QPL2210

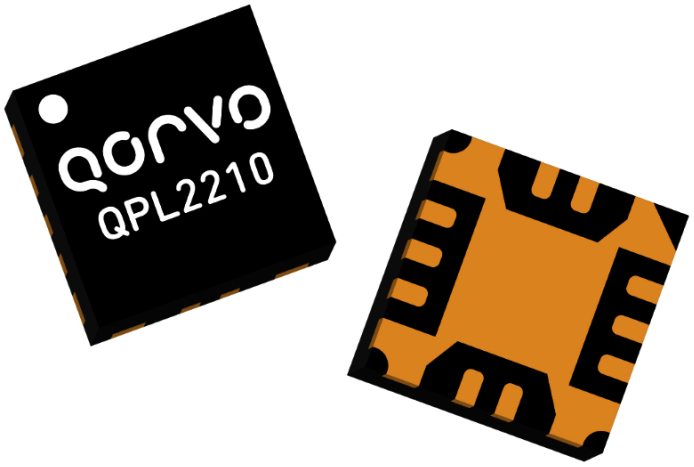
10 – 13 GHz Dual Channel Low Noise Amplifier

Product Overview

Qorvo's QPL2210 is a dual channel high-performance, low noise amplifier fabricated on Qorvo's production 90 nm pHEMT process (QPHT09). Covering 10 – 13 GHz, the QPL2210 provides 16 dB small signal gain and 1.2 dB noise figure. With a compact die size of 3 x 3 mm, the amplifier can deliver 5 dBm of saturated power with a high linearity of 8 dBm of output TOI at Pin = - 25 dBm/tone.

The dual channels have a high isolation of 20dB, with all RF ports matched to 50 ohms with integrated DC blocking caps on I/O ports for easy handling and simple system integration.

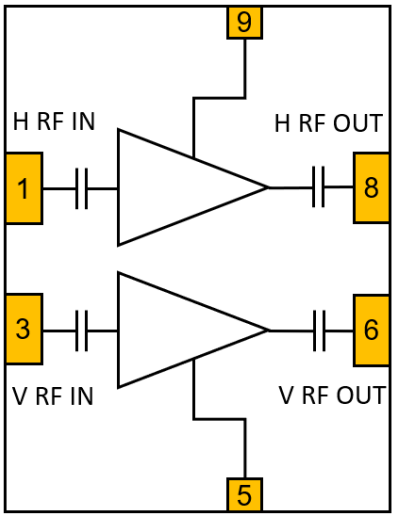
The high performance of the QPL2210 makes it ideal for airborne high density phased array radar applications as well as commercial communication systems.



Key Features

- Frequency Range: 10 – 13 GHz
- Noise Figure: 1.2 dB
- Small Signal Gain: 16 dB
- P1dB: -1.2 dBm
- Psat: 5 dBm
- TOI: 8 dBm (@ Pin= - 25 dBm / tone)
- Channel Isolations: 20dB
- Bias: VD = 2.0 V, IDQ = 8 to 13 mA (self - bias)
- Low power consumptions: 22 mW (typical)
- Package Dimensions: 3 x 3 x 0.85 mm

Functional Block Diagram



Applications

- Electronic Warfare (EW)
- Commercial and Military Radar
- Communication Systems

Ordering Information

Part No.	Description
QPL2210SR	Tape & Reel 7", Qty 100
QPL2210TR13	Tape and Reel 13", Qty 2500
QPL2210EVB01	QPL2210 Evaluation Board, Qty 1

Absolute Maximum Ratings

Parameter	Rating	Units
Drain Voltage (V_D)	4.5	V
Drain Current	45	mA
RF Input Power (50 Ω, 85 °C)	20	dBm
Storage Temperature	−55 to 150	°C

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

Parameter	Value	Units
Drain Voltage	2.0	V
Drain Current (quiescent / self-bias)	11	mA
Gate Voltage (not required)	-	V
Operating Temperature Range	−40 to 85	°C

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

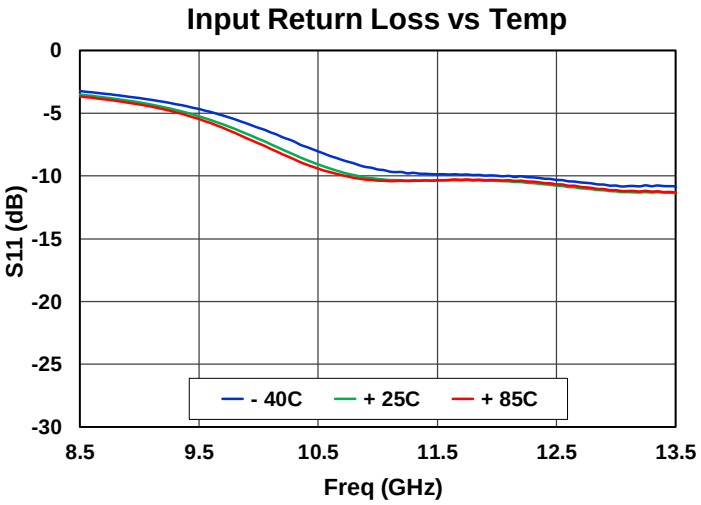
Electrical Specifications

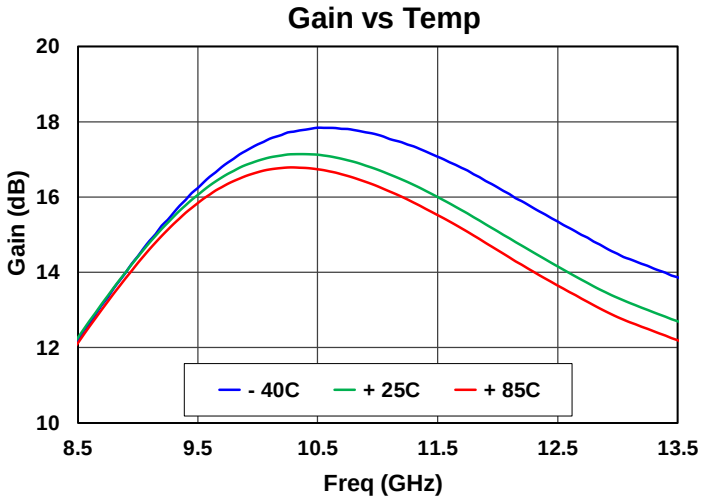
Test conditions unless otherwise noted: V_D = + 2.0 V, I_{DQ} = 8 to 13 mA, Temp. = + 25 °C.
Data de-embedded to reference planes.

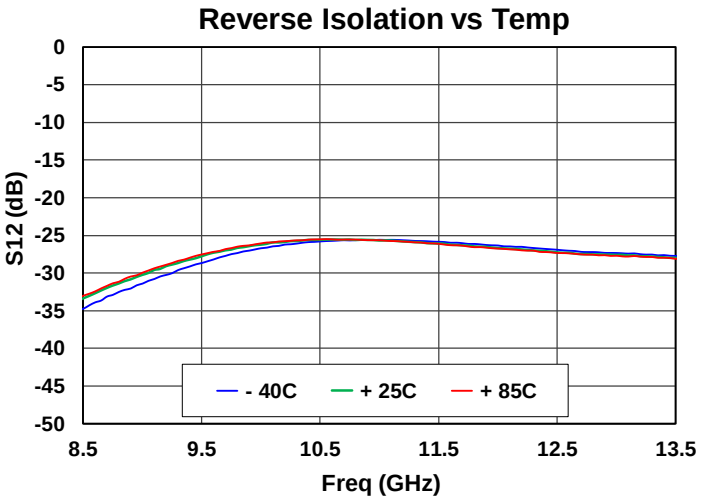
Parameter	Min	Typ	Max	Units
Operating Frequency	10		13	GHz
Small Signal Gain		16		dB
Noise Figure		1.2		dB
Power at 1-dB Compression		-1.2		dBm
Power at Saturation		5		dBm
Input Return Loss		9		dB
Output Return Loss		10		dB
Output TOI (Pin = -25 dBm / tone)		8.0		dBm
Gain (S21) Temperature Coefficient		−0.011		dB/°C

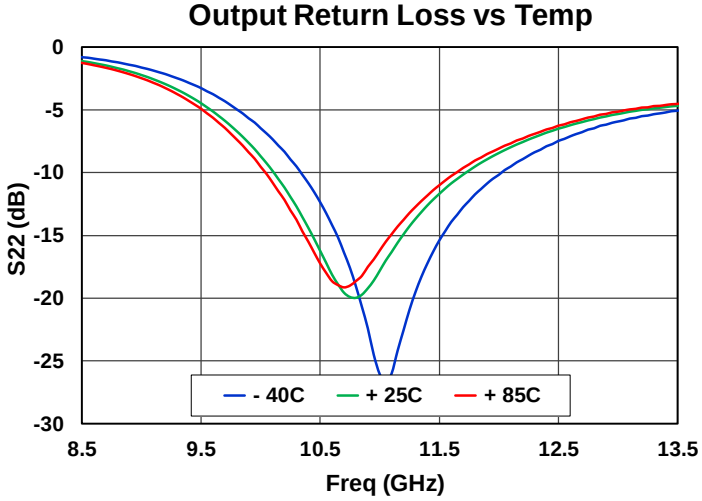
Performance Plots – Small Signal

Test conditions unless otherwise noted: V_D = + 2.0 V, I_{DQ} = 11 mA, Temp. = + 25 °C









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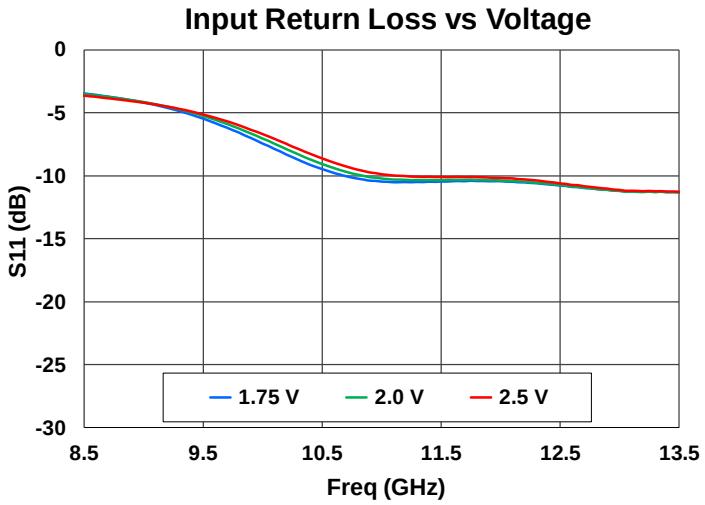
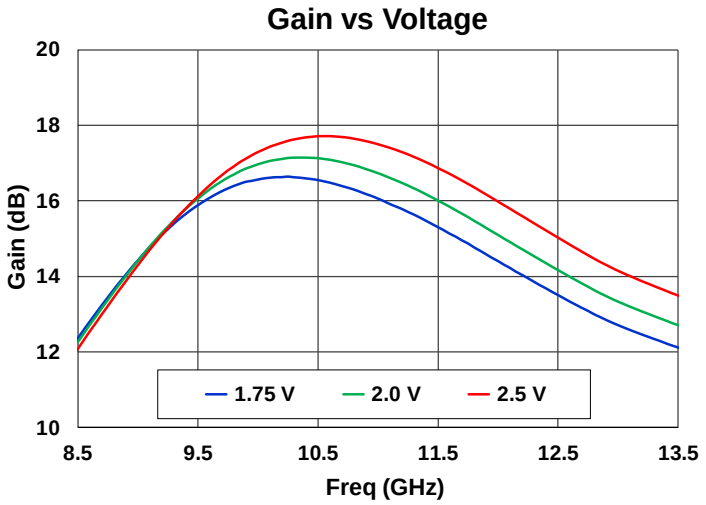
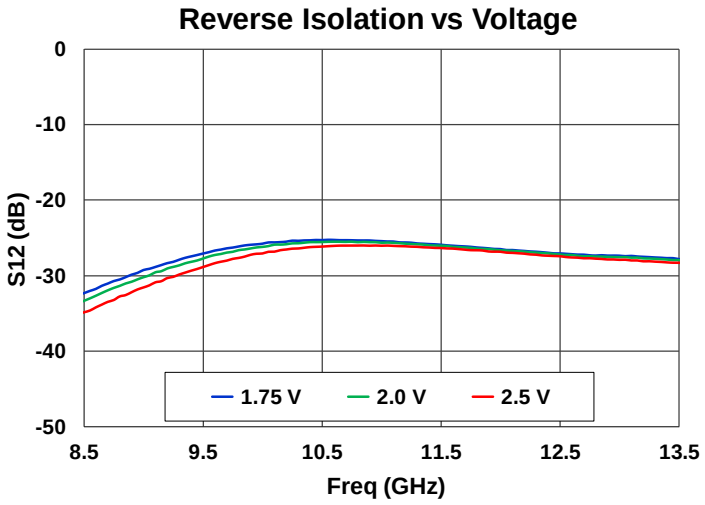
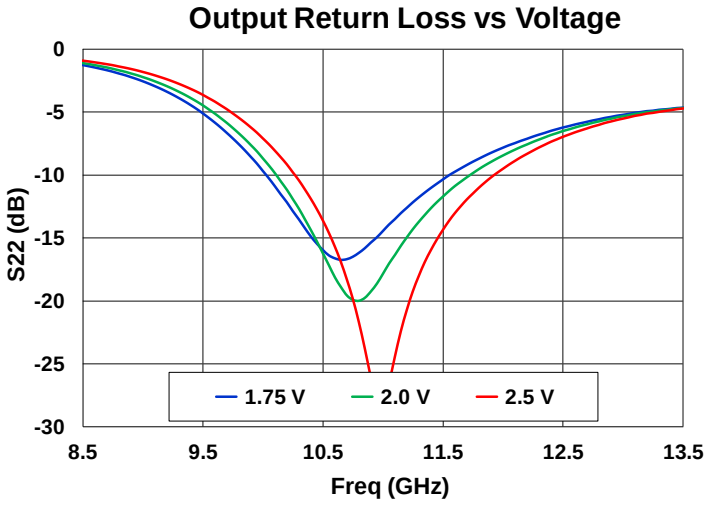


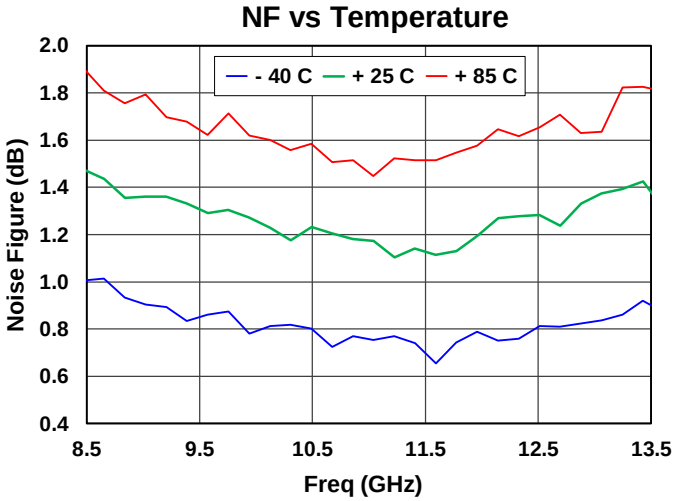


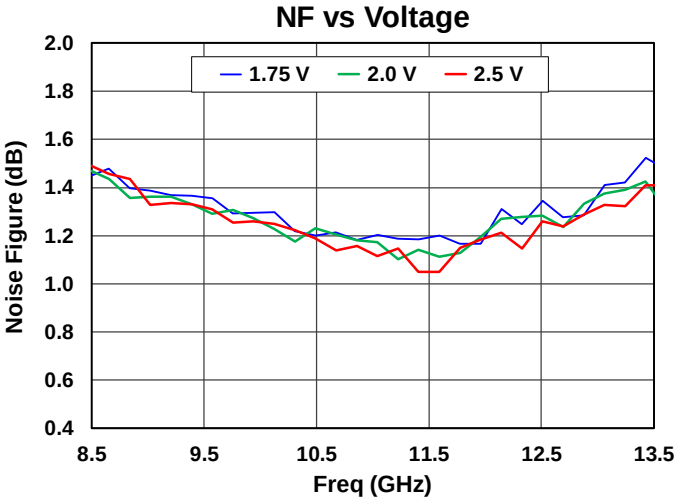


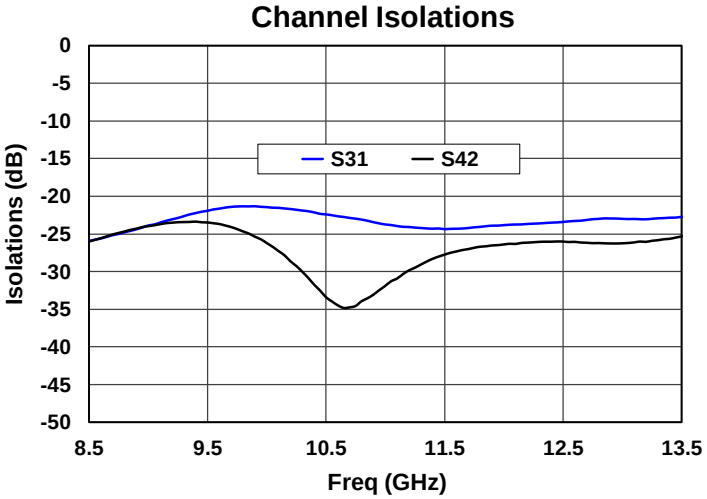


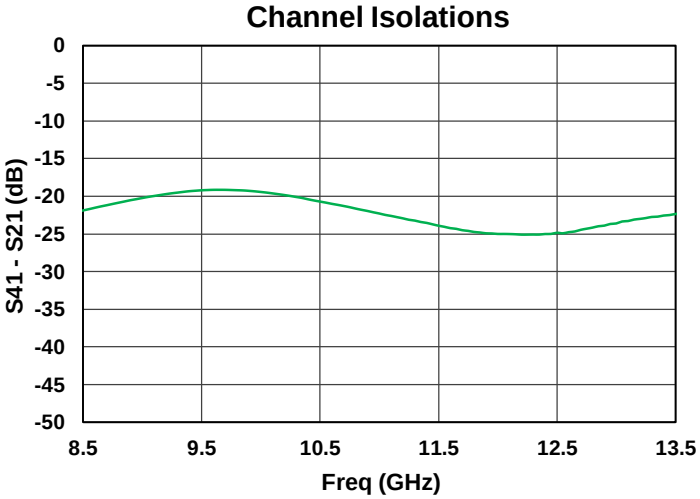
Performance Plots – Noise Figure and Channel Isolations

Test conditions unless otherwise noted: V_D = + 2.0 V, I_{DQ} = 11 mA, Temp. = + 25 °C
Isolation tests: Port 1 – H RFIN, 2 - H RFOUT, 3 - V RFIN, 4 – V RFOUT



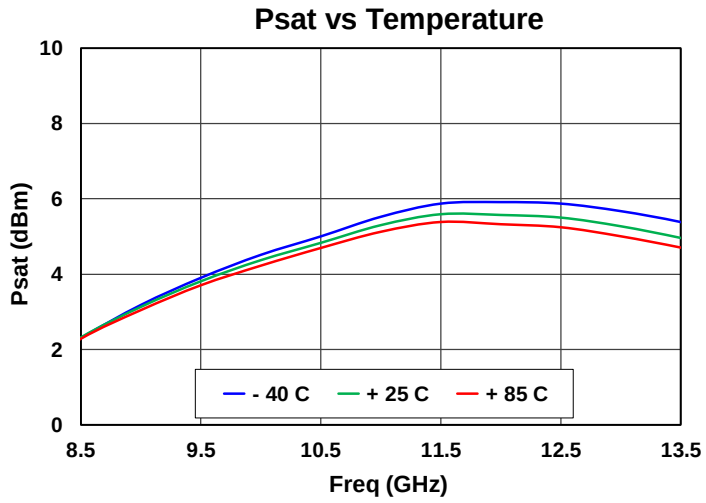


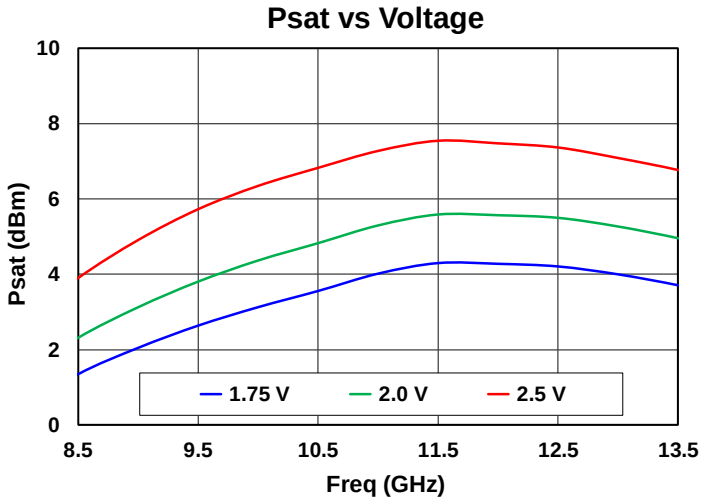


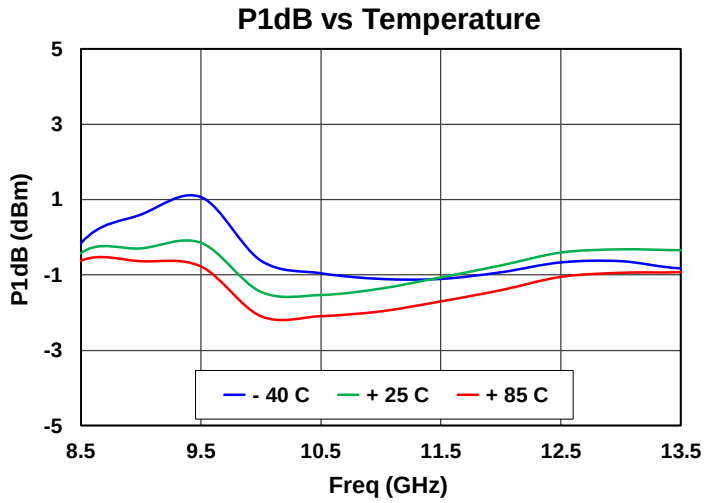


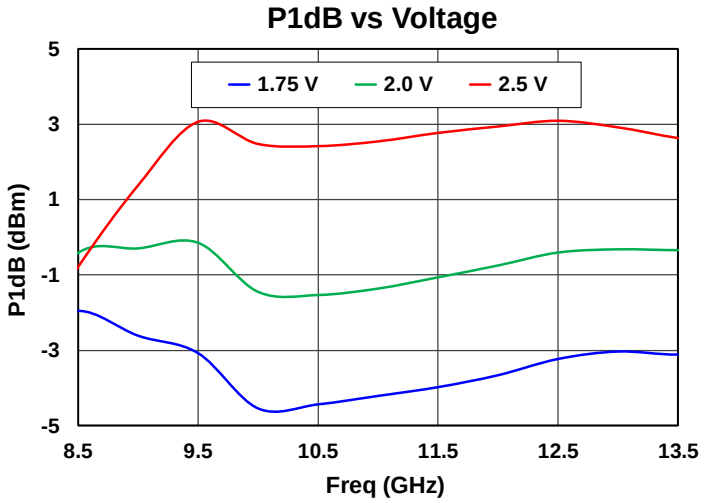
Performance Plots – Large Signal

Test conditions unless otherwise noted: V_D = + 2.0 V, I_{DQ} = 11 mA, Temp. = + 25 °C



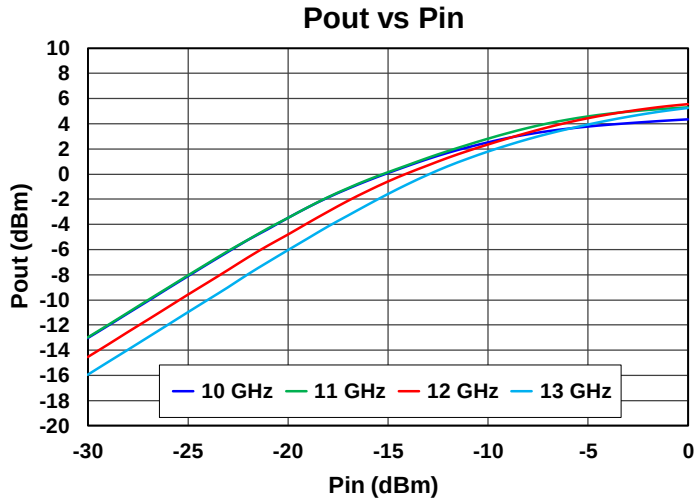


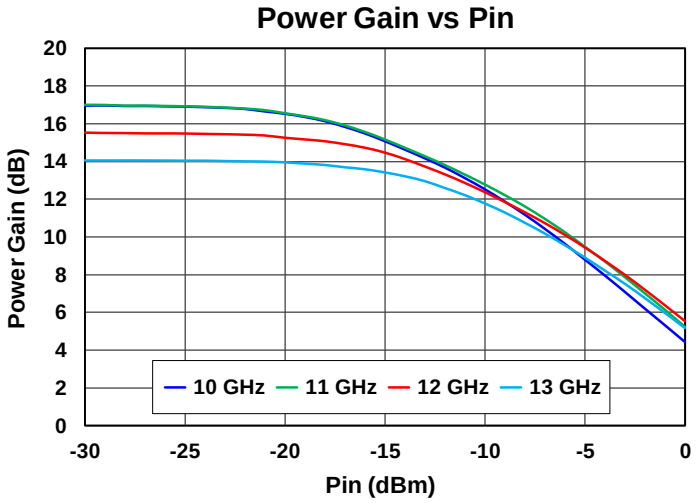


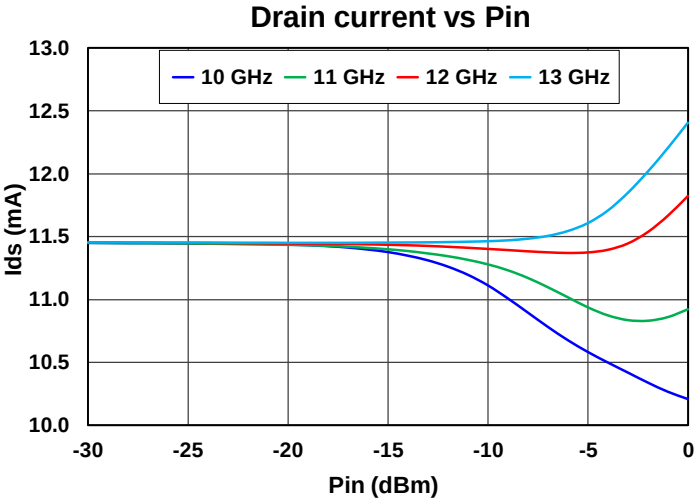


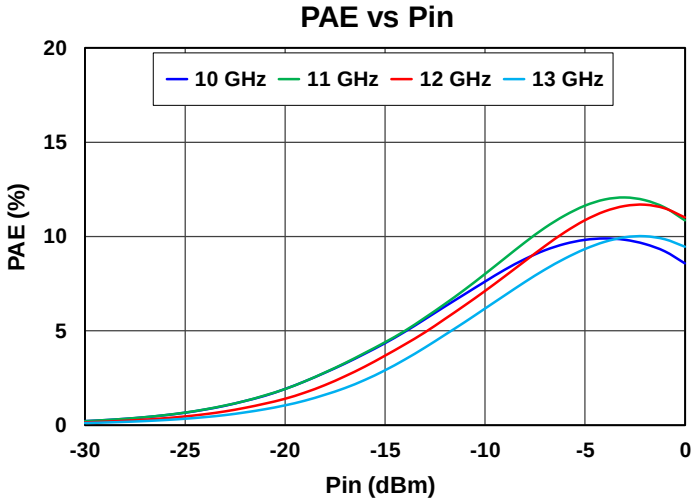
Performance Plots – Large Signal

Test conditions unless otherwise noted: V_D = + 2.0 V, I_{DQ} = 11 mA, Temp. = + 25 °C



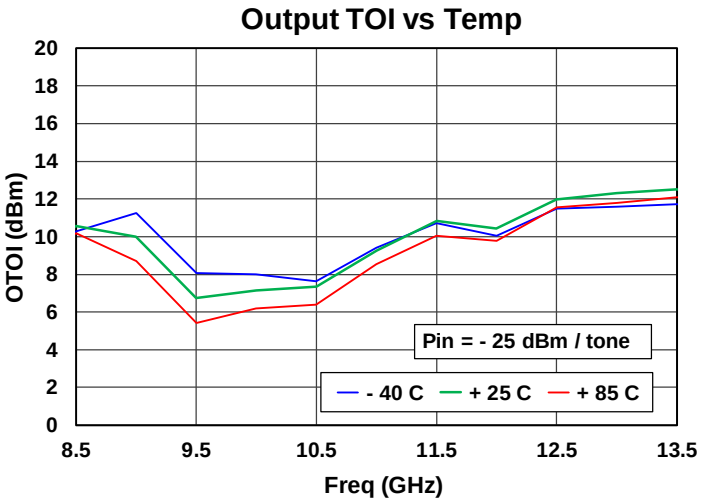


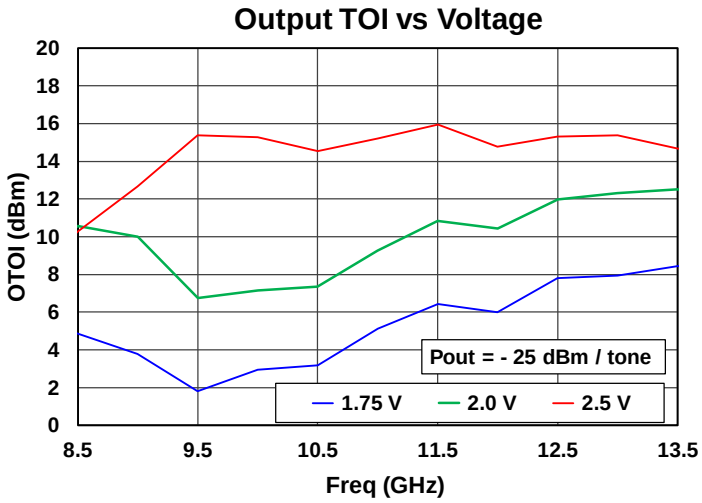


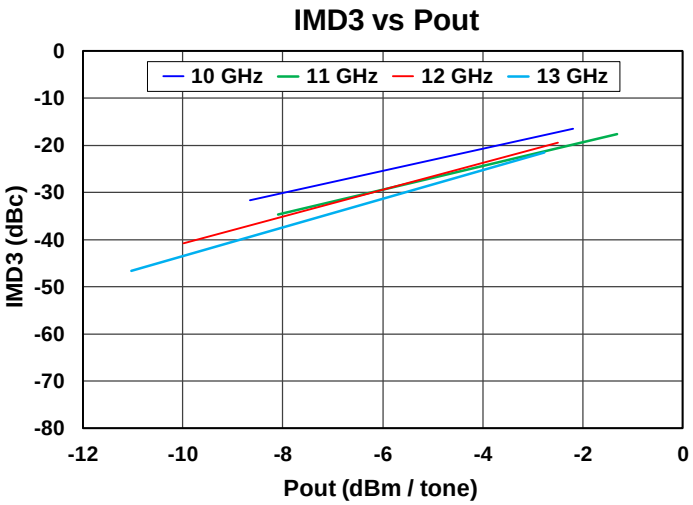


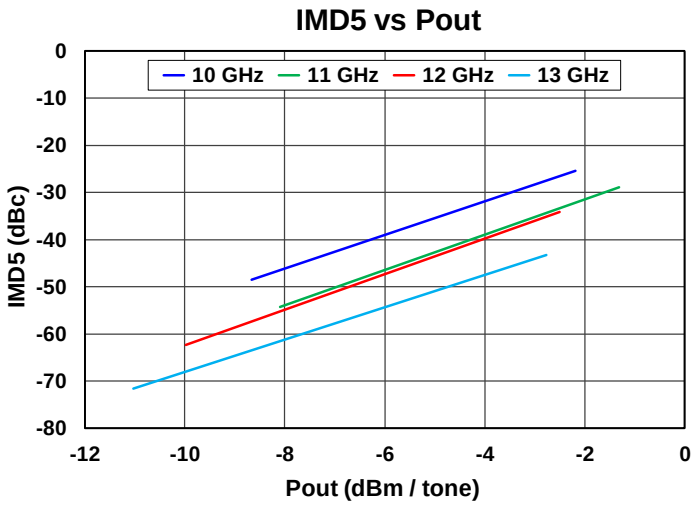
Performance Plots – Linearity

Test conditions unless otherwise noted: V_D = + 2.0 V, I_{DQ} = 11 mA, Tone spacing = 11 MHz, Temp. = + 25 °C

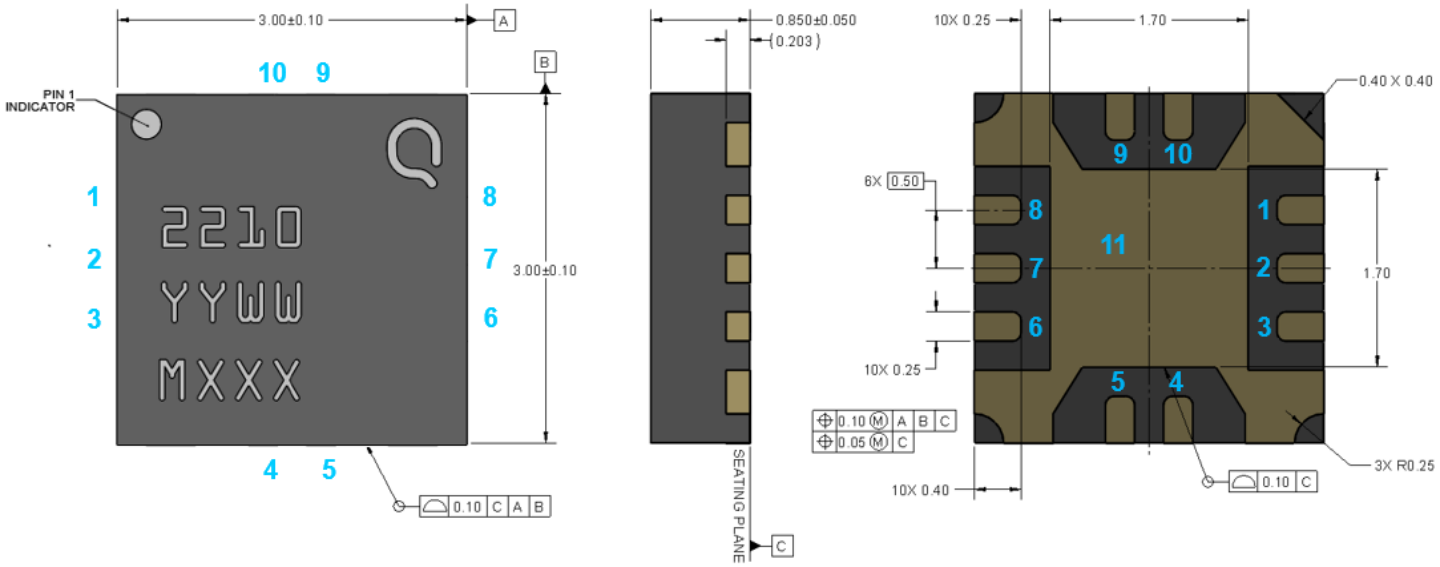








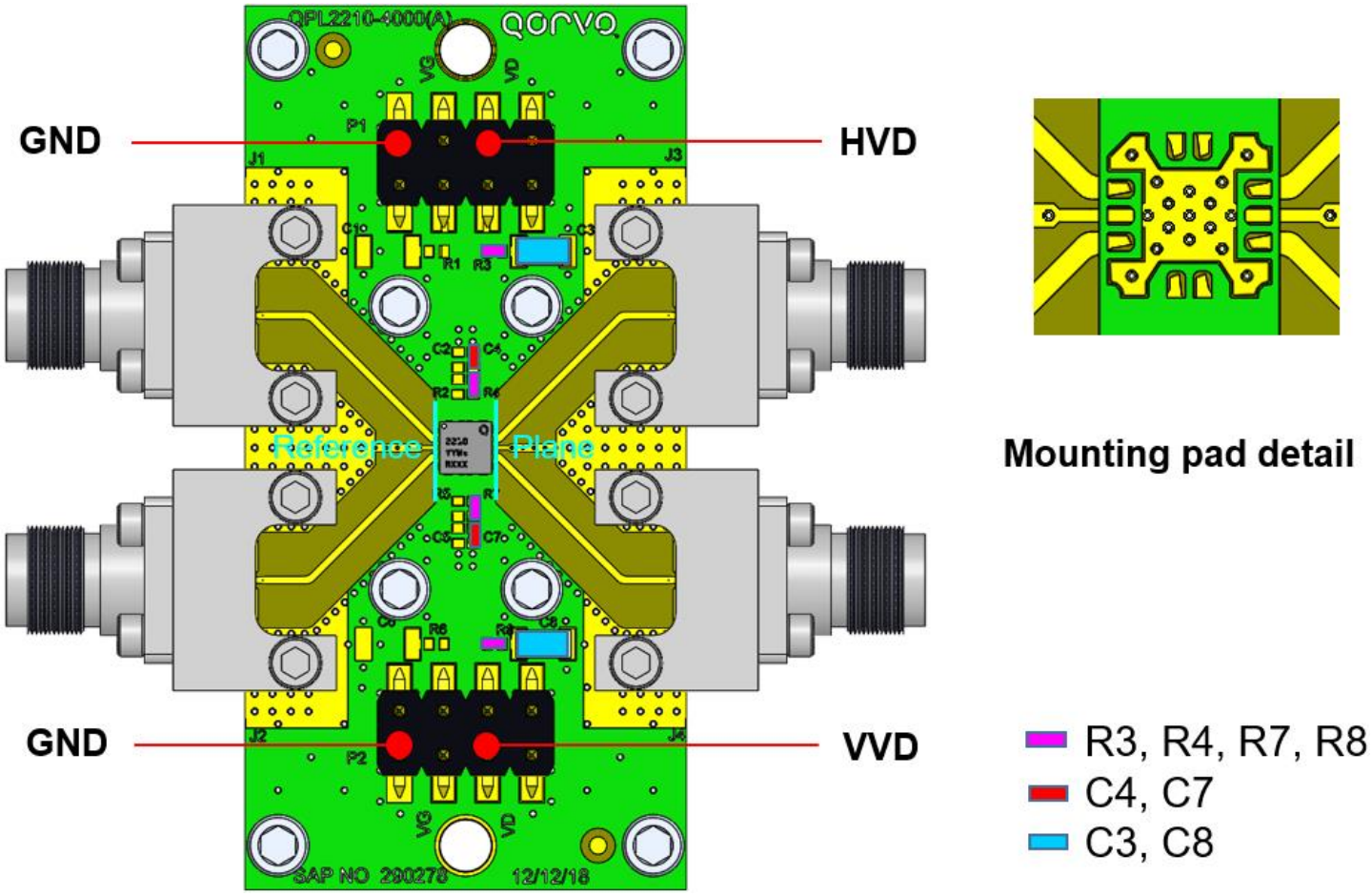
Mechanical Drawing and Bond Pad Descriptions



Dimensions in mm, package is mold encapsulated with gold plated leads
Part Marking: QPL2210 = Part Number
YY = Part Assembly Year, WW = Part Assembly Week, MXXX = Batch ID

Pad No.	Label	Description
1	H RF Input	Channel H RF Input, Matched to 50 ohms, DC Blocked
3	V RF Input	Channel V RF Input, Matched to 50 ohms, DC Blocked
5	VVD	Channel V VD
6	V RF Output	Channel H RF Output, Matched to 50 ohms, DC Blocked
8	H RF Output	Channel V RF Output, Matched to 50 ohms, DC Blocked
9	HVD	Channel H VD
4, 10	N/C	No Internal Connection
2, 7, 11	GND	Ground, Pins 2 and 7 are required to connect to GND to improve isolation.

Evaluation Board and BOM

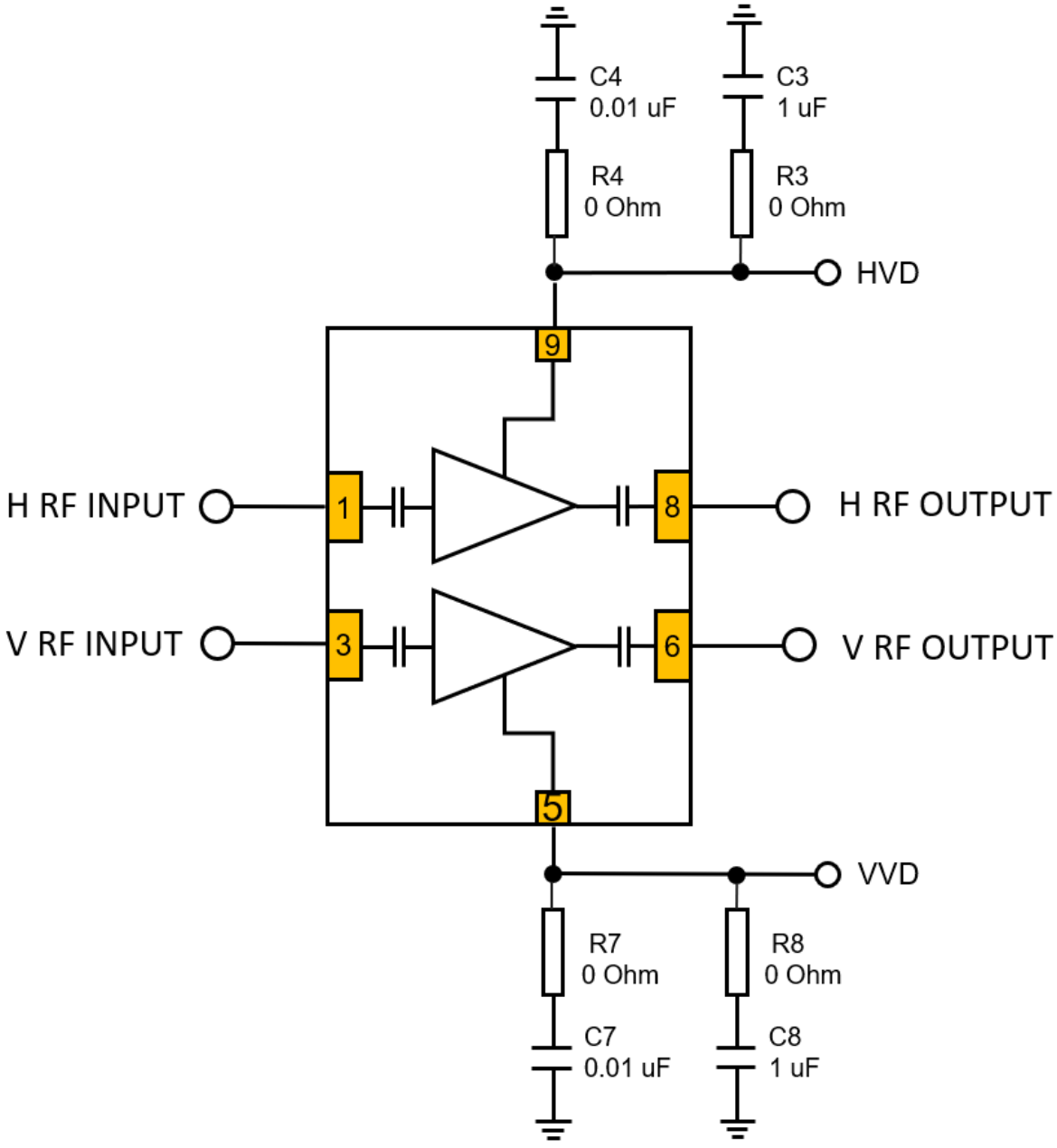


RF Layer is 0.008” thick Rogers Corp. RO4003C (ε_r = 3.35). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-01A-5.

Bill of Material – Evaluation Board

Ref. Des.	Value	Description	Manuf.	Part Number
R3, R4, R7, R8	0 Ohm	Res 0 Ohm, 5%, 1/10 W, 0402	Various	
C3, C8	1.0 uF	CAP 1.0UF, +/-10%, 16V, 1206, X7R ROHS	Various	
C4, C7	0.01 uF	CAP 0.01uF, 10%, 16V, 0402, X7R ROHS	Various	
RF IN, RF OUT	2.92 mm	2.92 MM END LAUNCH CONNECTOR	Southwest Microwave	1092-01A-5

Application Circuit and Biasing Sequence



Bias-up Procedure

1. Set I_D limit to 45 mA
2. Set V_D +2.0 V (device is self – bias, drain current will be between 8 to 13 mA)
3. Apply RF signal

Bias-down Procedure

1. Turn off RF signal
2. Set V_D to 0V
3. Turn off V_D supply

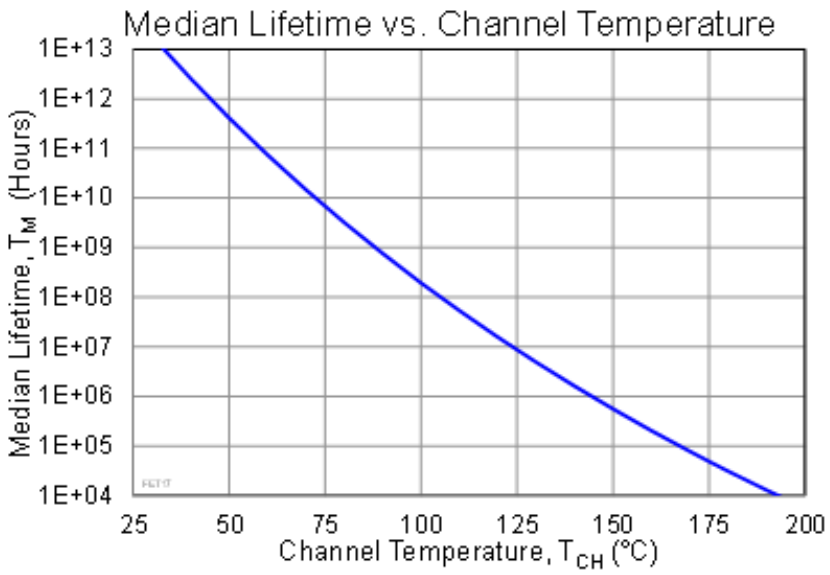
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85°C, V_D = 2.0 V, I_{DQ} = 11 mA Quiescent/Small Signal operation, P_{DISS} = 0.022 W	154.5	ºC/W
Channel Temperature, T_{CH} (Under RF)		88.4	°C
Median Lifetime (T_M)		9.5E08	Hrs

Notes:
1. Thermal resistance measured at back of carrier plate.

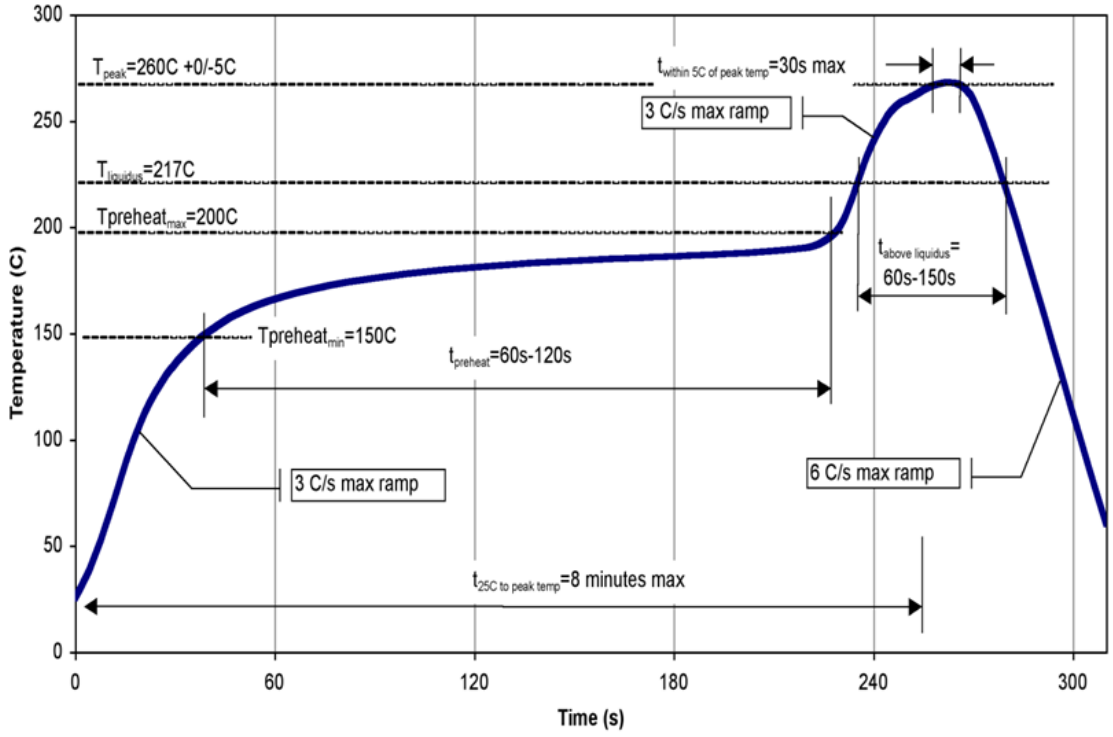
Median Lifetime

Test Conditions: V_D = +4 V
Failure Criteria is 10% reduction in I_{D_MAX}



Solderability and Recommended Soldering Temperature Profile

Compatible with the latest version of J-STD-020, Lead-free solder, 260 °C.



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	0B	ESDA / JEDEC JS-001-2017
ESD – Charge Device Model (CDM)	C2b	ANSI/ESD/JEDEC JS-002
MSL – Moisture Sensitivity Level	3	IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

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

Tel: **1-844-890-8163**

Web: www.qorvo.com

Email: customer.support@qorvo.com

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