

DC1346/46M/46S

MILLIMETRE WAVE GaAs SCHOTTKY BARRIER BEAM LEAD MIXER DIODE

The DC1346 GaAs Schottky Barrier Beam Lead Diode is manufactured using advanced epitaxial techniques. The Beam Leads are fabricated using a gold electroplating process. It can be bonded directly to strip-line circuits using recommended bonding procedures. The active diode area is protected using a glass dielectric which adds strength to the Beam Leads without significantly contributing to the stray capacitance. It is intended to be used in Millimetre Wave applications in the 30GHz to 100GHz band for:

- PCN Networks at 38GHz
- Military and Space Millimetre Wave Mixers up to 100GHz
- Automotive Collision Awareness Systems at 60GHz
- Automotive Intelligent Cruise Control Systems at 78GHz

LIMITING CONDITIONS OF USE

Operating Temperature Range	-55°C to +150°C
Storage Temperature Range	-55°C to +150°C
Burn Out Level at $T_{amb} = 25^{\circ}\text{C}$	60mW CW

FEATURES

- Low Noise Figure
- High Cut-Off Frequency
- Glass Passivated for Strength and Reliability
- Low Total Capacitance for High Conversion Efficiency
- Mixer Operation from Microwave through Millimetre Wave Frequencies
- Matched Pairs DC1346M
- Space Level Release DC1346S

DC TEST SPECIFICATION at $T_{amb} = 25^{\circ}\text{C}$

TEST	VALUE	CONDITION
Reverse Voltage V_R	>2V	$I_R = 10\mu\text{A}$
Forward Voltage V_F	720mV Typ	$I_F = 2.5\text{mA}$
Parasitic Capacitance C_p	20fF Typ	$V_{bias} = 0\text{V}$ $V_{signal} = 20\text{mV RMS}$ $f = 1\text{MHz}$
Ideality Factor	1.2 Typ	$I_F = 10\mu\text{A to } 100\mu\text{A}$
Tension Test T_N	2.0g Min 4.8g Typ	Pull-off test on bonded diode

	C_{TO} (fF)	R_S (Ω)	n
DC1346-1	35-50	<10	<1.4
DC1346-2	30-45	<10	<1.4
DC1346-3	32-38	<10	<1.4
DC1346-4	26-32	<8	<1.4
DC1346-5	<33	<6	<1.22
DC1346-6	37-43	<7	<1.4
DC1346-7	<35	<10	<1.4
DC1346-8	<40	<7	<1.4
DC1346-9	<40	<10	<1.2
DC1346-10	35-40	<7	<1.2

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RF TEST CHARACTERISTICS at $T_{amb} = 25^{\circ}\text{C}$

TEST	VALUE	CONDITION
Test Frequency f	90.0GHz	$P_{IN} = 2.0\text{mW}$ DC bias = 0.5V
Overall Noise Figure NF	8.0dB Typ	I.F. Amplifier: NF = 1.5dB at 30MHz $R_L = 15\Omega$
Conversion Loss	6.5dB Typ	$R_L = 15\Omega$
Rectified Current I_{RECT}	2.5mA Typ	$R_L = 15\Omega$
VSWR	1.2:1 Typ	$R_L = 15\Omega$
I.F. Impedance Z_{IF}	65 Ω $P_{IN} = 2.0\text{mW}$ DC bias = 0.5V	$R_L = 15\Omega$ I.F. = 1KHz

APPLICATION INFORMATION - BONDING

The DC1346 Beam Lead diodes are GaAs chips with coplanar gold tabs which extend on either side of the central chip. To bond the DC1346 diode onto a substrate, it should be placed face down on the substrate (active area facing down) with the bonding tabs flat on the bonding pad area. Care should be taken to position the diode in such a way that a small gap exists between the chip and the edge of the anode bonding pad to prevent a short circuit. Soldering the DC1346 to the substrate is not recommended. Smooth paste gold or silver conductive epoxies designed for microelectronic chip bonding applications which have a typical curing rate of approximately 1 hour at 125°C to 150°C are recommended.

The following attachment methods are recommended:

1. For Thermo-compression Bonding:

- Heated wedge temperature: 250°C to 300°C
- Wedge tip dimensions: 25 μm radius and 100 μm width
- Bonding force: 20 grams to 40 grams
- Background stage temperature: 120°C to 200°C

2. For Thermo-sonic Bonding, where mechanical and temperature sensitive substrates are employed, a heated background stage and a cold cross grooved wedge are recommended:

- Wedge tip width: 100 μm to 150 μm
- Bonding force: 10 grams to 30 grams
- Background stage temperature: 140°C nominal

HANDLING

The diodes are supplied in foil wrapped plastic capsules to prevent possible damage from static discharge and stray RF fields. Due to the very small dimensions, it is recommended that a suitable microscope (X25) be used. One of the following placements methods is recommended:

- A steel needle mounted in a wooden handle. The diode will readily adhere to the needle without the danger of electrical or mechanical damage.
- A fine wooden probe with the tip dipped in Isopropyl alcohol
- A vacuum probe pick-up with inner hole diameter of approximately 100 μm

The use of tweezers is not recommended because serious mechanical damage can occur. The Beam Leads are static sensitive. Precautions must be taken to ensure adequate grounding (bonding) of equipment and operators so that static discharges can not occur.

OUTLINE DIMENSIONS All dimension in mm

