National Semiconductor

MICROCIRCUIT DATA SHEET

MJLM137-K REV 0A0

Original Creation Date: 07/12/95
Last Update Date: 04/29/99
Last Major Revision Date: 04/21/99

3-TERMINAL VOLTAGE REGULATOR, -37 VOLTS ≤ VO ≤ -1.25 VOLTS AT 1.5A

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. Futher, the LM137K features internal current limiting, thermal shutdown and safe-area compensation, making it 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

JL137BYA
JL137SYA

Prime Die

LM137

Controlling Document

38510/11804,AMEND. 4

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
- Stantard 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
Maximum Power Dissipation (@ 25 C)	28 Watts
Minimum Input Voltage	-41.25V
Storage Temperature	-65 C to +150 C
Lead Temperature (Soldering, 10 seconds)	300 C
Thermal Resistance ThetaJA (Still Air)	40 C/W
(500LF/Min Air Flow)	14 C/W
ThetaJC	4 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 Rating 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

Recommended Operating Conditions

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

Electrical Characteristics

DC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vout	Output Voltage	Vin = -4.25V, Il = 5mA			-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3
		Vin = -4.25V, Il = 1.5A			-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3
		Vin = -41.25V, Il = 5mA			-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3
		Vin = -41.25V, Il = 200mA			-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3
Vrline	Line Regulation	-41.25V ≤ Vin ≤ -4.25, Il = 5mA			-9	9	mV	1
					-23	23	mV	2, 3
Vrload	Load Regulation	Vin = -6.25V, Il = 5mA to 1.5A			-6	6	mV	1
					-12	12	mV	2, 3
		Vin = -41.25V, Il = 5mA to 200mA			-6	6	mV	1
					-12	12	mV	2, 3
Vrth	Thermal Regulation	Vin = -14.6V, Il = 1.5A			-5	5	mV	1
Iadj	Adjust Pin Current	Vin = -4.25V, Il = 5mA			25	100	uA	1, 2, 3
		Vin = -41.25V, Il = 5mA			25	100	uA	1, 2, 3
Delta Iadj(line)	Adjust Pin Current Change vs. Line Voltage	-41.25V ≤ Vin ≤ -4.25, Il = 5mA			-5	5	uA	1, 2, 3
Delta Iadj(load)	Adjust Pin Current Change vs. Load Current	Vin = -6.25V, Il = 5mA to 1.5A			-5	5	uA	1, 2, 3
Ios	Output Short Circuit Current	Vin = -4.25V			1.5	3.5	A	1, 2, 3
		Vin = -40V			0.2	1	A	1, 2, 3
Vout (Recovery)	Output Voltage Recovery	Vin = -4.25V			-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3
		Vin = -40V			-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3

Electrical Characteristics

DC PARAMETERS(Continued)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iq	Minimum Load Current	Vin = -4.25V			0.2	3	mA	1, 2, 3
		Vin = -14.25V			0.2	3	mA	1, 2, 3
		Vin = -41.25V			1	5	mA	1, 2, 3
Vstart	Voltage Start-up	Vin = 4.25V, Il = 1.5A			-1.275	-1.225	V	1
					-1.3	-1.2	V	2, 3
Vout	Output Voltage	Vin = -6.25V, Il = 5mA (No Subgroup)	1		-1.3	-1.2	V	

AC PARAMETERS

Delta Vin/Delta Vout	Ripple Rejection	Vin = -6.25V, ei = 1Vrms at 2400Hz, Il = 500mA			50		dB	4
Vno	Output Noise Voltage	Vin = -6.25V, Il = 100mA				120	uVrms	
Delta Vout/Delta Vin	Line Transient Response	Vin = -6.25V, Il = 100mA, Vpulse = -1V				80	mV/V	7
Delta Vout/Delta Il	Load Transient Response	Vin = -6.25V, Il = 100mA, Delta Il = 400mA	2			60	mV	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 = -41.25V, Il = 5mA			-0.01	0.01	V	1
Vrline	Line Regulation	-41.25V $\leq$ Vin $\leq$ -4.25, Il = 5mA			-4	4	mV	1
Iadj	Adjust Pin Current	Vin = -41.25V, Il = 5mA			-10	10	uA	1

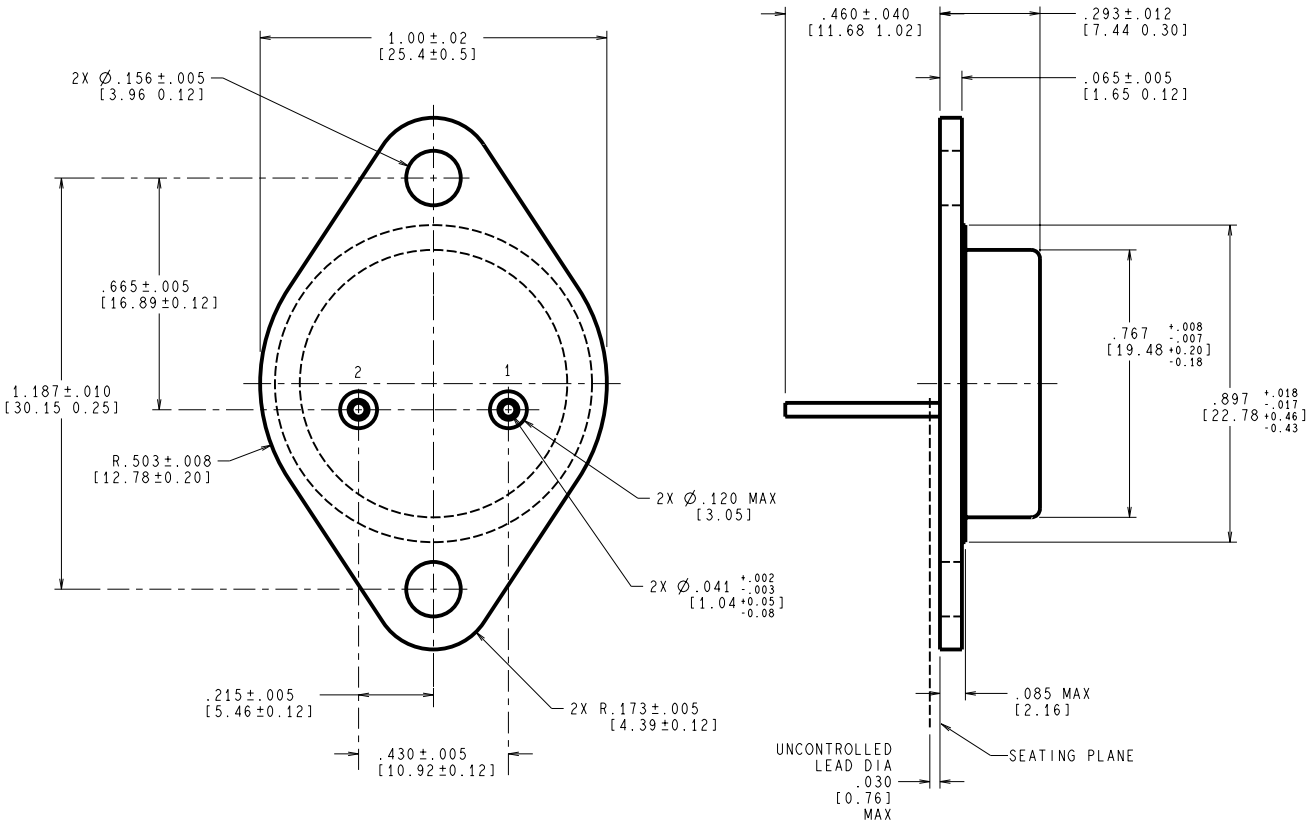
Note 1: Tested at +125 C; correlated to 150 C.
Note 2: S/S limit of .15mV/mA is equivalent to 60mV.

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.	

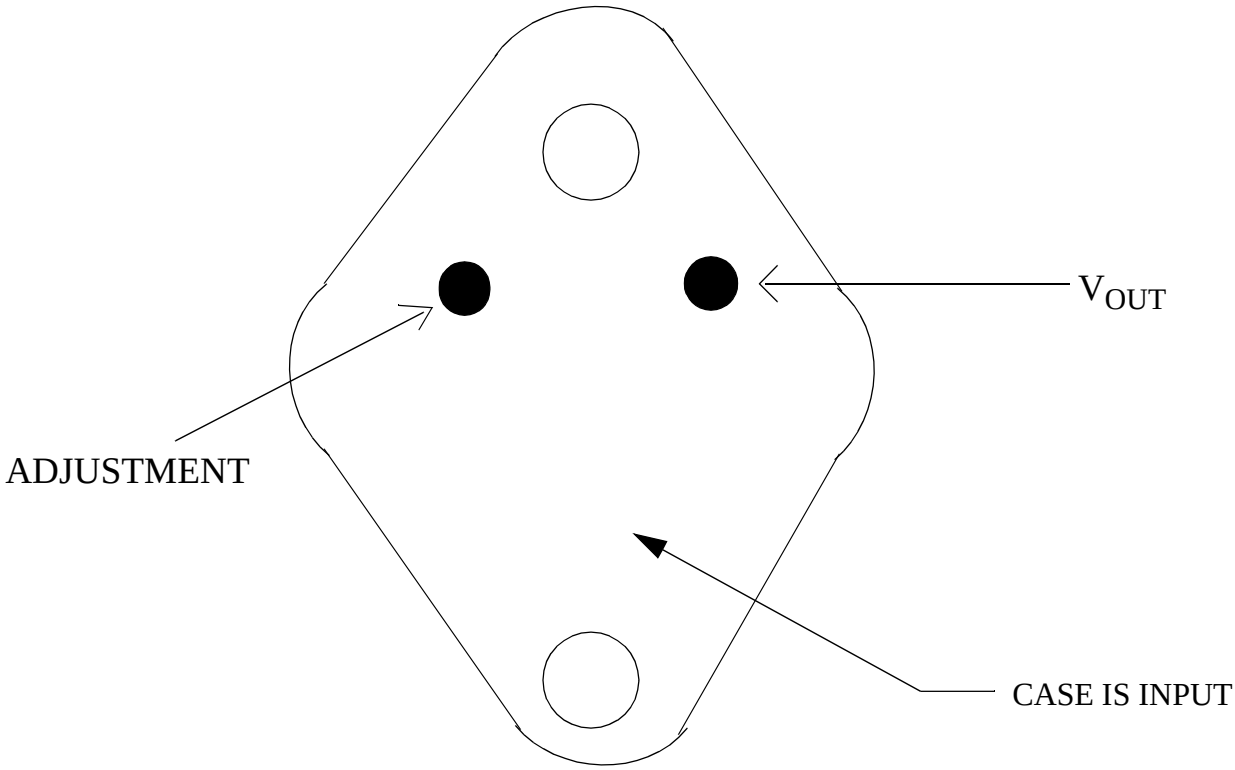
National Semiconductor
2900 Semiconductor dr, Santa Clara, CA 95052-8090

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	M0003394	04/29/99	Rose Malone	Update MDS from MJLM137-K, Rev. 0BL to Fully Released MDS MJLM137-K, Rev. 0A0.