

### Features

- ◆ No Wirebonds Required
- ◆ Rugged Silicon-Glass Construction
- ◆ Silicon Nitride Passivation
- ◆ Polymer Scratch and Impact Protection
- ◆ Low Parasitic Capacitance and Inductance
- ◆ Ultra Low Capacitance < 40 fF
- ◆ Excellent RC Product < 0.10 pS
- ◆ High Switching Cutoff Frequency > 110 GHz
- ◆ 110 Nanosecond Minority Carrier Lifetime
- ◆ Driven by Standard +5V TTL PIN Diode Driver

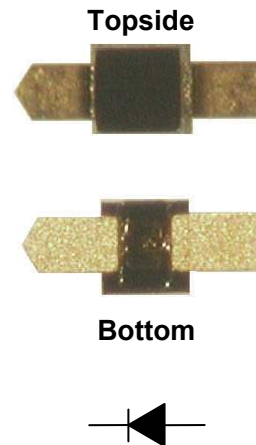
### Description

The MA4PBL027 is a silicon beamlead PIN diode fabricated with M/A-COM Technology Solutions HMIC™ process. It features one silicon pedestal embedded in a low loss, low dispersion glass which supports the beam-leads. The diode is formed on the top of the pedestal, and airbridges connect the diode to the beam-leads. The topside is fully encapsulated with silicon nitride and also has an additional polymer layer for scratch and impact protection. These protective coatings prevent damage to the diode junction and air-bridge during handling and assembly. The diodes exhibit low series resistance, low capacitance, and extremely fast switching speed.

### Applications

The ultra low capacitance, low RC product and low profile of the MA4PBL027 makes it an ideal choice for use in microwave and millimeter wave switch designs, where low insertion loss and high isolation are required. The low bias levels of +10 mA in the low loss state and 0v in the isolation state allows the use of a simple + 5V TTL gate driver. These diodes can be used as switching arrays on radar systems, high speed ECM circuits, optical switching networks, instrumentation, and other wideband multi-throw switch assemblies.

### MA4PBLP027



### Absolute Maximum Ratings @ T<sub>AMB</sub> = 25°C (unless otherwise specified)

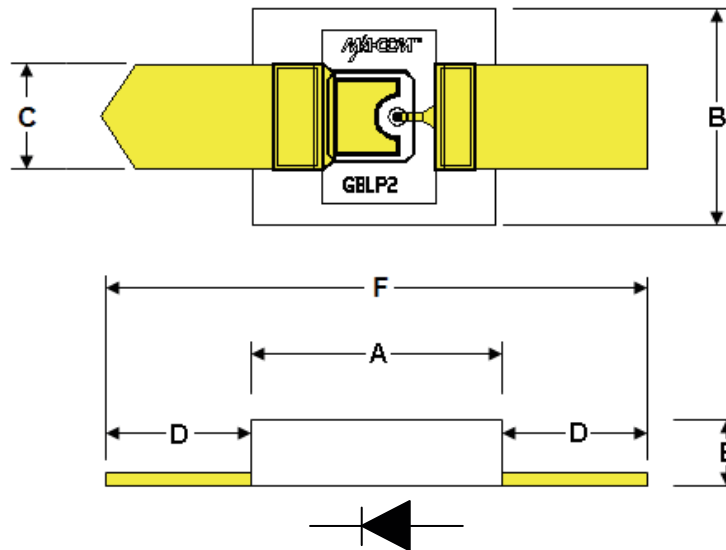
Parameter	Absolute Maximum
Forward Current	100 mA
Reverse Voltage	90 V
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +150°C
Junction Temperature	+175°C
RF C.W. Incident Power	30 dBm C.W.
RF & DC Dissipated Power	150 mW
Mounting Temperature	235°C for 10 sec.

### Electrical Specifications at $T_{AMB} = 25^{\circ}C$

Test Conditions	Parameters	Units	Min	Typical	Max.
Total Capacitance @ $-5V/10\text{ GHz}^1$	Ct	fF	–	26	30
Forward Resistance @ $+20mA/10\text{ GHz}^2$	Rs	Ohms	–	4	4.9
Forward Voltage at +10mA	Vf	Volts	1.2	1.36	1.5
Leakage Current at $-40\text{ V}$	Ir	nA	–	50	300
Minority Carrier Lifetime	TL	nS	–	5	10

**Notes:**

1. Capacitance is determined by measuring the isolation of a single series diode in a 50Ω line at 10GHz.
2. Forward series resistance is determined by measuring the insertion loss of a single series diode in a 50Ω line at 10GHz.



DIM	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	0.009	0.013	0.2286	0.3302
B	0.0049	0.0089	0.1245	0.2261
C	0.0037	0.0057	0.0940	0.1448
D	0.0049	0.0089	0.1245	0.2261
E	0.002	0.006	0.0508	0.1524
F	0.0218	0.0278	0.5537	0.70612

**ADVANCED:** Data Sheets contain information regarding a product M/A-COM is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.

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Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

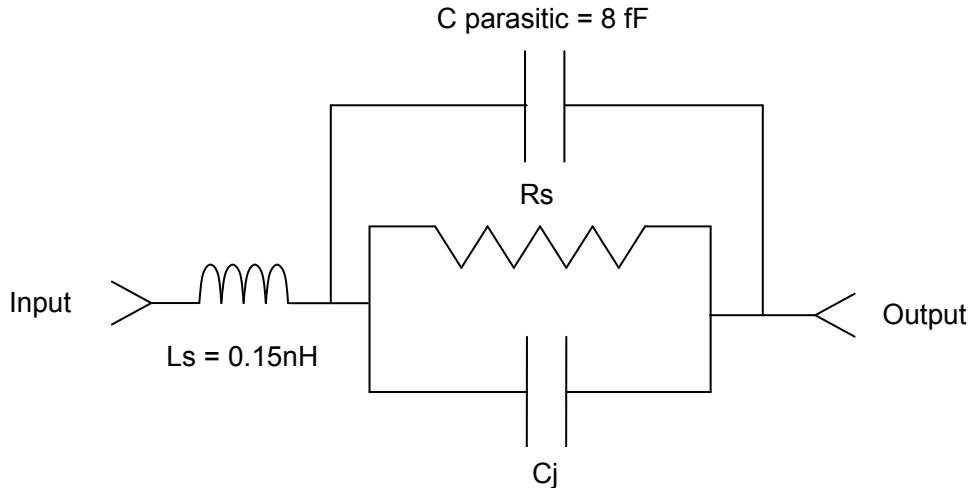
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Electrical Specifications at  $T_{AMB} = 25^{\circ}\text{C}$ 

Parameter	Symbol	Conditions	Units	Typical	Maximum
Total Capacitance	$C_T$	0V, 1MHz <sup>2</sup>	pF	0.048	
Total Capacitance	$C_T$	-3V, 1MHz <sup>2</sup>	pF	0.039	
Total Capacitance	$C_T$	-10V, 1MHz <sup>2</sup>	pF	0.033	0.040
Total Capacitance	$C_T$	-40V, 1MHz <sup>2</sup>	pF	0.030	0.040
Total Capacitance	$C_T$	0V, 100MHz <sup>2,4</sup>	pF	0.043	
Total Capacitance	$C_T$	-3V, 100MHz <sup>2,4</sup>	pF	0.033	
Total Capacitance	$C_T$	-10V, 100MHz <sup>2,4</sup>	pF	0.031	
Total Capacitance	$C_T$	-40V, 100MHz <sup>2,4</sup>	pF	0.027	
Total Capacitance	$C_T$	0V, 1GHz <sup>2,4</sup>	pF	0.039	
Total Capacitance	$C_T$	-3V, 1GHz <sup>2,4</sup>	pF	0.032	
Total Capacitance	$C_T$	-10V, 1GHz <sup>2,4</sup>	pF	0.029	
Total Capacitance	$C_T$	-40V, 1GHz <sup>2,4</sup>	pF	0.026	
Series Resistance	$R_S$	10mA, 100 MHz <sup>3,4</sup>	W	3.8	
Series Resistance	$R_S$	20mA, 100 MHz <sup>3,4</sup>	W	3.0	
Series Resistance	$R_S$	10mA, 1GHz <sup>3,4</sup>	W	3.5	
Series Resistance	$R_S$	20mA, 1GHz <sup>3,4</sup>	W	2.8	
Forward Voltage	$V_F$	20mA	V	0.917	1.1
Reverse Voltage	$V_R$	-10 $\mu$ A	V	110	
Reverse Current	$I_R$	-40 V	nA	1.0	
Reverse Current	$I_R$	-90 V	$\mu$ A	-	10.0
Carrier Lifetime	$T_L$	+10mA / -6mA	ns	110	

**Notes:**

- Total capacitance,  $C_T$ , is equivalent to the sum of Junction Capacitance,  $C_j$ , and Parasitic Capacitance,  $C_{par}$ .
- Series resistance  $R_S$  is equivalent to the total diode resistance :  $R_s = R_j$  ( Junction Resistance) +  $R_c$  ( Ohmic Resistance)
- $R_s$  and  $C_T$  are measured on an HP4291A Impedance Analyzer with die mounted in an ODS-186 package with conductive silver epoxy



### MA4PBL027 SPICE Model

NLPINM1	wBv= 90 V
Is=1.0E-14 A	wPmax= 150 mW
Vi=0.0 V	Ffe= 1.0
Un = 900 cm <sup>2</sup> /V-sec	M= 0.5
Wi= 14 um	Fc= 0.5
Rr= 100 K Ohms	Imax= 1.1E+5 A/m <sup>2</sup>
Cjmin= 0.030 pF	Kf= 0.0
Tau= 110 nsec	Af=1.0
	Vj= 0.7 V
	AllParams =
Rs(I)= Rc + Rj(I) = 0.05 Ohm	
Cj0= 0.040 pF	

**Handling and Assembly Procedures**

*The following precautions should be observed to avoid damaging these devices.*

**Cleanliness**

These devices should be handled in a clean environment.

**Static Sensitivity**

Silicon PIN diodes are ESD sensitive and can be damaged by static electricity. They are classified Class 1, HBM and proper ESD techniques should be used when handling these devices.

**General Handling**

A polymer layer provides scratch protection for the diode junction area and anode air bridge. However, the leads of beam lead devices are very fragile and must be handled with extreme care. The leads can easily be distorted or broken by the normal pressures if not careful while handling with tweezers. A vacuum pencil with a #27 tip is the preferred choice for picking and placing.

**Attachment**

These devices were designed to be inserted onto hard or soft substrates. Recommended methods of attachment include thermo-compression bonding, parallel-gap welding and electrically conductive silver epoxy.

**Ordering Information**

Part Number	Packaging
MA4PBL027	Gel Pak/100pcs