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August 2014

LP2951
Adjustable Micro-Power Voltage Regulator

Features

- Adjustable or Fixed 5 V Output Voltage
- Low Quiescent Current
- Low Dropout Voltage
- Low Temperature Coefficient
- Tight Line and Load Regulation
- Guaranteed 100 mA Output Current
- Internal Short Current and Thermal Limit
- Error Signals of Output Dropout
- External Shut Down

Applications

- Automotive Electronics
- Voltage Reference

Description

The LP2951 is an adjustable micro-power voltage regulator suitable for battery-powered systems. This regulator has various functions such as alarm that warns of a low output voltage often due to falling batteries on the input, the external shutdown enables the regulator to be switched on and off, current and temperature limiting.

8-SOIC

Ordering Information

Part Number	Operating Temperature Range	Top Mark	Package	Packing Method
LP2951CM	-40°C to +125°C	LP2951CM	SOIC 8L	Rail
LP2951CMX	-40°C to +125°C	LP2951CM	SOIC 8L	Tape and Reel

Block Diagram

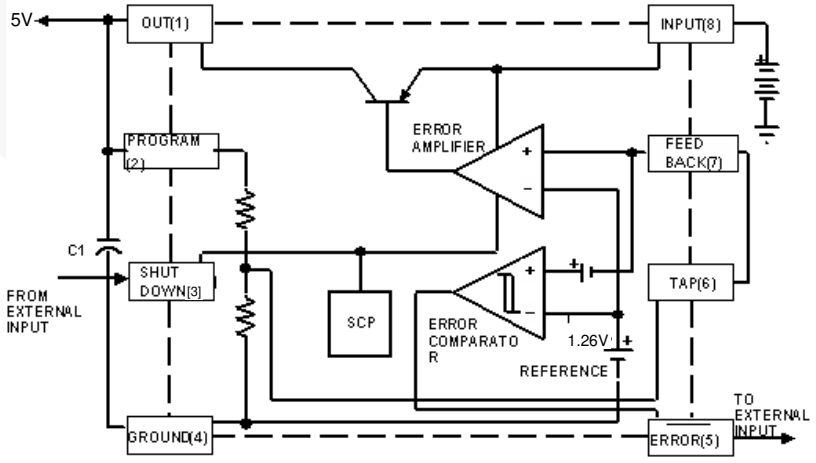


Figure 1. Block Diagram

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Unit
V_{IN}	Input Supply Voltage	-0.3 to 30.0	V
P_D	Power Dissipation	Internally Limited	W
$R_{\theta JA}$	Thermal Resistance Junction-to-Air	127.5	°C/W
T_{STG}	Storage Temperature Range	-65 to 150	°C
T_{OPR}	Operating Junction Temperature Range	-40 to 125	°C

Electrical Characteristics

FEEDBACK (Pin 7) tied to TAP (Pin 6), V_{OUT} (Pin 1) tied to PROGRAM (Pin 2). Values are at T_A = 25°C, unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Fixed Output Voltage	I_L = 50 mA	4.9	5.0	5.1	V
ALL VOLTAGE OPTIONS						
$\Delta V/\Delta T$	Output Voltage Temperature Coefficient[1]			50		ppm/°C
ΔV	Line Regulation[2]	$(V_O + 1)\ V \le V_{IN} \le 28\ V$, I_L = 50 mA			0.4	%
ΔV	Load Regulation[2]	100 µA ≤ I_L ≤ 100 mA			0.3	%
V_D	Dropout Voltage	I_L = 100 µA			150	mV
		I_L = 100 mA			600	
I_G	Ground Current	I_L = 100 µA			140	µA
		I_L = 100 mA			7	mA
I_{CL}	Current Limit	V_O = 0 V	110	165	220	mA
V_{REF}	Reference Voltage	$V_{IN} = (V_O + 1)\ V$, I_L = 100 µA	1.235	1.260	1.285	V
		[3]	1.225	1.260	1.295	
I_{FB}	Feedback Bias Current			20		nA
ERROR COMPARATOR						
V_{OL}	Output Low Voltage	$V_{IN} = (V_O - 0.5)\ V$, I_{OL} = 400 µA		150	400	mV
V_{TH}	High Threshold Voltage[4]		25	60		mV
V_{TL}	Low Threshold Voltage[4]			75	140	mV
V_{HYS}	Hysteresis[4]			15		mV
SHUTDOWN INPUT						
V_{SD}	Shutdown Threshold Range	[5]	0.6	1.3	2.0	V
I_{SD}	Shutdown Input Current	V_{SD} = 2.4 V		30	100	µA
		V_{SD} = 28 V		450	750	

Notes:

1. Output or reference voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature range.
2. Regulation is measured at constant junction temperature, using pulse testing with a low duty cycle.
3. $V_{REF} \le V_{OUT} \le (V_{IN} - 1\ V)$, $2.5\ V \le V_{IN} \le 28\ V$, $100\ \mu A \le I_L \le 100\ mA$, $T_A \le T_{AMAX}$.
4. Threshold and hysteresis are expressed in terms of voltage differential at the feedback terminal below the normal reference. To express these thresholds in terms of output voltage change, multiply by the error amplifier gain $= V_O / V_{REF} = (R1 + R2) / R2$.
5. $V_{shutdown} \le 0.6\ V$, V_{OUT} = ON, $V_{shutdown} \ge 2.0\ V$, V_{OUT} = OFF.

Typical Performance Characteristics

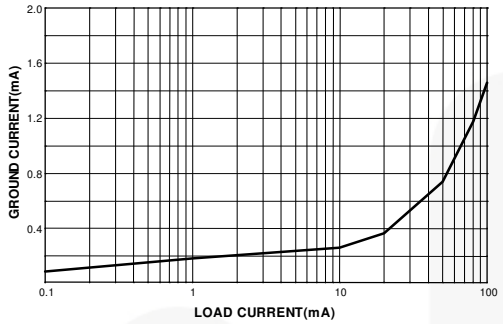


Figure 2. Quiescent Current

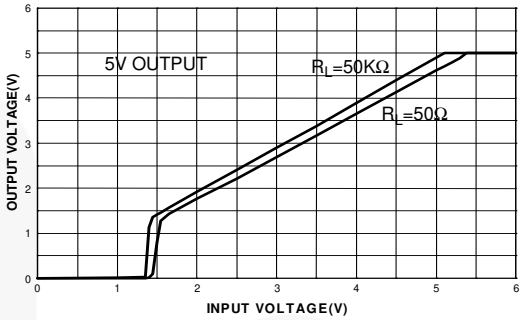


Figure 3. Dropout Characteristics

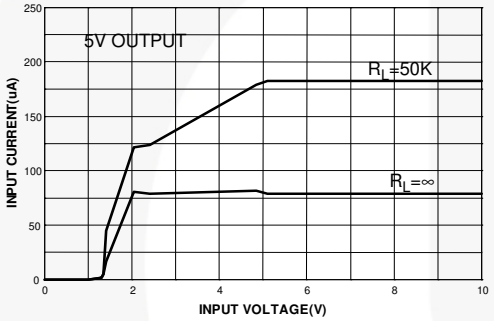


Figure 4. Input Current

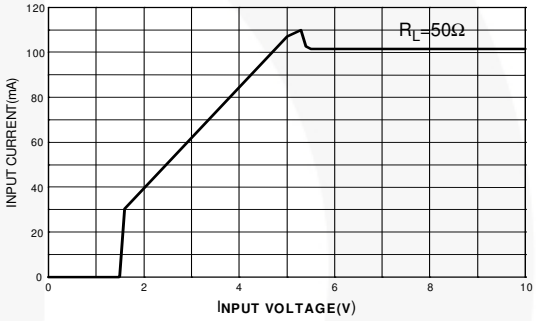


Figure 5. Input Current

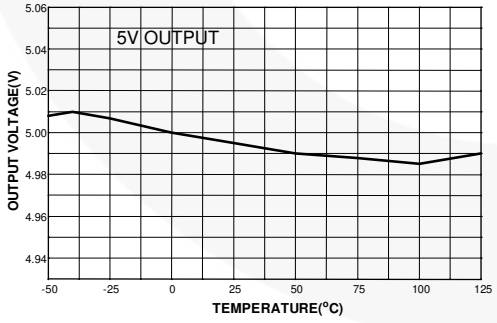


Figure 6. Output Voltage vs. Temperature

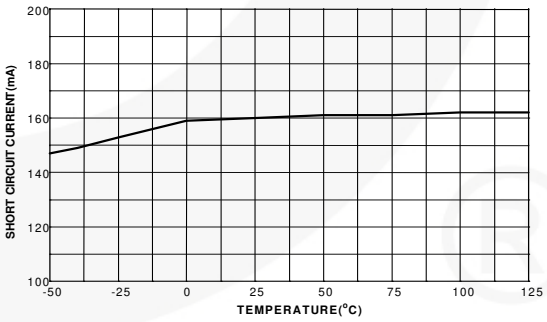


Figure 7. Short-Circuit Current

Typical Performance Characteristics (Continued)

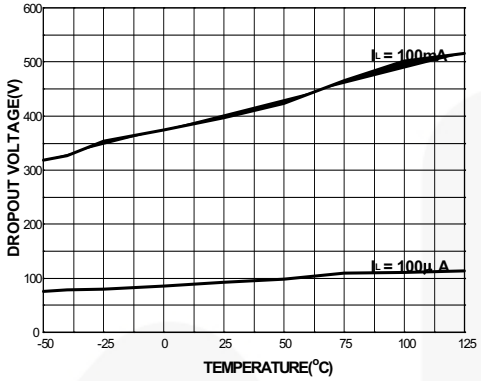


Figure 8. Dropout Voltage

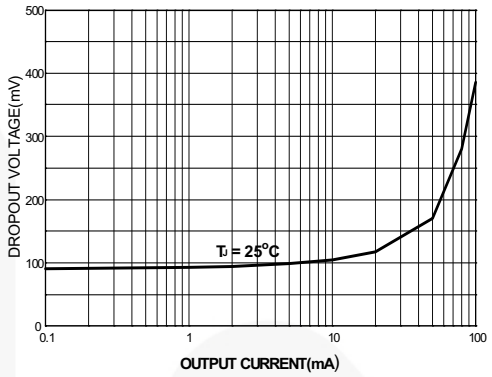
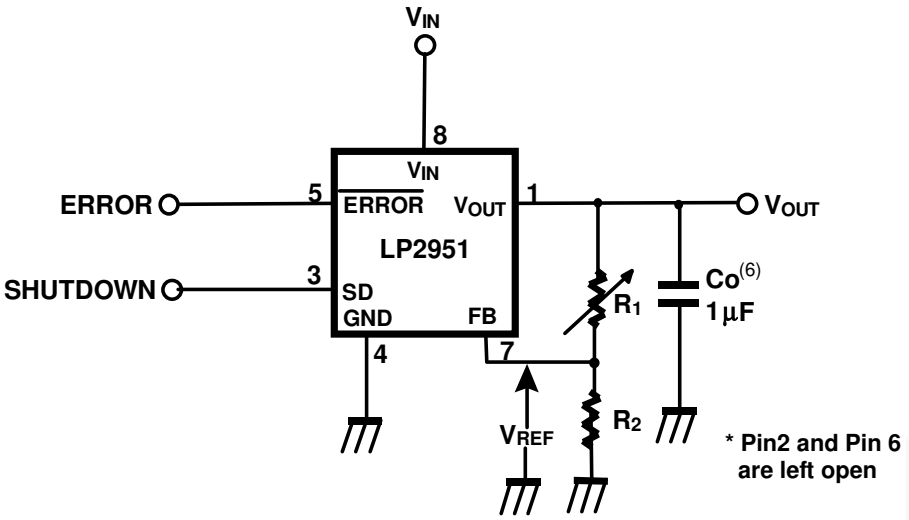


Figure 9. Dropout Voltage

Typical Application



$$V_O = V_{REF} \ (1 + R_i / R_2) + I_{FB} R_1$$

Figure 10. Adjustable Regulator

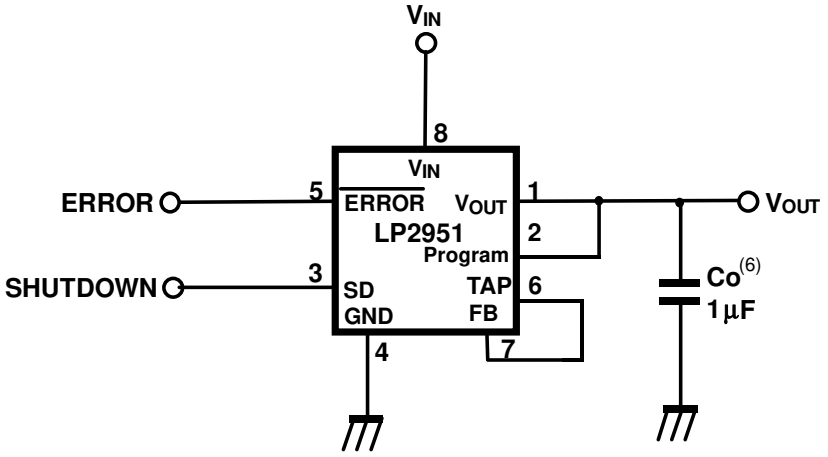


Figure 11. Fixed Output 5 V

Note:

6. C_O is required between the output and ground for stability at output voltages of 5 V or more. Since I_{FB} is controlled to less than 40 nA, the error associated with this term is negligible in most applications. At lower output voltage, more capacitance is required. without this capacitance the part oscillates.

Typical Application (Continued)

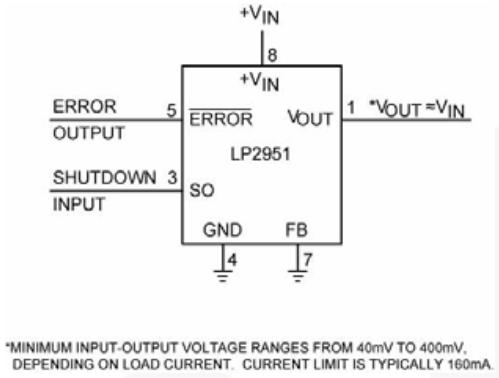


Figure 12. Wide Input Voltage Range Current Limiter

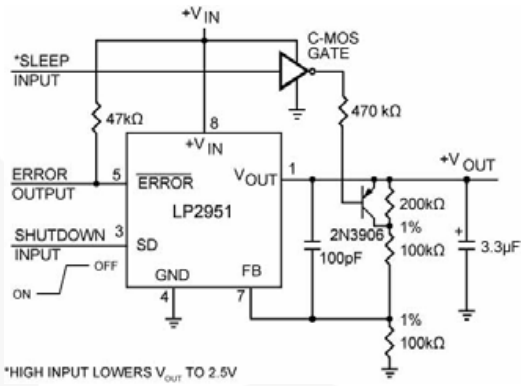


Figure 13. 5 V Regulator with 2.5 V Sleep Function

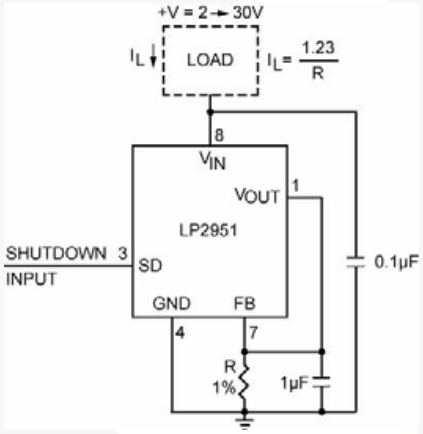


Figure 14. Low Drift Current Source

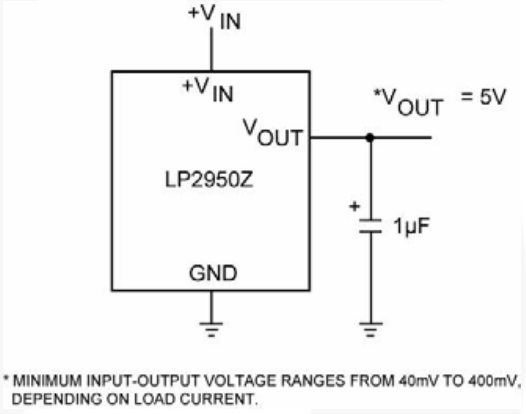


Figure 15. 5 V Current Limiter

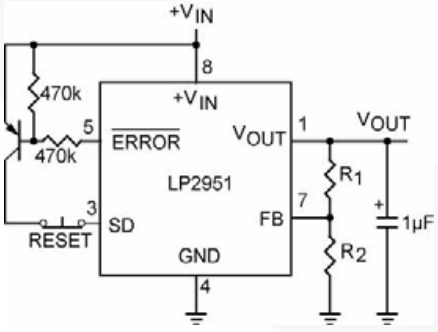


Figure 16. Latch Off When Error Flag Occurs

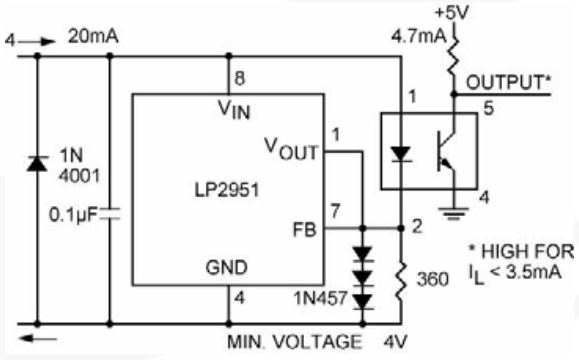
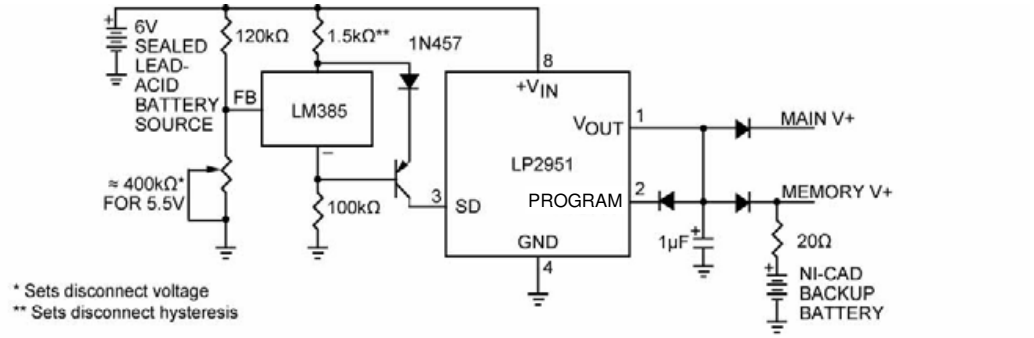


Figure 17. Open Circuit Detector for 4 mA to 20 mA Current Loop

Typical Application (Continued)



For values shown, Regulator shuts down when V_{IN} < 5.5 V and turns on again at 6.0 V. Current drain in disconnected mode is 150µA.

Figure 18. Low Battery Disconnect

Physical Dimensions

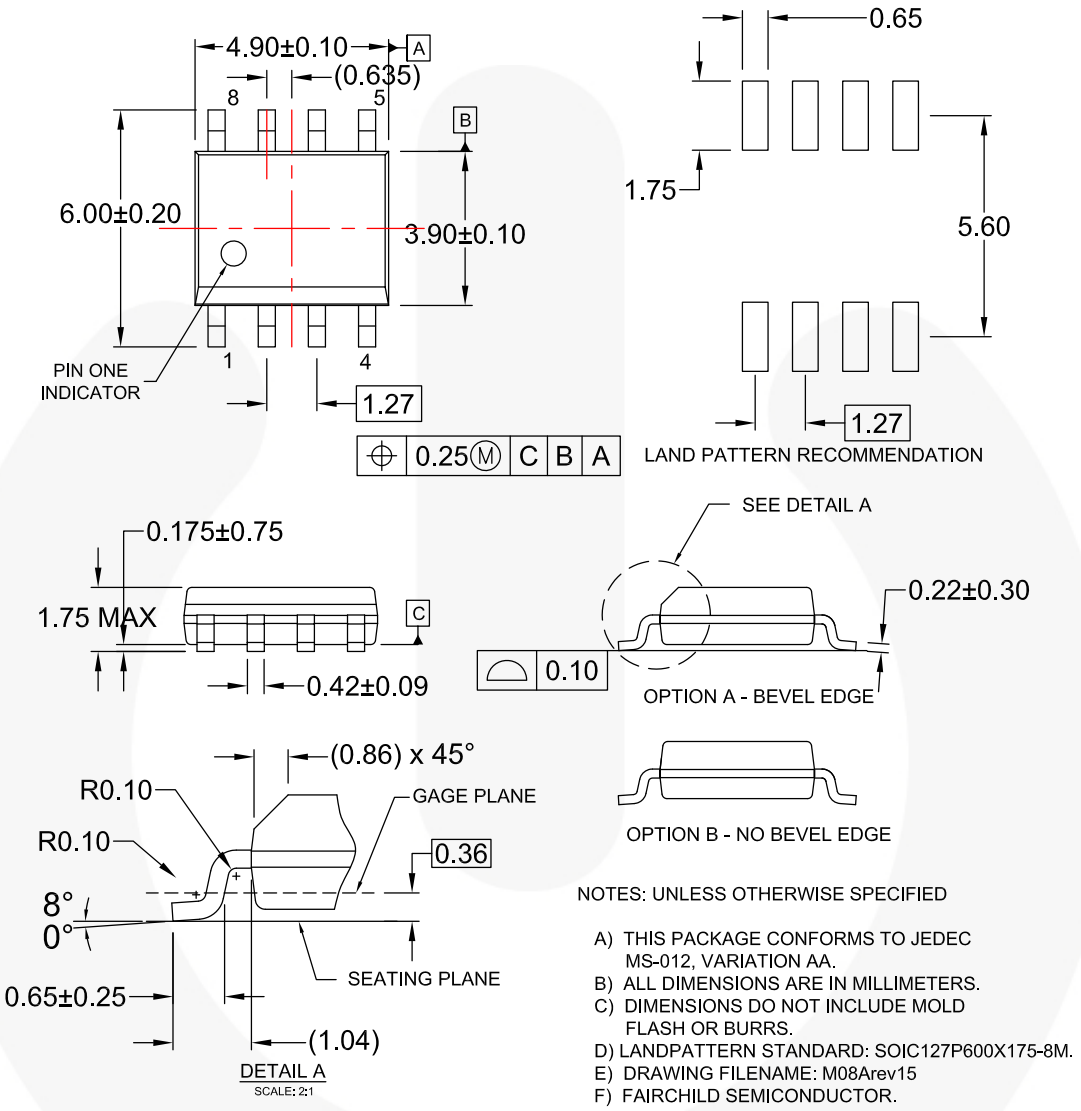


Figure 19. 8 Lead, SOIC, JEDEC MS-012, 0.150 inch NARROW BODY

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