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September 2014

KA317 / LM317
3-Terminal Positive Adjustable Regulator

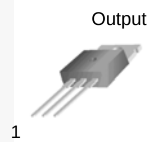
Features

- 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



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
KA317TU	TO-220 (Dual Gauge)	Rail	0°C to +125°C

Block Diagram

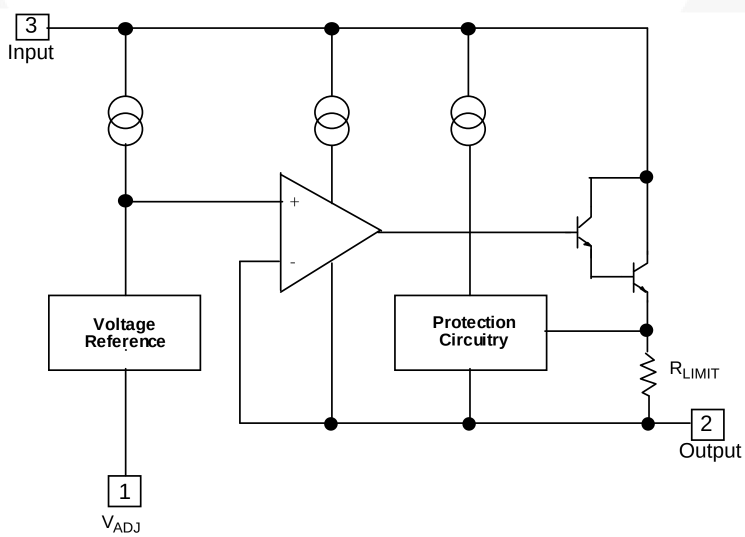


Figure 1. Block Diagram

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°C unless otherwise noted.

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

Thermal Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Units
P_D	Power Dissipation	Internally Limited	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	80	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5	°C/W

Electrical Characteristics

V_I-V_O = 5 V, I_O = 0.5 A, 0°C ≤ T_J ≤ +125°C, I_{MAX} = 1.5 A, P_{DMAX} = 20 W, unless otherwise specified.

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

Notes:

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} = 20 W).
2. C_{ADJ}, when used, is connected between the adjustment pin and ground.

Typical Performance Characteristics

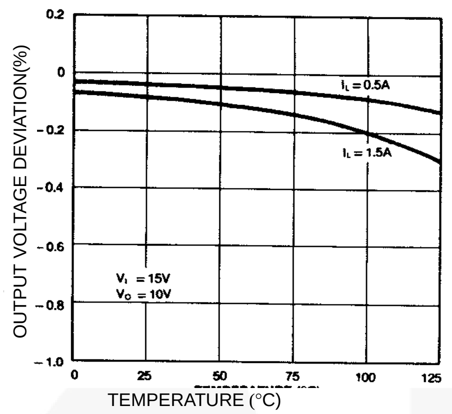


Figure 2. Load Regulation

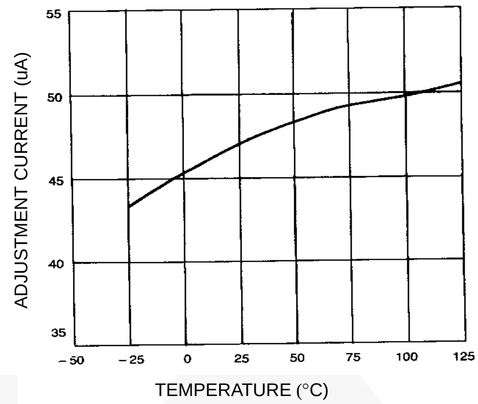


Figure 3. Adjustment Current

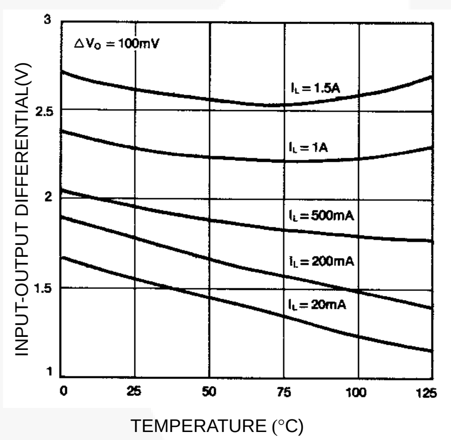


Figure 4. Dropout Voltage

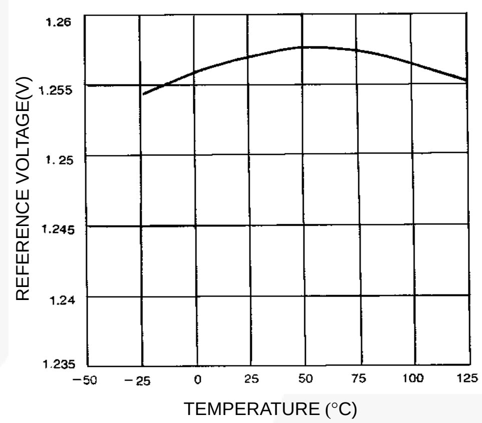


Figure 5. Reference Voltage

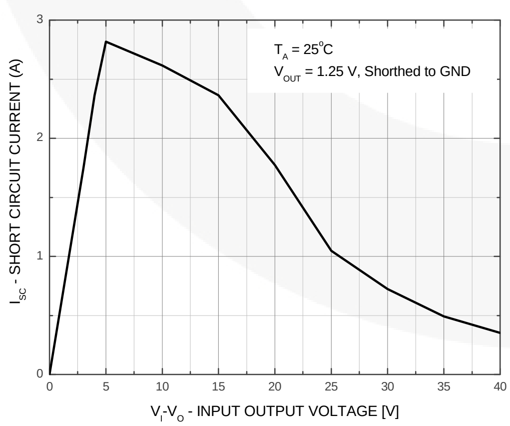
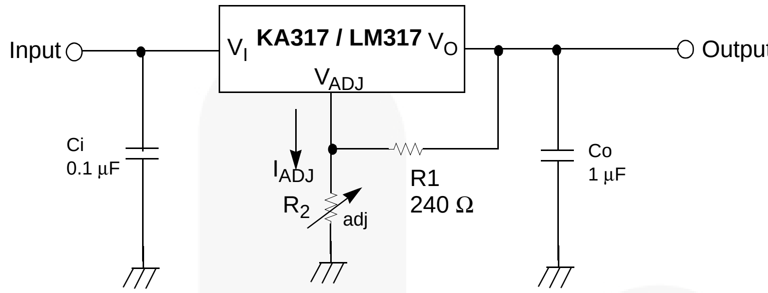


Figure 6. Short Circuit vs. Input-Output Voltage

Typical Application(3)



$$V_O = 1.25\text{ V}\,(1 + R_2 / R_1) + I_{ADJ}R_2$$

Figure 7. 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.

Physical Dimensions

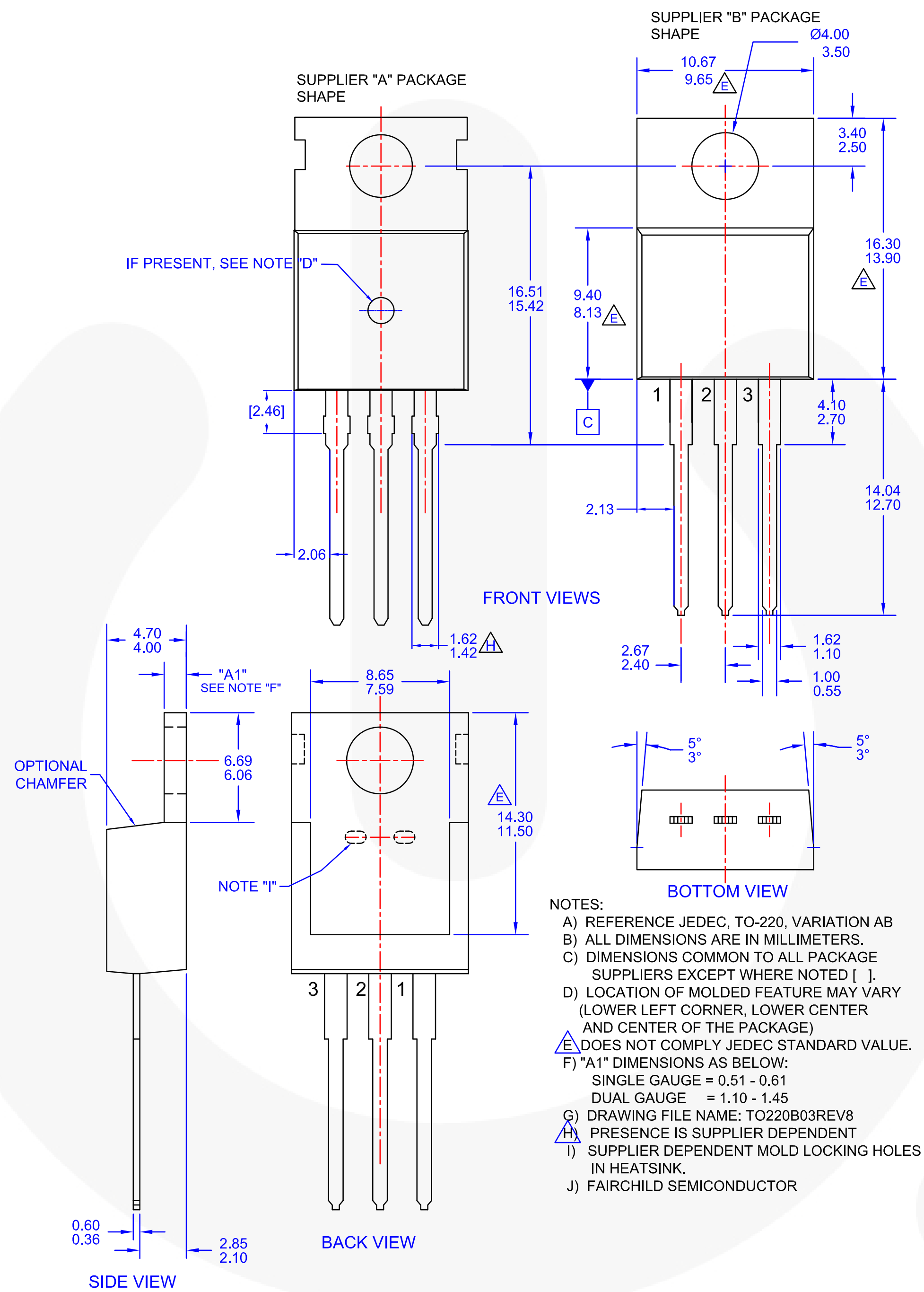


Figure 8. TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

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