

LM2930 3-Terminal Positive Regulator

Check for Samples: [LM2930](#)

FEATURES

- Input-Output Differential Less Than 0.6V
- Output Current in Excess of 150 mA
- Reverse Battery Protection
- 40V Load Dump Protection
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Mirror-Image Insertion Protection
- P⁺ Product Enhancement Tested

VOLTAGE RANGE

- LM2930T-5.0: 5V
- LM2930T-8.0: 8V
- LM2930S-5.0: 5V
- LM2930S-8.0: 8V

DESCRIPTION

The LM2930 3-terminal positive regulator features an ability to source 150 mA of output current with an input-output differential of 0.6V or less. Efficient use of low input voltages obtained, for example, from an automotive battery during cold crank conditions, allows 5V circuitry to be properly powered with supply voltages as low as 5.6V. Familiar regulator features such as current limit and thermal overload protection are also provided.

Designed originally for automotive applications, the LM2930 and all regulated circuitry are protected from reverse battery installations or 2 battery jumps. During line transients, such as a load dump (40V) when the input voltage to the regulator can momentarily exceed the specified maximum operating voltage, the regulator will automatically shut down to protect both internal circuits and the load. The LM2930 cannot be harmed by temporary mirror-image insertion.

Fixed outputs of 5V and 8V are available in the plastic TO-220 and SFM power packages.

Connection Diagrams

TO-220 Plastic Package

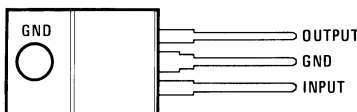


Figure 1. Front View
See Package Number NDE

SFM Plastic Surface-Mount Package

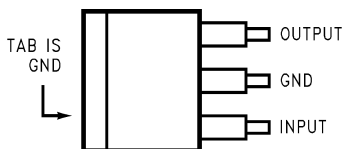


Figure 2. Top View
See Package Number KTT



Figure 3. Side View
See Package Number KTT



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 1998–2013, Texas Instruments Incorporated



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings⁽¹⁾⁽²⁾

Input Voltage	Operating Range	26V
	Overvoltage Protection	40V
	Reverse Voltage (100 ms)	–12V
	Reverse Voltage (DC)	–6V
Internal Power Dissipation ⁽³⁾		Internally Limited
Operating Temperature Range		–40°C to +85°C
Maximum Junction Temperature		125°C
Storage Temperature Range		–65°C to +150°C
Lead Temp. (Soldering, 10 seconds)		230°C

- (1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating ratings indicate conditions for which the device is functional, but do not ensure specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which ensure specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not ensured for parameters where no limit is given, however, the typical value is a good indication of device performance.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
- (3) Thermal resistance without a heat sink for junction to case temperature is 3°C/W and for case to ambient temperature is 50°C/W for the TO-220, 73°C/W for the SFM. If the SFM package is used, the thermal resistance can be reduced by increasing the P.C. board copper area thermally connected to the package. Using 0.5 square inches of copper area, θ_{JA} is 50°C/W; with 1 square inch of copper area, θ_{JA} is 37°C/W; and with 1.6 or more square inches of copper area, θ_{JA} is 32°C/W.

Electrical Characteristics⁽¹⁾

LM2930-5.0 $V_{IN}=14V$, $I_O=150$ mA, $T_J=25^\circ C$ ⁽²⁾, $C_2=10$ μF , unless otherwise specified

Parameter	Conditions	Typ	Tested Limit ⁽³⁾	Design Limit ⁽⁴⁾	Unit
Output Voltage		5	5.3		V_{MAX}
			4.7		V_{MIN}
	$6V \leq V_{IN} \leq 26V$, $5 mA \leq I_O \leq 150 mA$			5.5	V_{MAX}
	$-40^\circ C \leq T_J \leq 125^\circ C$			4.5	V_{MIN}
Line Regulation	$9V \leq V_{IN} \leq 16V$, $I_O=5$ mA	7	25		mV _{MAX}
	$6V \leq V_{IN} \leq 26V$, $I_O=5$ mA	30	80		mV _{MAX}
Load Regulation	$5 mA \leq I_O \leq 150 mA$	14	50		mV _{MAX}
Output Impedance	100 mA _{DC} & 10 mA _{rms} , 100 Hz–10 kHz	200			m Ω
Quiescent Current	$I_O=10$ mA	4	7		mA _{MAX}
	$I_O=150$ mA	18	40		mA _{MAX}
Output Noise Voltage	10 Hz–100 kHz	140			μV_{rms}
Long Term Stability		20			mV/1000 hr
Ripple Rejection	$f_O=120$ Hz	56			dB
Current Limit		400	700		mA _{MAX}
			150		mA _{MIN}
Dropout Voltage	$I_O=150$ mA	0.32	0.6		V_{MAX}
Output Voltage Under	$-12V \leq V_{IN} \leq 40V$, $R_L=100\Omega$		5.5		V_{MAX}
Transient Conditions			–0.3		V_{MIN}

- (1) All characteristics are measured with a capacitor across the input of 0.1 μF and a capacitor across the output of 10 μF . All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_W \leq 10$ ms, duty cycles $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.
- (2) To ensure constant junction temperature, low duty cycle pulse testing is used.
- (3) Ensured and 100% production tested.
- (4) Ensured (but not 100% production tested) over the operating temperature and input current ranges. These limits are not used to calculate outgoing quality levels.

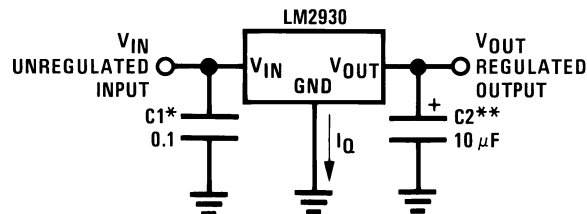
Electrical Characteristics⁽¹⁾

 LM2930-8.0 ($V_{IN}=14V$, $I_O=150\text{ mA}$, $T_J=25^\circ\text{C}$ ⁽²⁾, $C_2=10\text{ }\mu\text{F}$, unless otherwise specified)

Parameter	Conditions	Typ	Tested Limit ⁽³⁾	Design Limit ⁽⁴⁾	Unit
Output Voltage		8	8.5		V_{MAX}
			7.5		V_{MIN}
	$9.4V \leq V_{IN} \leq 26V$, $5\text{ mA} \leq I_O \leq 150\text{ mA}$, $-40^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$			8.8	V_{MAX}
				7.2	V_{MIN}
Line Regulation	$9.4V \leq V_{IN} \leq 16V$, $I_O=5\text{ mA}$	12	50		mV_{MAX}
	$9.4V \leq V_{IN} \leq 26V$, $I_O=5\text{ mA}$	50	100		mV_{MAX}
Load Regulation	$5\text{ mA} \leq I_O \leq 150\text{ mA}$	25	50		mV_{MAX}
Output Impedance	100 mA_{DC} & 10 mA_{rms} , $100\text{ Hz}-10\text{ kHz}$	300			$\text{m}\Omega$
Quiescent Current	$I_O=10\text{ mA}$	4	7		mA_{MAX}
	$I_O=150\text{ mA}$	18	40		mA_{MAX}
Output Noise Voltage	$10\text{ Hz}-100\text{ kHz}$	170			μV_{rms}
Long Term Stability		30			$\text{mV}/1000\text{ hr}$
Ripple Rejection	$f_O=120\text{ Hz}$	52			dB
Current Limit		400	700		mA_{MAX}
			150		mA_{MIN}
Dropout Voltage	$I_O=150\text{ mA}$	0.32	0.6		V_{MAX}
Output Voltage Under	$-12V \leq V_{IN} \leq 40V$, $R_L=100\Omega$		8.8		V_{MAX}
Transient Conditions			-0.3		V_{MIN}

- (1) All characteristics are measured with a capacitor across the input of $0.1\text{ }\mu\text{F}$ and a capacitor across the output of $10\text{ }\mu\text{F}$. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_W \leq 10\text{ ms}$, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.
- (2) To ensure constant junction temperature, low duty cycle pulse testing is used.
- (3) Ensured and 100% production tested.
- (4) Ensured (but not 100% production tested) over the operating temperature and input current ranges. These limits are not used to calculate outgoing quality levels.

Typical Application



*Required if regulator is located far from power supply filter.

** C_{OUT} must be at least $10\text{ }\mu\text{F}$ to maintain stability. May be increased without bound to maintain regulation during transients. Locate as close as possible to the regulator. This capacitor must be rated over the same operating temperature range as the regulator. The equivalent series resistance (ESR) of this capacitor should be less than 1Ω over the expected operating temperature range.

Typical Performance Characteristics

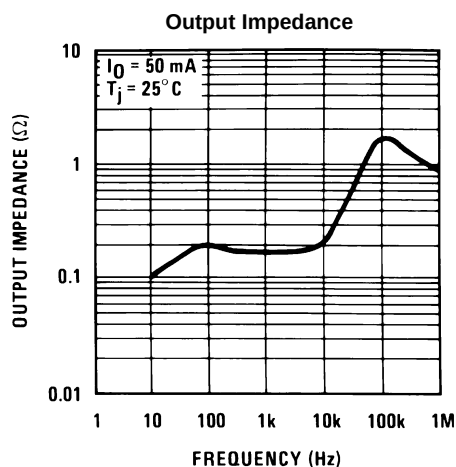


Figure 4.

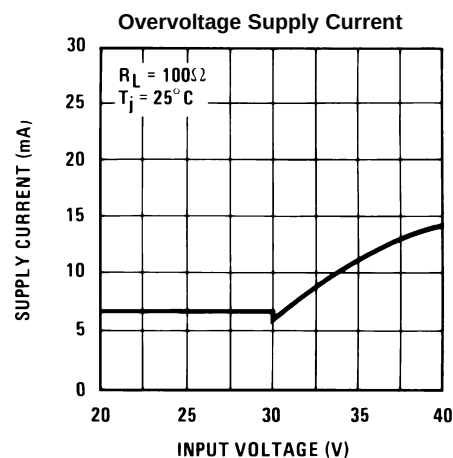


Figure 5.

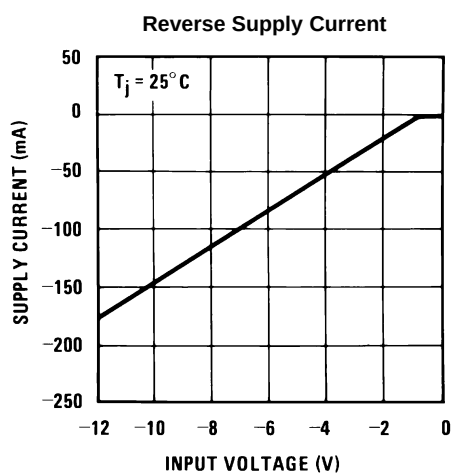


Figure 6.

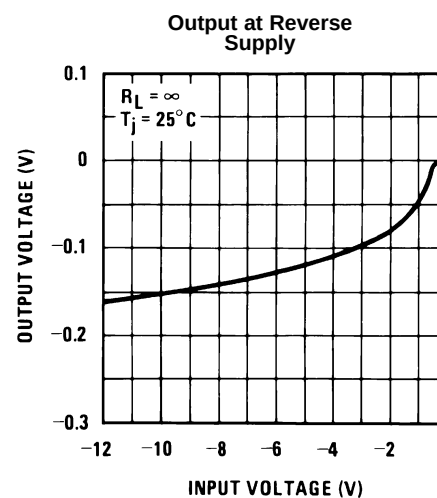


Figure 7.

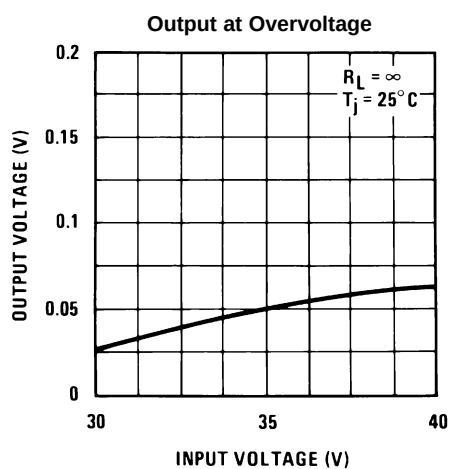


Figure 8.

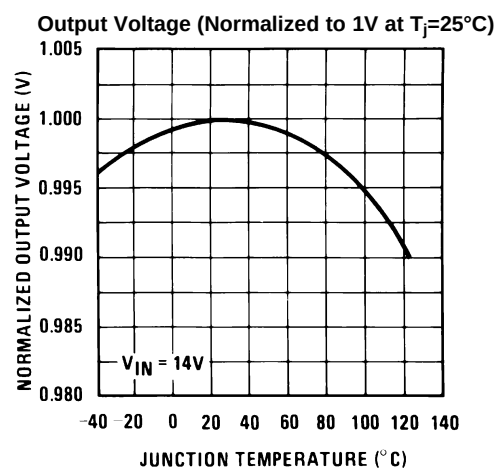


Figure 9.

Typical Performance Characteristics (continued)

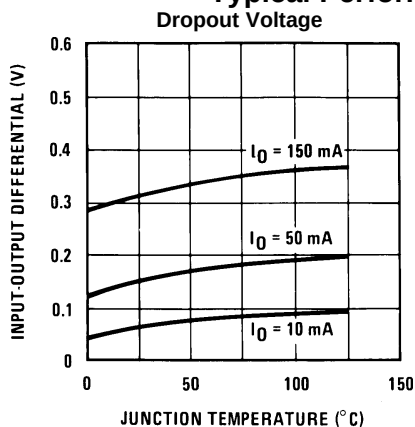


Figure 10.

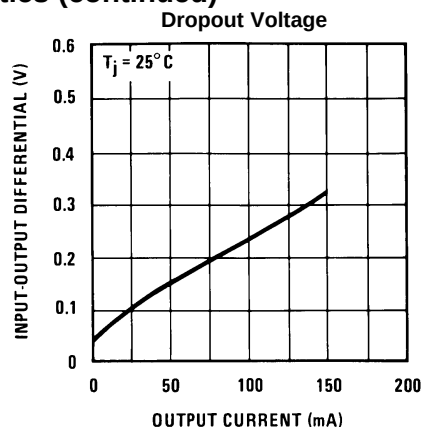


Figure 11.

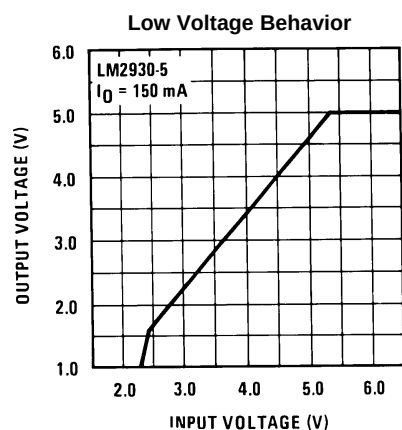


Figure 12.

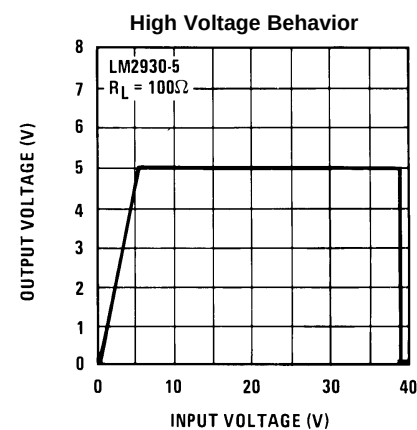


Figure 13.

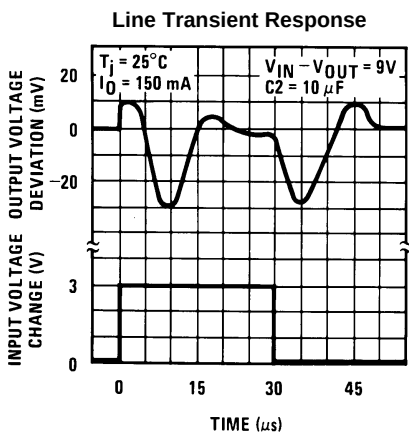


Figure 14.

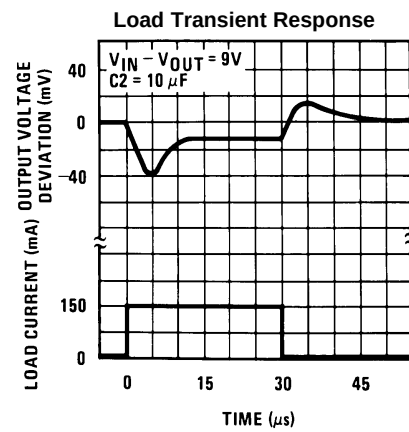


Figure 15.

Typical Performance Characteristics (continued)

Peak Output Current

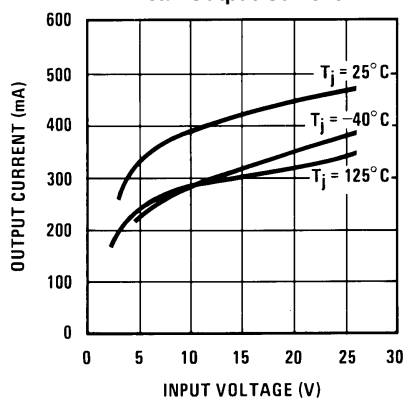


Figure 16.

Quiescent Current

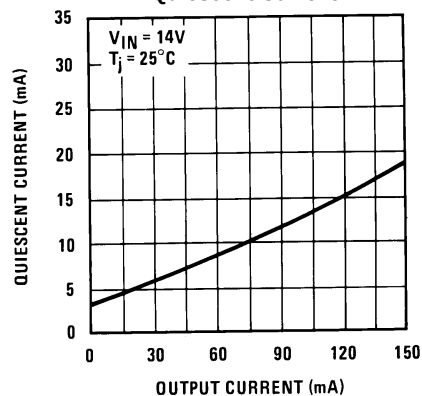


Figure 17.

Quiescent Current

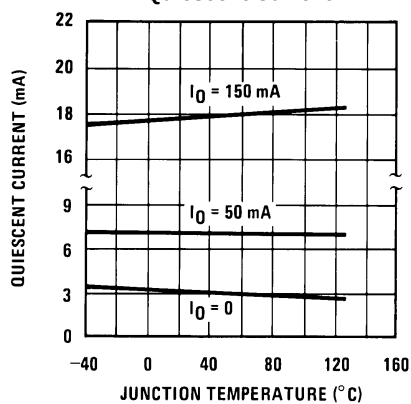


Figure 18.

Quiescent Current

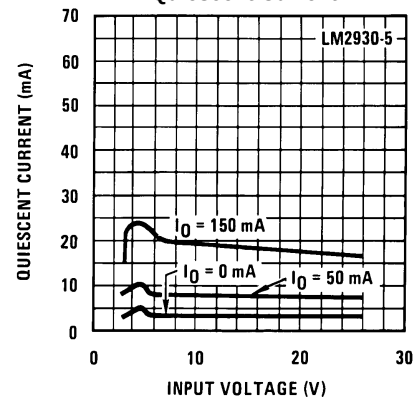


Figure 19.

Ripple Rejection

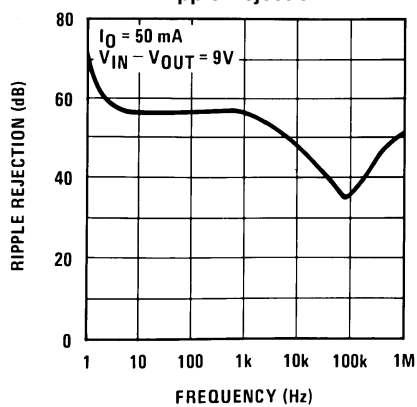


Figure 20.

Ripple Rejection

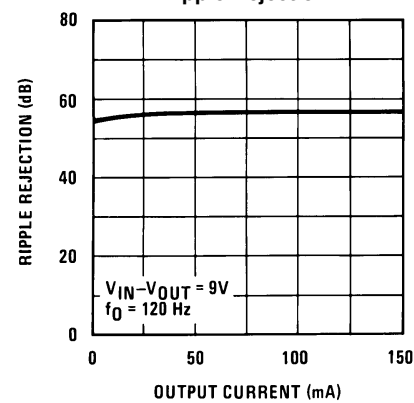


Figure 21.

Definition of Terms

Dropout Voltage: The input-output voltage differential at which the circuit ceases to regulate against further reduction in input voltage. Measured when the output voltage has dropped 100 mV from the nominal value obtained at 14V input, dropout voltage is dependent upon load current and junction temperature.

Input Voltage: The DC voltage applied to the input terminals with respect to ground.

Input-Output Differential: The voltage difference between the unregulated input voltage and the regulated output voltage for which the regulator will operate.

Line Regulation: The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

Load Regulation: The change in output voltage for a change in load current at constant chip temperature.

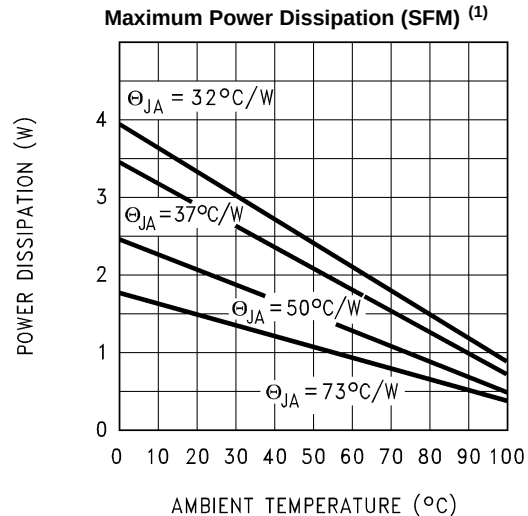
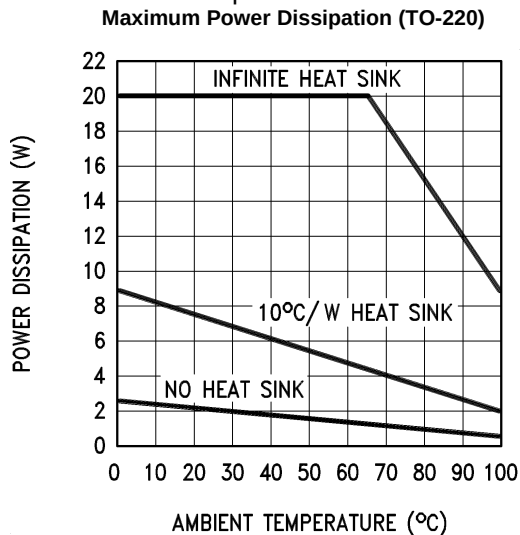
Long Term Stability: Output voltage stability under accelerated life-test conditions after 1000 hours with maximum rated voltage and junction temperature.

Output Noise Voltage: The rms AC voltage at the output, with constant load and no input ripple, measured over a specified frequency range.

Quiescent Current: That part of the positive input current that does not contribute to the positive load current. The regulator ground lead current.

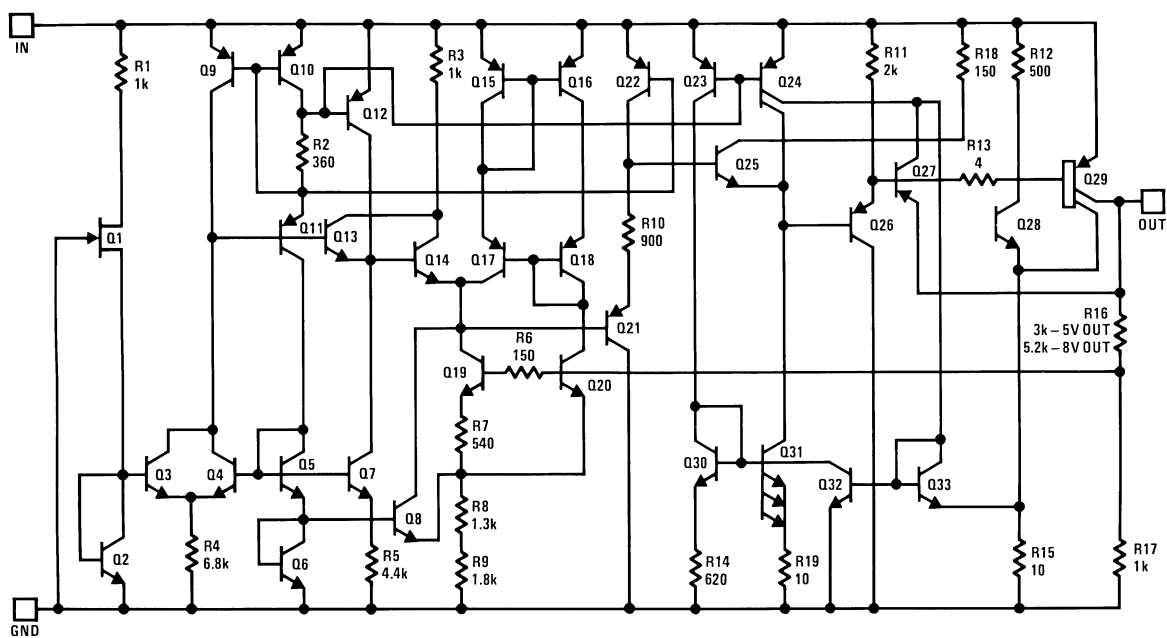
Ripple Rejection: The ratio of the peak-to-peak input ripple voltage to the peak-to-peak output ripple voltage.

Temperature Stability of V_O : The percentage change in output voltage for a thermal variation from room temperature to either temperature extreme.



- (1) Thermal resistance without a heat sink for junction to case temperature is 3°C/W and for case to ambient temperature is 50°C/W for the TO-220, 73°C/W for the SFM. If the SFM package is used, the thermal resistance can be reduced by increasing the P.C. board copper area thermally connected to the package. Using 0.5 square inches of copper area, Θ_{JA} is 50°C/W ; with 1 square inch of copper area, Θ_{JA} is 37°C/W ; and with 1.6 or more square inches of copper area, Θ_{JA} is 32°C/W .

Schematic Diagram



REVISION HISTORY

Changes from Revision C (April 2013) to Revision D	Page
• Changed layout of National Data Sheet to TI format	8

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LM2930T-5.0/NOPB	Active	Production	TO-220 (NDE) 3	45 TUBE	Yes	SN	Level-1-NA-UNLIM	-40 to 85	LM2930T -5.0 P+
LM2930T-5.0/NOPB.B	Active	Production	TO-220 (NDE) 3	45 TUBE	Yes	SN	Level-1-NA-UNLIM	-40 to 85	LM2930T -5.0 P+

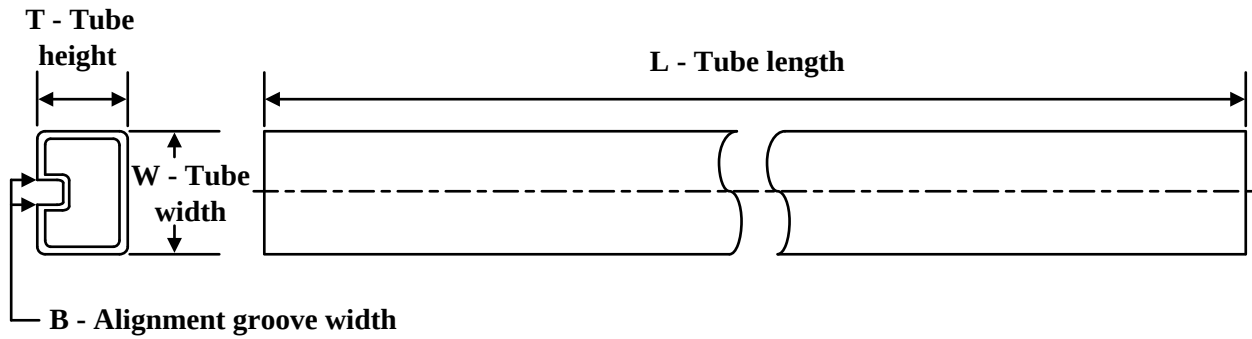
- (1) **Status:** For more details on status, see our [product life cycle](#).
- (2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
- (3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.
- (4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
- (5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
- (6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
LM2930T-5.0/NOPB	NDE	TO-220	3	45	502	33	6985	4.06
LM2930T-5.0/NOPB.B	NDE	TO-220	3	45	502	33	6985	4.06



IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2025, Texas Instruments Incorporated