MA4PBL027

HMIC Silicon Beamlead PIN Diode

V2

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

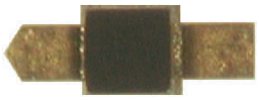
The MA4PBL027 is a silicon beamlead PIN diode fabricated with M/A-COM Technology Solutions HMIC™ process. It features one silicon pedestal embedded in a low loss, low dispersion glass which supports the beam-leads. The diode is formed on the top of the pedestal, and airbridges connect the diode to the 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.

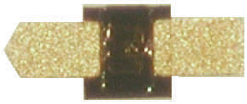
Applications

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.

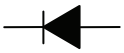
MA4PBLP027

Topside





Bottom



Absolute Maximum Ratings @ T_{AMB} = 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.

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.
PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.

HMIC Silicon Beamlead PIN Diode

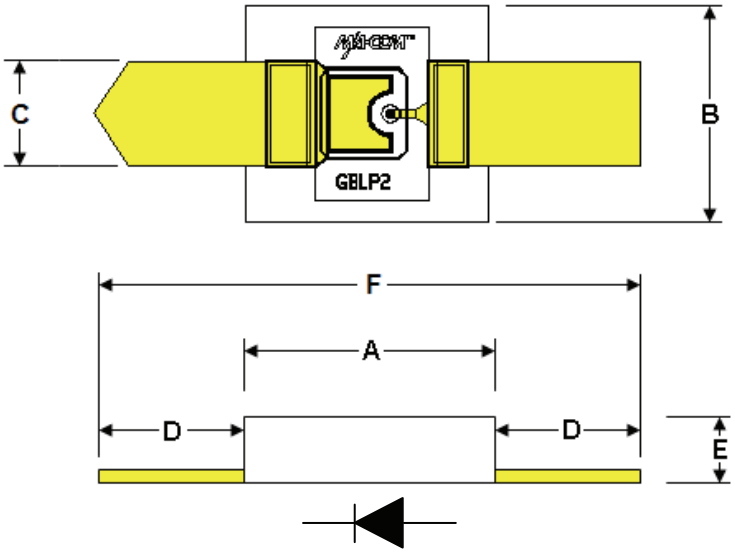
V2

Electrical Specifications at T_{AMB} = 25°C

Test Conditions	Paramters	Units	Min	Typical	Max.
Total Capacitance @ –5V/10 GHz [1]	Ct	fF	–	26	30
Forward Resistance @ +20mA/10 GHz [2]	Rs	Ohms	–	4	4.9
Forward Voltage at +10mA	Vf	Volts	1.2	1.36	1.5
Leakage Current at –40 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.
PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.

Electrical Specifications at T_{AMB} = 25°C

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

Notes:

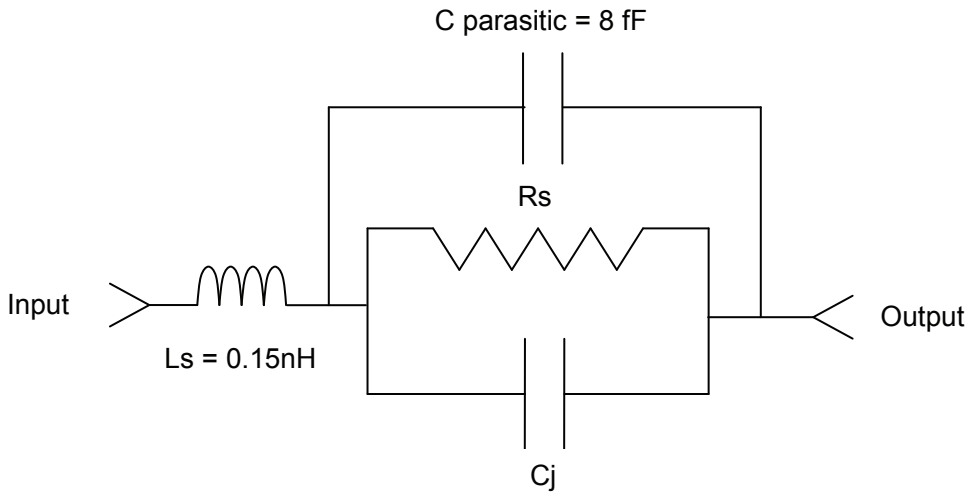
2. Total capacitance, C_T, is equivalent to the sum of Junction Capacitance ,Cj, and Parasitic Capacitance, Cpar.
3. Series resistance R_S is equivalent to the total diode resistance : Rs = Rj (Junction Resistance) + Rc (Ohmic Resistance)
4. Rs and C_T are measured on an HP4291A Impedance Analyzer with die mounted in an ODS-186 package with conductive silver epoxy

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.
PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.



MA4PBL027 SPICE Model

NLPINM1

Is=1.0E-14 A

Vi=0.0 V

Un = 900 cm^2/V-sec

Wi= 14 um

Rr= 100 K Ohms

Cjmin= 0.030 pF

Tau= 110 nsec

Rs(I)= Rc + Rj(I) = 0.05 Ohm

Cj0= 0.040 pF

wBv= 90 V

wPmax= 150 mW

Ffe= 1.0

M= 0.5

Fc= 0.5

Imax= 1.1E+5 A/m^2

Kf= 0.0

Af=1.0

Vj= 0.7 V

AllParams =

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.
PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.

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

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.
PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.