Voltage Regulators

LM103 regulator diode

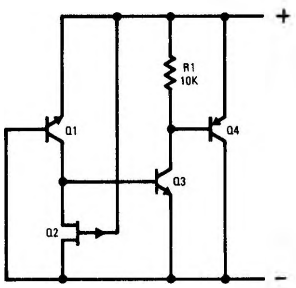
general description

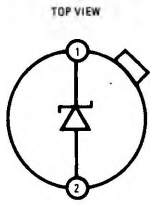
The LM103 is a two-terminal monolithic regulator diode electrically equivalent to a breakdown diode. The device makes use of the reverse punch-through of double-diffused transistors, combined with active circuitry, to produce a breakdown characteristic which is ten times sharper than single-junction 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 μA and 1 μA, it is completely specified from 10 μA to 10 mA. Noteworthy features of the device are:

- Exceptionally sharp breakdown
- Low dynamic impedance from 10 μA 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

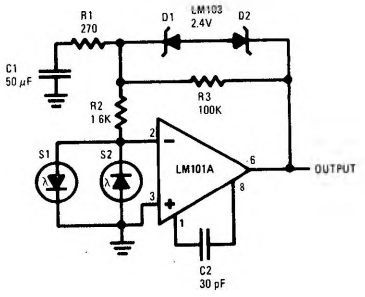




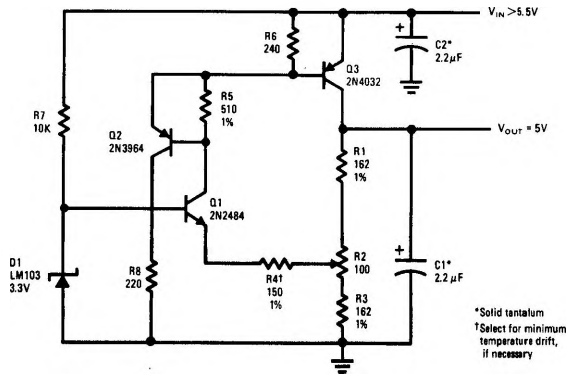
NOTE: Pin 2 connected to case.

typical applications

Saturating Servo Preamplifier with Rate Feedback



200 mA Positive Regulator



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

absolute maximum ratings

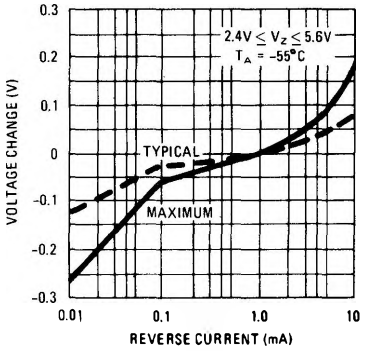
Power Dissipation (note 1)	250 mW
Reverse Current	20 mA
Forward Current	100 mA
Operating Temperature Range	−55°C to 125°C
Storage Temperature Range	−65°C to 150°C
Lead Temperature (soldering, 60 sec)	300°C

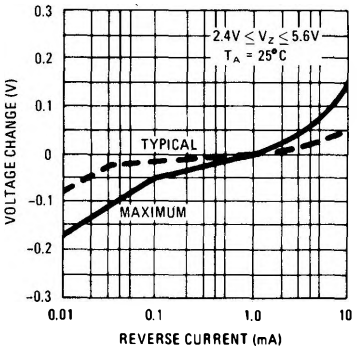
electrical characteristics (Note 2)

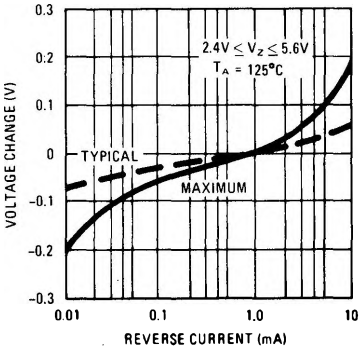
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Reverse Breakdown Voltage Change	$10\ \mu A \leq I_R \leq 100\ \mu A$		60	120	mV
	$100\ \mu A \leq I_R \leq 1\ mA$		15	50	mV
	$1\ mA \leq I_R \leq 10\ mA$		50	150	mV
Reverse Dynamic Impedance (Note 3)	$I_R = 3\ mA$		5	25	Ω
	$I_R = 0.3\ mA$		15	60	Ω
Reverse Leakage Current	$V_R = V_Z - 0.2V$		2	5	μA
Forward Voltage Drop	$I_F = 10\ mA$	0.7	0.8	1.0	V
Peak-to-Peak Broadband Noise Voltage	$10\ Hz \leq f \leq 100\ kHz$, $I_R = 1\ mA$		300		μV
Reverse Breakdown Voltage Change (Note 4)	$10\ \mu A \leq I_R \leq 100\ \mu A$			200	mV
	$100\ \mu A \leq I_R \leq 1\ mA$			60	mV
	$1\ mA \leq I_R \leq 10\ mA$			200	mV
Breakdown Voltage Temperature Coefficient (Note 4)	$100\ \mu A \leq I_R \leq 1\ mA$		−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 $T_A = 25°C$ and $1.8V < V_Z < 5.6V$ 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 50Ω resistor, as it may oscillate at some currents.
NOTE 3: Measured with the peak-to-peak change of reverse current equal to 10 percent of the dc reverse current.
NOTE 4: These specifications apply for $-55°C < T_A < 125°C$.

guaranteed reverse characteristics

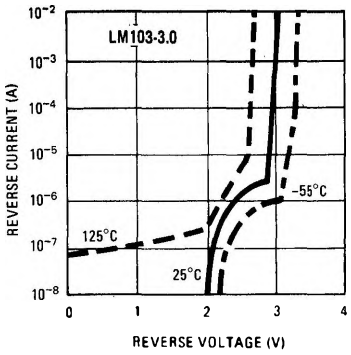




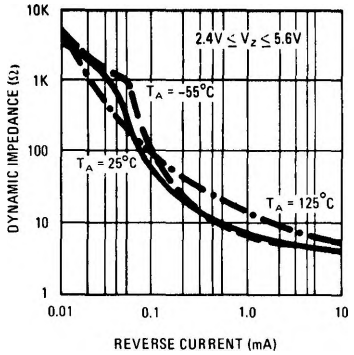


typical performance

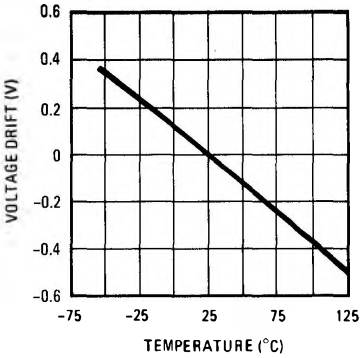
Reverse Characteristics



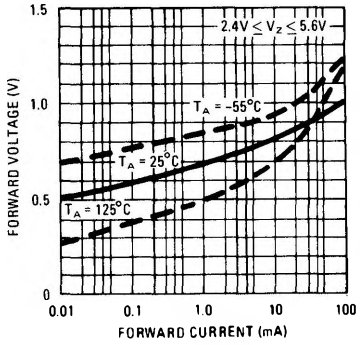
Reverse Dynamic Impedance



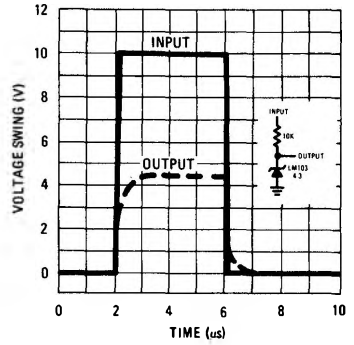
Temperature Drift



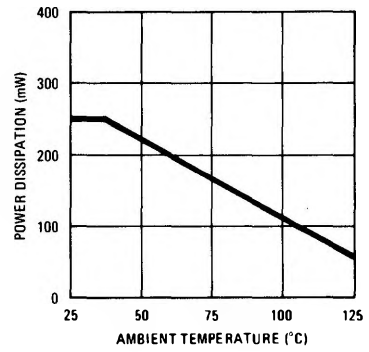
Forward Characteristics



Response Time



Maximum Power Dissipation



BREAKDOWN VOLTAGE*	PART NUMBER
1.8	LM103-1.8
2.0	LM103-2.0
2.2	LM103-2.2
2.4	LM103-2.4
2.7	LM103-2.7
3.0	LM103-3.0
3.3	LM103-3.3
3.6	LM103-3.6
3.9	LM103-3.9
4.3	LM103-4.3
4.7	LM103-4.7
5.1	LM103-5.1
5.6	LM103-5.6

*Measured at I_R = 1 mA.
Standard tolerance is ±10%.