



## LP2980/LP2981

### 50mA/100mA Ultra Low Dropout Voltage Regulator Proposed Specification

#### FEATURES

- Ultra Low Dropout Voltage
- Output Voltage Accuracy 0.5% (A Grade)
- Guaranteed 50mA Output Current
- Smallest Possible Size (SOT-23 Package)
- Requires Only 1 $\mu$ F External Capacitance
- 1 $\mu$ A Quiescent Current When Shutdown
- Low Ground Pin Current at All Load Currents
- High Peak Current Capability (150 mA Typical)
- Wide Supply Voltage Range (16V Max)
- Fast Dynamic Response to Line and Load

- Low  $Z_{OUT}$  Over Wide Frequency Range
- Overtemperature / Overcurrent Protection
- -25°C to 125°C Junction Temperature Range
- Similar Replacement for Industry LP2980 Socket

#### APPLICATIONS

- Cellular Phone
- Palmtop / Laptop Computer
- Personal Digital Assistant (PDA)
- Camcorder
- Personal Stereo
- Camera

#### PRODUCT DESCRIPTION

The ALPHA Semiconductor LP2980/LP2981 is a low power 50mA/100mA, fixed-output 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 LP2980/LP2981 features very low quiescent current and very low dropout voltage (Typ. 7mV at light load and 120mV at 50mA/100mA load). 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 LP2980/LP2981 useful as a low-power voltage reference. Other key additional features of this device include higher output current (100mA).

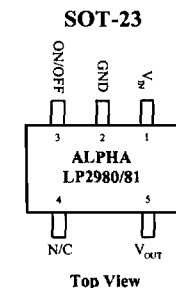
The main feature is the logic-compatible shutdown input which enables the regulator to be switched on and off. The regulator output voltage may be pin-strapped for a 5V, 3.3V and 3.0V or programmed from 1.24V to 29V with an external pair of resistors.

#### ORDERING INFORMATION

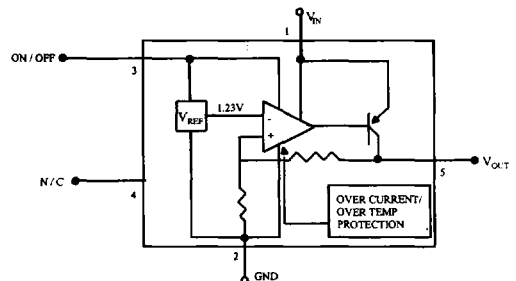
Part Number	Package Type	Oper. Temp. Range
LP2980AM-XX	SOT-23	IND.
LP2980M-XX	SOT-23	IND.

XX= 3.0V, 3.3V, OR 5.0V

#### Pin Connections



#### Block Diagram



# LP2980/LP2981

## ABSOLUTE MAXIMUM RATINGS (Note 1)

Storage Temperature Range	-65° to +150°C
Operating Junction Temperature Range	-25°C to +125°C
Lead Temperature (Soldering, 5 sec.)	260°C
ESD Rating (Note 2)	2kV
Power Dissipation (Note 3)	Internally Limited
Input Supply Voltage (Survival)	-0.3V to +16V

Input Supply Voltage (Operating)	2.1V to +16V
Shutdown Input Voltage (Survival)	-0.3V to +16V
Output Voltage (Survival, Note 4)	-0.3V to +9V
I <sub>OUT</sub> (Survival)	Short Circuit Protected
Input-Output Voltage (Survival, Note 5)	-0.3V to +16V

**ELECTRICAL CHARACTERISTICS** Limits in standard typeface are for T<sub>J</sub> = 25°C, and limits in **boldface type** apply over the full operating temperature range. Unless otherwise specified: V<sub>IN</sub> = V<sub>O(NOM)</sub> + 1V, I<sub>L</sub> = 1 mA, C<sub>OUT</sub> = 1 μF, V<sub>ON/OFF</sub> = 2V.

Parameter	Conditions	Typ	LP2980/81A-XX (Note 6)		LP2980/81-XX (Note 6)		Units
			Min	Max	Min	Max	
Output Voltage (5.0V Versions)	V <sub>IN</sub> = V <sub>O(NOM)</sub> + 1V 1 mA < I <sub>L</sub> < 50 mA	5.0	4.975 4.962 <b>4.875</b>	5.025 5.038 <b>5.125</b>	4.950 4.925 <b>4.825</b>	5.050 5.075 <b>5.175</b>	V
Output Voltage (3.3V Versions)	V <sub>IN</sub> = V <sub>O(NOM)</sub> + 1V 1 mA < I <sub>L</sub> < 50 mA	3.3	3.283 3.275 <b>3.217</b>	3.317 3.325 <b>3.383</b>	3.267 3.250 <b>3.184</b>	3.333 3.350 <b>3.416</b>	V
Output Voltage (3.0V Versions)	V <sub>IN</sub> = V <sub>O(NOM)</sub> + 1V 1 mA < I <sub>L</sub> < 50 mA	3.0	2.985 2.977 <b>2.925</b>	3.015 3.023 <b>3.075</b>	2.970 2.955 <b>2.895</b>	3.030 3.045 <b>3.105</b>	V
Output Voltage Line Regulation	V <sub>O(NOM)</sub> + 1V ≤ V <sub>IN</sub> ≤ 16V	0.007		0.014 <b>0.032</b>		0.014 <b>0.032</b>	%/V
Dropout Voltage (Note 7)	I <sub>L</sub> = 0	1		3 5		3 5	mV
	I <sub>L</sub> = 1 mA	7		10 15		10 15	
	I <sub>L</sub> = 10 mA	40		60 90		60 90	
	I <sub>L</sub> = 50 mA	120		150 225		150 225	
	I <sub>L</sub> = 100 mA	200		250 300		250 300	
Ground Pin Current	I <sub>L</sub> = 0	65		95 125		95 125	μA
	I <sub>L</sub> = 1 mA	80		110 170		110 170	
	I <sub>L</sub> = 10 mA	140		220 160		220 160	
	I <sub>L</sub> = 50 mA	375		600 1200		600 1200	
	I <sub>L</sub> = 100 mA	1300		1500 2000		1500 2000	
	V <sub>ON/OFF</sub> < 0.18V	0		1		1	
ON/OFF Input Voltage (Note 8)	High = O/P ON Low = O/P OFF	1.4 0.55	<b>2.0</b>	<b>0.18</b>	<b>2.0</b>	<b>0.18</b>	V
ON/OFF Input Current	V <sub>ON/OFF</sub> = 0 V <sub>ON/OFF</sub> = 5V	0 5		-1 <b>15</b>		-1 <b>15</b>	μA
Peak Output Current	V <sub>OUT</sub> ≥ V <sub>O(NOM)</sub> - 5%	150	100		100		mA
Output Noise Voltage (RMS)	BW = 300 Hz - 50 kHz, C <sub>OUT</sub> = 10 μF	160					μV
Ripple Rejection	f = 1 kHz C <sub>OUT</sub> = 10 μF	63					dB
Short Circuit Current	R <sub>DS(on)</sub> = 0 (Steady State) (Note 9)	150					mA

Note 1: Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its rated operating conditions.

Note 2: The ESD rating of pins 3 and 4 is 1 kV.

Note 3: The maximum allowable power dissipation is a function of the maximum junction temperature, T<sub>J(MAX)</sub>, the junction-to-ambient resistance, θ<sub>JA</sub>, and the ambient temperature, T<sub>A</sub>. The maximum allowable power dissipation at any ambient temperature is calculated using:

$$P(\text{MAX}) = T_{J(\text{MAX})} - T_A$$

The value of θ<sub>JA</sub> for the SOT-23 package is 300°C/W. Exceeding the maximum allowable power dissipation will cause excessive die temperature, and the regulator will go into thermal shutdown.

Note 4: If used in a dual-supply system where the regulator load is returned to a negative supply, the LP2980 output must be diode-clamped to ground.

Note 5: The output PNP structure contains a diode between the V<sub>IN</sub> and V<sub>OUT</sub> terminals that is normally reverse-biased. Reversing the polarity from V<sub>IN</sub> to V<sub>OUT</sub> will turn on this diode.

Note 6: Limits are 100% production tested at 25°C. Limits over the operating temperature range are guaranteed through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate ALPHA'S Averaging Outgoing Level (AOQL).

Note 7: Dropout voltage is defined as the input to output differential at which the output voltage drops 100 mV below the value measured with a 1 V differential.

Note 8: The ON/OFF inputs must be properly driven to prevent misoperation.

BLOCK DIAGRAM

