Ordering number:ENN3244

Monolithic Linear IC

LA5691D, 5691S

Voltage Regulator Driver with Watchdog Timer (with Output ON/OFF Function)

Overview

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).

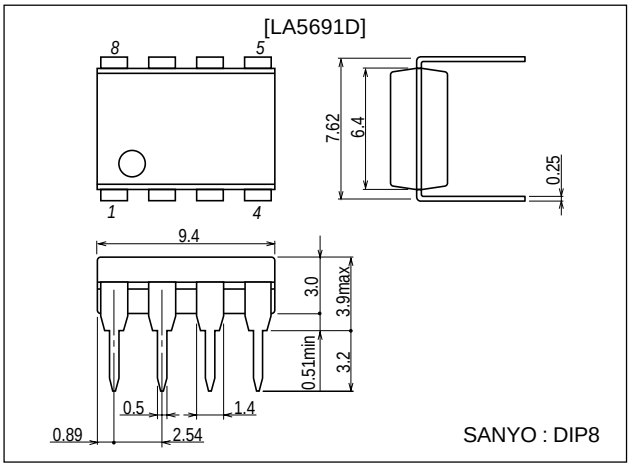
Features

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

Package Dimensions

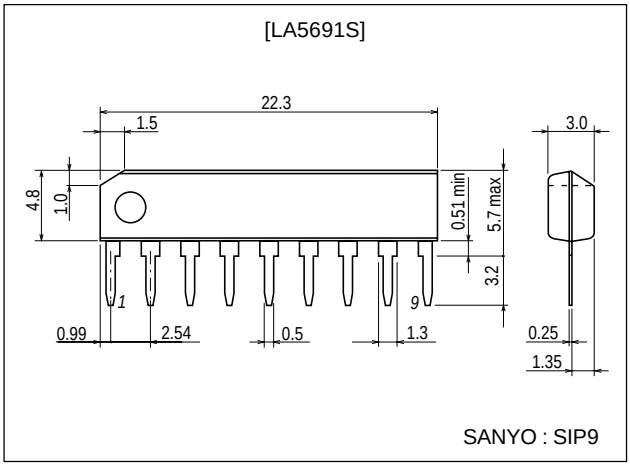
unit:mm

3001B-DIP8



unit:mm

3017C-SIP9



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Specifications

Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Control pin voltage	V_{CONT} max	1s	60	V
Control pin voltage	V_{CONT} max		41	V
Control pin current	I_{CONT} max	*V_{CC}≥6V	11	mA
Enable pin voltage	$V_{\overline{EN}}$ max		41	V
CK input voltage	V_{CK} max		25	V
Reset pin voltage	$V_{\overline{RES}}$ 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 LA5691D, 5691S externally to provide a low-saturation voltage regulator. Therefore, I_{CONT}≈100mA will flow, as starting current, in the V_{CC} range where the output cannnot be regulated.

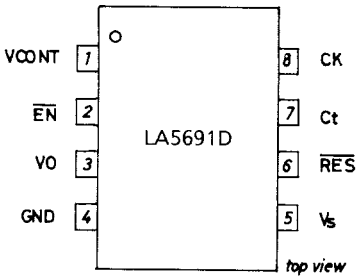
Operating Conditions at Ta = 25˚C

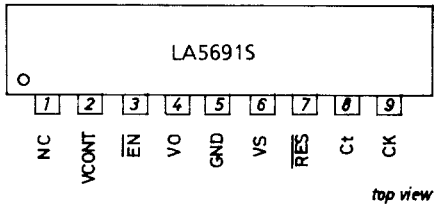
Parameter	Symbol	Conditions	Ratings	Unit
Control pin voltage	V_{CONT}		6 to 40	V
Control pin current	I_{CONT} max		10	mA
Reset output current	$I_{\overline{RES}}$ max	External R pull-up (with pull-up R 10kΩ)	8	mA
Reset detection voltage	V_S min		4	V

Operating Characteristics at Ta = 25˚C, V_{CC}=14V, I_O=50mA, unless otherwise specified. See specified Test Circuit.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_O		4.8	5.0	5.2	V
Line regulation	ΔV_{OLN1}	9V≤V_{CC}≤16V		2	10	mV
	ΔV_{OLN2}	6V≤V_{CC}≤40V		4	30	mV
Load regulation	ΔV_{OLD}	1mA≤I_O≤50mA		4	30	mV
Current drain	I_{CC}	I_O=0		4.1	6.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz, V_{CK}=0		200		µV
Temperature coefficient of output voltage	$\Delta V_O/\Delta Ta$	I_O=5mA, –40°C≤Ta≤+85°C		±0.2		mV/˚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}=5V		0.3	0.7	mA
L-level CK input current	I_{IL}	V_{CK}=0	–1.0	–0.1		µA
H-level reset output voltage	$V_{\overline{ORH}}$		4.8	5.0	5.2	V
L-level reset output voltage 1	$V_{\overline{ORL1}}$			40	200	mV
L-level reset output voltage 2	$V_{\overline{ORL2}}$	$I_{\overline{RES}}$=8mA		0.16	0.8	V
CK input pulse width	t_{CKW}	V_{CK}=5V	3			µs
Reset output delay time	t_d	C_t=1µF	7.5	10	12.5	ms
Watchdog time	t_{WD}	C_t=1µF	3.8	5.0	6.2	ms
Watchdog reset time	t_{WR}	C_t=1µF	0.1	0.25	0.4	ms
Reset hysteresis voltage	Vhys	V_S=4.5V	100	200	300	mV
L-level output coltage	$V_{O\ OFF}$	$V_{\overline{EN}}$=5V		150	300	mV
Quiescent current	$I_{Q\ OFF}$	$V_{\overline{EN}}$=5V		300	600	µA
Output OFF control voltage	$V_{\overline{EN}\ H}$	Output OFF	2			V
Output ON control voltage	$V_{\overline{EN}\ L}$	Output ON			0.8	V

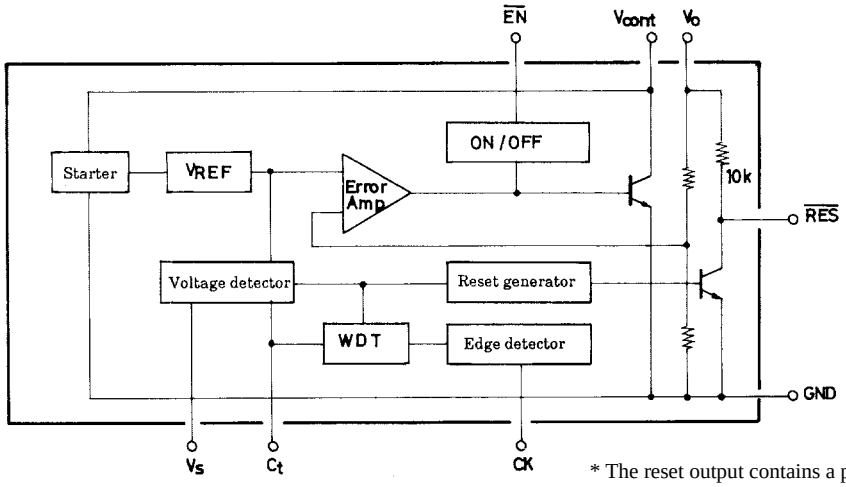
Pin Assignments





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

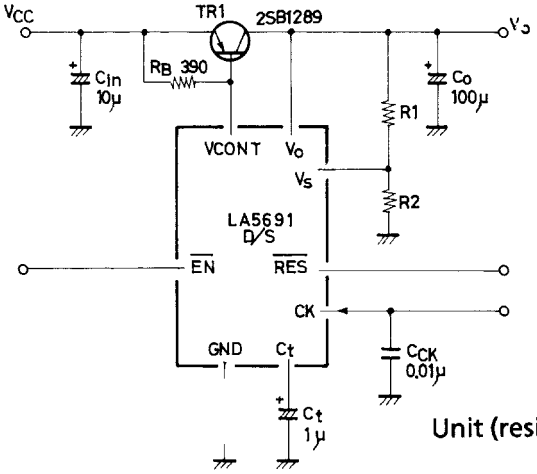
Equivalent Circuit Block Diagram



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

Unit (resistance: Ω)

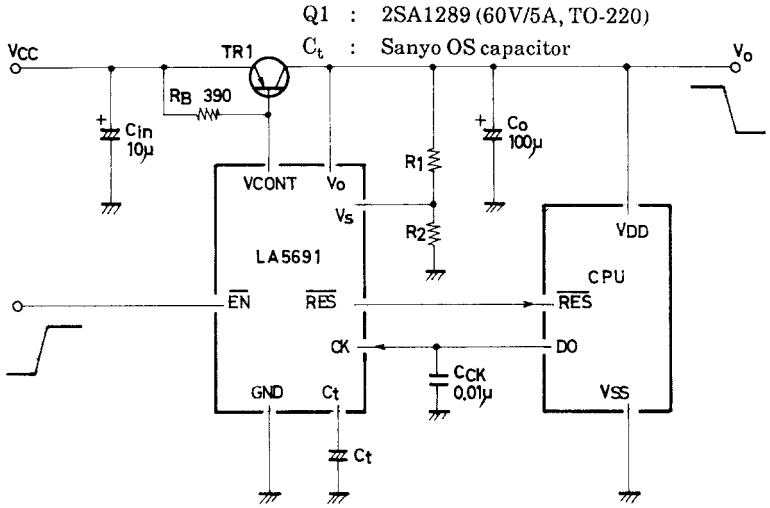
Test Circuit



Unit (resistance: Ω, capacitance: F)

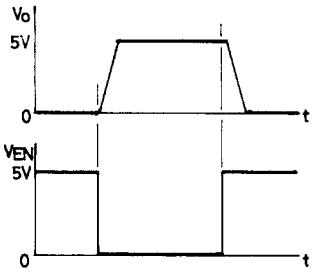
Sample Application Circuit

Q1 : 2SA1289 (60V/5A, TO-220)
C_t : Sanyo OS capacitor



Function Table

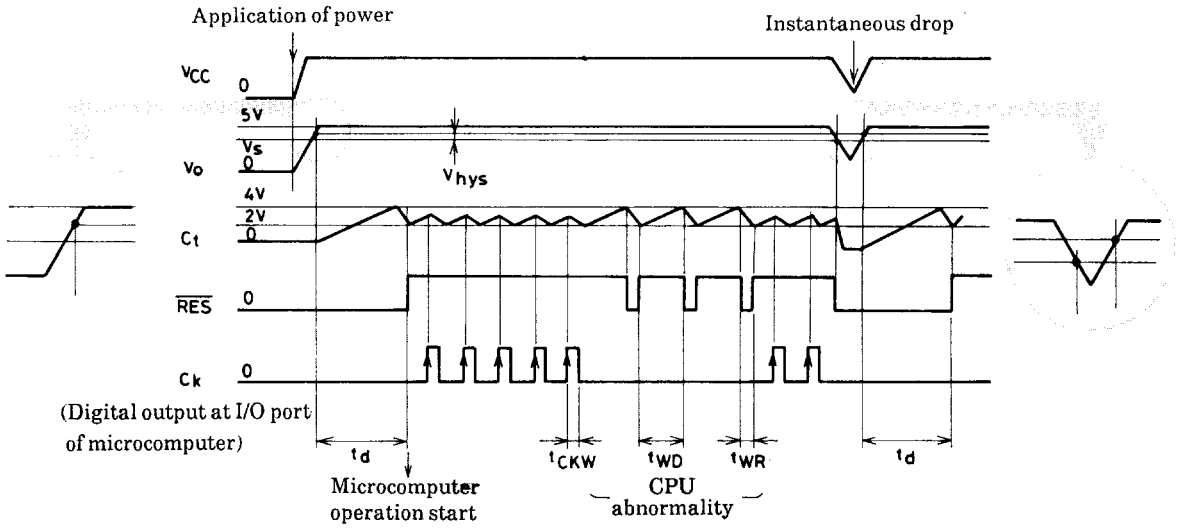
VEN	Vo
L	H
H	L



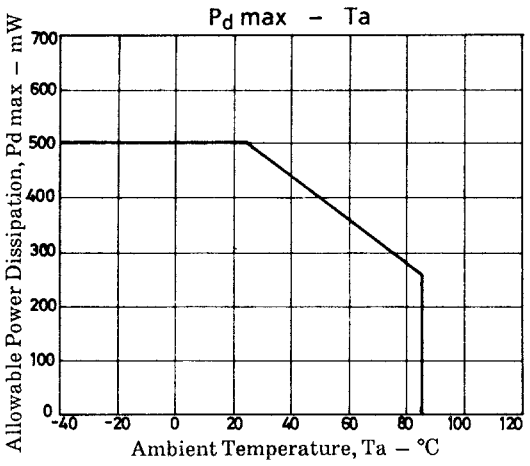
Unit (resistance: Ω, capacitance: F)

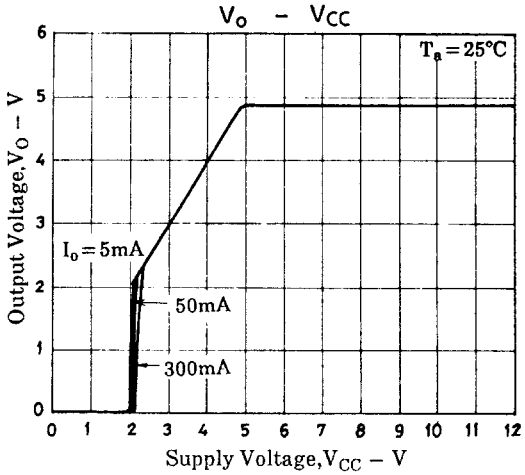
· Ct, C_O : Capacitors whose value does not vary with temperature very much.
· C_{CK} : Must be used to eliminate noise in the reset output.

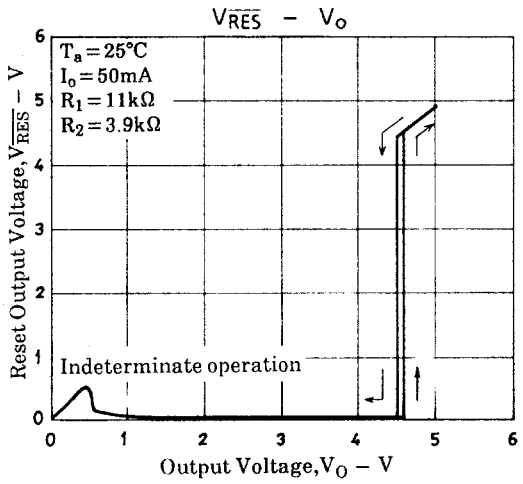
Timing Chart

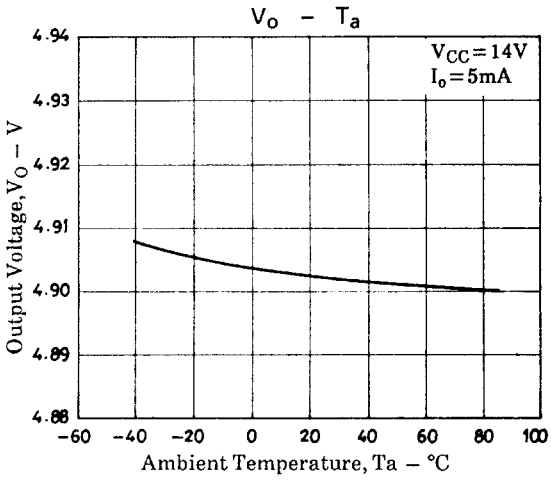


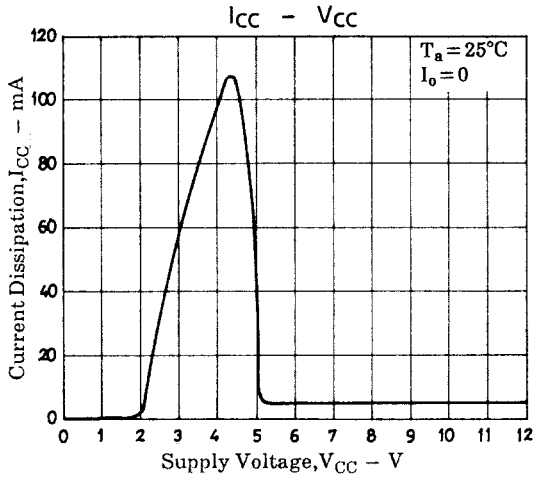
Note : Edge-triggered at the point indicated by the arrow of C_K signal.

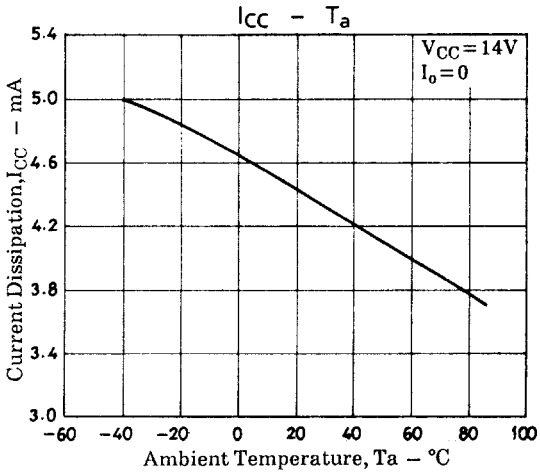


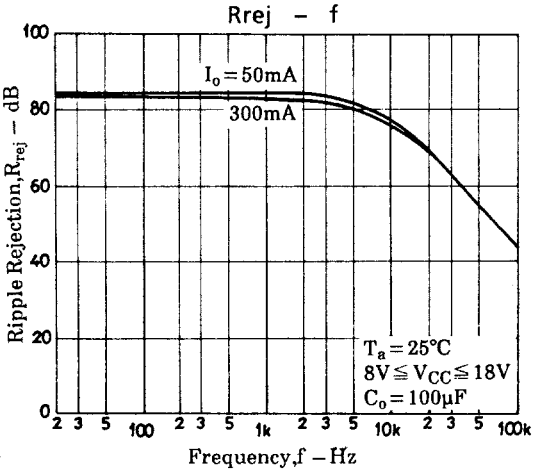


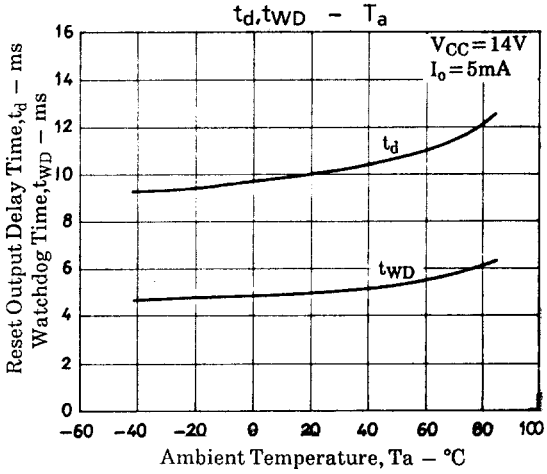


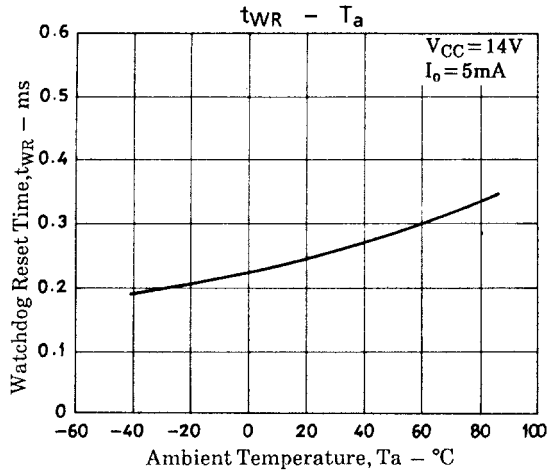


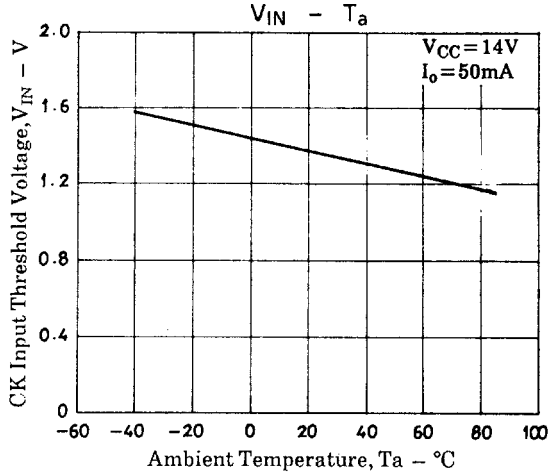

ICC – VCC
Ta = 25°C
Io = 0
Current Dissipation, ICC – mA
Supply Voltage, VCC – V

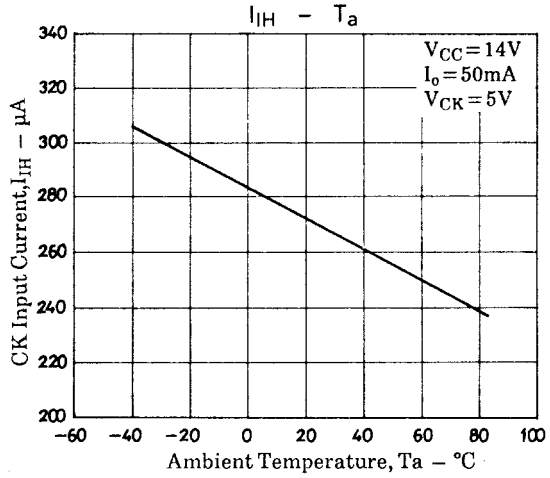

ICC – Ta
VCC = 14V
Io = 0
Current Dissipation, ICC – mA
Ambient Temperature, Ta – °C

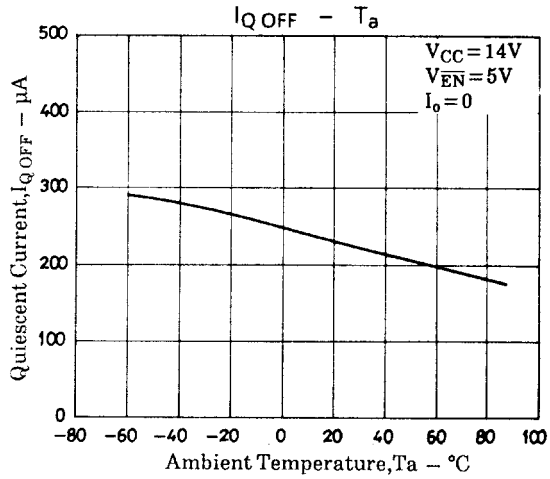

Rrej – f
Io = 50mA
300mA
Ta = 25°C
8V ≦ VCC ≦ 18V
Co = 100µF
Ripple Rejection, Rrej – dB
Frequency, f – Hz

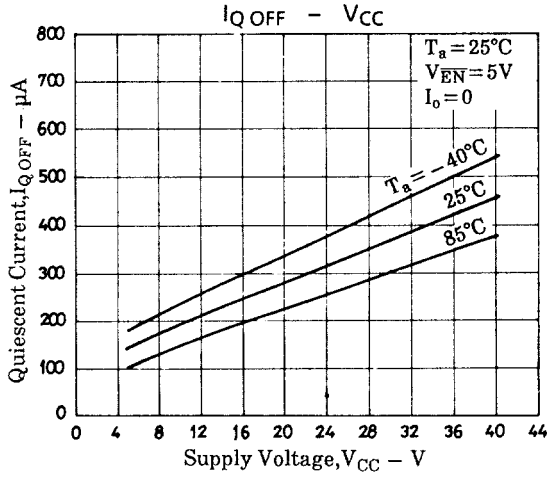

td, tWD – Ta
VCC = 14V
Io = 5mA
td
tWD
Reset Output Delay Time, td – ms
Watchdog Time, tWD – ms
Ambient Temperature, Ta – °C

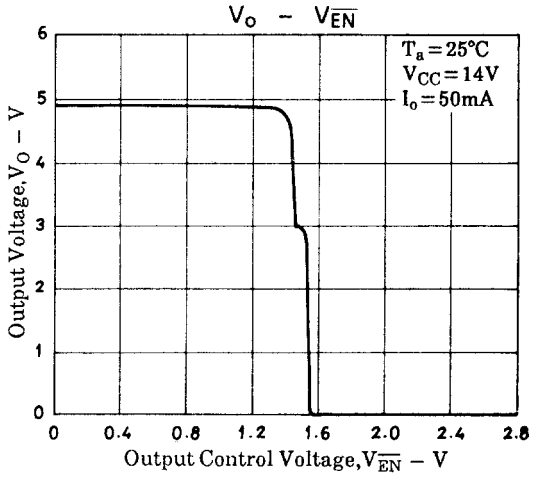

tWR – Ta
VCC = 14V
Io = 5mA
Watchdog Reset Time, tWR – ms
Ambient Temperature, Ta – °C

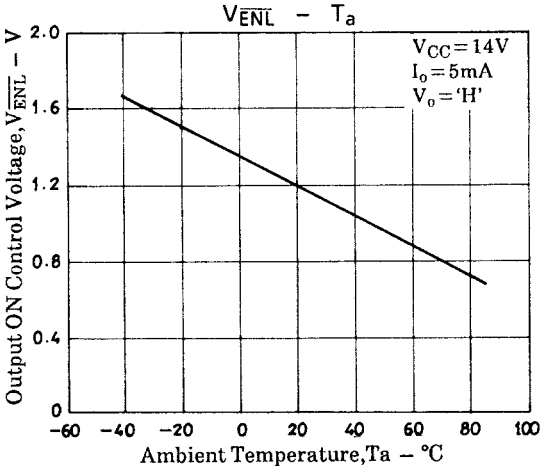

VIN – Ta
VCC = 14V
Io = 50mA
CK Input Threshold Voltage, VIN – V
Ambient Temperature, Ta – °C

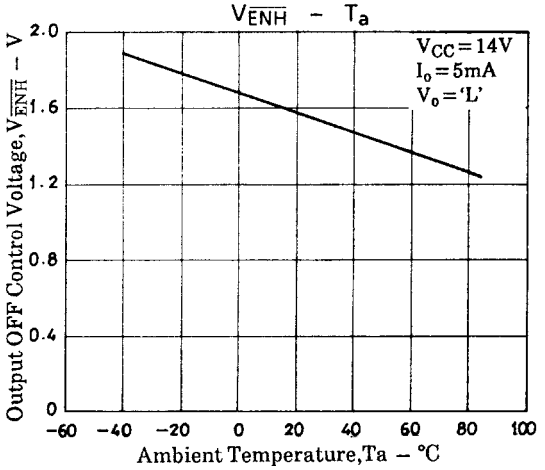

IIH – Ta
VCC = 14V
Io = 50mA
VCK = 5V
CK Input Current, IIH – µA
Ambient Temperature, Ta – °C

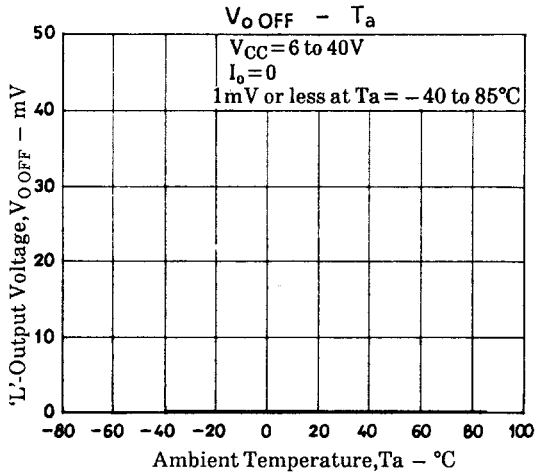

IQ OFF – Ta
VCC = 14V
VEN = 5V
Io = 0
Quiescent Current, IQ OFF – µA
Ambient Temperature, Ta – °C

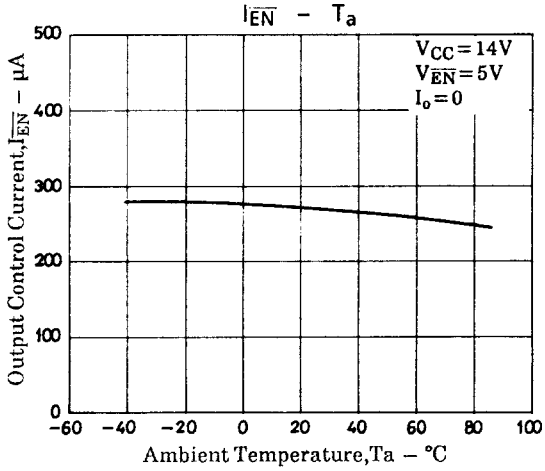

$I_{Q\,OFF}$ – V_{CC}
T_a = 25°C
$V_{\overline{EN}}$ = 5V
I_o = 0
T_a = –40°C
25°C
85°C
Quiescent Current, $I_{Q\,OFF}$ – µA
Supply Voltage, V_{CC} – V

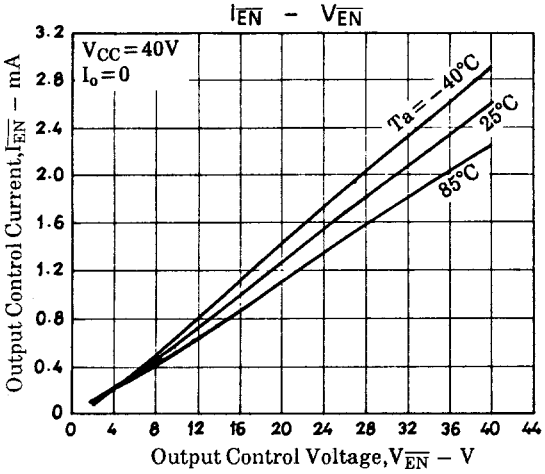

V_o – $V_{\overline{EN}}$
T_a = 25°C
V_{CC} = 14V
I_o = 50mA
Output Voltage, V_O – V
Output Control Voltage, $V_{\overline{EN}}$ – V


$V_{\overline{ENL}}$ – T_a
V_{CC} = 14V
I_o = 5mA
V_o = 'H'
Output ON Control Voltage, $V_{\overline{ENL}}$ – V
Ambient Temperature, Ta – °C


$V_{\overline{ENH}}$ – T_a
V_{CC} = 14V
I_o = 5mA
V_o = 'L'
Output OFF Control Voltage, $V_{\overline{ENH}}$ – V
Ambient Temperature, Ta – °C


$V_{O\,OFF}$ – T_a
V_{CC} = 6 to 40V
I_o = 0
1mV or less at Ta = –40 to 85°C
'L'-Output Voltage, $V_{O\,OFF}$ – mV
Ambient Temperature, Ta – °C


$I_{\overline{EN}}$ – T_a
V_{CC} = 14V
$V_{\overline{EN}}$ = 5V
I_o = 0
Output Control Current, $I_{\overline{EN}}$ – µA
Ambient Temperature, Ta – °C


$I_{\overline{EN}}$ – $V_{\overline{EN}}$
V_{CC} = 40V
I_o = 0
T_a = –40°C
25°C
85°C
Output Control Current, $I_{\overline{EN}}$ – mA
Output Control Voltage, $V_{\overline{EN}}$ – V