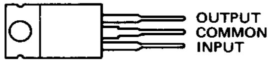
D2700, APRIL 1983—REVISED APRIL 1988

- **Input-Output Differential Less than 0.6 V**
- **Output Current of 150 mA**
- **Reverse Polarity Protection**
- **Line Transient Protection**
- **Internal Short-Circuit Current Limiting**
- **Internal Thermal Overload Protection**
- **Mirror-Image Insertion Protection**
- **Direct Replacement for National LM330T-5.0**

KC PACKAGE

(TOP VIEW)



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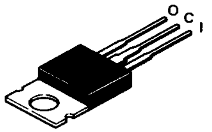
TO-220AB



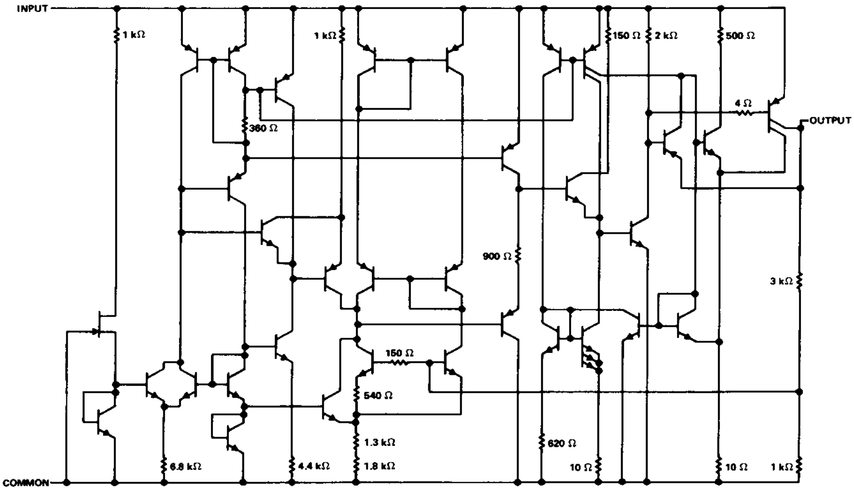
description

The LM330 3-terminal positive regulator features an ability to source 150 mA of output current with an input-output differential of 0.6 volt or less. Familar regulator features such as current limit and thermal overload protection are also provided.

The LM330 has low dropout voltage making it useful for certain battery applications. For example, since the low dropout voltage allows a longer battery discharge before the output falls out of regulation, a battery supplying the regulator input voltage may discharge to 5.6 V and still properly regulate the system and load voltage. The LM330 protects both itself and the regulated system from reverse installation of batteries.

Other protection features include line transient protection above 40 V, where the output actually shuts down to avoid damaging internal and external circuits. The LM330 regulator cannot be harmed by temporary mirror-image insertion.

schematic diagram



Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Continuous input voltage	26 V
Transient input voltage t = 1 s	40 V
Continuous total dissipation at 25°C free-air temperature (see Note 1)	2 W
Continuous total dissipation at (or below) case temperature (see Note 1)	15 W
Operating free-air, case, or virtual junction temperature	−55°C to 150°C
Storage temperature	−65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTE 1: For operation above 25°C free-air or case temperature, refer to Figures 1 and 2. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variations 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.

FREE-AIR TEMPERATURE
DISSIPATION DERATING CURVE

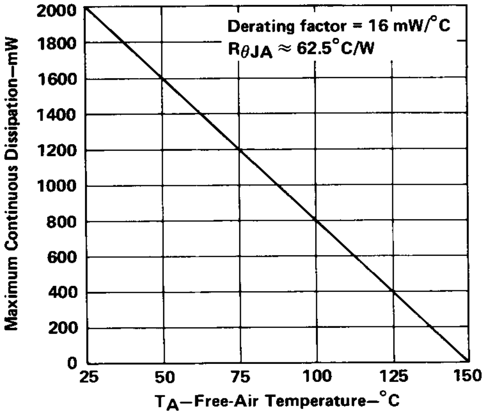


FIGURE 1

CASE TEMPERATURE
DISSIPATION DERATING CURVE

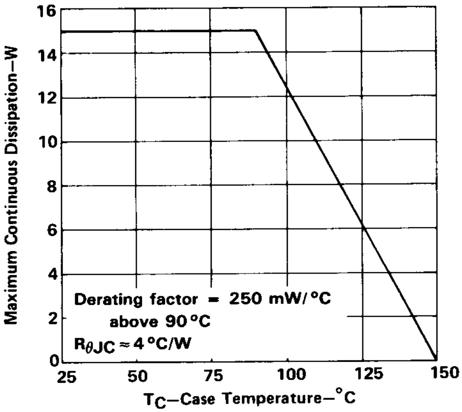


FIGURE 2

recommended operating conditions

		MIN	MAX	UNIT
I_O	Output current	5	150	mA
T_A	Operating virtual junction temperature	0	100	°C

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electrical characteristics at 25°C virtual junction temperature, V_I = 14 V, I_O = 150 mA, (unless otherwise noted)

PARAMETERS	TEST CONDITIONS†		MIN	TYP	MAX	UNIT
Output voltage	V_I = 6 V to 26 V, I_O = 5 mA to 150 mA, T_J = 0°C to 100°C		4.8	5	5.2	V
Input regulation		V_I = 9 V to 16 V		7	25	mV
		V_I = 6 V to 26 V		30	60	mV
Ripple rejection	f = 120 Hz			56		dB
Output regulation	I_O = 5 mA to 150 mA			14	50	mV
Output voltage long-term drift‡	After 1000 h at T_J = 150°C			20		mV
Dropout voltage	I_O = 150 mA			0.32	0.6	V
Output noise voltage	f = 10 Hz to 100 kHz			50		μV
Output voltage with input polarity reversed	R_L = 100 Ω	V_I = −30 V, t = 100 ms		> −0.3		V
	R_L = 100 Ω	V_I = −12 V, DC		> −0.3		V
Output voltage with input transient	V_I = 60 V, t = 100 ms			<5.5		V
	V_I = 50 V, t = 1 s			<5.5		V
Bias current with input transient	R_L = 100 Ω	V_I = 40 V, t = 1 s		14		mA
	R_L = 100 Ω	V_I = −6 V, t = 1 s		−80		mA
Overvoltage shutdown voltage			26	45		V
Output impedance	I_O = 100 mA, I_O = 10 mA (rms), f = 100 Hz to 10 kHz			200		mΩ
Bias current	I_O = 10 mA			3.5	7	mA
	I_O = 50 mA			5	11	mA
	I_O = 150 mA			18	40	mA
Bias current change	V_I = 6 V to 26 V			10		%
Peak output current			150	420	700	mA

† 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 and a 10-μF capacitor across the output.

‡ 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.

2

Data Sheets

TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE
vs
VIRTUAL JUNCTION TEMPERATURE

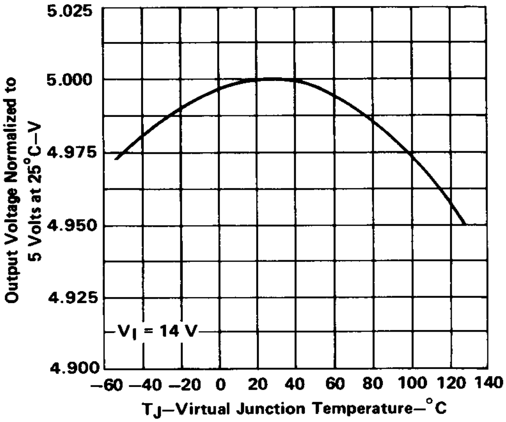


FIGURE 3

OUTPUT VOLTAGE
vs
INPUT VOLTAGE

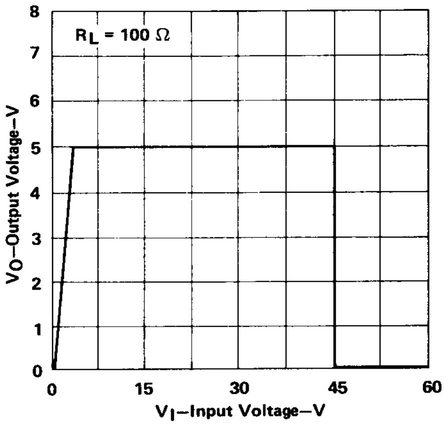


FIGURE 4

OUTPUT VOLTAGE
vs
INPUT VOLTAGE

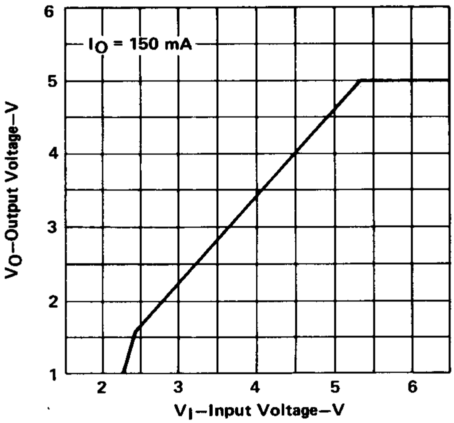


FIGURE 5

PEAK OUTPUT CURRENT
vs
INPUT VOLTAGE

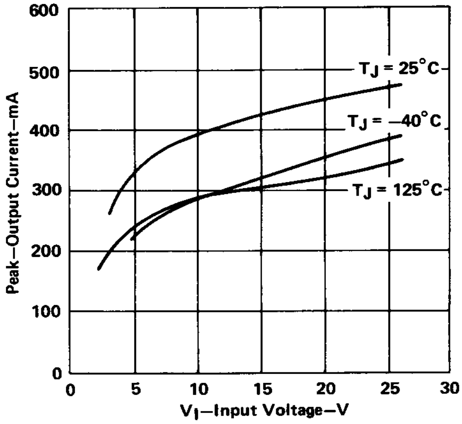


FIGURE 6

TYPICAL CHARACTERISTICS

RIPPLE REJECTION
vs
FREQUENCY

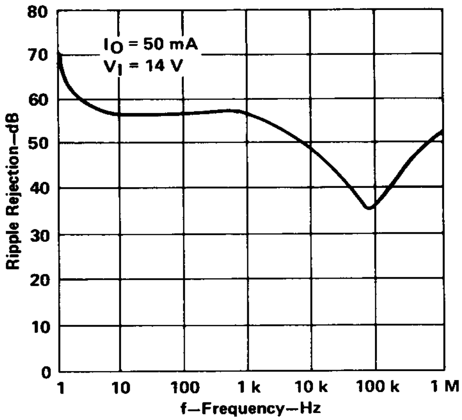


FIGURE 7

RIPPLE REJECTION
vs
OUTPUT CURRENT

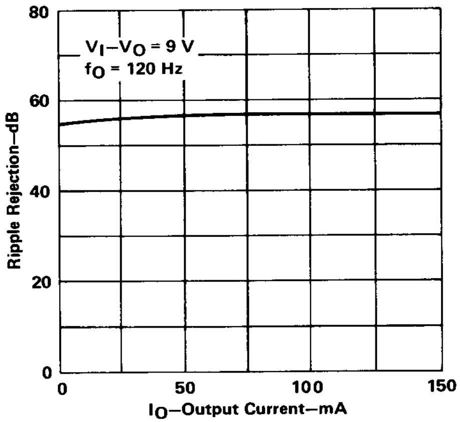


FIGURE 8

DROPOUT VOLTAGE
vs
VIRTUAL JUNCTION TEMPERATURE

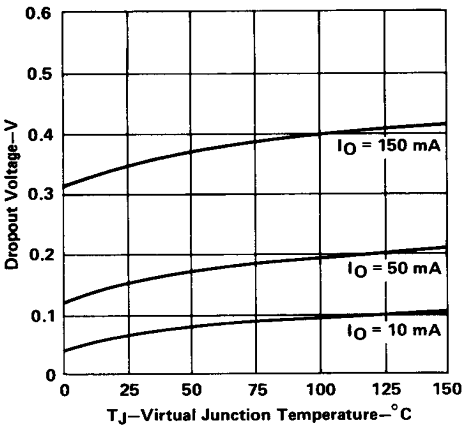


FIGURE 9

DROPOUT VOLTAGE
vs
OUTPUT CURRENT

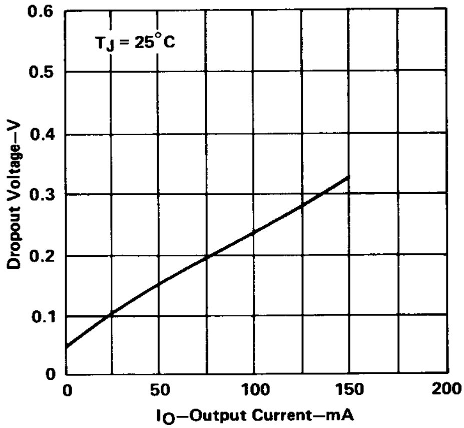


FIGURE 10

2
Data Sheets

TYPICAL CHARACTERISTICS

OUTPUT IMPEDANCE
vs
FREQUENCY

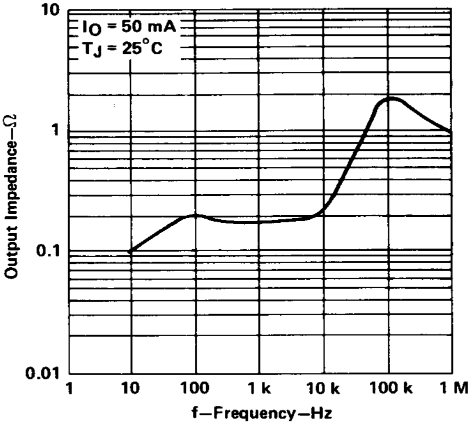


FIGURE 11

INPUT CURRENT
vs
INPUT VOLTAGE

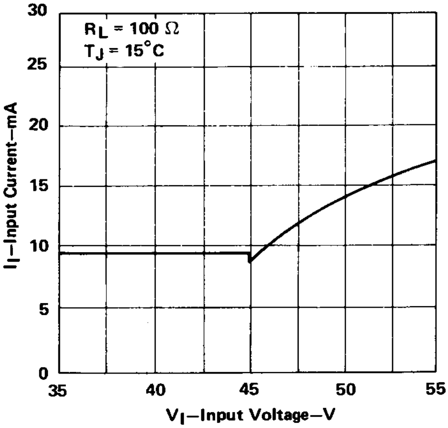


FIGURE 12

LINE TRANSIENT RESPONSE

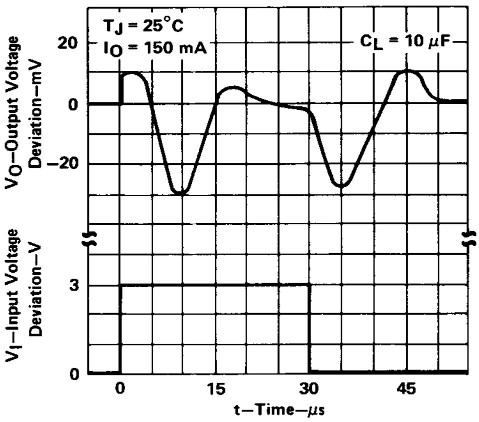


FIGURE 13

INPUT CURRENT
vs
REVERSE INPUT VOLTAGE

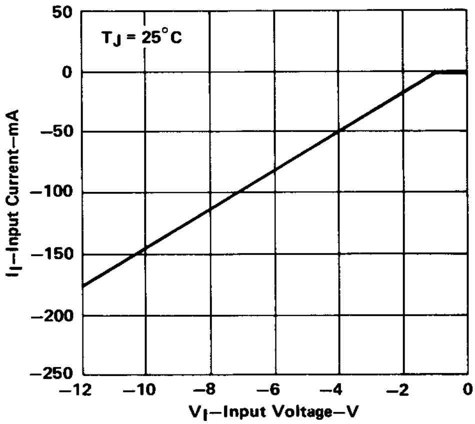


FIGURE 14

TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE
vs
REVERSE INPUT VOLTAGE

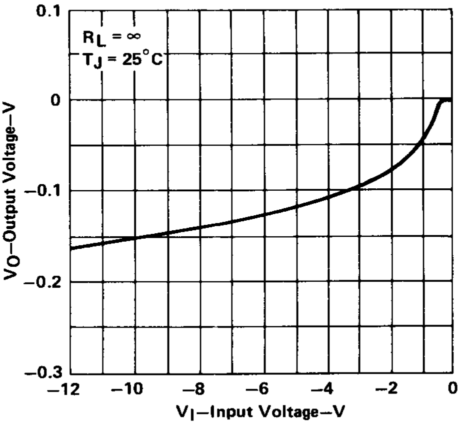


FIGURE 15

LOAD TRANSIENT RESPONSE

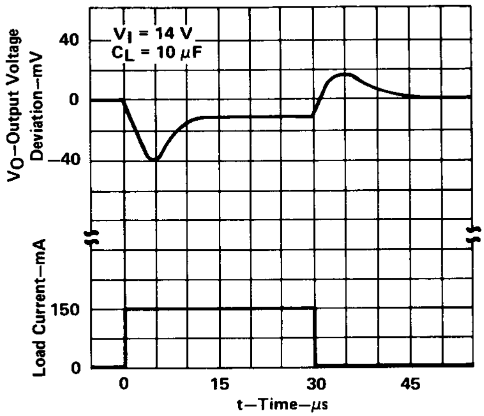


FIGURE 16

BIAS CURRENT
vs
OUTPUT CURRENT

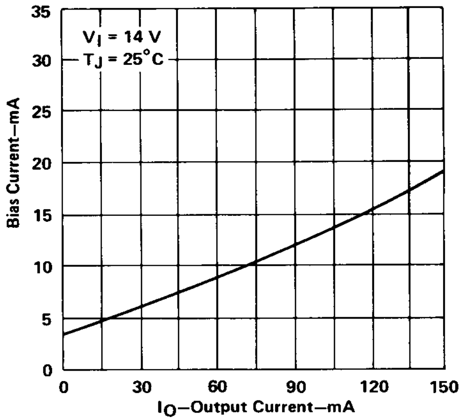


FIGURE 17

2 Data Sheets

TYPICAL CHARACTERISTICS

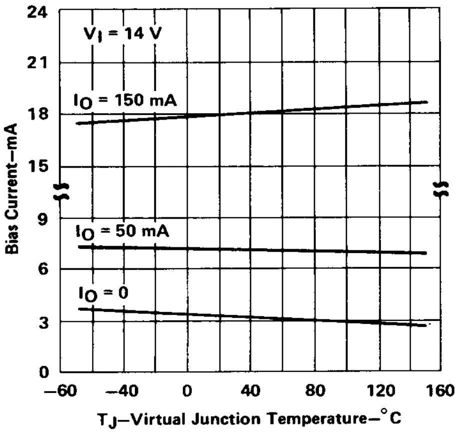


FIGURE 18

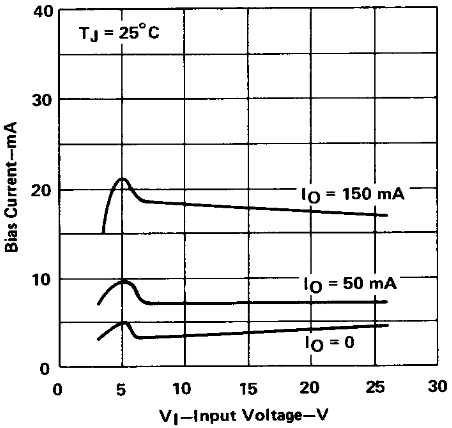
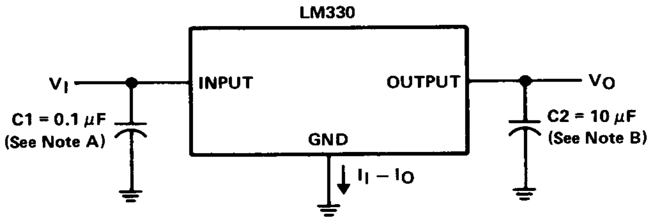


FIGURE 19

TYPICAL APPLICATION DATA



NOTES: A. Use of C1 is required if the regulator is not located in close proximity to the supply filter.
B. Capacitor C2 must be located as close as possible to the regulator and may be an aluminum or tantalum type capacitor. The minimum capacitance that will provide stability is 10-μF. The capacitor must be rated for operation at −40 °C to assure stability to that extreme.

FIGURE 20