

GaAs Flip-Chip Multiplier Varactor Diode 0.50 Gamma Abrupt

Rev. V5

Features

- Very Low Total Capacitance < 0.06 pF
- Extremely High Q > 15 K
- Silicon Nitride Passivation
- Polymer Scratch Protection
- Surface Mount Configuration
- RoHS* Compliant

Description

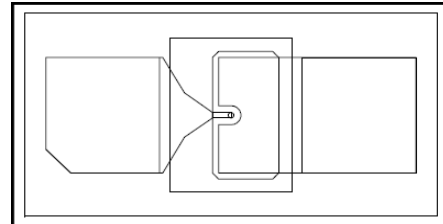
The MA46H146 / MAVR-000146 is a gallium arsenide flip chip multiplier varactor. These devices are facilitated on MOVPE epitaxial wafers using a process designed for high device uniformity and extremely low parasitics. These flip-chip diodes are fully passivated with silicon nitride and have an additional polymide layer 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.

These GaAs flip chip devices are ideally suited for millimeter wave frequency tunable filters, where extremely low parasitics are required to maintain reasonable Q. In addition, this product can be used in multiplier circuits, for 2X and 3X output frequencies in the millimeter wave frequency bands

Ordering Information

Part Number	Package
MA46H146	100 piece gel pack
MAVR-000146-12030W	100 piece waffle pack

Chip Layout



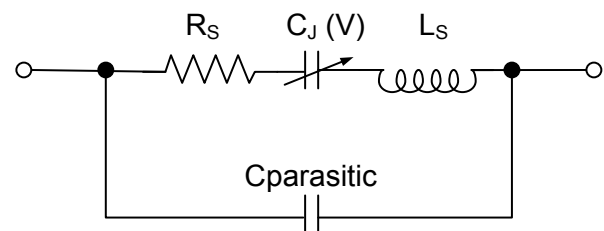
Front View (Circuit Side)



Back View (Operator Side)

Schematic

Flip-chip tuning varactor equivalent circuit



* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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Electrical Specifications: $T_A = +25^\circ\text{C}$, $\text{Gamma} = 0.45 - 0.55$, $V_R = 0$ to 20 V

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Total Capacitance	$V_R = 0$ V, 1 MHz $V_R = 4$ V, 1 MHz $V_R = 10$ V, 1 MHz $V_R = 25$ V, 1 MHz	pF	— 0.033 — —	0.063 0.040 0.032 0.030	— — — —
Total Capacitance Ratio	$V_R = 0$ V / 25 V	—	—	2.1	—
Q Minimum	$V_R = 4$ V, 50 MHz	—	—	15600	—
Breakdown Voltage	10 μA	V	26	—	—
Reverse Current	18 V	nA	—	—	50

Absolute Maximum Ratings^{1,2}

Parameter	Absolute Maximum
Reverse Voltage	-26 V
Forward Current	50 mA
Operating Temperature	-65°C to $+150^\circ\text{C}$
Storage Temperature	-65°C to $+150^\circ\text{C}$
Mounting Temperature	$<200^\circ\text{C}$

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

Handling Procedures

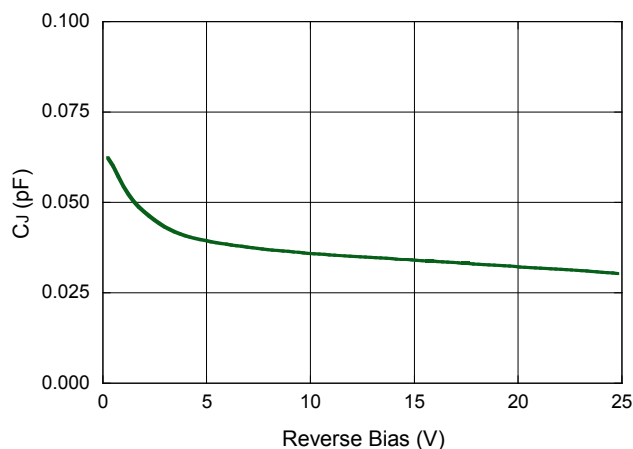
Please observe the following precautions to avoid damage:

Static Sensitivity

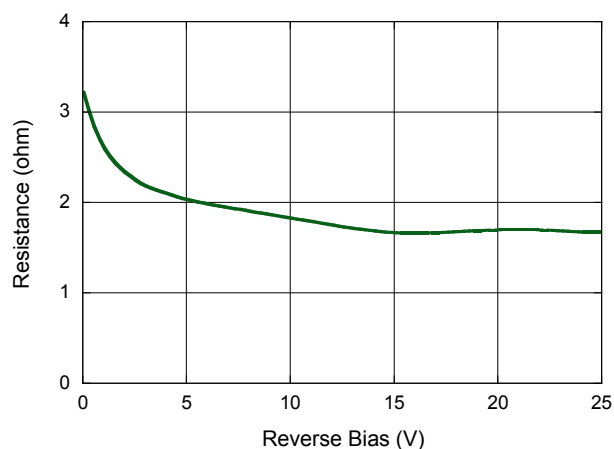
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves

Capacitance vs. Reverse Bias Voltage



Resistance @ 4 GHz vs. Reverse Bias Voltage



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Assembly Requirements

Using Electrically Conductive Ag Epoxy

These chips are designed to be inserted onto hard or soft substrates with the junction side down. They must be mounted with electrically conductive Ag epoxy. The die can also be assembled with the junction side up, and wire or ribbon bonds made from the bond pads to the circuit trace. Circuit can be preheated to 125 - 150°C. Use a controlled amount of conductive epoxy for each bond pad. Finished, uniform silver epoxy thickness should be between 1 - 2 mils. Cure epoxy per manufacturer's schedule. For extended cure times, temperatures must be below 200°C.

Solders are not recommended due to Tungsten metallization beneath the gold contacts.

Handling Procedures

Please observe the following precautions to avoid damage to the GaAs flip-chips:

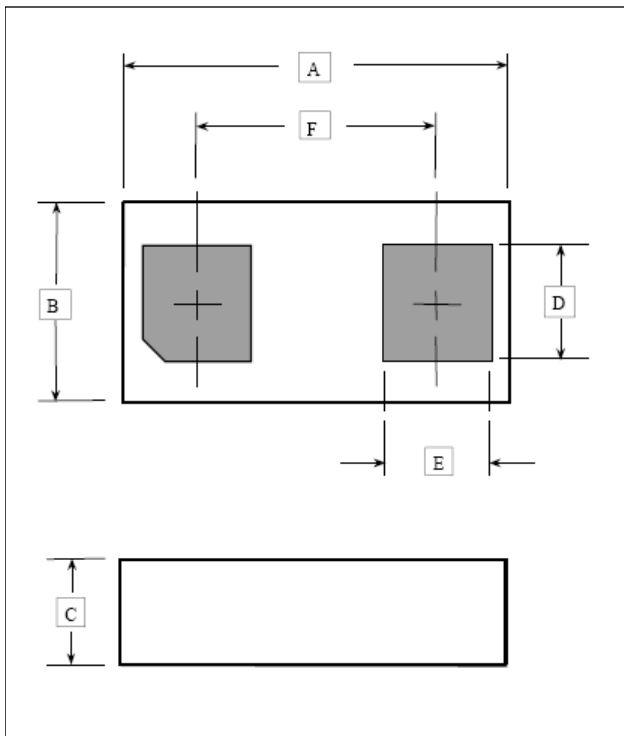
Cleanliness

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

General Handling

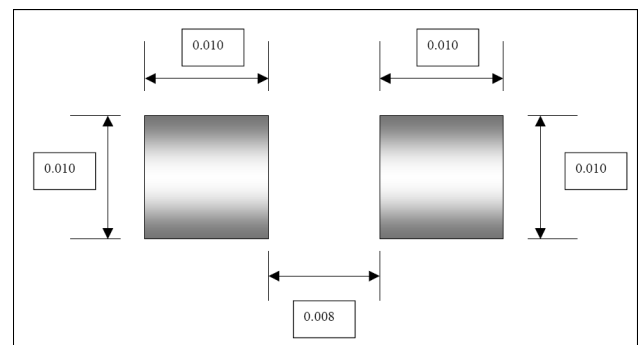
The protective polymer coating on the active areas of these devices provides scratch protection, particularly for the metal airbridge which contacts the anode. Dice can be handled with tweezers or vacuum pickups and are suitable for use with automatic pick-and-place equipment.

Dimensions



Dimension	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.025	0.027	0.64	0.69
B	0.012	0.015	0.30	0.38
C	0.006	0.008	0.15	0.20
D	0.007	0.009	0.18	0.23
E	0.006	0.008	0.15	0.20
F	0.015	0.017	0.38	0.43

Circuit Mounting Dimensions (inches)



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