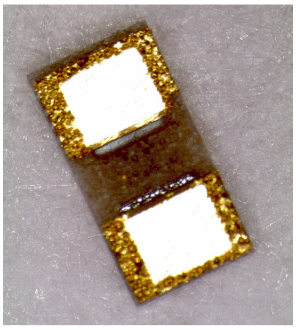
Semi-Scale PIN Diode Datasheet MSSP25250-70 PRELIMINARY



Features

- 0603 Surface Mount PIN Diode
- Lower Parasitics than Comparable Surface Mount Devices
- Higher Average Power Handling > 10 W C.W.
- Higher Voltage Rating > 300 Volts for Higher RF Peak Power
- Lower Rs < 1.0 Ω (Lower Insertion Loss & Higher IIP3)
- Lower Thermal Resistance (< 30 ºC/W) for Higher Operating Power
- RoHS Compliant

Description

The MSSP25250-70 Semi-Scale PIN Diode is manufactured using Aeroflex/Metelics proprietary diode process which provides an ultra-low parasitic PIN Diode in a 0603 Surface Mount package. This proprietary and unique geometry offers lower electrical and thermal resistance to provide higher average power performance to comparable surface mount diode packages. The low RC product (< 0.35 pS) and ultra-low parasitic Ls (< 0.1 nH) and Cpar (< 0.02 pF), optimize control circuit frequency performance beyond 6 GHz.

With lower Thermal Resistance (< 30 ºC/W), RF C.W. incident power levels of + 40 dBm and RF peak incident power levels of + 55 dBm are very achievable in higher power cold and hot switching applications. The low series resistance (< 1.0 Ω), coupled with the longer minority carrier lifetime, (> 500 ηS), provides better IIP3 distortion values > + 65 dBm, for RF and Microwave Switches.

Applications

The MSSP25250-70 Semi-Scale PIN Diode is designed to be used in Higher Power Switch and Attenuator applications, operating from 10 MHz to 6 GHz, requiring high volume, surface mount manufacturing. These devices are durable, reliable, and are capable of meeting all military, commercial, and industrial applications. The devices are fully RoHS compliant.

Environmental Capabilities

The MSSP25250-70 Semi-Scale PIN Diode is capable of meeting the environmental requirements of MIL-STD-750 and MIL-STD-220.

ESD Rating

PIN Diodes are susceptible to ESD conditions as with all semiconductors.
The ESD rating for this device is Class 1A, HBM.

MSSP25250-70 Electrical Specifications @ T_A = + 25 °C (Unless Otherwise Defined)

Parameter	Symbol	Units	Test Conditions	Minimum Value	Typical Value	Maximum Value
Voltage Breakdown	-Vb	Volts	| - 10 µA | @ D.C.	| - 300 |	| - 400 |	
Forward Voltage	Vf	Volts	+ 100 mA @ D.C.	0.8	1.1	1.2
Reverse Leakage Current	- Ir	ηA	| - 100 V | @ D.C.		| -20 |	| -100 |
Series Resistance	Rs	Ω	+ 100 mA @ 1 GHz		0.9	1.2
Parallel Resistance	Rp	KΩ	-40 V @ 1 GHz	50	150	
Capacitance	Ct	pF	-100 V @ 1 MHz		0.27	0.32
Minority Carrier Lifetime	T_L	ηS	(50% Control – 90 % Output Voltage) If =+10 mA /-Ir =- 6 mA F = 1 KHz	400	500	700
C.W. Thermal Resistance	θ	°C/W	I_H = 1A, I_L = 10 mA		30	35

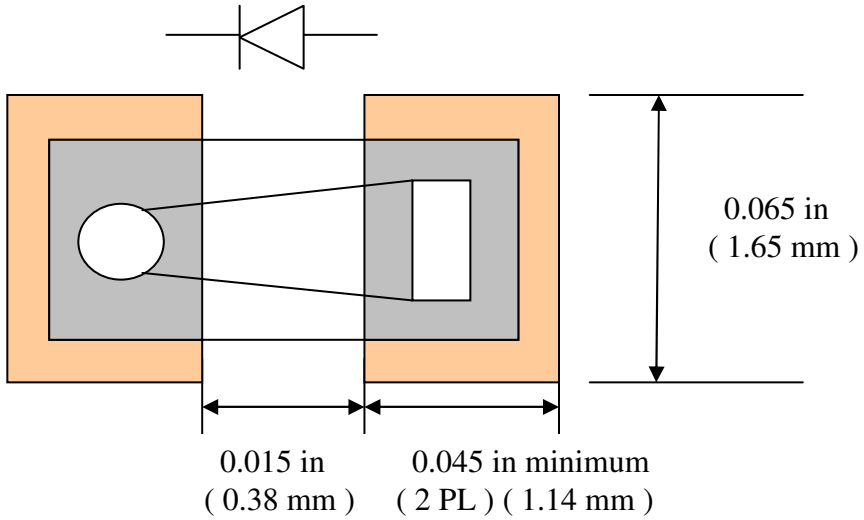
Electrical Specification Notes:

1. Series Resistance, (Rs) and Parallel Resistance (Rp) are measured on the HP 4291 Impedance Analyzer.
2. Total Capacitance, (Ct) is the summation of the Diode Junction Capacitance, (Cj), and the Parasitic Capacitance, Cpar.

Absolute Maximum Ratings @ T_A = + 25 °C (Unless Otherwise Defined)

Parameter	Absolute Maximum Value
Forward Current	500 mA
Reverse Voltage	| -400 | V
Forward Voltage	1.2 V @ 100 mA
Operating Temperature	- 65 °C to + 125 °C
Storage Temperature	- 65 °C to + 150 °C
Junction Temperature	+ 175 °C
Total Dissipated RF & D.C. Power (Diode Case on FR4 as a Series Diode Configuration)	2.0 W @ + 25 °C De-Rate Linearly at -13.3 mW / °C to 0 W @ + 175 °C
Total Dissipated RF & D.C. Power (Diode Case at Thermal Ground as a Shunt Diode Configuration)	5.0 W @ + 25 °C De-Rate Linearly at -33.3 mW / °C to 0 W @ + 175 °C
Assembly Temperature	+ 260 °C for 10 Seconds

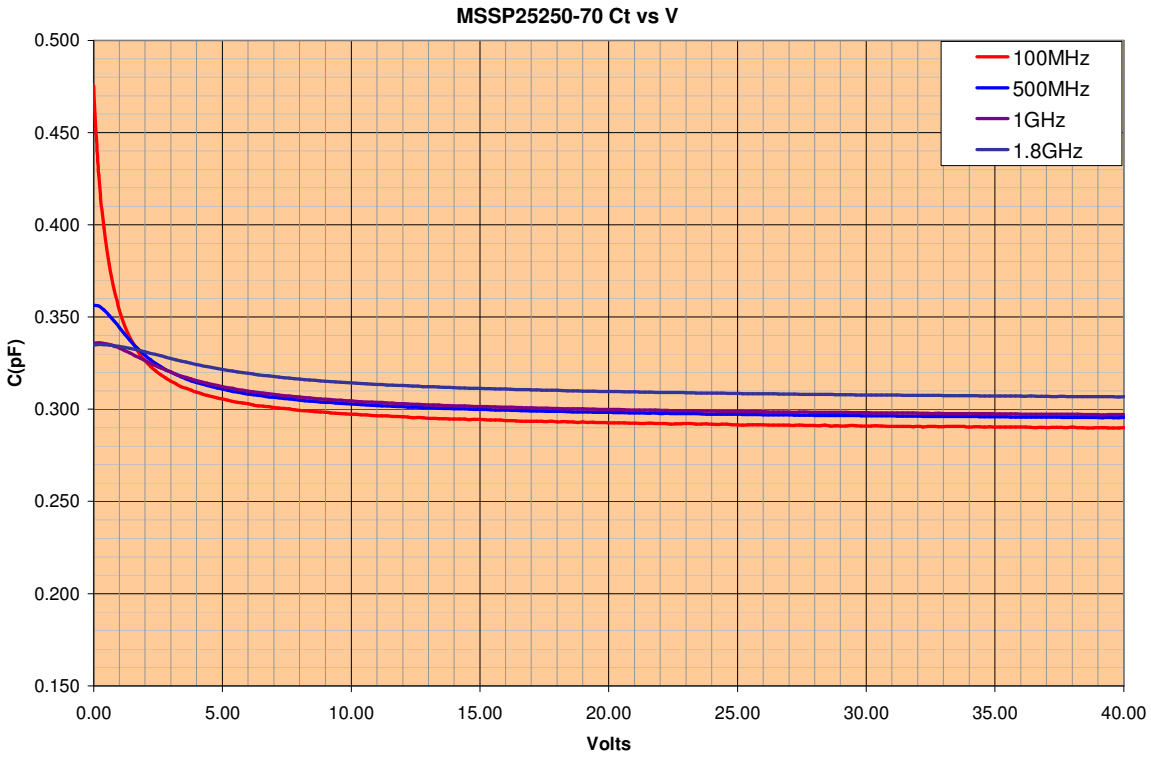
Circuit Pad Layout for MSSP25250-70 Semi-Scale PIN Diode (Topview)

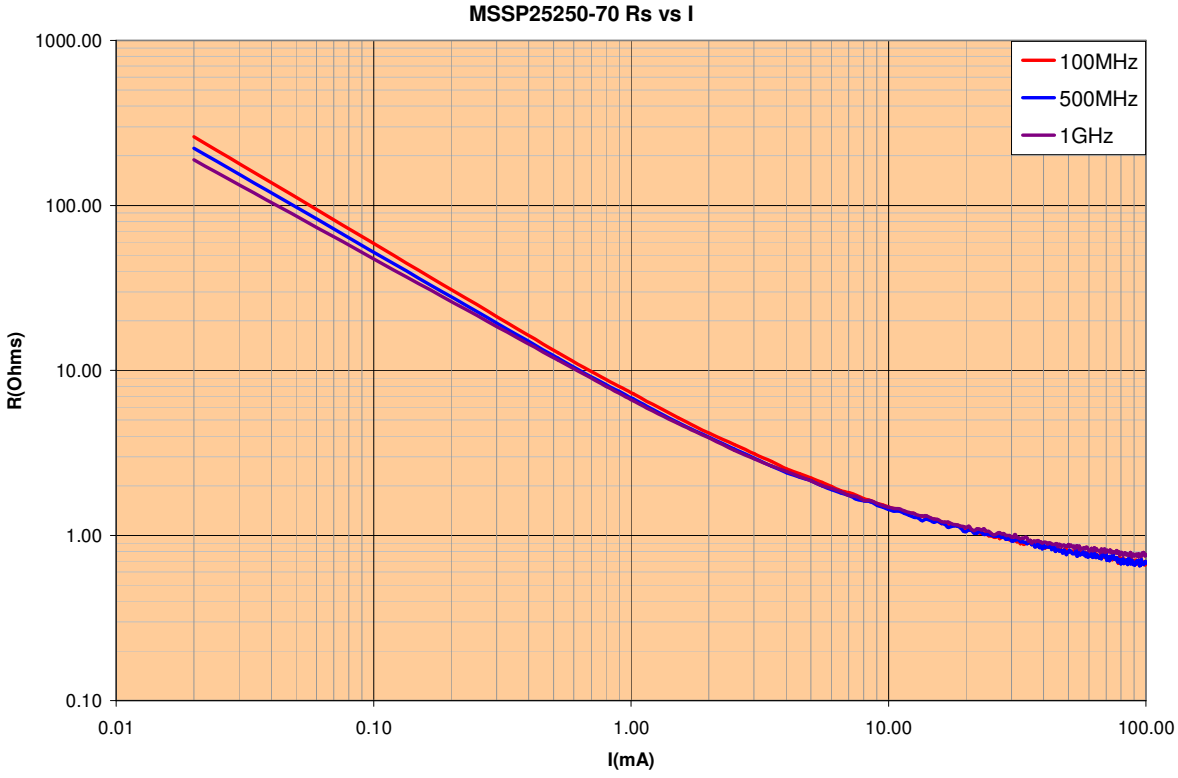


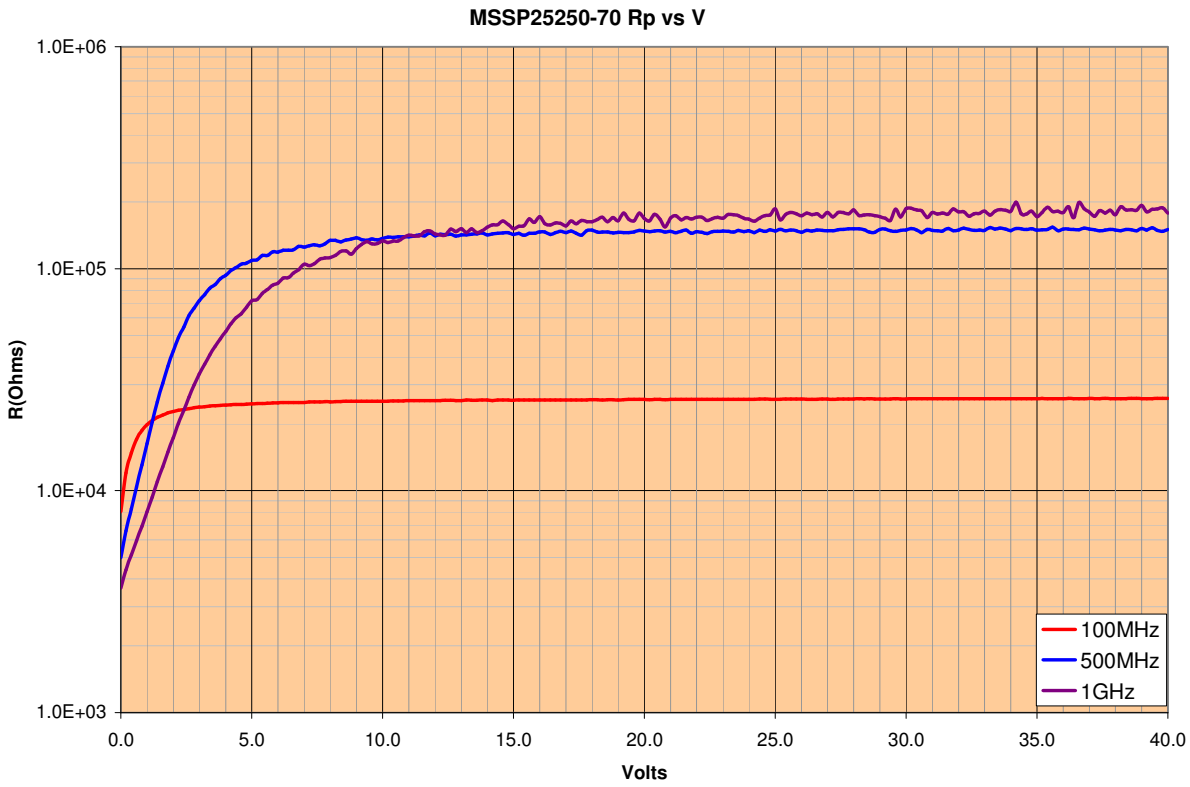
Assembly Instructions

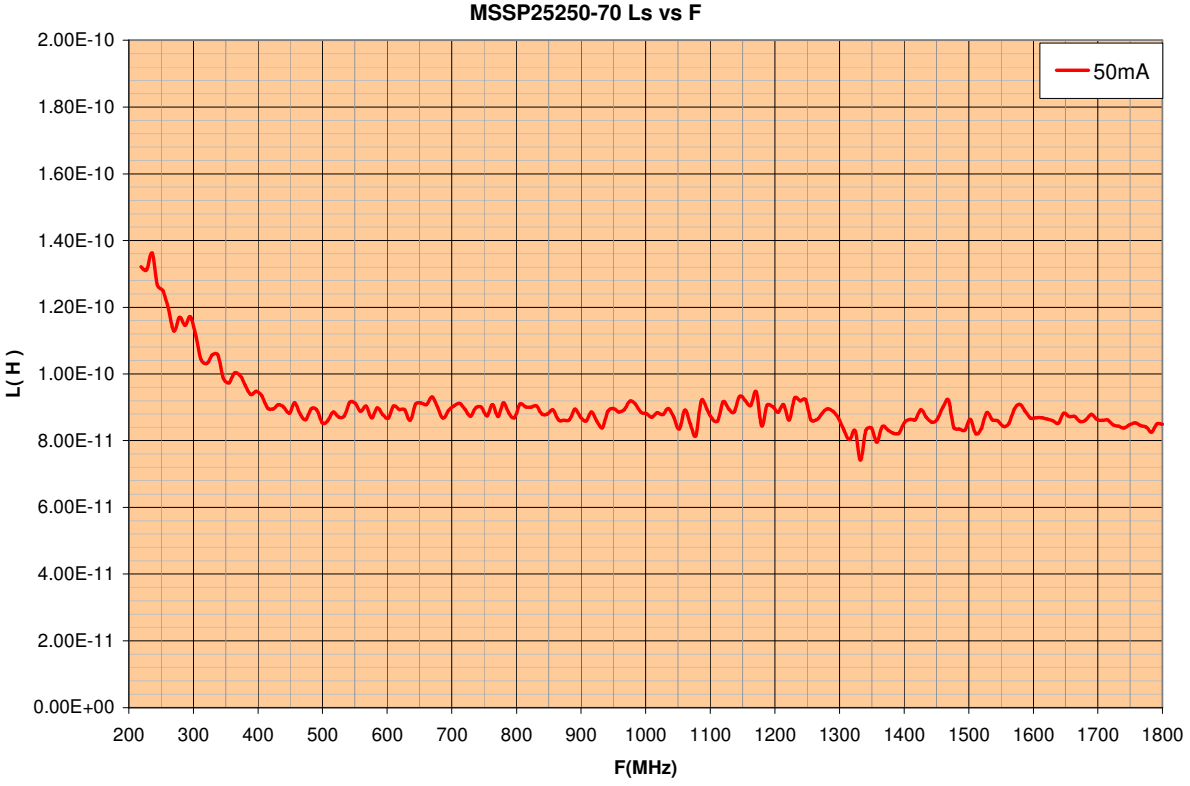
The Semi-Scale PIN Diodes are capable of being placed onto circuit boards with pick and place manufacturing equipment from tape-reel dispensing. The devices are attached to the circuit using conventional solder re-flow or wave soldering procedures with RoHS type or Sn 63 / Pb 37 type solders.

MSSP25025-70 Parametric Performance @ + 25 ºC

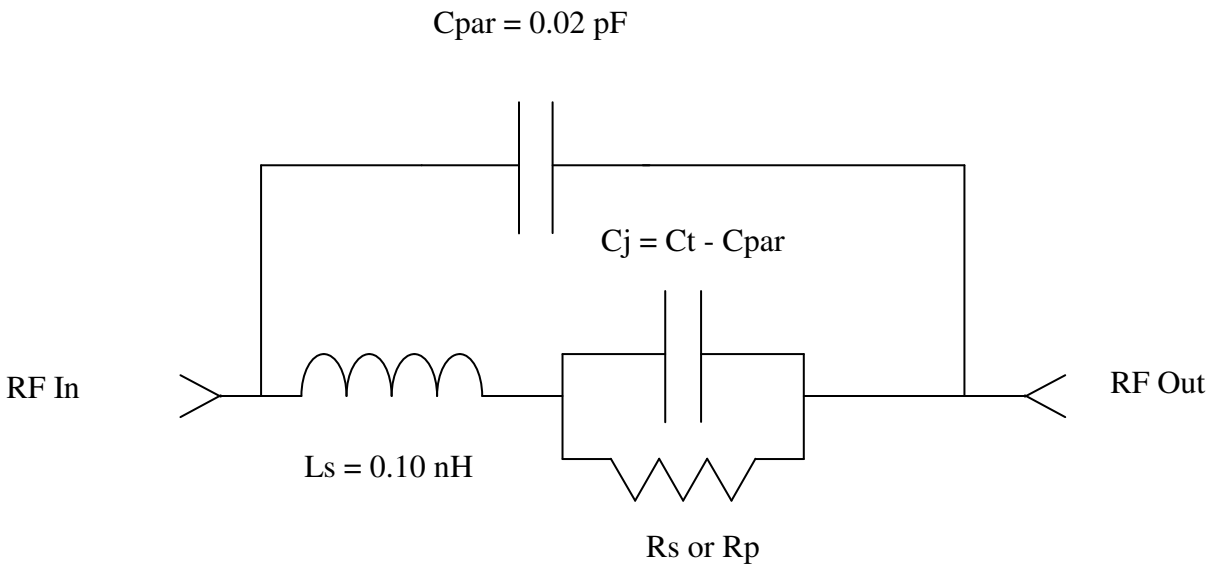





MSSP25250-70 Rp vs V
1.0E+06
1.0E+05
1.0E+04
1.0E+03
R(Ohms)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Volts
100MHz
500MHz
1GHz


MSSP25250-70 Ls vs F
2.00E-10
1.80E-10
1.60E-10
1.40E-10
1.20E-10
1.00E-10
8.00E-11
6.00E-11
4.00E-11
2.00E-11
0.00E+00
L(H)
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
F(MHz)
50mA

MSSP25250-70 Device Model



MSSP25250-70 SPICE Values

Parameter	Description	Value	Unit
Is	Saturation Current	1.0 E-14	Amps
Vi	I-region Forward Bias Voltage Drop	0.00	Volts
BV	Breakdown Voltage	400	Volts
UN	Electron Mobility	900	$cm^2/V\text{-}s$
WI	I – Region Width	2.5 E-5	Meters
Rr	I-region 0V Bias Resistance	1.0 E+4	Ω
Cmin	PIN Punchthrough Capacitance	3.0 E-13	Farads
TAU	Am bipolar I-region Lifetime	5.0 E-7	Sec
Rs	Ohmic Resistance	0.9	Ω
CJ0	Junction Capacitance @ 0V	3.5 E-13	Farads
Vj	Junction Potential	0.70	Volts
M	Grading Coefficient	1.0	None
KF	Flicker Noise Coefficient	0	None
AF	Flicker Noise Exponent	1.0	None
FC	Forward Bias Depletion Capacitance Coefficient	0.5	None
FFE	Flicker Noise Frequency Exponent	1.0	None

MSSP25250-70 Outline Drawing (Case Style 70)