QPD2730

110 W / 220 W, 48 V, Asymmetric Doherty

Product Description

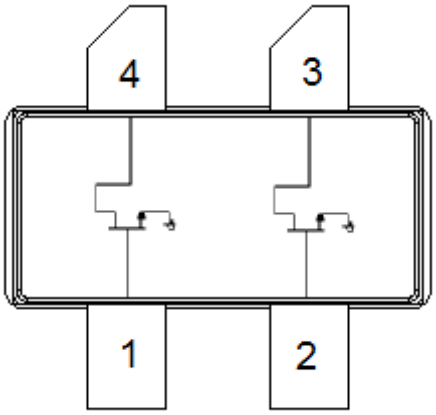
The QPD2730 is an asymmetric Doherty power device composed of pre-matched, discrete GaN on SiC HEMTs. The device operates from 2.575 to 2.635 GHz.

QPD2730 can deliver P_{AVG} of 36 W at +48 V operation.

ROHS compliant.

4 Lead NI780 Package

Functional Block Diagram



Product Features

- Operating Frequency Range: 2.575 – 2.635 GHz
- Peak Doherty Output Power: 54.8 dBm (302 W)
- Average Doherty Output Power: 45.6 dBm (36 W)
- Doherty Drain Efficiency: 55.8%
- Doherty Gain: 14.1 dB
- 4-lead, earless, ceramic flange NI780 package

Applications

- W-CDMA / LTE
- Macrocell Base Station
- Asymmetric Doherty Applications

Ordering Information

Part No.	Description
QPD2730	110 / 220 W, 2.6 GHz GaN Doherty
QPD2730-2.6-DOH	2.6 GHz Doherty Eval Board

Absolute Maximum Ratings

Parameter	Value / Range
Gate Current (I_G)	−21 to +21 mA
Drain Voltage (V_D)	+55 V
Peak RF Input Power	46 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 Conditions

Parameter	Min	Typ	Max	Units
Gate Voltage (V_{G1})		−2.7		V
Gate Voltage (V_{G2})		−4.75		V
Gate Current (I_{GQ})	−21	0.01	21	mA
Drain Voltage (V_{D1}, V_{D2})		48		V
Shutdown Voltage (V_{SV})			−4	V
Quiescent Current (I_{DQ1})		210	800	mA

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

RF Characterization – Doherty Specifications

Parameter	Conditions	Min	Typ	Max	Units
Frequency Range		2575		2635	MHz
Quiescent Current			220		mA
Doherty Gain	P_{AVG} = 45.6 dBm		14.1		dB
Average Power			45.6		dBm
Peak Power	P3dB		54.8		dBm
Drain Efficiency	P_{AVG} = 45.6 dBm		55.8		%

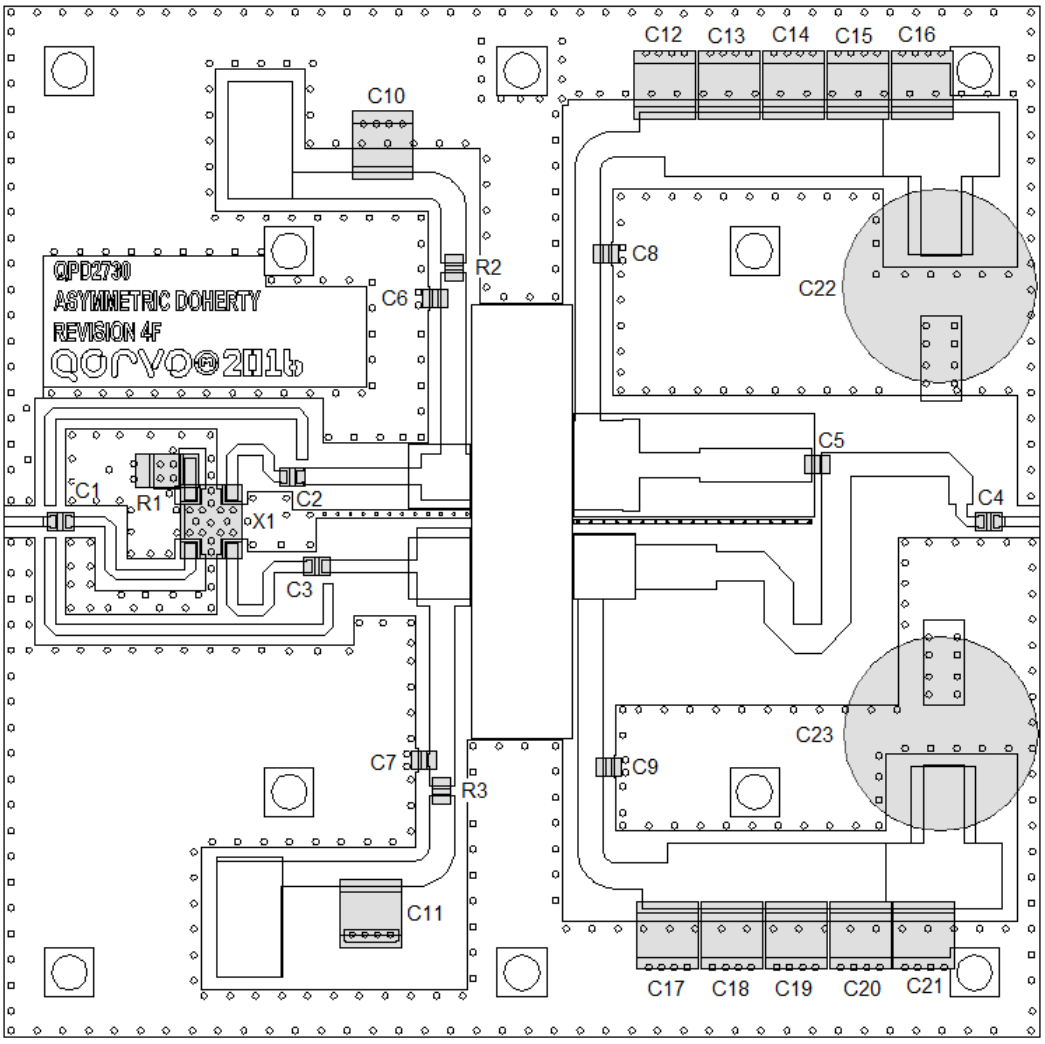
Test conditions unless otherwise noted: V_{G2} = −5.5 V, V_{D1} = V_{D2} = +48 V, I_{DQ1} = 220 mA, T = 25°C, Frequency = 2605 MHz, 1C WCDMA signal, Input PAR = 10 dB at 0.01% CCDF

Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance, Peak IR Surface Temperature at Average Power (θ_{JC})	T_{CASE} = 85°C, T_{CH} = 115°C, CW: P_{DISS} = 19.2 W, P_{OUT} = 28.8 W	1.56	°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.
4. Refer to the following document: GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates

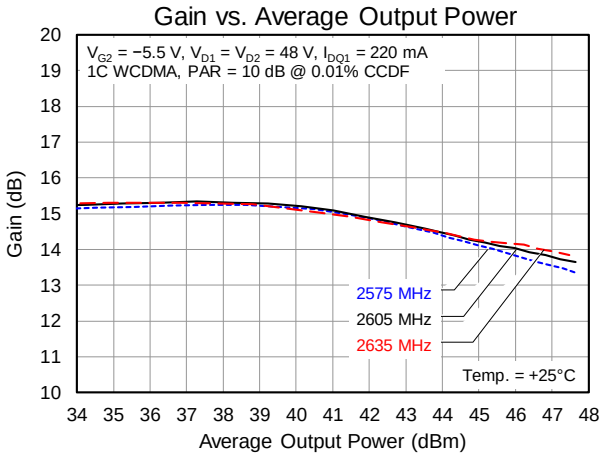
Doherty Evaluation Board Layout

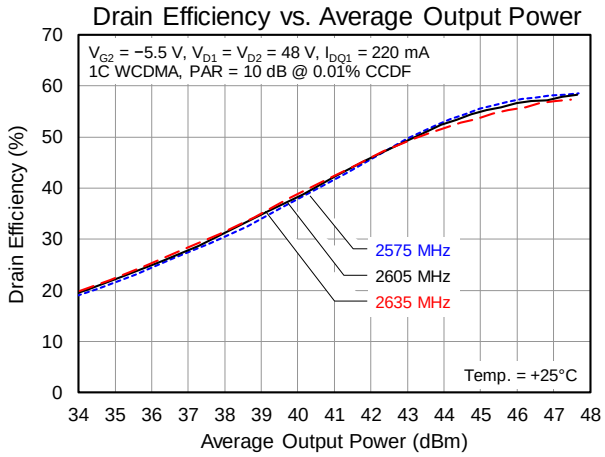


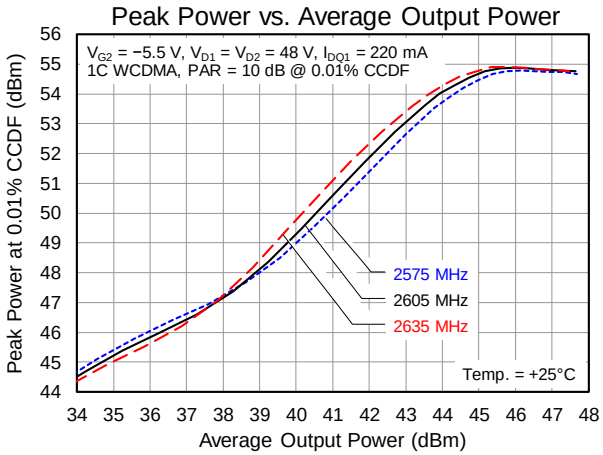
Bill of Materials

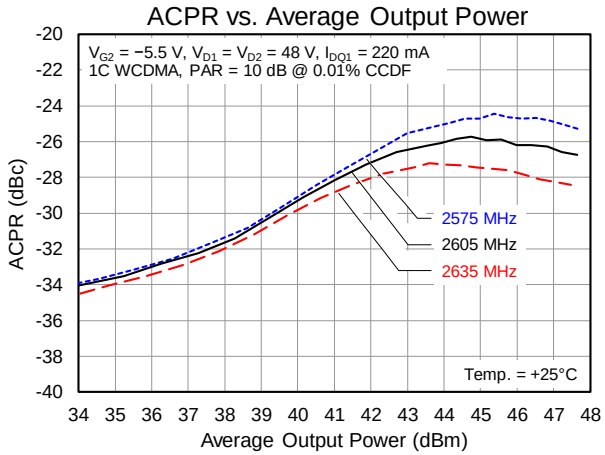
Reference Des.	Value	Description	Manuf.	Part Number
C1, C2, C3, C4, C5	20 pF	Capacitor, 20 pF	ATC	600F200JT250XT
C6, C7, C8, C9	4.3 pF	Capacitor, 4.3 pF	ATC	600F4R3CT250XT
C10, C11	1 µF	Capacitor, 1 µF, ceramic, >10 V, >1206	various	
C12, C13, C14, C15, C16, C17, C18, C19, C20, C21	10 µF	Capacitor, 10 µF, 100 V	TDK	C5750X7S2A106M230KB
C22, C23	220 µF	Capacitor, 220 µF, electrolytic, 100 V	Nichicon	UCZ2A221MNQ1MS
R1	50 Ω	Resistor, 50 Ω, 10 W	ATC	CS12010T0050
R2, R3	10 Ω	Resistor, 10 Ω, 1206	various	
X1	–	Coupler, 2 dB	Anaren	X3C25P1-02

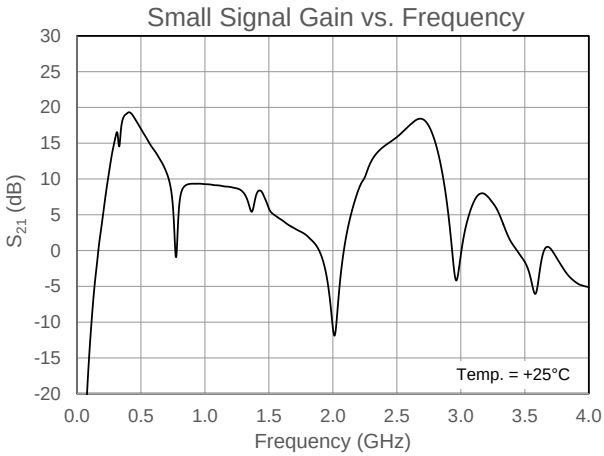
Doherty Performance Plots

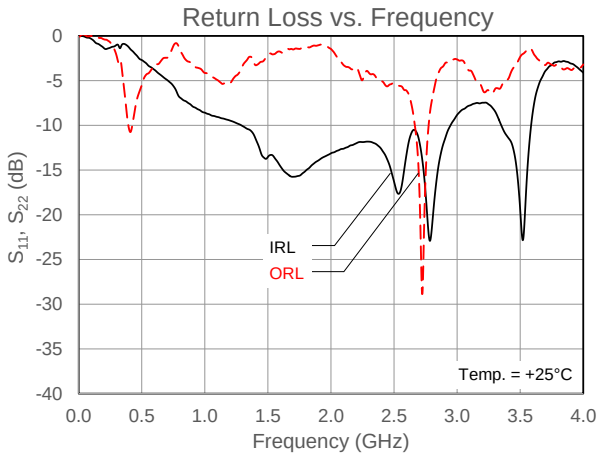












Test conditions unless otherwise noted: V_{G2} = −4.75 V, V_{D1} = V_{D2} = +48 V, I_{DQ1} = 210 mA, T = 25°C, Frequency = 2605 MHz, 1C WCDMA signal, Input PAR = 7 dB at 0.01% CCDF

Power-Tuned Carrier Amplifier Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
2575	17.710 – j14.460	16.414 – j0.156	15.48	50.74	60.50
2600	17.240 – j11.430	16.412 – j0.184	15.50	50.73	61.54
2635	21.810 – j10.050	16.416 – j0.189	15.24	50.67	61.73

Test conditions unless otherwise noted: V_{D1} = +48 V, I_{DQ1} = 210 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Efficiency-Tuned Carrier Amplifier Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
2575	17.710 – j14.460	8.846 – j9.607	17.92	48.95	73.51
2600	17.240 – j11.430	9.966 – j11.333	17.43	48.94	73.79
2635	21.810 – j10.050	11.869 – j9.968	17.03	49.37	72.96

Test conditions unless otherwise noted: V_{D1} = +48 V, I_{DQ1} = 210 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Power-Tuned Peaking Amplifier Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
2575	10.510 – j8.480	10.438 – j5.787	16.17	54.09	66.57
2600	10.330 – j6.500	10.873 – j3.769	15.63	54.09	63.55
2635	10.750 – j3.760	11.119 – j3.758	15.45	53.98	62.43

Test conditions unless otherwise noted: V_{D2} = +48 V, I_{DQ2} = 410 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

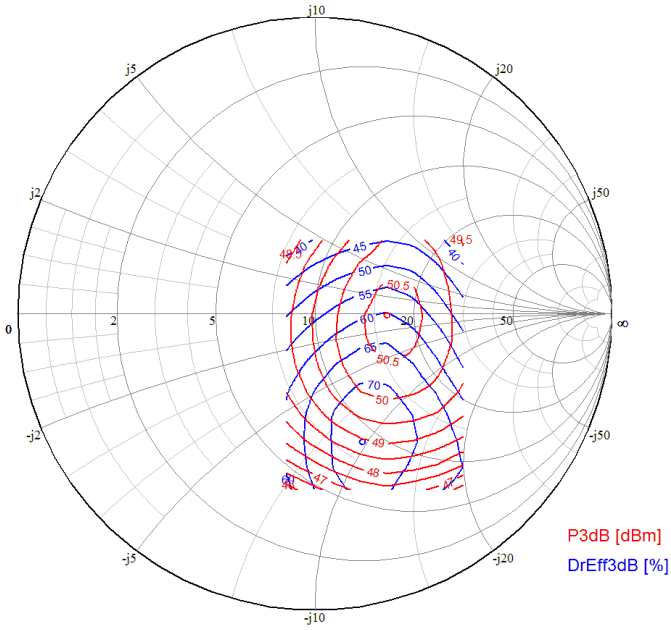
Efficiency-Tuned Peaking Amplifier Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
2575	10.510 – j8.480	6.319 – j9.729	17.62	52.82	74.01
2600	10.330 – j6.500	6.310 – j9.732	17.38	52.57	74.50
2635	10.750 – j3.760	6.309 – j9.711	17.50	52.35	72.97

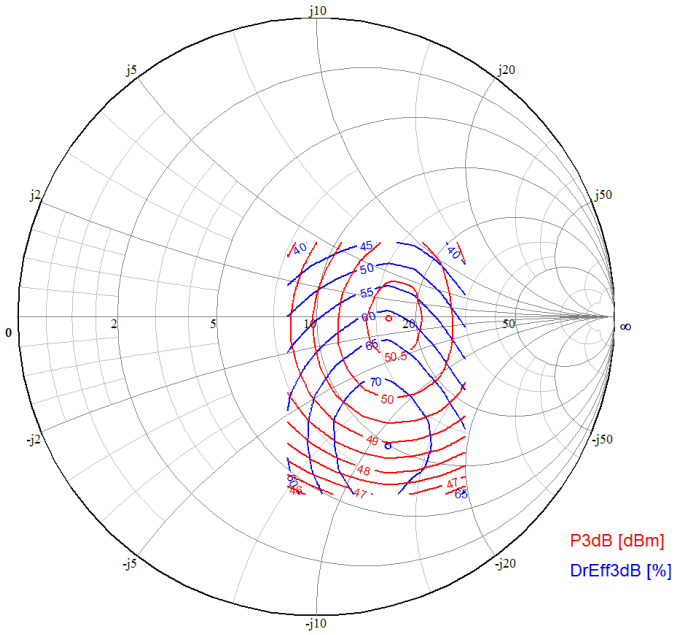
Test conditions unless otherwise noted: V_{D2} = +48 V, I_{DQ2} = 410 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Carrier Amplifier Load Pull Plots

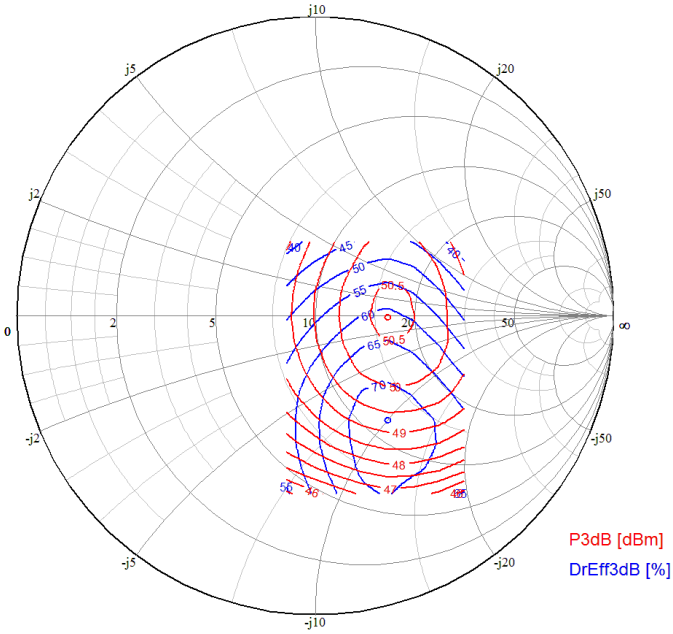
Load Pull at 2.575 GHz



Load Pull at 2.6 GHz



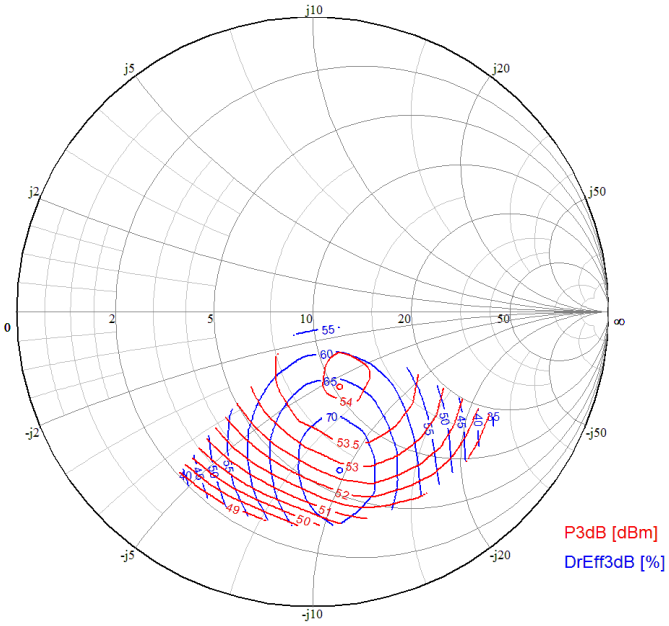
Load Pull at 2.635 GHz



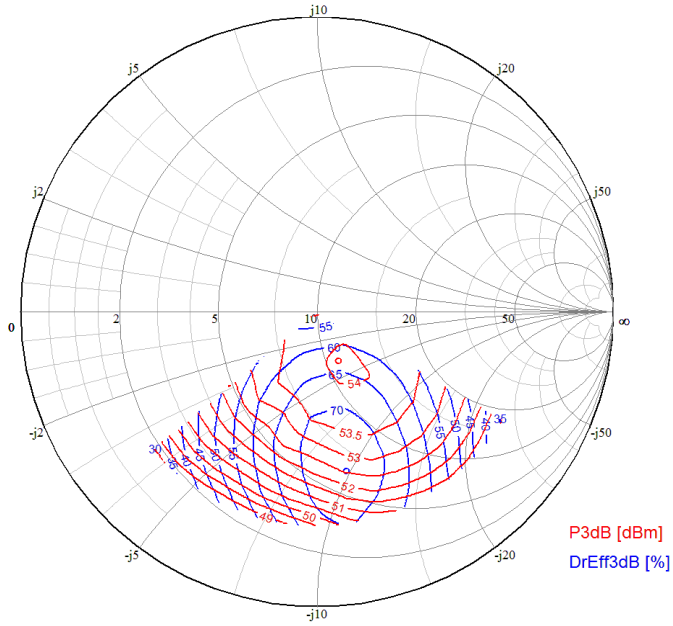
Test conditions unless otherwise noted: V_{D1} = +48 V, I_{DQ1} = 210 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Peaking Amplifier Load Pull Plots

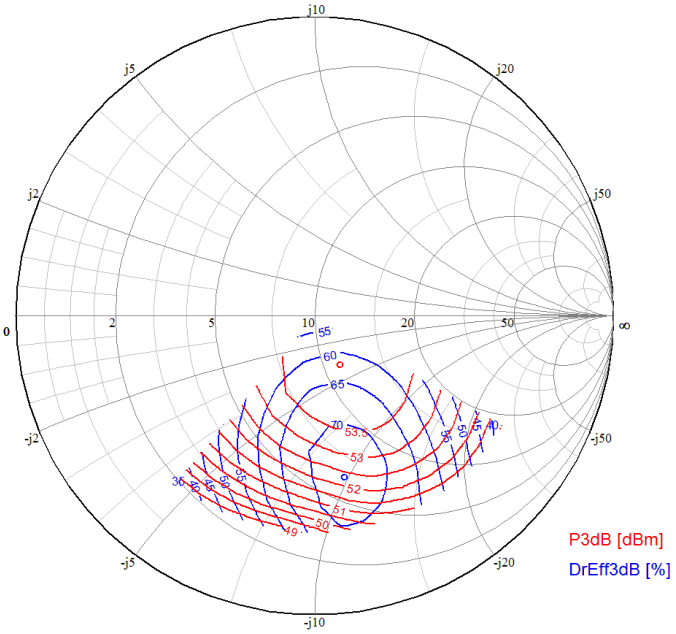
Load Pull at 2.575 GHz



Load Pull at 2.6 GHz

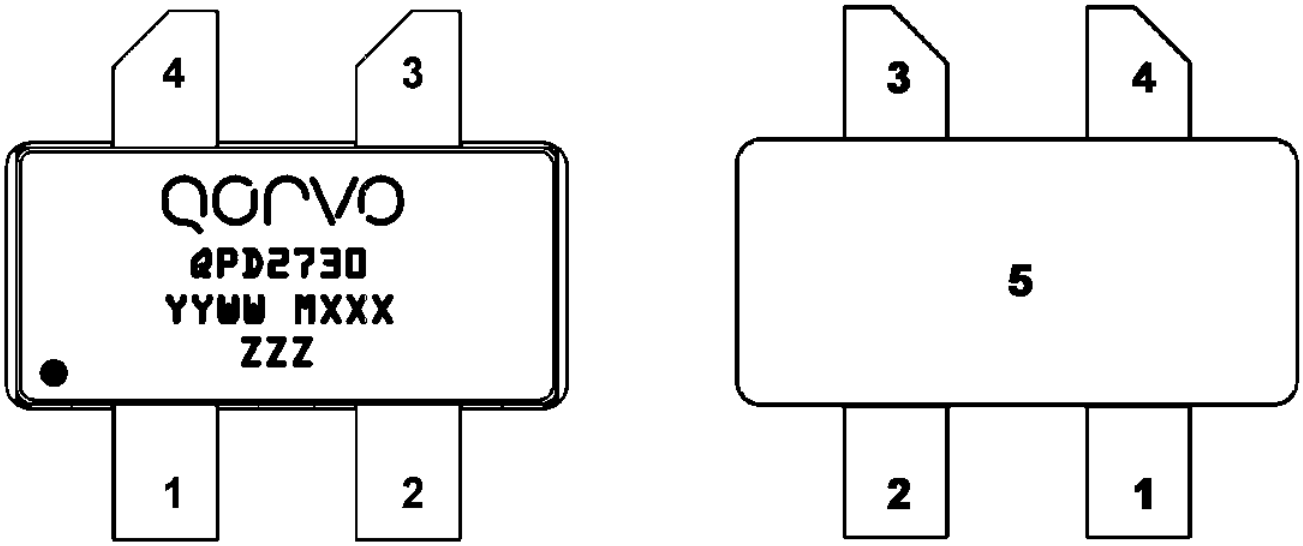


Load Pull at 2.635 GHz



Test conditions unless otherwise noted: V_{D2} = +48 V, I_{DQ2} = 410 mA, T = 25°C, Pulsed (10% duty cycle, 100 µs width)

Pin Configuration

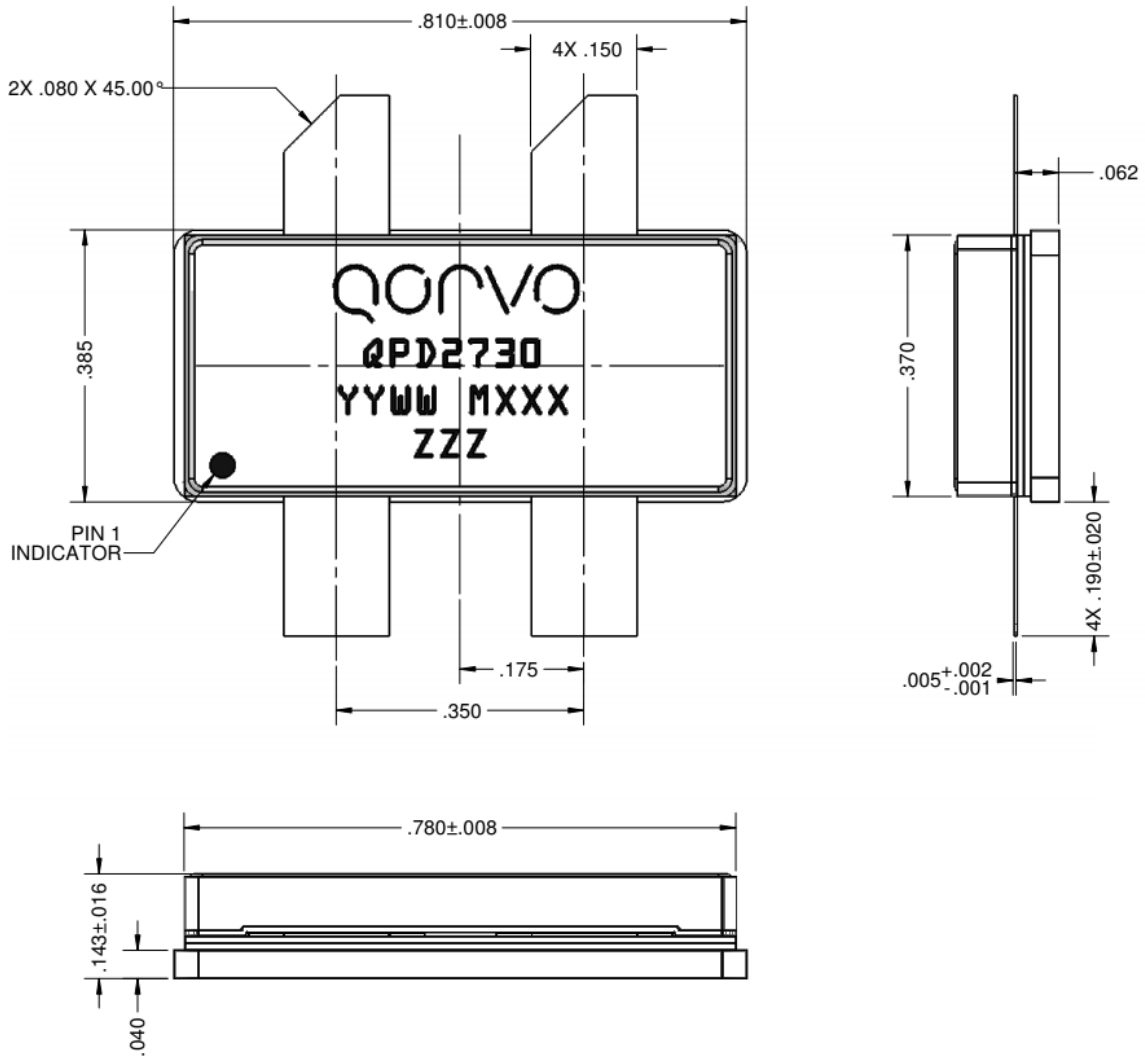


Pin Description

Pin No.	Label	Description
1	RF IN 1, V_{G1}	Carrier Amplifier RF Input, Gate Bias
2	RF IN 2, V_{G2}	Peaking Amplifier RF Input, Gate Bias
3	RF OUT 2, V_{D2}	Peaking Amplifier RF Output, Drain Bias
4	RF OUT 1, V_{D1}	Carrier Amplifier RF Output, Drain Bias
5 (Backside Paddle)	RF/DC GND	RF/DC Ground

Package Marking and Dimensions

Marking: Qorvo Logo
Part Number – QPD2730
Date Code – YYWW
Production Lot Number – MXXX
Serial Number – ZZZ



Notes: Unless Otherwise Specified;

1. Material:
   Package Base: Metal/Ceramic
   Package Lid: Ceramic
2. Package exposed metal base and leads are NiAu plated. Au thickness is minimum 60 µin.
3. Part is epoxy sealed.
4. Part meets industry NI780 footprint.
5. Body dimensions do not include lid shift or epoxy run out, which can be up to 0.020 per side.
6. Dimensions are in inches. General tolerance is ±0.005.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1B	ANSI/ESDA/JEDEC Standard JS-001
ESD – Charged Device Model (CDM)	Class C3	ANSI/ESDA/JEDEC Standard JS-002
MSL – 260°C Convection Reflow	Level 3	IPC/JEDEC Standard J-STD-020

Caution!
ESD-Sensitive Device

Solderability

Compatible with lead-free (260 °C maximum reflow temperature) soldering processes.
The use of no-clean solder to avoid washing after soldering is recommended.
Contact plating is NiAu. Au thickness is minimum 60 µin.

RoHS Compliance

This product is compliant with the 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:

- Product uses RoHS Exemption 7c-II to meet RoHS Compliance requirements.
- Halogen Free
- 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, and information about Qorvo:

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