

**MJLM117-H REV 1A1**

 Original Creation Date: 06/27/95  
 Last Update Date: 02/07/01  
 Last Major Revision Date: 02/02/01

**POSITIVE THREE TERMINAL ADJUSTABLE VOLTAGE REGULATOR**
**General Description**

The LM117 adjustable 3-terminal positive voltage regulator is capable of supplying in excess of 0.5A 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.

**Industry Part Number**

LM117H

**NS Part Numbers**

 JL117BXA  
 JL117SXA

**Prime Die**

LM117H

**Controlling Document**

38510/11703,AMEND.3 Cir.A 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 0.5A 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	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)	186 C/W
(500LF/Min Air flow)	64 C/W
ThetaJC	21 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<sub>dmax</sub> (T<sub>jmax</sub> - TA)/ThetaJA or the number given in the Absolute Maximum Rating, 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 <sub>l</sub> = -5mA			1.2	1.3	V	1, 2, 3
		Vin = 4.25V, I <sub>l</sub> = -500mA			1.2	1.3	V	1, 2, 3
		Vin = 41.25V, I <sub>l</sub> = -5mA			1.2	1.3	V	1, 2, 3
		Vin = 41.25V, I <sub>l</sub> = -50mA			1.2	1.3	V	1, 2, 3
Vrline	Line Regulation	4.25V ≤ Vin ≤ 41.25V, I <sub>l</sub> = -5mA			-9	9	mV	1
					-23	23	mV	2, 3
Vrload	Load Regulation	Vin = 6.25V, -500mA ≤ I <sub>l</sub> ≤ -5mA			-12	12	mV	1, 2, 3
		Vin = 41.25V, -50mA ≤ I <sub>l</sub> ≤ -5mA			-12	12	mV	1, 2, 3
Vrth	Thermal Regulation	Vin = 14.6V, I <sub>l</sub> = -500mA			-12	12	mV	1
Iadj	Adjust Pin Current	Vin = 4.25V, I <sub>l</sub> = -5mA			-100	-15	uA	1, 2, 3
		Vin = 41.25V, I <sub>l</sub> = -5mA			-100	-15	uA	1, 2, 3
Delta Iadj/Line	Adjust Pin Current Change	4.25V ≤ Vin ≤ 41.25V, I <sub>l</sub> = -5mA			-5	5	uA	1, 2, 3
Delta Iadj/Load	Adjust Pin Current Change	Vin = 6.25V, -500mA ≤ I <sub>l</sub> ≤ -5mA			-5	5	uA	1, 2, 3
Iq	Minimum Load Current	Vin = 4.25V, Forced Vout = 1.4V			-3	-0.5	mA	1, 2, 3
		Vin = 14.25V, Forced Vout = 1.4V			-3	-0.5	mA	1, 2, 3
		Vin = 41.25V, Forced Vout = 1.4V			-5	-1	mA	1, 2, 3
Ios	Output Short Circuit Current	Vin = 4.25V			-1.8	-0.5	A	1, 2, 3
		Vin = 40V			-0.5	-0.05	A	1, 2, 3
Vout (Recov)	Output Voltage Recovery	Vin = 4.25V, R <sub>l</sub> = 2.5 Ohms, C <sub>l</sub> = 20uF			1.2	1.3	V	1, 2, 3
		Vin = 40V, R <sub>l</sub> = 250 Ohms			1.2	1.3	V	1, 2, 3
Vout	Output Voltage Recovery	Vin = 6.25V, I <sub>l</sub> = -5mA	1		1.2	1.3	V	2

## Electrical Characteristics

### DC PARAMETERS (Continued)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vstart	Voltage Start-Up	Vin = 4.25V, Rl = 2.5 Ohms, C1 = 20uF, Il = -500mA			1.2	1.3	V	1, 2, 3

### AC PARAMETERS

Delta Vin/Delta Vout	Ripple Rejection	Vin = 6.25V, ei = 1Vrms at f = 2400Hz, Il = -125mA			65		dB	4
Vno	Output Noise Voltage	Vin = 6.25V, Il = -50mA				120	uVrms	7
Delta Vout/Delta Vin	Line Transient Response	Vin = 6.25V, Delta Vin = 3V, Il = -10mA				6	mV/V	7
Delta Vout/Delta Il	Load Transient Response	Vin = 6.25V, Delta Il = -200mA, Il = -50mA				0.6	mV/mA	7

### 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, Il = -5mA			-0.01	0.01	V	1
		Vin = 4.25V, Il = -500mA			-0.01	0.01	V	1
		Vin = 41.25V, Il = -5mA			-0.01	0.01	V	1
		Vin = 41.25V, Il = -50mA			-0.01	0.01	V	1
Vrline	Line Regulation	$4.25V \leq V_{in} \leq 41.25V$ , Il = -5mA			-4	4	mV	1
Iadj	Adjust Pin Current	Vin = 4.25V, Il = -5mA			-10	10	uA	1
		Vin = 41.25V, Il = -5mA			-10	10	uA	1

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

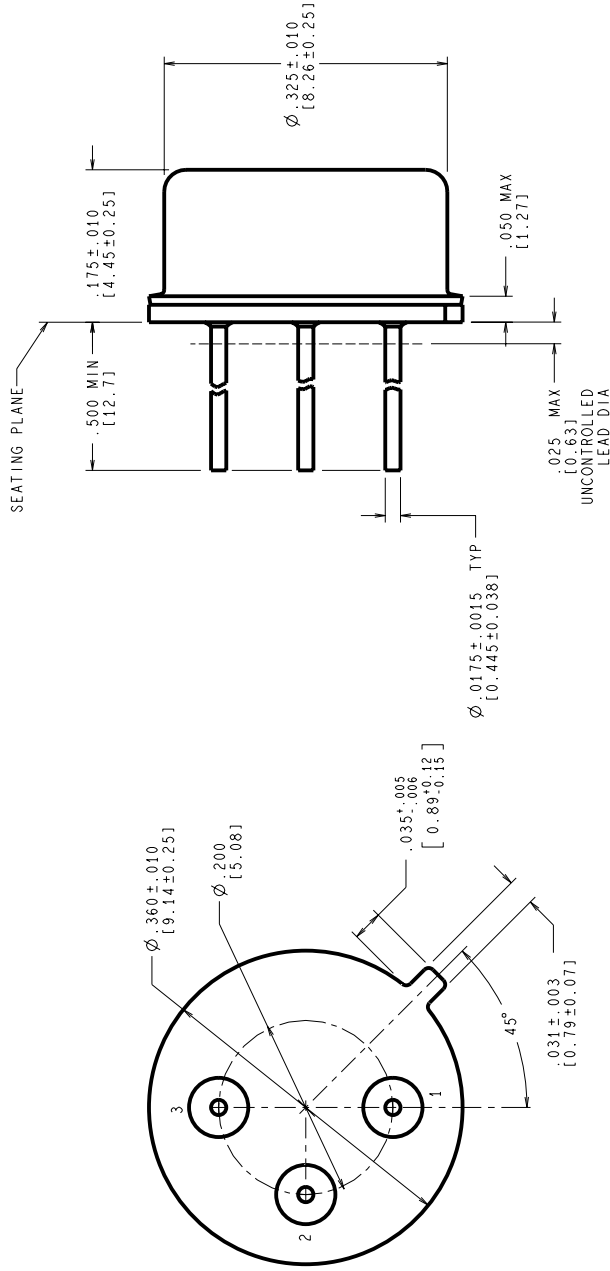
## Graphics and Diagrams

GRAPHICS#	DESCRIPTION
9784HRB2	METAL CAN (H), TO-39, 3LD, .200 DIA P.C. (B/I CKT)
H03ARD	METAL CAN (H), TO-39, 3LD, .200 DIA P.C. (P/P DWG)
P000174A	METAL CAN (H), TO-39, 3LD, .200 DIA P.C. (PINOUT)

See attached graphics following this page.

REVISIONS

LTR	DESCRIPTION	E.C. N.	DATE	BY/APP'D
C	REVISE & REDRAW PER NEW STANDARD	10403	05/24/94	TL/GM
D	UPDATE MILAERO STAMP: Ø .325 WAS Ø .326; REVISE TOLERANCES	10798	02/28/95	TL/L



CONTROLLING DIMENSION IS INCH  
VALUES IN [ ] ARE MILLIMETERS

NOTES: UNLESS OTHERWISE SPECIFIED

- LEADS TO BE LOCATED WITHIN .010 IN/ 0.25 mm OF THEIR TRUE POSITIONS RELATIVE TO A MAXIMUM WIDTH TAB.
- STANDARD METAL CAN TYPE: SOLID BASE, KOVAR.
- APPLIES TO MIL-AERO AND LINEAR PRODUCTS.
- REFERENCE JEDEC REGISTRATION TO-39, JEDEC PUBLICATION No. 95.

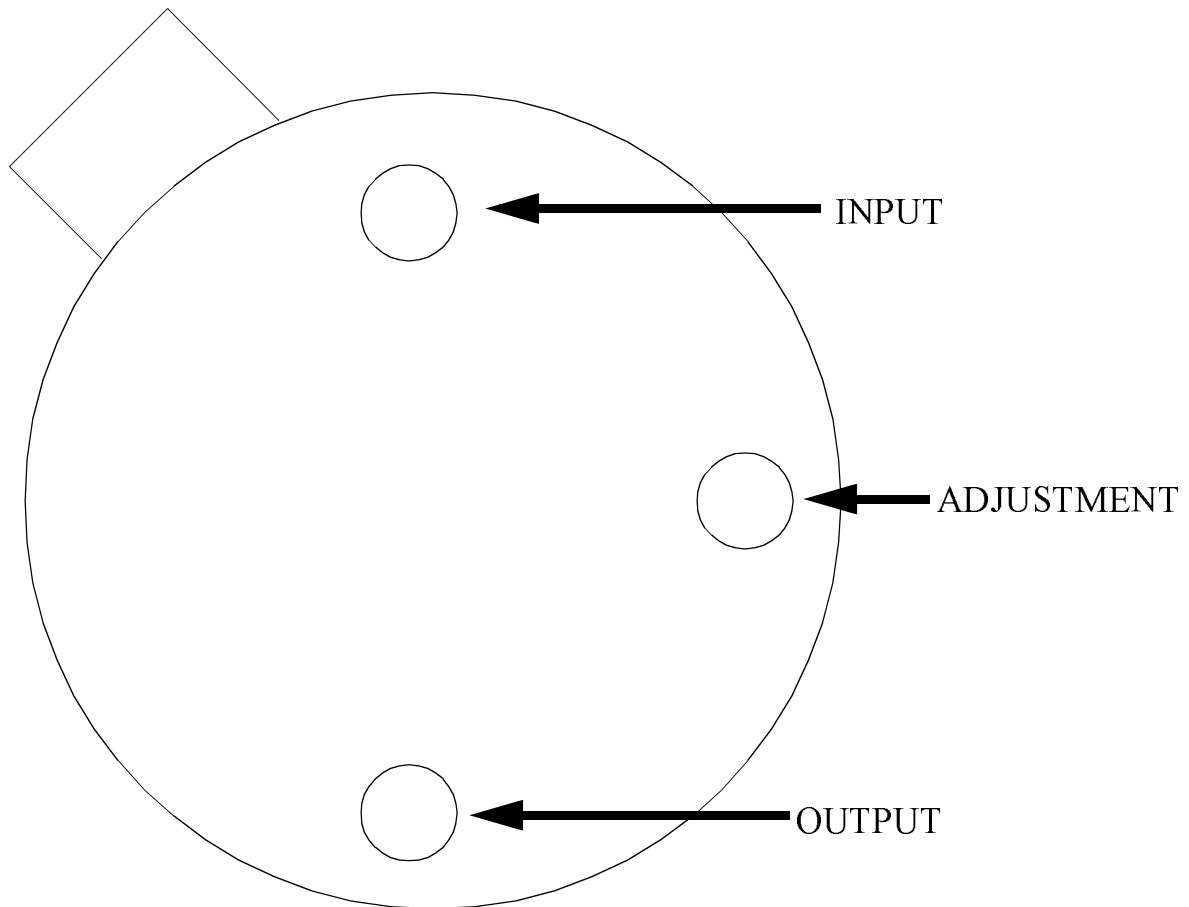
MIL-I-38535  
CONFIGURATION CONTROL

APPROVALS	DATE
DRW: T. LEQUANG	05/24/94
DATE: 05/24/94	
DRG. CHK.	
ENGR. CHK.	
PROJECTION	
SCALE	N/A
SIZE	C
DRAWING NUMBER	MKT-H03A
REV	D

DO NOT SCALE DRAWING SHEET 1 of 1

**National Semiconductor**  
2500 Semiconductor Dr., Santa Clara, CA 95052-8090

METAL CAN,  
TO-39, 3 LEAD,  
.200 DIA P.C.



LM117H, LM117HVH  
3 - LEAD TO-39  
CONNECTION DIAGRAM  
BOTTOM VIEW  
P000174A



National Semiconductor™  
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2900 SEMICONDUCTOR DRIVE  
SANTA CLARA, CA 95050

**Revision History**

<b>Rev</b>	<b>ECN #</b>	<b>Rel Date</b>	<b>Originator</b>	<b>Changes</b>
0C1	M0003587	02/07/01	Rose Malone	Updated MDS: MJLM117-H, Rev. 0B0 to MJLM117-H, Rev. 0C1. Corrected typo on Vrline, Delta Iadj/Line, Vout. Changed Iil to Il on all parameters. Updated B/I ckt graphic and Added Pinout.
1A1	M0003785	02/07/01	Rose Malone	Update MDS: MJLM117-H, Rev. 0C1 to MJLM117-H, Rev. 1A1. Removed in Electricals from Drift Values Section Parameter Vout(Recov)