NPQ2103-SM

27.5 – 31 GHz GaN 8 W Power Amplifier

Product Description

The Nxbeam NPQ2103-SM is a Ka-band high power amplifier fabricated in 0.2um GaN HEMT on SiC in a QFN package. The amplifier operates from 27.5 to 31 GHz and provides an average of 8 W saturated output power, 25% PAE, and 22 dB of linear gain. The QFN is designed for easy system integration with RF input and output ports matched to 50 ohms.

Applications

- Ka-band Satellite Communications
- 5G Infrastructure
- Point-to-Point/Multipoint Digital Radios

Key Features

- Frequency: 27.5 – 31 GHz
- Linear Gain (Ave.): 22 dB
- Psat (Ave.): 8 W
- PAE (Ave.): 25%

Electrical Specifications

Test Condition: Vd = 26 V, Idq = 0.5 A, CW Performance, Typical Performance at 25°C

Parameter		Min	Typical	Max	Unit
Frequency		27.5		31	GHz
Gain (Small Signal)	27.5 GHz		20.8		dB
	29 GHz		22.5		
	31 GHz		23.0		
Output Power (at Psat, Pin=23.3 dBm)	27.5 GHz		38.2		dBm
	29 GHz		39.6		
	31 GHz		38.3		
PAE (at Psat, Pin=23.3 dBm)	27.5 GHz		22.0		%
	29 GHz		28.0		
	31 GHz		27.0		
Power Gain (at Psat, Pin=23.3 dBm)	27.5 GHz		15.2		dB
	29 GHz		15.6		
	31 GHz		16.8		
Input Return Loss	27.5 GHz		6		dB
	29 GHz		25		
	31 GHz		14		
Output Return Loss	27.5 GHz		8		dB
	29 GHz		12		
	31 GHz		14		

Maximum Quiescent Bias

Parameter	Max	Unit
Drain Voltage (Vd1, Vd2)	28	V
Drain Current (Id1)	300	mA
Drain Current (Id2)	550	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.

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Absolute Maximum Ratings (Temp. = 25°C)

Parameter	Max	Unit
Drain Voltage (Vd1, Vd2)	28	V
Drain Current (Id1)	700	mA
Drain Current (Id2)	1400	mA
Gate Voltage (Vg1, Vg2)	0	V

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

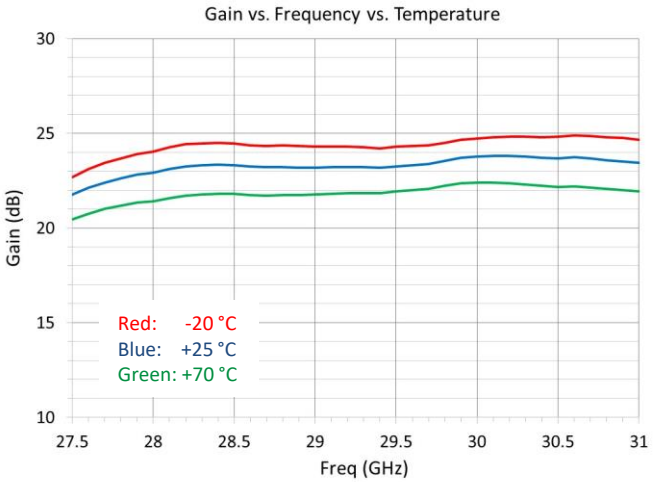
Recommended Quiescent Operating Condition

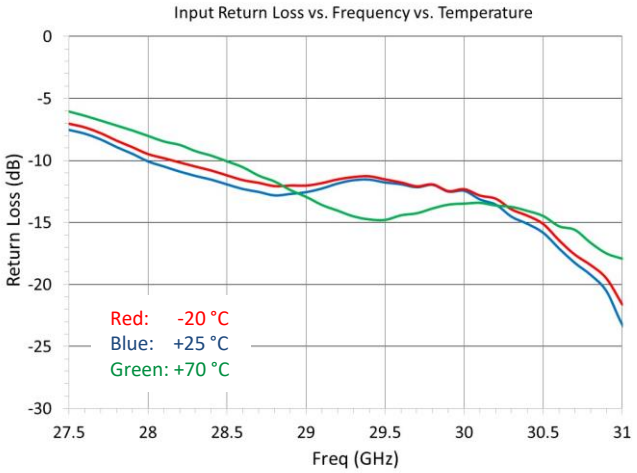
Parameter	Value	Unit
Drain Voltage (Vd1, Vd2)	20 - 27	V
Drain Current (Id1)	up to 300	mA
Drain Current (Id2)	up to 550	mA
Gate Voltage (Vg, Vg2) (Typical Range)	-5.5 to -3.5	V

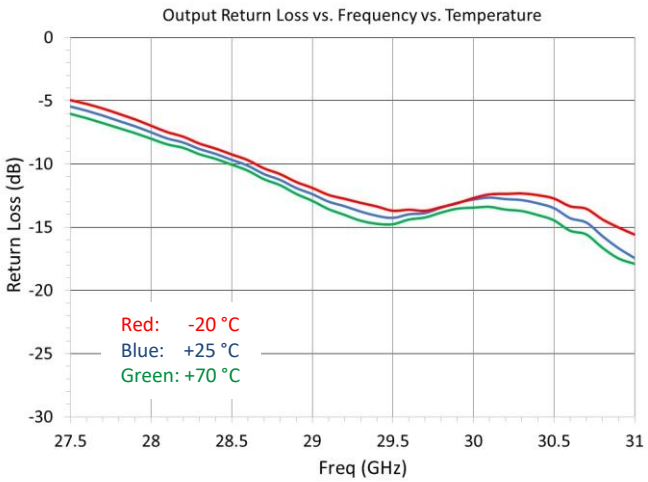
Gate voltage will vary based on desired current per stage

Small Signal Performance

Test Condition: Vd = 26 V, Idq = 0.5 A, (CW Performance, Typical Performance at 25°C)







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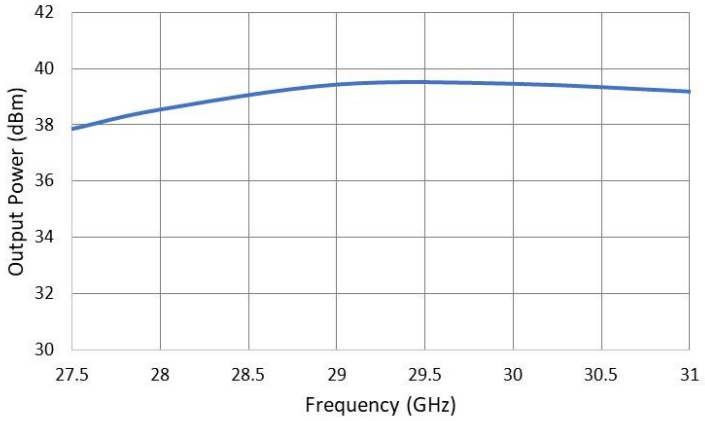
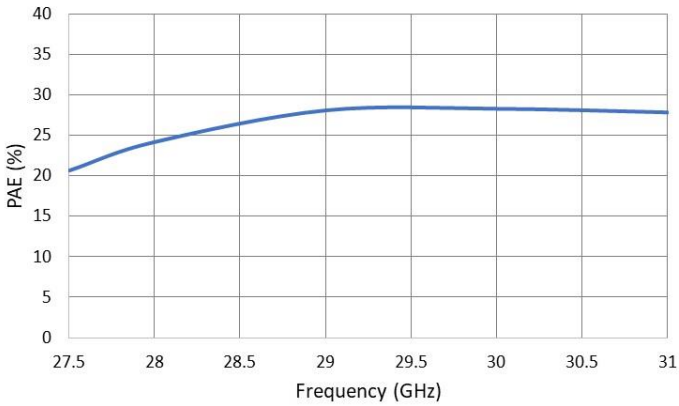
Large Signal Performance

Test Condition: Vd = 26 V, Idq = 0.5 A, Pin = 21.8 dBm
(CW Performance, Typical Performance at 25°C)

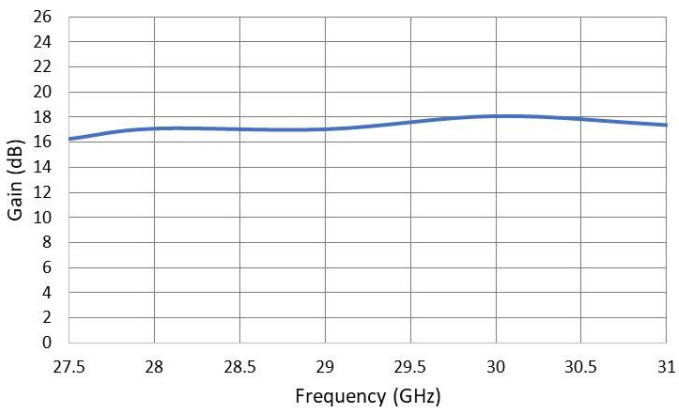
Output Power vs. Frequency (at 21.8 dBm Pin)



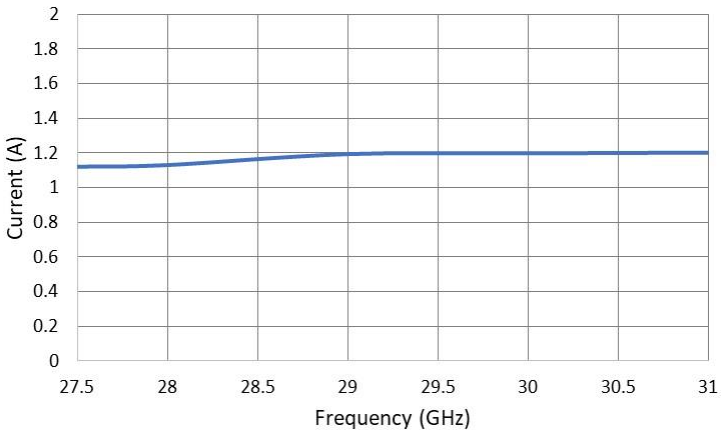
PAE vs. Frequency (at 21.8 dBm Pin)



Gain vs. Frequency (at 21.8 dBm Pin)



Drain Current vs. Frequency (at 21.8 dBm Pin)



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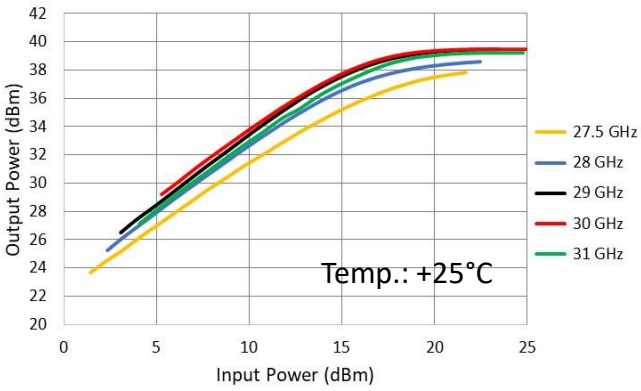
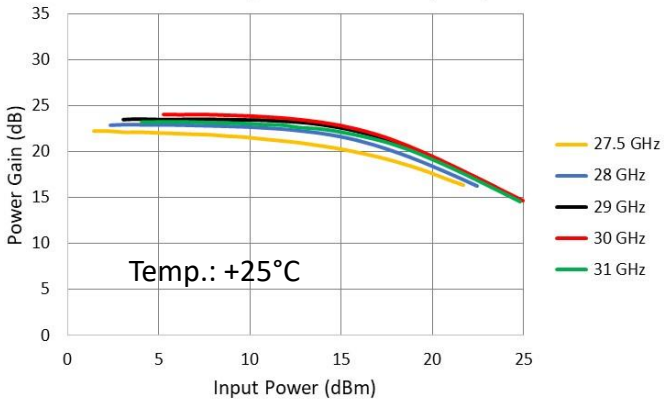
Large Signal Performance

Test Condition: Vd = 26 V, Idq = 0.5 A at 25°C, CW Performance

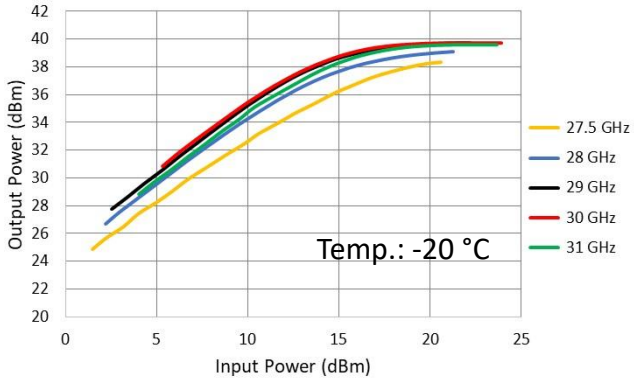
Output Power vs. Input Power vs. Frequency



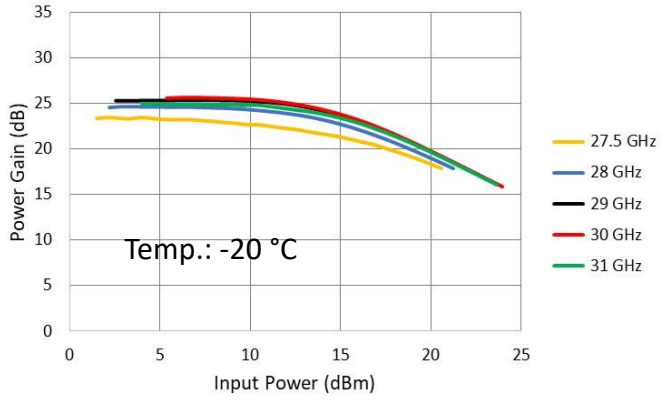
Power Gain vs. Input Power vs. Frequency



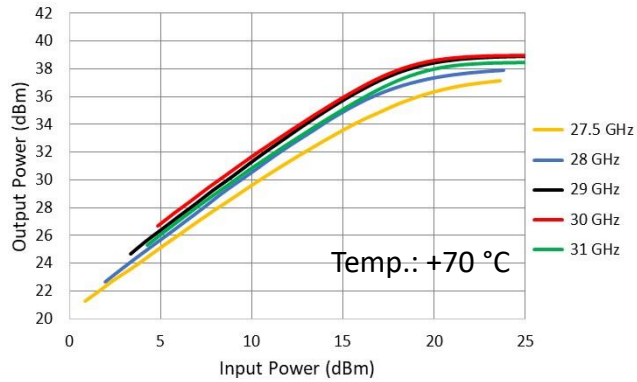
Output Power vs. Input Power vs. Frequency



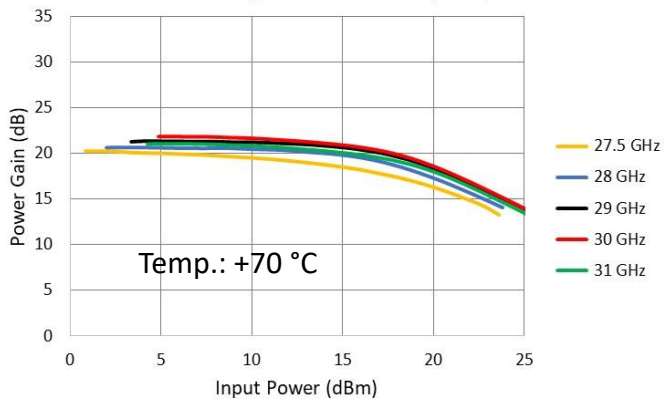
Power Gain vs. Input Power vs. Frequency



Output Power vs. Input Power vs. Frequency



Power Gain vs. Input Power vs. Frequency



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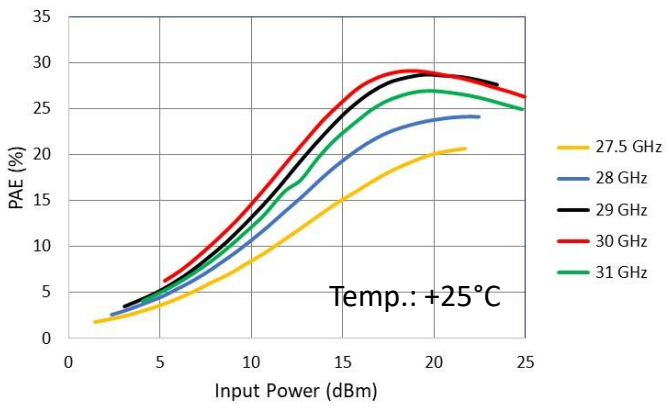
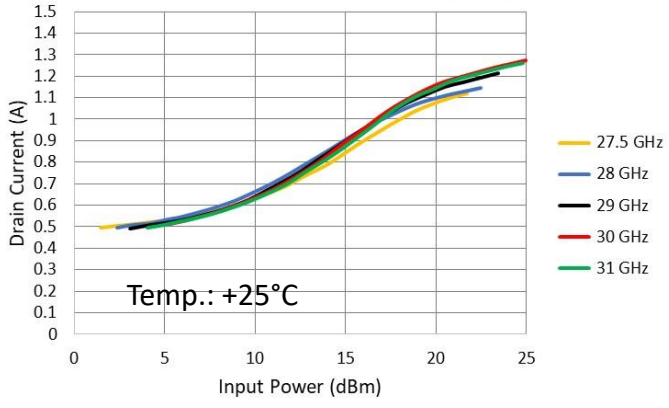
Large Signal Performance

Test Condition: Vd = 26 V, Idq = 0.5 A at 25°C, CW Performance

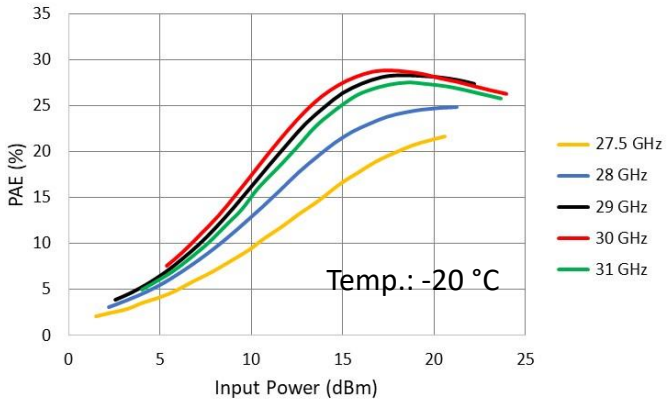
PAE vs. Input Power vs. Frequency



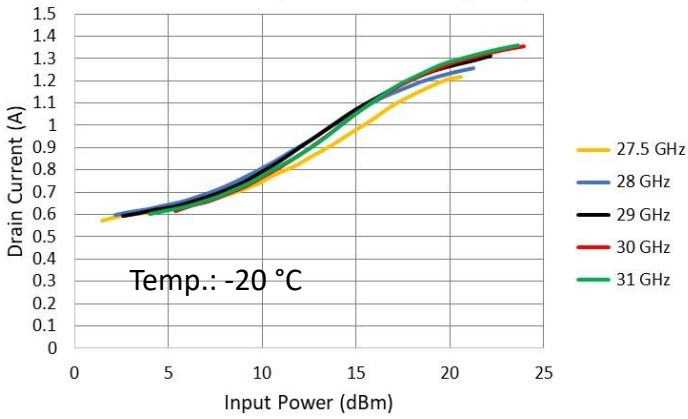
Drain Current vs. Input Power vs. Frequency



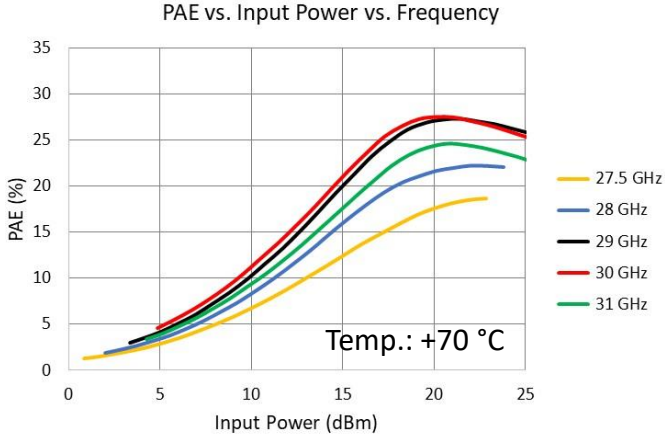
PAE vs. Input Power vs. Frequency



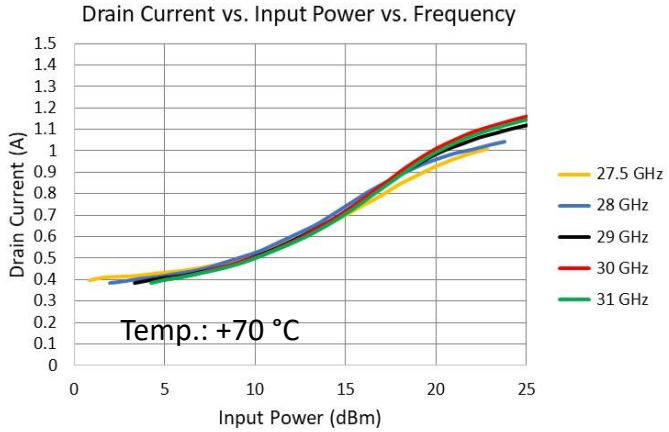
Drain Current vs. Input Power vs. Frequency



PAE vs. Input Power vs. Frequency



Drain Current vs. Input Power vs. Frequency



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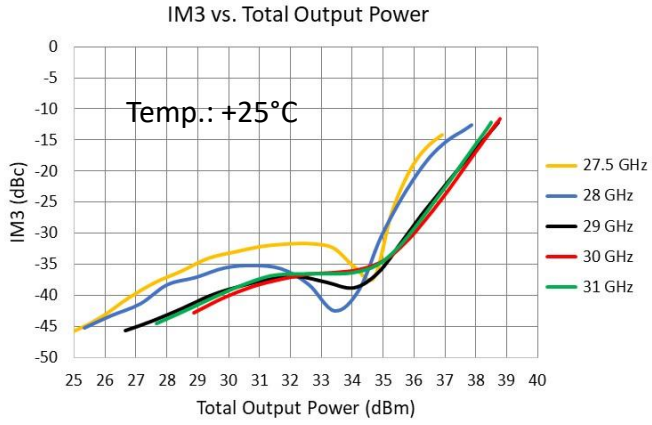
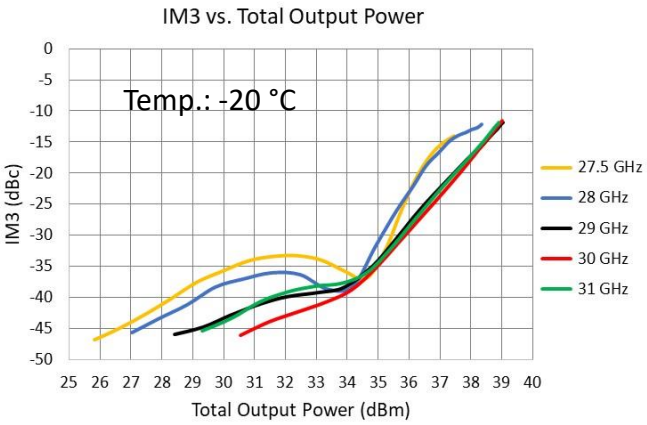
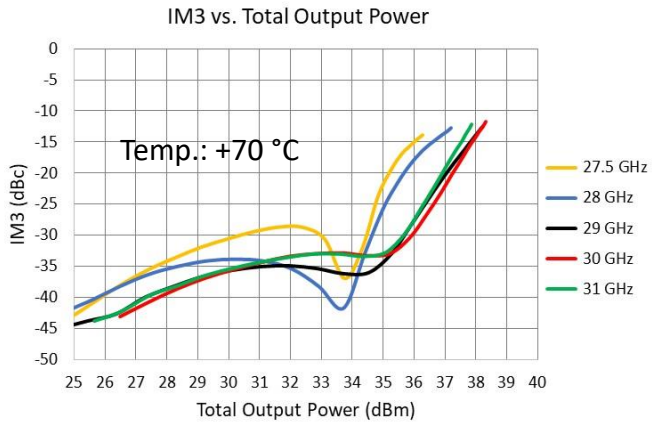
2-Tone Linearity Performance vs. Temperature

Test Condition: Vd = 26 V, Idq = 0.5 A at 25°C
10 MHz Tone Spacing

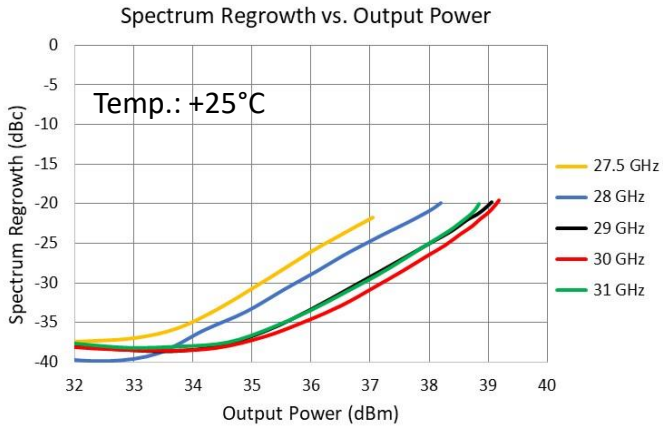


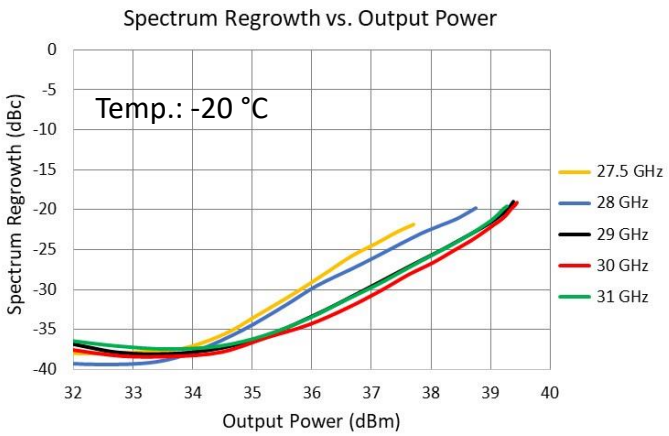


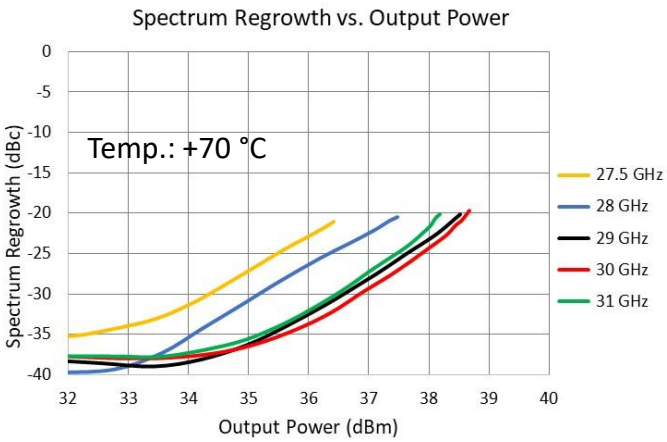


Spectral Regrowth Performance vs. Temperature

Test Condition: Vd = 26 V, Idq = 0.5 A at 25°C
QPSK, 10 MSPS, Alpha = 0.2







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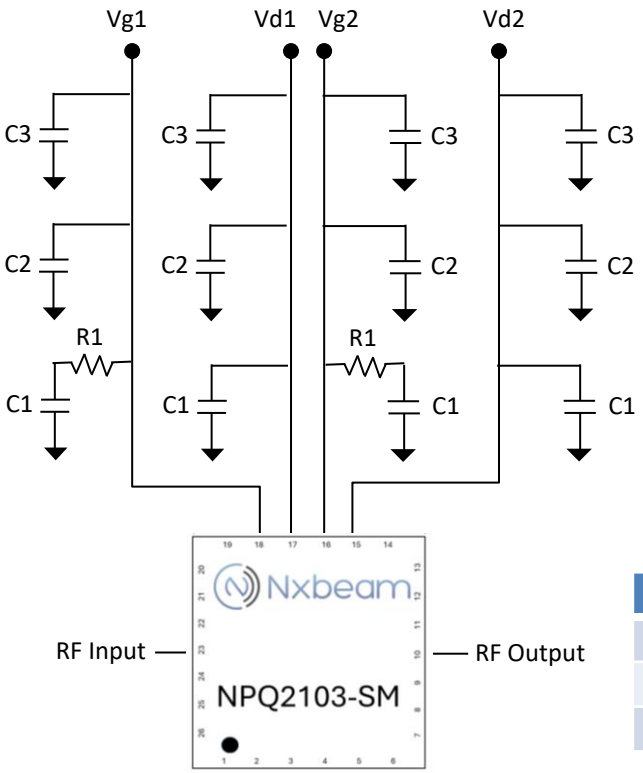
Connection and Off-Chip Components

The following diagram shows the recommended off-chip components. The off-chip components should be located as close to the part as possible. Please consult with Nxbeam on other off-chip network variations.

Pad Num.	Function
1	GND
2	GND
3	GND
4	GND
5	GND
6	GND
7	GND
8	GND
9	GND

Pad Num.	Function
10	RF OUT
11	GND
12	GND
13	GND
14	GND
15	Vd2
16	Vg2
17	Vd1
18	Vg1

Pad Num.	Function
19	GND
20	GND
21	GND
22	GND
23	RF IN
24	GND
25	GND
26	GND



Resistor	Value
R1	10 Ω

Capacitor	Value
C1	0.01 µF
C2	1 µF
C3	10 µF

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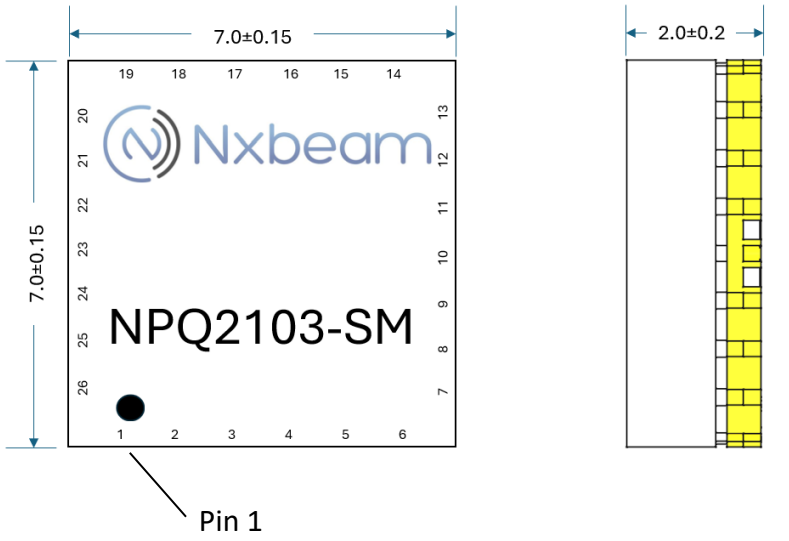
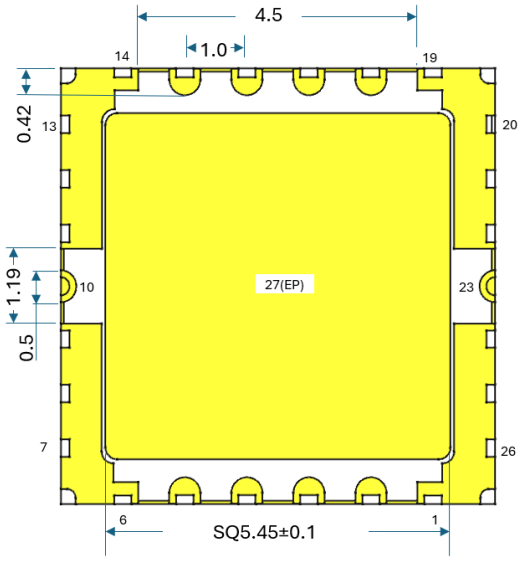
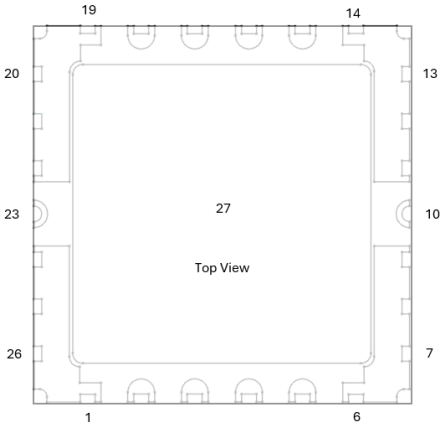
Dimensions
(all dimensions in mm)







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Bias Information

Bias-up Procedure:

1.) It is recommended that voltage and current limits be set on the power supplies prior to biasing the product, and that all supplies be properly grounded to the product.
2.) Apply a negative gate voltage of -8V to Vg1 and Vg2 to ensure all devices are pinched off.
3.) Gradually increase the drain bias voltage (Vd1, Vd2) to the desired bias level but not to exceed the maximum voltage of 28 V.
4.) Gradually increase the gate voltages (Vg1, Vg2) while monitoring the drain current until the desired drain current in each stage is achieved.
5.) Apply RF signal.

Bias-down Procedure:

1.) Turn off RF signal.
2.) Gradually decrease Vg1 and Vg2 down to -8 V.
3.) Gradually decrease the drain voltages (Vd1, Vd2) down to 0 V.
4.) Gradually increase gate voltages (Vg1, Vg2) to 0 V.
5.) Turn off supply voltages

ESD Sensitive Product

Important Information

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.

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