National Semiconductor

LM136-5.0/LM236-5.0/LM336-5.0 5.0V Reference Diode

General Description

The LM136-5.0/LM236-5.0/LM336-5.0 integrated circuits are precision 5.0V shunt regulator diodes. These monolithic IC voltage references operate as a low temperature coefficient 5.0V zener with 0.6Ω dynamic impedance. A third terminal on the LM136-5.0 allows the reference voltage and temperature coefficient to be trimmed easily.

The LM136-5.0 series is useful as a precision 5.0V low voltage reference for digital voltmeters, power supplies or op amp circuitry. The 5.0V makes it convenient to obtain a stable reference from low voltage supplies. Further, since the LM136-5.0 operates as a shunt regulator, it can be used as either a positive or negative voltage reference.

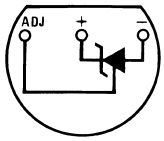
The LM136-5.0 is rated for operation over −55˚C to +125˚C while the LM236-5.0 is rated over a −25˚C to +85˚C temperature range. The LM336-5.0 is rated for operation over a 0˚C to +70˚C temperature range. See the connection diagrams for available packages. For applications requiring 2.5V see LM136-2.5.

Features

- Adjustable 4V to 6V
- Low temperature coefficient
- Wide operating current of 600 µA to 10 mA
- 0.6Ω dynamic impedance
- ± 1% initial tolerance available
- Guaranteed temperature stability
- Easily trimmed for minimum temperature drift
- Fast turn-on
- Three lead transistor package

Connection Diagrams

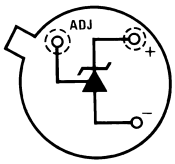
TO-92
Plastic Package



00571604

Bottom View
Order Number LM336Z-5.0 or LM336BZ-5.0
See NS Package Number Z03A

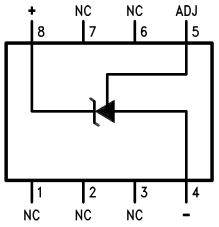
TO-46
Metal Can Package



00571605

Bottom View
Order Number LM136H-5.0, LM136H-5.0/883, LM236H-5.0, LM136AH-5.0, LM136AH-5.0/883, or LM236AH-5.0
See NS Package Number H03H

SO Package



00571607

Order Number LM336M-5.0 or LM336BM-5.0
See NS Package Number M08A

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Reverse Current	15mA
Forward Current	10mA
Storage Temperature	−60˚C to +150˚C
Operating Temperature Range (Note 2)	
LM136-5.0	−55˚C to +150˚C
LM236-5.0	−25˚C to +85˚C
LM336-5.0	0˚C to +70˚C
Soldering Information	
TO-92 Package (10 sec.)	260˚C
TO-46 Package (10 sec.)	300˚C
SO Package	
Vapor Phase (60 sec.)	215˚C
Infrared (15 sec.)	220˚C

See AN-450 “Surface Mounting Methods and Their Effect on Product Reliability” (appendix D) for other methods of soldering surface mount devices.

Electrical Characteristics

(Note 3)

Parameter	Conditions	LM136A-5.0/LM236A-5.0 LM136-5.0/LM236-5.0			LM336B-5.0 LM336-5.0			Units
		Min	Typ	Max	Min	Typ	Max	
Reverse Breakdown Voltage	T_A=25˚C, I_R=1 mA							
	LM136-5.0/LM236-5.0/LM336-5.0	4.9	5.00	5.1	4.8	5.00	5.2	V
	LM136A-5.0/LM236A-5.0, LM336B-5.0	4.95	5.00	5.05	4.90	5.00	5.1	V
Reverse Breakdown Change With Current	T_A=25˚C, 600 µA≤I_R≤10 mA		6	12		6	20	mV
Reverse Dynamic Impedance	T_A=25˚C, I_R=1 mA, f = 100 Hz		0.6	1.2		0.6	2	Ω
Temperature Stability (Note 4)	V_R Adjusted 5.00V							
	I_R=1 mA, (*Figure 2*)							
	0˚C≤T_A≤70˚C (LM336-5.0)					4	12	mV
	−25˚C≤T_A≤+85˚C (LM236-5.0)		7	18				mV
	−55˚C≤T_A≤+125˚C (LM136-5.0)		20	36				mV
Reverse Breakdown Change With Current	600 µA≤I_R≤10 mA		6	17		6	24	mV
Adjustment Range	Circuit of *Figure 1*		±1			±1		V
Reverse Dynamic Impedance	I_R = 1 mA		0.8	1.6		0.8	2.5	Ω
Long Term Stability	T_A=25˚C±0.1˚C, I_R=1 mA, t = 1000 hrs		20			20		ppm

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Electrical specifications do not apply when operating the device beyond its specified operating conditions.

Note 2: For elevated temperature operation, T_j max is:

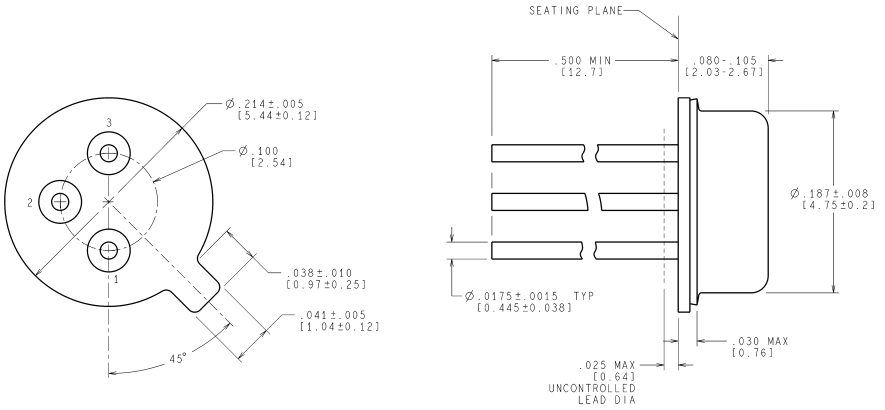
LM136	150˚C
LM236	125˚C
LM336	100˚C

Thermal Resistance	TO-92	TO-46	SO-8
θ_{ja} (Junction to Ambient)	180˚C/W (0.4" Leads) 170˚C/W (0.125" Leads)	440˚C/W	165˚C/W
θ_{ja} (Junction to Case)	N/A	80˚C/W	N/A

Note 3: Unless otherwise specified, the LM136-5.0 is specified from −55˚C≤T_A≤+125˚C, the LM236-5.0 from −25˚C≤T_A≤+85˚C and the LM336-5.0 from 0˚C≤T_A≤+70˚C.

Note 4: Temperature stability for the LM336 and LM236 family is guaranteed by design. Design limits are guaranteed (but not 100% percent production tested) over the indicated temperature and supply voltage ranges. These limits are not used to calculate outgoing quality levels. Stability is defined as the maximum charge in V_{REF} from 25˚C to T_A(min) or T_A(max).

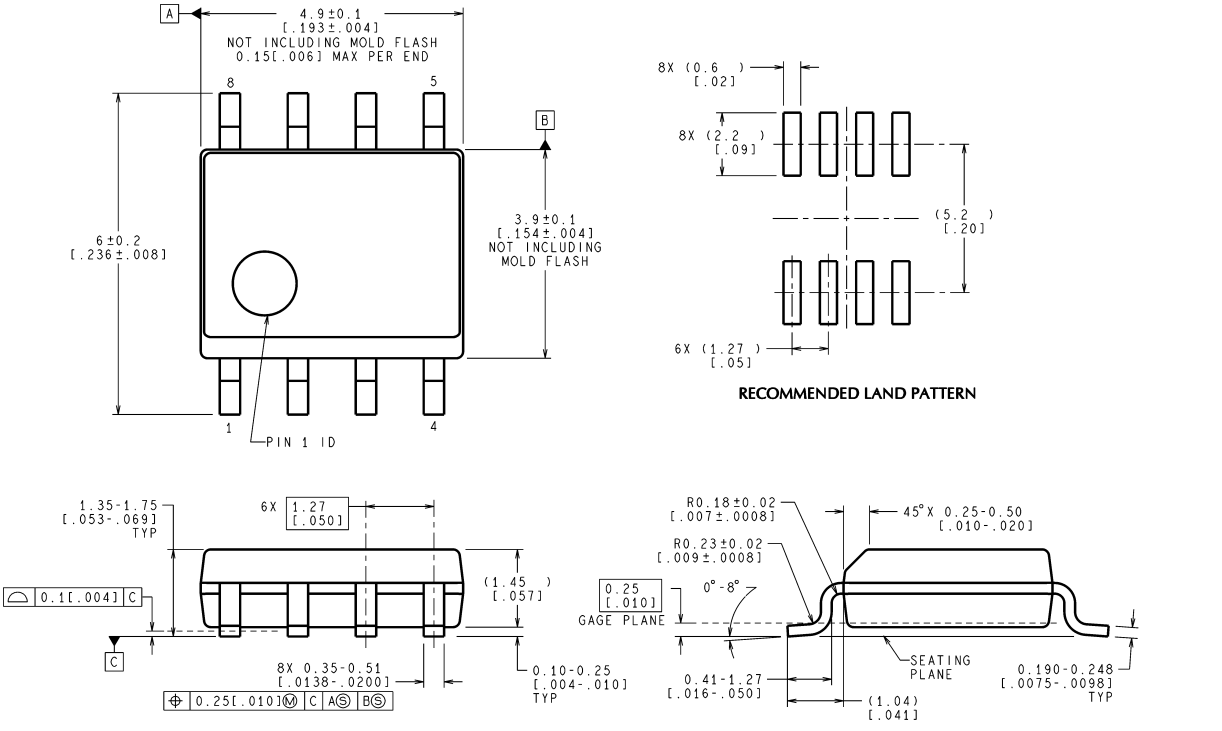
Physical Dimensions inches (millimeters)
unless otherwise noted



CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE IN MILLIMETERS

H03H (Rev F)

TO-46 Metal Can Package (H)
Order Number LM136H-5.0, LM136H-5.0/883, LM236H-5.0,
LM136AH-5.0, LM136AH-5.0/883 or LM236AH-5.0
NS Package Number H03H



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VALUES IN [ ] ARE INCHES
DIMENSIONS IN ( ) FOR REFERENCE ONLY

M08A (Rev K)

Small Outline (SO-8) Package
Order Number LM336M-5.0 or LM336BM-5.0
NS Package Number M08A