

# LM317

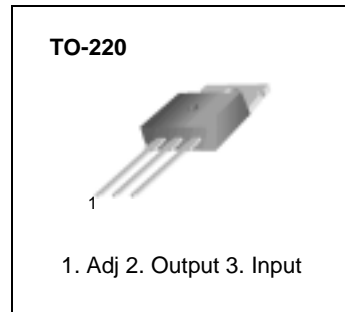
## 3-Terminal Positive Adjustable Regulator

### Features

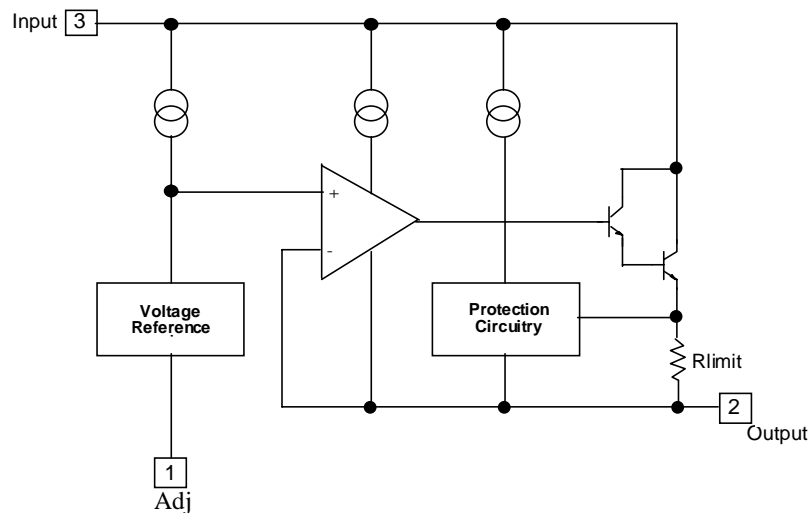
- Output Current In Excess of 1.5A
- Output Adjustable Between 1.2V and 37V
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe Operating Area Compensation
- TO-220 Package

### Description

This monolithic integrated circuit is an adjustable 3-terminal positive voltage regulator designed to supply more than 1.5A of load current with an output voltage adjustable over a 1.2 to 37V. It employs internal current limiting, thermal shut-down and safe area compensation.



### Internal Block Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input-Output Voltage Differential	$V_I - V_O$	40	V
Lead Temperature	$T_{LEAD}$	230	°C
Power Dissipation	$P_D$	Internally limited	W
Operating Junction Temperature Range	$T_j$	0 ~ +125	°C
Storage Temperature Range	$T_{STG}$	-65 ~ +125	°C
Temperature Coefficient of Output Voltage	$\Delta V_O / \Delta T$	±0.02	%/°C

## Electrical Characteristics

( $V_I - V_O = 5V$ ,  $I_O = 0.5A$ ,  $0^\circ C \leq T_J \leq +125^\circ C$ ,  $I_{MAX} = 1.5A$ ,  $P_{DMAX} = 20W$ , unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ.	Max.	Unit
Line Regulation (Note1)	Rline	$T_A = +25^\circ C$ $3V \leq V_I - V_O \leq 40V$	-	0.01	0.04	% / V
		$3V \leq V_I - V_O \leq 40V$	-	0.02	0.07	% / V
Load Regulation (Note1)	Rload	$T_A = +25^\circ C$ , $10mA \leq I_O \leq I_{MAX}$ $V_O < 5V$ $V_O \geq 5V$	-	18 0.4	25 0.5	mV% / $V_O$
		$10mA \leq I_O \leq I_{MAX}$ $V_O < 5V$ $V_O \geq 5V$	-	40 0.8	70 1.5	mV% / $V_O$
Adjustable Pin Current	IADJ	-	-	46	100	μA
Adjustable Pin Current Change	$\Delta I_{ADJ}$	$3V \leq V_I - V_O \leq 40V$ $10mA \leq I_O \leq I_{MAX}$ $P_D \leq P_{MAX}$	-	2.0	5	μA
Reference Voltage	VREF	$3V \leq V_{IN} - V_O \leq 40V$ $10mA \leq I_O \leq I_{MAX}$ $P_D \leq P_{MAX}$	1.20	1.25	1.30	V
Temperature Stability	ST <sub>T</sub>	-	-	0.7	-	% / $V_O$
Minimum Load Current to Maintain Regulation	I <sub>L(MIN)</sub>	$V_I - V_O = 40V$	-	3.5	12	mA
Maximum Output Current	I <sub>O(MAX)</sub>	$V_I - V_O \leq 15V$ , $P_D \leq P_{MAX}$ $V_I - V_O \leq 40V$ , $P_D \leq P_{MAX}$ $T_A = 25^\circ C$	1.0	2.2 0.3	-	A
RMS Noise, % of $V_{OUT}$	e <sub>N</sub>	$T_A = +25^\circ C$ , $10Hz \leq f \leq 10KHz$	-	0.003	0.01	% / $V_O$
Ripple Rejection	RR	$V_O = 10V$ , $f = 120Hz$ without C <sub>ADJ</sub> C <sub>ADJ</sub> = 10μF (Note2)	66	60 75	-	dB
Long-Term Stability, $T_J = T_{HIGH}$	ST	$T_A = +25^\circ C$ for end point measurements, 1000HR	-	0.3	1	%
Thermal Resistance Junction to Case	R <sub>θJC</sub>	-	-	5	-	°C / W

### Note:

1. Load and line regulation are specified at constant junction temperature. Change in  $V_D$  due to heating effects must be taken into account separately. Pulse testing with low duty is used. ( $P_{MAX} = 20W$ )
2. C<sub>ADJ</sub>, when used, is connected between the adjustment pin and ground.

## Typical Performance Characteristics

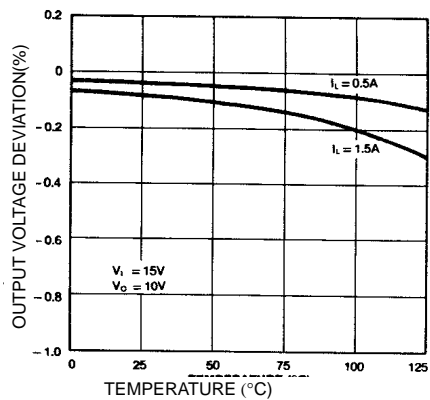


Figure 1. Load Regulation

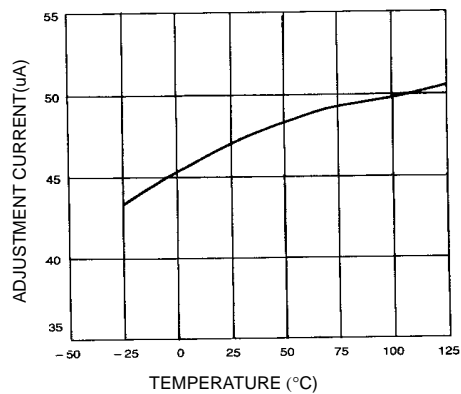


Figure 2. Adjustment Current

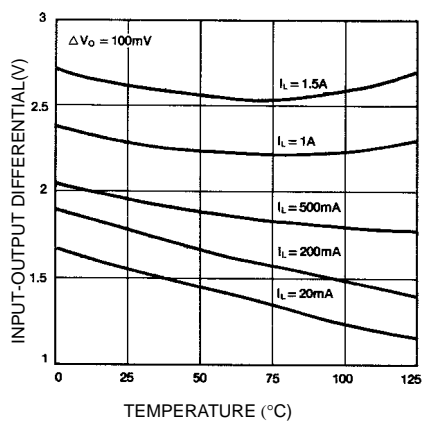


Figure 3. Dropout Voltage

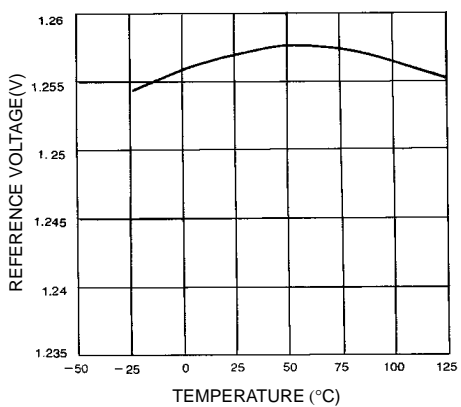
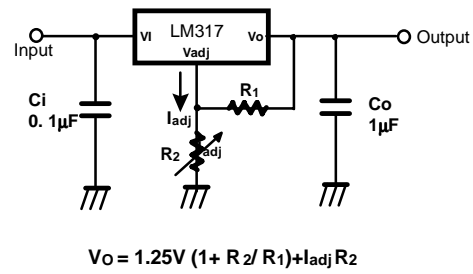


Figure 4. Reference Voltage

## Typical Application



**Figure 5. Programmable Regulator**

$C_i$  is required when regulator is located an appreciable distance from power supply filter.

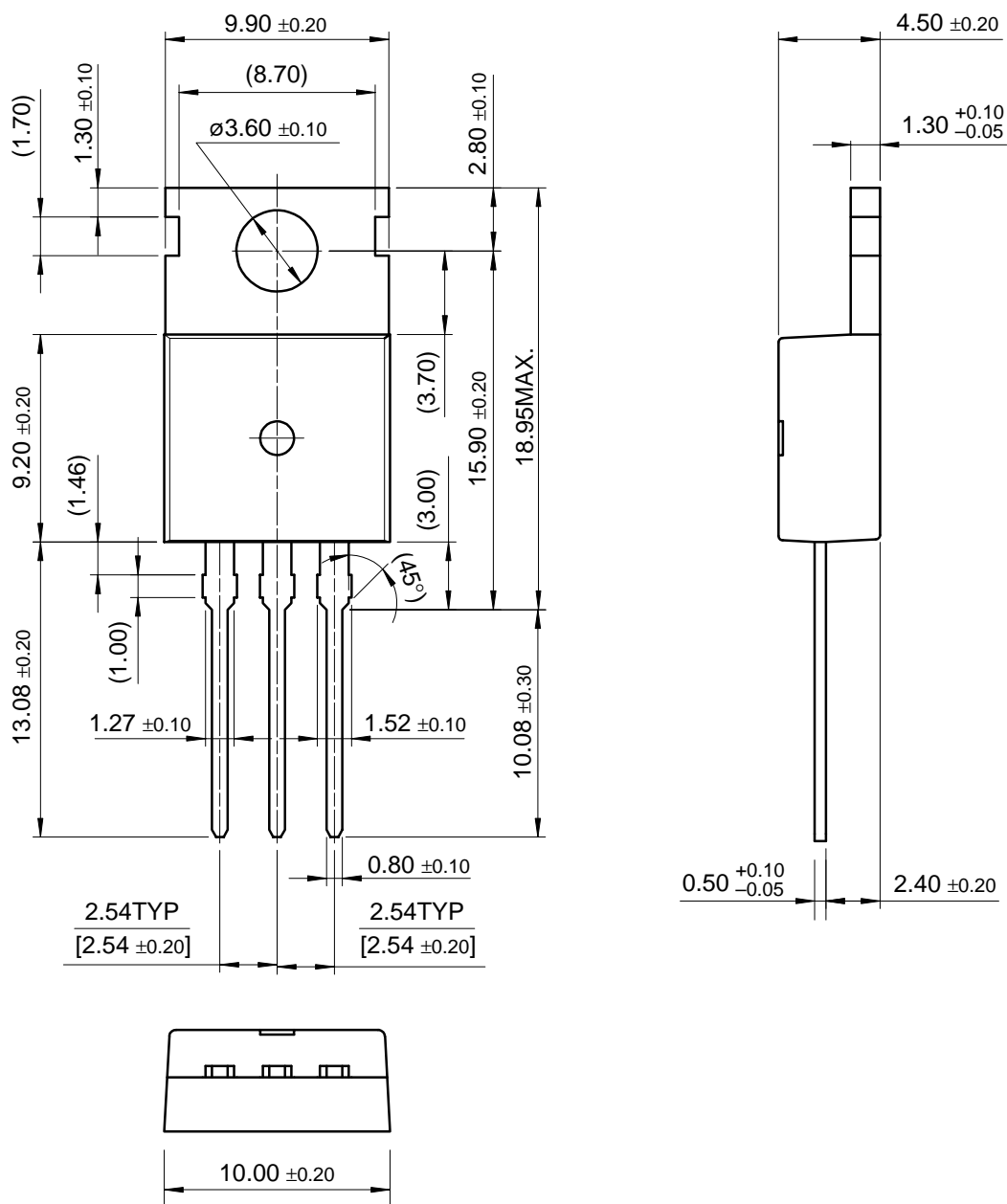
$C_o$  is not needed for stability, however, it does improve transient response.

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

# Mechanical Dimensions

## Package

### TO-220



**Ordering Information**

<b>Product Number</b>	<b>Package</b>	<b>Operating Temperature</b>
LM317T	TO-220	0°C to + 125°C



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