SPX2931

100mA Low Dropout Voltage Regulator

FEATURES

- 3.5V, 3.3V, and 3.0V Versions are Available
- Output Current in Excess of 100 mA
- Input-Output Differential is Less Than 0.6V
- Mirror-Image Insertion Protection
- Internal Thermal Overload Protection
- Available in TO-220, TO-92, SOT-89, and SO-8 Package Types
- Available as Adjustable with TTL Compatible Switch
- Similar Improved to Industry Standard LM2931
- Reverse Battery Protection
- Short Circuit Protection
- 60V Load Dump Protection
- -20V Reverse Transient Protection

APPLICATION

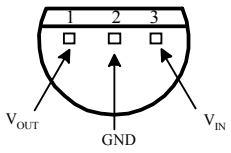
- Portable Instrumentation
- Radio Control Systems
- Cordless Telephones

PRODUCT DESCRIPTION

The SPX2931 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 SPX2931 features offers very low quiescent currents (0.4 mA.), and very low drop output voltage (typ. 50 mV at light load and 300 mV at 100 mA). Other features include the logic-compatible On/Off input which enables the regulator to be switched on and off. The SPX2931 is offered in a 3-pin TO-92/TO-220 package and SOT-89/SO-8 package.

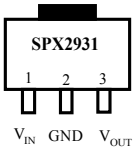
PIN CONNECTIONS

TO-92 (N)



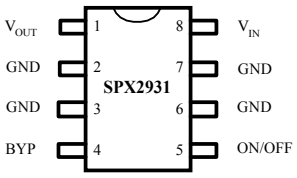
Bottom View

SOT-89 (M1)



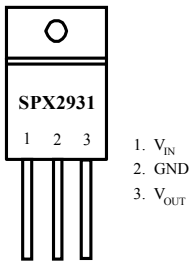
Top View

8-Pin Surface Mount (S)
Fixed Output



Top View

TO-220-3 (U)
Fixed



Front View

ABSOLUTE MAXIMUM RATINGS

Power Dissipation..... Internally limited
Lead Temp. (soldering, 5 Seconds)..... 260°C
Storage Temperature Range ..... -65°C to +150°C
Operating Junction Temperature Range ..... -40°C to +85°C
Input Supply Voltage..... -0.3 to +26V
ESD Rating.....2KV

ELECTRICAL CHARACTERISTICS

at V_S = 14V, T_A = 25°C, I_O = 10 mA, C2 = 100 µF, unless otherwise specified. (Note 1)

Parameter	Conditions	SPX2931A			SPX2931			Units
		Min	Typ	Max	Min	Typ	Max	
3.0 Volt Version		**SPX2931A-3**			**SPX2931-3**			
Output Voltage		2.94	3.00	3.06	2.91	3.00	3.09	V
	6V<V_{IN}< 26V, I_O = 100 mA Over Temp.	**2.88**	3.00	**3.12**	**2.85**	3.00	**3.15**	V
3.3 Volt Version		**SPX2931A-3.3**			**SPX2931-3.3**			
Output Voltage		3.23	3.30	3.36	3.20	3.30	3.39	V
	6V < V_{IN}< 26V, I_O = 100 mA Over Temp.	**3.20**	3.30	**3.39**	**3.16**	3.30	**3.43**	V
5 Volt Version		**SPX2931A-5**			**SPX2931-5**			
Output Voltage		4.81	5.00	5.19	4.75	5.00	5.25	V
	6V <V_{IN}< 26V, I_O =100 mA Over Temp.	**4.75**		**5.25**	**4.5**		**5.5**	V
All Voltage Options								
Long Term Stability			20			20		mV/1000
Line Regulation	9V < V_{IN} < 16V 6V < V_{IN} < 26V,		2.0 4.0	10 30		4.0	30	mV
Load Regulation	5 mA < I_O < 100 mA		14	50		14	50	mV
Dropout Voltage	I_O=10 mA I_O=50 mA I_O=100 mA		0.05 0.07 0.3	0.2 0.1 0.6		0.05 0.07 0.3	0.2 0.1 0.6	V V V
Quiescent Current	I_O < 10 mA, 6V < V_{IN} < 26V -40°C < Tj < 85°C I_O = 100 mA, V_{IN} = 14V, T_J = 25°C		0.4 15	1.0		0.4 15	1.0	mA mA
Maximum Operational Input Voltage		26	33		26	33		V
Maximum Line Transient	R_L= 500Ω, V_O<5.5V, 100ms	60	70		50	70		V
Reverse Polarity Input Voltage, DC	V_O > -0.3V, R_L = 500Ω	-15	-30		-15	30		V
Reverse Polarity Input Voltage, Transient	1% Duty Cycle, τ < 100ms, R_L = 500Ω	-50	-80		-50	-80		V
Output Noise Voltage	10Hz-100kHz, C_{OUT}=100µF		500			500		µVrms
Ripple Rejection	F_O = 120Hz		80			80		dB

Note 1: See TYPICAL APPLICATIONS notes to ensure constant junction temperature, low duty cycle pulse testing used.
Note 2: All limits are at 25°C or over the full operating temperature junction range of -40°C to +85°C.
Note 3: The maximum power dissipation is a function of maximum junction temperature, total thermal resistance, and ambient temperature.
Note 4: Human body model, 100 µF discharged through 1.5 KΩ.

Application Hints

The SPX2931 requires an output capacitor for device stability. The value required varies greatly depending upon the application circuit and other factors. The high frequency characteristics of electrolytic capacitors depend greatly on the type and also on the manufacturer. Sometimes only bench testing is the only means to determine the proper capacitor type and value. The high quality 100 µF aluminum electrolytic covers all general application circuits, this stability can be obtained with a tantalum electrolytic value of 47 µF.

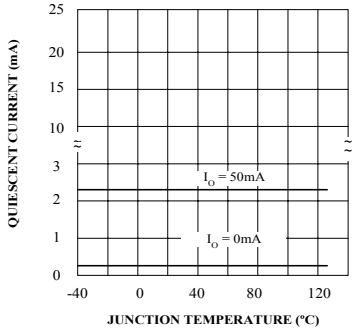
Another critical point of electrolytic characteristics is its performance over temperature. The SPX2931 is designed to operate starting at -40°C which may not be true in the case of electrolytic. Higher temperatures generally no problem. The electrolytic. type in aluminum will freeze around -30°C. This could cause an oscillation at output of regulator. At a lower temperature requirement by many applications the capacitor should maintain its performance. So as a result, for an application which regulator junction temperature does not exceed 25°C, the output capacitor can be reduced by the factor of two over the value needed for the entire temperature range.

Other points with linear regulators is that the twitch higher output current stability decreases. In most applications the SPX2931 is operating at few milliamps. In these applications the output capacitance can be further reduced. For example, when the regulator is running at 10mA output current the output capacitance value is half compared to the same regulator that is running at 100 mA.
With the SPX2931 adjustable regulator, the minimum value of output capacitance is a function of the output voltage. The value decreases with higher output voltages, since the internal loop gain is reduced.

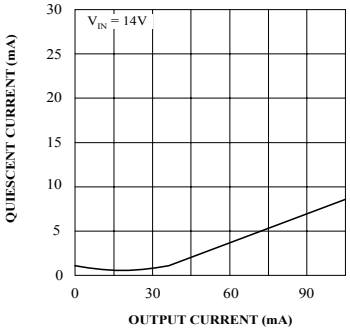
The worst case occurs at the lower temperature and maximum operating currents, the entire circuit and the electrolytic, should be cooled down to the minimum temperature. The minimum of 0.6 volts required at the input of regulator above the output to keep the power dissipation and die heating to its minimum. After the value for the capacitor has been determined for actual use, the value should be doubled.

TYPICAL CHARACTERISTICS

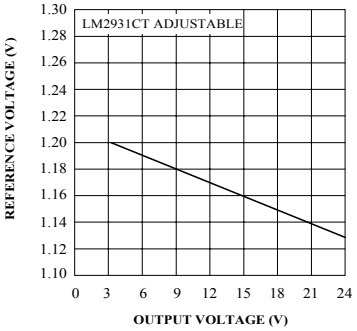
QUIESCENT CURRENT



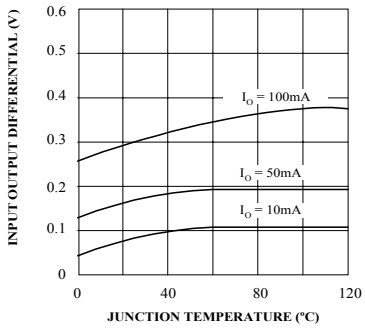
QUIESCENT CURRENT



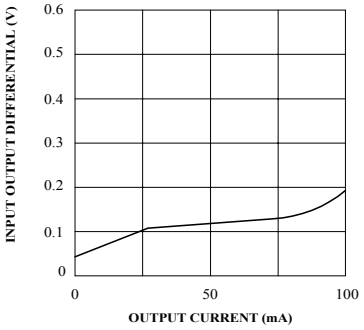
REFERENCE VOLTAGE



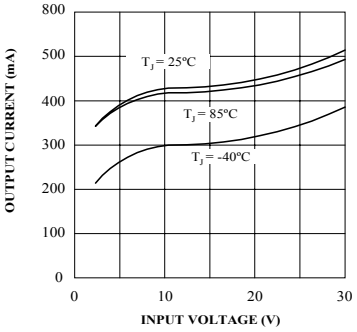
DROPOUT VOLTAGE



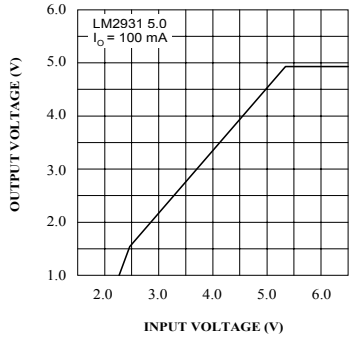
DROPOUT VOLTAGE



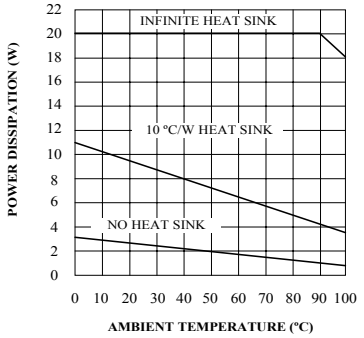
PEAK OUTPUT CURRENT



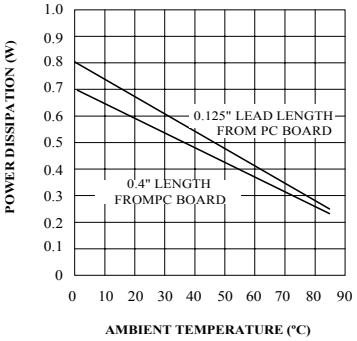
LOW VOLTAGE BEHAVIOR



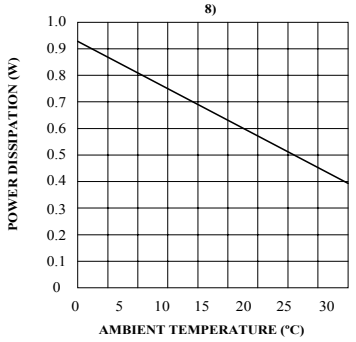
MAXIMUM POWER DISSIPATION (TO-220)



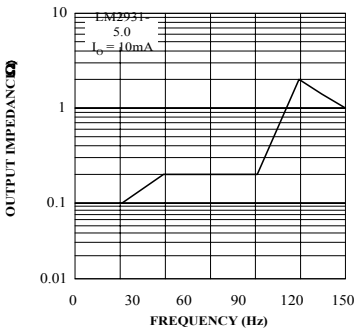
MAXIMUM POWER DISSIPATION (TO-92)



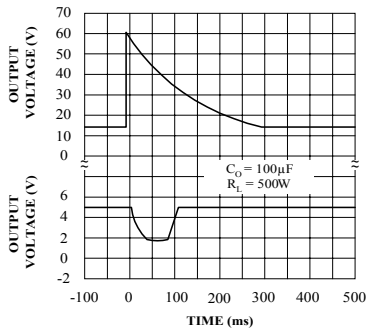
MAXIMUM POWER DISSIPATION (SO-8)



MAXIMUM POWER DISSIPATION



OPERATION DURING LOAD DUMP



TYPICAL APPLICATIONS

SPX2931 Fixed Output

SPX2931

SCHEMATIC DIAGRAM

ORDERING INFORMATION

Ordering No.	Precision	Output Voltage	Packages
SPX2931N	3%	Adj	3 Lead TO-92
SPX2931N-3.0	3%	3.0V	3 Lead TO-92
SPX2931N-3.3	3%	3.3V	3 Lead TO-92
SPX2931N-3.5	3%	3.5V	3 Lead TO-92
SPX2931AN	2%	Adj	3 Lead TO-92
SPX2931AN-3.0	2%	3.0V	3 Lead TO-92
SPX2931AN-3.3	2%	3.3V	3 Lead TO-92
SPX2931AN-3.5	2%	3.5V	3 Lead TO-92
SPX2931CN	5%	Adj	3 Lead TO-92
SPX2931CN-3.0	5%	3.0V	3 Lead TO-92
SPX2931CN-3.3	5%	3.3V	3 Lead TO-92
SPX2931CN-3.5	5%	3.5V	3 Lead TO-92
SPX2931S	3%	Adj	8 Lead SOIC
SPX2931S-3.0	3%	3.0V	8 Lead SOIC
SPX2931S-3.3	3%	3.3V	8 Lead SOIC
SPX2931S-3.5	3%	3.5V	8 Lead SOIC
SPX2391AS	2%	Adj	8 Lead SOIC
SPX2391AS-3.0	2%	3.0V	8 Lead SOIC
SPX2391AS-3.3	2%	3.3V	8 Lead SOIC
SPX2391AS-3.5	2%	3.5V	8 Lead SOIC
SPX2931CS	5%	Adj	8 Lead SOIC
SPX2931CS-3.0	5%	3.0V	8 Lead SOIC
SPX2931CS-3.3	5%	3.3V	8 Lead SOIC
SPX2931CS-3.5	5%	3.5V	8 Lead SOIC
SPX2931U	3%	Adj	3 Lead TO-220
SPX2931U-3.0	3%	3.0V	3 Lead TO-220
SPX2931U-3.3	3%	3.3V	3 Lead TO-220
SPX2931U-3.5	3%	3.5V	3 Lead TO-220
SPX2931AU	2%	Adj	3 Lead TO-220
SPX2931AU-3.0	2%	3.0V	3 Lead TO-220
SPX2931AU-3.3	2%	3.3V	3 Lead TO-220
SPX2931AU-3.5	2%	3.5V	3 Lead TO-220
SPX2931CU	5%	Adj	3 Lead TO-220
SPX2931CU-3.0	5%	3.0V	3 Lead TO-220
SPX2931CU-3.3	5%	3.3V	3 Lead TO-220
SPX2931CU-3.5	5%	3.5V	3 Lead TO-220
SPX2931M1	3%	Adj	3 Lead SOT-89
SPX2931M1-3.0	3%	3.0V	3 Lead SOT-89
SPX2931M1-3.3	3%	3.3V	3 Lead SOT-89
SPX2931M1-3.5	3%	3.5V	3 Lead SOT-89
SPX2931AM1	2%	Adj	3 Lead SOT-89
SPX2931AM1-3.0	2%	3.0V	3 Lead SOT-89
SPX2931AM1-3.3	2%	3.3V	3 Lead SOT-89
SPX2931AM1-3.5	2%	3.5V	3 Lead SOT-89
SPX2931CM1	5%	Adj	3 Lead SOT-89
SPX2931CM1-3.0	5%	3.0V	3 Lead SOT-89
SPX2931CM1-3.3	5%	3.3V	3 Lead SOT-89
SPX2931CM1-3.5	5%	3.5V	3 Lead SOT-89

SIGNAL PROCESSING EXCELLENCE

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