QPD0050

75 W, DC to 3.6 GHz 48V GaN RF Power Transistor

Applications

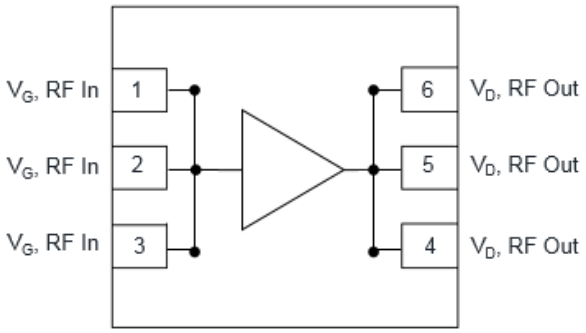
- W-CDMA / LTE
- Macrocell Base Station Driver
- Microcell Base Station
- Small Cell Final Stage
- Active Antenna
- General Purpose Applications

6 Pin 7.2x6.6mm DFN

Product Features

- Operating Frequency Range: DC to 3.6 GHz
- Operating Drain Voltage: 48 V
- Maximum Output Power (P_{SAT}): 82.8 W at 2.6 GHz
- Maximum Drain Efficiency: 78.5% at 2.6 GHz
- Efficiency-Tuned P3dB Gain: 19.4 dB at 2.6 GHz
- Surface Mount Plastic Package

Functional Block Diagram



General Description

The QPD0050 is a wide band over-molded QFN discrete power amplifier. The device is a single stage unmatched power amplifier transistor.

The QPD0050 can be used in Doherty architecture for the final stage of a base station power amplifier for small cell, microcell, and active antenna systems. The QPD0050 can also be used as a driver in a macrocell base station power amplifier.

The wide bandwidth of the QPD0050 makes it suitable for many different applications from DC to 3.6 GHz. QPD0050 can deliver P_{SAT} of 82 W at 48 V operation at 2.6 GHz.

Lead-free and ROHS compliant.

Pin Configuration

Pin No.	Label
1,2,3	RF IN, V_G
4,5,6	RF OUT, V_D
Backside Paddle	RF/DC Ground

Ordering Information

Part No.	ECCN	Description
QPD0050	EAR99	75 W 48 V DC-3.6 GHz GaN RF Power Transistor

Absolute Maximum Ratings

Parameter	Rating
Gate Voltage (V_G)	–10 V
Drain Voltage (V_D)	+55 V
Maximum RF Input Power `	35 dBm
VSWR Mismatch, P1dB Pulse (20% 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
Operating Temperature	–40			°C
Gate Voltage (V_G)		–2.7		V
Drain Voltage (V_D)		48		V
Quiescent Current (I_{CQ})		130		mA
T_{CH} for >10^6 hours MTTF			225	°C

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

RF Characterization – Power-Tuned Load Pull Performance

Test conditions unless otherwise noted: V_D = 48 V, I_{CQ} = 130 mA, T = 25°C, Pulsed CW (10% duty cycle, 100 µs width)

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
1800	4.01 – j2.99	6.15 + j1.97	21.04	48.78	63.68
2000	4.47 – j1.53	5.92 + j1.82	20.40	48.53	63.31
2140	6.09 – j1.33	6.11 + j0.96	19.68	48.45	61.46
2200	5.20 – j0.08	5.89 + j0.43	19.05	48.37	58.86
2500	6.86 + j0.57	4.74 – j1.10	17.68	49.04	62.82
2600	7.57 + j0.97	4.74 – j1.09	17.64	49.18	67.65
2700	7.43 + j1.34	4.92 – j2.26	16.84	49.03	61.32
3400	10.25 – j0.25	4.47 – j4.64	15.16	48.04	56.00
3500	9.38 + j0.01	4.47 – j4.63	15.25	48.12	59.38
3600	8.86 + j0.04	4.47 – j4.63	15.89	48.04	57.87

RF Characterization – Efficiency-Tuned Load Pull Performance

Test conditions unless otherwise noted: V_D = 48 V, I_{CQ} = 130 mA, T = 25°C, Pulsed CW (10% duty cycle, 100 µs width)

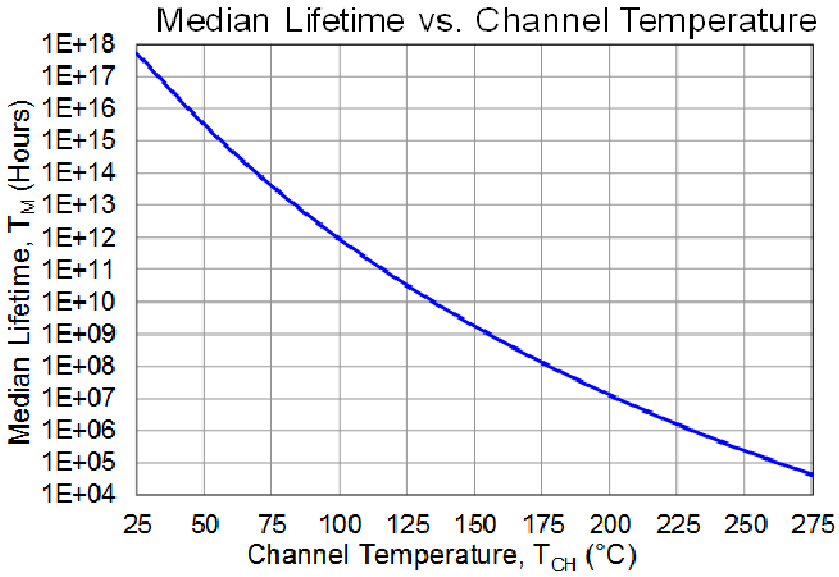
Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
1800	4.01 – j2.99	5.11 + j8.94	23.18	45.85	81.70
2000	4.01 – j1.53	4.80 + j4.73	22.06	47.49	71.76
2140	6.09 – j1.33	4.58 + j5.24	21.68	46.77	74.50
2200	5.20 – j0.08	3.91 + j4.22	21.30	46.91	71.82
2500	6.86 + j0.57	3.25 + j2.36	19.62	47.24	76.03
2600	7.57 + j0.97	2.91 + j1.69	19.36	47.27	78.51
2700	7.43 + j1.34	2.91 + j1.69	19.02	46.87	77.83
3400	10.25 – j0.25	2.17 – j2.02	16.84	46.16	70.07
3500	9.38 + j0.01	1.89 – j2.71	16.17	46.11	70.86
3600	8.86 + j0.04	2.62 – j3.05	17.07	46.98	67.45

Thermal Information

Parameter	Conditions	Value	Units
Thermal Resistance at Average Power (θ_{JC})	T_{CASE} = 105°C, T_{CH} = 139.12°C CW: P_{DISS} = 13.43 W, P_{OUT} = 3.55 W	2.54	°C/W

Notes:
1. Thermal resistance measured to package backside.

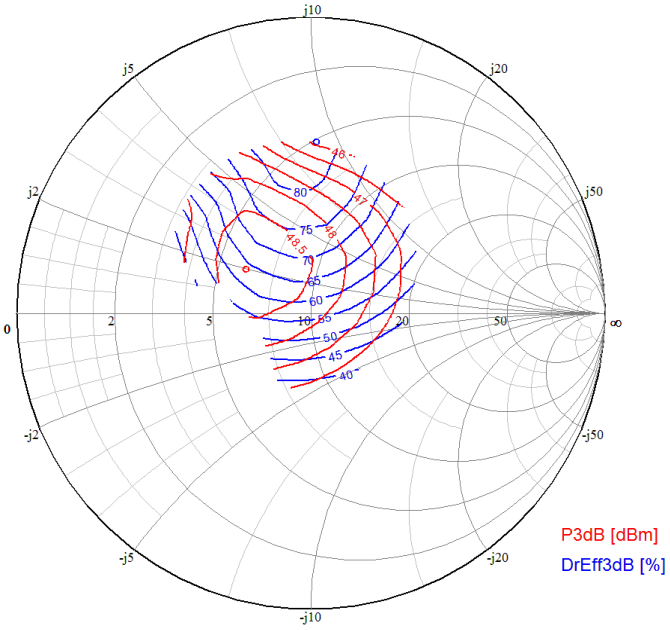
Median Lifetime



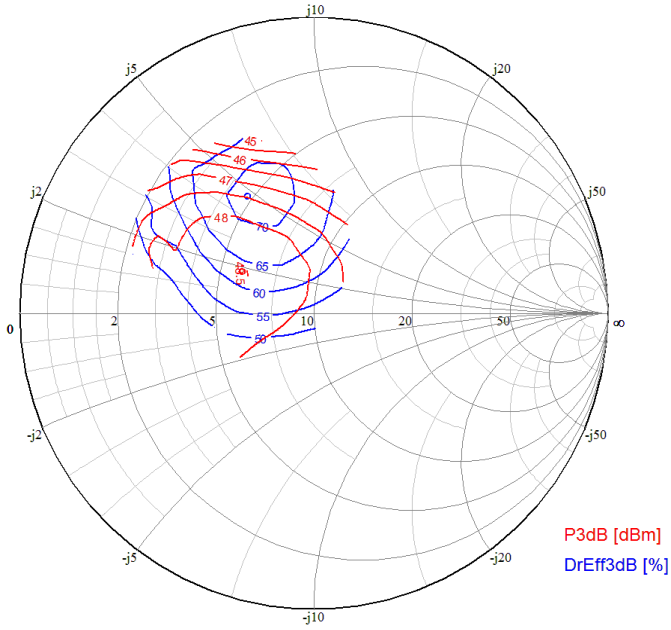
Load Pull Plots

Test conditions unless otherwise noted: V_D = 48 V, I_{CQ} = 131 mA, T = 25°C, Pulsed CW (10% duty cycle, 100 µs width)

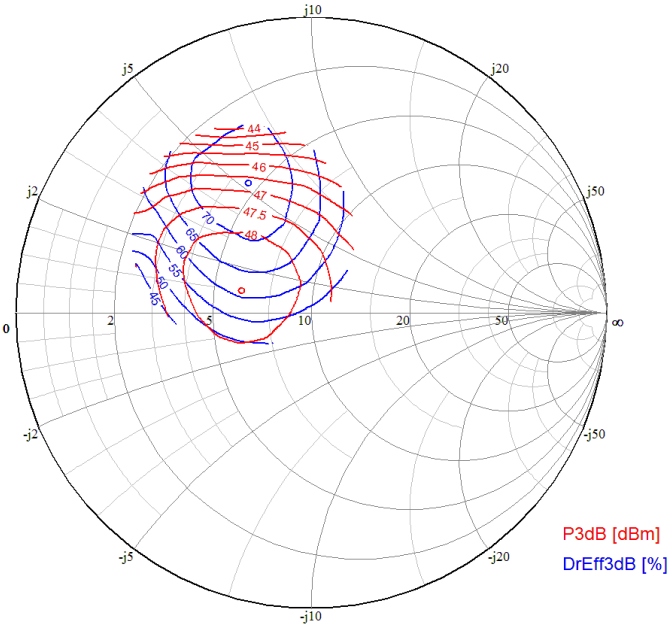
Load Pull at 1.8 GHz



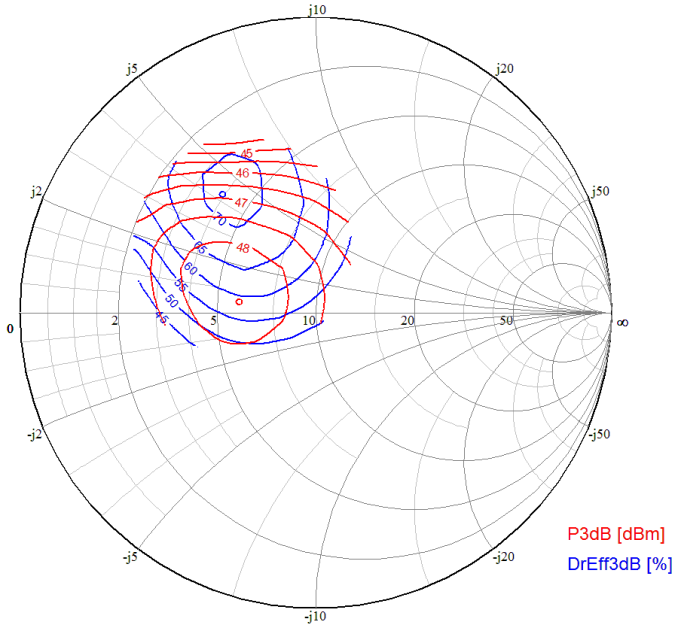
Load Pull at 2 GHz



Load Pull at 2.14 GHz



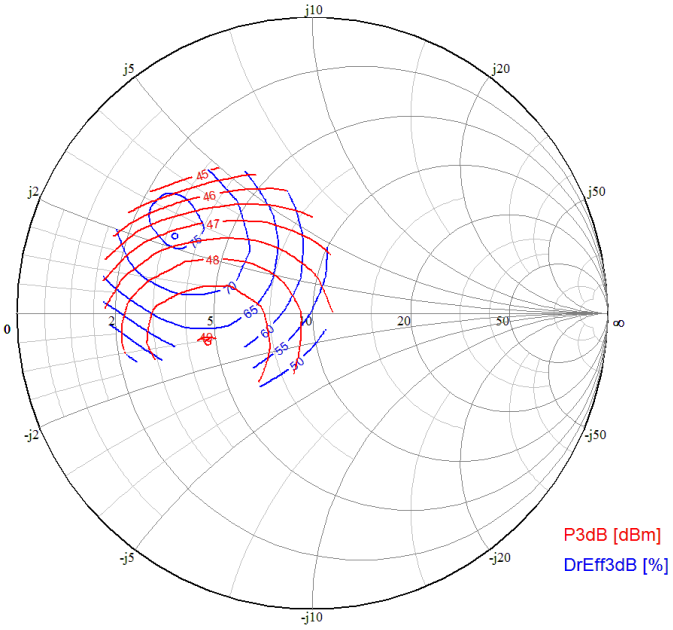
Load Pull at 2.2 GHz



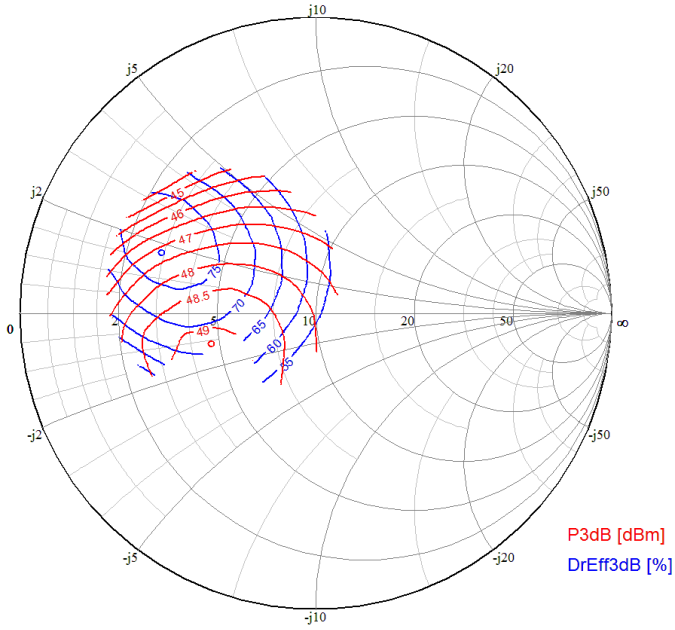
Load Pull Plots

Test conditions unless otherwise noted: V_D = 48 V, I_{CQ} = 131 mA, T = 25°C, Pulsed CW (10% duty cycle, 100 µs width)

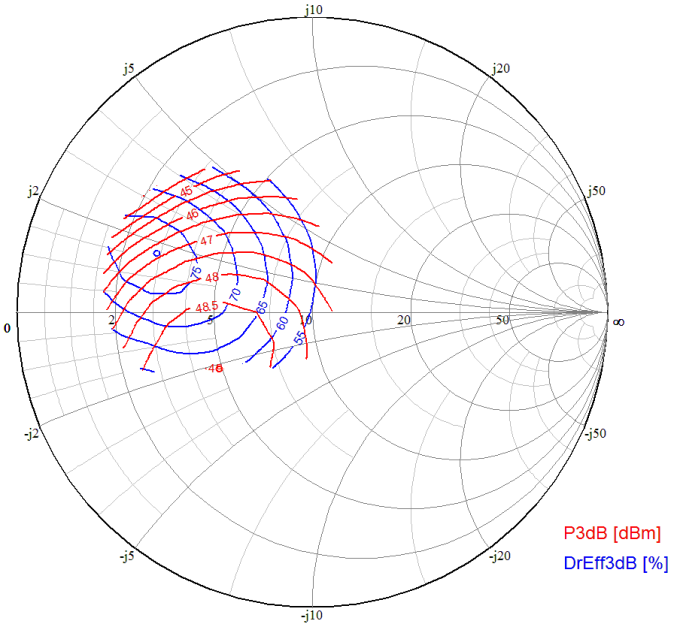
Load Pull at 2.5 GHz



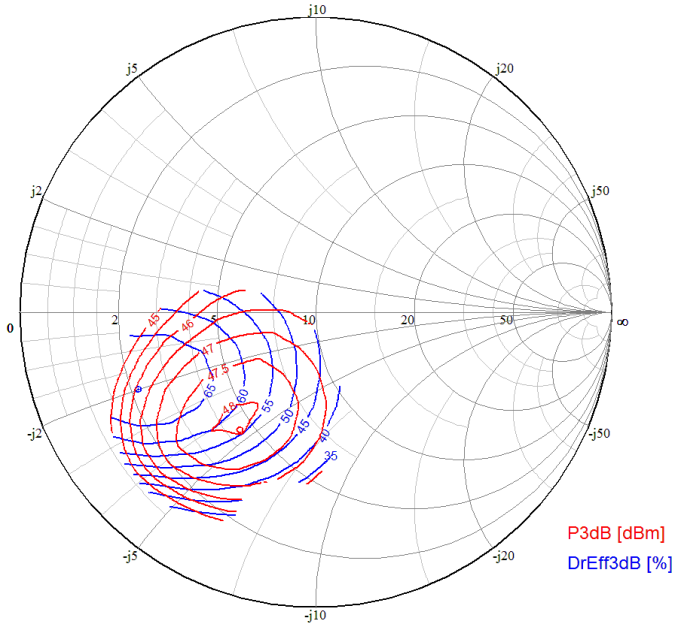
Load Pull at 2.6 GHz



Load Pull at 2.7 GHz



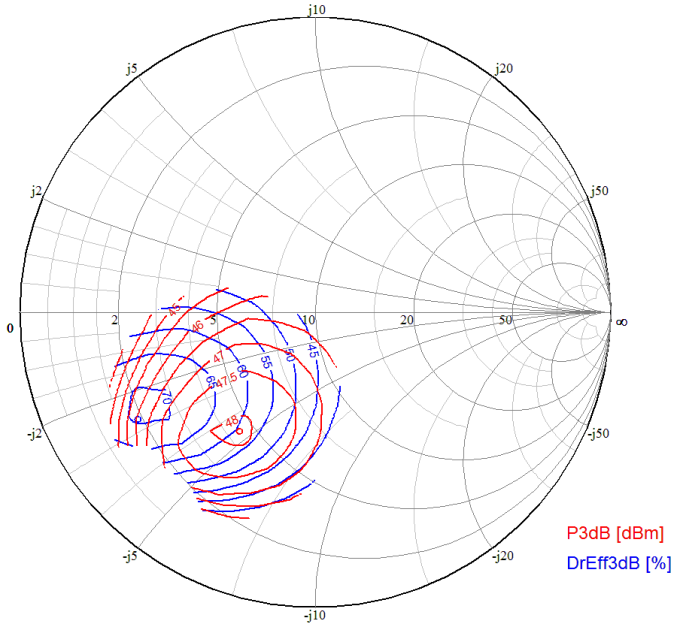
Load Pull at 3.4 GHz



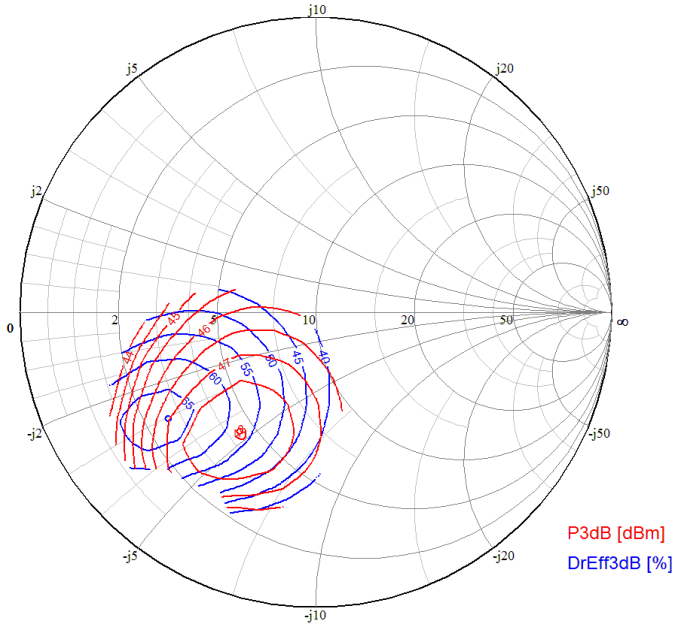
Load Pull Plots

Test conditions unless otherwise noted: V_D = 48 V, I_{CQ} = 131 mA, T = 25°C, Pulsed CW (10% duty cycle, 100 µs width)

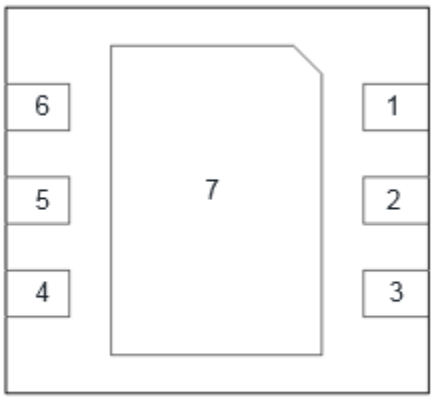
Load Pull at 3.5 GHz



Load Pull at 3.6 GHz



Pin Configuration and Description



BOTTOM VIEW

Pin No.	Label	Description
1, 2, 3	RF IN, V_G	RF Input, Gate Bias
4, 5, 6	RF OUT, V_D	RF Output, Drain Bias
7 (Backside Paddle)	RF/DC GND	RF/DC Ground

Package Marking and Dimensions

Marking: Product Name – QPD0050
Year, Work Week Assembly Code – YYWW
Assembly Number – MXXX

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