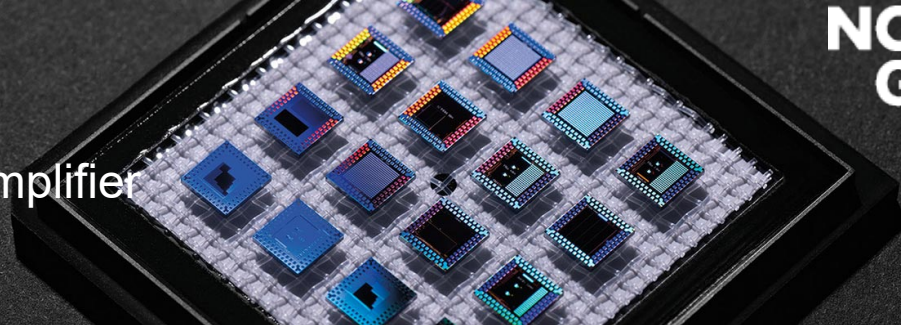
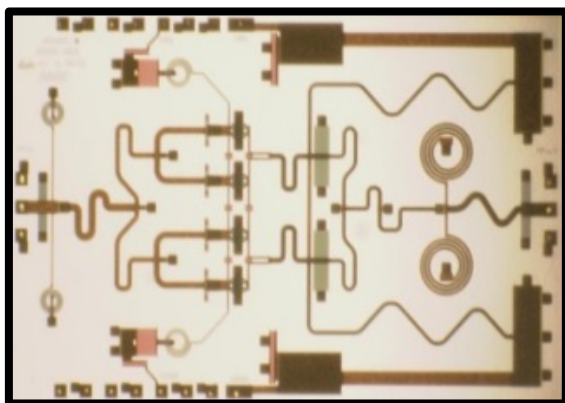


**APN267**  
**2-18 GHz**  
**GaN Power Amplifier**



Ask the t



**X = 4.4 mm Y = 2.8 mm**

**Product Features**

- RF frequency: 2 to 18 GHz
- Linear Gain: 10-13 dB across the band
- Psat: 38-40 dBm across the band
- Die Size: 12.32 sq. mm
- 0.2 um GaN HEMT Process
- 4 mil SiC substrate
- DC Power: 24 VDC @ 480 mA

**Applications**

- Electronic Warfare
- Radar
- Test Equipment

**Product Description**

The APN267 distributed GaN HEMT amplifier is a broadband, one-stage power device, designed for use in electronic warfare and test equipments. To ensure rugged and reliable operation, HEMT devices are fully passivated. Both bond pad and backside metallization are Au-based that is compatible with epoxy and eutectic die attach methods.

**Performance Characteristics (Ta = 25°C)**

Specification *	Min	Typ	Max	Unit
Frequency	2		18	GHz
Linear Gain	10	11	13	dB
Input Return Loss	2	8	12	dB
Output Return Loss	4	14	26	dB
P1dB (PP*)		35		dBm
Psat (PP*)	38	38.2	40	dBm
PAE @Psat (PP*)	25	33	38	%
P1dB (CW)		36.2		dBm
Psat (CW)	35	38.2	40	dBm
PAE @Psat (CW)		25.5		%
Vd1=Vd1a		24		V
Vg1. Vg1a		-3.5		V
Id1+Id1a		480		mA

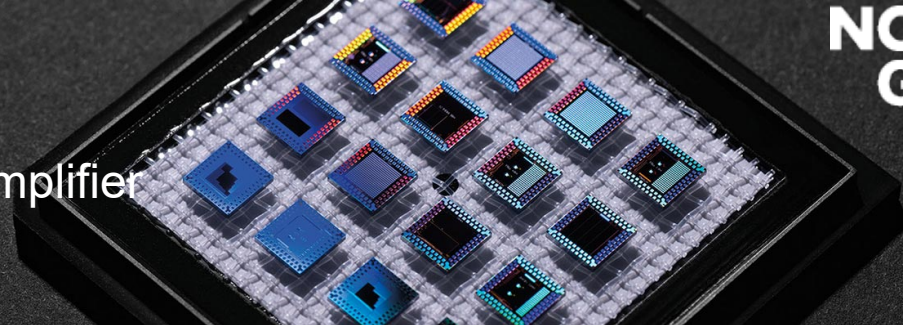
**Export Information**

ECCN: **5A991.g**

HTS (Schedule B) code: **8542.33.0000**

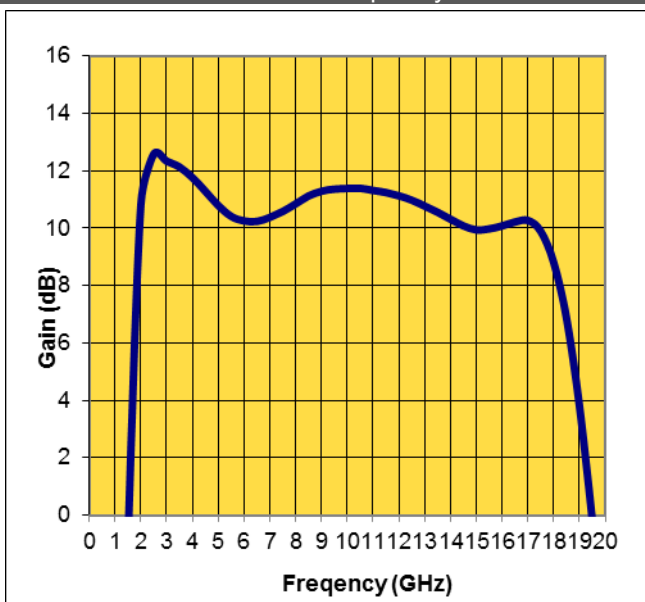
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## APN267 2-18 GHz GaN Power Amplifier

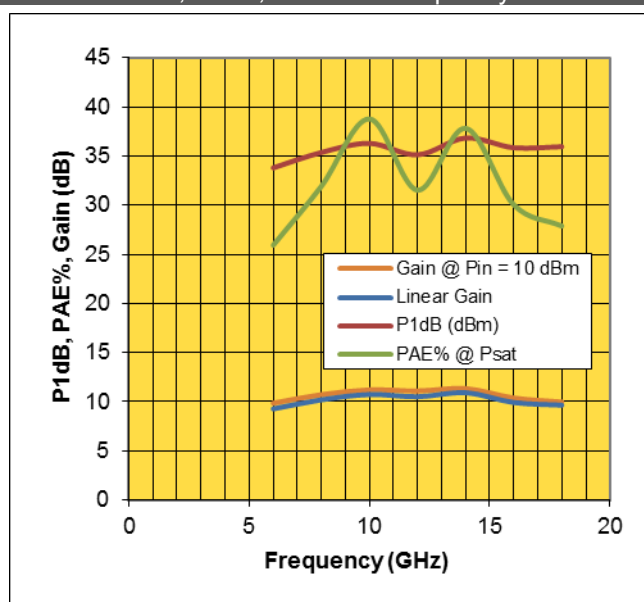


**On wafer measured Performance Characteristics (Typical Performance at 25°C)**  
**Vd = 24.0 V, Id1 + Id1a = 480 mA.**

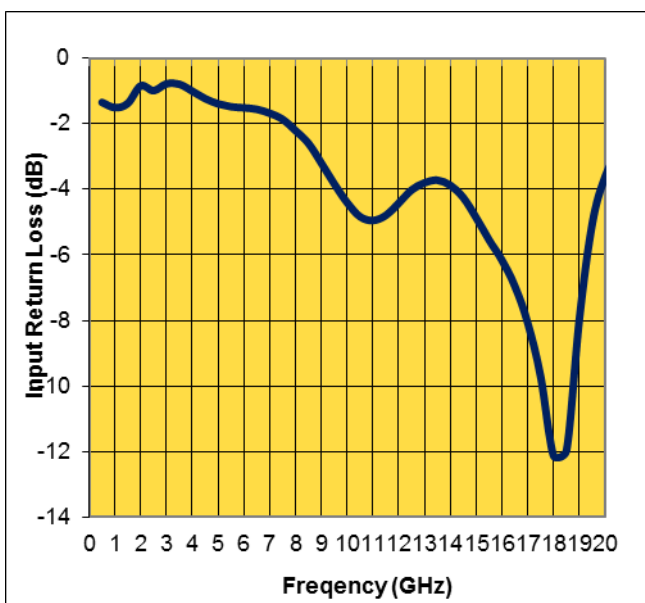
GAIN vs. Frequency



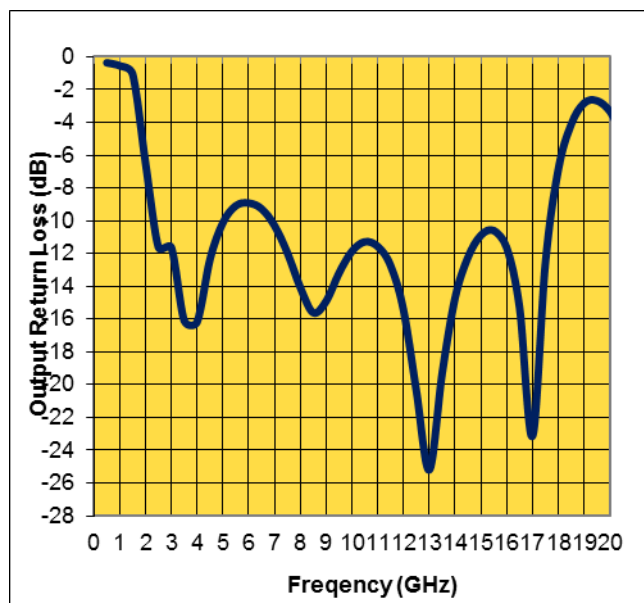
PAE, GAIN, P1dB vs. Frequency \*\*



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency

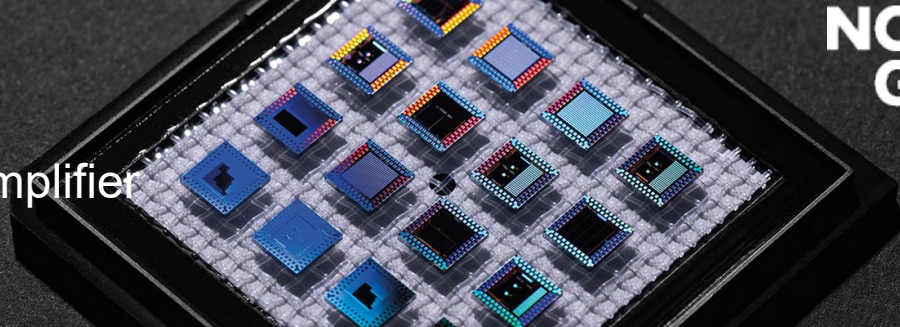


\*Pulsed-power on-wafer

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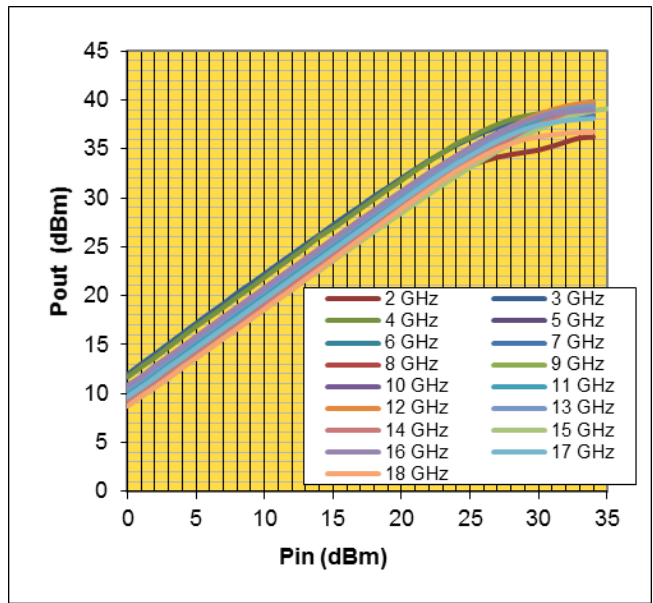
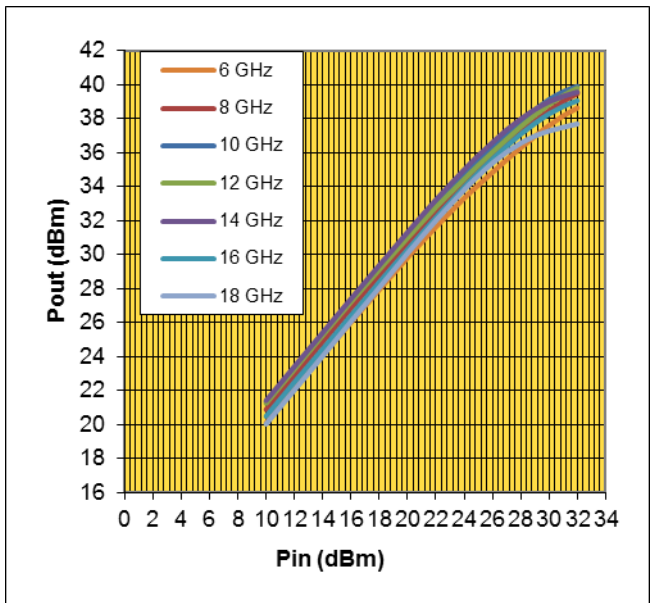
## APN267 2-18 GHz GaN Power Amplifier



On wafer measured Performance Characteristics (Typical Performance at 25°C)  
 $V_d = 24.0\text{ V}$ ,  $I_{d1} + I_{d1a} = 480\text{ mA}$ .

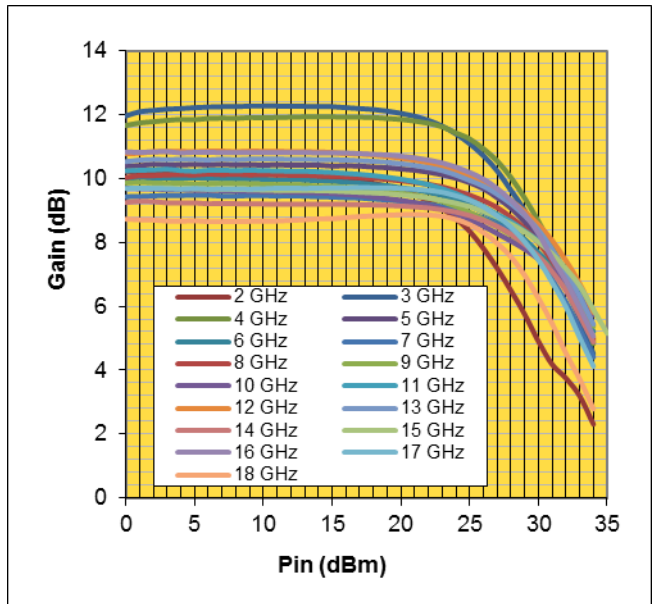
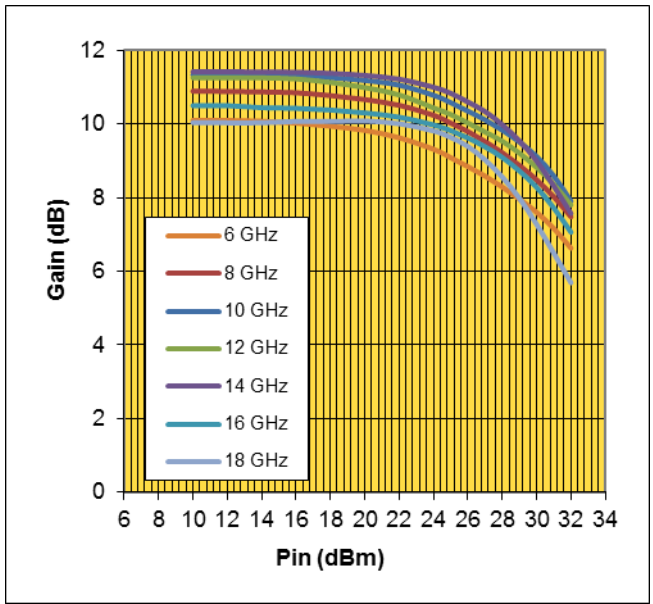
POUT vs. PIN\*

POUT vs. PIN\*\*



GAIN vs PIN\*

GAIN vs. PIN\*\*

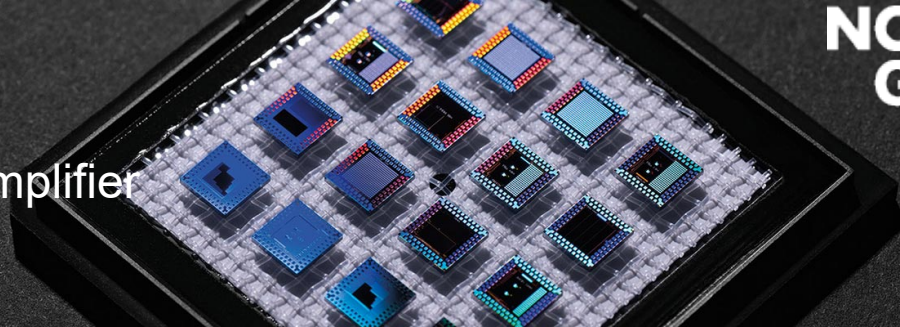


\*Pulsed-power on-wafer

\*\* CW fixtured

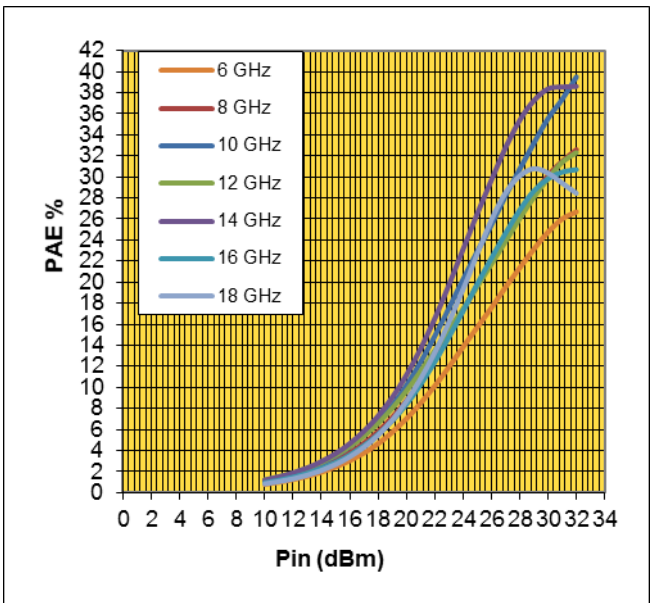
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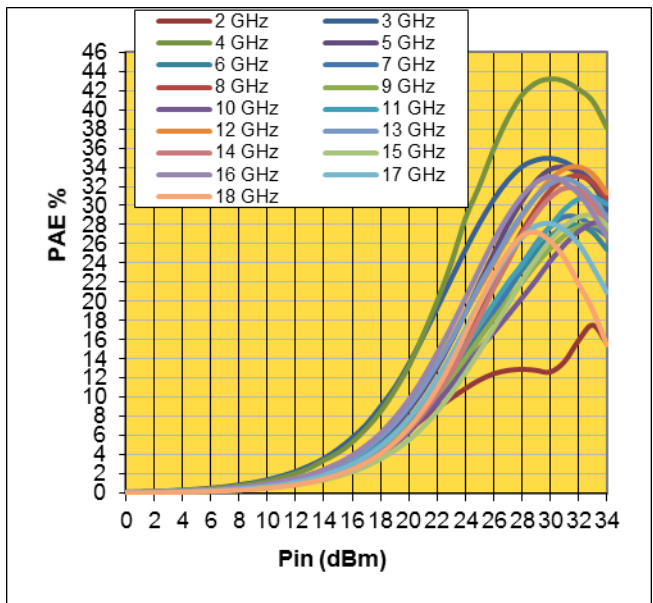


**On wafer measured Performance Characteristics (Typical Performance at 25°C)**  
**Vd = 24.0 V, Id1 + Id1a = 480 mA.**

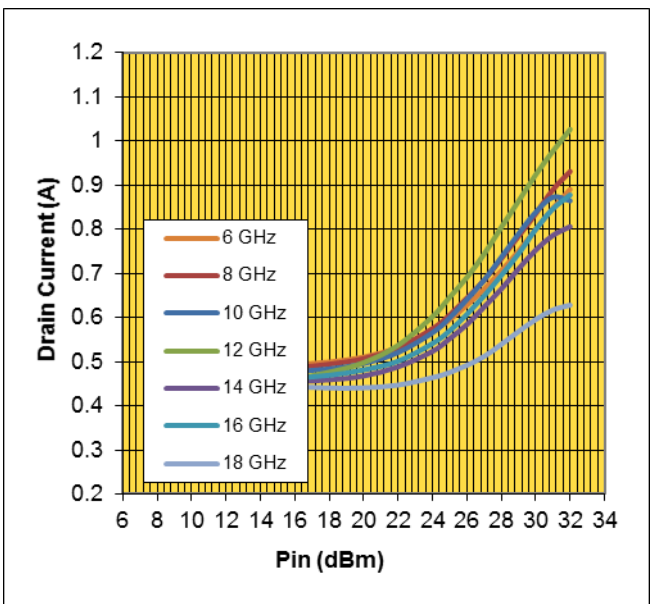
**PAE vs. PIN\***



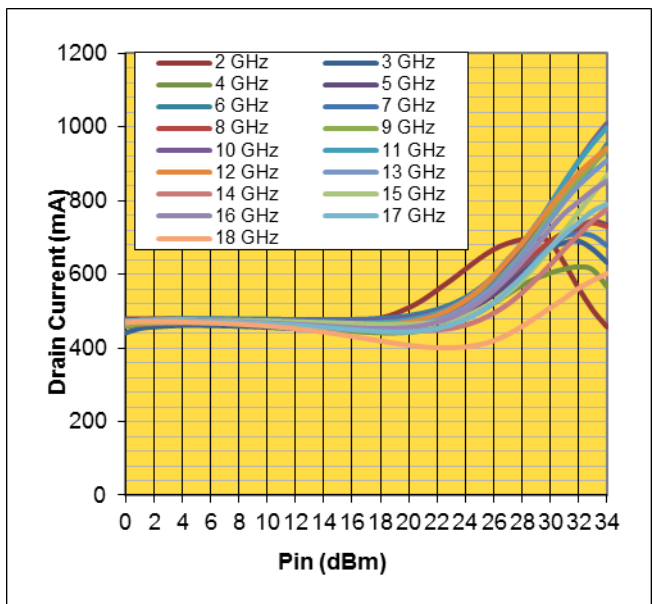
**PAE vs. PIN \*\***



**Drain Current vs PIN\***



**Drain Current vs. PIN\*\***

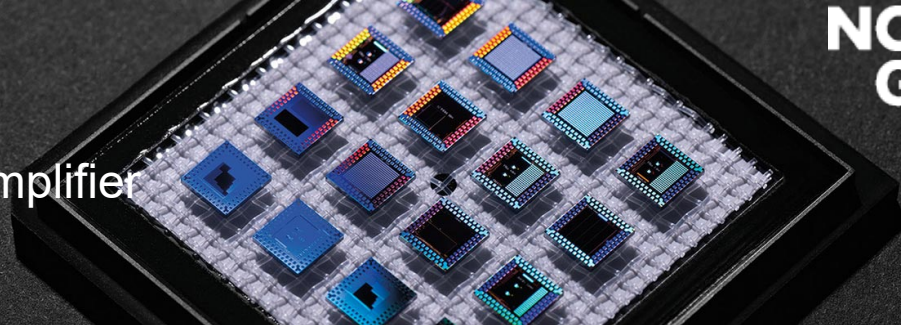


\* Pulsed-power on-wafer  
 \*\* CW fixtured

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**APN267**  
**2-18 GHz**  
**GaN Power Amplifier**

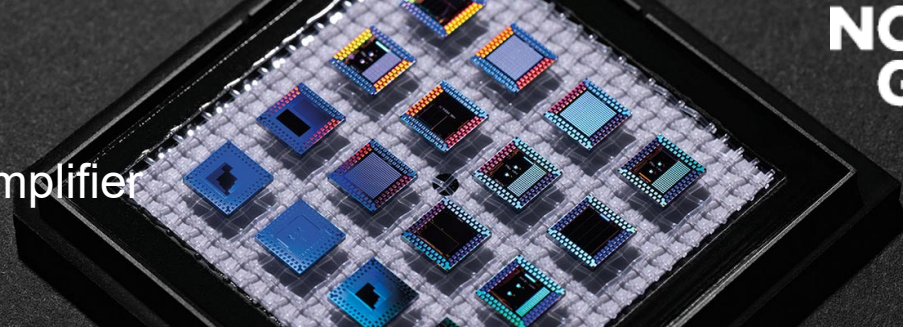


**On wafer measured Performance Characteristics (Typical Performance at 25°C)**  
**Vd = 24.0 V, Id1 + Id1a = 480 mA.**

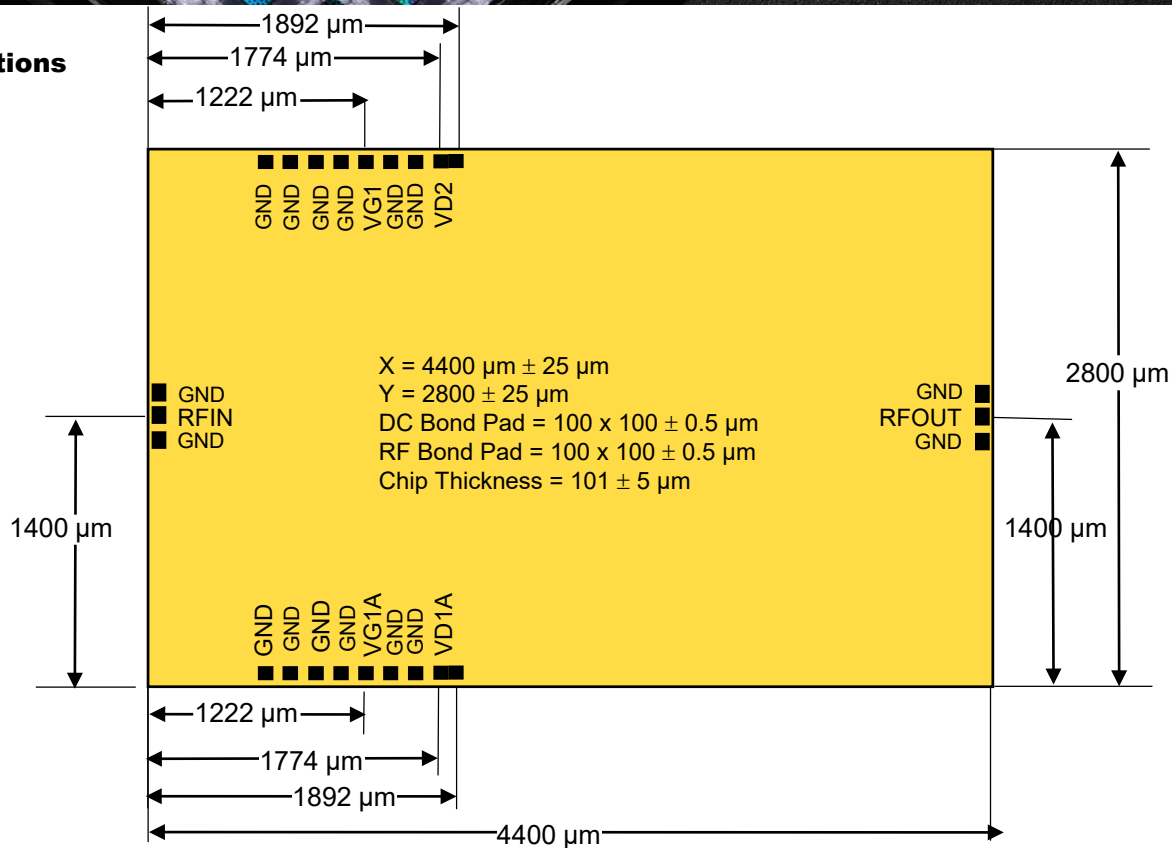
Freq GHz	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
2.0	0.900	-101.444	3.419	-73.394	0.012	-157.701	0.482	8.126
2.5	0.888	-119.353	4.224	-155.073	0.018	118.357	0.300	-170.826
3.0	0.910	-134.828	4.130	155.733	0.022	71.098	0.286	136.547
3.5	0.912	-149.993	4.083	116.126	0.025	32.204	0.141	121.495
4.0	0.891	-162.703	3.929	81.397	0.027	-1.300	0.111	-165.600
4.5	0.868	-173.839	3.712	50.706	0.029	-31.428	0.234	-167.036
5.0	0.853	173.901	3.479	23.546	0.030	-57.950	0.326	159.964
5.5	0.845	166.212	3.309	-1.169	0.031	-81.476	0.378	161.077
6.0	0.842	155.735	3.231	-24.235	0.033	-103.420	0.393	143.221
6.5	0.837	144.692	3.216	-46.459	0.035	-124.794	0.385	124.592
7.0	0.826	132.627	3.265	-68.675	0.039	-146.174	0.350	103.560
7.5	0.808	119.227	3.350	-91.421	0.042	-168.686	0.300	78.197
8.0	0.778	104.554	3.463	-114.776	0.047	168.831	0.246	46.052
8.5	0.745	88.333	3.589	-139.247	0.051	145.298	0.208	4.220
9.0	0.697	70.195	3.665	-164.449	0.055	120.931	0.210	-41.813
9.5	0.649	50.319	3.703	170.095	0.059	96.287	0.243	-80.868
10.0	0.608	28.781	3.714	144.329	0.062	71.961	0.277	-113.150
10.5	0.578	5.295	3.718	118.666	0.064	47.123	0.300	-137.922
11.0	0.570	-19.471	3.680	93.209	0.067	22.511	0.295	-161.220
11.5	0.579	-44.762	3.648	67.190	0.069	-2.551	0.267	124.150
12.0	0.603	-69.521	3.605	40.957	0.071	-27.685	0.211	154.647
12.5	0.631	-93.350	3.552	14.550	0.072	-53.295	0.141	128.738
13.0	0.647	-116.091	3.486	-12.468	0.074	-79.318	0.072	79.233
13.5	0.654	-137.861	3.419	-39.595	0.076	-106.205	0.073	-18.338
14.0	0.644	-158.478	3.340	-67.386	0.076	-132.689	0.146	-61.695
14.5	0.618	-67.999	3.259	-95.452	0.077	-159.987	0.214	-87.308
15.0	0.578	161.991	3.203	-123.836	0.078	170.168	0.266	-107.669
15.5	0.537	141.631	3.208	-153.496	0.080	144.035	0.286	-127.939
16.0	0.502	118.152	3.237	168.363	0.084	113.547	0.264	-149.355
16.5	0.461	89.089	3.286	140.726	0.088	80.431	0.184	-163.319
17.0	0.406	51.169	3.324	102.632	0.091	43.639	0.047	126.189
17.5	0.336	0.463	3.222	59.656	0.090	2.487	0.177	-27.855
18.0	0.250	-70.712	2.897	12.462	0.083	-42.649	0.405	-61.638

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**APN267**  
**2-18 GHz**  
**GaN Power Amplifier**



**Die Size and Bond Pad Locations (Not to Scale)**



**Biasing/De-Biasing Details:**

Bias for 1<sup>st</sup> must be from both sides.

Listed below are some guidelines for GaN device testing and wire bonding:





- a. Limit positive gate bias (G-S or G-D) to < 1V
- b. Know your devices' breakdown voltages
- c. Use a power supply with both voltage and current limit.
- d. With the power supply off and the voltage and current levels at minimum, attach the ground lead to your test fixture.
  - i. Apply negative gate voltage (-5 V) to ensure that all devices are off
  - ii. Ramp up drain bias to ~10 V
  - iii. Gradually increase gate bias voltage while monitoring drain current until 20% of the operating current is achieved
  - iv. Ramp up drain to operating bias
  - v. Gradually increase gate bias voltage while monitoring drain current until the operating current is achieved
- e. To safely de-bias GaN devices, start by debiasing output amplifier stages first (if applicable):
  - i. Gradually decrease drain bias to 0 V.
  - ii. Gradually decrease gate bias to 0 V.
  - iii. Turn off supply voltages

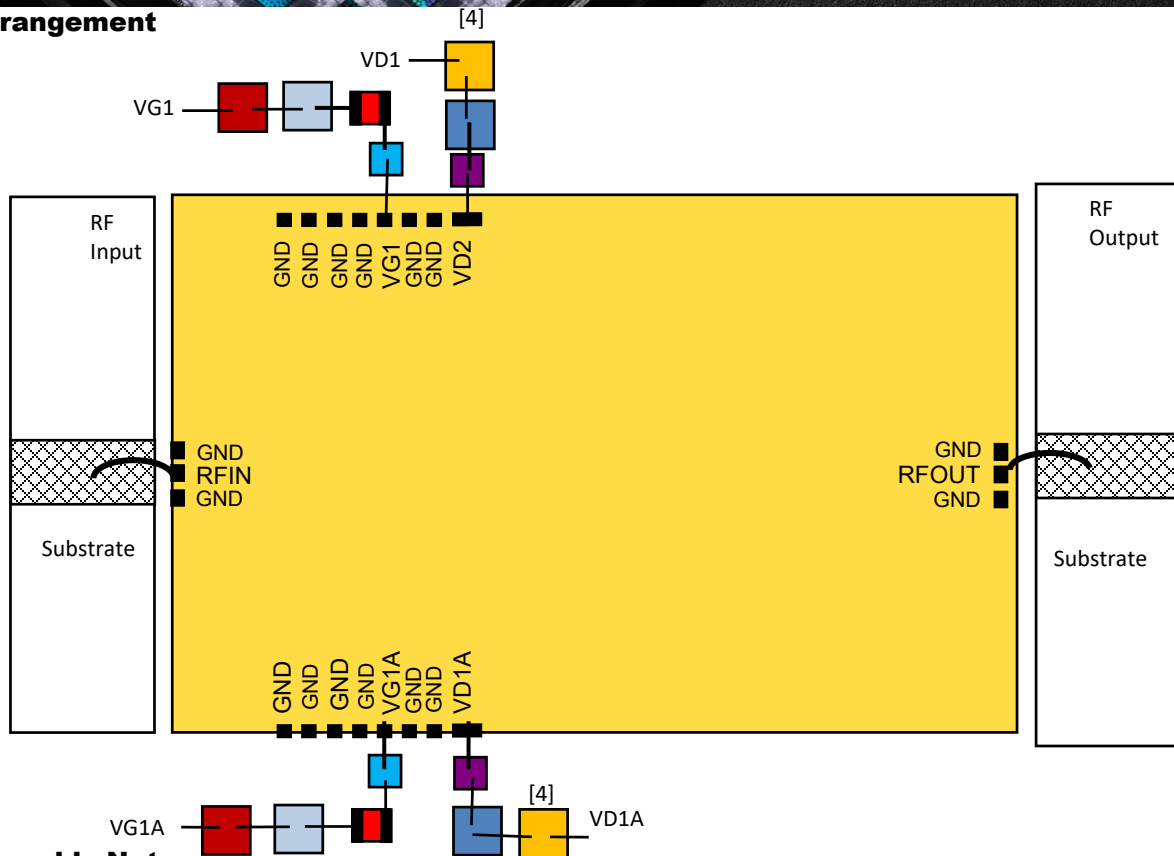
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## APN267 2-18 GHz GaN Power Amplifier

### Suggested Bonding Arrangement

-  = 0.1uF, 50V (Shunt) [4]
-  = 0.01uF, 50V (Shunt)
-  = 100 pF, 50V (Shunt)
-  = 0.1uF, 15V (Shunt)
-  = 0.01uF, 15V (Shunt)
-  = 10 Ohms, 30V (Series)
-  = 100 pF, 15V (Shunt)



### 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 <10 mil (long) by 3 by 0.5 mil ribbons on input and output.
3. Part must be biased from both sides as indicated.
4. The 0.1uF, 50V capacitors are not needed if the drain supply line is clean. If Drain Pulsing of the device is to be used, do **NOT** use the 0.1uF, 50V Capacitors.

### Mounting Processes

Most NGAS GaN IC chips have a gold backing and can be mounted successfully using either a conductive epoxy or AuSn attachment. NGAS recommends the use of AuSn for high power devices to provide a good thermal path and a good RF path to ground. Maximum recommended temp during die attach is 320°C for 30 seconds.

**Note:** Many of the NGAS parts do incorporate airbridges, so caution should be used when determining the pick up tool.

**CAUTION:** THE IMPROPER USE OF AuSn ATTACHMENT CAN CATASTROPHICALLY DAMAGE GaN CHIPS.

**PLEASE ALSO REFER TO OUR "GaN Chip Handling Application Note" BEFORE HANDLING, ASSEMBLING OR BIASING THESE MMICS!**

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