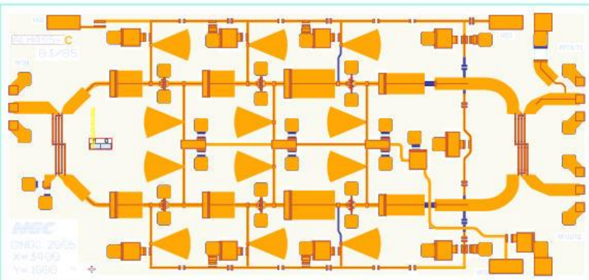
ALH495

80 – 100 GHz Balanced LNA

Product Datasheet

Revision: December 2011



X=3400 μm Y=1600 μm

Applications

- ♦ Wide Bandwidth Millimeter-wave Imaging RX Chains
- ♦ Sensors
- ♦ Radar
- ♦ Short Haul / High capacity Links

Product Features

- ♦ RF Frequency: 80 to 100 GHz
  effective bandwidth:
- ♦ Linear Gain (average from 80 to 100 GHz):
  - ➢ 16 dB typ.
- ♦ Noise Figure (average from 80 to 100 GHz):
  - ➢ 4.5 dB max. LNA Option (-A)
  - ➢ 5.5 dB max. Gain Block: Option (-B)
- ♦ Balanced Input and Output
- ♦ Die Size: < 5.5 sq. mm.
- ♦ DC Power: 2 VDC @ 50 mA

Description and Application

The ALH495 is a Balanced, three-stage, low noise monolithic HEMT amplifier designed for use in Millimeter-Wave Imaging where broad bandwidth and good return loss are important. 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	80		100	GHz
Linear Gain (Average)	16	18		dB
Noise Figure (Average)				
(-LN)		4.3	4.5	dB
(-GB)		4.8	5.5	dB
Input Return Loss		15		dB
80 - 90 Ghz	10			dB
90 - 100 Ghz	8			dB
Output Return Loss	10	15		dB
P1dB		3		dBm
Vd		2		V
Vg3a, Vg3b		-0.4		V
Id		50		mA

Ordering Information

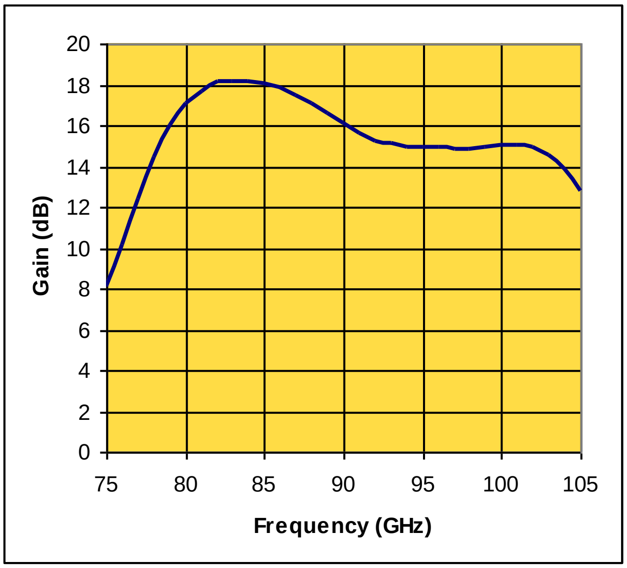
To Order LNA specify: ALH495 (-A)
To Order Gain Block Specify: ALH495 (-B)

Absolute Maximum Ratings (Ta = 25 C)

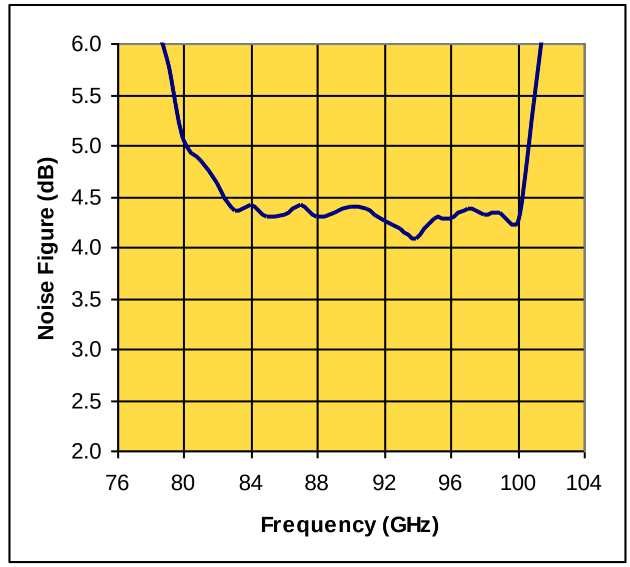
Parameter	Min	Max	Unit
Vd		3	V
Id		62	mA
Vg3a, Vg3b	-0.8	0.4	V
Input drive level		-10	dBm
Assy. Temperature (60 seconds)		300	deg. C

Measured Performance Characteristics (Typical Performance at 25°C)
Vd = 2V, Id = 50 mA

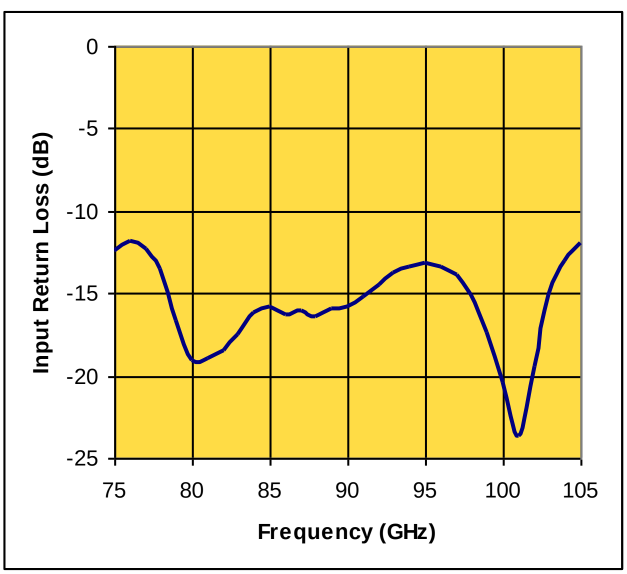
Linear Gain Versus Frequency



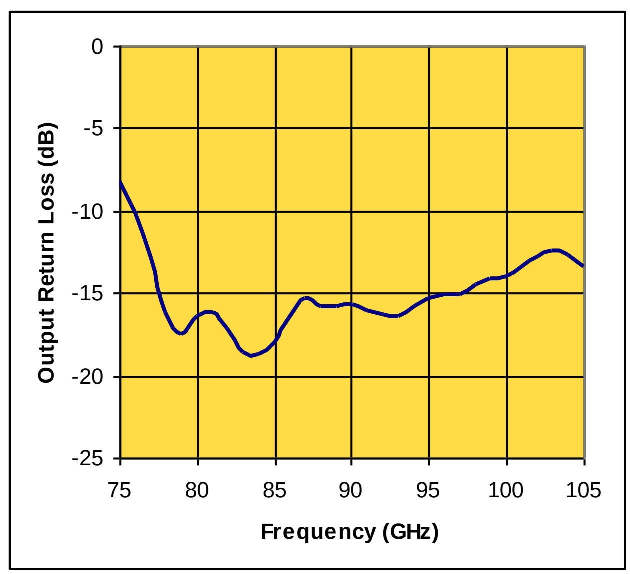
Noise Figure Versus Frequency



Input Return Loss Versus Frequency



Output Return Loss Versus Frequency

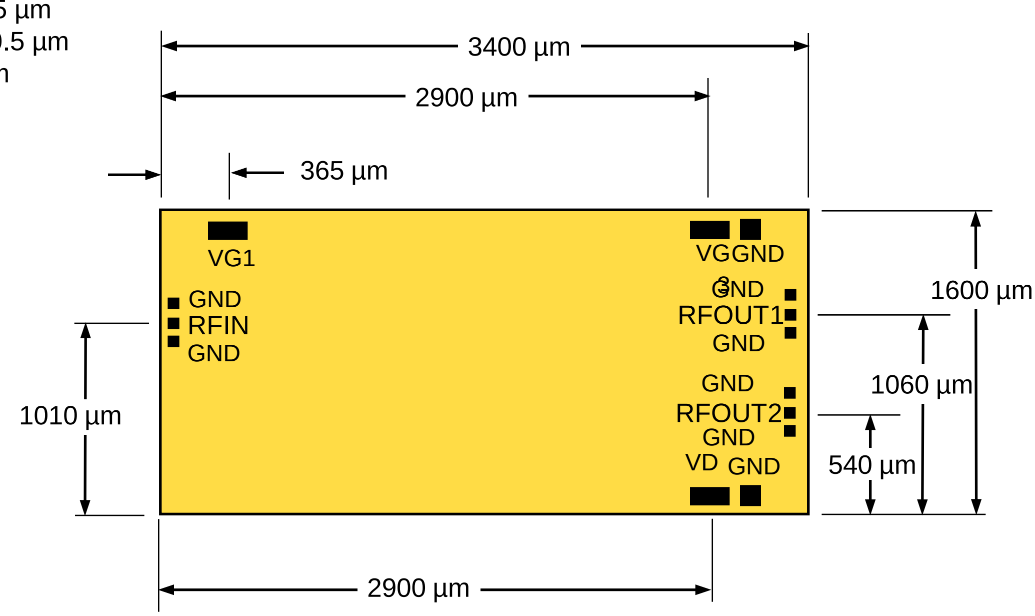


Measured Performance Characteristics (Typical Performance at 25°C)
Vd = 5 V, Id = 50 mA

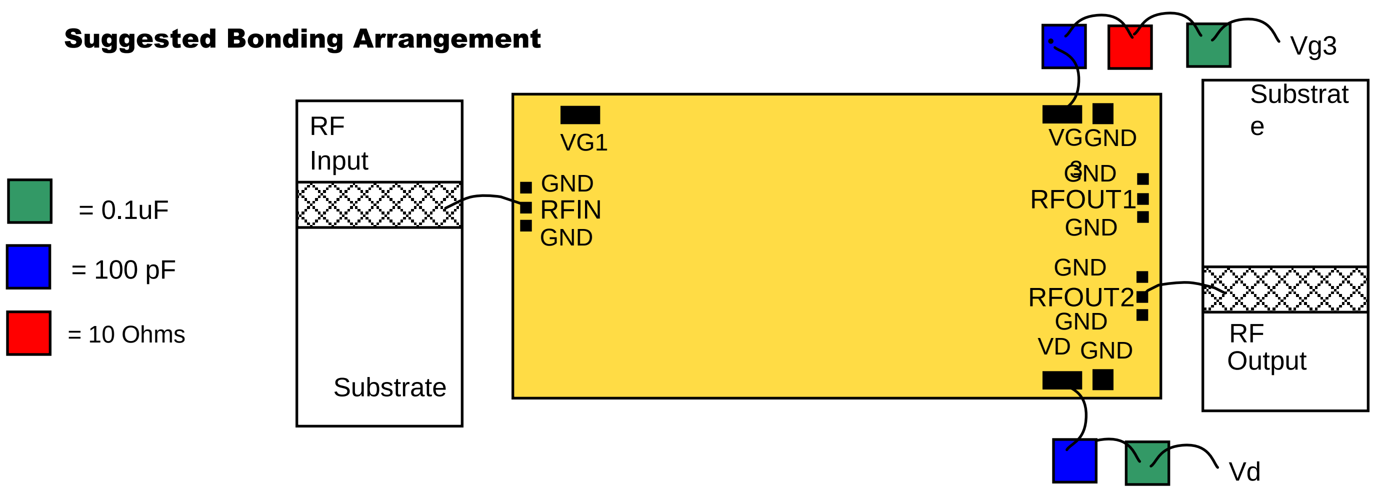
Freq. (GHz)	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
75	0.258	67.739	2.908	-30.934	0.003	-105.388	0.367	-5.864
76	0.289	45.265	3.750	-50.737	0.005	-163.707	0.292	-18.620
77	0.277	22.518	4.901	-76.010	0.005	170.983	0.208	-24.127
78	0.239	2.845	6.109	-104.933	0.007	120.086	0.154	-12.479
79	0.163	-11.711	6.906	-136.137	0.004	68.984	0.149	-0.729
80	0.121	-2.667	7.524	-165.902	0.007	58.430	0.185	1.567
81	0.111	24.525	7.790	165.815	0.003	29.706	0.188	-1.435
82	0.127	21.961	8.161	136.413	0.006	19.890	0.159	-11.636
83	0.139	33.310	8.013	109.338	0.008	-15.098	0.132	-0.314
84	0.180	26.145	8.026	82.767	0.005	-56.841	0.136	5.270
85	0.193	22.162	7.764	57.133	0.006	-73.752	0.148	18.488
86	0.187	15.540	7.485	32.754	0.004	-105.659	0.166	17.873
87	0.189	12.076	7.411	5.950	0.005	-125.554	0.181	11.844
88	0.175	10.878	6.896	-16.049	0.004	-170.273	0.175	10.909
89	0.178	13.118	6.475	-38.977	0.005	159.524	0.160	8.009
90	0.175	14.330	6.329	-59.791	0.007	138.317	0.142	8.777
91	0.183	18.210	6.080	-82.327	0.006	113.678	0.129	9.512
92	0.191	18.213	5.813	-102.766	0.007	99.491	0.126	20.784
93	0.207	16.750	5.480	-122.931	0.009	78.781	0.133	29.605
94	0.224	16.184	5.594	-143.162	0.010	65.865	0.148	35.788
95	0.238	10.236	5.610	-164.134	0.014	37.123	0.156	37.957
96	0.245	6.170	5.454	174.827	0.011	29.811	0.188	38.560
97	0.239	-1.684	5.458	152.892	0.013	14.787	0.198	39.754
98	0.223	-8.348	5.735	130.407	0.011	12.820	0.207	39.790
99	0.183	-20.743	6.016	105.568	0.019	-6.993	0.206	43.151
100	0.109	-20.307	5.946	76.823	0.018	-35.159	0.244	40.981
101	0.064	33.598	5.760	51.831	0.019	-45.096	0.262	43.994
102	0.132	62.801	5.534	24.231	0.015	-74.171	0.271	41.840
103	0.216	58.276	5.302	-5.160	0.014	-73.694	0.277	39.388
104	0.268	45.164	4.618	-36.001	0.012	-95.100	0.269	34.191
105	0.293	42.081	3.808	-62.646	0.008	-68.099	0.247	40.469

Die Size and Bond Pad Locations

X = 3400 µm 25 µm
Y = 1600 25 µm
RF Bond Pad = 51 x 51 0.5 µm
DC Bond Pad = 81 x 191 0.5 µm
Chip Thickness = 101 5 µm



Suggested Bonding Arrangement



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.
3. Vg1 is an optional gate bias pad and can be used in place of Vg3. Typical use would be NC.
4. RFOUT1 is not used under standard operation.