# MA4E20xx Series

## GaAs Beam Lead Schottky Diode

Rev. V6

### Features

- Low Series Resistance
- Low Capacitance
- High Cut-Off Frequency
- Silicon Nitride Passivation
- Multiple Configurations

### Description and Applications

The MA4E2037 single diode, MA4E2039 anti-parallel pair and MA4E2040 series tee are gallium arsenide beam lead Schottky barrier diodes. These devices are fabricated on OMCVD epitaxial wafers using a process designed for high device uniformity and extremely low parasitics. The high carrier mobility of gallium arsenide results in lower series resistance than a silicon Schottky with equivalent capacitance, resulting in lower noise figure and conversion loss. The diodes are fully passivated with silicon nitride and have an additional layer of a polymer for scratch protection. The protective coatings prevent damage to the junction and the anode air bridge during handling.

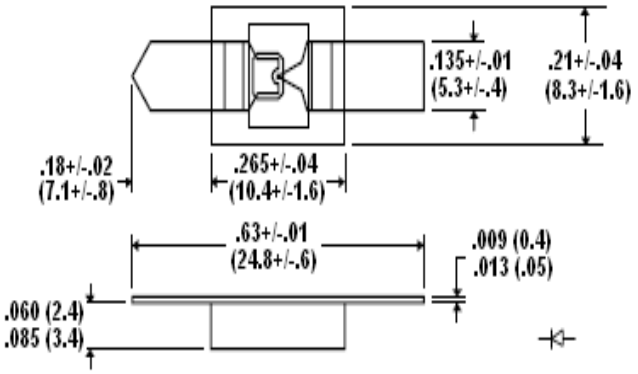
The high cut-off frequency of these diodes allows use through millimeter wave frequencies. Typical applications include single and double balanced mixers in PCN transceivers and radios, automotive radar systems and police radar detectors.

The MA4E2039 anti-parallel pair is designed for use in sub harmonically pumped mixers. Close matching of the diode characteristics in high LO suppression at the RF input.

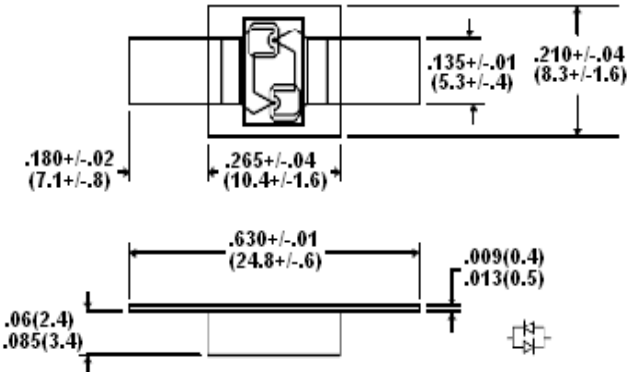
### Ordering Information

| Part Number | Package |
|---|---|
| MA4E2037 | Gel Pack (100 piece per) |
| MA4E2039 | Gel Pack (100 piece per) |
| MA4E2040 | Gel Pack (100 piece per) |

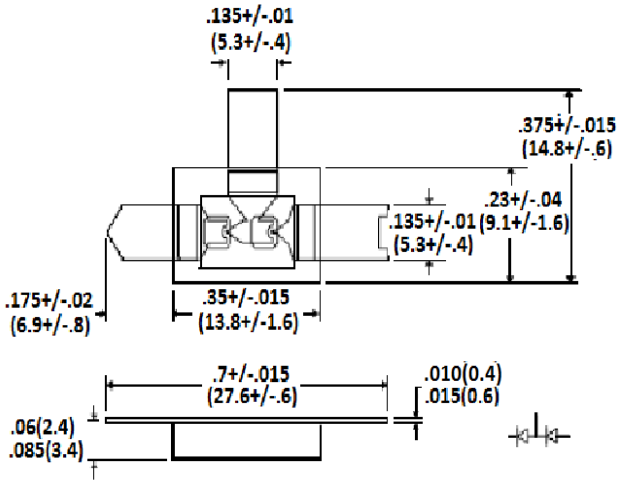
### MA4E2037




### MA4E2039




### MA4E2040




Notes: (Unless otherwise specified)
Dimensions are in mm (mils).
Views are with junction side up.

### Electrical Specifications: $T_A$ = +25°C (measured as single diodes)

| Parameter & Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|
| **MA4E2037** | | | | |
| Junction Capacitance @ 0 V, 1 MHz | pF | — | 0.020 | — |
| Total Capacitance @ 0 V, 1 MHz[1] | pF | 0.030 | 0.045 | 0.060 |
| Junction Capacitance Difference | pF | — | — | — |
| Series Resistance @ +10 mA[2] | Ω | — | 4.0 | 7.0 |
| Forward Voltage @ +1 mA | V | 0.60 | 0.70 | 0.80 |
| Forward Voltage Difference @ +1 mA | V | — | — | — |
| Reverse Voltage Breakdown @ -10 µA | V | 4.5 | 7.0 | — |
| **MA4E2039** | | | | |
| Junction Capacitance @ 0 V, 1 MHz | pF | — | 0.020 | — |
| Total Capacitance @ 0 V, 1 MHz[1] | pF | 0.030 | 0.045 | 0.060 |
| Junction Capacitance Difference | pF | — | 0.005 | 0.010 |
| Series Resistance @ +10 mA[2] | Ω | — | 4.0 | 7.0 |
| Forward Voltage @ +1 mA | V | 0.60 | 0.70 | 0.80 |
| Forward Voltage Difference @ +1 mA | V | — | 0.005 | 0.010 |
| Reverse Voltage Breakdown @ -10 µA | V | — | — | — |
| **MA4E2040** | | | | |
| Junction Capacitance @ 0 V, 1 MHz[3] | pF | — | 0.020 | — |
| Total Capacitance @ 0 V, 1 MHz[1,3] | pF | 0.030 | 0.045 | 0.060 |
| Junction Capacitance Difference | pF | — | 0.005 | 0.010 |
| Series Resistance @ +10 mA[2] | Ω | — | 4.0 | 7.0 |
| Forward Voltage @ +1 mA | V | 0.60 | 0.70 | 0.80 |
| Forward Voltage Difference @ +1 mA | V | — | 0.005 | 0.010 |
| Reverse Voltage Breakdown @ -10 µA | V | 4.5 | 7.0 | — |

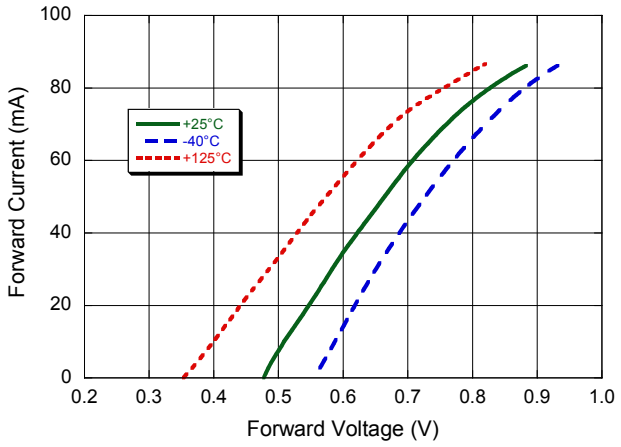
1. Total capacitance is equivalent to the sum of junction capacitance $C_J$ and parasitic capacitance $C_P$.
2. Series resistance is determined by measuring the dynamic resistance and subtracting the junction resistance of 2.6 Ω.
3. Capacitance for the MA4E2039 and MA4E2040 is per Schottky diode.

## Absolute Maximum Ratings[4,5]

| Parameter | Absolute Maximum |
|---|---|
| Incident Power (LO & RF) | 20 dBm |
| Operating Temperature | -65°C to +125°C |
| Storage Temperature | -65°C to +150°C |
| Mounting Temperature | +235°C for 10 seconds |

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.

## Forward Current vs. Temperature




## Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 0 devices.

## Handling Procedures

The protective polymer coating on the active areas of these die provides scratch protection, particularly for the metal air bridge which contacts the anode. Beam lead devices must, however, be handled with care since the leads may be easily distorted or broken by the normal pressures exerted when handled by tweezers. A vacuum pencil with a #27 tip is recommended for picking and placing.

## Mounting Techniques

These devices are designed to be inserted onto hard or soft substrates. Recommended methods of attachment include thermo-compression bonding, parallel-gap welding, solder reflow and conductive epoxy. See application note M541: "*Bonding and Handling Procedures for Chip Diode Devices*" for detailed instructions.

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