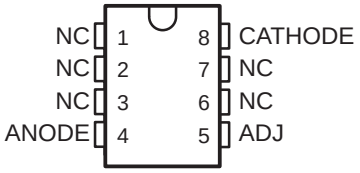
- **Low Temperature Coefficient**
- **Wide Operating Current . . . 400 μA to 10 mA**
- **0.27-Ω Dynamic Impedance**
- **±1% Tolerance Available**
- **Specified Temperature Stability**
- **Easily Trimmed for Minimum Temperature Drift**
- **Fast Turn-On**
- **Three-Lead Transistor Package**

D PACKAGE
(TOP VIEW)



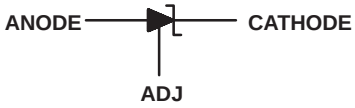
NC-No internal connection

LP PACKAGE
(TOP VIEW)

description

The LM236-2.5 and LM336-2.5 integrated circuits are precision 2.5-V shunt regulator diodes. These monolithic references operate as low temperature coefficient 2.5-V zeners with a 0.2-Ω dynamic impedance. A third terminal provided on the circuit allows the reference voltage and temperature coefficient to be easily trimmed.

symbol



The series are useful as precision 2.5-V low-voltage references (V_Z) for digital voltmeters, power supplies, or operational amplifier circuitry. The 2.5-V voltage reference makes it convenient to obtain a stable reference from 5-V logic supplies. Since the series operate as shunt regulators, they can be used as either positive or negative voltage references.

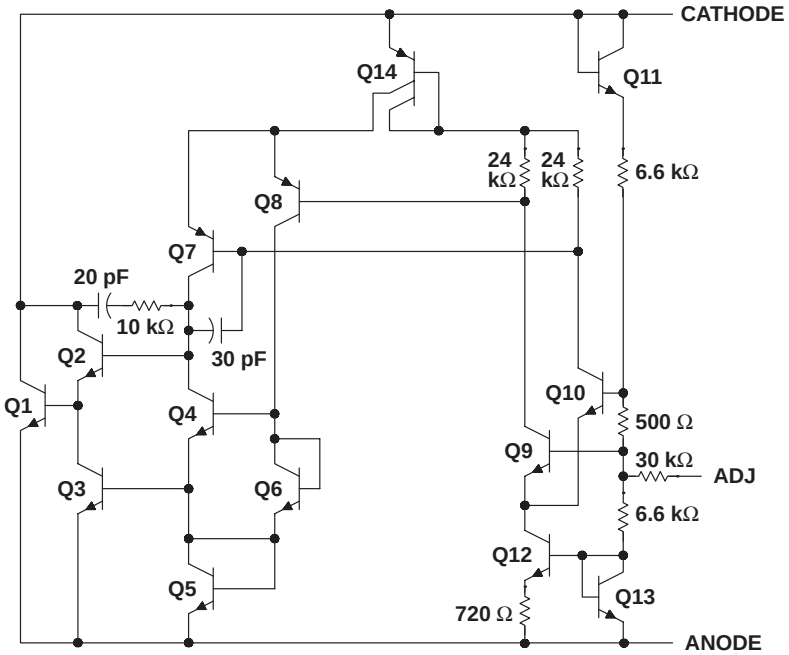
The LM236-2.5 is characterized for operation from –25°C to 85°C. The LM336-2.5 is characterized for operation from 0°C to 70°C.

AVAILABLE OPTIONS

T_A	PACKAGED DEVICES		CHIP FORM (Y)
	SMALL OUTLINE (D)	PLASTIC (LP)	
0°C to 70°C	LM336D-2.5	LM336LP-2.5	LM336Y-2.5
–25°C to 85°C	LM236D-2.5	LM236LP-2.5	—

The D package is available taped and reeled. Add the suffix R to the device type (i.e., LM336DR-2.5).

schematic diagram

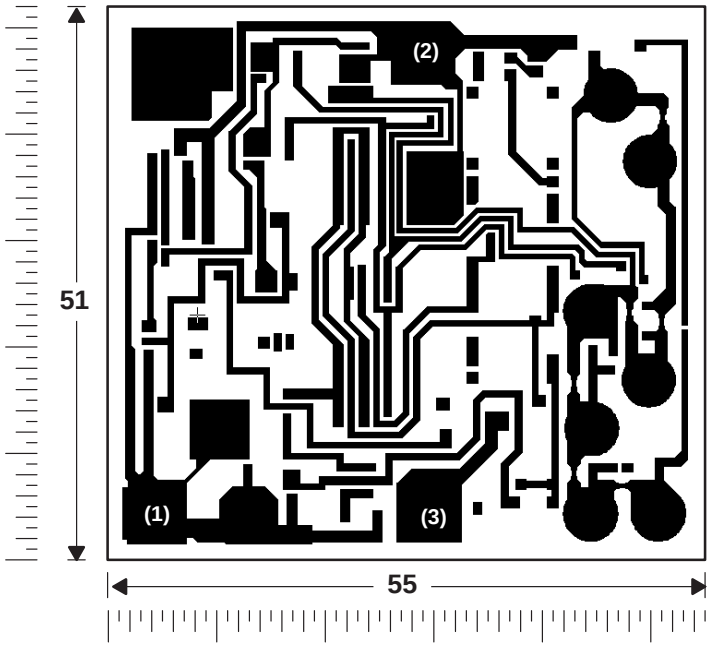


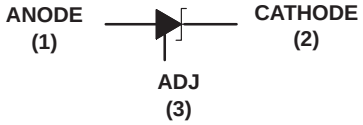
All component values are nominal

LM336Y-2.5 chip information

This chip, when properly assembled, displays characteristics similar to the LM336-2.5 (see electrical tables). Thermal compression or ultrasonic bonding can be used on the doped aluminum bonding pads. The chip can be mounted with conductive epoxy or a gold-silicon preform.

BONDING PAD ASSIGNMENTS





CHIP THICKNESS:
15 MILS TYPICAL

BONDING PADS:
4 × 4 MILS MINIMUM

$T_J$max = 150°C

TOLERANCES ARE ±10%.

ALL DIMENSIONS ARE IN MILS.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Reverse current, I_R . . . . . 20 mA
Forward current, I_F . . . . . 10 mA
Operating free-air temperature range, T_A: LM236-2.5 . . . . . –25°C to 85°C
LM336-2.5 . . . . . 0°C to 70°C
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or LP package . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

electrical characteristics at specified free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS		T_A‡	LM236-2.5			LM336-2.5			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reference voltage	I_Z = 1 mA	LM236, LM336	25°C	2.44	2.49	2.54	2.39	2.49	2.59	V
			LM236A, LM336B		2.465	2.49	2.515	2.44	2.49	2.54	
$\Delta V_{Z(\Delta T)}$	Change in reference voltage with temperature§	V_Z adjusted to 2.490 V, I_Z = 1 mA		Full range		3.5	9		1.8	6	mV
$\Delta V_{Z(\Delta I)}$	Change in reference voltage with current	I_Z = 400 μA to 10 mA		25°C		2.6	6		2.6	10	mV
				Full range		3	10		3	12	
$\Delta V_{Z(\Delta t)}$	Long-term change in reference voltage	I_Z = 1 mA		25°C		20			20		ppm/khr
Z_Z	Reference impedance	I_Z = 1 mA, f = 1 kHz		25°C		0.2	0.6		0.2	1	Ω
				Full range		0.4	1		0.4	1.4	

‡ Full range is –25°C to 85°C for the LM236-2.5 and 0°C to 70°C for the LM336-2.5.
§ Temperature stability (change in reference voltage with temperature) for these devices is ensured by design. Design limits are specified over the indicated temperature and supply voltage ranges. These limits are not used to calculate outgoing quality levels.

electrical characteristics, T_A = 25°C

PARAMETER		TEST CONDITIONS	LM336Y-2.5			UNIT
			MIN	TYP	MAX	
V_Z	Reference voltage	I_Z = 1 mA	2.39	2.49	2.59	V
$\Delta V_{Z(\Delta I)}$	Change in reference voltage with current	I_Z = 400 μA to 10 mA		2.6	10	mV
$\Delta V_{Z(\Delta t)}$	Long-term change in reference voltage	I_Z = 1 mA		20		ppm/khr
Z_Z	Reference impedance	I_Z = 1 mA, f = 1 kHz		0.2	1	Ω

TYPICAL CHARACTERISTICS

CHANGE IN REFERENCE VOLTAGE vs REFERENCE CURRENT

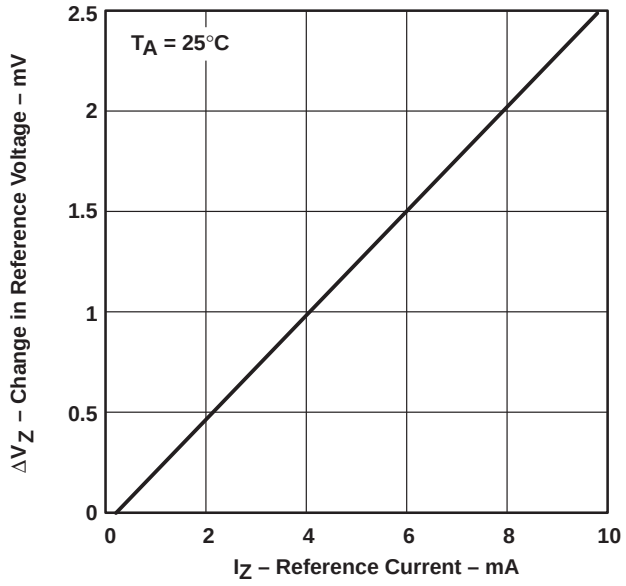


Figure 1

NOISE VOLTAGE vs FREQUENCY

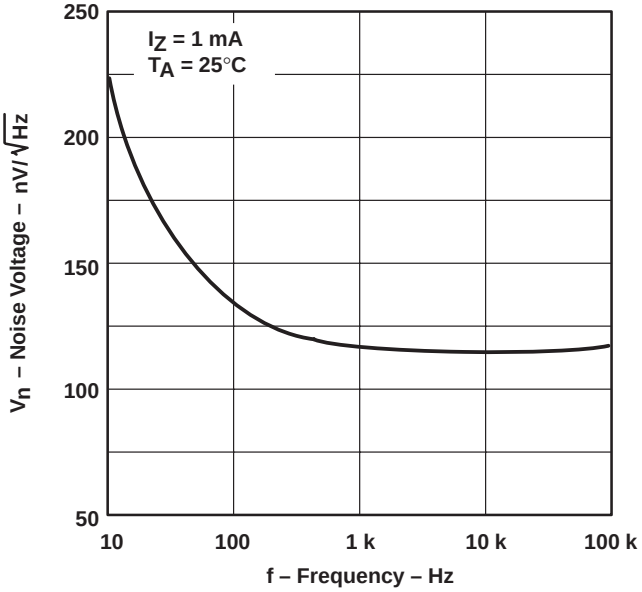


Figure 2

REFERENCE IMPEDANCE vs FREQUENCY

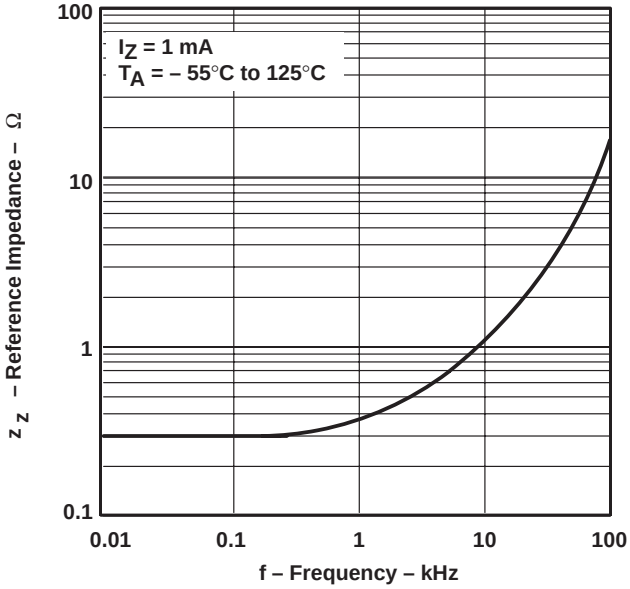


Figure 3

APPLICATION INFORMATION

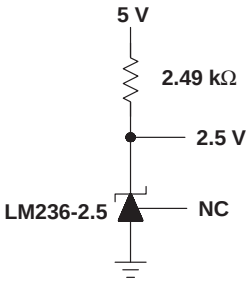
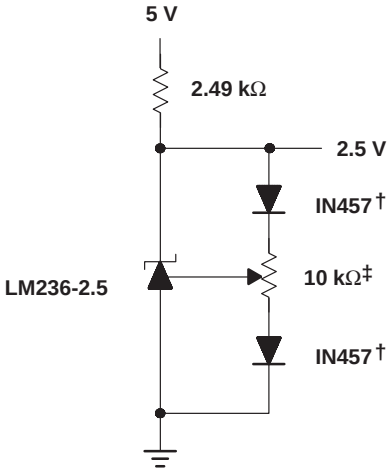


Figure 4. 2.5-V Reference



† Any silicon signal diode
‡ Adjust to 2.49 V

Figure 5. 2.5-V Reference With Minimum Temperature Coefficient

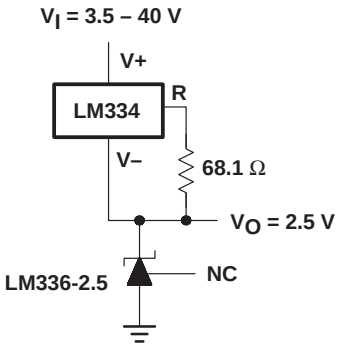


Figure 6. Wide Input Range Reference

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