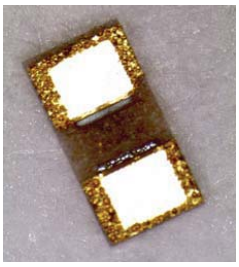
SEMI-SCALE™ PIN Diodes

MSSP25250-70 Series Datasheet

Features

- 0603 Surface Mount PIN Diode
  (1.5 mm x 0.76mm x 0.2 mm H)
- Lower Parasitics than Comparable Surface Mount Devices
- Higher Average Power Handling > 10 W C.W.
- Higher Voltage Rating > 350 Volts for Higher RF Peak Power
- Lower Rs < 1.2 Ω (Lower Insertion Loss & Higher IIP3)
- Lower Thermal Resistance (<30 °C/W) for Higher Operating Power
- RoHS Compliant



Circuit Side View

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 (< 0.15 nH) and Cpar (< 0.025 pF), optimize control circuit frequency performance for series or shunt diode configurations.

With lower Thermal Resistance (< 30 °C/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 (< 1.2 Ω), coupled with the longer minority carrier lifetime, (>500 ηS), provides better IIP3 distortion values > + 85 dBm, for RF and Microwave Switches.

Applications

The MSSP25250-70 SEMI-SCALE™ PIN Diode is designed to be used in Series, Series-Shunt, and Shunt Configurations 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-202, MILSTD-750, and MIL-STD-883..

ESD Rating

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

Document No. DS12636, Rev. A
Revision Date: 6/3/09

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

Parameter	Symbol	Units	Test Conditions	Minimum Value	Typical Value	Maximum Value
Voltage Breakdown (See Note 1)	-Vb	Volts	| - 10 µA | @ DC	| - 350 |	| - 400 |	
Forward Voltage	Vf	Volts	+100 mA @ DC	0.8	1.1	1.2
Reverse Leakage Current	- Ir	ηA	| -100 V | @ DC		| -20 |	| -50 |
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		0.28	0.32
Minority Carrier Lifetime	TL	µS	(50% Control – 90 % Output Voltage) If =+10 mA /-Ir =- 6 mA F = 1 KHz	400	500	700
C.W. Thermal Resistance	θ	°C/W	IH = 1A, IL = 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 in Air Ambient)	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)	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

Part Number Ordering Information:

Part Number	Packaging
MSSP25250-70-W	Waffle-Pack
MSSP25250-70-R	Tape-Reel

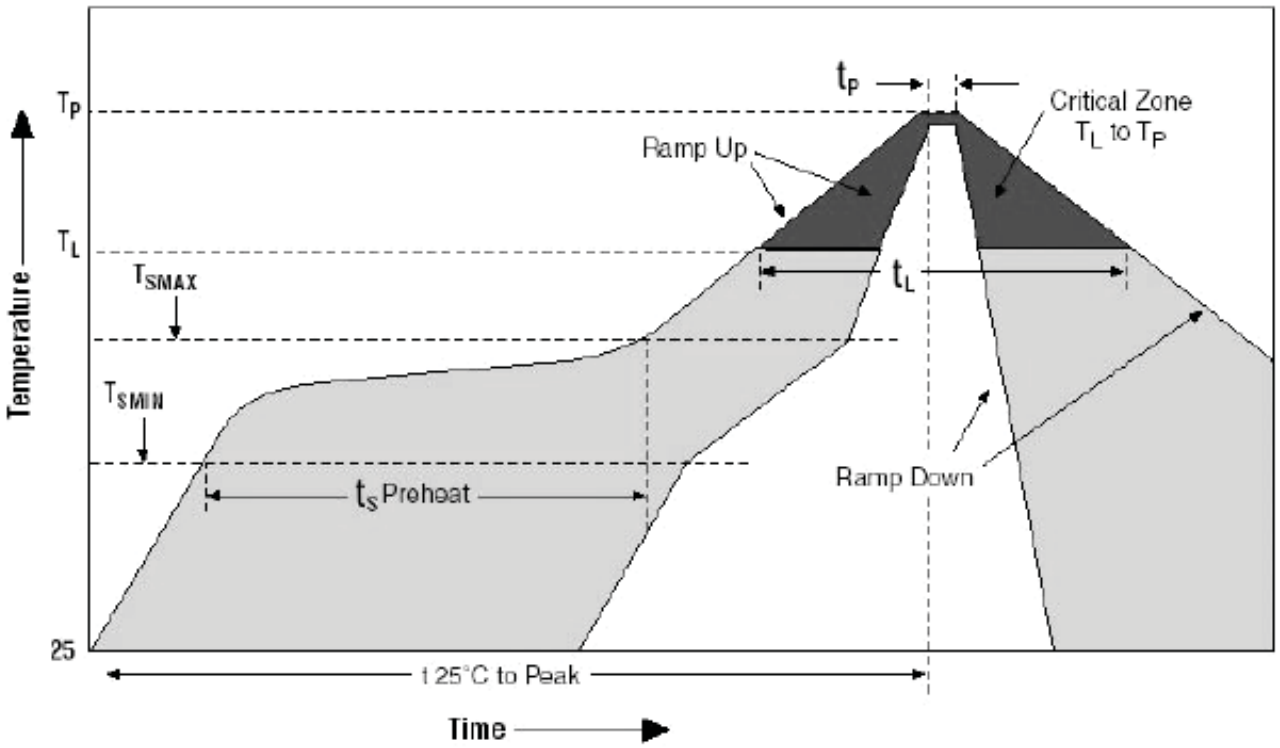
Assembly Instructions

The SEMI-SCALE™ PIN Diodes are capable of being placed onto circuit boards with pick and place manufacturing equipment from standard waffle-pack or 7 " and 13" diameter tape-reel dispensing. The devices are attached to the circuit board using conventional solder re-flow or wave soldering procedures with RoHS type or Sn 63 / Pb 37 type solders per Table I and Graph I Time-Temperature recommended profile.

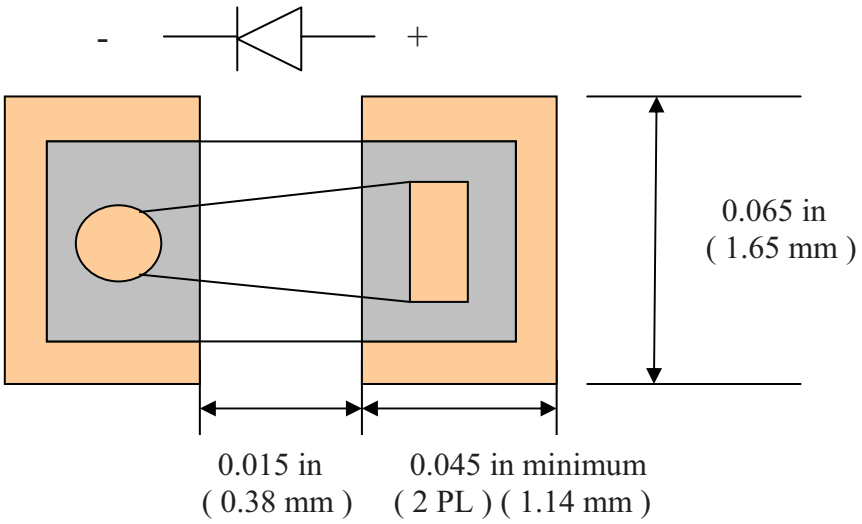
Table 1: Time-Temperature Profile for Sn 60/Pb40 or RoHS Type Solders

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	3°C/second maximum	3°C/second maximum
Preheat - Temperature Minimum (T_{SMIN}) - Temperature Maximum (T_{SMAX}) - Time (Minimum to maximum) (t_S)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
T_{SMAX} to T_L - Ramp-up Rate	 	 3°C/second maximum
Time Maintauined above: - Temperature (T_L) - Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature (T_P)	225 +0 / -5°C	245 +0/-5°C
Time within 5°C of actual Peak Temperature (T_P)	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second maximum	6°C/second maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

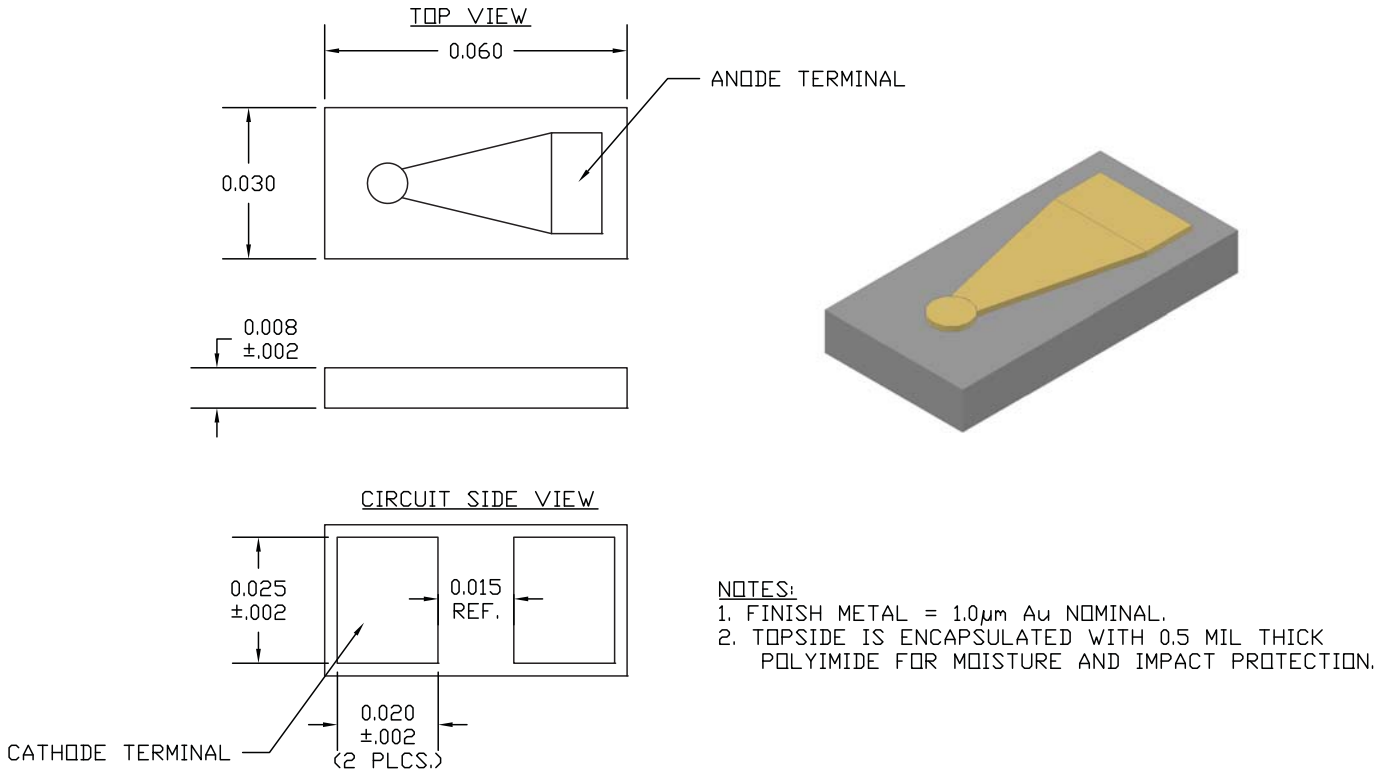
Graph1: Solder Re-Flow Time-Temperature Function



Circuit Pad Layout for MSSP25250-70 SEMI-SCALE™ PIN Diode (Topview)



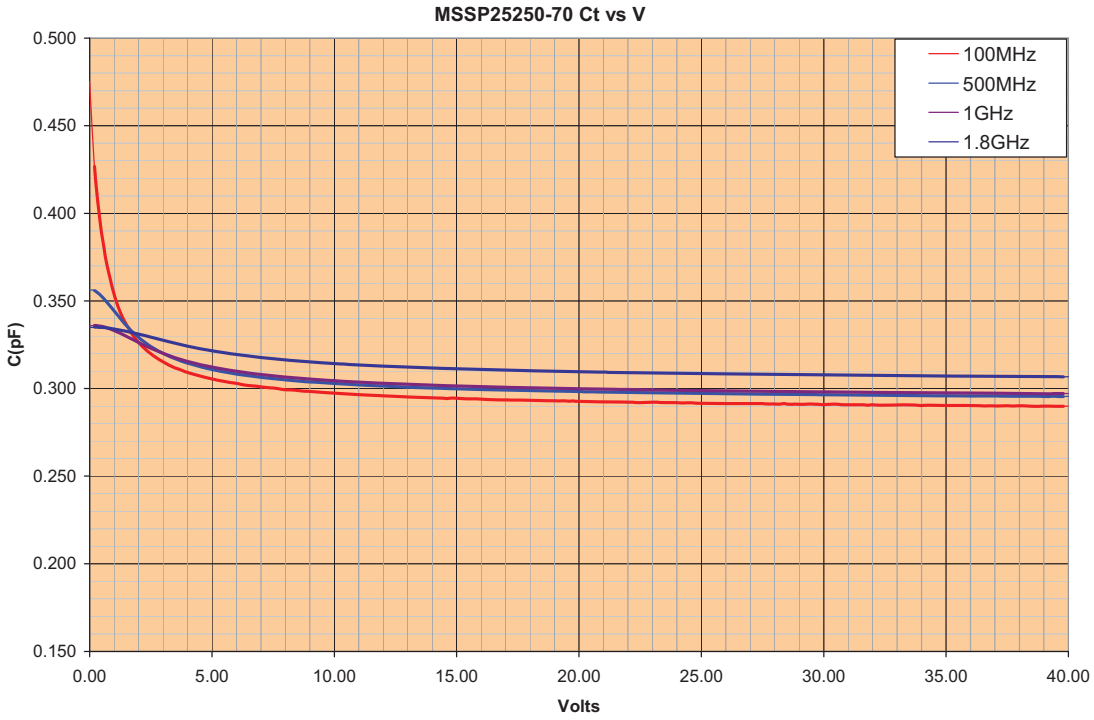
MSSP25250-70 Outline Drawing (Case Style 70)

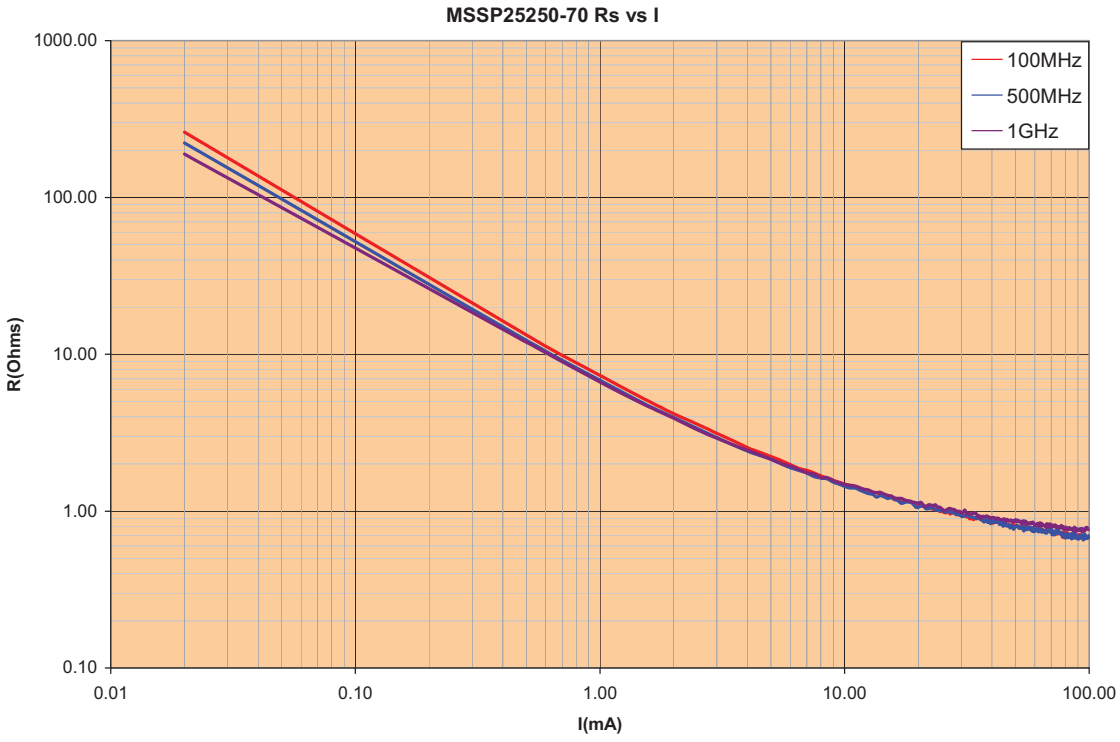


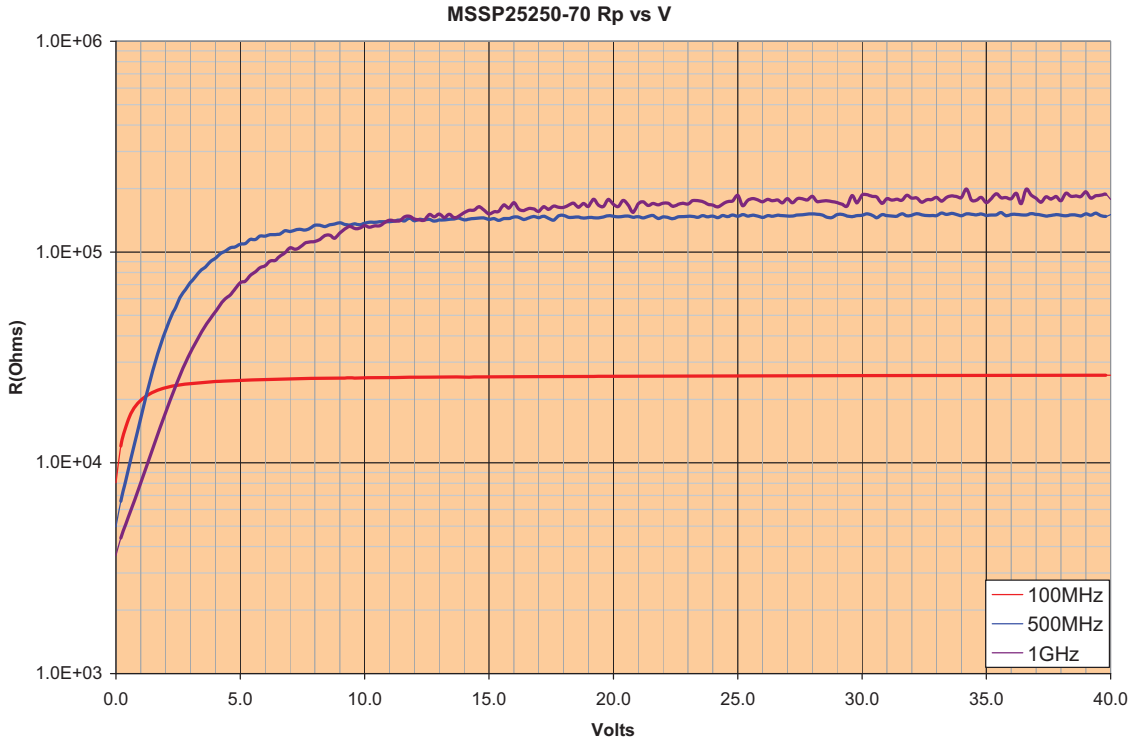
NOTES:
1. FINISH METAL = 1.0µm Au NOMINAL.
2. TOPSIDE IS ENCAPSULATED WITH 0.5 MIL THICK POLYIMIDE FOR MOISTURE AND IMPACT PROTECTION.

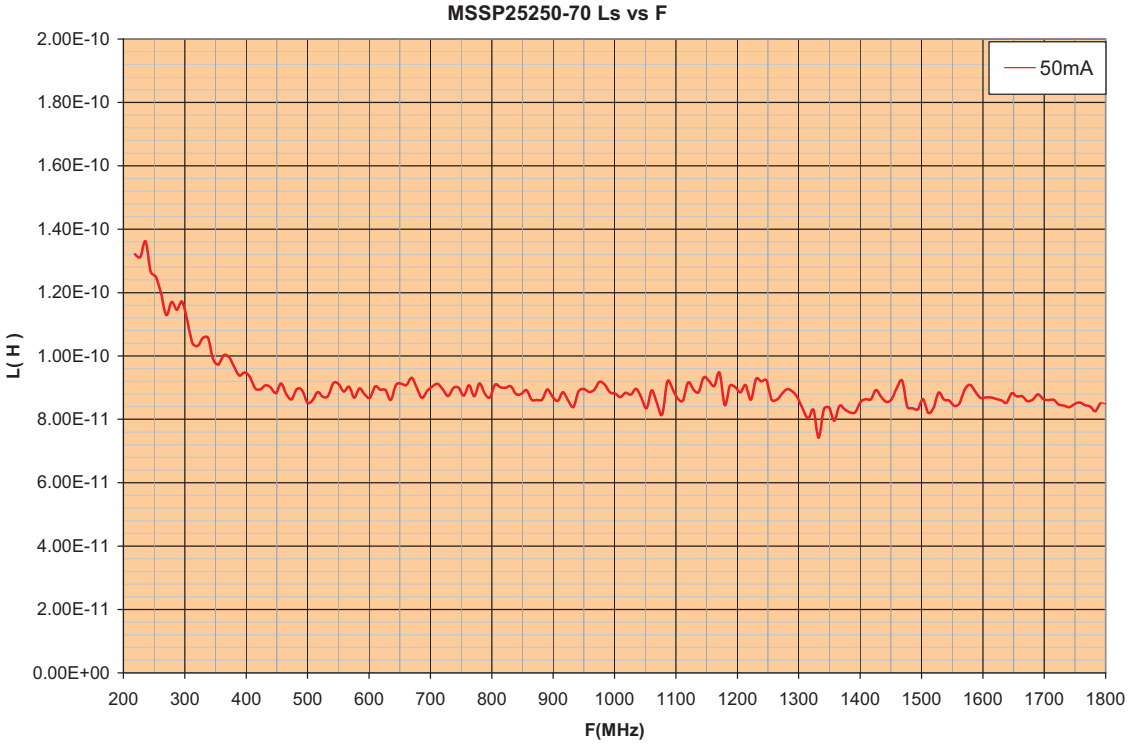
Top View

MSSP25025-70 Parametric Performance @ + 25 ºC

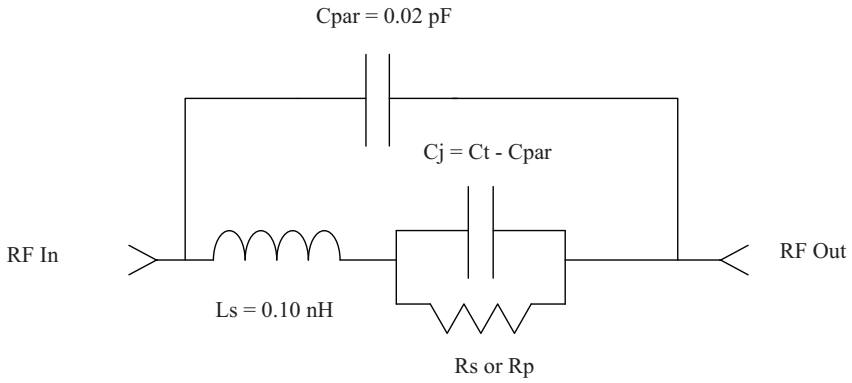





MSSP25250-70 Rp vs V
1.0E+06
1.0E+05
1.0E+04
1.0E+03
R(Ohms)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Volts
100MHz
500MHz
1GHz


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

DEVICE MODEL



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	cm2/V-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	ΩΩ
CJ0	Junction Capacitance @ 0V	4.0 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

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ISO 9001:2000

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A passion for performance.

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

Revision Date: 6/3/09