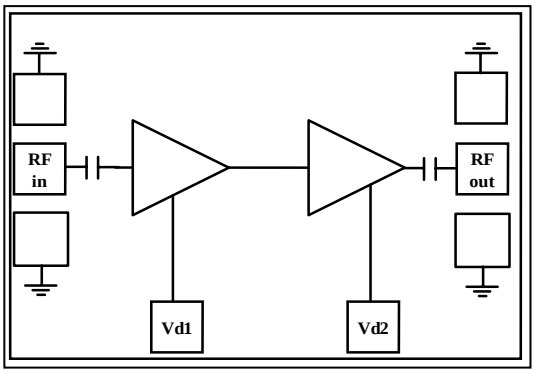
9.5 -12 GHz Ultra Low Noise Amplifier

Features

- **Frequency Range : 9.5-12 GHz**
- **Ultra Low Noise Figure ~ 0.8 dB (on-wafer)**
- **Gain : 13 dB**
- **Nominal P1dB@4V : 11dBm**
- **Input Return Loss >10 dB**
- **Output Return Loss > 15 dB**
- **Single supply operation**
- **No external matching required**
- **DC decoupled input and output**
- **0.15-um InGaAs pHEMT Technology**
- **Chip Dimensions: 2.9 x 1.7 x 0.1 mm**

Functional Diagram



Typical Applications

- **Radar**
- **Military**
- **Test Equipment and Sensors**
- **Point-to-Point Radios, Point-to-Multi-Point Radios & VSATS**

Description

The AMT2142032 is Ultra Low Noise Amplifier operating in 9.5-12 GHz. The LNA uses 2 stages of amplification to provide 13 dB of nominal gain with a typical mid-band noise figure of 1.3 dB. The LNA has nominal input return loss of 10 dB and output return losses of 15 dB. The nominal P1dB is 4 dBm and can be increased to 11 dBm when the last stage is operated at 4V. The chip operates from a single positive supply and is unconditionally stable. Circuit grounds are provided through vias to the backside metallization. The die is fabricated using a reliable 0.15μm InGaAs pHEMT technology. In addition to being used as the first stage, the LNA's excellent linearity encourages it usage for in the succeeding stages of a receiver chain. The LNA's good return losses and flat gain over the band makes it suitable for use 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	60	mA
Operating Temperature	-55 to +85	oC
Storage Temperature	-65 to +150	oC

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

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

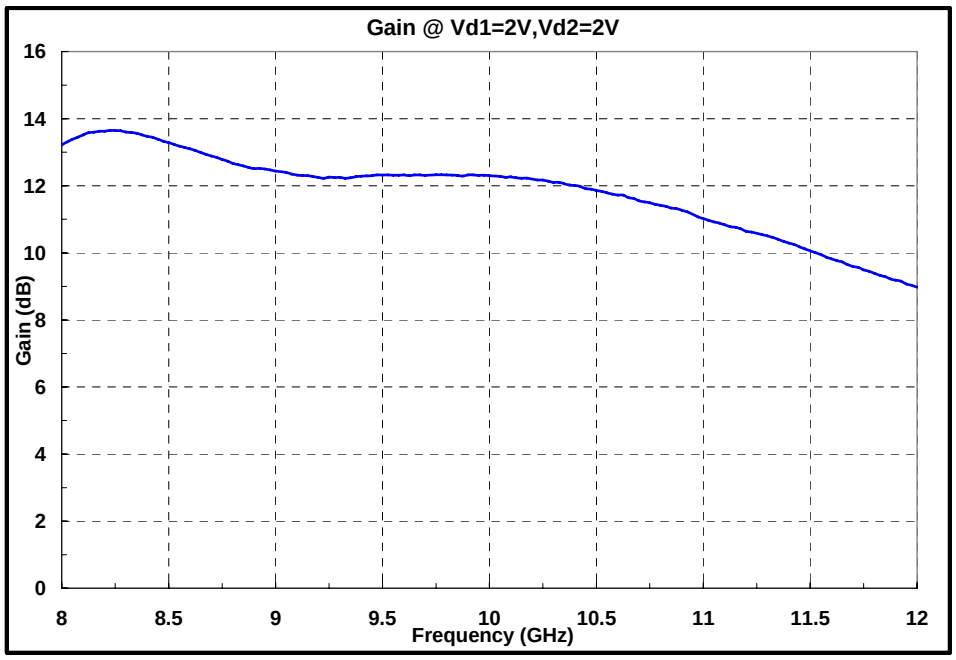
Parameter	Typ.	Typ.	Units
Frequency Range	9.5 -11	11 -12	GHz
Gain	13±0.4	11.5±1	dB
Noise Figure (max.)	0.8[2]/1.3	0.8[2]/1.3	dB
Input Return Loss(min.)	10	8	dB
Output Return Loss (min.)	15	12	dB
Output Power (P1dB) (min.)	4/11[3]		dBm
Saturated Output Power (Psat)	6/13[3]		dBm
Output Third Order Intercept (IP3)	15/22[3]		dBm
Supply Current (Id)	25/32[3]		mA

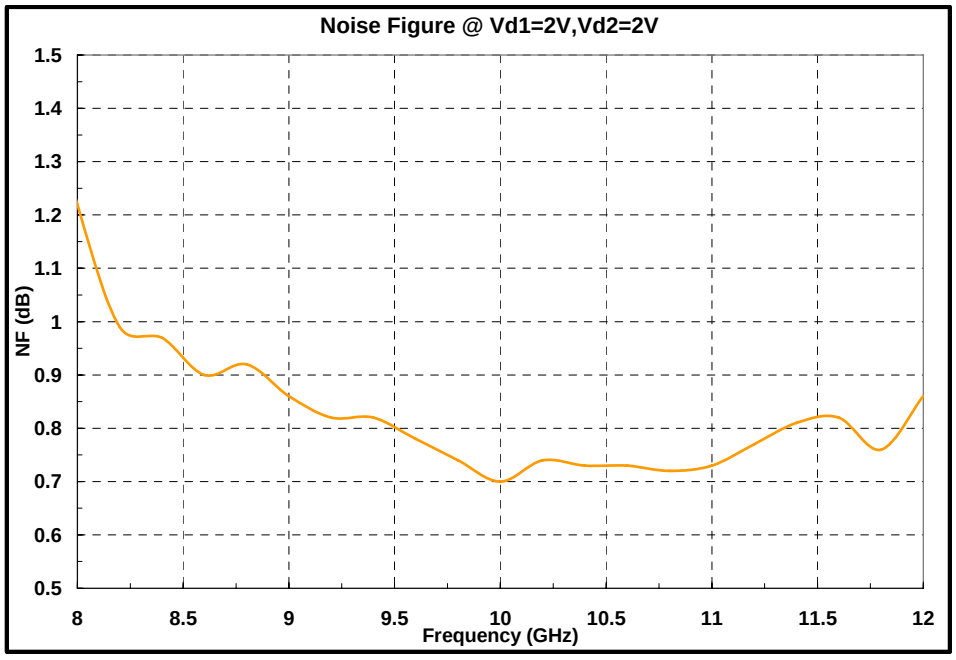
Note:

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

On-Wafer Test data

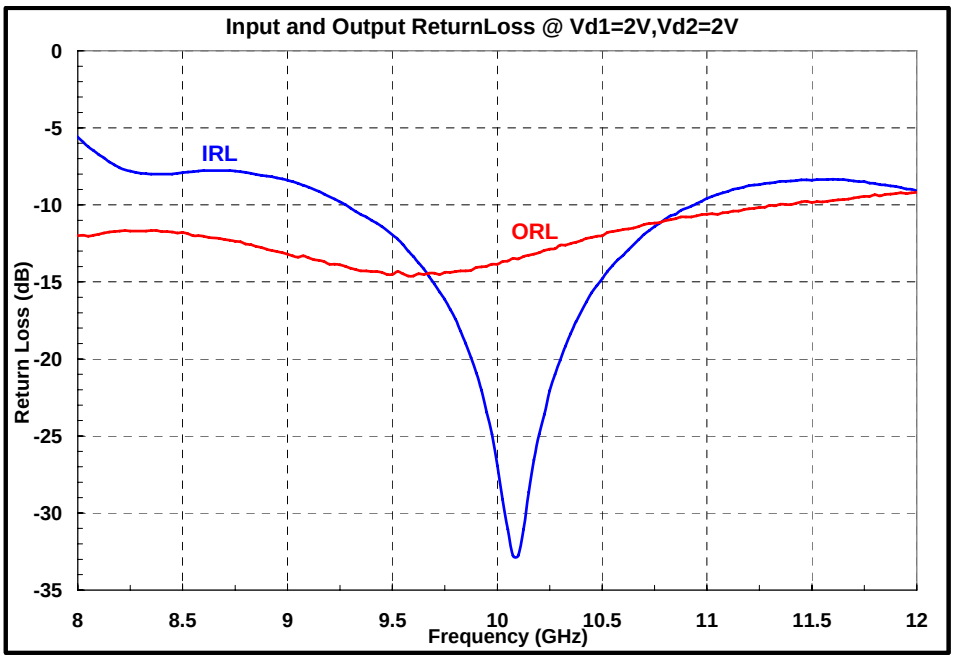
Vd1, Vd2, =2V, Total Current = 25 mA, T_A = 27 ^oC

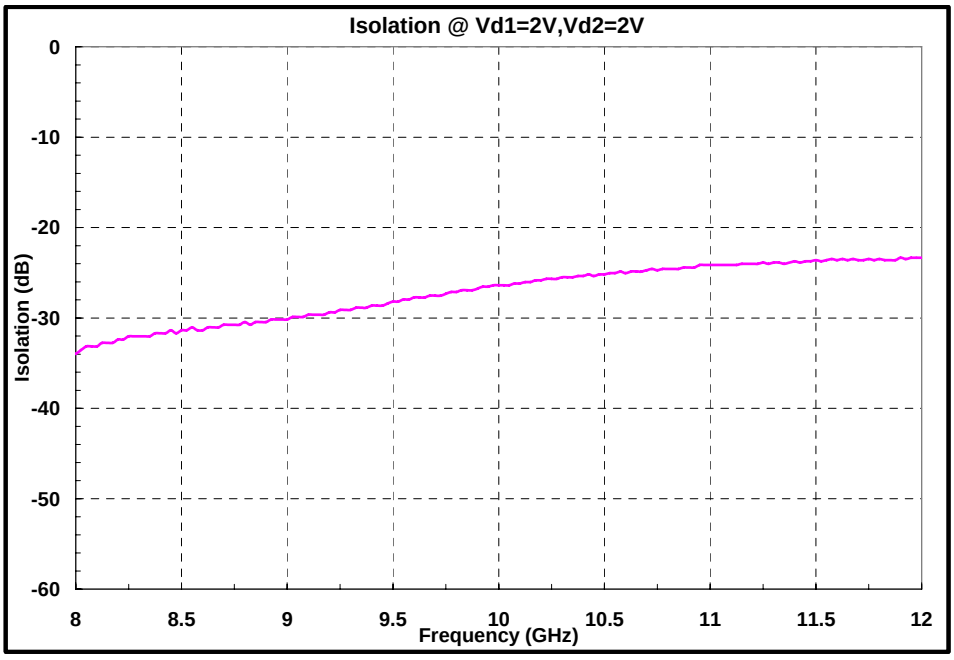




On-Wafer Test data

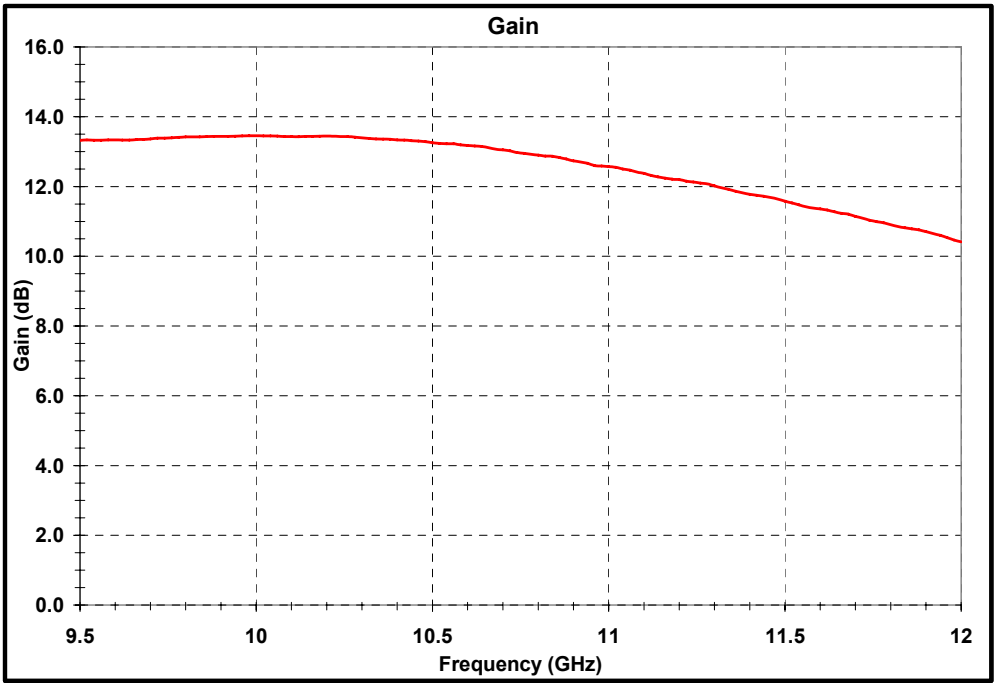
Vd1, Vd2, =2V, Total Current = 25 mA, T_A = 27 ^oC

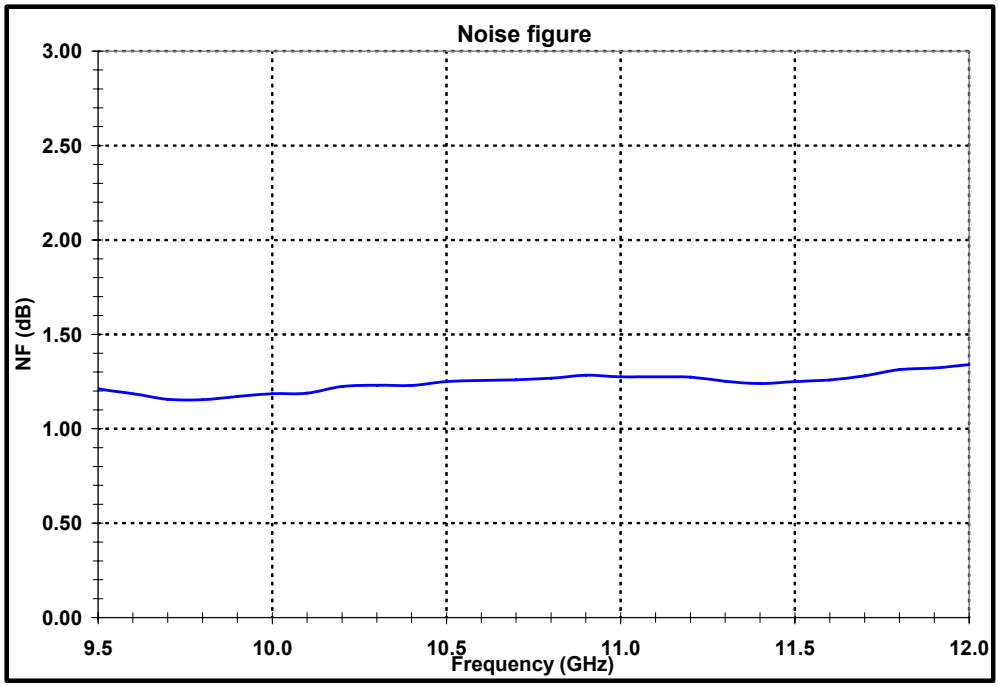




Test fixture data

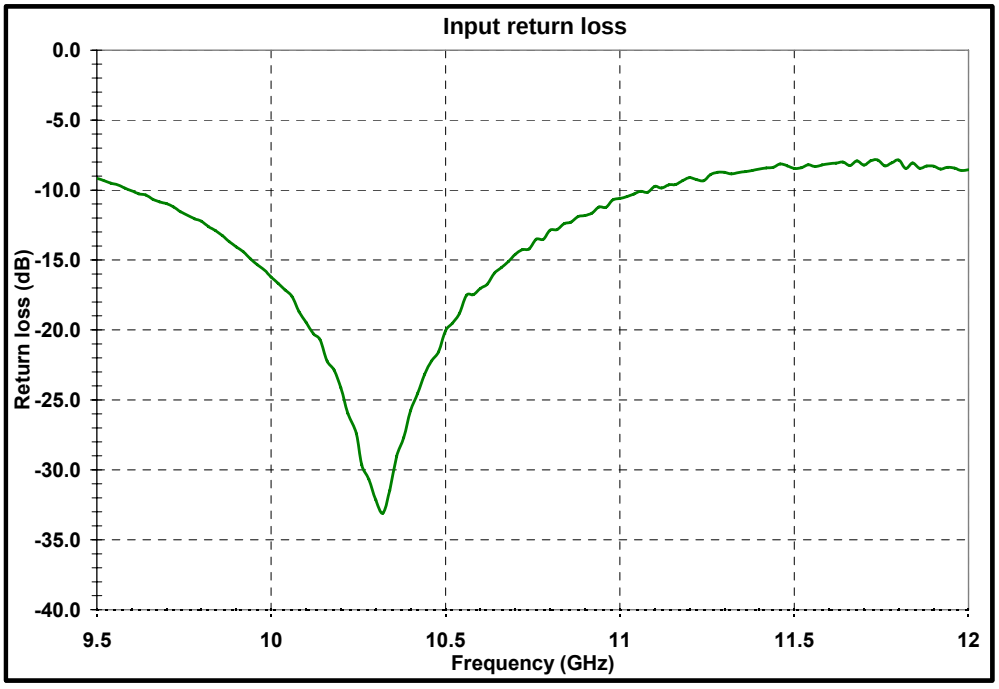
Vd1, Vd2, =2V, Total Current = 25 mA, T_A = 27 ^oC

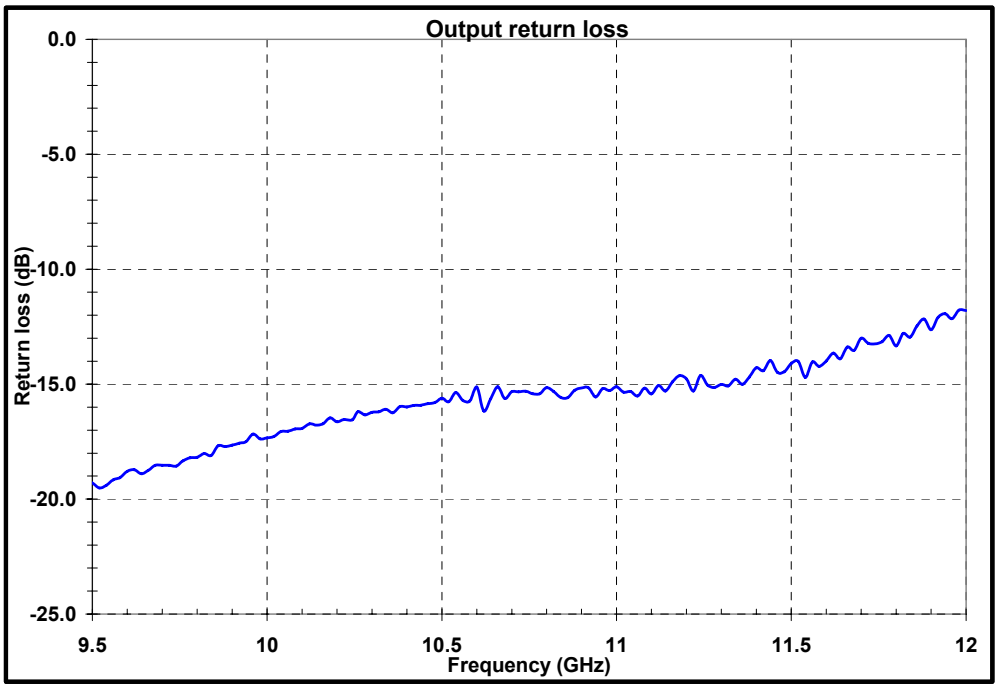




Test fixture data

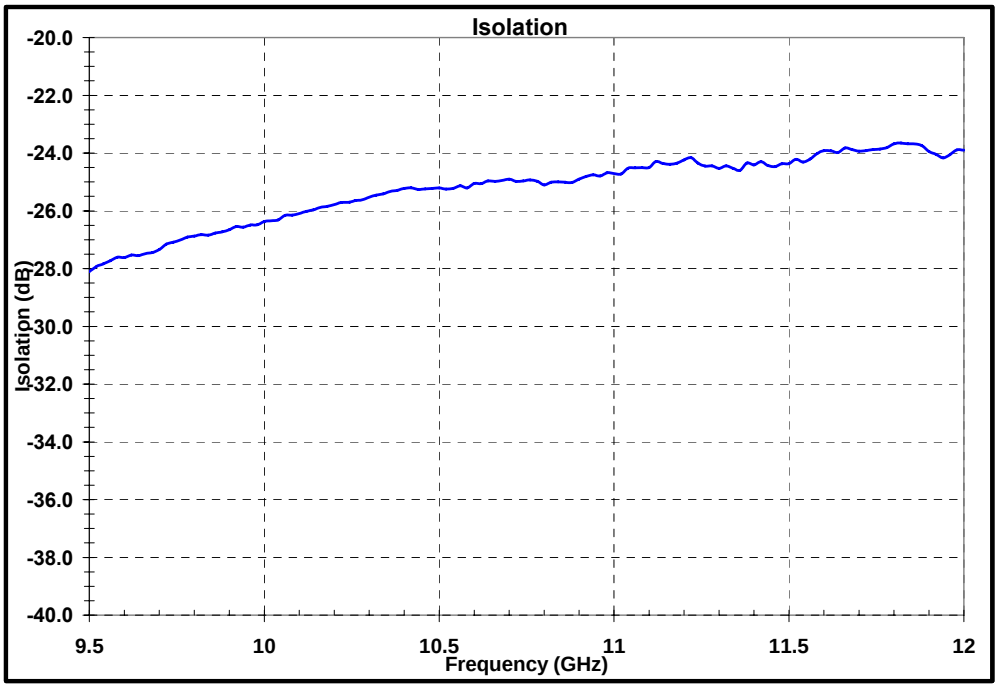
Vd1, Vd2, =2V, Total Current = 25 mA, T_A = 27 ^oC

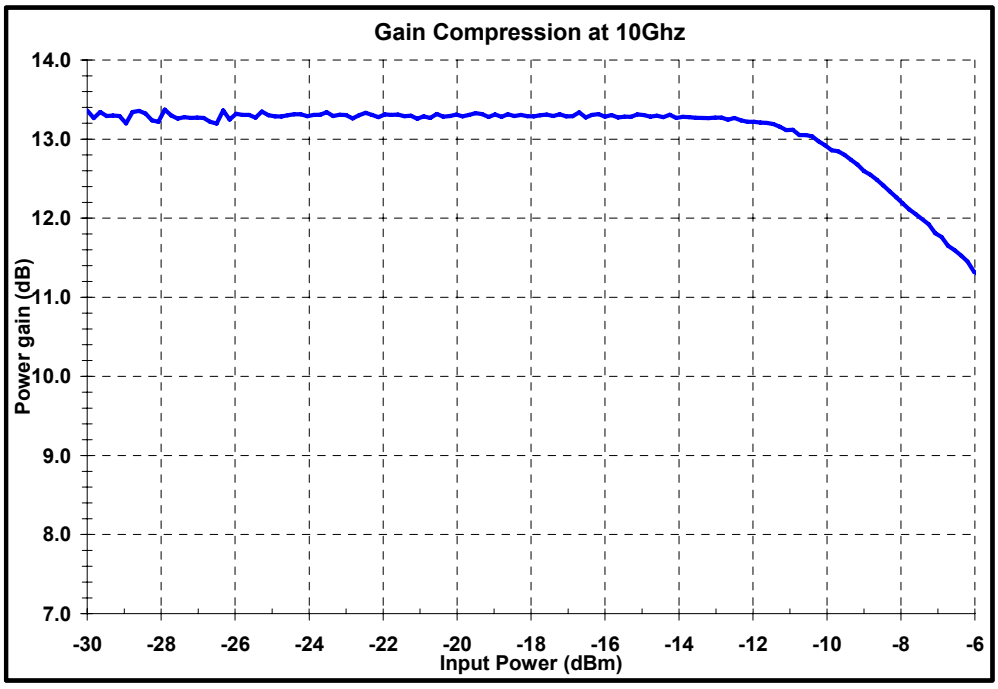




Test fixture data

Vd1, Vd2, =2V, Total Current = 25 mA, T_A = 27 ^oC

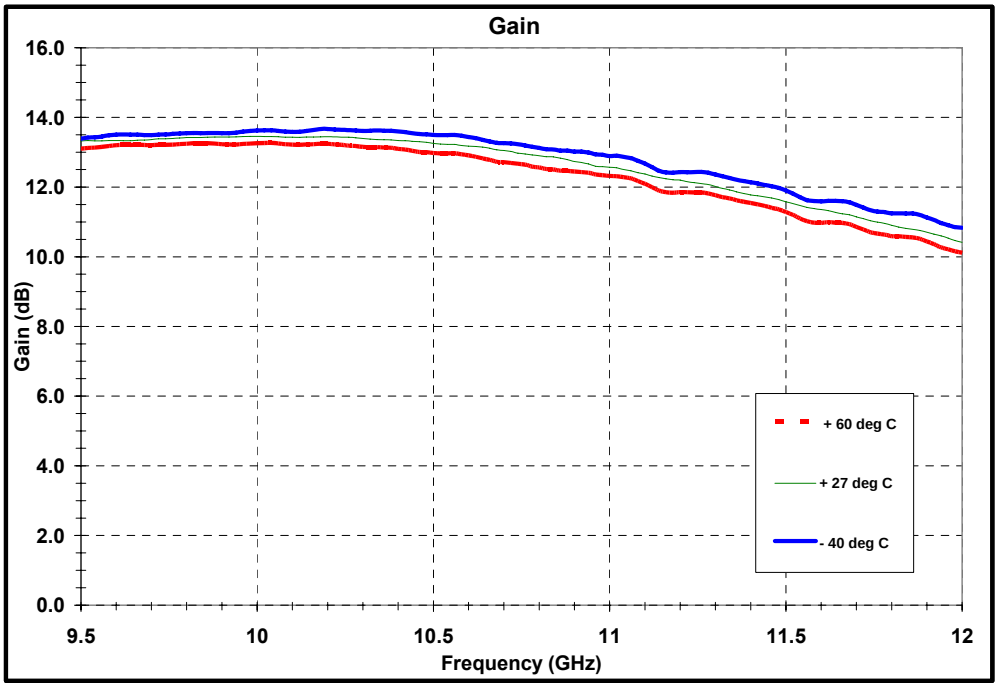


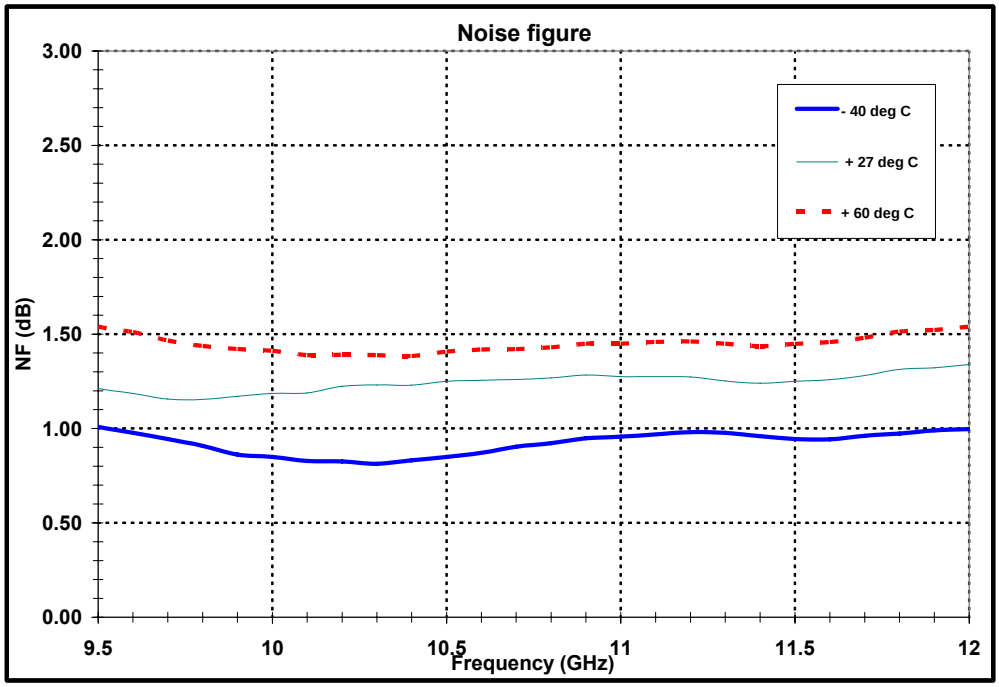


Performance over temperature

Vd1, Vd2, =2V

	-40 °C	+ 27 °C	+60 °C
Id	26 mA	25 mA	26mA

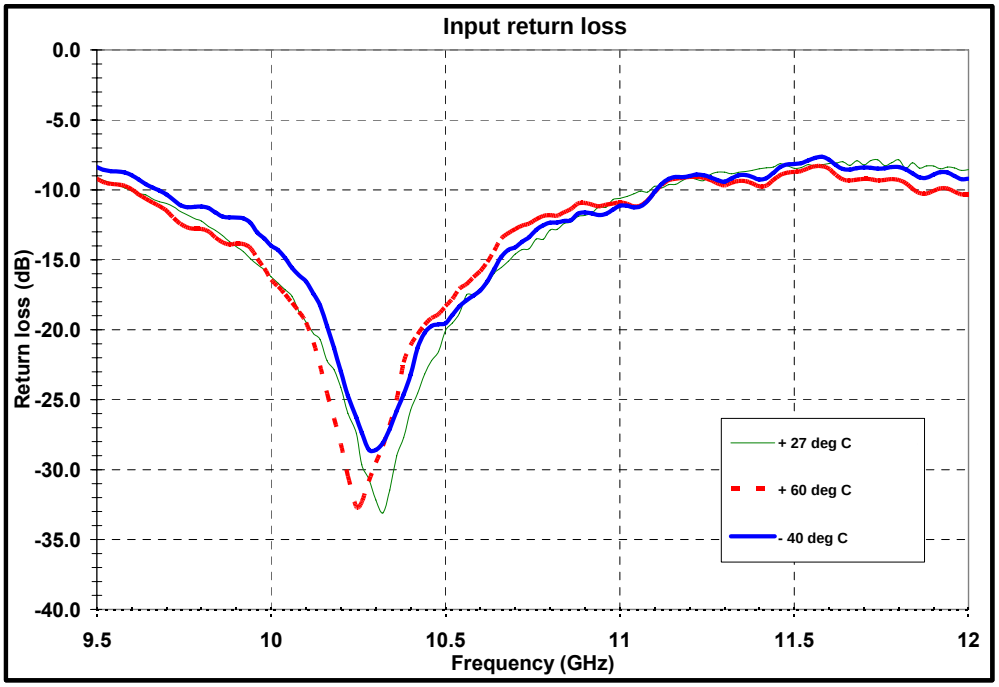


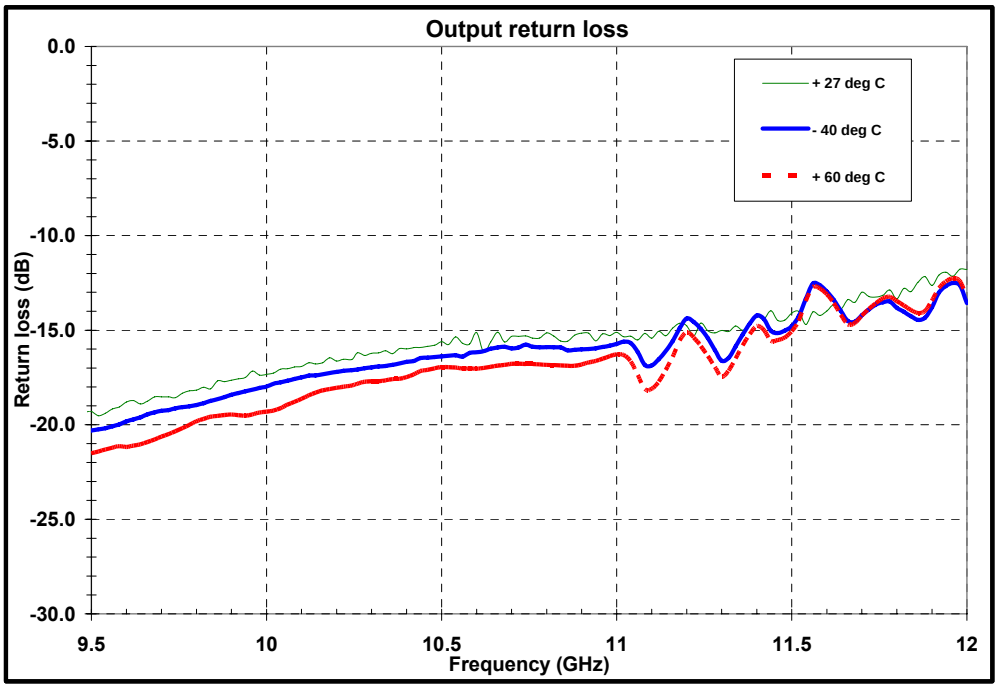


Performance over temperature

Vd1, Vd2, =2V

	-40 °C	+ 27 °C	+60 °C
Id	26 mA	25 mA	26mA

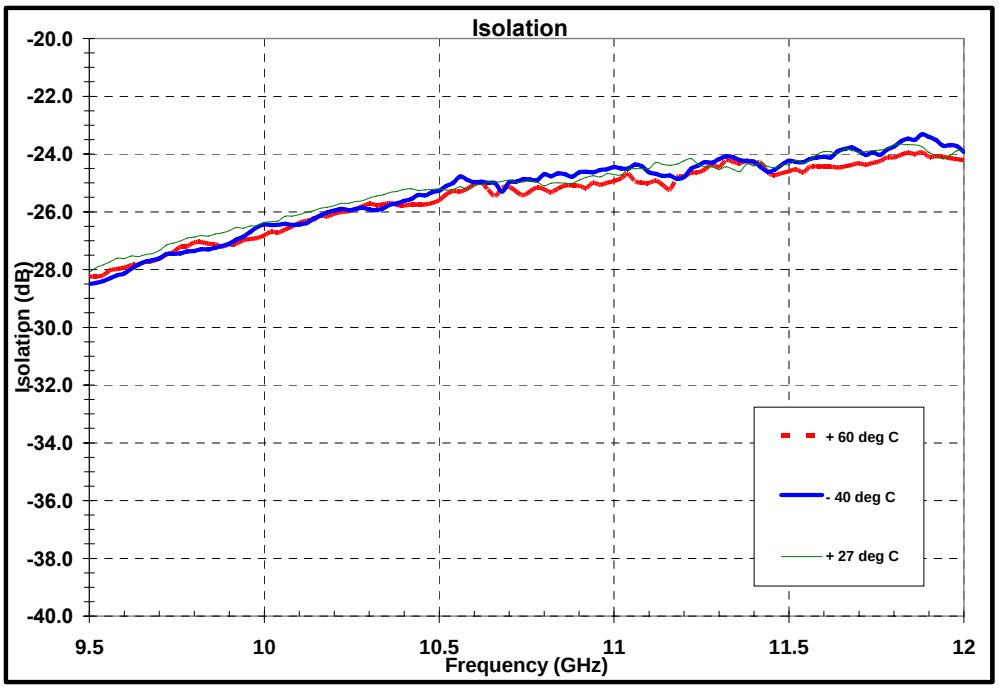




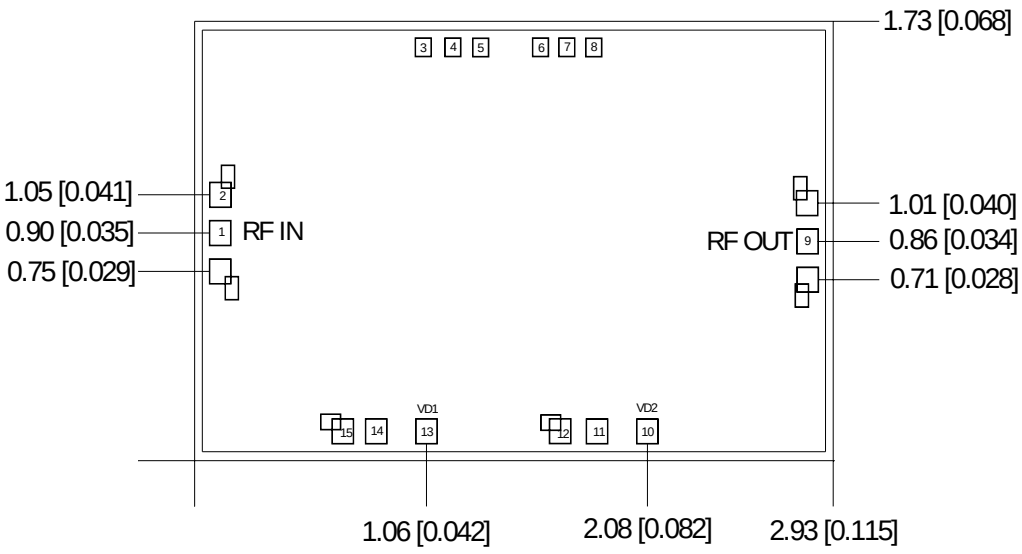
Performance over temperature

Vd1, Vd2, =2V

	-40 °C	+ 27 °C	+60 °C
Id	26 mA	25 mA	26mA



Mechanical Characteristics



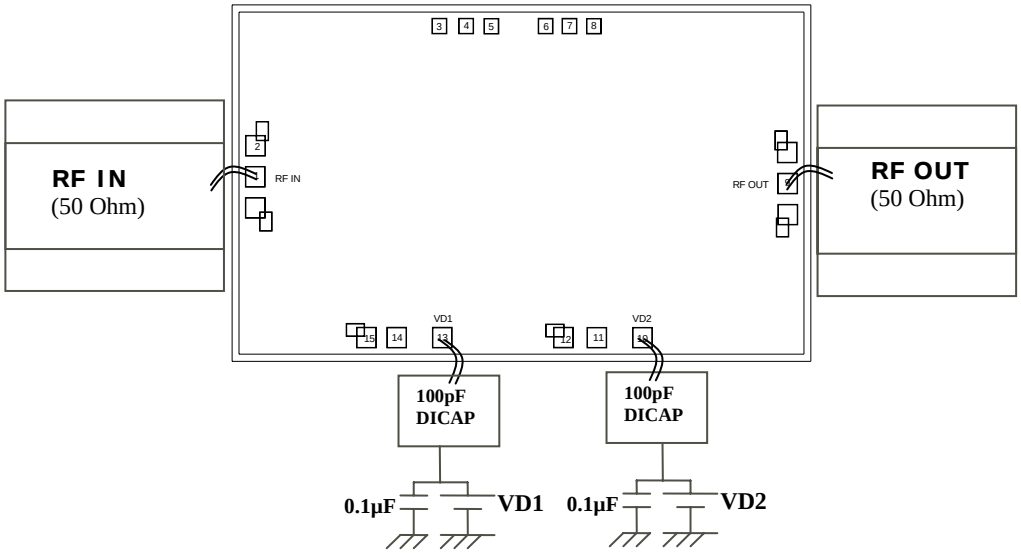
Units: millimeters (inches)

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

Note:

1. **Pad no. 1 : RF IN**
2. **Pad no. 9 : RF OUT**
3. **Pad no. 13 : 1st stage drain supply**
4. **Pad no. 10 : 2nd stage drain supply**

Recommended Assembly Diagram



Note:

1. Single one mil (0.0254 mm) bond wire of 500um to be used for RF Input.
2. Two 1 mil (0.0254mm) bond wires of 250um to be used for RF Output.
3. Two 1 mil (0.0254mm) bond wires of 250um to be used for bias at VD1, VD2.
4. Pads 3, 4, 5 and 6, 7, 8 can be used to tune ID1 and ID2 respectively by grounding them.
5. 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