MAAT-010521

Voltage Variable Attenuator
5 - 45 GHz

Rev. V4

Features

- 5 - 45 GHz frequency range
- 2 dB typical insertion loss
- >30 dB attenuation range
- High linearity, 30 dBm IIP3
- Lead-Free 3 mm, 16-Lead QFN Package
- RoHS* Compliant

Description

The MAAT-010521 is a voltage variable attenuator with analog control and up to 40 dB of attenuation. Excellent linearity is maintained over the full attenuation range. The attenuation level is set by two control voltages of 0 to -2V.

The 3mm QFN package is RoHS compliant and compatible with reflow temperatures to 260°C. Applications include transceivers for cellular infrastructure.

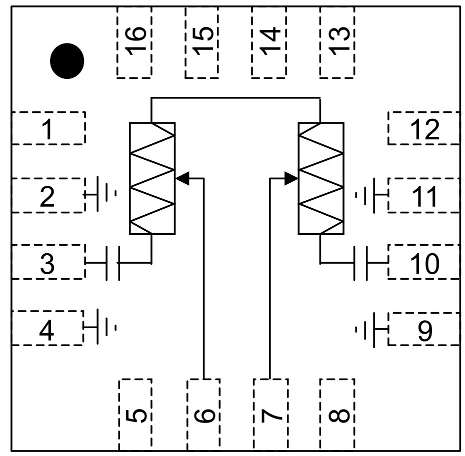
Ordering Information[1,2]

Part Number	Package
MAAT-010521-TR0500	500 piece reel
MAAT-010521-TR3000	3000 piece reel
MAAT-010521-001SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

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

Functional Block Diagram



Pin Configuration[3,4]

Pin No.	Function
1	No Connection
2	Ground
3	RF Input
4	Ground
5	No Connection
6	VC1
7	VC2
8	No Connection
9	Ground
10	RF Output
11	Ground
12	No Connection
13	No Connection
14	No Connection
15	No Connection
16	No Connection

3. It is recommended to connect unused pins to ground.
4. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

Electrical Specifications: T_A = +25°C, Z_0 = 50 Ω, P_{IN} = -10 dBm

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss (Vc1 and Vc2 = -2.0V)	5 - 10 GHz 10 - 20 GHz 20 - 40 GHz	dB	—	2 2 3	4 4 6
Attenuation (Vc1 and Vc2 = 0V)[5]	5 - 10 GHz 10 - 20 GHz 20 - 40 GHz	dB	24 31 34	30 40 40	—
Input P1dB	5 GHz to 25 GHz 25 GHz to 40 GHz	dBm	24 20	25 22	—
IIP3 (any attenuation)	P_{IN} = 12 dBm/tone @ 5.0 - 15.0 GHz P_{IN} =12 dBm/tone @ 15.0 - 26.5 GHz P_{IN} =12 dBm/tone @ 26.5 - 40.0 GHz	dBm	29 28 25	31 30 28	—
IIP3 (Vc1=Vc2=-2.0V)	P_{IN} = 12 dBm/tone @ 5 - 40 GHz	dBm	35	40	—
Input Return Loss (any attenuation)	—	dB	—	10	—
Output Return Loss (any attenuation)	—	dB	—	10	—

5. To increase attenuation from minimum attenuation state (VC1 = -2 V and VC2 = -2 V) to max attenuation state (VC1 = 0 V and VC2 = 0 V), VC1 increases to full range prior to adjusting VC2.

Absolute Maximum Ratings[6,7]

Parameter	Absolute Maximum
Input Power	+30 dBm
Voltage (RF pins)	30 V
Voltage (control pins)	+1 to -6 V
Storage Temperature	-55°C to +150°C
Case Temperature	-40°C to +85°C

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

Handling Procedures

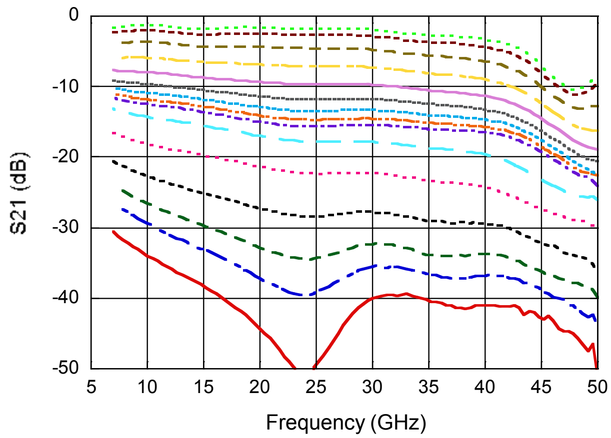
The following precautions should be observed to avoid damage:

Static Sensitivity

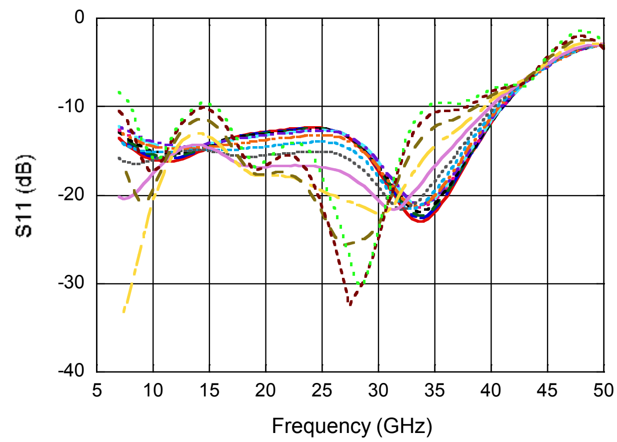
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these class 1C (HBM) devices.

Typical Performance Curves: S-Parameters

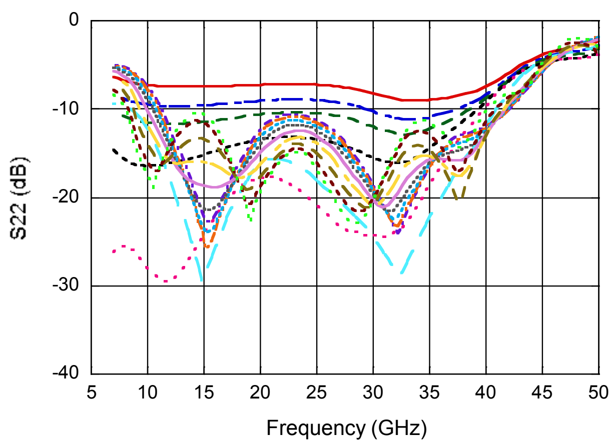
Gain

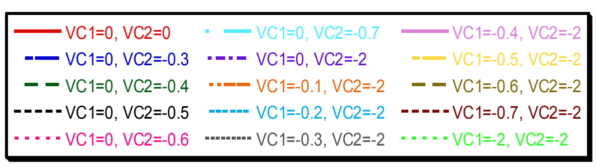


Input Return Loss



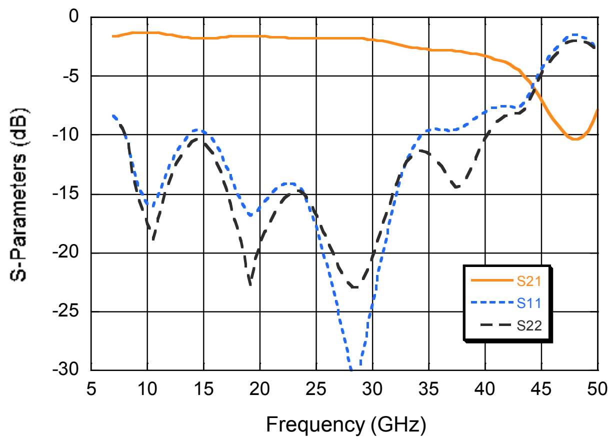
Output Return Loss



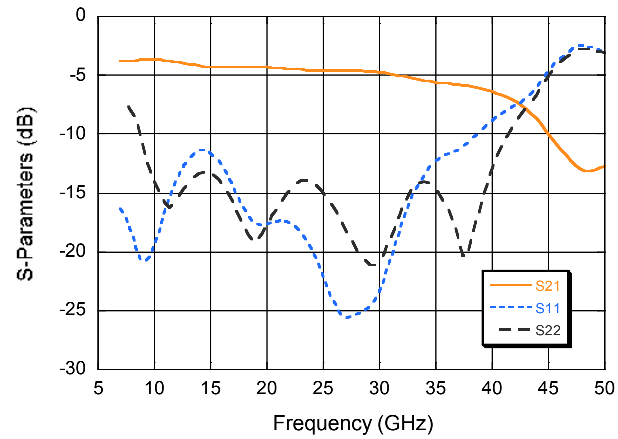


Typical Performance Curves: S-Parameters

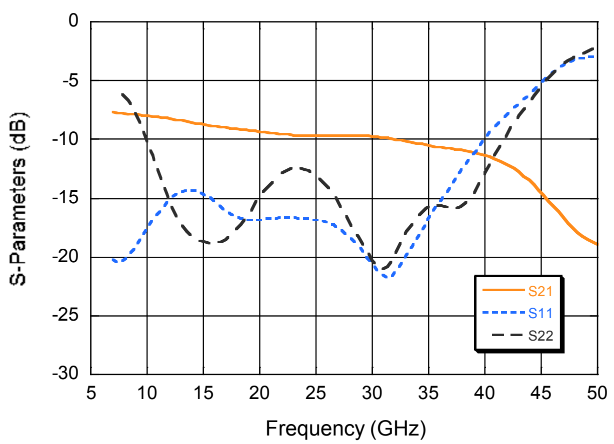
VC1 = -2, VC2 = -2



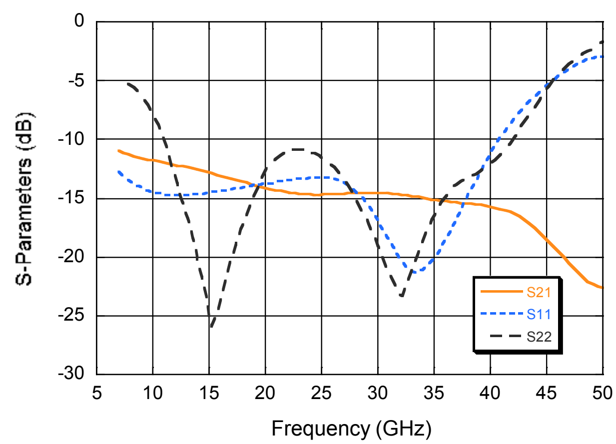
VC1 = -0.6, VC2 = -2



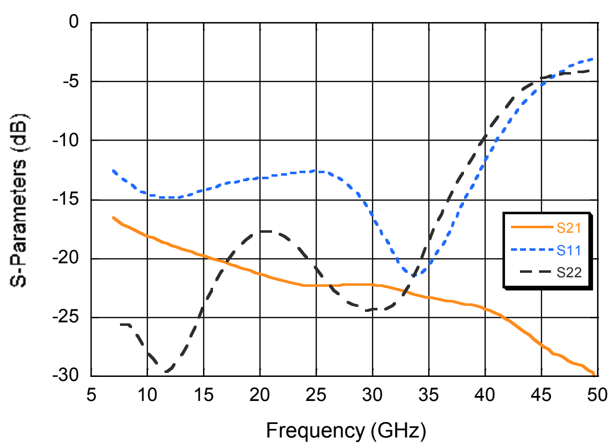
VC1 = -0.4, VC2 = -2



VC1 = -0.1, VC2 = -2

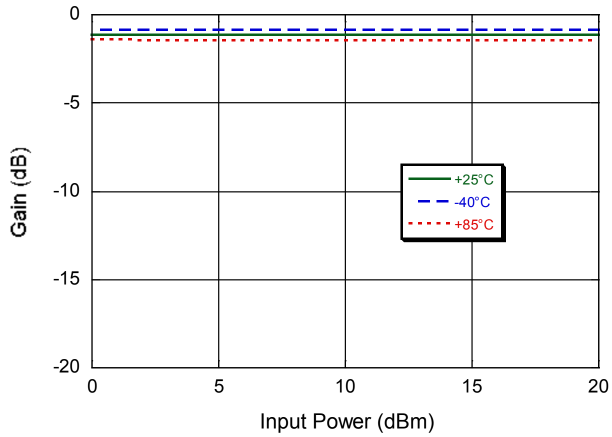


VC1 = 0, VC2 = -0.6

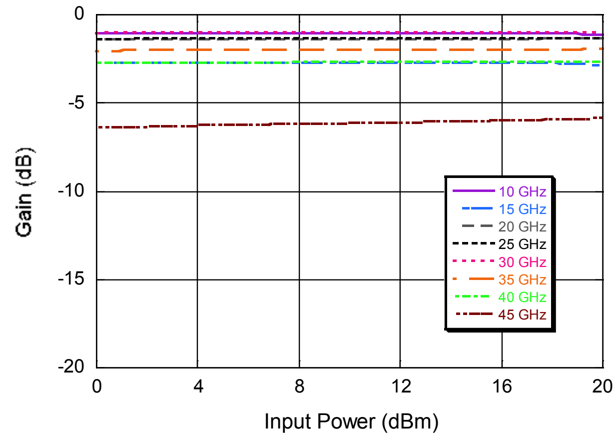


Typical Performance Curves: Gain

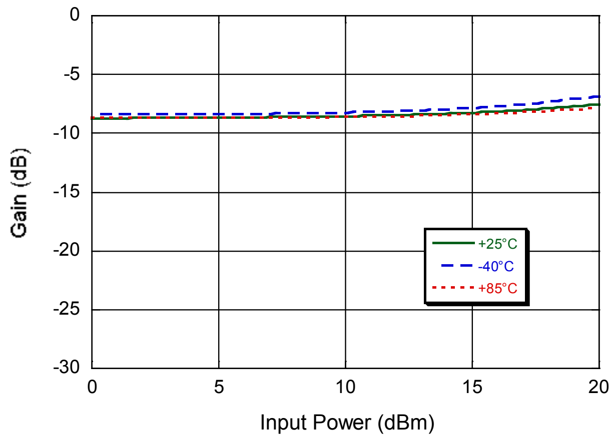
Gain vs. P_{IN} (VC1 = -2, VC2 = -2) @ 15 GHz



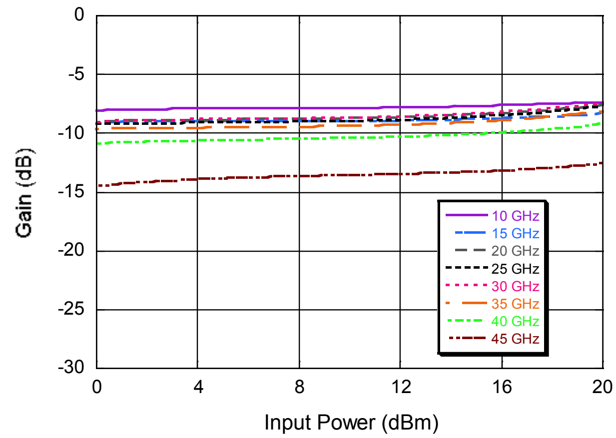
Gain vs. P_{IN} (VC1 = -2, VC2 = -2)



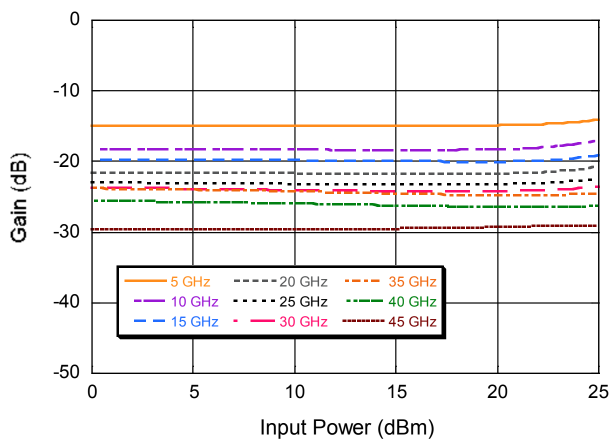
Gain vs. P_{IN} (VC1 = -0.4, VC2 = -2) @ 15 GHz



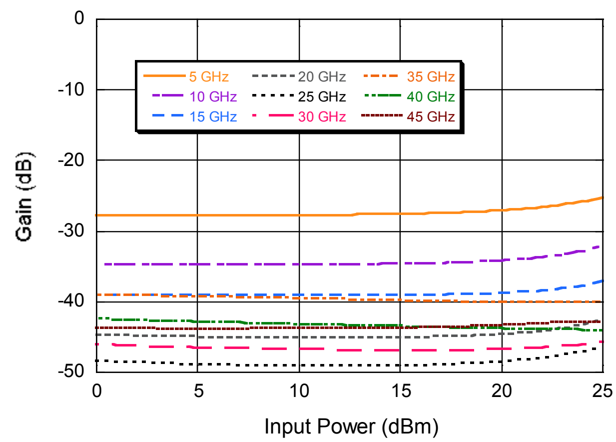
Gain vs. P_{IN} (VC1 = -0.4, VC2 = -2)



Gain vs. P_{IN} (VC1 = 0, VC2 = -0.6) @ 25°C

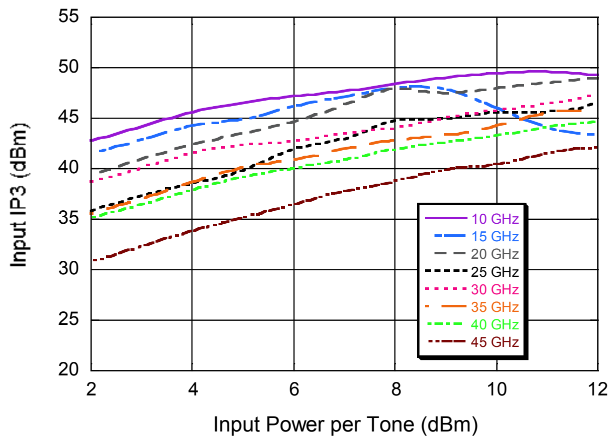


Gain vs. P_{IN} (VC1 = 0, VC2 = 0) @ 25°C

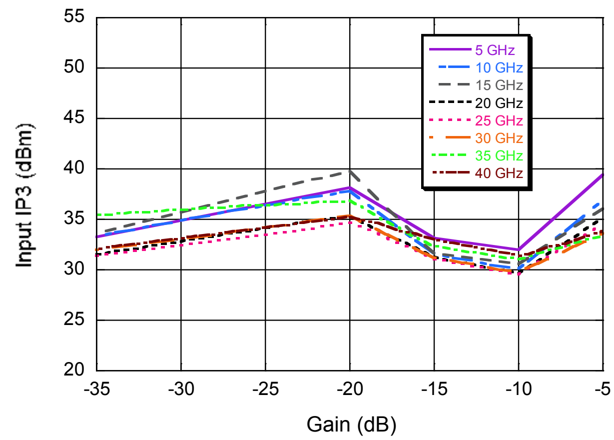


Typical Performance Curves: Input IP3

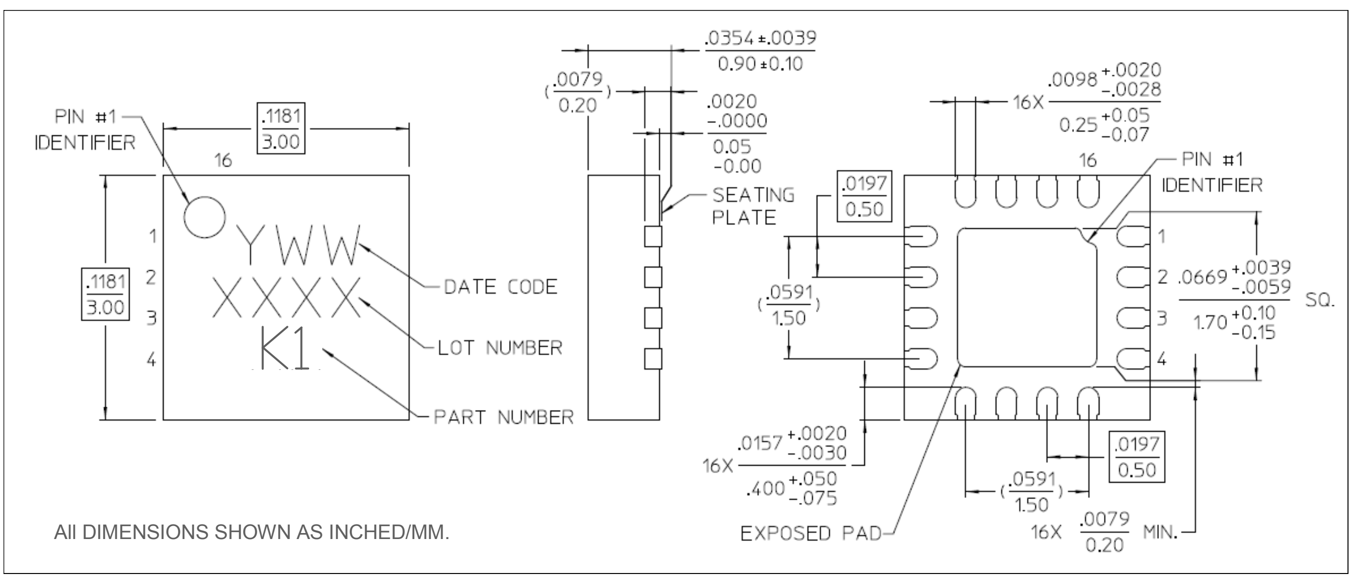
Input IP3 (VC1 = -2, VC2 = -2)



Input IP3 (P_{IN} per tone = 12 dBm)



Lead-Free **3 mm 16-Lead PQFN**†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is NiPdAuAg.