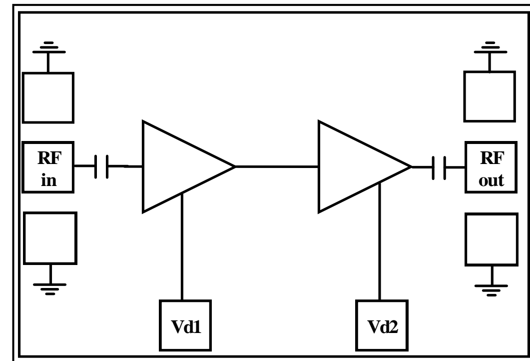
9.5 – 12.0 GHz Ultra Low Noise Amplifier

Features

- Frequency Range: 9.5 -12 GHz
- Ultra Low Noise Figure ~0.8 dB (on-wafer)
- Nominal Gain : 17.5 dB
- +6dBm P1dB @ 2V, 2V
- Input Return Loss < - 10 dB
- Output Return Loss < -15 dB
- Single supply operation
- No external matching required
- DC Decoupled RF ports
- 0.15-um InGaAs pHEMT Technology
- Chip Dimensions: 2.7 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

ASL1022 is a 2-stage Ultra Low Noise Amplifier, operating in 9.5-12GHz Bandwidth. The LNA features 17 dB of nominal gain and typical mid-band noise figure of 1.2 dB. The Input and output ports are DC decoupled. The chip operates on a single +2V/+5V supply voltage. The typical P1dB is 6 dBm and can be increased 14 dBm 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 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	120	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

Phone : +65 68092093
Fax : +65 63360650

Email: info@aeliussemi.com
URL: www.aeliussemi.com

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

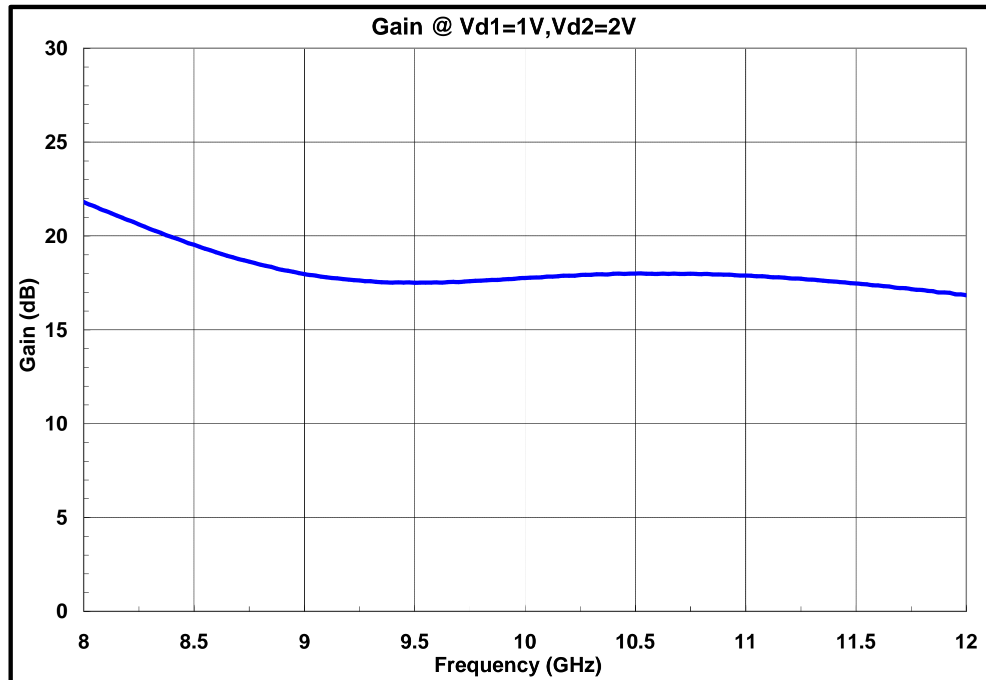
Parameter	Typ.	Typ.	Units
Frequency Range	9.5-10.5	10.5-12	GHz
Gain	17.5	17.5	dB
Gain Flatness	± 0.2	- 0.6	dB
Noise Figure (max.)	0.7[2]/1.1	0.8[2]/1.5	dB
Input Return Loss (min.)	10	20	dB
Output Return Loss (min.)	15	20	dB
Output Power (P1dB) (min.)	+6.5/14[3]		dBm
Saturated Output Power (Psat)	+9/16.5[3]		dBm
Output Third Order Intercept (OIP3)	15/23[3]		dBm
Supply Current (Id)	37/48[3]		mA

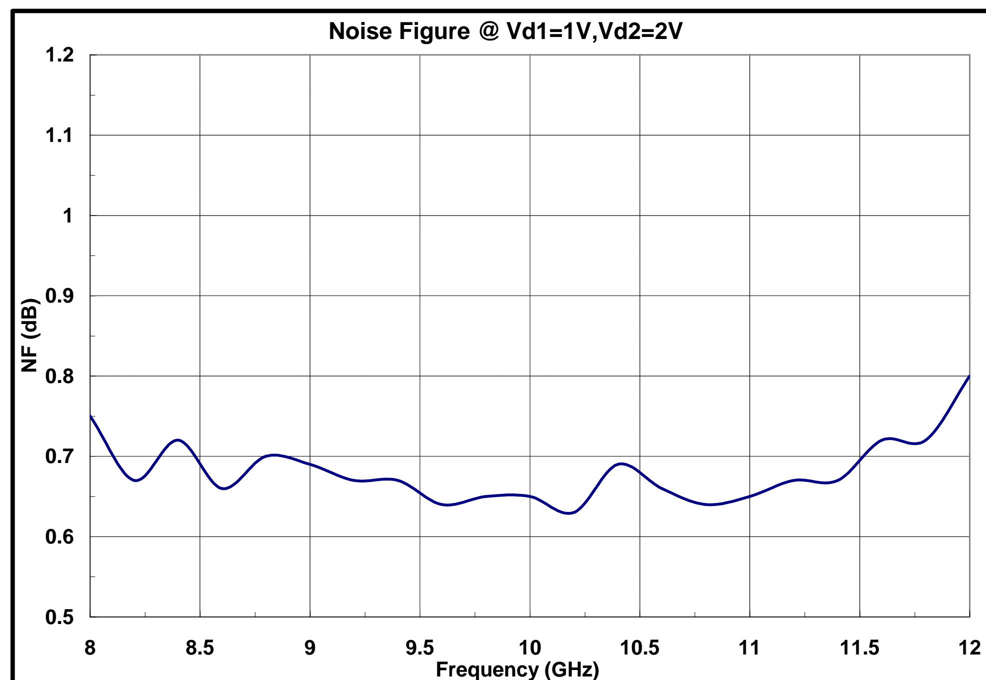
Note:

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

On-Wafer Test data

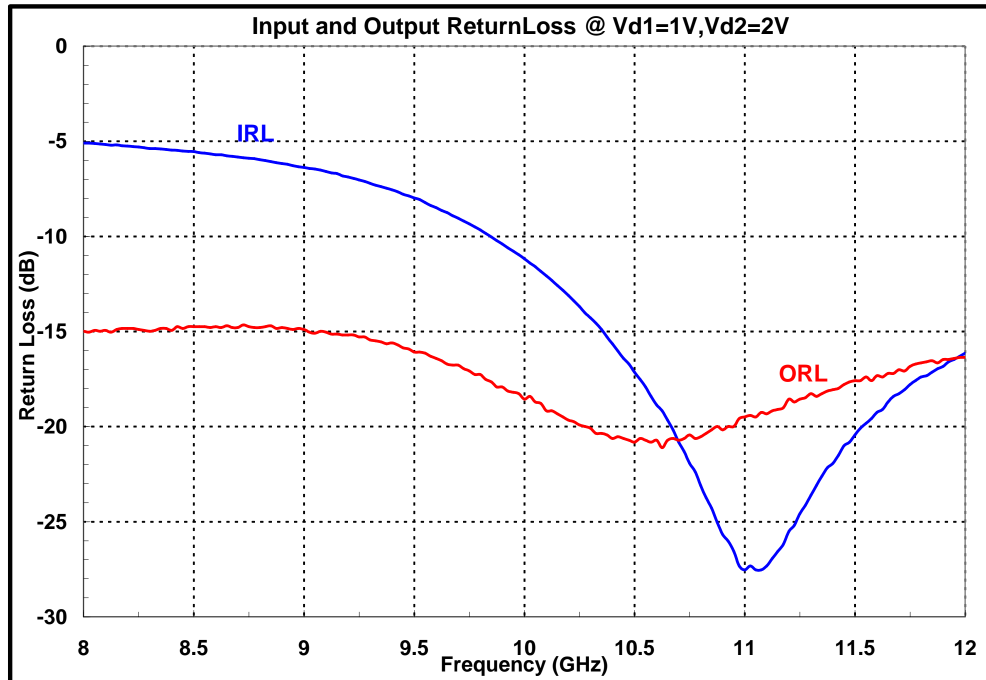
Vd1=1V, Vd2, =2V, Total Current = 25 mA, T_A = 27 °C

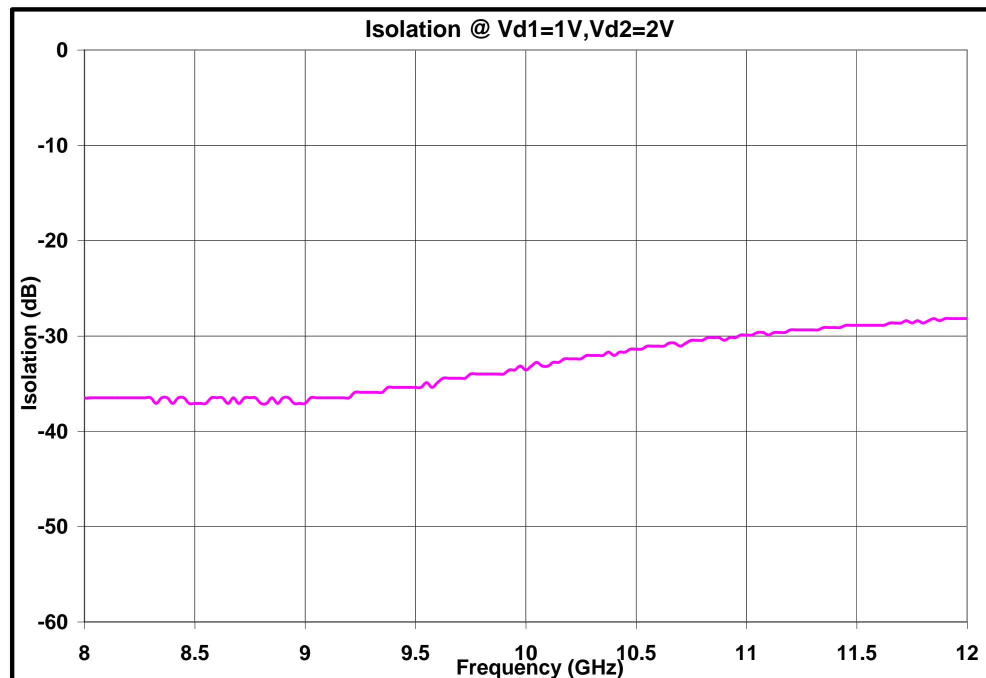




On-Wafer Test data

Vd1=1V, Vd2, =2V, Total Current = 25 mA, T_A = 27 °C



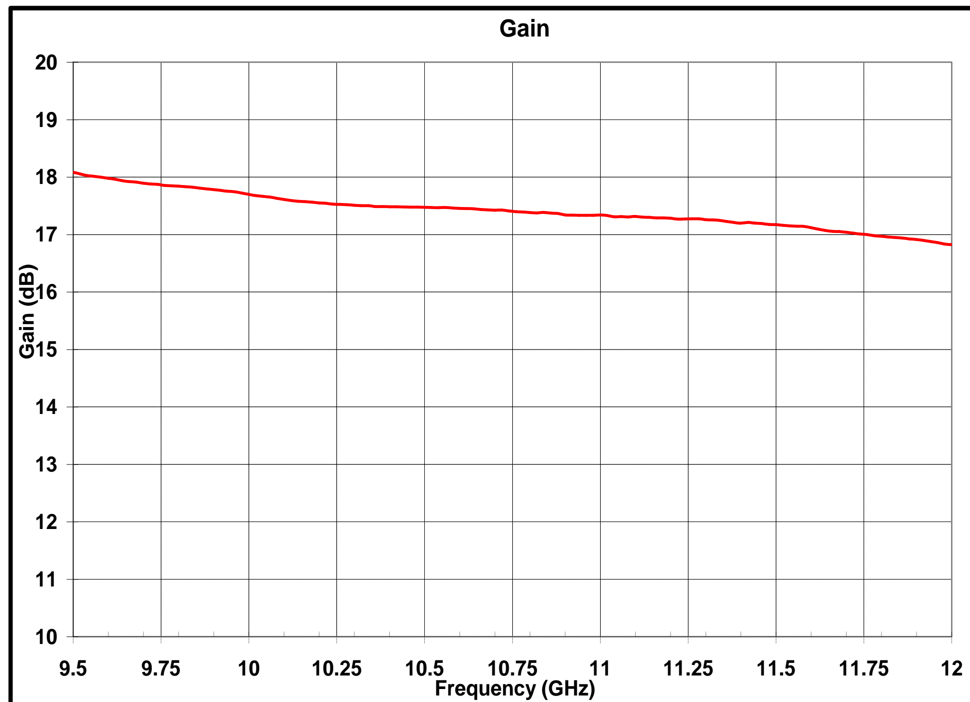


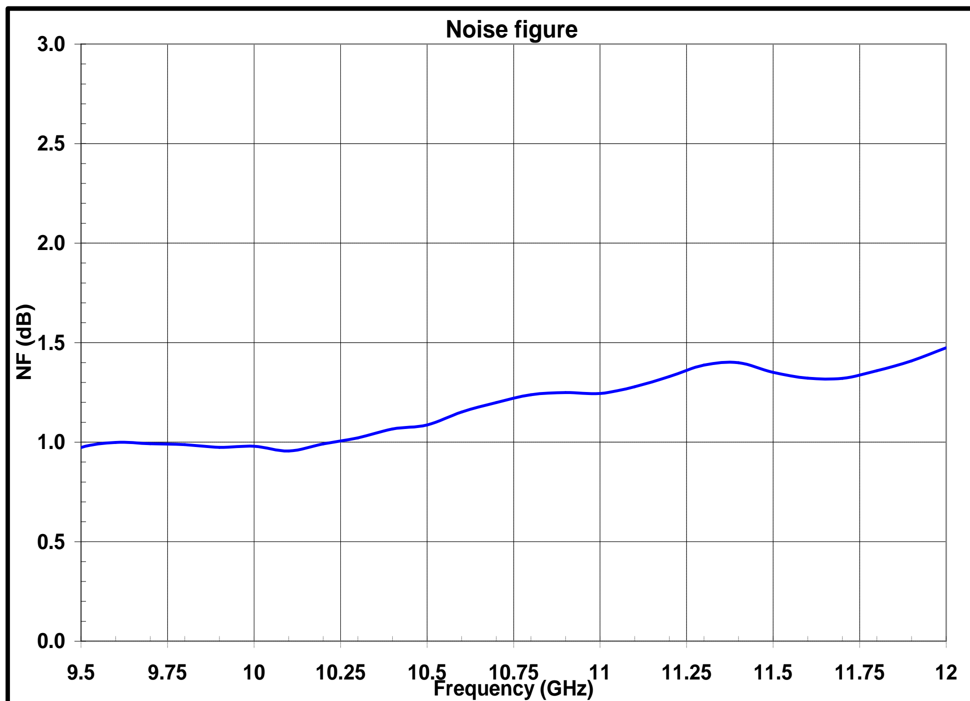
Phone : +65 68092093
Fax : +65 63360650

Email: info@aeliussemi.com
URL: www.aeliussemi.com

Test fixture data

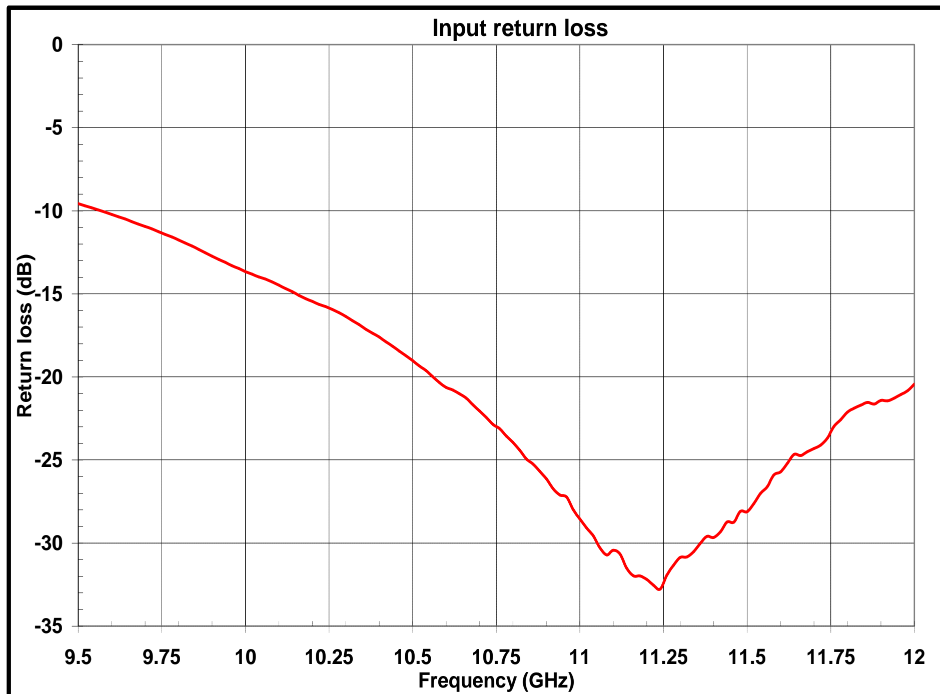
Vd1, Vd2, =2V, Total Current = 37 mA, TA = 25 °C

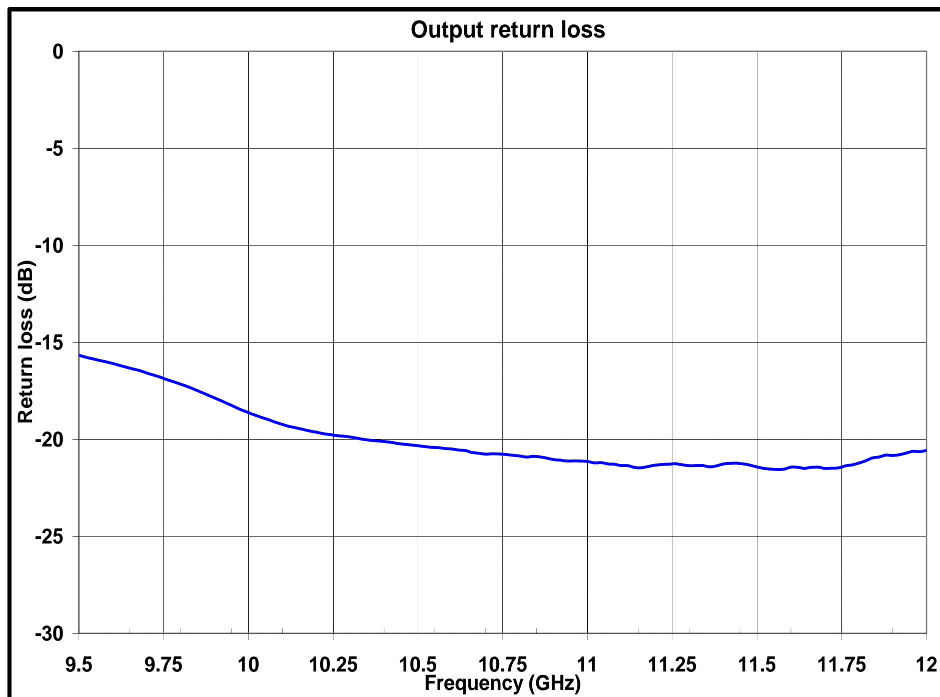




Test fixture data

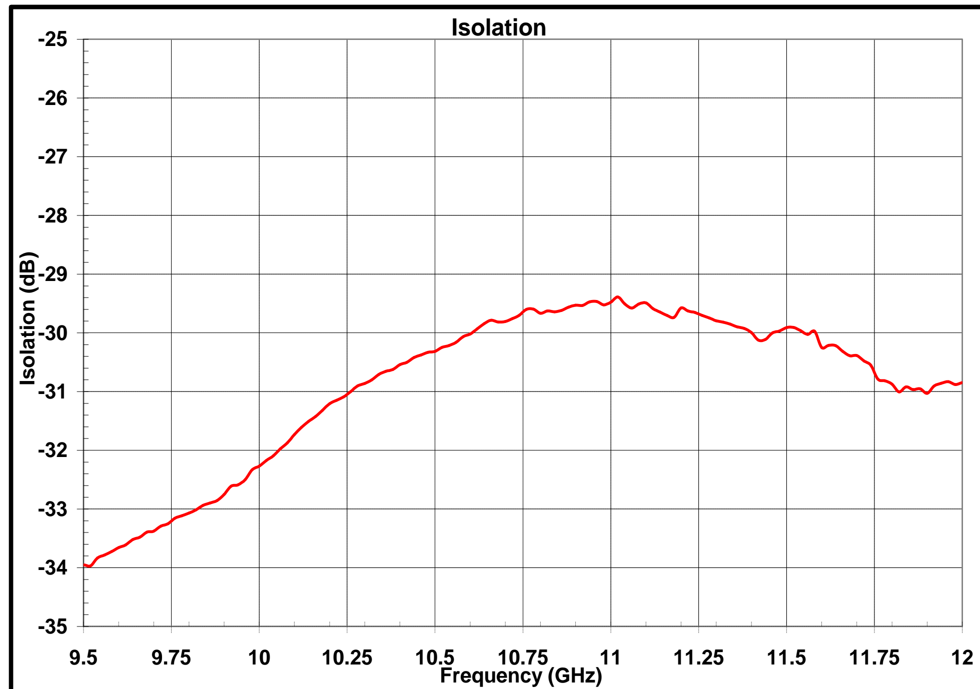
Vd1, Vd2, =2V, Total Current = 37 mA, TA = 25 °C

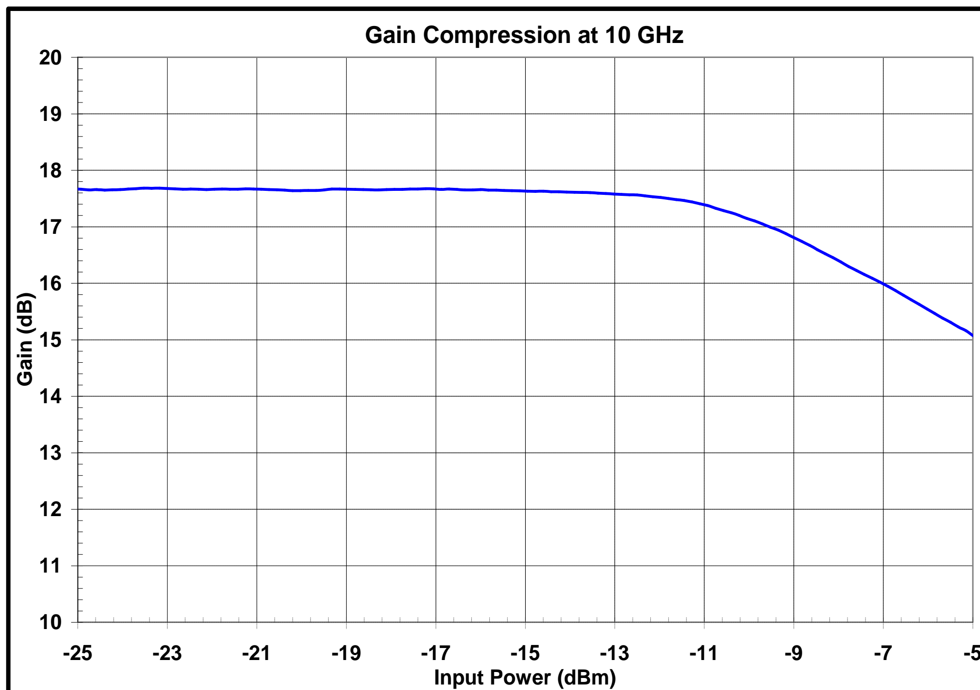




Test fixture data

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

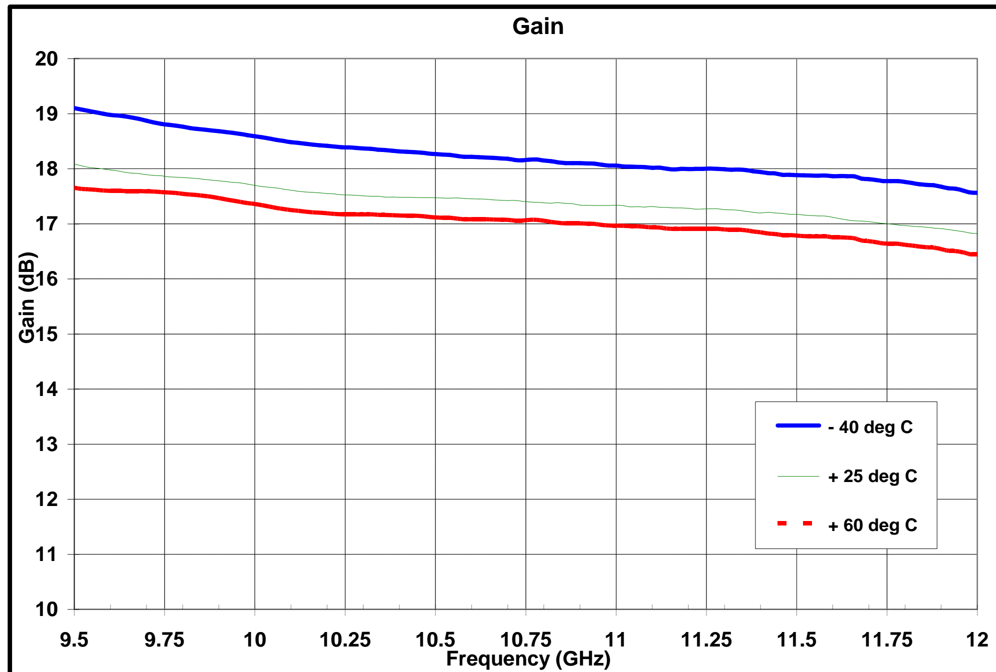


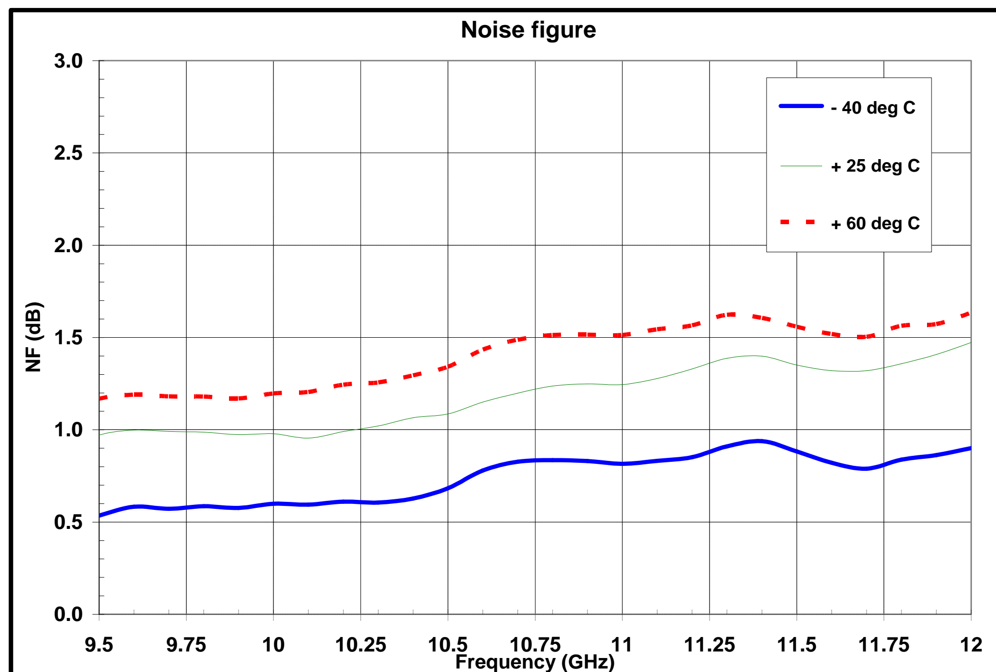


Performance over Temperature

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

	-40 °C	+ 25 °C	+60 °C
Id	36 mA	37 mA	36mA

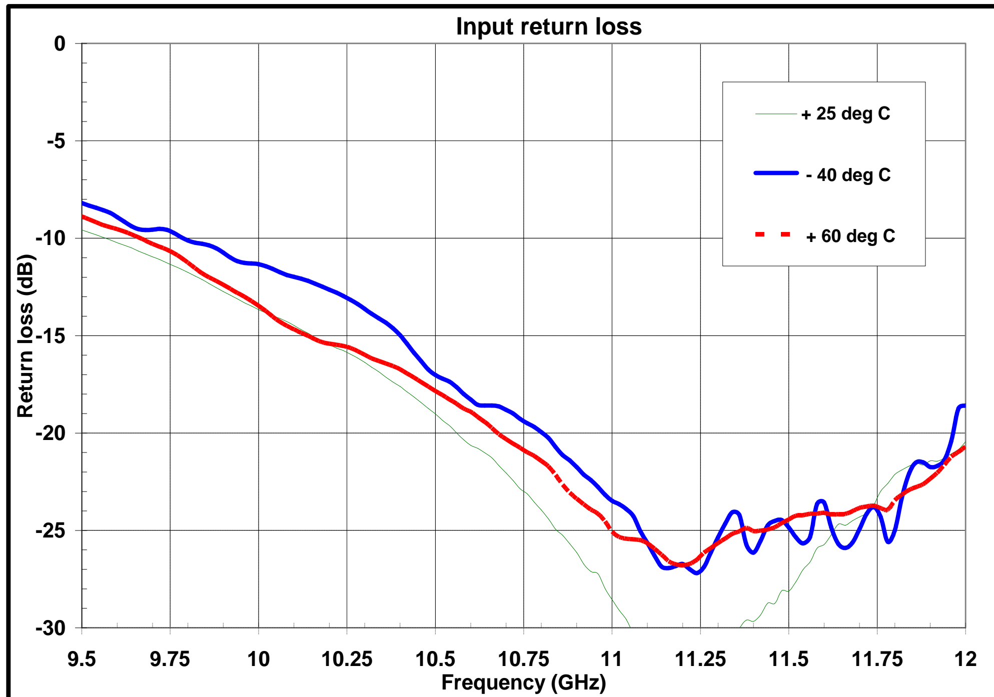


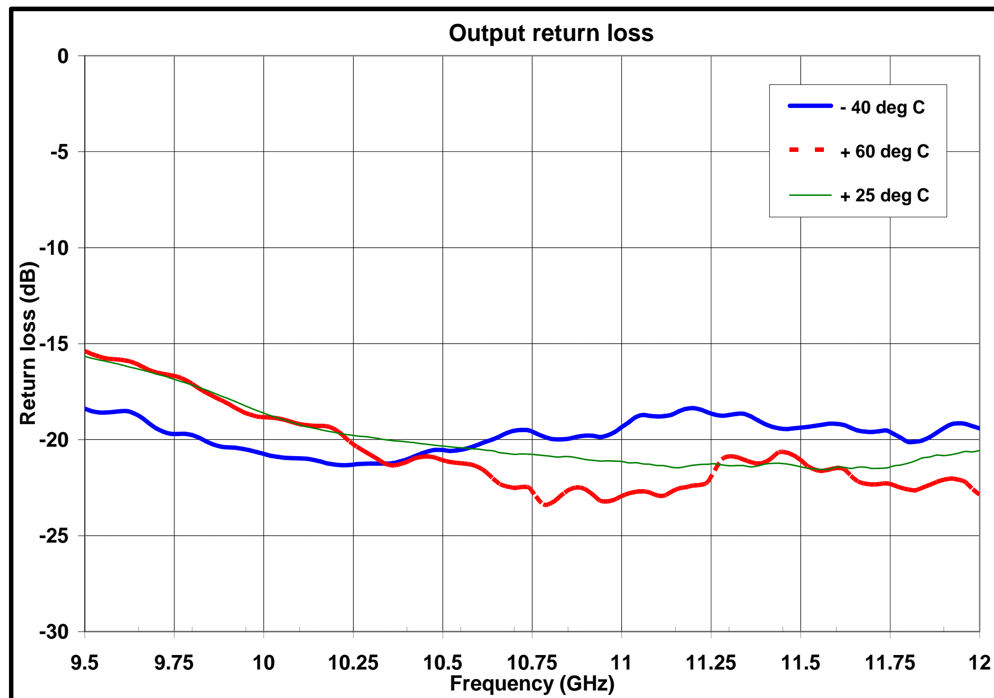


Performance over Temperature

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

	-40 °C	+ 25 °C	+60 °C
Id	36 mA	37 mA	36mA



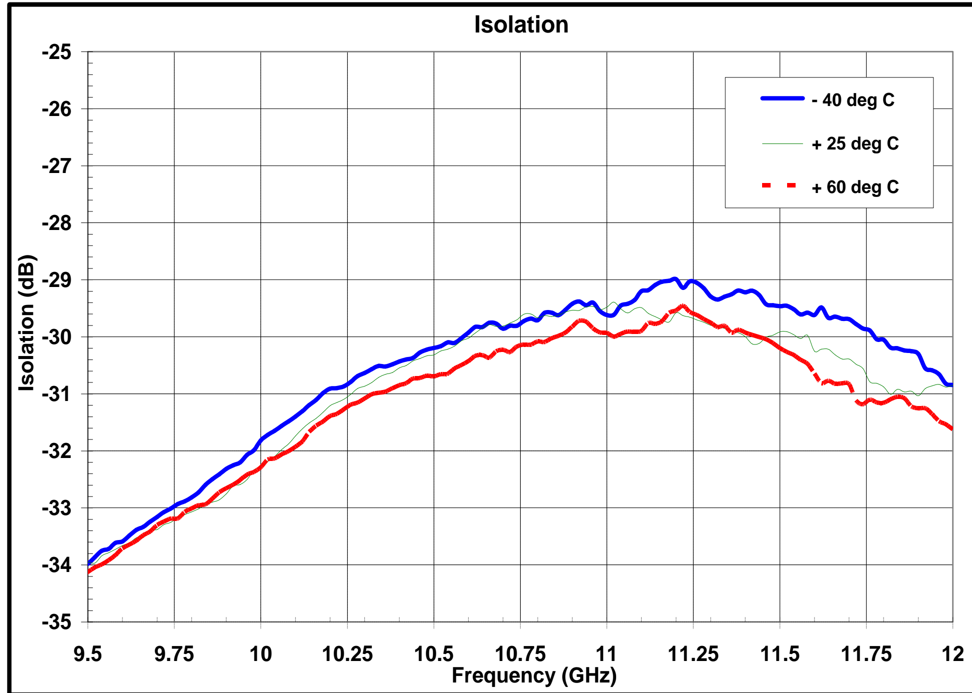


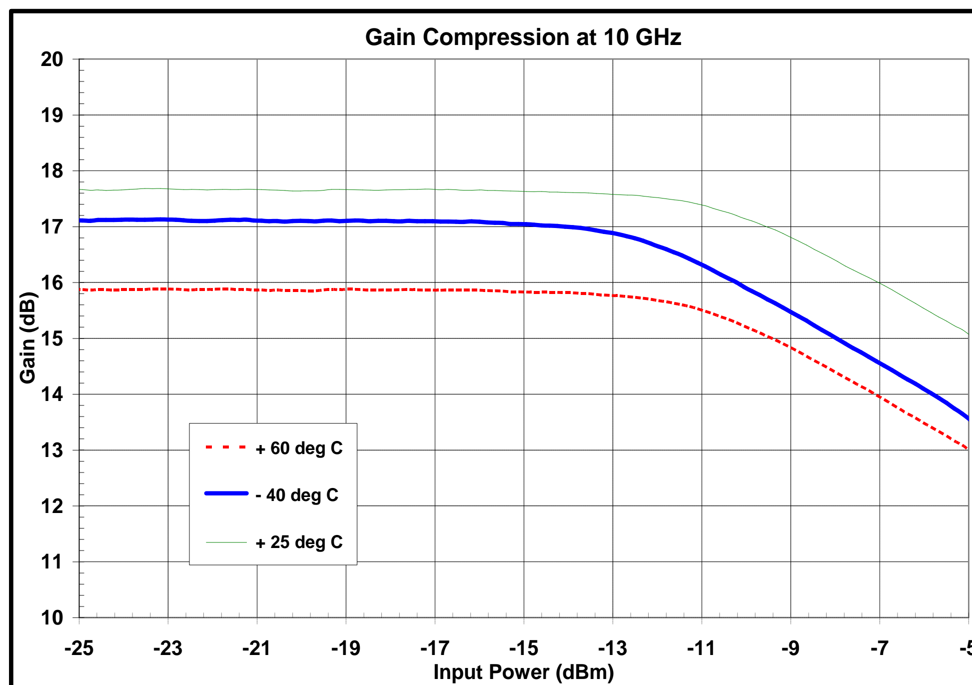
,

Performance over Temperature

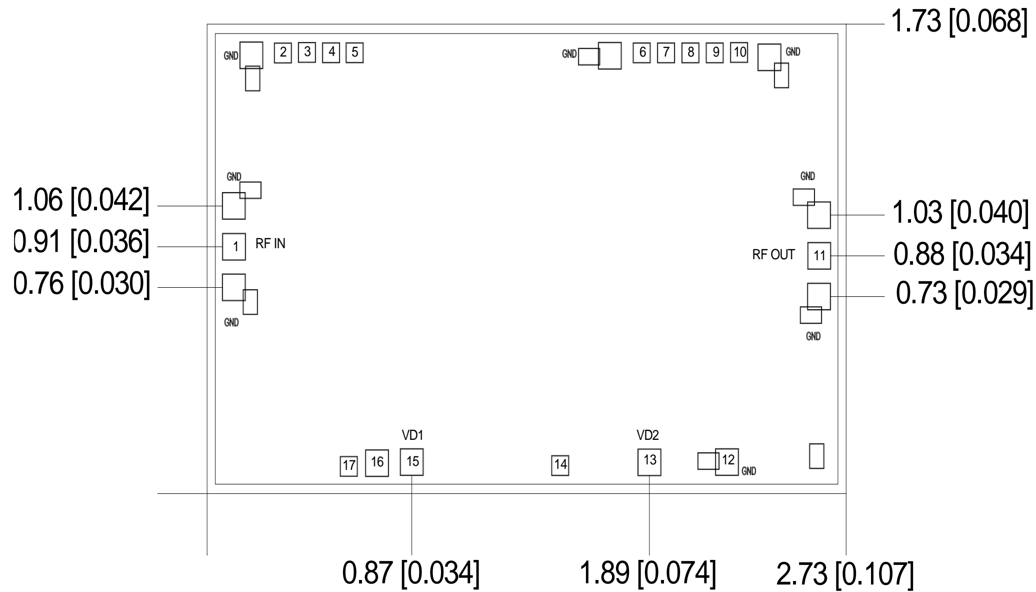
Vd1, Vd2 =2V, Total Current = 37 mA, TA = 25 °C

	-40 °C	+ 25 °C	+60 °C
Id	36 mA	37 mA	36mA





Mechanical Characteristics



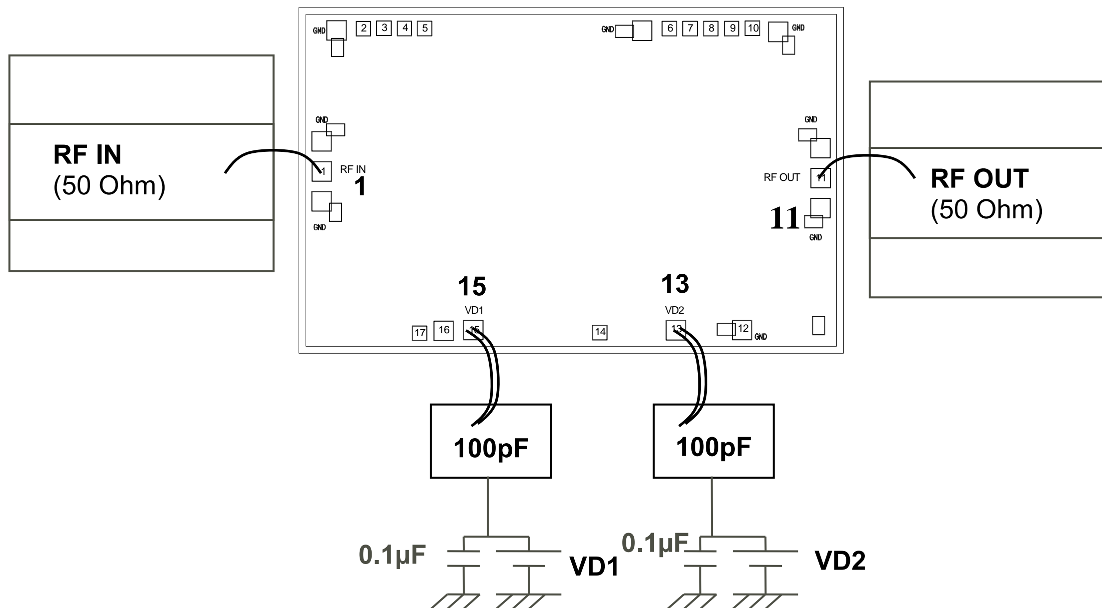
Units: millimeters (inches)

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

Note:

1. **Pad no. 1 : RF IN**
2. **Pad no. 11 : RF OUT**
3. **Pad no. 15 : 1st stage drain supply**
4. **Pad no. 13 : 2nd stage drain supply**

Recommended Assembly Diagram



Note:

1. Single 1 mil (0.0254 mm) bond wire of length 500um should be used for RF Input.
2. Single 1 mil (0.0254 mm) bond wire of length 400um should be used for RF Output
3. Two 1 mil (0.0254 mm) bond wires of length 250um should be used for DC bias at VD.
4. Bond Pad Nos. 2,3,4,5 and 6, 7, 8,9,10 may be used for increasing Id1 & 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

Phone : +65 68092093
Fax : +65 63360650

Email: info@aeliussemi.com
URL: www.aeliussemi.com