

Silicon Schottky Diode Ring Quads



Features

- Small Size
- Designed for High Volume, Low Cost
- Closely Matched Junctions
- High Reliability and Mechanically Rugged
- Three Barrier Heights Available
- Useful to X-Band
- Available in Chip or Plastic SOT-143 Package

Description

M/A-COM's MA4E2062 series is a high-performance silicon Schottky low, medium and high barrier Ring Quads. Typical applications include industrial and commercial applications in mixer and modulator circuits to X-band.

The MA4E2062 Ring Quad is fabricated using monolithic silicon diode technology that features gold metalization and IC passivation for increased performance and reliability. The closely matched junctions minimize variation in capacitance, forward voltage and series resistance between the four diodes which make up this ring quad.

The MA4E2062 series is available as a chip (MA4E2062) and in the plastic SOT-143 package (MA4E2062-1068T). The chip, MA4E2062, is available in Tape Frame and Gel Pack and the plastic SOT-143 package style is available in Tape and Reel for automatic pick and place assembly.

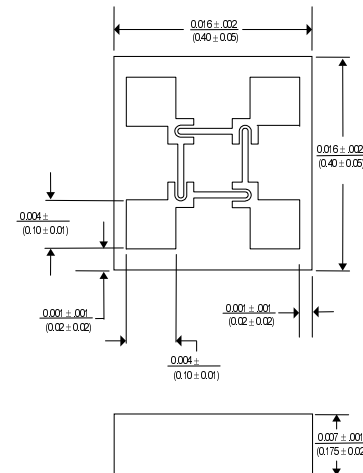
Absolute Maximum Ratings¹

Parameter	Absolute Maximum
Operating Temperature	
Chip	-65°C to +150°C
SOT-143	-65°C to +125°C
Incident RF Power (CW) ^{2,3,4}	75 mW
DC Current	50 mA
Junction Temperature	150°C
Storage Temperature	
Chip	-65°C to +150°C
SOT-143	-65°C to +125°C

1. Exceeding these limits may cause permanent damage.
2. Case Temperature (T_c) = 25 °C.
3. Derate at 3 mW/°C for T_c > 125°C (chip).
4. Derate linearly to zero watts at 125°C case temperature (SOT-143).

Package Outlines^{1,2,3}

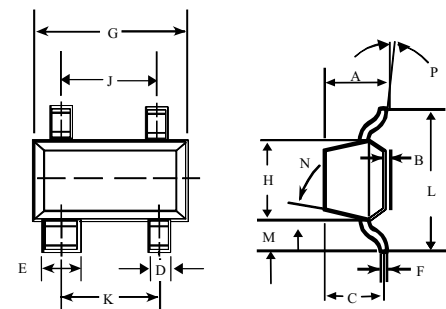
Chip



Notes: (unless otherwise specified)

1. Dimensions are in/mm
2. Bondpad Metalization is Gold.
3. Back side is silicon

SOT-143 (1068)



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	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

Electrical Specifications at +25°C

Model Number	Forward Voltage ¹ mV			Junction Capacitance ² pF			Dynamic Resistance ³ at 10mA Ω
	V _F Typ.	V _F Max.	ΔV _F [†] Max. ⁴	C _J Typ.	C _J Max.	ΔC _J [†] Max. ⁵	R _D Max.
MA4E2062L	220	240	5	0.4	0.6	0.05	7.0
MA4E2062L-1068T	220	240	5	0.4	0.6	0.05	7.0
MA4E2062M	380	400	5	0.4	0.6	0.05	8.0
MA4E2062M-1068T	380	400	5	0.4	0.6	0.05	8.0
MA4E2062H	580	600	5	0.4	0.6	0.05	6.0
MA4E2062H-1068T	580	600	5	0.4	0.6	0.05	6.0

1. V_F is measured at I_F = 1.0 mA

2. C_J is measured at V_R = 0 V and f = 1 MHz between non-adjacent bondpads.

3. Series resistance, R_S, is the slope resistance less the junction resistance at I_F = 10 mA.

4. 3 σ limit

5. 3 σ limit

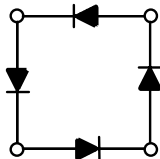
† Matching criteria between devices in quad.

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

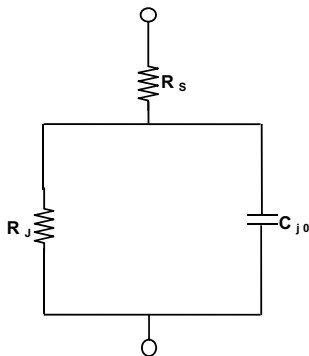
Circuit Model and Model Parameters

The preceding schematic and the non-linear circuit model parameters given will provide an accurate representation of the ring quad for use in harmonic balance simulators using the software's built-in diode model. It may be important to include the effects of bond wire inductance in the model of your circuit. A reasonable guideline is to use ~0.02 nH per 0.001" of length for 0.001" diameter gold wire. A SPICE netlist is also included for reference.

Schematic



Schottky Junction



Net List

```
.subckt MA4E2062L 1 2 3 4
* M/A-COM ISBU All Rights Reserved
* MA4E2062 Ring Quad
* diode junctions
D1 1 2 dma
D2 2 3 dma
D3 3 4 dma
D4 4 1 dma
.model dma ( is=566n ikf=0.02 n=1.04
+ rs=1.4 eg=0.7 xti=2 tt=0
+ cj0=0.32p m=0.23 fc=0.1 vj=0.16)
.ends
```

Spice Model Parameters¹

Parameter	L	M	H
IS	5.66n	3n	2n
IKF	0.02	0.02	0.02
N	1.04	1.05	1.68
RS	1.4	1.7	1.0
CJ0	0.32p	0.17p	0.40p
M	0.23	0.041	0.8
FC	0.1	0.1	0.2
VJ	0.16	0.07	0.70
EG	0.7	0.7	0.7
XTI	2	2	2
TT	0	0	0

1 Giuseppe Massabrio and Paolo Antognetti
Semiconductor Device Modeling with SPICE
McGraw-Hill 1993, 2nd Edition
ISBN 0-07-002469-3

Handling and Assembly

The MA4E2062 chip and all Schottky barrier junctions, are ESD sensitive. It is necessary to adhere to the proper ESD handling precautions.

Die attach may be performed using either epoxy or solder. To obtain a consistently strong attachment when using epoxies observe the vendor recommended cleanliness, epoxy pot life, curing, and carrier fluids. The cleanliness, time, temperature control and tooling are essential for a good epoxy attachment. The maximum soldering temperature is 290°C for 5 seconds. Solders that dissolve gold metalization are not recommended.

All electrical connections to the quad must be made through the four bondpads on the topside of the chip. The bondpads are junction-isolated from the chip's backside. Thermo-compression wedge bonding using 0.0007" to 0.001" diameter gold wire is recommended. The leads should be kept as short as possible (see model).

For more information on die attach and wire bonding see *Bonding and Handling Procedures for Chip Diode Devices* M/A-COM Application Note M541.

Ordering Information

Model No.	Delivery Form and Barrier Heights
MA4E2062L	Chip Tape Frame with Low Barrier Height
MA4E2062L	Chip Gel Pack with Low Barrier Height
MA4E2062L-1068	SOT-143 Bulk Pack with Low Barrier Height
MA4E2062L-1068T	SOT-143 Tape and Reel with Low Barrier Height
MA4E2062M	Chip Tape Frame with Medium Barrier Height
MA4E2062M	Chip Gel Pack with Medium Barrier Height
MA4E2062M-1068	SOT-143 Bulk Pack with Medium Barrier Height
MA4E2062M-1068T	SOT-143 Tape and Reel with Medium Barrier Height
MA4E2062H	Chip Tape Frame with High Barrier Height
MA4E2062H	Chip Gel Pack High Barrier Height
MA4E2062H-1068	SOT-143 Bulk Pack with High Barrier Height
MA4E2062H-1068T	SOT-143 Tape and Reel with High Barrier Height

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The preliminary specifications data sheet contains typical electrical specifications which may change prior to final introduction.

