MA4E2054L-1261

Low Barrier Schottky Chip

M/A-COM Products
Rev. V8

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: 0.14 pF (typ.)
- Low 1/F Noise
- RoHS* Compliant

Description and Applications

The MA4E2054L-1261 diode is a low barrier, n-type, silicon Schottky device. It is useful as a high performance mixer or detector diode at frequencies from VHF through X-band. These chips can be used in automatic assembly processes due to their 0.004" gold bond pads and sturdy construction.

Maximum Ratings

Parameter	Symbol	Unit	Values
Operating Temperature	T_{OP}	°C	-65 to +150
Storage Temperature	T_{STG}	°C	-65 to +150
Incident RF Power (CW)	P_T	mW	75[1]
Reverse Voltage @ 25 °C	V_R	V	3
Forward Current	I_F	mA	20
ESD Rating [2]	-	-	Class 0

1. At 25 °C case temperature, Derate linearly to zero watts at 150 °C case temperature.
2. Human Body Model

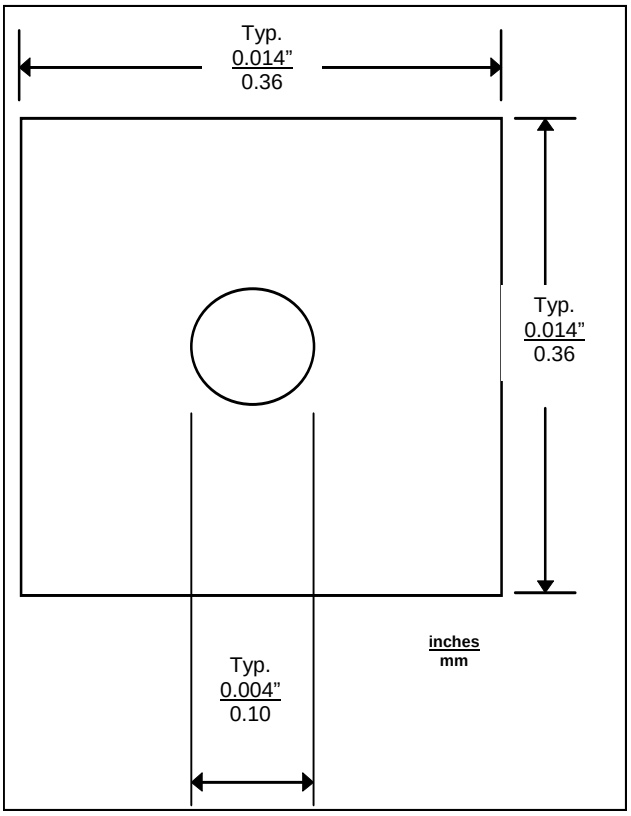
Electrical Specifications @ +25 °C

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	0.16 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 min.

2. $R_D = R_S + R_J$ where $R_J = \frac{26}{I_F \text{ (in mA)}}$

Single Junction Chip Outline

MA4E2054



Typical RF Performance @ +25 °C

Parameter	Conditions	Typical
Mixer Noise Figure[3]	f = 9.375 GHz LO = 0 dBm	5.7 dB (SSB)
IF Impedance	I_F = 30 MHz	200 ohms
Tangential Signal Sensitivity[4]	I_F = 20 uA BW = 2 MHz Video NF = 1.5 dB	-55 dBm
Detector Output, Voltage at -30 dBm[4]	R_L = 100K Ohms I_F = 20 µA	20 mV
Detector Output Voltage at -30 dBm[4]	R_L = 1M Ohm Zero Bias	20 mV

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

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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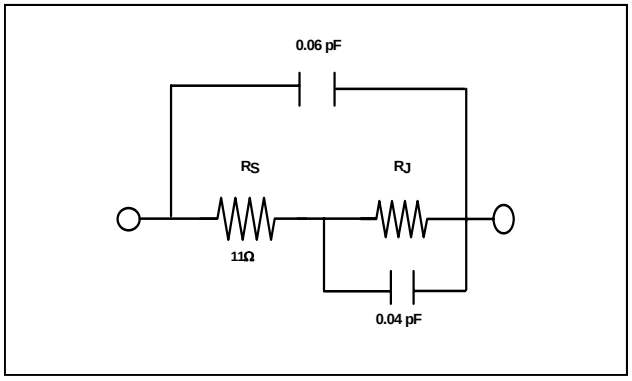
Circuit Model (Chip)



Spice Model Parameters

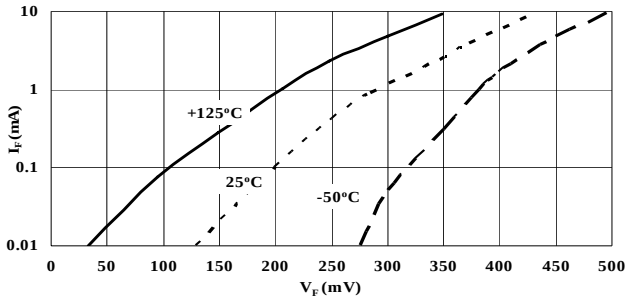
IS = 3 x 10^{-8} A	M = 0.50
RS = 11Ω	EG = 0.69 eV
N = 1.05	BV = 5.0 V
TT = 0 S	IBV = 1 x 10 $^{-5}$ A
C_T = 0.13 x 10 $^{-12}$ pF	
VJ = 0.40 V	

Recommended Assembly:

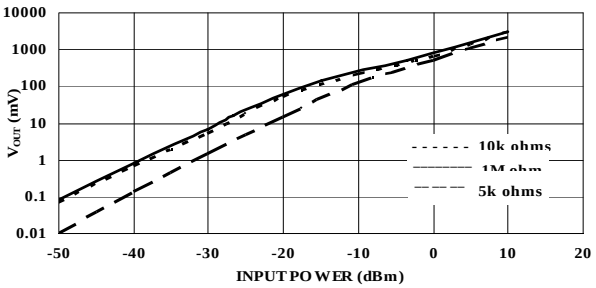
1. One mil diameter gold wire
2. Ball bond
3. Conductive silver epoxy for die mounting

Typical Performance Curves @ +25°C

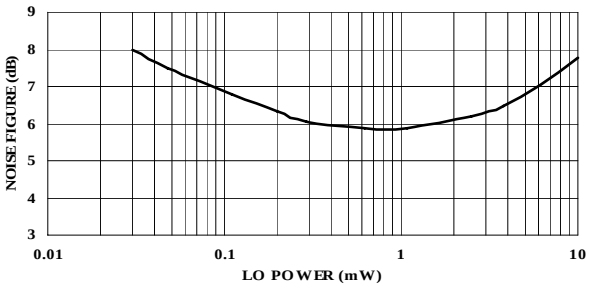
Forward Current vs. Forward Voltage and Temperature



Detector Output Voltage vs Input Power and Load Resistance. Diode Forward Biased at 20μA. Untuned Fixture at 9.375 GHz



Tuned Fixture Noise Figure vs. Lo Power at 9.375 GHz



Detector Output Voltage vs Input Power and Load Resistance. Diode at Zero Bias. Untuned Fixture at 9.375 GHz