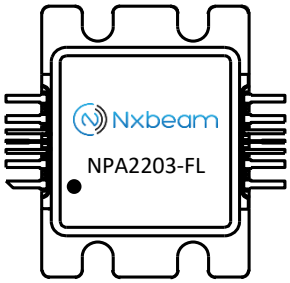
NPA2203-FL

27.5 – 31 GHz GaN 25 W Power Amplifier

Product Description

The Nxbeam NPA2203-FL is a GaN Ka-band high power amplifier in a high-performance leaded flange package. The part operates from 27.5 to 31 GHz and provides an average of 25 W saturated output power, 24% PAE, and 21.5 dB of linear gain. The amplifier consists of three gain stages that can be biased independently providing flexibility to tailor performance to specific application needs. The NPA2203-FL has RF input and output matched to 50 Ω with internal blocking capacitors for easy system integration.



Applications

- Ka-band Satellite Communications
- Point-to-Point/Multipoint Digital Radios

Key Features

- Frequency: 27.5 – 31 GHz
- Linear Gain: 21.5 dB
- Psat (Ave.): 25 W
- PAE (Ave.): 24%

Electrical Specifications

Test Condition: Vd = 26 V, Idq = 1.9 A, All Data is CW, Typical Performance at 25°C

Parameter		Min	Typical	Max	Unit
Frequency		27.5		31	GHz
Gain (Small Signal)	27 GHz		20.2		dB
	29 GHz		21.3		
	31 GHz		22.3		
Output Power (at Psat, Pin=28.8 dBm)	27 GHz		44.0		dBm
	29 GHz		44.1		
	31 GHz		44.1		
PAE (at Psat, Pin=28.8 dBm)	27 GHz		23		%
	29 GHz		24		
	31 GHz		24		
Power Gain (at Psat, Pin=28.8 dBm)	27 GHz		15.4		dB
	29 GHz		15.8		
	31 GHz		17.0		
Input Return Loss	27 GHz		14		dB
	29 GHz		13		
	31 GHz		18		
Output Return Loss	27 GHz		10		dB
	29 GHz		9		
	31 GHz		17		

Maximum Quiescent Bias

Parameter	Max	Unit
Drain Voltage (Vd)	28	V
Drain Current (Id1)	264	mA
Drain Current (Id2)	640	mA
Drain Current (Id3)	2112	mA

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Absolute Maximum Ratings (Temp. = 25°C)

Parameter	Min	Max	Unit
Drain Voltage (Vd)		28	V
Drain Current (Id1)		660	mA
Drain Current (Id2)		1600	mA
Drain Current (Id3)		5250	mA
Gate Voltage (Vg1, Vg2, Vg3)	-8	0	V

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

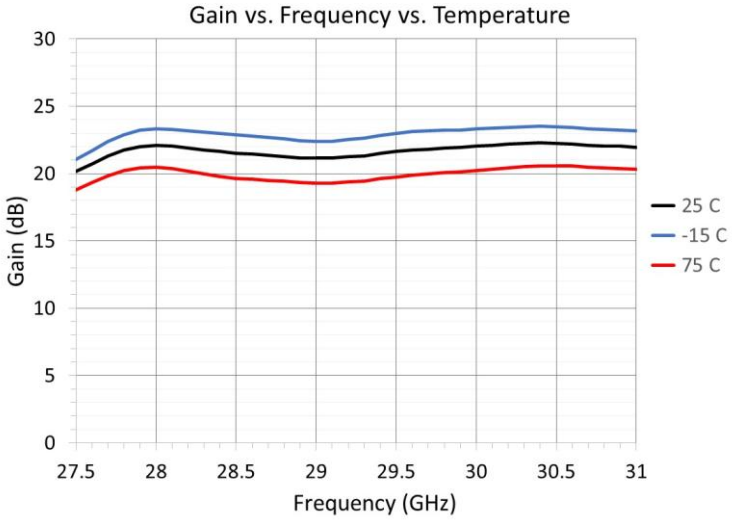
Recommended Quiescent Operating Condition

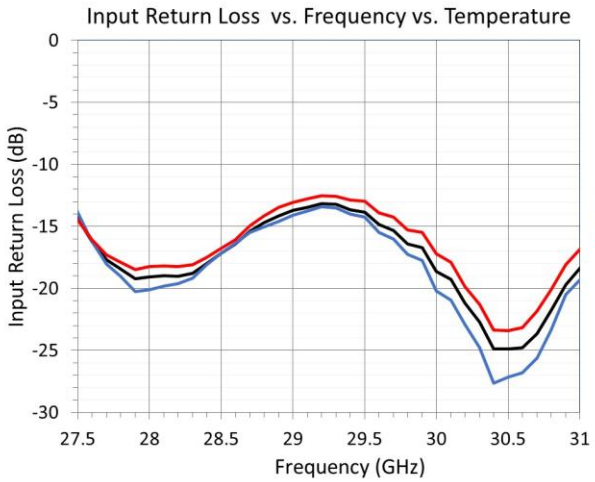
Parameter	Value	Unit
Drain Voltage (Vd)	20 - 28	V
Drain Current (Id1)	up to 264	mA
Drain Current (Id2)	up to 640	mA
Drain Current (Id3)	up to 2112	mA
Gate Voltage (Vg) (Typical Range)	-4	V

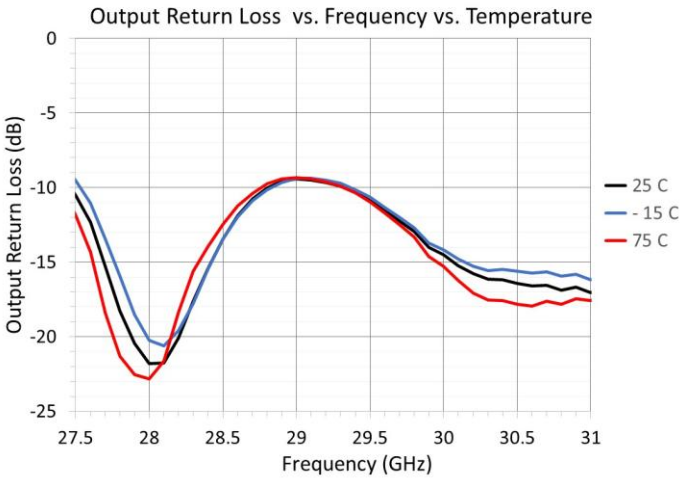
Gate voltage will vary based on desired current per stage

Small Signal Performance

Test Condition: Vd = 26 V, Idq = 1.9 A, (CW Performance)



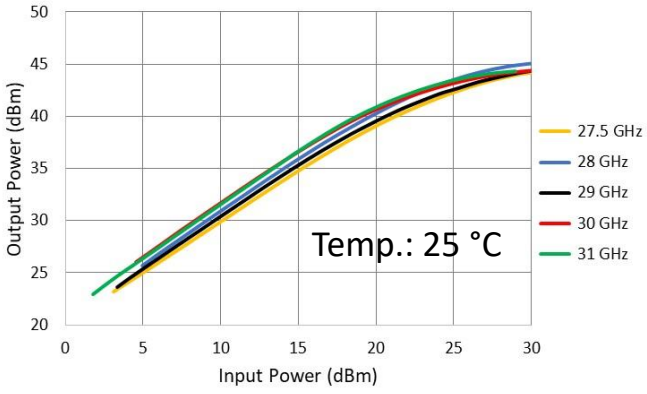




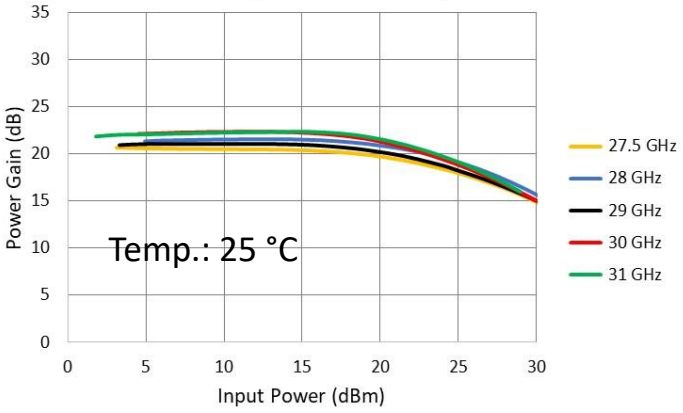
Large Signal Performance

Test Condition: Vd = 26 V, Idq = 1.9 A, CW Performance

Output Power vs. Input Power vs. Frequency



Power Gain vs. Input Power vs. Frequency



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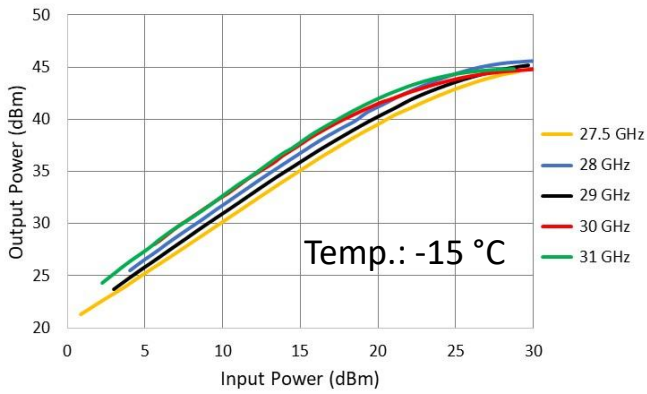
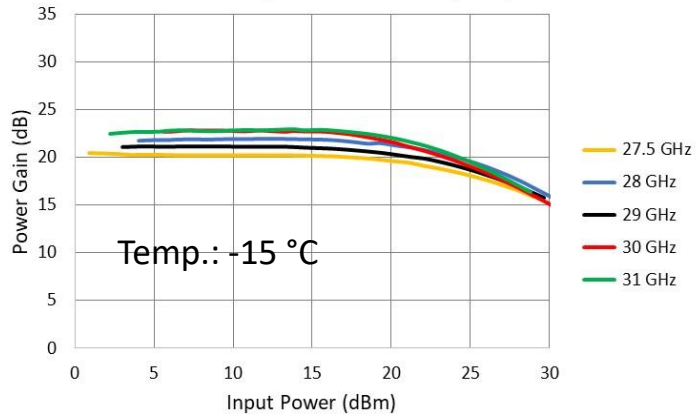
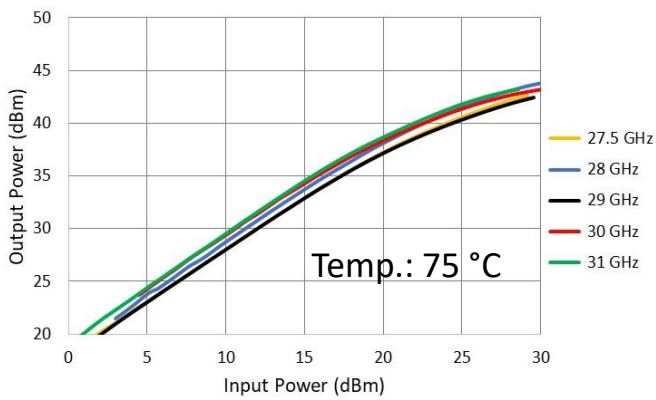


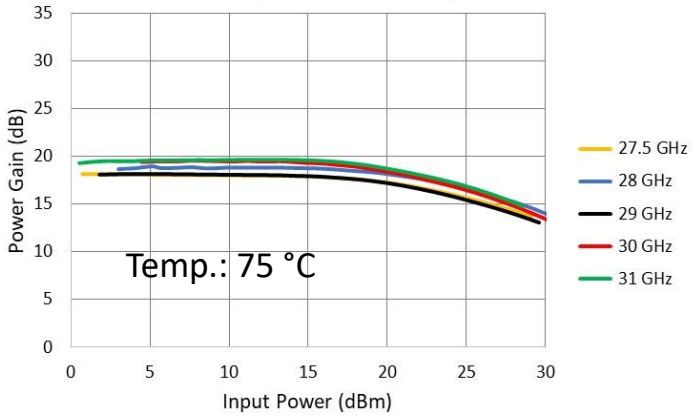
Power Gain vs. Input Power vs. Frequency



Output Power vs. Input Power vs. Frequency



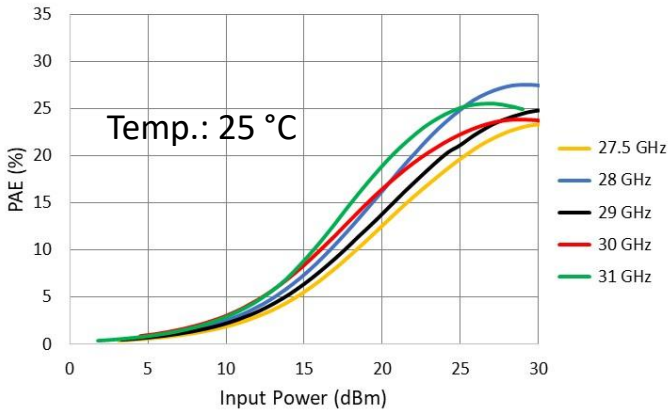
Power Gain vs. Input Power vs. Frequency



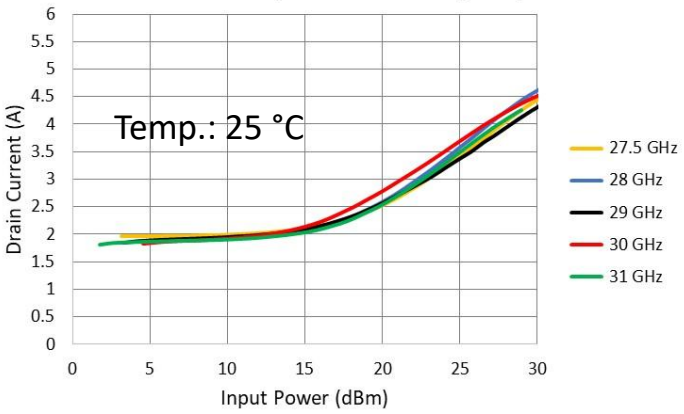
Large Signal Performance (continued)

Test Condition: Vd = 26 V, Idq = 1.9 A, CW Performance

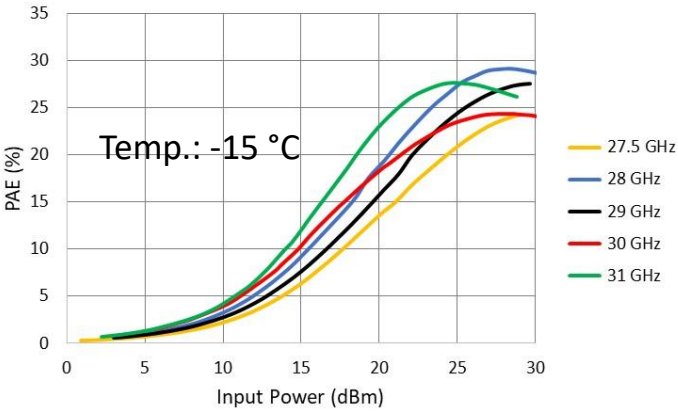
PAE vs. Input Power vs. Frequency



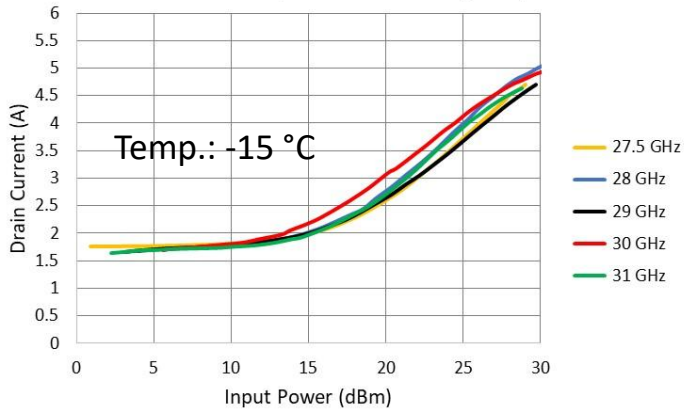
Drain Current vs. Input Power vs. Frequency



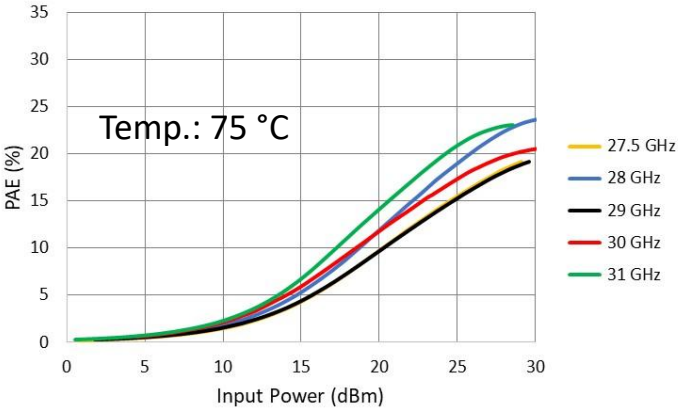
PAE vs. Input Power vs. Frequency



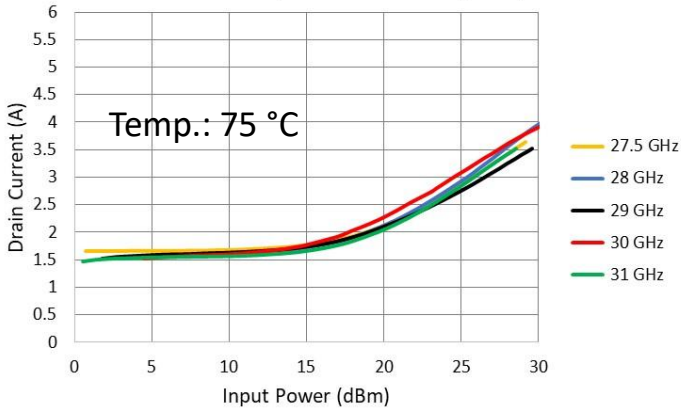
Drain Current vs. Input Power vs. Frequency



PAE vs. Input Power vs. Frequency

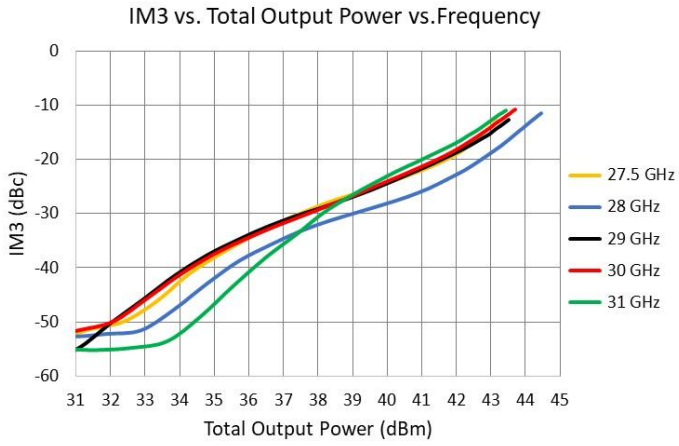


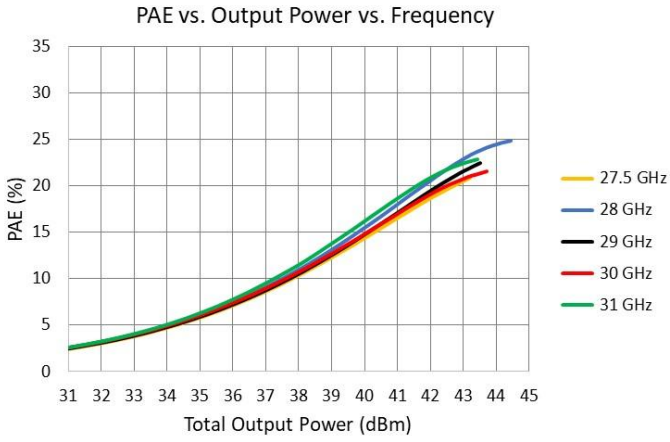
Drain Current vs. Input Power vs. Frequency



2-Tone Linearity Performance

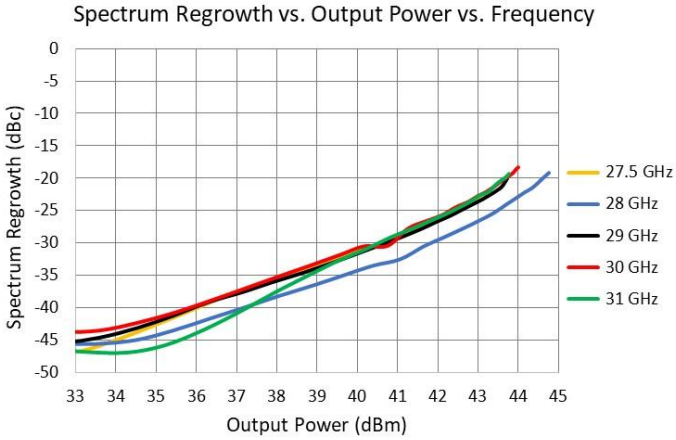
Test Condition: Vd = 26 V, Idq = 19 A at 25°C, 10 MHz Tone Spacing

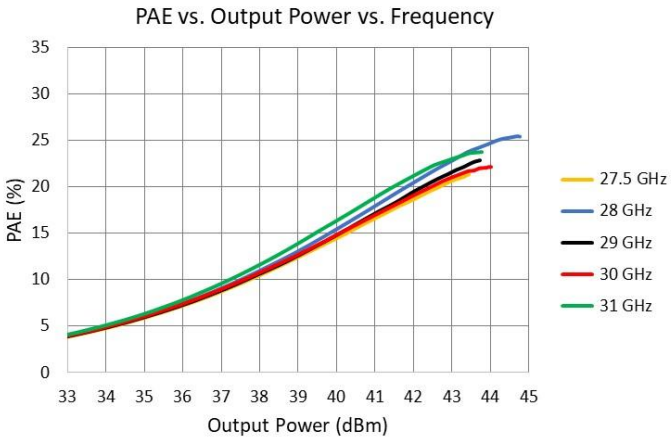




Spectral Regrowth Performance

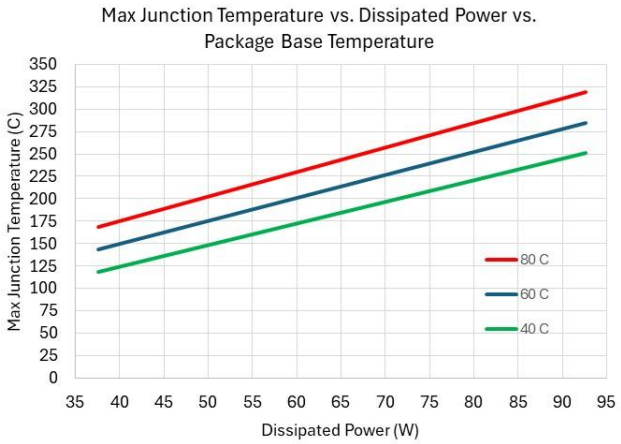
Test Condition: Vd = 26 V, Idq = 1.9 A at 25°C QPSK, 10 MSPS, Alpha = 0.2

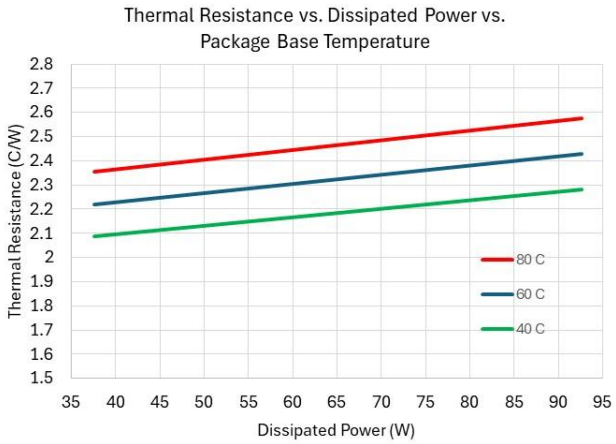




Thermal Information

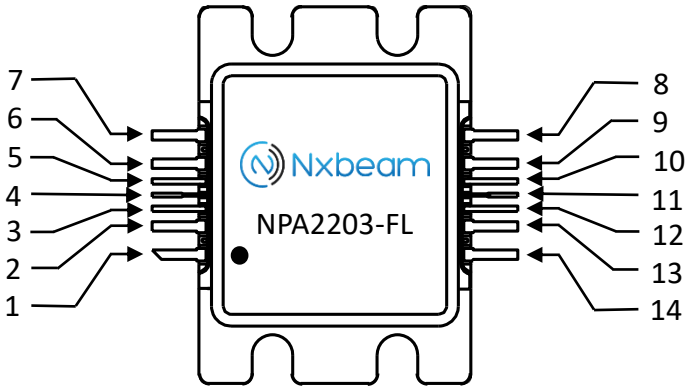
Junction Temperature and Thermal Resistance Referenced From Backside of Package





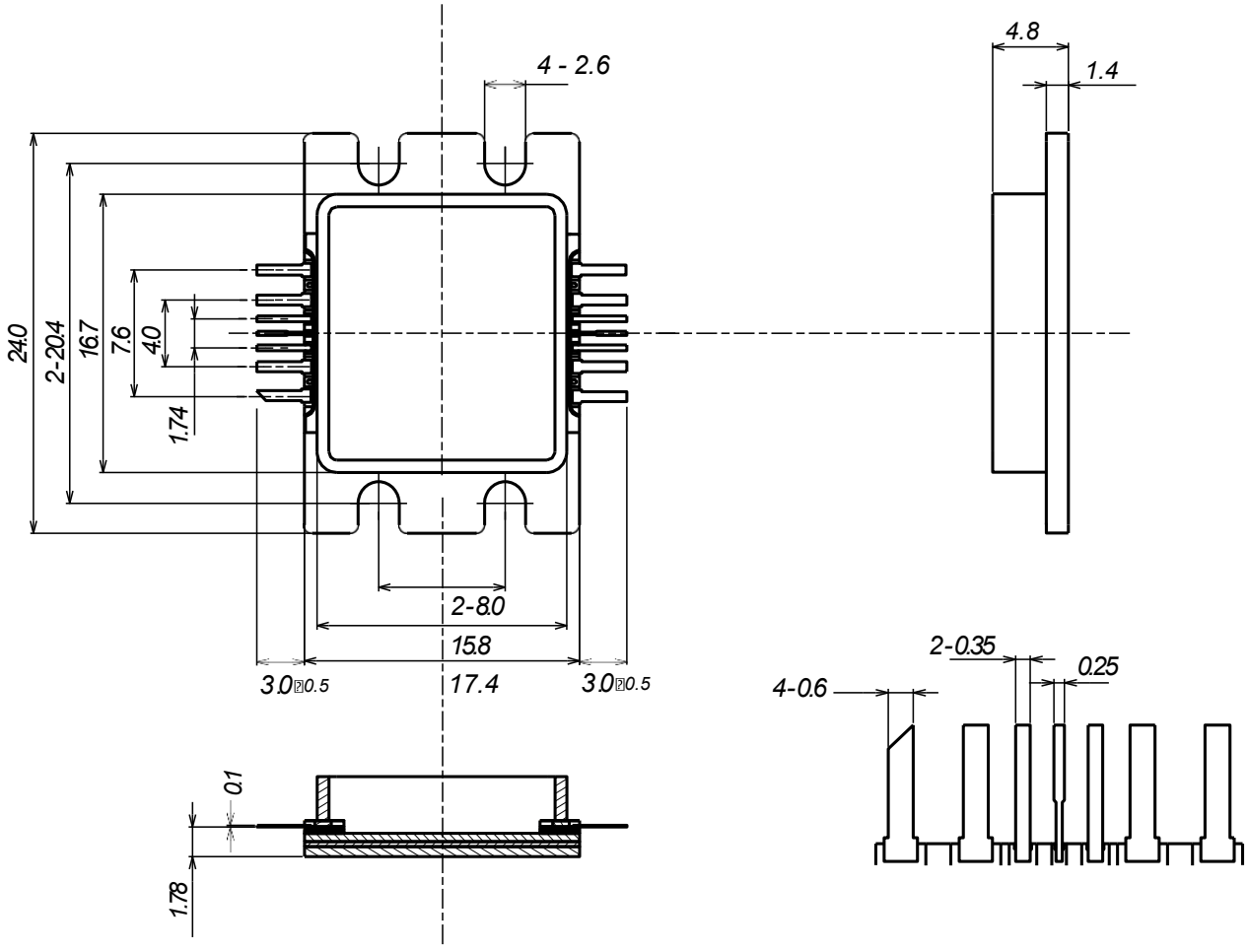
Note 1: Mean time to failure per junction temperature information can be found in the following document: Nxbeam_GaN20MMIC_Reliability.pdf

Package Pin Connection Information



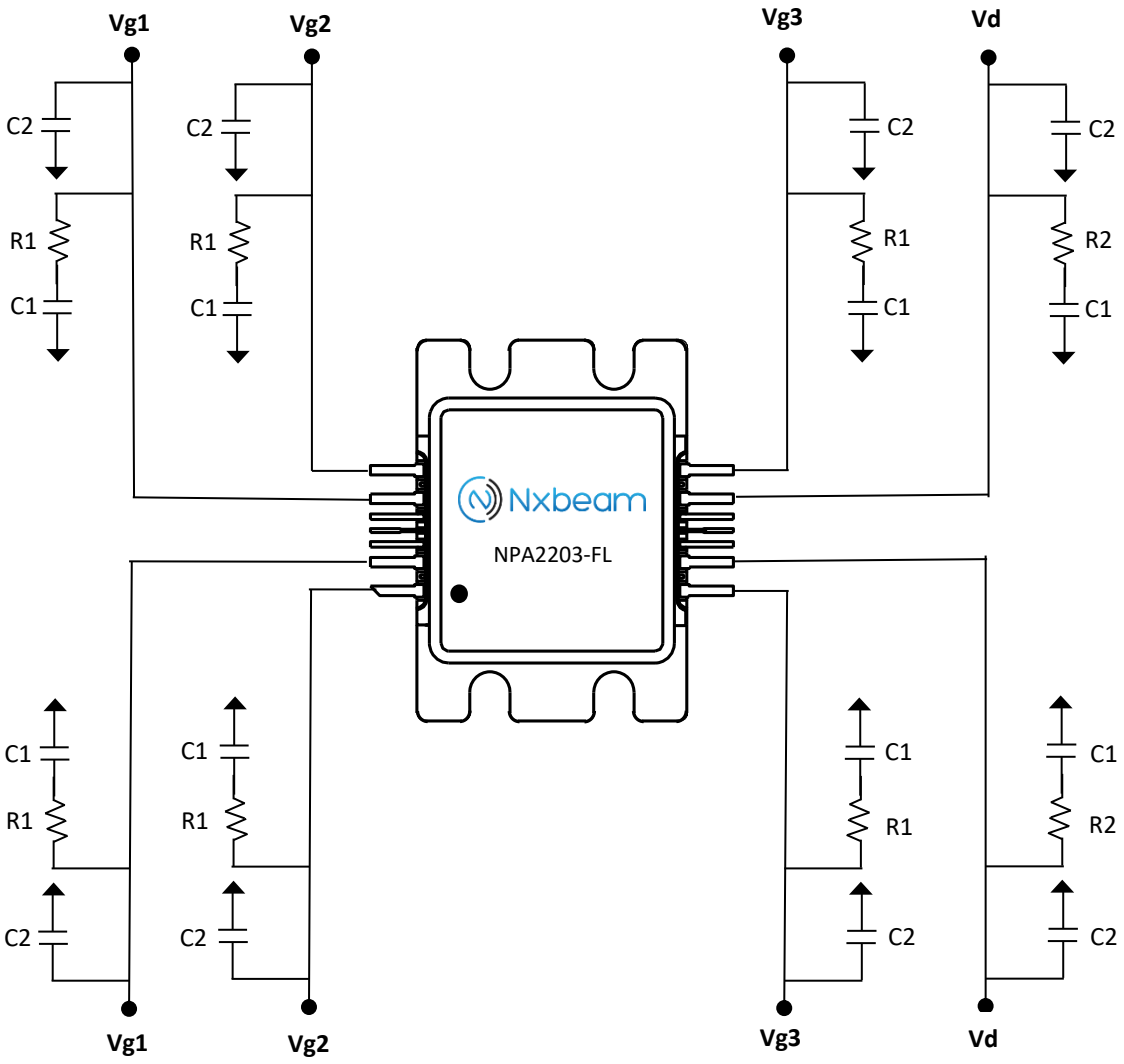
Pad Num.	Function
1, 7	Vg2
2, 6	Vg1
3, 5, 10, 12	Gnd
4	RF in
8, 14	Vg3
9, 13	Vd
11	RF out

Package Dimensions (all dimensions in mm)



Suggested Off-Package Components

The following diagram shows the recommended off-package component.



Capacitor	Value
C1	0.1 µF
C2	10 µF

Resistor	Value
R1	10 Ω
R2 (optional)	1 Ω

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 -8V to Vg1, Vg2, and Vg3 to ensure all devices are pinched off.
4.) Gradually increase the drain bias voltage (Vd) 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 -8 V.
3.) Gradually decrease the drain voltages (Vd) down to 0 V.
4.) Gradually increase gate voltages (Vg1, Vg2, Vg3) to 0 V.
5.) Turn off supply voltages

ESD Sensitive Product

Important Information

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