

**MNLM185-2.5-X REV 2A2**

 Original Creation Date: 08/15/95  
 Last Update Date: 12/12/02  
 Last Major Revision Date: 11/20/02

**2.5V MICROPPOWER VOLTAGE REFERENCE DIODE**
**General Description**

The LM185-2.5 is a micropower 2-terminal band-gap voltage regulator diode. Operating over a 20uA to 20mA current range, it features exceptionally low dynamic impedance and good temperature stability. On-chip trimming is used to provide tight voltage tolerance. Since the LM185-2.5 band-gap reference uses only transistors and resistors, low noise and good long term stability result.

Careful design of the LM185-2.5 has made the device exceptionally tolerant of capacitive loading, making it easy to use in almost any reference application. The wide dynamic operating range allows its use with widely varying supplies with excellent regulation.

The extremely low power drain of the LM185-2.5 makes it useful for micropower circuitry. This voltage reference can be used to make portable meters, regulators or general purpose analog circuitry with battery life approaching shelf life. Further, the wide operating current allows it to replace older references with a tighter tolerance part. For applications requiring 1.2V see LM185-1.2.

**Industry Part Number**

LM185

**NS Part Numbers**

 LM185H-2.5-SMD  
 LM185H-2.5/883  
 LM185WG-2.5-QV  
 LM185WG-2.5/883

**Prime Die**

LM185

**Controlling Document**

SEE FEATURES SECTION

**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**

- Operating current of 20uA to 20mA
- 0.6 Ohm dynamic impedance
- Low temperature coefficient
- Low voltage reference-2.5V

- CONTROLLING DOCUMENT:

LM185H-2.5-SMD	5962-8759402XA
LM185WG-2.5-QV	5962-8759402VYA
LM185WG-2.5/883	5962-8759402YA

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**MICROCIRCUIT DATA SHEET****MNLM185-2.5-X REV 2A2**Original Creation Date: 08/15/95  
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**Industry Part Number**

LM185

**NS Part Numbers**LM185H-2.5-SMD  
LM185H-2.5/883  
LM185WG-2.5-QV  
LM185WG-2.5/883**Prime Die**

LM185

**Controlling Document**

SEE FEATURES SECTION

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**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**

- Operating current of 20uA to 20mA
- 0.6 Ohm dynamic impedance
- Low temperature coefficient
- Low voltage reference-2.5V

- CONTROLLING DOCUMENT:

LM185H-2.5-SMD	5962-8759402XA
LM185WG-2.5-QV	5962-8759402VYA
LM185WG-2.5/883	5962-8759402YA

**(Absolute Maximum Ratings)**

(Note 1)

Reverse Current		30mA
Forward Current		10mA
Operating Temperature Range		-55 C ≤ Ta ≤ +125 C
Maximum Junction Temperature (Note 2)		150 C
Storage Temperature		-55 C ≤ Ta ≤ +150 C
Lead Temperature (Soldering, 10 seconds)		
METAL CAN		300 C
CERAMIC SOIC		260 C
Thermal Resistance		
ThetaJA		
METAL CAN	(Still Air)	300 C/W
	(500LF/Min Air Flow)	139 C/W
CERMIC SOIC	(Still Air)	194 C/W
	(500LF/Min Air Flow)	128 C/W
ThetaJC		
METAL CAN		57 C/W
CERMIC SOIC		23 C/W
Package Weight (Typical)		
METAL CAN		TBD
CERAMIC SOIC		210mg
ESD Tolerance (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 power dissipation at any temperature is P<sub>dmax</sub> = (Tjmax - Ta) / ThetaJA or the number given in the Absolute Maximum Ratings, whichever is lower.

Note 3: Human body model, 1.5K ohms in series with 100pF.

## Electrical Characteristics

### DC PARAMETERS:

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vref	Reverse Breakdown Voltage	Ir = 20uA			2.462	2.538	V	1
		Ir = 30uA			2.425	2.575	V	2, 3
		Ir = 1mA			2.462	2.538	V	1
					2.425	2.575	V	2, 3
		Ir = 20mA			2.462	2.538	V	1
				2.425	2.575	V	2, 3	
Delta Vref/ Delta Ir	Reverse Breakdown Voltage Change with Current	20uA ≤ Ir ≤ 1mA			-1.0	1.0	mV	1
		30uA ≤ Ir ≤ 1mA			-1.5	1.5	mV	2, 3
		1mA ≤ Ir ≤ 20mA			-10.0	10.0	mV	1
			-20.0	20.0	mV	2, 3		
Vf	Forward Bias Voltage	If = 2mA			-1.0	-0.4	V	1

### DC PARAMETERS: DRIFT VALUES

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

DC: "Delta Calculations to be performed after Burn-In and Group B-5, unless otherwise specified on IPI"

Vref	Reverse Breakdown Voltage	Ir = 20uA			-10	10	mV	1
		Ir = 20mA			-10	10	mV	1

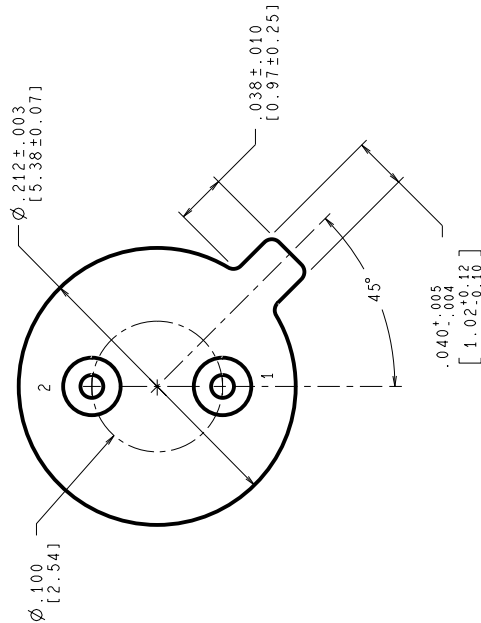
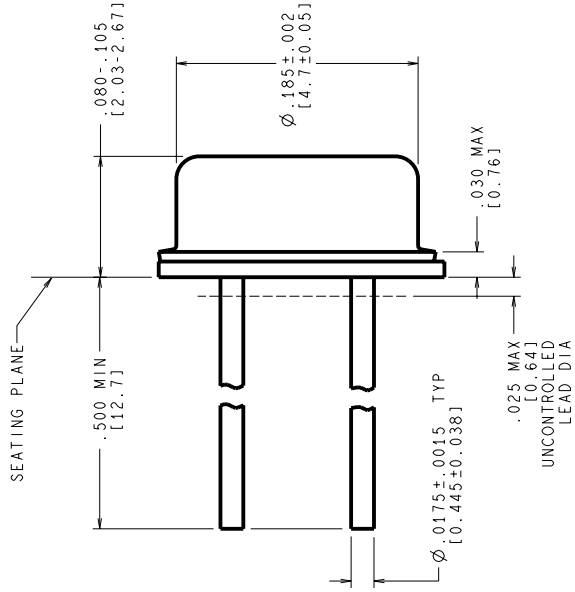
## Graphics and Diagrams

GRAPHICS#	DESCRIPTION
06331HRA7	CERAMIC SOIC (WG), 10 LEAD (B/I CKT)
07114HRA2	METAL CAN, T0-46, 2LD, .100 DIA P.C. (B/I CKT)
H02ARE	METAL CAN, T0-46, 2LD, .100 DIA P.C. (P/P DWG)
P000124B	CERAMIC SOIC (WG), 10 LEAD (PINOUT)
P000364B	METAL CAN, T0-46, 2 LD, .100 DIA P.C. (PINOUT)
WG10ARC	CERAMIC SOIC (WG), 10 LEAD (P/P DWG)

See attached graphics following this page.

REVISIONS

LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
D	REVISE & REDRAW PER NEW STANDARD	10402	05/04/1994	TL/GY
E	UPDATE TITLE & MIL/AERO STAMP. CHANGE DWG SIZE FORMAT FROM B TO C.	12131	11/17/1998	MS/



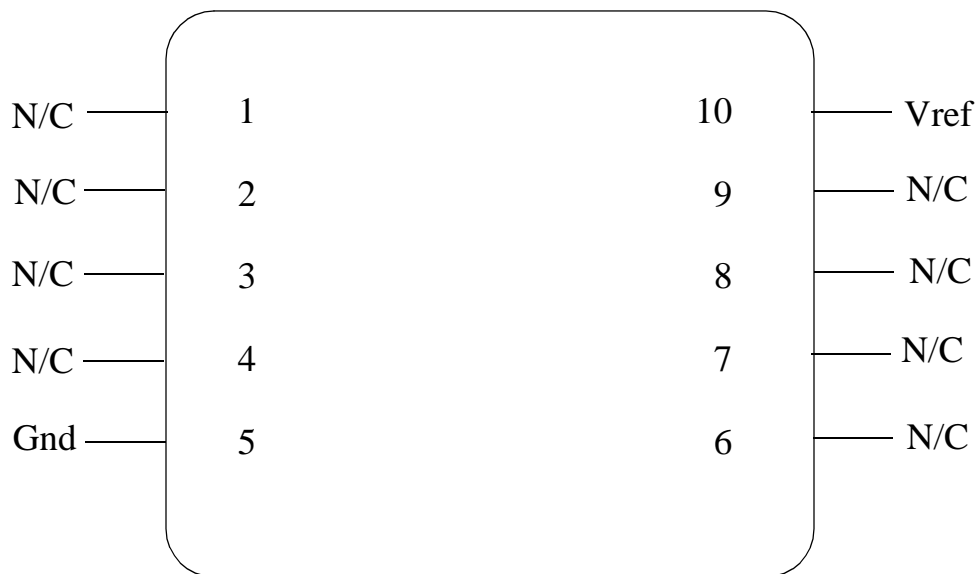
CONTROLLING DIMENSION IS INCH  
VALUES IN ( ) ARE MILLIMETERS

MIL-PRF-38535  
CONFIGURATION CONTROL

NOTES: UNLESS OTHERWISE SPECIFIED

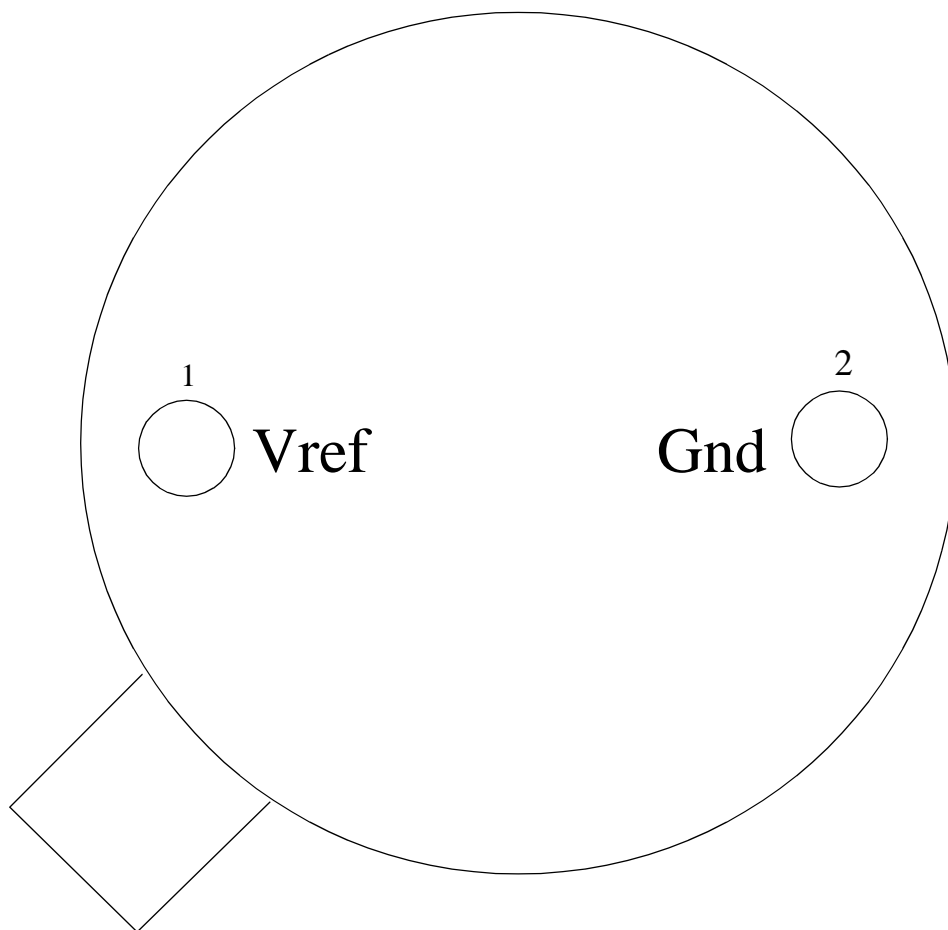
- LEADS TO BE LOCATED WITHIN .007 IN/ 0.18 mm OF THEIR TRUE POSITIONS RELATIVE TO A MAXIMUM WIDTH TAB.
- STANDARD METAL CAN TYPE: SOLID BASE.
- APPLIES TO MIL-AERO AND LINEAR PRODUCTS.
- REFERENCE JEDEC REGISTRATION TO-46, JEDEC PUBLICATION No. 95.

APPROVALS	DATE	SCALE	SIZE	DRAWING NUMBER	REV
DRW'G: T. LEQUANG	05/04/1994	N/A	C	(SC)MKT-H02A	E
DATE: 05/04/1994					
ENGR. CHK.					
PROJECTION					
DO NOT SCALE DRAWING					
National Semiconductor 2800 Semiconductor Dr., Santa Clara, CA 95052-8090					
METAL CAN TO-46, 2 LEAD, .100 DIA P.C.					



**LM185WG-2.5**  
**10 - LEAD CERPACK SOIC**  
**CONNECTION DIAGRAM**  
**TOP VIEW**  
**P000124B**

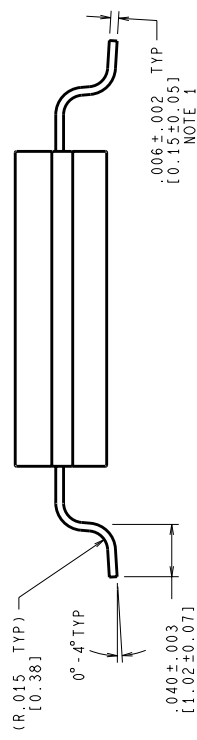
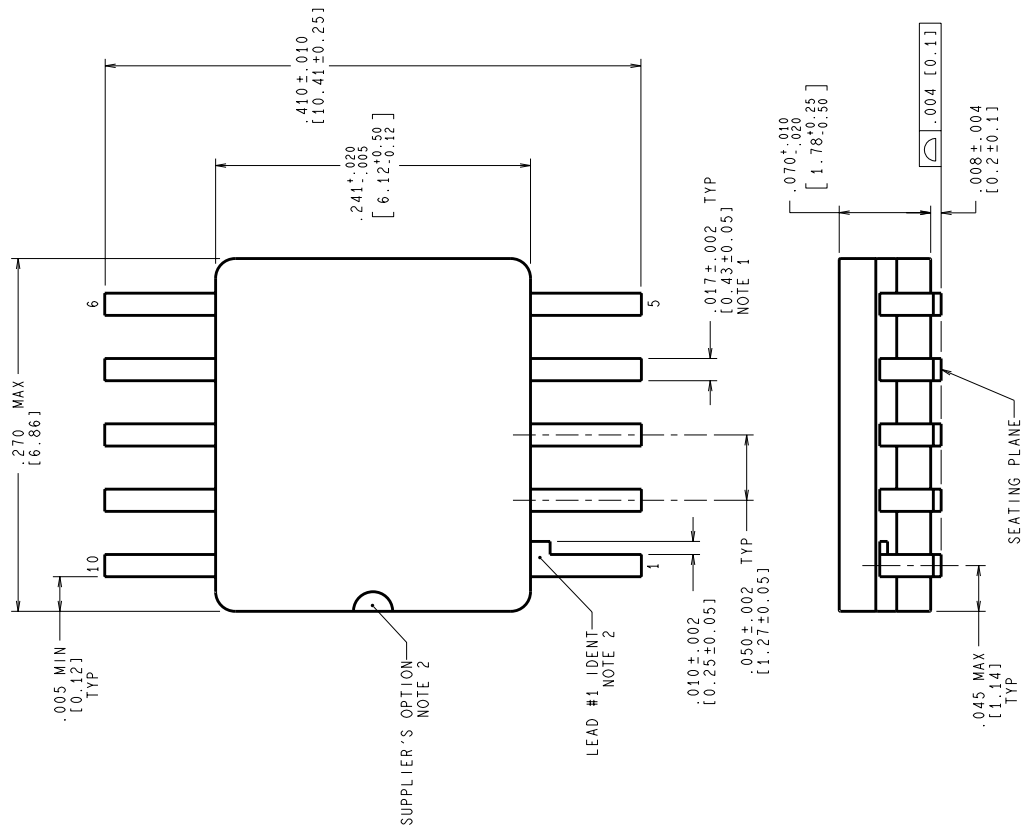




LM185H-2.5  
2 - LEAD TO-46  
CONNECTION DIAGRAM  
BOTTOM VIEW  
P000364B

REVISIONS

LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
A	RELEASE TO DOCUMENT CONTROL	11374	02/29/1996	MS/KH
B	LD PITCH TOL WAS ±.005; CHANGE LD RADIUS TO REF DIM; REMOVE THE OTHER R.006±.002 DIM. .040±.003 WAS .037±.003	11441	04/19/1996	MS/KH
C	R .015(0.38) WAS R .006(0.15)	11838	10/08/1997	TL/



CONTROLLING DIMENSION IS INCH  
VALUES IN | ARE MILLIMETERS

MIL-PRF-38535  
CONFIGURATION CONTROL

NOTES: UNLESS OTHERWISE SPECIFIED

- LEAD FINISH: SOLDER DIPPED WITH Sn60 OR Sn63 SOLDER CONFORMING TO MIL-PRF-38535 TO A MINIMUM THICKNESS OF 200 MICRONS/ 5.08 MICROMETERS. SOLDER MAY BE APPLIED OVER LEAD BASIS METAL OR Sn PLATE. MAXIMUM LIMIT MAY BE INCREASED BY .003 IN/ 0.08mm AFTER LEAD FINISH APPLIED.
- LEAD 1 IDENTIFICATION SHALL BE:
  - A NOTCH OR OTHER MARK WITHIN THIS AREA
  - A TAB ON LEAD 1, EITHER SIDE
- NO JEDEC REGISTRATION AS OF FEBRUARY 1996.

APPROVALS	DATE	SCALE	SIZE	DRAWING NUMBER	REV
DRN: MARYA SUCHY	02/29/96	N/A	C	(SC)MKT-WG10A	C
DATE: 02/29/96					
ENGR. CHK:					
NATIONAL SEMICONDUCTOR 2800 Semiconductor Dr., Santa Clara, CA 95052-8090					
CERPACK, 10 LEAD, GULL WING					
DO NOT SCALE DRAWING					
SHEET 1 of 1					