

**DESCRIPTION**

The LX1004 Micropower Voltage References are two terminal bandgap reference diodes designed and optimized for accurate low power operation in portable and other power sensitive systems. Operating currents are guaranteed from as low as 10µA up to 20mA giving designers a great deal of flexibility in optimizing power consumption, noise and ultimate application performance. The LX1004 is available in fixed 1.2V and 2.5V reference values.

Process and circuit design optimization provide for high accuracy with initial tolerance values of ±4mV and ±20mV, respectively. Complementing their initial accuracy, the bandgap reference is temperature compensated to deliver 20ppm performance over the 0° to 70°C operating temperature range. The LX1004 from Linfinit is a pin-for-pin replacement for the LT1004 and LM385 families of voltage references.

**KEY FEATURES**

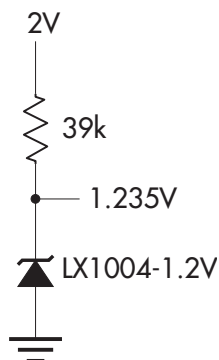
- GUARANTEED ±4mV INITIAL ACCURACY LX1004-1.2
- GUARANTEED ±20mV INITIAL ACCURACY LX1004-2.5
- GUARANTEED 10µA OPERATING CURRENT
- GUARANTEED TEMPERATURE PERFORMANCE
- OPERATES UP TO 20mA
- VERY LOW DYNAMIC IMPEDANCE

**APPLICATIONS**

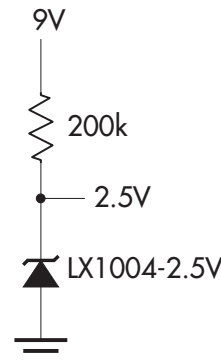
- PORTABLE METER REFERENCES
- PORTABLE TEST INSTRUMENTS
- BATTERY OPERATED SYSTEMS
- CURRENT LOOP INSTRUMENTATION

**PRODUCT HIGHLIGHT**

MICROPOWER REFERENCE FROM 2 CELL BATTERY



MICROPOWER REFERENCE FROM 9V BATTERY



**PACKAGE ORDER INFORMATION**

T <sub>A</sub> (°C)	Reference Voltage	Initial Tolerance	DM	LP
			Plastic SOIC 8-pin	Plastic TO-92 3-pin
0 to 70	1.2V	±4mV	LX1004CDM-1.2	LX1004CLP-1.2
	2.5V	±20mV	LX1004CDM-2.5	LX1004CLP-2.5

Note: All surface-mount packages are available in Tape & Reel. Append the letter "T" to part number. (i.e. LX1004CDM-2.5T)

**FOR FURTHER INFORMATION CALL (714) 898-8121**

## 1.2V & 2.5V MICROPOWER VOLTAGE REFERENCES

### PRODUCTION DATA SHEET

#### ABSOLUTE MAXIMUM RATINGS (Note 1)

Reverse Breakdown Current .....	30mA
Forward Current .....	10mA
Operating Temperature Range .....	0°C to 70°C
Storage Temperature Range .....	-65°C to 150°C
Lead Temperature (soldering, 10 seconds) .....	300°C

Note 1. Values beyond which damage may occur. All voltages are specified with respect to ground, and all currents are positive into the specified terminal

#### THERMAL DATA

##### DM PACKAGE:

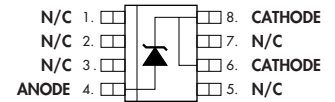
THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$	165°C/W
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##### LP PACKAGE:

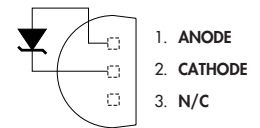
THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$	165°C/W
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The  $\theta_{JA}$  numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

#### PACKAGE PIN OUTS



**DM PACKAGE**  
(Top View)



**LP PACKAGE**  
(Top View)

1.2V & 2.5V MICROPWR VOLTAGE REFERENCES

PRODUCTION DATA SHEET

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, these specifications apply to  $T_A = 25^\circ\text{C}$  for LX1004C. Typ. number represents  $T_A = 25^\circ\text{C}$  value.

LX1004 - 1.2

Parameter	Symbol	Test Conditions	LX1004 - 1.2			Units
			Min.	Typ.	Max.	
Reverse Breakdown Voltage	$V_z$	$I_R = 100\mu\text{A}, T_A = 25^\circ\text{C}$	1.231	1.235	1.239	V
		$0^\circ \leq T_A \leq 70^\circ\text{C}$	1.225	1.235	1.245	V
Average Temperature Coefficient	$\frac{\Delta V_z}{\Delta \text{Temp}}$	$I_{\text{MIN}} \leq I_R \leq 20\text{mA}$		20		ppm/ $^\circ\text{C}$
Minimum Operating Current	$I_{\text{MIN}}$	$0^\circ \leq T_A \leq 70^\circ\text{C}$		8	10	$\mu\text{A}$
Reverse Breakdown Voltage Change with Current	$\frac{\Delta V_z}{\Delta I_R}$	$I_{\text{MIN}} \leq I_R \leq 1\text{mA}, T_A = 25^\circ\text{C}$			1	mV
		$I_{\text{MIN}} \leq I_R \leq 1\text{mA}, 0^\circ \leq T_A \leq 70^\circ\text{C}$			1.5	mV
		$1\text{mA} \leq I_R \leq 20\text{mA}, T_A = 25^\circ\text{C}$			10	mV
Reverse Dynamic Impedance	$r_z$	$I_R = 100\mu\text{A}, T_A = 25^\circ\text{C}$		0.2	0.6	$\Omega$
		$I_R = 100\mu\text{A}, 0^\circ \leq T_A \leq 70^\circ\text{C}$			1.5	$\Omega$
Wide Band Noise (RMS)	$e_n$	$I_R = 100\mu\text{A}; 10\text{Hz} \leq f \leq 10\text{kHz}$		60		$\mu\text{V}$
Long Term Stability	$\frac{\Delta V_z}{\Delta \text{Time}}$	$I_R = 100\mu\text{A}; T_A = 25^\circ\text{C} \pm 0.1^\circ\text{C}$		20		ppm/kHr

LX1004 - 2.5

Parameter	Symbol	Test Conditions	LX1004 - 2.5			Units
			Min.	Typ.	Max.	
Reverse Breakdown Voltage	$V_z$	$I_R = 100\mu\text{A}, T_A = 25^\circ\text{C}$	2.480	2.500	2.520	V
		$0^\circ \leq T_A \leq 70^\circ\text{C}$	2.470		2.530	V
Average Temperature Coefficient	$\frac{\Delta V_z}{\Delta \text{Temp}}$	$I_{\text{MIN}} \leq I_R \leq 20\text{mA}$		20		ppm/ $^\circ\text{C}$
Minimum Operating Current	$I_{\text{MIN}}$	$0^\circ \leq T_A \leq 70^\circ\text{C}$		12	20	$\mu\text{A}$
Reverse Breakdown Voltage Change with Current	$\frac{\Delta V_z}{\Delta I_R}$	$I_{\text{MIN}} \leq I_R \leq 1\text{mA}, T_A = 25^\circ\text{C}$			1	mV
		$I_{\text{MIN}} \leq I_R \leq 1\text{mA}, 0^\circ \leq T_A \leq 70^\circ\text{C}$			1.5	mV
		$1\text{mA} \leq I_R \leq 20\text{mA}, T_A = 25^\circ\text{C}$			10	mV
Reverse Dynamic Impedance	$r_z$	$I_R = 100\mu\text{A}, T_A = 25^\circ\text{C}$		0.2	0.6	$\Omega$
		$I_R = 100\mu\text{A}, 0^\circ \leq T_A \leq 70^\circ\text{C}$			1.5	$\Omega$
Wide Band Noise (RMS)	$e_n$	$I_R = 100\mu\text{A}; 10\text{Hz} \leq f \leq 10\text{kHz}$		120		$\mu\text{V}$
Long Term Stability	$\frac{\Delta V_z}{\Delta \text{Time}}$	$I_R = 100\mu\text{A}; T_A = 25^\circ\text{C} \pm 0.1^\circ\text{C}$		20		ppm/kHr

GRAPH / CURVE INDEX

Characteristic Curves — LX1004-1.2V

FIGURE #

- TEMPERATURE DRIFT
- REVERSE CHARACTERISTICS
- REVERSE VOLTAGE CHANGE
- FORWARD CHARACTERISTICS
- REVERSE DYNAMIC IMPEDANCE
- NOISE VOLTAGE
- RESPONSE TIME

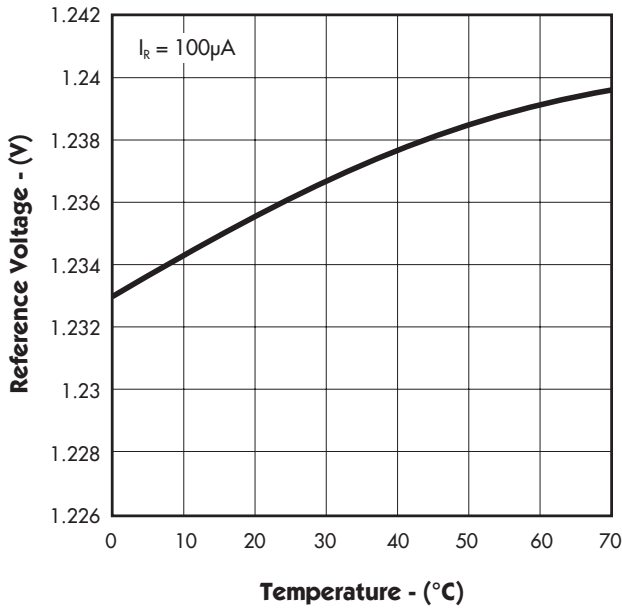
Characteristic Curves — LX1004-2.5V

FIGURE #

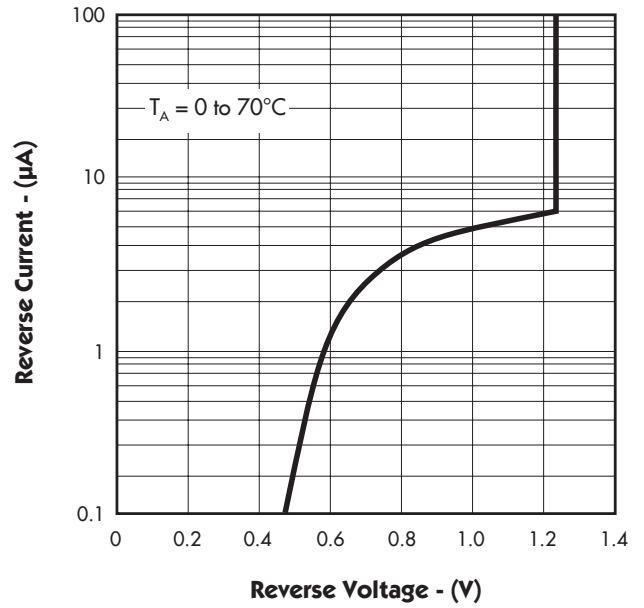
- RESPONSE TIME
- REVERSE CHARACTERISTICS
- FORWARD CHARACTERISTICS
- TEMPERATURE DRIFT
- NOISE VOLTAGE
- REVERSE DYNAMIC IMPEDANCE

#### CHARACTERISTIC CURVES — LX1004-1.2V

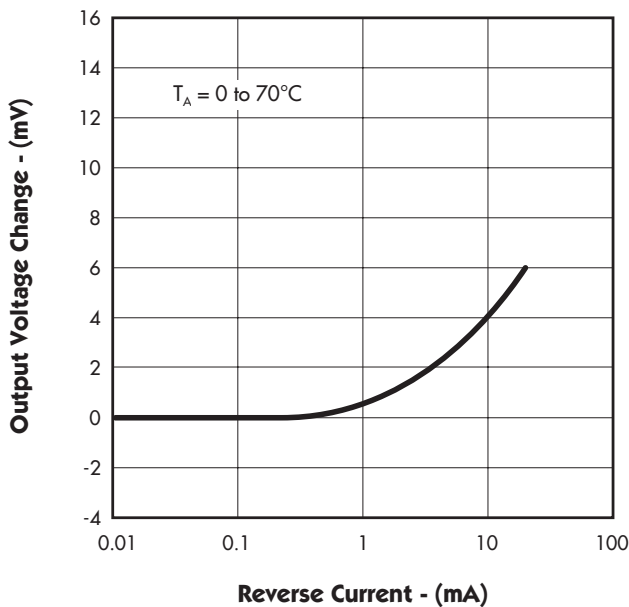
**FIGURE 1. — TEMPERATURE DRIFT**



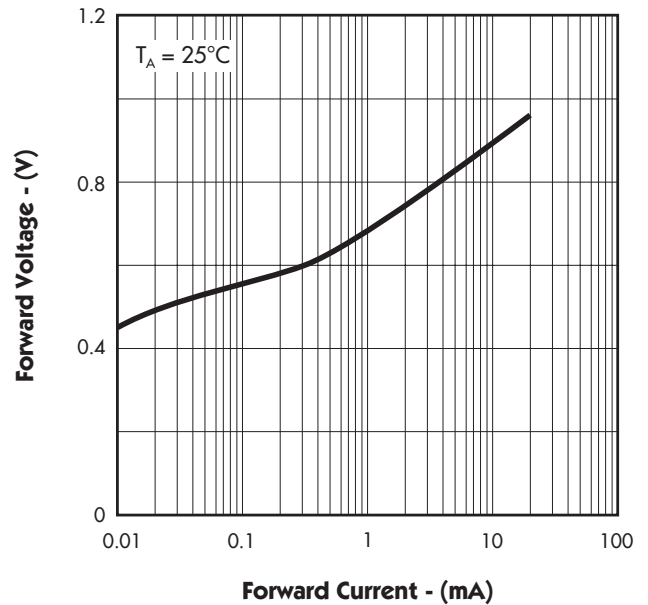
**FIGURE 2. — REVERSE CHARACTERISTICS**



**FIGURE 3. — REVERSE VOLTAGE CHANGE**



**FIGURE 4. — FORWARD CHARACTERISTICS**



1.2V & 2.5V MICROPOWER VOLTAGE REFERENCES

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CHARACTERISTIC CURVES — LX1004-1.2V

FIGURE 5. — REVERSE DYNAMIC IMPEDANCE

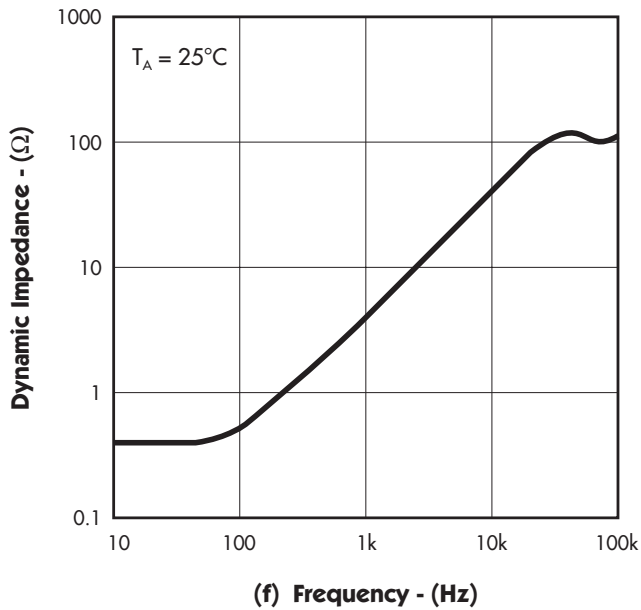


FIGURE 6. — NOISE VOLTAGE

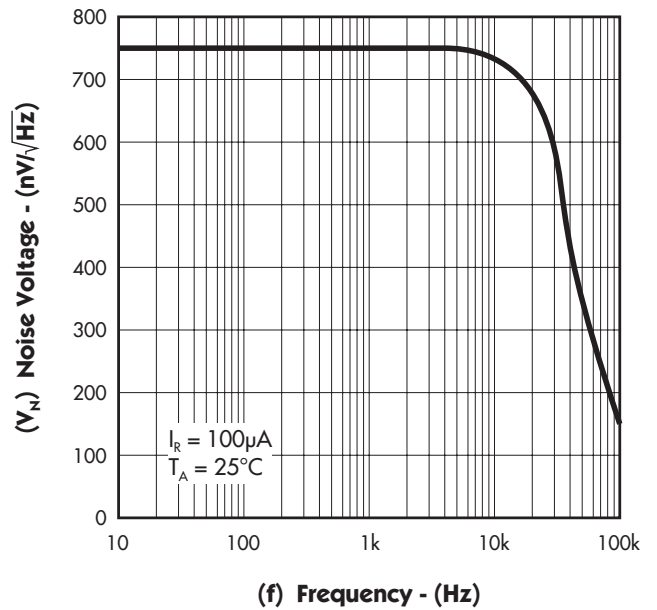
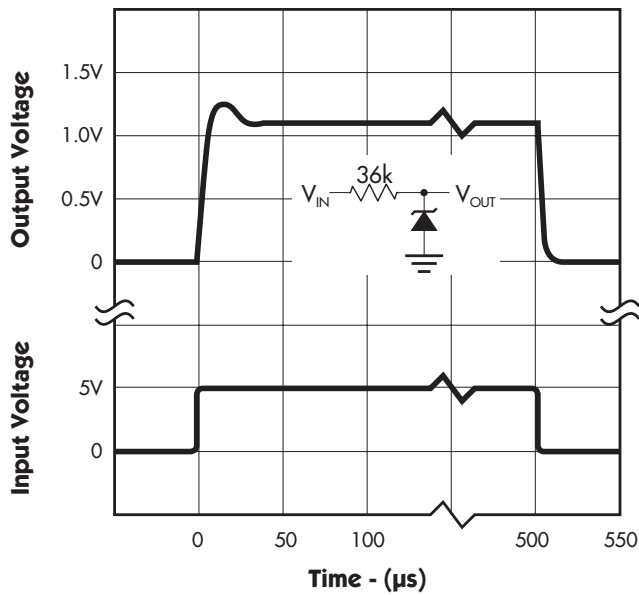
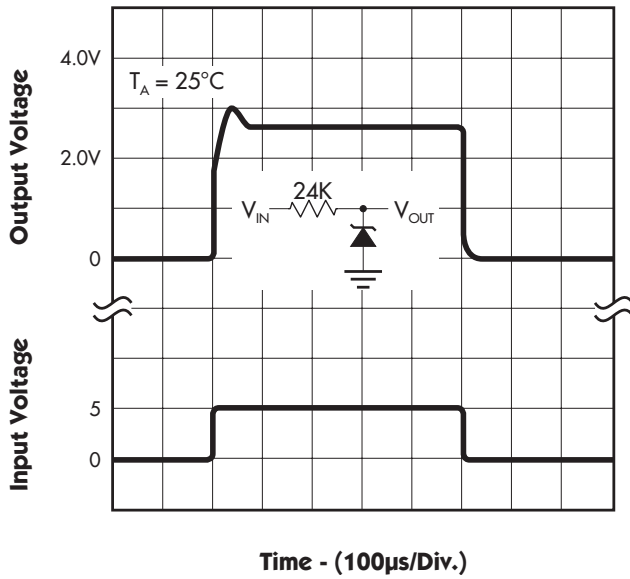


FIGURE 7. — RESPONSE TIME

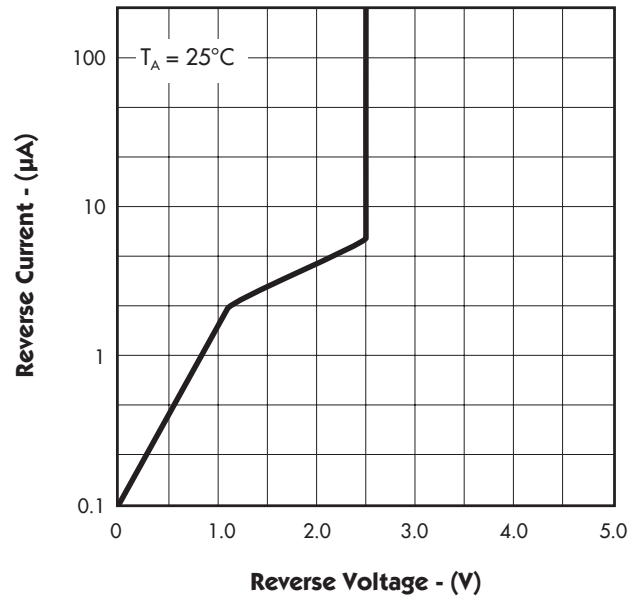


#### CHARACTERISTIC CURVES — LX1004-2.5V

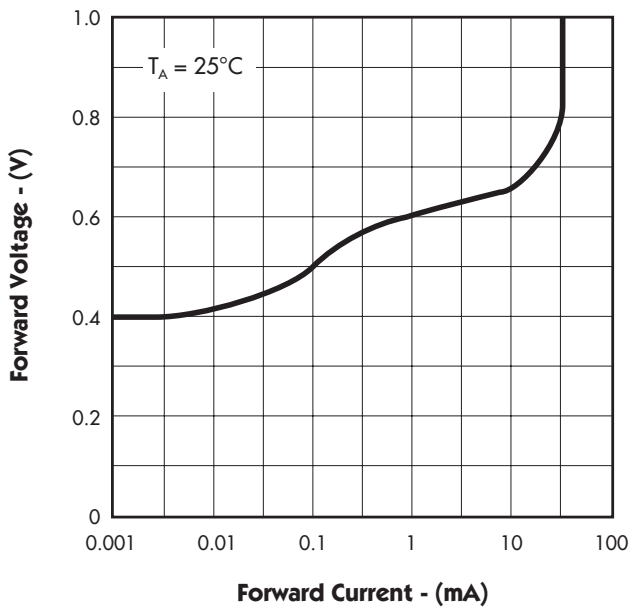
**FIGURE 8. — RESPONSE TIME**



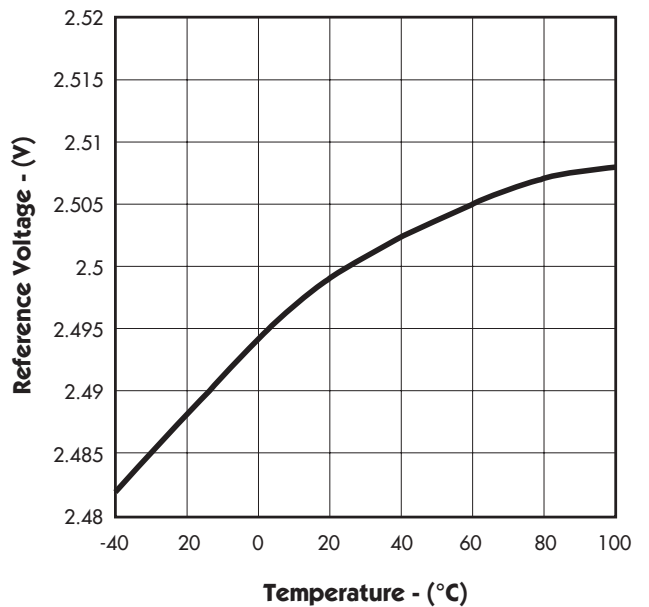
**FIGURE 9. — REVERSE CHARACTERISTICS**



**FIGURE 10. — FORWARD CHARACTERISTICS**



**FIGURE 11. — TEMPERATURE DRIFT**



1.2V & 2.5V MICROPOWER VOLTAGE REFERENCES

PRODUCTION DATA SHEET

CHARACTERISTIC CURVES — LX1004-2.5V

FIGURE 12. — NOISE VOLTAGE

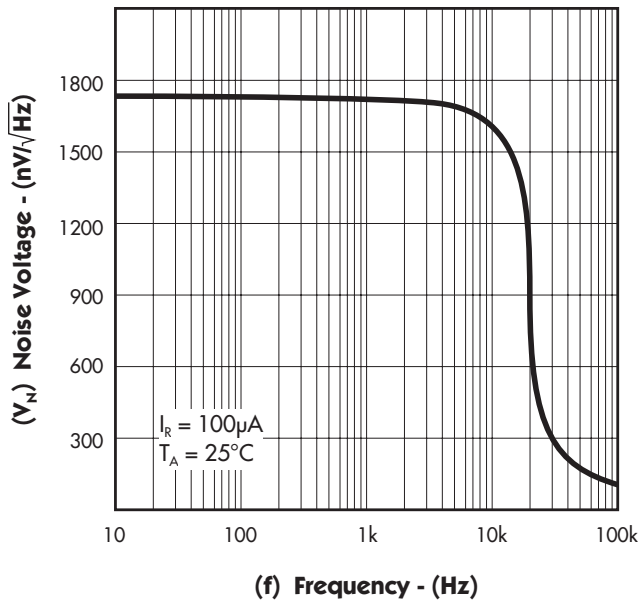


FIGURE 13. — REVERSE DYNAMIC IMPEDANCE

