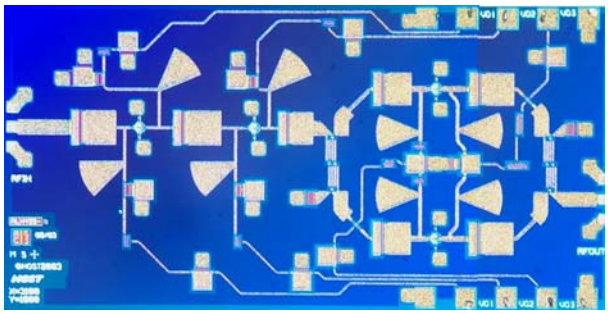
NORTHROP GRUMMAN

Velocium Products

ALH459
71 – 86 GHz Low Noise Amplifier

Product Datasheet

Revision: September 2007



X=3100 µm Y=1600 µm

Product Features

- RF frequency: 71 to 86 GHz
- Noise figure: < 5 dB
- Linear gain: 14 dB
- P1dB: 7 dBm, expected
- Unconditionally stable
- DC Power: 2.4 Vdc at 30 mA
- Die Size: < 5.0 sq. mm

Applications

- New FCC E-Band Communication Systems
  - Covers both 71-76 GHz and 81-86 GHz Frequency Bands
- Short-Haul / High Capacity Links
- Enterprise Wireless LAN
- Wireless Fiber Replacement
- Automotive Radar

Product Description

The ALH459 monolithic HEMT is a broadband, three-stage, low noise device. The LNAs balanced output design provides unconditional stability as well as excellent output VSWR. 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	71		86	GHz
Linear Gain	13	14		dB
Noise Figure		4		dB
Input Return Loss		10		dB
Output Return Loss		10		dB
P1dB		7		dBm
Vd1 and Vd2		2.1		V
Vd3		2.4		V
Vg		-0.2		V
Id and Id2		6		mA
Id3		18		mA

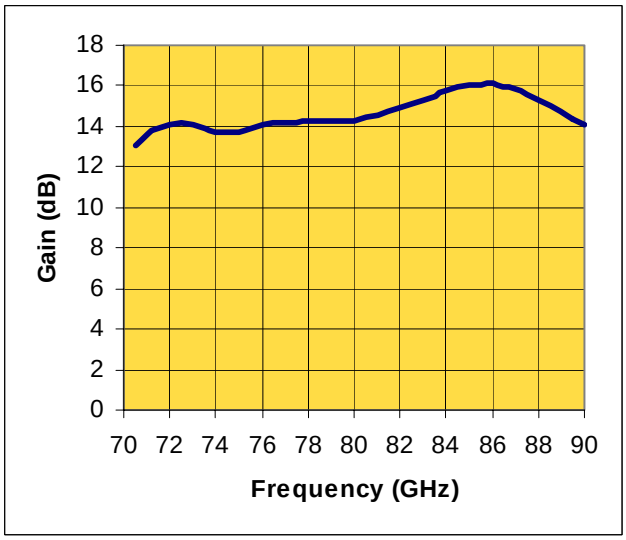
Absolute Maximum Ratings (Ta = 25°C)

Parameter	Min	Max	Unit
Vd1, Vd2, Vd3		3	V
Id1		10	mA
Id2		10	mA
Id3		25	mA
Vg1, Vg2, Vg3	-1	0.3	V
Input drive level		-3	dBm
Assy. Temperature (60 seconds)		300	deg. C

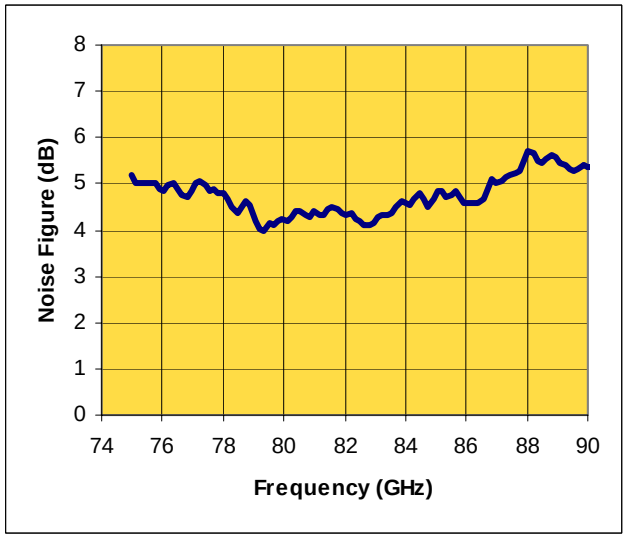
Velocium Products • Phone: (310) 814-5000 • Fax: (310) 812-7011 • E-mail: st-velocium.sales@ngc.com • Web: www.st.northropgrumman.com/velocium/

Measured Performance Characteristics (Typical Performance at 25°C)
Vd1 and Vd2 = 2.1 V, Vd3 = 2.4V, Id1= Id2 = 6 mA, Id3= 18mA

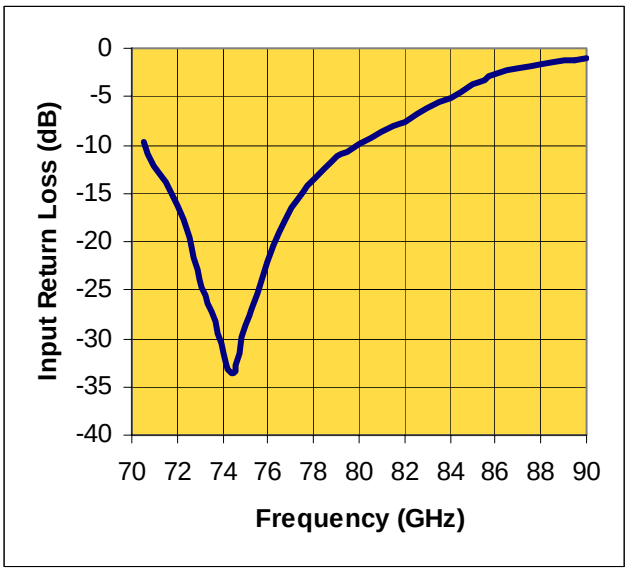
Linear Gain Versus Frequency



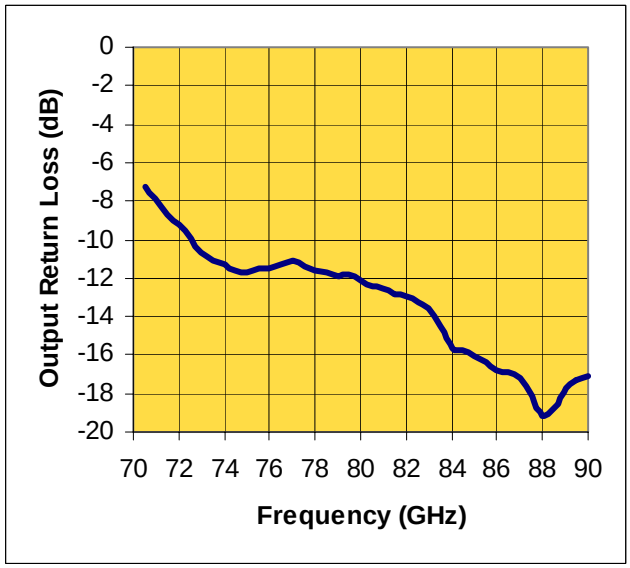
Noise Figure Versus Frequency



Input Return Loss Versus Frequency



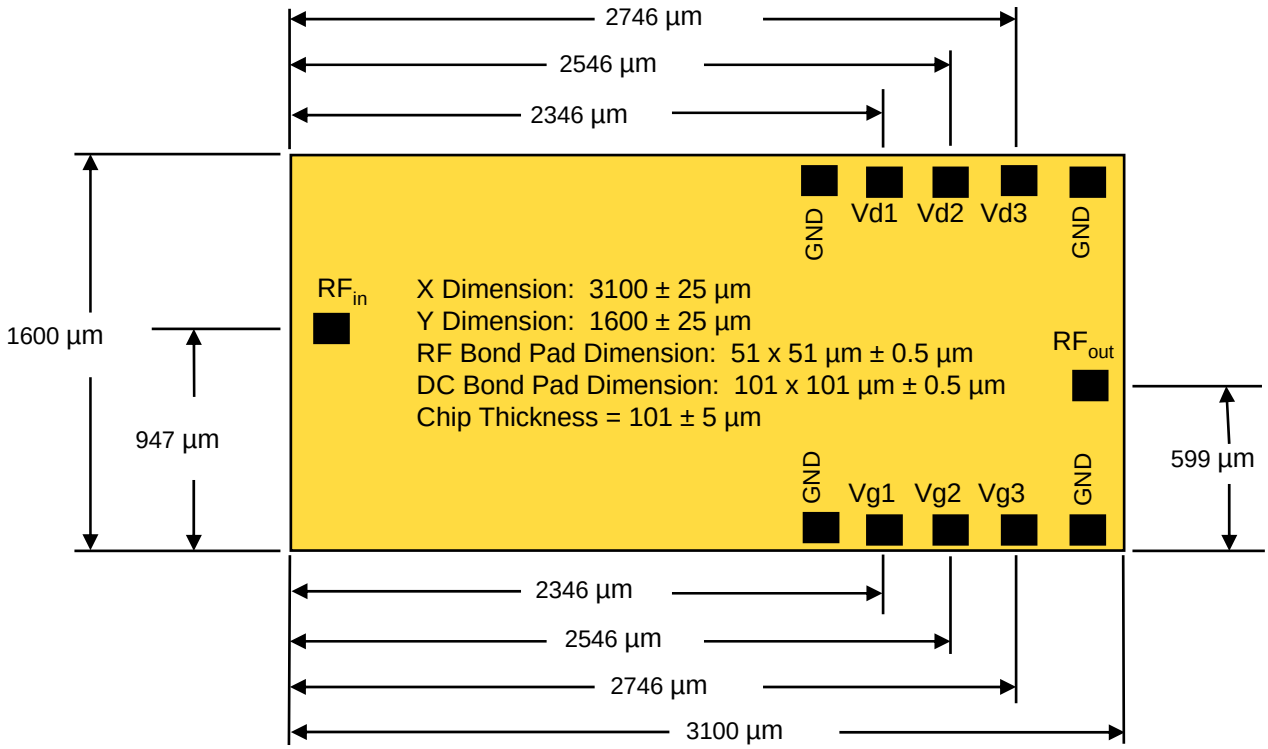
Output Return Loss Versus Frequency



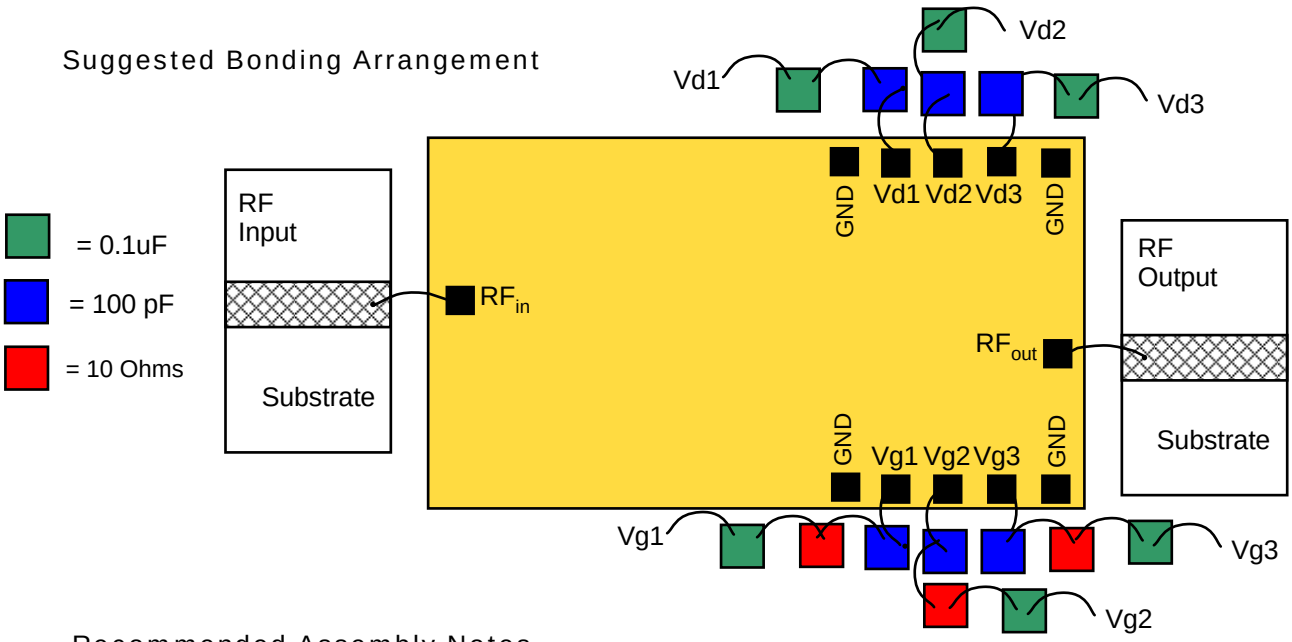
Measured Performance Characteristics (Typical Performance at 25°C)
Vd3 = 2V, Id3 = 25 mA

Freq. (GHz)	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
70.0	0.545	-10.114	5.261	-1.816	0.009	-70.365	0.404	-55.001
70.5	0.464	-15.959	5.383	-15.986	0.009	-82.691	0.331	-69.788
71.0	0.391	-19.726	5.481	-31.268	0.008	-91.219	0.267	-81.065
71.5	0.324	-21.801	5.300	-42.471	0.007	-100.341	0.215	-90.197
72.0	0.266	-21.380	5.475	-53.459	0.007	-110.968	0.175	-99.711
72.5	0.226	-17.065	5.453	-66.328	0.007	-104.620	0.152	-109.778
73.0	0.191	-11.534	5.470	-78.909	0.005	-120.948	0.120	-121.211
73.5	0.176	-2.108	5.381	-90.065	0.005	-117.337	0.088	-132.494
74.0	0.171	7.171	5.428	-101.465	0.005	-108.672	0.076	-141.797
74.5	0.179	15.117	5.214	-112.107	0.006	-144.931	0.061	-161.729
75.0	0.194	21.381	5.293	-122.454	0.005	-147.704	0.049	-166.753
75.5	0.211	24.374	5.305	-132.986	0.004	-151.641	0.059	-170.227
76.0	0.235	28.090	5.346	-141.469	0.004	172.403	0.058	179.556
76.5	0.266	27.887	5.479	-152.203	0.002	139.461	0.068	170.874
77.0	0.301	27.226	5.520	-162.531	0.003	132.857	0.083	160.944
77.5	0.337	24.901	5.477	-173.064	0.004	106.119	0.101	151.383
78.0	0.374	20.875	5.607	177.804	0.003	88.688	0.120	141.617
78.5	0.400	16.702	5.630	166.859	0.004	55.444	0.137	134.641
79.0	0.435	11.957	5.422	155.549	0.005	35.002	0.160	127.934
79.5	0.465	6.004	5.519	145.596	0.005	50.927	0.176	117.530
80.0	0.482	1.269	5.468	135.220	0.005	6.236	0.197	110.086
80.5	0.499	-3.082	5.536	124.299	0.006	-13.351	0.215	103.875
81.0	0.515	-8.400	5.532	113.355	0.007	-7.915	0.232	98.323
81.5	0.538	-12.670	5.648	102.965	0.005	-11.329	0.250	92.185
82.0	0.562	-17.199	5.740	92.128	0.007	-22.744	0.271	86.139
82.5	0.582	-22.209	5.883	82.664	0.007	-22.215	0.291	79.133
83.0	0.604	-27.143	5.879	72.801	0.010	-43.120	0.307	72.007
83.5	0.627	-33.171	6.117	62.457	0.008	-56.927	0.315	66.029
84.0	0.640	-38.409	6.258	52.405	0.009	-64.928	0.327	59.780
84.5	0.648	-43.229	6.253	40.294	0.010	-65.877	0.336	52.892
85.0	0.669	-48.726	6.288	29.141	0.010	-55.273	0.343	46.865
85.5	0.679	-54.046	6.285	17.787	0.011	-75.643	0.343	38.656
86.0	0.692	-59.943	6.134	4.097	0.009	-101.065	0.331	30.474
86.5	0.712	-65.162	6.073	-6.537	0.012	-86.531	0.319	21.172
87.0	0.724	-72.058	6.261	-19.524	0.013	-111.918	0.285	13.536
87.5	0.713	-76.945	6.155	-32.592	0.015	-124.757	0.251	8.739
88.0	0.717	-82.090	5.976	-43.429	0.013	-139.184	0.230	6.373
88.5	0.713	-87.487	5.965	-55.211	0.013	-146.323	0.211	2.877
89.0	0.711	-92.688	6.017	-65.900	0.013	-160.636	0.189	-2.780
89.5	0.708	-98.378	5.897	-76.909	0.015	-164.277	0.157	-4.969
90.0	0.703	-102.331	5.662	-89.259	0.015	-178.227	0.131	-1.697

Die Size and Bond Pad Locations



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.