LP2950-XX/LP2951-XX, LP2950K-XX/LP2951K-XX **100mA Low Dropout Voltage Regulators**

October 1995 – revised July 2014

FEATURES

- High accuracy output voltage
- Guaranteed 100mA output
- Very low quiescent
- 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 1.24V 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 is an excellent choice for use in battery-powered applications such as cordless telephones, radio control systems, and portable computers.
The LP2950-XX/LP2951-XX features a very low quiescent current (75μA typ.) and a very low drop output voltage (typ. 40mV at a light load and 380mV at 100mA). This includes a tight initial tolerance of 0.5% typ., an extremely good load and line regulation of 0.05% typ., and a 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 a power-on reset for warning of a low output voltage, which is due to falling batteries on the input. Another feature is the logic-compatible shutdown input, which enables 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 volts or programmed for 1.24 volt to 29 volts with an external pair of resistors.
The LP2950-XX is offered in 3-pin TO-92 package compatible with other regulators.

Absolute Maximum Ratings

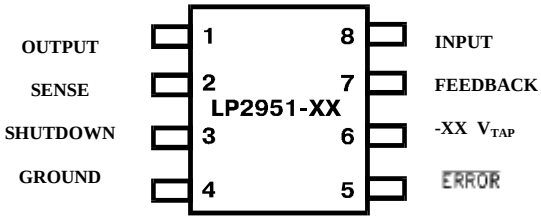
Power Dissipation	Internally-limited
Lead Temperature (Soldering, 5 seconds)	260ºC
Storage Temperature Range	-65ºC to +150ºC
Operating Junction Temperature Range	-55ºC to +150ºC
Input Supply Voltage	-0.3 to +30V
Feedback Input Voltage	-1.5 to +30V
Shutdown Input Voltage	-0.3 to +30V
Error Comparator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

Device Selection Guide

V_{OUT}, V_{olts},	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 (V_{OUT} =2.0V to 5.0V) are also available.
Please, consult the factory for more information

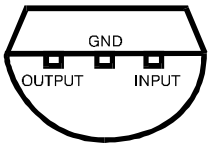
Pin Connection LP2951-XX



Top View

TO-92 Plastic Package

(LP2950-XX only)



Bottom View

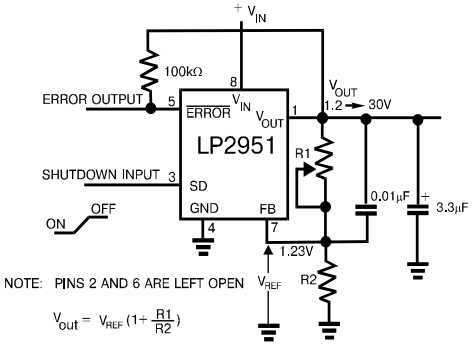


Fig.1. Adjustable Regulator

ELECTRICAL CHARACTERISTICS

Parameter	Conditions (Note 1)	Min	Typ	Max	Units
Output Voltage	T_J=25°C -25°C ≤ T_J ≤ 85°C Full Operating Temperature	0.988 IV_0I 0.985 IV_0I 0.98 IV_0I	V_0	1.012 IV_0I 1.015 IV_0I 1.02 IV_0I	V
Output Voltage	100µA ≤ I_L ≤ 100mA, T_J≤ T_{JMAX}	0.976 IV_0I	V_0	1.024 IV_0I	
Output Voltage Temperature Coefficient	(Note 2)		50	150	ppm/ºC
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	V_{OUT} =0		160	200	mA
Thermal Regulation			0.05	0.2	%/w
Output Noise, 10Hz to 100kHz	C_L =1 µF C_L =200 µF C_L =3.3 µF (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 2)		50		ppm/°C
Feedback Pin Bias Current Temperature Coefficient			0.1		nA/°C
Error Comparator					
Output Leakage Current	V_{OH} = 30V		0.01	1.0	µA
Output Low Voltage	V_{IN} = 4.5V, I_{OL} = 400 µA		150	250	mV
Upper Threshold Voltage	(Note 7)	40	60		
Lower Threshold Voltage	(Note 7)		75	95	
Hysteresis	(Note 7)		15		
Shutdown Input					
Input Logic Voltage	Low (Regulator ON) High(Regulator OFF)	 2	1.3	0.7	V
SHUTDOWN Pin Input Current	$V_{shutdown}$ = 2.4V $V_{shutdown}$ = 30V		30 450	50 600	µA
Regulator Output Current in Shutdown	(Note 8)				
	V_{OUT}= 5.0V		3	10	
	3.3V ≤ V_{OUT} < 5.0V			20	
	2.0V ≤ V_{OUT} < 3.3V			30	

Note 1: Unless otherwise specified all limits guaranteed for T_J = 25°C, V_{IN}= V_0 +1V, I_L =100µA and C_L=1µF. Additional conditions for the 8-pin versions are the FEEDBACK tied to –XX V_{TAP} and the OUTPUT tied to the SENSE output (V_{OUT} =XX V) and $V_{shutdown}$ ≤ 0.8V.

Note 2: Output or Reference Voltage Temperature Coefficients defined as the worst case voltage change divided by the total temperature range.

Note3: 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, the Line Regulation is guaranteed by design to 0.2%.

Note 5: Dropout Voltage is defined as the input to differential at which the output voltage drops 100 mV 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.

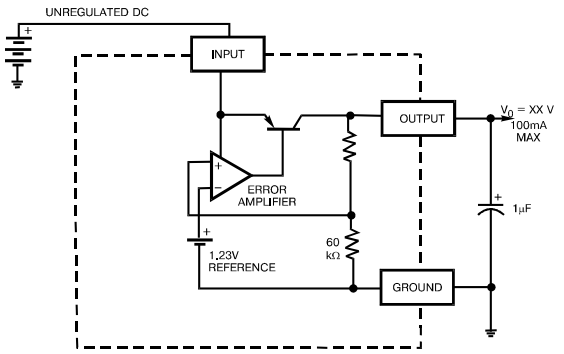
Note 6: V_{ref} ≤ V_{OUT} ≤ (V_{IN} -1V), 2.3V ≤ V_{IN} ≤ 30V, 100µA ≤ I_L ≤ 100mA, T_J ≤ T_{JMAX}

Note7: 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 an 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 guaranteed to go low when the output drops by 95mV x 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.

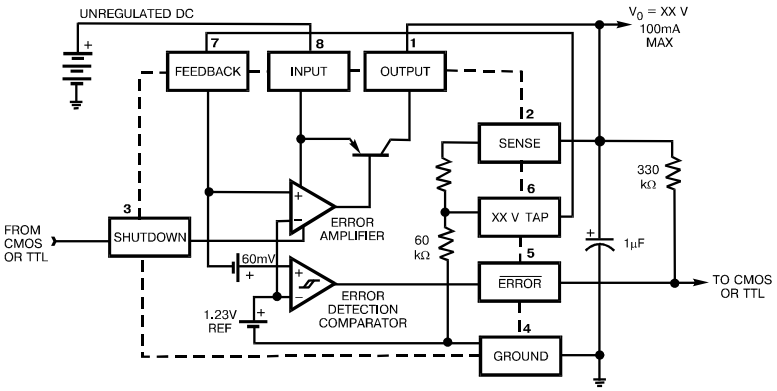
Note 8: $V_{shutdown}$ ≥ 2 V, V_{IN} ≤ 30V, V_{OUT} = 0, FEEDBACK pin tied to –XX V_{TAP}.

Block Diagram and Typical Applications

LP2950-XX

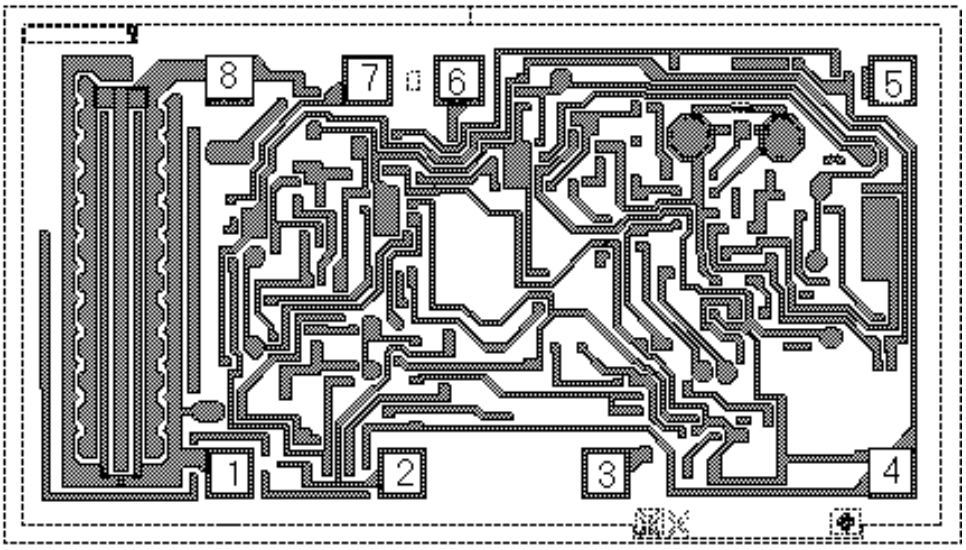


LP2951-XX



Pad Location LP2951-XX

(For LP2950-XX fixed versions see Note 1)



Chip Size: 2.05 x 1.15mm
LP2950/2951 – for 4” wafers
LP2950K/2951K –for 6” wafers

Pad Location Coordinates

Pad	Name	X(μm)	Y(μm)
1	Output	440	110
2	Sense	810	110
3	Shutdown	1250	110
4	GND (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