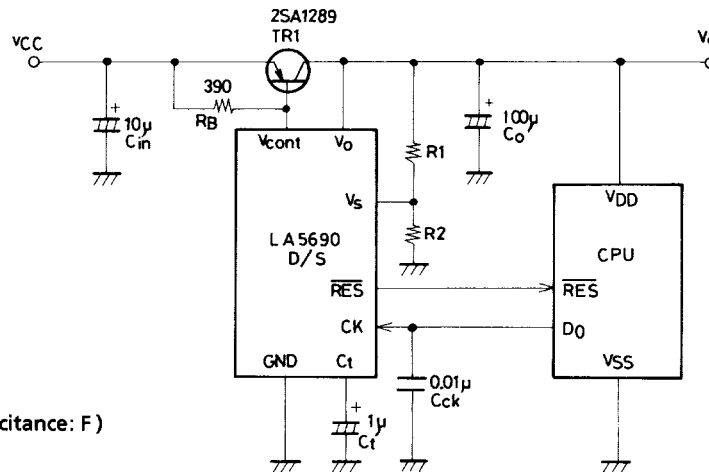
Timing Chart



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

# LA5690D, 5690S

## Sample Application Circuit



Unit (resistance: Ω, capacitance: F)

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

Ct : Sanyo OS capacitor

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

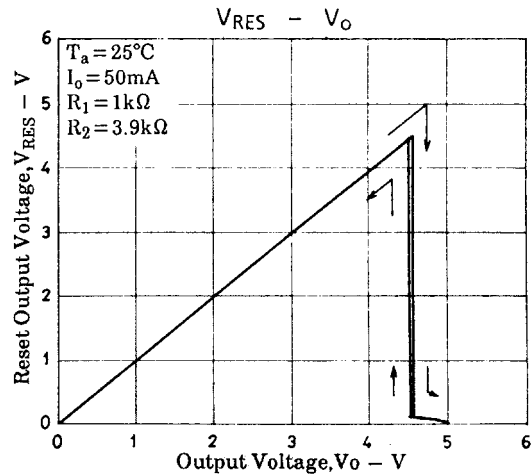
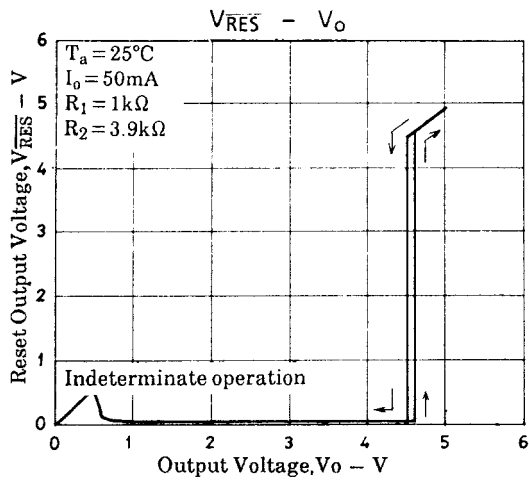
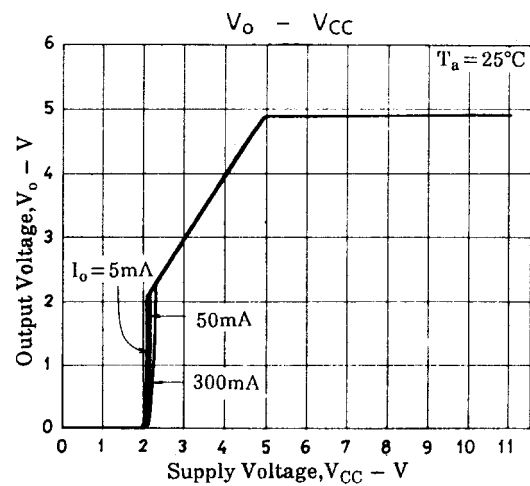
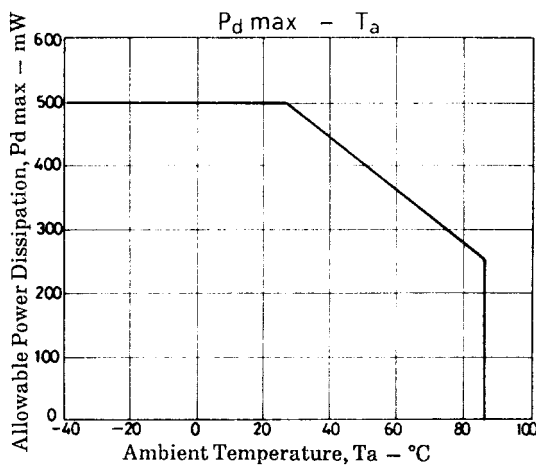
$$V_{REF} \approx 1.18(V)$$

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

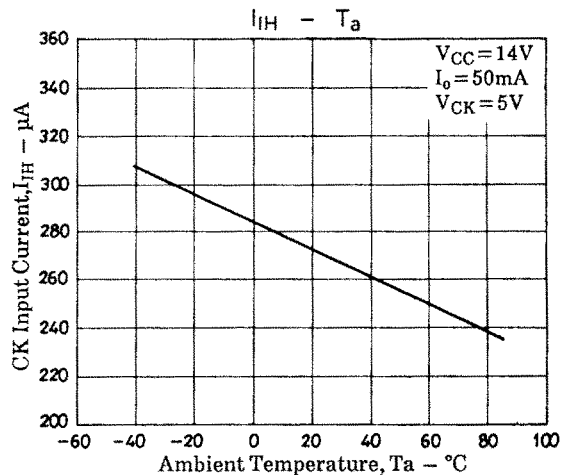
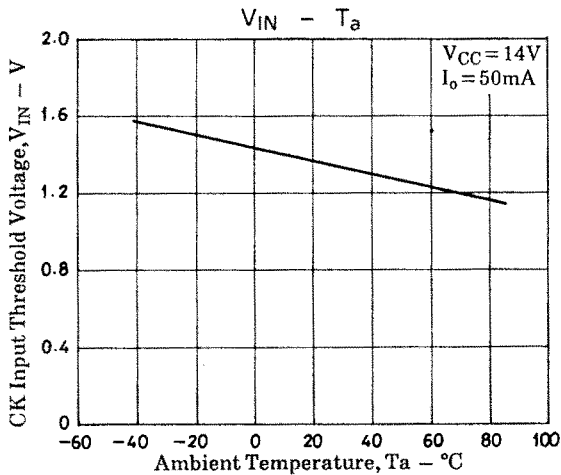
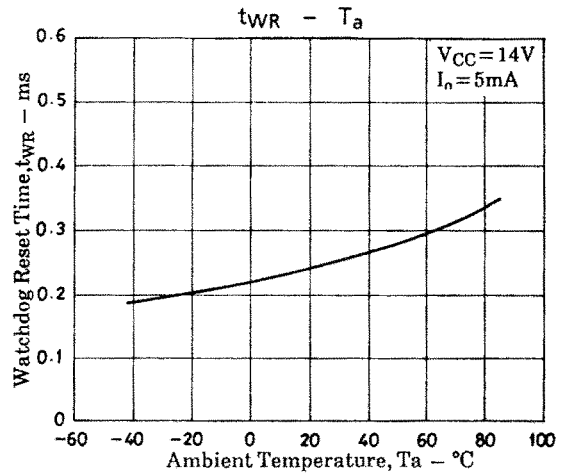
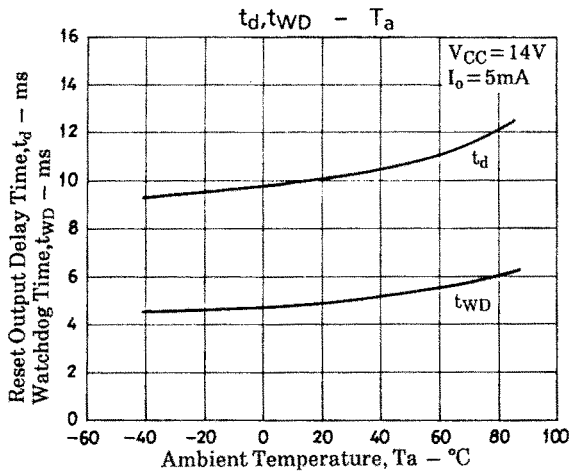
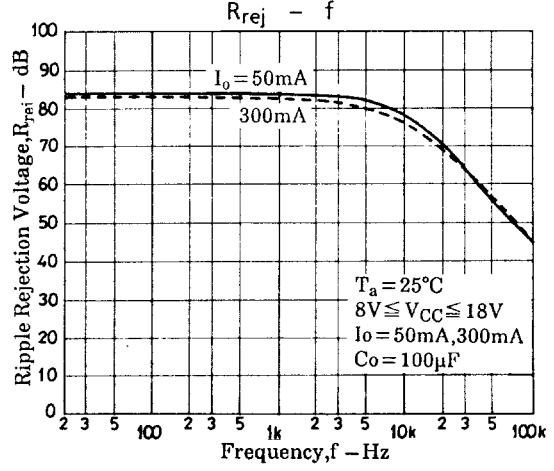
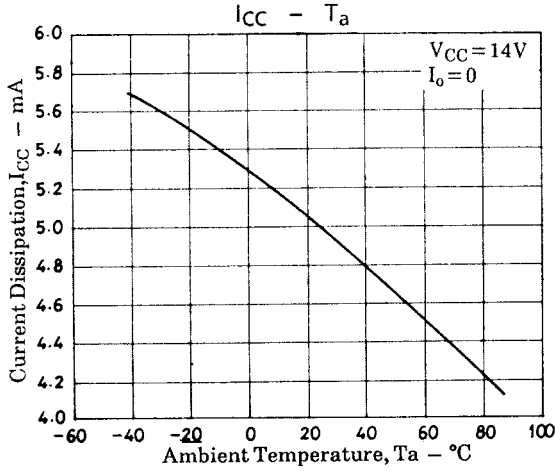
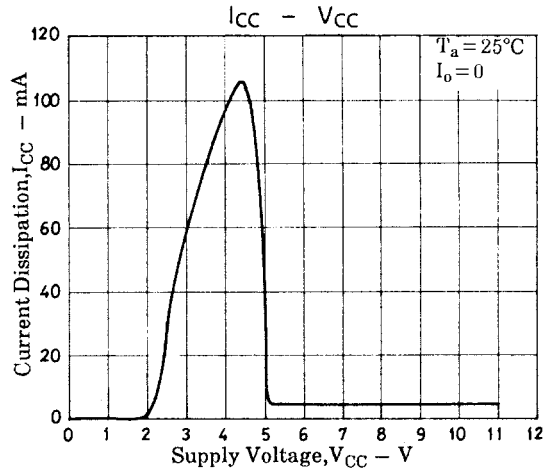
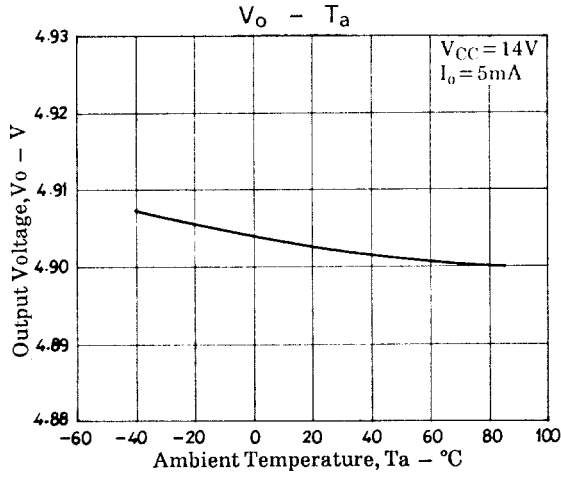
$$t_{WD} = 5 \times C_t (\mu F) [ms]$$

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

- Ct, Co : Capacitors whose value does not vary with temperature very much.
- CCK : Must be used to eliminate noise in the reset output.



# LA5690D, 5690S



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