Switch, SP4T, 50 W
30 MHz - 5 GHz

MASW-011201
Rev. V1

Features

- CW Power Handling: 47 dBm @ +85°C, 4 GHz
- Peak Power Handling: 58 dBm @ +85°C, 4 GHz
- Insertion Loss: 0.8 dB @ 4 GHz
- Isolation: 35 dB @ 4 GHz
- Positive DC Bias
- Lead-Free 11.0 x 8.0 x 2.4 mm Package
- RoHS* Compliant

Applications

- Broadband
- MIL-COM
- IED
- Cellular

Description

The MASW-011201 is a high power PIN diode SP4T switch in a common anode configuration, operating from 30 MHz to 5 GHz. It features low insertion loss and excellent linearity. This device is capable of handling 50 W CW of incident power at a base plate temperature of +85ºC.

This high power switch is ideal for use on broadband, MIL-COM, IED, and cellular applications that require higher CW and pulsed power operation. This device operates with positive-only DC bias, making it suitable for switch-filter and power amplifier control circuits.

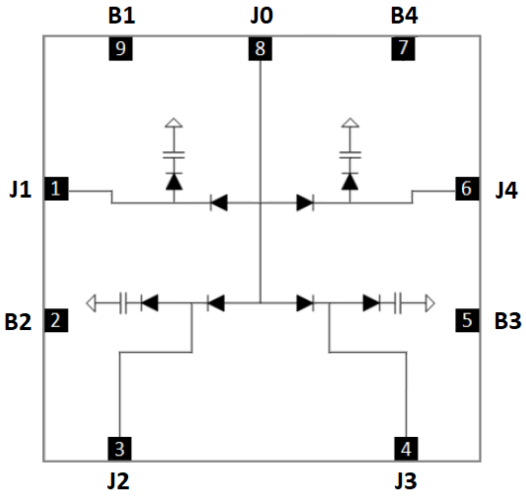
The MASW-011201 is manufactured using MACOM's hybrid manufacturing process featuring high voltage PIN diodes and passive devices integrated in a 11 x 8 x 2.4 mm QFN style 8-lead ceramic package.

Ordering Information[1]

Part Number	Package
MASW-011201	Parts in Gel-Pak
MASW-011201-SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration[2]

Pin #	Function
1	J1 RF Output
2	B2 Shunt Diode DC Bias
3	J2 RF Output
4	J3 RF Output
5	B3 Shunt Diode DC Bias
6	J4 RF Output
7	B4 Shunt Diode DC Bias
8	J0 RF Input
9	B1 Shunt Diode DC Bias
Paddle[3]	Ground

2. MACOM recommends connecting all No Connection (N/C) pins to ground.
3. The exposed paddle centered on the package bottom must be connected to RF, DC and thermal ground.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Electrical Specifications:
T_A = 25°C, P_{IN} = 0 dBm, Z_0 = 50 Ω, Bias[4] = 4 V / 300 mA, 100 V / 25 mA

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	1 GHz 3 GHz 5 GHz	dB	—	0.35 0.60 1.20	0.6 1.0 1.7
Isolation	1 GHz 3 GHz 5 GHz	dB	43 34 26	48 43 35	—
Return Loss	1 GHz 3 GHz 5 GHz	dB	—	25 17 12	—
CW Incident Power[4]	85°C Base plate, 4 GHz	dBm	—	47	—
Peak Incident Power[4]	85°C Base plate, 4 GHz, 10 µs RF pulse width, 5% duty cycle	dBm	—	58	—
Input IP3	F1 = 900 MHz, F2 = 910 MHz 44 dBm / Tone	dBm	—	74	—
T_{ON}, T_{OFF}	50% control - 90% RF and 10% RF 10 KHz Rep. Rate in Commutating Mode	µs	—	10	—
T_{RISE}, T_{FALL}	10 - 90% RF Voltage 10 KHz Rep. Rate in Commutating Mode	µs	—	5	—

4. Maximum source and load VSWR = 1.2:1 each.

Nominal Operating Conditions[5,6]

Parameter	Nominal Value
CW Incident Power	48 dBm @ +60°C 47 dBm @ +85°C
Peak Incident Power	10 µs, 5% duty 59 dBm @ +60°C 58 dBm @ +85°C
DC Operating Voltage & Current Bias $+V_{CC}$ $+V_{DD}$	 4 ±3% V @ 300 mA 100 ±3% V @ 25 mA
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C

5. Operating at nominal conditions with $T_J \leq +175°C$ will ensure MTTF > 1 x 10^6 hours.
6. Maximum Source VSWR = 1.2 :1 and Load VSWR = 1.2:1

Maximum Survivability Ratings[7,8]

Parameter	Absolute Maximum
CW Incident Power	50 dBm @ +60°C 49 dBm @ +85°C
Peak Incident Power	10 µs, 5% duty 61 dBm @ +60°C 60 dBm @ +85°C
DC Operating Voltage & Current Bias $+V_{CC}$ $+V_{DD}$	 5 ±10% V @ 400 mA 200 ±3% V @ 50 mA
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C

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

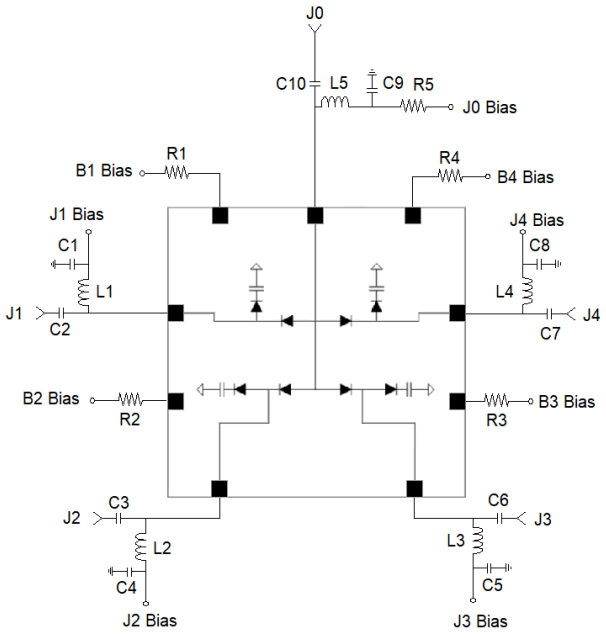
DC Bias to RF Truth Table[8]

Insertion Loss Typical Bias State = 4 V @ 300 mA, Isolation Bias Typical State = 100 V @ 25 mA

RF State	J0 Bias (VCOM)	J1 Bias (SER1)	B1 Bias (SH1)	J2 Bias (SER2)	B2 Bias (SH2)	J3 Bias (SER3)	B3 Bias (SH3)	J4 Bias (SER4)	B4 Bias (SH4)
J0 - J1 Insertion Loss J0 - J2 Isolation J0 - J3 Isolation J0 - J4 Isolation	4 V @ 300 mA	0 V @ 300 mA	100 V @ 0 mA	100 V @ 25 mA	0 V @ 25 mA	100 V @ 25 mA	0 V @ 25 mA	100 V @ 0 mA	0 V @ 25 mA
J0 - J2 Insertion Loss J0 - J1 Isolation J0 - J3 Isolation J0 - J4 Isolation	4 V @ 300 mA	100 V @ 25 mA	0 V @ 25 mA	0 V @ 300 mA	100 V @ 0 mA	100 V @ 25 mA	0 V @ 25 mA	100 V @ 25 mA	0 V @ 25 mA
J0 - J3 Insertion Loss J0 - J1 Isolation J0 - J2 Isolation J0 - J4 Isolation	4 V @ 300 mA	100 V @ 25 mA	0 V @ 25 mA	100 V @ 25 mA	0 V @ 25 mA	0 V @ 300 mA	100 V @ 0 mA	100 V @ 25 mA	0 V @ 25 mA
J0 - J4 Insertion Loss J0 - J1 Isolation J0 - J2 Isolation J0 - J3 Isolation	4 V @ 300 mA	100 V @ 25 mA	0 V @ 25 mA	100 V @ 25 mA	0 V @ 25 mA	100 V @ 25 mA	0 V @ 25 mA	0 V @ 300 mA	100 V @ 0 mA

8. This device requires positive DC voltage to operate the PIN diodes under both the forward and reverse bias conditions. For safe operation of a reverse biased PIN diode at high power, the minimum DC bias voltage, applied to B1 - B4, is dependent on RF frequency, incident power, and VSWR. See the High Power DC Bias Voltage table for high power operation.

Application Schematic



Off-Chip Component Values[9]

Component	Value (50 MHz - 1 GHz)	Value (1 - 5 GHz)
C1, C4, C5, C8, C9	1000 pF	270 pF
C2, C3, C6, C7, C10	270 pF	6.8 pF
L1 - L5	560 nH	20 nH
R1 - R4	4 KΩ	4 KΩ
R5	6.8 Ω	6.8 Ω

9. Off-chip components must be rated appropriately to ensure safe performance under high power operation.

Handling Procedures

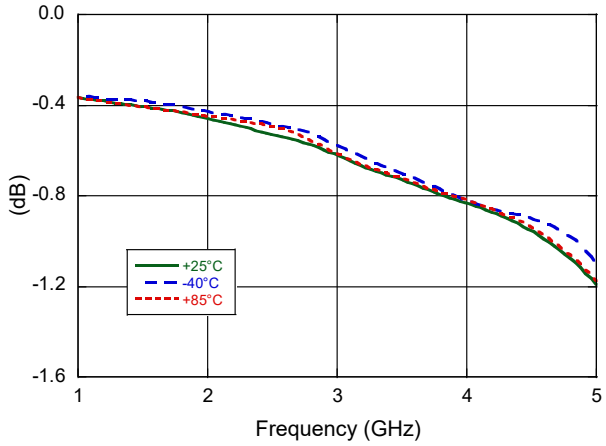
Please observe the following precautions to avoid damage:

Static Sensitivity

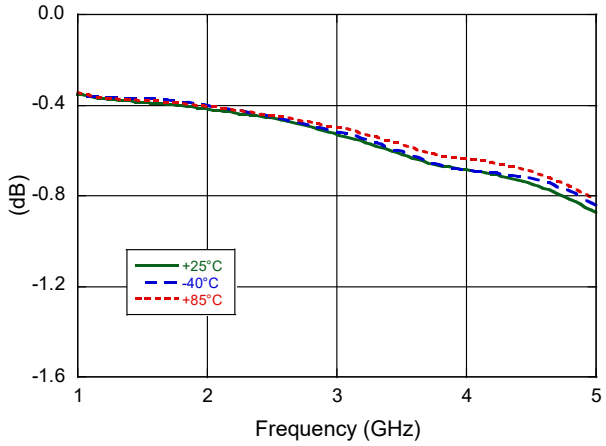
Silicon integrated circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class TBD HBM devices.

Typical Performance Curves: High Band

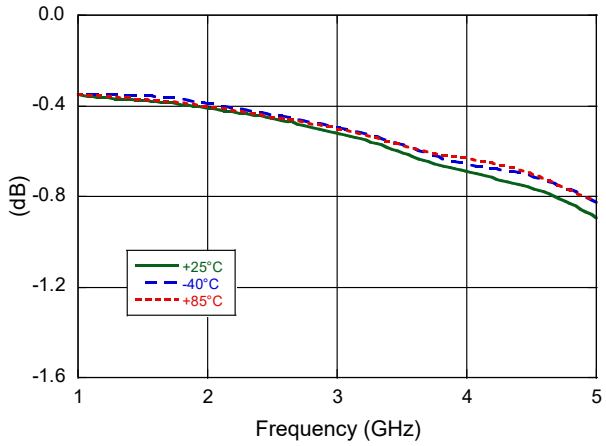
Insertion Loss (J0 - J1)



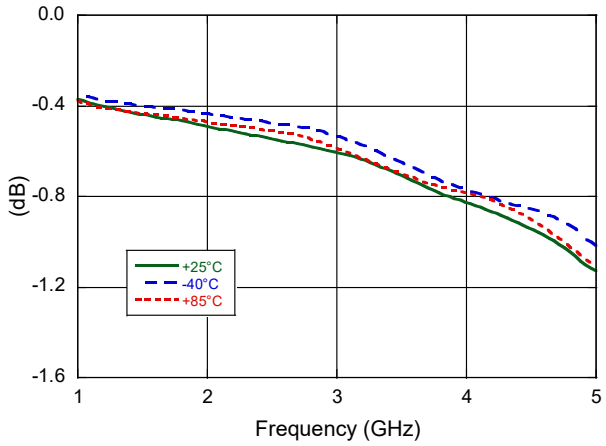
Insertion Loss (J0 - J2)



Insertion Loss (J0 - J3)

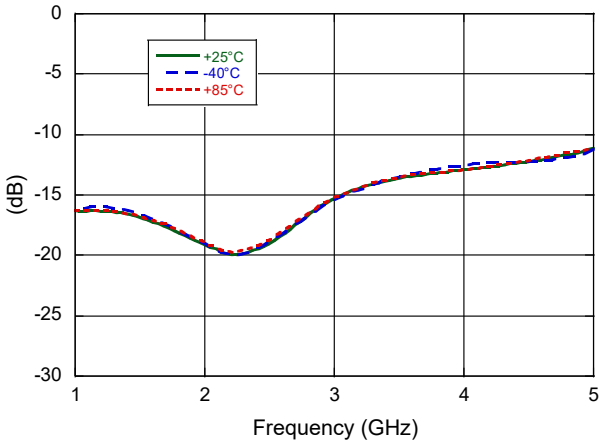


Insertion Loss (J0 - J4)

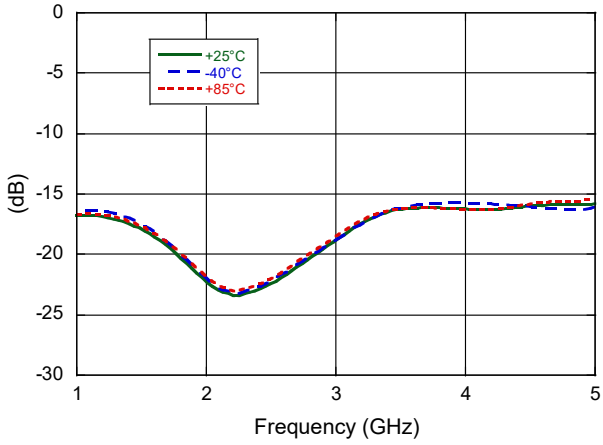


Typical Performance Curves: High Band

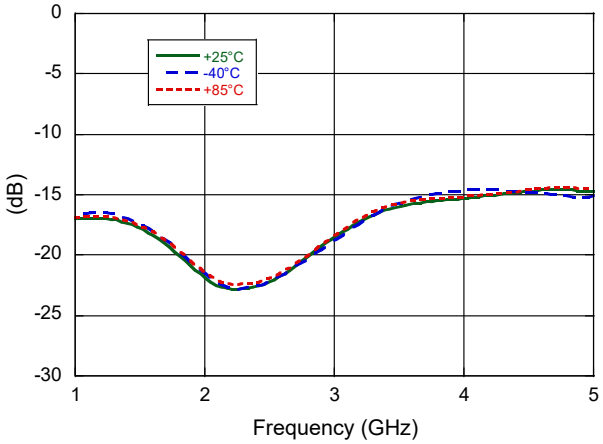
Input Return Loss (J0 - J1)



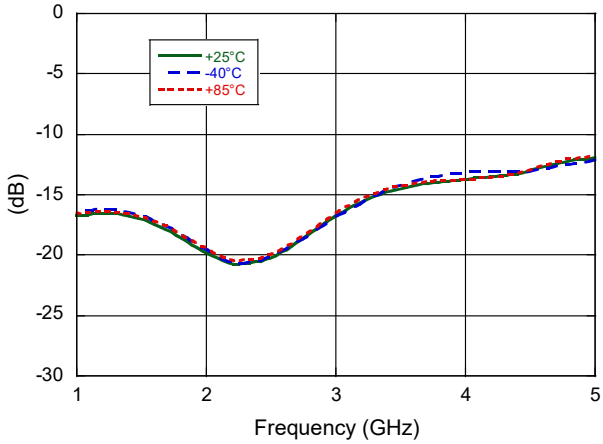
Input Return Loss (J0 - J2)



Input Return Loss (J0 - J3)

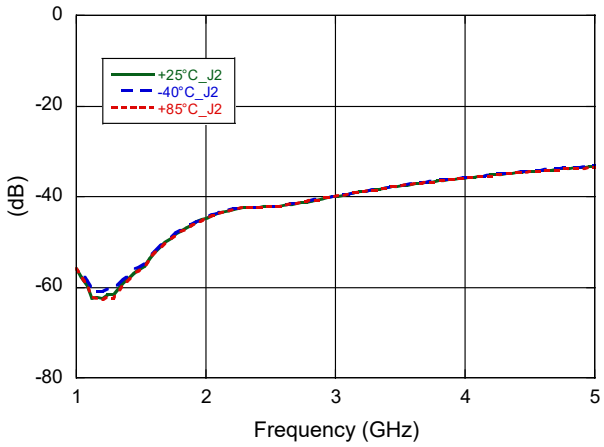


Input Return Loss (J0 - J4)

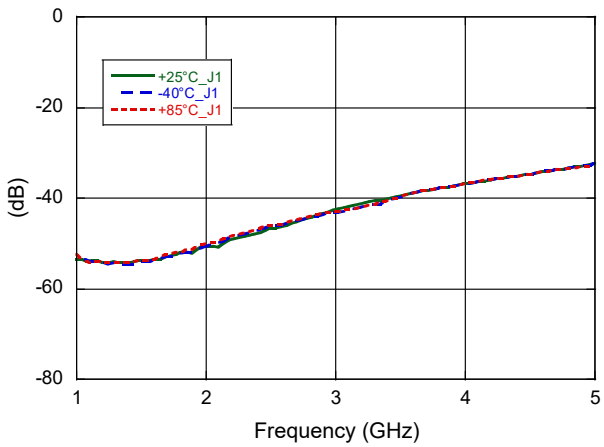


Typical Performance Curves: High Band

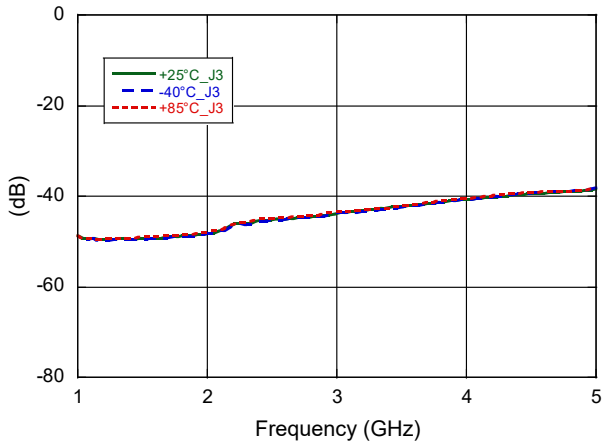
Isolation (J0 - J1), IL J2



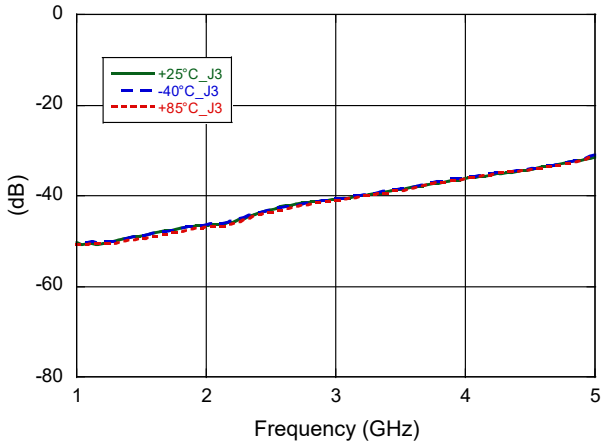
Isolation (J0 - J2), IL J1



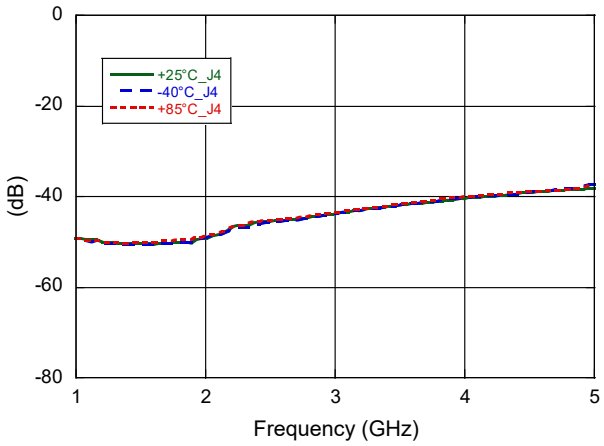
Isolation (J0 - J1), IL J3



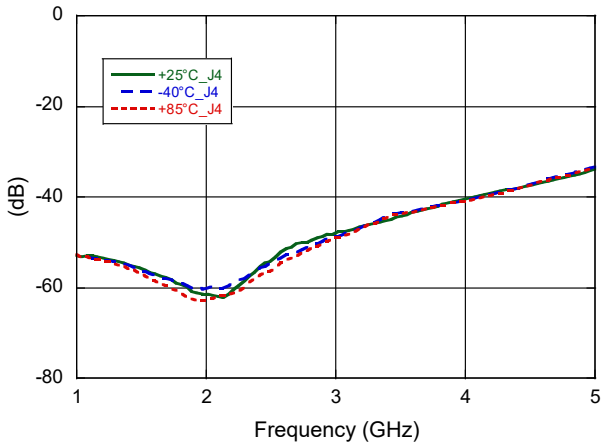
Isolation (J0 - J2), IL J3



Isolation (J0 - J1), IL J4

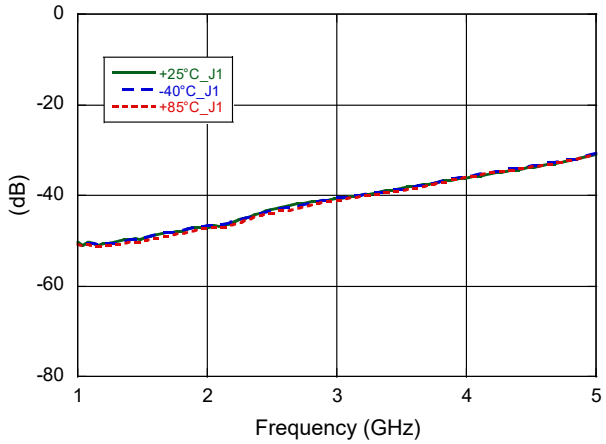


Isolation (J0 - J2), IL J4

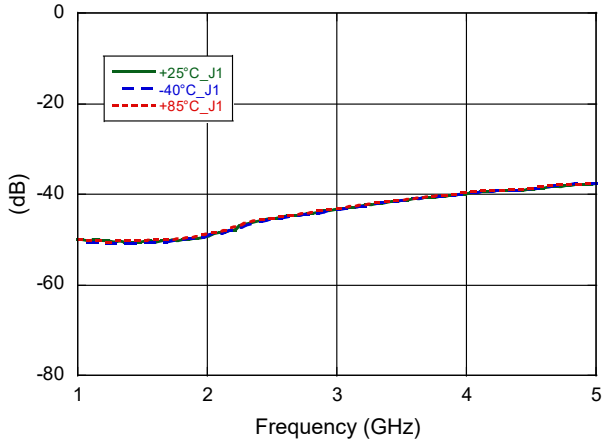


Typical Performance Curves: High Band

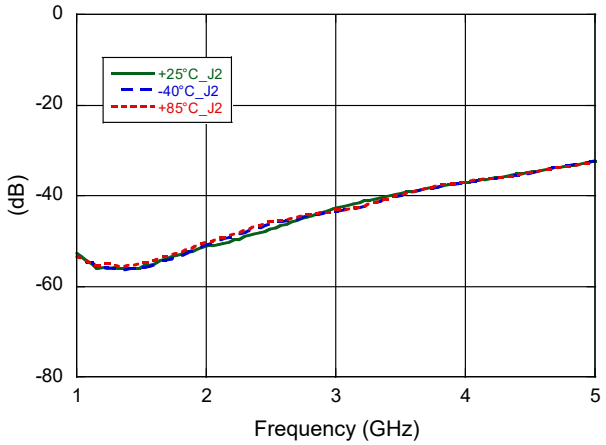
Isolation (J0 - J3), IL J1



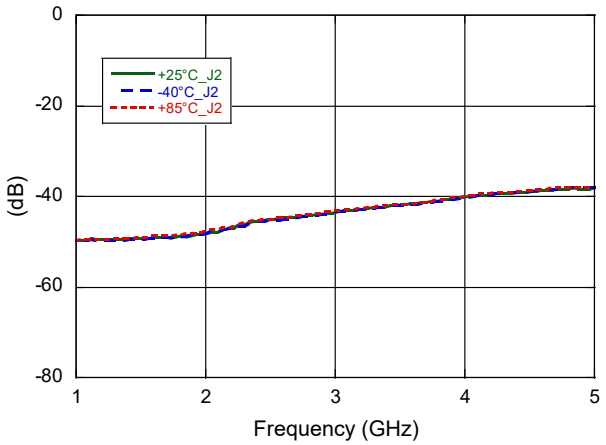
Isolation (J0 - J4), IL J1



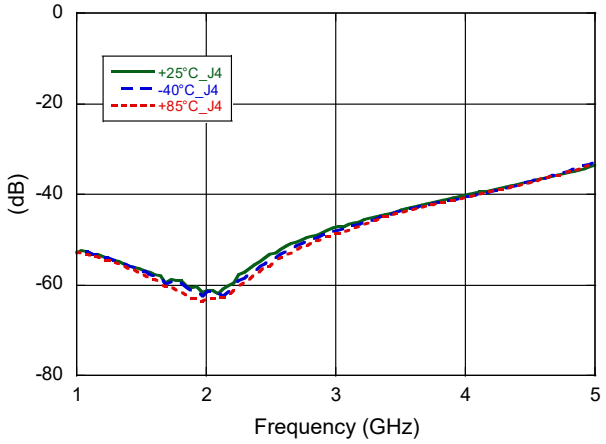
Isolation (J0 - J3), IL J2



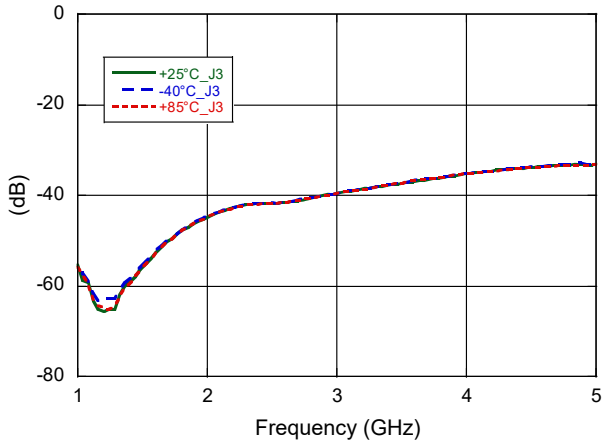
Isolation (J0 - J4), IL J2



Isolation (J0 - J3), IL J4

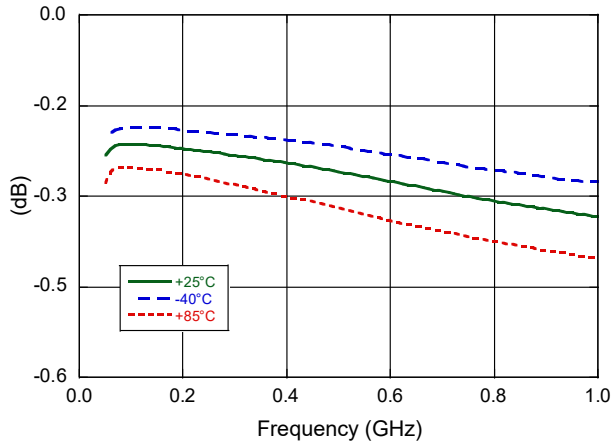


Isolation (J0 - J4), IL J3

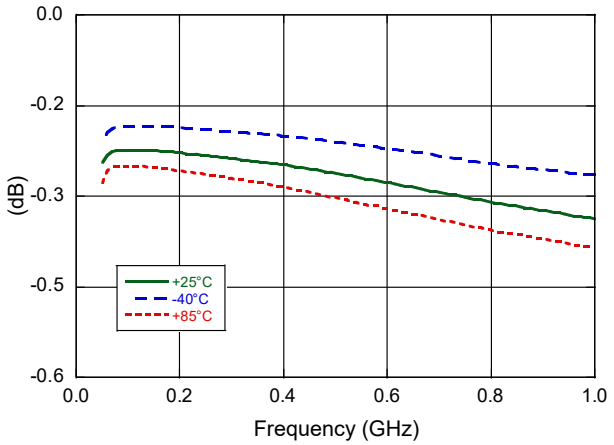


Typical Performance Curves: Low Band

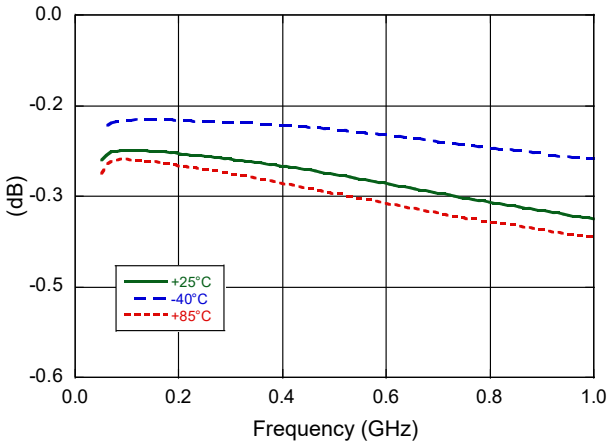
Insertion Loss (J0 - J1)



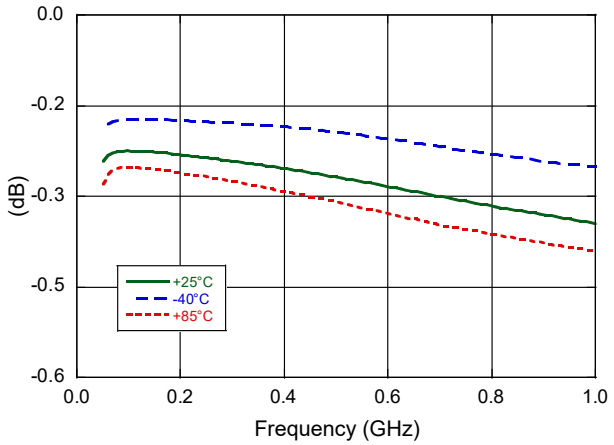
Insertion Loss (J0 - J2)



Insertion Loss (J0 - J3)

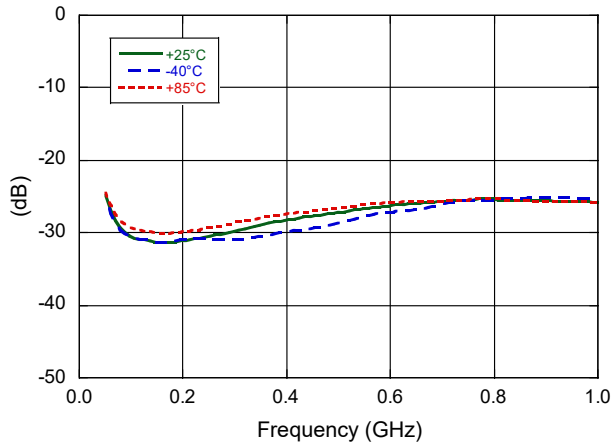


Insertion Loss (J0 - J4)

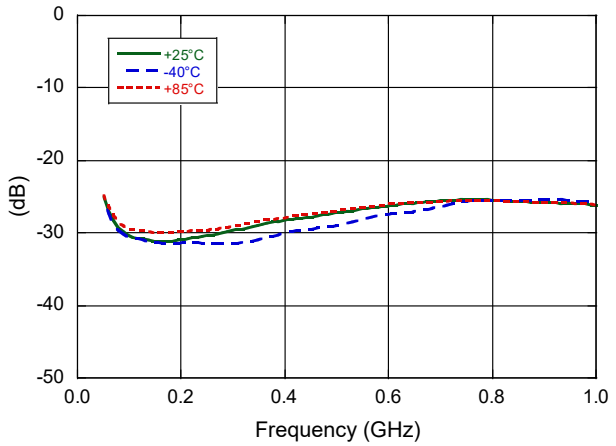


Typical Performance Curves: Low Band

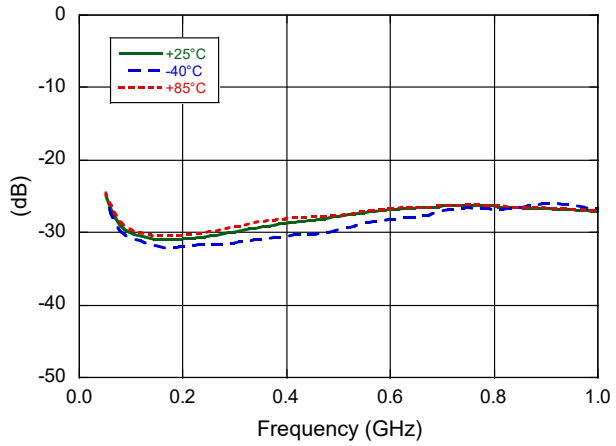
Input Return Loss (J0 - J1)



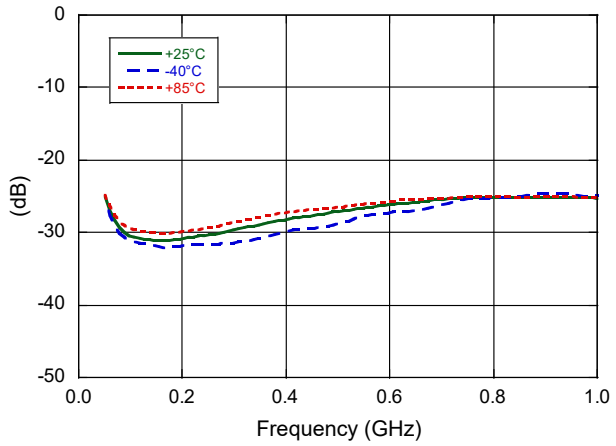
Input Return Loss (J0 - J2)



Input Return Loss (J0 - J3)

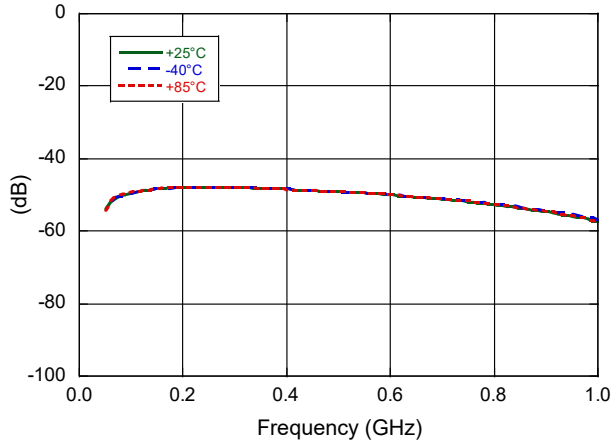


Input Return Loss (J0 - J4)

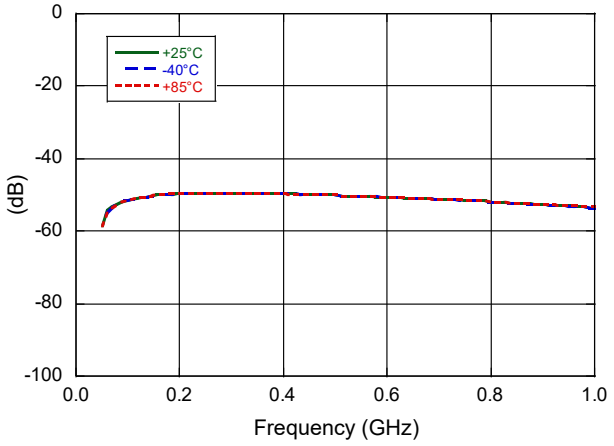


Typical Performance Curves: Low Band

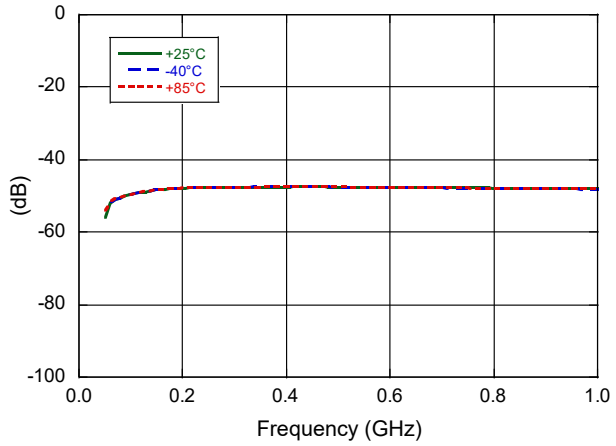
Isolation (J0 - J1), IL J2



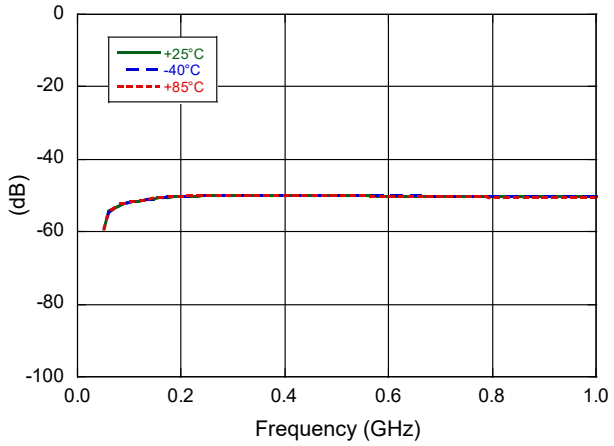
Isolation (J0 - J2), IL J1



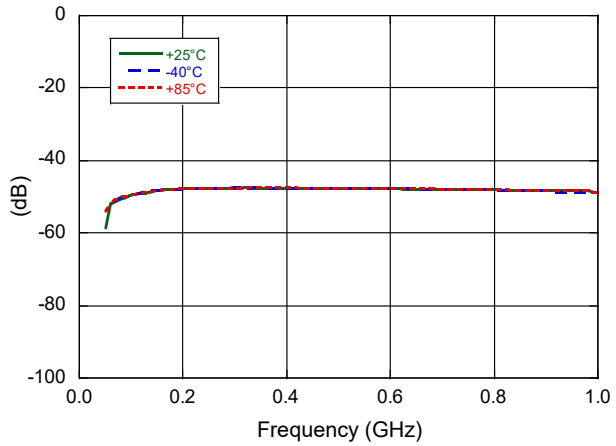
Isolation (J0 - J1), IL J3



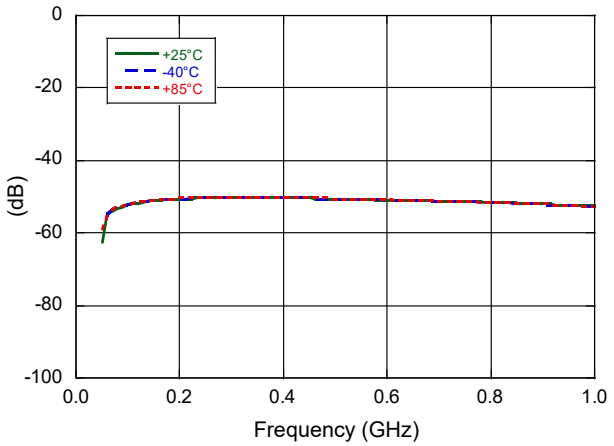
Isolation (J0 - J2), IL J3



Isolation (J0 - J1), IL J4

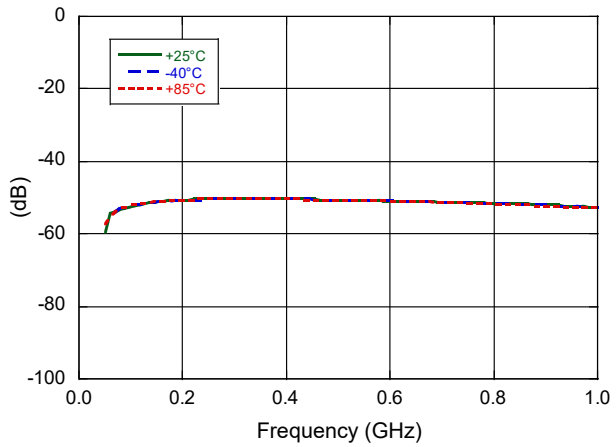


Isolation (J0 - J2), IL J4

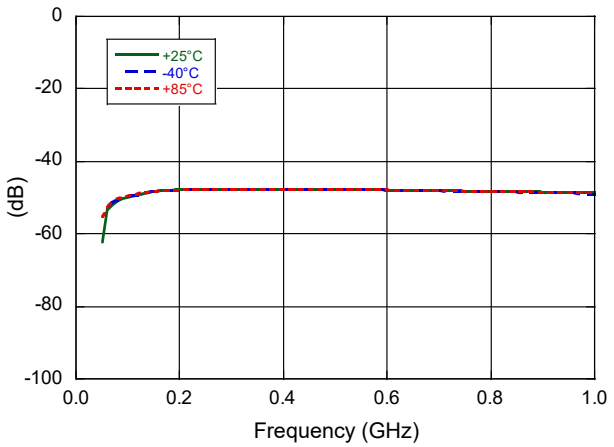


Typical Performance Curves: Low Band

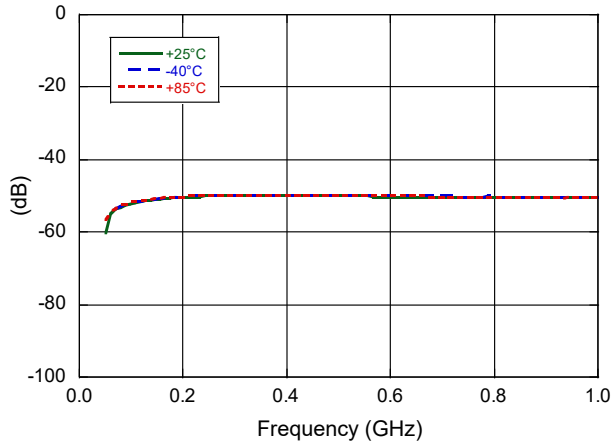
Isolation (J0 - J3), IL J1



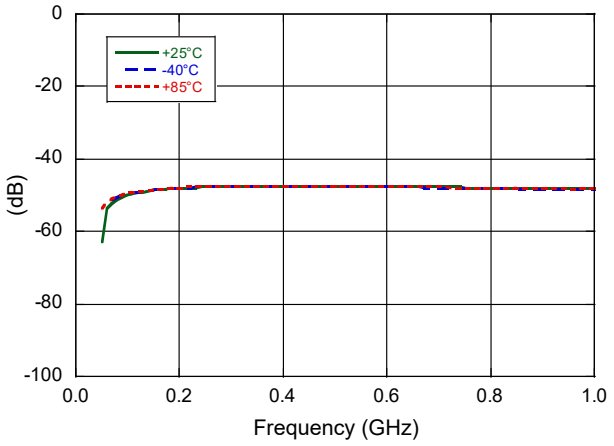
Isolation (J0 - J4), IL J1



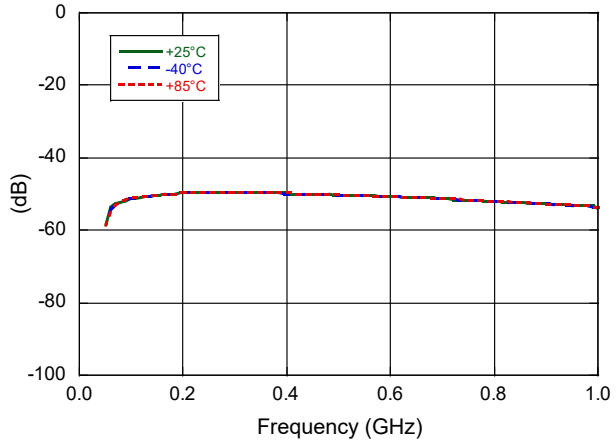
Isolation (J0 - J3), IL J2



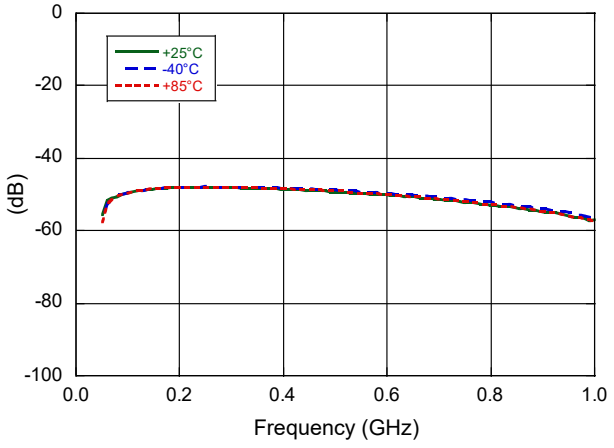
Isolation (J0 - J4), IL J2



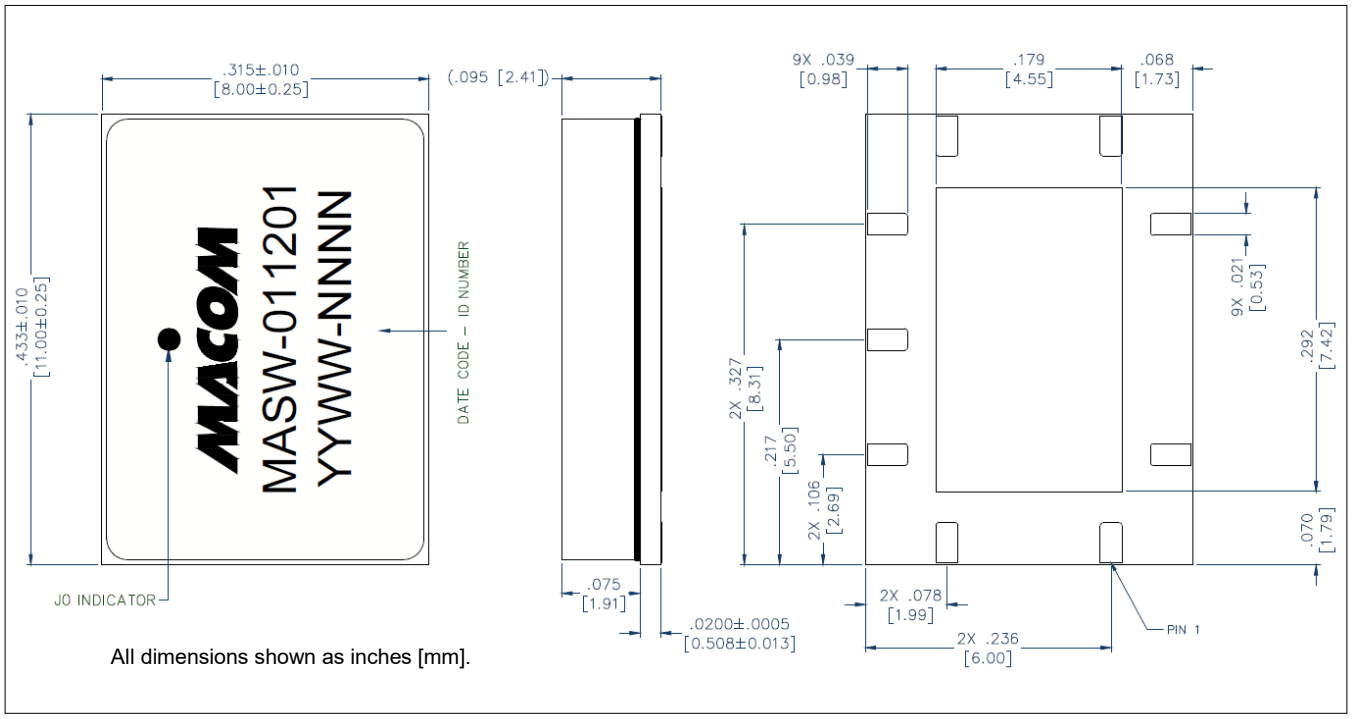
Isolation (J0 - J3), IL J4



Isolation (J0 - J4), IL J3



Lead Free 8 x 11 mm QFN 9-Lead†



All dimensions shown as inches [mm].

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 3 requirements.
Plating is TiWAuCuNiAu.