

FEATURES

- 20 μ A to 20mA Operating Range
- Guaranteed 1% Initial Voltage Tolerance
- Guaranteed 1 Ω Dynamic Impedance
- Very Low Power Consumption

APPLICATIONS

- Portable Meter References
- Portable Test Instruments
- Battery-Operated Systems
- Panel Meters
- Current Loop Instrumentation

DESCRIPTION

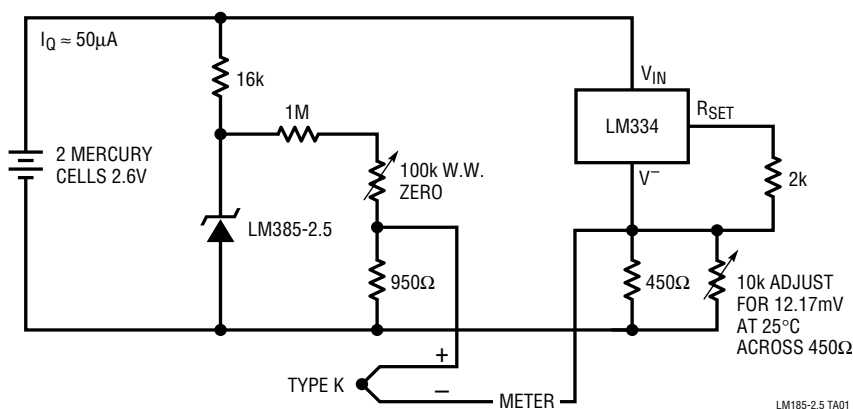
The LM185-2.5 is a two-terminal band gap reference diode that has been designed for applications which require precision performance with micropower operation. The device provides guaranteed operation specifications at currents as low as 20 μ A. The nominal voltage is 2.5V with both 1% and 2% tolerances available. Some additional features are: maximum dynamic impedance of 1 Ω , low noise and excellent stability over time and temperature. The advanced design, processing and testing techniques make Linear's LM185-2.5 a superior choice over previous designs. A circuit for cold junction compensation of a thermocouple is shown below.

For applications requiring guaranteed temperature drift, see the LT1034 data sheet.

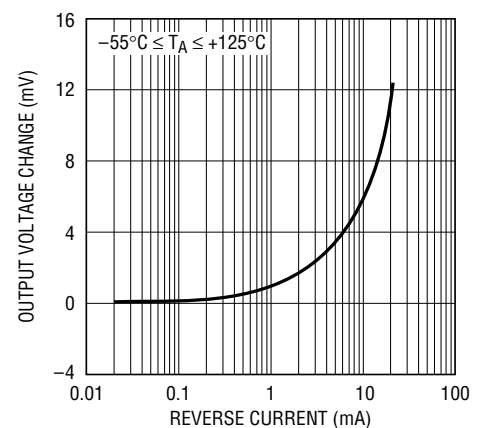
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TYPICAL APPLICATION

Thermocouple Cold Junction Compensator



Reverse Voltage Change

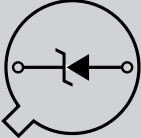
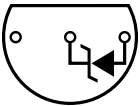
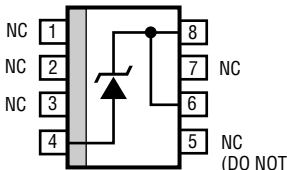


LM185-2.5/ LM285-2.5/LM385-2.5

ABSOLUTE MAXIMUM RATINGS (Note 1)

Reverse Breakdown Current	30mA	Storage Temperature Range	
Forward Current	10mA	LM185-2.5 (OBSOLETE)	–65°C to 150°C
Operating Temperature Range		LM285-2.5	–65°C to 150°C
LM185-2.5 (OBSOLETE)	–55°C to 125°C	LM385-2.5	–65°C to 150°C
LM285-2.5	–40°C to 85°C	Lead Temperature (Soldering, 10 sec.)	300°C
LM385-2.5	0°C to 70°C		

PACKAGE/ORDER INFORMATION

BOTTOM VIEW  H PACKAGE 2-LEAD TO-46 METAL CAN $T_{JMAX} = 150^{\circ}C, \theta_{JA} = 440^{\circ}C/W, \theta_{JC} = 80^{\circ}C/W$ OBSOLETE PACKAGE Consider the S8 or Z Packages for Alternate Source	ORDER PART NUMBER LM185H-2.5 LM285H-2.5 LM385H-2.5 LM385BH-2.5 (NOTE 3)	BOTTOM VIEW  Z PACKAGE 3-LEAD TO-92 PLASTIC $T_{JMAX} = 100^{\circ}C, \theta_{JA} = 160^{\circ}C/W$	ORDER PART NUMBER LM285Z-2.5 LM385Z-2.5 LM385BZ-2.5 (NOTE 3)
	TOP VIEW  S8 PACKAGE 8-LEAD PLASTIC SO $T_{JMAX} = 150^{\circ}C, \theta_{JA} = 220^{\circ}C/W$	ORDER PART NUMBER LM285S8-2.5 LM385S8-2.5 LM385BS8-2.5	S8 PART MARKING 2852 3852 3852B

Consult LTC Marketing for parts specified with wider operating temperature ranges.

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^\circ\text{C}$. (Note 2)

SYMBOL	PARAMETER	CONDITIONS		LM185-2.5/285-2.5			LM385-2.5/385B-2.5			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse Breakdown Voltage	$T_A = 25^\circ\text{C}$, $20\mu\text{A} \leq I_R \leq 20\text{mA}$ LM185-2.5/285-2.5 LM385-2.5 LM385B-2.5 (Note 3)		2.462	2.500	2.538	2.425 2.462	2.500	2.575 2.538	V V V
$\frac{\Delta V_Z}{\Delta \text{Temp}}$	Average Temperature Coefficient	$20\mu\text{A} \leq I_R \leq 20\text{mA}$ (Note 3)		20			20			ppm/ $^\circ\text{C}$
I_{MIN}	Minimum Operating Current	$T_{\text{MIN}} \leq T_A \leq T_{\text{MAX}}$	●	8 20			8 20			μA
$\frac{\Delta V_Z}{\Delta I_R}$	Reverse Breakdown Voltage Change With Current	$20\mu\text{A} \leq I_R \leq 1\text{mA}$ $T_A = 25^\circ\text{C}$ $T_{\text{MIN}} \leq T_A \leq T_{\text{MAX}}$		1.0			2.0			mV
			●	1.5			2.5			mV
		$1\text{mA} \leq I_R \leq 20\text{mA}$ $T_A = 25^\circ\text{C}$ $T_{\text{MIN}} \leq T_A \leq T_{\text{MAX}}$		10			20			mV
			●	20			25			mV
r_Z	Reverse Dynamic Impedance	$I_R = 100\mu\text{A}$ (Note 4) $T_A = 25^\circ\text{C}$ $T_{\text{MIN}} \leq T_A \leq T_{\text{MAX}}$		0.2 0.6			0.4 1.0			Ω
			●	1.5			1.5			Ω
e_n	Wide Band Noise (RMS)	$10\text{Hz} \leq f \leq 10\text{kHz}$, $I_R = 100\mu\text{A}$		120			120			μV
$\frac{\Delta V_Z}{\Delta \text{Time}}$	Long Term Stability	$T_A = 25^\circ\text{C} \pm 0.1^\circ\text{C}$, $I_R = 100\mu\text{A}$		20			20			ppm/kHr

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

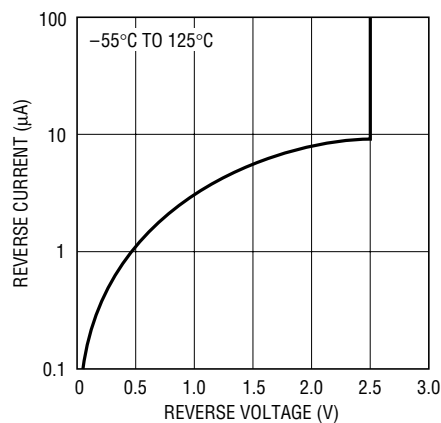
Note 2: All specifications are for $T_A = 25^\circ\text{C}$ unless otherwise noted. For the LM185-2.5 $T_{\text{MIN}} = -55^\circ\text{C}$ and $T_{\text{MAX}} = 125^\circ\text{C}$. For LM285-2.5, $T_{\text{MIN}} = -40^\circ\text{C}$ and $T_{\text{MAX}} = 85^\circ\text{C}$. For LM385-2.5, $T_{\text{MIN}} = 0^\circ\text{C}$ and $T_{\text{MAX}} = 70^\circ\text{C}$.

Note 3: For very low initial tolerance, consult LT1004 data sheet. The LT1004 is a low cost, pin for pin substitution device. For guaranteed temperature coefficient consult the LT1034-2.5 data sheet.

Note 4: Guaranteed but not tested.

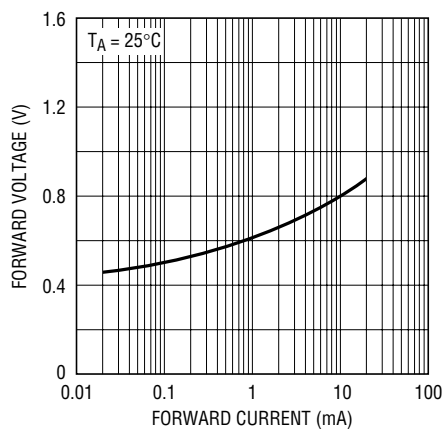
TYPICAL PERFORMANCE CHARACTERISTICS

Reverse Characteristics



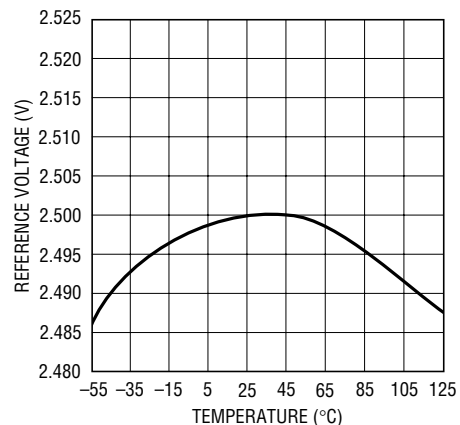
LM185-2.5 • TPC01

Forward Characteristics



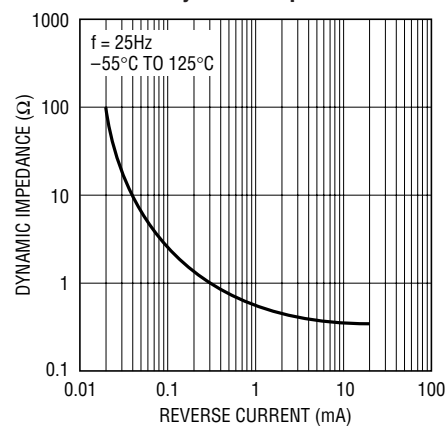
LM185-2.5 • TPC02

Temperature Drift



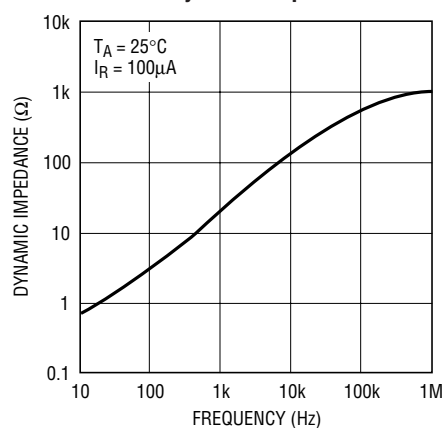
LM185-2.5 • TPC03

Reverse Dynamic Impedance



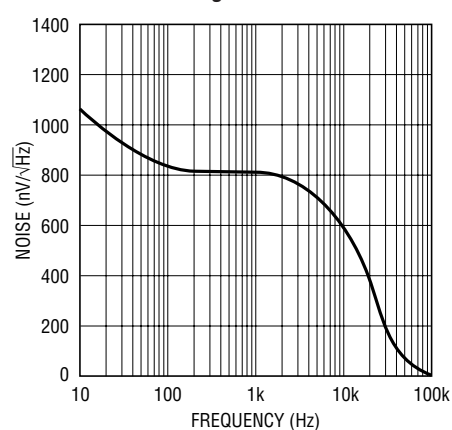
LM185-2.5 • TPC05

Reverse Dynamic Impedance



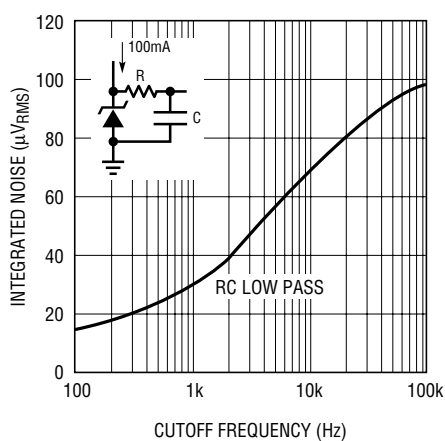
LM185-2.5 • TPC05

Noise Voltage



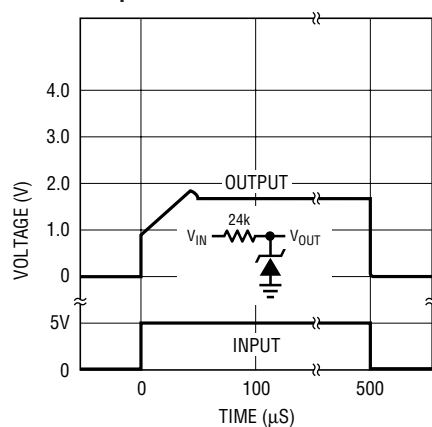
LM185-2.5 • TPC06

Filtered Output Noise



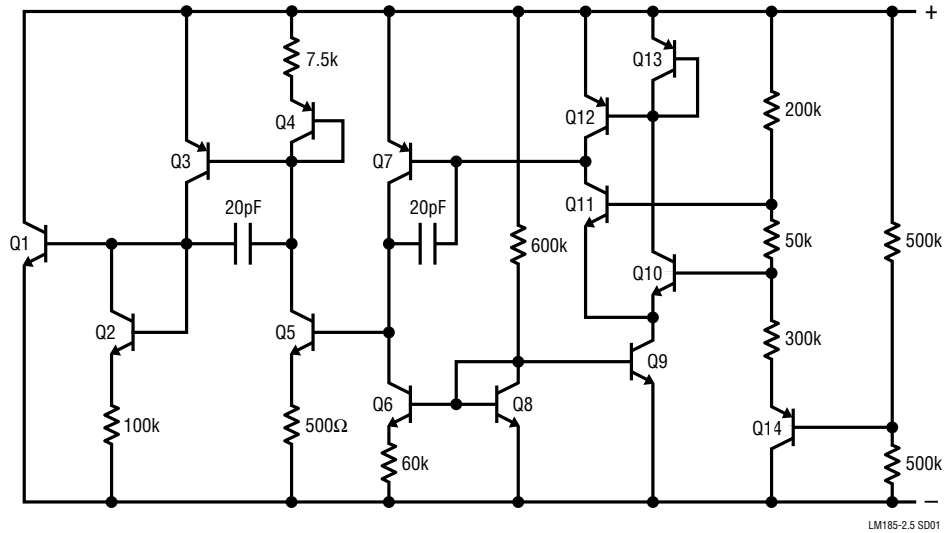
LM185-2.5 • TPC07

Response Time



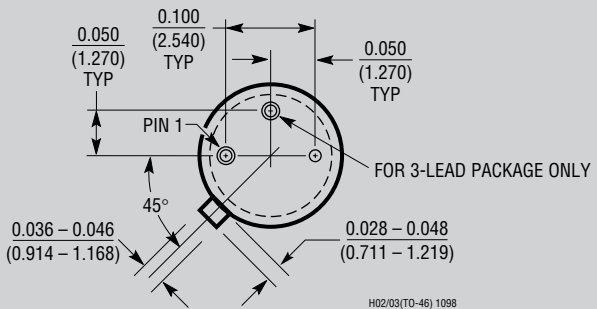
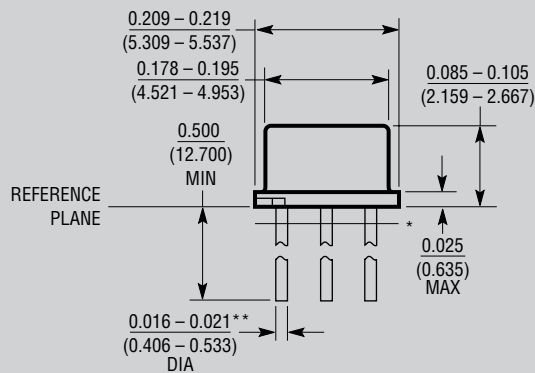
LM185-2.5 • TPC08

SCHEMATIC DIAGRAM



PACKAGE DESCRIPTION

H Package 2-Lead and 3-Lead TO-46 Metal Can (Reference LTC DWG # 05-08-1340)



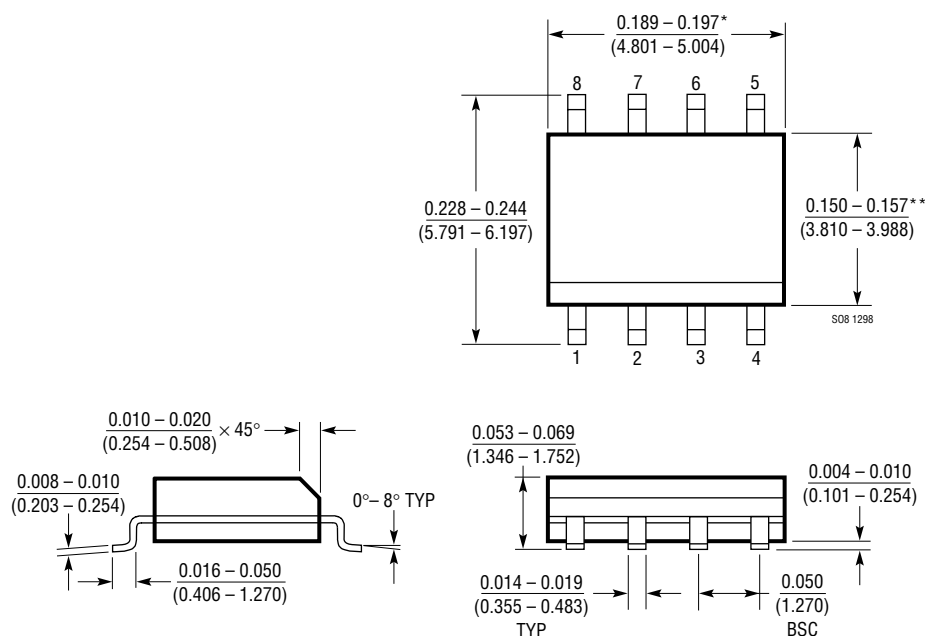
*LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND 0.045" BELOW THE REFERENCE PLANE

**FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS $\frac{0.016 - 0.024}{(0.406 - 0.610)}$

OBSOLETE PACKAGE

PACKAGE DESCRIPTION

S8 Package
8-Lead Plastic Small Outline (Narrow .150 Inch)
(Reference LTC DWG # 05-08-1610)

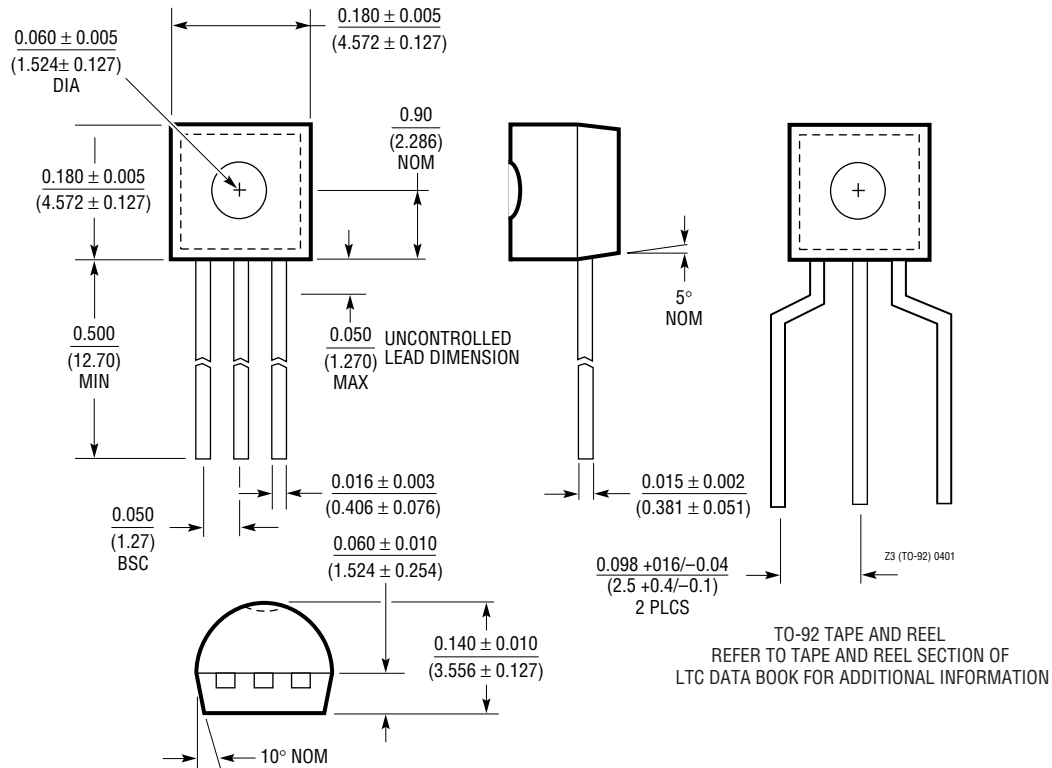


*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE

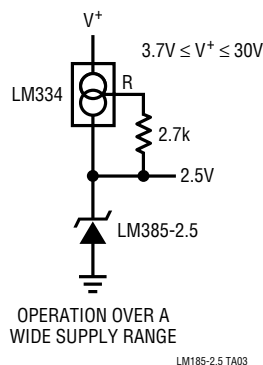
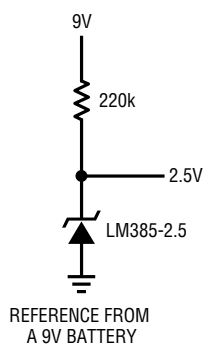
**DIMENSION DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010" (0.254mm) PER SIDE

PACKAGE DESCRIPTION

Z Package
3-Lead Plastic TO-92 (Similar to TO-226)
(Reference LTC DWG # 05-08-1410)



TYPICAL APPLICATIONS



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1634	Micropower Shunt Voltage Reference	0.05% Initial Accuracy, 10ppm/°C Maximum Tempco Output Voltage: 1.25V, 2.5V, 4.096V and 5V