

## FEATURES

- 3-Terminal regulators (TO-92)
- 100mA output within 2% over temperature
- Very low quiescent current
- Extremely tight load and line regulation
- Very low temperature coefficient
- Current and thermal limiting
- Unregulated DC input can withstand -20V reverse battery and +60V positive transients
- Moisture Sensitivity Level 3

## APPLICATION

- High-efficiency linear regulator
- Battery powered systems
- Portable consumer equipment
- Portable / Palm, Desktop / Notebook computers
- Portable Instrumentation
- Automotive Electronics
- SMPS Post-Regulator

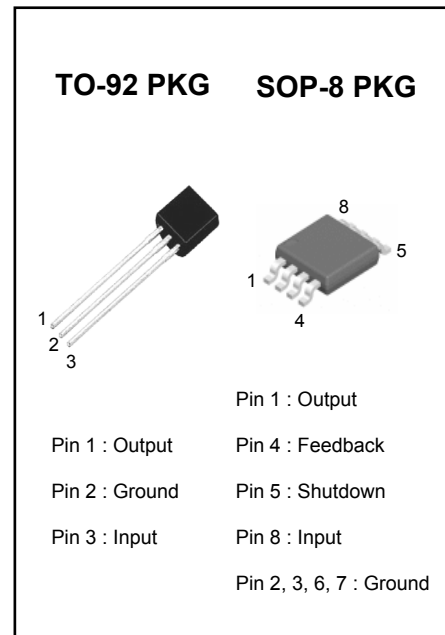
## PRODUCT DESCRIPTION

This series of fixed-voltage and adjustable monolithic micropower voltage regulators is designed for a wide range of applications. This device excellent choice for use in battery-powered application.

Futhermore, the quiescent current increases only slightly at dropout, which prolongs battery life.

This series of fixed-voltage and adjustable voltage regulators features very low quiescent current (100uA Typ.) and very low drop output voltage (Typ. 60mV at light load 300mV at 100mA). This Include a tight initial tolerance of 0.5% typ, extremely food load and line regulation of 0.05% Typ., and very low output temperature coefficient.

This series of fixed-voltage and adjustable regulators is offered in 3-Pin TO-92 package for LM2930 and 8-Pin SOP-8 package for LM2931 compatible with other fixed-voltage regulators.

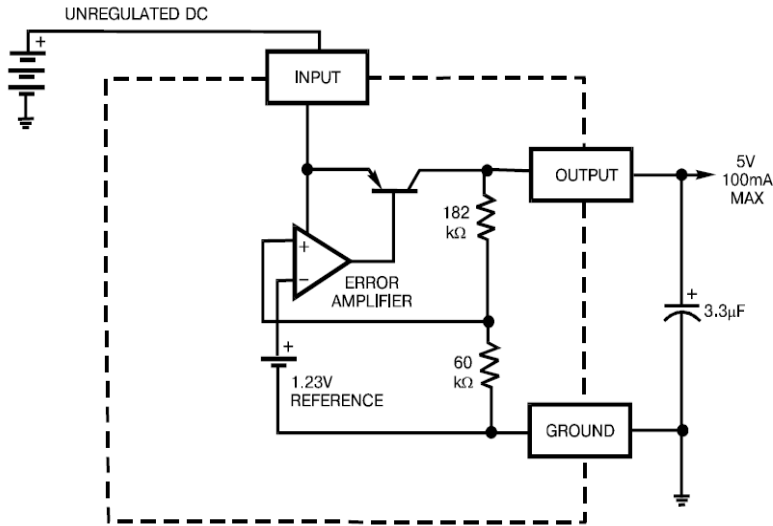


## ORDERING INFORMATION

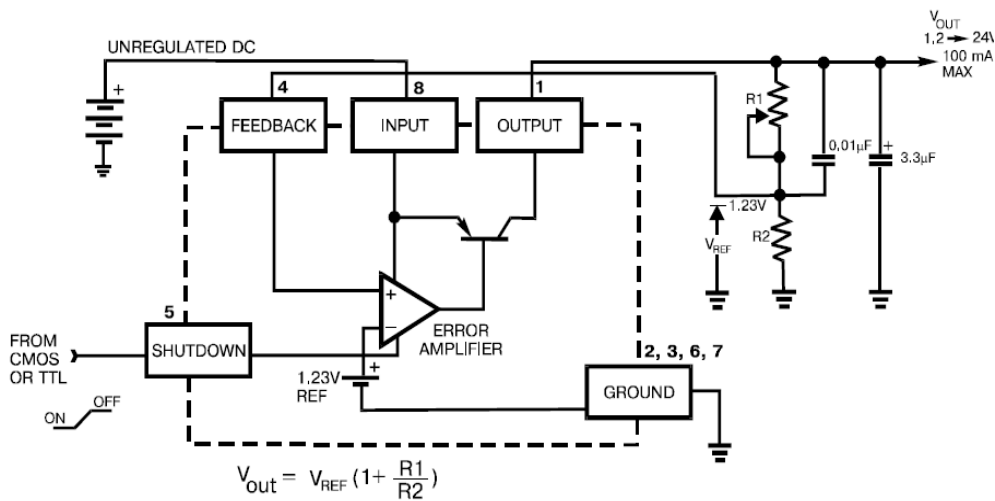
DEVICE	PKG
LM2930TA-XX	TO-92
LM2931D-XX	SOP-8

( XX = Output Voltage = 5.0V, 8.0V, ADJ )

**BLOCK DIAGRAM AND TYPICAL APPLICATIONS (Fixed)**



**BLOCK DIAGRAM AND TYPICAL APPLICATIONS (Adjustable)**



**ABSOLUTE MAXIMUM RATINGS**

POWER DISSIPATION	INTERNALLY LIMITED
Lead Temperature (Soldering, 5 seconds)	260 °C
Storage Temperature Range	-65 °C to +150 °C
Operating Junction Temperature Range	-55 °C to +150 °C
Input Supply Voltage	-20V to +35V

## ELECTRICAL CHARACTERISTICS (at $T_A=25^\circ\text{C}$ , $V_{IN}=15\text{V}$ , unless otherwise specified)

PARAMETER	CONDITIONS (Note 2)	MIN	TYP	MAX	UNITS
Output Voltage	$-25^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$	0.985   $V_O$	$V_O$	1.015   $V_O$	V
	Full Operating Temperature	0.980   $V_O$		1.020   $V_O$	
Output Voltage	$100\mu\text{A} \leq I_L \leq 100\text{mA}, T_J \leq T_{J\text{MAX}}$	0.975   $V_O$	$V_O$	1.025   $V_O$	
Input Supply Voltage				26	
Output Voltage Temperature Coefficient	(Note 1)		50	150	ppm/ $^\circ\text{C}$
Line Regulation (Note 2)	$13\text{V} \leq V_{IN} \leq 26\text{V}$ (Note 3)		0.1	0.4	%
Load Regulation (Note 2)	$1\text{mA} \leq I_L \leq 100\text{mA}$		0.1	0.6	%
Dropout Voltage (Note 4)	$I_L=10\text{mA}$		60	250	mV
	$I_L=100\text{mA}$		300	600	
Ground Current (Note 5)	$I_L=100\mu\text{A}$		100	150	$\mu\text{A}$
	$I_L=10\text{mA}$		0.9	1.5	mA
	$I_L=100\text{mA}$		8	12	mA
Dropout Ground Current (Note 5)	$V_{IN}=V_O-0.5\text{V}, I_L=100\mu\text{A}$		110	170	$\mu\text{A}$
Current Limit	$V_O=0$		160	200	mA
Thermal Regulation (Note 6)			0.05	0.3	%/W
Output Noise, 10Hz to 100kHz $I_L=10\text{mA}$	$C_L=2.2\mu\text{F}$		500		$\mu\text{V}_{\text{rms}}$
	$C_L=3.3\mu\text{F}$		350		
	$C_L=33\mu\text{F}$		120		
Ripple Rejection Ratio	$I_O=10\text{mA}, f=120\text{Hz}, C_O=100\mu\text{F}$ $V_{in} = V_O + 3\text{V} + 2\text{V}_{\text{pp}}$	60			dB
<b>SOP-8 PKG only</b>					
Reference Voltage		1.21	1.235	1.26	V
Reference Voltage	Over Temperature (Note 7)	1.185		1.285	
Feedback Pin Bias Current			20	40	nA
Reference Voltage Temperature Coefficient	(Note 1)		50		ppm/ $^\circ\text{C}$
Feedback Voltage Temperature Coefficient			0.1		nA/ $^\circ\text{C}$
<b>Shutdown Input</b>					
Input Logic Voltage	Low (Regulator ON)		1.3	0.7	V
	High (Regulator OFF)	2			
Shutdown Pin Input Current	$V_S=2.4\text{V}$		30	50	$\mu\text{A}$
	$V_S=26\text{V}$		450	600	
Regulator Output Current Shutdown	(Note 8)				
	$5.0\text{V} \leq V_O < 15.0\text{V}$			10	
	$3.3\text{V} \leq V_O < 5.0\text{V}$			20	
	$2.0\text{V} \leq V_O < 3.3\text{V}$			30	

Note 1 : Output or reference voltage temperature coefficients defined as the worst case voltage change divided by the total temperature range.

Note 2 : Regulation is measured at constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.

Note 3 : Line regulation is tested at 150 °C for  $I_L=1\text{mA}$ . For  $I_L=100\mu\text{A}$  and  $T_J=125^\circ\text{C}$ , line regulation is guaranteed by design to 0.2%.

Note 4 : Dropout voltage is defined as the input to output differential at which the output voltage drops 2% below its nominal value measured at 1V differential.

Note 5 : Ground pin current is the regulator quiescent current. The total current drawn from the source is the sum of the ground pin current and output load current.

Note 6 : Thermal regulation is the change in output voltage at a time T after a change in power dissipation, excluding load or line regulation effects. Specifications are for a 50mA load pulse (1.25W) for T=10ms.

Note 7 :  $V_{REF} \leq V_O \leq (V_{IN}-1V)$ ,  $2.3V \leq V_{IN} \leq 30V$ ,  $100\mu\text{A} \leq I_L \leq 100\text{mA}$ ,  $T_J \leq T_{JMAX}$

Note 8 :  $V_{SHUTDOWN} \geq 2V$ ,  $V_{IN} \leq 26V$ ,  $V_O=0$ , Feed-back pin tied to -XX V Tap.