EN: This Datasheet/Document is presented by the manufacturer.

Please visit our website for pricing and availability at www.hestore.hu.

Micropower Voltage Reference

FEATURES

- **Guaranteed** ±4mV Initial Accuracy LT1004-1.2
- **Guaranteed** ±20mV Accuracy LT1004-2.5
- **Guaranteed** 10µA Operating Current
- **Guaranteed** Temperature Performance
- Operates up to 20mA
- Very Low Dynamic Impedance

APPLICATIONS

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

DESCRIPTION

The LT®1004 micropower voltage reference is a 2-terminal bandgap reference diode designed to provide high accuracy and excellent temperature characteristics at very low operating currents. Optimization of the key parameters in the design, processing and testing of the device results in accuracy specifications previously attainable only with selected units. Below is a distribution plot of reference voltage for a typical lot of LT1004-1.2. Virtually all of the units fall well within the prescribed limits of ±4mV.

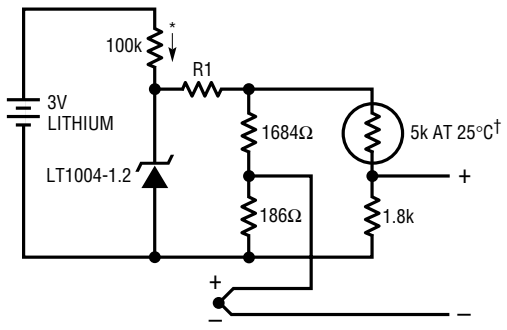
The LT1004 is a pin-for-pin replacement for the LM185/LM385 series of references with improved accuracy specifications. More important, the LT1004 is an attractive device for use in systems where accuracy was previously obtained at the expense of power consumption and trimming.

For a low drift micropower reference with guaranteed temperature coefficient, see the LT1034 data sheet.

LT, LTC and LT are registered trademarks of Linear Technology Corporation.

TYPICAL APPLICATION

Micropower Cold Junction Compensation for Thermocouples

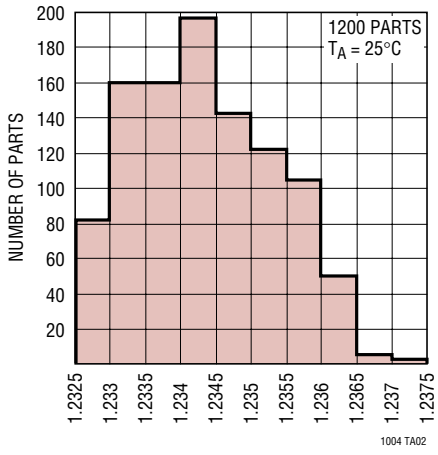


THERMOCOUPLE TYPE	R1
J	233k
K	299k
T	300k
S	2.1M

* QUIESCENT CURRENT ≅ 15µA
† YELLOW SPRINGS INST. CO. PART #44007
COMPENSATES WITHIN ±1°C FROM 0°C TO 60°C

1004 TA01

Typical Distribution of Reference Voltage (LT1004-1.2)



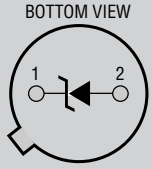
1004 TA02

ABSOLUTE MAXIMUM RATINGS (Note 1)

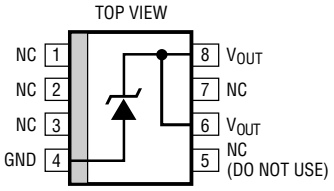
Reverse Breakdown Current 30mA
Forward Current 10mA
Storage Temperature Range ..... –65°C to 150°C
Lead Temperature (Soldering, 10 sec)..... 300°C

Operating Temperature Range
LT1004M **(OBSOLETE)** ..... –55°C to 125°C
LT1004I ..... –40°C to 85°C
LT1004C ..... 0°C to 70°C

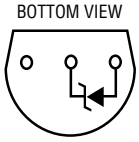
PACKAGE/ORDER INFORMATION



H PACKAGE
2-LEAD TO-46 METAL CAN
T_{JMAX} = 150°C, θ_{JA} = 440°C/W, θ_{JC} = 80°C/W



S8 PACKAGE
8-LEAD PLASTIC SO
T_{JMAX} = 100°C, θ_{JA} = 150°C/W



Z PACKAGE
3-LEAD PLASTIC TO-92
T_{JMAX} = 100°C, θ_{JA} = 160°C/W

ORDER PART NUMBER	ORDER PART NUMBER	S8 PART MARKING	ORDER PART NUMBER
LT1004MH-1.2 LT1004CH-1.2 LT1004MH-2.5 LT1004CH-2.5 **OBSOLETE PACKAGE** Consider the SO-8 or Z Packages for Alternate Source	LT1004CS8-1.2 LT1004CS8-2.5 LT1004IS8-1.2 LT1004IS8-2.5	0412 0425 0412I 0425I	LT1004CZ-1.2 LT1004CZ-2.5 LT1004IZ-1.2 LT1004IZ-2.5

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°C. (Note 2)

SYMBOL	PARAMETER	CONDITIONS		LT1004-1.2 MIN	LT1004-1.2 TYP	LT1004-1.2 MAX	LT1004-2.5 MIN	LT1004-2.5 TYP	LT1004-2.5 MAX	UNITS
V_Z	Reverse Breakdown Voltage	I_R = 100µA		1.231	1.235	1.239	2.480	2.500	2.520	V
		LT1004M: –55°C ≤ T_A ≤ 125°C	●	1.220	1.230	1.245	2.460	2.500	2.535	V
		LT1004C: 0°C ≤ T_A ≤ 70°C	●	1.225	1.235	1.245	2.470	2.500	2.530	V
		LT1004I: –40°C ≤ T_A ≤ 85°C	●	1.220	1.230	1.245	2.460	2.500	2.530	V
$\frac{\Delta V_Z}{\Delta Temp}$	Average Temperature Coefficient	$I_{MIN} \le I_R \le$ 20mA (Note 3)			20			20		ppm/°C
I_{MIN}	Minimum Operating Current		●		8	10		12	20	µA
$\frac{\Delta V_Z}{\Delta I_R}$	Reverse Breakdown Voltage Change with Current	$I_{MIN} \le I_R \le$ 1mA				1.0			1.0	mV
			●			1.5			1.5	mV
		1mA ≤ $I_R \le$ 20mA				10			10	mV
			●			20			20	mV
r_Z	Reverse Dynamic Impedance	I_R = 100µA			0.2	0.6		0.2	0.6	Ω
			●			1.5			1.5	Ω
e_n	Wide Band Noise (RMS)	I_R = 100µA, 10Hz ≤ f ≤ 10kHz			60			120		µV
$\frac{\Delta V_Z}{\Delta Time}$	Long Term Stability	I_R = 100µA, T_A = 25°C ± 0.1°C			20			20		ppm/kHr

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

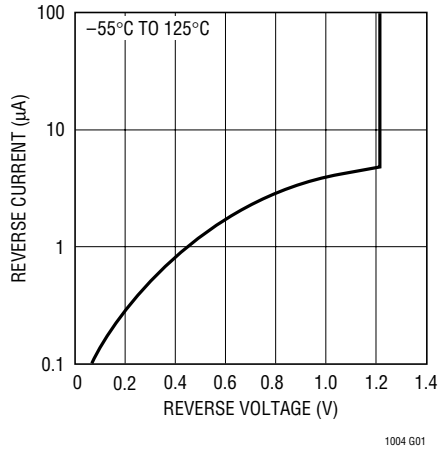
Note 2: All specifications are for T_A = 25°C unless otherwise noted.

Note 3: Selected devices with guaranteed maximum temperature coefficient are available upon request.

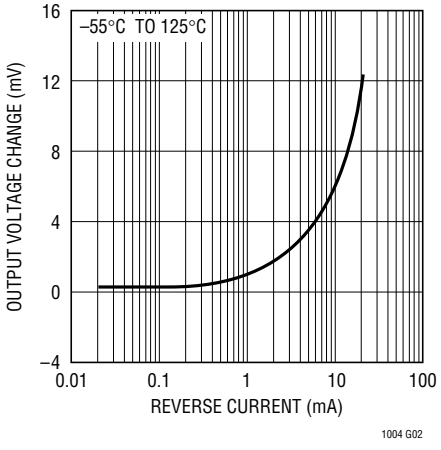
For MIL-STD components, please refer to LTC 883C data sheet for test listing and parameters.

TYPICAL PERFORMANCE CHARACTERISTICS (1.2V)

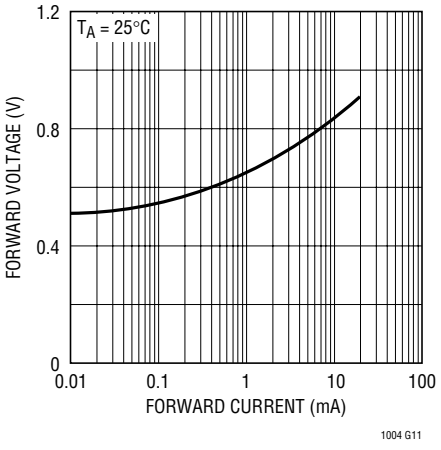
Reverse Characteristics



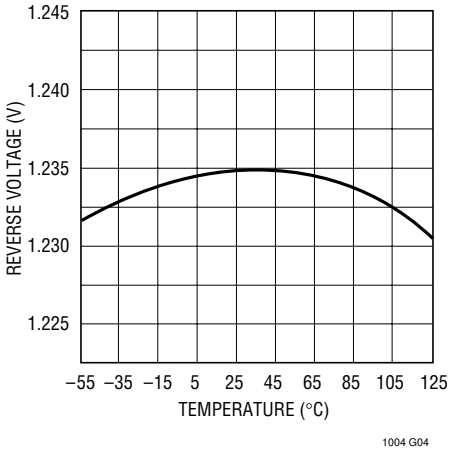
Reverse Voltage Change



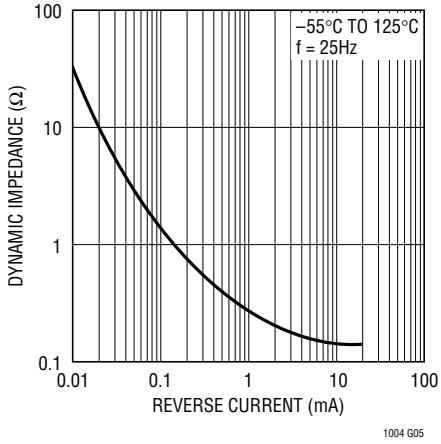
Forward Characteristics



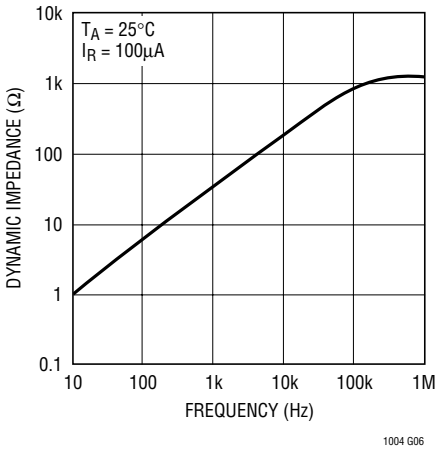
Temperature Drift



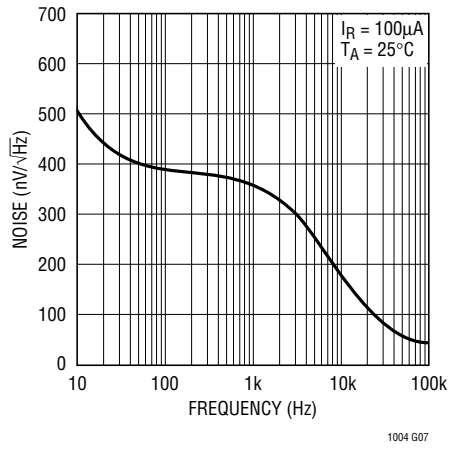
Reverse Dynamic Impedance



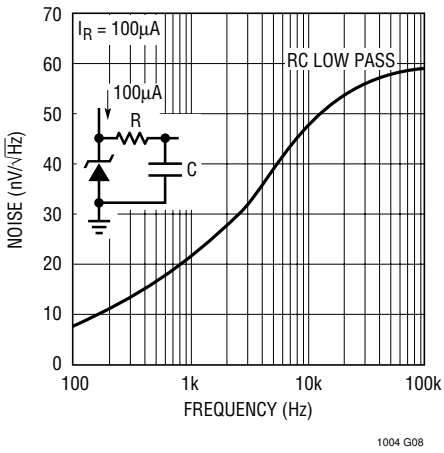
Reverse Dynamic Impedance



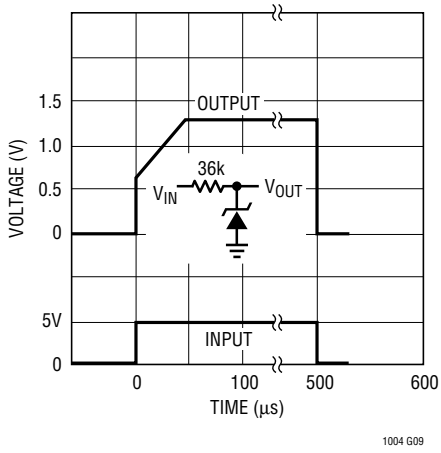
Noise Voltage



Filtered Output Noise

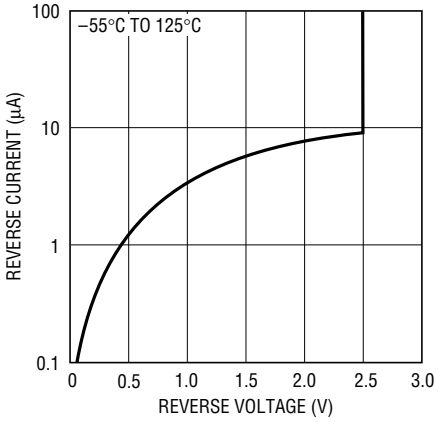


Reponse Time



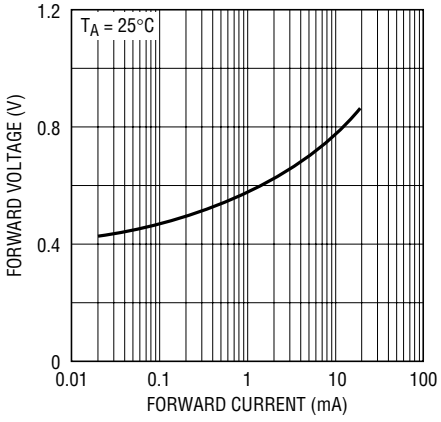
TYPICAL PERFORMANCE CHARACTERISTICS (2.5V)

Reverse Characteristics



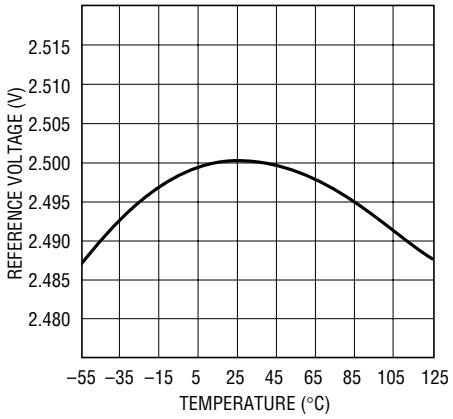
1004 G10

Forward Characteristics



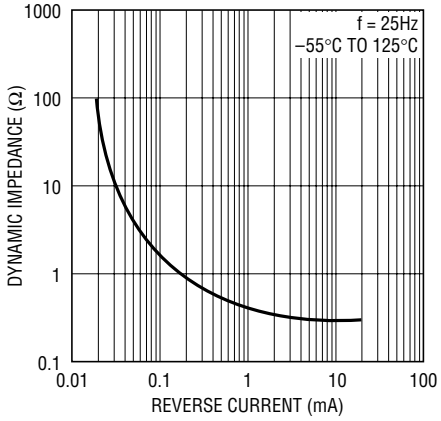
1004 G11

Temperature Drift



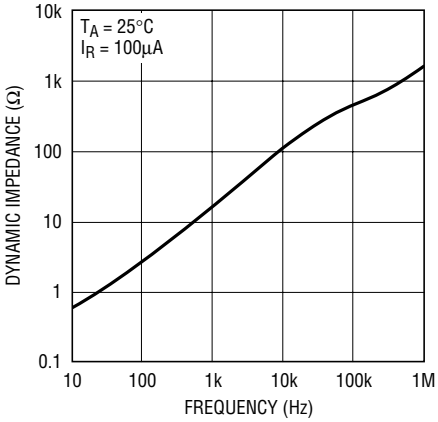
1004 G12

Reverse Dynamic Impedance



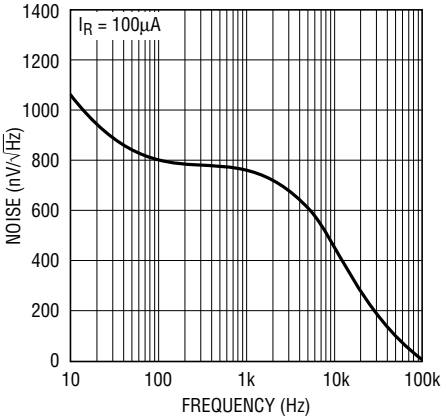
1004 G13

Reverse Dynamic Impedance



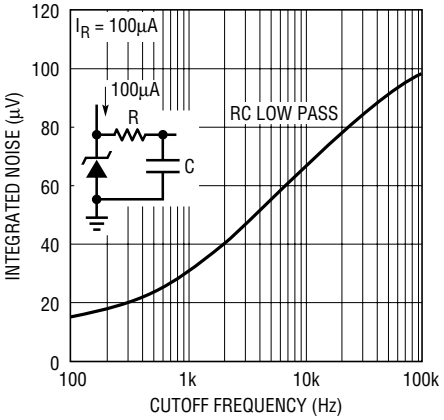
1004 G14

Noise Voltage



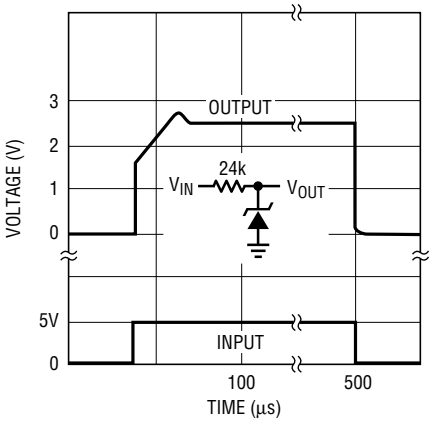
1004 G15

Filtered Output Noise



1004 G16

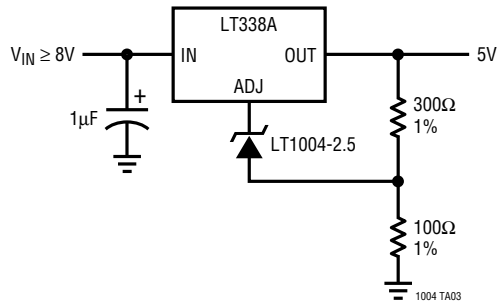
Reponse Time



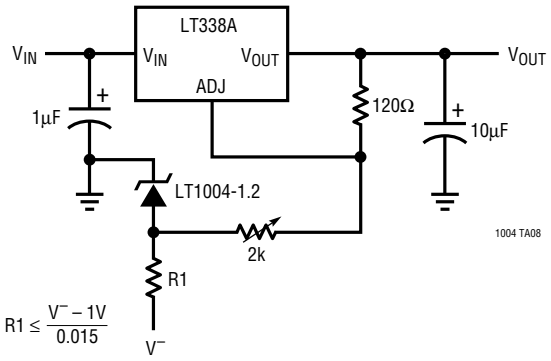
1004 G17

TYPICAL APPLICATIONS

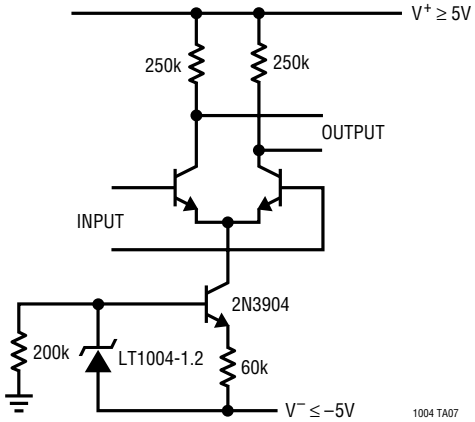
High Stability 5V Regulator



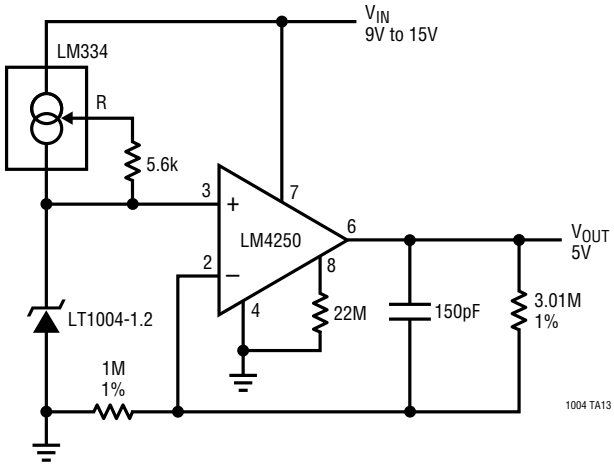
Variable Output Supply



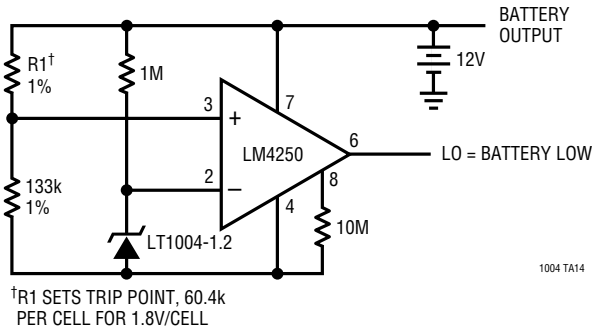
Constant Gain Amplifier Over Temperature



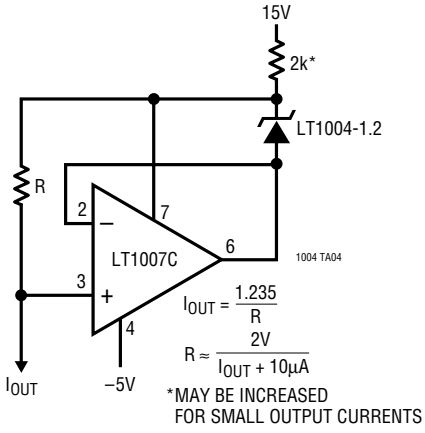
Micropower 5V Reference



Lead Acid Low-Battery Detector

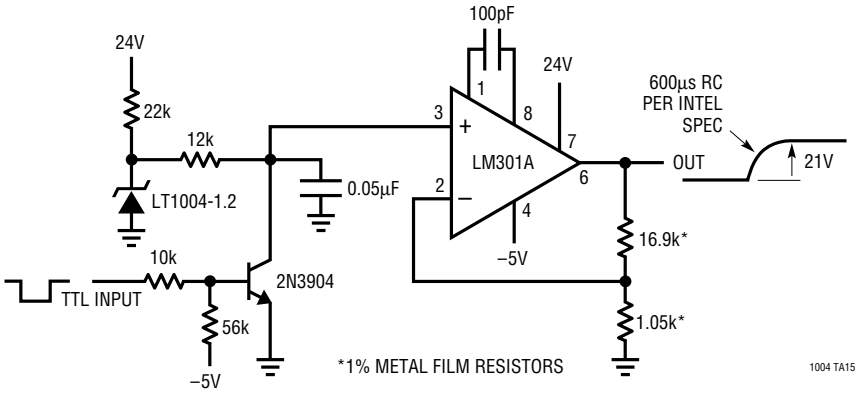


Ground Referenced Current Source

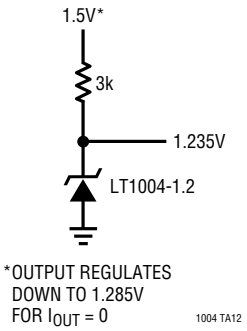


TYPICAL APPLICATIONS

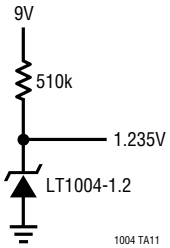
VPP Generator for Eproms — No Trim Required



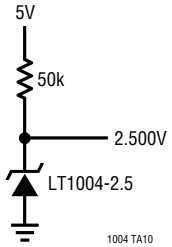
1.2V Reference from 1.5V Battery



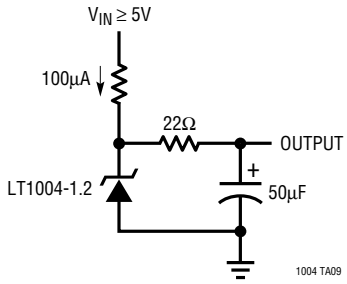
Micropower Reference from 9V Battery



2.5V Reference

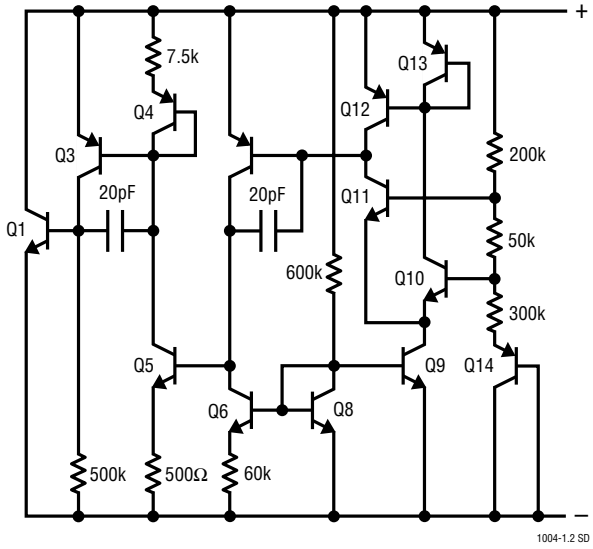


Low Noise Reference

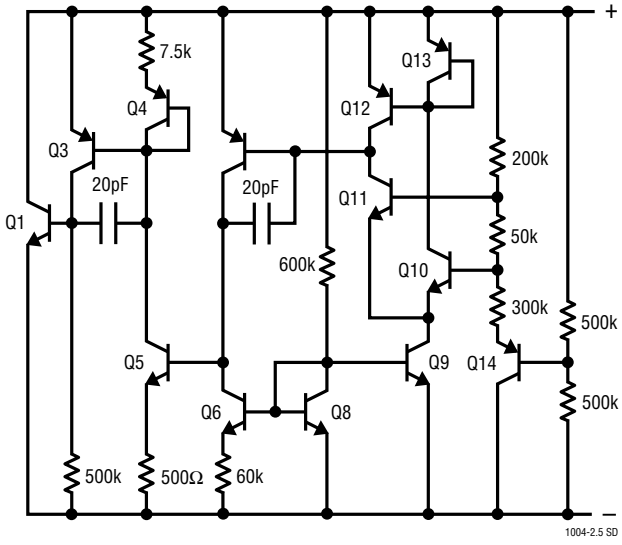


SCHEMATIC DIAGRAMS

LT1004-1.2

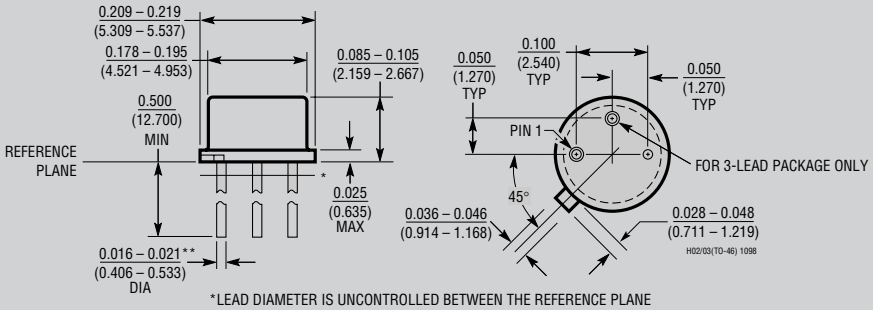


LT1004-2.5



PACKAGE DESCRIPTION

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

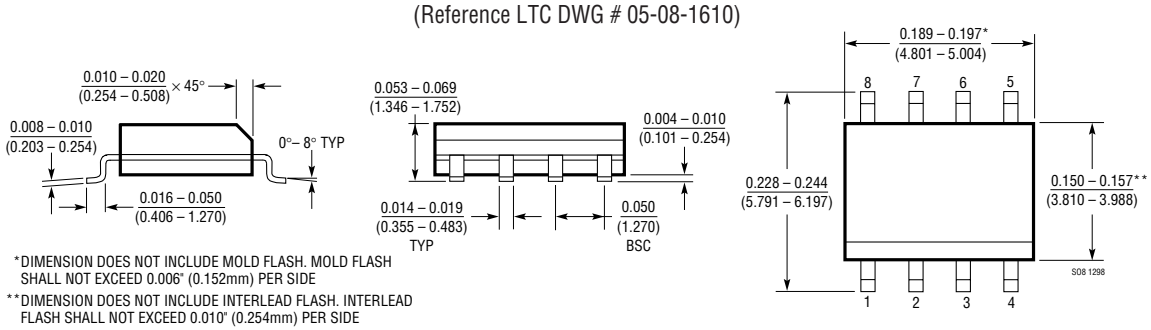


*LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND 0.045" BELOW THE REFERENCE PLANE

**FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS 0.016 – 0.024 (0.406 – 0.610)

OBSOLETE PACKAGE

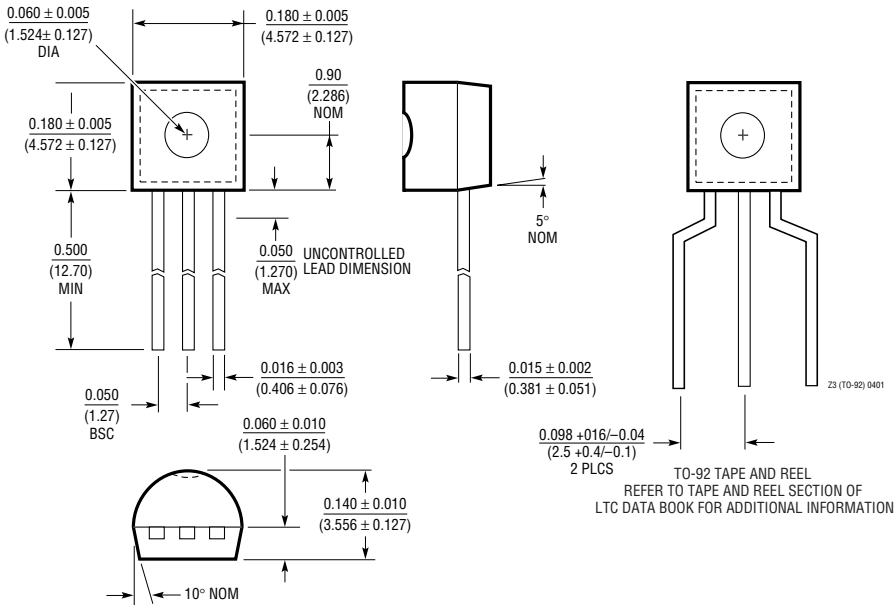
S8 Package
8-Lead Plastic Small Outline (Narrow .150 Inch)
(Reference LTC DWG # 05-08-1610)



*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

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

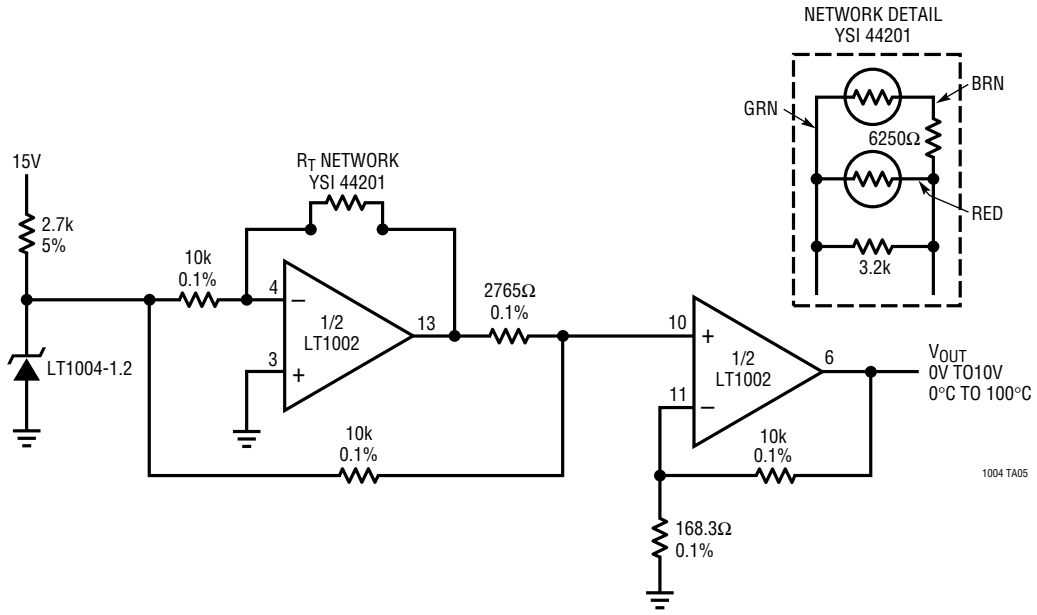


TO-92 TAPE AND REEL
REFER TO TAPE AND REEL SECTION OF
LTC DATA BOOK FOR ADDITIONAL INFORMATION

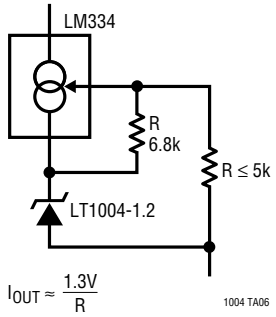
Information furnished by Linear Technology Corporation is believed to be accurate and reliable. However, no responsibility is assumed for its use. Linear Technology Corporation makes no representation that the interconnection of its circuits as described herein will not infringe on existing patent rights.

TYPICAL APPLICATIONS

0°C to 100°C Linear Output Thermometer



Low Temperature Coefficient 2-Terminal Current Source



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1634	Micropower Precision Shunt Reference	10μA Operating Current, 10ppm/°C Maximum Drift, 0.05% Initial Accuracy
LT1460S3-2.5	Micropower Series Reference in SOT-23	100μA Operating Current, 20ppm/°C Maximum Drift, 0.2% Initial Accuracy
LT1790	Precision Micropower LDO Reference in SOT-23	10ppm/°C Max Drift, 0.05% Initial Accuracy

Linear Technology Corporation
1630 McCarthy Blvd., Milpitas, CA 95035-7417
(408) 432-1900 • FAX: (408) 434-0507 • www.linear.com
1004fb LT/TP 0601 REV B 1.5K • PRINTED IN USA
© LINEAR TECHNOLOGY CORPORATION 1985