

LM103 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 1.8V to 5.6V are available; and, although the design is optimized for operation between 100 μ A and 1 mA, it is completely specified from 10 μ A to 10 mA.

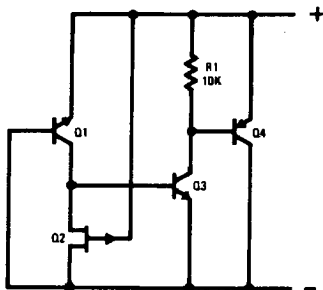
Features

- Exceptionally sharp breakdown
- Low dynamic impedance from 10 μ A to 10 mA

- Performance guaranteed over full military temperature range
- Planar, passivated junctions for stable operation
- Low capacitance.

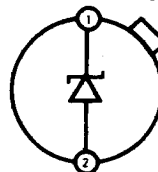
The LM103, packaged in a hermetically sealed, modified TO-46 header is useful in a wide range of circuit applications from level shifting to simple voltage regulation. It can also be employed with operational amplifiers in producing breakpoints to generate nonlinear transfer functions. Finally, its unique characteristics recommend it as a reference element in low voltage power supplies with input voltages down to 4V.

Schematic and Connection Diagrams



TL/H/6170-1

Metal Can Package



Note: Pin 2 connected to case.

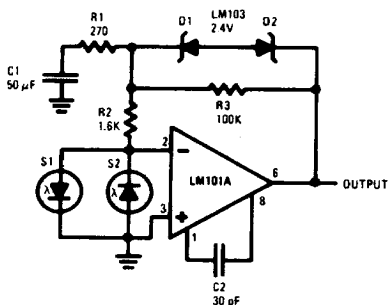
TOP VIEW

TL/H/6170-2

Order Number LM103H
See NS Package H02A

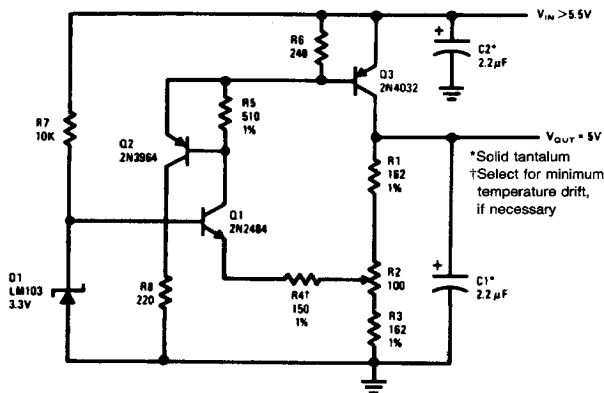
Typical Applications

Saturating Servo Preamplifier
with Rate Feedback



TL/H/6170-3

200 mA Positive Regulator



*Solid tantalum
†Select for minimum
temperature drift,
if necessary

TL/H/6170-4

**Covered by U.S. Patent Number 3,571,630

Absolute Maximum Ratings

Power Dissipation (Note 1)	250 mW	Operating Temperature Range	-55°C to 125°C
Reverse Current	20 mA	Storage Temperature Range	-65°C to 150°C
Forward Current	100 mA	Lead Temperature (Soldering, 60 seconds)	300°C

Electrical Characteristics (Note 2)

Parameter	Conditions	Min	Typ	Max	Unit
Reverse Breakdown Voltage Change	$10 \mu\text{A} \leq I_R \leq 100 \mu\text{A}$		60	120	mV
	$100 \mu\text{A} \leq I_R \leq 1 \text{ mA}$		15	50	mV
	$1 \text{ mA} \leq I_R \leq 10 \text{ mA}$		50	150	mV
Reverse Dynamic Impedance (Note 3)	$I_R = 3 \text{ mA}$		5	25	Ω
	$I_R = 0.3 \text{ mA}$		15	60	Ω
Reverse Leakage Current	$V_R = V_Z - 0.2 \text{ V}$		2	5	μA
Forward Voltage Drop	$I_F = 10 \text{ mA}$	0.7	0.8	1.0	V
Peak-to-Peak Broadband Noise Voltage	$10 \text{ Hz} \leq f \leq 100 \text{ kHz}$, $I_R = 1 \text{ mA}$		300		μV
Reverse Breakdown Voltage Change with Current (Note 4)	$10 \mu\text{A} \leq I_R \leq 100 \mu\text{A}$			200	mV
	$100 \mu\text{A} \leq I_R \leq 1 \text{ mA}$			60	mV
	$1 \text{ mA} \leq I_R \leq 10 \text{ mA}$			200	mV
Breakdown Voltage Temperature Coefficient (Note 4)	$100 \mu\text{A} \leq I_R \leq 1 \text{ mA}$		-5.0		mV/°C

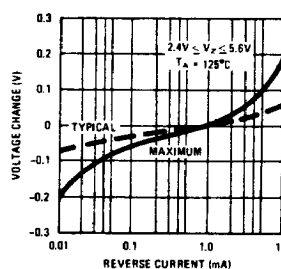
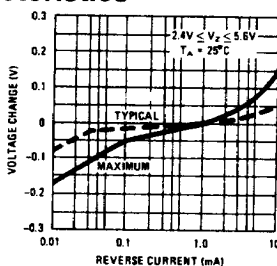
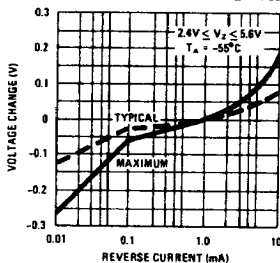
Note 1: For operating at elevated temperatures, the device must be derated based on a 150°C maximum junction temperature and a thermal resistance of 80° C/W junction to case or 440° C/W junction to ambient (see curve).

Note 2: These specifications apply for $T_A = 25^\circ\text{C}$ and $1.8 \text{ V} < V_Z < 5.6 \text{ V}$ unless stated otherwise. The diode should not be operated with shunt capacitances between 100 pF and 0.01 μF , unless isolated by at least a 300 Ω resistor, as it may oscillate at some currents. For voltages between 4.3V and 5.6V, the maximum shunt capacitance is 50 pF rather than 100 pF.

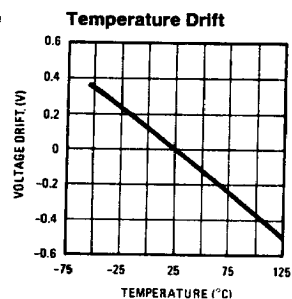
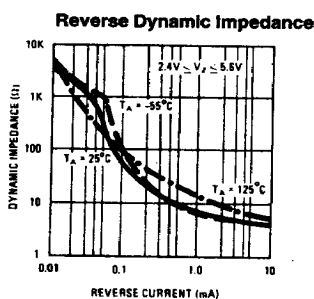
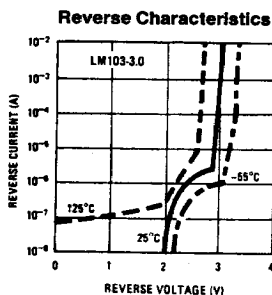
Note 3: Measured with the peak-to-peak change of reverse current equal to 10% of the DC reverse current.

Note 4: These specifications apply for $-55^\circ\text{C} < T_A < +125^\circ\text{C}$.

Guaranteed Reverse Characteristics

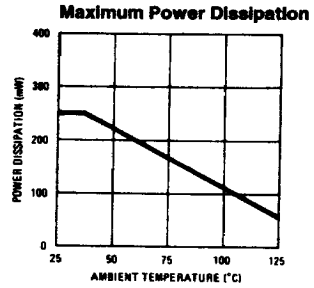
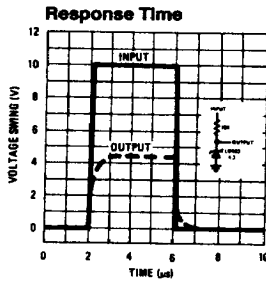
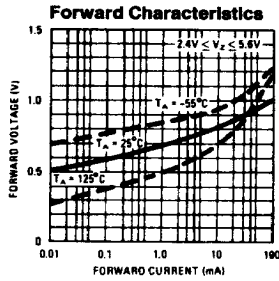


Typical Performance Characteristics



TL/H/6170-5

Typical Performance Characteristics (Continued)



TL/H/8170-6

BREAKDOWN VOLTAGE*	PART NUMBER
1.8	LM103H-1.8
2.0	LM103H-2.0
2.2	LM103H-2.2
2.4	LM103H-2.4
2.7	LM103H-2.7
3.0	LM103H-3.0
3.3	LM103H-3.3
3.6	LM103H-3.6
3.9	LM103H-3.9
4.3	LM103H-4.3
4.7	LM103H-4.7
5.1	LM103H-5.1
5.6	LM103H-5.6

*Measured at $I_R = 1\text{ mA}$.
 Standard tolerance is $\pm 10\%$.