



100mA Low Dropout Voltage Regulator

FEATURES

- 5.0V, 4.5V, 4.0V, 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 AS2931 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 AS2931 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 AS2931 is offered in a 3-pin TO-92/TO-220 package compatible with other 5V regulators and SOT-89/SO-8 package.

The regulator output voltage may be internally pin-strapped for a 3.5V, 3.3V, 3.0V, or programmed from 3V to 24V with an external pair of resistors.

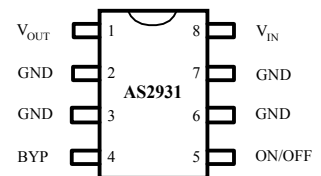
ORDERING INFORMATION

TO-92 3-PIN	SO-8	SOT-89 3-PIN	TO-220 3/5 PIN	OPER. TEMP. RANGE
AS2931AN-X	AS2931AS-X	AS2931AM1-X	AS2931AU-X	-40°C to +85°C
AS2931N-X	AS2931S-X	AS2931M1-X	AS2931U-X	-40°C to +85°C
	AS2931CS-X		AS2931CU-X	-40°C to +85°C

X = Output Voltages (X = 3.0V, 3.3V, 3.5V) or blank for Adj.)

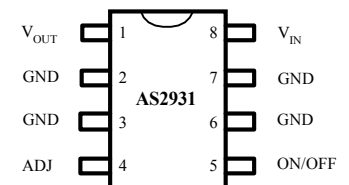
PIN CONNECTIONS

8-Pin Surface Mount (S)
Fixed Output



Top View

8-Pin Surface Mount (S)
Adj Output



Top View

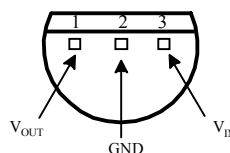
TO-220-3 (U)
Fixed



Front View

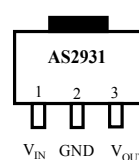
1. V_{IN}
2. GND
3. V_{OUT}

TO-92 (N)



Bottom View

SOT-89 (M1)



Top 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 $V_S = 14V$, $T_A = 25^\circ C$, $I_O = 10\text{ mA}$, $C_2 = 100\text{ }\mu F$, unless otherwise specified. (Note 1)

Parameter	Conditions	AS2931A			AS2931			Units
		Min	Typ	Max	Min	Typ	Max	
3.0 Volt Version		AS2931A-3			AS2931-3			
Output Voltage	$6V < V_{IN} < 26V$, $I_O = 100\text{ mA}$ Over Temp.	2.94	3.00	3.06	2.91	3.00	3.09	V
		2.88	3.00	3.12	2.85	3.00	3.15	V
3.3 Volt Version		AS2931A-3.3			AS2931-3.3			
Output Voltage	$6V < V_{IN} < 26V$, $I_O = 100\text{ mA}$ Over Temp.	3.23	3.30	3.36	3.20	3.30	3.39	V
		3.20	3.30	3.39	3.16	3.30	3.43	V
5 Volt Version		AS2931A-5			AS2931-5			
Output Voltage	$6V < V_{IN} < 26V$, $I_O = 100\text{ mA}$ Over Temp.	4.81	5.00	5.19	4.75	5.00	5.25	V
		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	$5\text{ mA} < I_O < 100\text{ mA}$		14	50		14	50	mV
Dropout Voltage	$I_O = 10\text{ mA}$ $I_O = 50\text{ mA}$ $I_O = 100\text{ mA}$		0.05	0.2		0.05	0.2	V
			0.07	0.1		0.07	0.1	V
			0.3	0.6		0.3	0.6	V
Quiescent Current	$I_O < 10\text{ mA}$, $6V < V_{IN} < 26V$ $-40^\circ C < T_j < 85^\circ C$ $I_O = 100\text{ mA}$, $V_{IN} = 14V$, $T_j = 25^\circ C$		0.4	1.0		0.4	1.0	mA
			15			15		mA
Maximum Operational Input Voltage		26	33		26	33		V
Maximum Line Transient	$R_L = 500\Omega$, $V_O < 5.5V$, 100ms	60	70		50	70		V
Reverse Polarity Input Voltage, DC	$V_O > -0.3V$, $R_L = 500\Omega$	-15	-30		-15	30		V
Reverse Polarity Input Voltage, Transient	1% Duty Cycle, $\tau < 100\text{ms}$, $R_L = 500\Omega$	-50	-80		-50	-80		V
Output Noise Voltage	10Hz-100kHz, $C_{OUT} = 100\mu F$		500			500		μV_{rms}
Ripple Rejection	$F_O = 120\text{Hz}$		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 K Ω .

Application Hints

The AS2931 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 μ F aluminum electrolytic covers all general application circuits, this stability can be obtained with a tantalum electrolytic value of 47 μ F.

Another critical point of electrolytic characteristics is its performance over temperature. The AS2931 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

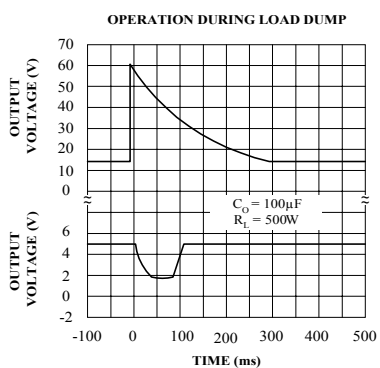
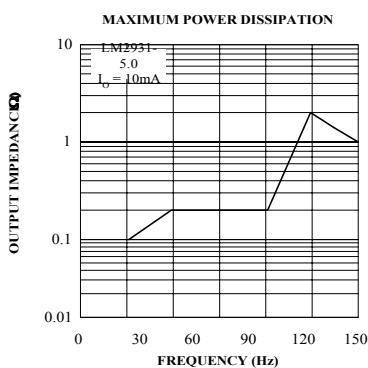
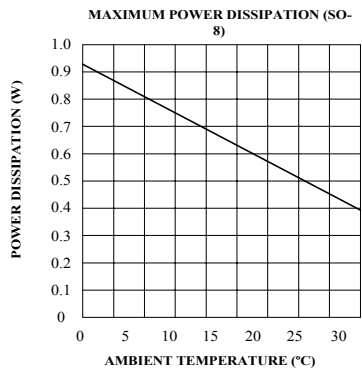
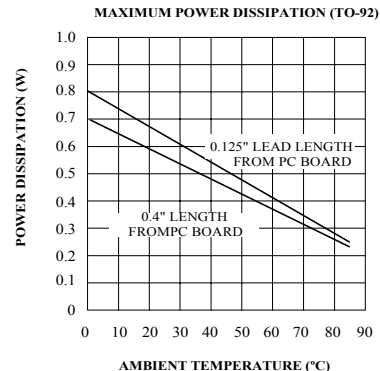
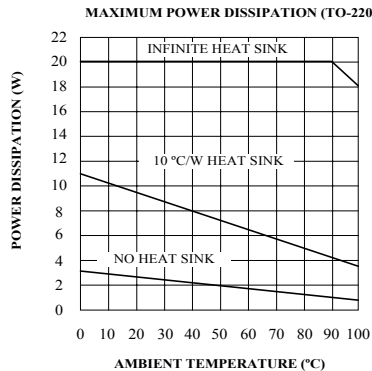
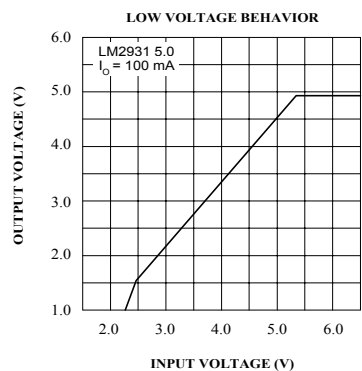
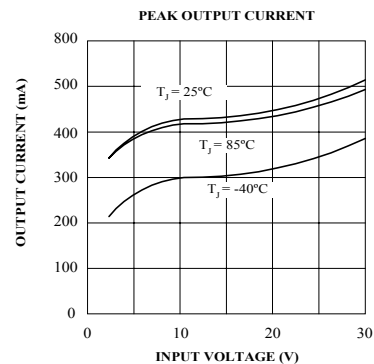
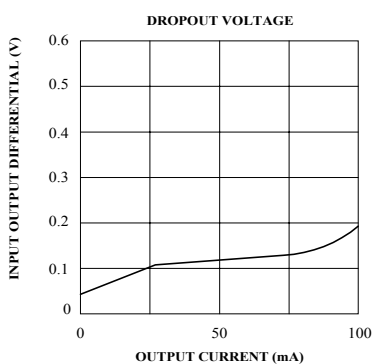
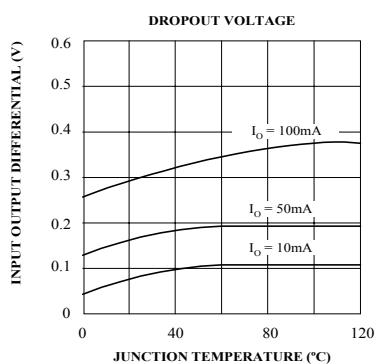
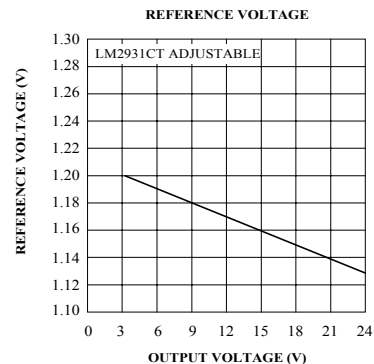
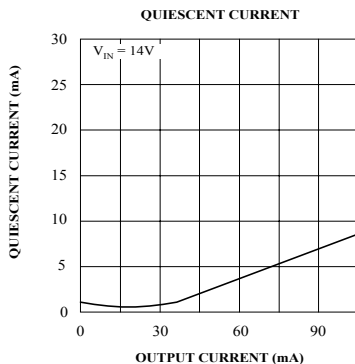
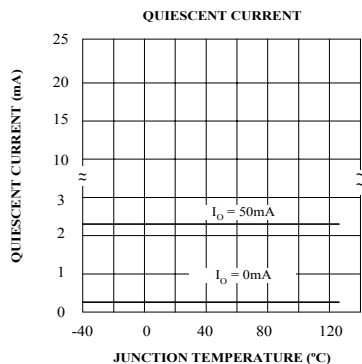
factor of two over the value needed for the entire temperature range.

Other points with linear regulators is that the twitch higher output current stability decreases. In most applications the AS2931 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 AS2931 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



TYPICAL APPLICATIONS

AS2931 Fixed Output

AS2931

SCHEMATIC DIAGRAM