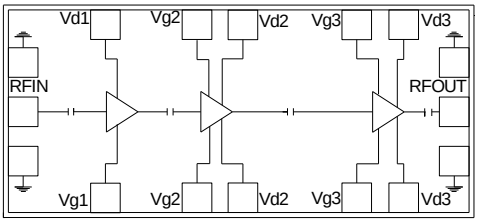
9 – 13.5 GHz GaN 15 Watt Power Amplifier

Features

- **Frequency Range : 9 – 13.5GHz**
- **42 dBm Output Psat**
- **23 dB Small Signal Gain**
- **30% PAE**
- **High IP3**
- **No external matching required**
- **DC decoupled input and output**
- **GaN HEMT Technology**
- **Chip dimension: 5.15 x 2.6 x 0.1 mm**

Functional Diagram



Typical Applications

- **RADAR**
- **MMDS**
- **VSAT**

Description

The ASL4047 is a three stage GaN HEMT based MMIC Power Amplifier, it is designed for Class AB operation over the operating frequency band of 9.0 - 13.5GHz. The PA delivers output power of 42dBm (min) with a small signal gain of 23dB and 30% PAE over the operating frequency band. The input/output are matched to 50 ohms and the circuit grounds are provided through vias to the backside metallization.

Absolute Maximum Ratings (1)

Parameter	Absolute Maximum	Units
Drain supply voltage	+32	volts
Drain current (I_{dq})	2.8	A
RF input power at V_d=28V	37	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

Electrical Specifications [1] @ T_A = 25 °C, Vd = 28V, V_g = -2.6V Z_o = 50 Ω
Pulse Duty Cycle = 10%

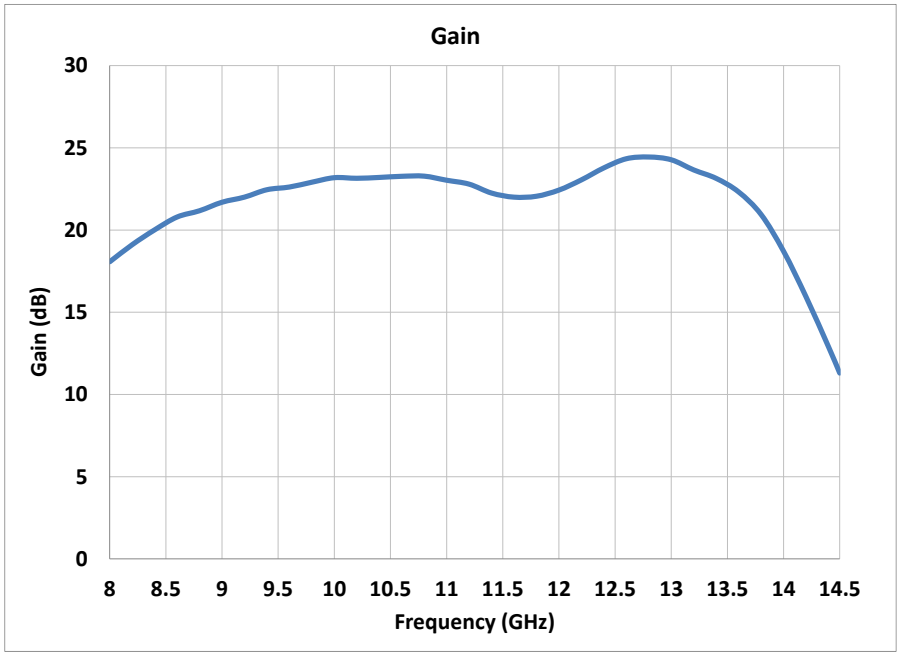
Parameter	Min.	Typ.	Max.	Units
Frequency Range	9		13.5	GHz
Small Signal Gain	21.5	23	--	dB
Small Signal Gain Flatness	--	+/-1.5	--	dB
Input Return Loss	--	<-9	--	dB
Output Return Loss	--	<-6	--	dB
Output Saturated Power(Psat)	--	>42	--	dBm
Output Third Order Intercept point (OIP3)	--	--	--	dBm
PAE [1]	--	30	--	%
Drain Bias Voltage (V_{d1}, V_{d2}, V_{d3})	--	28	32	V
Gate Bias Voltage (V_{g1}, V_{g2}, V_{g3})	--	-2.6	--	V
Supply Current (I_{dq})	--	1.4	--	A
Supply Current (I_{dsat}[2])	--	2.2	--	A

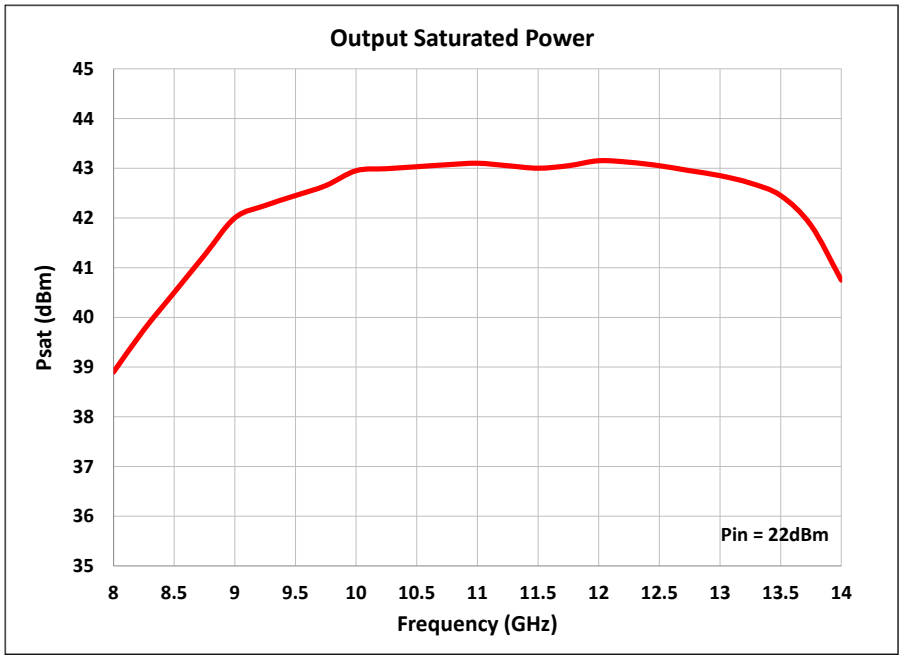
Note:

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

Test fixture data

V_{d1} = V_{d2} = V_{d3} = 28V, V_{g1} = V_{g2} = V_{g3} = -2.6V, I_{dq} = 1.4A, T_A = 25 °C, Duty Cycle = 10%





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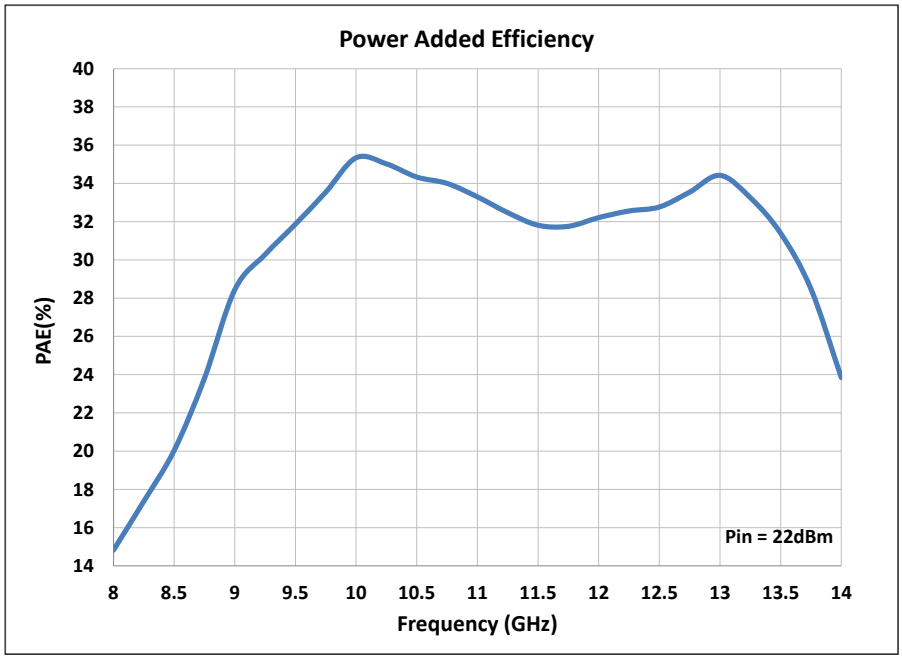

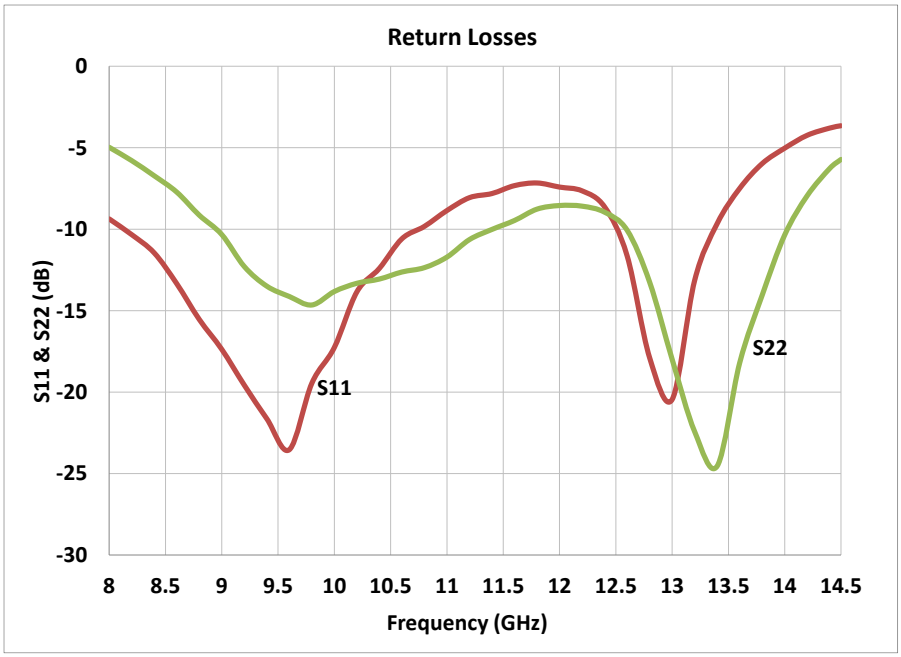

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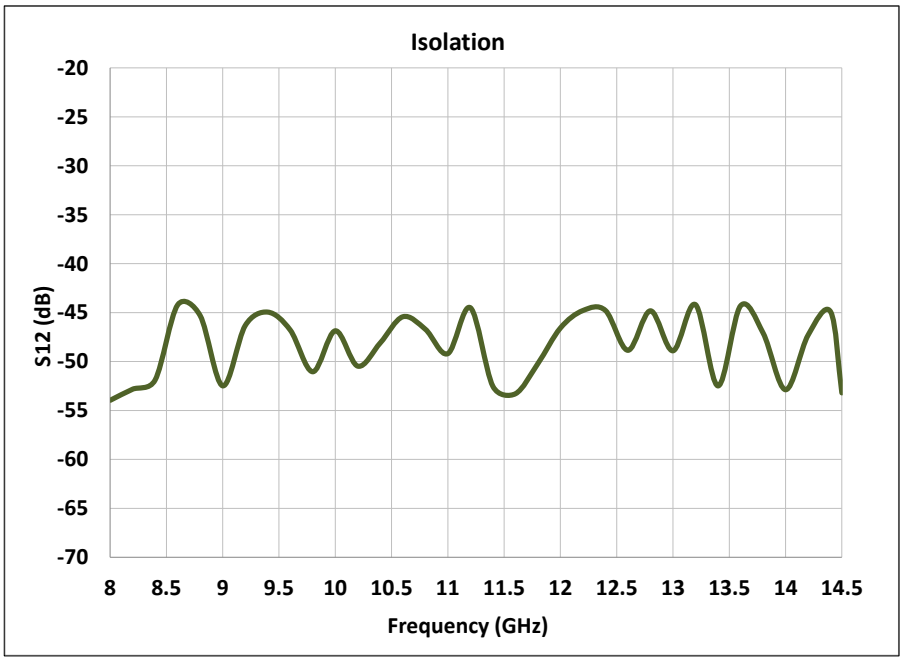
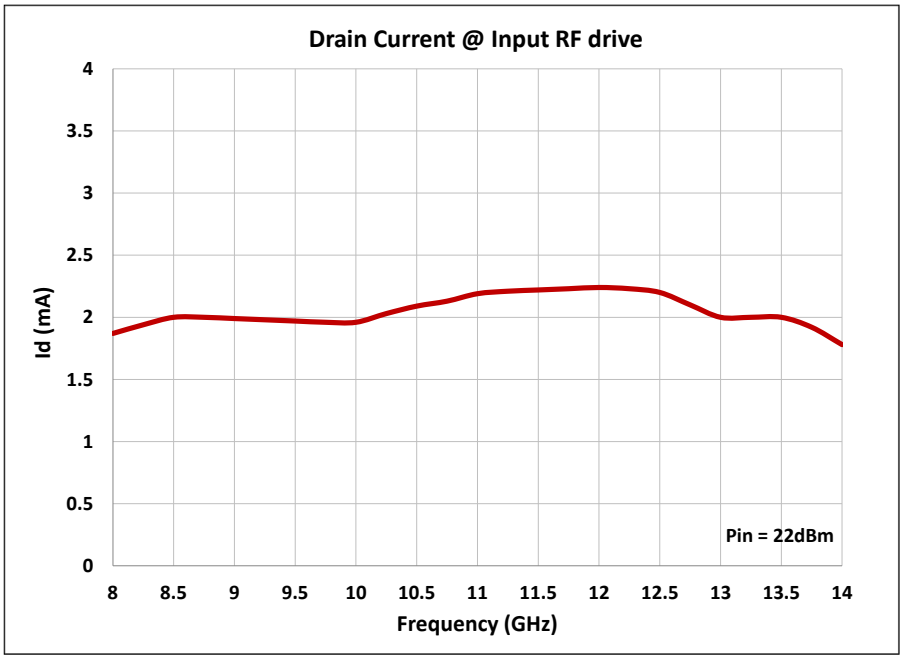




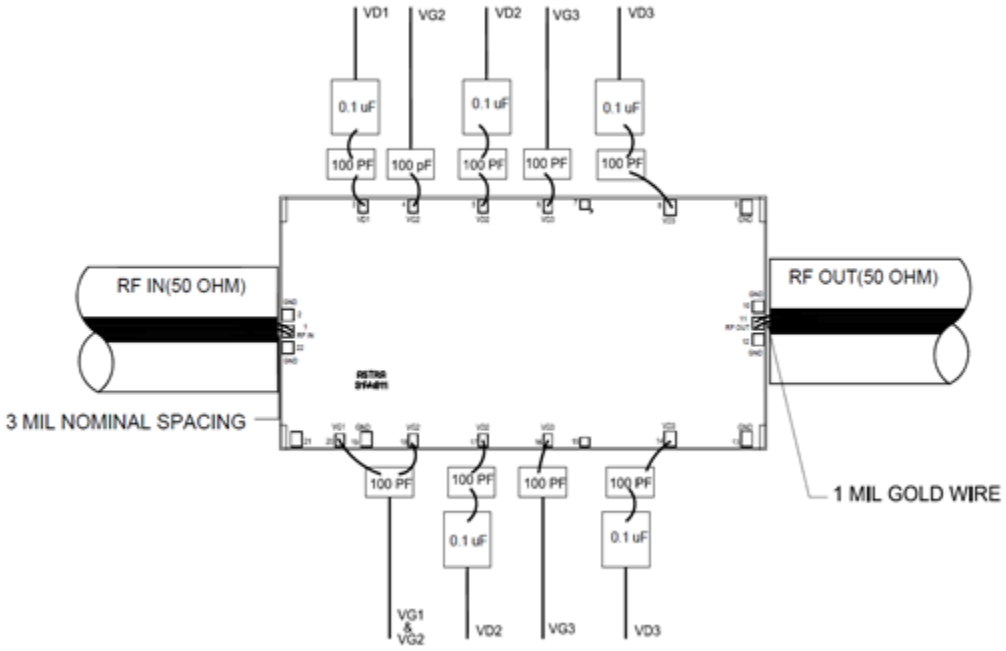
Mechanical Characteristics

Units: millimeters (inches)

Note:

1. All RF and DC bond pads are 100µm x 100µm
2. Pad no. 1 : RF IN
3. Pad no. 20 : 1st stage gate voltage (VG1)
4. Pad no. 3 : 1st stage drain voltage (VD1)
5. Pad no. 4,18 : 2nd stage gate voltage (VG2)
6. Pad no. 5,17 : 2nd stage drain voltage (VD2)
7. Pad no. 6,16 : 3rd stage gate voltage (VG3)
8. Pad no. 8,14 : 3rd stage drain voltage (VD3)
9. Pad no. 11 : RF OUT

Recommended Assembly Diagram



Note :

1. Two 1 mil (0.0254mm) bond wires of minimum length should be used for RF input, RF output and from chip bond pad to 100pF capacitor.
2. Input and output 50 ohm lines are preferably on 5mil or 10mil RT Duroid substrate.
3. The RF input & output ports are DC decoupled on-chip.
4. Coefficient of thermal expansion matching is recommended for reliability purpose.
5. Use high thermal conductive material for die mounting for long term reliability.
6. Maintain base plate temperature less than 70 degC under RF operation for optimum performance.

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 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 - 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