

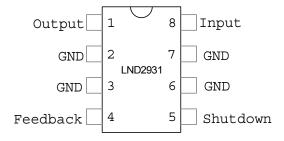
LND2931

# 100mA Low Dropout Voltage Regulator

### **GENERAL DESCRIPTION**

This series of fixed-voltage and adjustable monolithic micropower voltage regulators is designed for a wide range of applications. This device is an excellent choice for use in batterypowered application. Furthermore, the quiescent current increases only slightly at dropout, which prolongs battery life. This series of fixed-voltage (Tvp. 60mV at light load and 300mV at 100mV) 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. This series of fixedvoltage and adjustable regulators is offered in 3pin TO-92 package (TO-220-5, SO-8 for LND2931) compatible with other fixed-voltage regulators.

### PIN CONFIGURATION



### **FEATURES**

- 3- terminal regulators (To-220-5, SO-8 for LND2931)
- 100mA output within 2% over temperature
- Very low guiescent current
- Low dropout voltage (300mV Typ)
- Extremely tight load and line regulation
- Very low temperature coefficient
- Current and thermal limiting
- Unregulated DC input can withstand
   -20V reverse battery and +60V positive transients
- Direct replacement for National LM2931 fixed series, but has lower ground current, higher accuracy of output voltage and extremely tight load and line regulation. For adjust model LND2931 see typical applications on figure 2.

### **APPLICATIONS**

- High-efficiency linear regulators
- Battery powered systems
- Portable/Palm top/ Notebook Computers
- Portable consumer equipment
- Portable instrumentation
- Automotive Electronics
- SMPS Post Regulator



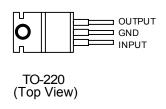
# **ABSOLUTE MAXIMUM RATINGS**

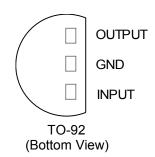
Power Dissipation	Internally Limited	
Lead Temperature(Soldering, 5 seconds)	260°C	
Storage Temperature Range	-65°C to +150°C	
Operating Junction Temperature Range	-55°C to +150°C	
Input Supply Voltage	-20V to +35V	

# **DEVICE SELECTION GUIDE**

Vout , VOLTS	Device
3.3V*	LND2931-3.3
5.0V	LND2931-5.0
8.0V	LND2931-8.0
8.5V	LND2931-8.5
9.0V	LND2931-9.0
10.0V	LND2931-10
12.0V	LND2931-12
15.0V	LND2931-15
3.0v to 24V	LND2931

 $<sup>^{\</sup>star}$  Other fixed versions are also available,  $V_{OUT}$  =2.0V to 5.0V. Please consult for more information.





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# **ELECTRICAL CHARACTERISTICS**

 $(T_J = 25^{\circ}C,\ I_O = 100\mu\text{A},\ V_{IN} = 14\text{V}\ (\text{for 2931-15},\ V_{IN} = 16\text{V}),\ C_O = 100\mu\text{F};\ unless \ otherwise \ noted)$ 

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage (Fixed Model)	-25° C≤Tյ≤ 85°C Full Operating Temperature	0.985  V <sub>O</sub>   0.98  V <sub>O</sub>	Vo	1.015 V <sub>O</sub>   1.02  V <sub>O</sub>	V
Output Voltage (Fixed Model)	100μA≤I <sub>L</sub> ≤ 100mA, T <sub>J</sub> ≤Tjmax	0.975  V <sub>O</sub>	Vo	1.025  V <sub>O</sub>	
Input Supply Voltage				26	
Output Voltage Temperature Coefficient	(Note 1)		50	150	ppm/°C
Line Regulation (Note 2)	13V ≤ Vin ≤ 26V (Note 3)		0.1	0.4	%
Load Regulation(Note 2)	1mA≤ I <sub>L</sub> ≤ 100mA		0.1	0.3	%
Dropout Voltage(Note 4)	I <sub>L</sub> =10mA I <sub>L</sub> =100mA		60 300	200 600	mV
Ground Current (Note 5)	I <sub>L</sub> =100μA I <sub>L</sub> =10mA I <sub>L</sub> =100mA		100 0.9 8	150 1.5 12	μA mA mA
Dropout Ground Current (Note 5)	V <sub>in</sub> =V <sub>out</sub> -0.5V , I <sub>L</sub> =100μA		110	170	μA
Current Limit	V <sub>out</sub> =0		160	200	mA
Thermal Regulation(Note6)			0.05	0.2	% / W
Output Noise, 10Hz to 100KHz I <sub>L</sub> = 100mA	$C_L$ =2.2 $\mu$ F $C_L$ =3.3 $\mu$ F $C_L$ =33 $\mu$ F		500 350 120		μV RMS
Ripple Rejection Ratio	$I_O$ =10mA,f=120Hz, $C_o$ =100 $\mu$ F, Vin= $V_o$ +3V+2Vpp	60			dB
TO-220-5, SO-8 Versions C	Only	l			I
Reference Voltage		1.21	1.235	1.26	V
Reference Voltage	Over Temperature (note 7)	1.185		1.285	
Feedback Pin Bias Current			20	40	nA
Reference Voltage Temperature Coefficient	(Note 1)		50		ppm/°C
Feedback Pin Bias Current Temperature Coefficient			0.1		nA/°C
Shutdown Input					
Input Logic Voltage	Low(Regulator ON) High (Regulator OFF)	2	1.3	0.7	V
Shutdown Pin Input Current	V <sub>S</sub> = 2.4V V <sub>S</sub> = 26V		30 450	50 600	μΑ
Regulator Output Current in Shutdown	(Note 8)				
	5.0V ≤V <sub>out</sub> <15.0V			10	
	3.3V ≤V <sub>out</sub> <5.0 V			20	
	2.0V ≤V <sub>out</sub> <3.3V			30	

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Note 1: Output or reference voltage temperature coefficients defined as the worst case voltage change divided by the total temperature range.

Note 2: Regulations are 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 3: Line regulation is tested at 150°C for  $I_L$  = 1mA, for  $I_L$ =100 $\mu$ A and  $T_{J}$ =125°C, line regulation is guaranteed by design to 0.2%. For LND2931-15 16V<= Vin <=26V.

Note 4: Dropout voltage is defined as the input to output differential at which the output voltage drops 2% below its nominal value measured at 1V differential.

Note 5: Ground pin current is the regulator quiescent current. The total current drawn from the source is the sum of the ground pin current and output load current.

Note 6: Thermal regulation is the change in output voltage at a time T after a change in power dissipation, excluding load or line regulation effects. Specifications are for a 50mA load pulse (1.25W pulse) for T=10ms.

Note7: Vref  $\leq$  V<sub>out</sub>  $\leq$  (Vin-1V), 2.3V $\leq$ Vin  $\leq$  26V, 100 $\mu$ A  $\leq$ I<sub>L</sub>  $\leq$  100 $\mu$ A, T<sub>J</sub>  $\leq$  T<sub>imax</sub>.

Note 8: Vshutdown  $\geq$  2V,  $V_{IN} \leq$  26V, Vout =0V.

### **BLOCK DIAGRAM AND TYPICAL APPLICATIONS**

Figure 1: Fixed Regulator

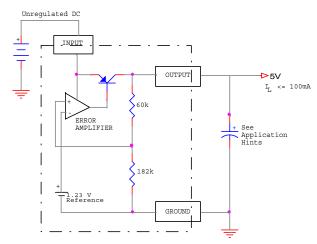
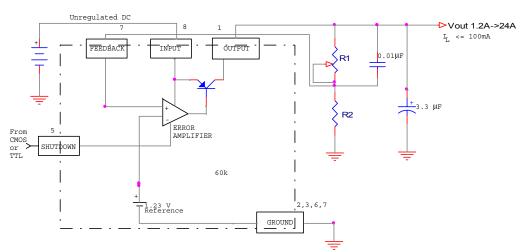


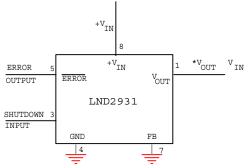
Figure 2:Adjustable Regulator



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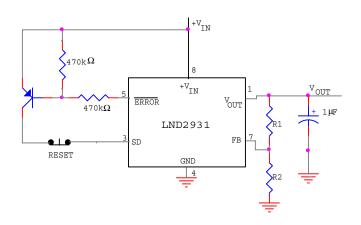


## **TYPICAL APPLICATIONS**

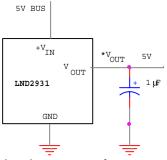


\*Minimum input-output voltage ranges from  $40\,\text{mV}$  to  $400\,\text{mV},$  depending on load current. Current limit is typically 160mA.

### Wide Input Voltage Range Current Limiter

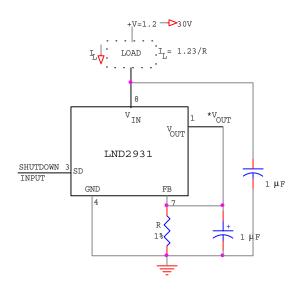


Latch Off When Error Flag Occurs



\*Minimum input-output voltage ranges from 40mV to 400mV, depending on load current. Current limit is typically 160mA.

#### **5V Current Limiter**



Low Drift Current Source