FEATURES

- High accuracy output voltage
- Guaranteed 100mA output
- Very low quiescent current
- Low dropout voltage
- Extremely tight load and line regulation
- Very low temperature coefficient
- Needs only 1µF 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 is a low power voltage regulator. This device excellent choice for use in battery powered application such as c ordless telephone, radio control systems, and portable computers.
The LP2950-XX/LP2951-XX features very low quiescent current (75µA Typ.) and very low drop output voltage (Typ. 40mV at light load and 380mV at 100mA). This includes a tight initial tolerance of 0.5% typ., extremely good load and line regulation of 0.05% typ., and very low output temperature coefficient, making the LP2950-XX/LP2951-XX useful as a low-power voltage reference.
The error flag output feature is used as power-on reset for warn of a low output voltage, due to following batteries on input. Other feature i s the logic-compatible shutdown input which enable the regulator to be switched on and off.
The LP2951-XX is available in 8-pin plastic packages. The regulator output voltage may be pin-strapped for a -XX volt or programmed from 1.24 volt to 29 volts with 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

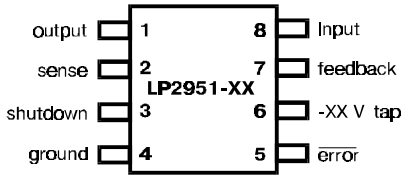
Device Selection Guide

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

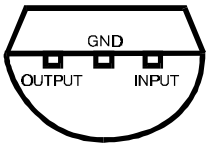
LP2951-XX



Top View

TO-92 Plastic Package

(LP2950-XX only)



Bottom View

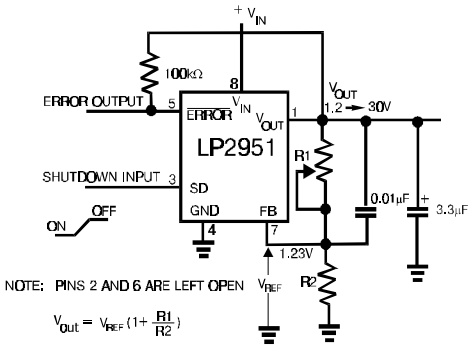


Figure 1. Adjustable Regulator

ELECTRICAL CHARACTERISTICS (at T_a = 25°C, V_{IN} = 15V, unless otherwise noted)

Parameter	Conditions (Note 2)	Min	Typ	Max	Units
Output Voltage	-25°C≤T_J≤85°C Full Operating Temperature	0.985 $\|V_0\|$ 0.98 $\|V_0\|$	V_0	1.015 $\|V_0\|$ 1.02 $\|V_0\|$	V
Output Voltage	100µA ≤ I_L ≤ 100mA, T_J≤T_{JMAX}	0.976$\|V_0\|$	V_0	1.024 $\|V_0\|$	
Output Voltage Temperature Coefficient	(Note 1)		50	150	ppm/°C
Line Regulation (Note 3)	V_0 + 1V ≤ V_{in} ≤ 30V (Note 4)		0.04	0.4	%
Load Regulation (Note 3)	100µA ≤ I_L ≤ 100mA		0.1	0.3	%
Dropout Voltage (Note 5)	I_L=100 µA I_L=100 mA		50 380	80 450	mV
Ground Current	I_L=100 µA I_L=100 mA		75 8	120 12	µA mA
Dropout Ground Current	V_{in}=V_0 - 0.5V, I_L=100 µA		110	170	µA
Current Limit	Vout=0		160	200	mA
Thermal Regulation			0.05	0.2	%/W
Output Noise, 10Hz to 100KHz	C_L=1µF C_L=200µF C_L=3.3µF (Bypass=0.01 µF pins 7 to 1 (LP2951-XX))		430 160 100		µV rms
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/°C
Feedback Pin Bias Current Temperature Coefficient			0.1		nA/°C
Error Comparator					
Output Leakage Current	Voh=30V		0.01	1.0	µA
Output Low Voltage	Vin=4.5V, I_{OL}=400 µA		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=2.4V V_S=30V		30 450	50 600	µA
Regulator Output Current in Shutdown	(Note 9)				
	V_{OUT} = 5.0 V		3	10	
	3.3V ≤ V_{OUT} < 5.0 V			20	
	2.0V ≤ V_{OUT} < 3.3 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: Unless otherwise specified all limits guaranteed for T_J = 25°C, Vin = V_0 + 1V, I_L = 100µA and C_L = 1µF. Additional conditions for the 8-pin versions are feedback tied to -XX V tap and output tied to output Sense (V_{out} = XX V) and $V_{shutdown}$ ≤ 0.8 V

Note 3: Regulations 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 LP2951-XX is tested at 150°C for I_L = 1mA. For I_L = 100µA and T_J = 125°C, line regulation is guaranteed by design to 0.2%. See typical performance characteristics for line regulation versus temperature and load current.

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 input supply voltage of 2V (2.3V over temperature) must be taken into account.

Note 6: Vref ≤ Vout ≤ (Vin - 1V), 2.3V ≤ Vin ≤ 30V, 100µA ≤ I_L ≤ 100mA, T_J ≤ T_{JMAX}

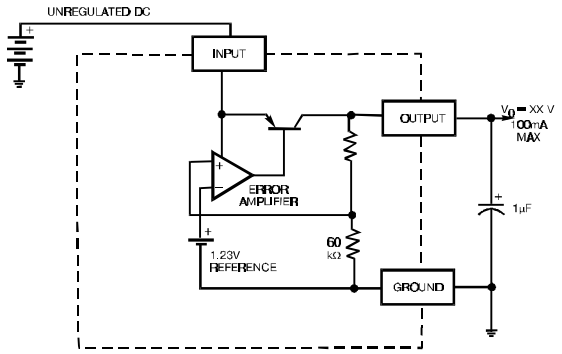
Note 7: Output or reference voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range

Note 8: Comparator thresholds are expressed in terms of a voltage differential at the feedback terminal below the nominal reference voltage measured at V_0 + 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 x 5V/ 1.235V=384mV. Thresholds remain constant as a percent of Vout as Vout is varied , with the dropout warning occurring at typically 5% below nominal, 7.5% guaranteed.

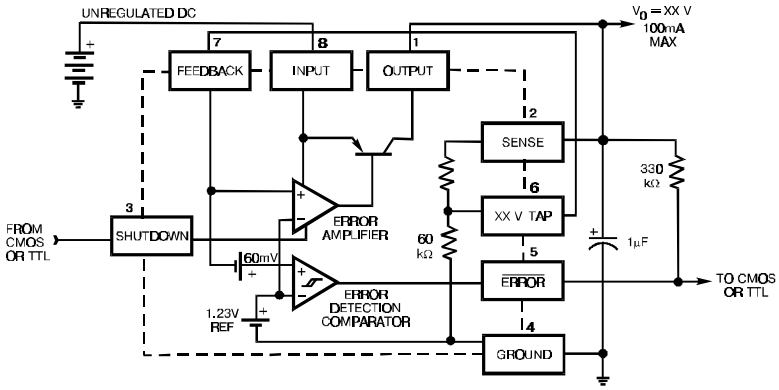
Note 9: $V_{shutdown}$ ≥ 2V, Vin ≤ 30V, Vout = 0, Feed-back pin tied to -XX V Tap.

Block Diagram and Typical Applications

LP2950-XX

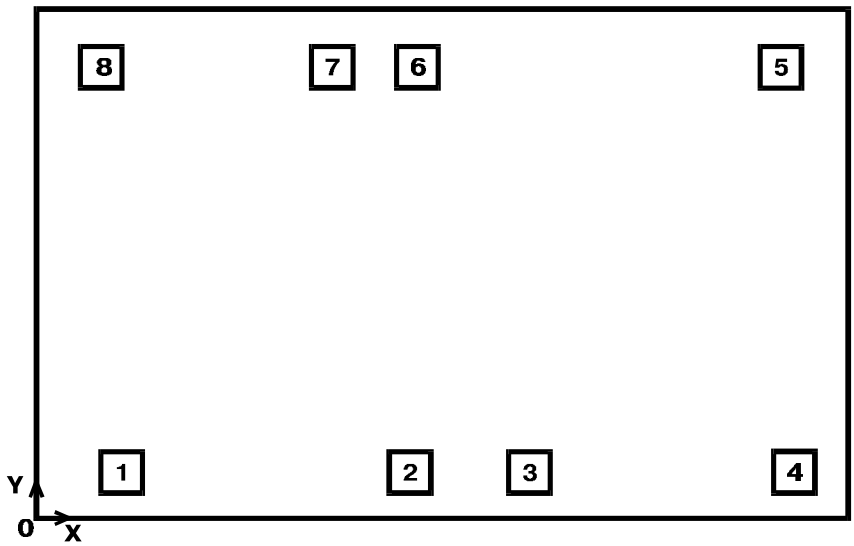


LP2951-XX



PAD LOCATION LP2951-XX

(For LP2950-XX fixed versions see Note 1)



Chip Size: 2.05 x 1.15 mm

Pad N	Pad Name	X (µm)	Y (µm)
1	Output	440	110
2	Sense	810	110
3	Shutdown	1250	110
4	Ground	1865	110
5	$\overline{\text{Error}}$	1865	950
6	XX V tap	935	950
7	Feedback	735	950
8	Input	440	950

Note 1: For LP2950-XX: 8 - connected to Input
1,2 - connected to Output
4 - connected to GND