NPA2004-DE

25 – 27.5 GHz GaN 40 W Power Amplifier

Product Description

The Nxbeam NPA2004-DE is a Ka-band high power amplifier MMIC fabricated in 0.2um GaN HEMT on SiC. The MMIC operates from 25 to 27.5 GHz and provides 40 W saturated output power, 34% PAE, and 24 dB of linear gain. The NPA2004-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.

Applications

- Ka-band Satellite Communications
- 5G mmWave (n257)
- Point-to-Point/Multipoint Digital Radios

Key Features

- Frequency: 25 – 27.5 GHz
- Linear Gain: 24 dB
- Psat: 40 W
- PAE: 34%
- Chip Dimensions: 4.975 x 3.975 x 0.1 mm

Electrical Specifications

Test Condition: Vd = 26 V , Idq = 2.1 A

Parameter	Min	Typical	Max	Unit
Frequency	25		27.5	GHz
Gain (Small Signal)		24		dB
Output Power (at Psat, Pin=26 dBm, at 27.5 GHz)		46		dBm
PAE (at Psat, Pin=26 dBm, at 27.5 GHz)		34		%
Power Gain (at Psat, Pin=26 dBm, at 27.5 GHz)		20		dB
Input Return Loss			-8	dB
Output Return Loss			-4	dB

Maximum Quiescent Bias

Parameter	Max	Unit
Drain Voltage (Vd1, Vd2, Vd3)	28	V
Drain Current (Id1)	240	mA
Drain Current (Id2)	592	mA
Drain Current (Id3)	2368	mA

Maximum quiescent bias represents the operational bias used during reliability life testing. Biasing the part at or below this bias ensures reliability will be bound by the published reliability results.

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)		1480	mA
Drain Current (Id3)		5920	mA
Gate Voltage (Vg1, Vg2, Vg3)	-8	0	V

Absolute maximum ratings represent the maximum current under power saturation conditions.

Recommended Quiescent Operating Condition

Parameter	Value	Unit
Drain Voltage (Vd)	20 - 28	V
Drain Current (Id1)	up to 240	mA
Drain Current (Id2)	up to 592	mA
Drain Current (Id3)	up to 2368	mA
Gate Voltage (Vg) (Typical Range)	-4	V

Gate voltage will vary based on desired current per stage

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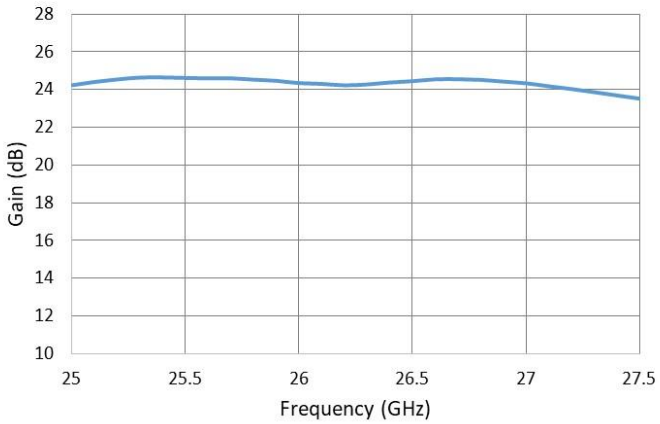
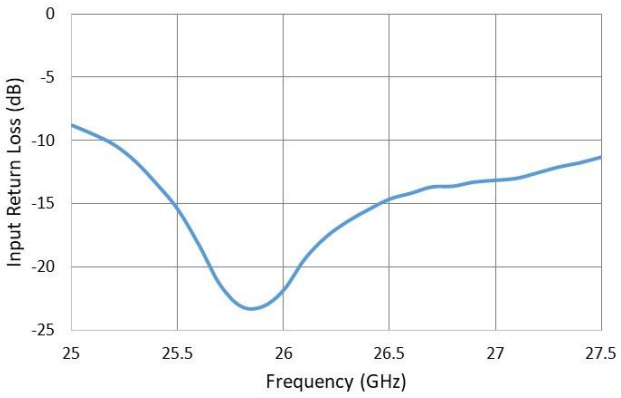
Small Signal Performance

Test Condition: Vd = 26 V, Idq = 2.1 A, (CW Performance in Fixture, Typical Performance at 25°C)

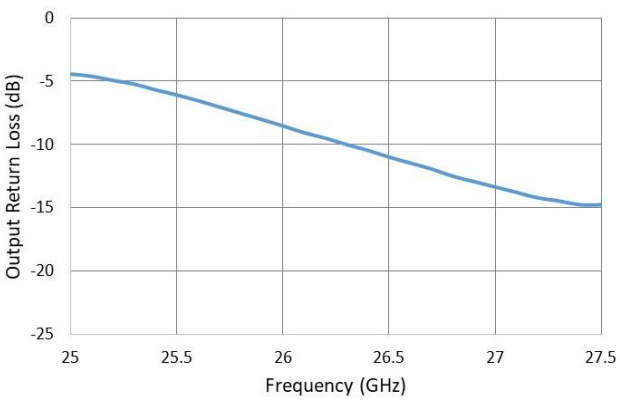
Gain vs. Frequency



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



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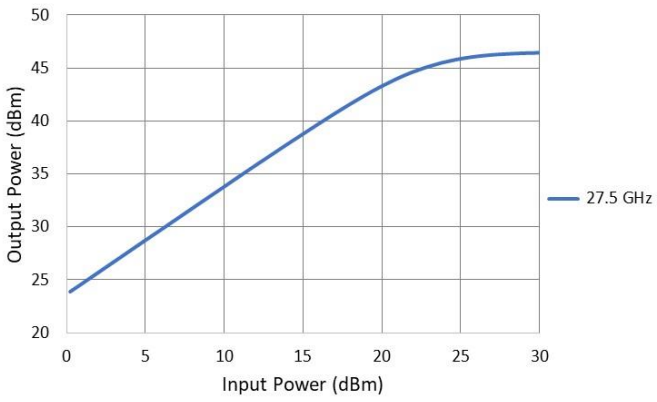
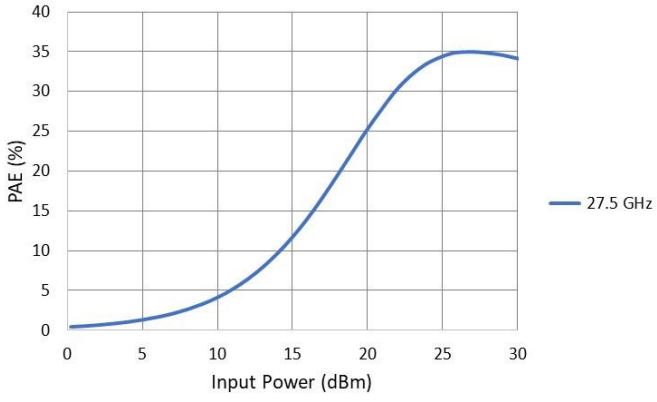
Large Signal Performance

Test Condition: Vd = 26 V, Idq = 2.1 A,
(CW Performance in Fixture, Typical Performance at 25°C)

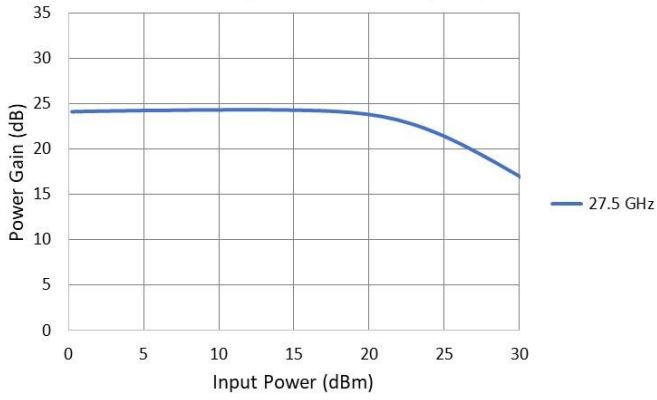
Output Power vs. Input Power vs. Frequency



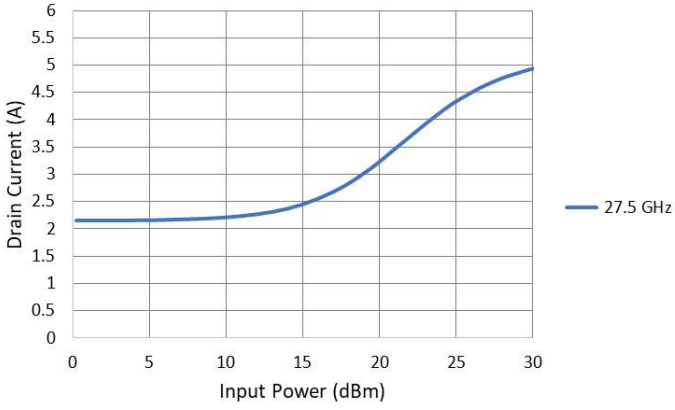
PAE vs. Input Power vs. Frequency



Power Gain vs. Input Power vs. Frequency



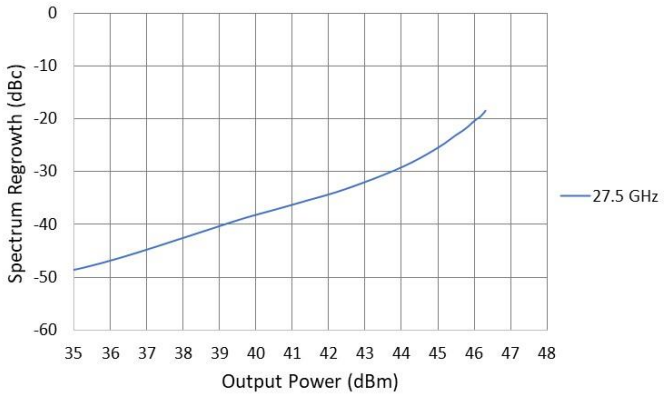
Drain Current vs. Input Power vs. Frequency



Spectral Regrowth Performance

(QPSK, 10 MSPS, Alpha=0.2), Typical Performance at 25°C,

Spectrum Regrowth vs. Output Power



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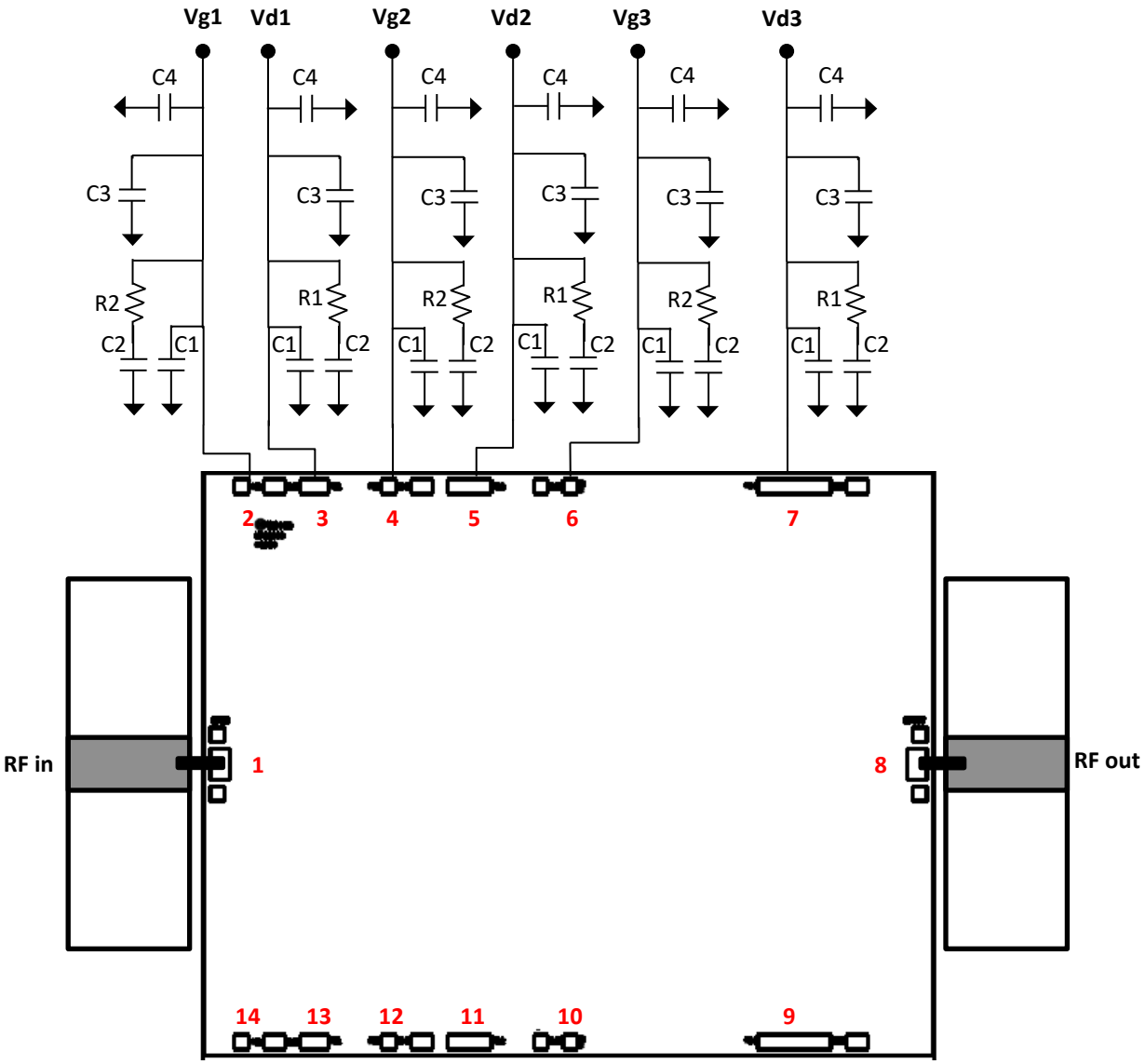
Suggested Off-Chip Components

The following diagram shows the recommended off-chip components to be used with the NPA2004-DE. The off-chip components should be duplicated on both top and bottom sides of the chip and located as close to the chip as possible. Bias should be applied to the chip from both sides. Please consult with Nxbeam on other off-chip network variations.



Recommended Off-Chip Component Values

Capacitor	Value
C1	100 pF
C2	0.01 µF
C3	1 µF
C4	10 µF

Resistor	Value
R1	1 Ω
R2	10 Ω

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Assembly Process

- Nxbeam recommends using a silver sintering paste for die attachment of the NPA2004-DE due to their higher thermal conductivities relative to other die attachment methods.
- This product contains metal air bridges so caution should be taken when handling the die to avoid damage.

Bias Information

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 a negative gate voltage of -7V to Vg1, Vg2, and Vg3 to ensure all devices are pinched off.
4.) Gradually increase the drain bias voltage (Vd1, Vd2, Vd3) to the desired bias level but not to exceed the maximum voltage of 28 V.
5.) Gradually increase the gate voltages (Vg1, Vg2, Vg3) while monitoring the drain current until the desired drain current in each stage is achieved.
6.) Apply RF signal.

Bias-down Procedure:

1.) Turn off RF signal.
2.) Gradually decrease Vg1, Vg2, and Vg3 down to -7 V.
3.) Gradually decrease the drain voltages (Vd1, Vd2, Vd3) down to 0 V.
4.) Gradually increase gate voltages (Vg1, Vg2, Vg3) to 0 V.
5.) Turn off supply voltages

ESD Sensitive Product

Export Information

This product is controlled by US law for export under the ECCN 3A001.b.2.c. The purchaser of this product, whether in the US or abroad, is responsible for compliance with all US laws regarding export, transfer, or re-transfer of this product. For more information, please refer to the Export Administration Regulations at https://www.bis.doc.gov/index.php. Nxbeam reminds you that it is your responsibility to ascertain your export compliance obligations and to comply with all applicable laws and regulations.

Important Information

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