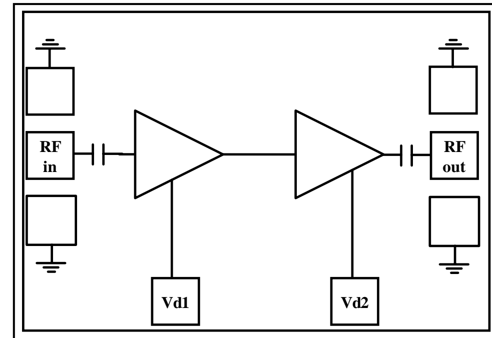
9.5 -12 GHz Ultra Low Noise Amplifier

Features

- Frequency Range: 9.5-12 GHz
- Ultra Low Noise Figure ~0.8 dB (on-wafer)
- Gain : 18 dB
- +7dBm P1dB @ 2V, 2V
- Input Return Loss <- 10 dB
- Output Return Loss <- 18 dB
- Single supply operation
- No external matching required
- DC decoupled RF Ports
- 0.15-um InGaAs pHEMT Technology
- Chip Dimensions: 2.1 x 1.7 x 0.1 mm

Functional Diagram



Typical Applications

- Radar front end
- Military
- Test Equipment and Sensors
- Point-to-Point Radios, Point-to-Multi-Point Radios & VSATS
- General X-Band Gain Block / Driver amplifier

Description

The AMT2142041A is a 2-stage Ultra Low Noise Amplifier, operating in 9.5-12GHz frequency band. The LNA features 18 dB of nominal gain and a typical mid-band noise figure of 1.2 dB. Input and output ports are DC decoupled. On-chip Bypass capacitors are provided in Drain Bias path. The chip operates on a single positive supply. The typical P1dB is 7 dBm and can be increased to 14dBm when the last stage is operated at 4V. The LNA is unconditionally stable. Circuit grounds are provided through vias to the backside metallization. In addition to being used as the first stage, the LNA's excellent linearity encourages its usage for in the succeeding stages of a receiver chain. The LNA 's good return losses and flat gain over the band makes it ideal to be used as a cascadable gain block.

Absolute Maximum Ratings(1)

Parameter	Absolute Maximum	Units
Positive DC voltage	+6	V
RF input power	+ 15	dBm
Supply Current	65	mA
Operating Temperature	-55 to +85	°C
Storage Temperature	-65 to +150	°C

1. Operation beyond these limits may cause permanent damage to the component

Electrical Specifications [1] @ T_A = 25°C, Z_o=50 Ω, Vd1=2V, Vd2=2V

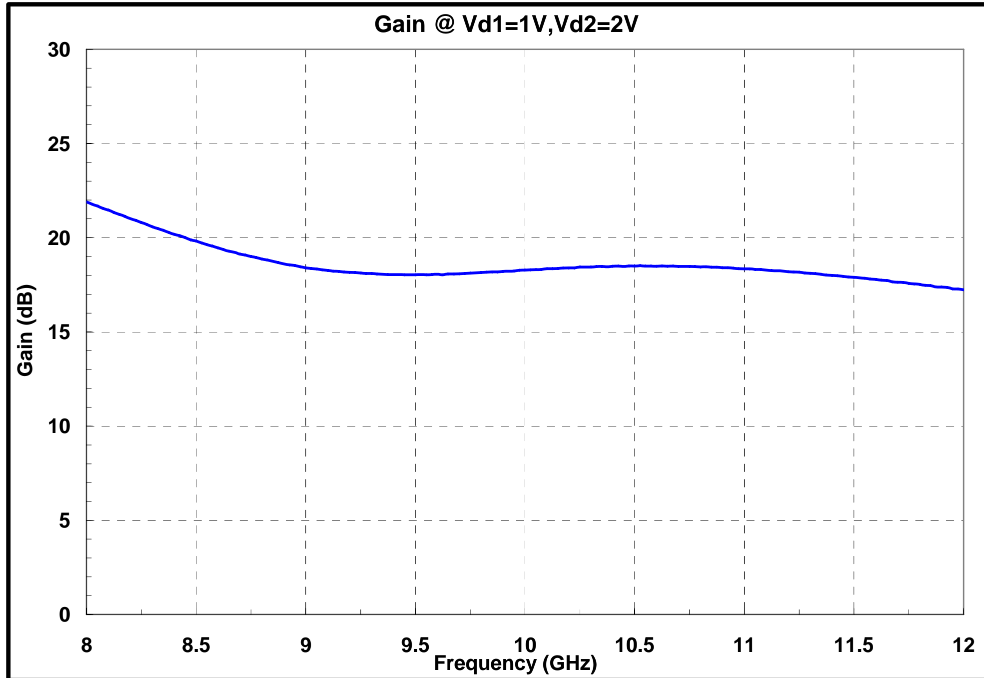
Parameter	Typ.	Typ.	Units
Frequency Range	9.5 – 10.5	10.5 - 12	GHz
Gain	18.5	18.5	dB
Gain Flatness	± 0.1	± 0.3	dB
Noise Figure (max.)	0.7[2]/1.2	0.8[2]/1.6	dB
Input Return Loss (min.)	9	15	dB
Output Return Loss (min.)	15	18	dB
Output Power (P1dB) (min.)	+7/14[2]		dBm
Saturated Output Power (Psat)	+10/17[2]		dBm
Output Third Order Intercept (OIP3)	15/23[2]		dBm
Supply Current (Id)	38/43[2]		mA

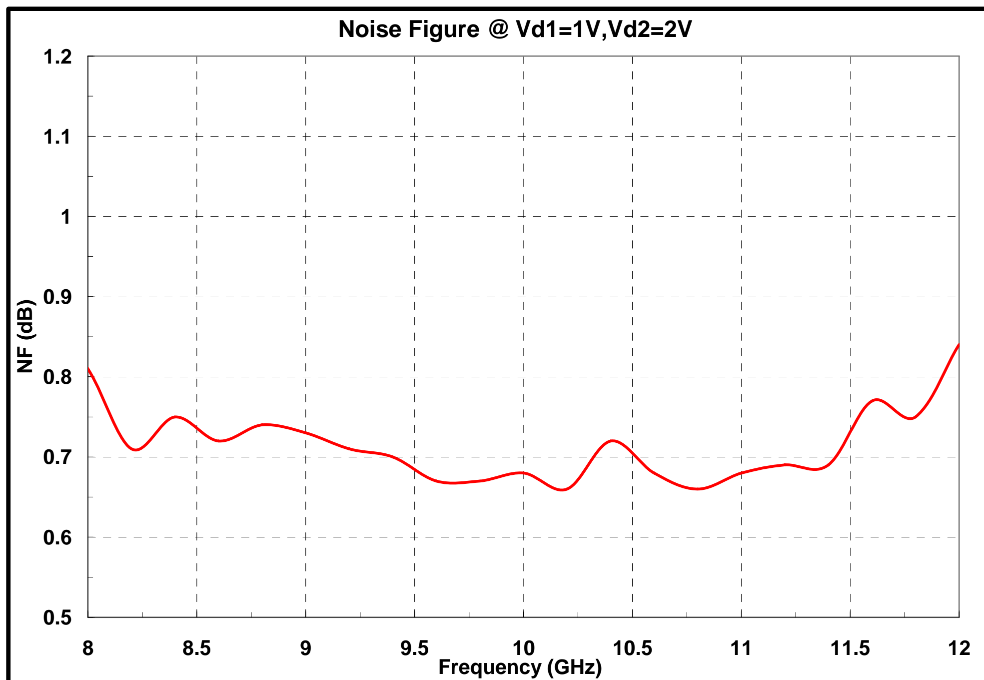
Note:

1. Electrical Specifications as measured in a test fixture
2. On-Wafer measurement at Vd1=1V, Vd2=2V
3. Vd1=2, Vd2=4V

On-Wafer Test data

Vd1=1V, Vd2, =2V, Total Current = 25 mA, $T_A = 27\,^{o}C$





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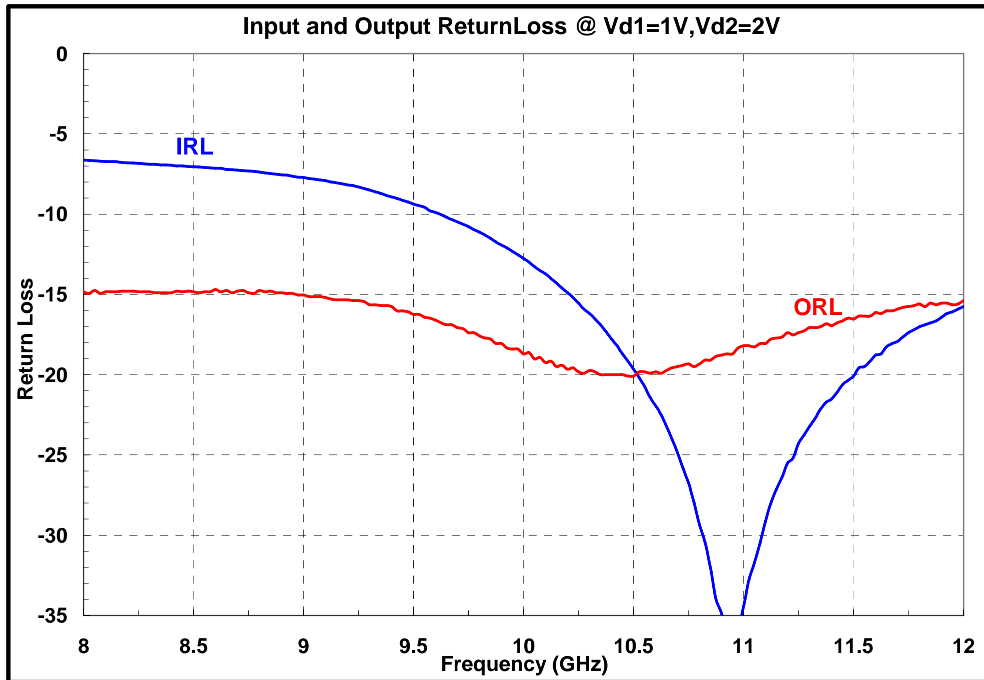
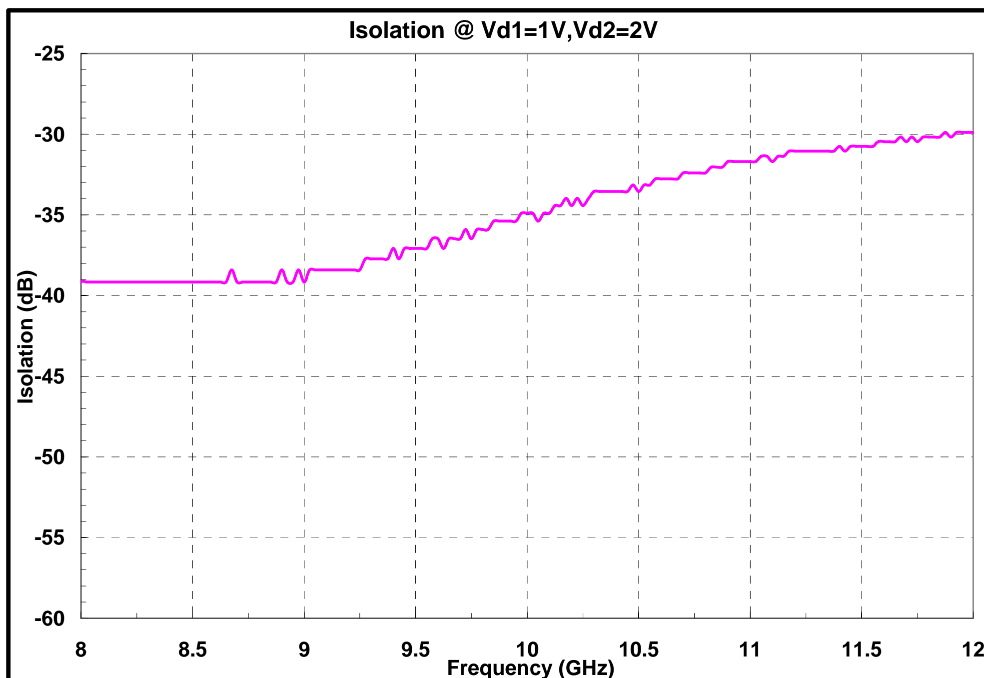
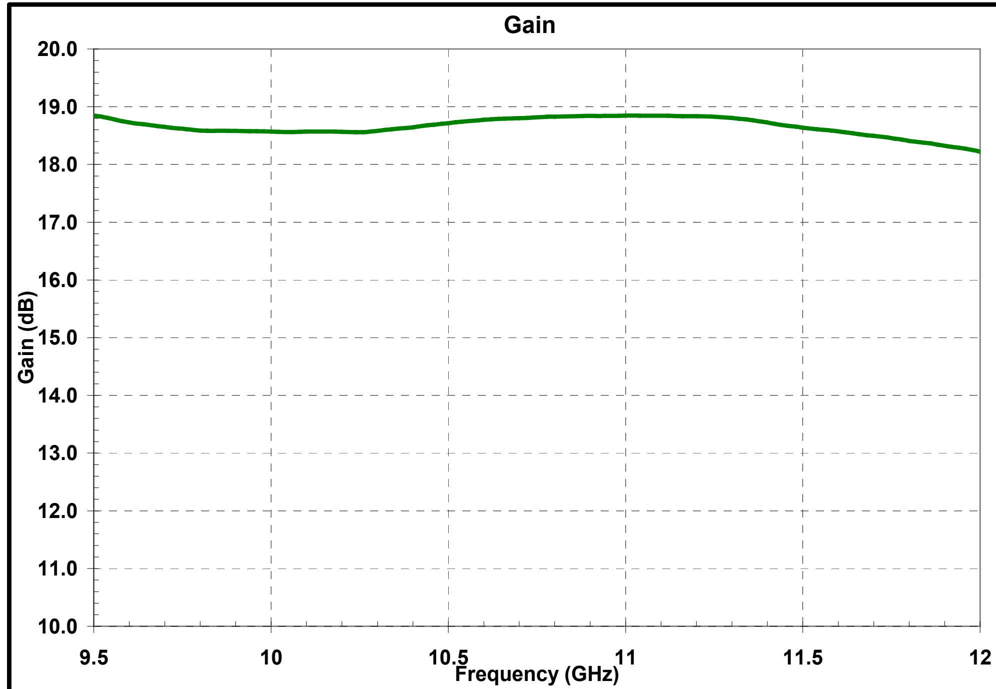
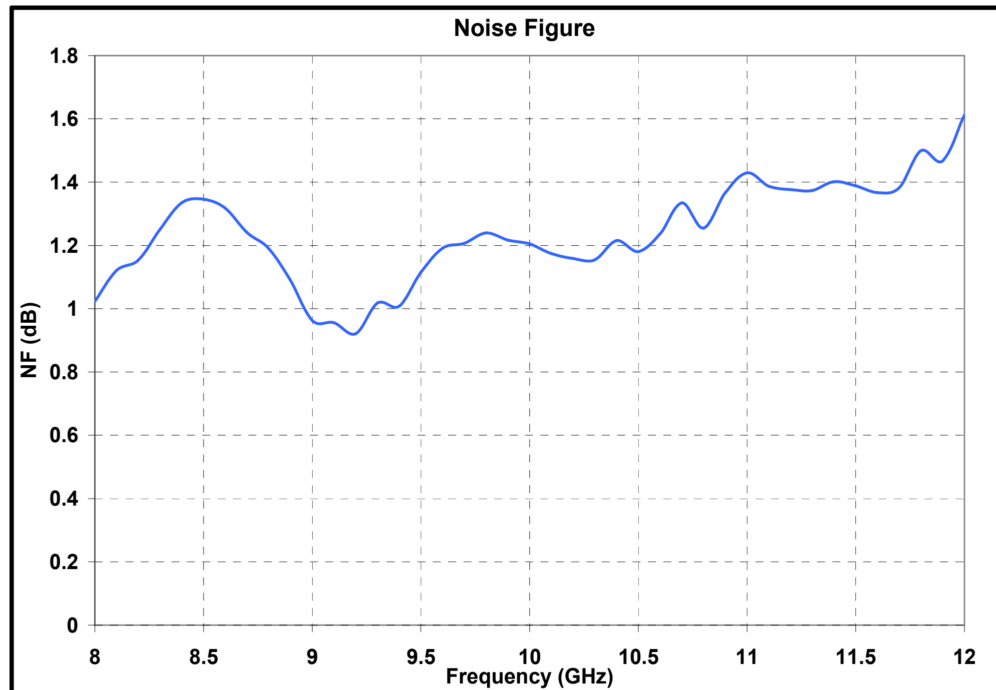




Test fixture data

Vd1, Vd2, =2V, Total Current = 37 mA, T_A = 27°C





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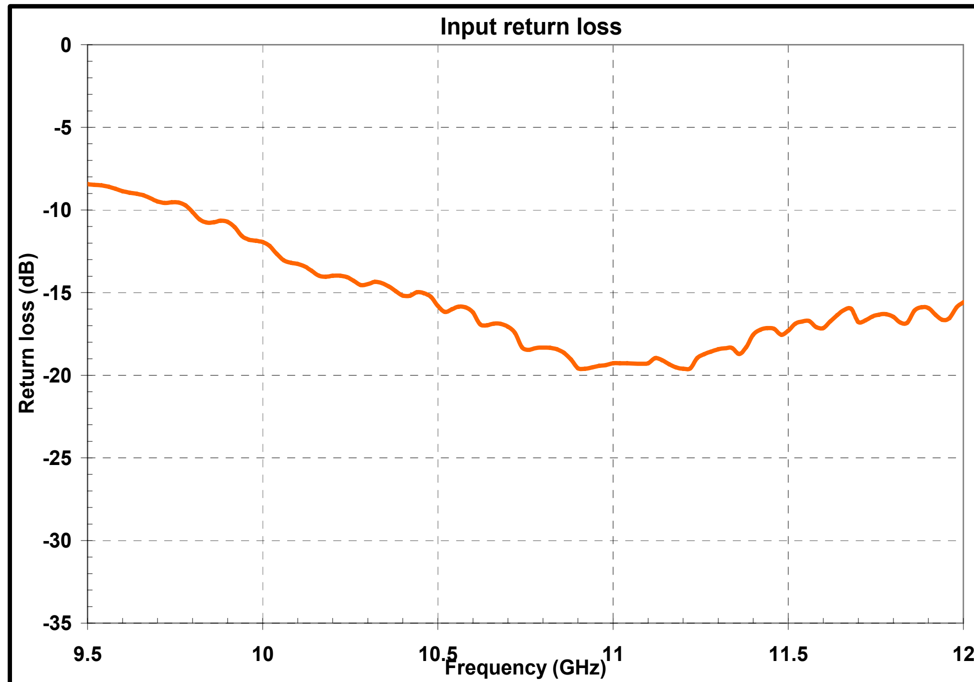

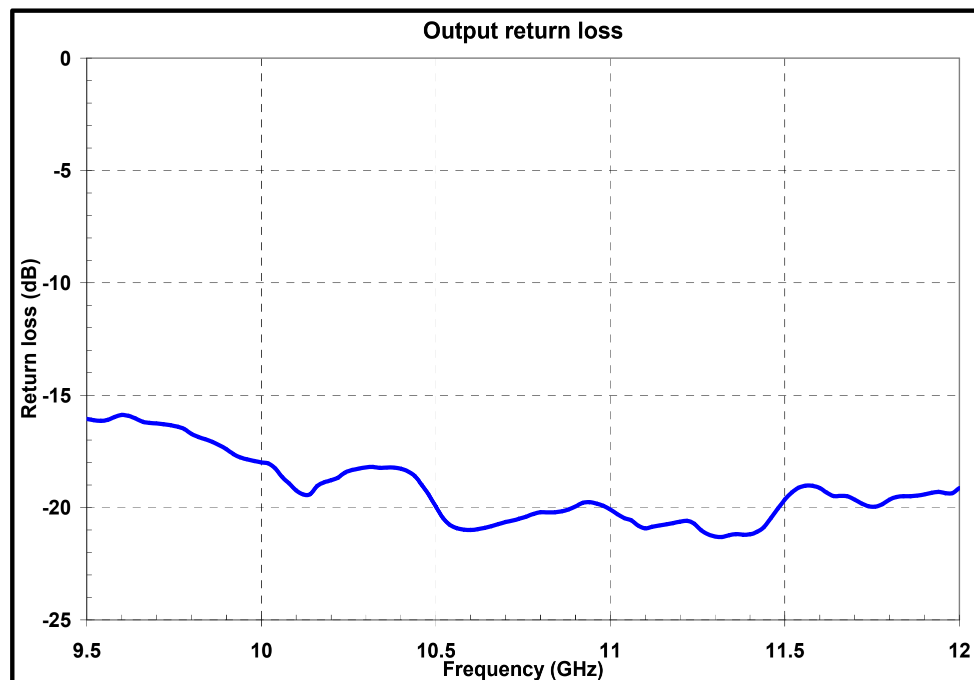

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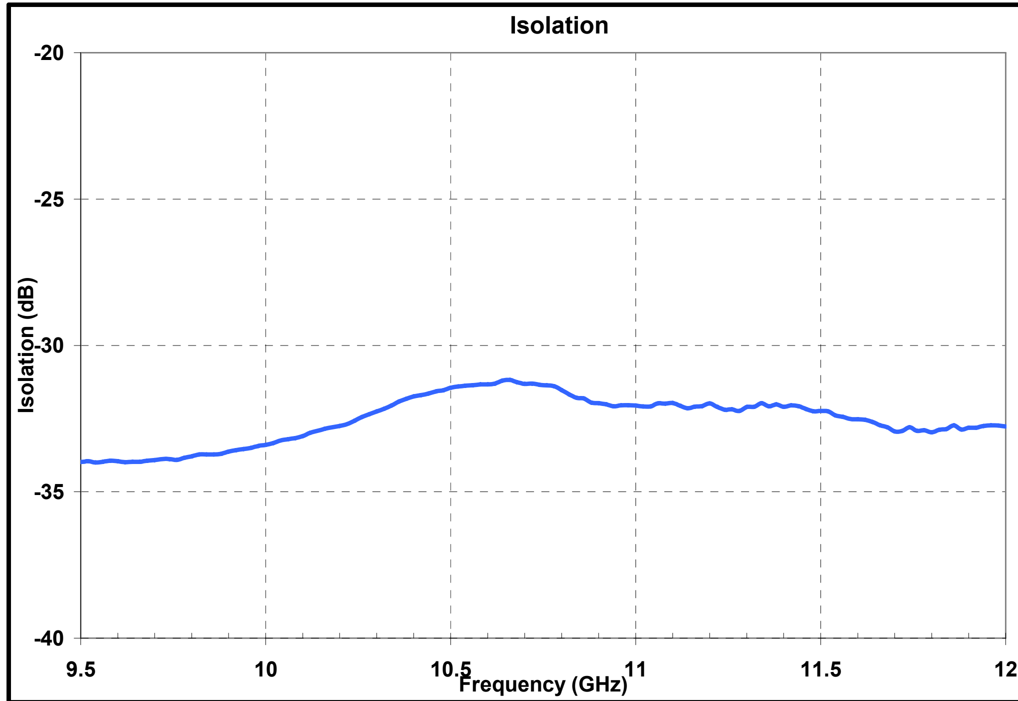
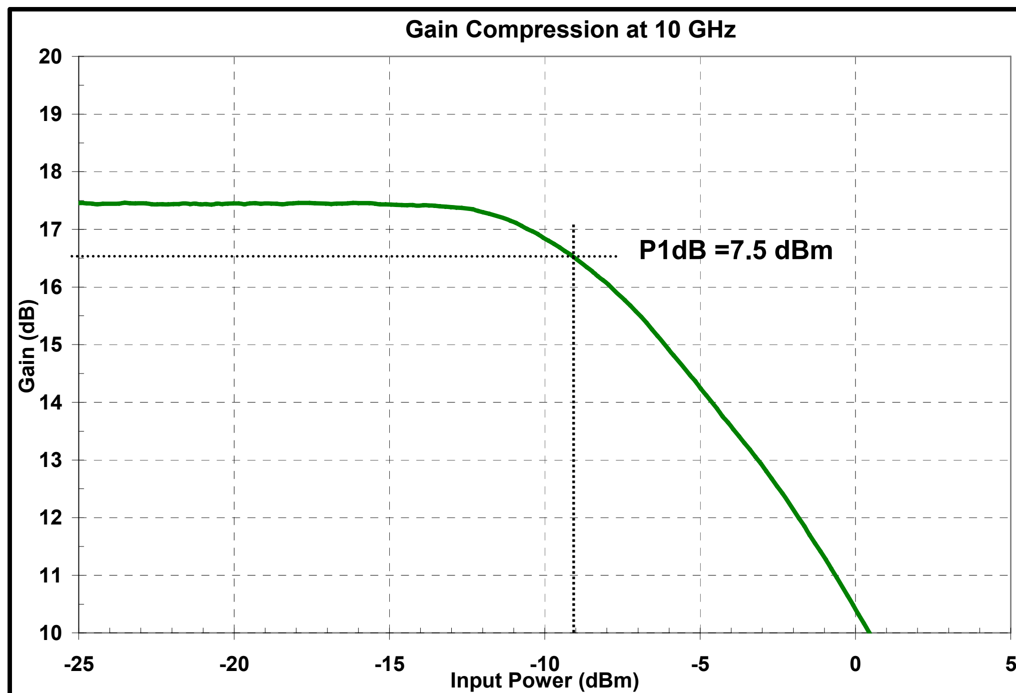
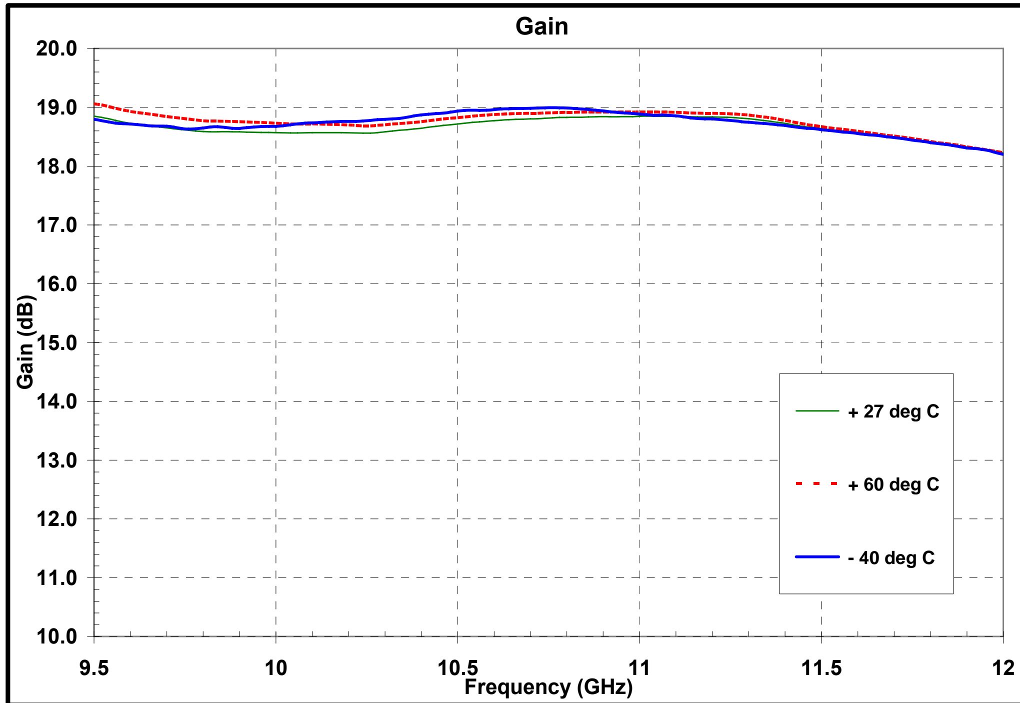


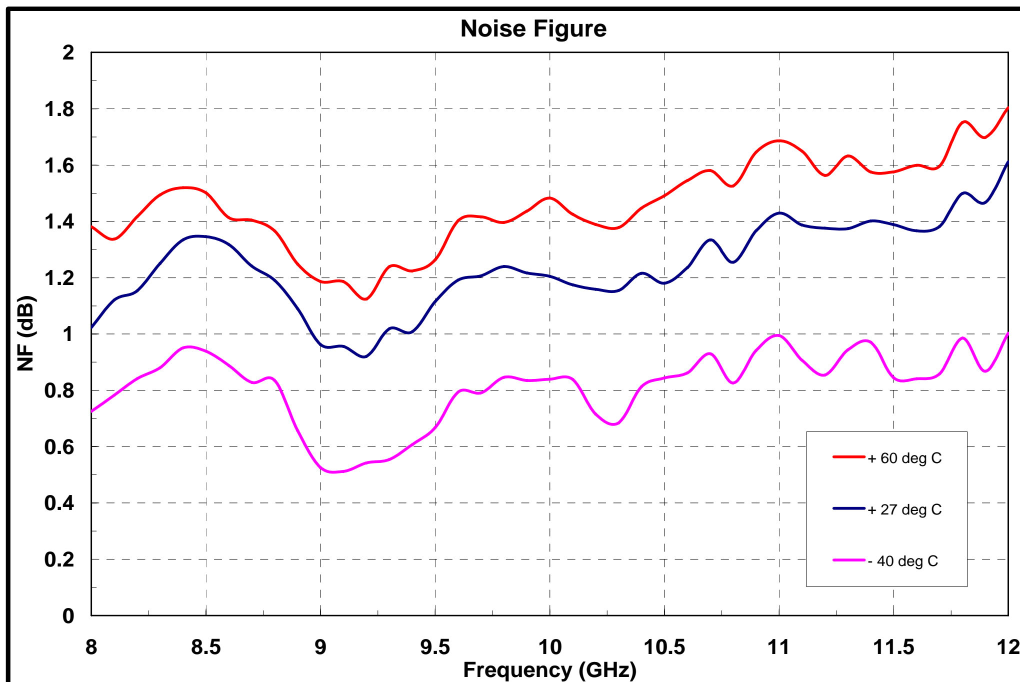


Performance over Temperature

Vd1, Vd2 =2V, Total Current = 37 mA, T_A = 25 °C

	-40 °C	+ 25 °C	+60 °C
Id	37 mA	38 mA	38mA





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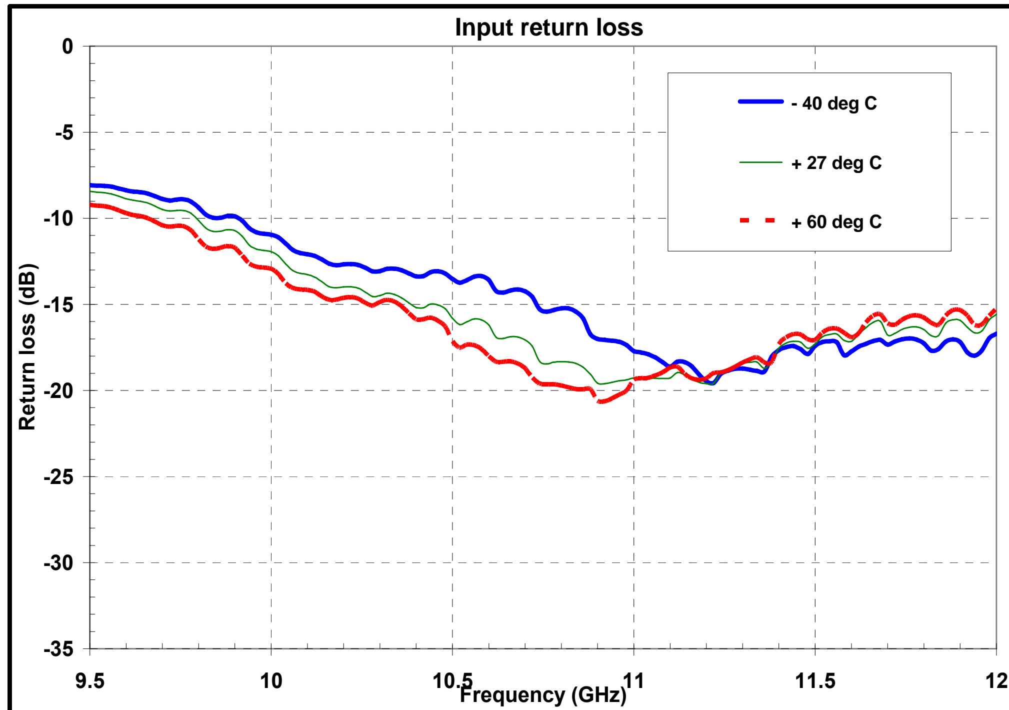

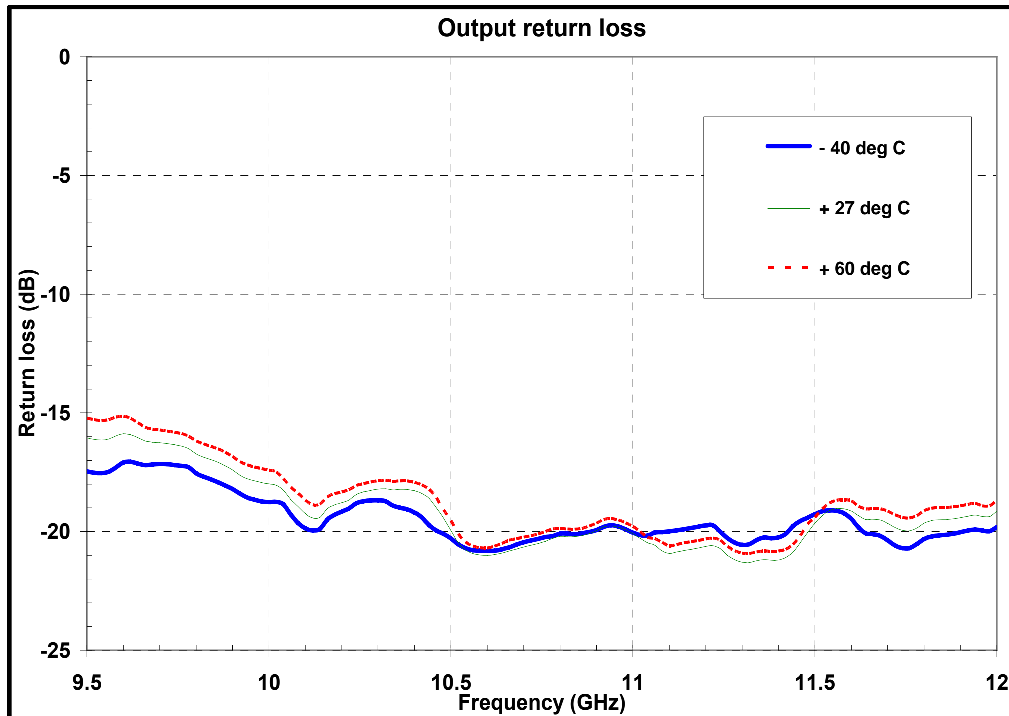

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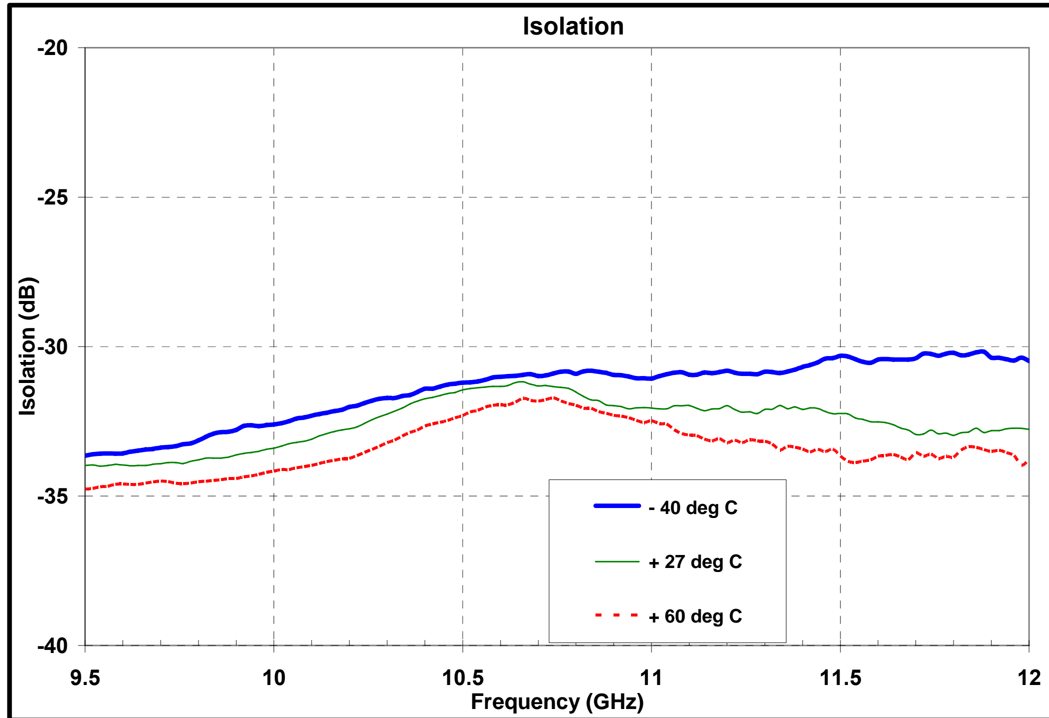
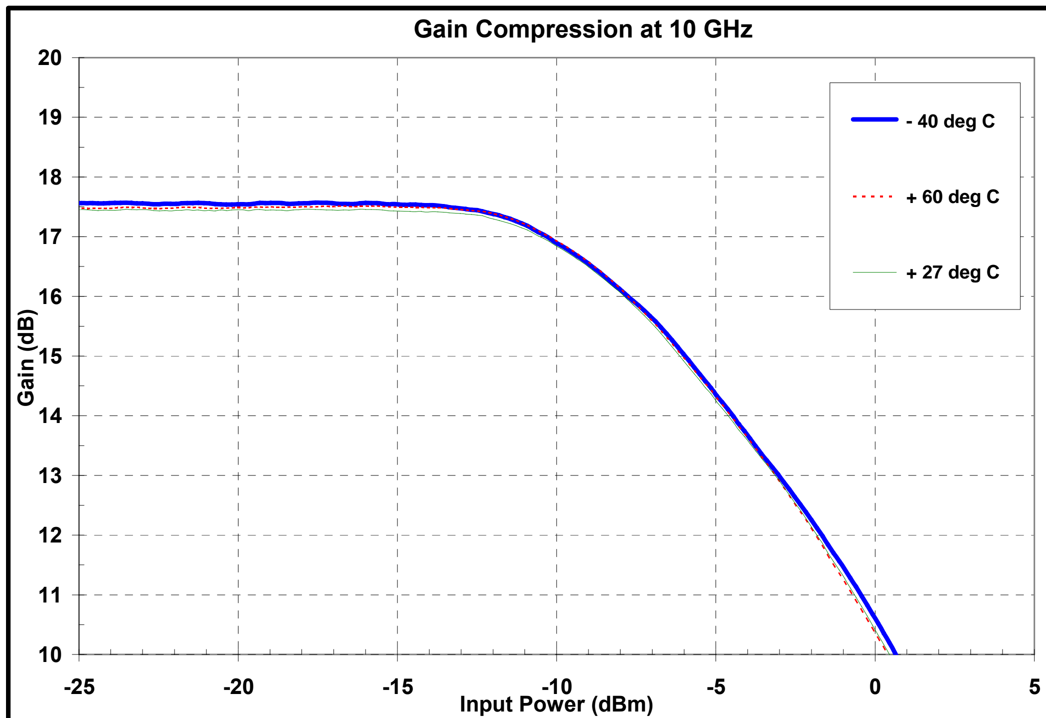
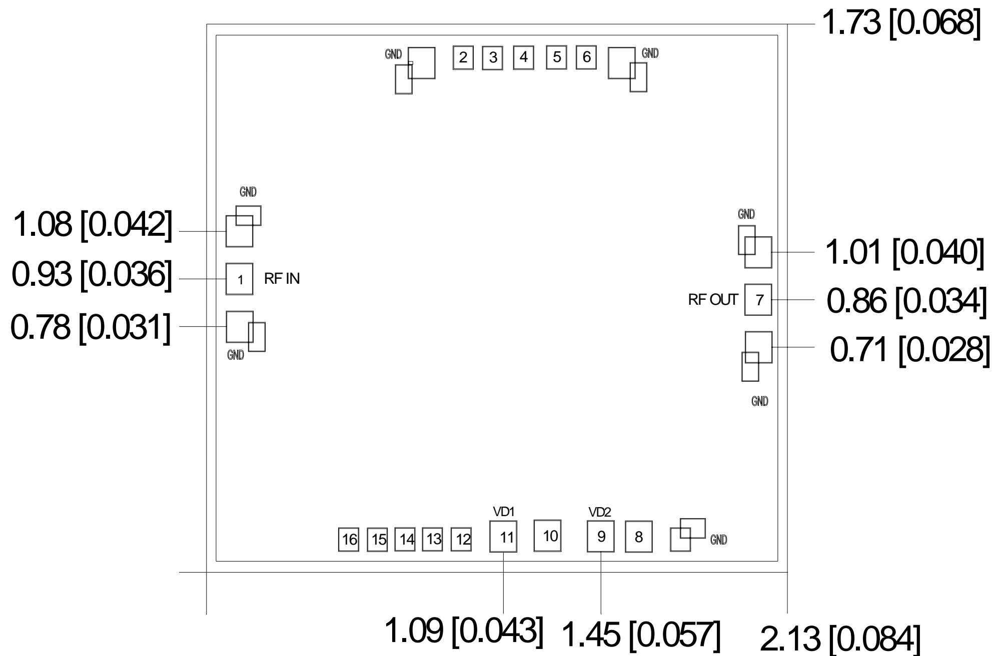




Mechanical Characteristics



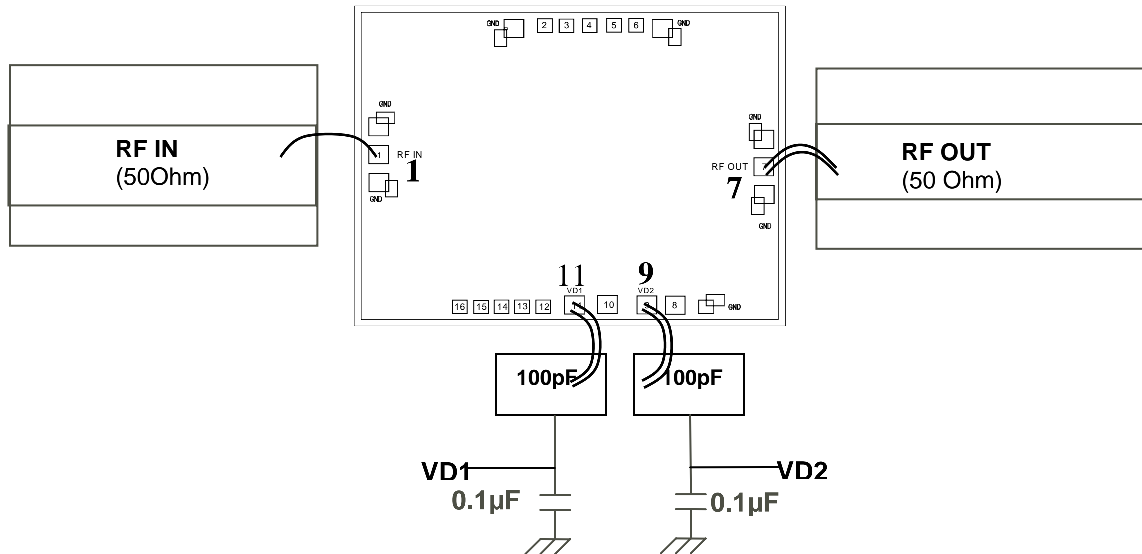
Units: millimeters (inches)

All RF and DC bond pads are 100µm x 100µm

Note:

1. **Pad no. 1 : RF IN**
2. **Pad no. 7 : RF OUT**
3. **Pad no. 11 : 1st stage drain supply**
4. **Pad no. 9 : 2nd stage drain supply**

Recommended Assembly Diagram



Note:

1. Single one mil (0.0254 mm) bond wire of length 350um should be used for RF Input.
2. Two 1 mil (0.0254 mm) bond wires of length 250um should be used for RF Output and DC bias at VD.
3. Bond Pad Nos 2,3,4,5,6 and 12,13,14,15 may be used for increasing Id1 & Id2 respectively by grounding them.
4. Additional 100pF Bypass capacitor needs to be used in Drain bias path.

Die attach: For Epoxy attachment, use of a two-component conductive epoxy is recommended. An epoxy fillet should be visible around the total die periphery. If Eutectic attachment is preferred, use of fluxless AuSn (80/20) 1-2 mil thick preform solder is recommended. Use of AuGe preform should be strictly avoided.

Wire bonding: For DC pad connections use either ball or wedge bonds. For best RF performance, use of 150 - 200µm length of wedge bonds is advised. Single Ball bonds of 250-300µm though acceptable, may cause a deviation in RF performance.

GaAs MMIC devices are susceptible to Electrostatic discharge. Proper precautions should be observed during handling, assembly & testing

All information and Specifications are subject to change without prior notice