

MNLM137-K REV 0A0

 Original Creation Date: 07/12/95
 Last Update Date: 03/23/00
 Last Major Revision Date: 04/21/99

3 TERMINAL ADJUSTABLE NEGATIVE REGULATOR

General Description

The LM137K 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 -37V. 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 LM137K features internal current limiting, thermal shutdown and safe-area compensation, making them virtually blowout-proof against overloads.

The LM137K serves a wide variety of applications including local on-card regulation, programmable-output voltage regulation or precision current regulation. The LM137K is an ideal complement to the LM117K adjustable positive regulator.

Industry Part Number

LM137

NS Part Numbers

LM137K/883

Prime Die

LM137

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

- Output voltage adjustable from -1.2V to -37V
- 1.5A output current guaranteed, -55 C to +150 C
- Line regulation typically 0.01%/V
- Load regulation typically 0.3%
- Excellent thermal regulation, 0.002%/W
- 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	40V
Operating Junction Temperature	-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
Thermal Resistance ThetaJA (Still Air) (500LF/Min Air Flow)	40 C/W 14 C/W
ThetaJC	3 C/W
Package Weight (Typical)	12750mg
ESD Rating (Note 3)	2K Volts

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 $P_{dmax} = (T_{jmax} - TA) / \Theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower.

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

Recommended Operating Conditions

Ta	-55 C to +125 C
Input Voltage Range	-41.25V to -4.25V

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: $V_{in} = -4.25V$, $I_l = 8mA$, $V_{out} = V_{ref}$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vref	Reference Voltage				-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3
		$V_{in} = -42V$			-1.275	-1.225	V	1
		$V_{in} = -41.3V$			-1.3	-1.2	V	2, 3
Iq	Minimum Load Current	$V_{out} = -1.7V$				3	mA	1, 2, 3
		$V_{out} = -1.7V$, $V_{in} = -11.75V$				3	mA	1, 2, 3
		$V_{out} = -1.7V$, $V_{in} = -42V$				5	mA	1
		$V_{out} = -1.7V$, $V_{in} = -41.3V$				5	mA	2, 3
Rline	Line Regulation	$-42V \leq V_{in} \leq -4.25V$			-9	9	mV	1
		$-41.3V \leq V_{in} \leq -4.25V$			-23	23	mV	2, 3
Rload	Load Regulation	$V_{in} = -6.25V$, $8mA \leq I_l \leq 1.5A$			-25	25	mV	1, 2, 3
		$V_{in} = -14.5V$, $8mA \leq I_l \leq 1.5A$			-25	25	mV	1
		$V_{in} = -40V$, $8mA \leq I_l \leq 300 mA$			-25	25	mV	1
		$V_{in} = -40V$, $8mA \leq I_l \leq 250 mA$			-25	25	mV	2, 3
Iadj	Adjustment Pin Current					100	uA	1, 2, 3
		$V_{in} = -42V$				100	uA	1
		$V_{in} = -41.3V$				100	uA	2, 3
Delta Iadj / (line)	Change vs Line Voltage	$-42V \leq V_{in} \leq -4.25V$			-5	5	uA	1
		$-41.3V \leq V_{in} \leq -4.25V$			-5	5	uA	2, 3
Delta Iadj / (load)	Change vs Load Current	$8 mA \leq I_l \leq 1.5A$, $V_{in} = -6.25V$			-5	5	uA	1, 2, 3
Vrth	Thermal Regulation Thermal Recovery	$V_{in} = -14.5V$, $I_l = 1.5mA$, $t = 10mS$			-5	5	mV	1
		$V_{in} = -14.5V$, $I_l = 8mA$, $t = 10mS$			-5	5	mV	1
Theta JC	Thermal Resistance		1			3	Deg C/W	1
Icl	Current Limit	$V_{in} = -5V$			-3.5	-1.5	A	1, 2, 3
		$V_{in} = -40V$			-1.2	-0.24	A	1, 2, 3

Electrical Characteristics

AC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Rr	Ripple Rejection Ratio	Vin= -6.25V, Vout=Vref, f=120Hz, I1=0.5A, ei=1Vrms	2, 3		66		dB	4, 5, 6

DC PARAMETERS: DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: Vin = -4.25V, I1 = 8mA, Vout=Vref. "Deltas not required on B-Level product. Deltas required for S-Level product ONLY as specified on Internal Processing Instructions (IPI)."

Vref	Reference Voltage				-0.01	0.01	V	1
Rline	Line Regulation	$-42V \leq V_{in} \leq -4.25V$			-4	4	mV	1
Iadj	Adjustment Pin Current				-10	10	uA	1

Note 1: Guaranteed parameter, not tested.

Note 2: Bench test refer to (SG) RPI-3-362.

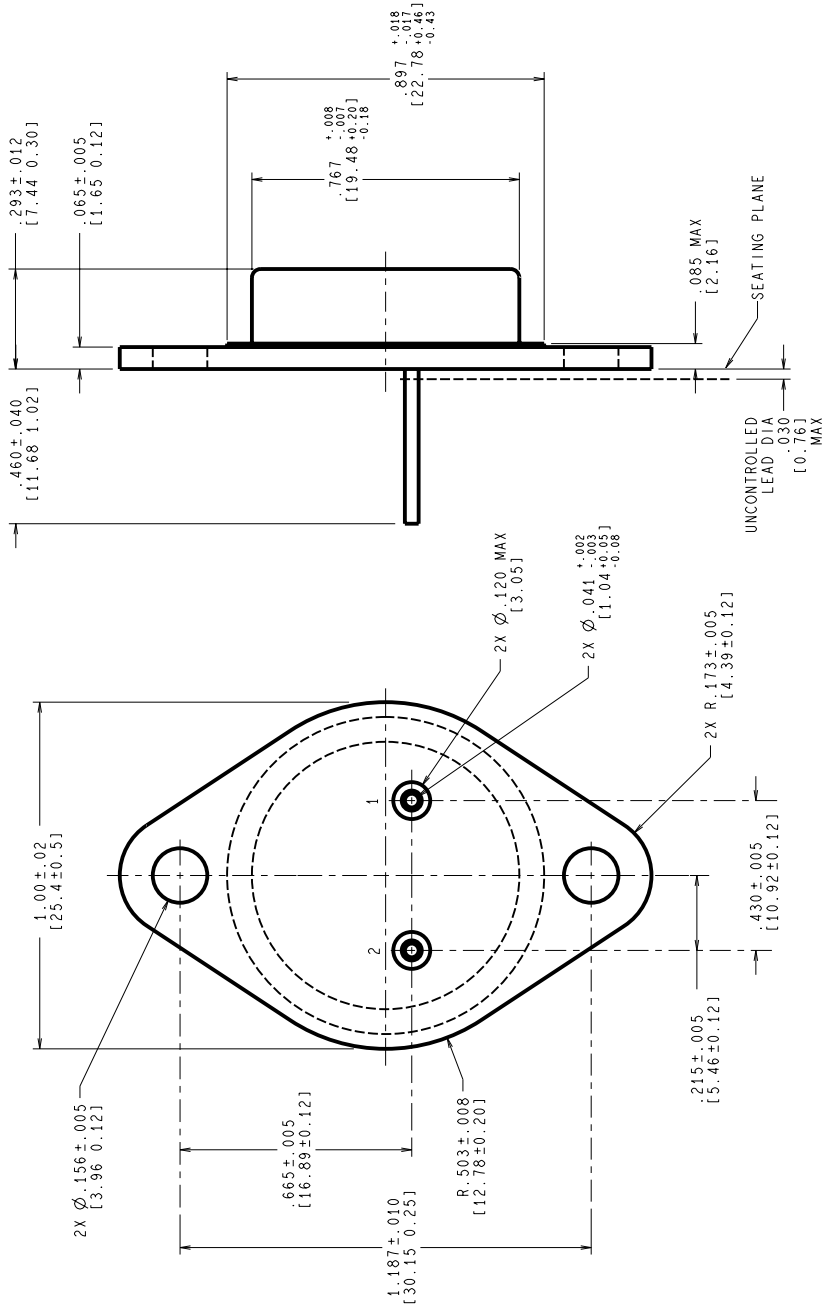
Note 3: Test at +25 C, guaranteed but not tested at +125 C and -55 C.

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
E	REDRAW ON PROFILE: 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

MIL-PRF-38535
CONFIGURATION CONTROL

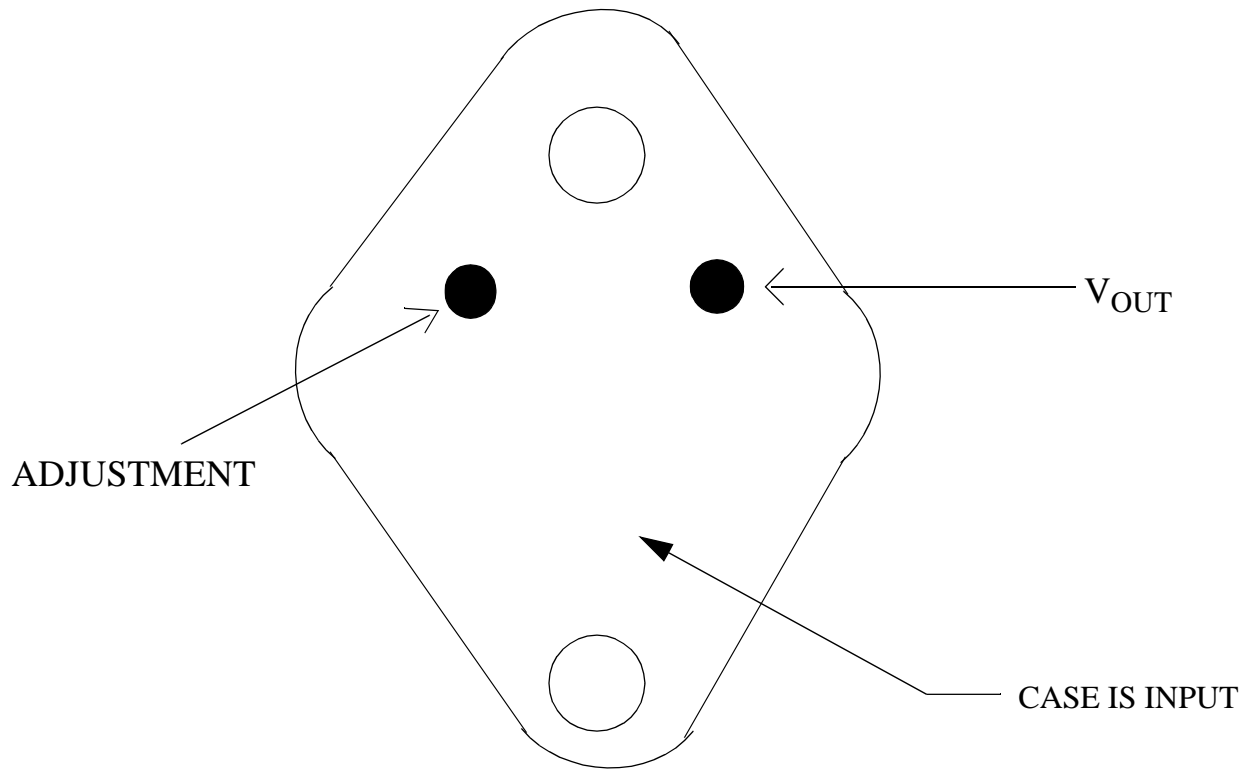
NOTES: UNLESS OTHERWISE SPECIFIED

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.

APPROVALS		DATE
DRNWR	MARTA SUCHY	09/15/95
DRG. CHK.		
ENGR. CHK.		
PROJECTION		
SCALE	N/A	
SIZE	C	
DRAWING NUMBER	MKT-K02C	
REV	E	

National Semiconductor
2800 Semiconductor Dr., Santa Clara, CA 95052-8090

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



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	M0003392	03/23/00	Rose Malone	Update MDS from MNLM137-K, Rev. 0BL to Fully Released MDS MNLM137-K, Rev. 0A0.