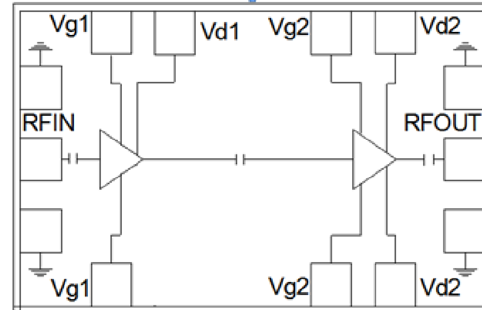
8 – 10 GHz 4 Watt Power Amplifier

Features

- Frequency Range : 8 – 10GHz
- 36.5 dBm Psat
- 14 dB Power gain
- 25% PAE
- High IP3
- Dual bias operation
- DC decoupled input and output
- 0.5 µm InGaAs pHEMT Technology
- Chip dimension: 5.2 x 2.5 x 0.1 mm

Functional Diagram



Typical Applications

- RADAR
- Military & space
- LMDS, VSAT

Description

The ASL4013 is a X-band Power amplifier with 36.5dBm power output. The PA uses 2 stages of amplification and operates in 8 – 10 GHz frequency range. The PA features 14 dB of gain with input and output return losses of 9 dB respectively. The PA has a high IP3 of 45dBm and 25% PAE. This feature enables it to be used in the applications requiring efficiency along with linearity. The chip operates with dual bias supply voltage.The die is fabricated using a reliable 0.5µm InGaAs pHEMT technology. The Circuit grounds are provided through vias to the backside metallization.

Absolute Maximum Ratings [1]

Parameter	Absolute Maximum	Units
Drain bias voltage (Vd)	+9	volts
Drain current (Id)	2.3	A
RF input power (RFin at Vd=9V)	33	dBm
Operating temperature	-50 to +85	°C
Storage Temperature	-65 to +150	°C

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

Aelius Semiconductors Pte. Ltd., Singapore
Phone: +65 68092093
Fax: +65 63360650
Email: info@aeliussemi.com
URL: www.aeliussemi.com

Electrical Specifications [1] @ T_A = 25 °C, V_{d1} = V_{d2} = 8V, V_{g1} = V_{g2} = -1.1V Z_o =50 Ω, Pulse Duty Cycle = 10%

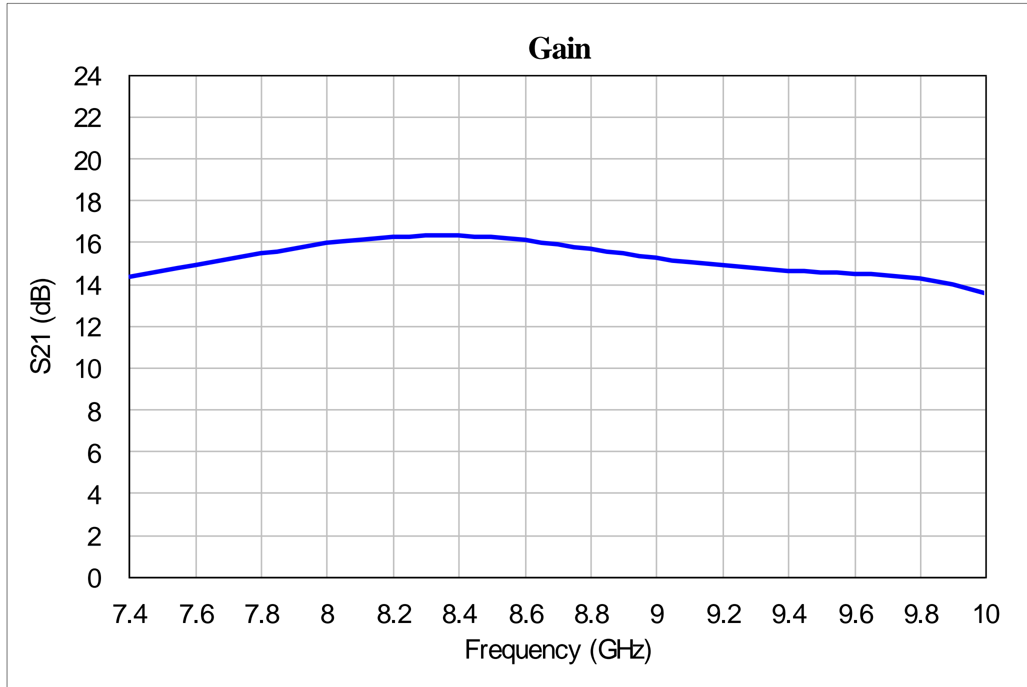
Parameter	Min.	Typ.	Max.	Units
Frequency Range	8		10	GHz
Gain	12	14		dB
Gain Flatness		+/-1		dB
Output Power (P1 dB)	34.5	35.5		dBm
Input Return Loss		9		dB
Output Return Loss		9		dB
Saturated output power (Psat)	35.5	36.5		dBm
Output Third Order Intercept (IP3)		45		dBm
Power Added Efficiency (PAE[2])		25%		--
Gate Bias Voltage (V_g)	-1.25	-1.1	-0.7	V
Supply Current(I_{dq})		1.5		A
Supply Current(I_{dsat}[3])		2.1		A

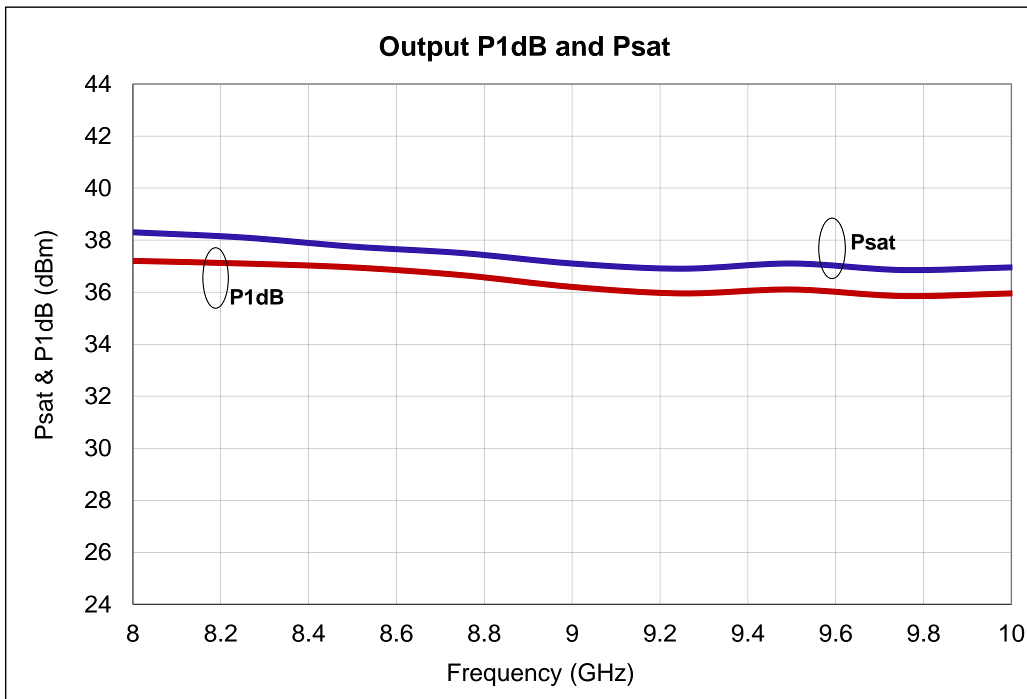
Note:

1. Electrical specifications as measured in test fixture.
2. Measured at 2dB Gain Compression Point.
3. I_{dsat} is the maximum drain current under input RF drive condition.

Test fixture data

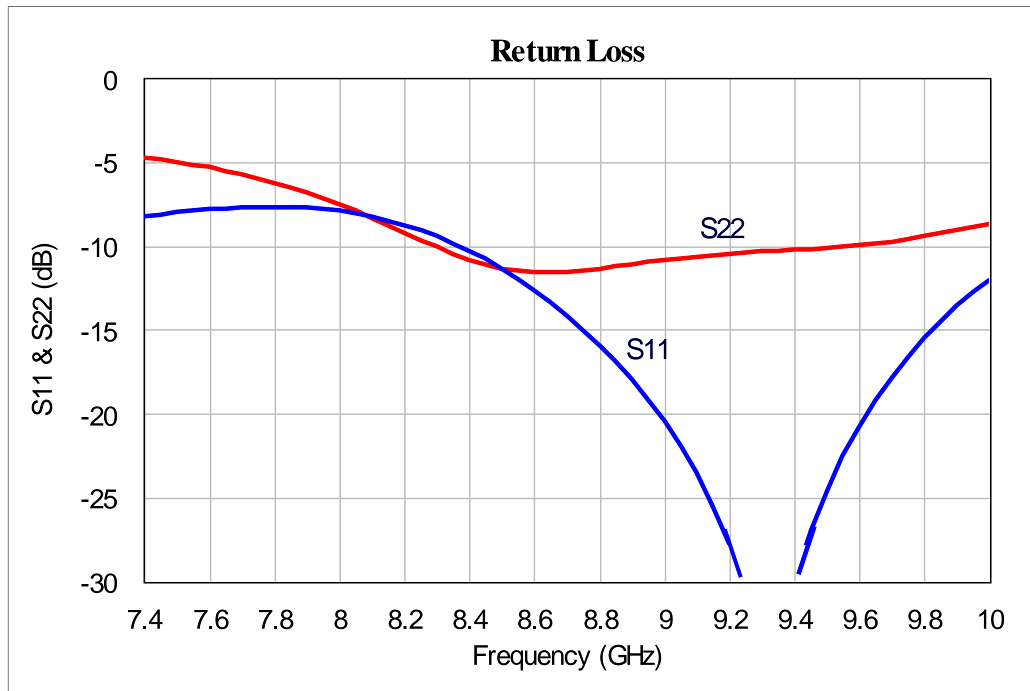
V_{d1} = V_{d2} = 8V, V_{g1} = V_{g2} = -1.1V, Total Current (Idq) = 1.5A, T_A = 25 °C
Pulse Duty Cycle = 10%

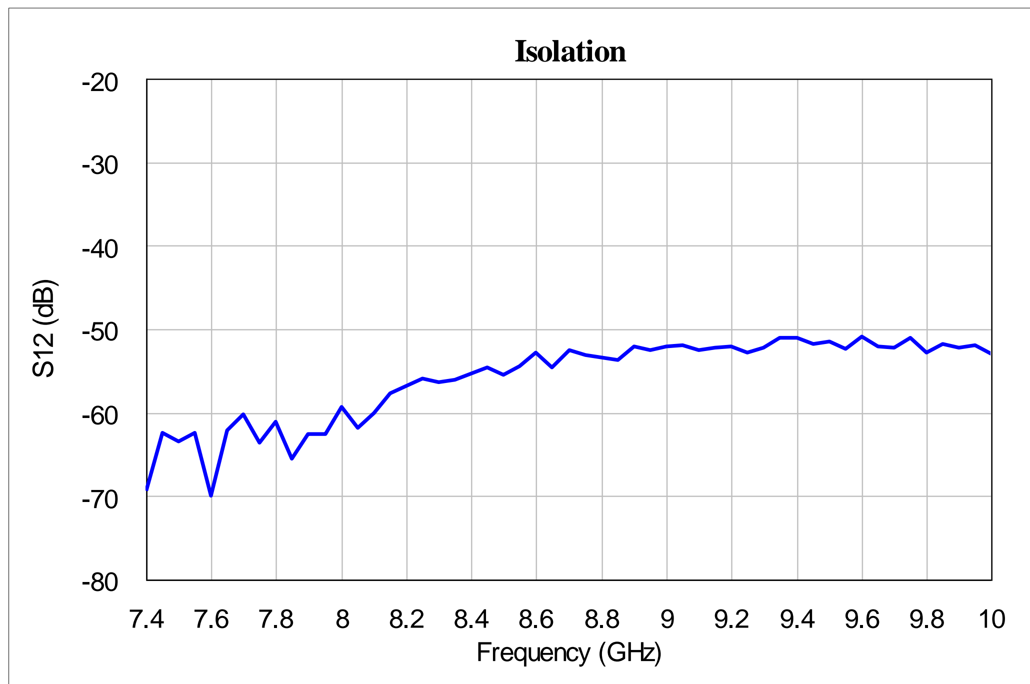




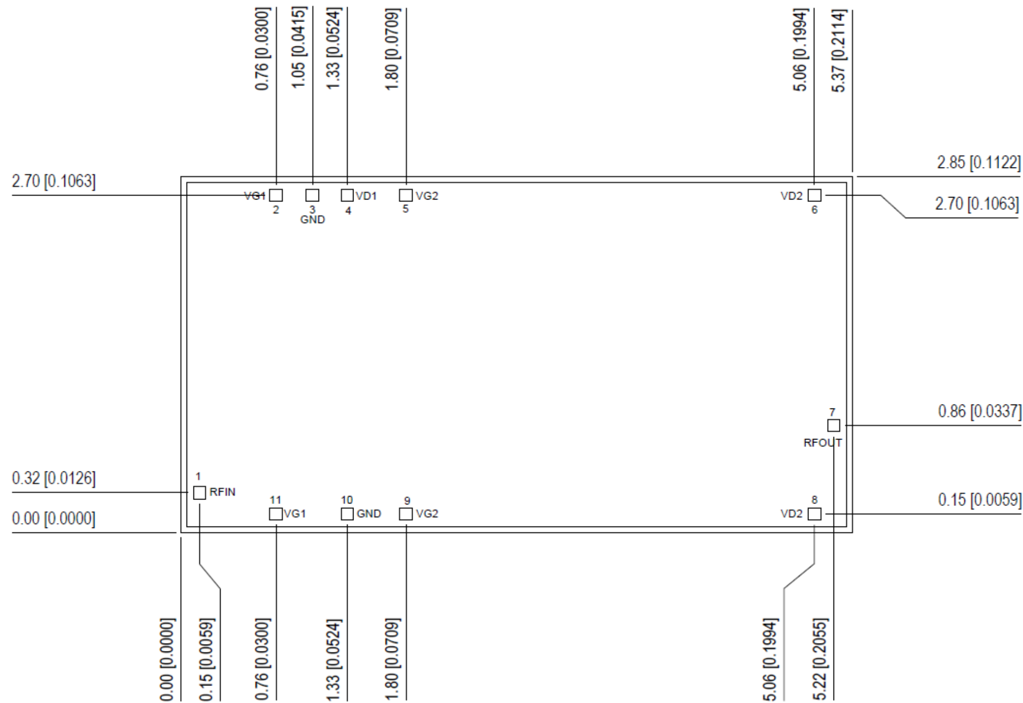
Test fixture data

V_{d1} = V_{d2} = 8V, V_{g1} = V_{g2} = -1.1V, Total Current (Idq) = 1.5A, T_A = 25 °C
Pulse Duty Cycle = 10%





Bond Pad Locations

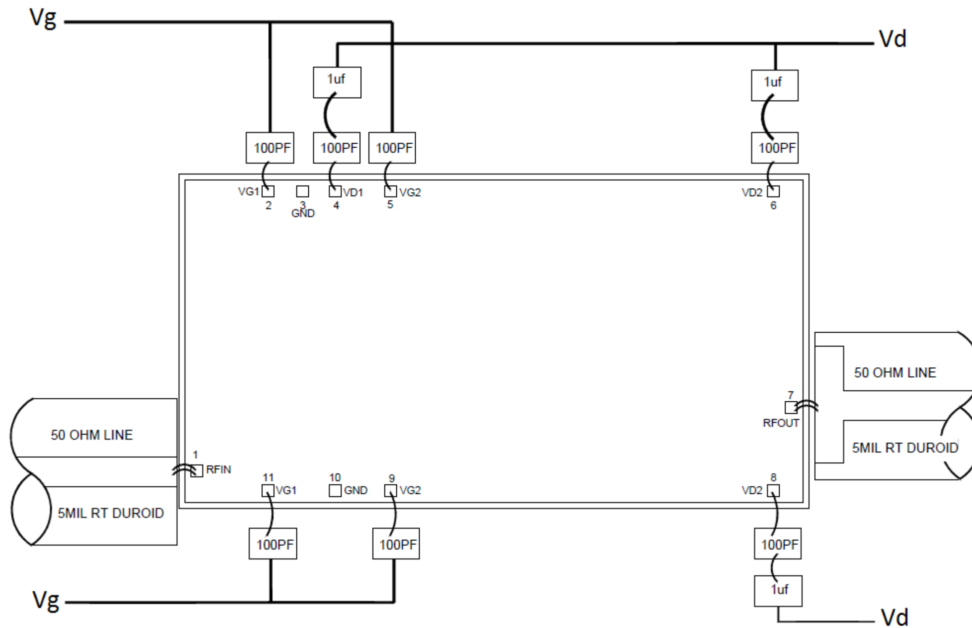


Units: millimeters (inches)

Note:

1. All RF and DC bond pads are 100µm x 100µm
2. Pad no. 1 : RF IN
3. Pad no. 2,11 : 1st stage gate voltage(V_{g1})
4. Pad no. 7 : RF Output
5. Pad no. 4 : 1st stage drain voltage(V_{d1})
6. Pad no. 5,9 : 2nd stage gate voltage(V_{g2})
7. Pad no. 6,8 : 2nd stage drain voltage (V_{d2})
8. All the dimensions shown above are measured taking bottom left corner as reference.

Recommended Assembly Diagram



Note :

1. Open stub of 4mm length, 0.7mm width and 0.05mm thickness to be placed at output immediate to the chip, so as to improve the output power match.
2. Two 1 mil (0.0254mm) bond wires of minimum length should be used for RF input and output.
3. Two 1 mil (0.0254mm) bond wires of minimum length should be used from chip bond pad to 100pF capacitor.
4. Input and output 50 ohm lines are on 5 mil RT Duroid.
5. 100pF (Single Layer) bypass capacitors are used at Gate Bias, 100pF (Single Layer) and 1uF bypass capacitors are used at Drain Bias terminals of the PA as shown above.
6. The RF input & output ports are DC decoupled on-chip.
7. Proper heat sink like Copper tungsten or copper molybdenum to be used to improve the reliability of the chip.
8. Base Plate Temperature (T_B) has to be maintained less than 70^0 C in order to achieve better MTBF of the Power Amplifier.

Die attach: Eutectic attachment using flux less 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 to 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. Before using the product, please refer to the latest datasheet available in the website.

Aelius Semiconductors Pte. Ltd., Singapore
Phone: +65 68092093
Fax: +65 63360650
Email: info@aeliussemi.com
URL: www.aeliussemi.com