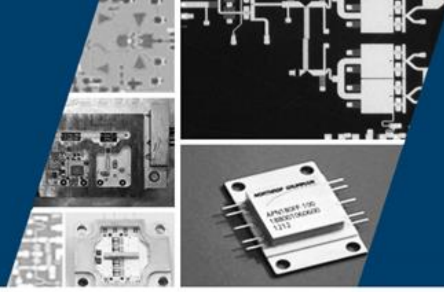
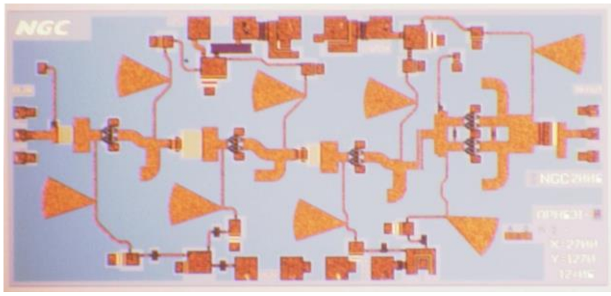
APH631
92 – 96 GHz
Drive Amplifier



NORTHROP GRUMMAN

Product Datasheet

Revision: April 2015



X=2700 µm Y=1270 µm

Applications

- ♦ Short Haul / High Capacity Links
- ♦ Sensors
- ♦ Radar

Product Features

- ♦ RF Frequency: 92 to 96 GHz
- ♦ Linear Gain: 23 dB typ.
- ♦ Psat: 18 dBm typ.
- ♦ P1dB: 15 dBm typ.
- ♦ Die Size: 3.5 sq. mm.
- ♦ 2 mil substrate
- ♦ DC Power: 4 VDC @ 200 mA

Product Description

The APH631 monolithic HEMT amplifier is a broadband, four-stage power device, designed for use in commercial digital radios and wireless LANs. 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	20	23		dB
Input Return Loss		7		dB
Output Return Loss		7		dB
P3dB		18		dBm
P1dB		15		dBm
Vd1, Vd34		4		V
Vg12		-0.1		V
Vg34		-0.1		V
Id1		80		mA
Id34		120		mA

Absolute Maximum Ratings (Ta = 25°C)

Parameter	Min	Max	Unit
Vd1, Vd34		4.5	V
Id1		100	mA
Id34		200	mA
Vg12, Vg34	-0.8	0.3	V
Input drive level		5	dBm
Assy. Temperature (60 seconds)		300	deg. C

Web: http://www.as.northropgrumman.com/mps

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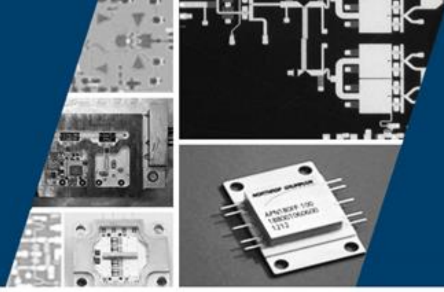
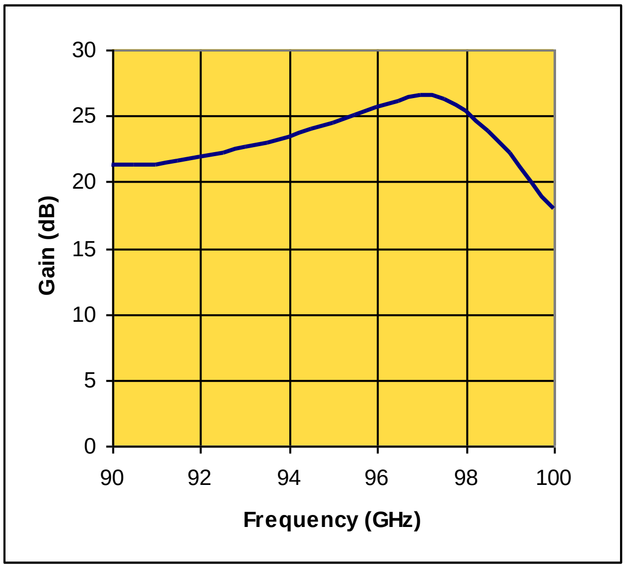
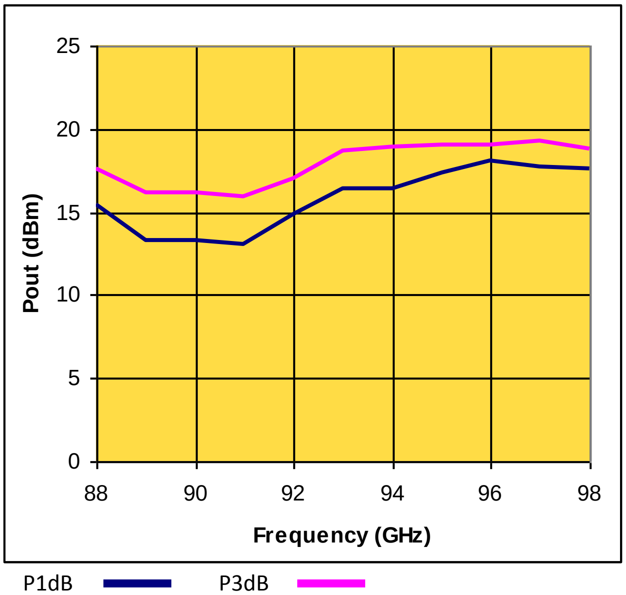


Measured Performance Characteristics (Typical Performance at 25°C)
Vd1 = Vd34 = 4.0 V, Id1 = 80 mA, Id34 = 120 mA

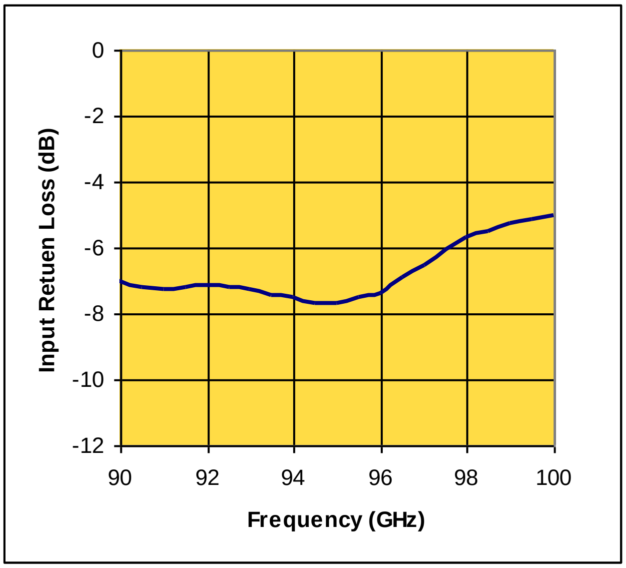
Linear Gain Versus Frequency



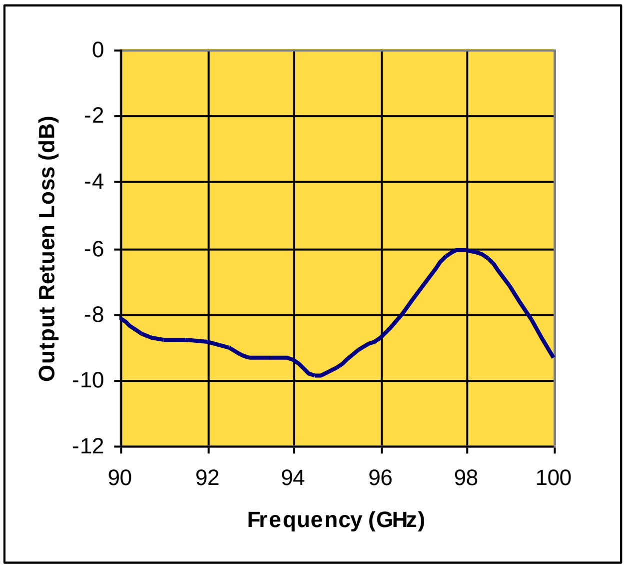
Fixtured Output Power Versus Frequency

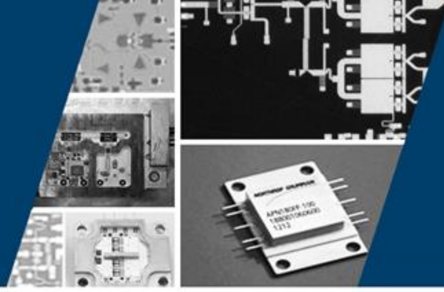


Input Return Loss Versus Frequency



Output Return Loss Versus Frequency





Measured Performance Characteristics (Typical Performance at 25°C)
Vd1 = Vd34 = 4.0 V, Id1 = 80 mA, Id34 = 120 mA

Freq GHz	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
88.0	0.516	-124.396	10.201	-55.046	0.006	-56.406	0.416	-7.631
88.5	0.507	-128.116	10.469	-68.677	0.006	-59.402	0.405	-13.282
89.0	0.503	-133.397	10.787	-82.202	0.006	-61.938	0.399	-19.386
89.5	0.490	-139.823	11.176	-96.006	0.005	-62.576	0.402	-24.893
90.0	0.483	-145.788	11.578	-110.551	0.006	-66.246	0.392	-30.811
90.5	0.473	-149.860	11.625	-125.675	0.005	-74.452	0.373	-37.229
91.0	0.463	-139.284	11.678	-138.783	0.004	-78.283	0.366	-43.255
91.5	0.459	-107.336	12.047	-151.250	0.004	-75.080	0.366	-47.229
92.0	0.453	-40.535	12.424	-118.124	0.004	-80.096	0.363	-52.658
92.5	0.444	38.706	12.960	8.789	0.004	-81.164	0.357	-55.338
93.0	0.438	112.719	13.532	115.486	0.004	-74.443	0.343	-60.887
93.5	0.427	149.750	14.169	146.862	0.004	-88.976	0.345	-66.442
94.0	0.424	146.714	14.907	135.044	0.003	-75.546	0.344	-68.333
94.5	0.415	136.757	15.940	119.358	0.003	-66.234	0.325	-70.227
95.0	0.419	124.592	16.816	101.663	0.003	-68.092	0.332	-75.636
95.5	0.429	111.352	17.841	83.078	0.003	-54.704	0.355	-76.309
96.0	0.440	95.412	19.175	63.721	0.004	-53.349	0.369	-77.778
96.5	0.466	78.892	20.454	41.556	0.004	-54.537	0.401	-80.914
97.0	0.485	62.406	21.424	16.401	0.005	-60.370	0.446	-88.485
97.5	0.510	47.536	20.970	-11.623	0.005	-67.088	0.491	-100.255
98.0	0.529	33.050	18.869	-39.482	0.006	-74.937	0.501	-113.815
98.5	0.539	22.229	15.967	-65.885	0.006	-88.381	0.486	-127.696
99.0	0.554	11.718	13.158	-89.835	0.006	-92.435	0.443	-140.247
99.5	0.562	3.706	10.202	-109.865	0.006	-103.295	0.392	-150.015
100.0	0.568	-3.450	8.060	-128.600	0.006	-113.040	0.344	-156.120

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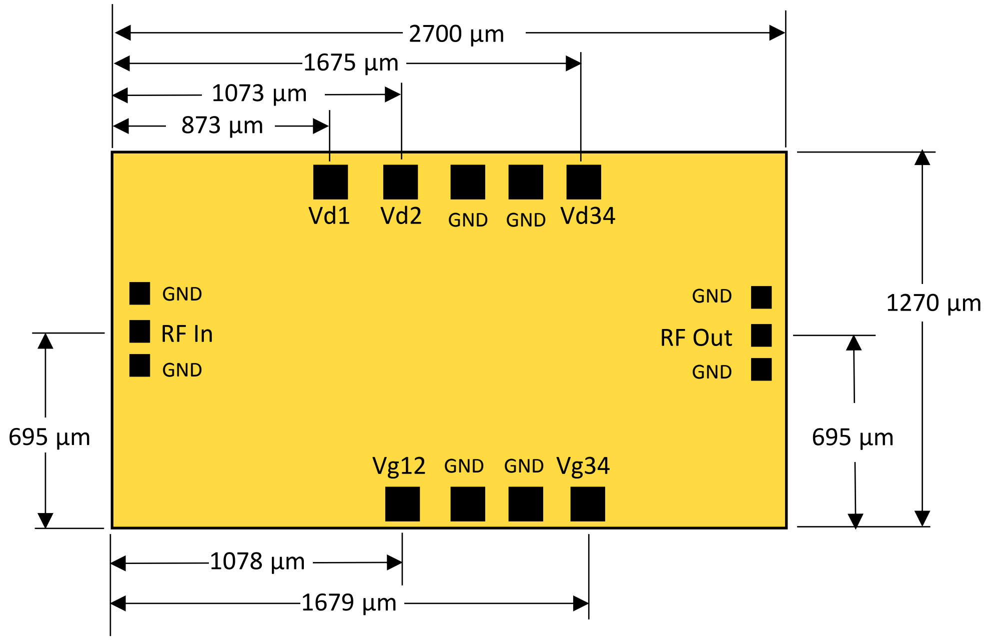
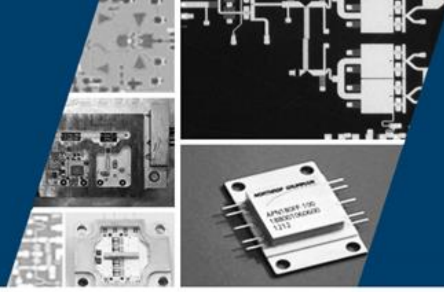
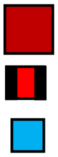
Die Size and Bond Pad Locations (Not to Scale)

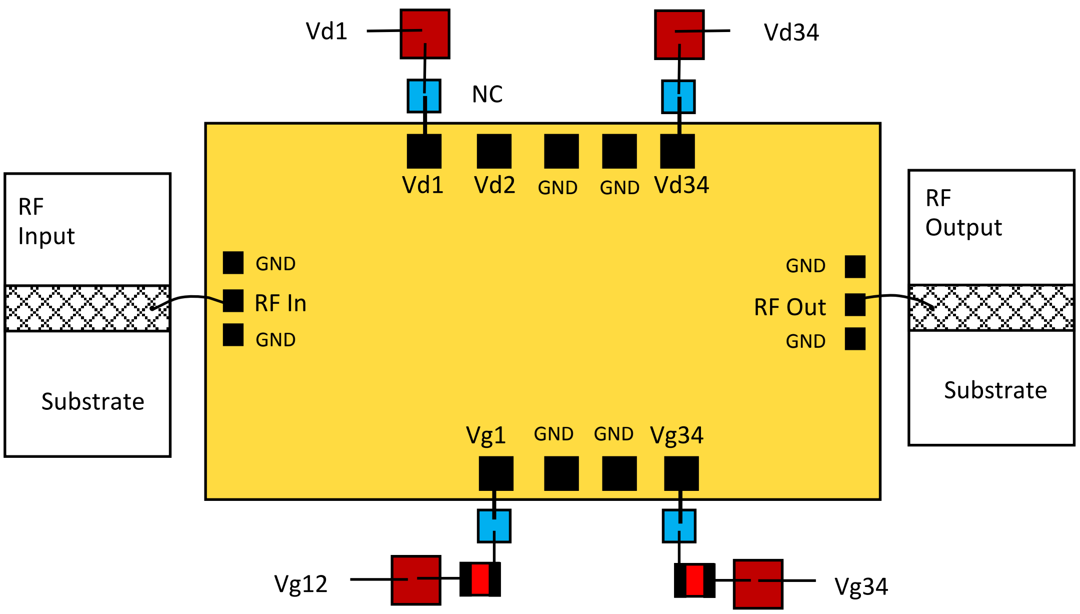
X Dimension: 2700 ± 25 µm
Y Dimension: 1270 ± 25 µm
RF Bond Pad Dimension: 50 x 50 ± 0.5 µm
DC Bond Pad Dimension: 101 x 101 ± 0.5 µm
Chip Thickness = 50 ± 5 µm





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.