

LM317

3-Terminal Positive Adjustable Regulator

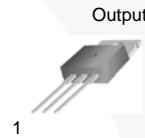
Features

- Output-Current In Excess of 1.5 A
- Output-Adjustable Between 1.2 V and 37 V
- 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 1.5 A of load current with an output voltage adjustable over a 1.2 V to 37 V range. It employs internal current limiting, thermal shutdown, and safe area compensation.

TO-220 (Single Gauge)



1. Adj 2. Output 3. Input

Ordering Information

Product Number	Package	Packing Method	Operating Temperature
LM317T	TO-220 (Single Gauge)	Rail	0°C to +125°C

Block Diagram

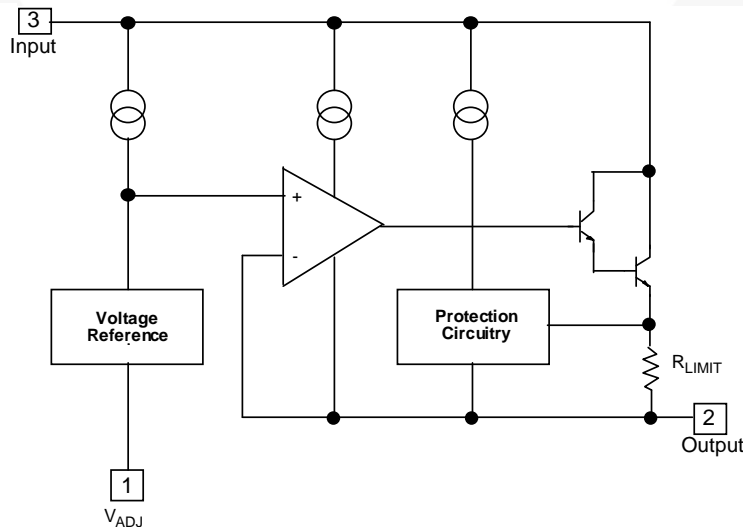


Figure 1. Block Diagram

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Value	Unit
$V_I - V_O$	Input-Output Voltage Differential	40	V
T_{LEAD}	Lead Temperature	230	$^\circ\text{C}$
P_D	Power Dissipation	Internally Limited	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	80	$^\circ\text{C}/\text{W}$
T_J	Operating Junction Temperature Range	0 to +125	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-65 to +125	$^\circ\text{C}$
$\Delta V_O/\Delta T$	Temperature Coefficient of Output Voltage	± 0.02	$\%/^\circ\text{C}$

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R_{LINE}	Line Regulation ⁽¹⁾	$T_A = +25^\circ\text{C}$ $3\text{ V} \leq V_I - V_O \leq 40\text{ V}$		0.01	0.04	%/V
		$3\text{ V} \leq V_I - V_O \leq 40\text{ V}$		0.02	0.07	%/V
R_{LOAD}	Load Regulation ⁽¹⁾	$T_A = +25^\circ\text{C}$, $10\text{ mA} \leq I_O \leq I_{\text{MAX}}$	$V_O < 5\text{ V}$	18	25	mV
			$V_O \geq 5\text{ V}$	0.4	0.5	%/V _O
		$10\text{ mA} \leq I_O \leq I_{\text{MAX}}$	$V_O < 5\text{ V}$	40	70	mV
			$V_O \geq 5\text{ V}$	0.8	1.5	%/V _O
I_{ADJ}	Adjustable Pin Current			46	100	μA
ΔI_{ADJ}	Adjustable Pin Current Change	$3\text{ V} \leq V_I - V_O \leq 40\text{ V}$, $10\text{ mA} \leq I_O \leq I_{\text{MAX}}$, $P_D \leq P_{\text{MAX}}$		2.0	5.0	μA
V_{REF}	Reference Voltage	$3\text{ V} \leq V_{\text{IN}} - V_O \leq 40\text{ V}$, $10\text{ mA} \leq I_O \leq I_{\text{MAX}}$, $P_D \leq P_{\text{MAX}}$	1.20	1.25	1.30	V
ST_T	Temperature Stability			0.7		%/V _O
$I_{\text{L(MIN)}}$	Minimum Load Current to Maintain Regulation	$V_I - V_O = 40\text{ V}$		3.5	12.0	mA
$I_{\text{O(MAX)}}$	Maximum Output Current	$T_A = 25^\circ\text{C}$	$V_I - V_O \leq 15\text{ V}$, $P_D \leq P_{\text{MAX}}$	1.5	2.2	A
			$V_I - V_O \leq 40\text{ V}$, $P_D \leq P_{\text{MAX}}$		0.3	A
e_N	RMS Noise, % of V _{OUT}	$T_A = +25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 10\text{ kHz}$		0.003	0.010	%/V _O
RR	Ripple Rejection	$V_O = 10\text{ V}$, $f = 120\text{ Hz}$ without C _{ADJ}		60		dB
		C _{ADJ} = 10 μF ⁽²⁾	66	75		dB
ST	Long-Term Stability, $T_J = T_{\text{HIGH}}$	$T_A = +25^\circ\text{C}$ for End Point Measurements, 1000 HR		0.3	1.0	%

Notes:

- 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 ($P_{\text{MAX}} = 20\text{ W}$).
- C_{ADJ}, when used, is connected between the adjustment pin and ground.

Typical Performance Characteristics

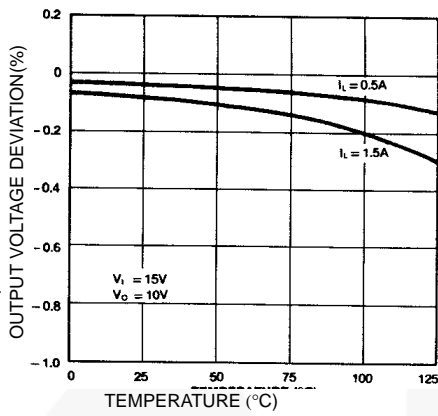


Figure 2. Load Regulation

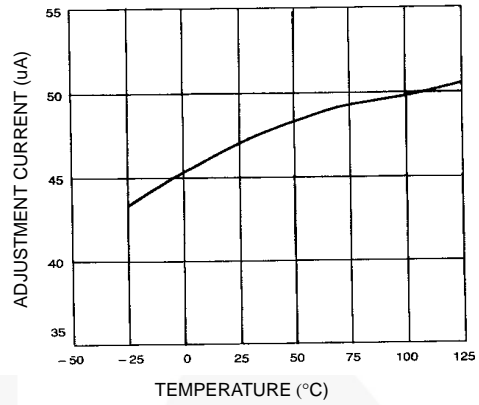


Figure 3. Adjustment Current

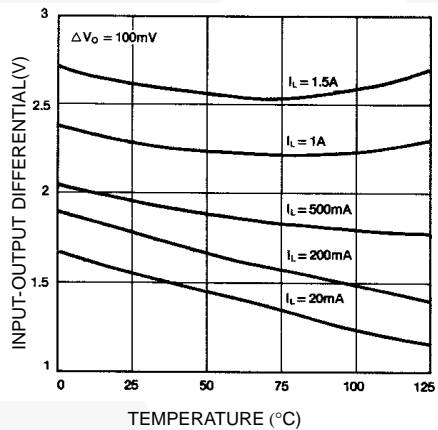


Figure 4. Dropout Voltage

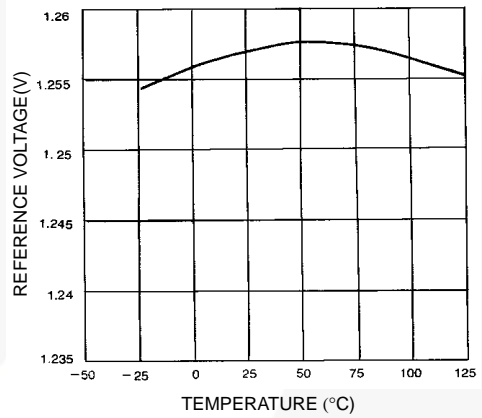
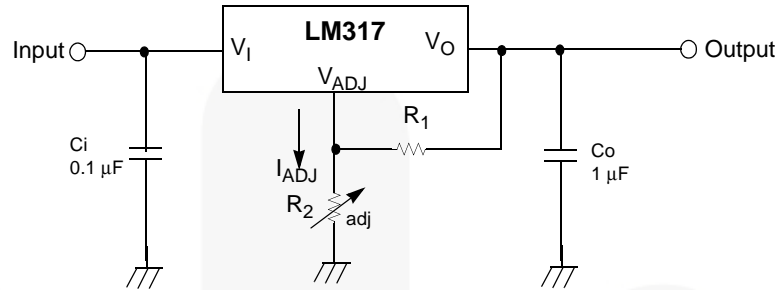


Figure 5. Reference Voltage

Typical Application⁽³⁾



$$V_O = 1.25 \text{ V} \left(1 + \frac{R_2}{R_1} \right) + I_{ADJ} R_2$$

Figure 6. Typical Application






Note:

3. C_I is required when the 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 μA , the error associated with this term is negligible in most applications.



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