MACOM an AMP company

Surface Mount Low Barrier X-Band Schottky Diodes

MA4E2054 Series

V3.00

Features

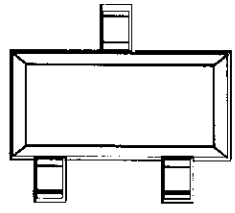
- Low I_R (<100nA @ 1V, <500nA @ 3V)
- Designed for High Volume, Low Cost Detector and Mixer Applications
- Low Noise Figure: 5.7 dB (SSB) at X-Band
- High Detector Sensitivity: -55 dBm TSS
- Low Capacitance: 0.25 pF
- Low 1/F Noise
- Single, Series Pair, and Unconnected Pair Configurations
- Tape and Reel

Description

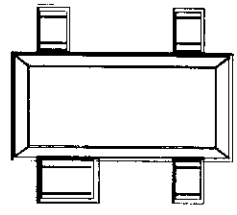
The MA4E2054 series are low barrier n-type silicon Schottky diodes assembled in low cost surface mount plastic packages. They are designed for usage as high performance mixer and detector diodes at frequencies from VHF through X-band.

The MA4E2054A-287T and MA4E2054C-287T are single element Schottky diodes characterized for use as single ended mixers and detectors. The MA4E2054B-287T and MA4E2054D-287T incorporate two Schottky chips in the SOT-23 package in series pair configurations. The MA4E2054E-1068T consists of two Schottky chips in the SOT-143 package in an unconnected pair configuration. These diodes are useful for balanced mixer and detector voltage doubler circuits. Applications for the MA4E2054 series include VSAT and DBS mixers. The small diode package size and low cost make them attractive for use in RF tag applications for identification and toll collection.

SOT-23 (287)

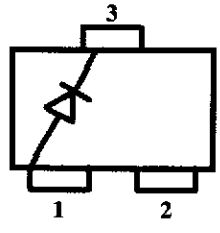


SOT-143 (1068)

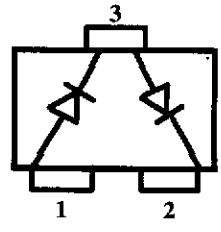


Configurations

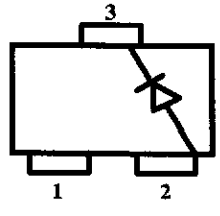
TOP VIEW



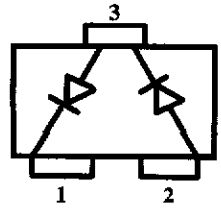
SINGLE
MA4E2054A-287T



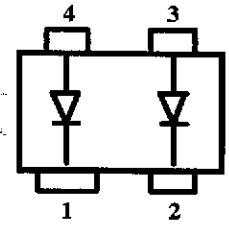
SERIES PAIR
MA4E2054B-287T



SINGLE
MA4E2054C-287T



SERIES PAIR
MA4E2054D-287T



UNCONNECTED PAIR
MA4E2054E-1068T

Maximum Ratings

Parameter	Unit	Values
Operating Temperature	°C	-65 to +125
Storage Temperature	°C	-65 to +125
Incident RF Power (CW)	mW	75*
Reverse Voltage @ 25°C	V	3
Forward Current	mA	20
Soldering Temperature	°C	+260 for 5 sec.

* At 25°C case temperature. Derate linearly to zero watts at 125°C case temperature.

Electrical Specifications @ +25° C

Parameter	Condition	Symbol	Specification
Breakdown Voltage	I_R = 10 µA	V_B	3.0 V min.
Reverse Leakage Current	V_R =1 V	I_R	100 nA max.
Reverse Leakage Current	V_R = 3 V	I_R	500 nA max.
Total Capacitance	V_R = 0 V f = 1 MHz	C_T	0.25 pF max.
Dynamic Resistance[2]	I_F = 10 mA	R_D	17 Ohms max.
Forward Voltage	I_F = 1 mA	V_F	250 mV min. 350 mV max.
Forward Voltage Difference[1]	I_F = 1 mA	ΔV_F	20 mV max.

1 Applies to MA4E2054B-287T, MA4E2054D-287T and MA4E2054E-1068T.

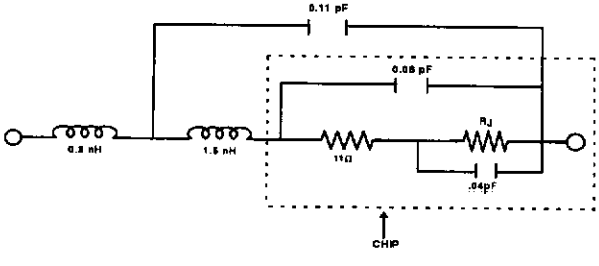
2 RD = RS + RJ where RJ = $\frac{26}{I_F}$ (in mA)

Typical RF Performance @ 25°C

Parameter	Conditions	Typical Value
Mixer Noise Figure[1]	f = 9.375 GHz LO = 0 dBm	5.7 dB (SSB)
IF Impedance	I_F = 30 MHz	200 ohms
Tangential Signal Sensitivity[2]	I_F = 20 µA BW = 2 MHz Video NF = 1.5 dB	-55 dBm
Detector Output Voltage at -30 dBm[2]	R_L = 100K Ohms I_F = 20 µA	20 mV
Detector Output Voltage at -30 dBm[2]	R_L = 1M Ohm Zero Bias	20 mV

1. Fixture tuned to 9.375 GHz.
2. Fixture tuned to 2.5 GHz. See figures on page 3 for untuned fixture performance.

Circuit Model (SOT-23)

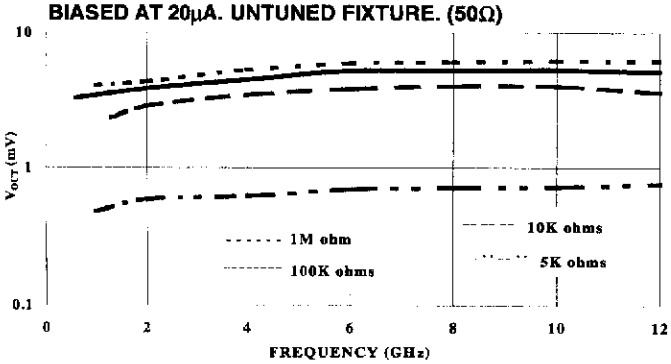


Spice Model Parameters

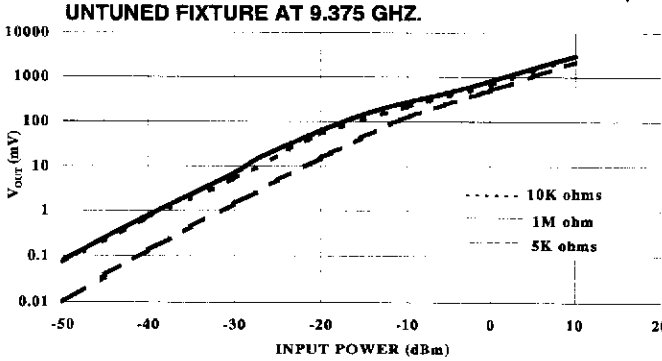
IS = 3 x 10^{-8} A	M = 0.50
RS = 11Ω	EG = 0.69 eV
N = 1.05	BV = 5.0 V
TT = 0 S	IBV = 1 x 10^{-5} A
Cj(0) = 0.10 x 10^{-12} pF	
Cpar = .11 x 10^{-12} pF	
VJ = 0.40 V	

Typical Performance Curves @ 25°C
(MA4E2054A-287T)

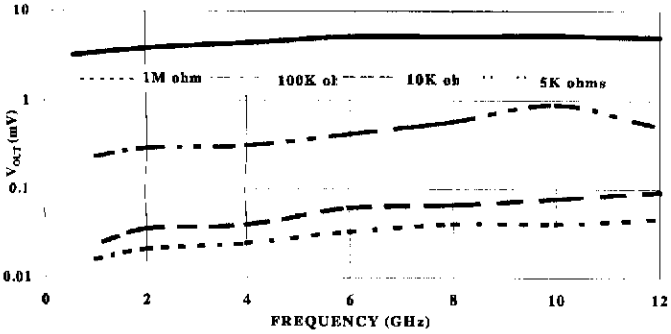
DETECTOR OUTPUT VOLTAGE vs FREQUENCY AND LOAD RESISTANCE AT -30 dBm. DIODE FORWARD BIASED AT 20μA. UNTUNED FIXTURE. (50Ω)



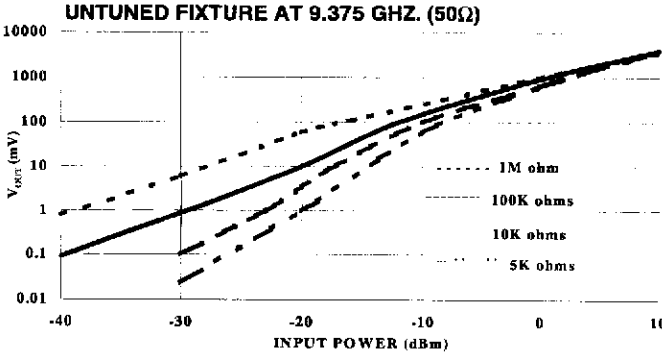
DETECTOR OUTPUT VOLTAGE vs INPUT POWER AND LOAD RESISTANCE. DIODE FORWARD BIASED AT 20 μA. UNTUNED FIXTURE AT 9.375 GHZ.



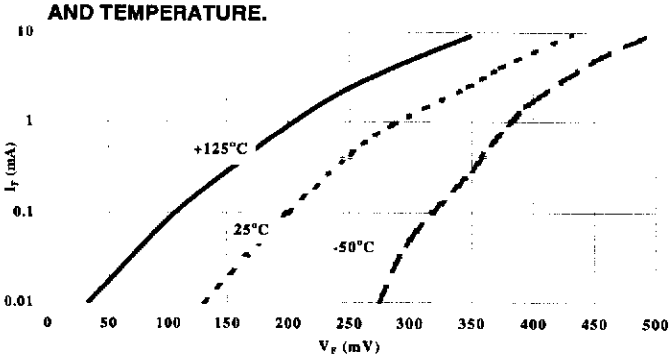
DETECTOR OUTPUT VOLTAGE vs FREQUENCY AND LOAD RESISTANCE AT -30 dBm. DIODE AT ZERO BIAS. UNTUNED FIXTURE.



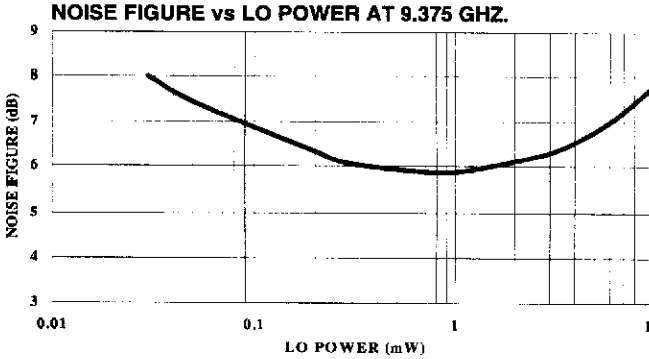
DETECTOR OUTPUT VOLTAGE vs INPUT POWER AND LOAD RESISTANCE. DIODE AT ZERO BIAS. UNTUNED FIXTURE AT 9.375 GHZ. (50Ω)



FORWARD CURRENT vs FORWARD VOLTAGE AND TEMPERATURE.

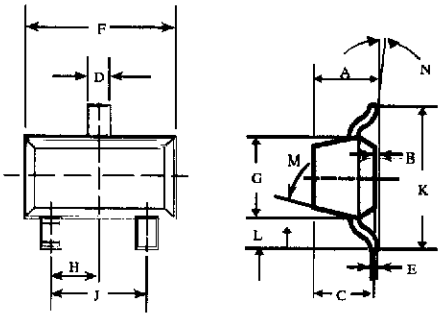


TUNED FIXTURE
NOISE FIGURE vs LO POWER AT 9.375 GHZ.



Case Styles

SOT-23



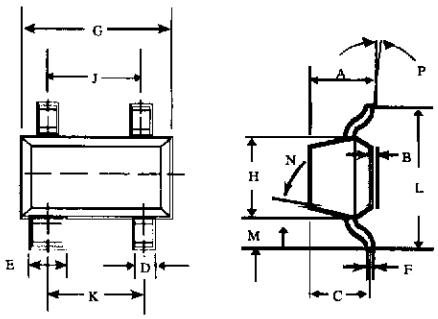
SOT-23 (Case 287)

DIM.	INCHES MIN.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS MAX.
A	—	0.048	—	1,22
B	—	0.008	—	0,20
C	—	0.040	—	1,00
D	0.013	0.020	0,35	0,50
E	0.003	0.006	0,08	0,15
F	0.110	0.119	2,80	3,00
G	0.047	0.056	1,20	1,40
H	0.037 typical		0,95 typical	
J	0.075 typical		1,90 typical	
K	—	0.103	—	2,60
L	—	0.024	—	0,60

DIM.	GRADIENT
M	10° max.[1]
N	2° . . .30°

Note:
1. Applicable on all sides

SOT-143



SOT-143 (Case 1068)

DIM.	INCHES MIN.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS MAX.
A	—	0.044	—	1.10
B	—	0.044	—	1.10
C	—	0.040	—	1.00
D	0.030	0.035	0.75	0.90
E	0.013	0.020	0.35	0.50
F	0.003	0.006	0.08	0.15
G	0.110	0.119	2.80	3.00
H	0.047	0.056	1.20	1.40
J	0.075 typical		1.90 typical	
K	0.075 typical		1.90 typical	
L	—	0.103	—	2.6
M	—	0.024	—	0.6

DIM.	GRADIENT
N	10° max.[1]
P	2° . . . 30°

Note:
1. Applicable on all sides