National Semiconductor

MICROCIRCUIT DATA SHEET

MNLM137HV-K REV 0A0

Original Creation Date: 07/12/95
Last Update Date: 04/16/99
Last Major Revision Date: 03/26/99

3 TERMINAL ADJUSTABLE NEGATIVE REGULATOR

General Description

The LM137HVK is an adjustable 3-terminal negative voltage regulator capable of supplying in excess of -1.5A over an output voltage range of -1.2V to -47V. This regulator is exceptionally easy to apply, requiring only 2 external resistors to set the output voltage and 1 output capacitor for frequency compensation. The circuit design has been optimized for excellent regulation and low thermal transients. Further, the LM137HVK features internal current limiting, thermal shutdown and safe-area compensation, making it virtually blowout-proof against overloads.

The LM137HVK serves a wide variety of applications including local on-card regulation, programmable-output voltage regulation or precision current regulation. The LM137HVK is an ideal complement to the LM117HVK adjustable positive regulator.

Industry Part Number

LM137HV

NS Part Numbers

LM137HVK/883

Prime Die

LM137HVK

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{o}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

- Output voltage adjustable from -1.2 to -47V
- 1.5A output current guaranteed, -55 C to +150 C
- Line regulation typically 0.01%/V
- Load regulation typically 0.3%
- Excellent thermal regulation, 0.0002%/W
- 77 dB ripple rejection
- Excellent rejection of thermal transients
- 50 ppm/ C temperature coefficient
- Temperature- independent current limit
- Internal thermal overload protection
- Standard 3-lead transistor package
- Output short circuit protected

(Absolute Maximum Ratings)
(Note 1)

Power Dissipation (Note 2)	Internally Limited
Input-Output Voltage Differential	50V
Operating Junction Temperature Range	-55 C to +150 C
Maximum Junction Temperature (Note 2)	150 C
Storage Temperature	-65 C to +150 C
Lead Temperature (Soldering, 10 seconds)	300 C
Themal Resistance	
ThetaJA (Still Air)	42 C/W
(500LF/Min Air Flow)	14 C/W
ThetaJC	3 C/W
Package Weight (Typical)	12750mg
ESD Rating (Note 3)	4000V

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 Pdmax = (Tjmax - TA)/ThetaJA or the number given in the Absolute Maximum Ratings, whichever is lower.

Note 3: Human body model, 100pF discharged through 1.5K Ohms

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vin=-40V, Il= 8mA, Vo=Vref= -1.25V (nominal)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vref	Reference Voltage	Vin = -4.25V			1.272	-1.23	V	1
					-1.28	-1.225	V	2, 3
		Vin = -42V			-1.272	-1.23	V	1
		Vin = -41.3V			-1.28	-1.225	V	2, 3
Rline	Line Regulation	-42V ≤ Vin ≤ -4.25V				9.4	mV	1
		-41.3V ≤ Vin ≤ -4.25V				9.4	mV	2, 3
Rload	Load Regulation	Vin = -54V, 10mA ≤ Io ≤ 110mA			-25	25	mV	1
		Vin = -6.25V, 8mA ≤ Io ≤ 1.5A			-25	25	mV	1, 2, 3
Vrth	Thermal Regulation	Io = 1.5A, Vin = -14.5V, t = 10mS			-5	5	mV	1
Iadj	Adjustment Pin Current	Vin = -42V				100	uA	1
		Vin = -41.3V				100	uA	2, 3
		Vin = -4.25V				100	uA	1, 2, 3
		Vin = -54V				100	uA	1
Delta Iadj	Adjustment Pin Current	-42V ≤ Vin ≤ -4.25V			-5	5	uA	1
		-41.3V ≤ Vin ≤ -4.25V			-5	5	uA	2, 3
		-54V ≤ Vin ≤ -4.25V			-6	6	uA	1
		Vin = -6.25V, 8mA ≤ Io ≤ 1.5A			-5	5	uA	1, 2, 3
Iq	Minimum Load Current	Vo = 1.7V, Vin = -4.25V				3	mA	1, 2, 3
		Vo = -1.7V, Vin = -11.75V				3	mA	1, 2, 3
		Vo = -1.7V, Vin = -42V				5	mA	1
		Vo = -1.7V, Vin = -41.3V				5	mA	2, 3
Isc	Short Circuit	Vin = -5V			-2.85	-1.6	A	1
					-3.5	-1.6	A	2, 3
		Vin = -51.25V	1		-0.8	-0.2	A	1

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: Vin=-40V, Il= 8mA, Vo=Vref= -1.25V (nominal)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Rn	Ripple Rejection	Vin=-6.25V, Vout=Vref, f=120Hz, ein=1V rms, Il=0.5A	2, 3		66		dB	4, 5, 6

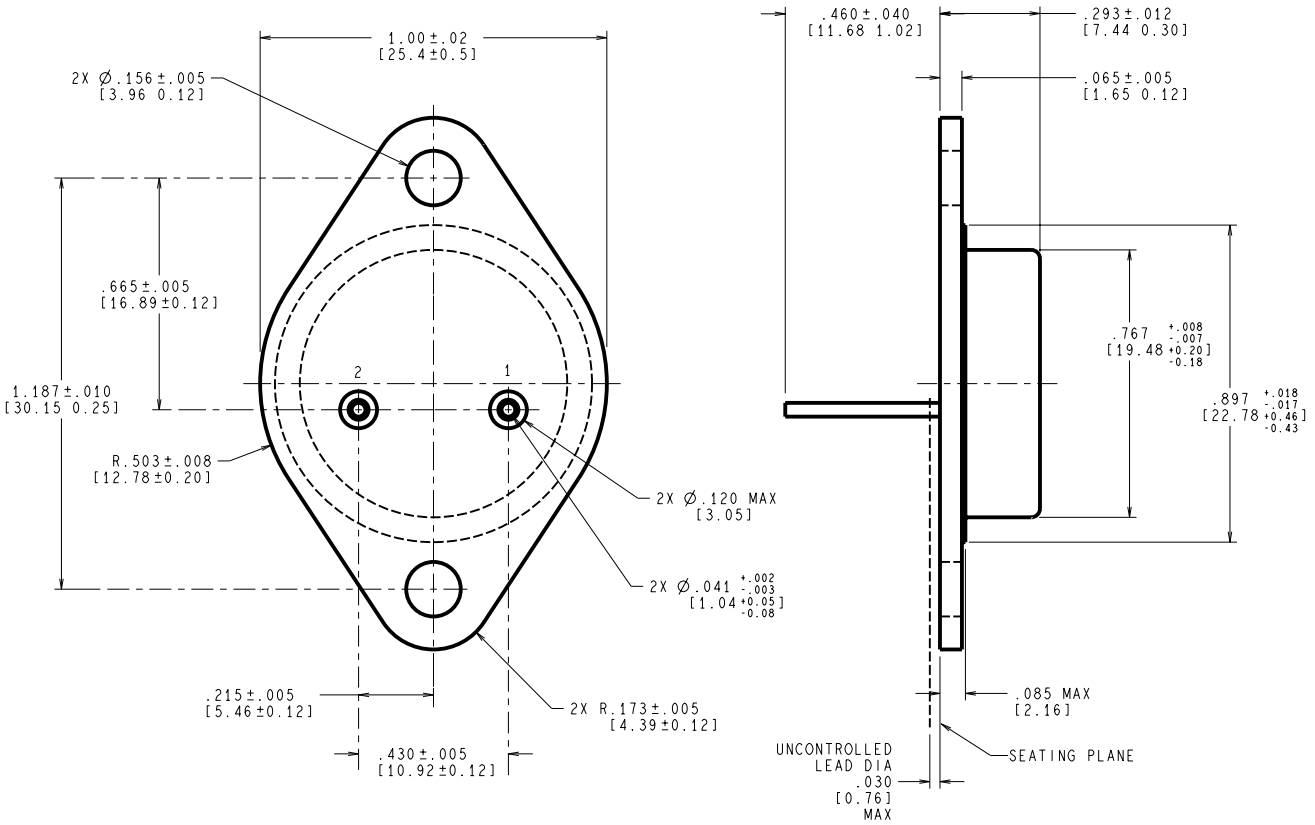
Note 1: Guaranteed parameter not tested.
Note 2: Tested at +25 C, guaranteed but not tested at +125 C and -55C.
Note 3: Bench test per (SG)RPI-3-362.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
05191HRB4	METAL CAN (KA), TO-3, 2LD, LOW PROFILE (B/I CKT)
K02CRE	METAL CAN (KA), TO-3, 2LD, LOW PROFILE (P/P DWG)
P000200A	METAL CAN (KA), TO-3, 2 LD, 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.	

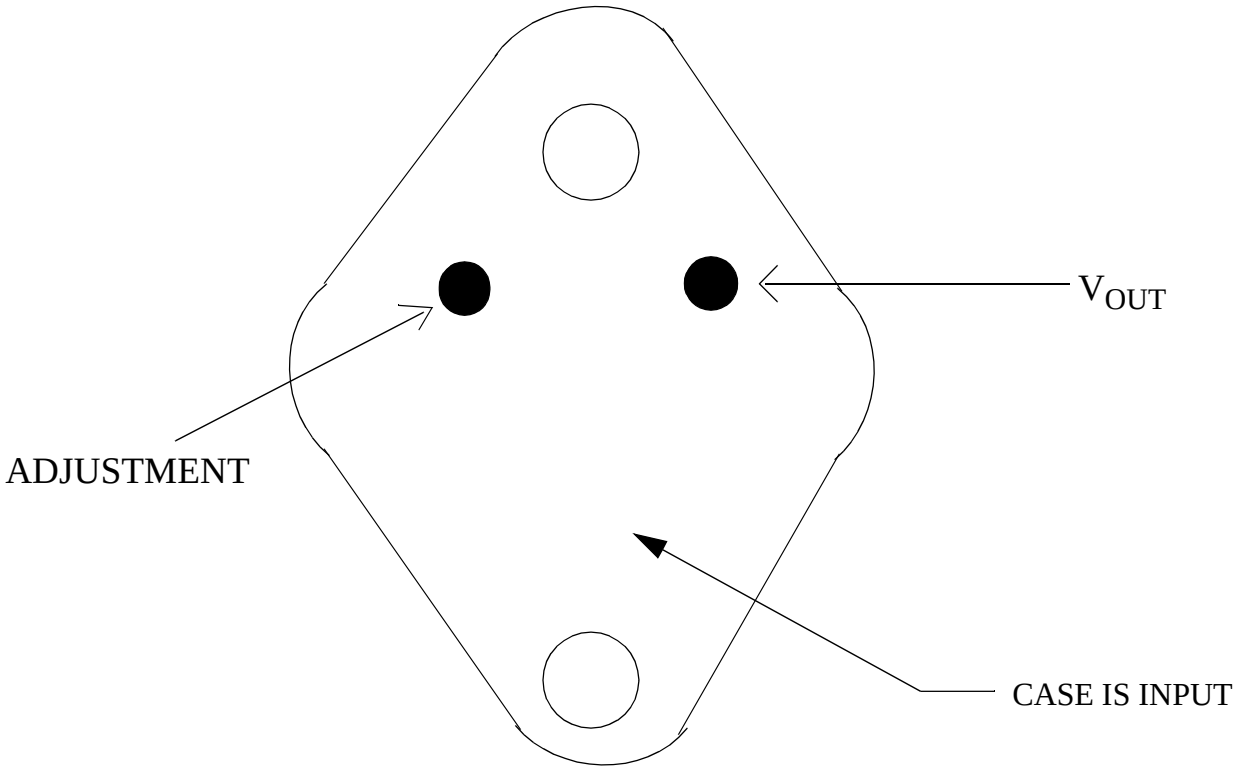
National Semiconductor
2900 Semiconductor dr, Santa Clara, CA 95052-8090

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



LM137K, LM137HVK

2 - LEAD TO3

CONNECTION DIAGRAM

BOTTOM VIEW

P000200A

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

Revision History

Rev	ECN #	Rel Date	Originator	Changes
0A0	M0003345	04/16/99	Rose Malone	Verified NSID, Added Features Section, reference to Thermal Resistance info., Package Weight and ESD limit. Updated to fully released MDS. Obsolete RETS137HVK, Rev. 7B. Update MDS: MNLM137-HVK-X, Rev. 0AL to MNLM137HV-K, Rev. 0A0. CHANGE Nomenclature from MNLM137-HVK-X to MNLM137HV-K.