Spatium™ QPB0206N

2 – 6 GHz GaN Amplifier

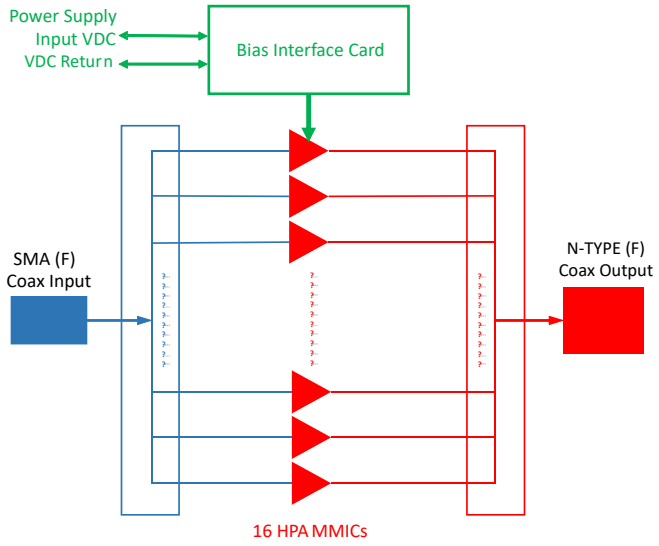
Product Description

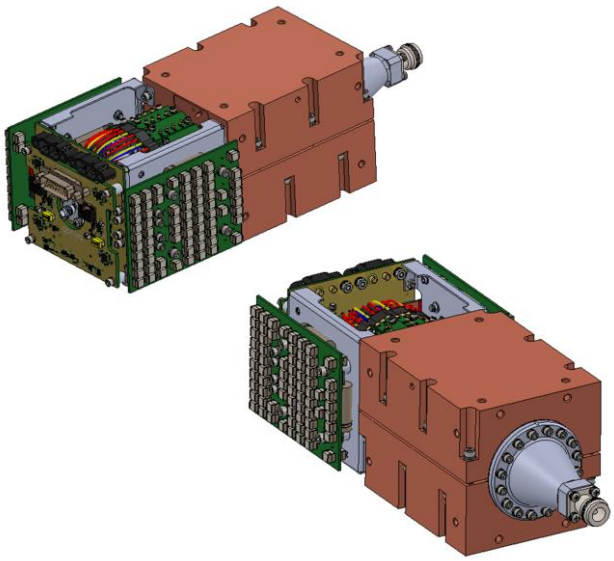
An excellent alternative to traveling wave tube amplifiers, Qorvo's Spatium™ QPB0206N is a solid state, spatial combining amplifier with an operating range of 2–6 GHz. With its maximum performance in output power, gain, power added efficiency, and frequency range, this Spatium is the ideal building block for microwave subsystems with wide-ranging applications.

Qorvo's patented and field-proven Spatium combining technology provides unprecedented Solid-State Power Amplifier (SSPA) performance in a rugged, compact size and weight which reduces total cost of ownership compared to alternative technologies. This product offering combines Qorvo's market leadership in GaN technology and MMIC design along with our high-count combining techniques for a best in class solution to power amplification.

The QPB0206N is equipped with an integrated bias card, which allows for convenience of operation, reducing electrical losses in the bias networks, and weight reduction over using a separate bias card. It provides individualized bias settings for each amplifier blade in the Spatium SSPA as well as drain pulsing up to 1 MHz PRF for superior power savings and noise performance.

Functional Block Diagram





Input (T) and Output (B)

Product Features

- Frequency Range: 2 – 6 GHz
- Saturated Output Power: 54.3 dBm (P_{IN} = 36 dBm)
- Large Signal Gain: 18.3 dB (P_{IN} = 36 dBm)
- Solid State MMIC Reliability
- Multi-Element Redundancy
- Instant On (no warm-up)
- Integrated Bias Card

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Applications

- TWTA Replacement

Ordering Information

Part No.	Description
QPB0206N	2 – 6 GHz Spatium™ Amplifier

Absolute Maximum Ratings

Parameter [1]	Min Value	Max Value	Units
Prime Power Supply (V_D) [2]	-	32	V
Power Supply Current	-	47	A
Load VSWR	-	3:1	-
Input Power (CW, VSWR 1.5:1, 25 °C)	-	42	dBm
Storage Temperature	-55	85	°C

1 Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied. Extended application of Absolute Maximum Rating conditions may reduce device reliability.
2 Rating for thermal reliability.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Drain Voltage (V_D)		24		V
Quiescent Current (Small Signal Operation)		20		A
Operating Current (Under RF Drive)		See data plots		A
Operating Temperature [1]	-40		71	°C
DC Pulse Width [2]	0.5		See note 3	uS
DC Pulse Period [2]	1			uS

1. Refers to outside clamp surface temperature, 2- sided cooling required.
2. Unit can be DC or RF pulsed, these limits are applicable to DC pulsing only.

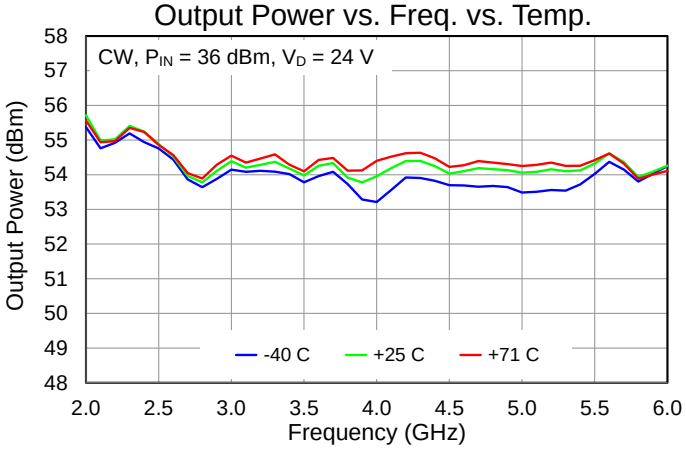
Parameter [1]	Min	Typ	Max	Units
Frequency	2		6	GHz
CW Saturated Power (P_{IN} = 36 dBm)		54.0		dBm
CW Power-Added Efficiency (P_{IN} = 36 dBm)		32		%
CW Power Gain (P_{IN} = 36 dBm)		18		dB
Pulse Mode Saturated Power (P_{IN} = 36 dBm) [2]		54.0		dBm
Pulse Mode Power-Added Efficiency (P_{IN} = 36 dBm) [2]		30		%
Pulse Mode Power Gain (P_{IN} = 36 dBm) [2]		18		dB
Small Signal Gain (S21)		32.2		dB
Input Return Loss		16		dB
Switch Time (RF Pulsing)			30	ns
Switch Time Enable to 90% RF ON (DC Pulsing)		189	200	ns
Switch Time Disable 10% RF OFF (DC Pulsing)		169	200	ns
Input RF Interface	SMA (F)			-
Output RF Interface	Type N (F)			-
Weight: Amp + Bias Card	16.5 (7.48)			lbs. (kg)
Weight: Amp + Bias Card + One Capacitor Bank	17.0 (7.71)			lbs. (kg)
Weight: Amp + Bias Card + Two Capacitor Banks	17.0 (7.71) / 17.5 (7.94)			lbs. (kg)
Dimensions: Amp + Bias Card (L) x (W) x (H)	11.33 x 3.4 x 3.4 (287.8 x 86.4 x 86.4)			inch (mm)
Dimensions: Amp + Bias Card + One Capacitor Bank	11.33 x 4.1 x 3.4 (287.8 x 104.1 x 86.4)			inch (mm)
Dimensions: Amp + Bias Card + Two Capacitor Banks	11.33 x 4.8 x 3.4 (287.8 x 121.9 x 86.4)			inch (mm)

1. Electrical specifications are measured at specified or recommended test conditions. Specifications are not guaranteed over all recommended operating conditions.
2 DC pulsing, Pulse Width = 500 nS, DC = 50%.

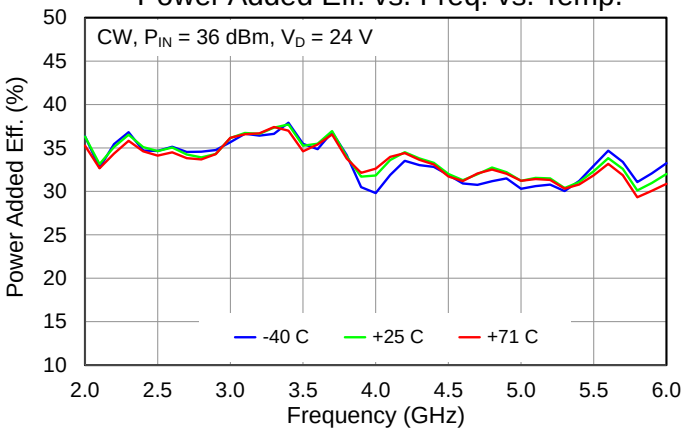
Typical Performance – Large Signal (CW)

Conditions unless otherwise specified: V_D = 24 V, P_{IN} = 36 dBm, T_{CLAMP} = 25 °C

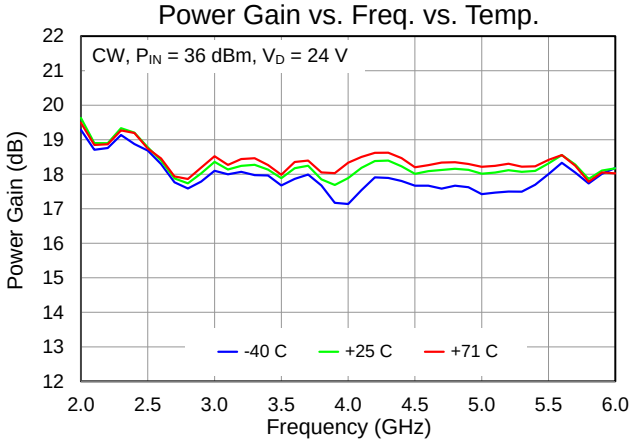
Output Power vs. Freq. vs. Temp.



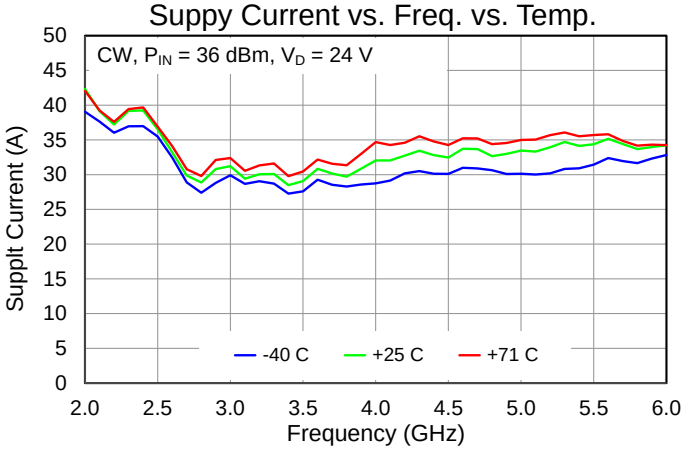
Power Added Eff. vs. Freq. vs. Temp.



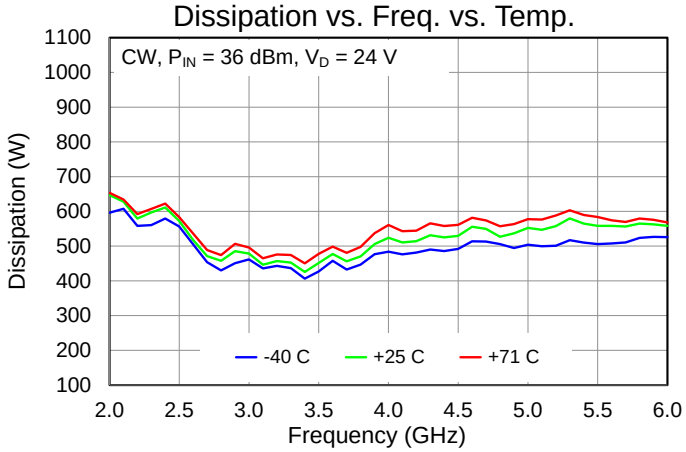
Power Gain vs. Freq. vs. Temp.



Suppy Current vs. Freq. vs. Temp.



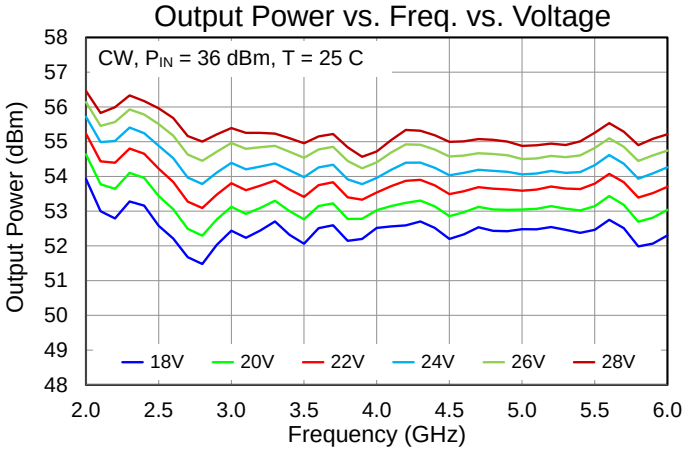
Dissipation vs. Freq. vs. Temp.



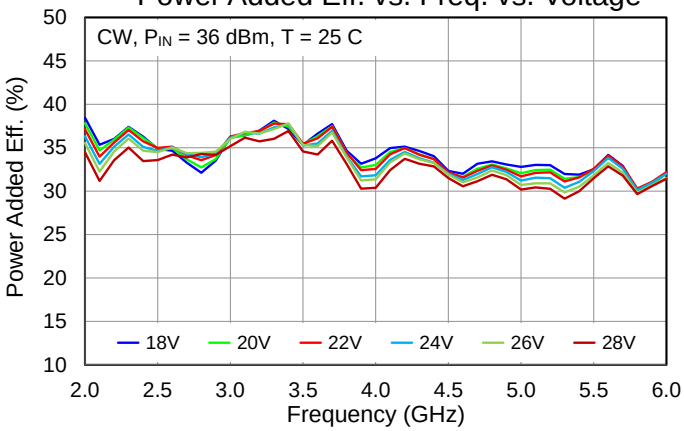
Typical Performance – Large Signal (CW)

Conditions unless otherwise specified: V_D = 24 V, P_{IN} = 36 dBm, T_{CLAMP} = 25 °C

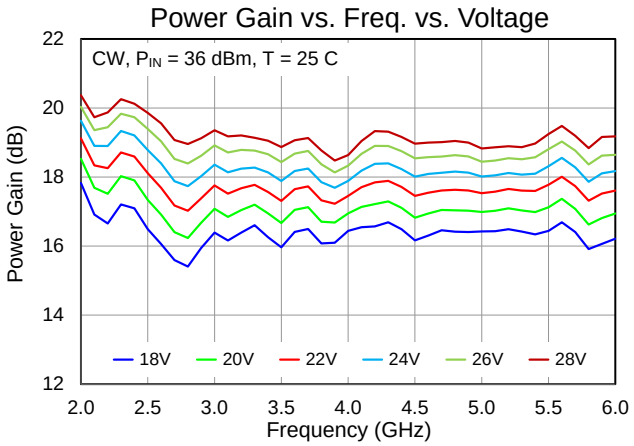
Output Power vs. Freq. vs. Voltage



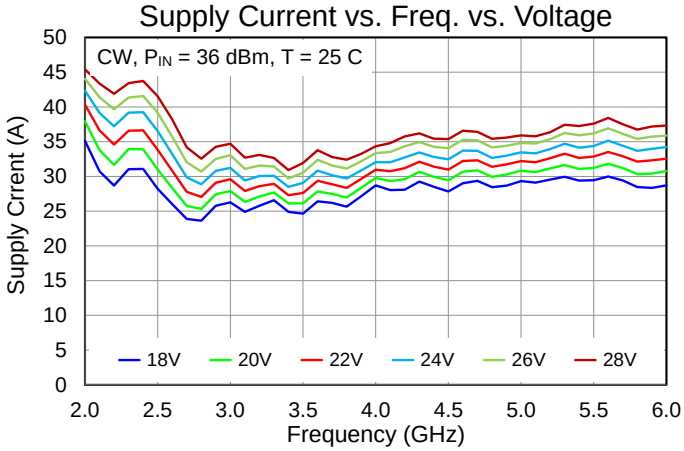
Power Added Eff. vs. Freq. vs. Voltage



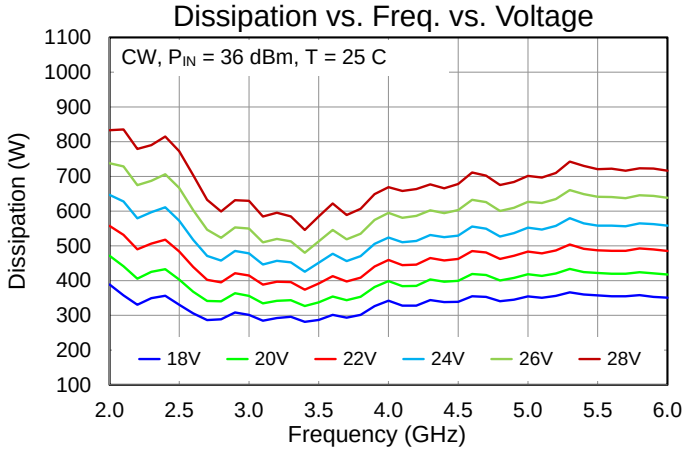
Power Gain vs. Freq. vs. Voltage



Supply Current vs. Freq. vs. Voltage

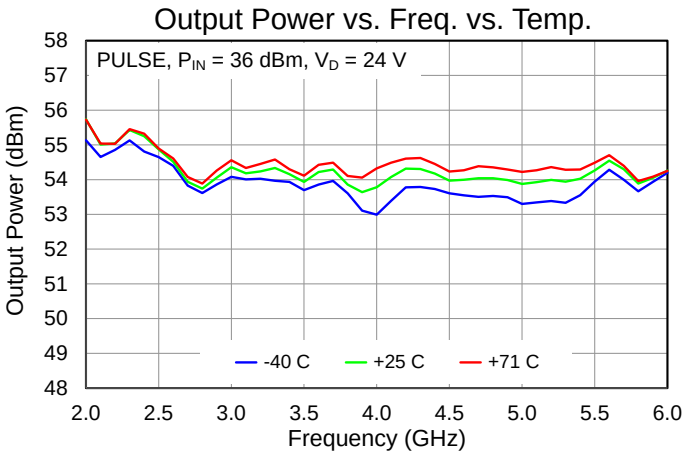


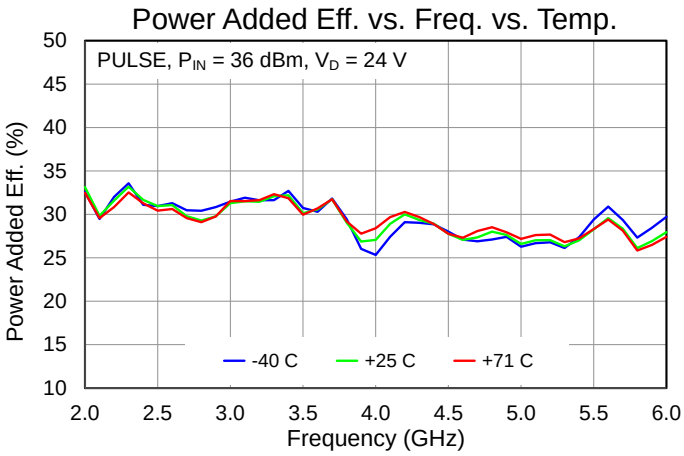
Dissipation vs. Freq. vs. Voltage

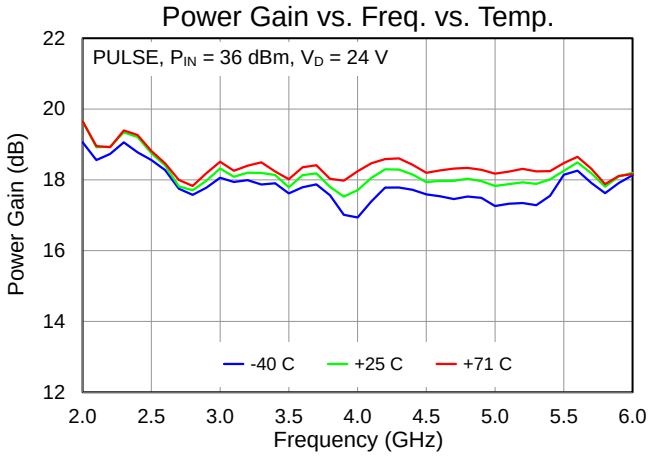


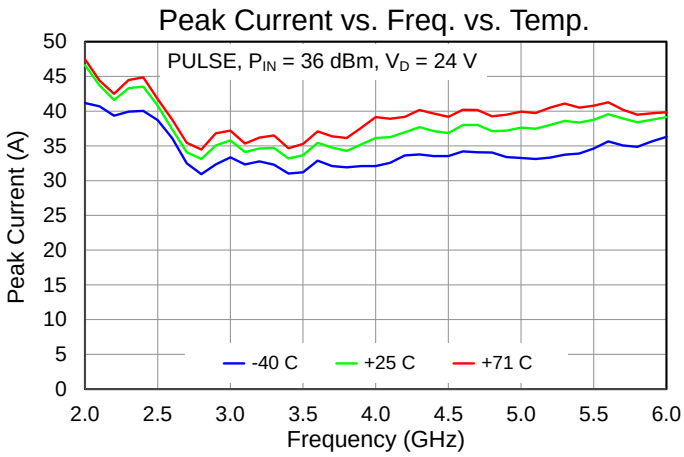
Typical Performance – Large Signal (Pulsed)

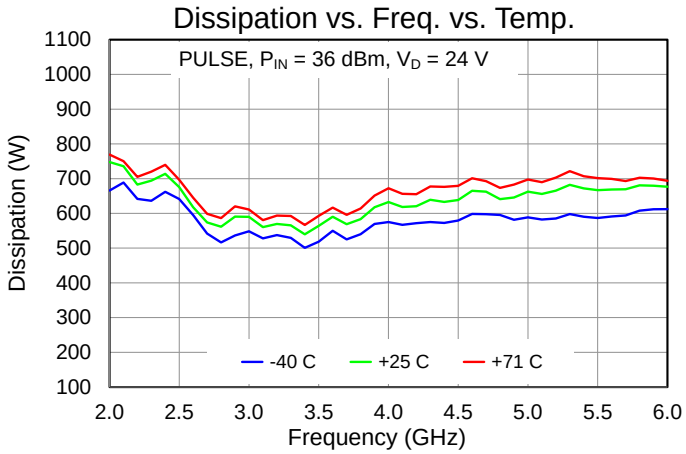
Conditions unless otherwise specified: V_D = 24 V, P_{IN} = 36 dBm, PW = 500 ns, DC = 50%, T_{CLAMP} = 25 °C







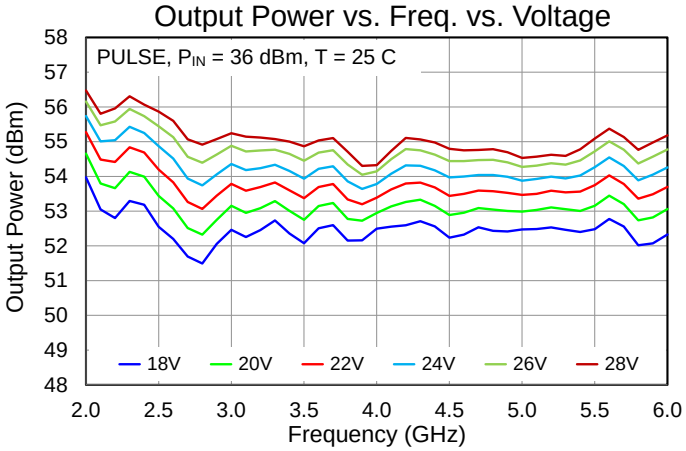




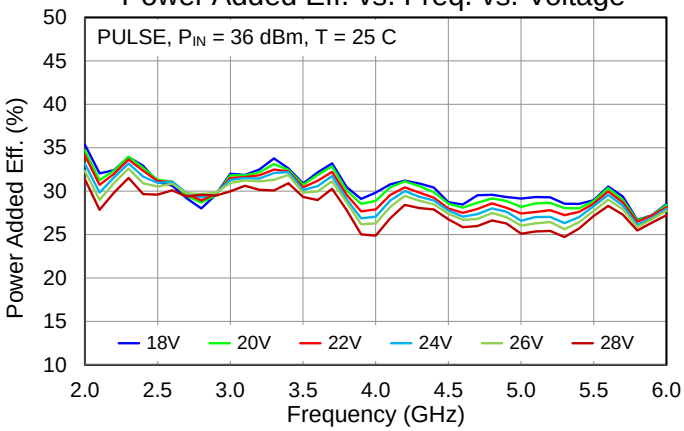
Typical Performance – Large Signal (Pulsed)

Conditions unless otherwise specified: V_D = 24 V, P_{IN} = 36 dBm, PW = 500 ns, DC = 50%, T_{CLAMP} = 25 °C

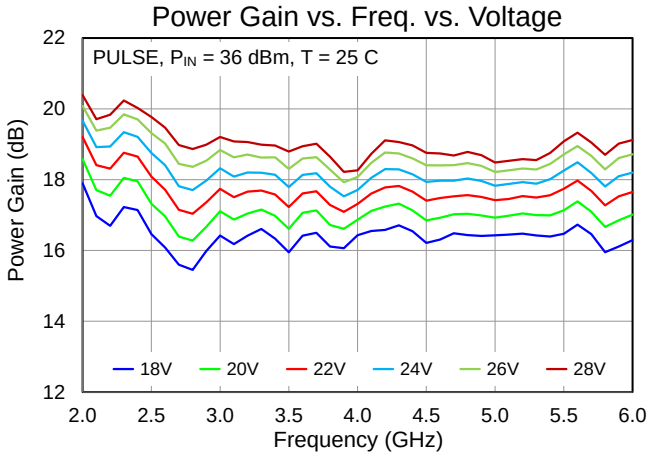
Output Power vs. Freq. vs. Voltage



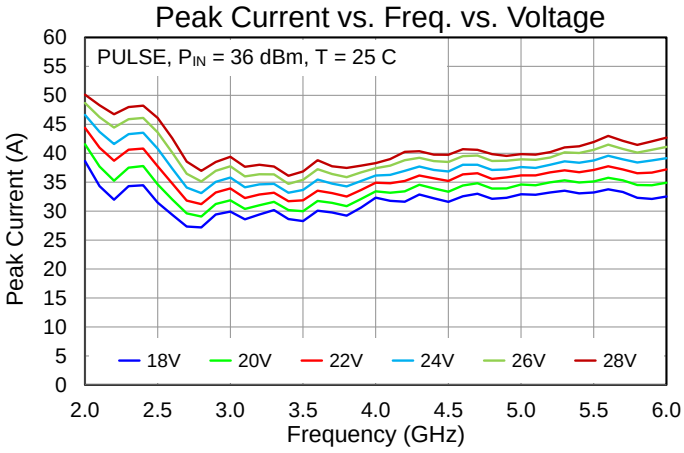
Power Added Eff. vs. Freq. vs. Voltage



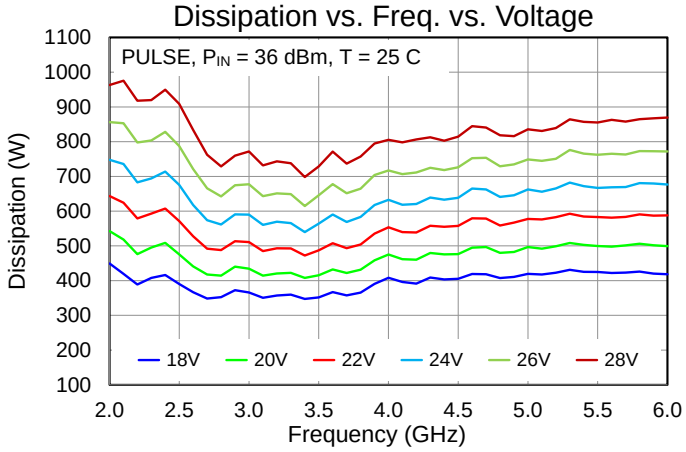
Power Gain vs. Freq. vs. Voltage



Peak Current vs. Freq. vs. Voltage



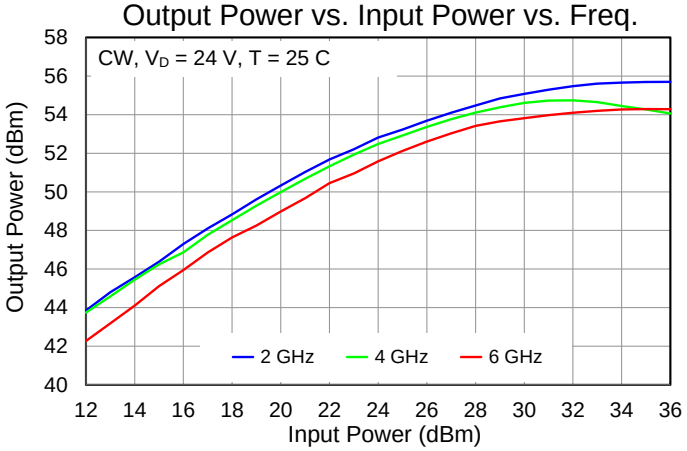
Dissipation vs. Freq. vs. Voltage



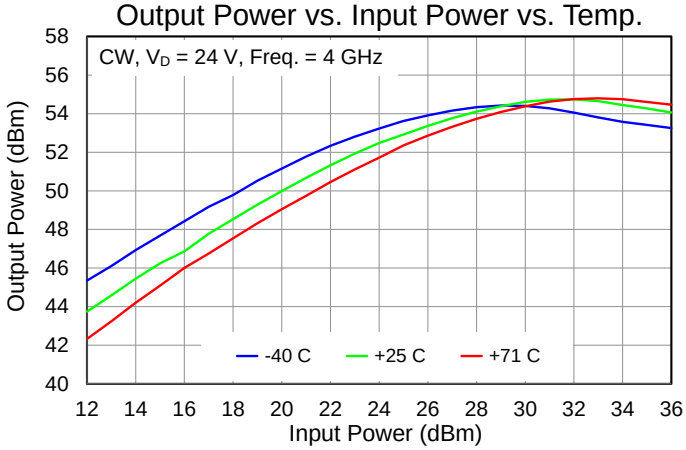
Typical Performance – Large Signal (CW)

Conditions unless otherwise specified: V_D = 24 V, T_{CLAMP} = 25 °C

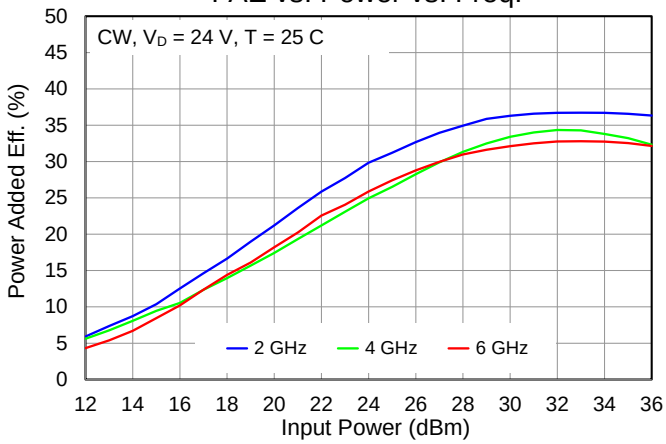
Output Power vs. Input Power vs. Freq.



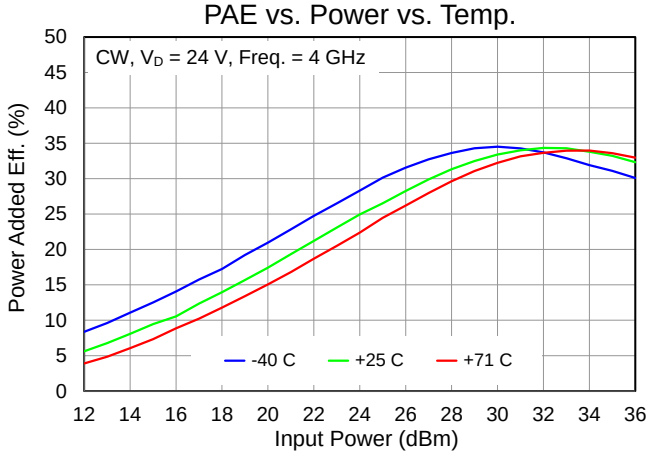
Output Power vs. Input Power vs. Temp.



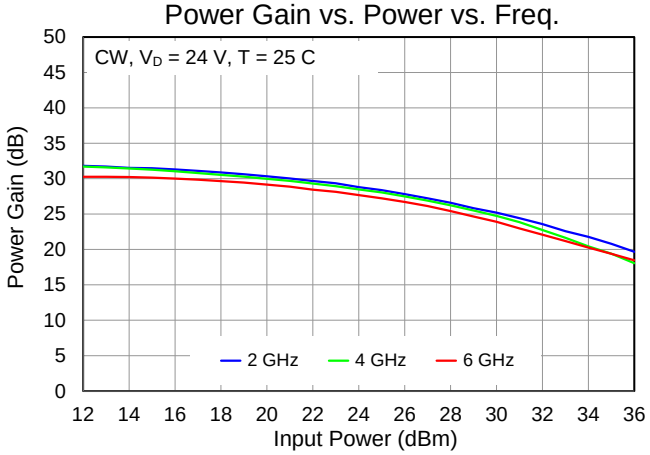
PAE vs. Power vs. Freq.



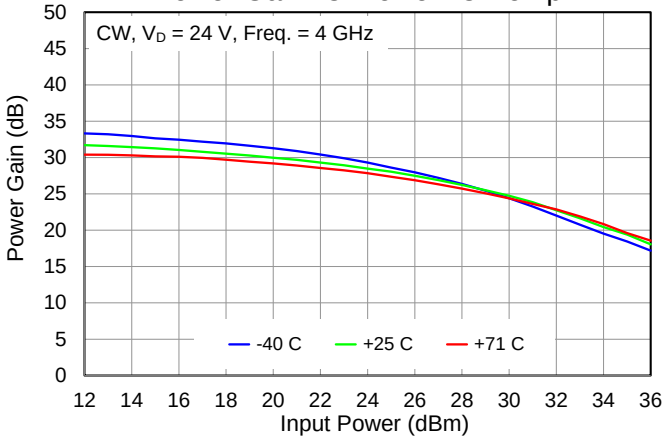
PAE vs. Power vs. Temp.



Power Gain vs. Power vs. Freq.

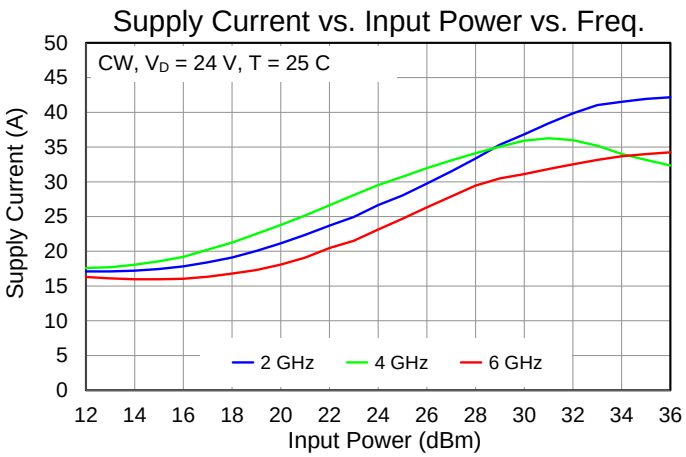


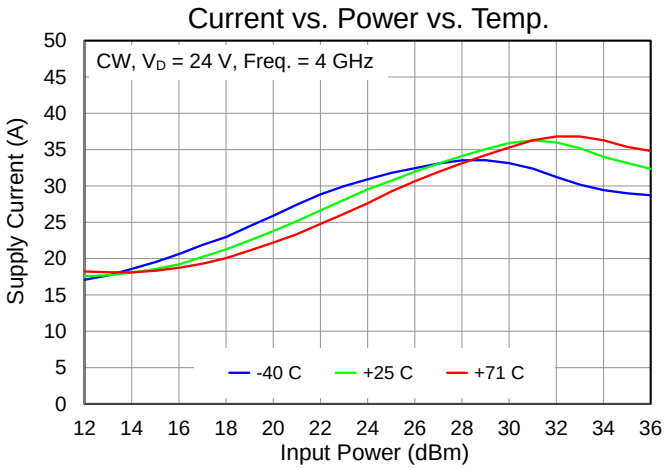
Power Gain vs. Power vs. Temp.

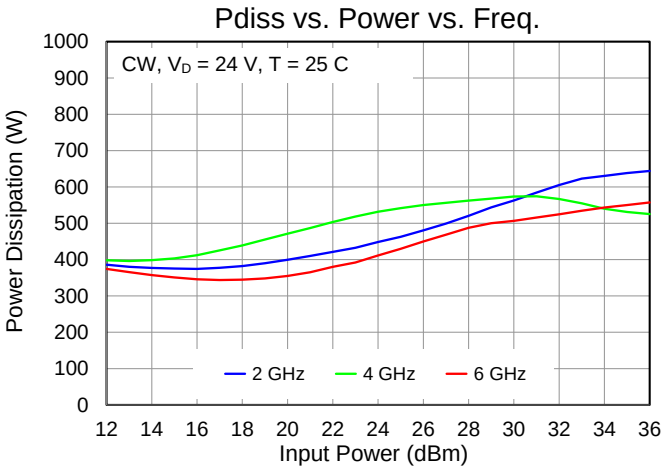


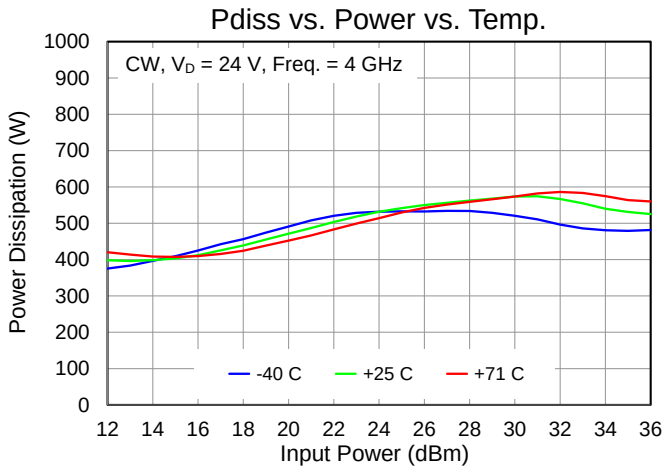
Typical Performance – Large Signal (CW)

Conditions unless otherwise specified: V_D = 24 V, T_{CLAMP} = 25 °C



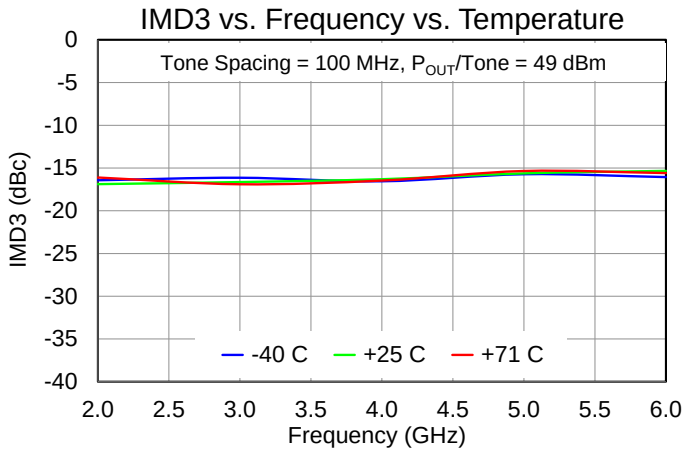


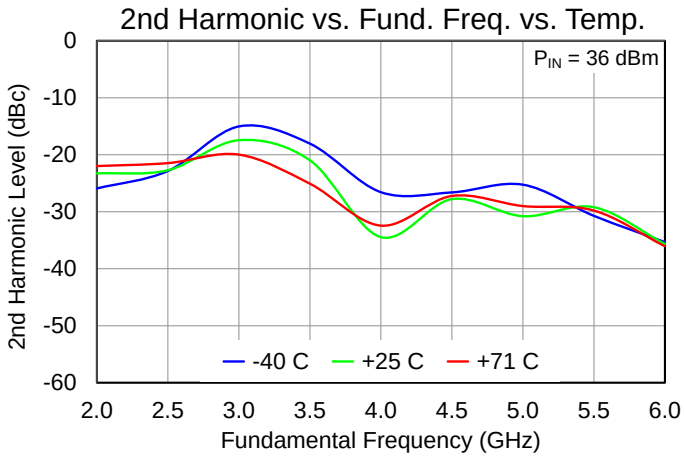


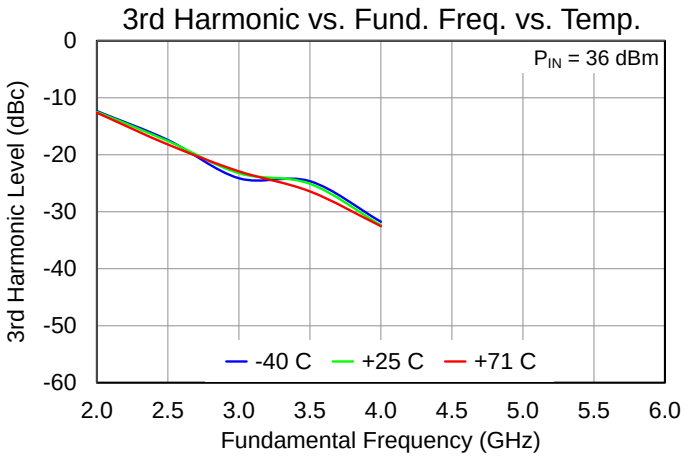


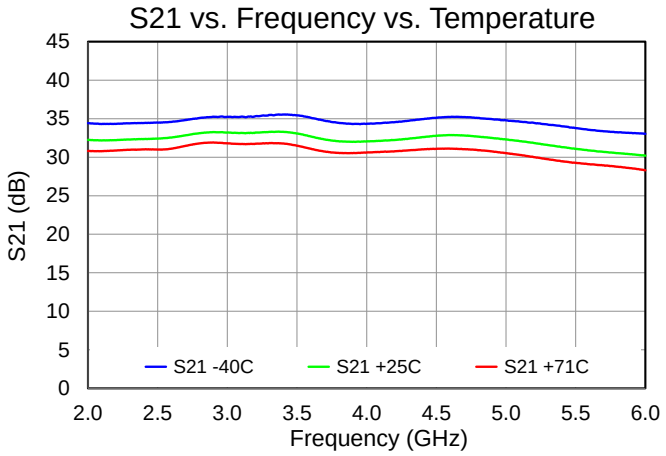
Typical Performance – Linearity, Harmonics, Small Signal

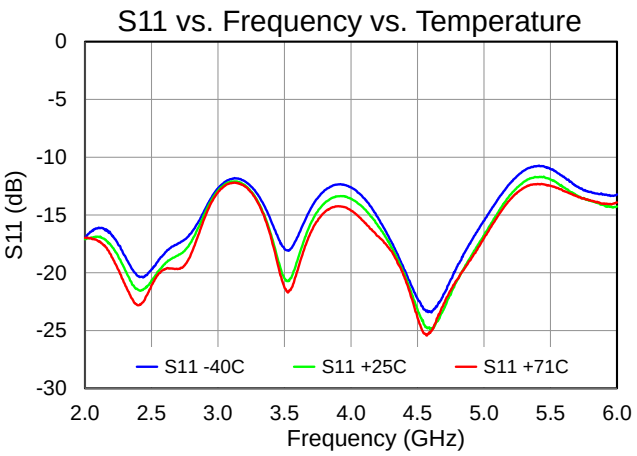
Conditions unless otherwise specified: V_D =24 V, I_{DQ} = 20 A, T_{CLAMP} = 25 °C, CW



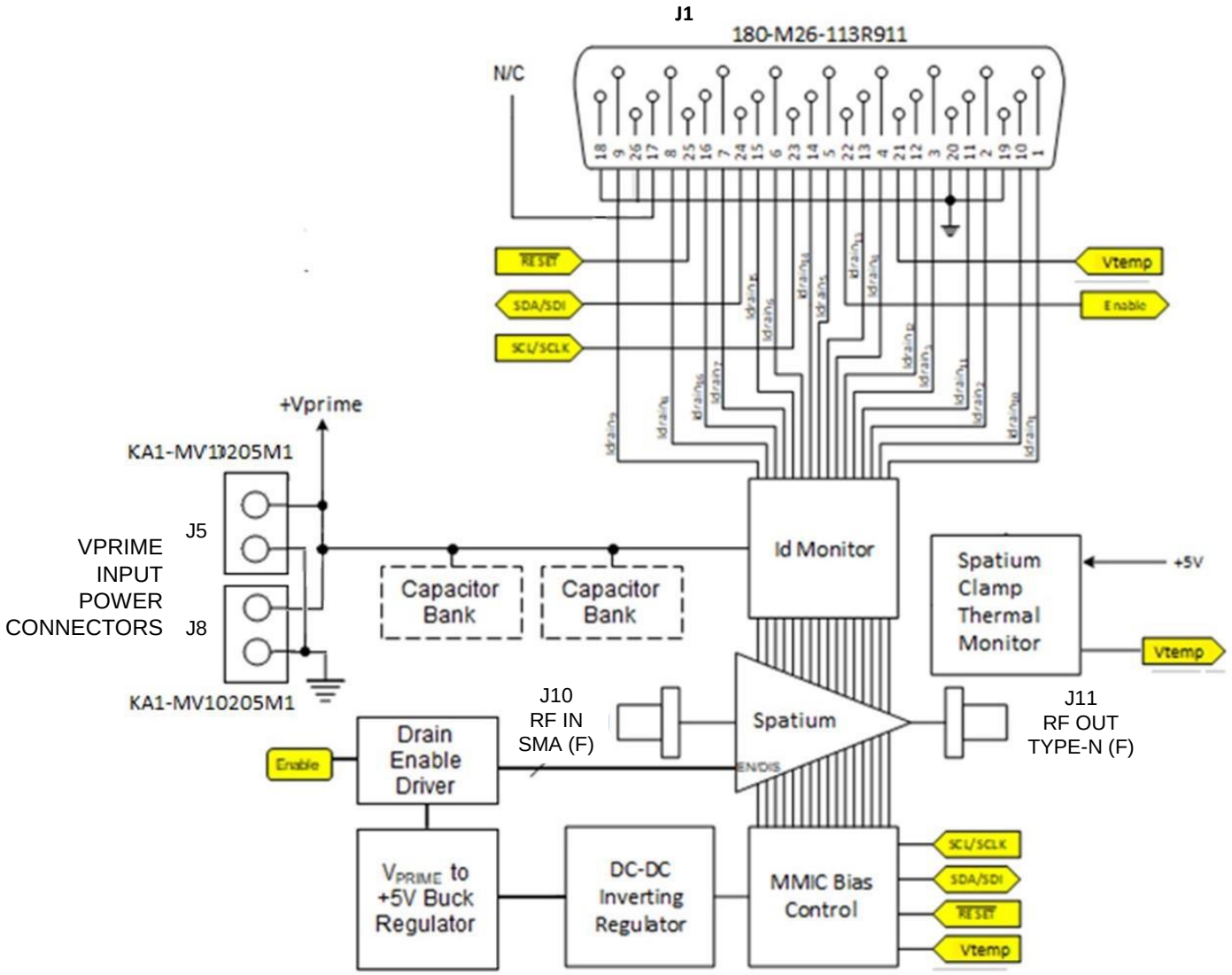








Block Diagram and Description



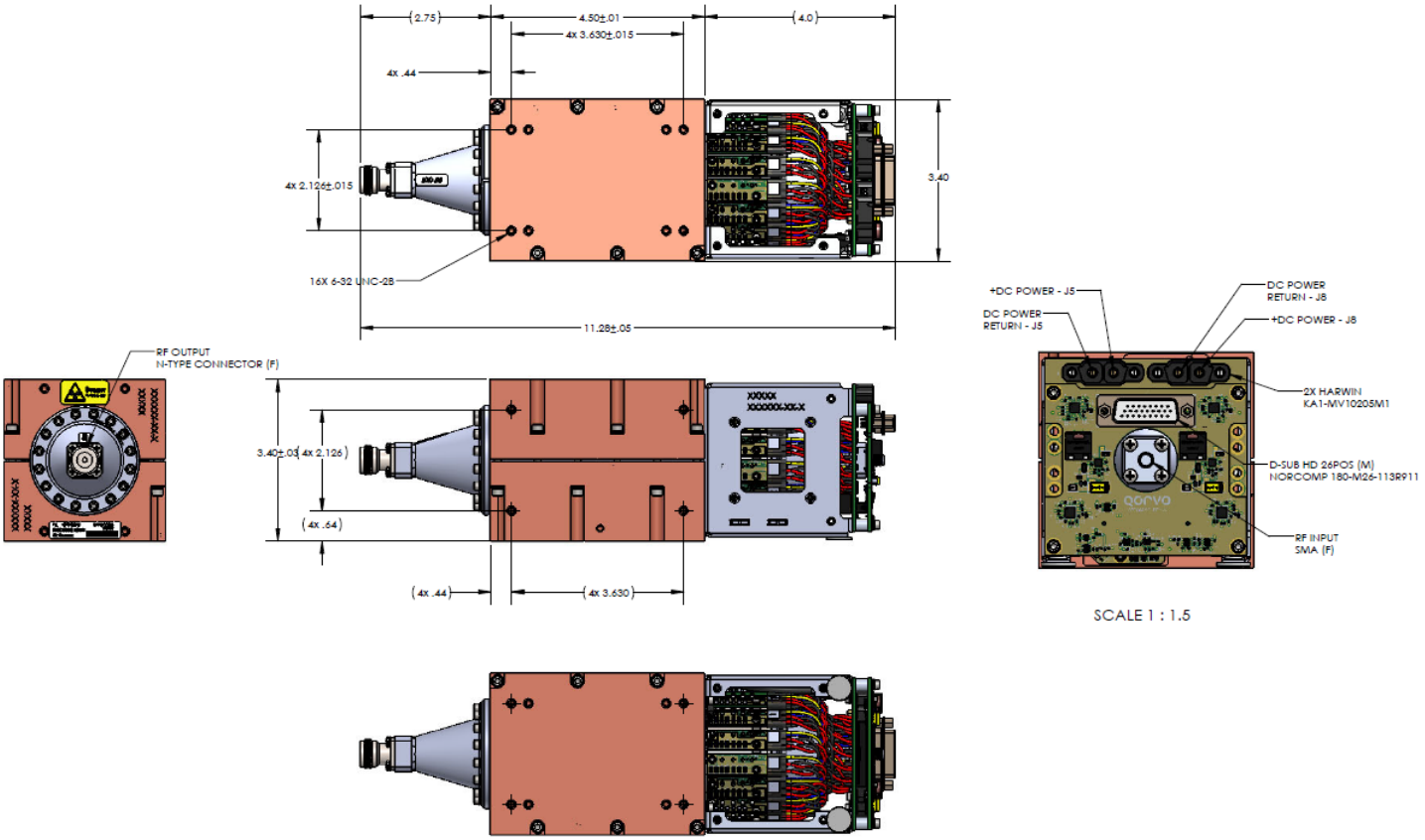
Pin No.	Label	Description
RF In	J10	SMA (F), DC Grounded.
RF Out	J11	TYPE-N (F), DC Grounded.
Auxiliary	J1	D-SUB HD 26POS (M), NORCOMP 180-M26-113R911, Mates with 180-026-273L000.
Power	J5, J8	HARWIN, KA1-MV10205M1, Mates with KA1-2010298F1 / KA1-0400005

J1 Connector Pin Labels and Function Descriptions

Pin No.	Label	Description
1 2 … 16	ID_Drain 1 ID_Drain 2 … ID_Drain 16	Amplifier Bias Monitoring, voltage of these pins follows 0.5V/A times the current flowing through amplifiers 1, 2 to 16, can be used for diagnostics / status of amplifier, otherwise leave open.
17, 18	5V0	+5V internally generated reference voltage, can be used to supply 100mA of current if required, otherwise, leave open. Do not apply a voltage to these pins.
19, 20	GND	Logic / signal ground.
21	VTEMP	Temperature monitoring. [1]
22	ENABLE	5V CMOS logic command bit for setting the gain stages to lo power mode operation. 0V puts the unit into a low-power stage while 5V will allow normal operation, in the absence of an external logic signal (open), the amplifier will power on with the application of supply voltage.
23	SCL	I2C bus used to program amplifier (For factory use only).
24	SDA	I2C bus used to program amplifier (For factory use only).
25	RESET	I2C bus used to program amplifier (For factory use only).
26	GND	Logic / signal ground.

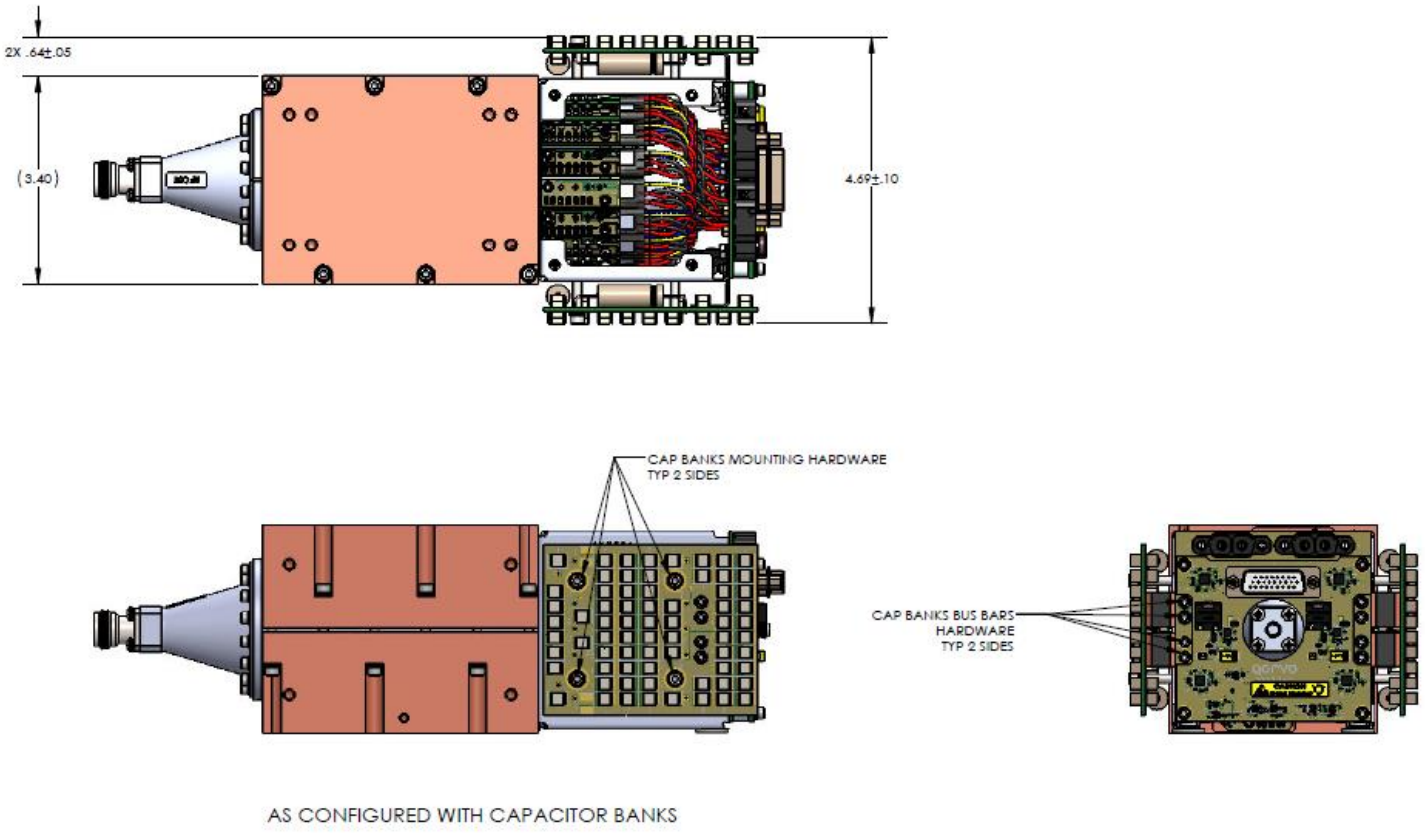
1 Connects to Texas Instruments LMT87 temperature sensor output. For relation between output voltage and temperature, please see the LMT87 datasheet.

Mechanical Information – Outline Drawing (Amp + Bias Card)



Dimensions are in INCHES

Mechanical Information – Outline Drawing (Amp + Bias Card + 2 Cap. Banks)



AS CONFIGURED WITH CAPACITOR BANKS

Dimensions are in INCHES

Handling Precautions

Caution!
ESD-Sensitive Device

RF VOLTAGE HAZARD: Contact with RF fields at the output connector can cause burns or electric shock. High levels of RF/Microwave energy may be present when the unit is operating.

HIGH DC CURRENT HAZARD: High levels of DC current are present when the unit is operating.

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: www.qorvo.com
Tel: 1-844-890-8163
Email: customer.support@qorvo.com

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