

# LM317

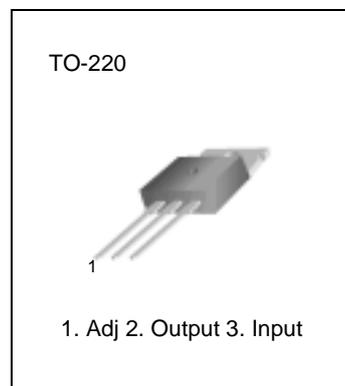
## 3-terminal positive adjustable regulator

### Features

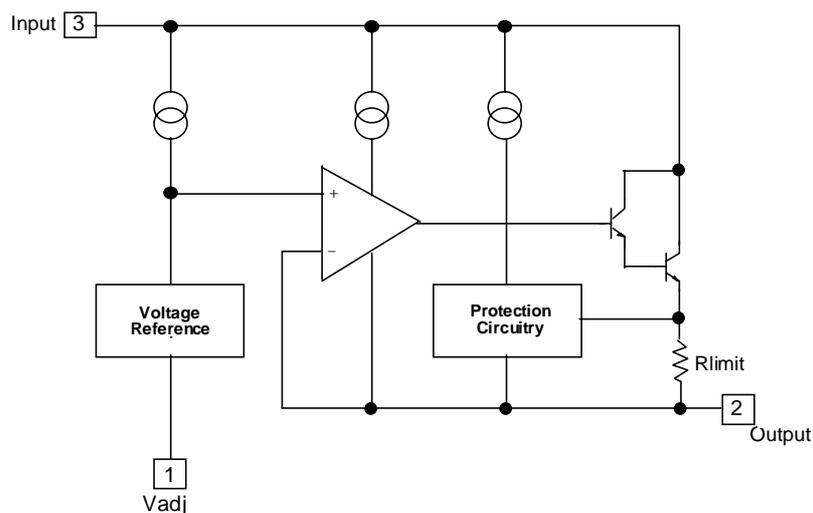
- Output Current In Excess of 1.5A
- Output Adjustable Between 1.2V and 37V
- Internal Thermal-Overload Protection
- Internal Short-Circuit Current-Limiting
- Output Transistor Safe-Area Compensation
- TO-220 Package

### 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 Temperature Range	$T_{OPR}$	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

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

Parameter	Symbol	Conditions	Min	Typ.	Max.	Unit
Line Regulation	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	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 <sub>O</sub>
		$10mA \leq I_O \leq I_{MAX}$ $V_O < 5V$ $V_O \geq 5V$	-	40 0.8	70 1.5	mV %/V <sub>O</sub>
Adjustable Pin Current	I <sub>ADJ</sub>	-	-	46	100	µA
Adjustable Pin Current Change	ΔI <sub>ADJ</sub>	$3V \leq V_I - V_O \leq 40V$ $10mA \leq I_O \leq I_{MAX}$ $P_D \leq P_{MAX}$	-	2.0	5	µA
Reference Voltage	V <sub>REF</sub>	$3V \leq V_{IN} - V_O \leq 40V$ $10mA \leq I_O \leq I_{MAX}$ $P_D \leq P_{MAX}$	1.20	1.25	1.30	V
Temperature Stability	STT	-	-	0.7	-	%/V <sub>O</sub>
Minimum Load Current to Maintain Regulation	L(MIN)	$V_I - V_O = 40V$	-	3.5	12	mA
Maximum Output Current	I <sub>O</sub> (MAX)	$V_I - V_O \leq 15V$ , $P_D \leq P_{MAX}$ $V_I - V_O \leq 40V$ , $P_D \leq P_{MAX}$ $T_A = 25^\circ C$	1.0	2.2 0.3	-	A
RMS Noise, % of V <sub>OUT</sub>	e <sub>N</sub>	$T_A = +25^\circ C$ , $10Hz \leq f \leq 10KHz$	-	0.003	0.01	%/V <sub>O</sub>
Ripple Rejection	RR	$V_O = 10V$ , $f = 120Hz$ without C <sub>ADJ</sub> C <sub>ADJ</sub> = 10µF	66	60 75	-	dB
Long-Term Stability, T <sub>J</sub> = T <sub>HIGH</sub>	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

- Load and line regulation are specified at constant junction temperature. Change in V<sub>D</sub> due to heating effects must be taken into account separately. Pulse testing with low duty is used. (P<sub>MAX</sub> = 20W)

## Typical Performance Characteristics

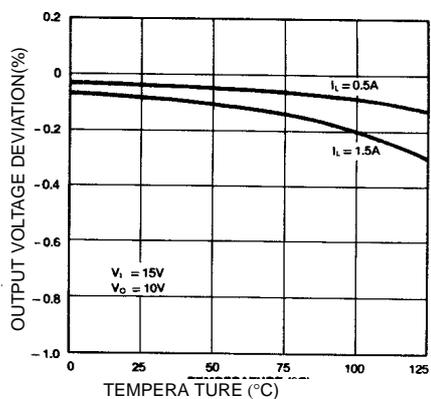


Figure 1. Load Regulation

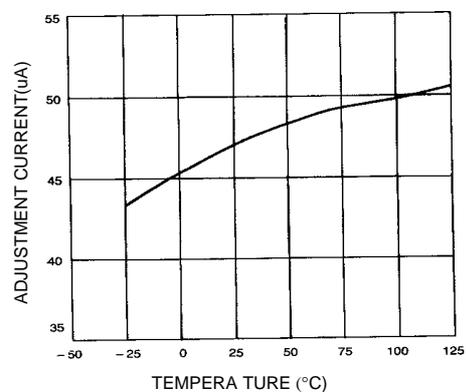


Figure 2. Adjustment Current

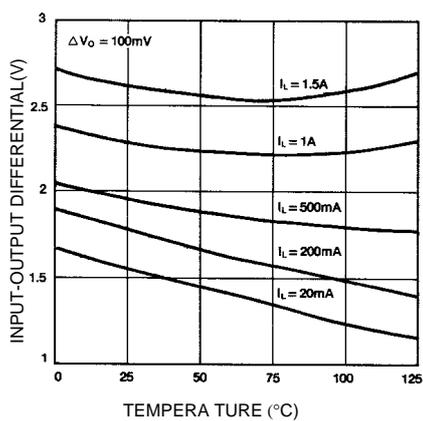


Figure 3. Dropout Voltage

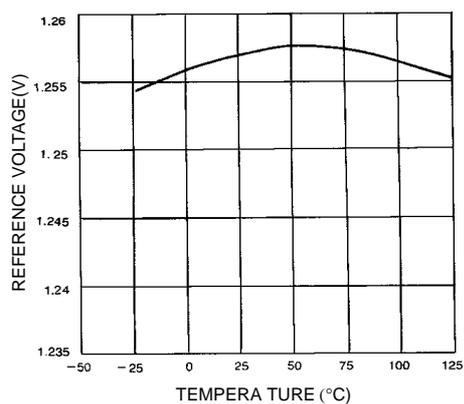
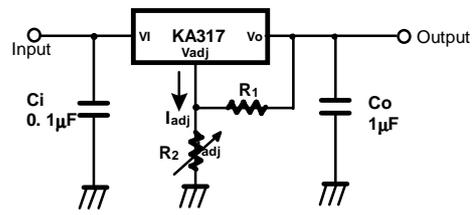


Figure 4. Reference Voltage

## Typical Application



$$V_O = 1.25V (1 + R_2 / R_1) + I_{adj} R_2$$

**Figure 5. Programmable Regulator**

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

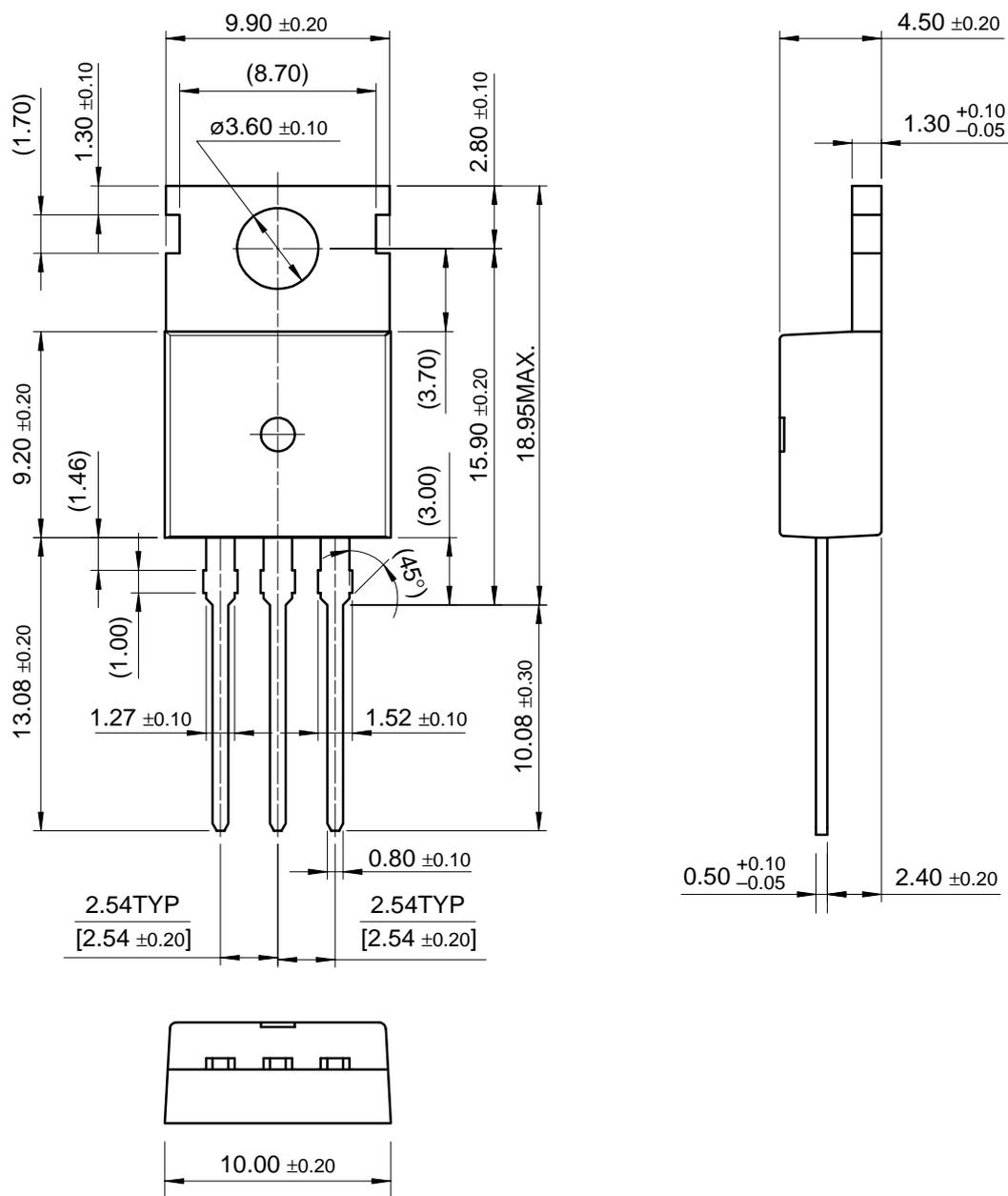
$C_o$  is not needed for stability, however, it does improve transient response.

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

Product Number	Package	Operating Temperature
LM317T	TO-220	0°C to + 125°C



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