MA4SPS552

SURMOUNT™ PIN Diode

Rev. V3

Features

- Surface Mount Device
- No Wirebonds Required
- Rugged Silicon-Glass Construction
- Silicon Nitride Passivation
- Polymer Scratch Protection
- Ultra-Low Parasitic Capacitance and Inductance
- Higher Power Handling (Efficient Heat sinking)
- RoHS* Compliant

Description

The MA4SPS552 is a silicon-glass PIN diode chip fabricated with MACOM's patented HMIC process. This device features two silicon pedestals embedded in a low loss 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 conductive. Selective backside metallization is applied producing a surface mount device. The topside is fully encapsulated with silicon nitride and has an additional polymer layer for scratch 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 CW) or higher incident peak power (200 W, 1 µs, 0.001 Duty) series, shunt, or series-shunt switches. Small parasitic inductance, 0.7 nH, and excellent RC constant (0.20 ps) make the devices ideal for TR switch and accessory switch circuits, where higher P1db and IP3 values are required.

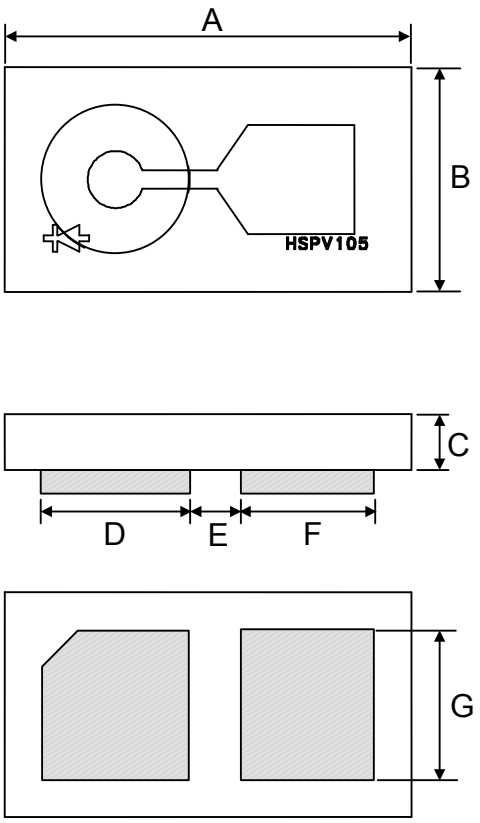
These diodes can also be used in π, T, Tapered Resistance, and Switched-Pad Attenuator Control Circuits for 50 Ω or 75 Ω systems.

Ordering Information[1]

Part Number	Package
MA4SPS552	100 pc. die in carrier
MADP-000552-12810T	3000 pc. pocket tape on reel

1. Reference Application Note M513 for reel size information.

Package Dimensions[2]



DIM	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.0207	0.0226	0.525	0.575
B	0.0108	0.0128	0.275	0.325
C	0.0040	0.0080	0.102	0.203
D	0.0075	0.0095	0.190	0.241
E	0.0032	0.004	0.081	0.101
F	0.0061	0.0081	0.155	0.205
G	0.0069	0.0089	0.175	0.225

2. Backside metal: 0.1 µm thick.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

Electrical Specifications @ +25°C

Symbol	Parameter	Conditions	Units	Min.	Typ.	Max.
C_T	Capacitance	-40 V, 1 MHz -40 V, 1 GHz	pF	—	0.08 0.06	0.14 —
R_S	Resistance	100 mA, 100 MHz 20 mA, 100 MHz	Ω	—	1.7 2.4	—
V_F	Forward Voltage	100 mA 10 mA	V	—	1.00 0.88	1.25 1.00
V_R	Reverse Voltage	-10 µA	V	| - 200 |	| - 275 |	—
I_R	Reverse Leakage Current	-40 V	nA	—	| - 10 |	—
$R\Theta_{JC}$	Thermal Resistance	Steady State	°C/W	—	30	—
T_L	Lifetime	+10 mA / -6 mA (50% - 90% V)	µs	—	2.5	—

Absolute Maximum Ratings[3,4]

Parameter	Absolute Maximum
Dissipated RF & DC Power	1 W
Forward Current	100 mA
Reverse Voltage	-200 V
Operating Temperature	-65°C to +150°C
Storage Temperature	-65°C to +150°C
Junction Temperature	+175°C
Mounting Temperature	+260°C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. MACOM does not recommend sustained operation near these survivability limits.

Handling Procedures

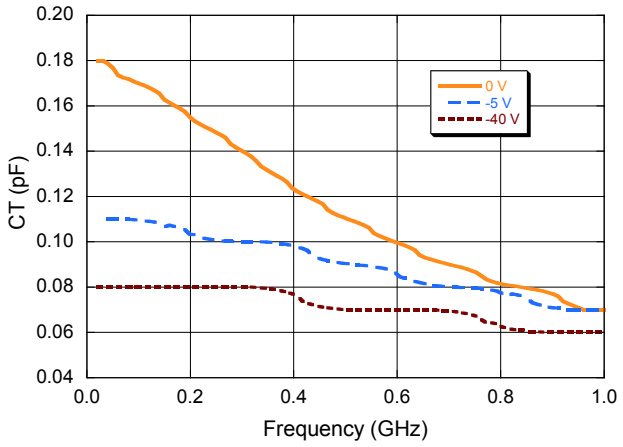
Please observe the following precautions to avoid damage:

Static Sensitivity

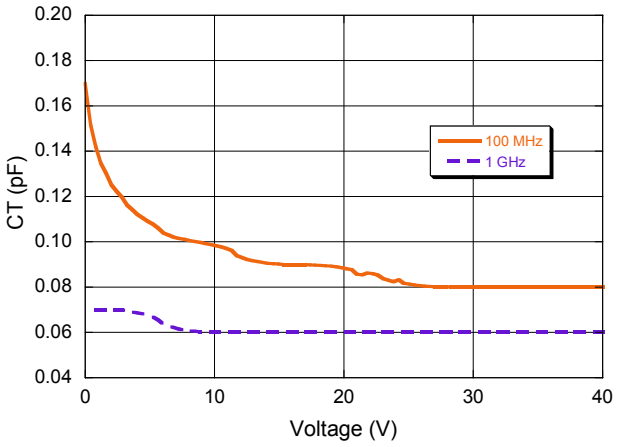
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves

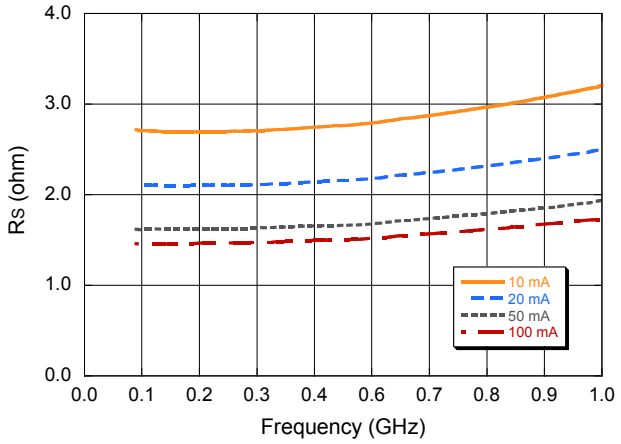
Capacitance vs. Frequency



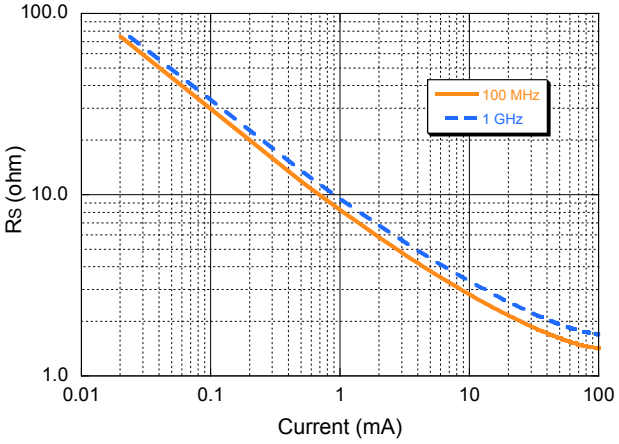
Capacitance vs. Voltage



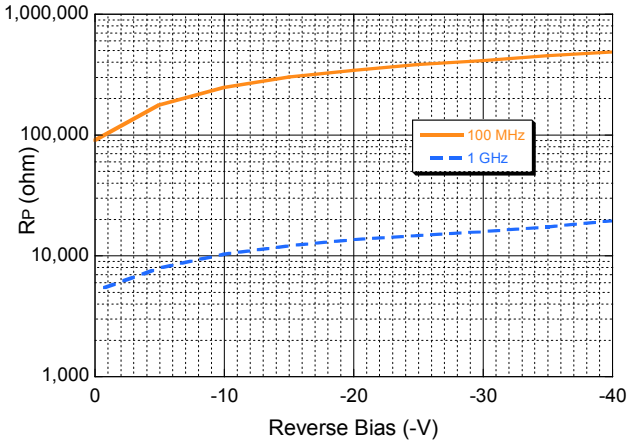
Series Resistance vs. Frequency



Series Resistance vs. Current

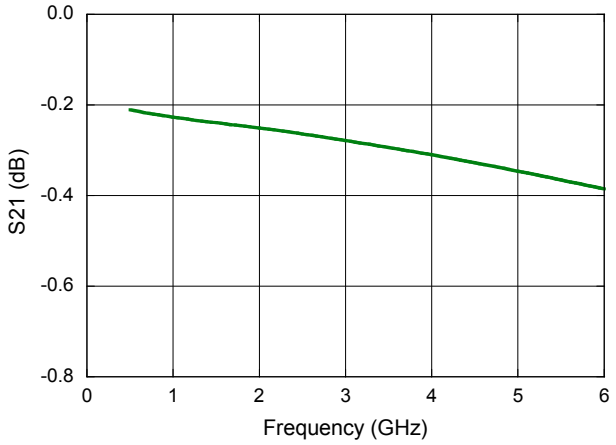


Series Resistance vs. Reverse Bias

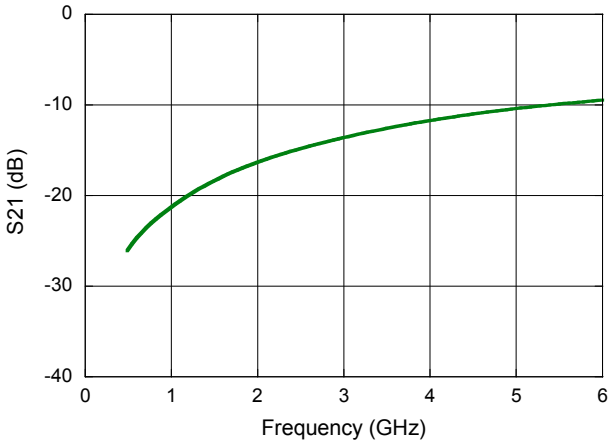


Typical Performance Curves

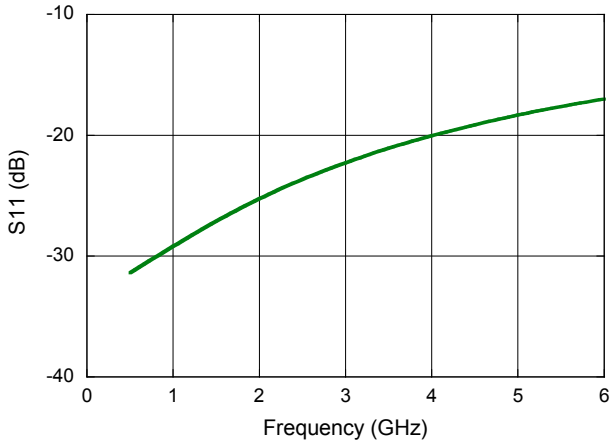
Insertion Loss vs. Frequency



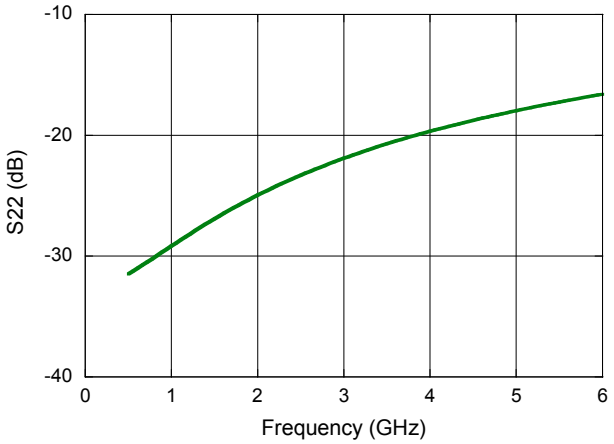
Isolation vs. Frequency



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



Handling

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.

Die Attach

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 devices and are removed from the active junction locations. These devices are well suited for solder attachment onto hard and soft substrates. The use of 80Au/20Sn and 60Sn/40Pb solder is recommended. Conductive epoxy for attachment may also be used.

When soldering these devices to a hard substrate, hot gas die bonding is preferred. We re-commend utilizing a vacuum tip and 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 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. Equal Heat must be applied to both ohmic contacts. 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.

Recommended temperature and re-flow profiles for 60/40, Sn/Pb and RoHS compliant solders are provided in Application Note M538 , “Surface Mounting Instructions“.