

# GaAs Flip Chip Schottky Barrier Diodes

## MA4E1317, MA4E1318 MA4E1319-1, MA4E1319-2

V2.00

### Features

- Low Series Resistance
- Low Capacitance
- High Cutoff Frequency
- Silicon Nitride Passivation
- Polyimide Scratch Protection
- Designed for Easy Circuit Insertion

### Description

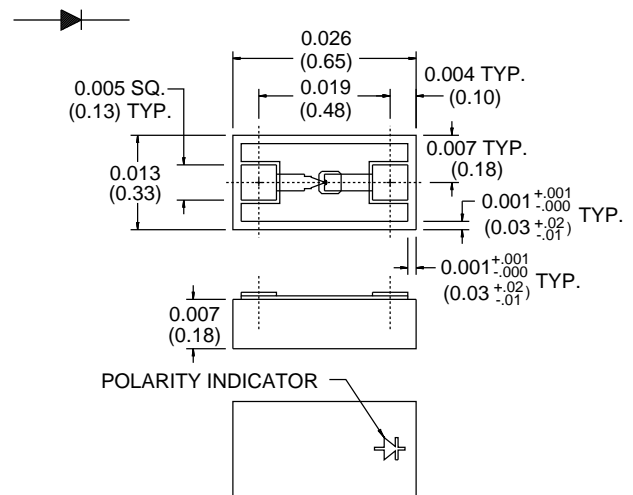
M/A-COM's MA4E1317 single, MA4E1318 anti-parallel pair, MA4E1319-1 reverse tee and MA4E1319-2 series tee are gallium arsenide flip chip Schottky barrier diodes. These diodes are fabricated on OMCVD epitaxial wafers using a process designed for repeatable electrical characteristics and extremely low parasitics. The diodes are fully passivated with silicon nitride and have an additional layer of polyimide for scratch protection. The protective coatings prevent damage to the junction during automated or manual handling. The flip chip configuration is suitable for pick and place insertion.

### Applications

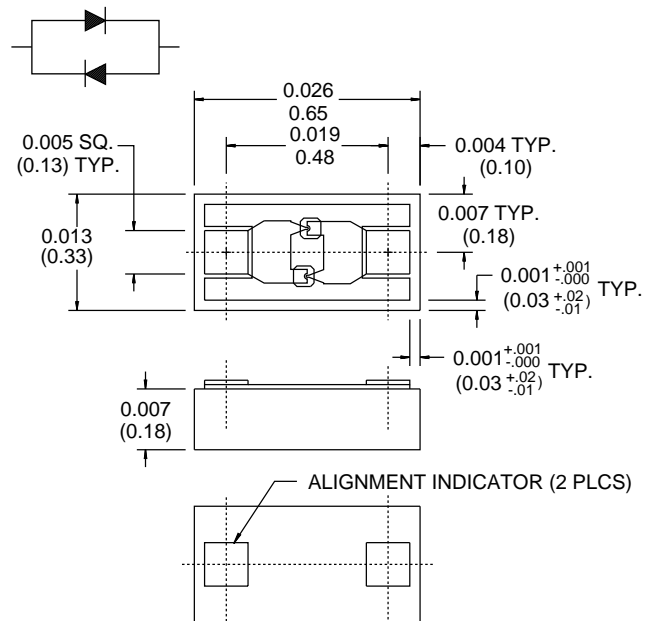
The high cutoff frequency of these diodes allows use through millimeter wave frequencies. Typical applications include single and double balanced mixers in PCN transceivers and radios, police radar detectors, and automotive radar detectors. The diodes can be used through 80 GHz.

The MA4E1318 anti-parallel pair is designed for use in subharmonically pumped mixers. Close matching of the diode characteristics results in high LO suppression at the RF input.

### MA4E1317<sup>1,2</sup> Case Style 1198



### MA4E1318<sup>1,2</sup> Case Style 1197



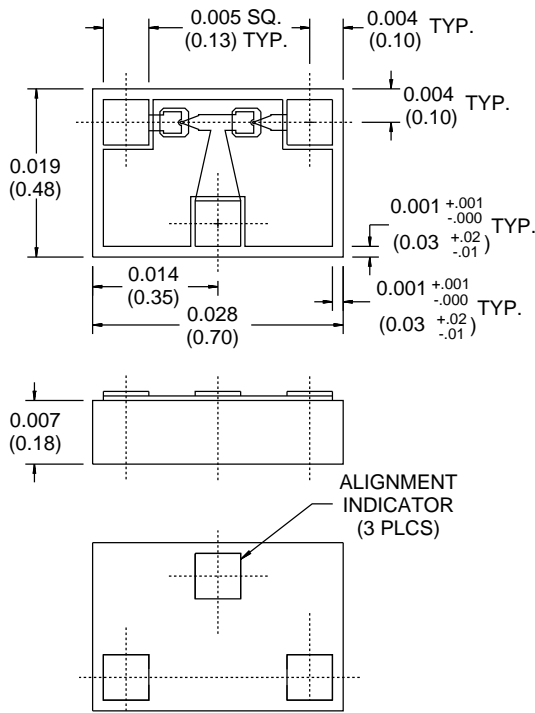
1. Dimensions in ( ) are in mm.
2. Unless otherwise noted, tolerance are inches  $\pm 0.001$ " (millimeters  $\pm 0.025$  mm)
3. Schematic is for junction side up.

Specifications Subject to Change Without Notice.

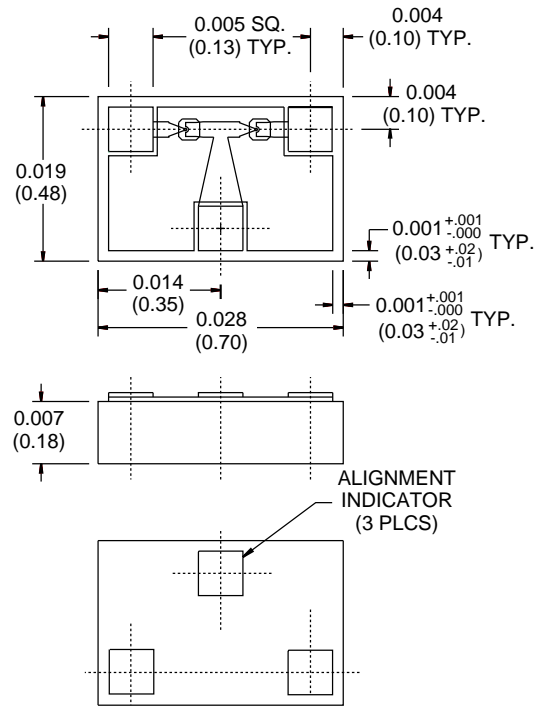
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**MA4E1319-1<sup>1,2</sup>**  
**Case Style 1199**



**MA4E1319-2<sup>1,2</sup>**  
**Case Style 1200**



1. Dimensions in ( ) are in mm.
2. Unless otherwise noted, tolerance are inches ±.001" (millimeters ±.025 mm)
3. Schematic is for junction side up.

**Electrical Specifications @ T<sub>A</sub> = +25°C**

Parameters @ Conditions	Symbol	Units	MA4E1317			MA4E1318			MA4E1319-1 or -2		
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
Junction Capacitance 0 V @ 1 MHz	C <sub>j</sub>	pF	-	0.020	-	-	0.020 <sup>6</sup>	-	-	0.020 <sup>6</sup>	-
Total Capacitance 0 V @ 1 MHz <sup>4</sup>	C <sub>T</sub>	pF	0.030	0.045	0.060	0.030 <sup>6</sup>	0.045 <sup>6</sup>	0.060 <sup>6</sup>	0.030 <sup>6</sup>	0.045 <sup>6</sup>	0.060 <sup>6</sup>
Junction Capacitance Difference	ΔC <sub>j</sub>	pF	-	-	-	-	0.005	0.010	-	0.005	0.010
Series Resistance @ +10 mA <sup>5</sup>	R <sub>S</sub>	Ohms	-	4	7	-	4	7	-	4	7
Forward Voltage @ +1 mA	V <sub>F1</sub>	Volts	0.60	0.70	0.80	0.60	0.70	0.80	0.60	0.70	0.80
Forward Voltage Difference @ 1 mA	ΔV <sub>F</sub>	Volts	-	-	-	-	0.005	0.010	-	0.005	0.010
Reverse Voltage @ -10 uA	V <sub>R</sub>	Volts	4.5	7	-	-	-	-	4.5	7	-
SSB Noise Figure	NF	dB	-	6.5 <sup>7</sup>	-	-	6.5 <sup>7</sup>	-	-	6.5 <sup>7</sup>	-

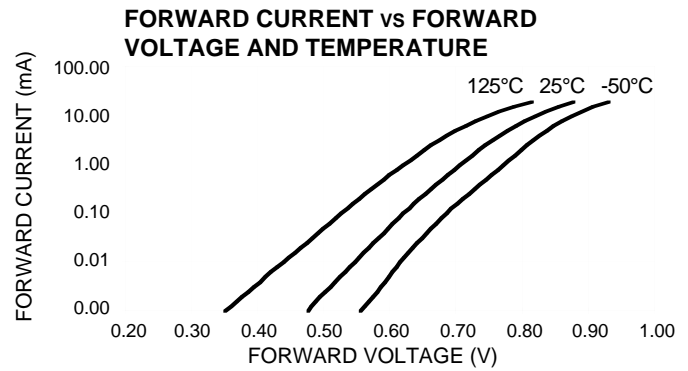
4. Total capacitance is equivalent to the sum of junction capacitance C<sub>j</sub> and parasitic capacitance C<sub>p</sub>.
5. Series resistance is determined by measuring the dynamic resistance and subtracting the junction resistance of 2.6 Ohms.
6. Capacitance for the MA4E1318 and MA4E1319-1 or -2 is per Schottky diode.
7. Measured at an LO frequency of 9.375 GHz, with an IF frequency of 300 MHz. LO drive level is +6 dBm for a single Schottky junction. The IF noise figure contribution (1.5 dB) is included.

Specifications Subject to Change Without Notice.

## Absolute Maximum Ratings<sup>1</sup>

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

1. Exceeding these limits may cause permanent damage.



## Handling Procedures

The following precautions should be observed to avoid damaging these chips:

**Cleanliness:** These chips should be handled in a clean environment. Do not attempt to clean die after installation.

**Static Sensitivity:** Schottky barrier diodes are ESD sensitive and can be damaged by static electricity. Proper ESD techniques should be used when handling these devices.

**General Handling:** The protective polymer coating on the active areas of these die provides scratch protection, particularly for the metal airbridge which contacts the anode. Die can be handled with tweezers or vacuum pickups and are suitable for use with automatic pick-and-place equipment.

## Mounting Techniques

These chips were designed to be inserted onto hard or soft substrates with the junction side down. They can be mounted with conductive epoxy or with a low temperature solder preform. The die can also be assembled with the junction side up, and wire or ribbon bonds made to the pads.

**Solder Die Attach:** Solder which does not scavenge gold, such as Indalloy # 2, is recommended. Sn-Pb based solders are not recommended due to solder embrittlement. Do not expose die to a temperature greater than 235°C, or greater than 200°C for longer than 10 seconds. No more than three seconds of scrubbing should be required for attachment.

**Epoxy Die Attach:** Assembly can be preheated to 125 to 150°C. Use a minimum amount of epoxy. Cure epoxy as per manufacturer's schedule. For extended cure times, temperatures should be kept below 200°C.

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