

FEATURES

- High accuracy output voltage
- Guaranteed 100mA output current
- Very low quiescent current
- Low dropout voltage
- Extremely tight load and line regulation
- Very low temperature coefficient
- Needs only 1uF for stability
- Error Flag warns of output dropout
- Logic-Controlled electronic shutdown
- Output programmable from 1.24 to 29V

APPLICATIONS

- Battery powered systems
- Cordless telephones
- Radio control systems
- Portable/Palm top/Notebook computers
- Portable consumer equipment
- Portable Instrumentation
- Avionics
- Automotive Electronics
- SMPS Post-Regulator
- Voltage Reference

PRODUCT DESCRIPTION

The LP2950-XX/LP2951-XX are micropower voltage regulators with very low quiescent current (75uA typ.) and very low dropout voltage (typ. 40 mV at light loads and 380mV at 100mA). Careful design of the LP2950-XX/LP2951-XX has minimized all contributions to the error budget. This includes a tight initial tolerance (0.5% typ.), extremely good load and line regulation (0.05% typ.) and a very low output voltage temperature coefficient, making the part useful as a low-power voltage reference. The LP2950-XX/LP2951-XX are ideally suited for use in battery powered systems. Furthermore, the quiescent current of the LP2950-XX/LP2951-XX increases only slightly in dropout, prolonging battery life.

Another feature is an error flag output which warns of a low output voltage, often due to falling batteries on the input. It may be used for a power-on reset. A second feature is the logic-compatible shutdown input which enables the regulator to be switched on and off. Also the part may be pin strapped for a 5V, 3V, or 3.3V output (depending on version), or programmed from 1.24V to 29V with an external pair of resistors. The LP2950-XX is offered in 3-pin TO-92 package compatible with other fixed regulator.

Absolute Maximum Ratings

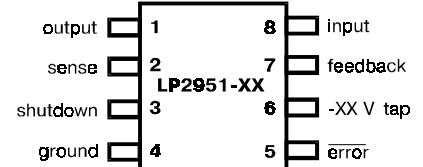
Power Dissipation	Internally Limited
Lead Temperature (Soldering, 5 seconds)	260°C
Storage Temperature Range	-65°C to +150°C
Operating Junction Temperature Range	-55°C to +150°C
Input Supply Voltage	-0.3 to +30V
Feedback Input Voltage	-1.5 to +30V
Shutdown Input Voltage	-0.3 to +30V
Error Comparator Output	-0.3 to +30V

Device Selection Guide

Vout, Volts	Device
2.85*	LP2950-2.85, LP2951-2.85
3.0	LP2950-3.0, LP2951-3.0
3.3	LP2950-3.3, LP2951-3.3
5.0	LP2950-5.0, LP2951-5.0

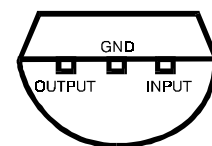
* - other versions are also available
 Vout = 2.0V to 5.0V. Please consult factory for more information

Pin Connection LP2951-XX

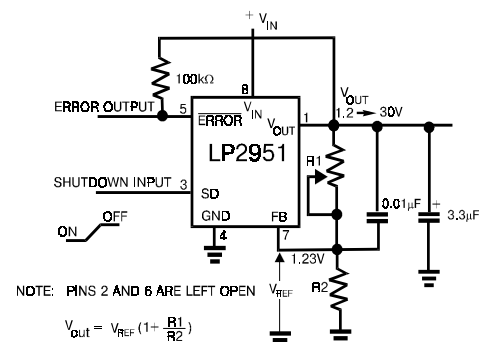


Top View

TO-92 Plastic Package (LP2950-XX only)



Bottom View



ELECTRICAL CHARACTERISTICS (at $T_a = 25^\circ\text{C}$, $V_{in}=15\text{V}$: unless otherwise noted)

Parameter	Conditions (Note 2)	Min	Typ	Max	Units
Output Voltage	$-25^\circ\text{C} \leq T < 85^\circ\text{C}$ Full Operating Temperature	0.985 IVol 0.98 IVol	V_o	1.015 IVol 1.02 IVol	V
	$100\mu\text{A} \leq I_L \leq 100\text{mA}$, $T_J \leq T_{JMAX}$	0.976 V _o	V_o	1.024 V _o	
Output Voltage Temperature Coefficient	(Note 1)		50	150	ppm/ $^\circ\text{C}$
Line Regulation (Note 3)	$V_o + 1\text{V} \leq V_{in} \leq 30\text{V}$ (Note 4)		0.04	0.4	%
Load Regulation (Note 3)	$100\mu\text{A} \leq I_L \leq 100\text{mA}$		0.1	0.3	%
Dropout Voltage (Note 5)	$I_L=100\mu\text{A}$		50	80	mV
	$I_L=100\text{mA}$		380	450	
Ground Current	$I_L=100\mu\text{A}$		75	120	μA mA
	$I_L=100\text{mA}$		8	12	
Dropout Ground Current	$V_{in}=V_o - 0.5\text{V}$, $I_L=100\mu\text{A}$		110	170	μA
Current Limit	$V_{out}=0$		160	200	mA
Thermal Regulation			0.05	0.2	%/ $^\circ\text{W}$
Output Noise, 10Hz to 100KHz	$C_L=1\mu\text{F}$ $C_L=200\mu\text{F}$ $C_L=3.3\mu\text{F}$ (Bypass=0.01 μF pins 7 to 1 (LP2951-XX))		430		$\mu\text{V rms}$
			160		
			100		
8-pin Versions only					
Reference Voltage		1.21	1.235	1.26	V
Reference Voltage	Over Temperature (Note 6)	1.185		1.285	
Feedback Pin Bias Current			20	40	nA
Reference Voltage Temperature Coefficient	(Note 7)		50		ppm/ $^\circ\text{C}$
Feedback Pin Bias Current Temperature Coefficient			0.1		nA/ $^\circ\text{C}$
Error Comparator					
Output Leakage Current	$V_{oh}=30\text{V}$		0.01	1.0	μA
Output Low Voltage	$V_{in}=4.5\text{V}$, $I_{OL}=400\mu\text{A}$		150	250	mV
Upper Threshold Voltage	(Note 8)	40	60		
Lower Threshold Voltage	(Note 8)		75	95	
Hysteresis	(Note 8)		15		
Shutdown Input					
Input Logic Voltage	Low (Regulator ON) High (Regulator OFF)	2	1.3	0.7	V
Shut down Pin Input Current	$V_S=2.4\text{V}$		30	50	μA
	$V_S=30\text{V}$		450	600	
Regulator Output Current in Shutdown	(Note 9)				
	$V_{OUT} = 5.0\text{V}$		3	10	
	$3.3\text{V} \leq V_{OUT} < 5.0\text{V}$			20	
	$2.0\text{V} \leq V_{OUT} < 3.3\text{V}$			30	

Note1: Absolute Maximum Ratings are limits beyond which damage to the device may occur. For guaranteed performance limits and associated test conditions, see the Electrical Characteristics tables.

Note 2: Unless otherwise specified all limits guaranteed for $T_J=25^\circ\text{C}$, $V_{in}=V_o + 1\text{V}$, $I_L=100\mu\text{A}$ and $C_L=1\mu\text{F}$ for 5V versions and 2.2 μF for 3V and 3.3V versions. Additional conditions for the 8-pin versions are FEEDBACK tied to V_{TAP} , OUTPUT tied to SENSE, and $V_{SHUTDOWN} < 0.8\text{V}$.

Note 3: 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 4: Line regulation for the LP2951-XX is tested at 150°C for $I_L=\text{mA}$. For $I_L=100\mu\text{A}$ and $T_J=125^\circ\text{C}$, line regulation is guaranteed by design to 0.2%.

Note 5: Dropout voltage is defined as the input to output differential at which the output voltage drops 100mV below its nominal value measured at 1V differential. At very low values of programmed output voltage, the minimum supply voltage of 2V (2.3V over temperature) must be taken into account.

Note 6: $V_{REF} \leq V_{OUT} \leq (V_{IN} - 1\text{V})$, $2.3\text{V} \leq V_{IN} \leq 30\text{V}$, $100\mu\text{A} \leq I_L \leq 100\text{mA}$, $T_J \leq T_{max}$.

Note 7: Output or reference voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.



LP2950-XX/LP2951-XX Series of Adjustable Micropower Voltage Regulators

Note 8: Comparator thresholds are expressed in terms of a voltage differential at the feedback terminal below the nominal reference voltage measured at $V_o + 1V$ input. To express these thresholds in terms of output voltage change, multiply by the error amplifier gain $= V_{out}/V_{ref} = (R1 + R2)/R2$. For example, at a programmed output voltage of 5V, the error output is guaranteed to go low when the output drops by $95mV \times 5V/1.235V = 384mV$. Thresholds remain constant as a percent of V_{out} as V_{out} is varied, with the dropout warning occurring at typically 5% below nominal, 7.5% guaranteed.

Note 9: $V_{shutdown} \geq 2V$, $V_{in} \leq 30V$, $V_{out}=0$, Feed-back pin tied to -XX V tap.