

# NCP4672

## Linear Voltage Regulator - Dual, $V_{in}$ and $V_{out}$ Voltage Detector

The NCP4672 is a dual linear voltage regulator with input voltage and output voltage detectors. This part is useful in systems where multiple voltages are required such as for core and I/O. The NCP4672 is very accurate at 2% over full input voltage and full load current. The NCP4672 eliminates the need for external voltage supervision due to the two built in voltage detectors. The voltage detector on the input is set to 7.0 V. The output voltage detector is for channel 1 and is set to 2.9 V. An external capacitor is used to set the duration of this reset signal. Other features include short circuit protection and thermal shutdown protection. The NCP4672 has been designed to work with a 4.7  $\mu\text{F}$  output capacitor having an ESR between 0.1  $\Omega$  and 5.0  $\Omega$ .

### Features

- Accuracy: 2% at Full Voltage and Load
- Excellent Ripple Rejection: 70 dB @ 1 kHz
- Voltage Detector for Input Voltage
- Voltage Detector for Output Voltage
- Programmable Delay of Reset Signal
- Thermal Short Circuit Protection
- This is a Pb-Free Device

### Typical Application

- Small Core and I/O Power
- Consumer Equipment
- Measurement Equipment
- Industrial Equipment

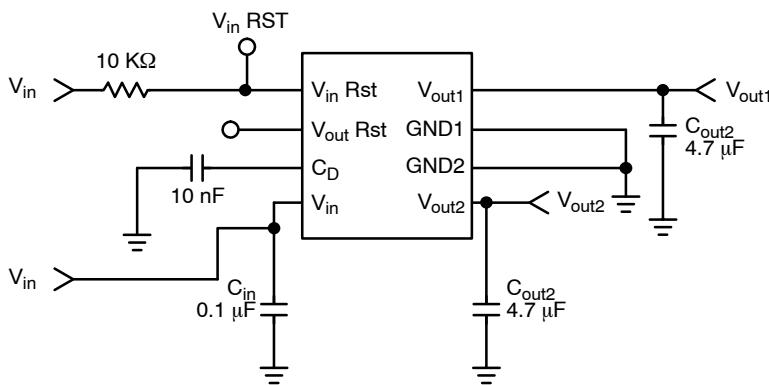


Figure 1. Typical Application Circuit



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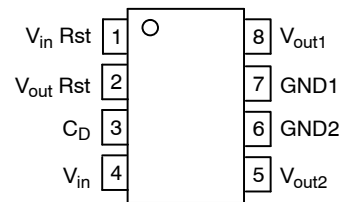
<http://onsemi.com>

### MARKING DIAGRAM



- 4672 = Specific Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- = Pb-Free Package

### PIN CONFIGURATION



(Top View)

### ORDERING INFORMATION

Device	Package	Shipping†
NCP4672DR2G	SOIC-8 (Pb-Free)	2500 Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage	$V_{inmax}$	-0.3 ~ 18	V
Output Voltage	$V_{out}$	-0.3 to $V_{in} + 0.3$	V
Output Current 1 Output Current 2	$I_{out1max}$ $I_{out2max}$	30 80	mA mA
Output Short Circuit Duration	-	Infinite	-
Power Dissipation and Thermal Characteristics – SOIC-8 Power Dissipation Thermal Resistance, Junction-to-Ambient Minimum Pad Size 200 mm <sup>2</sup> Pad Size (Note 1) Thermal Resistance, Junction-to-Case	$P_D$ $R_{\theta JA}$  $R_{\theta JC}$	Internally Limited  190 160 25	W  °C/W °C/W °C/W
Operating Junction Temperature Range	$T_{stg}$	-40 to 125	°C
Storage Temperature Range	$T_{solder}$	-55 to 150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Refer to Figure 4 for more information.

## PIN DESCRIPTION

Pin Number	Symbol	Description
1	$V_{in RST}$	Open-collector, active-low output of the input voltage detector with hysteresis. Threshold levels are typical 7.0 V/ 7.35 V at $V_{CC}$ pin.
2	$V_{o RST}$	Active-low output of the reset generator. Reset generator is based on sensing of the $V_{out1}$ voltage. Sensing is with hysteresis – threshold levels are typically 2.9 V/ 2.95 V at $V_{out1}$ . Reset is generated at rising edge of the $V_{out1}$ and it's duration is set by external capacitor connected to $C_D$ pin.
3	$C_D$	Programmable delay of the reset generator. Delay is adjusted by inserting a capacitor between $C_D$ and GND (typically 10 ms for 10 nF capacitor).
4	$V_{CC}$	Supply Voltage
5	$V_{out2}$	1.8 V/ 80 mA LDO Regulator Output
6	GND2	Ground for $V_{out2}$ (internally connected with GND1)
7	GND1	Ground for $V_{out1}$ (internally connected with GND2)
8	$V_{out1}$	3.5 V/30 mA LDO Regulator Output

## RECOMMENDED CONDITIONS ( $T_A = 25^\circ\text{C}$ , $C_{in} = 0.1 \mu\text{F}$ Ceramic, $C_{out} = 4.7 \mu\text{F}$ )

Characteristics	Symbol	Min	Typ	Max	Unit
Input Voltage	$V_{in}$	3.8	12	16	V
Output Current (where $V_{out}$ remains within accuracy)	$I_{out1}$ $I_{out2}$	0 0	- -	20 70	mA

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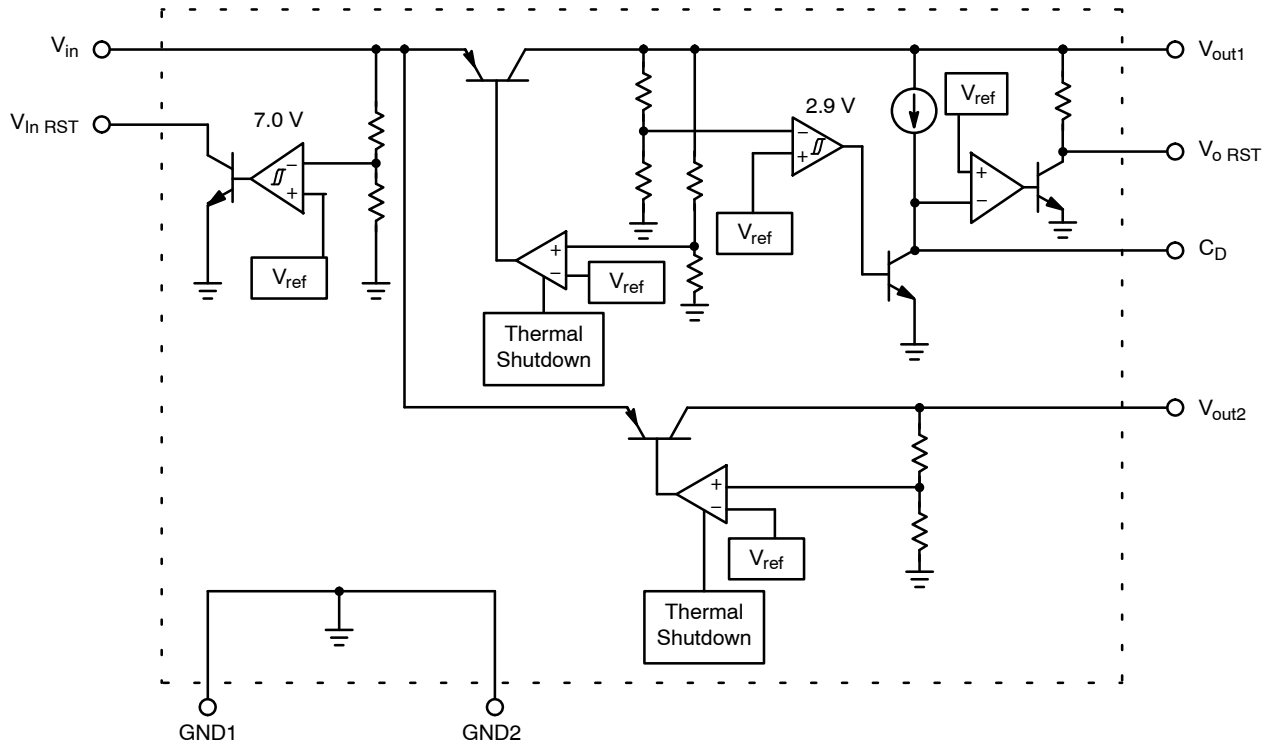


Figure 1.

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## ELECTRICAL CHARACTERISTICS (C<sub>in</sub> = 0.1 μF Ceramic, C<sub>out</sub> = 4.7 μF with ESR = 0.1 – 5.0 Ω, V<sub>in</sub> = 12 V, T<sub>A</sub> = 25°C)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage V <sub>out1</sub> (V <sub>in</sub> = 4.5 V, I <sub>out1</sub> = 20 mA) V <sub>out2</sub> (V <sub>in</sub> = 4.5 V, I <sub>out2</sub> = 40 mA)	V <sub>adj</sub>	3.43 1.764	3.5 1.8	3.57 1.836	V
Line Regulation V <sub>out1</sub> (V <sub>in</sub> = 4.5 V, I <sub>out1</sub> = 20 mA) V <sub>out2</sub> (V <sub>in</sub> = 4.5 V to 10 V, I <sub>out2</sub> = 40 mA)	Reg <sub>line</sub>	– –	3.0 3.0	30 30	mV
Load Regulation V <sub>out1</sub> (V <sub>in</sub> = 4.5 V, I <sub>out1</sub> = 0.1 mA to 20 mA) V <sub>out2</sub> (V <sub>in</sub> = 4.5 V, I <sub>out2</sub> = 0.1 mA to 70 mA)	Reg <sub>load</sub>	– –	3.0 2.0	40 40	mV
Dropout Voltage V <sub>out1</sub> (V <sub>in</sub> = 3.3 V, I <sub>out1</sub> = 20 mA)	V <sub>in</sub> – V <sub>out1</sub>	–	150	300	mV
Ground Pin Current (V <sub>in</sub> = 8.0 V, I <sub>out1</sub> = I <sub>out2</sub> = 0 mA) (V <sub>in</sub> = 2.7 V, I <sub>out1</sub> = I <sub>out2</sub> = 0 mA, R <sub>pu</sub> = infinite)	I <sub>GND</sub>	– –	1.0 3.0	2.0 –	mA
Short Current Limit V <sub>out1</sub> V <sub>out2</sub>	I <sub>SC</sub>	30 80	60 150	– –	mA
Thermal Shutdown		–	165	–	°C
Temperature Coefficient V <sub>out1</sub> (T <sub>J</sub> = –30 to 85°C, V <sub>in</sub> = 4.5 V, I <sub>out1</sub> = 20 mA) V <sub>out2</sub> (T <sub>J</sub> = –30 to 85°C, V <sub>in</sub> = 4.5 V, I <sub>out2</sub> = 40 mA)	T <sub>C</sub>	– –	100 100	– –	ppm/°C
Ripple Rejection (Note 6) V <sub>out1</sub> (V <sub>in</sub> = 4.5 V, V <sub>ripple</sub> = 1.0 V, I <sub>out1</sub> = 20 mA, 120 Hz) V <sub>out2</sub> (V <sub>in</sub> = 4.5 V, V <sub>ripple</sub> = 1.0 V, I <sub>out2</sub> = 40 mA, 120 Hz)	R <sub>R</sub>	– –	65 70	– –	dB
Output Noise Voltage V <sub>out1</sub> (V <sub>in</sub> = 4.5 V, f = 20 Hz – 80 kHz, I <sub>out1</sub> = 20 mA) V <sub>out2</sub> (V <sub>in</sub> = 4.5 V, f = 20 Hz – 80 kHz, I <sub>out2</sub> = 40 mA)	V <sub>n</sub>	– –	80 50	– –	μV <sub>rms</sub>

### V<sub>in</sub> Detect

Detecting Voltage L (V <sub>in</sub> = H to L)	V <sub>SLin</sub>	6.72	7.0	7.28	V
Detecting Voltage H (V <sub>in</sub> = L to H)	V <sub>SHin</sub>	–	7.35	–	V
Hysteresis Voltage (V <sub>in</sub> = H to L to H)	Δ V <sub>Sin</sub>	140	350	560	mV
V <sub>SLin</sub> Temperature Coefficient (T <sub>J</sub> = –30°C to +85°C)	V <sub>SLin</sub> T <sub>C</sub>	–	100	–	ppm/°C
Low-Level Output Voltage (V <sub>in</sub> = 6.0 V, V <sub>t1</sub> = 5.0 V, R <sub>t1</sub> = 10 kΩ) (Note 5)	V <sub>OLin1</sub>	–	100	200	mV
Threshold Operating Voltage (V <sub>OPLin</sub> = V <sub>t1</sub> = 1.0 V)	V <sub>OLin2</sub>	–	–	0.4	V

### V<sub>out</sub> Detect

Detecting Voltage L (V <sub>in</sub> = H to L)	V <sub>SLout</sub>	2.78	2.9	3.020	V
Detecting Voltage H (V <sub>in</sub> = L to H)	V <sub>SHout</sub>	–	2.95	–	V
Hysteresis Voltage (V <sub>in</sub> = H to L to H)	Δ V <sub>Sout</sub>	25	50	100	mV
V <sub>SLin</sub> Temperature Coefficient (T <sub>J</sub> = –30°C to +85°C)	V <sub>SLin</sub> T <sub>C</sub>	–	100	–	ppm/°C
Low-Level Output Voltage (V <sub>out1</sub> = 2.6 V)	V <sub>OLout1</sub>	–	100	200	mV
Threshold Operating Voltage (V <sub>OPLout</sub> = 0.85 V)	V <sub>OLout2</sub>	–	–	0.4	V
Reset Delay Time (C <sub>D</sub> = 10 nF)	t <sub>PLH</sub>	5	10	15	ms
“L” Transmission Delay Time (C <sub>D</sub> = 10 nF)	t <sub>PHL</sub>	–	30	90	μs

2. This device series contains ESD protection and exceeds the following tests:

Human Body Model 2000 V per MIL-STD-883, Method 3015  
Machine Model Method 200 V.

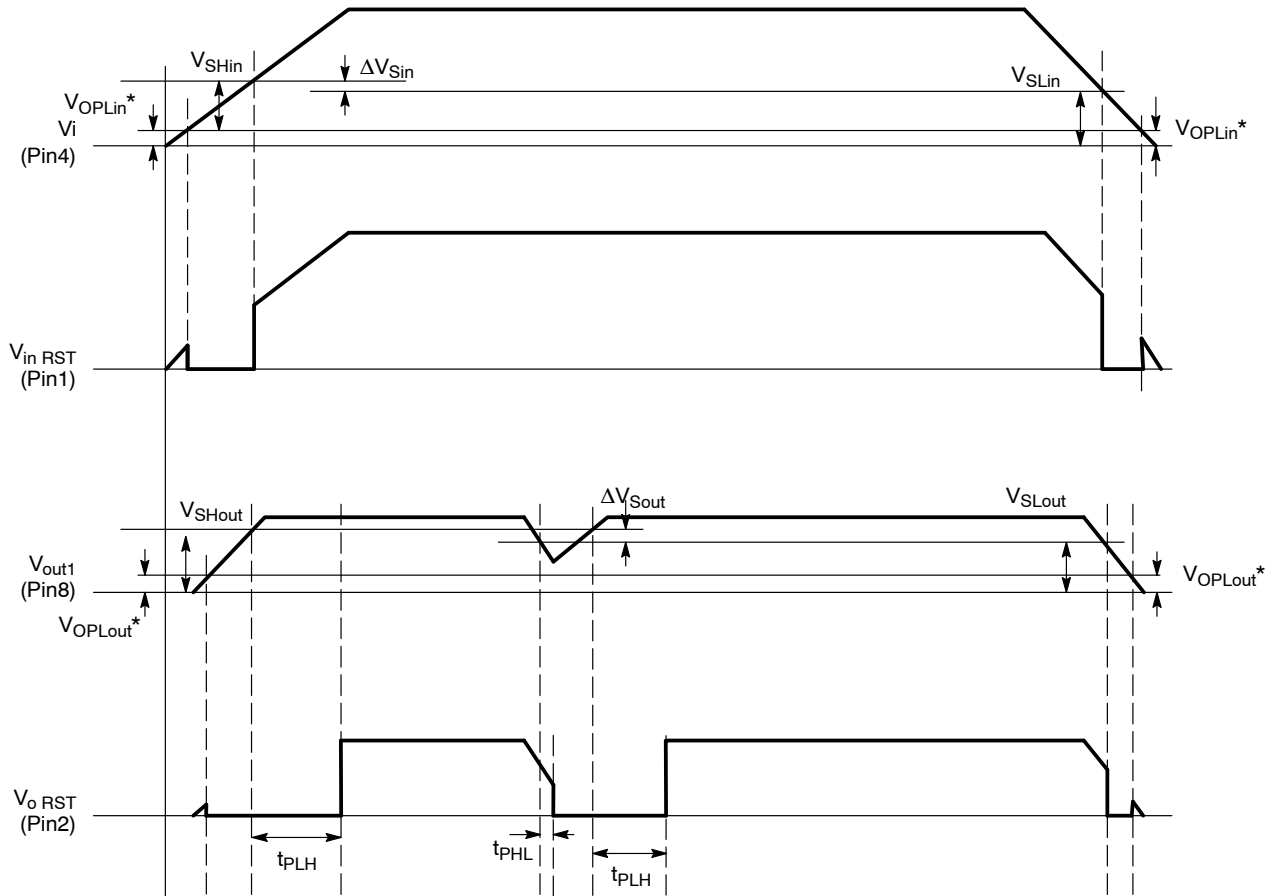
3. The maximum package power dissipation is:  $P_D = \frac{T_J(\max) - T_A}{R_{\theta JA}}$

4. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.

5. Refer to Figure 3.

6. Guaranteed by design.

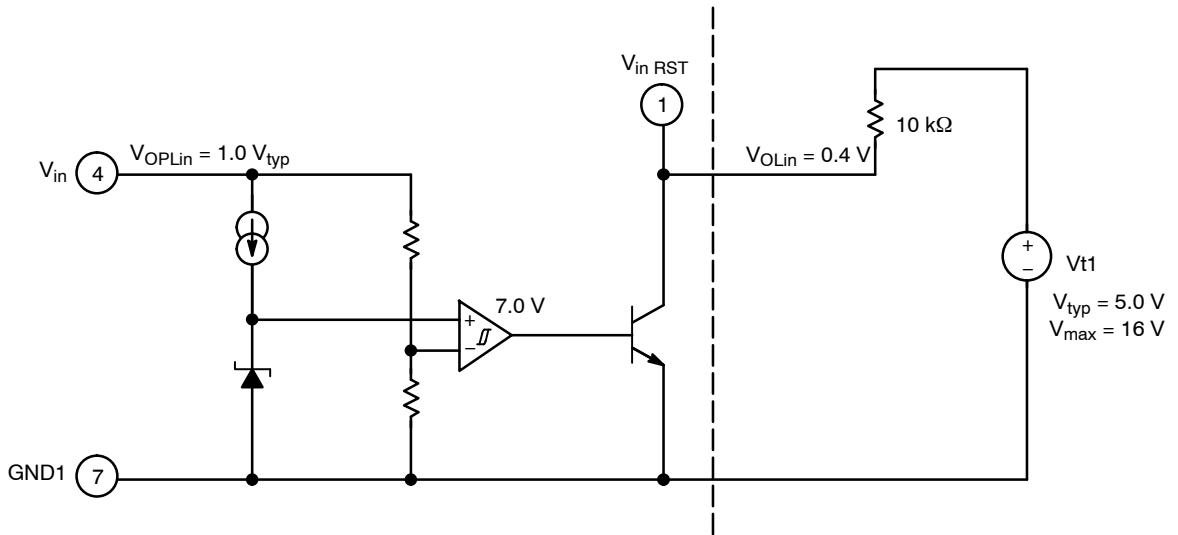
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\*;  $V_{OPLin}$  shows theoretical on this chart.  
 $V_{OPLin}$  spec. must be specified on Pin 1 voltage (0.4 V)

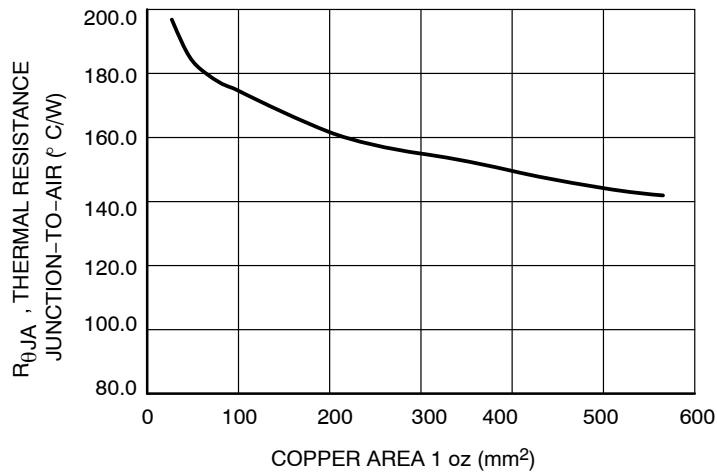
\*;  $V_{OPLout}$  shows theoretical on this chart.  
 $V_{OPLout}$  spec. must be specified on Pin 2 voltage (0.4 V)

**Figure 2. Dual Regulator Timing**

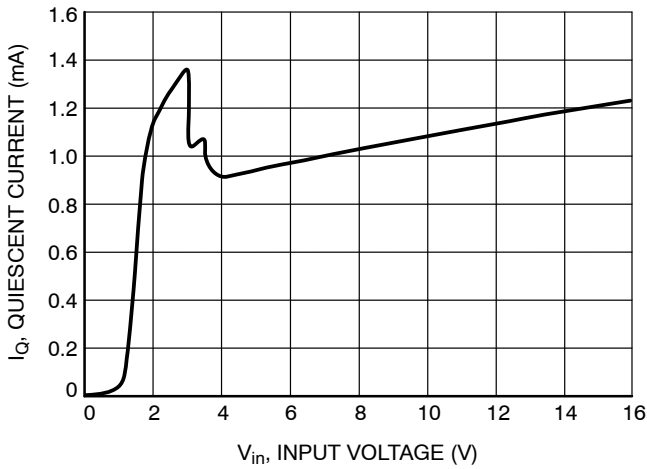


**Figure 3. Threshold Operating Voltage  $V_{OPLin}$  Under Condition  $V_{OLin} = 0.4 V$**

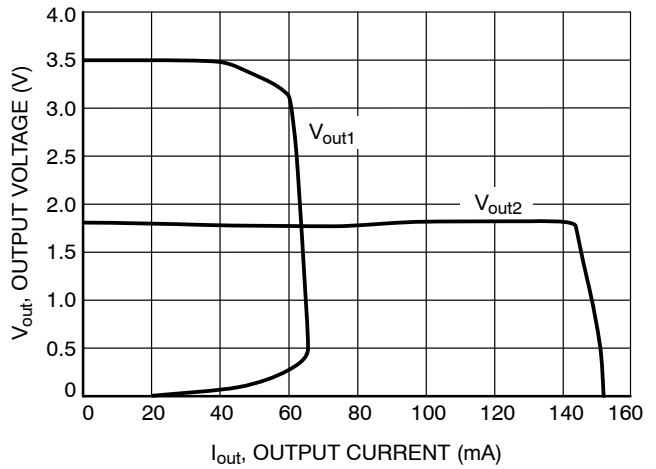
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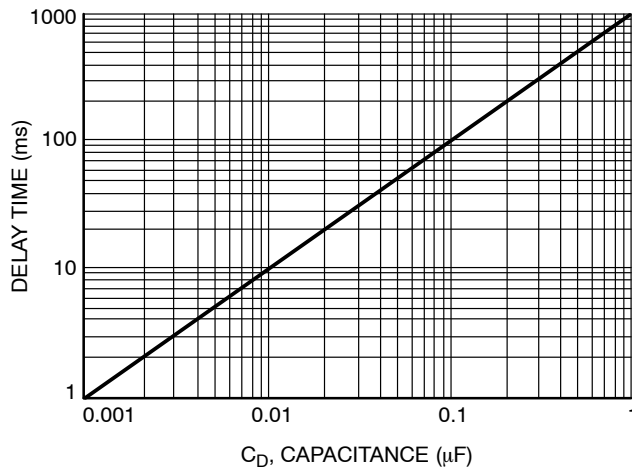
**Figure 4. SOP-8 Thermal Resistance versus P.C.B. Copper Area**



**Figure 5. Quiescent Current versus Input Voltage**



**Figure 6. Peak Current Limit**



**Figure 7. Delay Time versus Capacitance**

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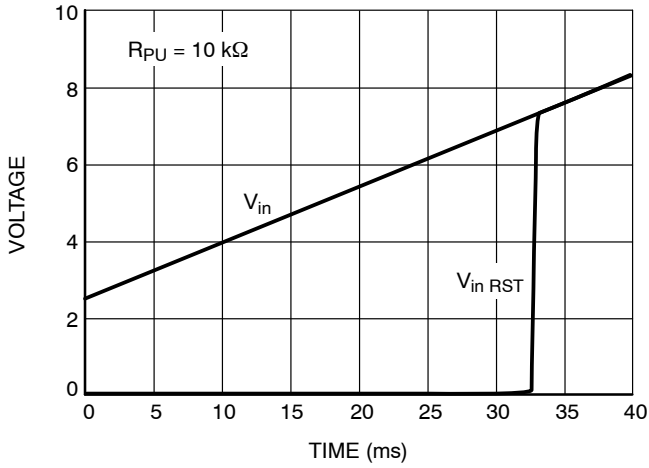


Figure 8.  $V_{in}$  and  $V_{in\ RST}$  versus Time

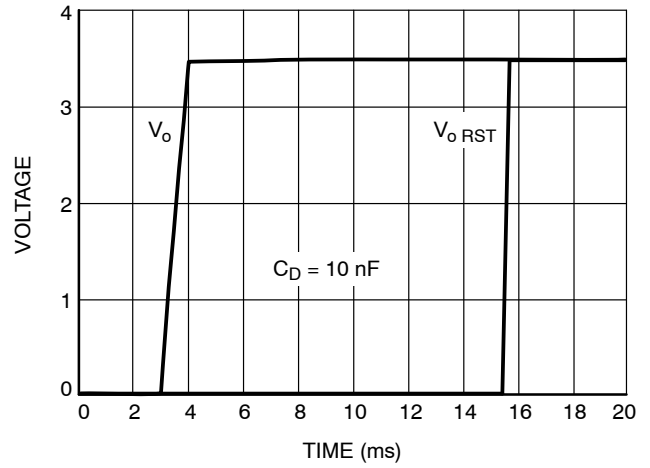


Figure 9.  $V_o$  and  $V_o\ RST$  versus Time

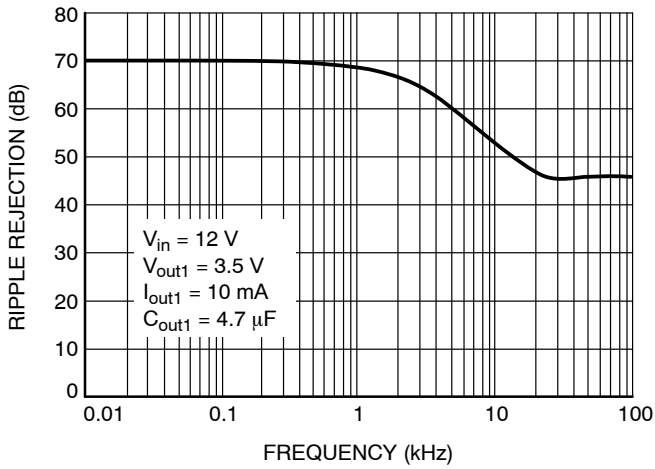


Figure 10.  $V_{out1}$  Ripple Rejection

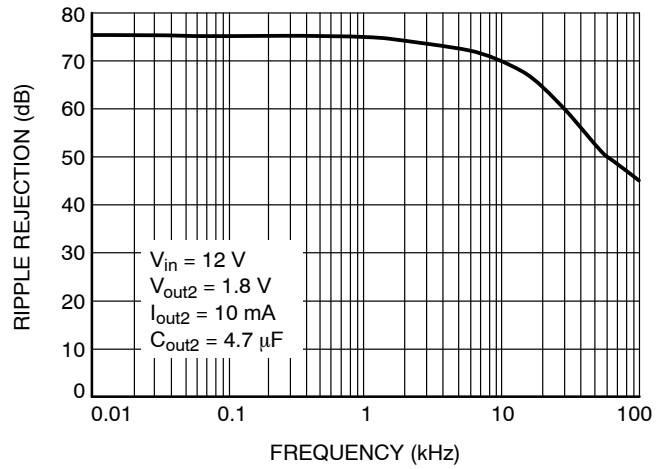
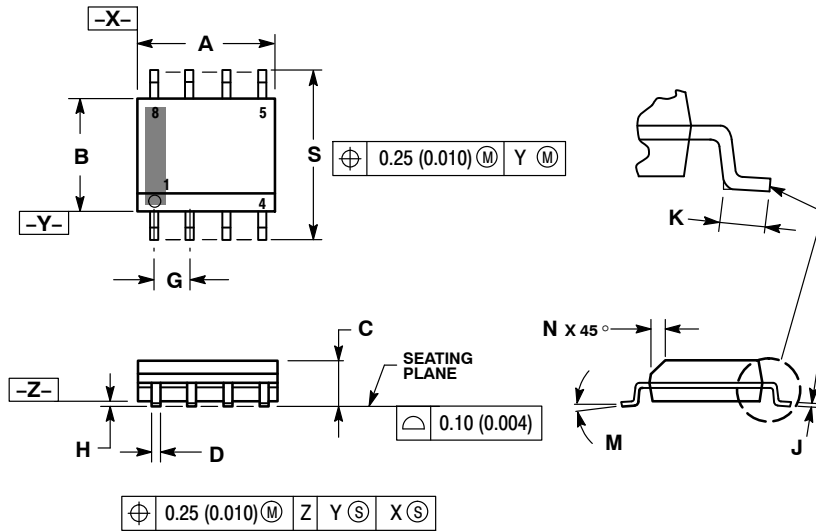


Figure 11.  $V_{out2}$  Ripple Rejection

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## PACKAGE DIMENSIONS

SOIC-8  
NB SUFFIX  
CASE 751-07  
ISSUE AH

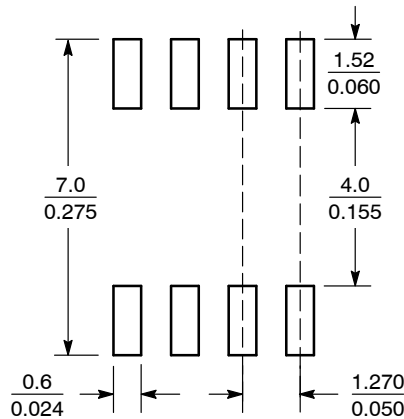


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

### SOLDERING FOOTPRINT\*



SCALE 6:1 (mm/inches)

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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