National Semiconductor

MICROCIRCUIT DATA SHEET

MNLM117HV-K REV 0C1

Original Creation Date: 06/27/95
Last Update Date: 10/08/99
Last Major Revision Date: 06/27/95

POSITIVE THREE TERMINAL HIGH VOLTAGE ADJUSTABLE REGULATOR

General Description

The LM117HV adjustable 3-terminal positive voltage regulator is capable of supplying in excess of 1.5A over a 1.2V to 57V 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 LM117HV 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 rejections ratios which are difficult to achieve with standard 3-terminal regulators.

Besides replacing fixed regulators, the LM117HV 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. do not short the output to ground).

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 LM117HV 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

LM117HVK

NS Part Numbers

LM117HVK/883

Prime Die

LM117HVK

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

- Adjustable output down to 1.2V
- Guaranteed 1.5A output current
- Line regulation typically 0.01%/V
- Load regulation typically 0.1%
- Current limit constant with temperature
- Eliminates the need to stock many voltages
- 80 dB ripple rejection
- Output is short-circuit protected

(Absolute Maximum Ratings)
(Note 1)

Power Dissipation (Note 2)	Internally Limited
Input-Output Voltage Differential	+60V, -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 2)	2000V

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 Pdmsx = (Tjmax - TA)/ThetaJA or the number given in the Absolute Maximum Ratings, whichever is lower.
Note 3: Human body model, 1.5K Ohms is series with 100pF.

Recommended Operating Conditions

Operating Temperature Range	-55 C $\leq$ TA $\leq$ +125 C

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vdiff = |Vin - Vout|, Il = 10mA

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iadj	Adjustment Pin Current	Vdiff = 3V				100	uA	1
		Vdiff = 3.3V				100	uA	2, 3
		Vdiff = 40V				100	uA	1, 2, 3
Iq	Minimum Load Current	Vdiff = 3V, Vout = 1.7V				5	mA	1
		Vdiff = 3.3V, Vout = 1.7V				5	mA	2, 3
		Vdiff = 40V, Vout = 1.7V				5	mA	1, 2, 3
		Vdiff = 60V, Vout = 1.7V			.25	8.2	mA	1
Vref	Reference Voltage	Vdiff = 3V			1.2	1.3	V	1
		Vdiff = 3.3V			1.2	1.3	V	2, 3
		Vdiff = 40V			1.2	1.3	V	1, 2, 3
Rline	Line Regulation Under Load	3V <= Vdiff <= 40V, Vout = Vref			-8.64	8.64	mV	1
		3.3V <= Vdiff <= 40V, Vout = Vref			-18	18	mV	2, 3
		40V <= Vdiff <= 60V, Il = 60mA			-25	25	mV	1
Rload	Load Regulation	Vdiff = 3V, Il = 10mA to 1.5A			-15	15	mV	1
		Vdiff = 3.3V, Il = 10mA to 1.5A			-15	15	mV	2, 3
		Vdiff = 40V, Il = 10mA to 300mA			-15	15	mV	1
		Vdiff = 40V, Il = 10mA to 195mA			-15	15	mV	2, 3
Delta/ Iadj	Adjustment Pin Current Change	Vdiff = 3V, Il = 10mA to 1.5A			-5	5	uA	1
		Vdiff = 3.3V, Il = 10mA to 1.5A			-5	5	uA	2, 3
		Vdiff = 40V, Il = 10mA to 300mA			-5	5	uA	1
		Vdiff = 40V, Il = 10mA to 195mA			-5	5	uA	2, 3
		3V $\leq$ Vdiff $\leq$ 40V			-5	5	uA	1
		3.3V $\leq$ Vdiff $\leq$ 40V			-5	5	uA	2, 3
Ios	Short Circuit Current	Vdiff = 60V			0	0.4	A	1
		Vdiff = 3V			1.5	3.5	A	1
Theta R	Thermal Regulation	Vdiff = 40V, Il = 300mA, t = 20mS				10.5	mV	1

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: Vdiff = |Vin - Vout|, Il = 10mA

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Rr	Ripple Rejection	Vin = +6.25V, f = 120Hz, ein = 1Vrms, Il = .5A, Vout = Vref	1		66		dB	4, 5, 6

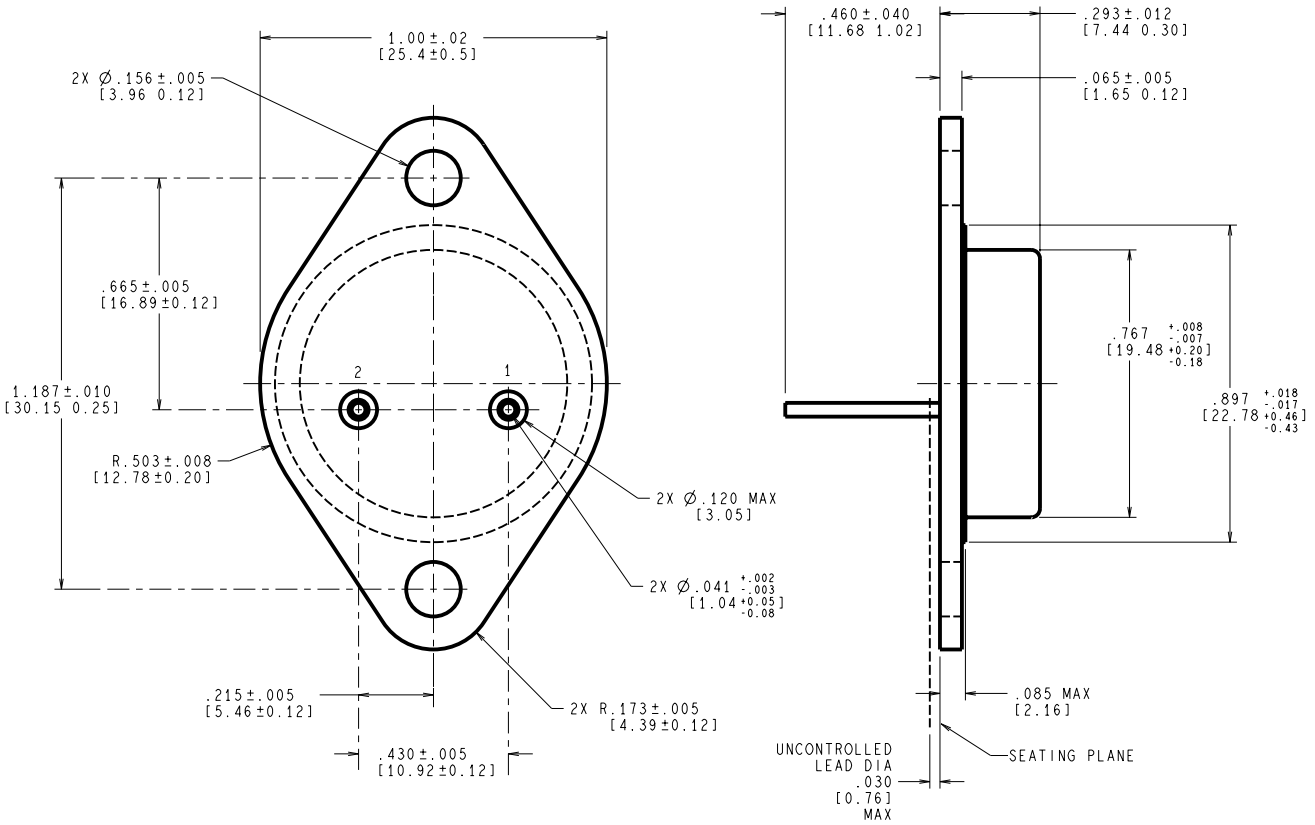
Note 1: Tested at +25 C; guaranteed but not tested at +125 C and -55 C.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
9757HRE3	(blank)
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.

REVISIONS				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
E	REDRAW ON PRO/E; UPDATE MIL/AERO STAMP; NOTE 2: MIL-PRF-38535 WAS MIL-I-38535.	11155	09/15/95	MS/



CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

NOTES: UNLESS OTHERWISE SPECIFIED

1. STANDARD HEADER TYPE SOLID BASE.
2. STANDARD LEAD FINISH:
   PER MIL-PRF-38535 TYPE X OR EQUIVALENT.
3. LEAD NOT BENT GREATER THAN 15° .
4. DIMENSIONS BASED ON JEDEC STANDARD TO-3,
   PUBLICATION 95, PAGE 98.

MIL-PRF-38535
CONFIGURATION CONTROL

APPROVALS	DATE
DRAWN: MARTA SUCHY	09/15/95
DFTG. CHK.	
ENGR. CHK.	

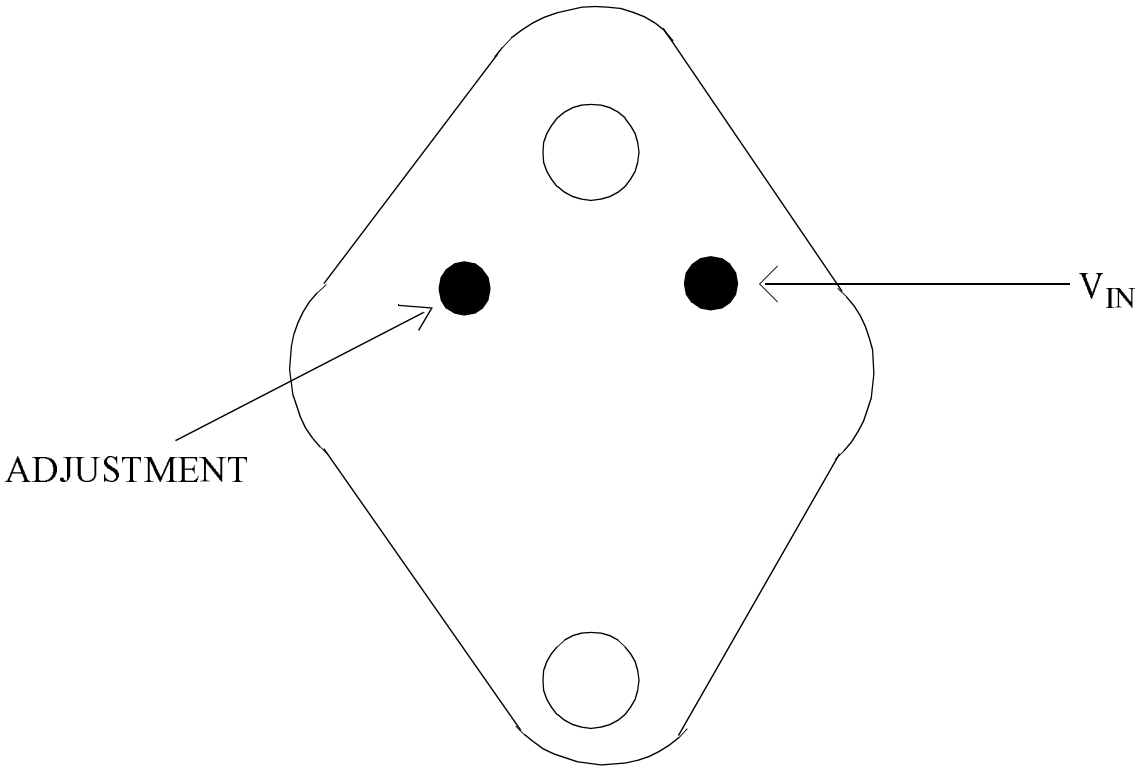
National Semiconductor
2900 Semiconductor dr, Santa Clara, CA 95052-8090

METAL CAN, TO-3, 2 LEAD, LOW PROFILE

PROJECTION
INCH [MM]

SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-K02C	E

DO NOT SCALE DRAWING | SHEET 1 of 1



LM117K, LM117HVK

2 - LEAD TO3

CONNECTION DIAGRAM

BOTTOM VIEW

P000173A

National Semiconductor™
MIL/AEROSPACE OPERATIONS
2900 SEMICONDUCTOR DRIVE
SANTA CLARA, CA 95050

Revision History

Rev	ECN #	Rel Date	Originator	Changes
0B0	M0001518	10/08/99	Barbara Lopez	Updated MDS from: MNLM117HV-K Rev. 0A0 to MNLM117HV-K Rev. 0B0. Corrected typo from t = 20nS to t = 20mS on Theta R parameter.
0C1	M0002572	10/08/99	Barbara Lopez	Update MDS: MNLM117HV-K Rev. 0B0 to MNLM117HV-K Rev. 0C1. Added power dissipation note, updated thermal data in Absolute section. Update B/I graphic Rev., MKT outline Rev. and added Pinout to Graphics section.