MAAM-010373

Broadband CATV Amplifier
50 - 1100 MHz

Rev. V4

Features

- 75 Ω Input / Output Match
- Low Noise Figure: 2.2 dB
- High Gain: 22 dB
- High Linearity: -74 dBc CTB, -62 dBc CSO
- High ESD Threshold: HBM Class 1B
- Lead Free SOT-89 Package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

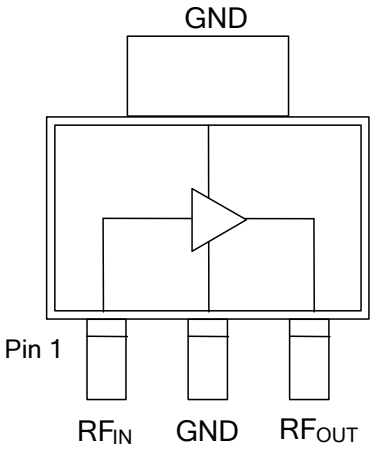
Description

The MAAM-010373 CATV amplifier is a GaAs MMIC that exhibits low distortion and high gain in a lead-free surface mount package.

This broadband amplifier employs a monolithic single stage design featuring a convenient 75 Ω input/output impedance that minimizes the number of external components required.

The MAAM-010373 is fabricated using a pHEMT process to realize low noise and low distortion. The process features full passivation for robust performance and reliability.

Functional Schematic



Pin Configuration

Pin No.	Pin Name	Description
1	RF_{IN}	RF Input
2	GND	Ground
3	RF_{OUT}	RF Output / Drain Supply

Ordering Information [1,2]

Part Number	Package
MAAM-010373-000000	Bulk Packaging
MAAM-010373-TR1000	1000 piece reel
MAAM-010373-TR3000	3000 piece reel
MAAM-010373-001SMB	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.

Broadband CATV Amplifier
50 - 1100 MHz

Electrical Specifications: T_A = 25°C, Freq: 50 - 1000 MHz, V_{DD} = 8 V, Z_0 = 75 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	—	dB	20	22	24
Gain Flatness	—	dB	—	+/- 0.5	1
Noise Figure	—	dB	—	2.2	3
Input Return Loss	—	dB	—	18	—
Output Return Loss	—	dB	—	20	—
Reverse Isolation	—	dB	—	25	—
Output IP3	6 MHz Spacing, -10 dBm output per tone	dBm	—	40	—
Output IP2	6 MHz Spacing, -10 dBm output per tone	dBm	—	50	—
Composite Triple Beat, CTB	80 ch. NTSC flat, +33 dBmV / ch. at the output	dBc	—	-74	—
Composite Second Order, CSO	80 ch. NTSC flat +33 dBmV / ch. at the output	dBc	—	-62	—
P1dB	403.25 MHz	dBm	—	25	—
I_{DD}	8 Volts	mA	—	148	165

Absolute Maximum Ratings[3,4,5]

Parameter	Absolute Maximum
RF Input Power	6 dBm
Voltage	10 volts
Operating Temperature	-40°C to +85°C
Junction Temperature[6]	+150°C
Storage Temperature	-65°C to +150°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.
5. Operating at nominal conditions with $T_J \leq +150°C$ will ensure MTTF > 1 x 10^6 hours.
6. Junction Temperature (T_J) = T_C + Θ_{JC} * ((V * I) - (P_{OUT} - P_{IN}))
   Typical thermal resistance (Θ_{JC}) = 32°C/W.
   a) For T_C = +25 °C,
   T_J = +63°C @ 8 V, 148 mA
   b) For T_C = +85 °C,
   T_J = +123°C @ 8 V, 148 mA

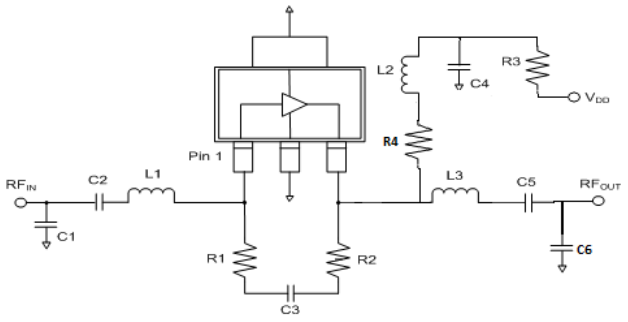
Handling Procedures

Please observe the following precautions 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 devices.

Schematic
Including Off-Chip Components

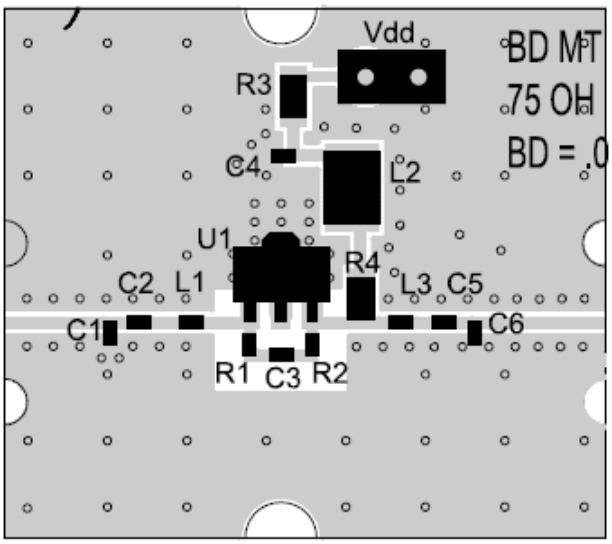


Off-Chip Component Values

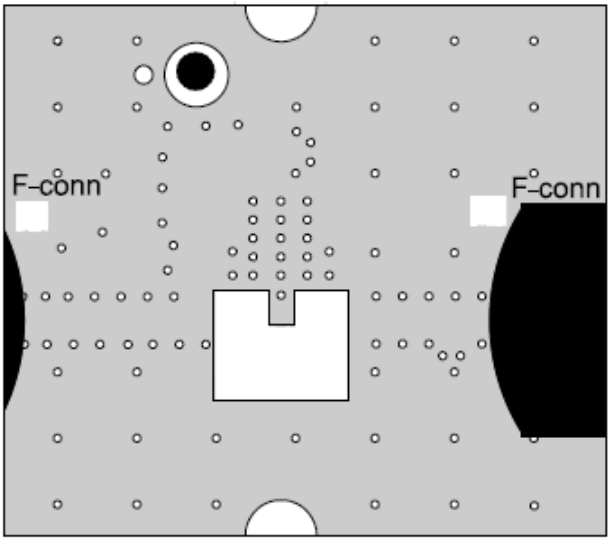
Component	Value	Package
C1	1.5 pF	0402
C2, C3, C4	0.01 µF	0402
C5	270 pF	0402
C6	0.5 pF	0402
L1	10 nH	0402
L2[7]	1 µH	1210
L3	8.2 nH	0402
R1	360 Ω	0402
R2	715 Ω	0402
R3	0 Ω	0805
R4	2 Ω	0805

7. L2 is EPCOS part number B82422A1102K100.

Recommended PCB Layout



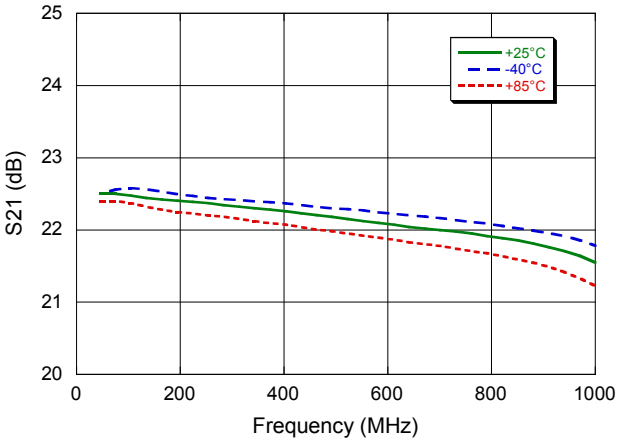
Component Side Metal Layer
(Viewed from Top)



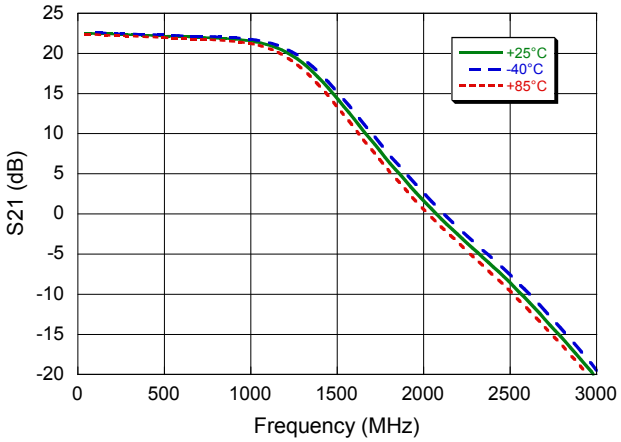
Bottom Side Metal Layer
(Viewed from Bottom)

Typical Performance Curves:

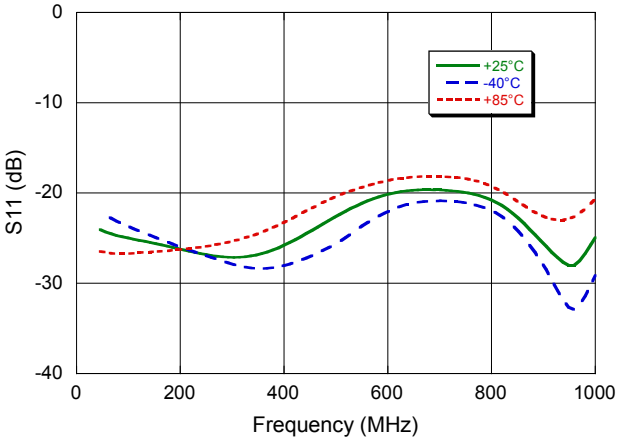
Gain to 1000 MHz



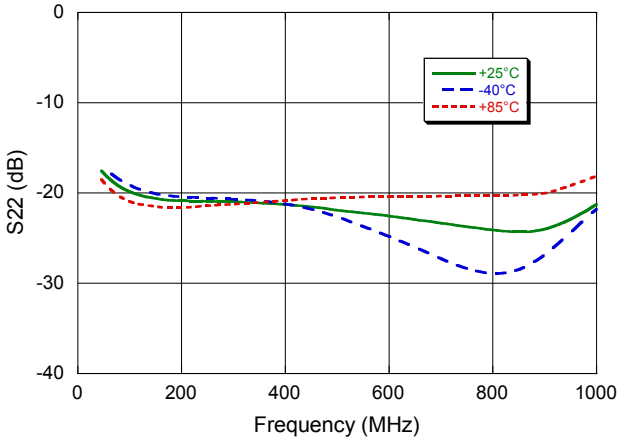
Gain to 3000 MHz



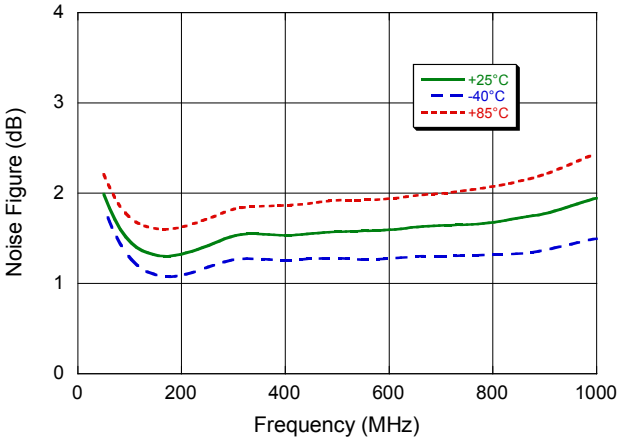
Input Return Loss



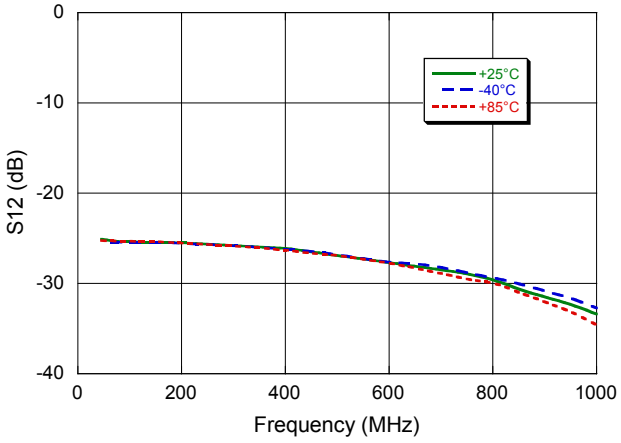
Output Return Loss



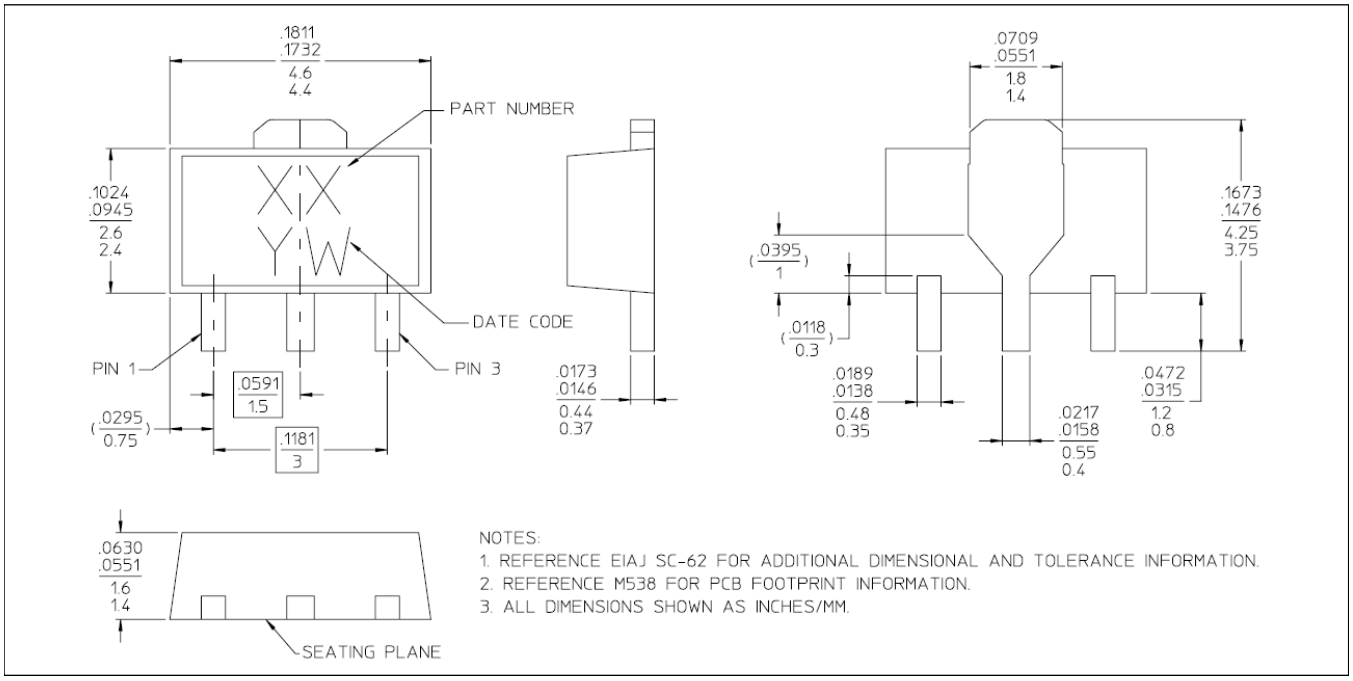
Noise Figure



Reverse Isolation



Lead-Free SOT-89 Plastic Package†



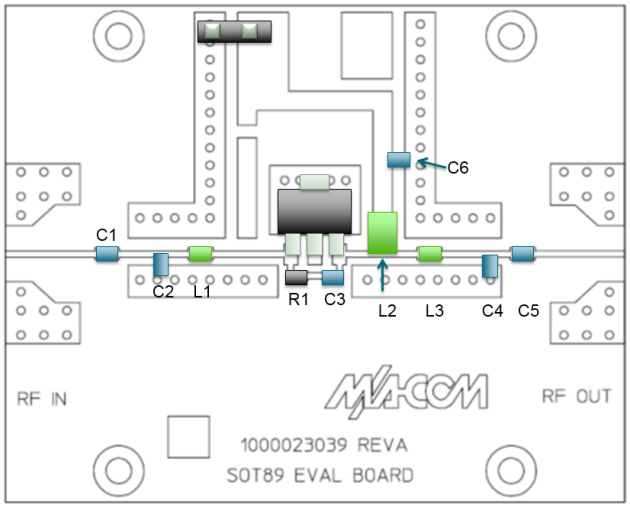
† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

Applications Section @ 13.56 MHz

Electrical Specifications: T_A = 25°C, Freq: 13.56 MHz, V_{DD} = 9 V, Z_0 = 50 Ω

Parameter	Units	Min.	Typ.	Max.
Gain	dB	—	21.8	—
Input Return Loss	dB	—	12.5	—
Output Return Loss	dB	—	13.5	—
Noise Figure	dB	—	4.8	—
P1dB	dBm	—	26.7	—
Output IP3 (6 MHz Spacing, -10 dBm input per tone)	dBm	—	37	—
I_{DD}	mA	—	190	—

Recommended PCB Layout



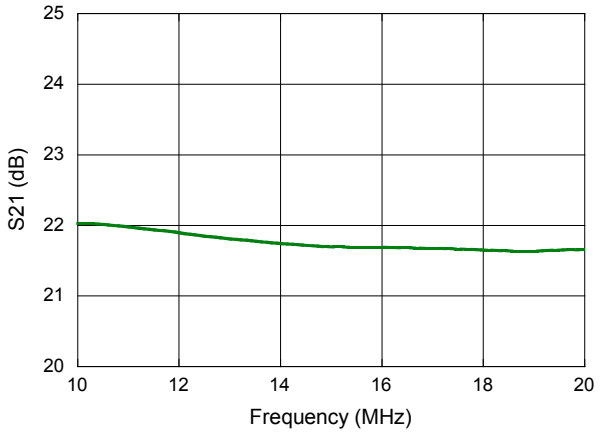
Off-Chip Component Values

Component	Value	Package
C1, C5	1000 pF	0402
C2, C3, C4	20 pF	0402
C6	0.1 µF	0402
L1	10 nH	0402
L2	3.9 µH	0805
L3	8.2 nH	0402
R1	910 Ω	0402

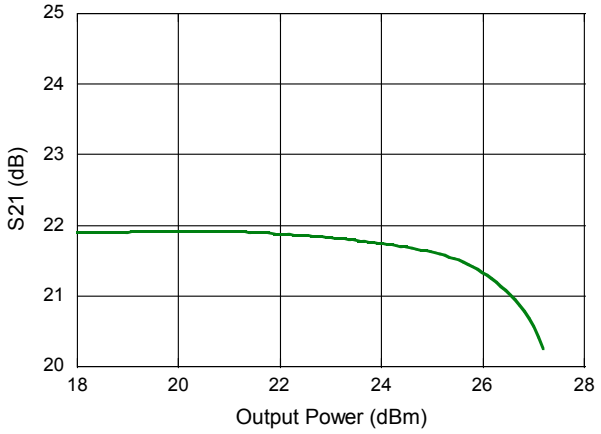
Applications Section @ 13.56 MHz

Typical Performance Curves:

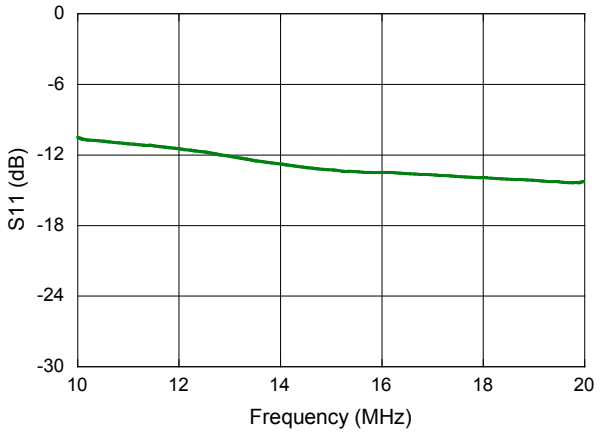
Gain



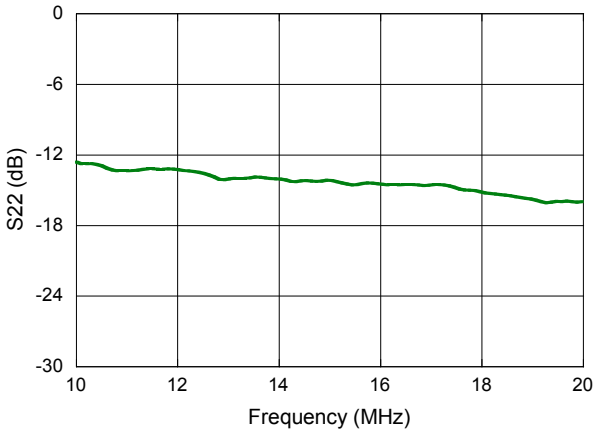
Compression



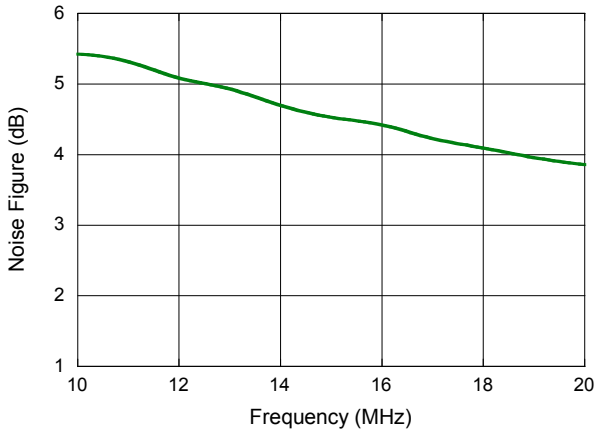
Input Return Loss



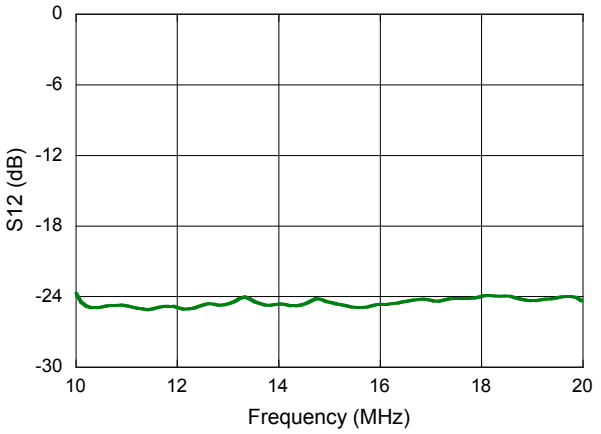
Output Return Loss



Noise Figure



Reverse Isolation



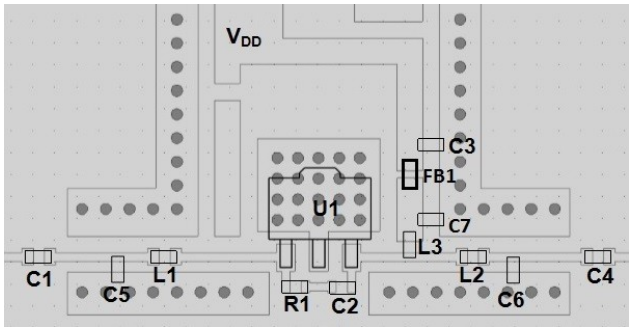
Applications Section: 30 - 800 MHz, 50 Ω

The MAAM-010373 is designed to work as a low noise gain block over a wide range of frequencies. Input and output can be tuned for 50 Ω applications, the 30 - 800 MHz band 50 Ω application circuit is shown below.

Typical Performance: T_A = 25°C, V_{DD}= 8 V, 139 mA, Z_0 = 50 Ω, 30 - 800 MHz Application

Parameter	Units	Min.	Typ.	Max.
Gain	dB	—	20	—
Reverse Isolation	dB	—	25	—
Input Return Loss	dB	—	10	—
Output Return Loss	dB	—	10	—
Noise Figure	dB	—	1.5	—
P1dB	dBm	—	26	—
I_{DD}	mA	—	139	—

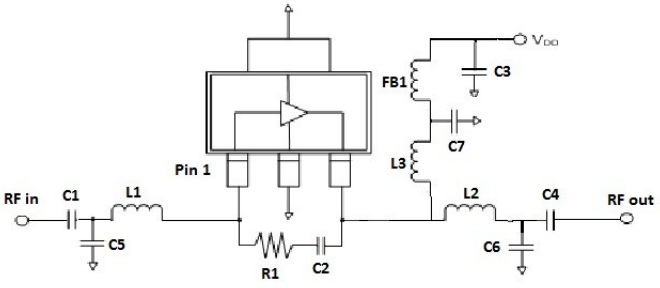
Recommended PCB Layout



Off-Chip Component Values

Component	Value	Package
C1	1.5 pF	0402
C2, C3, C4	0.01 µF	0402
C5	270 pF	0402
C6	0.5 pF	0402
L1	10 nH	0402
L2[7]	1 µH	1210
L3	8.2 nH	0402
R1	360 Ω	0402
R2	715 Ω	0402
R3	0 Ω	0805
R4	2 Ω	0805

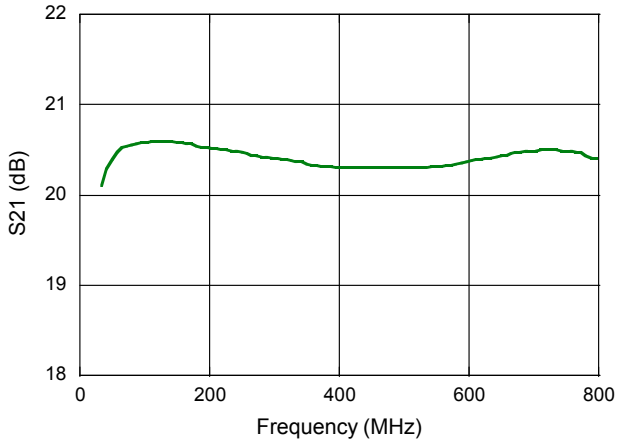
Recommended Schematic



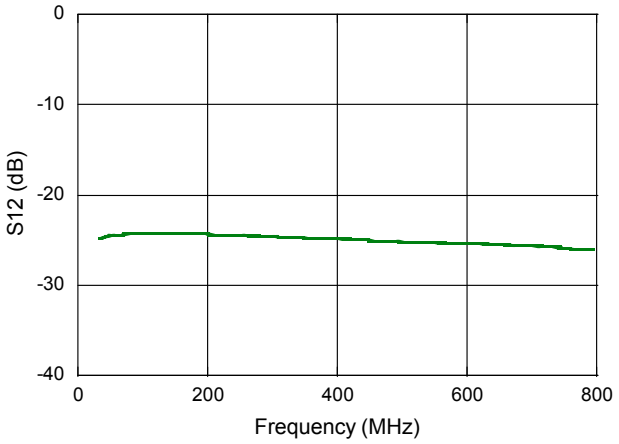
Applications Section: 30 - 800 MHz, 50 Ω

Typical Performance Curves @ +25°C:

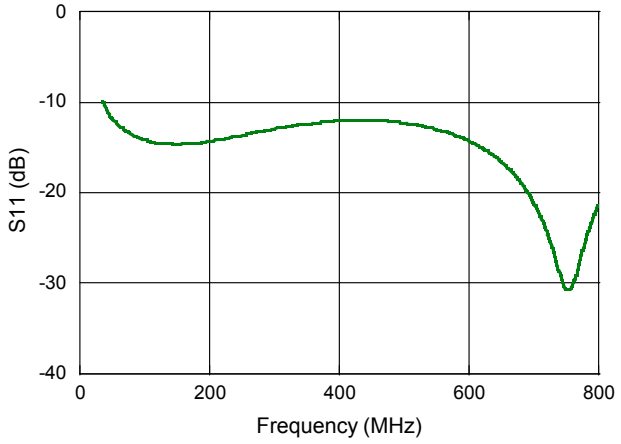
Gain



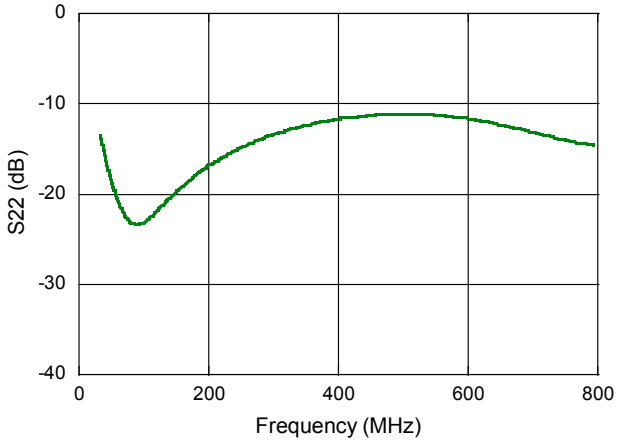
Reverse Isolation



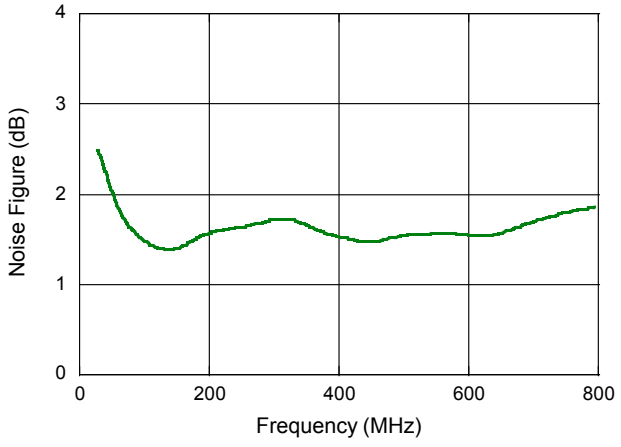
Input Return Loss



Output Return Loss



Noise Figure



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