GaAs Beam Lead Schottky Diodes

Rev. V3

Features

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

Description and Applications

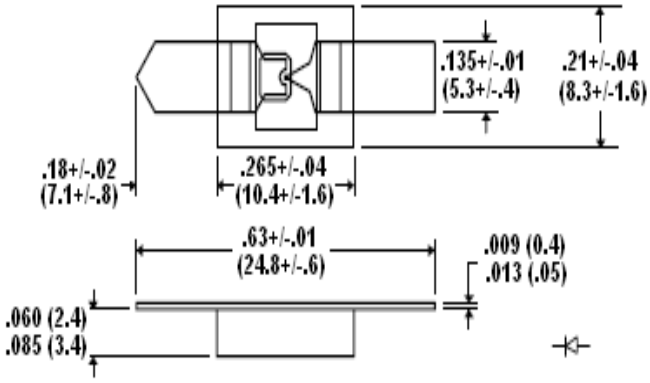
M/A-Com's MA4E2037 and MA4E2038 single diodes, MA4E2039 anti-parallel pair and MA4E2040 series tee are gallium arsenide beam lead Schottky barrier diodes. These devices are fabricated on OMCVD epitaxial wafers using a process designed for high device uniformity and extremely low parasitics. The high 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.

Applications

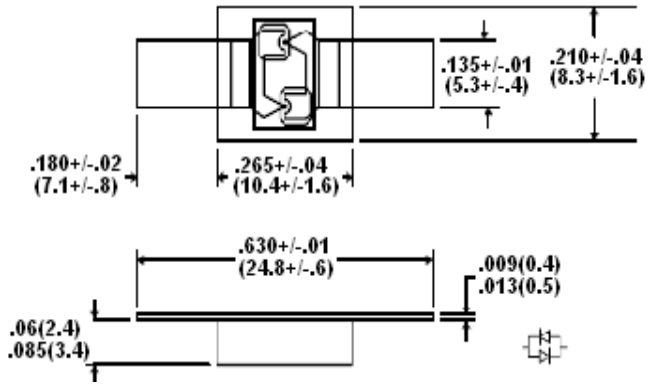
The high cut-off frequency of these diodes allows use through millimeter wave frequencies. Typical applications include single and double balanced mixers in PCN transceivers and radios, automotive radar systems and police radar detectors.

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.

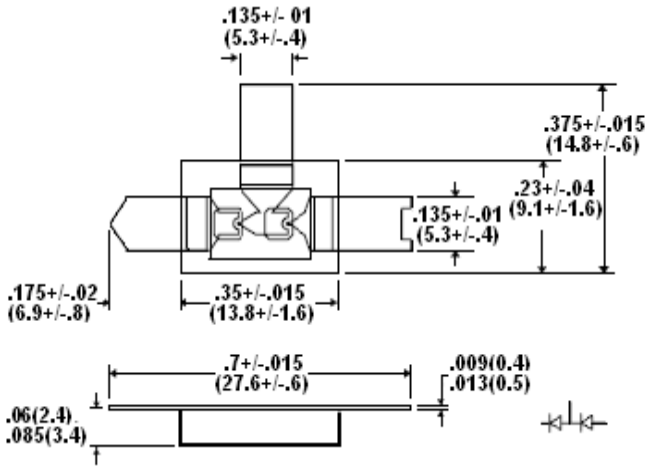
MA4E2037, MA4E2038



MA4E2039



MA4E2040



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

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Electrical Specifications @ + 25 °C (Measured as Single Diodes)

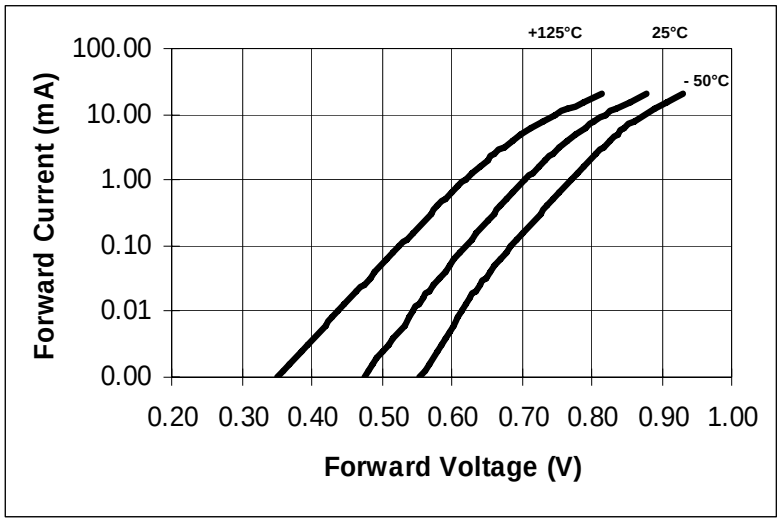
Parameters and Test Conditions	Symbol	Units	MA4E2037			MA4E2038		
			Min.	Typ.	Max.	Min.	Typ.	Max.
Junction Capacitance at 0V at 1 MHz	Cj	pF		.020			.015	
Total Capacitance at 0V at 1 MHz[1]	Ct	pF	.030	.045	.060	-	.035	.045
Junction Capacitance Difference	DCj	pF						
Series Resistance at +10mA[2]	Rs	Ohms		4	7		6.5	10
Forward Voltage at +1mA	Vf1	Volts	.60	.70	.80	.60	.70	.80
Forward Voltage Difference at 1mA	DVf	Volts						
Reverse Breakdown Voltage at -10uA	Vbr	Volts	4.5	7		4.5	7	

Parameters and Test Conditions	Symbol	Units	MA4E2039			MA4E2040		
			Min.	Typ.	Max.	Min.	Typ.	Max.
Junction Capacitance at 0V at 1 MHz	Cj	pF		.020[3]			.020[3]	
Total Capacitance at 0V at 1 MHz[1]	Ct	pF	.030[3]	.045[3]	.060[3]	.030[3]	.045[3]	.060[3]
Junction Capacitance Difference	DCj	pF		.005	.010		.005	.010
Series Resistance at +10mA[2]	Rs	Ohms		4	7		4	7
Forward Voltage at +1mA	Vf1	Volts	.60	.70	.80	.60	.70	.80
Forward Voltage Difference at 1mA	DVf	Volts		.005	.010		.005	.010
Reverse Breakdown Voltage at -10uA	Vbr	Volts						

Notes:

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

Forward Current vs Temperature



Absolute Maximum Ratings [1]

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
Electrostatic Discharge (ESD) Classification [2]	Class 0

1. Operation of this device above any one of these parameters may cause permanent damage.
2. Human Body Model

Handling Procedures

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

Cleanliness: The 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 air bridge which contacts the anode. Beam lead devices must, however, must 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.