



PIN Diode Chips with Offset Bond Pads



Features

- Bond Pads Removed From Active Junction
- Large Bond Pads Support Multiple Bond Wires
- Rugged Silicon-Glass Construction
- Silicon Nitride Passivation
- Polyimide Scratch Protection

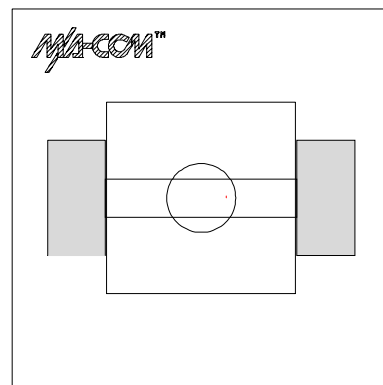
Description

These silicon - glass PIN diode chips are fabricated with M/A-COM's patented HMIC™ process. They contain a single shunt silicon PIN diode embedded in a glass substrate with dual 75 x 150 micron bond pads located near the chip edges. The large pads allow use of multiple bond wires. The location of these pads on a glass substrate results in low parasitic capacitance. The diode junction is passivated with silicon nitride and a layer of polyimide has been added for scratch protection during assembly. The devices are available on industry standard tape frame for automatic insertion and assembly in high volume applications.

Applications

These diodes are designed for use as general PIN elements in switches and switched pad attenuators. The chips can handle up to 10 watts of RF power, and are well suited for use in T/R switches for subscriber phones, particularly the higher power and higher frequency systems for satellite based systems. They are also useful for the switching element in phased array radar applications. The larger bond pad allows for two (2) 1 mil dia contact wires which reduces the bond wire inductance almost in half.

Chip Layout



Absolute Maximum Rating¹

Parameter	Absolute Maximum
Operating Temperature	-60°C to +150°C
Storage Temperature	-65°C to +175°C
Forward Current	100mA
Reverse Voltage	70 V
Incident RF Power	+40 dBm (CW)
Mounting Temperature	+320°C for 10 seconds

1. Exceeding these limits may cause permanent damage.

Electrical Specifications @ +25°C

Parameters	Symbol	Units	Test Conditions	MA4BPS101			MA4BPS201			MA4BPS301		
				Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
Total Capacitance	C _T	pF	-5 Volts at 1 MHz		0.13	0.17		0.20	0.25		0.30	0.35
Series Resistance ¹	R _s	Ω	+10 mA at 1 GHz		1.9	2.4		1.0	1.3		0.9	1.2
Parallel Resistance ²	R _p	KΩ	0 Volts at 1 GHz		14			6			6	
Breakdown Voltage	V _b	Volts	-10 uA	70	110		70	110		70	110	
Carrier Lifetime ²	T _L	nS	+10mA/-6mA		300			300			300	
Thermal Impedance ²	θ _{jc}	°C/W	1A/0.01A, 10 mS		38			28			24	

1. Guaranteed by correlation to 2 MHz on-wafer measurements.

2. Tested on a sample basis only.

Handling and Mounting Information

Handling

All semiconductor dice should be handled with care to avoid damage or contamination. For an individual die, the use of plastic tipped tweezers or vacuum pick-up tool is recommended. When using automatic pick and place, abrasion and mechanical shock should be minimized.

Mounting

The dice have Ti-Pt-Au back metal, with a final gold thickness of 0.1 micron. They can be die mounted with a gold-tin eutectic solder preform or conductive epoxy. The mounting surface must be clean and flat.

Eutectic Die Attachment

An 80/20 gold-tin eutectic solder preform is recommended with a work surface temperature of 255°C and a tool tip temperature of 265°C. When hot gas is applied, the tool tip temperature should be 290°C. The chip should not be exposed to temperatures greater than 320°C for more than 20 seconds. No more than three seconds should be required for attachment.

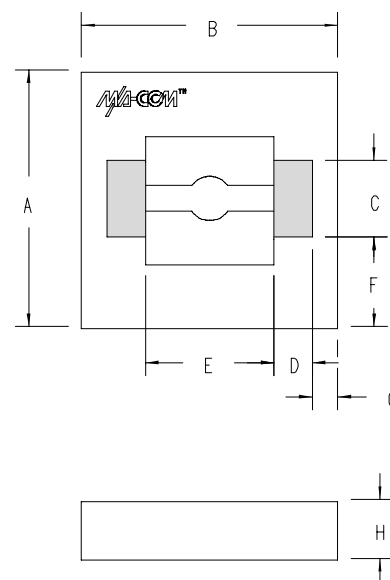
Epoxy Die Attachment

A minimum amount of epoxy should be used. A thin epoxy fillet should be visible around the perimeter of the chip after placement. Cure epoxy per manufacturer's schedule.

Wire Bonding

The two bond pads on these die have a Ti-Pt-Au metalization scheme, with a final gold thickness of 2.5 microns. The pads are 75 x 150 microns; up to two wires or a 100 micron wide ribbon can be bonded to each pad. Thermosonic wedge wire bonding of 0.001" diameter gold wire is recommended with a stage temperature of 150°C and a force of 25 to 40 grams. Ultrasonic energy should be adjusted to the minimum required.

Chip Outline Drawing (ODS-1244)

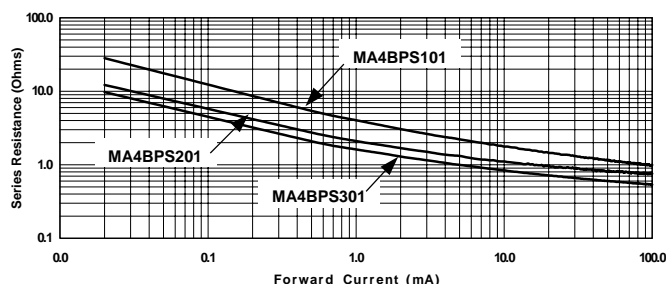


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.019	0.0213	0.480	0.540
B	0.019	0.0213	0.480	0.540
C	0.0055	0.0063	0.140	0.160
D	0.0026	0.0033	0.065	0.085
E	0.0094	0.0102	0.240	0.260
F	0.007 Ref.		0.180 Ref.	
G	0.002 Ref.		0.050 Ref.	
H	0.0043	0.0055	0.110	0.140

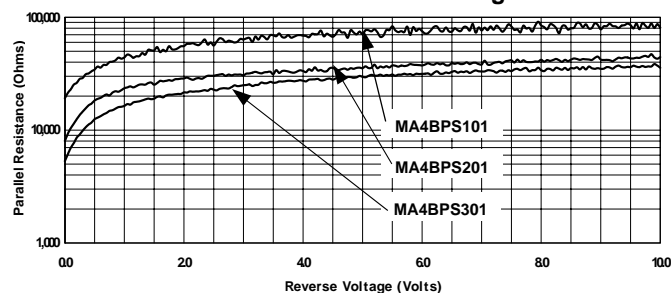
- Notes:
1. Bond pad material: 2.5 micron thick gold.
 2. Shaded areas indicate wire bonding pads
 3. Backside metal: 0.1 micron thick gold.

Typical Resistance Curves

Series Resistance vs. Forward Current at 1 GHz



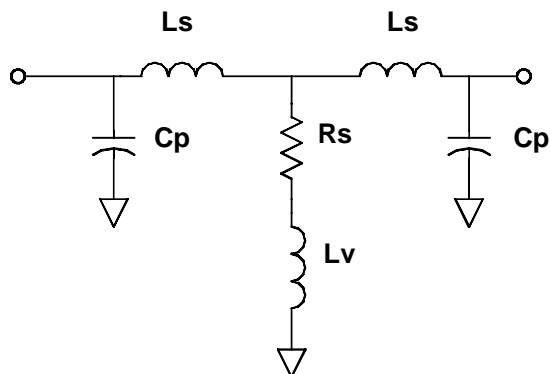
Parallel Resistance vs. Reverse Voltage at 1 GHz



V2.01

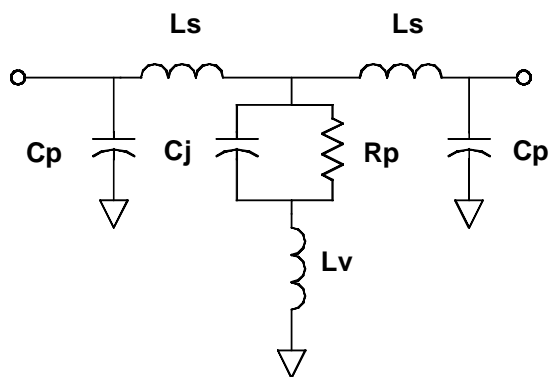
Equivalent Circuits

Devices Typical Forward Bias Equivalent Circuit



Conditions	Rs 10mA @ 1 GHz	Cp	Ls	Lv
Units	Ohms	pF	nH	nH
MA4BPS101	1.9	0.03	0.05	0.08
MA4BPS201	1.0	0.03	0.05	0.05
MA4BPS301	0.9	0.03	0.05	0.04

Devices Typical Forward Bias Equivalent Circuit



Conditions	Cj -5V @ 1 MHz	Rp 0V @ 1 GHz	Cp -	Ls	Lv
Units	pF	KW	pF	nH	nH
MA4BPS101	0.07	14	0.03	0.05	0.08
MA4BPS201	0.14	6	0.03	0.05	0.05
MA4BPS301	0.24	6	0.03	0.05	0.04

Note: Since the spice models for PIN and PN Junctions do not accurately predict the effects of stored charge, M/A-COM does not provide Spice Parameters for PIN diodes. On wafer S-Parameter Data are available.

