

# LM2990

## Negative Low Dropout Regulator

### General Description

The LM2990 is a three-terminal, low dropout, 1 ampere negative voltage regulator available with fixed output voltages of -5, -5.2, -12, and -15V.

The LM2990 uses new circuit design techniques to provide low dropout and low quiescent current. The dropout voltage at 1A load current is typically 0.6V and a guaranteed worst-case maximum of 1V over the entire operating temperature range. The quiescent current is typically 1 mA with 1A load current and an input-output voltage differential greater than 3V. A unique circuit design of the internal bias supply limits the quiescent current to only 9 mA (typical) when the regulator is in the dropout mode ( $V_{OUT} - V_{IN} \leq 3V$ ). Output voltage accuracy is guaranteed to  $\pm 5\%$  over load, and temperature extremes.

The LM2990 is short-circuit proof, and thermal shutdown includes hysteresis to enhance the reliability of the device when overloaded for an extended period of time. The

LM2990 is available in a 3-lead TO-220 package and is rated for operation over the automotive temperature range of  $-40^{\circ}C$  to  $+125^{\circ}C$ .

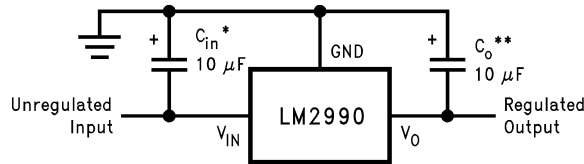
### Features

- 5% output accuracy over entire operating range
- Output current in excess of 1A
- Dropout voltage typically 0.6V at 1A load
- Low quiescent current
- Internal short circuit current limit
- Internal thermal shutdown with hysteresis
- Functional complement to the LM2940 series

### Applications

- Post switcher regulator
- Local, on-card, regulation
- Battery operated equipment

### Typical Application



01080101

\*Required if the regulator is located further than 6 inches from the power supply filter capacitors. A 1  $\mu F$  solid tantalum or a 10  $\mu F$  aluminum electrolytic capacitor is recommended.

\*\*Required for stability. Must be at least a 10  $\mu F$  aluminum electrolytic or a 1  $\mu F$  solid tantalum to maintain stability. May be increased without bound to maintain regulation during transients. Locate the capacitor as close as possible to the regulator. The equivalent series resistance (ESR) is critical, and should be less than 10 $\Omega$  over the same operating temperature range as the regulator.

### Ordering Information and Connection Diagrams

Temperature Range	Output Voltage				Package
	-5.0	-5.2	-12	-15	
-40°C to +125°C	LM2990T-5.0	LM2990T-5.2	LM2990T-12	LM2990T-15	TO-220
	LM2990S-5.0		LM2990S-12	LM2990S-15	TO-263
-55°C to +125°C	LM2990J-5.0-QML 5962-9571101QEA		LM2990J-12-QML 5962-9571001QEA	LM2990J-15-QML 5962-9570901QEA	J16A
	LM2990WG5.0-QML 5962-9571101QXA				WG16A

**Absolute Maximum Ratings** (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Input Voltage	-26V to +0.3V
ESD Susceptibility (Note 2)	2 kV
Power Dissipation (Note 3)	Internally Limited
Junction Temperature ( $T_{Jmax}$ )	125°C
Storage Temperature	-65°C to +150°C

Lead Temperature  
(Soldering, 10 sec.)

260°C

**Operating Ratings**(Note 1)

Junction Temperature Range ( $T_J$ )	-40°C to +125°C
Maximum Input Voltage (Operational)	-26V

**Electrical Characteristics**

$V_{IN} = -5V + V_{O(NOM)}$  (Note 6) ,  $I_O = 1A$ ,  $C_O = 47 \mu F$ , unless otherwise specified. **Boldface** limits apply over the entire operating temperature range,  $-40^\circ C \leq T_J \leq 125^\circ C$ , all other limits apply for  $T_J = 25^\circ C$ .

Parameter	Conditions	LM2990-5.0		LM2990-5.2		Units (Limit)
		Typ (Note 4)	Limit (Note 5)	Typ (Note 4)	Limit (Note 5)	
Output Voltage ( $V_O$ )	$5 mA \leq I_O \leq 1A$		-4.90 -5.10		-5.10 -5.30	V (max) mV (min) V
	$5 mA \leq I_O \leq 1A$	-5	<b>-4.75</b> <b>-5.25</b>	-5.2	<b>-4.94</b> <b>-5.46</b>	V (max) V (min)
Line Regulation	$I_O = 5 mA$ , $V_{O(NOM)} -1V > V_{IN} > -26V$	4	40	4	40	mV (max)
Load Regulation	$50 mA \leq I_O \leq 1A$	1	40	1	40	mV (max)
Dropout Voltage	$I_O = 0.1A$ , $\Delta V_O \leq 100 mV$	0.1	<b>0.3</b>	0.1	<b>0.3</b>	V (max)
	$I_O = 1A$ , $\Delta V_O \leq 100 mV$	0.6	<b>1</b>	0.6	<b>1</b>	V (max)
Quiescent Current ( $I_q$ )	$I_O \leq 1A$	1	5	1	5	mA (max)
	$I_O = 1A$ , $V_{IN} = V_{O(NOM)}$	9	50	9	50	mA (max)
Short Circuit Current	$R_L = 1\Omega$ (Note 7)	1.8	1.5	1.8	1.5	A (min)
Maximum Output Current	(Note 7)	1.8	1.5	1.8	1.5	A (min)
Ripple Rejection	$V_{ripple} = 1 V_{rms}$ , $f_{ripple} = 1 kHz$ , $I_O = 5 mA$	58	50	58	50	dB (min)
Output Noise Voltage	10 Hz–100 kHz, $I_O = 5 mA$	250	750	250	750	$\mu V$ (max)
Long Term Stability	1000 Hours	2000		2000		ppm

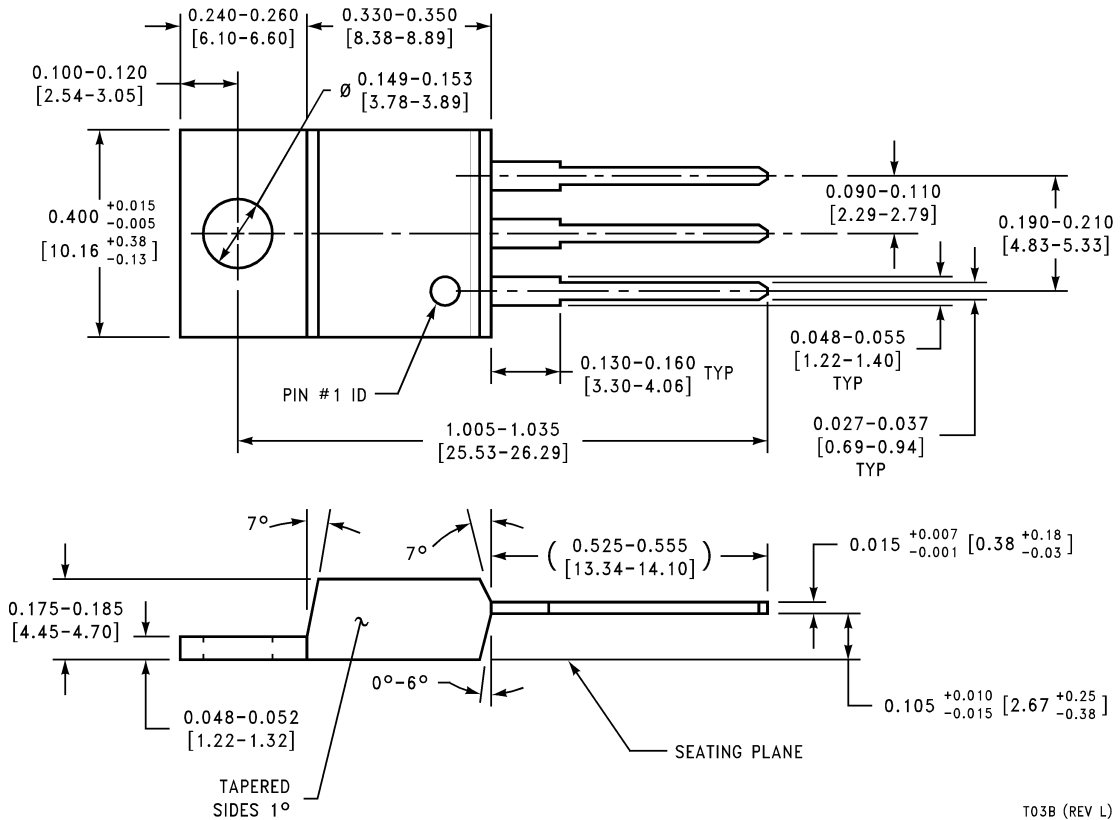
**Electrical Characteristics**

$V_{IN} = -5V + V_{O(NOM)}$  (Note 6) ,  $I_O = 1A$ ,  $C_O = 47 \mu F$ , unless otherwise specified. **Boldface** limits apply over the entire operating temperature range,  $-40^\circ C \leq T_J \leq 125^\circ C$ , all other limits apply for  $T_J = 25^\circ C$ .

Parameter	Conditions	LM2990-12		LM2990-15		Units (Limit)
		Typ (Note 4)	Limit (Note 5)	Typ (Note 4)	Limit (Note 5)	
Output Voltage ( $V_O$ )	$5 mA \leq I_O \leq 1A$		-11.76 -12.24		-14.70 -15.30	V (max) V (min) V
	$5 mA \leq I_O \leq 1A$	-12	<b>-11.40</b> <b>-12.60</b>	-15	<b>-14.25</b> <b>-15.75</b>	V (max) V (min)
Line Regulation	$I_O = 5 mA$ , $V_{O(NOM)} -1V > V_{IN} > -26V$	6	60	6	60	mV (max)
Load Regulation	$50 mA \leq I_O \leq 1A$	3	50	3	50	mV (max)
Dropout Voltage	$I_O = 0.1A$ , $\Delta V_O \leq 100 mV$	0.1	<b>0.3</b>	0.1	<b>0.3</b>	V (max)
	$I_O = 1A$ , $\Delta V_O \leq 100 mV$	0.6	<b>1</b>	0.6	<b>1</b>	V (max)

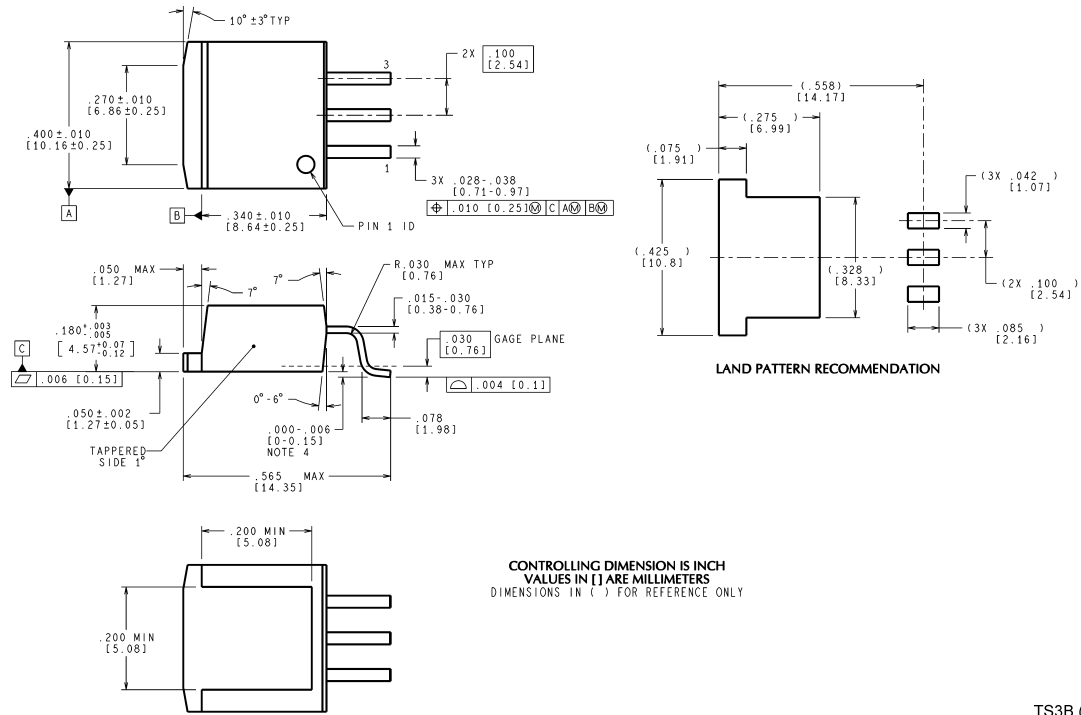
**Physical Dimensions** inches (millimeters)

unless otherwise noted



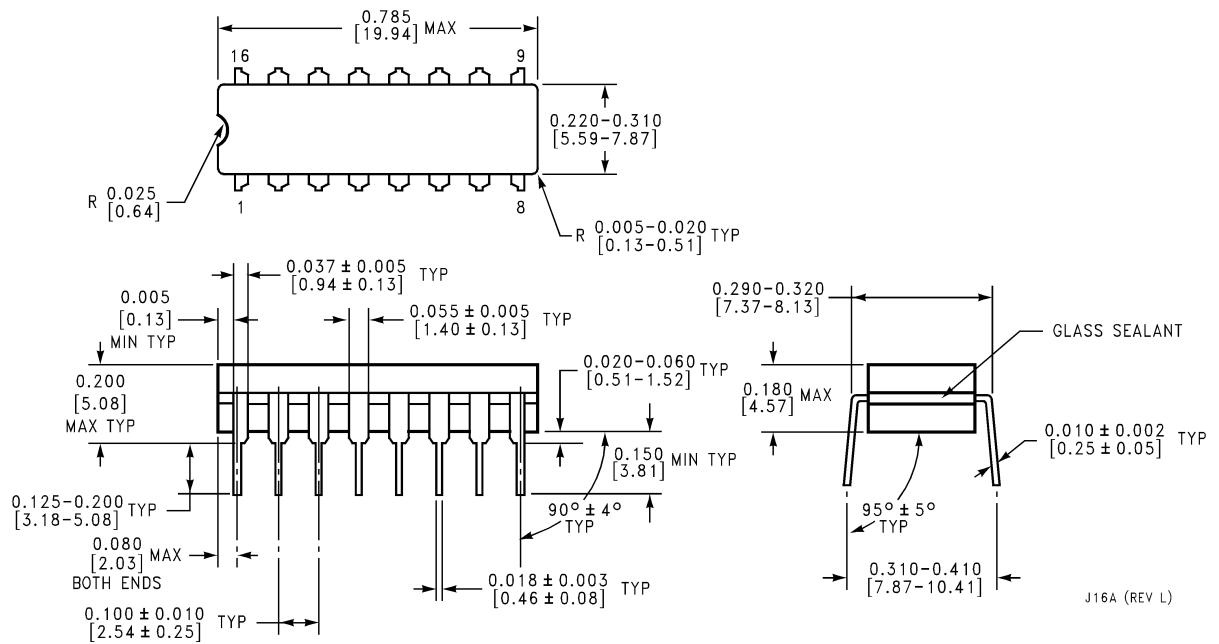
**TO-220 3-Lead Molded Package**  
**Order Number LM2990T-5.0, LM2990T-5.2, LM2990T-12 or LM2990T-15**  
**NS Package Number T03B**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



TS3B (Rev F)

**TO-263 3-Lead Plastic Surface Mount Package**  
**Order Number LM2990S-5.0, LM2990S-12 or LM2990S-15**  
**NS Package Number TS3B**



J16A (REV L)

**16-Lead Ceramic Dual-in-Line Package**  
**LM2990J-5.0-QML (5962-9571101QEA), LM2990J-12-QML (5962-9571001QEA), or LM2990J-15-QML (5962-9570901QEA),**  
**NS Package Number J16A**