

### FEATURES

±1.2% Accuracy Over Line and Load Regulations  
@ 25°C

Ultralow Dropout Voltage: 80 mV Typical @ 50 mA  
Requires Only  $C_O = 0.47 \mu\text{F}$  for Stability  
anyCAP = Stable with All Types of Capacitors  
(Including MLCC)

Current and Thermal Limiting

Low Noise

Low Shutdown Current: 1  $\mu\text{A}$

2.8 V to 12 V Supply Range  
-20°C to +85°C Ambient Temperature Range

Several Fixed Voltage Options

Ultrasmall SOT-23-5 Package

Excellent Line and Load Regulations

### APPLICATIONS

Cellular Telephones

Notebook, Palmtop Computers

Battery Powered Systems

PCMCIA Regulator

Bar Code Scanners

Camcorders, Cameras

### GENERAL DESCRIPTION

The ADP3308 is a member of the ADP330x family of precision low dropout anyCAP voltage regulators. It is pin-for-pin and functionally compatible with National's LP2980, but offers performance advantages. The ADP3308 stands out from the conventional LDOs with a novel architecture and an enhanced process. Its patented design requires only a 0.47  $\mu\text{F}$  output capacitor for stability. This device is stable with any type of capacitor regardless of its ESR (Equivalent Serial Resistance) value, including ceramic types for space restricted applications. The ADP3308 achieves ±1.2% accuracy at room temperature and ±2.2% overall accuracy over temperature, line and load regulations. The dropout voltage of the ADP3308 is only 80 mV (typical) at 50 mA. This device also includes a current limit and a shutdown feature. In shutdown mode, the ground current is reduced to ~1  $\mu\text{A}$ .

The ADP3308 operates with a wide input voltage range from 2.8 V to 12 V and delivers a load current in excess of 100 mA. The ADP3308 anyCAP LDO offers a wide range of output voltages. For 100 mA version, refer to the ADP3309 data sheet.

### FUNCTIONAL BLOCK DIAGRAM

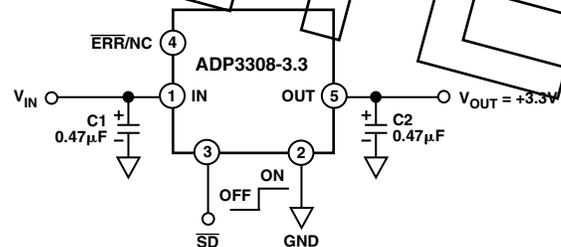
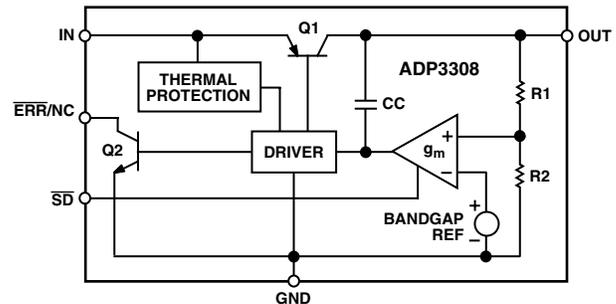


Figure 1. Typical Application Circuit

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### REV. B

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# ADP3308-xx—SPECIFICATIONS (@ $T_A = -20^\circ\text{C}$ to $+85^\circ\text{C}$ , $V_{IN} = 7\text{ V}$ , $C_{IN} = 0.47\ \mu\text{F}$ , $C_{OUT} = 0.47\ \mu\text{F}$ , unless otherwise noted.)<sup>1</sup> The following specifications apply to all voltage options.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
OUTPUT VOLTAGE ACCURACY	$V_{OUT}$	$V_{IN} = V_{OUTNOM} + 0.3\text{ V}$ to $12\text{ V}$ $I_L = 0.1\text{ mA}$ to $50\text{ mA}$ $T_A = 25^\circ\text{C}$ $V_{IN} = V_{OUTNOM} + 0.3\text{ V}$ to $12\text{ V}$ $I_L = 0.1\text{ mA}$ to $50\text{ mA}$	-1.2 -2.2		+1.2 +2.2	%
LINE REGULATION	$\frac{\Delta V_O}{\Delta V_{IN}}$	$V_{IN} = V_{OUTNOM} + 0.3\text{ V}$ to $12\text{ V}$ $T_A = 25^\circ\text{C}$		0.02		mV/V
LOAD REGULATION	$\frac{\Delta V_O}{\Delta I_L}$	$I_L = 0.1\text{ mA}$ to $50\text{ mA}$ $T_A = 25^\circ\text{C}$		0.06		mV/mA
GROUND CURRENT	$I_{GND}$	$I_L = 50\text{ mA}$ $I_L = 0.1\text{ mA}$		0.54 0.19	1.4 0.3	mA mA
GROUND CURRENT IN DROPOUT	$I_{GND}$	$V_{IN} = 2.4\text{ V}$ $I_L = 0.1\text{ mA}$		0.9	1.7	mA
DROPOUT VOLTAGE	$V_{DROP}$	$V_{OUT} = 98\%$ of $V_{OUTNOM}$ $I_L = 50\text{ mA}$ $I_L = 10\text{ mA}$ $I_L = 1\text{ mA}$		0.08 0.025 0.004	0.17 0.07 0.030	V V V
SHUTDOWN THRESHOLD	$V_{THSD}$	ON OFF	2.0	0.75 0.75		V V
SHUTDOWN PIN INPUT CURRENT	$I_{SDDN}$	$0 < V_{SD} \leq 5\text{ V}$ $5 < V_{SD} \leq 12\text{ V}$ @ $V_{IN} = 12\text{ V}$			1 9	$\mu\text{A}$ $\mu\text{A}$
GROUND CURRENT IN SHUTDOWN MODE	$I_Q$	$V_{SD} = 0\text{ V}$ , $V_{IN} = 12\text{ V}$ $T_A = 25^\circ\text{C}$ $V_{SD} = 0\text{ V}$ , $V_{IN} = 12\text{ V}$ $T_A = 85^\circ\text{C}$		0.005 0.01	1 3	$\mu\text{A}$ $\mu\text{A}$
OUTPUT CURRENT IN SHUTDOWN MODE	$I_{OSD}$	$T_A = 25^\circ\text{C}$ @ $V_{IN} = 12\text{ V}$ $T_A = 85^\circ\text{C}$ @ $V_{IN} = 12\text{ V}$			2 4	$\mu\text{A}$ $\mu\text{A}$
ERROR PIN OUTPUT LEAKAGE	$I_{EL}$				13	$\mu\text{A}$
ERROR PIN OUTPUT “LOW” VOLTAGE	$V_{EOL}$	$I_{SINK} = 400\ \mu\text{A}$		0.12	0.3	V
PEAK LOAD CURRENT	$I_{LDPK}$	$V_{IN} = V_{OUTNOM} + 1\text{ V}$ , $T_A = 25^\circ\text{C}$		150		mA
OUTPUT NOISE @ 5 V OUTPUT	$V_{NOISE}$	$f = 10\text{ Hz}$ – $100\text{ kHz}$		100		$\mu\text{V rms}$

## NOTES

<sup>1</sup>Ambient temperature of  $85^\circ\text{C}$  corresponds to a junction temperature of  $125^\circ\text{C}$  under typical full load test conditions.

Specifications subject to change without notice.

## ABSOLUTE MAXIMUM RATINGS\*

Input Supply Voltage	−0.3 V to +16 V
Shutdown Input Voltage	−0.3 V to +16 V
Power Dissipation	Internally Limited
Operating Ambient Temperature Range	−55°C to +125°C
Operating Junction Temperature Range	−55°C to +125°C
$\theta_{JA}$	165°C/W
$\theta_{JC}$	92°C/W
Storage Temperature Range	−65°C to +150°C
Lead Temperature Range (Soldering 10 sec)	300°C
Vapor Phase (60 sec)	215°C
Infrared (15 sec)	220°C

\*This is a stress rating only; operation beyond these limits can cause the device to be permanently damaged.

## ORDERING GUIDE

Model	Voltage Output	Package Option*	Marking Code
ADP3308ART-2.5	2.5 V	SOT-23	LAC
ADP3308ART-2.7	2.7 V	SOT-23	DAC
ADP3308ART-2.85	2.85 V	SOT-23	DJC
ADP3308ART-2.9	2.9 V	SOT-23	DKC
ADP3308ART-3	3.0 V	SOT-23	DCC
ADP3308ART-3.3	3.3 V	SOT-23	DEC
ADP3308ART-3.6	3.6 V	SOT-23	DFC

\*SOT = Surface Mount.

Contact the factory for the availability of other output voltage options.

## Other Member of anyCAP Family<sup>1</sup>

Model	Output Current	Package Option <sup>2</sup>
ADP3309	100 mA	SOT-23-5 Lead

## NOTES

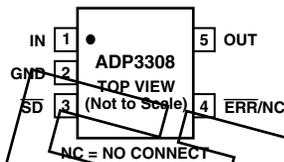
<sup>1</sup>See individual data sheet for detailed ordering information.

<sup>2</sup>SOT = Surface Mount.

## PIN FUNCTION DESCRIPTIONS

Pin	Name	Function
1	IN	Regulator Input.
2	GND	Ground Pin.
3	$\overline{SD}$	Active Low Shutdown Pin. Connect to ground to disable the regulator output. When shutdown is not used, this pin should be connected to the input pin.
4	$\overline{ERR/NC}$	Open Collector. Output that goes low to indicate the output is about to go out of regulation or no connect.
5	OUT	Output of the Regulator, fixed 2.5, 2.7, 2.85, 2.9, 3.0, 3.3, or 3.6 volts output voltage. Bypass to ground with a 0.47 $\mu$ F or larger capacitor.

## PIN CONFIGURATION

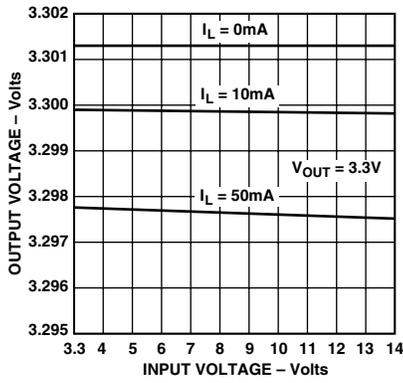


## CAUTION

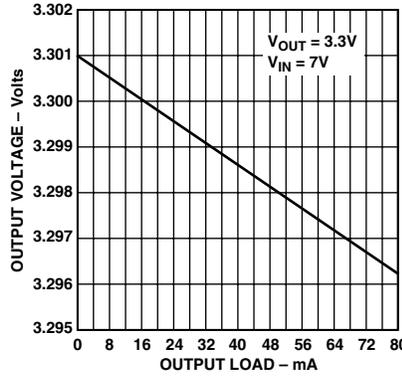
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the ADP3308 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



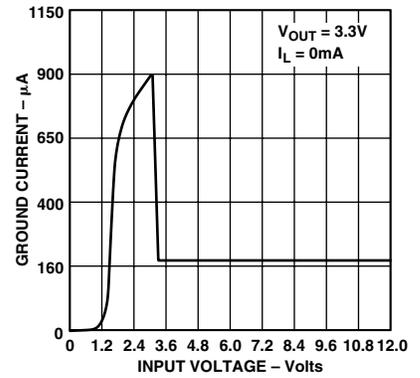
# ADP3308—Typical Performance Characteristics



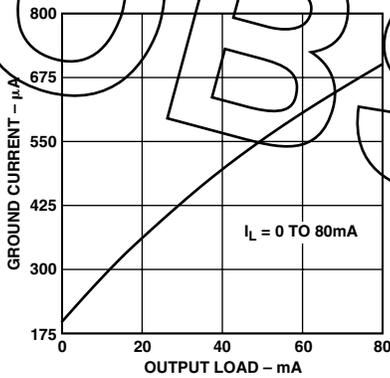
TPC 1. Line Regulation: Output Voltage vs. Supply Voltage



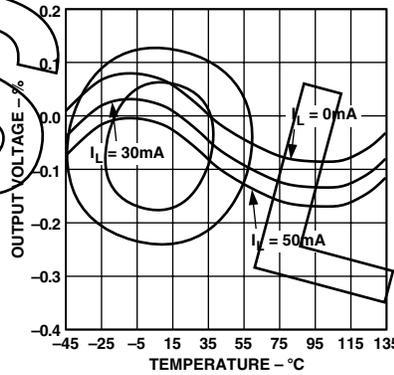
TPC 2. Output Voltage vs. Load Current



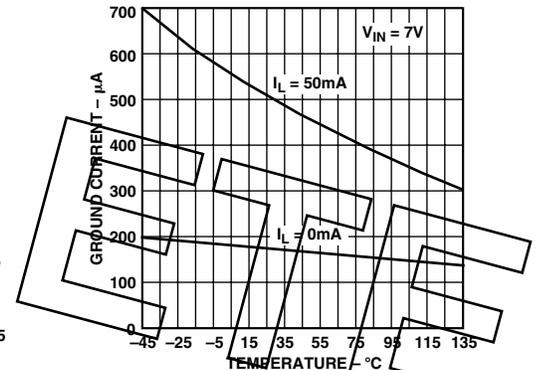
TPC 3. Quiescent Current vs. Supply Voltage



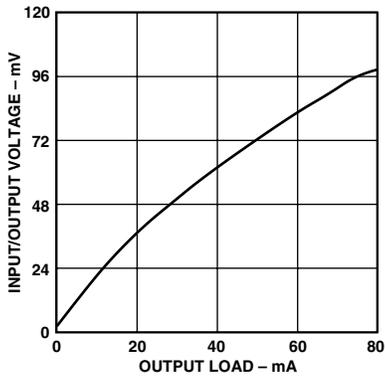
TPC 4. Quiescent Current vs. Load Current



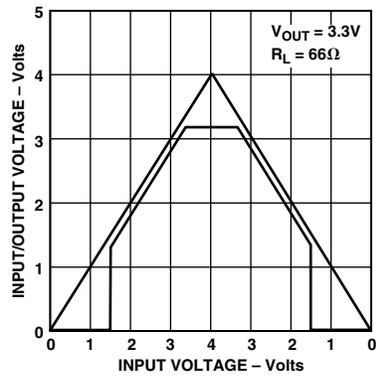
TPC 5. Output Voltage Variation % vs. Temperature



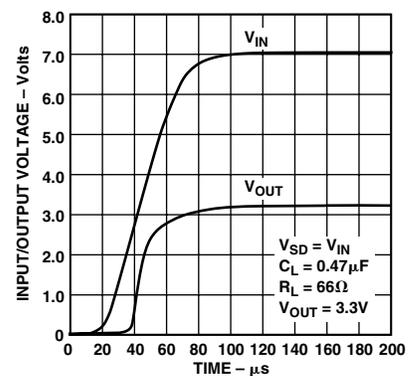
TPC 6. Quiescent Current vs. Temperature



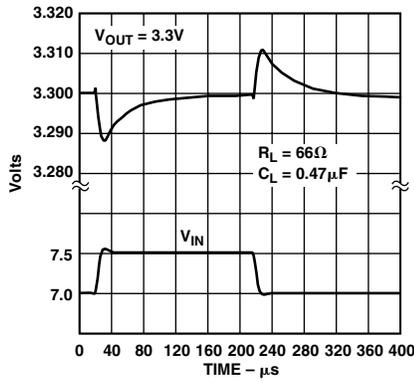
TPC 7. Dropout Voltage vs. Output Current



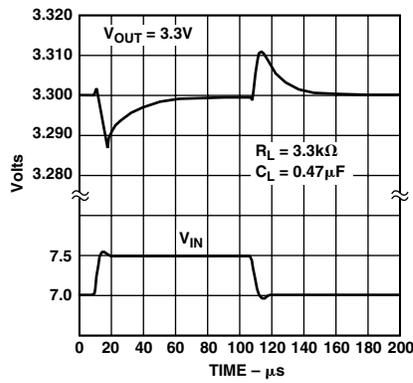
TPC 8. Power-Up/Power-Down



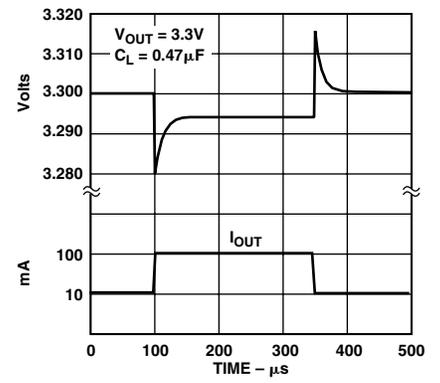
TPC 9. Power-Up Overshoot



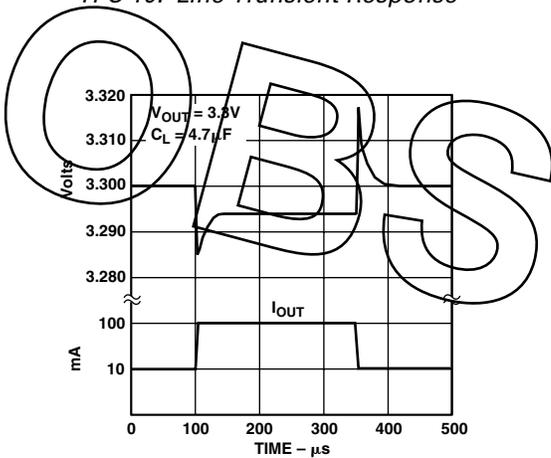
TPC 10. Line Transient Response



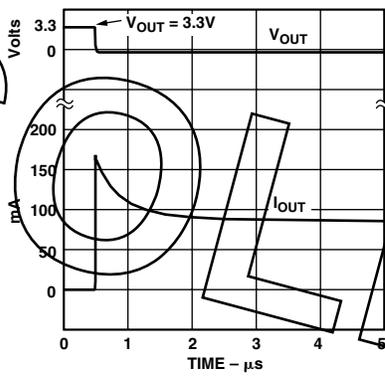
TPC 11. Line Transient Response



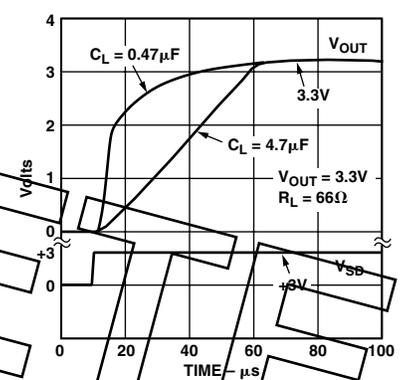
TPC 12. Load Transient



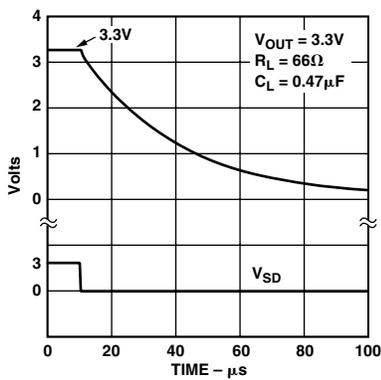
TPC 13. Load Transient



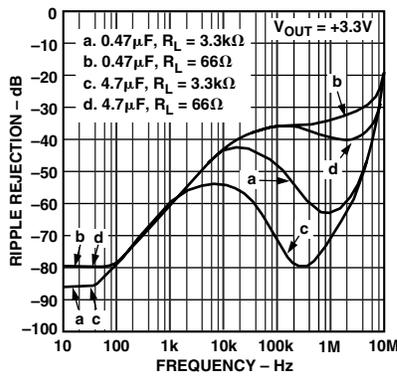
TPC 14. Short Circuit Current



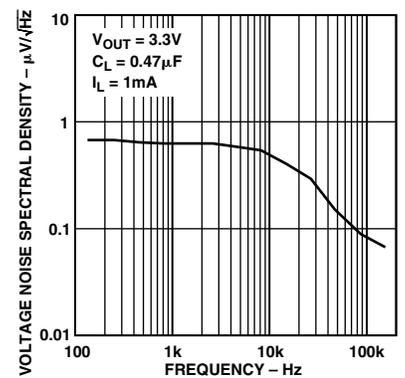
TPC 15. Turn On



TPC 16. Turn Off



TPC 17. Power Supply Ripple Rejection



TPC 18. Output Noise Density



The following general guidelines will be helpful when designing a board layout:

1. PC board traces with larger cross section areas will remove more heat. For optimum results, use PC boards with thicker copper and or wider traces.
2. Increase the surface area exposed to open air so heat can be removed by convection or forced air flow.
3. Do not use solder mask or silk screen on the heat dissipating traces because it will increase the junction to ambient thermal resistance of the package.

### Shutdown Mode

Applying a TTL high signal to the shutdown pin or tying it to the input pin will turn the output ON. Pulling the shutdown pin down to a TTL low signal or tying it to ground will turn the output OFF. In shutdown mode, quiescent current is reduced to less than 1  $\mu$ A.

### APPLICATION CIRCUITS

#### Crossover Switch

The circuit in Figure 3 shows that two ADP3308s can be used to form a mixed supply voltage system. The output switches between two different levels selected by an external digital input. Output voltages can be any combination of voltages from the Ordering Guide of the data sheet.

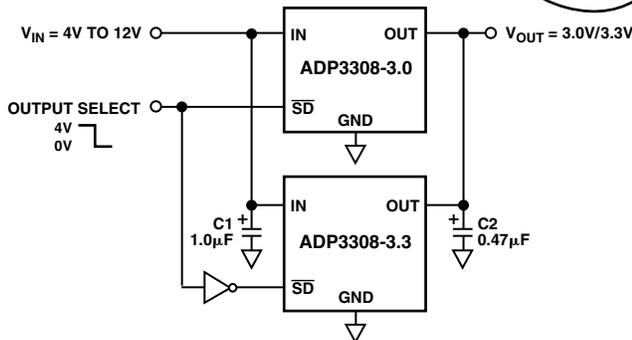


Figure 3. Crossover Switch

### Higher Output Current

The ADP3308 can source up to 50 mA without any heatsink or pass transistor. If higher current is needed, an appropriate pass transistor can be used, as in Figure 4, to increase the output current to 1 A.

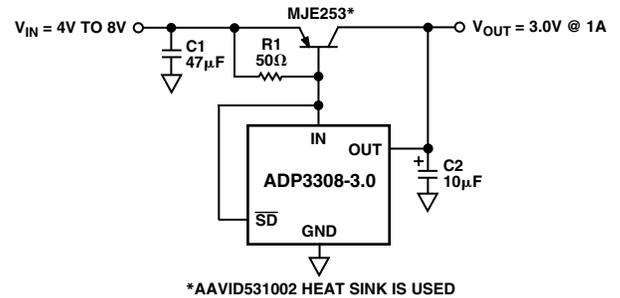


Figure 4. Higher Output Current Linear Regulator

### Constant Dropout Post Regulator

The circuit in Figure 5 provides high precision with low dropout for any regulated output voltage. It significantly reduces the ripple from a switching regulator while providing a constant dropout voltage, which limits the power dissipation of the LDO to 30 mW. The ADP3000 used in this circuit is a switching regulator in the step-up configuration.

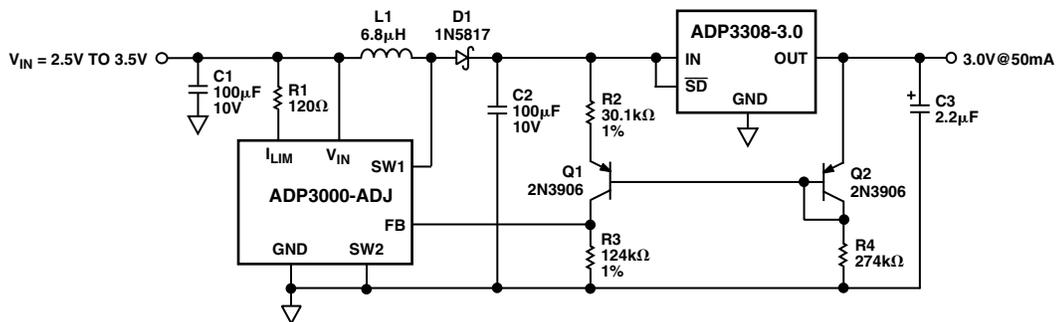
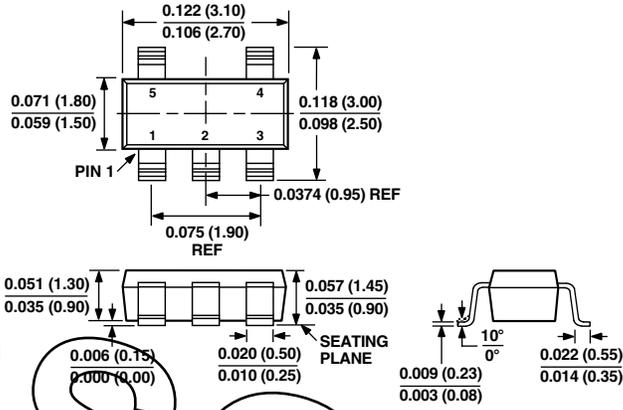


Figure 5. Constant Dropout Post Regulator

**OUTLINE DIMENSIONS**

Dimensions shown in inches and (mm).

**5-Lead Surface Mount Package  
(SOT-23)**



OBSOLETE