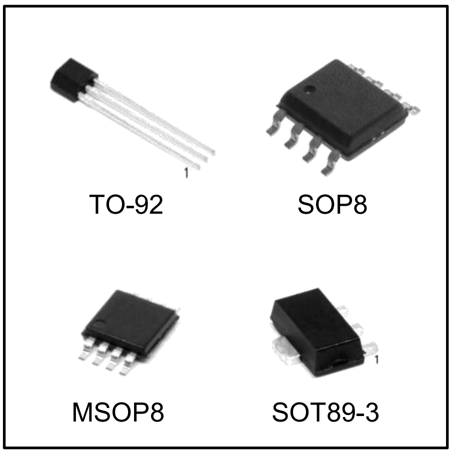
3-TERMINAL ADJUSTABLE REGULATOR

FEATURES

- Oitput Voltage Range Adjustable 1.2V to 32V When Used With External Resistor Divider
- Output Current Caoability of 100mA
- Inpit Regulation Typically 0.01%Per
- Input-Voltage Change
- Output Regulation Typically 0.5%
- Ripple Rejection Typically 80dB
- For Higher Output Current Requirements,See LM317M(500mA)and LM317(1.5A)



ORDERING INFORMATION

Device	Package Type	Marking	Packing	Packing Qty
LM317LD	SOP8		REEL	
LM317LDGK	MSOP8		REEL	
LM317LILP	TO-92		BAG	
LM317LIPK	SOT89-3		REEL	

DESCRIPTION

The LM317L is an adjustable three-terminal positive-voltage regulator capable of supplying 100 mA over an output-voltage range of 1.2 V to 32 V. It is exceptionally easy to use and requires only two external resistors to set the output voltage.

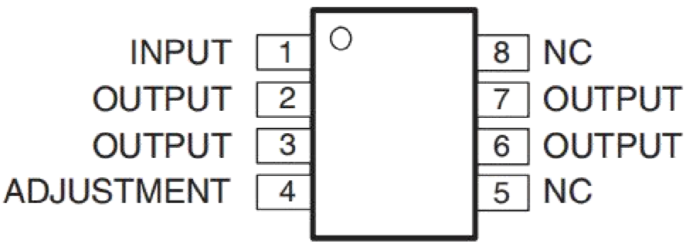
In addition to higher performance than fixed regulators, this regulator offers full overload protection, available only in integrated circuits. Included on the chip are current-limiting and thermal-overload protection. All overload-protection circuitry remains fully functional even when ADJUSTMENT is disconnected. Normally, no capacitors are needed unless the device is situated far from the input filter capacitors, in which case an input bypass is needed. An optional output capacitor can be added to improve transient response. ADJUSTMENT can be bypassed to achieve very high ripple rejection, which is difficult to achieve with standard three-terminal regulators.

In addition to replacing fixed regulators, the LM317L regulator is useful in a wide variety of other applications. Since the regulator is floating and sees only the input-to-output differential voltage, supplies of several hundred volts can be regulated as long as the maximum input-to-output differential is not exceeded. Its primary application is that of a programmable output regulator, but by connecting a fixed resistor between ADJUSTMENT and OUTPUT, this device can be used as a precision current regulator. Supplies with electronic shutdown can be achieved by clamping ADJUSTMENT to ground, programming the output to 1.2 V, where most loads draw little current.

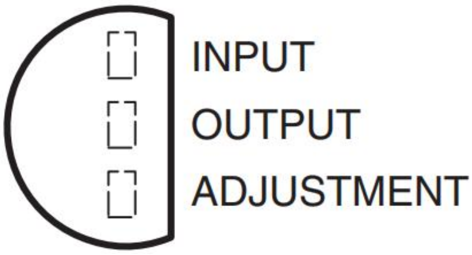
The LM317L is characterized for operation over the virtual junction temperature range of -40°C to 85°C.

PIN CONNECTION

SOP8/MSOP8
(TOP VIEW)

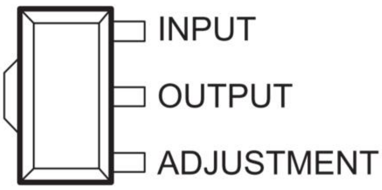


TO-92
(TOP VIEW)



NC-No internal commection
OUTPUT terminals are all internally connected.

SOT89-3
(TOP VIEW)



Absolutute Maximum Ratings(1)

over operating temperature range (unless otherwise noted)

Symbol	Parameter		Min	Max	Unit
$V_I - V_O$	Input-to-output differential voltage			35	V
θ_{JA}	Package thermal impedance[2]	M package[3]		97.1	°C/W
		Z package[3]		139.5	
		MM package[3]		149.4	
T_J	Max junction temperature			150	°C
T_{stg}	Storage temperature range		–65	150	°C

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute Maximum- rated conditions for extended periods may affect device reliability.

(2) Maximum power dissipation is a function of TJ (max), θJA, and TA. The maximum allowable power dissipation at any allowable ambient temperature is PD = (TJ (max) – TA)/θJA. Operating at the absolute maximum TJ of 150°C can affect reliability.

(3) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
$V_I - V_O$	Input-to-output voltage differential		35	V
I_O	Output current	2.5	100	mA
T_A	Operating ambient temperature range	–40	85	°C

Electrical Characteristics

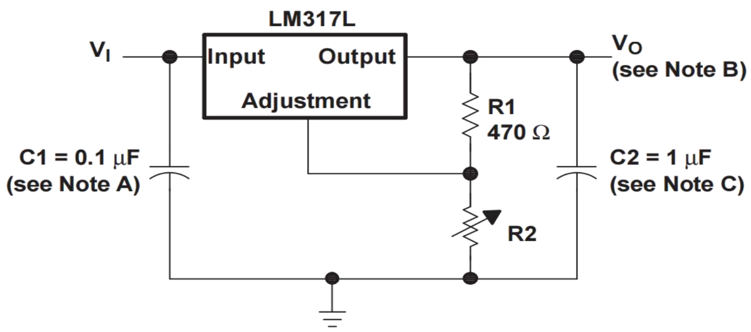
over recommended operating virtual-junction temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[1]		MIN	TYP	MAX	UNIT
Input voltage regulation[2]	$V_I - V_O$ = 5 V to 35 V	T_A = 25°C		0.01	0.02	%V
		I_O = 2.5 mA to 100 mA		0.02	0.05	
Ripple regulation	V_O = 10 V,	f = 120 Hz	65			dB
	V_O = 10 V, 10-μF capacitor between ADJUSTMENT and ground		66	80		
Output voltage regulation	V_I = 5 V to 35 V, T_A = 25°C, I_O = 2.5 mA to 100 mA,	$V_O \le 5$ V	25			mV
		$V_O \ge 5$ V	5			mV/V
	V_I = 5 V to 35 V, I_O = 2.5 mA to 100 mA	$V_O \le 5$ V	50			mV
		$V_O \ge 5$ V	10			mV/V
Output voltage change with temperature	T_A = -40°C to 85 °C		10			mV/V
Output voltage long-term drift	After 1000 hours at T_A = 85°C and $V_I - V_O$ = 35 V			3	10	mV/V
Output noise voltage	f = 10 Hz to 10 kHz,	T_A = 25°C	30			μV/V
Minimum output current to maintain regulation	$V_I - V_O$ = 35 V			1.5	2.5	mA
Peak output current	$V_I - V_O \le 35$ V		100	200		mA
ADJUSTMENT current				50	100	μA
Change in ADJUSTMENT current	$V_I - V_O$ = 2.5 V to 35 V,	I_O = 2.5 mA to 100 mA		0.2	5	μA
Reference voltage (output to ADJUSTMENT)	$V_I - V_O$ = 5 V to 35 V, P ≤ rated dissipation	I_O = 2.5 mA to 100 mA,	1.2	1.25	1.3	V

(1) Unless otherwise noted, these specifications apply for the following test conditions: VI – VO = 5V and IO = 40 mA. Pulse-testing techniques must be used that maintain the junction temperature as close to the ambient temperature as possible. All characteristics are measured with a 0.1-μF capacitor across the input and a 1-μF capacitor across the output.

(2) Input voltage regulation is expressed here as the percentage change in output voltage per 1-V change at the input.

APPLICATION INFORMATION



NOTES: A. Use of an input bypass capacitor is recommended if regulator is far from the filter capacitors.

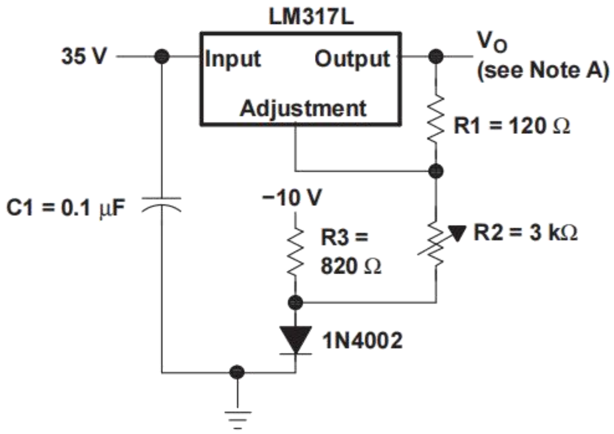
B. Output voltage is calculated from the equation:

$$VO = Vref\left(1+\frac{R2}{R1}\right)$$

where: Vref equals the difference between OUTPUT and ADJUSTMENT voltages (≈1.25 V).

C. Use of an output capacitor improves transient response, but is optional.

Figure 1. Adjustable Voltage Regulator

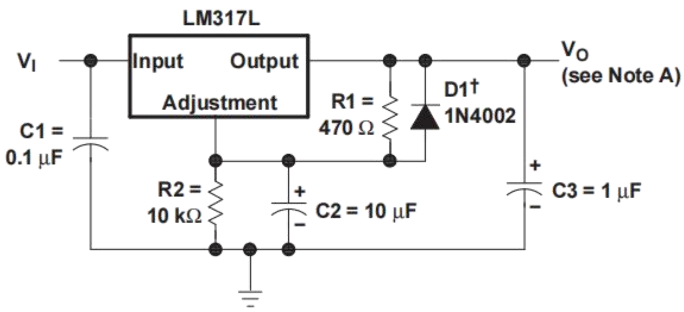


NOTE A: Output voltage is calculated from the equation:

$$VO = Vref\left(1+\frac{R2+R3}{R1}\right)-10V$$

where: Vref equals the difference between OUTPUT and ADJUSTMENT voltages (≈1.25 V).

Figure 2. 0-V to 30-V Regulator Circuit



† D1 discharges C2 if output is shorted to ground.

NOTE A: Use of an output capacitor improves transient response, but is optional.

Figure 3. Regulator Circuit With Improved Ripple Rejection

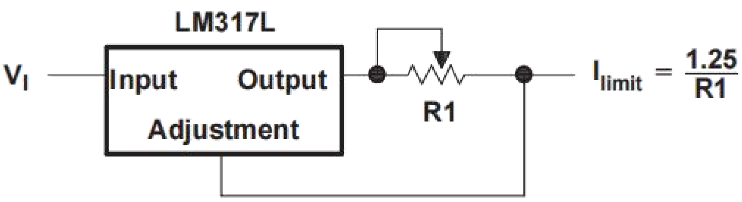


Figure 4. Precision Current-Limiter Circuit

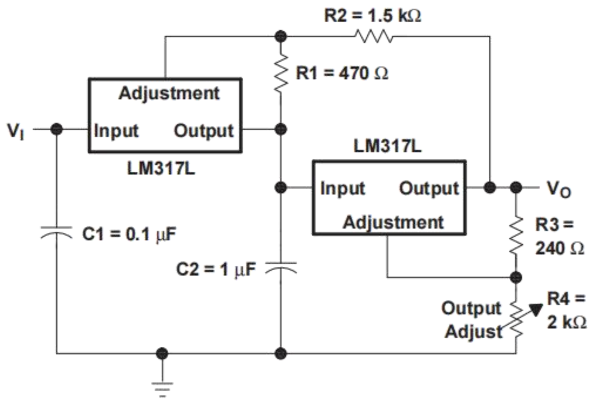


Figure 5. Tracking Preregulator Circuit

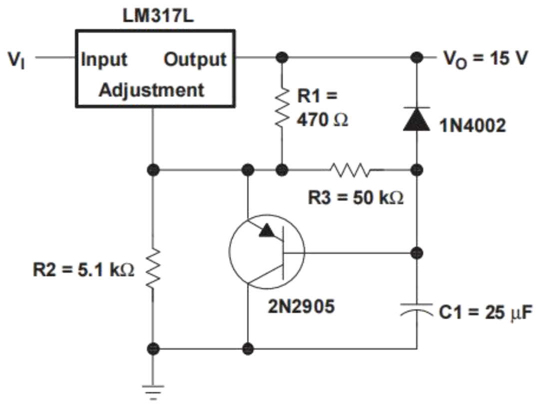


Figure 6. Slow-Turnon 15-V Regulator Circuit

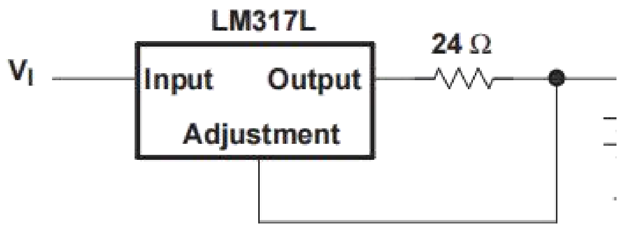


Figure 7. 50-mA Constant-Current Battery-Charger

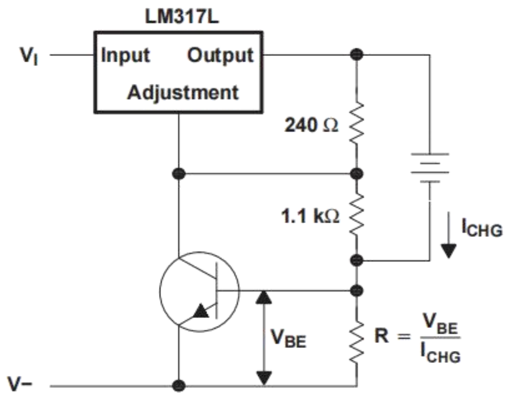
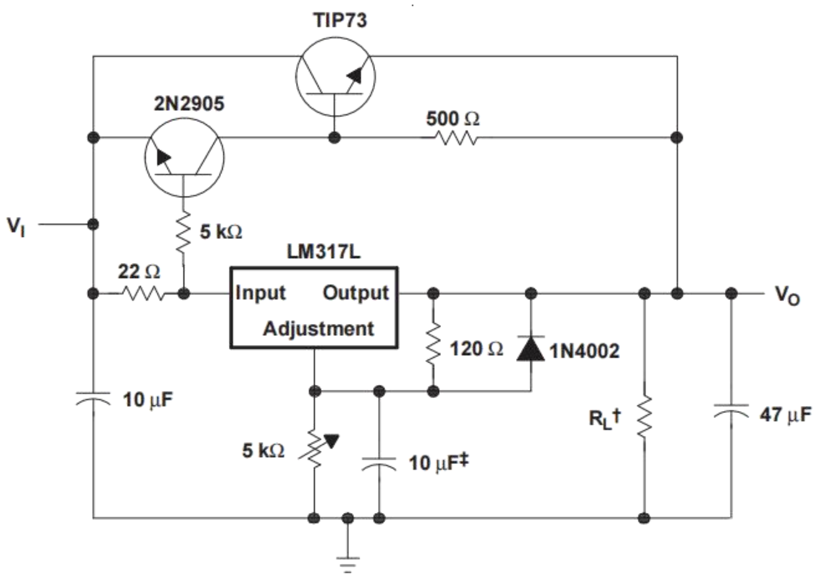


Figure 8. Current-Limited 6-V Charger Circuit



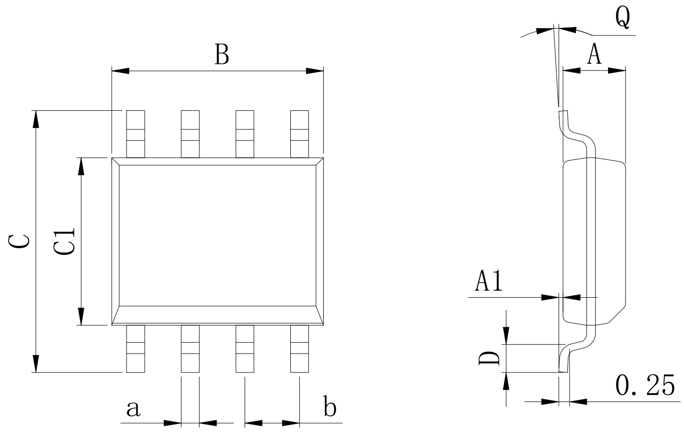
† Minimum load current is 30 mA.

‡ Optional capacitor improves ripple rejection.

Figure 9. High-Current Adjustable Regulator

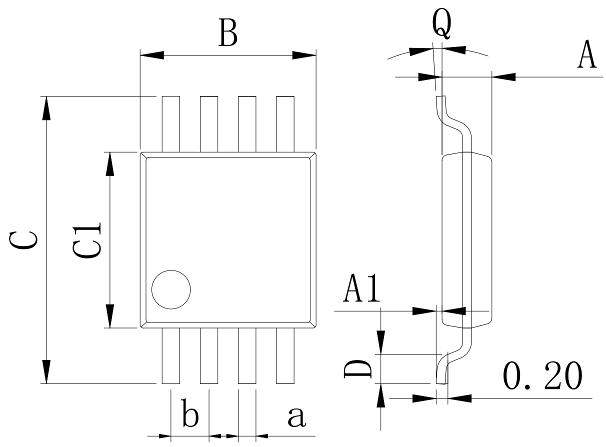
Physical Dimensions

SOP8



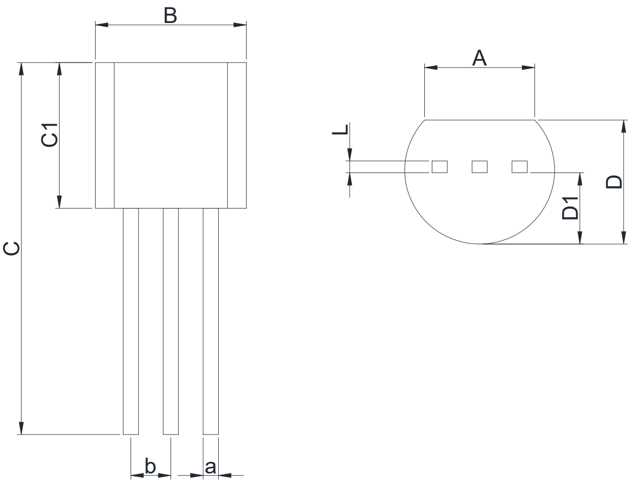
Dimensions In Millimeters(SOP8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

MSOP8



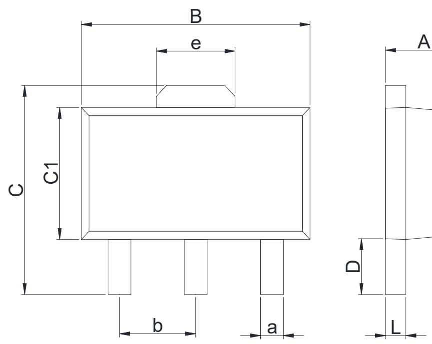
Dimensions In Millimeters(MSOP8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.80	0.05	2.90	4.75	2.90	0.35	0°	0.25	0.65 BSC
Max:	0.90	0.20	3.10	5.05	3.10	0.75	8°	0.35	

TO-92



Dimensions In Millimeters(TO-92)									
Symbol:	A	B	C	C1	D	D1	L	a	b
Min:	3.43	4.44	11.2	4.32	3.17	2.03	0.33	0.40	1.27BSC
Max:	3.83	5.21	12.7	5.34	4.19	2.67	0.42	0.52	

SOT89-3



Dimensions In Millimeters(SOT89-3)									
Symbol:	A	B	C	C1	D	L	a	b	e
Min:	1.40	4.40	3.94	2.30	090	0.35	0.40	1.50	1.55
Max:	1.60	4.60	4.25	2.60	1.20	0.44	0.55	BSC	BSC