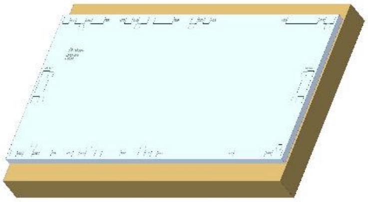
NPA2030-TB-501

27.5 – 31 GHz GaN 20 W Power Amplifier

Product Description

The Nxbeam NPA2030-TB-501 is a Ka-band high power amplifier MMIC fabricated in 0.2um GaN HEMT on SiC mounted on a high thermal conductive heat spreader (tab). The part operates from 27.5 to 31 GHz and provides 20 W of saturated output power, 35% PAE, and 25 dB linear gain. The RF input and output are matched to 50 Ω with DC blocking capacitors for easy system integration. The HEMT devices are fully passivated for reliable operation. Bond pad and heat spreader metallization are Au-based.



Applications

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

Key Features

• Frequency: 27.5 – 31 GHz
• Linear Gain: 25 dB
• Psat: 20 W
• PAE: 35%

Electrical Specifications

Test Condition: Vd = 24 V, Idq = 1.0 A, CW Performance in Fixture, Typical Performance at 25°C

Parameter		Min	Typical	Max	Unit
Frequency		27.5		31	GHz
Gain (Small Signal)	27.5 GHz		24.2		dB
	29 GHz		25.1		
	31 GHz		24.4		
Output Power (at Psat, Pin=22 dBm)	27.5 GHz		43.2		dBm
	29 GHz		42.9		
	31 GHz		42.1		
PAE (at Psat, Pin=22 dBm)	27.5 GHz		36.5		%
	29 GHz		35.2		
	31 GHz		34.1		
Power Gain (at Psat, Pin=22 dBm)	27.5 GHz		20.8		dB
	29 GHz		20.6		
	31 GHz		20.3		
Input Return Loss	27.5 GHz		7		dB
	29 GHz		12		
	31 GHz		16		
Output Return Loss	27.5 GHz		11		dB
	29 GHz		25		
	31 GHz		15		

Maximum Quiescent Bias

Parameter	Max	Unit
Drain Voltage (Vd1, Vd2, Vd3)	28	V
Drain Current (Id1)	120	mA
Drain Current (Id2)	285	mA
Drain Current (Id3)	1150	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.

4388 Cerritos Avenue
Los Alamitos, CA 90720

www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

Absolute Maximum Ratings (Temp. = 25°C)

Parameter	Min	Max	Unit
Drain Voltage (Vd1, Vd2, Vd3)		28	V
Drain Current (Id1)		300	mA
Drain Current (Id2)		720	mA
Drain Current (Id3)		2880	mA
Gate Voltage (Vg1, Vg2, Vg3)	-8	0	V

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

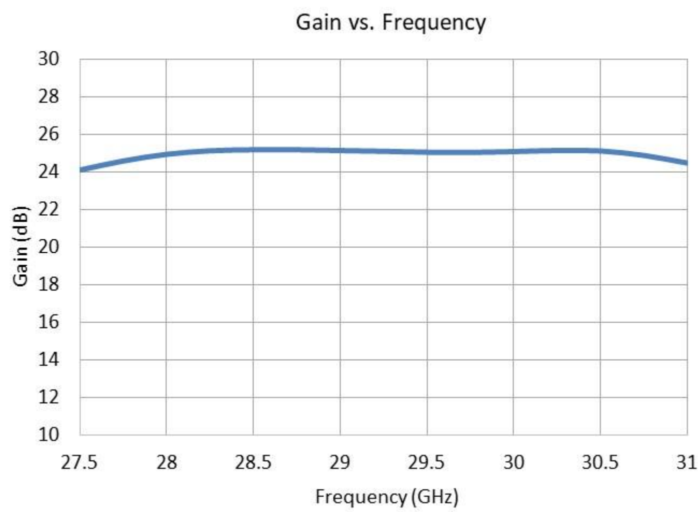
Recommended Quiescent Operating Condition

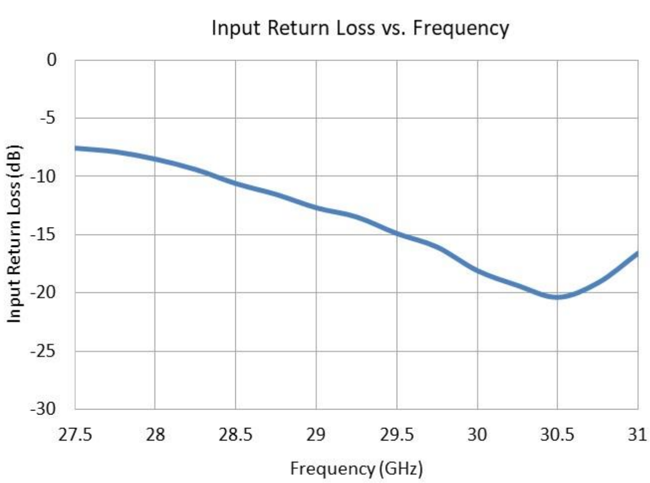
Parameter	Max	Unit
Drain Voltage (Vd1, Vd2, Vd3)	20 - 28	V
Drain Current (Id1)	up to 120	mA
Drain Current (Id2)	up to 285	mA
Drain Current (Id3)	up to 1150	mA
Gate Voltage (typical range)	-6 to -3.5	0

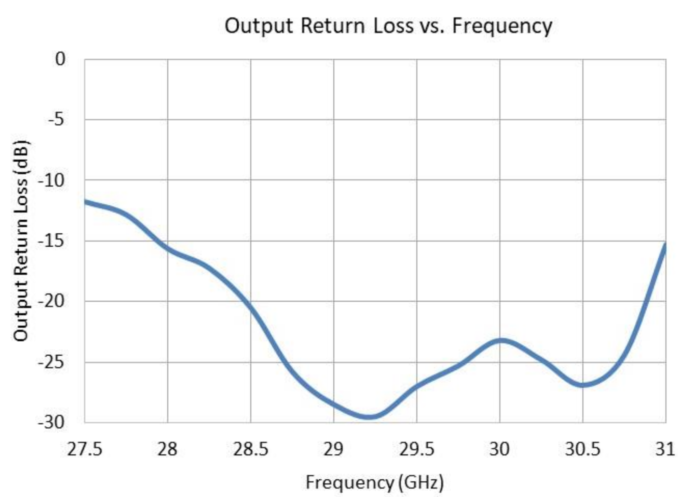
Gate voltage will vary based on desired current per stage

Small Signal Performance

Test Condition: Vd = 24 V, Idq = 1.0 A, (CW Performance in Fixture, Typical Performance at 25°C)







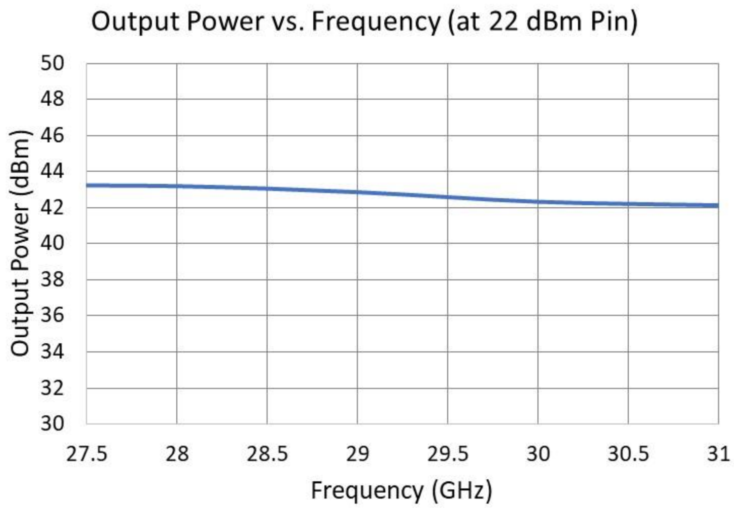
4388 Cerritos Avenue
Los Alamitos, CA 90720

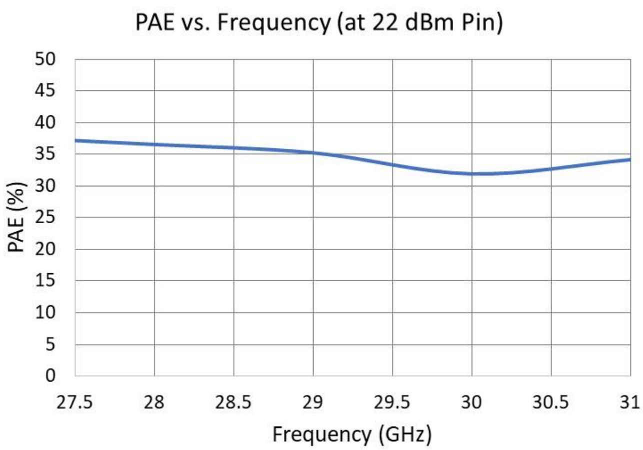
www.nxbeam.com
info@nxbeam.com

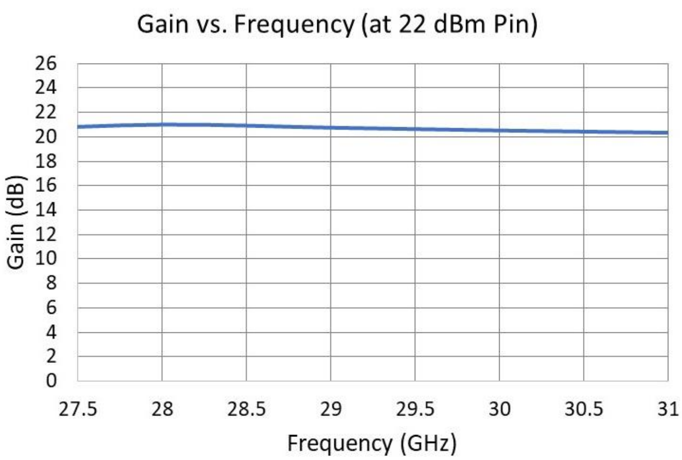
Phone: 949-656-2883

Large Signal Performance

Test Condition: Vd = 24 V, Idq = 1.0 A, Pin = 22 dBm (Psat)
(CW Performance in Fixture, Typical Performance at 25°C)



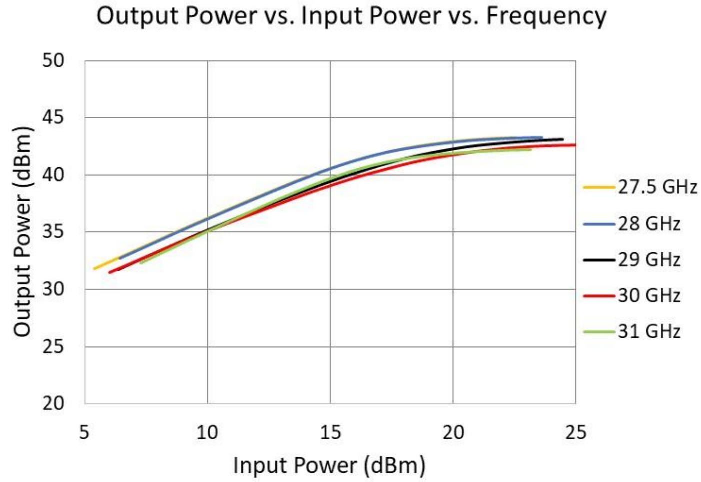


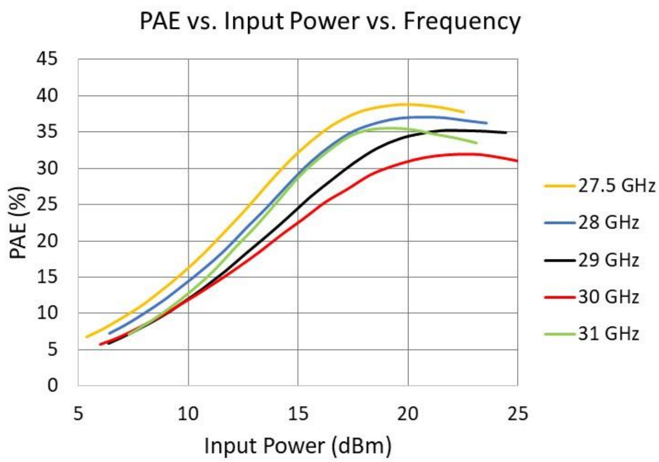


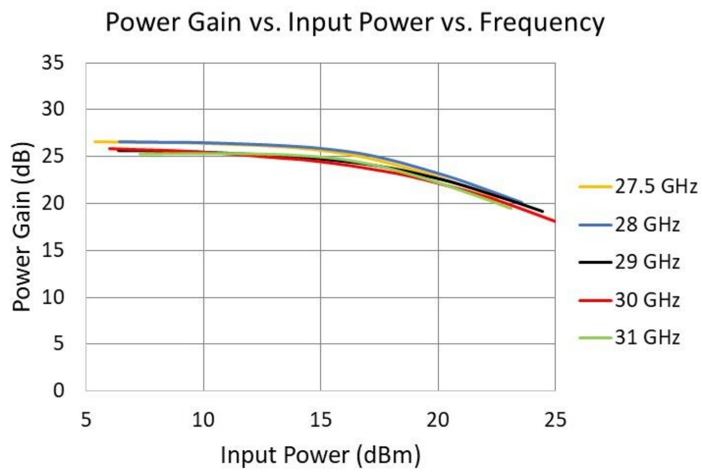
4388 Cerritos Avenue
Los Alamitos, CA 90720
www.nxbeam.com
info@nxbeam.com
Phone: 949-656-2883

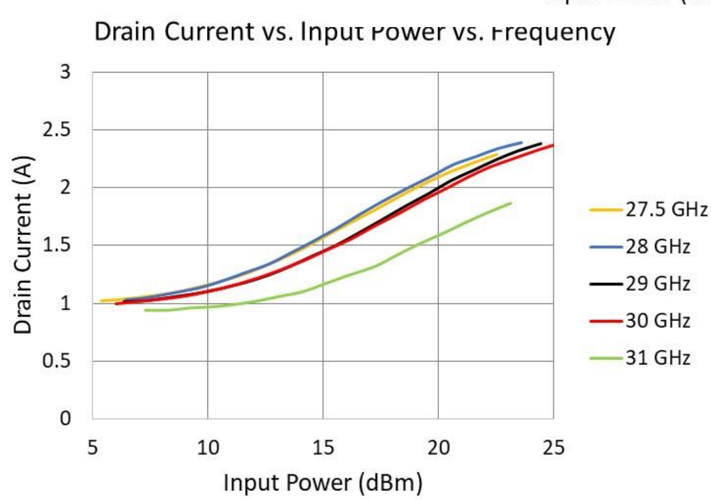
Large Signal Performance

Test Condition: Vd = 24 V, Idq = 1.0 A
(CW Performance in Fixture, Typical Performance at 25°C)









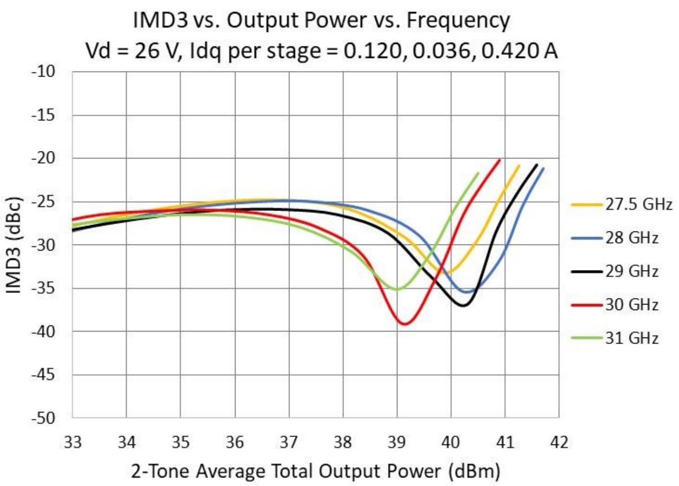
4388 Cerritos Avenue
Los Alamitos, CA 90720

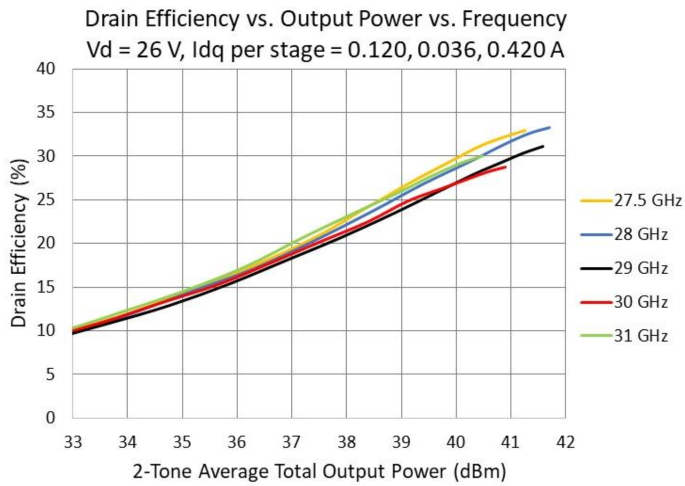
www.nxbeam.com
info@nxbeam.com

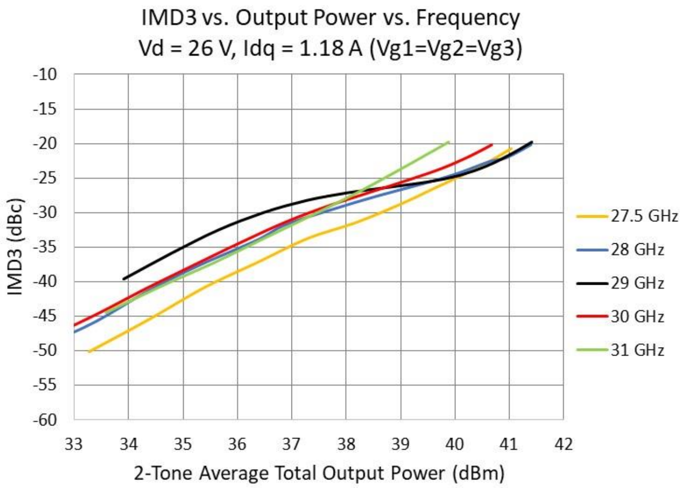
Phone: 949-656-2883

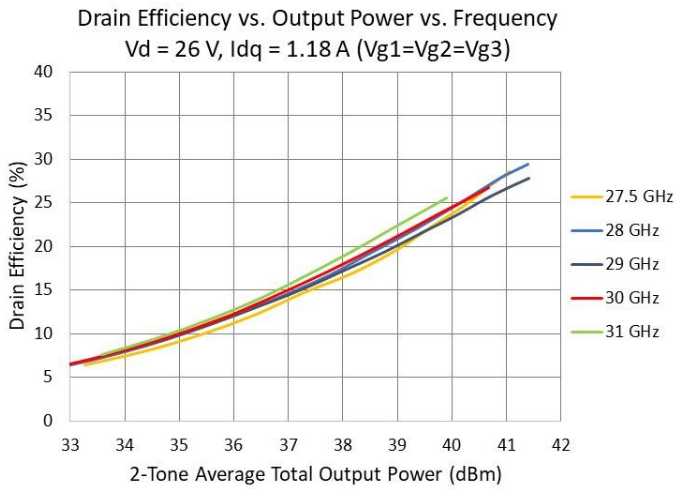
2-Tone Linearity Performance

10 MHz Tone Spacing , CW Performance in Fixture, Typical Performance at 25°C,









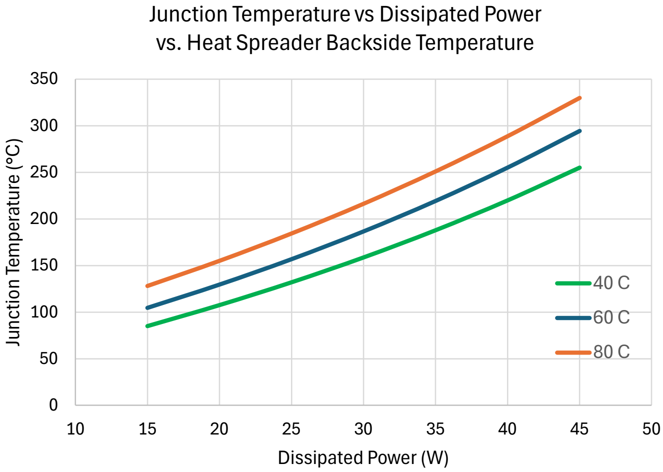
4388 Cerritos Avenue
Los Alamitos, CA 90720

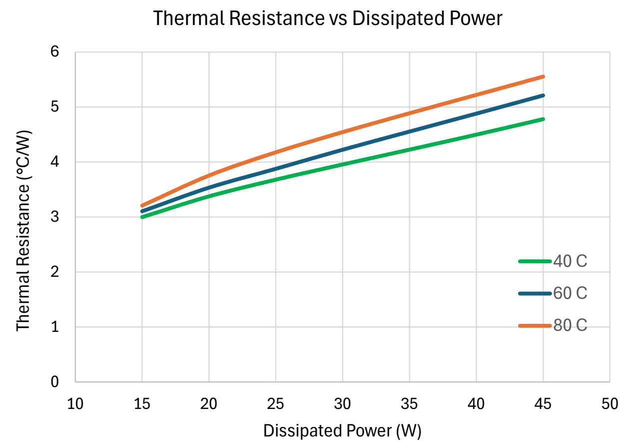
www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

Thermal Information

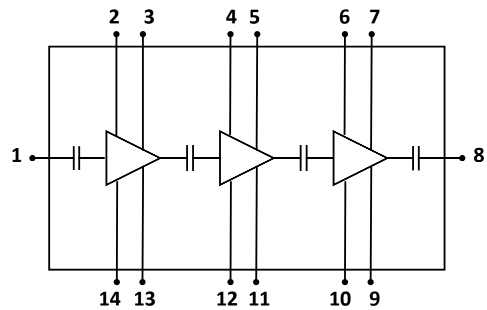
Junction Temperature and Thermal Resistance Referenced From Backside of Heat Spreader





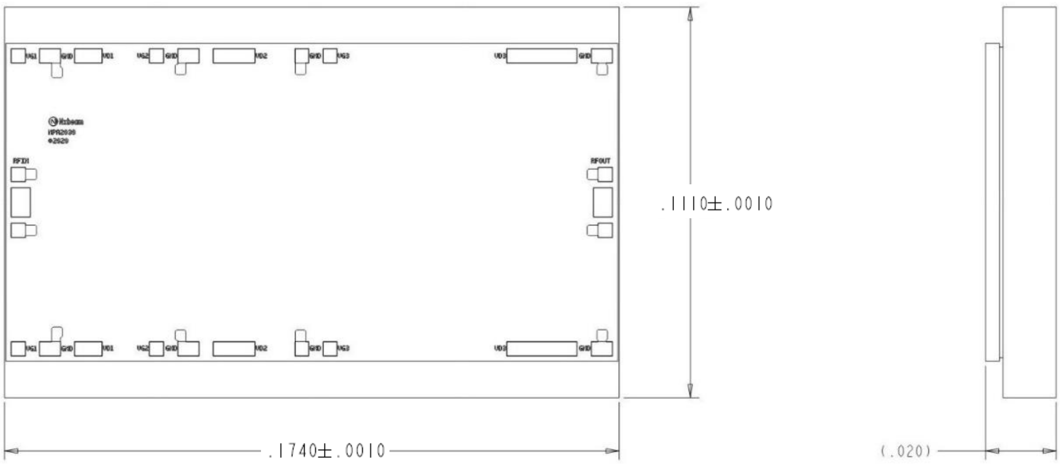
Note 1: Mean time to failure per junction temperature information can be found in the following document: Nxbeam_GaN20MMIC_Reliability.pdf

Circuit Block Diagram



Pin number information detailed under Product Dimensions and Bond Pad Information

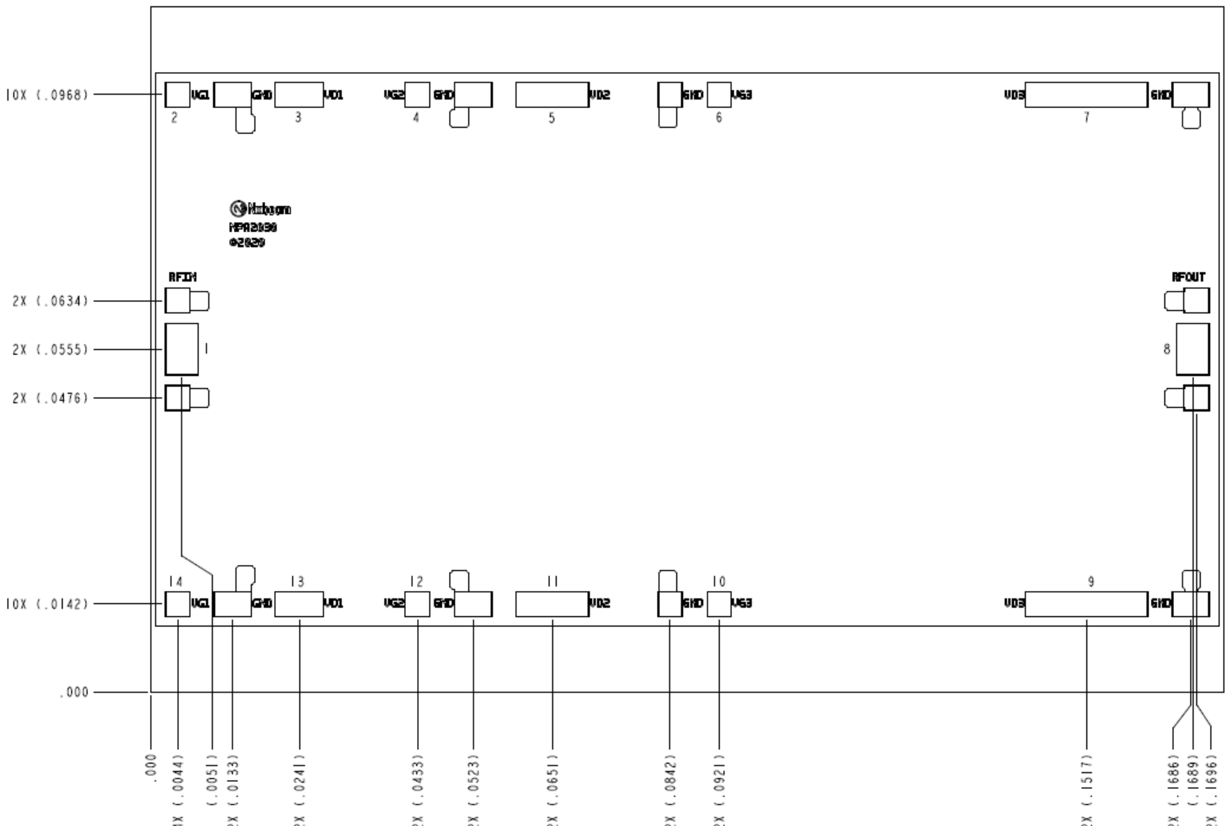
Product Dimensions (all dimensions in inches)



4388 Cerritos Avenue
Los Alamitos, CA 90720
www.nxbeam.com
info@nxbeam.com
Phone: 949-656-2883

Product Dimensions and Bond Pad Information
(all dimensions in inches unless otherwise noted)

INTERFACE IDENTIFICATION			
ID	FUNCTION	PAD NUMBER	PAD SIZE (MICRONS)
RFIN	RF INPUT	1	134 X 208
RFOUT	RF OUTPUT	8	134 X 208
VG1	GATE VOLTAGE - STAGE 1 (-8V MIN)	2,14	100 X 100
VD1	DRAIN VOLTAGE - STAGE 1 (28V MAX)	3,13	200 X 100
VG2	GATE VOLTAGE - STAGE 2 (-8V MIN)	4,12	100 X 100
VD2	DRAIN VOLTAGE - STAGE 2 (28V MAX)	5,11	300 X 100
VG3	GATE VOLTAGE - STAGE 3 (-8V MIN)	6,10	100 X 100
VD3	DRAIN VOLTAGE - STAGE 3 (28V MAX)	7,9	500 X 100



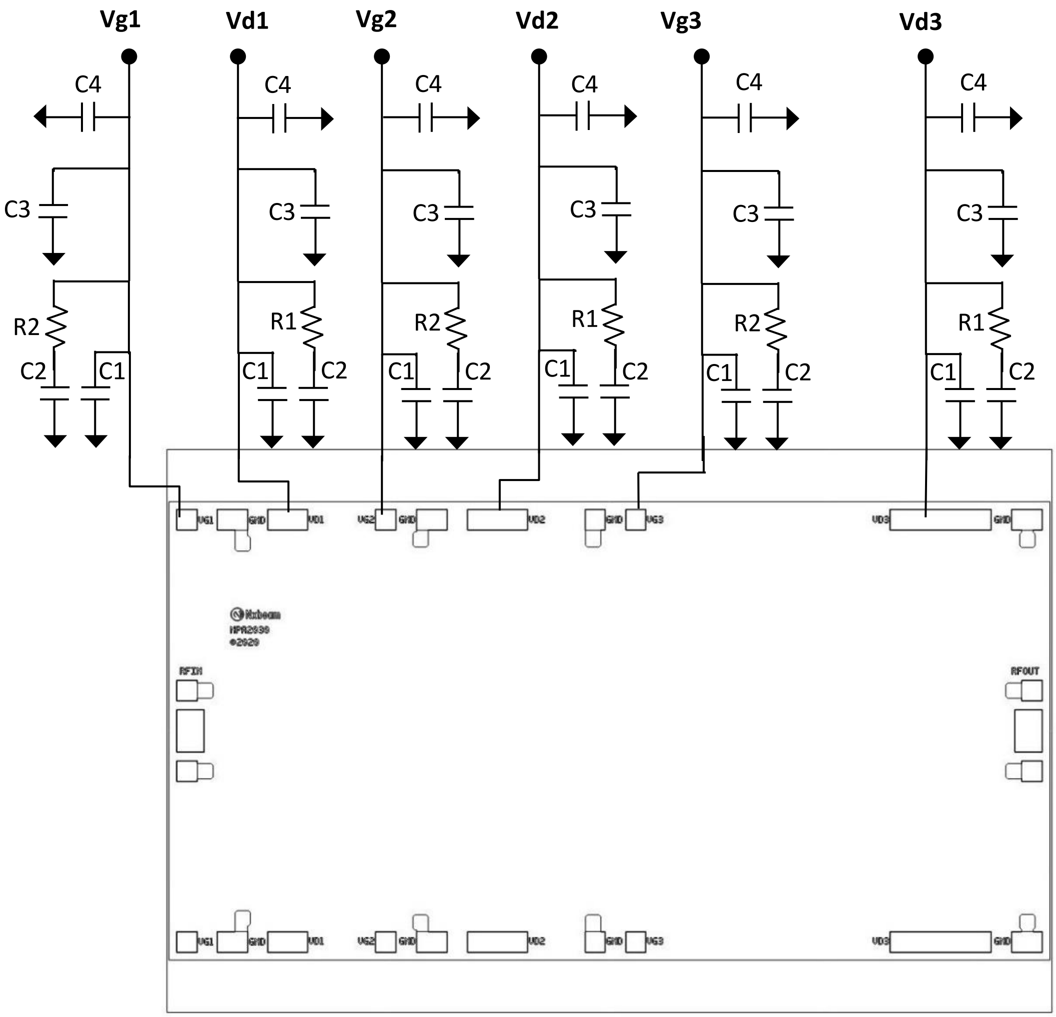
4388 Cerritos Avenue
Los Alamitos, CA 90720

www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

Suggested Off-Chip Components

The following diagram shows the recommended off-chip components to be used with the NPA2030-TB-501. It is recommended that the off-chip components be duplicated on both top and bottom sides of the chip, but it is not mandatory as the part can be biased from one side. The off-chip components should be located as close to the chip as possible. Please consult with Nxbeam on other off-chip network variations.



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

4388 Cerritos Avenue
Los Alamitos, CA 90720

www.nxbeam.com
info@nxbeam.com

Phone: 949-656-2883

Assembly Process

- The heat spreader is gold plated and can be mounted using either a high thermal conductive epoxy or solder attachment.
- Maximum recommended temperature during product attachment is 250 °C for not more than 30 seconds.
- This product contains metal air bridges so caution should be taken when handling 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 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

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.

4388 Cerritos Avenue
Los Alamitos, CA 90720
www.nxbeam.com
info@nxbeam.com
Phone: 949-656-2883