National Semiconductor

MILITARY DATA SHEET

MNLM103-3.6-H REV 0A0

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REFERENCE DIODE

General Description

The LM103 is a two-terminal monolithic reference diode electrically equivalent to a breakdown diode. The device makes use of the reverse punch-through of double-diffused transistors, combined with active circuitry, to produce a breakdown characteristic which is ten times sharper than single-junction zener diodes at low voltages. Breakdown voltages from 3.0V to 3.9V are available; and, although the design is optimized for operation between 100uA and 1mA, it is completely specified from 10uA to 10mA. Noteworthy features of the device are:

- Exceptionally sharp breakdown
- Low dynamic impedance from 10uA to 10mA
- Planar, passivated junctions for stable operation
- Low capacitance

The LM103, is useful in a wide range of circuit applications from level shifting to simple voltage regulation. It can also be employed with operational amplifiers in producing breakpoints to generate nonlinear transfer functions. Finally, its unique characteristics recommend it as a reference element in low voltage power supplies with input voltages down to 4V.

Industry Part Number

LM103

NS Part Numbers

LM103H-3.6-SMD*
LM103H-3.6/883

Prime Die

LM103

Controlling Document

7702808XA*

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

(Absolute Maximum Ratings)
(Note 1)

Power Dissipation (Note 2)		250mW
Reverse Current		20mA
Forward Current		100mA
Operating Temperature Range		-55 C to 125 C
Storage Temperature Range		-65 C to 150 C
Maximum Junction Temperature		150 C
Lead Temperature (Soldering, 60 seconds)		300 C
Thermal Resistance		
ThetaJA		
Metal Can Pkg	(Still Air @ 0.5W)	292 C/W
	(500LF/Min Air flow @ 0.5W)	147 C/W
ThetaJC		
Metal Can Pkg		58 C/W
ESD Tolerance (Note 3)		TBD

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Note 2: The maximum power dissipation must be derated at elevated temperatures and is dictated by Tjmax (maximum junction temperature), ThetaJA (package junction to ambient thermal resistance), and TA (ambient temperature). The maximum allowable power dissipation at any temperature is Pdmax - (Tjmax - TA)/ThetaJA or the number given in the Absolute Maximum Ratings, whichever is lower.

Note 3: Human body model, 1.5K Ohms in series with 100pF.

Electrical Characteristics

DC PARAMETERS:

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Tolerance = ±10%.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vz	Zener Voltage	Ir = 400uA	2, 3		3.24	3.96	V	1
			3		0.8	7	V	2
			3		1	8	V	3
		Ir = 1mA	2, 3		3.24	3.96	V	1
			3		0.8	7	V	2
			3		1	8	V	3
		Ir = 2mA	2, 3		3.24	3.96	V	1
			3		0.8	7	V	2
			3		1	8	V	3
		Ir = 3mA	2, 3		3.24	3.96	V	1
			3		0.8	7	V	2
			3		1	8	V	3
Delta Vz/ Delta Ir	Zener Voltage Change	10uA ≤ Ir ≤ 100uA				120	mV	1
		10uA ≤ Ir ≤ 100uA				200	mV	2, 3
		100uA ≤ Ir ≤ 1mA				50	mV	1
		100uA ≤ Ir ≤ 1mA				70	mV	2
		100uA ≤ Ir ≤ 1mA				60	mV	3
		1mA ≤ Ir ≤ 5mA				150	mV	1
		1mA ≤ Ir ≤ 5mA				200	mV	2, 3
Ir	Reverse Leakage Current	Vr = Vz -200mV (test uses Vz reading from Ir = 400uA subgroup 1)				5	uA	1
						50	uA	2, 3
Vf	Forward Voltage Drop	If = 5mA			-0.7	-1	V	1
					-0.5	-1.5	V	2, 3
Rr	Reverse Dynamic Impedance	Ir = 3mA ±5%				25	Ohms	1
Delta Vz/ Delta t	Temperature Coefficient of Zener Voltage	100uA ≤ Ir ≤ 1mA, -55 C ≤ TA ≤ 125 C	1			-8	mV/ C	1
Vn	Peak-to-Peak Broadband Noise Voltage	1Hz ≤ f ≤ 100KHz, Ir = 1mA	1			1000	uV	1
Rr	Rev. Dynamic Impedance	Ir = 0.3mA	1			60	Ohms	1

Electrical Characteristics

DC PARAMETERS:(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Tolerance = ±10%.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Delta Vz / Delta Ir	Zener Voltage Change	10uA ≤ Ir ≤ 1mA	1			260	mV	1, 2, 3

DC PARAMETERS: DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Tolerance = ±10%. "Deltas not required on B-Level product. Deltas required for S-Level product ONLY as specified on Internal Processing Instructions (IPI)."

Vz	Zener Voltage	Ir = 400uA			-0.08	0.08	V	1
		Ir = 1mA			-0.08	0.08	V	1
		Ir = 2mA			-0.08	0.08	V	1
		Ir = 3mA			-0.08	0.08	V	1

Note 1: Guaranteed parameter not tested.
Note 2: Tests 1 to 4 are set on the Teradyne based on the nominal Zener Voltage of the devices being tested. Limits are as shown. Acceptable Deltas would be as shown. Tolerance is 10%. Nominal Zener Voltage is last two digits of device name.
Note 3: Test 1 to 4 at extreme temperatures can be datalogged (for purposes of computing temp-coefficient) but have no set limits. The limits listed in the Min and Max columns are those tested in the programs (for all Zener Voltages).