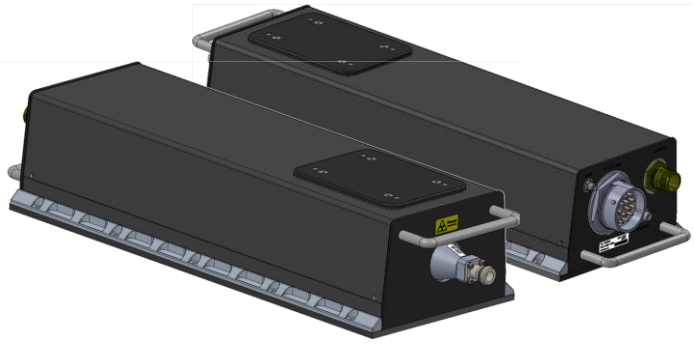
Spatium™ QPR0220

2 – 18 GHz Wideband GaN SSPA

Product Description

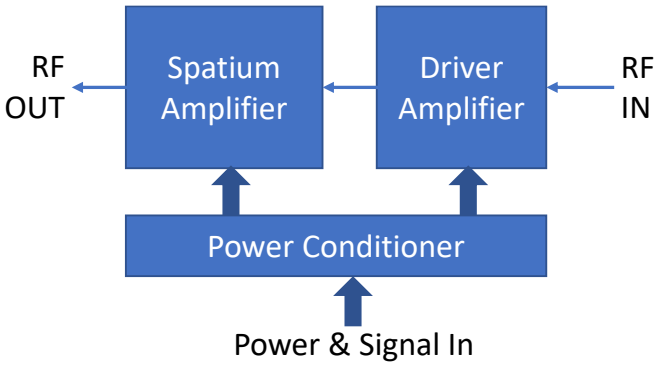
An excellent alternative to traveling wave tube amplifiers, Qorvo's Spatium™ QPR0220 is an integrated solid state, spatial-combining amplifier and driver amplifier with an operating range of 2–18 GHz while achieving 52.7 dBm (186 Watts) of instantaneous saturated power. With its maximum performance in output power, gain, efficiency, and power flatness, this Spatium is the ideal building block for microwave high power transmitters for EW and radar 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 wideband MMIC design along with our high-count combining techniques for a best in class solution to power amplification.



Output / Input

Functional Block Diagram



Product Features

- Frequency Range: 2 – 18 GHz
- Saturated Output Power: 52.7 dBm (P_{IN} = 15 dBm)
- Solid State MMIC Reliability
- Multi-Element Redundancy
- Instant On (no warm-up)

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

Applications

- TWTA Replacement

Ordering Information

Part No.	Description
QPR0220	2 – 18 GHz Spatium™ Amplifier

Absolute Maximum Ratings

Parameter	Value / Range
Prime Power (V_{DC})*	20 V
Drain Current (I_{D_DRIVE})	75 A
RF Input Power, max.	30 dBm
Storage Temperature	–40 to +85 °C

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.

* Rating for thermal reliability

Recommended Operating Conditions

Parameter	Value / Range
Drain Voltage (V_D)	18 V
Quiescent Drain Current (I_{DQ})	46 A
Operating Drain Current (I_D)	See data plots
Operating Temperature**	–40 to +71 °C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

** Refers to outside BASE surface temperature

Electrical Specifications

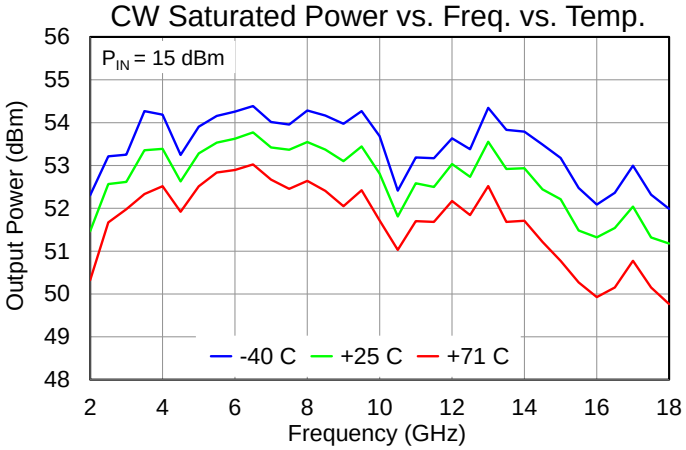
Test conditions unless otherwise noted: V_D = 18 V, I_{DQ} = 46 A, T_{BASE} = 25 °C, CW Operation

Parameter	Min	Typ	Max	Units
Frequency	2		18	GHz
Saturated P_{OUT}, CW (P_{IN} = 15 dBm)		52.7		dBm
Power-Added Efficiency, CW (P_{IN} = 15 dBm)		17.6		%
Power Gain, CW (P_{IN} = 15 dBm)		37.7		dB
Small Signal Gain		56.6		dB
Input Return Loss		15		dB
Switching Time (PW=500 ns, F=10 GHz, P_{IN}=15 dBm)				
ENABLE > 2.5 V to 90% RF (ON)		182	200	ns
ENABLE < 2.5 V to 10% RF (OFF)		148	200	ns
Second Harmonic, CW (In band, P_{IN} = 15 dBm)		–23		dBc
Third Harmonic, CW (In band, P_{IN} = 15 dBm)		–16		dBc
Input RF Interface		SMA (F)		
Output RF Interface		Type N (F)		
Weight		26.0 (11.79)		lbs. (kg)
Dimensions (L) x (W) x (H)		19.5 x 6.3 x 3.9		inches
		495.3 x 160.0 x 99.1		millimeters

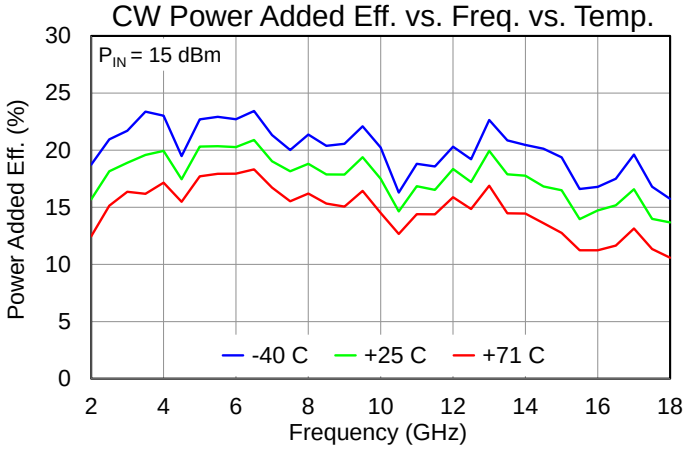
Typical Performance – Large Signal (CW)

Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, CW Operation. P_{IN} = 15 dBm

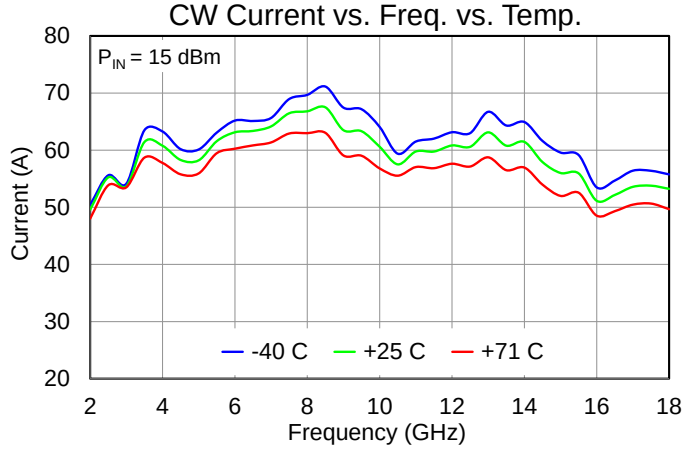
CW Saturated Power vs. Freq. vs. Temp.



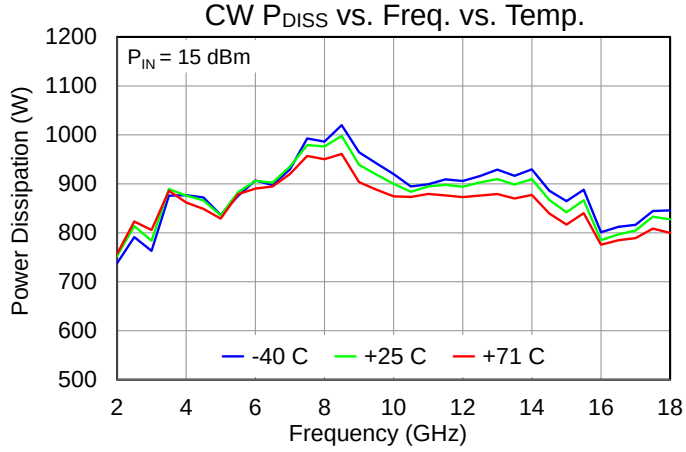
CW Power Added Eff. vs. Freq. vs. Temp.



CW Current vs. Freq. vs. Temp.

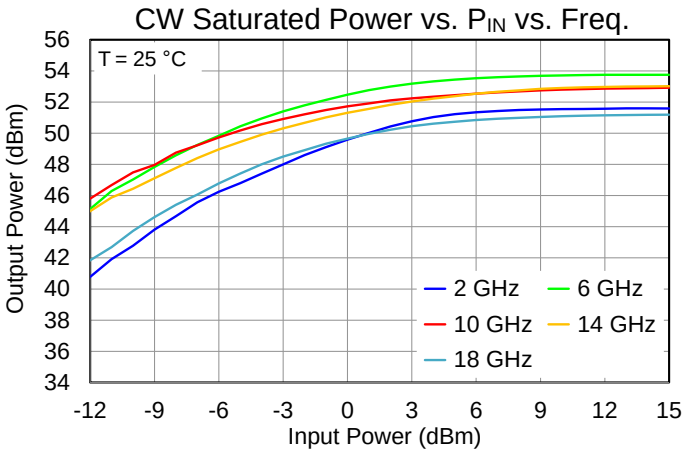


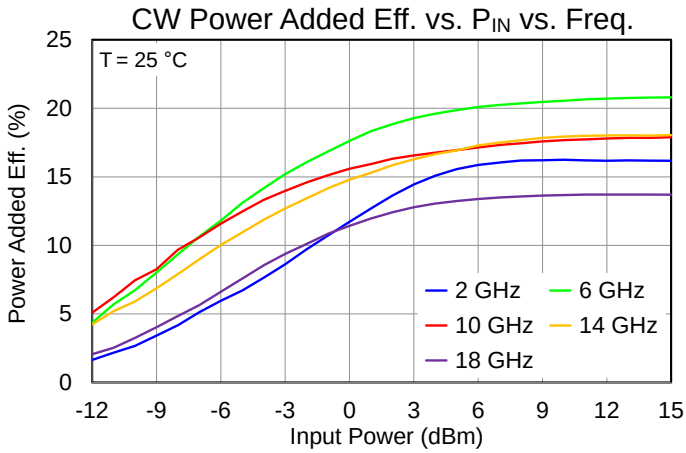
CW P_{DISS} vs. Freq. vs. Temp.

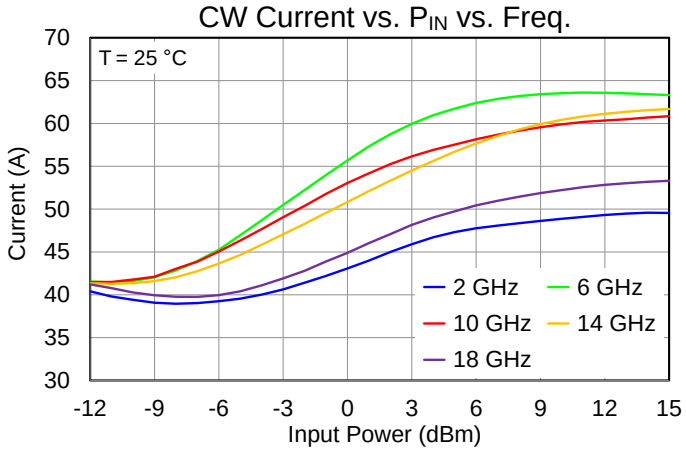


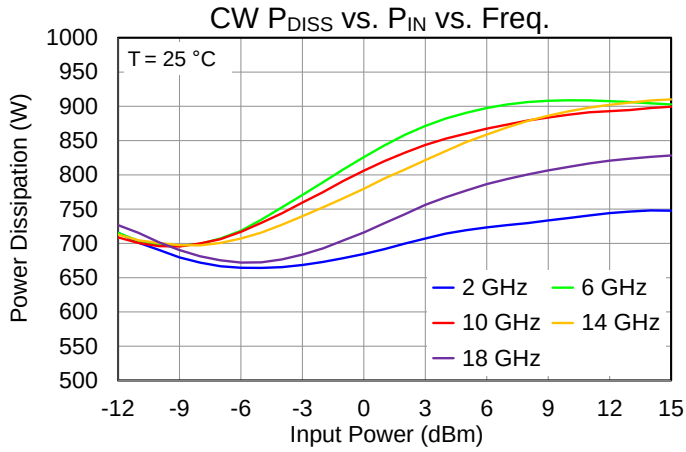
Typical Performance – Large Signal (CW)

Test conditions unless noted: V_D = 18 V, T_{BASE} = 25 °C, CW Operation





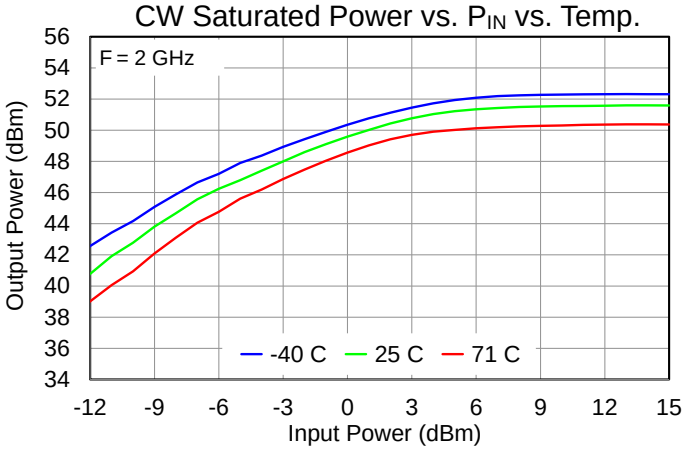




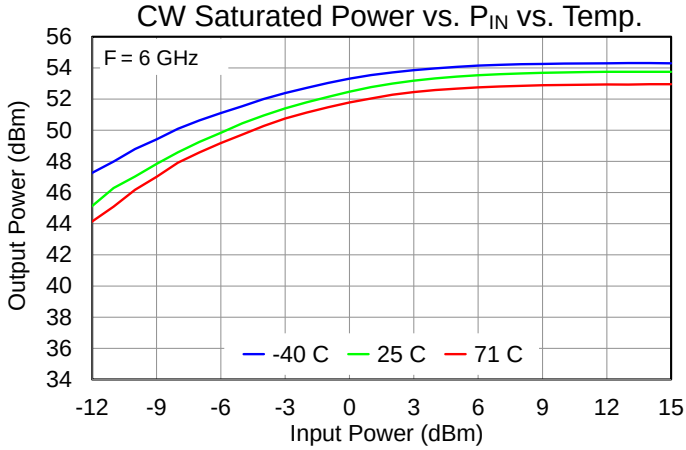
Typical Performance – Large Signal (CW)

Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, CW Operation

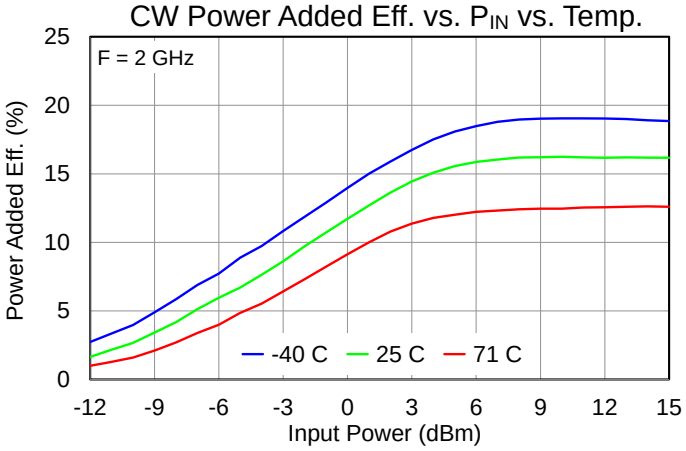
CW Saturated Power vs. P_{IN} vs. Temp.



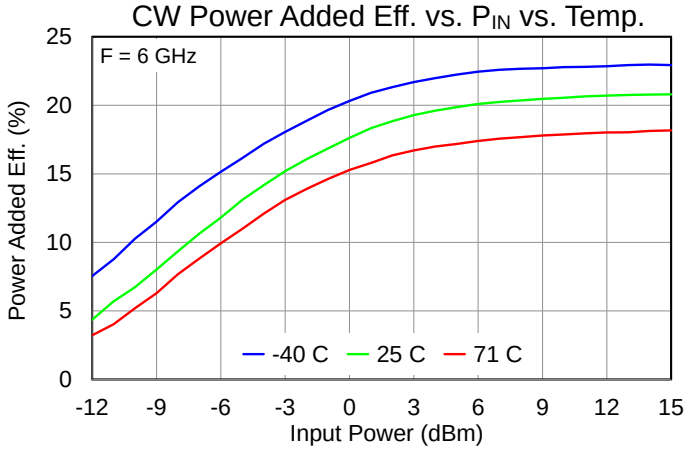
CW Saturated Power vs. P_{IN} vs. Temp.



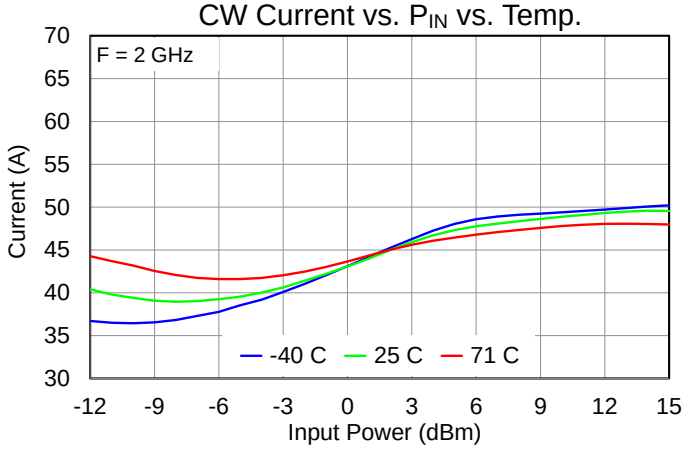
CW Power Added Eff. vs. P_{IN} vs. Temp.



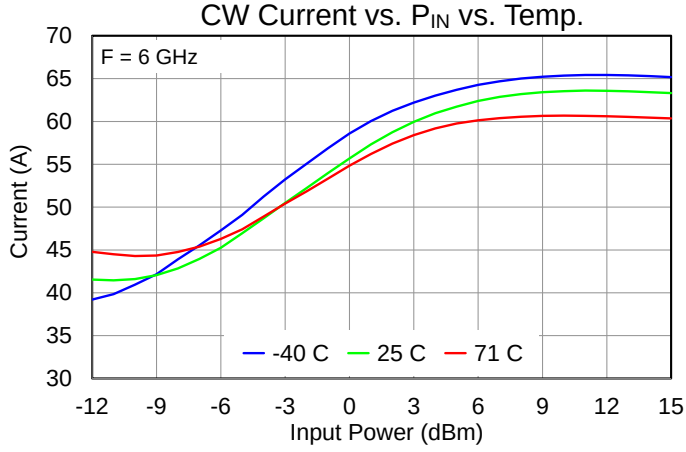
CW Power Added Eff. vs. P_{IN} vs. Temp.



CW Current vs. P_{IN} vs. Temp.



CW Current vs. P_{IN} vs. Temp.



Typical Performance – Large Signal (CW)

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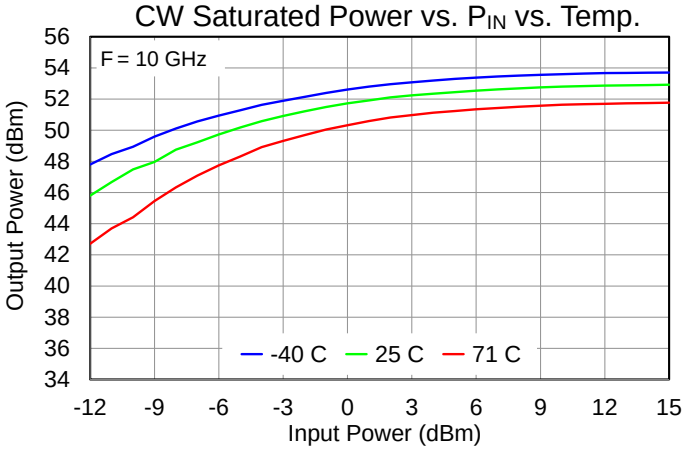
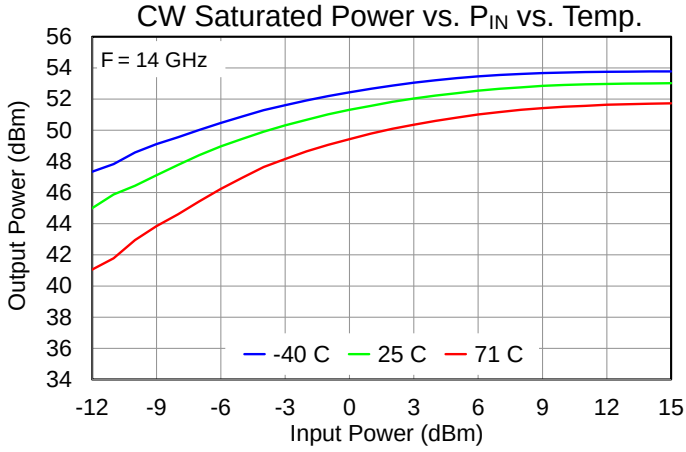
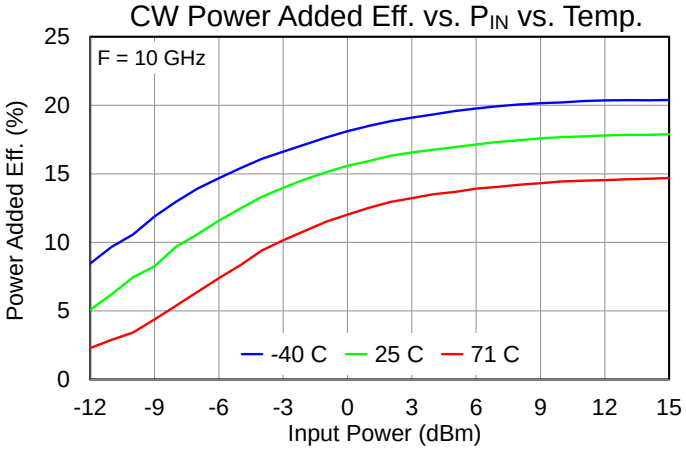
CW Saturated Power vs. P_{IN} vs. Temp.



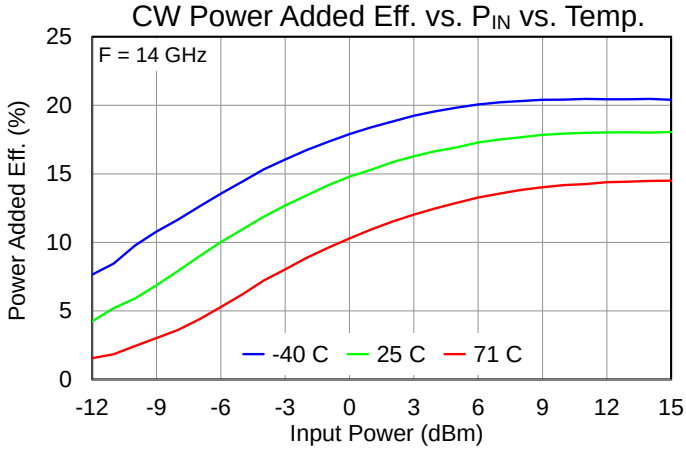
CW Saturated Power vs. P_{IN} vs. Temp.



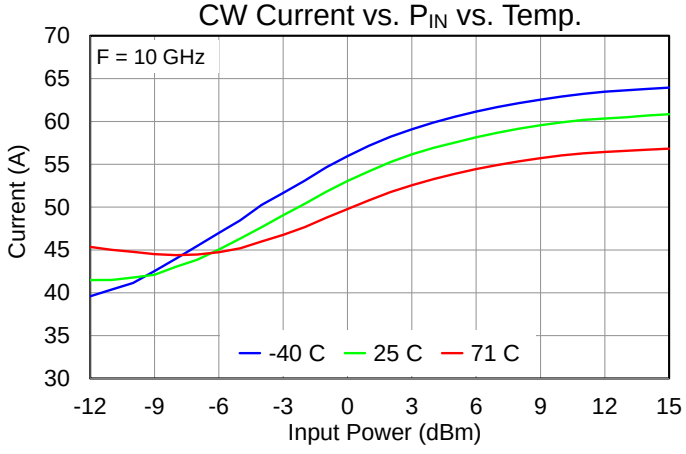
CW Power Added Eff. vs. P_{IN} vs. Temp.



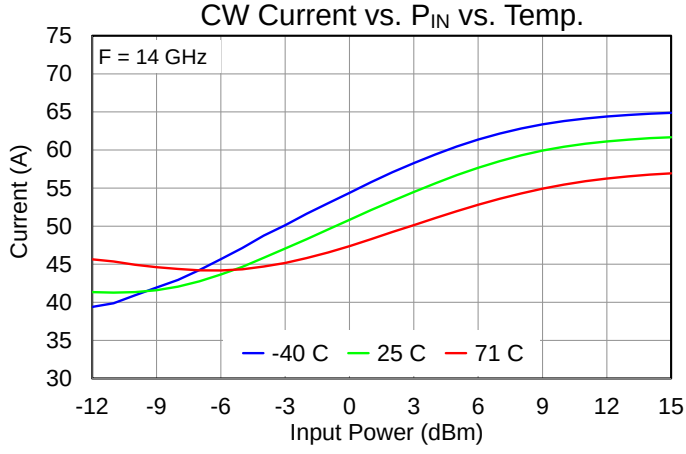
CW Power Added Eff. vs. P_{IN} vs. Temp.



CW Current vs. P_{IN} vs. Temp.



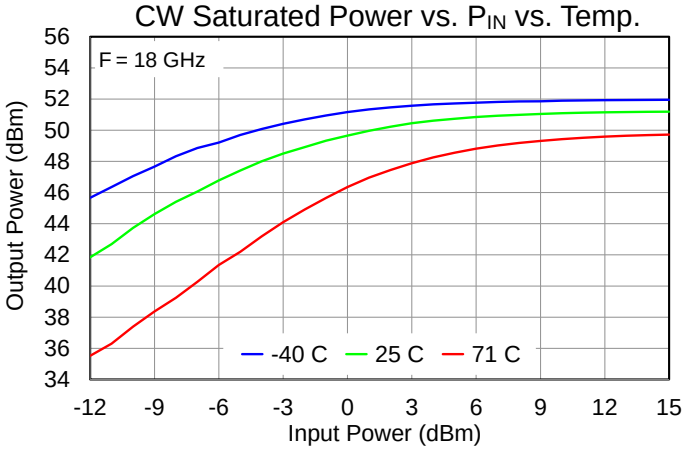
CW Current vs. P_{IN} vs. Temp.



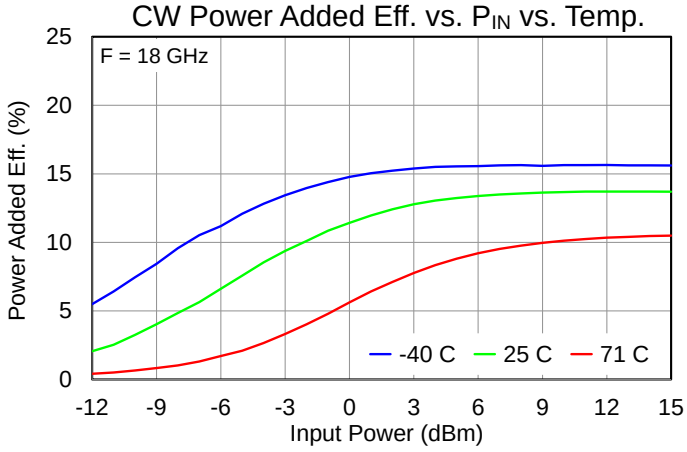
Typical Performance – Large Signal (CW)

Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, CW Operation

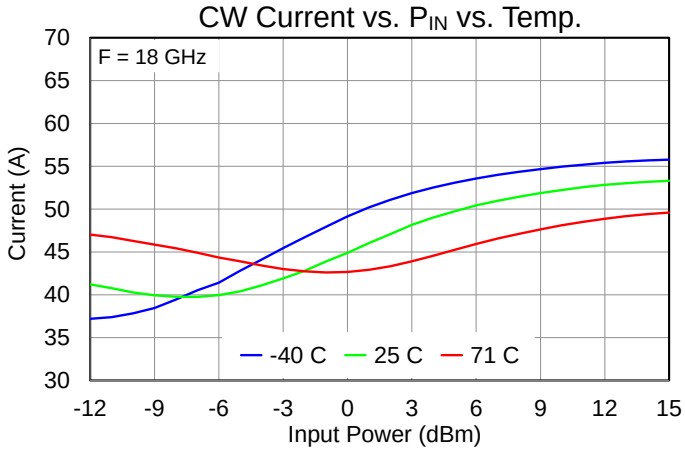
CW Saturated Power vs. P_{IN} vs. Temp.



CW Power Added Eff. vs. P_{IN} vs. Temp.

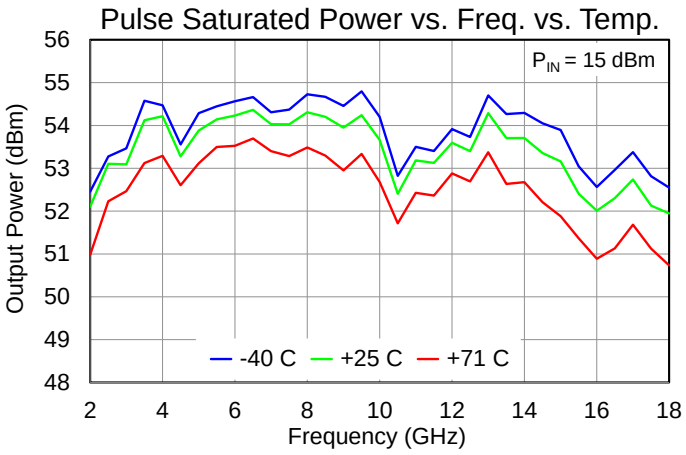


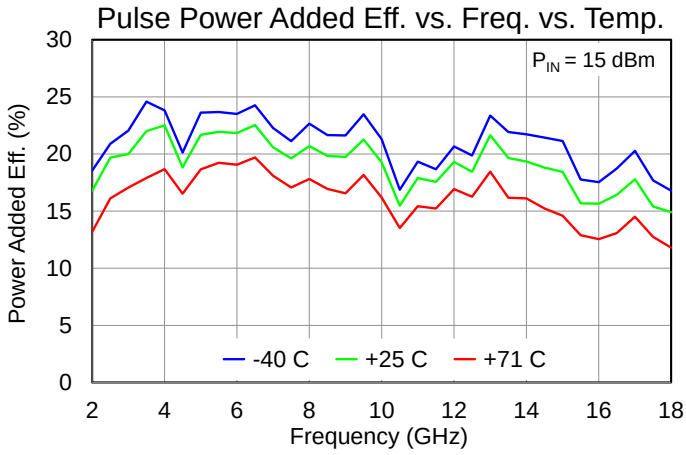
CW Current vs. P_{IN} vs. Temp.

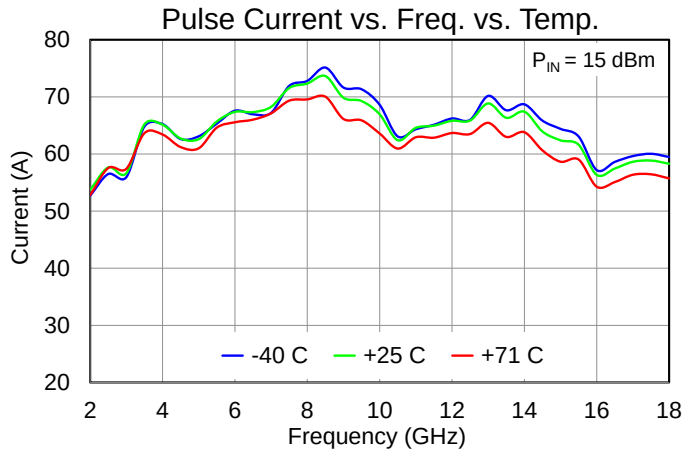


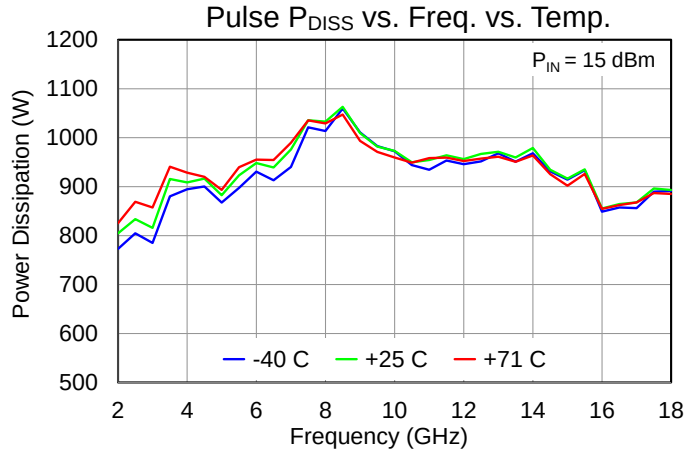
Typical Performance – Large Signal (Pulse)

Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, Pulse Width = 1 us, Duty Cycle 50%, P_{IN} = 15 dBm



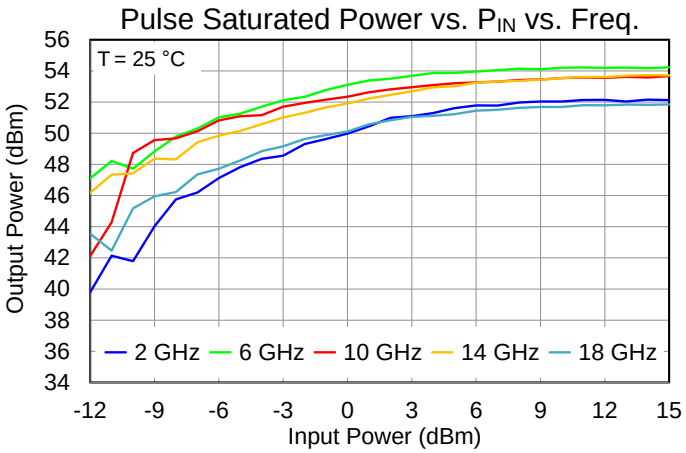


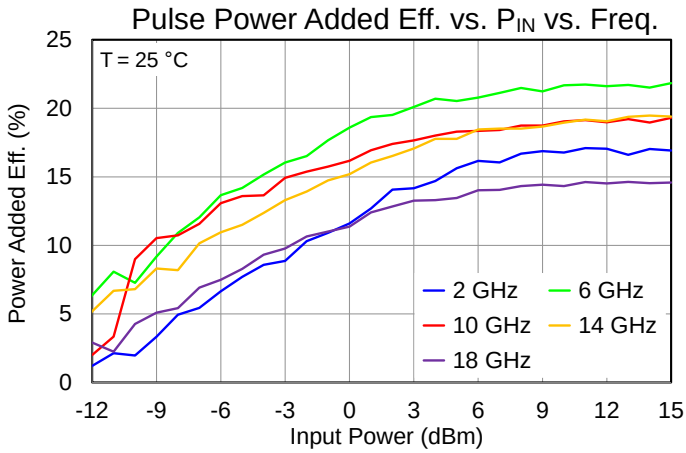


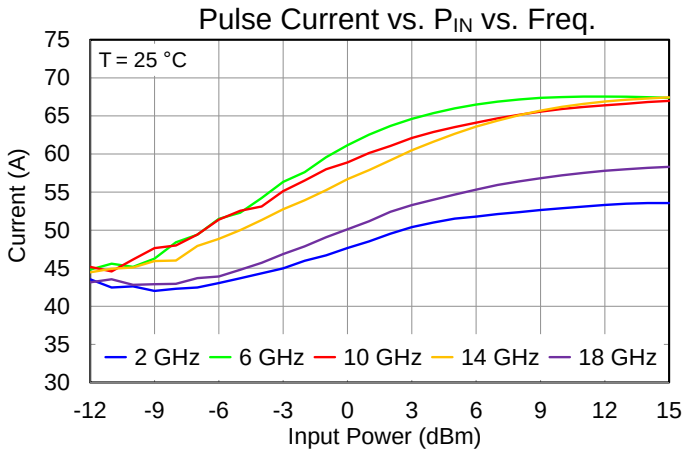


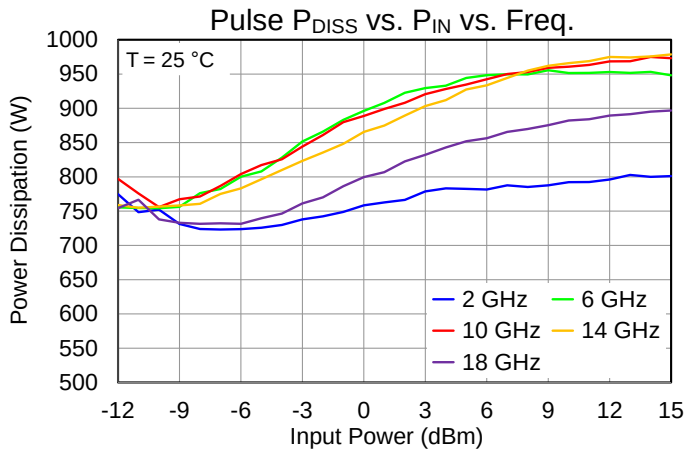
Typical Performance – Large Signal (Pulse)

Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, Pulse Width = 1 us, Duty Cycle 50%





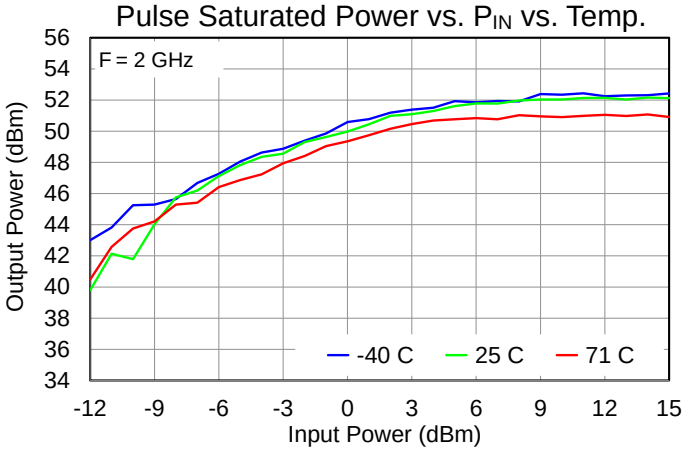




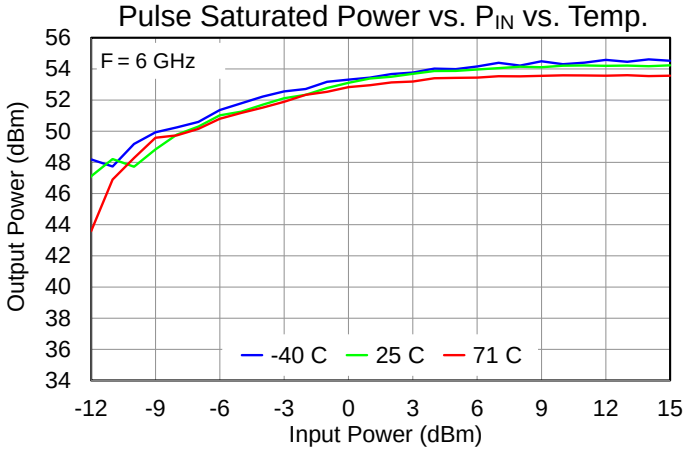
Typical Performance – Large Signal (Pulse)

Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, Pulse Width = 1 us, Duty Cycle 50%

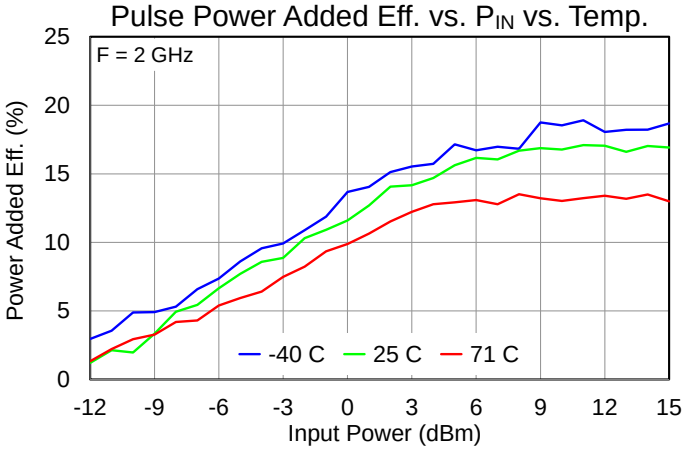
Pulse Saturated Power vs. P_{IN} vs. Temp.



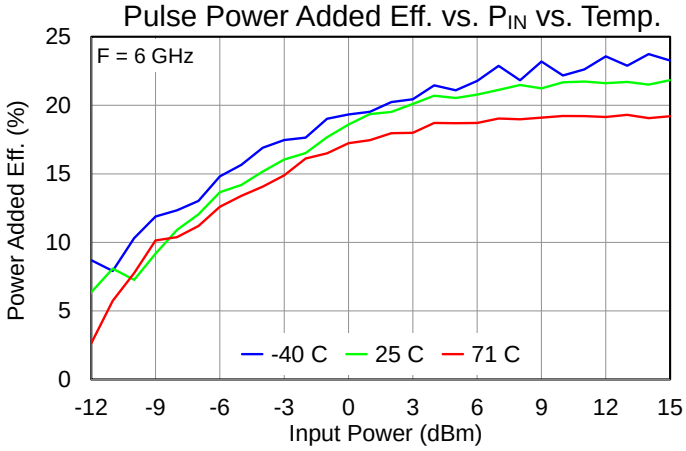
Pulse Saturated Power vs. P_{IN} vs. Temp.



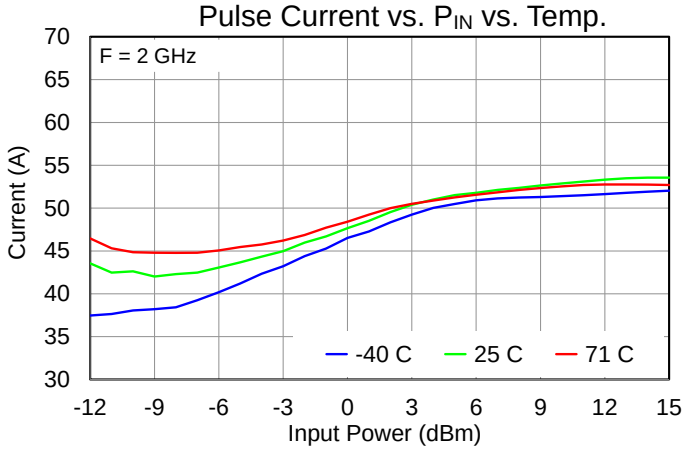
Pulse Power Added Eff. vs. P_{IN} vs. Temp.



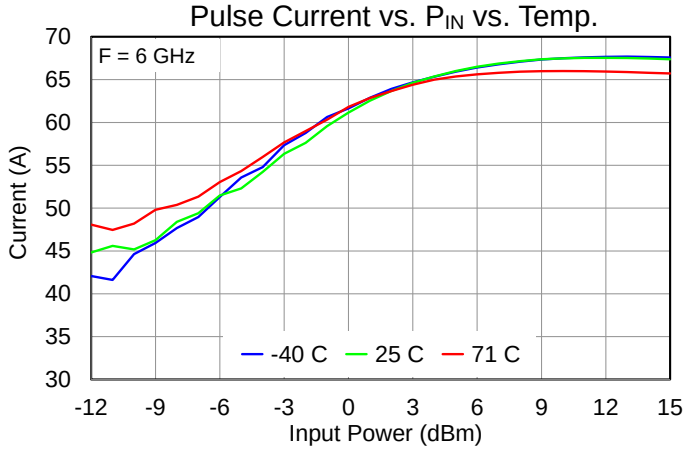
Pulse Power Added Eff. vs. P_{IN} vs. Temp.



Pulse Current vs. P_{IN} vs. Temp.

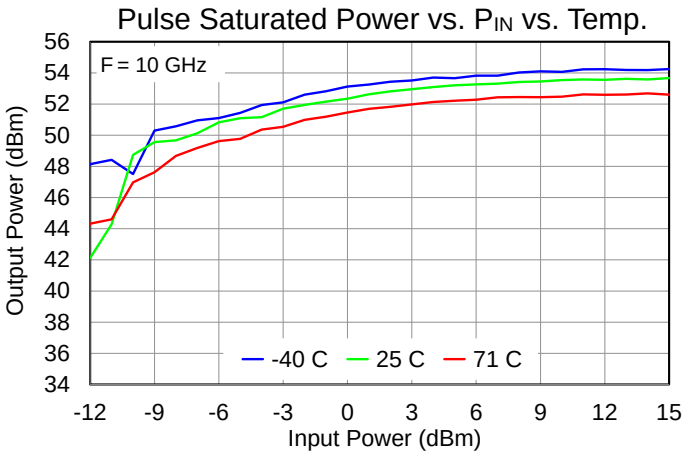


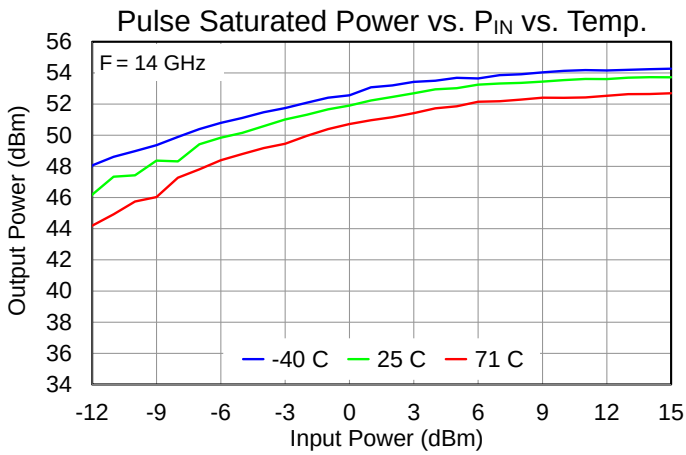
Pulse Current vs. P_{IN} vs. Temp.

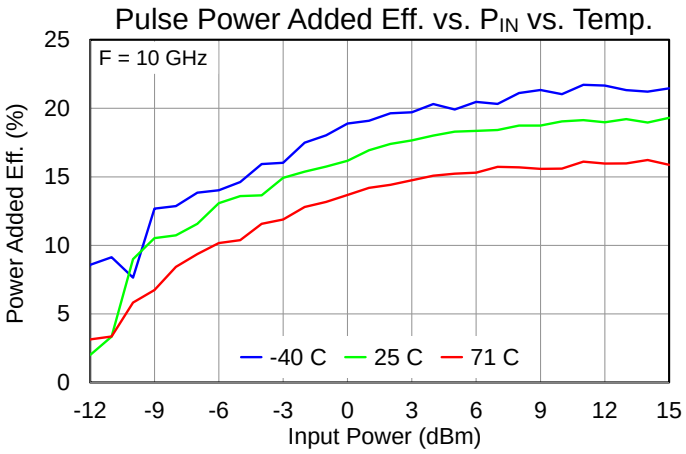


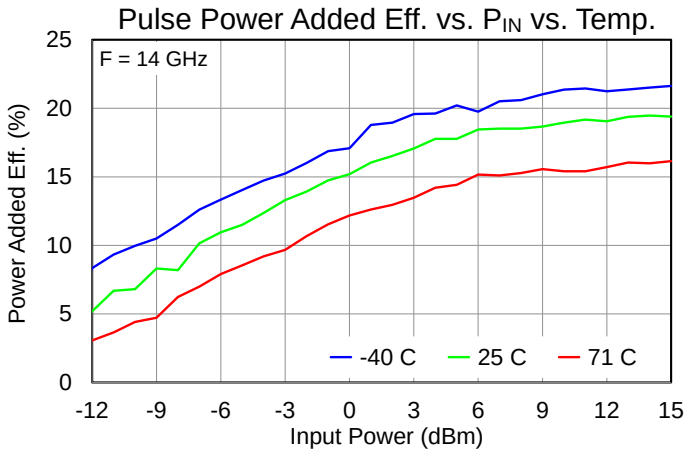
Typical Performance – Large Signal (Pulse)

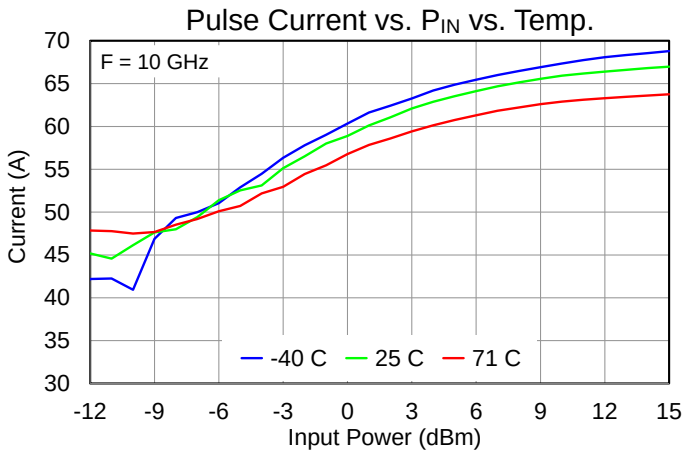
Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, Pulse Width = 1 us, Duty Cycle 50%

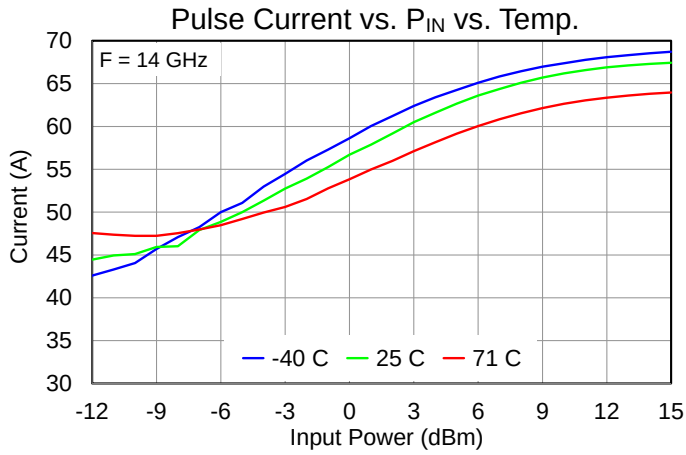






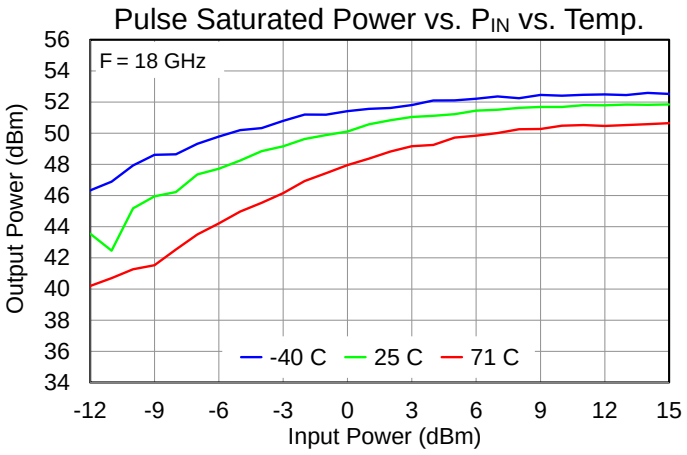


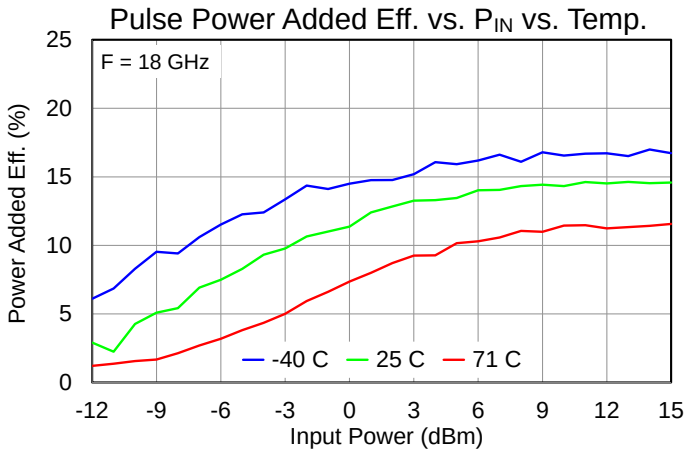


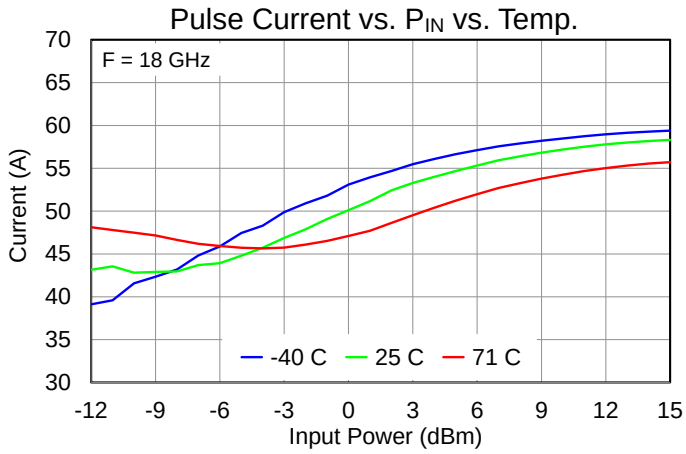


Typical Performance – Large Signal (Pulse)

Test conditions unless noted: V_D = 18 V, T_{BASE} = as shown, Pulse Width = 1 us, Duty Cycle 50%



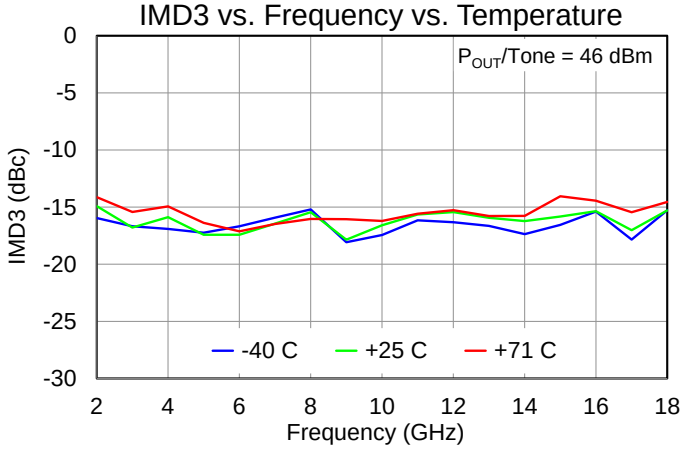




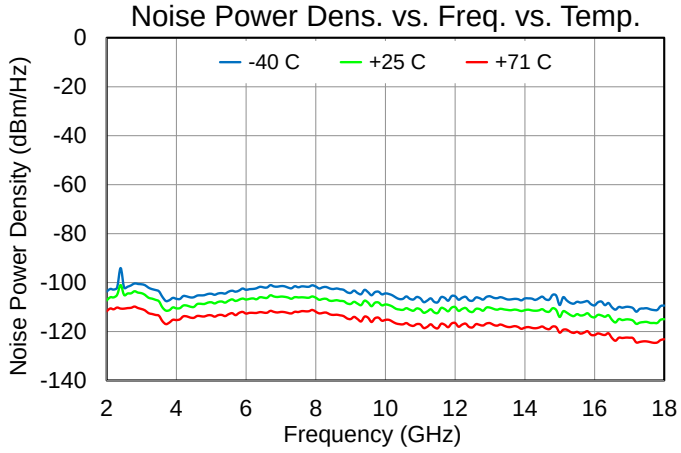
Typical Performance – Linearity (CW)

Test conditions unless otherwise noted: V_D = 18 V, T_{BASE} = as shown, Tone Separation = 100 MHz

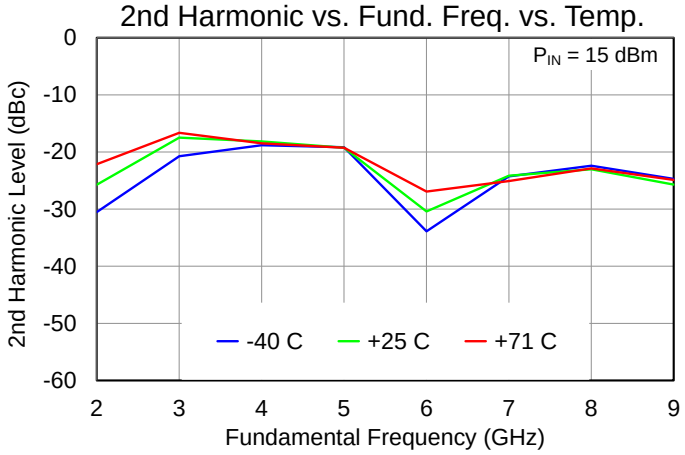
IMD3 vs. Frequency vs. Temperature



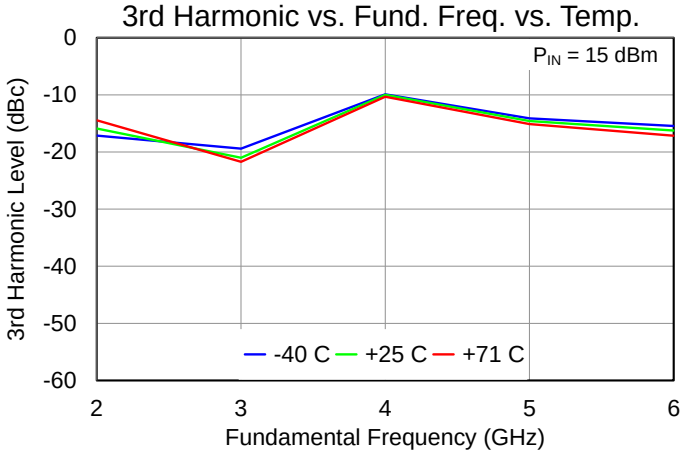
Noise Power Dens. vs. Freq. vs. Temp.



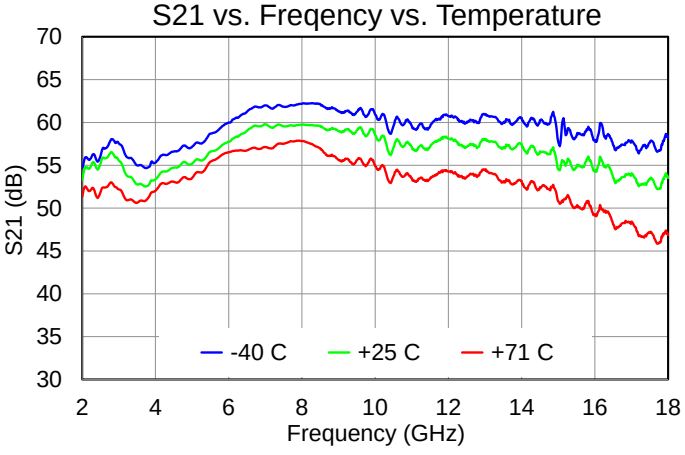
2nd Harmonic vs. Fund. Freq. vs. Temp.



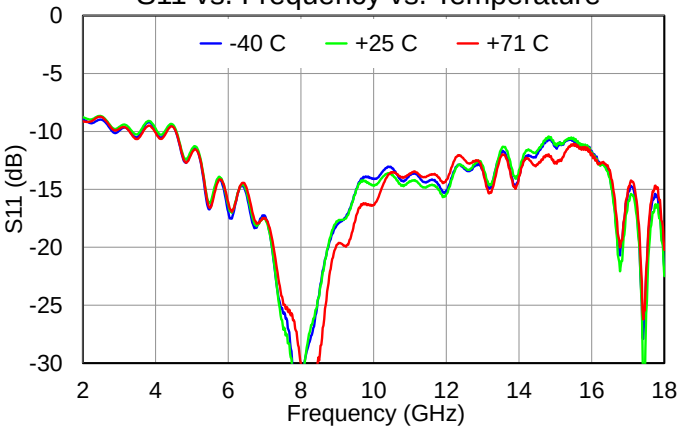
3rd Harmonic vs. Fund. Freq. vs. Temp.



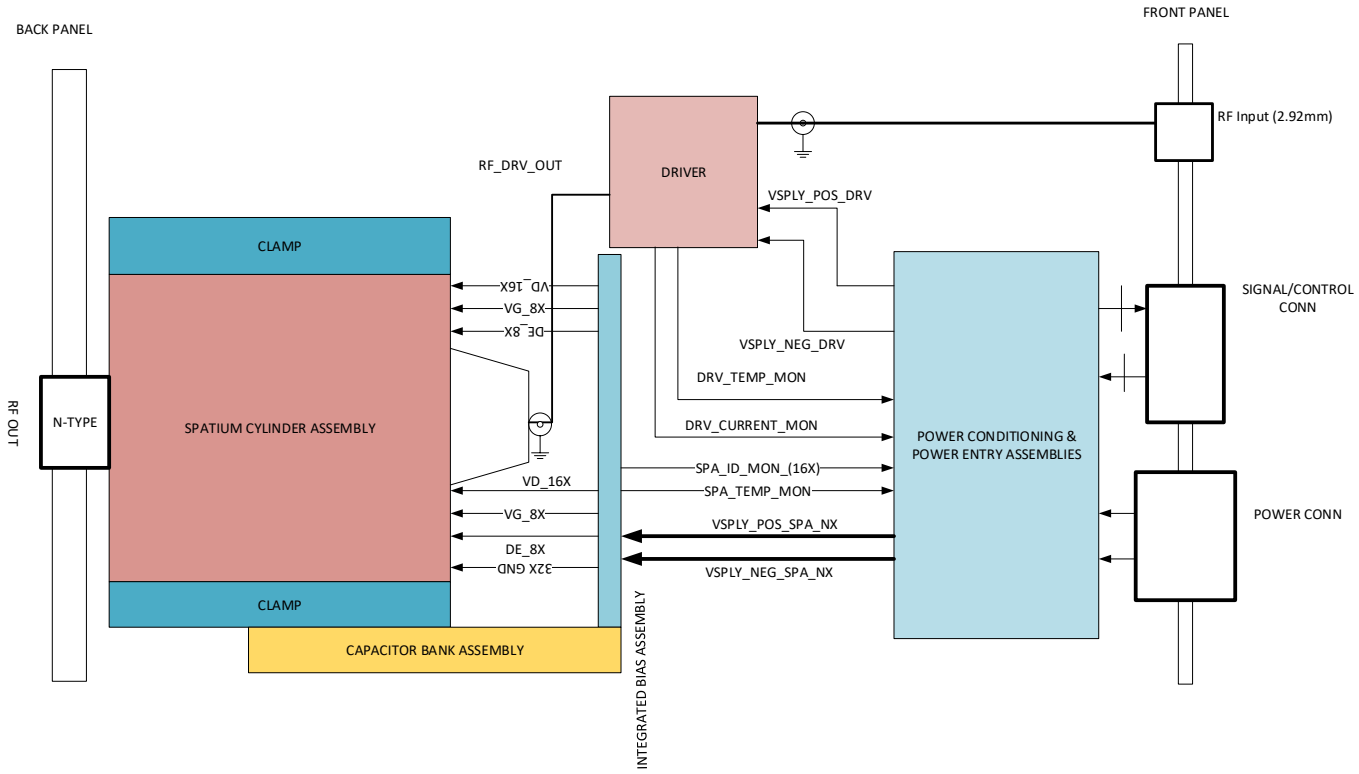
S21 vs. Freqency vs. Temperature



S11 vs. Frequency vs. Temperature

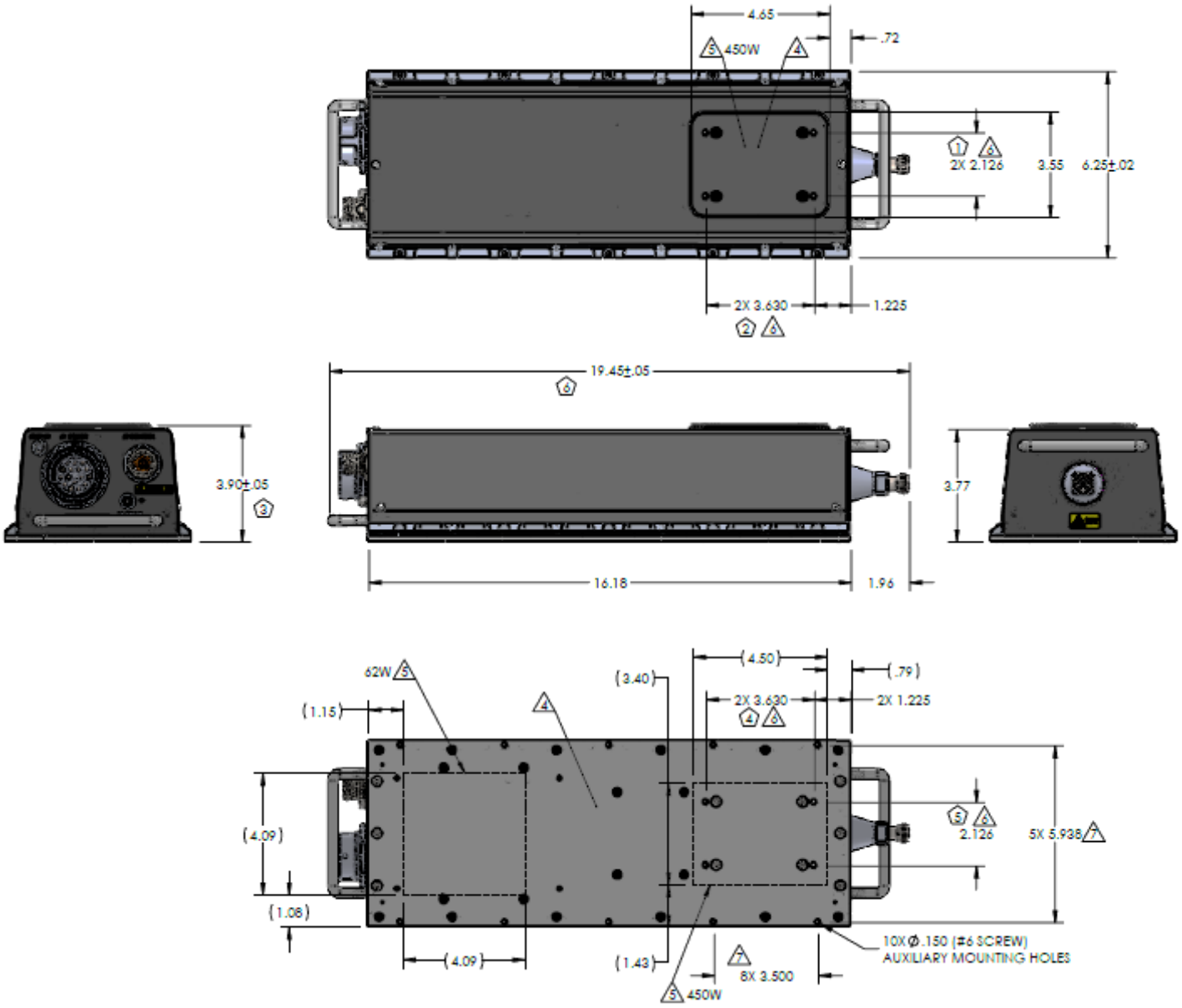


Block Diagram and Description



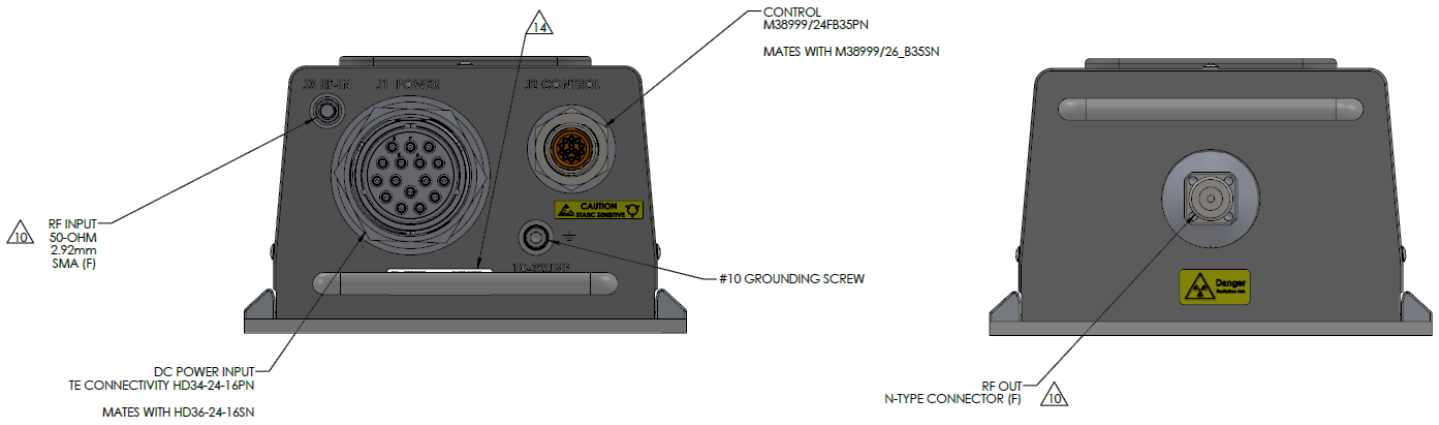
Pin No.	Label	Description
RF In	RF INPUT	2.92 mm (F) Coaxial RF Input
RF Out	RF OUTPUT	Type N (F) Coaxial RF Output
DC Power Input Connector	J1 POWER	TE CONNECTIVITY HD34-24-16PN
Control Input Connector	J2 CONTROL	D38999/24FB35PN

Mechanical Information – Unit Outline Drawing



Dimensions are in INCHES

Mechanical Information – Outline Drawing



Dimensions are in INCHES

TABLE 1	
J1 POWER CONNECTOR	
REF DES	TYPE
J1-A	+18VDC
J1-D	+18VDC
J1-E	+18VDC
J1-F	+18VDC
J1-G	+18VDC
J1-H	+18VDC
J1-R	+18VDC
J1-S	+18VDC
J1-B	DC RTN
J1-C	DC RTN
J1-J	DC RTN
J1-K	DC RTN
J1-L	DC RTN
J1-M	DC RTN
J1-N	DC RTN
J1-P	DC RTN

TABLE 2		
J2 CONTROL CONNECTOR		
REF DES	FUNCTION	SIGNAL
J2-1	RESET	TTL
J2-2	SIGNAL GND	GROUND
J2-3	SYS ENABLE	TTL
J2-4	PHASE CNTRL 1	N/C
J2-5	PHASE CNTRL 3	N/C
J2-6	SIGNAL GND	GROUND
J2-7	SPA FAULT	TTL
J2-8	DRV FAULT	TTL
J2-9	SPA TEMP	-40°C = 3.2V, 25°C = 2.3V, 71°C = 1.7V*
J2-10	DRV TEMP	-40°C = 3.2V, 25°C = 2.3V, 71°C = 1.7V*
J2-11	PHASE CNTRL2	N/C
J2-12	PHASE CNTRL 4	N/C
J2-13	PHASE CNTRL 5	N/C

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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