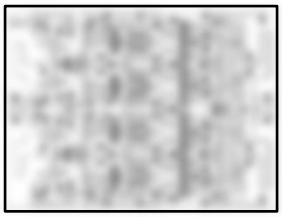
NPA1010-DE

12.0 – 15.5 GHz GaN 40W Power Amplifier

Product Description

The Nxbeam NPA1010-DE is a Ku-band high power GaN MMIC fabricated in 0.2um GaN HEMT on SiC. This part is ideally suited for satellite communications, point-to-point radios, and radar applications. The MMIC operates from 12.0 to 15.5 GHz and can provide 40 W of saturated output power or 30W of linear power at > 22% PAE in an ultra-small footprint of 18.5 mm^2 (5 mm x 3.7 mm).

The NPA1010-DE comes in die form with RF input and output matched to 50 Ω with DC blocking capacitors for easy system integration. The HEMT devices are fully passivated for reliable operation. Bond pad and backside metallization are Au-based for compatibility with eutectic die attachment methods.



Key Features

- Frequency: 12.0 – 15.5 GHz
- Linear Gain: 25 dB
- Psat: 46 dBm
- Linear Power: 44.7 dBm at -25 dBc
- PAE: > 22 %
- Chip Dimensions: 5 x 3.7 x 0.1 mm

Electrical Specifications (Peak Power Operation)

Test Condition: Vd = 28 V, Idq = 4 A, Temp. = 25 °C (all data is CW in-fixture)

Parameter	Min	Typical	Max	Unit
Frequency	12.0		15.5	GHz
Output Power (at Psat)		46		dBm
Gain (small signal)		25		dB
Power Gain (at Psat)		20		dB
Power Added Efficiency (at Psat)		> 22		%
Input Return Loss		> 12		dB
Output Return Loss		> 8		dB

Electrical Specifications (Linear Power Operation)

Test Condition: Vd = 26V, Idq = 1.76A, Temp. = 25 °C
Measured at -25 dBc under QPSK modulation, Channel BW = 1 MHz

Parameter	Min	Typical	Max	Unit
Frequency	12.0		15.5	GHz
Small Signal Gain		22		dB
Linear Output Power		44.7		dBm
Power Gain		20		dB
Power Added Efficiency		22		%

Absolute Maximum Ratings (Temp. = 25°C)

Parameter	Min	Max	Unit
Drain Voltage (Vd1, Vd2, Vd3)		28	V
Drain Current (Id1)		600	mA
Drain Current (Id2)		2100	mA
Drain Current (Id3)		5400	mA
Gate Voltage (Vg1, Vg2, Vg3)	-7	0	V
Input Power (Pin)		TBD	dBm
Assembly Temperature (30 seconds)		320	°C

Recommended Operating Condition

Parameter	Value	Unit
Drain Voltage (Vd)	20 - 28	V
Drain Current (Idq)	up to 4	A
Gate Voltage (Vg) (Typical)	-3.8	V

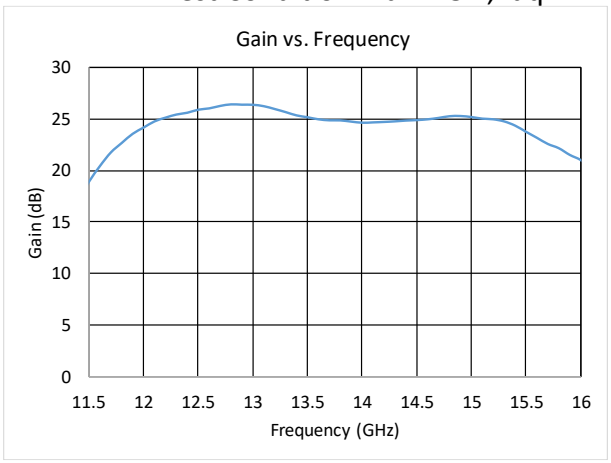
5151 Oceanus Dr., Suite 105
Huntington Beach, CA 92649

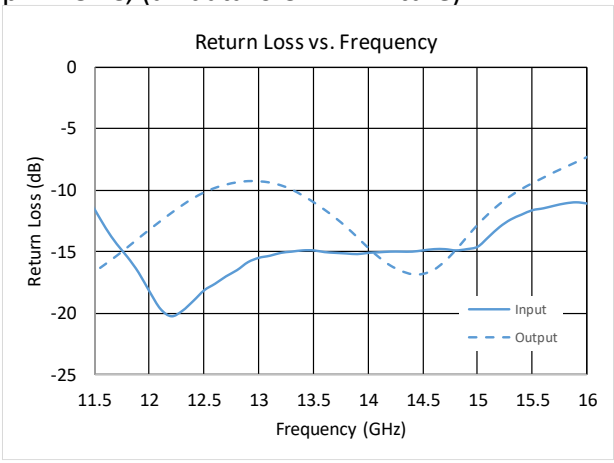
www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

Small Signal Performance

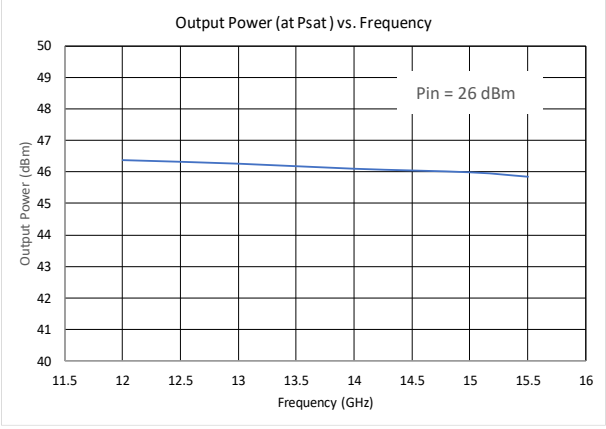
Test Condition: Vd = 28 V, Idq = 4 A, Temp. = 25 °C, (all data is CW in-fixture)

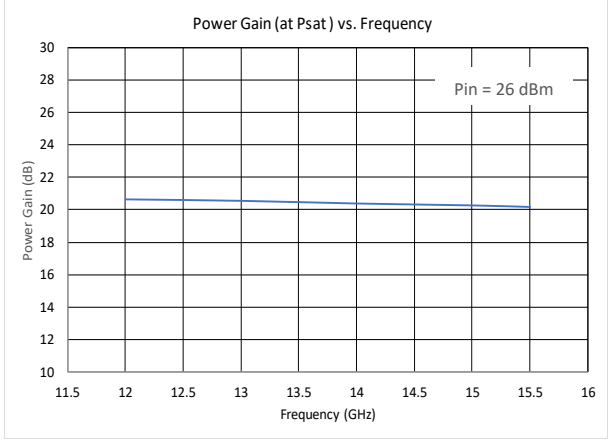


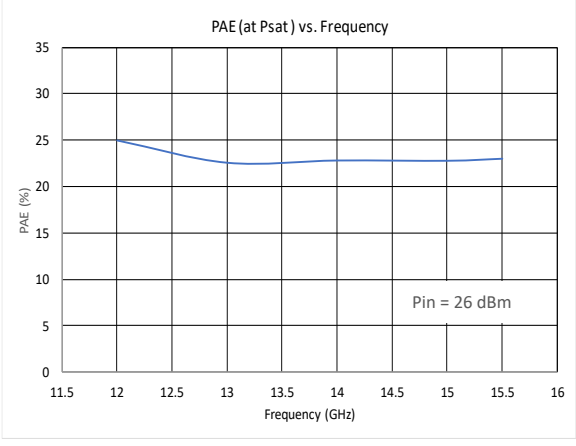


Large Signal Performance

Test Condition: Vd = 28 V, Idq = 4 A, Temp. = 25 °C, (all data is CW in-fixture)







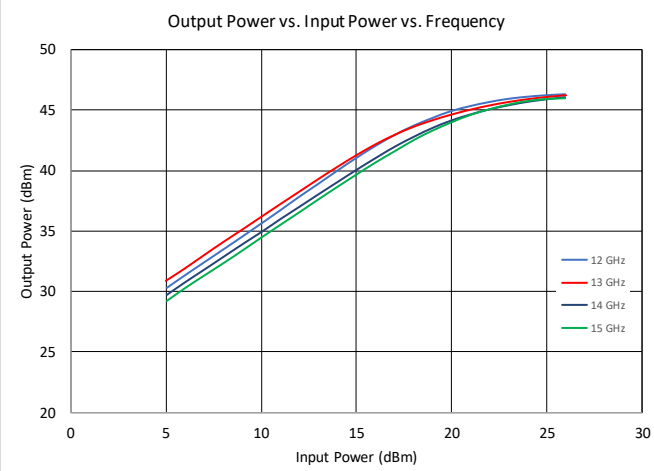
5151 Oceanus Dr., Suite 105
Huntington Beach, CA 92649

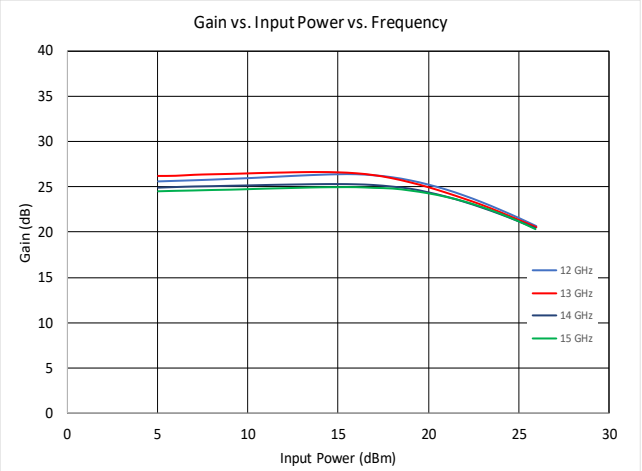
www.nxbeam.com
info@nxbeam.com

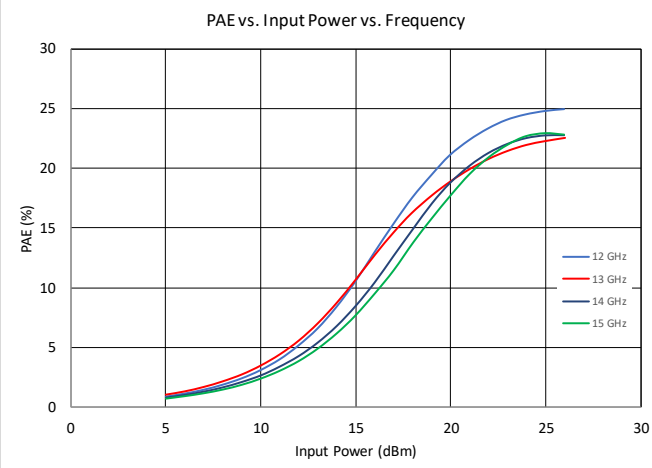
Phone: 949-656-2883

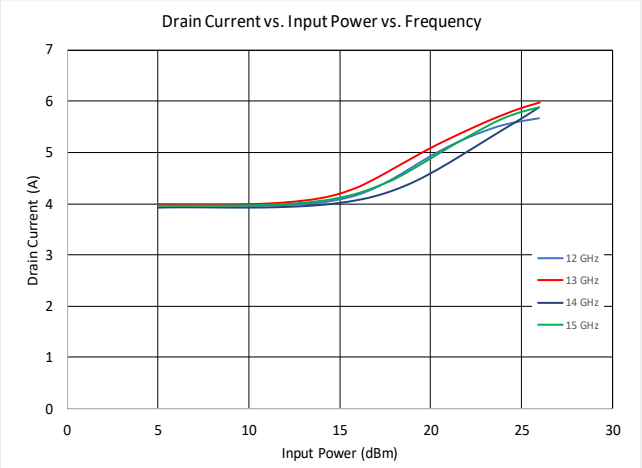
Large Signal Performance

Test Condition: Vd = 28 V, Idq = 4 A, Temp. = 25 °C, (all data is CW in-fixture)









5151 Oceanus Dr., Suite 105
Huntington Beach, CA 92649

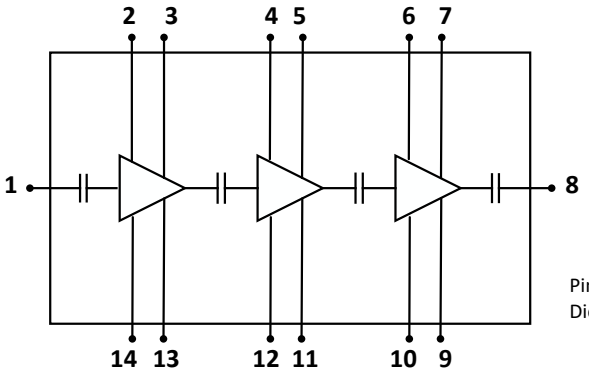
www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

Linearity Performance (T=25 °C) (CW in-fixture)

Test Condition: Vd = 26V, Idq = 1.76A, Temp. = 25 °C, QPSK modulation, Channel BW = 1 MHz

Circuit Block Diagram



Pin number information detailed under Die Size and Bond Pad Information

5151 Oceanus Dr., Suite 105
Huntington Beach, CA 92649

www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

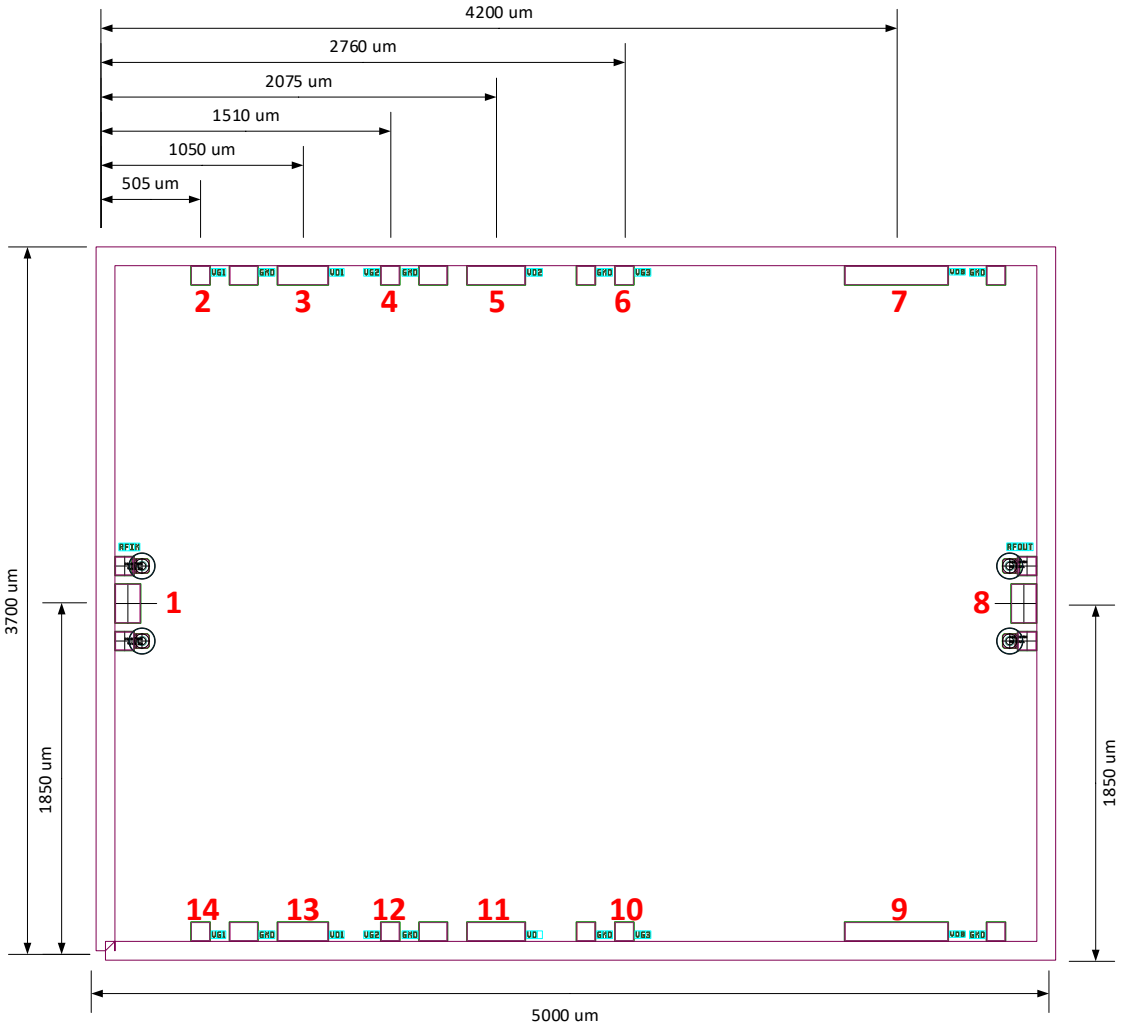
Die Size and Bond Pad Information

Chip Size = 5000 ±25 um x 3700 ±25 um
Chip Thickness = 100 um
Chip Backside metal is ground

RF Input/Output Pad Dimensions = 134 um x 208 um
DC Pad Dimensions:

- Vg1, Vg2, Vg3 = 100 um x 100 um
- Vd1 = 270 um x 100 um
- Vd2 = 310 um x 100 um
- Vd3 = 550 um x 100 um

Pad Num.	Function
1	RF in
2, 14	Vg1
3, 13	Vd1
4, 12	Vg2
5, 11	Vd2
6, 10	Vg3
7, 9	Vd3
8	RF out



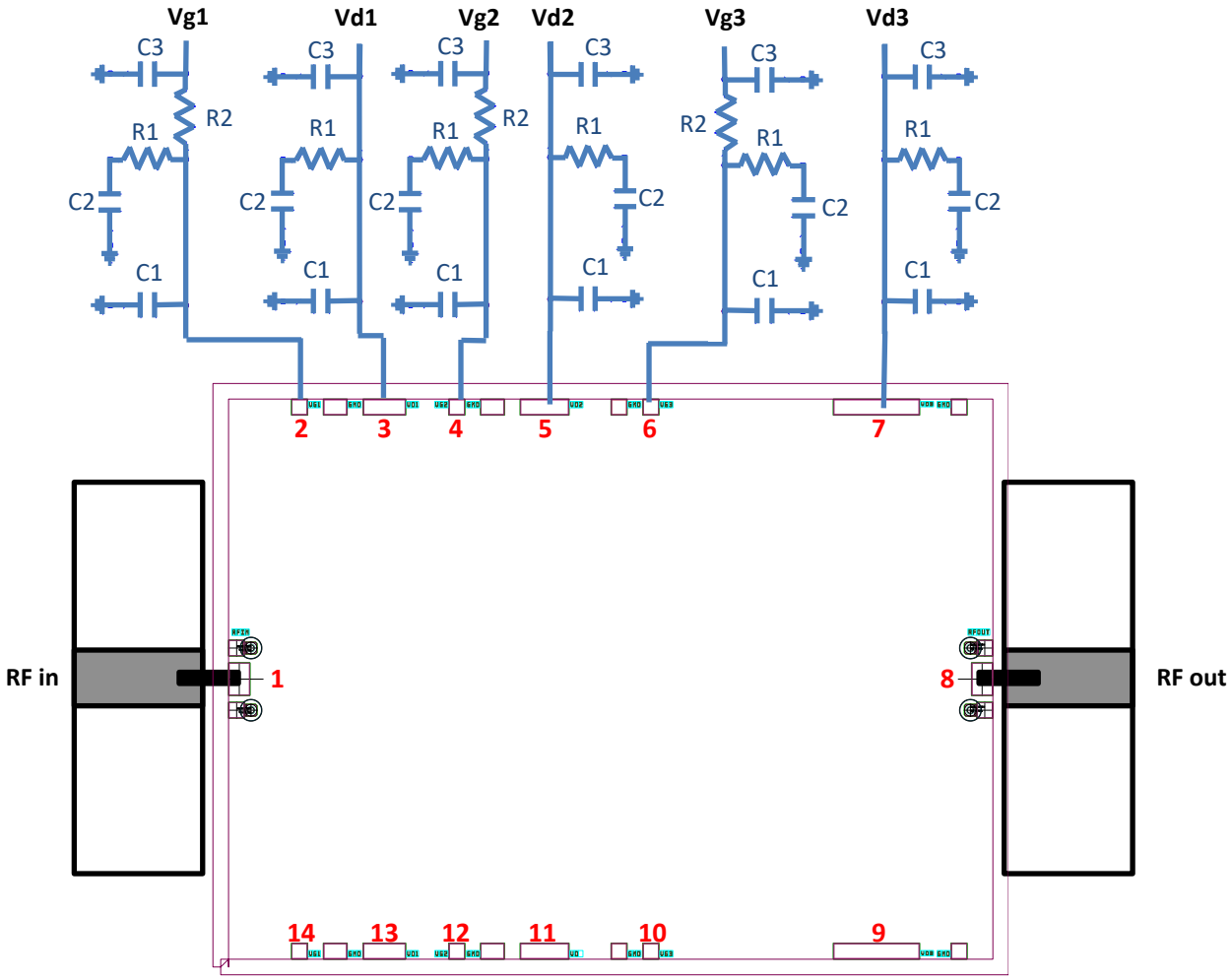
5151 Oceanus Dr., Suite 105
Huntington Beach, CA 92649

www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

Suggested Bonding Arraignment

The following diagram is a suggested bonding arraignment but other arraignments are possible. It is also possible to tie all gate voltages together as well as all drain voltages together. Off-chip components only shown for one side of chip but bias needs applied from both sides.



Off-Chip Component Values

Capacitor	Value
C1	100 pF
C2	0.01 µF
C3	1 µF

Resistor	Value
R1	10 Ω
R2	100 Ω

5151 Oceanus Dr., Suite 105
Huntington Beach, CA 92649
www.nxbeam.com
info@nxbeam.com
Phone: 949-656-2883

Assembly Process

- This product has gold backside metallization and can be mounted using either a conductive epoxy or AuSn attachment.
- Nxbeam recommends the use of AuSn attachment due to the high power level of this product to ensure good thermal conductivity.
- Maximum recommended temperature during die attachment is 320 °C for 30 seconds.
- This product contains metal air bridges so caution should be taken when handling the die to avoid damage.

Bias Information

The NPA1010-DE must be biased from both top and bottom of the chip.

Bias-up Procedure:
1.) It is recommended that voltage and current limits are set on the voltage supply's prior to biasing the product.
2.) Ensure power supplies are properly grounded to the product test fixture.
3.) Apply negative gate voltage (-6 V) to ensure all devices are pinched off.
4.) Gradually increase the drain bias voltage to the desired bias level but not to exceed the maximum voltage of 28 V.
5.) Gradually increase the gate voltage while monitoring the drain current until the desired drain current is achieved.
6.) Apply RF signal.

Bias-down Procedure:
1.) Turn off RF signal.
2.) Gradually decrease the gate voltage down to -6 V.
3.) Gradually decrease the drain voltage down to 0 V.
4.) Gradually increase gate voltage to 0 V.
5.) Turn off supply voltages

ESD Sensitive Product

Important Information

The data contained in this document is a sampling of production data. Nxbeam Inc. reserves the right to update and change without notice the characteristic data and other specifications as they apply to this document. Customers should obtain and verify the most recent product information before placing orders. Nxbeam Inc. assumes no responsibility or liability whatsoever for the use of the information contained herein.

The product represented by this datasheet is subject to U.S. Export Law as contained in ITAR or the EAR regulations.

5151 Oceanus Dr., Suite 105
Huntington Beach, CA 92649
www.nxbeam.com
info@nxbeam.com
Phone: 949-656-2883