

# LM317L, NCV317LB

## 100 mA Adjustable Output, Positive Voltage Regulator

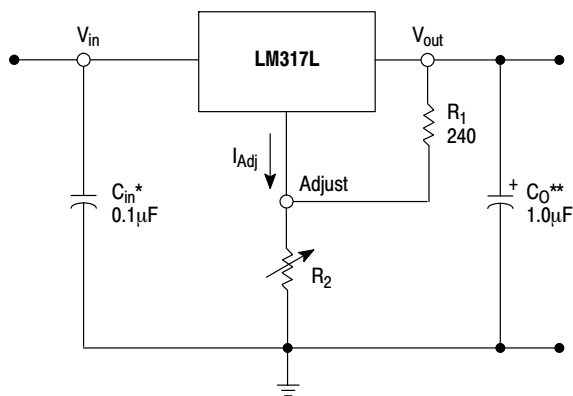
The LM317L is an adjustable 3-terminal positive voltage regulator capable of supplying in excess of 100 mA over an output voltage range of 1.2 V to 37 V. This voltage regulator is exceptionally easy to use and requires only two external resistors to set the output voltage. Further, it employs internal current limiting, thermal shutdown and safe area compensation, making them essentially blow-out proof.

The LM317L serves a wide variety of applications including local, on card regulation. This device can also be used to make a programmable output regulator, or by connecting a fixed resistor between the adjustment and output, the LM317L can be used as a precision current regulator.

### Features

- Output Current in Excess of 100 mA
- Output Adjustable Between 1.2 V and 37 V
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Floating Operation for High Voltage Applications
- Standard 3-Lead Transistor Package
- Eliminates Stocking Many Fixed Voltages
- Pb-Free Packages are Available
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes

### Simplified Application



\*  $C_{in}$  is required if regulator is located an appreciable distance from power supply filter.

\*\*  $C_O$  is not needed for stability, however, it does improve transient response.

$$V_{out} = 1.25 V \left( 1 + \frac{R_2}{R_1} \right) + I_{Adj} R_2$$

Since  $I_{Adj}$  is controlled to less than 100  $\mu A$ , the error associated with this term is negligible in most applications.

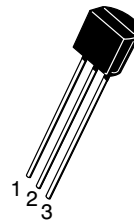


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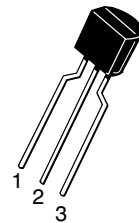
## LOW CURRENT THREE-TERMINAL ADJUSTABLE POSITIVE VOLTAGE REGULATOR



Pin 1.  $V_{in}$   
2.  $V_{out}$   
3.  $V_{out}$   
4. Adjust  
5. N.C.  
6.  $V_{out}$   
7.  $V_{out}$   
8. N.C.



TO-92  
Z SUFFIX  
CASE 29



Pin 1. Adjust  
2.  $V_{out}$   
3.  $V_{in}$

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 10 of this data sheet.

# LM317L, NCV317LB

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input-Output Voltage Differential	$V_I - V_O$	40	Vdc
Power Dissipation Case 29 (TO-92) $T_A = 25^\circ\text{C}$ Thermal Resistance, Junction-to-Ambient Thermal Resistance, Junction-to-Case	$P_D$ $R_{\theta JA}$ $R_{\theta JC}$	Internally Limited 160 83	W $^\circ\text{C/W}$ $^\circ\text{C/W}$
Case 751 (SOIC-8) (Note 1) $T_A = 25^\circ\text{C}$ Thermal Resistance, Junction-to-Ambient Thermal Resistance, Junction-to-Case	$P_D$ $R_{\theta JA}$ $R_{\theta JC}$	Internally Limited 180 45	W $^\circ\text{C/W}$ $^\circ\text{C/W}$
Operating Junction Temperature Range	$T_J$	-40 to +150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- SOIC-8 Junction-to-Ambient Thermal Resistance is for minimum recommended pad size. Refer to Figure 24 for Thermal Resistance variation versus pad size.
- This device series contains ESD protection and exceeds the following tests:  
Human Body Model, 2000 V per MIL STD 883, Method 3015.  
Machine Model Method, 200 V.

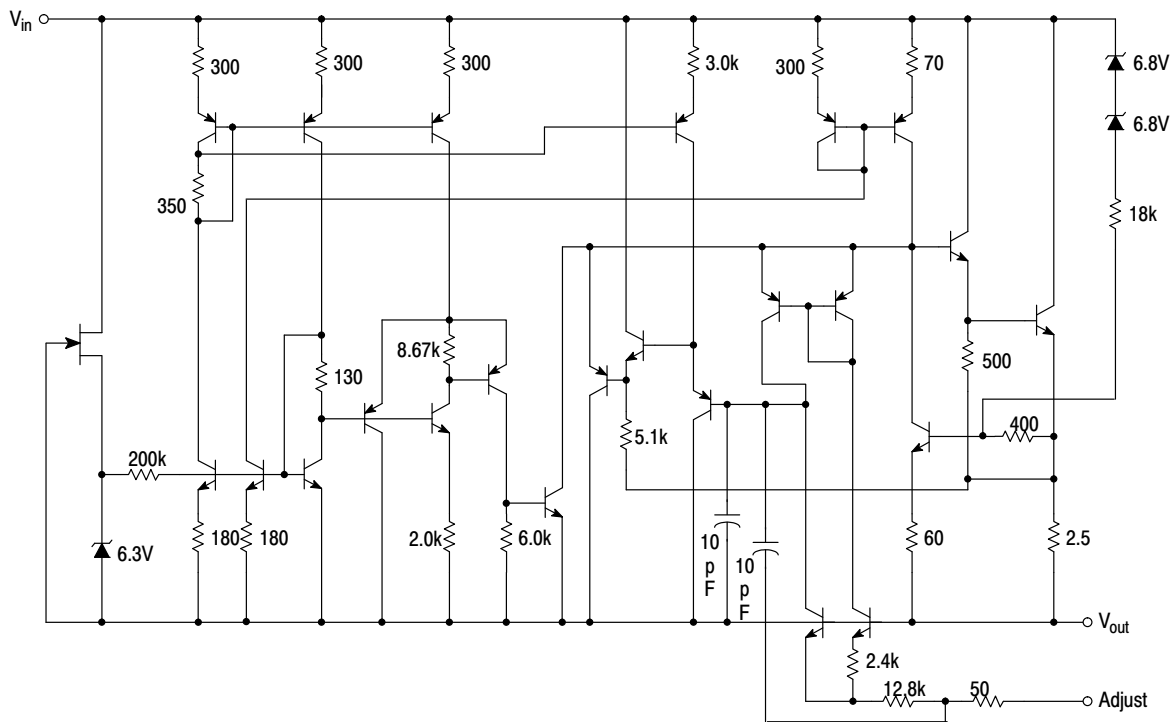


Figure 1. Representative Schematic Diagram

## LM317L, NCV317LB

**ELECTRICAL CHARACTERISTICS** ( $V_I - V_O = 5.0\text{ V}$ ;  $I_O = 40\text{ mA}$ ;  $T_J = T_{\text{low}}$  to  $T_{\text{high}}$  (Note 3);  $I_{\text{max}}$  and  $P_{\text{max}}$  (Note 4); unless otherwise noted.)

Characteristics	Figure	Symbol	LM317L, LB, NCV317LB			Unit
			Min	Typ	Max	
Line Regulation (Note 5) $T_A = 25^\circ\text{C}$ , $3.0\text{ V} \leq V_I - V_O \leq 40\text{ V}$	1	$\text{Reg}_{\text{line}}$	-	0.01	0.04	%/V
Load Regulation (Note 5), $T_A = 25^\circ\text{C}$ $10\text{ mA} \leq I_O \leq I_{\text{max}}$ - LM317L $V_O \leq 5.0\text{ V}$ $V_O \geq 5.0\text{ V}$	2	$\text{Reg}_{\text{load}}$	- -	5.0 0.1	25 0.5	mV % $V_O$
Adjustment Pin Current	3	$I_{\text{Adj}}$	-	50	100	$\mu\text{A}$
Adjustment Pin Current Change $2.5\text{ V} \leq V_I - V_O \leq 40\text{ V}$ , $P_D \leq P_{\text{max}}$ $10\text{ mA} \leq I_O \leq I_{\text{max}}$ - LM317L	1, 2	$\Delta I_{\text{Adj}}$	-	0.2	5.0	$\mu\text{A}$
Reference Voltage $3.0\text{ V} \leq V_I - V_O \leq 40\text{ V}$ , $P_D \leq P_{\text{max}}$ $10\text{ mA} \leq I_O \leq I_{\text{max}}$ - LM317L	3	$V_{\text{ref}}$	1.20	1.25	1.30	V
Line Regulation (Note 5), $3.0\text{ V} \leq V_I - V_O \leq 40\text{ V}$	1	$\text{Reg}_{\text{line}}$	-	0.02	0.07	%/V
Load Regulation (Note 5) $10\text{ mA} \leq I_O \leq I_{\text{max}}$ - LM317L $V_O \leq 5.0\text{ V}$ $V_O \geq 5.0\text{ V}$	2	$\text{Reg}_{\text{load}}$	- -	20 0.3	70 1.5	mV % $V_O$
Temperature Stability ( $T_{\text{low}} \leq T_J \leq T_{\text{high}}$ )	3	$T_S$	-	0.7	-	% $V_O$
Minimum Load Current to Maintain Regulation ( $V_I - V_O = 40\text{ V}$ )	3	$I_{\text{Lmin}}$	-	3.5	10	mA
Maximum Output Current $V_I - V_O \leq 6.25\text{ V}$ , $P_D \leq P_{\text{max}}$ , Z Package $V_I - V_O \leq 40\text{ V}$ , $P_D \leq P_{\text{max}}$ , $T_A = 25^\circ\text{C}$ , Z Package	3	$I_{\text{max}}$	100 -	200 20	- -	mA
RMS Noise, % of $V_O$ $T_A = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 10\text{ kHz}$	-	N	-	0.003	-	% $V_O$
Ripple Rejection (Note 6) $V_O = 1.2\text{ V}$ , $f = 120\text{ Hz}$ $C_{\text{Adj}} = 10\ \mu\text{F}$ , $V_O = 10.0\text{ V}$	4	RR	60 -	80 80	- -	dB
Thermal Shutdown (Note 7)	-	-	-	180	-	$^\circ\text{C}$
Long Term Stability, $T_J = T_{\text{high}}$ (Note 8) $T_A = 25^\circ\text{C}$ for Endpoint Measurements	3	S	-	0.3	1.0	%/1.0 k Hrs.

3.  $T_{\text{low}}$  to  $T_{\text{high}} = 0^\circ$  to  $+125^\circ\text{C}$  for LM317L     $-40^\circ$  to  $+125^\circ\text{C}$  for LM317LB, NCV317LB

4.  $I_{\text{max}} = 100\text{ mA}$      $P_{\text{max}} = 625\text{ mW}$

5. Load and line regulation are specified at constant junction temperature. Changes in  $V_O$  due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

6.  $C_{\text{Adj}}$ , when used, is connected between the adjustment pin and ground.

7. Thermal characteristics are not subject to production test.

8. Since Long-Term Stability cannot be measured on each device before shipment, this specification is an engineering estimate of average stability from lot to lot.

# LM317L, NCV317LB

## ORDERING INFORMATION

Device	Operating Temperature Range	Package	Shipping <sup>†</sup>	
LM317LBD	T <sub>J</sub> = -40°C to +125°C	SOIC-8	98 Units / Rail	
LM317LBDG		SOIC-8 (Pb-Free)	98 Units / Rail	
LM317LBDR2		SOIC-8	2500/Tape & Reel	
LM317LBDR2G		SOIC-8 (Pb-Free)	2500/Tape & Reel	
LM317LBZ		TO-92	2000 Units / Bag	
LM317LBZG		TO-92 (Pb-Free)	2000 Units / Bag	
LM317LBZRA		TO-92	2000 Tape & Reel	
LM317LBZRAG		TO-92 (Pb-Free)	2000 Tape & Reel	
LM317LBZRP		TO-92	2000 Ammo Pack	
LM317LBZRPG		TO-92 (Pb-Free)	2000 Ammo Pack	
NCV317LBDG*		SOIC-8 (Pb-Free)	98 Units / Rail	
NCV317LBDR2*		SOIC-8	2500/Tape & Reel	
NCV317LBDR2G*		SOIC-8 (Pb-Free)	2500/Tape & Reel	
NCV317LBZG*		TO-92 (Pb-Free)	2000 Units / Bag	
NCV317LBZRAG*		TO-92 (Pb-Free)	2000 Tape & Reel	
LM317LD		T <sub>J</sub> = 0°C to +125°C	SOIC-8	98 Units / Rail
LM317LDG			SOIC-8 (Pb-Free)	98 Units / Rail
LM317LDR2	SOIC-8		2500/Tape & Reel	
LM317LDR2G	SOIC-8 (Pb-Free)		2500/Tape & Reel	
LM317LZ	TO-92		2000 Units / Bag	
LM317LZG	TO-92 (Pb-Free)		2000 Units / Bag	
LM317LZRA	TO-92		2000 Tape & Reel	
LM317LZRAG	TO-92 (Pb-Free)		2000 Tape & Reel	
LM317LZRE	TO-92		2000 Tape & Reel	
LM317LZREG	TO-92 (Pb-Free)		2000 Tape & Reel	
LM317LZRM	TO-92		2000 Ammo Pack	
LM317LZRMG	TO-92 (Pb-Free)		2000 Ammo Pack	
LM317LZRP	TO-92		2000 Ammo Pack	
LM317LZRPG	TO-92 (Pb-Free)		2000 Ammo Pack	

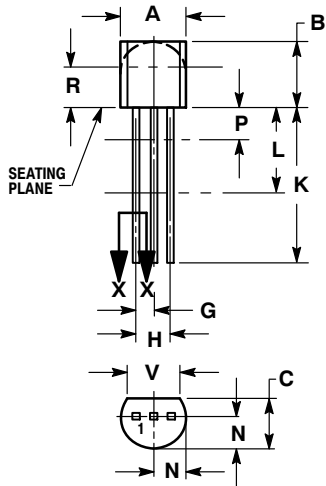
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\* NCV devices: T<sub>low</sub> = -40°C, T<sub>high</sub> = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and control change.

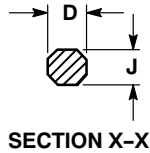
# LM317L, NCV317LB

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
Z SUFFIX  
CASE 29-11  
ISSUE AM



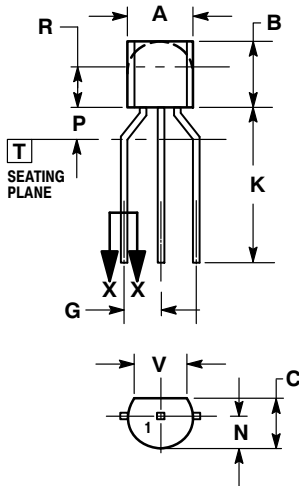
STRAIGHT LEAD  
BULK PACK



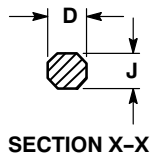
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---



BENT LEAD  
TAPE & REEL  
AMMO PACK



NOTES:

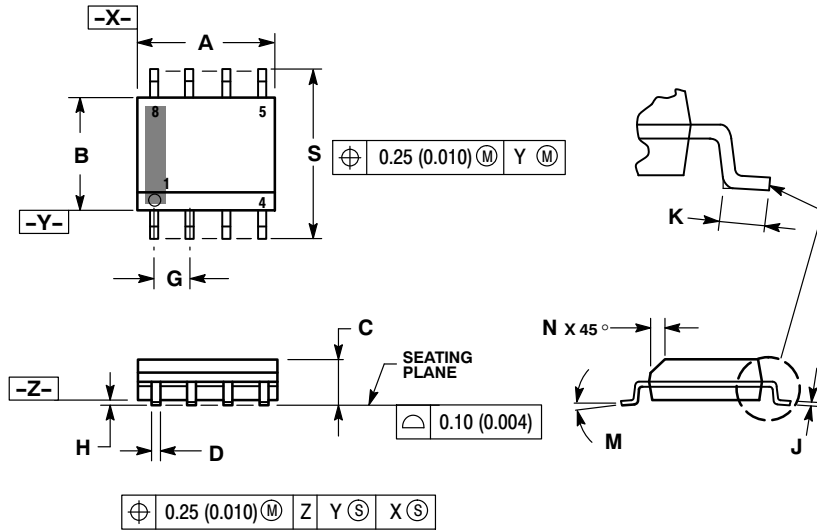
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

# LM317L, NCV317LB

## PACKAGE DIMENSIONS

SOIC-8  
D SUFFIX  
CASE 751-07  
ISSUE AJ

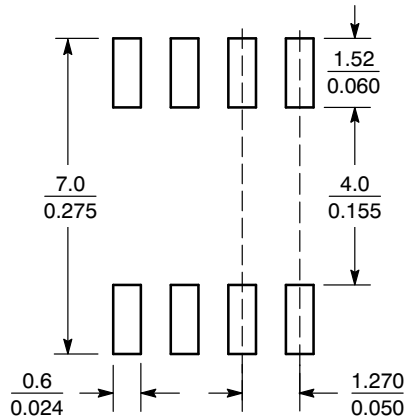


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

### SOLDERING FOOTPRINT\*



SCALE 6:1  $\left( \frac{\text{mm}}{\text{inches}} \right)$

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.