QPD2195

400 W, 48 V, 1.8-2.2 GHz GaN RF Power Transistor

Product Description

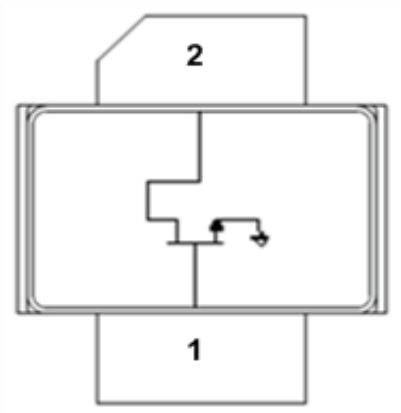
The QPD2195 is a discrete GaN on SiC HEMT which operates from 1.8-2.2 GHz. The device is a single stage pre-matched power amplifier transistor.

The QPD2195 can be used in Doherty architecture for the final stage of a base station power amplifier for macrocell high efficiency systems.

QPD2195 can deliver P_{3dB} of 400 W at +48 V operation.

Lead-free and ROHS compliant.

Functional Block Diagram



2 Lead NI780 Package

Product Features[1]

- Operating Frequency Range: 1.8-2.2 GHz
- Operating Drain Voltage: +48 V
- Maximum Output Power[1] (P_{3dB}): 400 W
- Maximum Drain Efficiency[1]: 75.4%
- Efficiency-Tuned P3dB Gain[1]: 19.1 dB
- 2-lead, earless, ceramic flange NI780 package

Note 1: @ 2.11 GHz Load Pull

Applications

- W-CDMA / LTE
- Macrocell Base Station, B3-B1
- Active Antenna

Ordering Information

Part No.	ECCN	Description
QPD2195S2	EAR99	Box (2 Samples Each)
QPD2195SQ	EAR99	Tray (25 Samples)
QPD2195SR	EAR99	Reel (100 Samples)
QPD2195PCB4B01	EAR99	1.805-2.170 GHz Eval. Board

Absolute Maximum Ratings

Parameter	Value / Range
Gate Current (I_G)	−67 to 67 mA
Drain Voltage (V_D)	+55 V
Peak RF Input Power	44 dBm
VSWR Mismatch, P1dB Pulse (10 % duty cycle, 100 µ width), T = 25 °C	10:1
Storage Temperature	−65 to +150°C

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating

Parameter	Min	Typ	Max	Units
Operating Temperature	−40	–	–	°C
Gate Voltage (V_G)	–	−2.8	–	V
Drain Voltage (V_D)	–	48	–	V
Quiescent Current (I_{DQ})	–	720	–	mA
T_{CH} for >10^6 hours MTTF	–	–	250	°C

Electrical performance is measured under conditions noted in the electrical specifications table. Specifications are not guaranteed over all recommended operating conditions.

RF Characterization

Parameter	Conditions	Min	Typ	Max	Units
Frequency Range		1805	–	2170	MHz
Quiescent Current		–	720	–	mA
Linear Gain		–	20.4	–	dB
P3dB		–	56.3	–	dBm
Drain Efficiency	P3dB	–	70.1	–	%

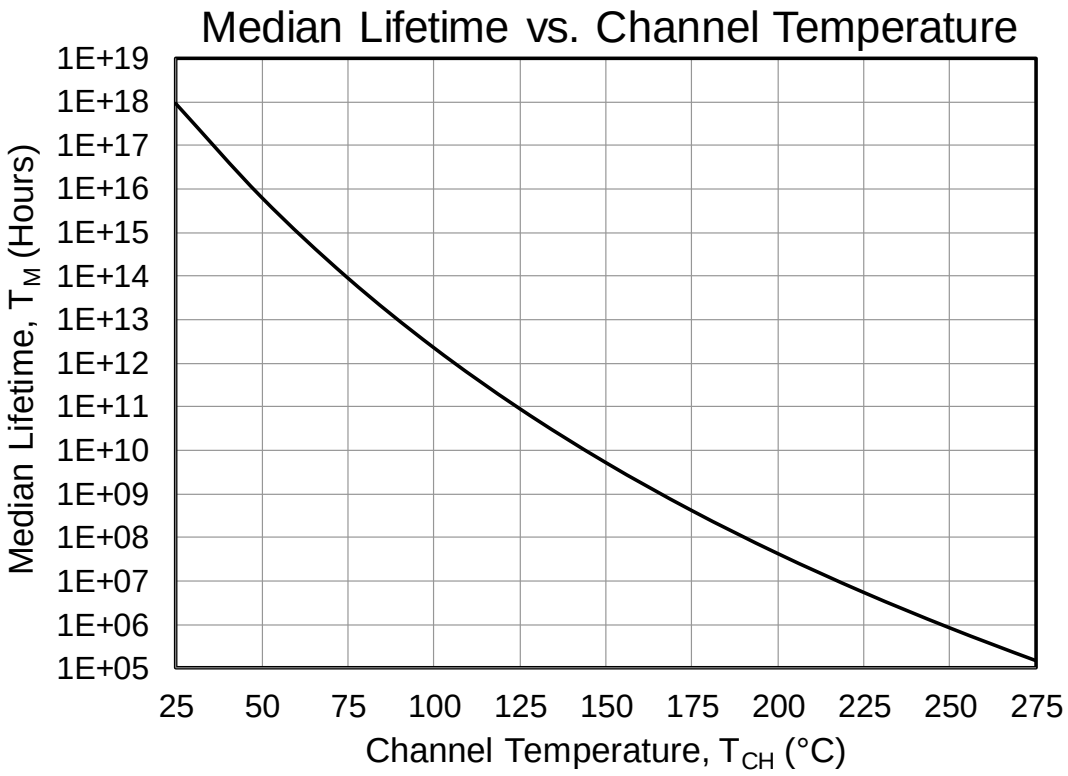
Test conditions unless otherwise noted: V_D = +48 V, I_{DQ} = 720 mA, T = 25°C, Pulsed CW (10% duty cycle, 100 µs width) on Class AB single-ended EVB at 1880 MHz

Thermal and Reliability Information

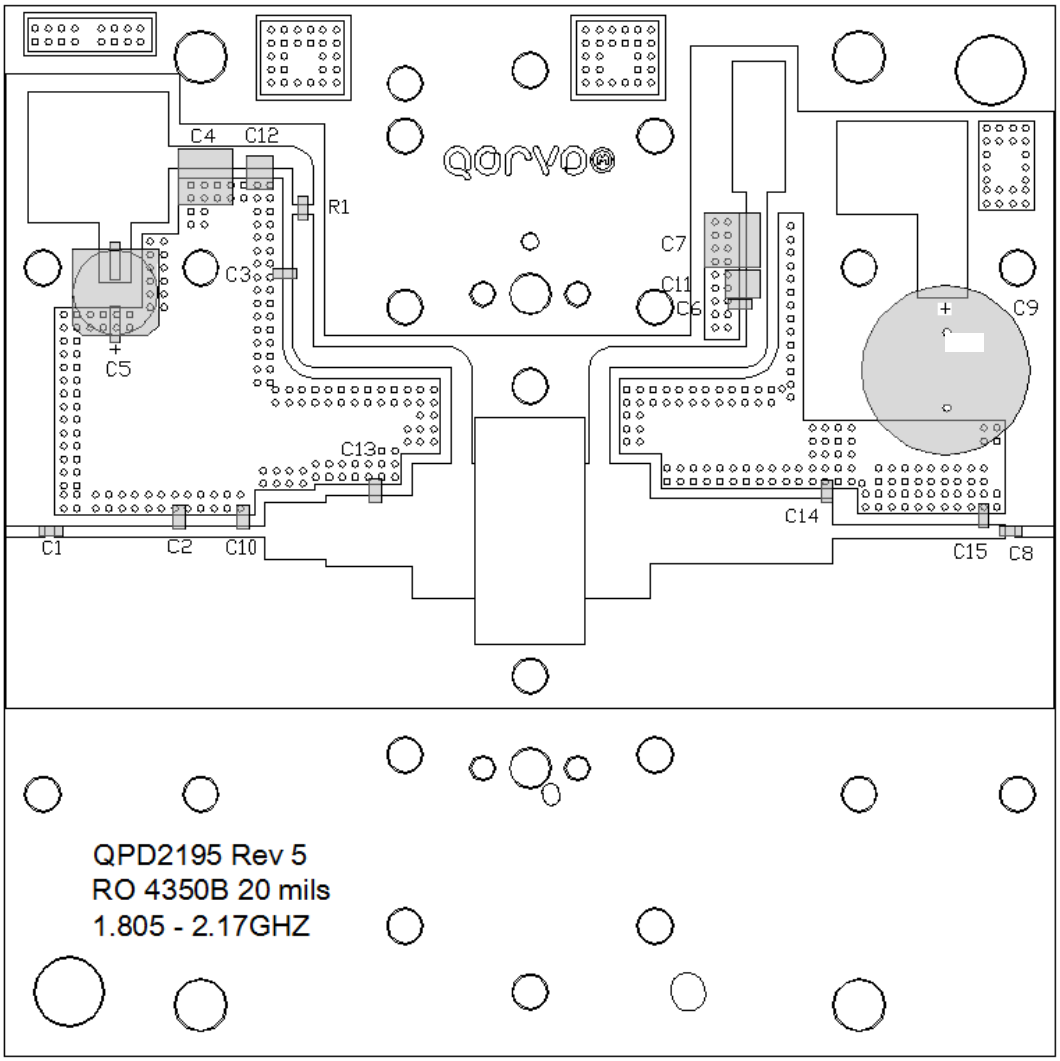
Parameter	Test Conditions	Value	Units
Carrier Amplifier Thermal Resistance at Average Power (θ_{JC})	T_{CASE} = 85°C, T_{CH} = 121°C, CW: P_{DISS} = 60 W, P_{OUT} = 90 W	0.6	°C/W

Notes:
1. Thermal resistance measured to package backside.
2. Based on expected carrier amplifier efficiency of Doherty.
3. P_{OUT} assumes 20% peaking amplifier contribution of total average Doherty rated power.

Median Lifetime



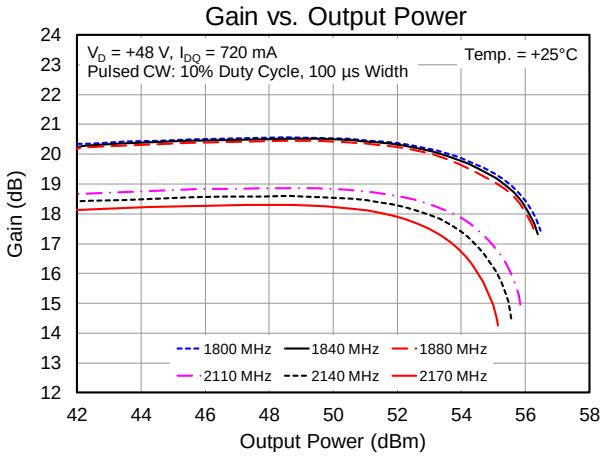
Single-Ended Evaluation Board Layout

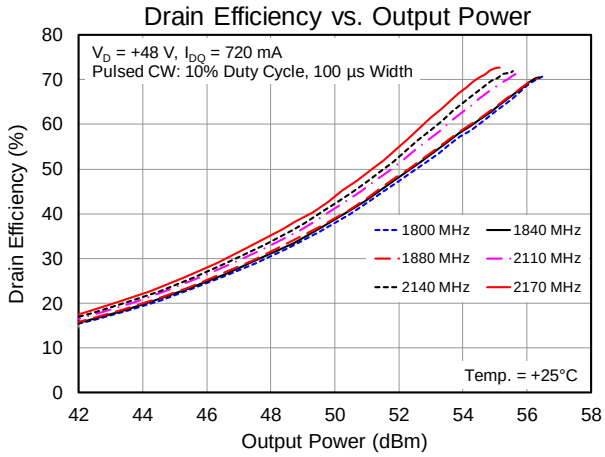


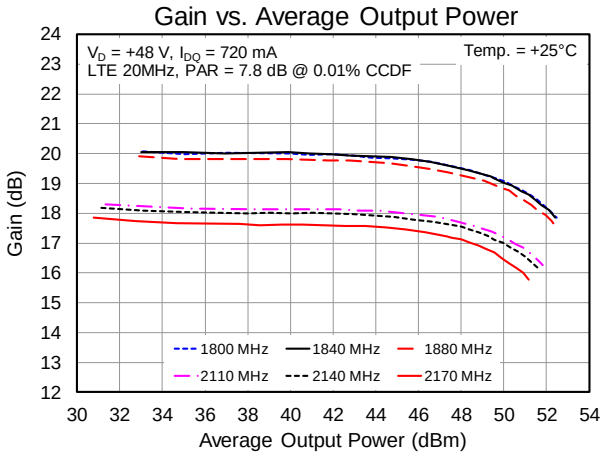
Bill of Materials

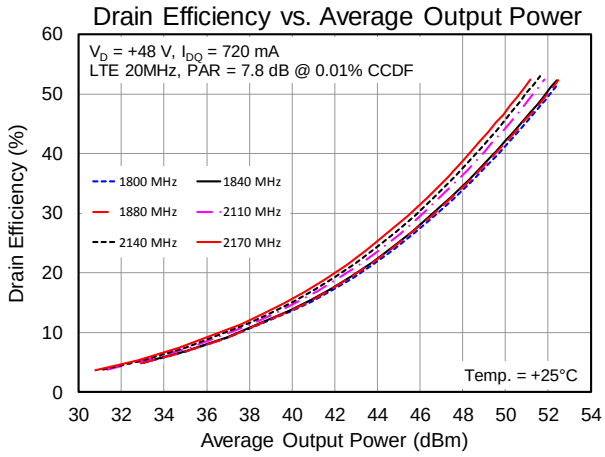
Reference Des.	Value	Description	Manuf.	Part Number
C1, C3, C6, C8	33 pF	Capacitor, 33 pF, 5%, 250V	ATC	ATC800A330JT250X
C2	0.6 pF	Capacitor, 0.6 pF, +/- 0.1pF, 250V	ATC	ATC800A0R6BT250X
C10	0.2 pF	Capacitor, 0.2 pF, +/- 0.1pF, 250V	ATC	ATC800A0R2BT250X
C14, C15	0.4 pF	Capacitor, 0.4 pF, +/- 0.1pF, 250V	ATC	ATC800A0R4BT250X
C13	0.3 pF	Capacitor, 0.3 pF, +/- 0.1pF, 250V	ATC	ATC800A0R3BT250X
C11, C12	1.0 µF	Capacitor, 1 µF, 10%, 100V, X7R	MURATA	GRM32NR72A104KA01L
C4, C7	4.7 µF	Capacitor, 4.7 µF, 10%, 100V, X7R	MURATA	GRM55ER72A475KA01L
C5	100 µF	Capacitor, 100uF, 50V, +/-20%, SMD	Panasonic	EEE-1HA101UAP
C9	220 µF	Capacitor, 220uF, 100V, +/-20%, SMD	Panasonic	AFK227M2AR44T-F
R1	10 Ω	Resistor, 10 Ω, 5%, 0.25W, 1206	Panasonic	ERJ-8ENF10R0V

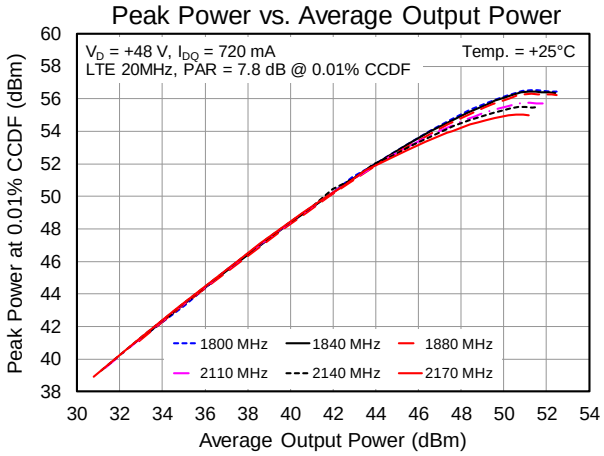
Single-Ended Evaluation Board Performance Plots

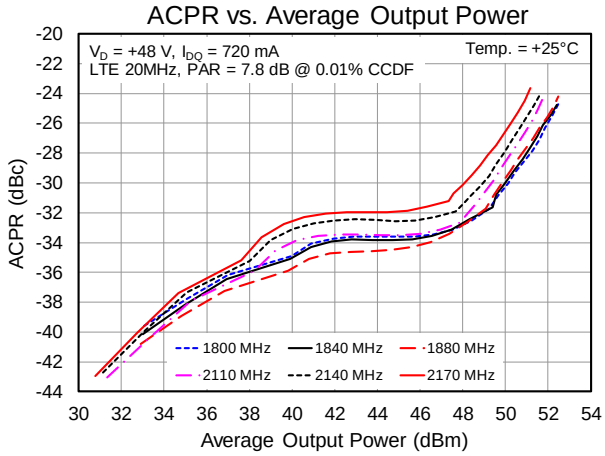






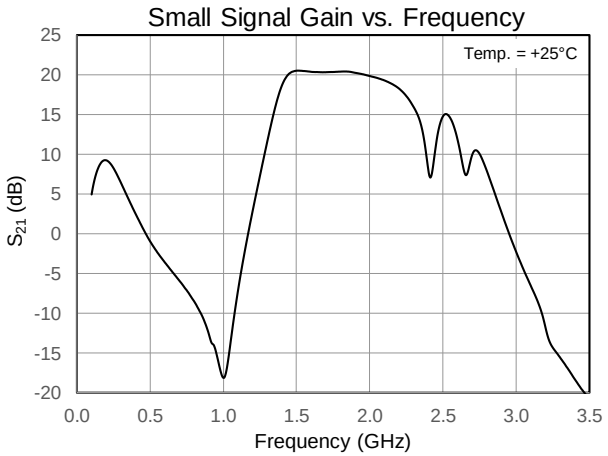


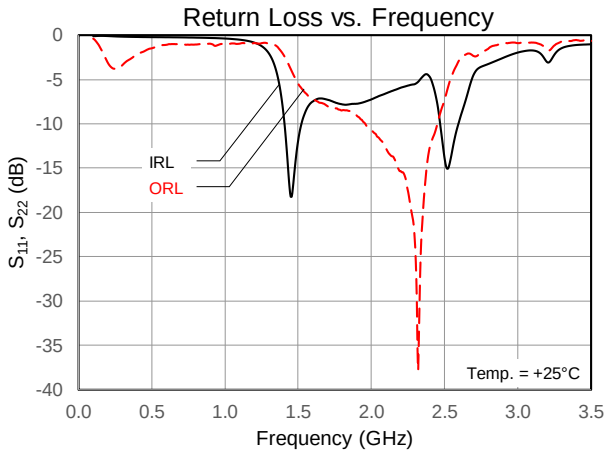




Test conditions unless otherwise noted: V_D = +48 V, I_{DQ} = 720 mA, T = 25°C, on Class AB single-ended EVB

Single-Ended Evaluation Board Performance Plots





Test conditions unless otherwise noted: V_D = +48 V, I_{DQ} = 720 mA, T = 25°C, on Class AB single-ended EVB

RF Characterization – Power-Tuned Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
1800	1.68 – j2.21	5.39 – j1.33	18.2	56.0	60.5
1840	1.34 – j2.45	5.39 – j1.33	18.1	56.1	62.7
1880	1.44 - j2.82	5.54 - j0.11	17.8	56.2	60.9
1990	1.51 – j3.72	5.79 + j1.48	17.4	56.0	60.4
2110	2.00 – j5.57	3.89 + j3.09	17.2	56.0	60.5
2140	2.48 – j6.14	3.67 + j3.42	16.7	56.0	59.5
2170	3.07 - j6.71	3.67 + j3.42	16.6	56.1	61.8
2200	3.38 – j7.21	3.11 + j3.04	16.6	55.9	58.5

Test conditions unless otherwise noted: V_D = +48 V, I_{DQ} = 720 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

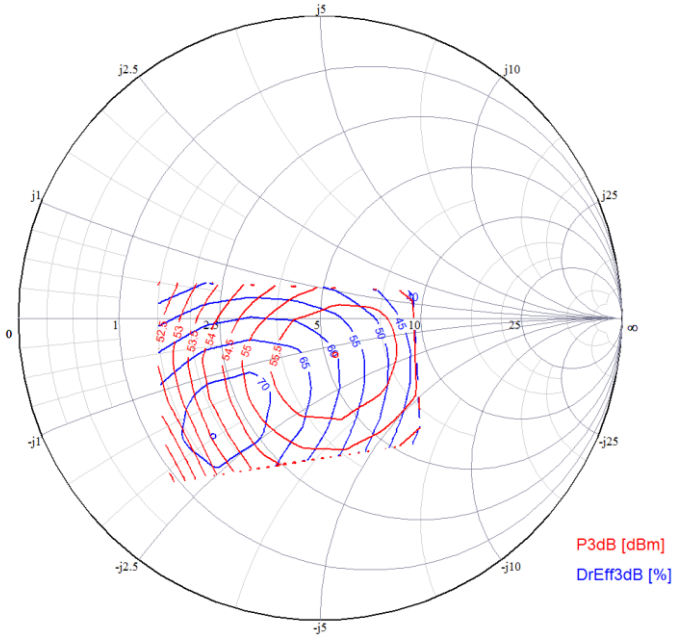
RF Characterization – Efficiency-Tuned Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
1800	1.68 – j2.21	1.79 – j1.97	20.3	53.5	72.6
1840	1.34 – j2.45	1.79 – j1.97	20.2	53.2	73.3
1880	1.44 - j2.82	1.79 - j1.97	19.9	53.1	73.9
1990	1.51 – j3.72	3.10 – j1.88	19.4	53.9	74.1
2110	2.00 – j5.57	4.36 – j2.15	19.1	53.2	75.4
2140	2.48 – j6.14	4.40 – j2.03	18.8	53.0	75.5
2170	3.07 - j6.71	5.70 - j2.55	18.4	53.0	77.4
2200	3.38 – j7.21	6.74 – j1.27	18.4	53.6	75.5

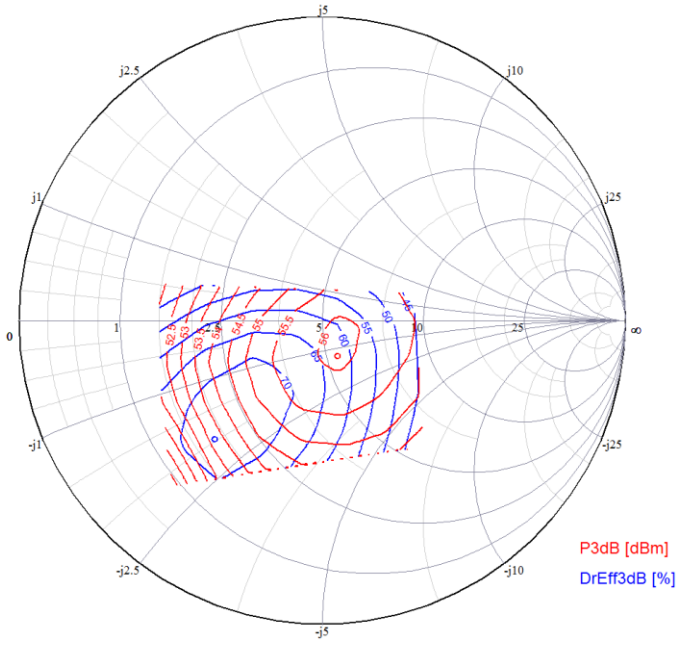
Test conditions unless otherwise noted: V_D = +48 V, I_{DQ} = 720 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Load Pull Plots

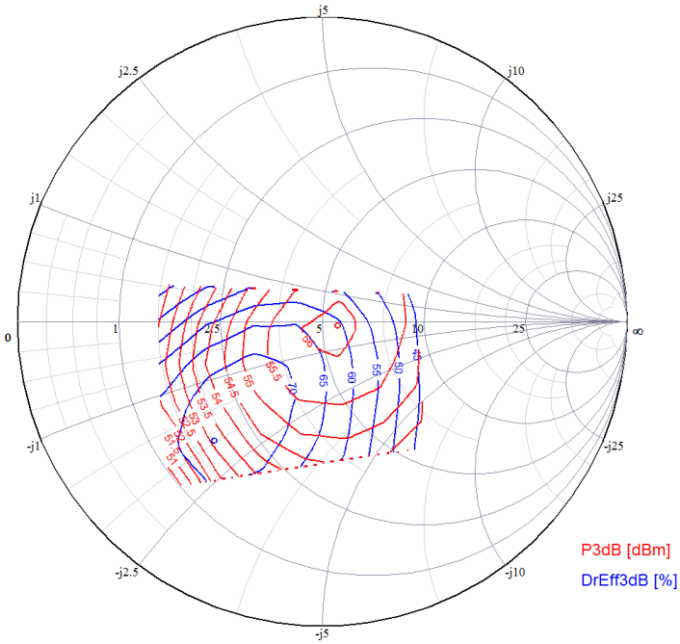
Load Pull at 1.8 GHz



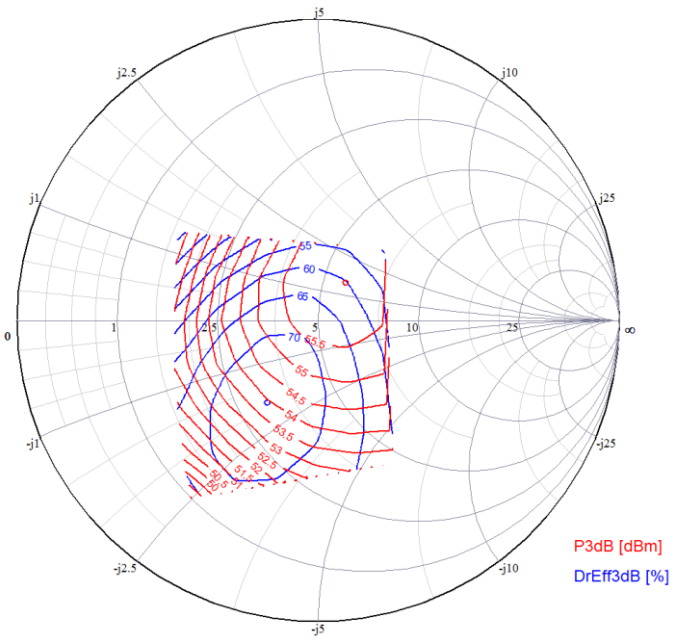
Load Pull at 1.84 GHz



Load Pull at 1.88 GHz



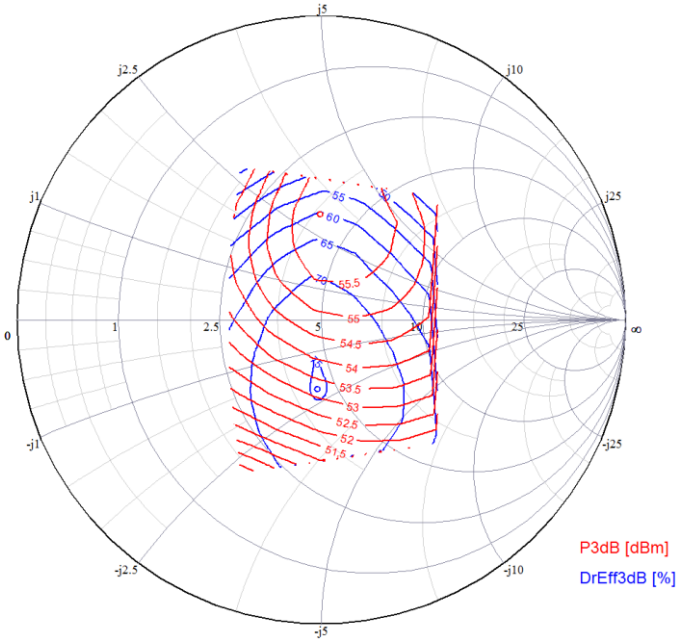
Load Pull at 1.99 GHz



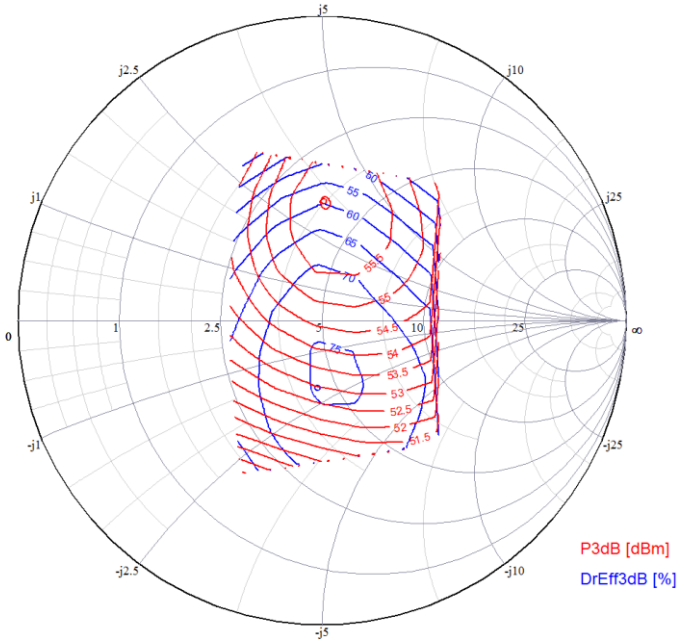
Test conditions unless otherwise noted: V_D = +48 V, I_{DQ} = 720 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Load Pull Plots

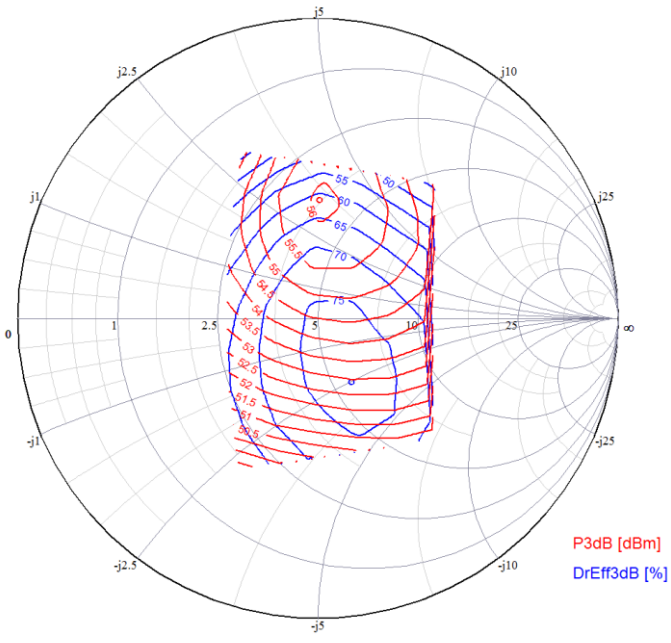
Load Pull at 2.11 GHz



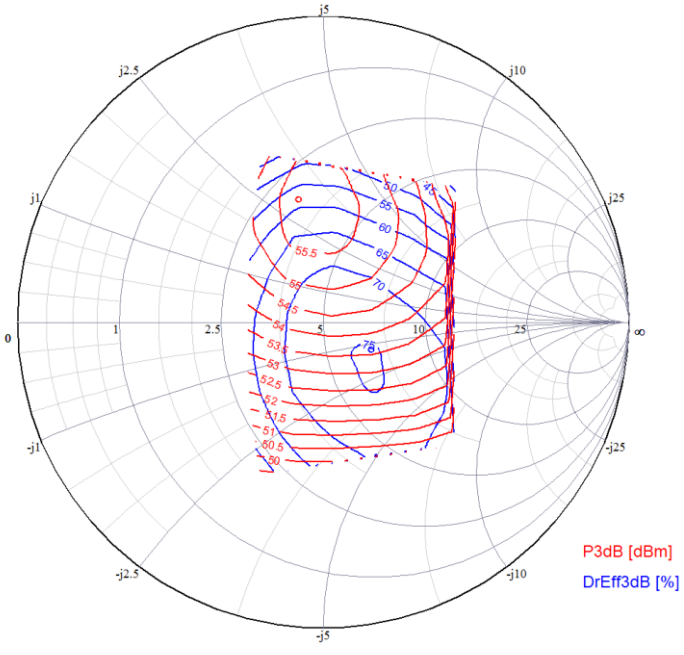
Load Pull at 2.14 GHz



Load Pull at 2.17 GHz

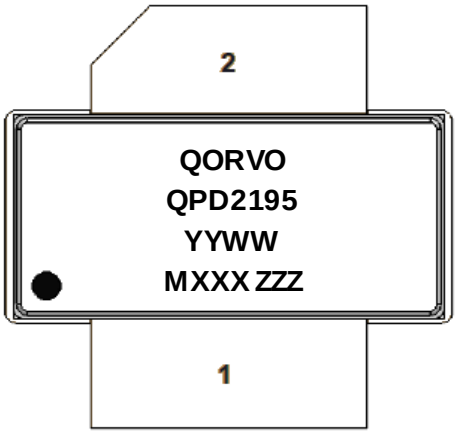


Load Pull at 2.2 GHz

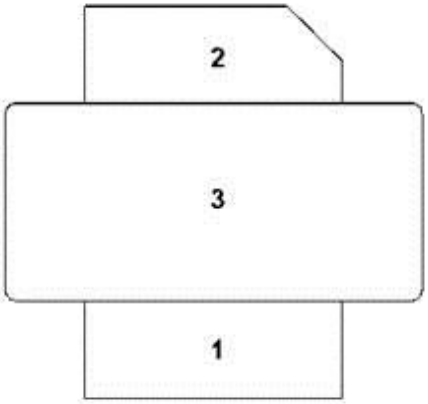


Test conditions unless otherwise noted: V_D = +48 V, I_{DQ} = 720 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Pin Configuration



TOP VIEW



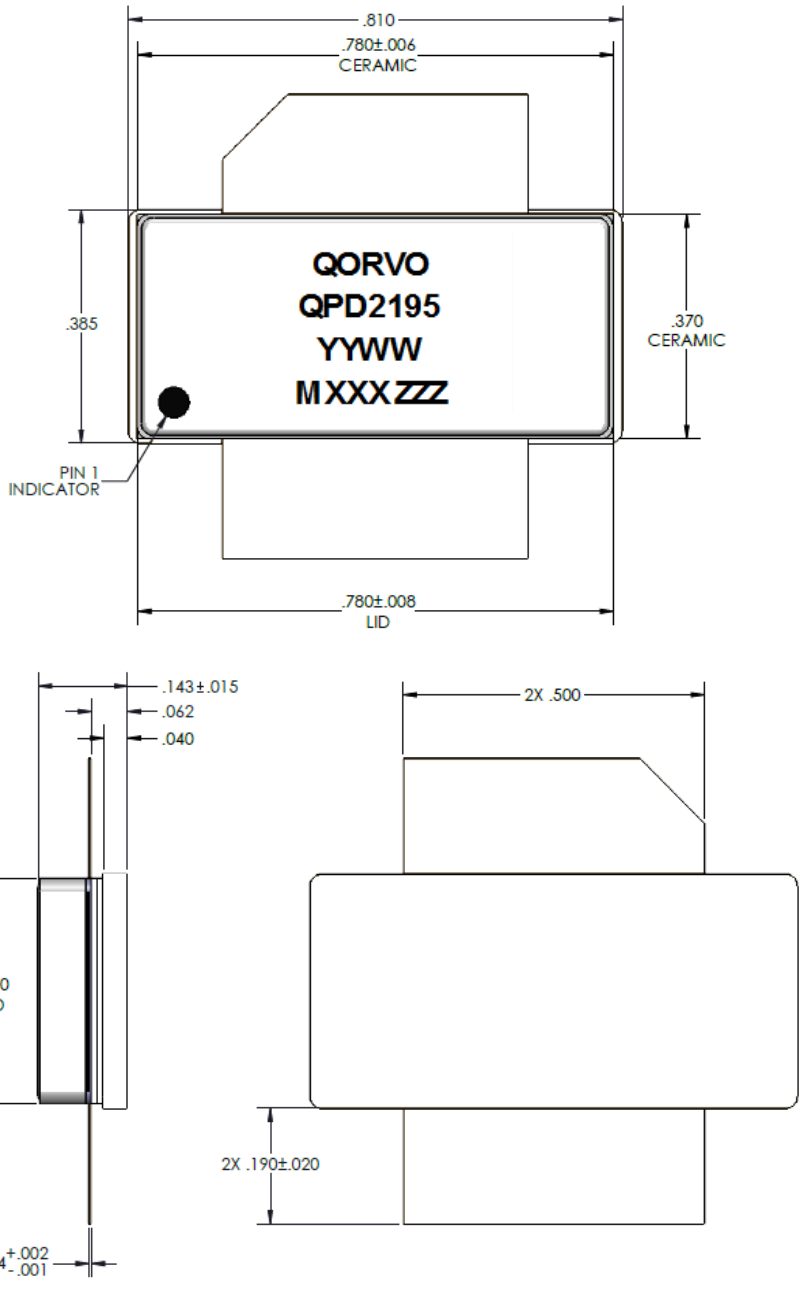
BOTTOM VIEW

Pin Description

Pin No.	Label	Description
1	RF IN, VG	RF Input, Gate Bias
2	RF OUT, VD	RF Output, Drain Bias
3 (Backside Paddle)	RF/DC GND	RF/DC Ground

Package Marking and Dimensions

Marking: Qorvo Logo
Part Number and Package Version – QPD2195
Date Code – YYWW
Production Lot Number – MXXX
Serial Number – ZZZ



Notes:
1. All dimensions are in inches. Angles are in degrees.
2. Exposed metallization is NiAu plated.