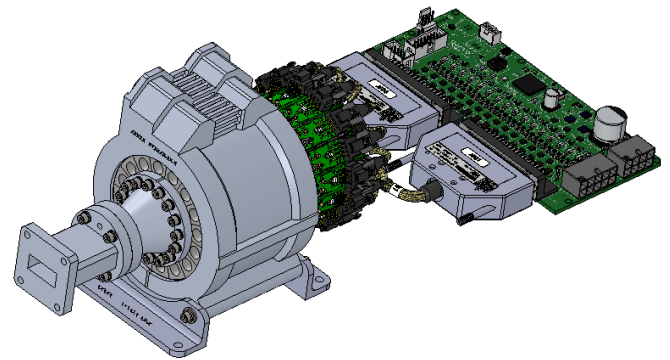


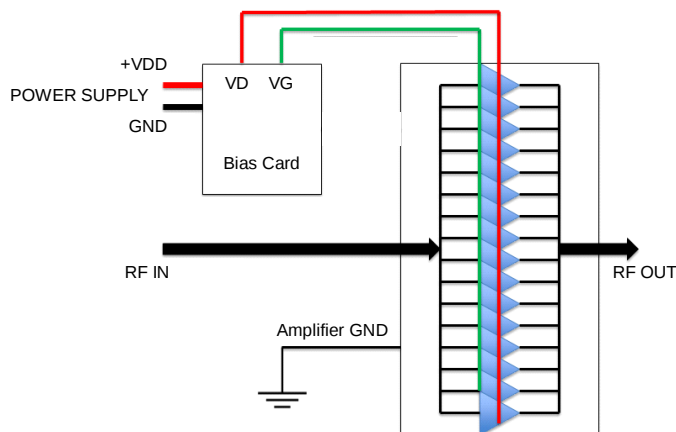
Product Description

An excellent alternative to traveling wave tube amplifiers, Qorvo's Spatium™ QPB1024 is a solid state, spatial-combining amplifier with an operating range of 8.0–11.0 GHz while achieving greater than 57 dBm (500 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 military and commercial applications. Liquid cooling capability provides excellent thermal management and reliable operation.

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.



Functional Block Diagram



Product Features

- Frequency Range: 8.0 – 11.0 GHz
- Saturated Output Power: > 57 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
QPB1024	8.0 – 11.0 GHz Spatium™ Amplifier

Absolute Maximum Ratings

Parameter	Value / Range
Prime Power (V_{DC})*	30 V
Drain Current (I_{D_DRIVE})	115 A
Output VSWR	3:1
RF Input Power, max.	43 dBm
Storage Temperature	-40 to +85 °C
Coolant Inlet Pressure	80 PSI

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)	28 V
Quiescent Drain Current (I_{DQ})	10.4 A
Operating Drain Current (I_D at P_{SAT})	72 A
Ambient Operating Temperature	-40 to +75 °C
Coolant Input Temperature	0 to +26 °C
Coolant Flow Rate	1.0 to 3.4 GPM

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

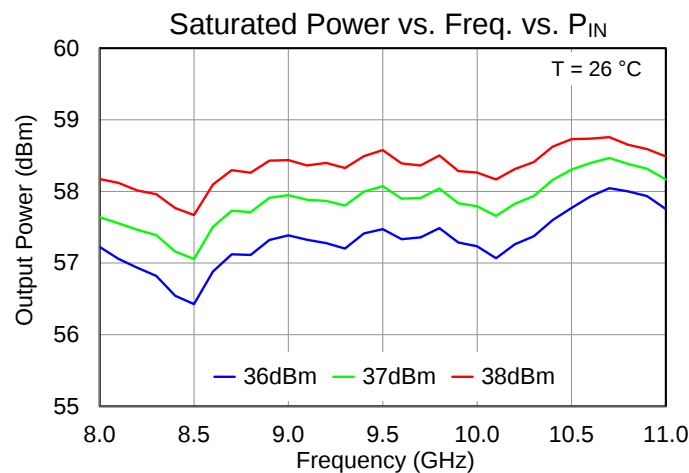
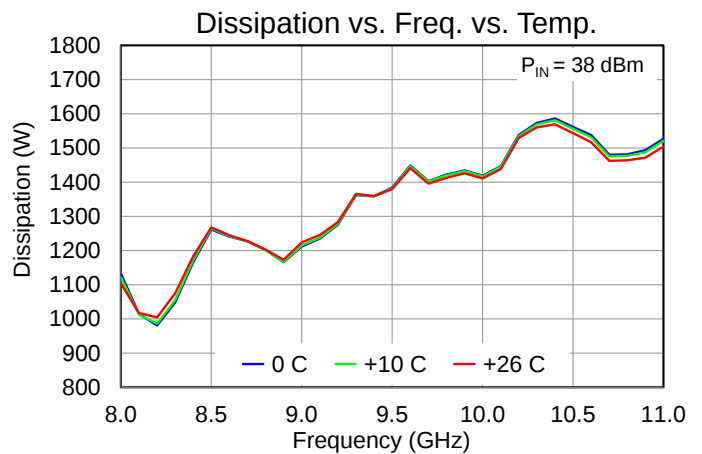
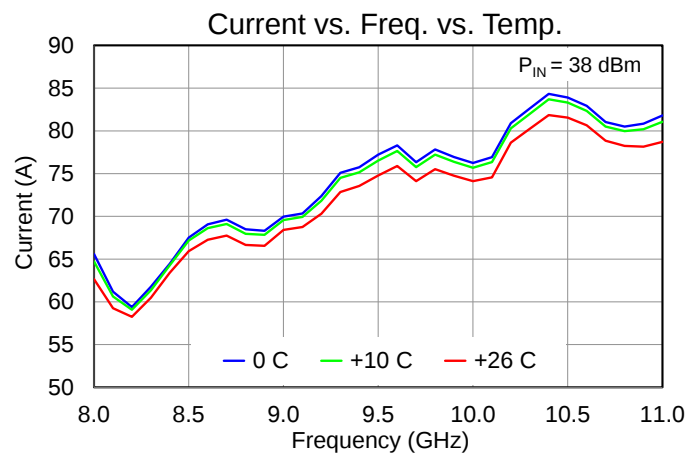
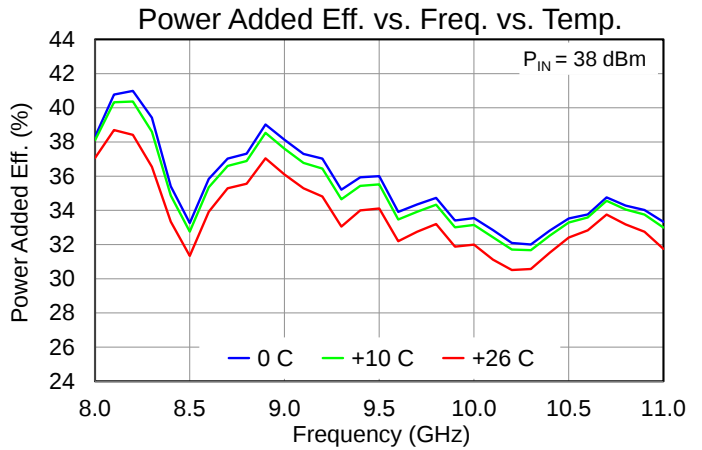
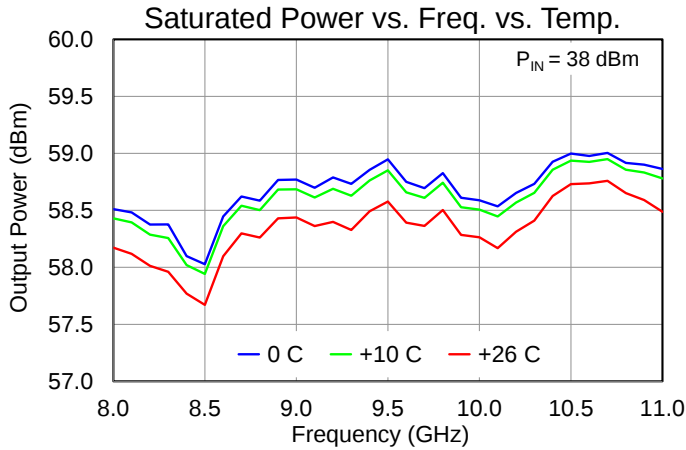
Electrical Specifications

Test conditions unless otherwise noted: $V_D = 28$ V, $I_{DQ} = 10.4$ A, $P_{IN} = 38$ dBm, $T_{COOLANT} = 26$ °C, CW Operation

Parameter	Min	Typ	Max	Units
Frequency	8		11	GHz
Saturated P_{OUT} , CW ($P_{IN} = 38$ dBm)		58.3		dBm
Power-Added Efficiency, CW ($P_{IN} = 38$ dBm)		33.8		%
Power Gain, CW ($P_{IN} = 38$ dBm)		20.3		dB
Small Signal Gain		≥ 26.6		dB
Input Return Loss		≥ 10		dB
Output Return Loss		≥ 10		dB
IMD3, CW (10 MHz spacing, $P_{OUT/TONE} = 49$ dBm)		≤ -28		dBc
IMD5, CW (10 MHz spacing, $P_{OUT/TONE} = 49$ dBm)		≤ -35		dBc
Input RF Interface	SMA(F)			
Output RF Interface	WR90 Waveguide / UG39/U Flange			
Weight (Amplifier Unit, Bias Card, Cable, Coolant)	12.0 (5.44)			lbs. (kg)
Dimensions – Amplifier Unit (L) x (W) x (H)	9.4 x 5.5 x 5.0			inches
	238.8 x 139.7 x 127.0			millimeters

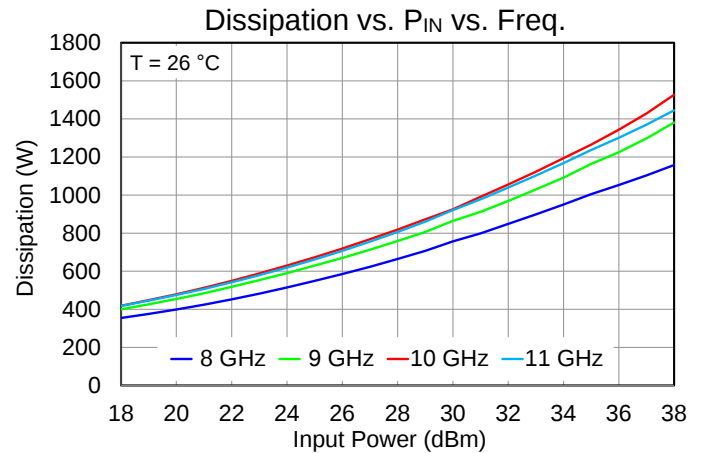
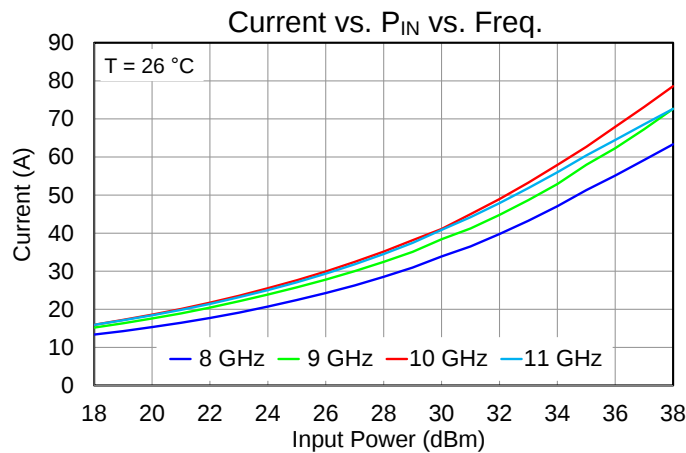
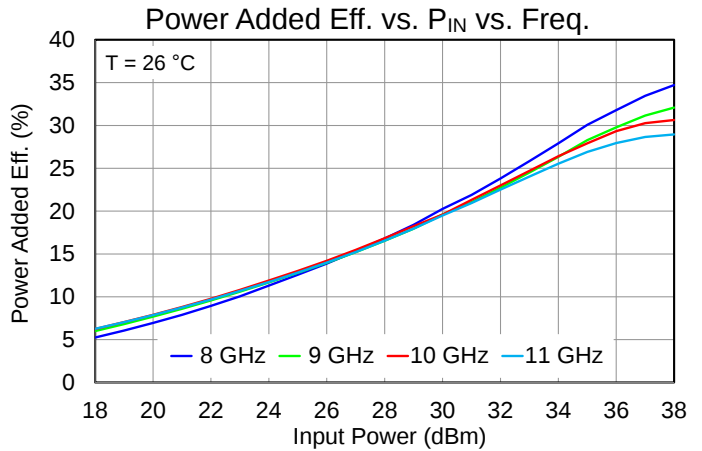
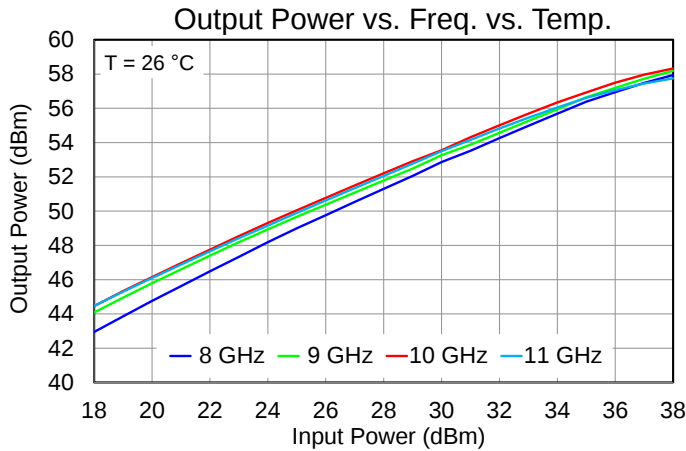
Typical Performance – Large Signal (CW)

Test conditions unless otherwise noted: $V_D = 28\text{ V}$, $I_{DQ} = 10.4\text{ A}$, $P_{IN} = 38\text{ dBm}$, $T_{COOLANT} = 26\text{ }^{\circ}\text{C}$, CW Operation



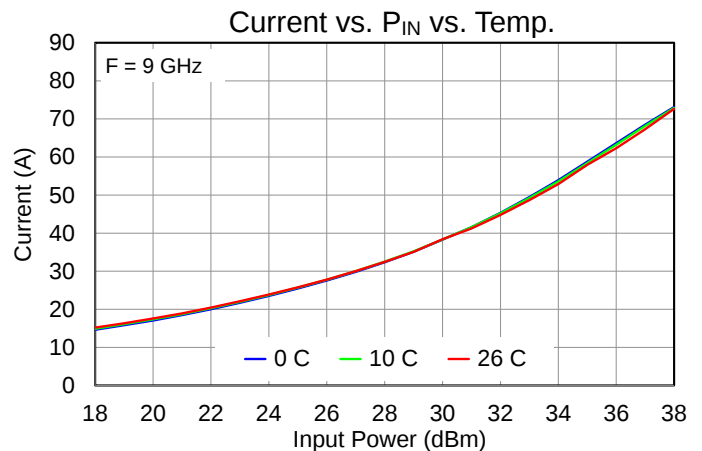
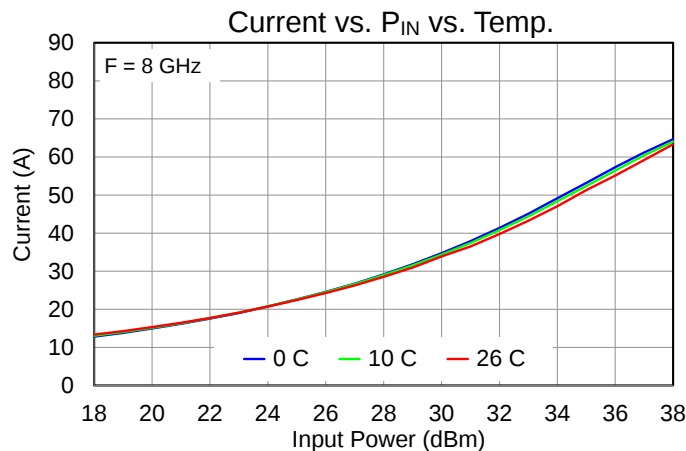
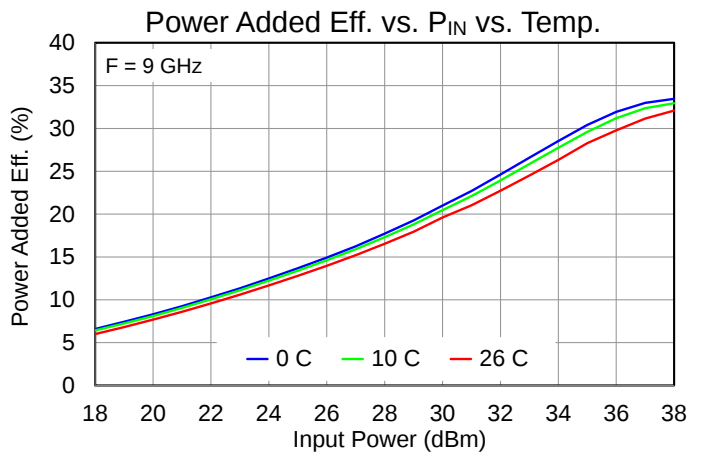
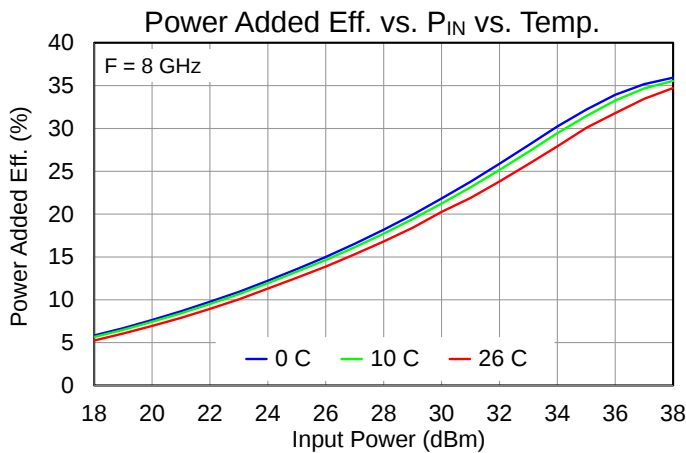
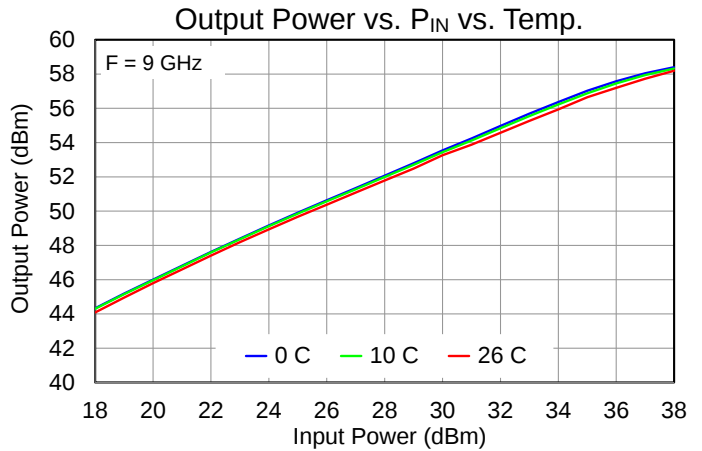
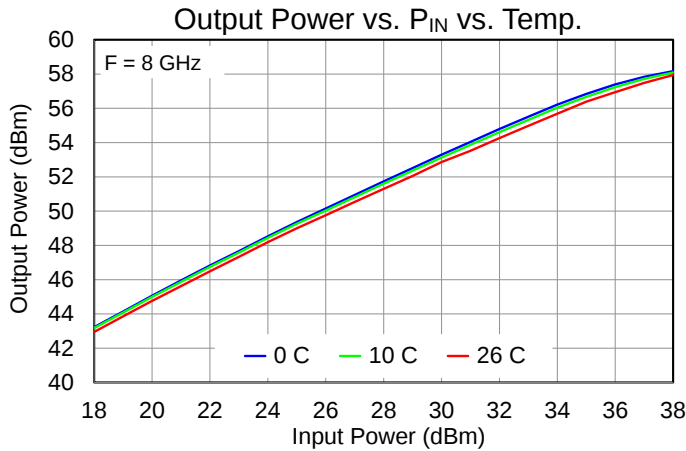
Typical Performance – Large Signal (CW)

Test conditions unless otherwise noted: $V_D = 28\text{ V}$, $I_{DQ} = 10.4\text{ A}$, Pulsed $P_{IN} = 38\text{ dBm}$, $T_{COOLANT} = 26\text{ }^{\circ}\text{C}$, $PW = 10\text{ }\mu\text{s}$, $DC = 10\%$



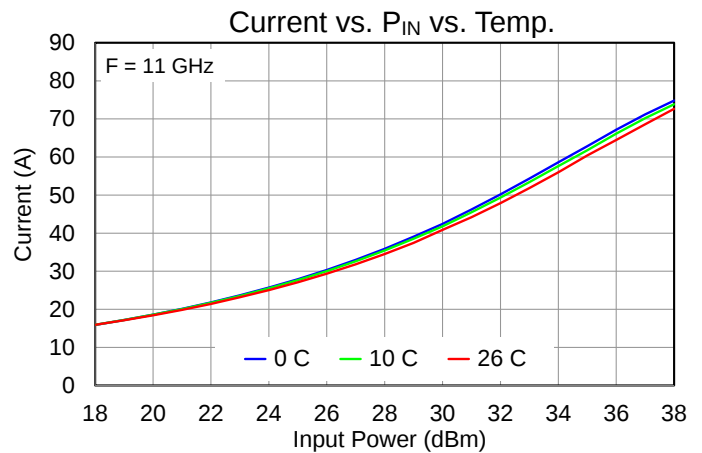
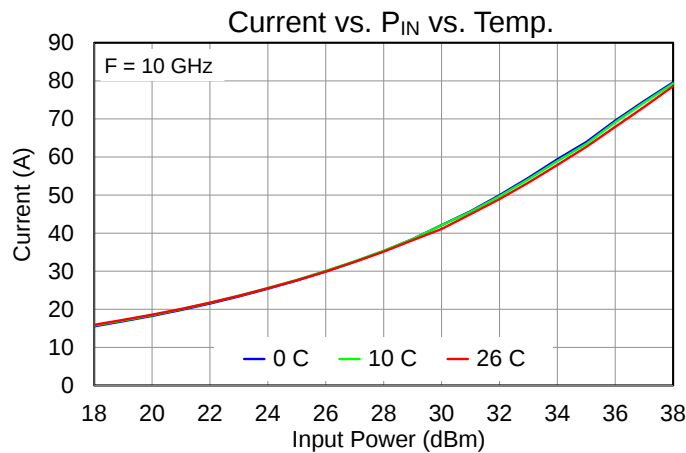
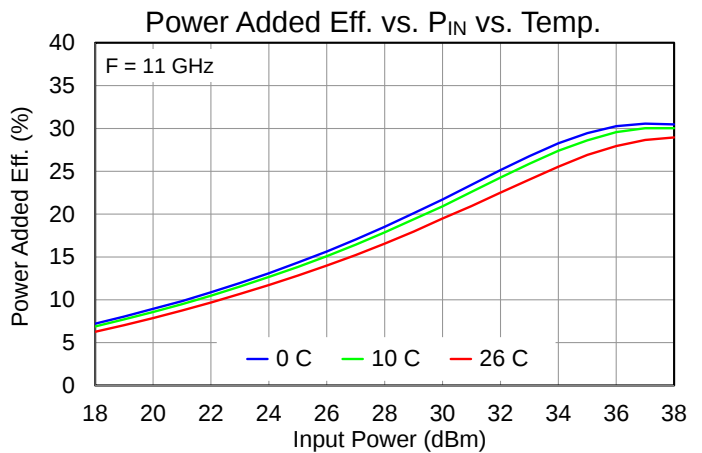
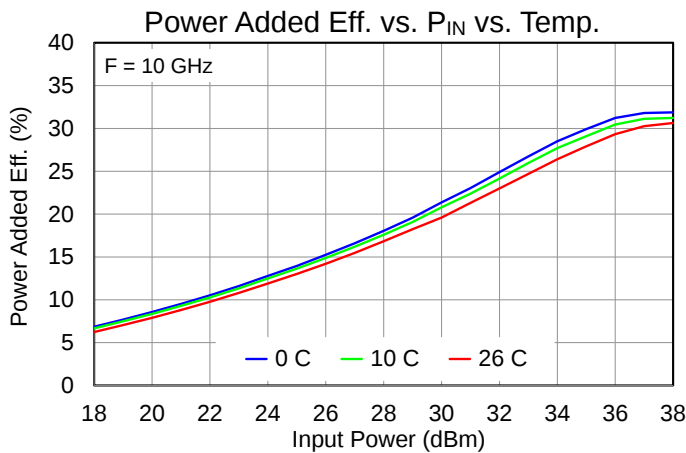
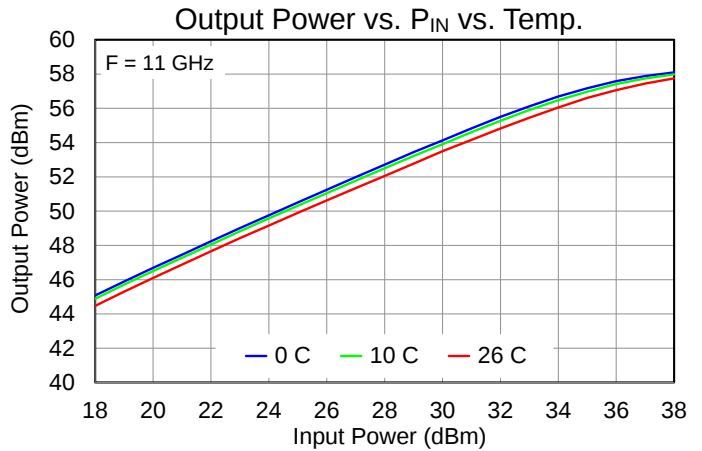
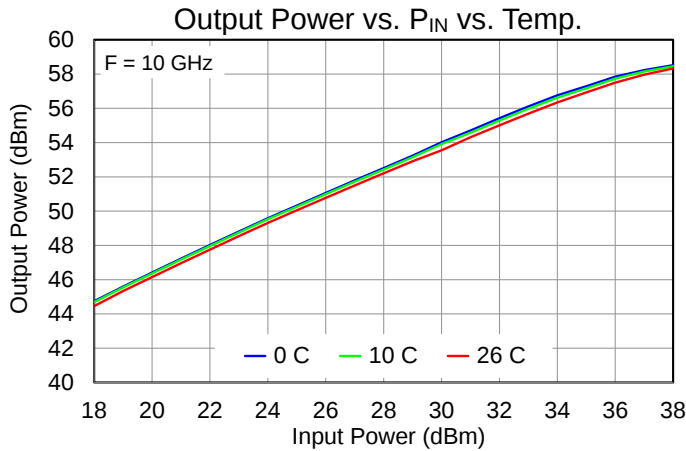
Typical Performance – Large Signal (CW)

Test conditions unless otherwise noted: $V_D = 28\text{ V}$, $I_{DQ} = 10.4\text{ A}$, Pulsed $P_{IN} = 38\text{ dBm}$, $T_{COOLANT} = 26\text{ }^{\circ}\text{C}$, $PW = 10\text{ }\mu\text{s}$, $DC = 10\%$



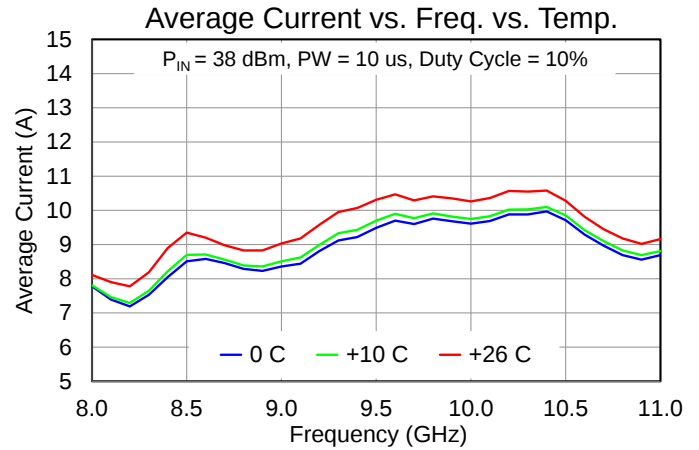
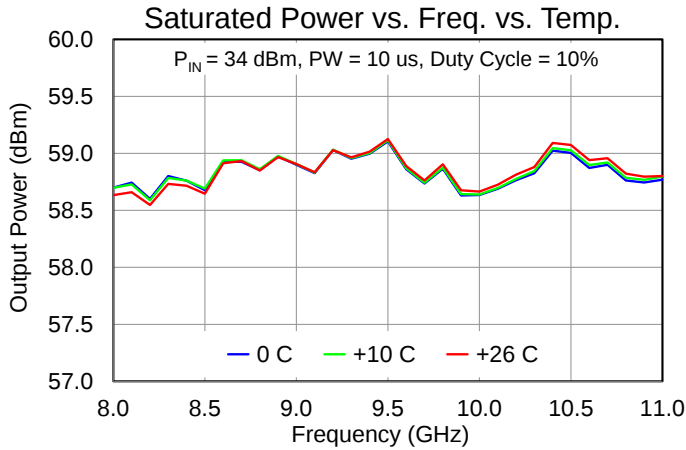
Typical Performance – Large Signal (CW)

Test conditions unless otherwise noted: $V_D = 28\text{ V}$, $I_{DQ} = 10.4\text{ A}$, Pulsed $P_{IN} = 38\text{ dBm}$, $T_{COOLANT} = 26\text{ }^\circ\text{C}$, $PW = 10\text{ }\mu\text{s}$, $DC = 10\%$



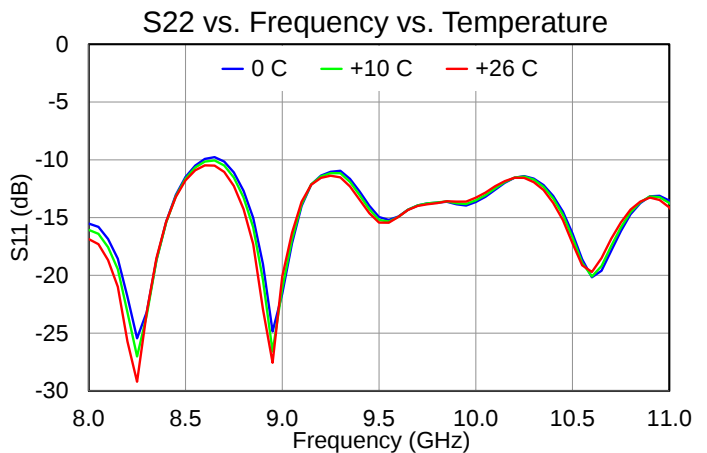
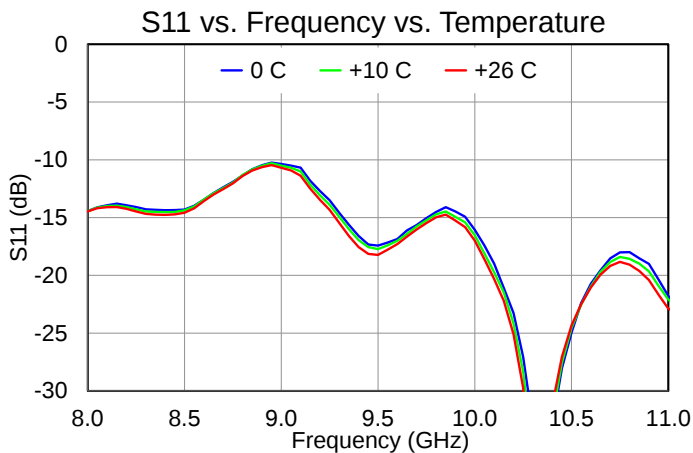
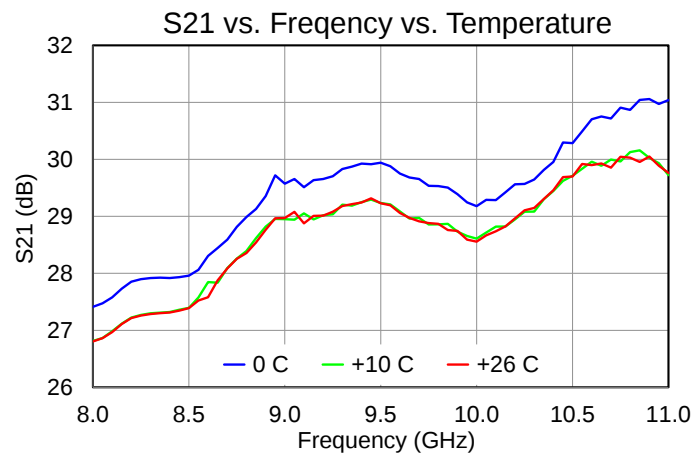
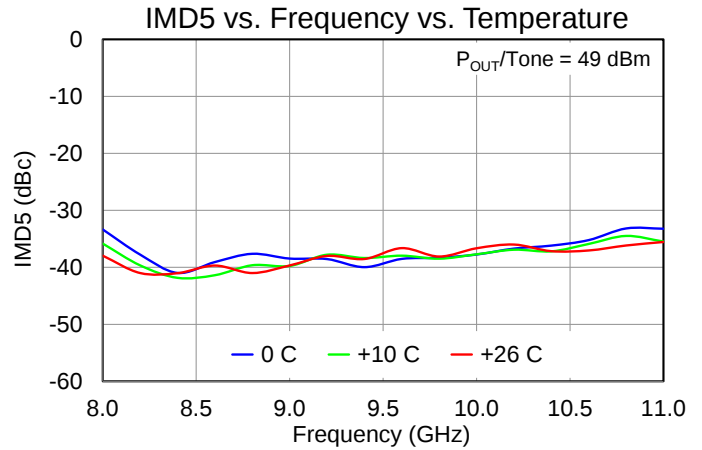
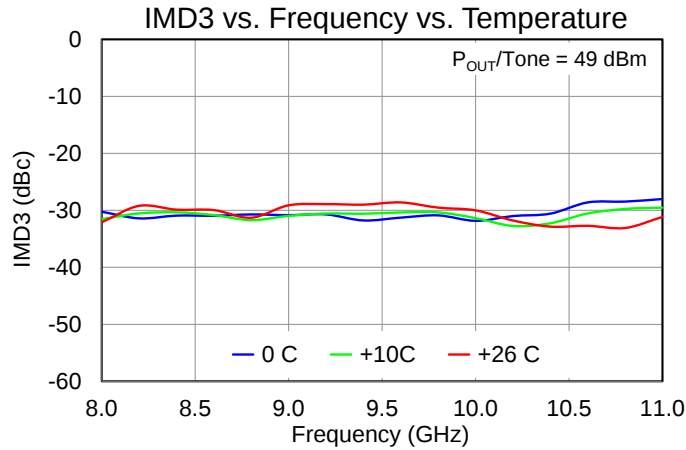
Typical Performance – Large Signal (Pulse)

Test conditions unless otherwise noted: $V_D = 28$ V, $I_{DQ} = 10.4$ A, Pulsed $P_{IN} = 38$ dBm, $T_{COOLANT} = 26$ °C, $PW = 10$ μ s, $DC = 10\%$



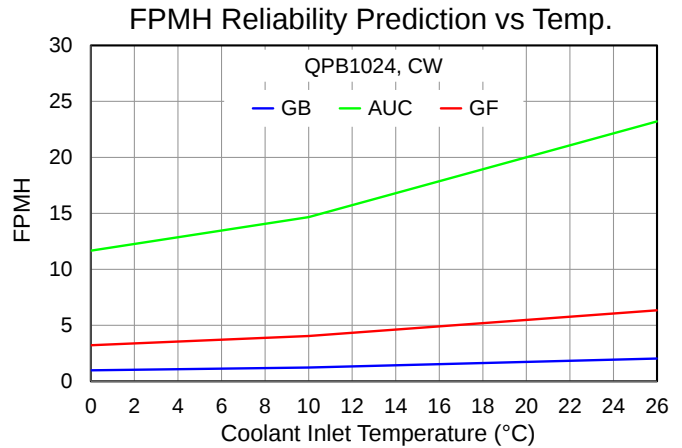
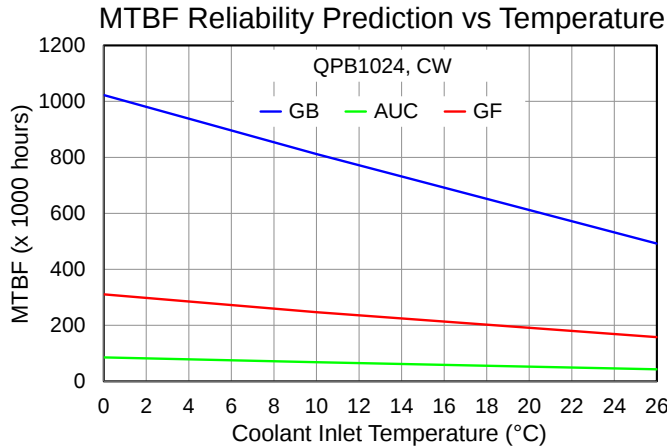
Typical Performance – Linearity, S-Parameters

Test conditions unless otherwise noted: $V_D = 28\text{ V}$, $I_{DQ} = 10.4\text{ A}$, $T_{\text{COOLANT}} = 26\text{ }^{\circ}\text{C}$, CW Operation, 10 MHz Tone Spacing

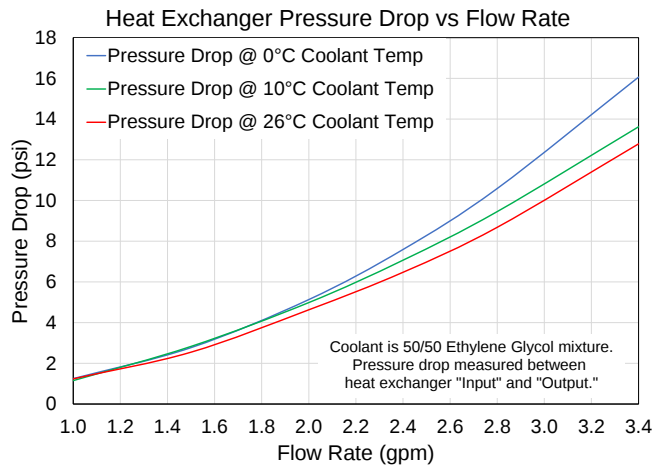


Typical Performance – Reliability

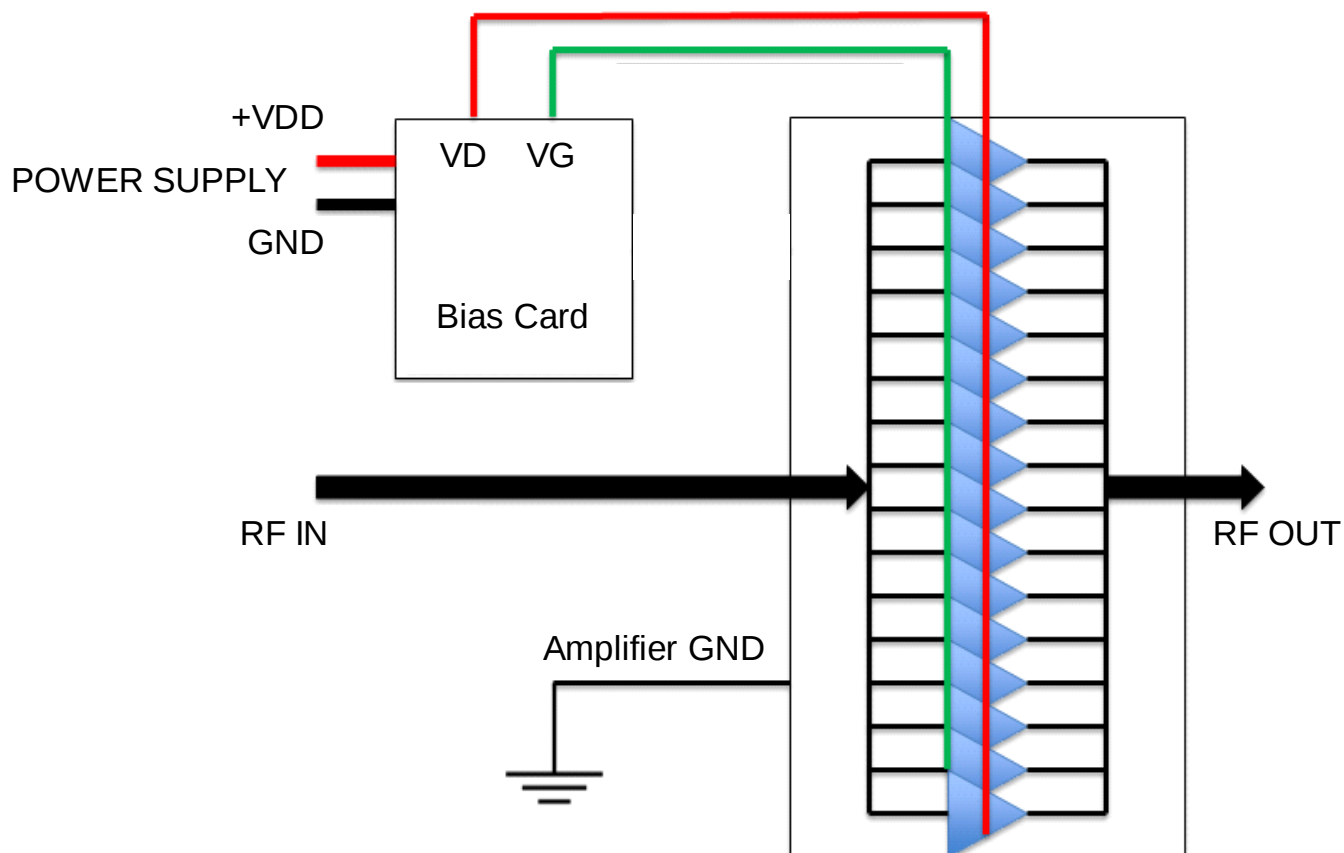
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Typical Performance – Heat Exchanger Pressure Drop

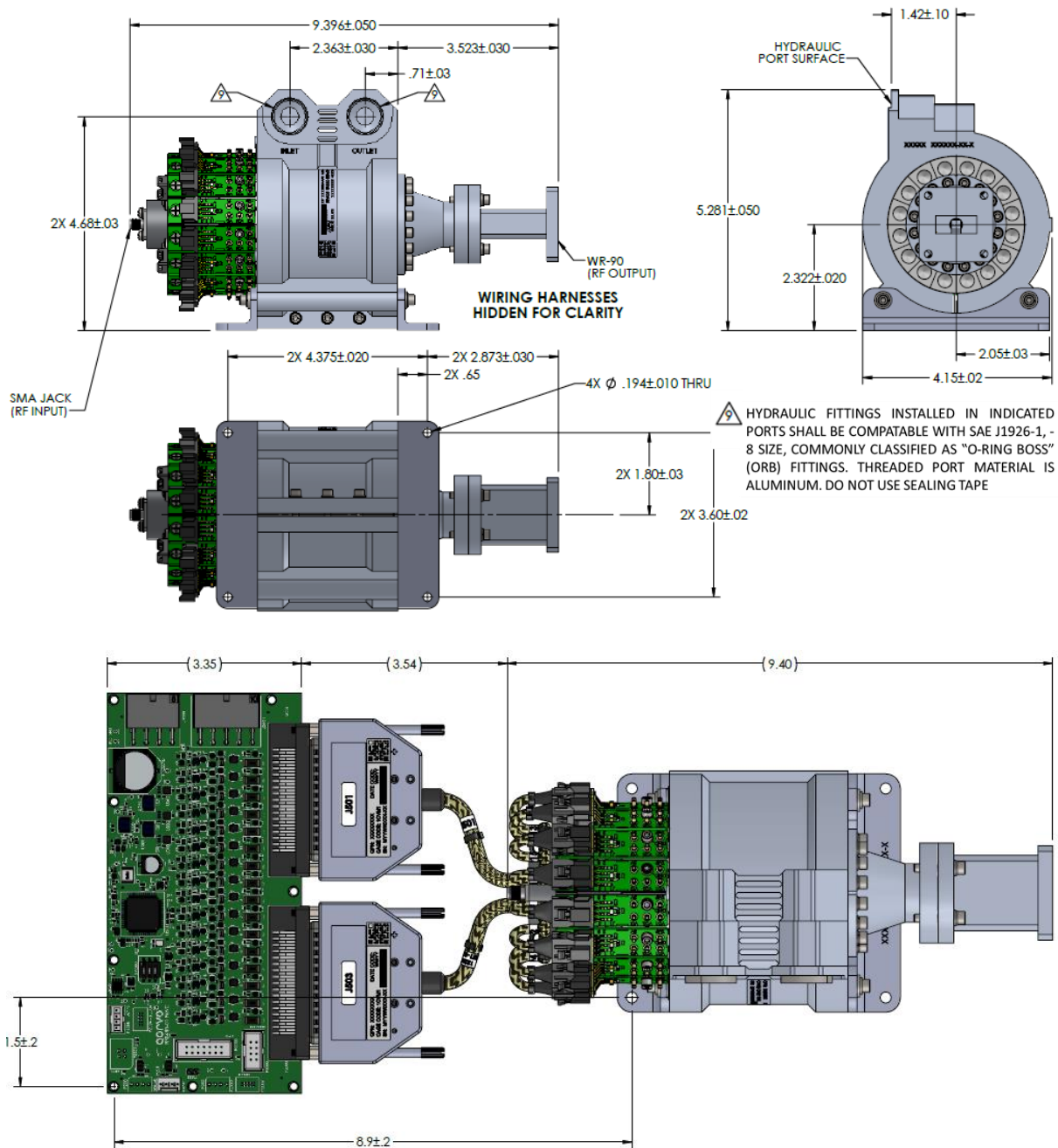


Block Diagram and Description



Pin No.	Label	Description
RF In	N/A	SMA (F) Coaxial RF Input.
RF Out	N/A	WR90 Waveguide / UG39/U Flange
Bias Card	P2001, P2003	HARTING connector, 09665527611
POWER SUPPLY +VDD	J2000	MOLEX connector, 76825-0008
POWER SUPPLY GND	J2001	MOLEX connector, 76825-0010

Mechanical Information – Outline Drawing (Spatium™ Unit)



12. DO NOT CONNECT SPARE PINS.
13. MAX WEIGHT 12.0 LBS.
14. DIELECTRIC GREASE SHOULD BE USED BETWEEN WIRING HARNESSES AND ELECTRICAL CONNECTORS.
15. MARK PG010 (LABEL) PER SPE-000975. THE QPN SHALL BE: 811477-00-XX (XX IS THE REVISION). THE SAME LABEL WITH THE SAME SERIAL NUMBER SHALL BE USED FOR THE MATCHED SET (SPATIUM, 2X CABLES, AND GPBC PCBs). LOCATE LABEL AS SHOWN.

SN: ***
BATCH I.D.
WORK WEEK
CALENDAR YEAR
MANUFACTURER

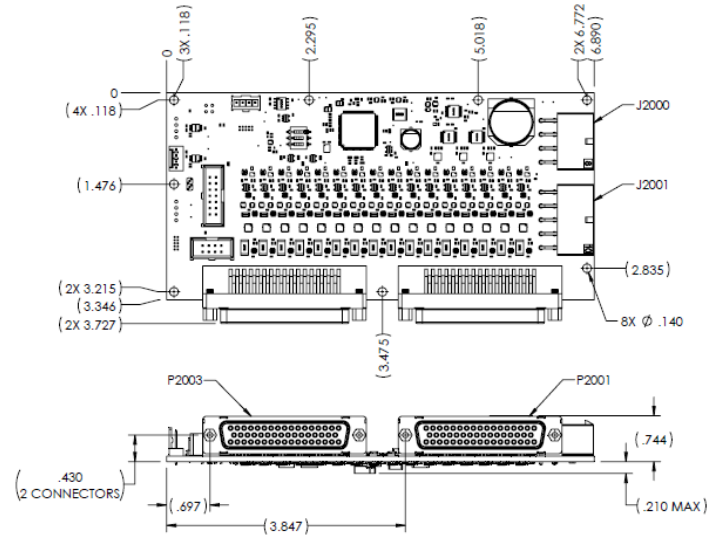
QPN: XXXXXXXX DATE CODE: WWYY
CAGE CODE: 1CVM1
SN: MYYWWXX-XX

Dimensions are in INCHES

Mechanical Information – Outline Drawing (General Purpose Bias Card - GPBC)

BIAS CARD P2001 (HARTING: 09665527611) CABLE JS01			
Pin No	Function	Pin No	Function
1	VG15	26	VD12
2	VD16	27	GND
3	GND	28	VG10
4	VD15	29	VD11
5	GND	30	GND
6	VD14	31	VD10
7	GND	32	GND
8	VD13	33	VD9
9	VG12	34	VG16
10	VD12	35	VD16
11	GND	36	GND
12	VG9	37	VD15
13	VD11	38	GND
14	GND	39	VD14
15	VD10	40	GND
16	GND	41	VD13
17	VD9	42	VG14
18	VD16	43	VD12
19	GND	44	GND
20	VD15	45	VG11
21	GND	46	VD11
22	VD14	47	GND
23	GND	48	VD10
24	VD13	49	GND
25	VG13	50	VD9

BIAS CARD P2003 (HARTING: 09665527611) CABLE JS03			
Pin No	Function	Pin No	Function
1	VG7	26	VD4
2	VD8	27	GND
3	GND	28	VG2
4	VD7	29	VD3
5	GND	30	GND
6	VD6	31	VD2
7	GND	32	GND
8	VD5	33	VD1
9	VG4	34	VG8
10	VD4	35	VD8
11	GND	36	GND
12	VG1	37	VD7
13	VD3	38	GND
14	GND	39	VD6
15	VD2	40	GND
16	GND	41	VD5
17	VD1	42	VG6
18	VD8	43	VD4
19	GND	44	GND
20	VD7	45	VG3
21	GND	46	VD3
22	VD6	47	GND
23	GND	48	VD2
24	VD5	49	GND
25	VG5	50	VD1



BIAS CARD J2000 76825-0008 MOLEX	
Pin No	Function
1	+VDD
2	+VDD
3	+VDD
4	+VDD
5	+VDD
6	+VDD
7	+VDD
8	+VDD

BIAS CARD J2001 76825-0010 MOLEX	
Pin No	Function
1	GND
2	GND
3	GND
4	GND
5	GND
6	GND
7	GND
8	GND
9	GND
10	GND

BLADE INTERFACE PCBS J1 105314-1308 MOLEX	
Pin No	Function
1	GND
2	+VDD
3	GND
4	GND
5	VG
6	N/C
7	N/C
8	GND

AT AMBIENT TEMPERATURES $\geq 50^{\circ}\text{C}$ MINIMUM 200 FPM AIRFLOW SHALL BE PRESENT ON THE TOP SURFACE OF THE GPBC. AIRFLOW DIRECTION NON-CRITICAL.

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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