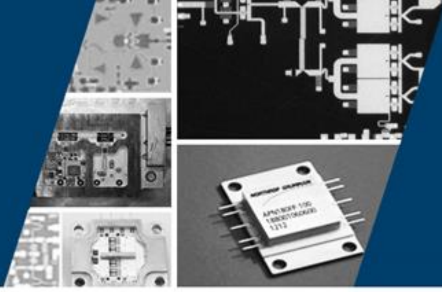
APH669
81-86 GHz
Medium Power Amplifier



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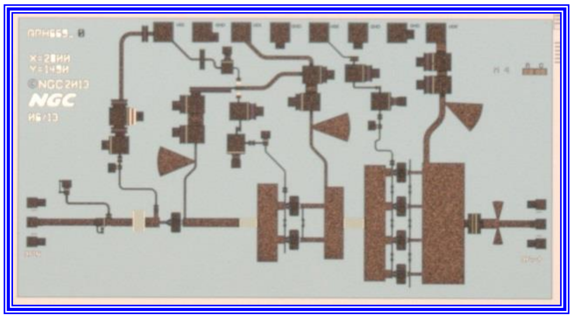
Preliminary Datasheet

Revision: February 2015



X=2800 µm Y=1490 µm

Applications

- FCC E-band Communication Systems @ 81-86 GHz Frequency Band
- Short Haul / High Capacity Links
- Enterprise Wireless LAN
- Wireless Fiber Replacement

Product Features

- RF Frequency: 81 to 86 GHz
- Linear Gain: 16 dB typ.
- Psat: 23.5 dBm typ.
- Die Size: 4.17 sq. mm.
- 2 mil substrate
- DC Power: 4 VDC @ 305 mA

Product Description

The APH669 is a Gallium Arsenide-based broadband, three-stage power amplifier device, designed for use in commercial digital radios and wireless LANs. To ensure rugged and reliable operation, GaAs pHEMT 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	81		86	GHz
Linear Gain	15	16		dB
Input Return Loss	6	10		dB
Output Return Loss	8	11		dB
P1dB		20		dBm
Psat	22.5	23.5		dBm
Max PAE%		13		%
Vd1, Vd2		4		V
Vg1		0.02		V
Vg2		0.02		V
Id1		135		mA
Id2		180		mA

Absolute Maximum Ratings (Ta = 25°C)

Parameter	Min	Max	Unit
Vd1, Vd2		4	V
Vg1	-0.8	0.3	V
Vg2	-0.8	0.3	V
Id1		150	mA
Id2		200	mA
Input drive level		16	dBm
Assy. Temperature (60 seconds)		300	deg. C

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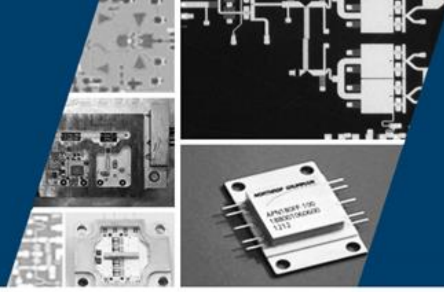

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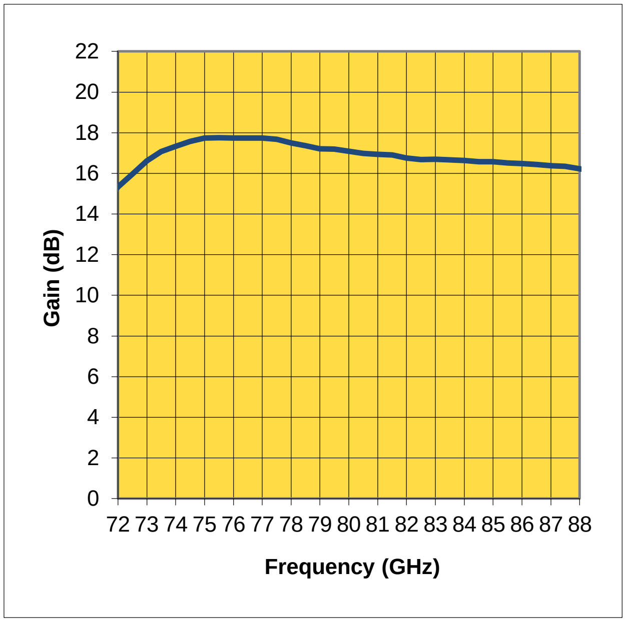
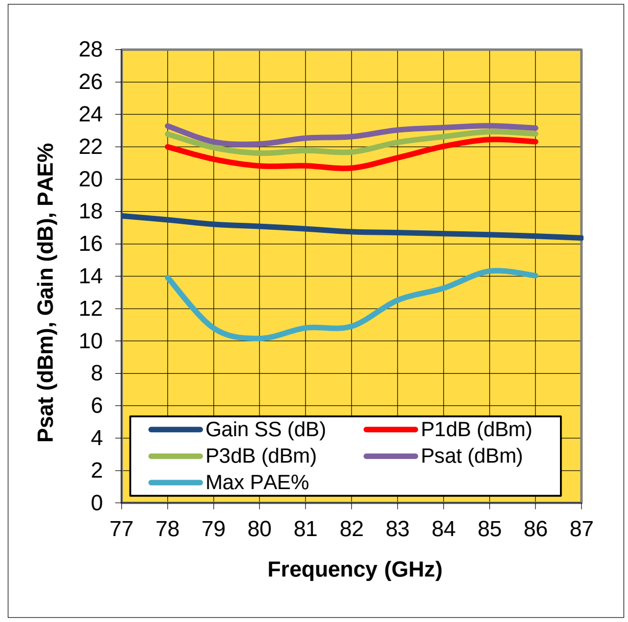
Measured (On-Wafer) Performance Characteristics (Typical Performance at 25°C)
Vd = 4V, Id1 = 135 mA, Id2 = 180 mA

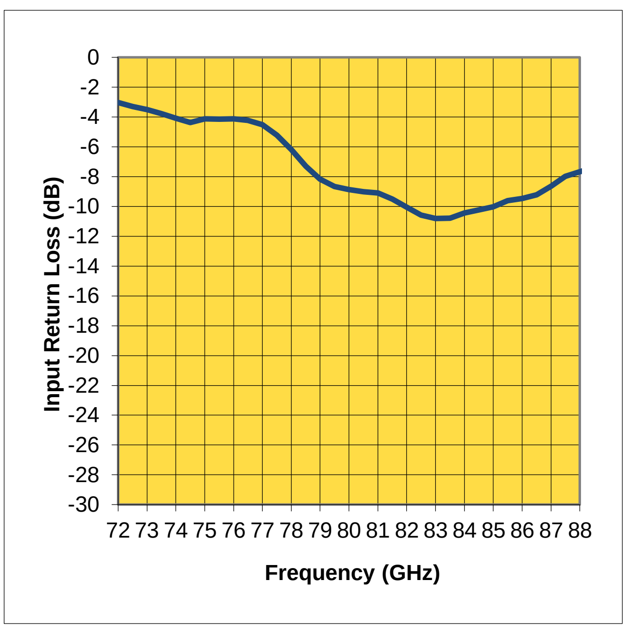
Linear Gain vs. Frequency



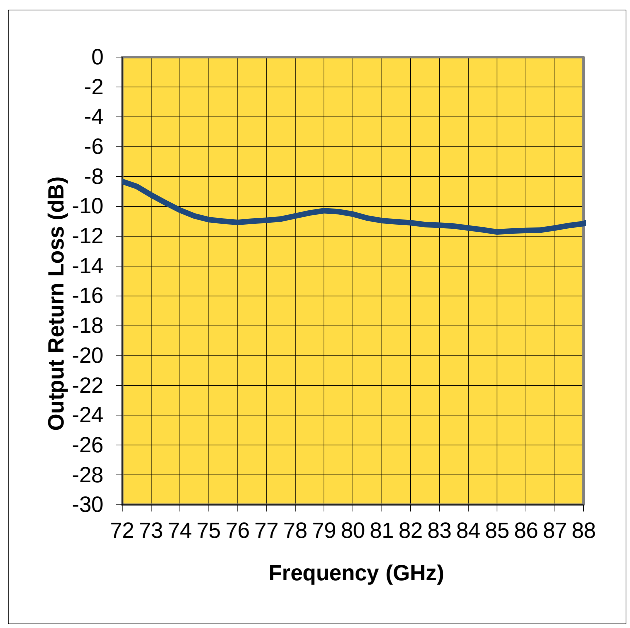
Output Power, Gain, PAE% vs. Frequency *



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



* Pulsed-Power On-Wafer

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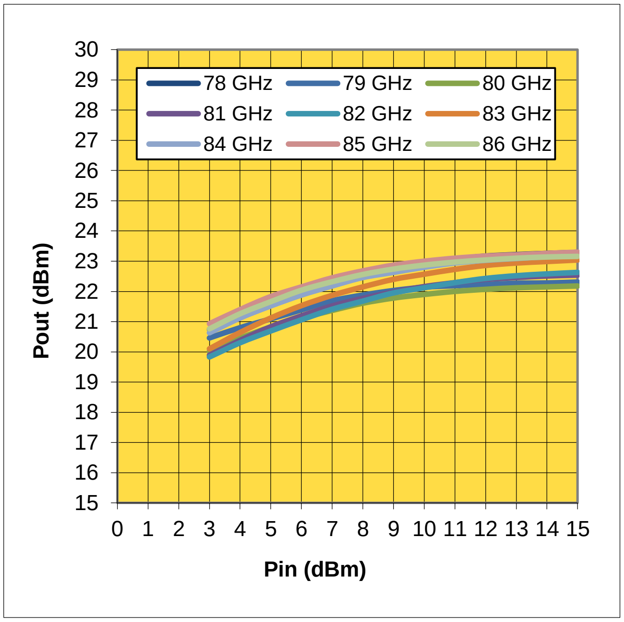
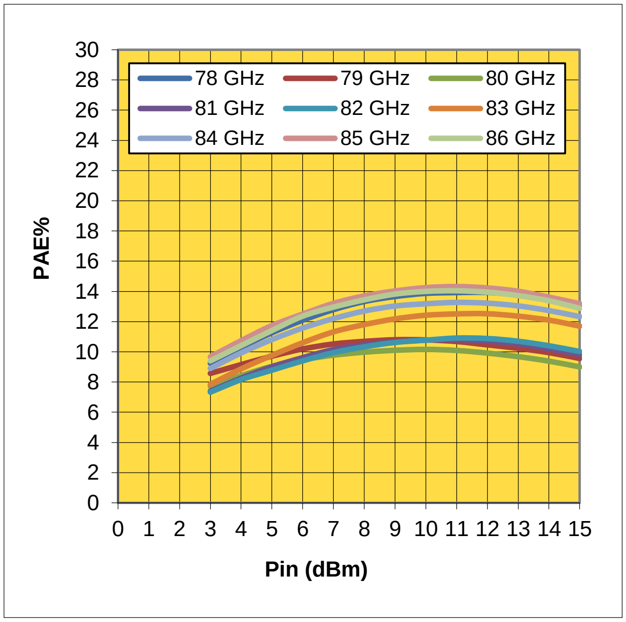
Measured (On-Wafer) Performance Characteristics (Typical Performance at 25°C)
Vd = 4V, Id1+Id1a = 270 mA, Id2+Id2a = 360 mA

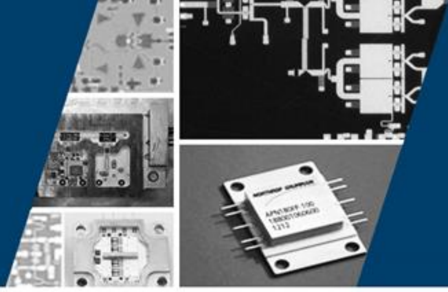
Pout vs. Pin *



PAE% vs. Pin *



* Pulsed-Power On-Wafer



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Measured (On-Wafer) Performance Characteristics (Typical Performance at 25°C)
Vd = 4V, Id1 = 135 mA, Id2 = 180 mA

Freq GHz	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
78.0	0.459	-14.274	7.412	-72.163	0.009	-47.948	0.302	-98.141
78.5	0.400	-22.544	7.257	-84.655	0.009	-61.129	0.310	-104.682
79.0	0.365	-31.374	7.147	-96.334	0.010	-65.854	0.316	-111.613
79.5	0.341	-39.445	7.084	-108.331	0.008	-81.280	0.313	-118.855
80.0	0.328	-48.508	6.945	-120.143	0.009	-90.170	0.308	-125.986
80.5	0.322	-54.418	6.856	-130.964	0.008	-96.751	0.298	-131.624
81.0	0.318	-60.945	6.831	-141.873	0.007	-101.162	0.292	-136.913
81.5	0.306	-69.567	6.816	-153.485	0.007	-100.561	0.286	-141.929
82.0	0.292	-80.787	6.703	-165.314	0.006	-107.765	0.283	-146.580
82.5	0.279	-89.759	6.649	-176.297	0.006	-113.624	0.277	-152.328
83.0	0.277	-99.409	6.691	171.950	0.006	-123.470	0.275	-157.391
83.5	0.282	-108.126	6.689	160.051	0.005	-119.126	0.273	-162.911
84.0	0.299	-117.702	6.704	147.441	0.005	-130.499	0.268	-168.005
84.5	0.311	-128.277	6.684	135.817	0.004	-141.326	0.266	-173.958
85.0	0.323	-136.992	6.702	123.687	0.004	-139.469	0.262	179.923
85.5	0.339	-146.233	6.662	111.431	0.004	-146.339	0.263	174.859
86.0	0.347	-155.073	6.638	99.413	0.003	-150.262	0.265	167.939
86.5	0.359	-161.729	6.609	87.044	0.002	-139.199	0.266	159.894
87.0	0.385	-167.500	6.545	73.957	0.002	-152.400	0.271	152.160
87.5	0.415	-175.037	6.511	60.499	0.003	-143.607	0.273	143.589
88.0	0.429	177.994	6.423	46.956	0.002	-145.965	0.279	134.765
88.5	0.442	171.986	6.344	33.257	0.001	-132.040	0.290	124.971
89.0	0.468	165.995	6.243	18.477	0.001	-163.769	0.302	114.651
89.5	0.491	160.025	6.051	3.382	0.001	-146.942	0.315	104.014
90.0	0.509	154.380	5.854	-11.245	0.001	-102.200	0.337	92.243
90.5	0.527	149.249	5.584	-26.393	0.000	-112.630	0.356	79.633
91.0	0.542	144.111	5.280	-41.770	0.001	-83.437	0.374	66.872
91.5	0.554	138.253	4.913	-56.865	0.002	-161.650	0.393	55.378
92.0	0.565	133.153	4.501	-71.450	0.001	-97.439	0.409	43.910
92.5	0.575	128.283	4.080	-85.920	0.001	-128.857	0.431	33.081
93.0	0.588	123.711	3.660	-99.845	0.002	-135.403	0.447	23.107
93.5	0.596	119.497	3.261	-113.104	0.002	-131.274	0.464	13.822
94.0	0.599	115.272	2.881	-125.672	0.002	-140.992	0.475	5.005
94.5	0.603	111.421	2.546	-137.682	0.001	-144.766	0.486	-2.759
95.0	0.608	107.563	2.246	-149.258	0.002	-163.231	0.498	-9.738
95.5	0.612	103.963	1.981	-160.112	0.002	143.593	0.510	-16.213
96.0	0.614	100.148	1.751	-170.732	0.003	119.290	0.523	-22.422

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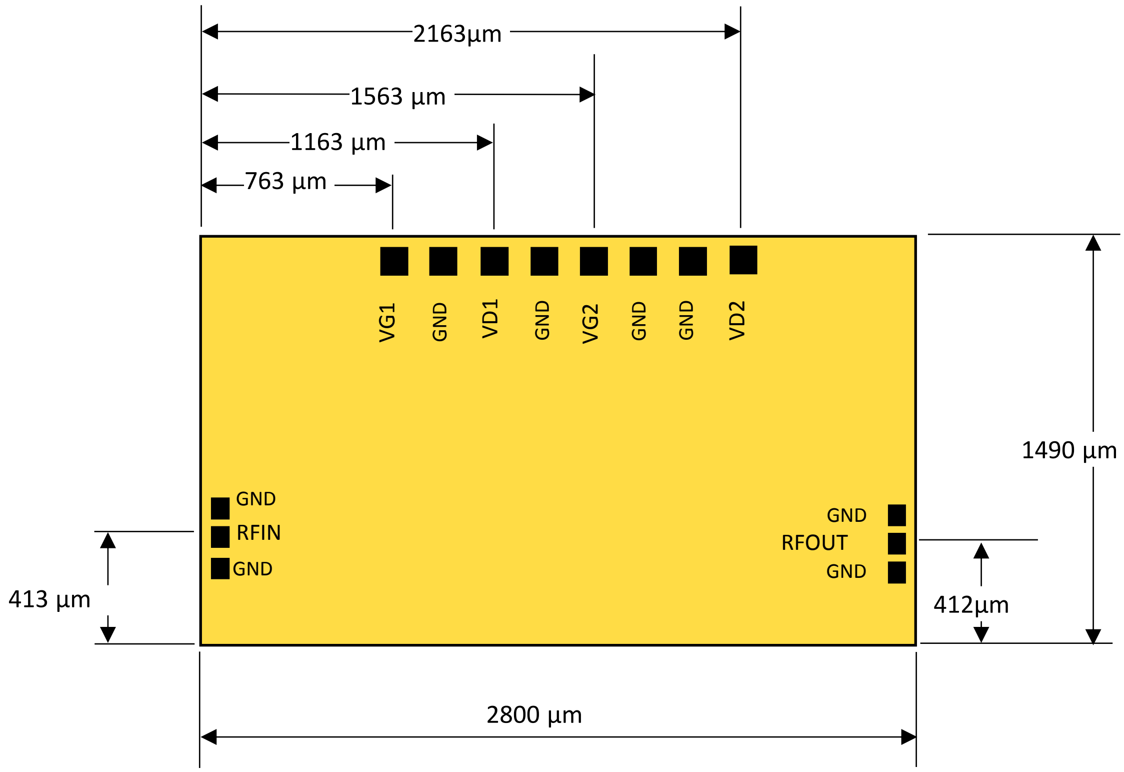
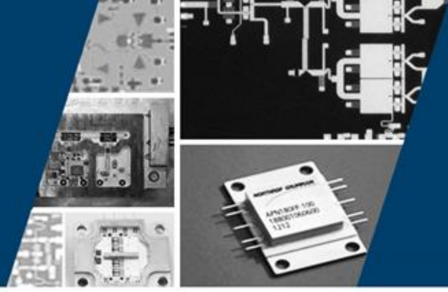
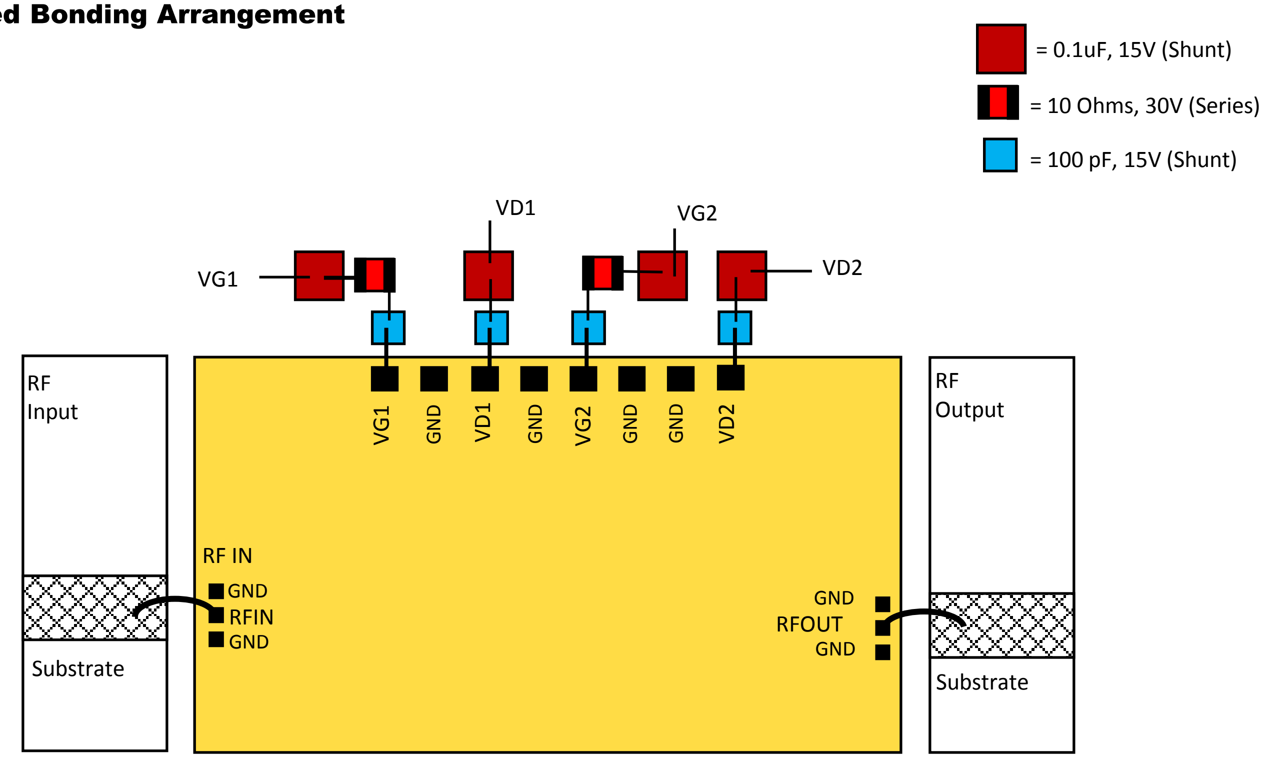
Die Size and Bond Pad Locations (Not to Scale)

X = 2800 µm ± 25 µm
Y = 1490 ± 25 µm
DC Bond Pad = 100 x 100 ± 0.5 µm
RF Bond Pad = 50 x 50 ± 0.5 µm
Chip Thickness = 50 ± 5 µm





Suggested Bonding Arrangement



Recommended Assembly Notes

1. Bypass caps should be 100 pF ceramic (single-layer) placed no further 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.

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