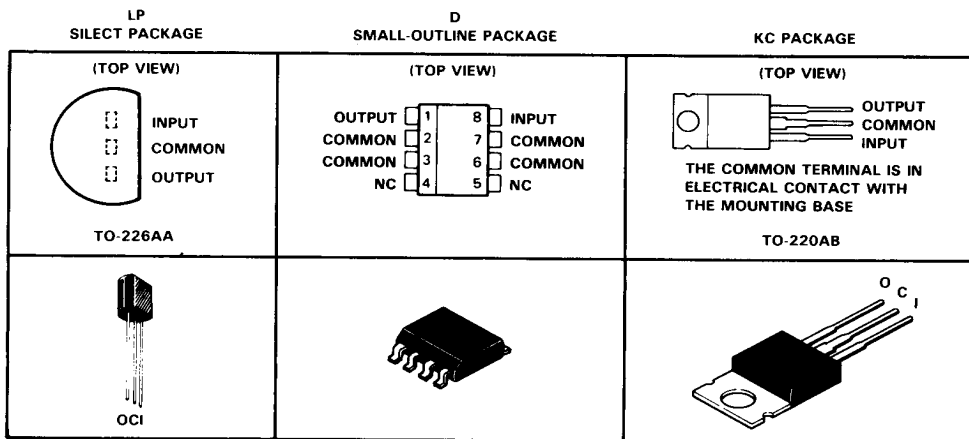


LM2931-5AQ 3-TERMINAL POSITIVE VOLTAGE REGULATOR

D2828, AUGUST 1988—REVISED OCTOBER 1988

- Input-Output Differential Less than 0.6 V
- Output Current of 150 mA
- Reverse Battery Protection
- Very Low Quiescent Current
- 60-V Load-Dump Protection
- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- Mirror-Image Insertion Protection
- Reverse Transient Protection
- Direct Improved Replacement for National LM2931-5 and LM2931A-5



description

The LM2931-5AQ is a 3-terminal positive voltage regulator that provides a 5-V regulated output. It features the ability to source 150 mA of output current with an input-output differential of 0.6 V or less. Familiar regulator features such as current limit and thermal overload protection are also provided.

This device also has a low dropout voltage making it useful for certain battery applications. For example, because the low dropout voltage allows a longer battery discharge before the output falls out of regulation, the battery supplying the regulator input voltage may discharge to 5.6 V and still properly regulate the 5-V load voltage. Supporting this feature, the LM2931-5AQ protects both itself and the regulated system from reverse battery installation or 2-battery jumps. The very low quiescent current feature is especially useful in battery-powered applications.

Other protection features include line transient protection from load-dump of up to 60 V. In this case, the regulator shuts down to avoid damaging internal and external circuits. The LM2931-5AQ regulator is virtually immune to temporary mirror-image insertion.

The Q suffix indicates that the device is characterized for operation from -40°C to 125°C .

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

TEXAS
INSTRUMENTS

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LM2931-5AQ

3-TERMINAL POSITIVE VOLTAGE REGULATOR

absolute maximum ratings over operating junction temperature range (unless otherwise noted)

Continuous input voltage	26 V
Transient input voltage: $t = 1 \text{ s}$	60 V
Continuous reverse input voltage	-15 V
Transient reverse input voltage: $t = 100 \text{ ms}$	-50 V
Continuous total dissipation (see Note 1)	See Dissipation Rating Tables 1 and 2
Operating virtual junction temperature	-40°C to 125°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTE 1: To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variation in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection may be activated at power levels slightly above or below the rated dissipation.

DISSIPATION RATING TABLE 1 — FREE-AIR TEMPERATURE

PACKAGE	$T_A \leq 25^\circ\text{C}$	DERATING FACTOR	$T_A = 125^\circ\text{C}$
	POWER RATING	ABOVE $T_A = 25^\circ\text{C}$	POWER RATING
D	825 mW	6.6 mW/°C	165 mW
KC	2000 mW	16 mW/°C	400 mW
LP	775 mW	6.2 mW/°C	155 mW

DISSIPATION RATING TABLE 2 — CASE TEMPERATURE

PACKAGE	$T_C \leq 25^\circ\text{C}$	DERATING	DERATE	$T_C = 125^\circ\text{C}$
	POWER RATING	FACTOR	ABOVE T_C	POWER RATING
D	1600 mW	29.4 mW/°C	96°C	735 mW
KC	20 W	0.18 W/°C	39°C	4.5 W
LP	1600 mW	28.6 mW/°C	94°C	715 mW

recommended operating conditions

	MIN	MAX	UNIT
Output current, I_O		150	mA
Operating virtual junction temperature, T_J	-40	125	°C

electrical characteristics at 25°C virtual junction temperature, $V_I = 14 \text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	MIN	TYP	MAX	UNIT
Output voltage	$V_I = 6 \text{ V to } 26 \text{ V}$, $I_O \leq 150 \text{ mA}$, $T_J = -40^\circ\text{C to } 125^\circ\text{C}$	4.75	5	5.25	V
Input regulation	$I_O = 10 \text{ mA}$, $V_I = 9 \text{ V to } 16 \text{ V}$		2	10	mV
	$V_I = 6 \text{ V to } 26 \text{ V}$		4	30	
Ripple rejection	$I_O = 10 \text{ mA}$, $f = 120 \text{ Hz}$	60	80		dB
Output regulation	$I_O = 5 \text{ mA to } 150 \text{ mA}$		14	50	mV
Output voltage long-term drift‡	$I_O = 10 \text{ mA}$, After 1000 h at $T_J = 125^\circ\text{C}$		20		mV
Dropout voltage	$I_O = 10 \text{ mA}$		0.05	0.2	V
	$I_O = 150 \text{ mA}$		0.3	0.6	
Output noise voltage	$I_O = 10 \text{ mA}$, $f = 10 \text{ Hz to } 100 \text{ kHz}$		500		µV rms
Bias current	$V_I = 6 \text{ V to } 26 \text{ V}$, $I_O = 10 \text{ mA}$, $T_J = -40^\circ\text{C to } 125^\circ\text{C}$		0.4	1	mA
	$V_I = 14 \text{ V}$, $I_O = 150 \text{ mA}$, $T_J = 25^\circ\text{C}$		10	12	

† Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input to common and a 100-µF capacitor, with equivalent series resistance of less than 1 Ω, across the output to common.

‡ Since long-term drift cannot be measured on the individual devices prior to shipment, this specification is not intended to be a guarantee or warranty. It is an engineering estimate of the average drift to be expected from lot to lot.