

### 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 <sup>1</sup>
Reverse Voltage @ 25 °C	$V_R$	V	3
Forward Current	$I_F$	mA	20
ESD Rating <sup>2</sup>	-	-	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

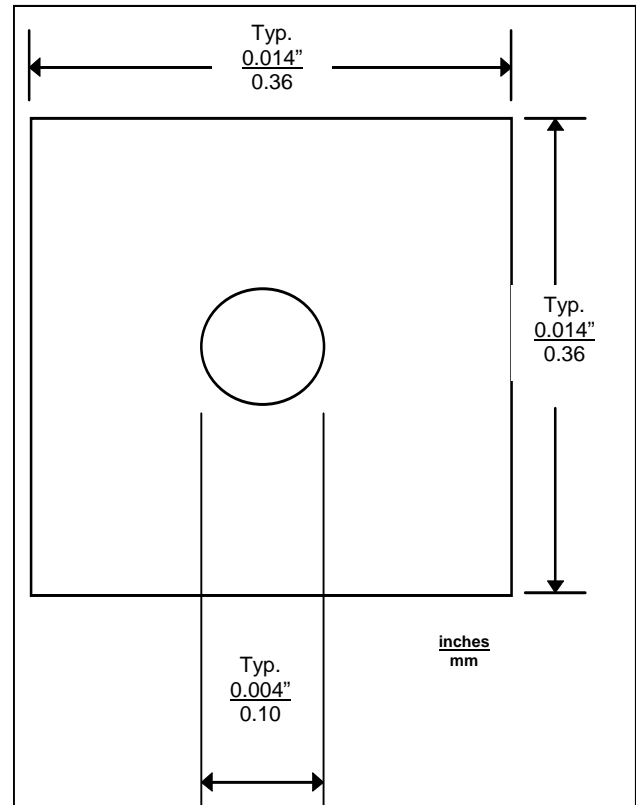
Parameter	Condition	Symbol	Specification
Breakdown Voltage	$I_R = 10 \mu A$	$V_B$	3.0 V min.
Reverse Leakage Current	$V_R = 1 V$	$I_R$	100 nA max.
Reverse Leakage Current	$V_R = 3 V$	$I_R$	500 nA max.
Total Capacitance	$V_R = 0 V$ $f = 1 MHz$	$C_T$	0.16 pF max.
Dynamic Resistance <sup>2</sup>	$I_F = 10 mA$	$R_D$	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  $R_J = \frac{26}{I_F}$  (in mA)

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

### Single Junction Chip Outline

#### MA4E2054



### Typical RF Performance @ +25 °C

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

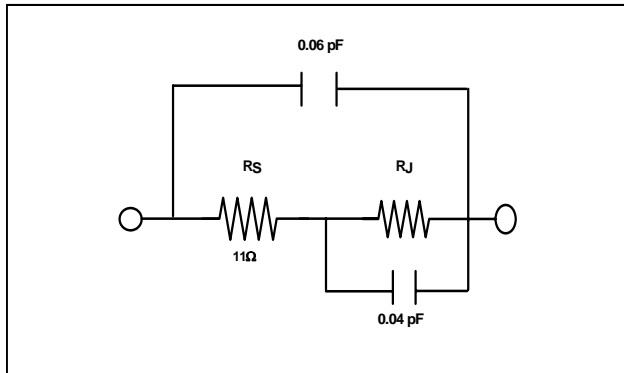
3. Fixture tuned to 9.375 GHz.
4. Fixture tuned to 2.5 GHz. See figures on page 3 for untuned fixture performance.

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### Circuit Model (Chip)



### Spice Model Parameters

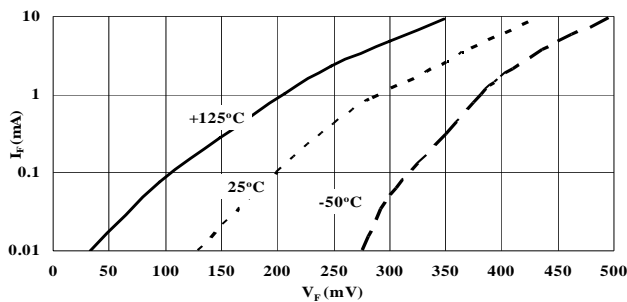
$IS = 3 \times 10^{-8} \text{ A}$	$M = 0.50$
$RS = 11\Omega$	$EG = 0.69 \text{ eV}$
$N = 1.05$	$BV = 5.0 \text{ V}$
$TT = 0 \text{ S}$	$IBV = 1 \times 10^{-5} \text{ A}$
$C_T = 0.13 \times 10^{-12} \text{ pF}$	
$VJ = 0.40 \text{ V}$	

### Recommended Assembly:

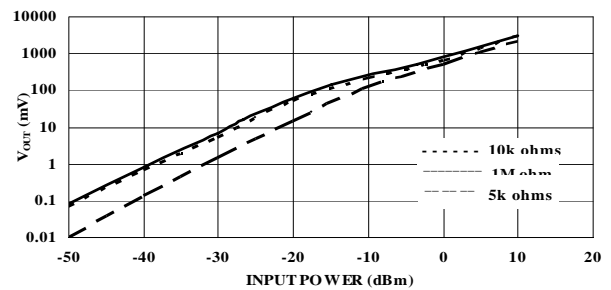
1. One mil diameter gold wire
2. Ball bond
3. Conductive silver epoxy for die mounting

### Typical Performance Curves @ +25°C

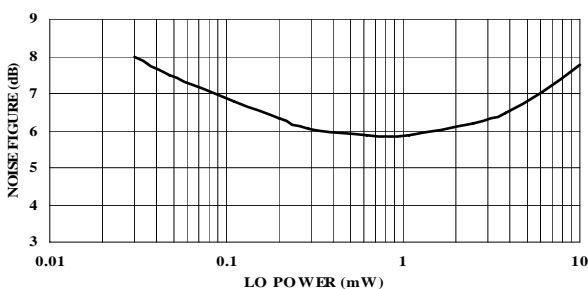
**Forward Current vs. Forward Voltage and Temperature**



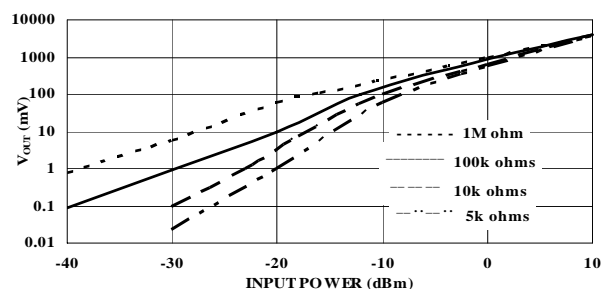
**Detector Output Voltage vs Input Power and Load Resistance. Diode Forward Biased at 20μA. Untuned Fixture at 9.375 GHz**



**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**



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