SURMOUNT™ PIN Diode

MA4SPS402 V2

Features

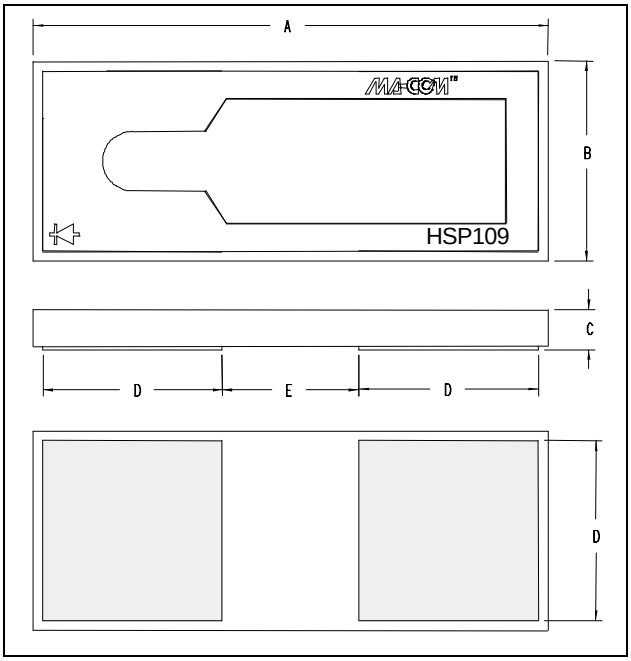
- Surface Mount Device
- No Wirebonds Required
- Rugged Silicon-Glass Construction
- Silicon Nitride Passivation
- Polymer Scratch Protection
- Low Parasitic Capacitance and Inductance
- High Power Handling (Efficient Heatsinking)

Description and Applications

This device is a Silicon-Glass PIN diode chip fabricated with M/A-COM's patented HMIC™ process. This device features two silicon pedestals embedded in a low loss, low dispersion glass. The diode is formed on the top of one pedestal and connections to the backside of the device are facilitated by making the pedestal sidewalls electrically conductive. Selective backside metallization is applied producing a surface mount device. This Vertical Conic Section Topology provides for Exceptional Heat Transfer. The topside is fully encapsulated with silicon nitride and has an additional polymer layer for scratch and impact protection. These protective coatings prevent damage to the junction and the anode air-bridge during handling and assembly.

These packageless devices are suitable for usage in Moderate Incident Power (5 W C.W.) or Higher Incident Peak Power (50 W) Series, Shunt, or Series-Shunt Switches. Smaller Parasitic Inductance, 0.45 nH, and Excellent RC Constant, 0.23 pS, make the devices ideal for Higher Frequency Switch Elements compared to their Plastic Device Counterparts.

Case Style ODS-1253
(Topview to Backside Contacts View)



1. Backside metal: 0.1 micron thk. gold.
2. Shaded areas indicate backside bonding pads.

Dimensions

Dim	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.0465	0.0505	1.181	1.283
B	0.0173	0.0213	0.439	0.541
C	0.004	0.006	0.102	0.203
D	0.0150	0.0170	0.381	0.432
E	0.0140	0.0160	0.356	0.406

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Electrical Specifications @ + 25 °C

Symbol	Test Conditions	Units	Min.	Typ.	Max.
C_T	-40 V, 1 MHz[1]	pF		0.055	0.06
C_T	-40 V, 1 GHz [1,3]	pF		0.045	
R_S	10 mA, 1 GHz[2,3]	Ω		5.0	5.8
V_F	1.0 mA	V		0.90	1.00
V_R	-10 µA	V	l -70 l	l –100 l	
I_R	-70 V	µA		l -0.1 l	l -10 l
$R_{\theta JL}$	I_H=1A, I_L=10 mA[4]	°C/W		150	
T_L	+10 mA / -6 mA (50% - 90% V)	ns		200	400

Notes
1. Total capacitance, CT, is equivalent to the sum of Junction Capacitance ,Cj, and Parasitic Capacitance, Cpar.
2. Series resistance RS is equivalent to the total diode resistance : Rs = Rj (Junction Resistance) + Rc (Ohmic Resistance)
3. Rs and CT are measured on an HP4291A Impedance Analyzer with die mounted in an ODS-186 package with conductive silver epoxy.
4. Steady-state R_{θ}JL measured with die mounted in an ODS-186 package with conductive silver epoxy.

Absolute Maximum Ratings[1] @ TA = +25 °C (unless otherwise specified)

Parameter	Absolute Maximum
Reverse Voltage	l -100 V l
Forward Current	250 mA
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +150 °C
Junction Temperature	+175 °C
Dissipated Power (RF & DC)	1000 m W
Mounting Temperature	+235 °C for 10 seconds

1. Operation of this device above any one of these parameters may cause permanent damage.

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Handling Procedures

All semiconductor chips should be handled with care to avoid damage or contamination from perspiration and skin oils. The use of plastic tipped tweezers or vacuum pickups is strongly recommended for individual components. Bulk handling should insure that abrasion and mechanical shock are minimized.

Bonding Techniques

Attachment to a circuit board is made simple through the use of surface mount technology. Mounting pads are conveniently located on the bottom surface of these diodes and are removed from the active junction locations. These devices are well suited for solder attachment onto hard and soft substrates. The use of 80/20 Au/Sn and 60/40 Sn/Pb solder is recommended, with an equal temperature profile across the contacts. Conductive epoxy paste for attachment may also be used.

When soldering these devices to a hard substrate, hot gas die bonding is preferred. We recommend utilizing a vacuum tip and a force of 60 to 100 grams applied normal to the top surface of the device. When soldering to soft substrates, it is recommended to use a lead-tin interface at the circuit board mounting pads. Position the die so that its mounting pads are aligned with the circuit board's mounting pads and reflow the solder by heating the circuit trace near the mounting pad while applying 60 to 100 grams of force perpendicular to the top surface of the die.

Since the HMIC™ glass is transparent, the edges of the mounting pads closest to each other can be visually inspected through the die after attach is completed.

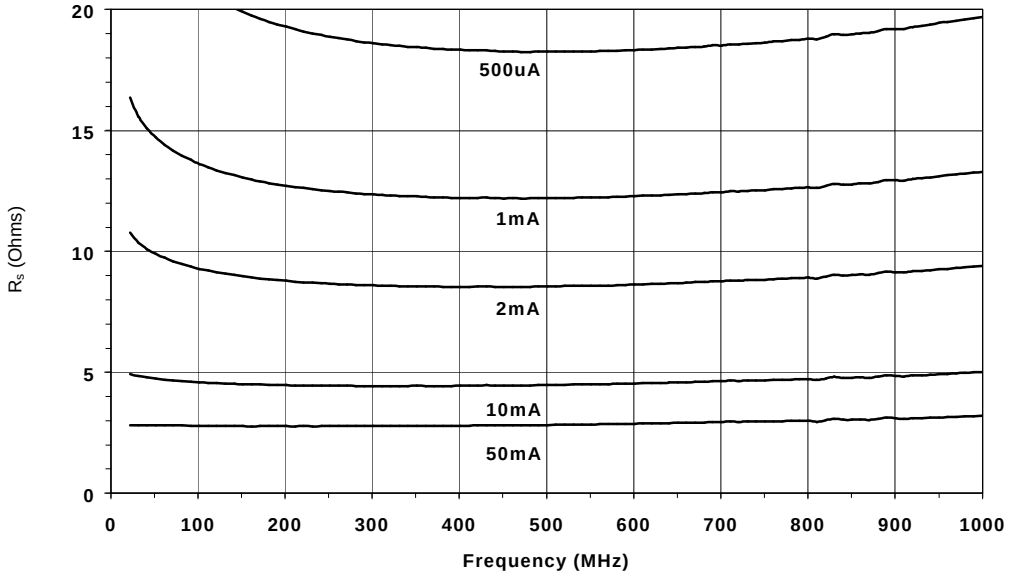
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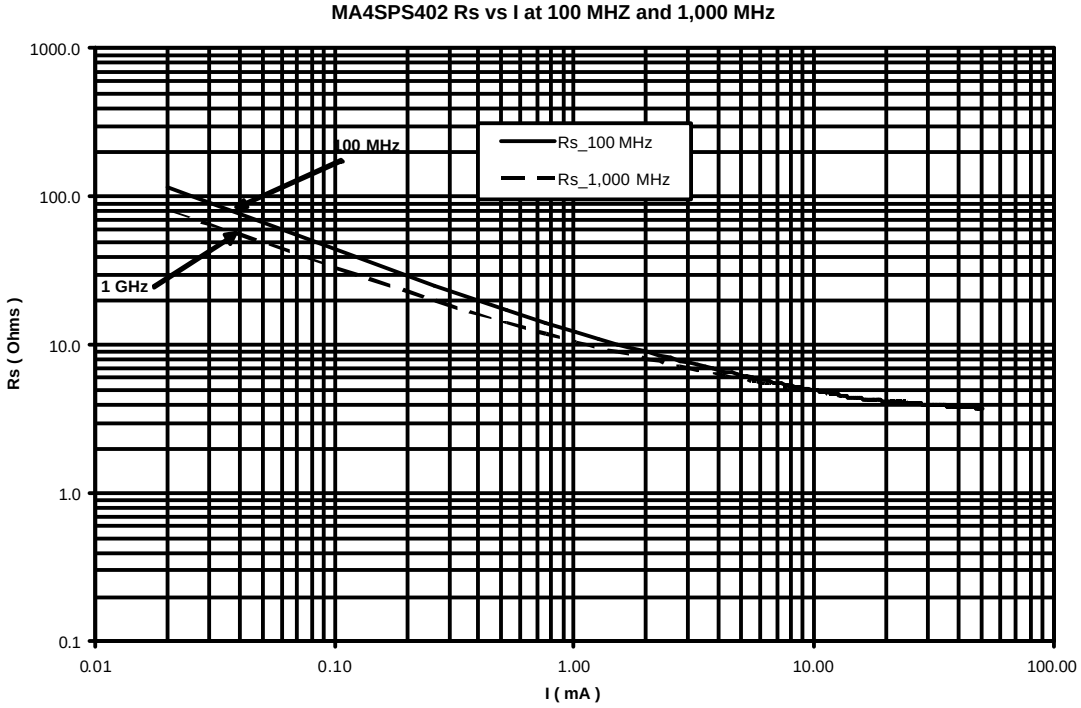
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Typical Performance Curves @ +25 °C

R_S vs. Forward Current and Frequency





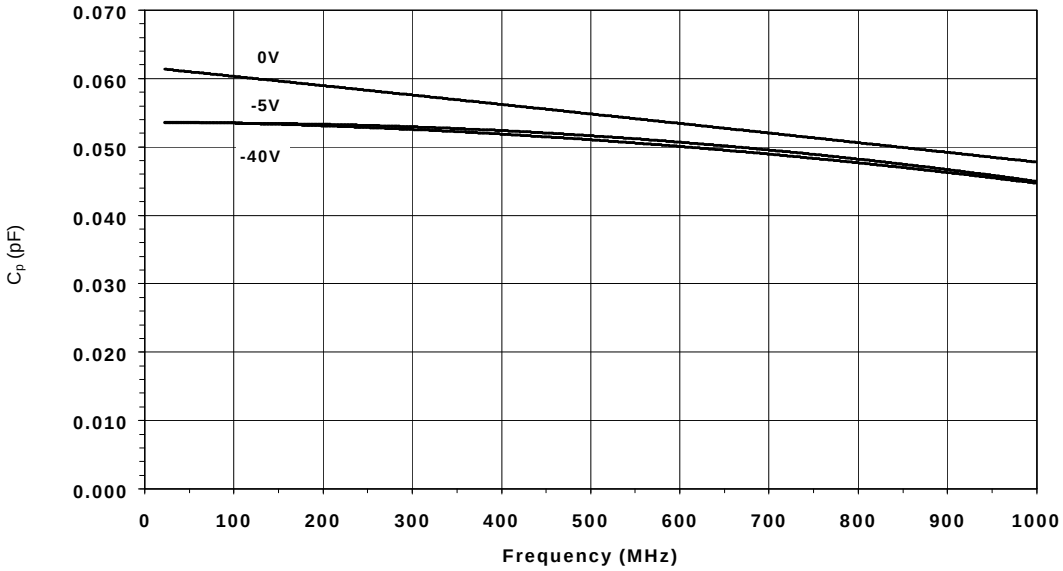
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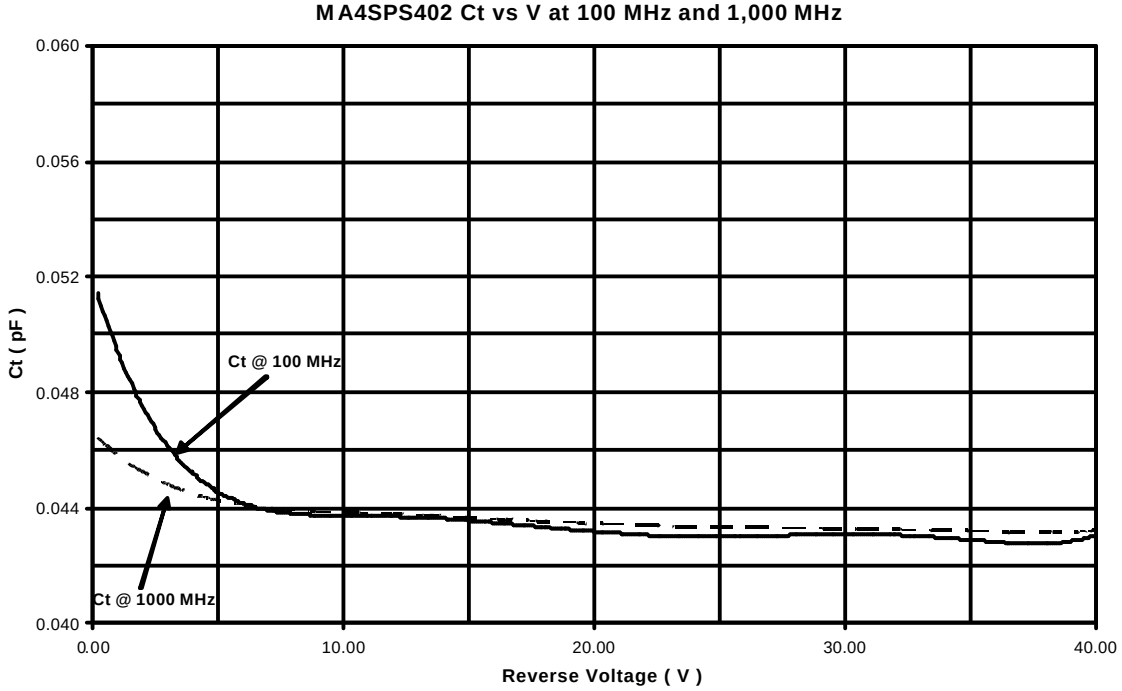
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Typical Performance Curves @ +25 °C

C_T vs. Reverse Voltage and Frequency





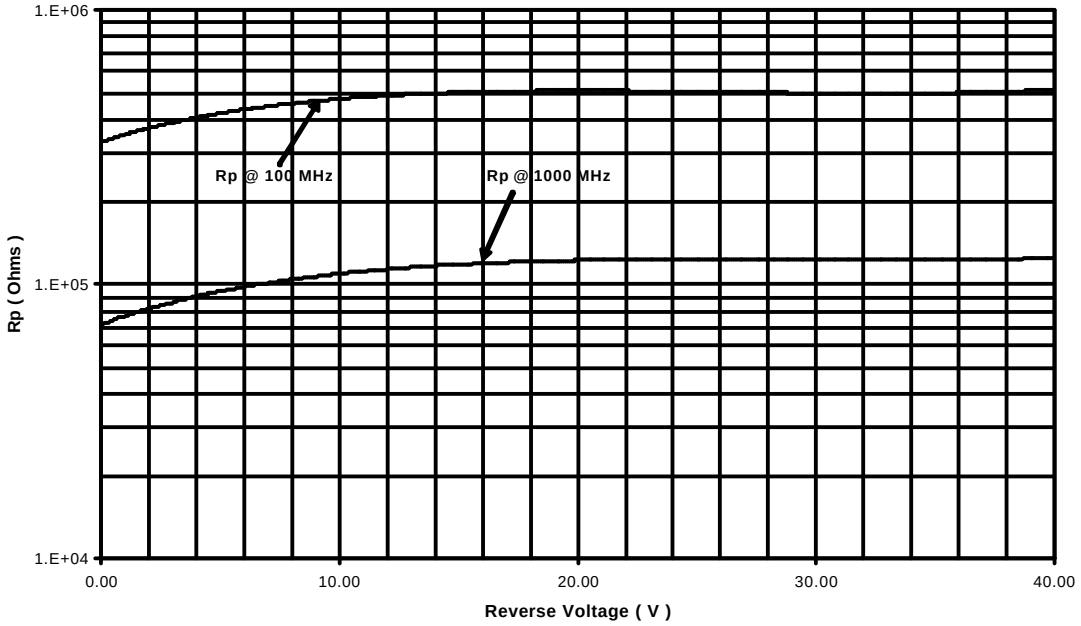
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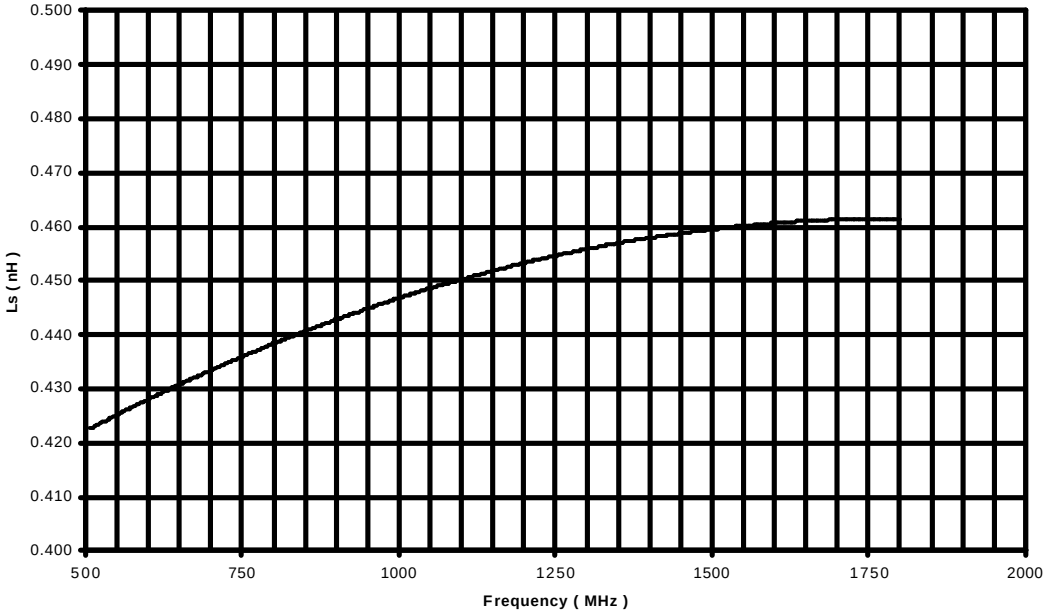
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Typical Performance Curves @ +25 °C

MA4SPS402 Rp vs V at 100 MHz and 1,000 MHz



MA4SPS402 Ls vs Frequency at 10 mA



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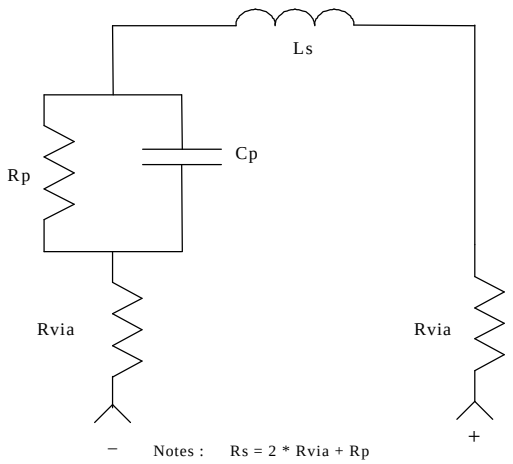
MA4SPS402 ADS SPICE Model

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PinDiodeModel
NLPINM1
Is=1.0E-14 A
Vi=0.0 V
Un=900 cm^2/V-sec
Wi=6.5 um
Rr=20 K Ohm
Cmin=0.045
Tau=0.20 usec
Rs=0.1 Ohm
Cj0=0.06 pF
Vj=0.7 V
M=0.5
Fc=0.5
Imax=1.0E+6 A/m^2
Kf=0.0
Af=1.0

wBv=100 V
wPmax=1.0 W
Ffe=1.0

MA4SPS402 Schematic



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