

#### DESCRIPTION

The LM385/385B 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 15 $\mu$ A up to 20mA for the LX385/385B-1.2, and 20 $\mu$ A up to 20mA for the LM385/385B-2.5, giving designers a great deal of flexibility in optimizing power consumption, noise and ultimate application performance. As an added feature, the references output impedance is extraordinarily low over the entire operating range of quiescent current. This enables an extremely wide dynamic load range with little effect on the overall reference accuracy.

The LM385 family is available in fixed 1.2V and 2.5V reference values. Process and circuit design optimization provides for high accuracy with initial tolerance values of 1% for the LM385B-1.2, 2% for the LM385-1.2, 1.5% for the LM385B-2.5, and 3% for the LM385-2.5. Complementing their initial accuracy, the bandgap reference is temperature compensated to deliver 20ppm performance over the 0° to 70°C operating temperature range.

The LM385 family from Linnfinity is a pin-to-pin replacement for the LM385/385B family of voltage references.

**IMPORTANT:** For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

#### KEY FEATURES

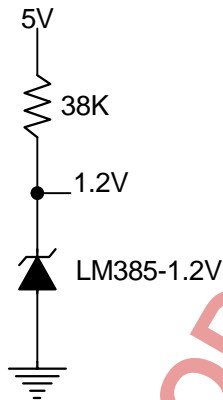
- Guaranteed 1% Initial Accuracy (LM385B-1.2)
- Guaranteed 2.5% Initial Accuracy (LM385-1.2)
- Guaranteed 1.5% Initial Accuracy (LM385B-2.5)
- Guaranteed 3.0% Initial Accuracy (LM385-2.5)
- Guaranteed 20 $\mu$ A Operating Current
- Low Temperature coefficient
- Operating Current of 20 $\mu$ A to 20mA
- Very Low Dynamic Impedance: 10 $\Omega$

#### APPLICATIONS

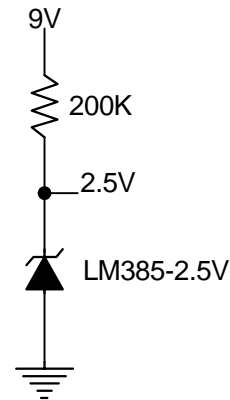
- Portable Meter References
- Portable Test Instruments
- Battery Operated Systems
- Current Loop Instrumentation

#### PRODUCT HIGHLIGHT

1.2V REFERENCE



MICROPOWER REFERENCED FROM 9V BATTERY



#### PACKAGE ORDER INFO

T <sub>A</sub> (°C)	Reference Voltage	Initial Tolerance	DM	Plastic SOIC 8-Pin	LP	Plastic TO-92 3-Pin
			RoHS Compliant / Pb-free Transition DC: 0440		RoHS Compliant / Pb-free Transition DC: 0509	
0 to 70	1.2V	±30mV	LM385DM-1.2	LM385LP-1.2		
		±12mV	LM385BDM-1.2	LM385BLP-1.2		
	2.5V	±75mV	LM385DM-2.5	LM385LP-2.5		
		±38mV	LM385BDM-2.5	LM385BLP-2.5		

Note: Available in Tape & Reel. Append the letters "TR" to the part number. (i.e. LX385BDM-TR)

# LM385/385B

## 1.2 & 2.5V MICROPOWER VOLTAGE REFERENCE

### PRODUCTION DATA SHEET

#### ABSOLUTE MAXIMUM RATINGS (Note 1)

Reverse Breakdown Current .....	30mA
Forward Current .....	10mA
Operating Temperature Range	
LM385 .....	0°C to 70°C
Storage Temperature Range .....	-65°C to 150°C
Lead Temperature (soldering, 10 seconds) .....	300°C
Pb-free / RoHS Peak Package Solder Reflow Temp (40second max. exposure) .....	260°C (+0, -5)

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:

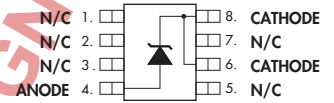
THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$	165°C/W
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##### LP PACKAGE:

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.

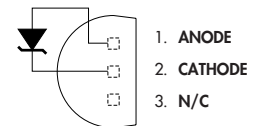
#### PACKAGE PIN OUTS



##### DM PACKAGE

(Top View)

100% Pb-free / RoHS Matte Tin Lead Finish



##### LP PACKAGE

(Top View)

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## 1.2 &amp; 2.5V MICROPOWER VOLTAGE REFERENCE

## PRODUCTION DATA SHEET

## ELECTRICAL CHARACTERISTICS

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

## LM385/385B-1.2

Parameter	Symbol	Test Conditions	LM385/385B-1.2			Units	
			Min.	Typ.	Max.		
Reverse Breakdown Voltage	LM385	$V_Z$	$I_{MIN} \leq I_R \leq I_{MAX}$	1.205	1.235	1.260	V
	LM385B		$I_{MIN} \leq I_R \leq I_{MAX}$	1.223	1.235	1.247	V
Average Temperature Coefficient		$\frac{\Delta V_Z}{\Delta \text{Temp}}$	$I_R = 100\mu\text{A}$		20		ppm/ $^\circ\text{C}$
Minimum Operating Current		$I_{MIN}$		8	15		$\mu\text{A}$
Reverse Breakdown Voltage Change with Current	$e$	$\frac{\Delta V_Z}{\Delta I_R}$	$I_{MIN} \leq I_R \leq 1\text{mA}$			1.5	mV
			$1\text{mA} \leq I_R \leq 20\text{mA}$			20	mV
Reverse Dynamic Impedance		$r_z$	$I_R = 100\mu\text{A}$		1		$\Omega$
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

## LM385/385B-2.5

Parameter	Symbol	Test Conditions	LM385/385B-2.5			Units	
			Min.	Typ.	Max.		
Reverse Breakdown Voltage	LM385	$V_Z$	$I_{MIN} \leq I_R \leq I_{MAX}$	2.425	2.500	2.575	V
	LM385B		$I_{MIN} \leq I_R \leq I_{MAX}$	2.462	2.500	2.538	V
Average Temperature Coefficient		$\frac{\Delta V_Z}{\Delta \text{Temp}}$	$I_R = 100\mu\text{A}$		20		ppm/ $^\circ\text{C}$
Minimum Operating Current		$I_{MIN}$		13	20		$\mu\text{A}$
Reverse Breakdown Voltage Change with Current	$e$	$\frac{\Delta V_Z}{\Delta I_R}$	$I_{MIN} \leq I_R \leq 1\text{mA}$			2	mV
			$1\text{mA} \leq I_R \leq 20\text{mA}$			20	mV
Reverse Dynamic Impedance		$r_z$	$I_R = 100\mu\text{A}, f = 20\text{Hz}$		1		$\Omega$
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  
LM385/385B-1.2

## FIGURE #

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

Characteristic Curves  
LM385/385B-2.5

## FIGURE #

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

#### CHARACTERISTIC CURVES — LM385/385B-1.2V

FIGURE 1. — RESPONSE TIME

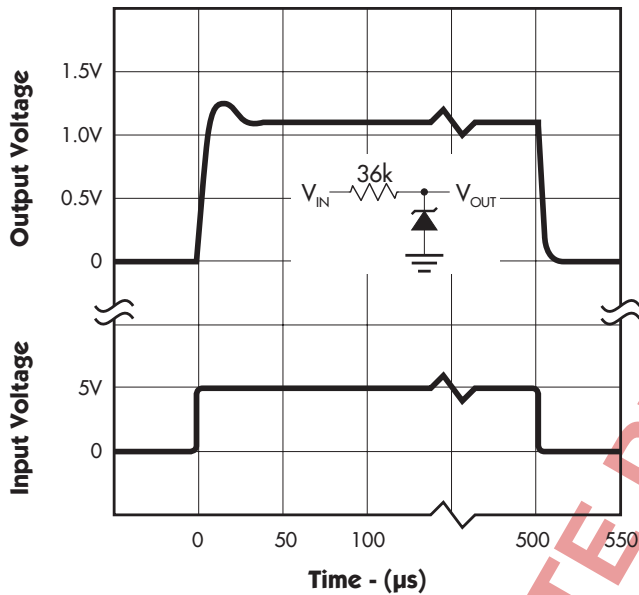


FIGURE 2. — REVERSE CHARACTERISTICS

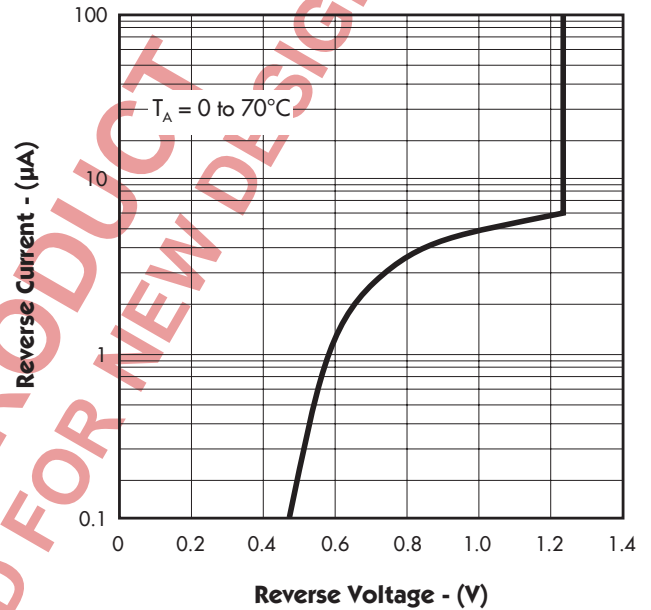


FIGURE 3. — FORWARD CHARACTERISTICS

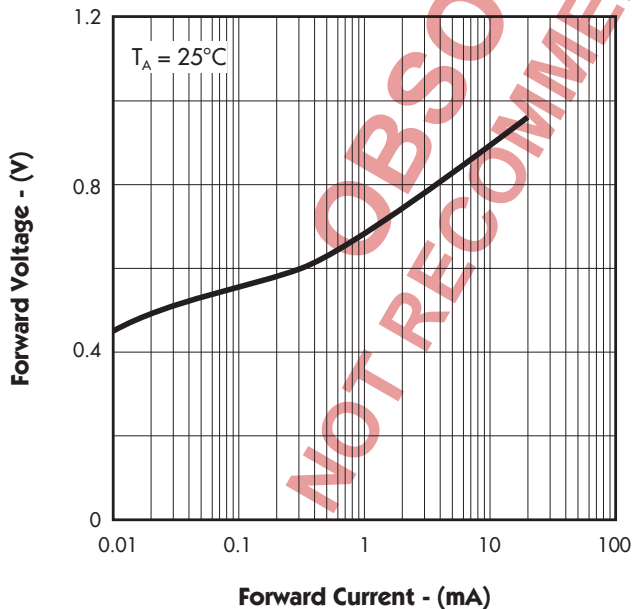
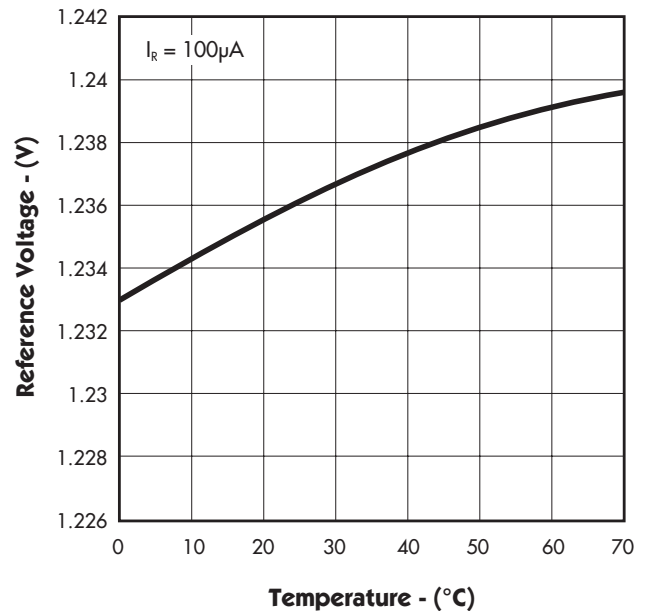


FIGURE 4. — TEMPERATURE DRIFT



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CHARACTERISTIC CURVES — LM385/385B-1.2V

FIGURE 5. — REVERSE VOLTAGE CHANGE

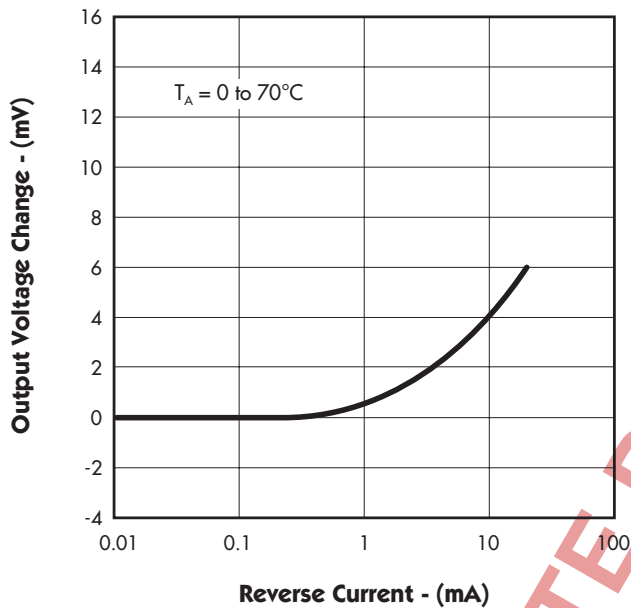


FIGURE 6. — REVERSE DYNAMIC IMPEDANCE

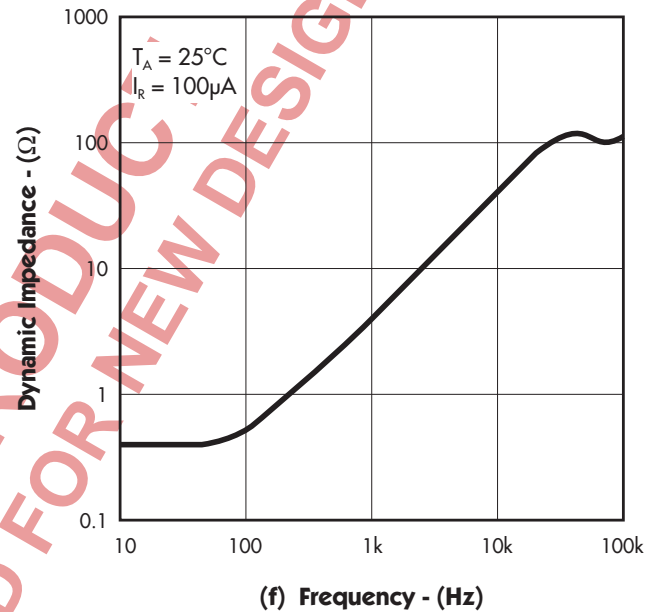
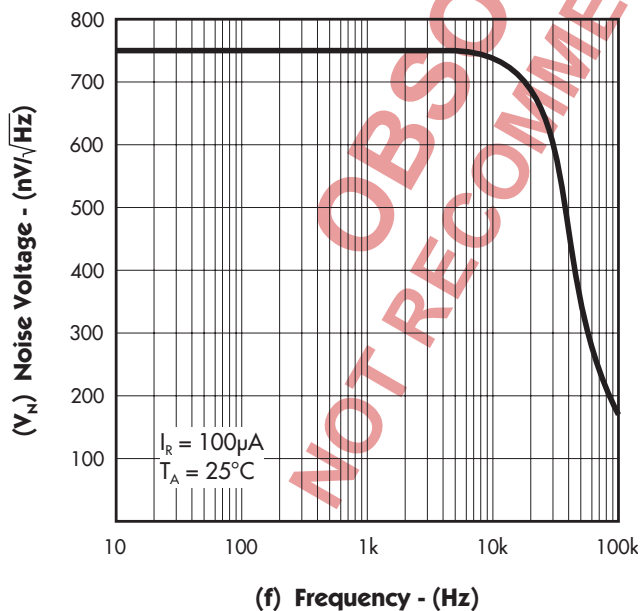


FIGURE 7. — NOISE VOLTAGE



#### CHARACTERISTIC CURVES — LM385/385B-2.5V

FIGURE 8. — RESPONSE TIME

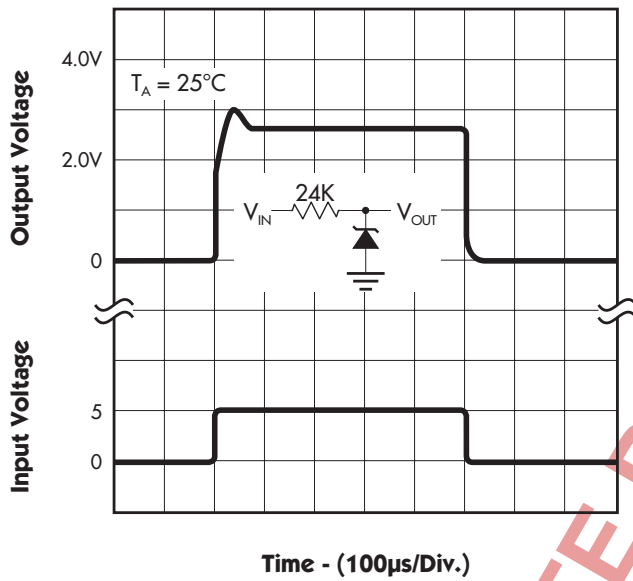


FIGURE 9. — REVERSE CHARACTERISTICS

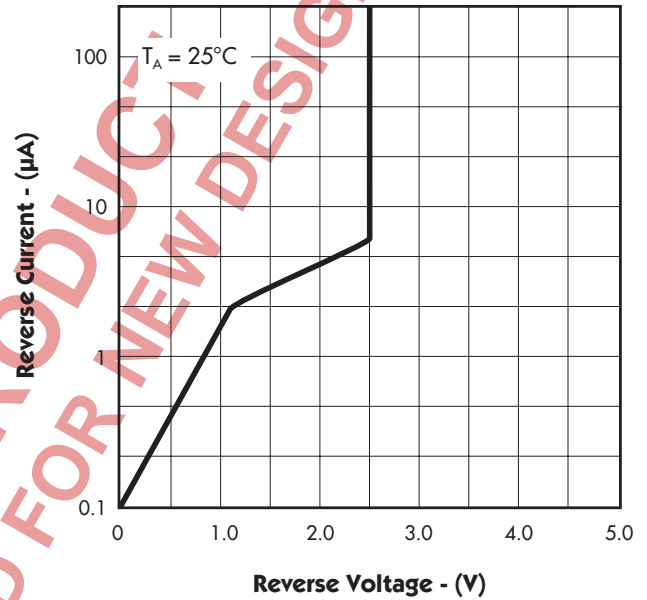


FIGURE 10. — FORWARD CHARACTERISTICS

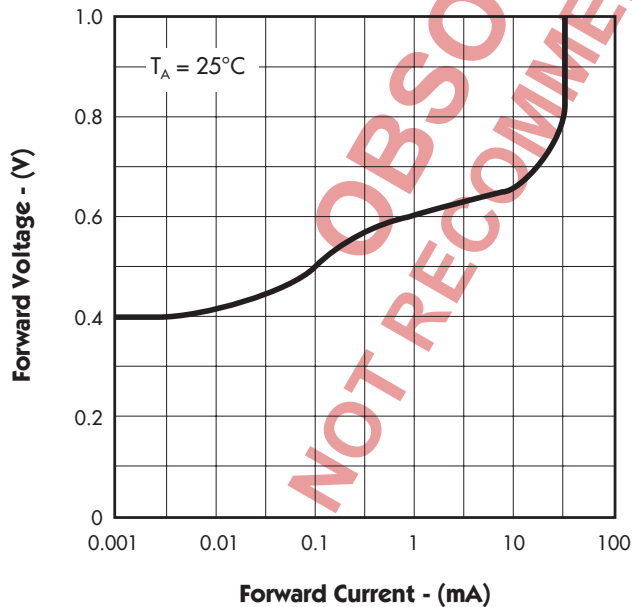
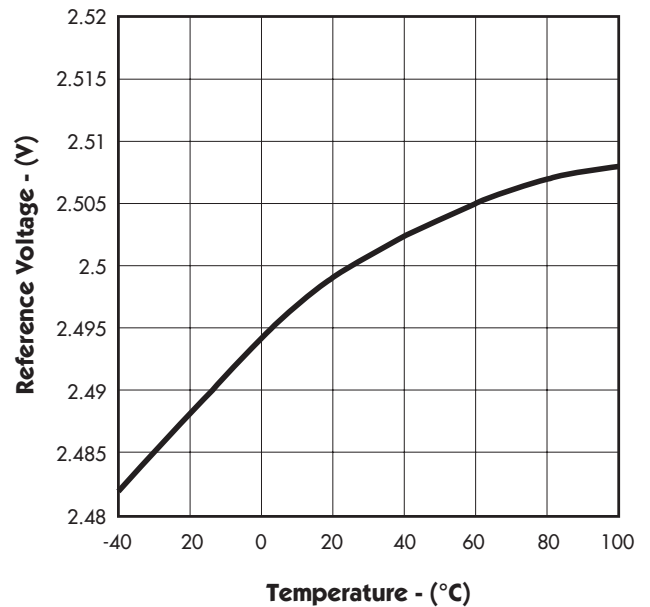


FIGURE 11. — TEMPERATURE DRIFT



## 1.2 &amp; 2.5V MICROPOWER VOLTAGE REFERENCE

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## CHARACTERISTIC CURVES — LM385/385B-2.5V

FIGURE 12. — REVERSE DYNAMIC IMPEDANCE

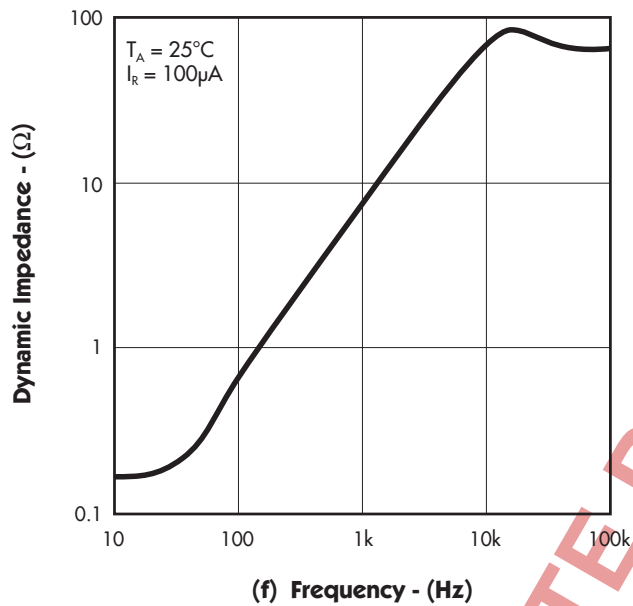
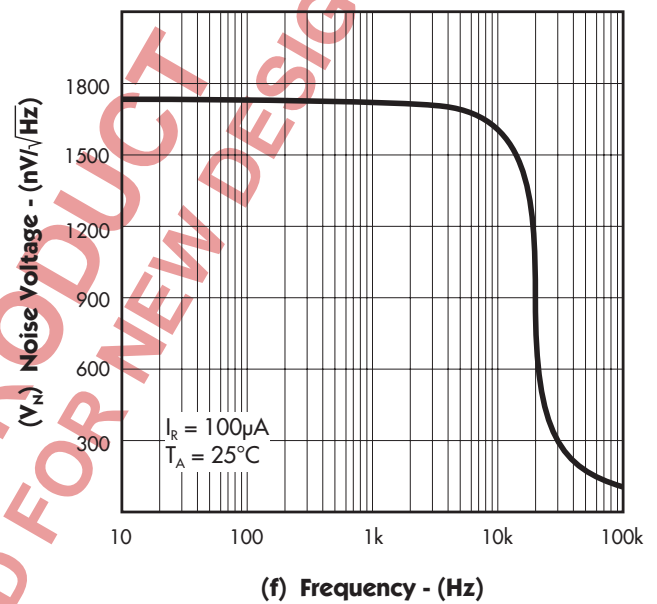


FIGURE 13. — NOISE VOLTAGE



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