Micropower Voltage Reference

FEATURES

- 10μA to 20mA operating range
- *Guaranteed* 1% initial voltage tolerance
- *Guaranteed* 1Ω dynamic impedance
- Very low power consumption

APPLICATIONS

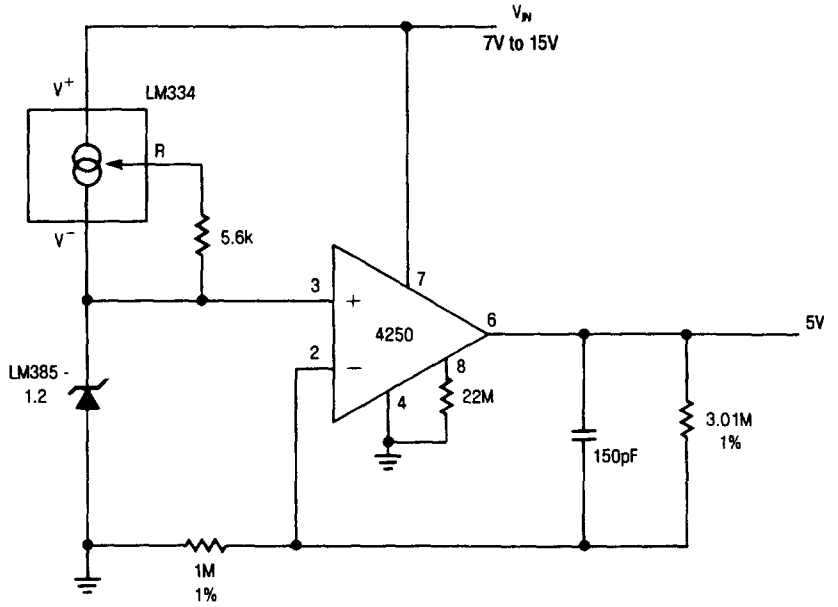
- Portable meter references
- Portable test instruments
- Battery operated systems
- Current loop instrumentation

DESCRIPTION

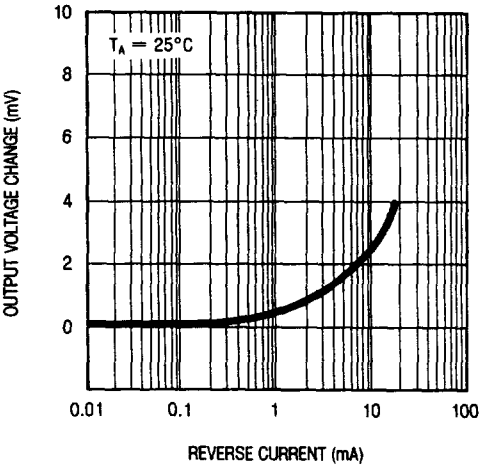
The LM185-1.2 is a two terminal band gap reference diode that has been designed for applications which require precision performance with micropower operation. The device provides guaranteed operating specifications at currents as low as 10μA. The nominal voltage is 1.235V with both 1% and 2% tolerances available. Some additional features are: maximum dynamic impedance of 1Ω, low noise and excellent stability over time and temperature. Advanced design, processing and testing techniques make Linear's LM185-1.2 a superior choice over previous designs. A micro-power 5V reference application is shown below. For guaranteed TC, micropower references, see the LT1034 data sheet.

3

Micro-power 5V Reference



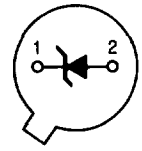
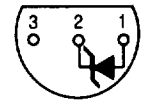
Reverse Voltage Change with Current



ABSOLUTE MAXIMUM RATINGS

Reverse Breakdown Current..... 30mA
Forward Current..... 10mA
Operating Temperature Range
LM185-1.2..... −55°C to 125°C
LM385-1.2..... 0°C to 70°C
Storage Temperature Range
LM185-1.2..... −65°C to 150°C
LM385-1.2..... −65°C to 150°C
Lead Temperature (Soldering, 10 sec.)..... 300°C

PACKAGE/ORDER INFORMATION

	ORDER PART NUMBER
BOTTOM VIEW  H PACKAGE TO-46 METAL CAN	LM185H-1.2 LM385H-1.2 LM385BH-1.2 (NOTE 3)
BOTTOM VIEW  Z PACKAGE TO-92 PLASTIC	LM385Z-1.2 LM385BZ-1.2 (NOTE 3)

ELECTRICAL CHARACTERISTICS (See Note 1)

SYMBOL	PARAMETER	CONDITIONS		LM185-1.2 MIN	LM185-1.2 TYP	LM185-1.2 MAX	LM385-1.2/385B-1.2 MIN	LM385-1.2/385B-1.2 TYP	LM385-1.2/385B-1.2 MAX	UNITS
V_Z	Reverse Breakdown Voltage	$T_A = 25°C$, $I_{min} \leq I_R \leq 20mA$								
		LM185-1.2		1.223	1.235	1.247				V
		LM385-1.2					1.205	1.235	1.260	V
		LM385B-1.2 (Note 3)					1.223	1.235	1.247	V
$\frac{\Delta V_Z}{\Delta \text{ Temp}}$	Average Temperature Coefficient	$I_{min} \leq I_R \leq 20mA$ (Note 2 and Note 3)			20			20		ppm/°C
I_{min}	Minimum Operating Current	$T_{min} \leq T_A \leq T_{max}$	●		8	10		8	15	μA
$\frac{\Delta V_Z}{\Delta I_R}$	Reverse Breakdown Voltage Change with Current	$I_{min} \leq I_R \leq 1mA$								
		$T_A = 25°C$				1			1	mV
		$T_{min} \leq T_A \leq T_{max}$	●			1.5			1.5	mV
		$1mA \leq I_R \leq 20mA$								
		$T_A = 25°C$				10			20	mV
		$T_{min} \leq T_A \leq T_{max}$	●			20			25	mV
r_Z	Reverse Dynamic Impedance	$I_R = 100\mu A$								
		$T_A = 25°C$			0.2	0.6		0.4	1	Ω
		$T_{min} \leq T_A \leq T_{max}$	●			1.5			1.5	Ω
e_n	Wide Band Noise (RMS)	$I_R = 100\mu A$								
		$10Hz \leq f \leq 10kHz$			60			60		μV
$\frac{\Delta V_Z}{\Delta \text{ Time}}$	Long Term Stability	$I_R = 100\mu A$								
		$T_A = 25°C \pm 0.1°C$			20			20		ppm/kHr

The ● denotes the specifications which apply over full operating temperature range.

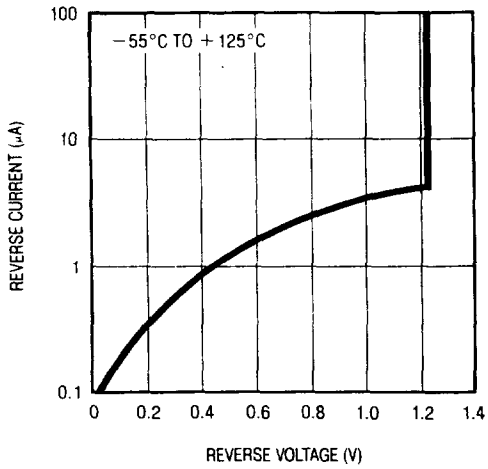
Note 1: All specifications are for $T_A = 25°C$ unless otherwise noted. For the LM185-1.2 $T_{min} = -55°C$ and $T_{max} = +125°C$. For LM385-1.2 $T_{min} = 0°C$ and $T_{max} = +70°C$.

Note 2: Selected devices with guaranteed maximum temperature coefficient are available upon request.

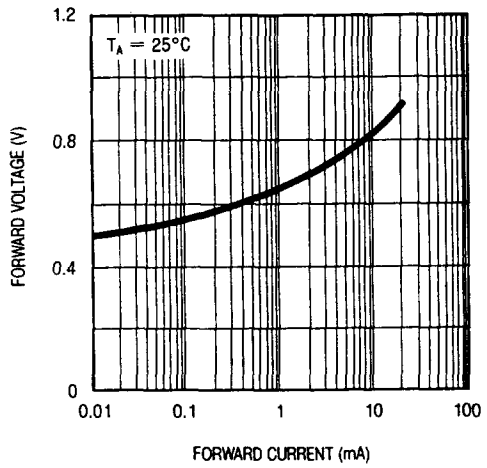
Note 3: For applications requiring low initial tolerance guaranteed over temperature consult LT1004 data sheet. The LT1004 is a low cost pin for pin substitution device

TYPICAL PERFORMANCE CHARACTERISTICS

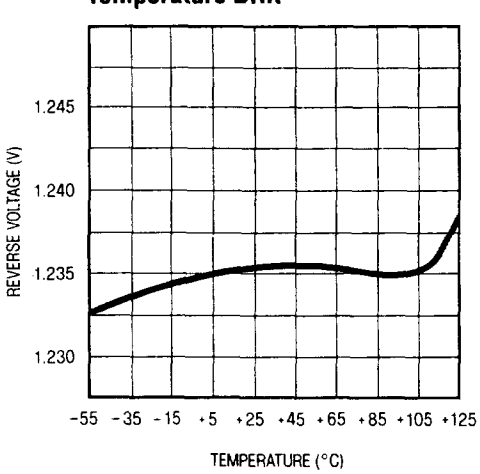
Reverse Characteristics



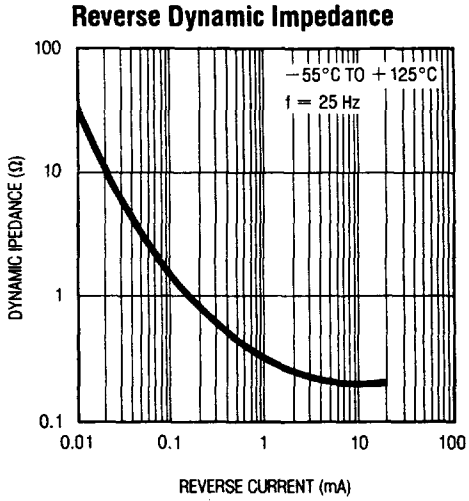
Forward Characteristics



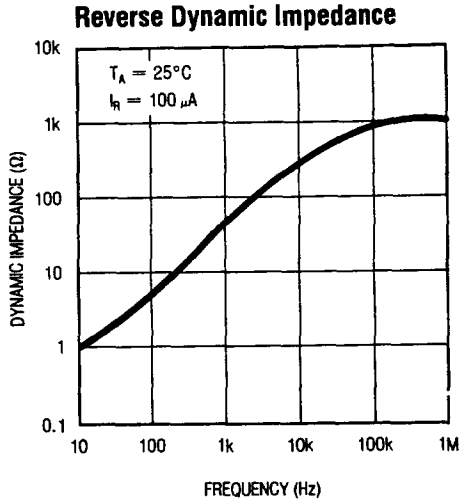
Temperature Drift



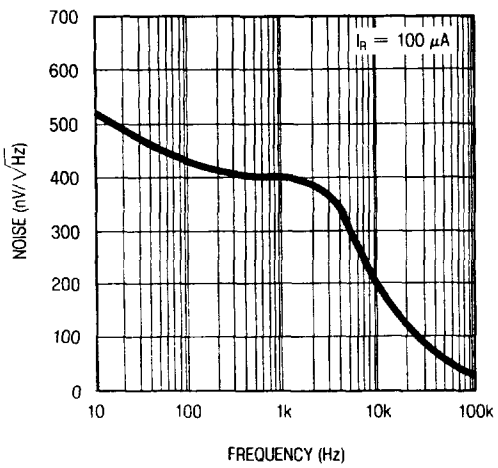
Reverse Dynamic Impedance



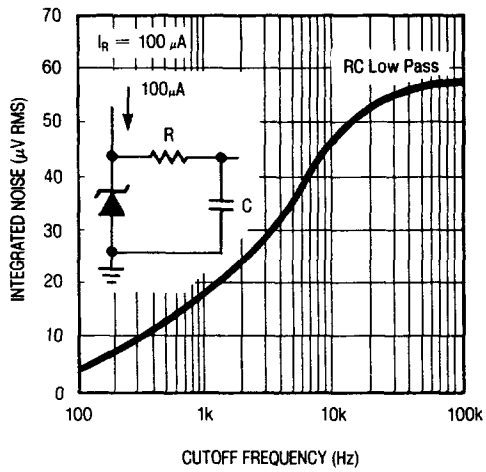
Reverse Dynamic Impedance



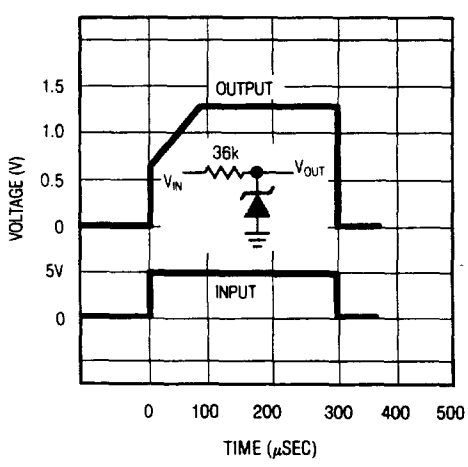
Noise Voltage



Filtered Output Noise

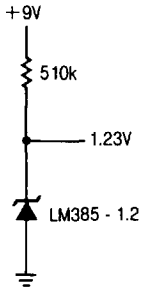


Response Time

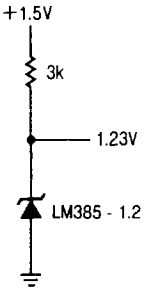


TYPICAL APPLICATIONS

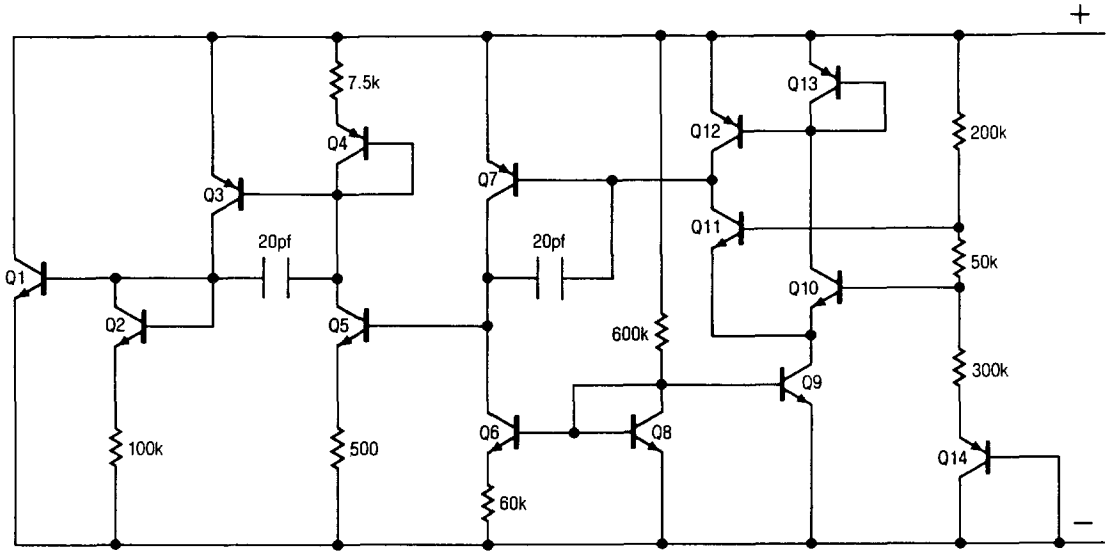
Micropower Reference for 9V Battery



1.2V Reference from 1.5V Battery

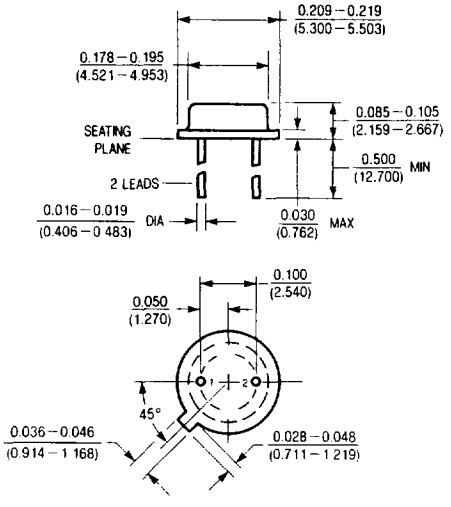


SCHEMATIC DIAGRAM



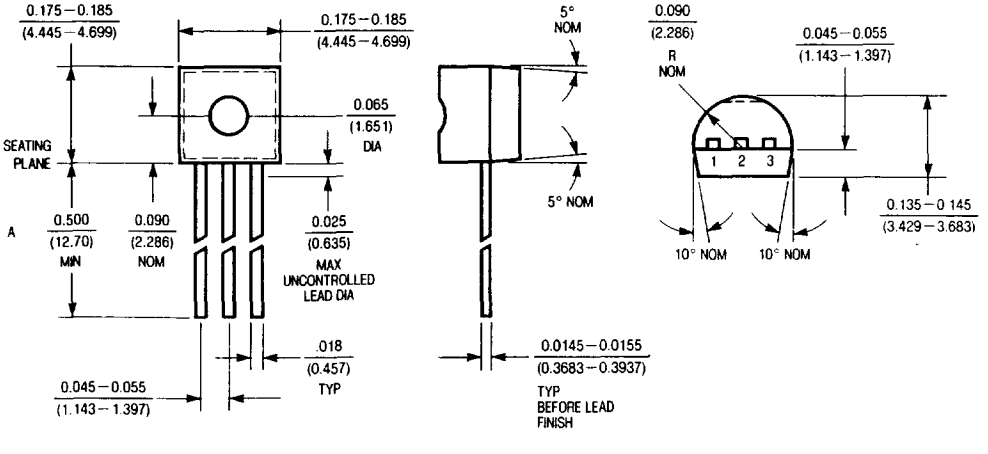
PACKAGE DESCRIPTION

H Package, 2 Lead TO-46 Metal Can



$T_j$max	Θ_{ja}	Θ_{jc}
150°C	440°C/W	80°C/W

Z Package, 3 Lead TO-92 Plastic



$T_j$max	Θ_{ja}
150°C	160°C/W

LINEAR TECHNOLOGY