Ordering number : EN7559C

SANYO Semiconductors
DATA SHEET

Monolithic Linear IC

LA5693AM — Voltage Regulator Driver with Watchdog Timer

Overview

The LA5693AM 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 LA5693AM can hold the reset output, it is especially suited for use in peripheral control and monitor output applications including valves used in refrigeration equipment, hot water supply system. In addition, as the LA5693AM assures reliable operation over a wide range of operating temperatures (-40 to +125°C), it can find many applications in microcontroller systems for use in automobiles and other industrial equipment.

Features

- An external PNP transistor can be used to provide a low-saturation voltage regulator.
- Since the CK input has no edge detector, a high degree of flexibility is allowed in applications.
- Variable detection voltage.
- The watchdog time can be made longer.

Functions

- Output voltage 5V control.
- Watchdog timer.
- Power-ON reset function.
- Reset hold output [$\overline{\text{RES}}$ (2)] (Cleared with CK reinput).

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Control pin voltage	V_{CONT} max	1sec	60	V
Control pin voltage	V_{CONT} max		41	V
Control pin current	I_{CONT} max	*V_{CC} ≥ 6V	11	mA
CK input voltage	V_{CK} max		25	v
Reset pin voltage	$V_{\overline{RES}}$(1) max, $V_{\overline{RES}}$(2) max		41	V

Continued on next page.

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Continued from preceding page.

Parameter	Symbol	Conditions	Ratings	Unit
Allowable power dissipation	Pd max		370	mW
Operating temperature	Topr		-40 to +125	°C
Storage temperature	Tstg		-55 to +150	°C

* : A PNP transistor is connected to the LA5693AM 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 cannot be regulated.

Operating Conditions at Ta = -40 to +125°C

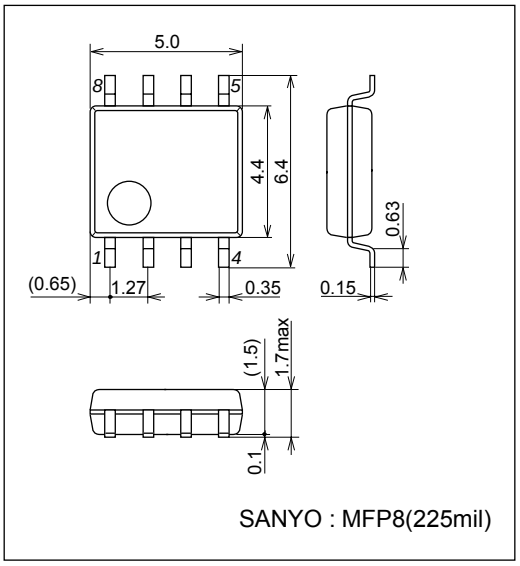
Parameter	Symbol	Conditions	Ratings	Unit
Control pin voltage	V_{CONT}		6 to 40	V
Control pin current	I_{CONT}		10	mA
Reset output current	$I_{\overline{RES}}(1)$ max, $I_{\overline{RES}}(2)$ max	$\overline{RES}(2)$: 10kΩ pull-up	8	mA
Reset detection voltage	V_S min		4	V

Operating Characteristics at Ta= -40 to +125°C, V_{CC}=14V, I_O=50mA, unless otherwise specified.

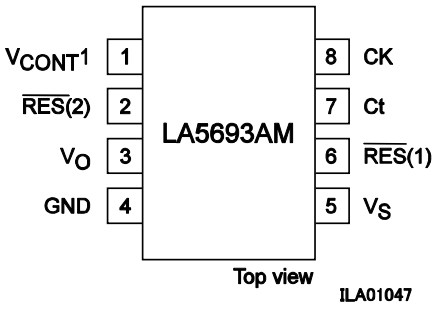
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_O		4.8	5.0	5.2	V
Line regulation1	$\Delta V_{OLN}1$	9V ≤ V_{CC} ≤ 16V		2	10	mV
Line regulation2	$\Delta V_{OLN}2$	6V ≤ V_{CC} ≤ 40V		4	30	mV
Load regulation	ΔV_{OLD}	1mA ≤ I_O ≤ 50mA		4	30	mV
Current dissipation	I_{CC}	I_O = 0		4.4	6.5	mA
Output noise voltage	V_{NO}	10Hz ≤ f ≤ 100kHz, V_{CK} = 0		150		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	mV
'L'-level CK input current	I_{IL}	V_{CK} = 0V	-1.0	-0.1		μA
'H'-level reset output voltage	$V_{\overline{ORH}}(1)$, $V_{\overline{ORH}}(2)$	$\overline{RES}(2)$: 10kΩ pull-up	4.8	5.0	5.2	V
'L'-level reset output voltage1	$V_{\overline{ORL}}(1)1$, $V_{\overline{ORL}}(1)1$	$\overline{RES}(2)$: 10kΩ pull-up		40	200	mV
'L'-level reset output voltage2	$V_{\overline{ORL}}(1)2$, $V_{\overline{ORL}}(1)2$	$I_{\overline{RES}}(1)$ = $I_{\overline{RES}}(2)$ = 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	7.0	10	20	ms
Watchdog time 1	$t_{WD}1$	C_t = 1μF (Ta = -40 to +125°C)	25	40	60	ms
Watchdog time 2	$t_{WD}2$	C_t = 1μF (Ta = -40 to +85°C)	25	40	53	ms
Watchdog reset time	t_{WR}	C_t = 1μF	0.1	0.25	0.4	ms
Reset hysteresis voltage	V_{hys}	V_S = 4.5V	100	200	300	mV

Package Dimensions

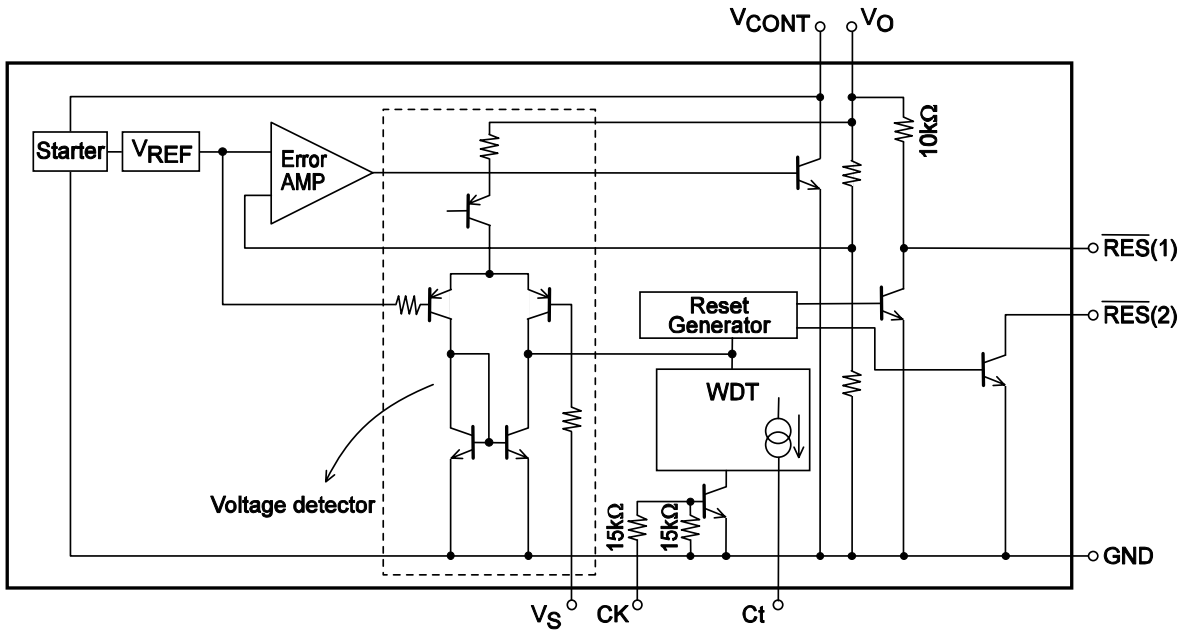
unit : mm
3032D



Pin Assignment



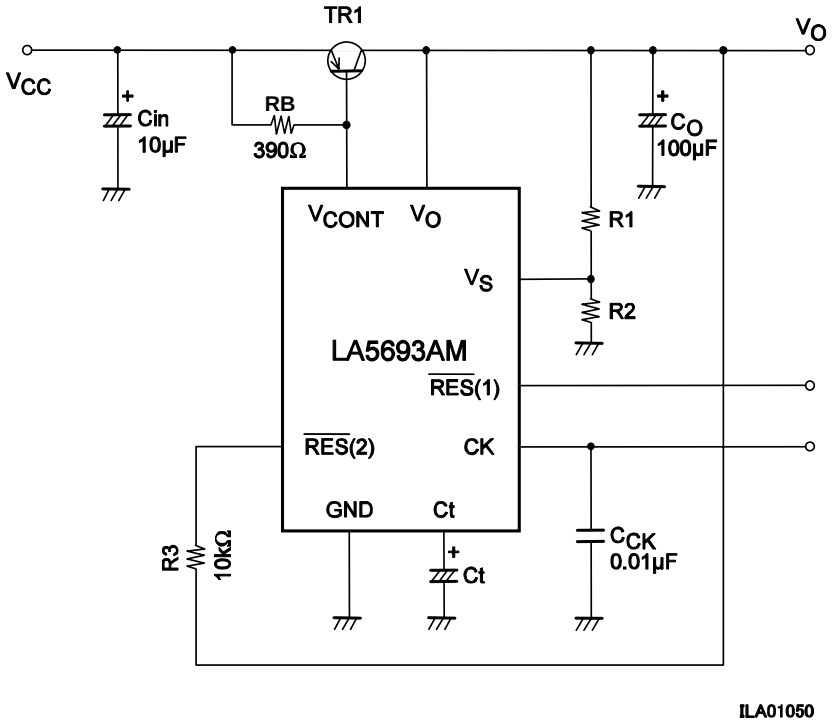
Block Diagram



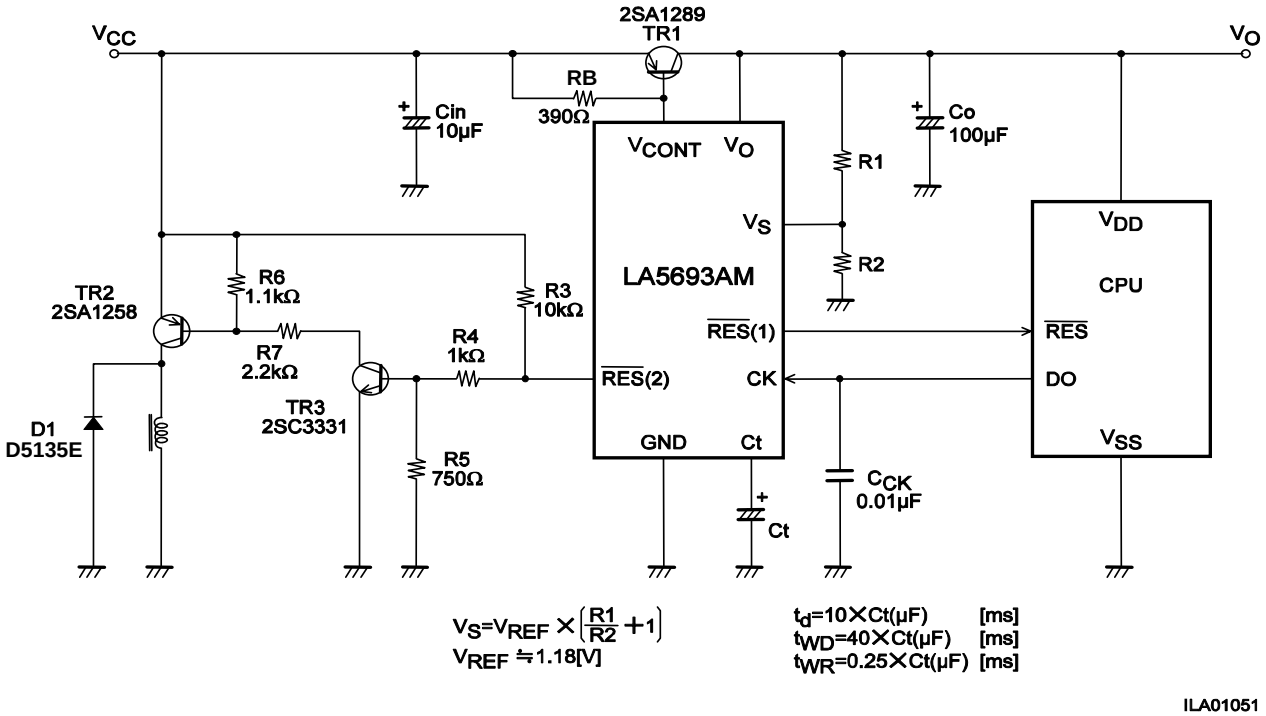
RES(1) : Contains a pull-up resistor of 10kΩ.
RES(2) : Open collctor.

ILA01049

Test Circuit



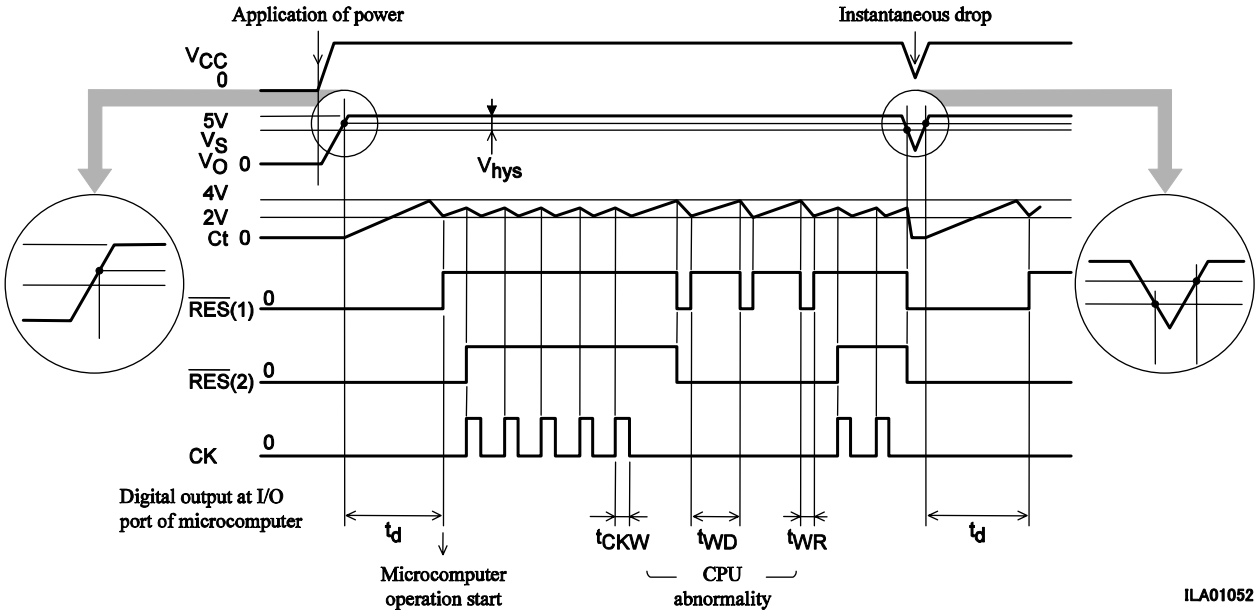
Sample Application Circuit



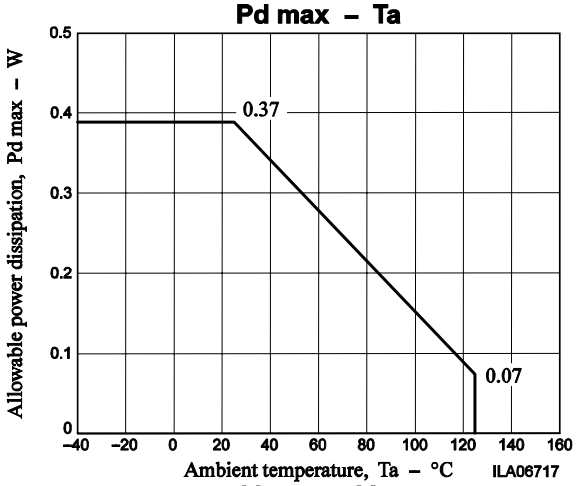
Note on application

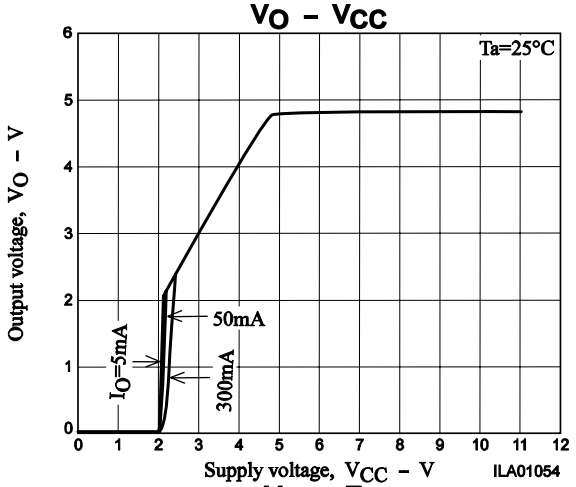
1. For stable operation, place Cin, CO, and TR1 as near to the IC as possible.
2. When used in 0°C or below it, a capacitor of which impedance at high-frequency operation is low and has a good temperature characteristic (such as SANYO OS-CON capacitor or others) should be used to prevent oscillation.
3. Set VS to the output voltage level where the circuit will be reset using external resistors R1 and R2. VS should be set to 4V or greater due to internal circuit operation.
4. CCK must be inserted to cut the high range element of clock noise to prevent it from becoming a reset output noise.
5. For Ct, a capacitor which less varies the capacitance according to the temperature should be used.

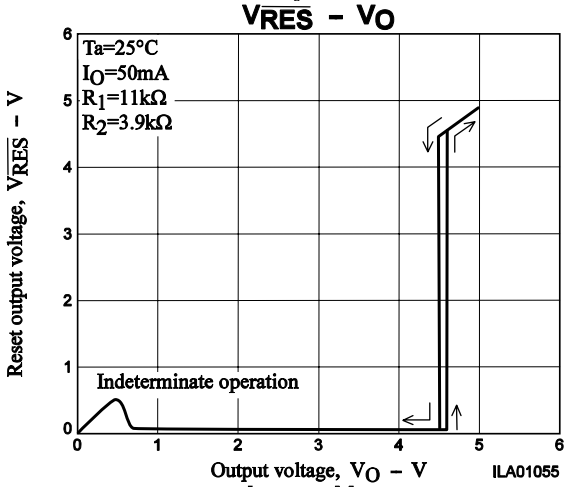
Timing Chart

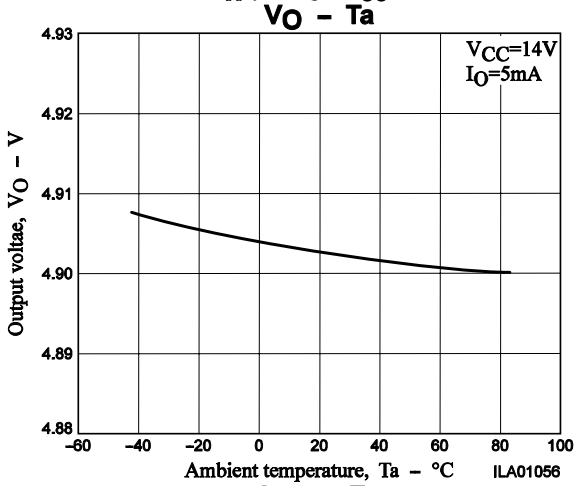


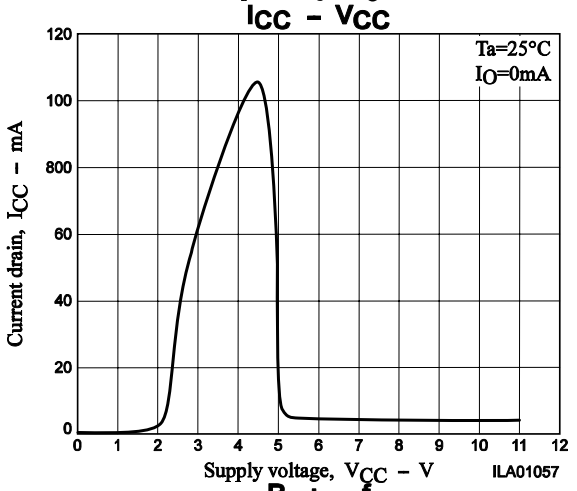
Note : Edge-triggered at the point indicated by the arrow of CK signal.

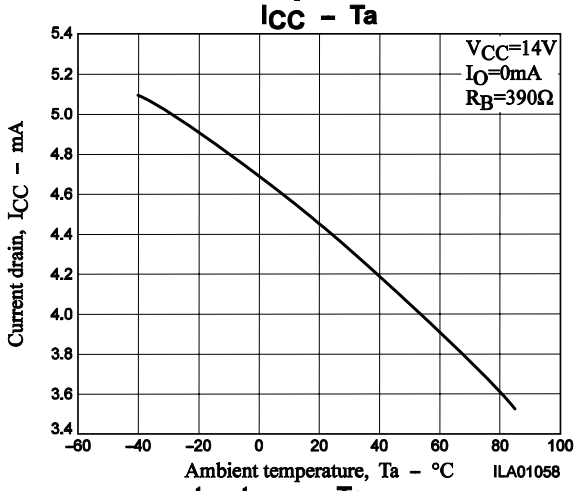

Pd max – Ta
Allowable power dissipation, Pd max – W
0.37
0.07
Ambient temperature, Ta – °C
ILA06717

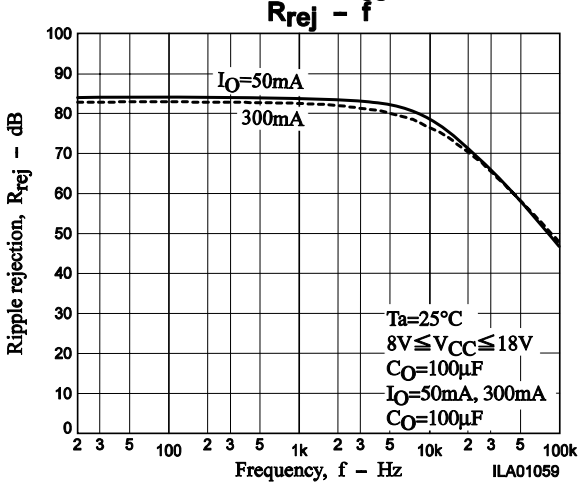

VO – VCC
Ta=25°C
Output voltage, VO – V
IO=5mA
50mA
300mA
Supply voltage, VCC – V
ILA01054

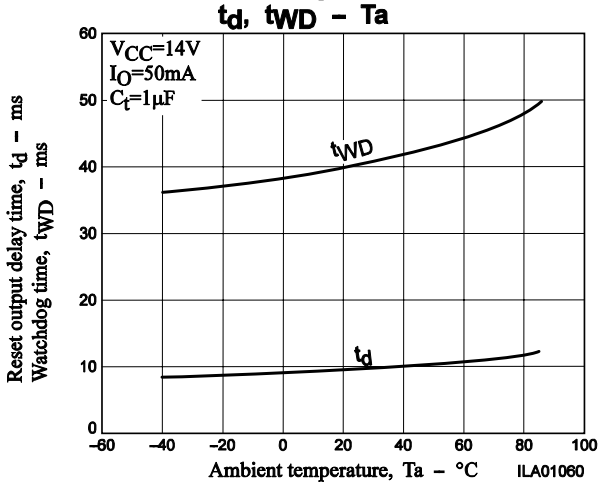

VRES – VO
Ta=25°C
IO=50mA
R1=11kΩ
R2=3.9kΩ
Reset output voltage, VRES – V
Indeterminate operation
Output voltage, VO – V
ILA01055

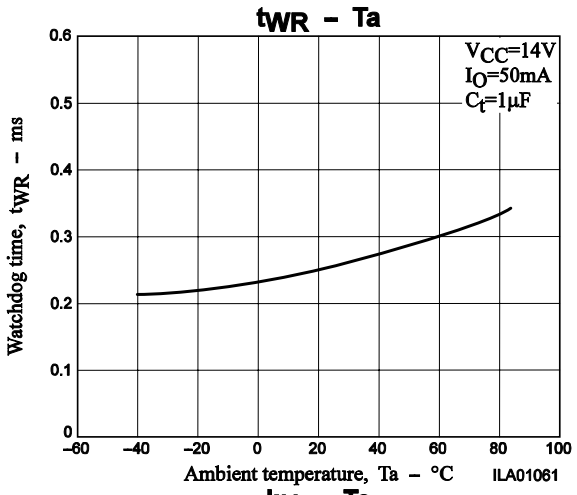

VO – Ta
VCC=14V
IO=5mA
Output voltae, VO – V
Ambient temperature, Ta – °C
ILA01056

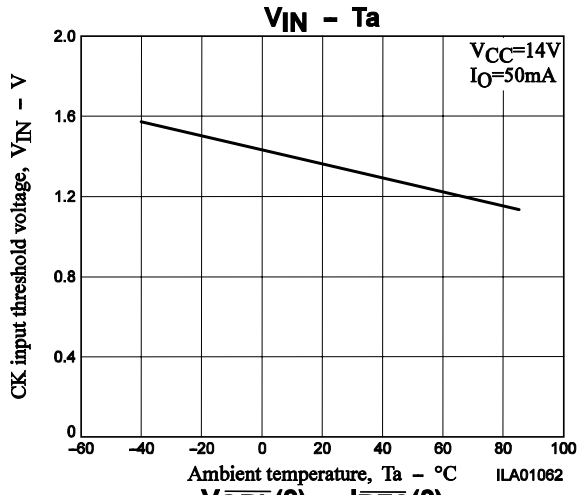

ICC – VCC
Ta=25°C
IO=0mA
Current drain, ICC – mA
Supply voltage, VCC – V
ILA01057

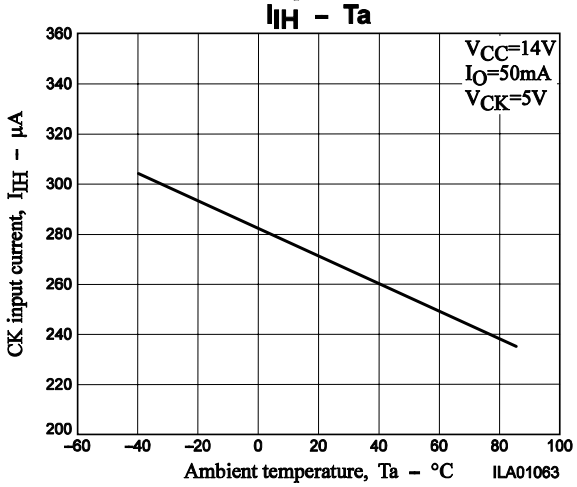

ICC – Ta
VCC=14V
IO=0mA
RB=390Ω
Current drain, ICC – mA
Ambient temperature, Ta – °C
ILA01058

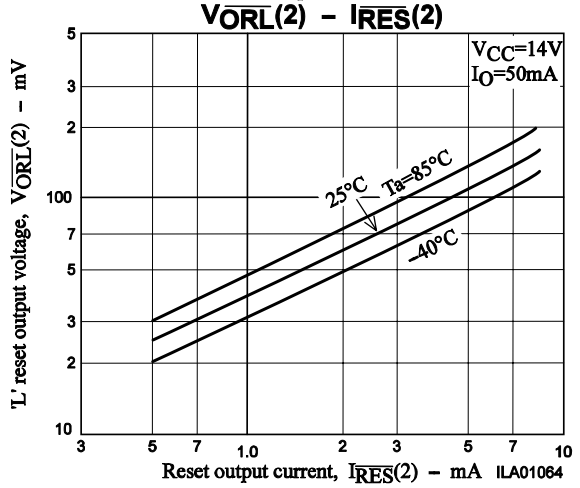

Rrej – f
IO=50mA
300mA
Ripple rejection, Rrej – dB
Ta=25°C
8V≦VCC≦18V
CO=100µF
IO=50mA, 300mA
CO=100µF
Frequency, f – Hz
ILA01059


td, tWD – Ta
VCC=14V
IO=50mA
Ct=1µF
tWD
td
Reset output delay time, td – ms
Watchdog time, tWD – ms
Ambient temperature, Ta – °C
ILA01060









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