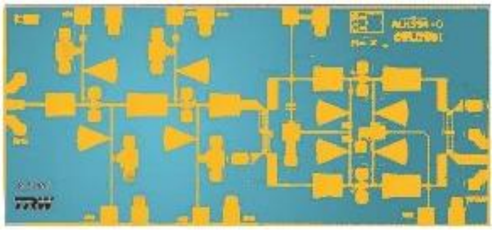
ALH394

92 – 96 GHz Low Noise Amplifier

Product Datasheet

Revision: December 2011



X=3250 µm Y=1500 µm

Applications

- Short Haul / High Capacity Links
- Sensors
- Radar
- Millimeter-wave Imaging

Product Features

- RF Frequency: 92 to 96 GHz
- Linear Gain: 17 dB typ.
- Noise Figure: 5 dB typ.
- Die Size: 4.9 sq. mm.
- DC Power: 2 VDC @ 34 mA

Description and Application

The ALH394 is a broadband, three-stage, low noise monolithic HEMT amplifier designed for use in commercial digital microwave radios and wireless LANs. The small die size allows for extremely compact packaging. To ensure rugged and reliable operation, HEMT devices are fully passivated. Both bond pad and backside metallization are Ti/Au, which is compatible with conventional die attach, thermocompression and thermosonic wire bonding assembly techniques.

Performance Characteristics (Ta = 25°C)

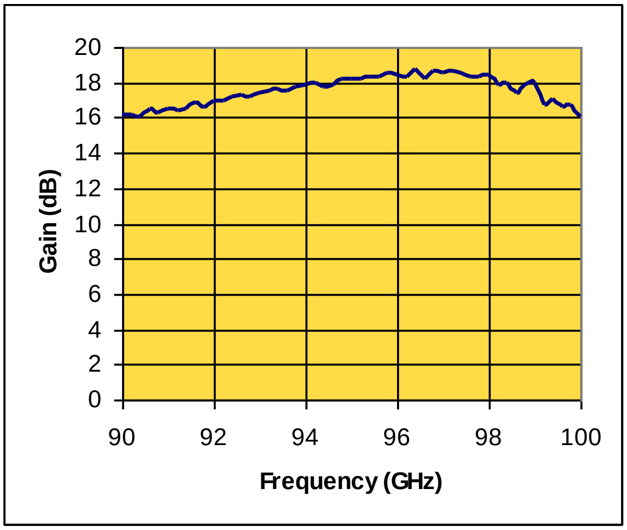
Specification	Min	Typ	Max	Unit
Frequency	92		96	GHz
Linear Gain		17		dB
Noise Figure		5		dB
Input Return Loss	2			dB
Output Return Loss	7			dB
P1dB		5		dBm
Vd1, Vd2, Vd3		2		V
Vg1, Vg2		-0.4		V
Vg3		-0.2		V
Id1		7		mA
Id2		7		mA
Id3		20		mA

Absolute Maximum Ratings (Ta = 25°C)

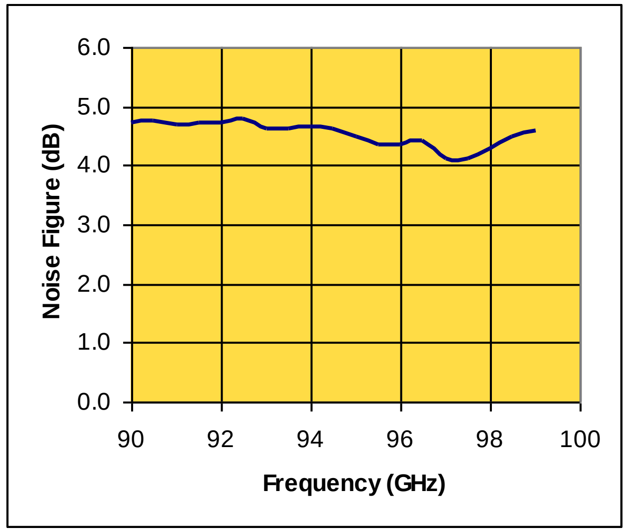
Parameter	Min	Max	Unit
Vd1, Vd2, Vd3		3	V
Id1		10	mA
Id2		10	mA
Id3		25	mA
Vg1, Vg2, Vg3	-0.8	0.2	V
Input drive level		-5	dBm
Assy. Temperature (60 seconds)		300	deg. C

Measured Performance Characteristics (Typical Performance at 25°C)
Vd1 = Vd2 = Vd3 = 2V, Id1 = 7 mA, Id2 = 7 mA, Id3 = 20 mA

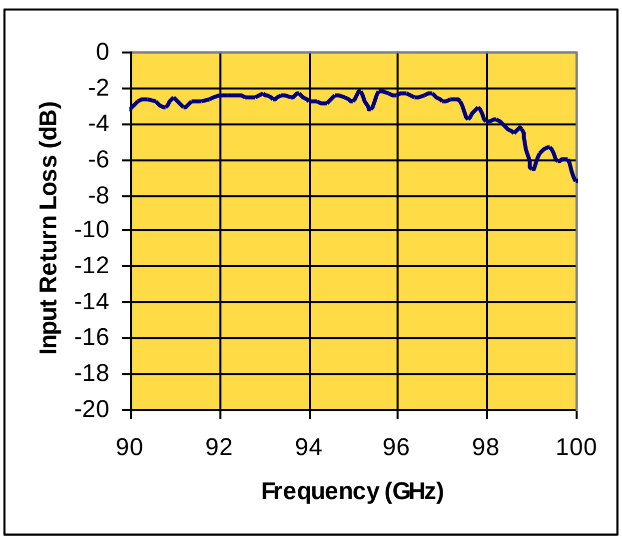
Linear Gain Versus Frequency



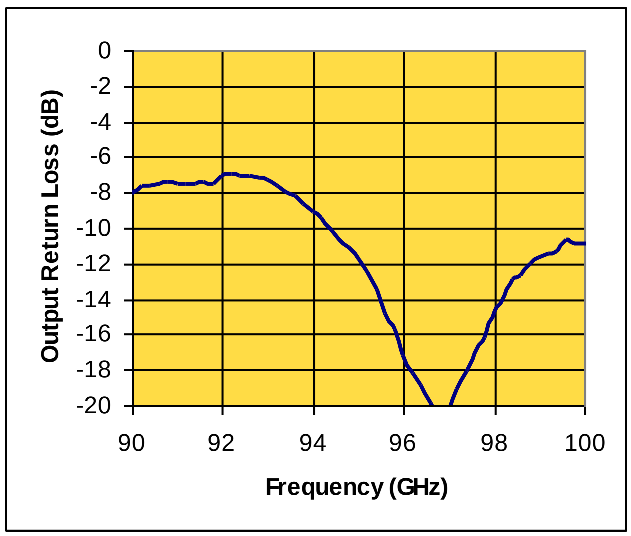
Noise Figure Versus Frequency



Input Return Loss Versus Frequency

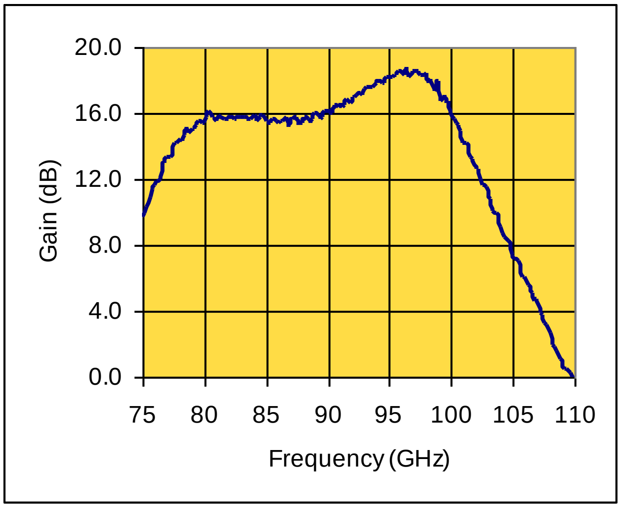


Output Return Loss Versus Frequency

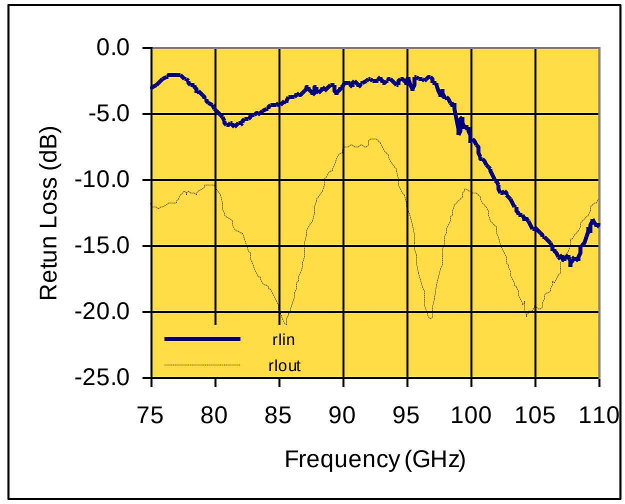


Measured Performance Characteristics (Typical Performance at 25°C)
Vd1 = Vd2 = Vd3 = 2V, Id1 = 7 mA, Id2 = 7 mA, Id3 = 20 mA

Wide-Band Linear Gain Versus Frequency



Wide-Band Return Loss Versus Frequency

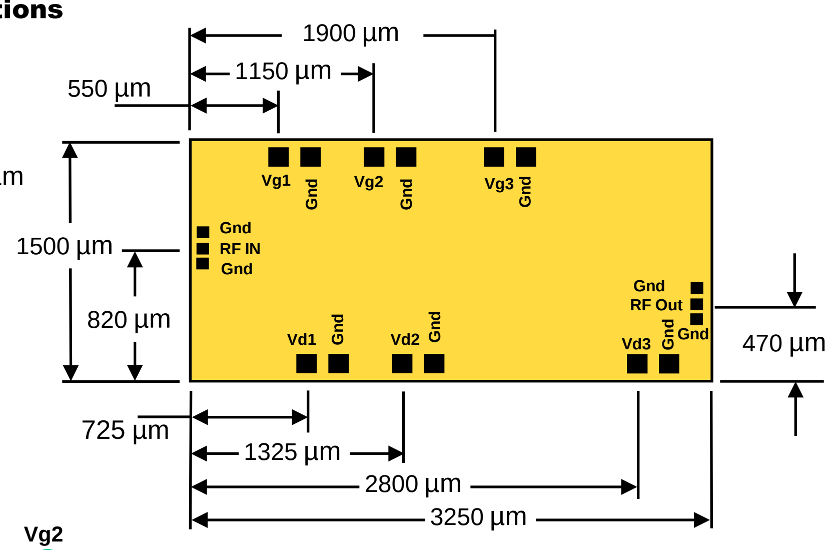


Measured Performance Characteristics (Typical Performance at 25°C)
Vd1 = Vd2 = Vd3 = 2V, Id1 = 7 mA, Id2 = 7 mA, Id3 = 20 mA

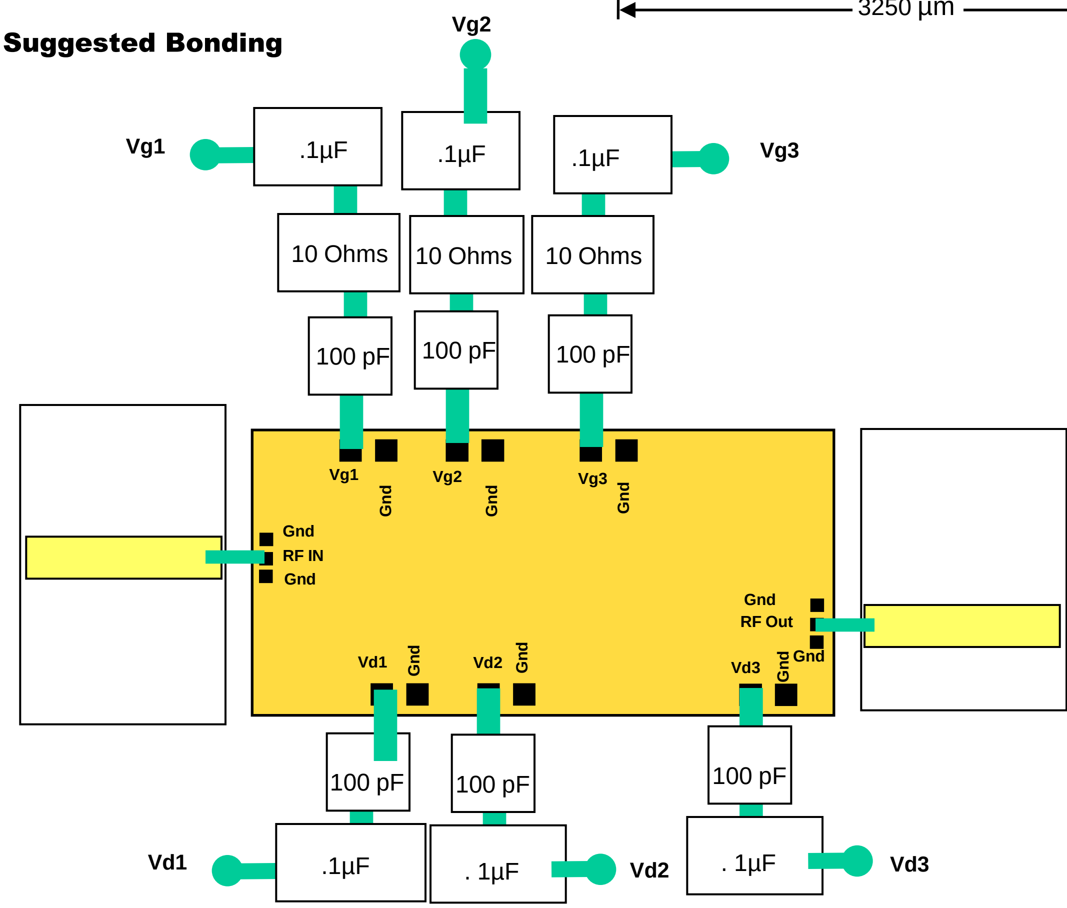
Freq GHz	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
75.0	0.70	99.9	3.04	-17.6	0.00	-118.4	0.26	-165.8
76.0	0.76	91.7	3.81	-42.4	0.00	-132.1	0.25	162.3
77.0	0.78	80.6	4.63	-72.5	0.00	-121.1	0.26	131.0
78.0	0.74	70.4	5.27	-102.7	0.00	141.4	0.28	102.9
79.0	0.65	62.9	5.63	-133.7	0.00	-171.5	0.29	84.1
80.0	0.58	61.7	5.91	-161.8	0.00	134.8	0.30	59.5
81.0	0.51	64.7	5.98	167.5	0.00	6.0	0.23	44.0
82.0	0.51	68.6	6.09	141.8	0.00	9.3	0.20	36.3
83.0	0.55	68.8	6.17	118.2	0.00	-81.1	0.15	30.4
84.0	0.58	67.5	6.25	94.3	0.01	-57.3	0.13	39.6
85.0	0.61	64.1	5.93	70.7	0.01	-151.4	0.10	38.7
86.0	0.65	62.4	5.87	48.8	0.00	-135.8	0.10	76.9
87.0	0.68	56.4	6.00	23.0	0.01	-154.5	0.17	89.4
88.0	0.70	51.4	5.90	3.0	0.01	172.8	0.26	81.9
89.0	0.72	45.1	6.27	-18.3	0.01	178.4	0.34	66.2
90.0	0.69	40.7	6.41	-40.5	0.01	169.1	0.40	50.6
91.0	0.75	32.6	6.72	-63.3	0.02	136.7	0.42	32.9
92.0	0.75	26.2	7.07	-86.0	0.01	114.8	0.44	17.5
93.0	0.76	17.8	7.45	-111.4	0.01	83.1	0.43	-4.5
94.0	0.73	8.7	7.79	-136.7	0.01	69.3	0.35	-28.8
95.0	0.72	0.1	8.07	-162.6	0.01	41.2	0.26	-54.6
96.0	0.75	-12.6	8.33	168.9	0.01	39.4	0.14	-95.3
97.0	0.73	-28.9	8.48	136.1	0.01	25.7	0.10	-179.8
98.0	0.64	-46.6	8.36	104.7	0.01	-6.8	0.18	111.5
99.0	0.47	-60.6	7.89	73.3	0.02	-53.8	0.26	74.2
100.0	0.43	-80.6	6.34	41.2	0.01	-88.6	0.29	46.0
101.0	0.38	-92.4	5.14	11.0	0.01	-96.4	0.26	26.0
102.0	0.31	-102.7	4.30	-15.7	0.01	-149.7	0.20	13.9
103.0	0.27	-111.8	3.58	-39.9	0.01	-179.2	0.15	12.1
104.0	0.23	-123.6	2.86	-61.8	0.01	132.9	0.11	20.7
105.0	0.21	-127.7	2.33	-83.5	0.00	-163.4	0.11	46.1

Die Size and Bond Pad Locations

X = 3250 µm ± 25 µm
Y = 1500 ± 25 µm
RF Bond Pad = 50 x 50 ± 0.5 µm
DC Bond Pad = 101 x 101 ± 0.5 µm
Chip Thickness = 101 ± 5 µm



Suggested Bonding



Recommended Assembly Notes

1. Bypass caps should be 100 pF (approximately) ceramic (single-layer) placed no farther than 30 mils from the amplifier.
2. Best performance obtained from use of < 6 mil (long) by 1.5 by 0.5 mil ribbons on input and output.