

MJLM117-K REV 0C1

 Original Creation Date: 06/27/95
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POSITIVE THREE TERMINAL ADJUSTABLE VOLTAGE REGULATOR
General Description

The LM117 adjustable 3-terminal positive voltage regulator is capable of supplying in excess of 1.5A over a 1.2V to 37V output range. It is exceptionally easy to use and requires only two external resistors to set the output voltage. Further, both line and load regulation are better than standard fixed regulators.

In addition to higher performance than fixed regulators, the LM117 offers full overload protection available only in IC's. Included on the chip are current limit, thermal overload protection and safe area protection. All overload protection circuitry remains fully functional even if the adjustment terminal is disconnected.

Normally, no capacitors are needed unless the device is situated more than 6 inches from the input filter capacitors in which case an input bypass is needed. An optional output capacitor can be added to improve transient response. The adjustment terminal can be bypassed to achieve very high ripple rejection ratios which are difficult to achieve with standard 3-terminal regulators.

Besides replacing fixed regulators, the LM117 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, (i.e., avoid short-circuiting the output).

Also, it makes an especially simple adjustable switching regulator, a programmable output regulator, or by connecting a fixed resistor between the adjustment pin and output, the LM117 can be used as a precision current regulator. Supplies with electronic shutdown can be achieved by clamping the adjustment terminal to ground which programs the output to 1.2V where most loads draw little current.

For applications requiring greater output current, see LM150 (3A) and LM138 (5A) data sheets. For the negative complement, see LM137 data sheet.

Industry Part Number

LM117K

NS Part Numbers

 JL117BYA
 JL117SYA

Prime Die

LM117K

Controlling Document

38510/11704,AMEND.3 REV A

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- Guaranteed 1.5A output current
- Adjustable output down to 1.2V
- Current limit constant with temperature
- 80 dB ripple rejection
- Output is short-circuit protected

(Absolute Maximum Ratings)

(Note 1)

Power Dissipation (Note 2)	Internally Limited
Input-Output Voltage Differential	+40V, -0.3V
Maximum Junction Temperature	150 C
Storage Temperature Range	-65 C to +150 C
Lead Temperature (Soldering, 10 seconds)	300 C
Thermal Resistance	
ThetaJA (Still Air)	39 C/W
(500LF/Min Air flow)	14 C/W
ThetaJC	1.9 C/W
ESD Tolerance (Note 3)	3000V

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Note 2: The maximum power dissipation must be derated at elevated temperatures, and is dictated by Tjmax (maximum junction temperature), ThetaJA (package junction to ambient thermal resistance), and TA (ambient temperature). The maximum allowable power dissipation at any temperature is $P_{dmax} = (T_{jmax} - T_A) / \Theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower.

Note 3: Human body model, 1.5K Ohms in series with 100pF.

Recommended Operating Conditions

Operating Temperature Range	-55 C ≤ TA ≤ +125 C
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Electrical Characteristics

DC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vout	Output Voltage	Vin = 4.25V, I _l = -5mA			1.2	1.3	V	1, 2, 3
		Vin = 4.25V, I _l = -1.5A			1.2	1.3	V	1, 2, 3
		Vin = 41.25V, I _l = -5mA			1.2	1.3	V	1, 2, 3
		Vin = 41.25V, I _l = -200mA			1.2	1.3	V	1, 2, 3
Vrline	Line Regulation	4.25V ≤ Vin ≤ 41.25V, I _l = -5mA			-9	9	mV	1
					-23	23	mV	2, 3
Vrload	Load Regulation	Vin = 6.25V, -1.5A ≤ I _l ≤ -5mA			-3.5	3.5	mV	1
					-12	12	mV	2, 3
		Vin = 41.25V, -200mA ≤ I _l ≤ -5mA			-3.5	3.5	mV	1
					-12	12	mV	2, 3
Vrth	Thermal Regulation	Vin = 14.6V, I _l = -1.5A			-12	12	mV	1
Iadj	Adjust Pin Current	Vin = 4.25V, I _l = -5mA			-100	-15	uA	1, 2, 3
		Vin = 41.25V, I _l = -5mA			-100	-15	uA	1, 2, 3
Delta Iadj/Line	Adjust Pin Current Change	4.25V ≤ Vin ≤ 41.25V, I _l = -5mA			-5	5	uA	1, 2, 3
Delta Iadj/Load	Adjust Pin Current Change	Vin = 6.25V, -1.5A ≤ I _l ≤ -5mA			-5	5	uA	1, 2, 3
Ios	Output Short Circuit Current	Vin = 4.25V			-3.5	-1.5	A	1, 2, 3
		Vin = 40V			-1	-0.18	A	1, 2, 3
Vout (Recov)	Output Voltage Recovery	Vin = 4.25V, R _l = 0.833 Ohms, C _l = 20uF			1.2	1.3	V	1, 2, 3
		Vin = 40V, R _l = 250 Ohms			1.2	1.3	V	1, 2, 3
Iq	Minimum Load Current	Vin = 4.25V, Forced Vout = 1.4V			-3	-0.2	mA	1, 2, 3
		Vin = 14.25V, Forced Vout = 1.4V			-3	-0.2	mA	1, 2, 3
		Vin = 41.25V, Forced Vout = 1.4V			-5	-0.2	mA	1, 2, 3
Vstart	Voltage Start-Up	Vin = 4.25V, R _l = 0.833 Ohms, C _l =20uF, I _l = -1.5A			1.2	1.3	V	1, 2, 3

Electrical Characteristics

DC PARAMETERS (Continued)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vout	Output Voltage	Vin = 6.25V, I _L = -5mA	1		1.2	1.3	V	2

AC PARAMETERS

Vno	Output Noise Voltage	Vin = 6.25V, I _L = -100mA				120	uVrms	7
DeltaVout/DeltaVin	Line Transient Response	Vin = 6.25V, Delta Vin = 3V, I _L = -10mA	2			18	mV	7
DeltaVout/Delta I _L	Load Transient Response	Vin = 6.25V, Delta I _L = -400mA, I _L = -100mA	3			120	mV	7
Delta Vin/Delta Vout	Ripple Rejection	Vin = 6.25V, e _i = 1Vrms at f = 2400Hz, I _L = -500mA			65		dB	4

DC PARAMETERS: DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)
 DC: "Delta calculations performed on JAN S and QMLV devices at group B, subgroup 5 ONLY".

Vout	Output Voltage	Vin = 4.25V, I _L = -5mA			-0.01	0.01	V	1
		Vin = 4.25V, I _L = -1.5A			-0.01	0.01	V	1
		Vin = 41.25V, I _L = -5mA			-0.01	0.01	V	1
		Vin = 41.25V, I _L = -200mA			-0.01	0.01	V	1
Vrline	Line Regulation	4.25V ≤ Vin ≤ 41.25V, I _L = -5mA			-4	4	mV	1
Iadj	Adjust Pin Current	Vin = 4.25V, I _L = -5mA			-10	10	uA	1
		Vin = 41.25V, I _L = -5mA			-10	10	uA	1

Note 1: Tested at TA = +125 C, correlated to TA = +150 C.

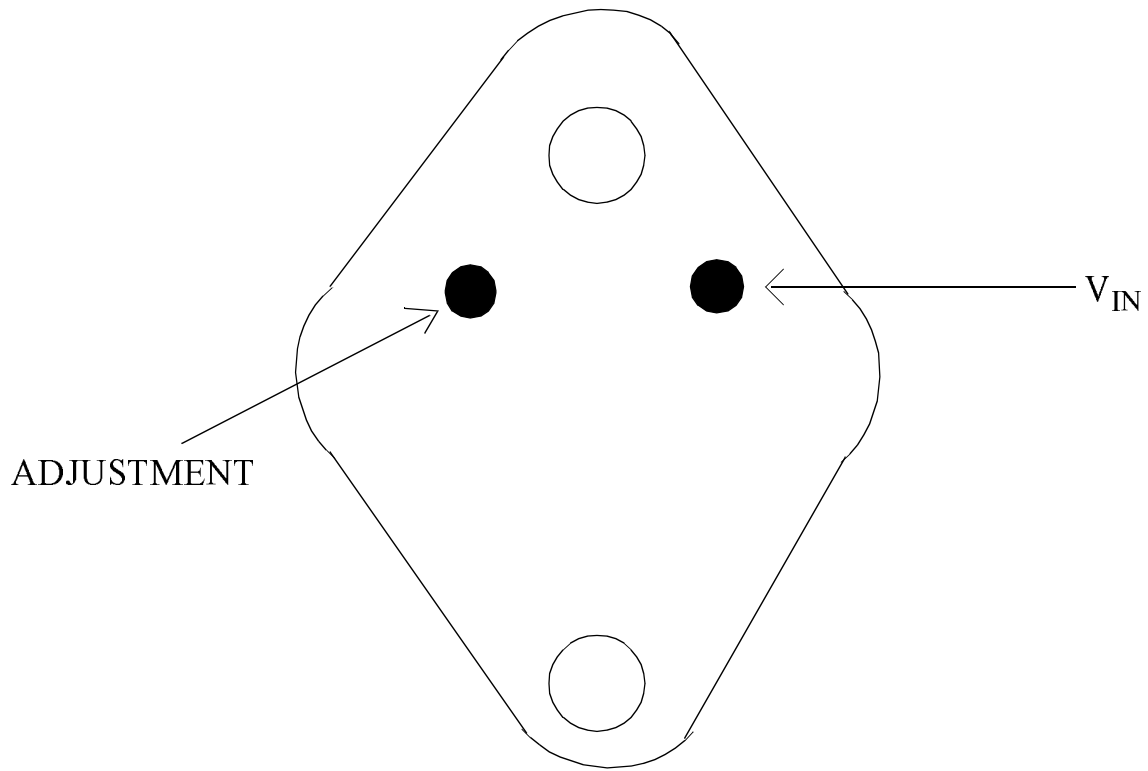
Note 2: S/S limit of 6mV/V is equivalent to 18mV.

Note 3: S/S limit of .3mV/V is equivalent to 120mV.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
09757HRE4	METAL CAN (KA), TO-3, 2LD, LOW PROFILE (B/I CKT)
K02CRE	METAL CAN (KA), TO-3, 2LD, LOW PROFILE (P/P DWG)
P000173A	METAL CAN (KA), TO-3, 2LD, LOW PROFILE (PINOUT)

See attached graphics following this page.



LM117K, LM117HVK
2 - LEAD TO3
CONNECTION DIAGRAM
BOTTOM VIEW
P000173A



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Revision History

Rev	ECN #	Rel Date	Originator	Changes
0C1	M0003586	11/04/99	Rose Malone	Update MDS: MJLM117-K, Rev. 0B0 to MJLM117-K, Rev. 0C1. Updated Thermal Data in Absolute section, B/I ckt, Mkt Outline graphics. Added Pinout.