

Product Description

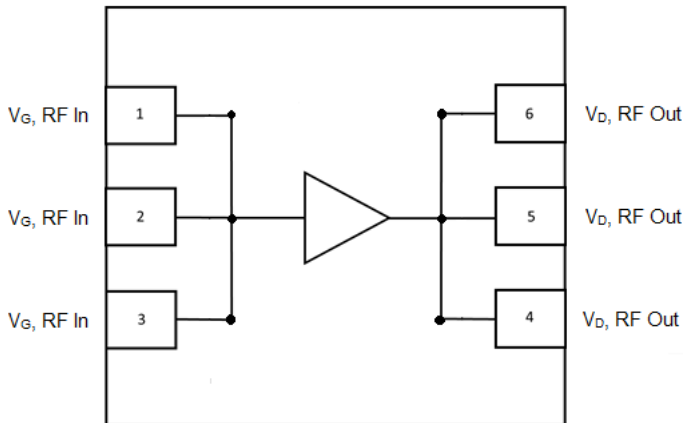
The QPD0060 is a wide band over-molded DFN discrete power amplifier. The device is a single stage unmatched power amplifier transistor.

The QPD0060 can be used in Doherty architecture for the final stage of a base station amplifier for small cell, microcell, and active antenna systems. The QPD0060 can also be used as a driver in a macrocell base station power amplifier.

The wide bandwidth of the QPD0060 makes it suitable for many different applications from DC to 3.6 GHz. QPD0060 can deliver P_{SAT} of 90 W at +48 V operation.

Lead-free and ROHS compliant.

Functional Block Diagram



6 Pin 7.2x 6.6 mm DFN

Product Features

- Operating Frequency Range: DC to 3.6 GHz
- Operating Drain Voltage: +48 V
- Maximum Output Power (P_{SAT}): 95 W
- Maximum Drain Efficiency: 73.6%
- Efficiency-Tuned P3dB Gain: 22.9 dB
- Surface Mount Plastic Package

Applications

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

Ordering Information

Part No.	ECCN	Description
QPD0060TR7	EAR99	7" Reel with 250 pieces
QPD0060PCB4B01	EAR99	1.8 – 2.2 GHz Eval Board

Absolute Maximum Ratings

Parameter	Range / Value	Units
Gate Voltage (V_G)	-10	V
Drain Voltage (V_D)	+55	V
Maximum RF Input Power	38	dBm
VSWR Mismatch, P1dB Puls (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_{DQ})	-	150	-	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.

Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Frequency Range		1800	-	3800	MHz
Quiescent Current		-	150	-	mA
Gain	P3dB	-	16.2	-	dB
P3dB		-	49.4	-	dBm
Drain Efficiency	P3dB	-	65.1	-	%

Test conditions unless otherwise noted: $V_D = +48$ V, $I_{DQ} = 150$ mA, T = 25°C, Pulsed (10% duty cycle, 100 μ s width), on a Class AB single-ended EVB tuned for 1.8-2.2 GHz

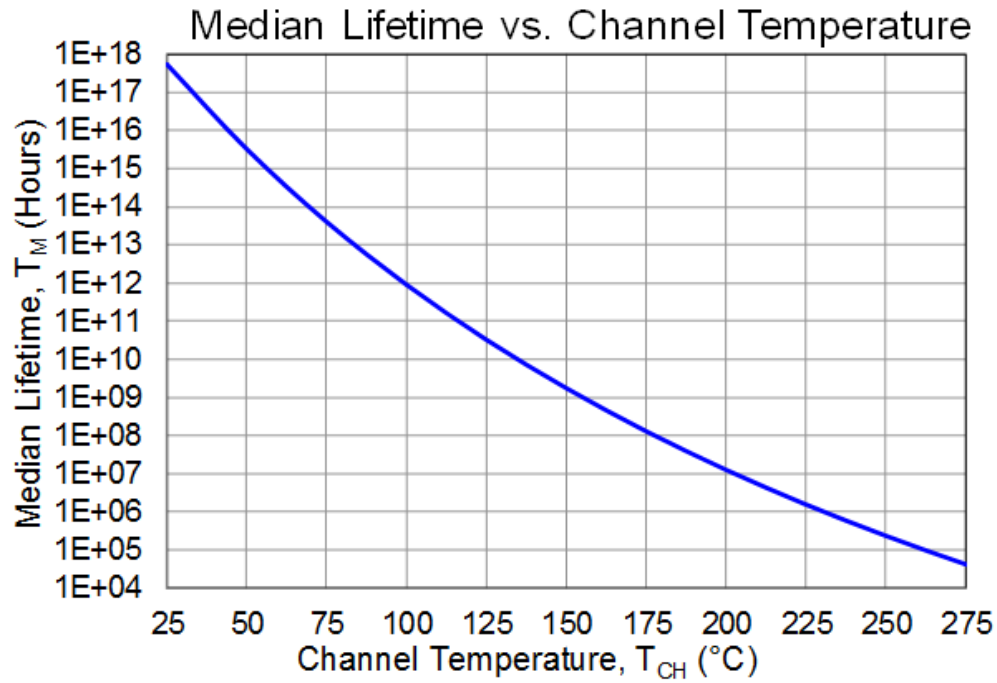
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance at Average Power (θ_{JC})	$T_{CASE} = 105^{\circ}C$, $T_{CH} = 163^{\circ}C$ CW: $P_{DISS} = 21.4 W$, $P_{OUT} = 5 W$	2.6	$^{\circ}C/W$

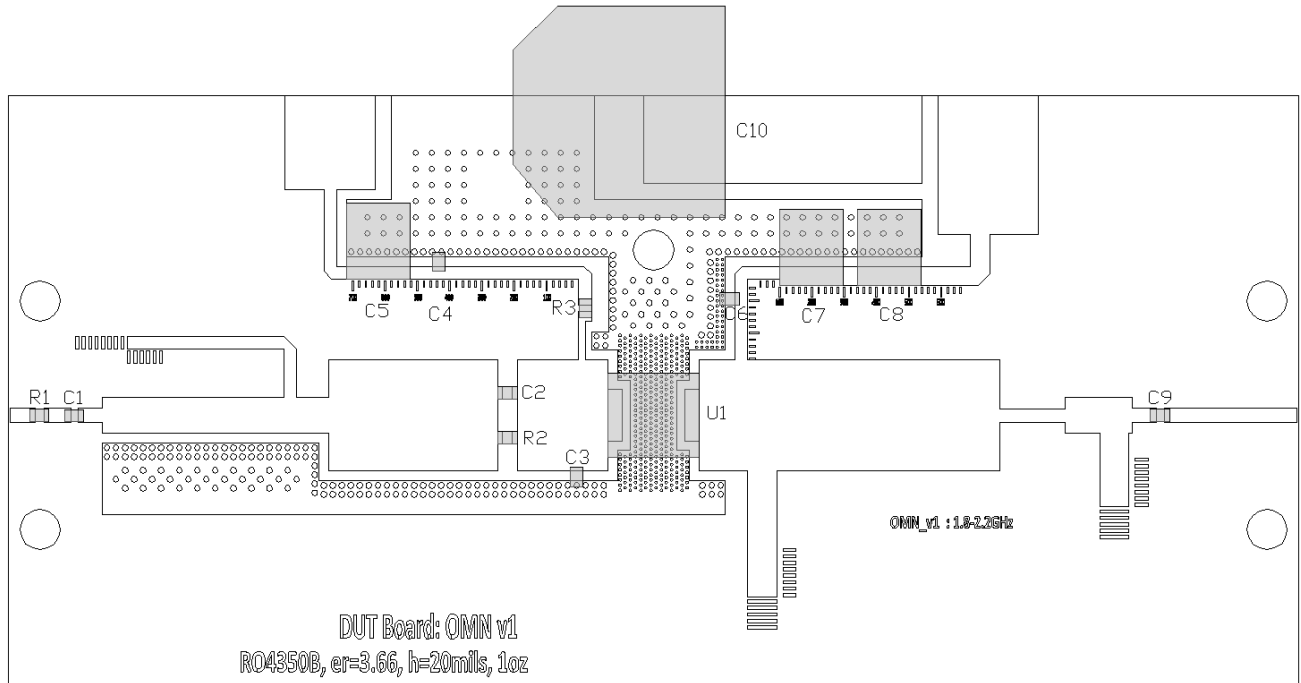
Notes:

1. Thermal resistance measured to package backside

Median Lifetime



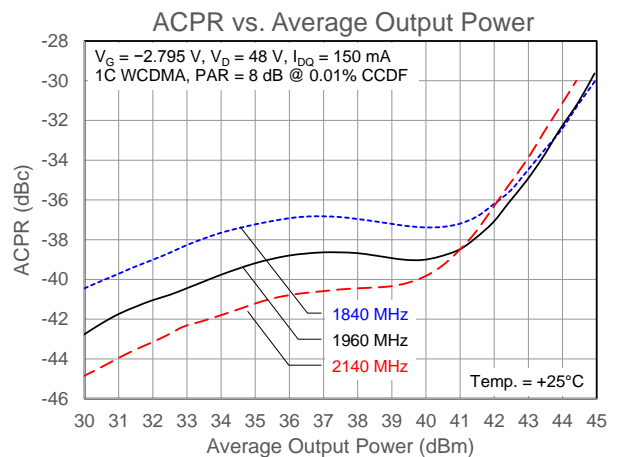
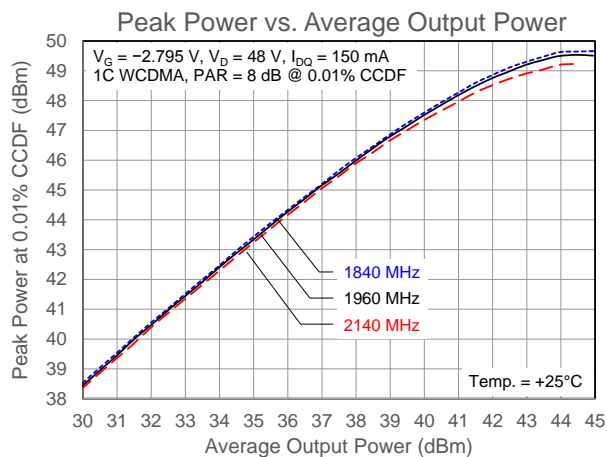
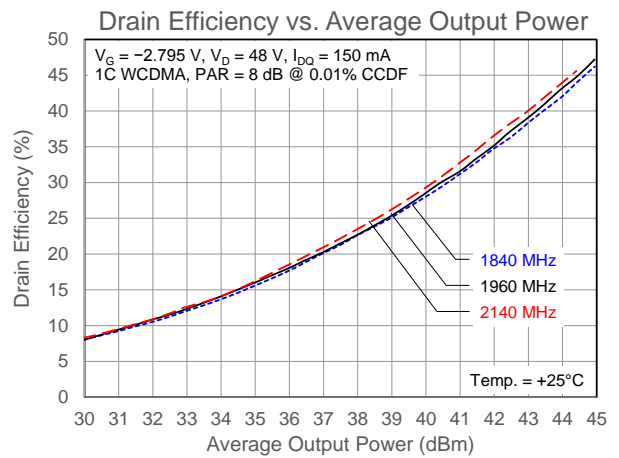
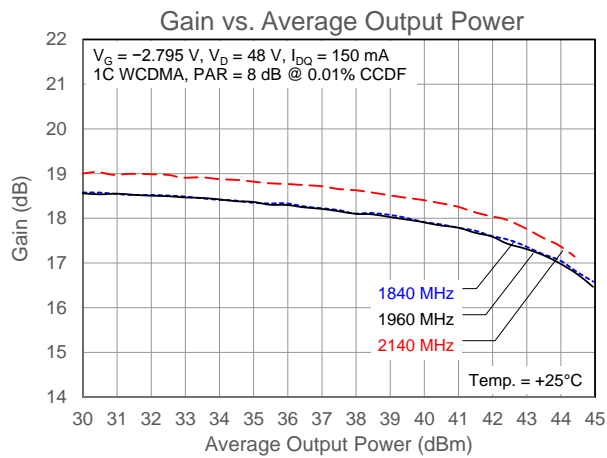
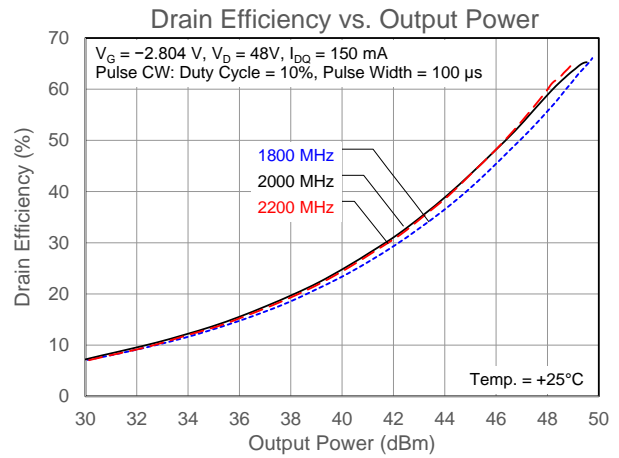
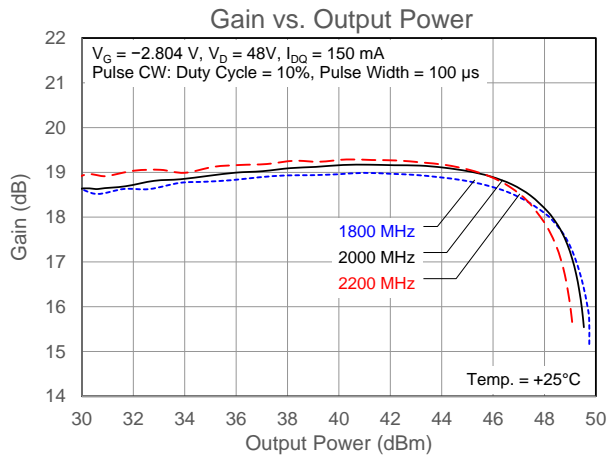
QPD0060PCB4B01 1.8 – 2.2 GHz Evaluation Board Layout



Bill of Materials – QPD0060PCB4B01 1.8 – 2.2 GHz Evaluation Board

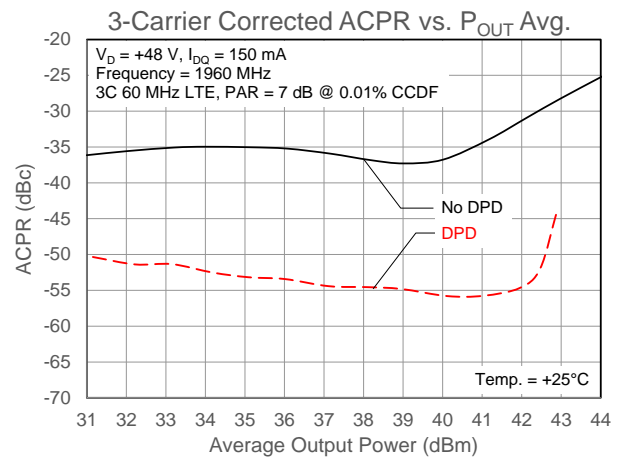
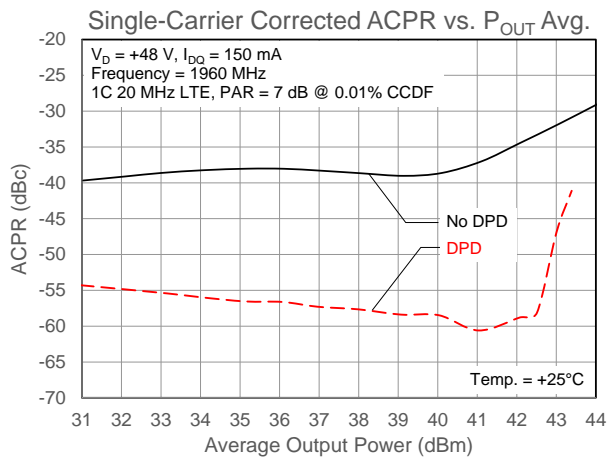
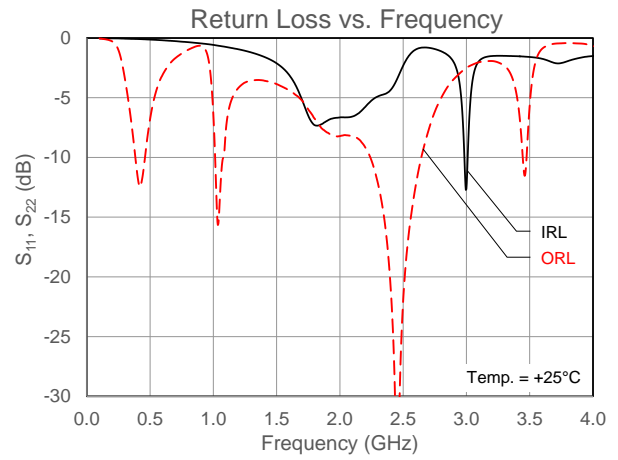
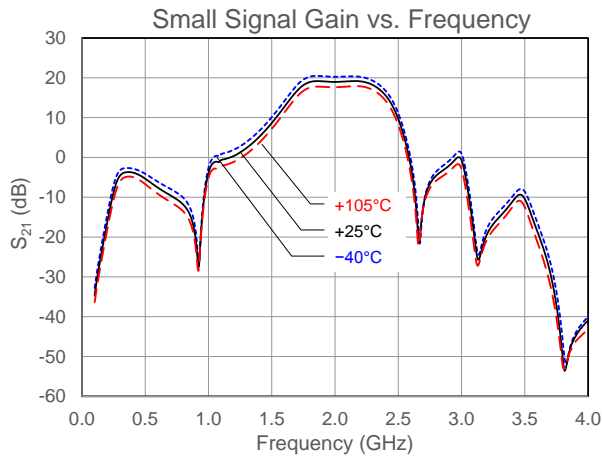
Reference Des.	Value	Description	Manuf.	Part No.
C1	1.6 pF	Capacitor, ±0.05 pF, 250 V, HI-Q, 0603	ATC	600S1R6AT250XT
C2, C3	3.0 pF	Capacitor, ±0.1 pF, 250 V, HI-Q, 0603	ATC	600S3R0BT250XT
C4, C6, C9	20 pF	Capacitor, 1%, 250 V, HI-Q, 0603	ATC	600S200FT250XT
C5, C7, C8	10 µF	Capacitor, 20%, 100 V, X7S, 2220	TDK	C5750X7S2A106M230KB
C10	100 µF	Capacitor, 20%, 100 V, AL ELEC, RAD, SMD	Panasonic	EEV-TG2A101M
R1	3.0 Ω	Resistor, 5%, 0.1 W, 0603	various	–
R2	220 Ω	Resistor, 5%, 0.1 W, 0603, Lead Free	KOA Speer	RK73B1JT221J
R3	10 Ω	Resistor, 0603, ROHS	Kamaya	RMC1/16K10R0FTP
U1	–	100 W GaN RF Transistor	Qorvo	QPD0060

Performance Plots



Test conditions unless otherwise noted: $V_D = +48\text{ V}$, $I_{DQ} = 150\text{ mA}$, $T = 25^\circ\text{C}$, on a Class AB single-ended EVB tuned for 1.8-2.2 GHz

Performance Plots



Test conditions unless otherwise noted: $V_D = +48$ V, $I_{DQ} = 150$ mA, $T = 25^\circ\text{C}$, on a Class AB single-ended EVB tuned for 1.8-2.2 GHz



RF Characterization – Power-Tuned Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
1800	7.62 + j0.37	6.03 + j0.84	21.3	49.7	59.1
2000	9.99 + j4.10	5.37 – j0.33	20.3	49.8	57.8
2200	8.66 + j0.82	6.05 + j0.08	19.8	49.7	63.0

Test conditions unless otherwise noted: $V_D = +48\text{ V}$, $I_{DQ} = 150\text{ mA}$, $T = 25^\circ\text{C}$, Pulsed (10% duty cycle, 100 μs width) on a Class AB single-ended EVB tuned for 1.8-2.2 GHz

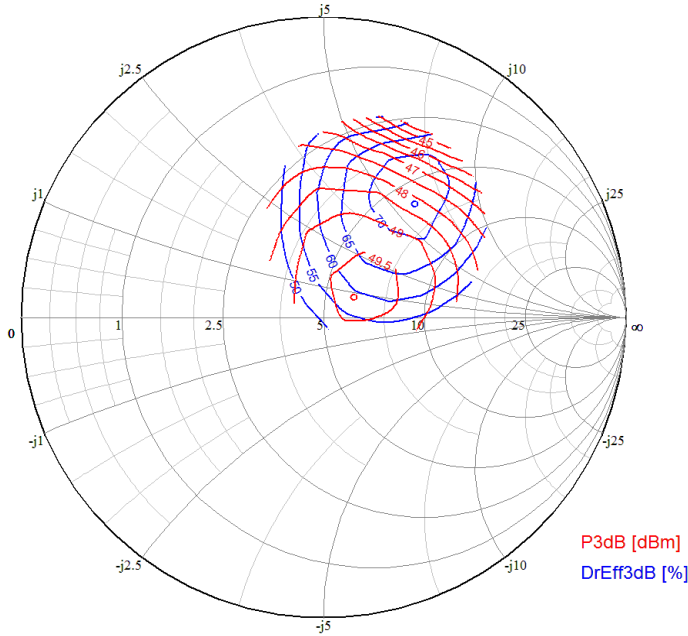
RF Characterization – Efficiency-Tuned Load Pull Performance

Frequency (MHz)	Source Impedance	Load Impedance	Gain @ P3dB (dB)	P3dB (dBm)	Drain Efficiency (%)
1800	7.62 + j0.37	6.08 + j5.97	23.1	48.3	72.6
2000	9.99 + j4.10	3.98 + j4.40	22.9	47.9	73.6
2200	8.66 + j0.82	3.30 + j3.51	22.0	47.4	72.4

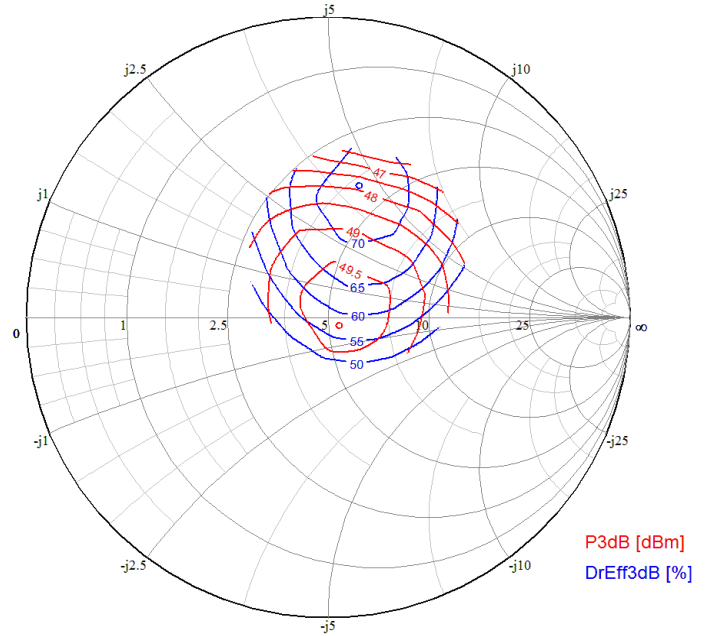
Test conditions unless otherwise noted: $V_D = +48\text{ V}$, $I_{DQ} = 150\text{ mA}$, $T = 25^\circ\text{C}$, Pulsed (10% duty cycle, 100 μs width) on a Class AB single-ended EVB tuned for 1.8-2.2 GHz

Load Pull Plots

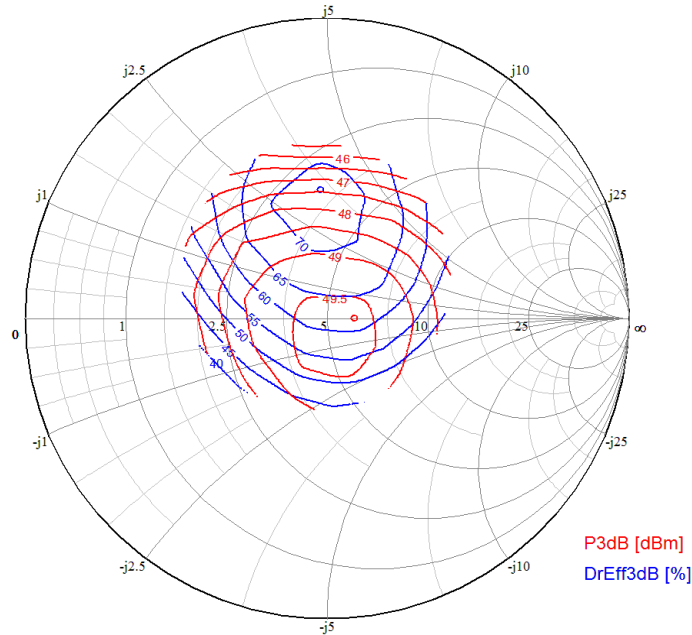
Load Pull at 1.8 GHz



Load Pull at 2 GHz

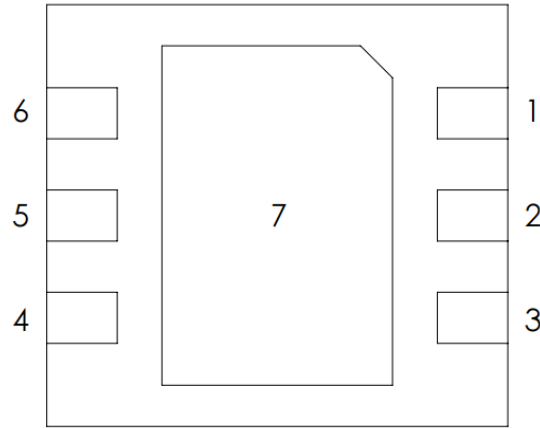


Load Pull at 2.2 GHz



Test conditions unless otherwise noted: $V_D = +48\text{ V}$, $I_{DQ} = 150\text{ mA}$, $T = 25^\circ\text{C}$, Pulsed (10% duty cycle, 100 μs width) on a Class AB single-ended EVB tuned for 1.8-2.2 GHz

Pin Configuration and Description

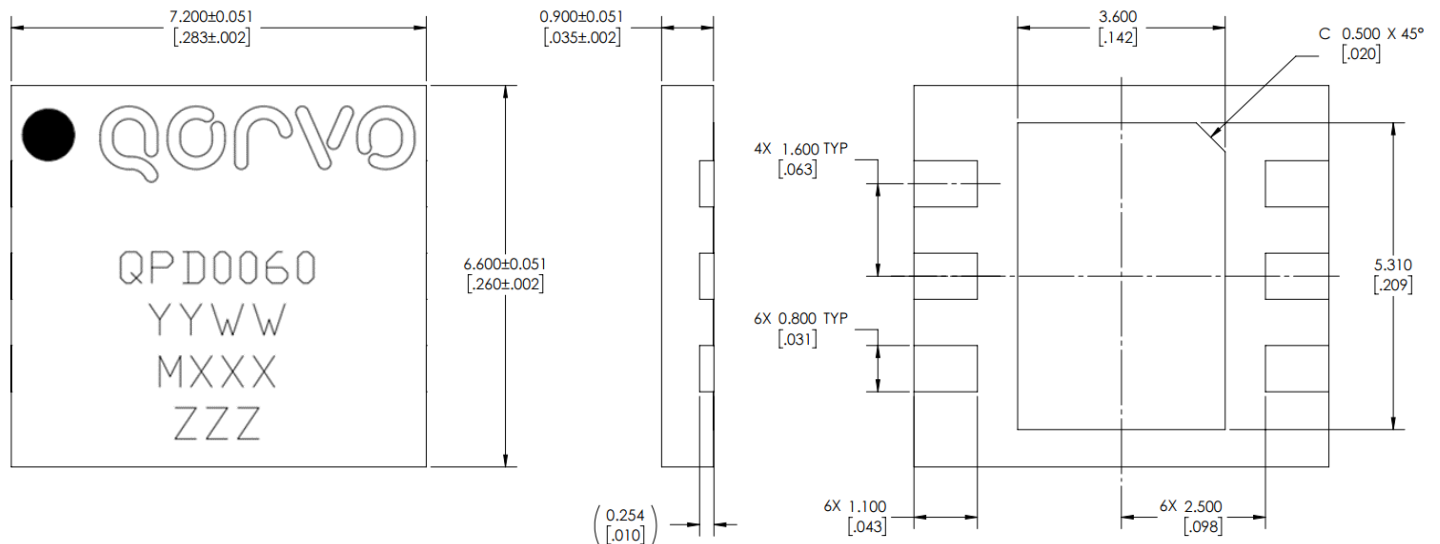


BOTTOM VIEW

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

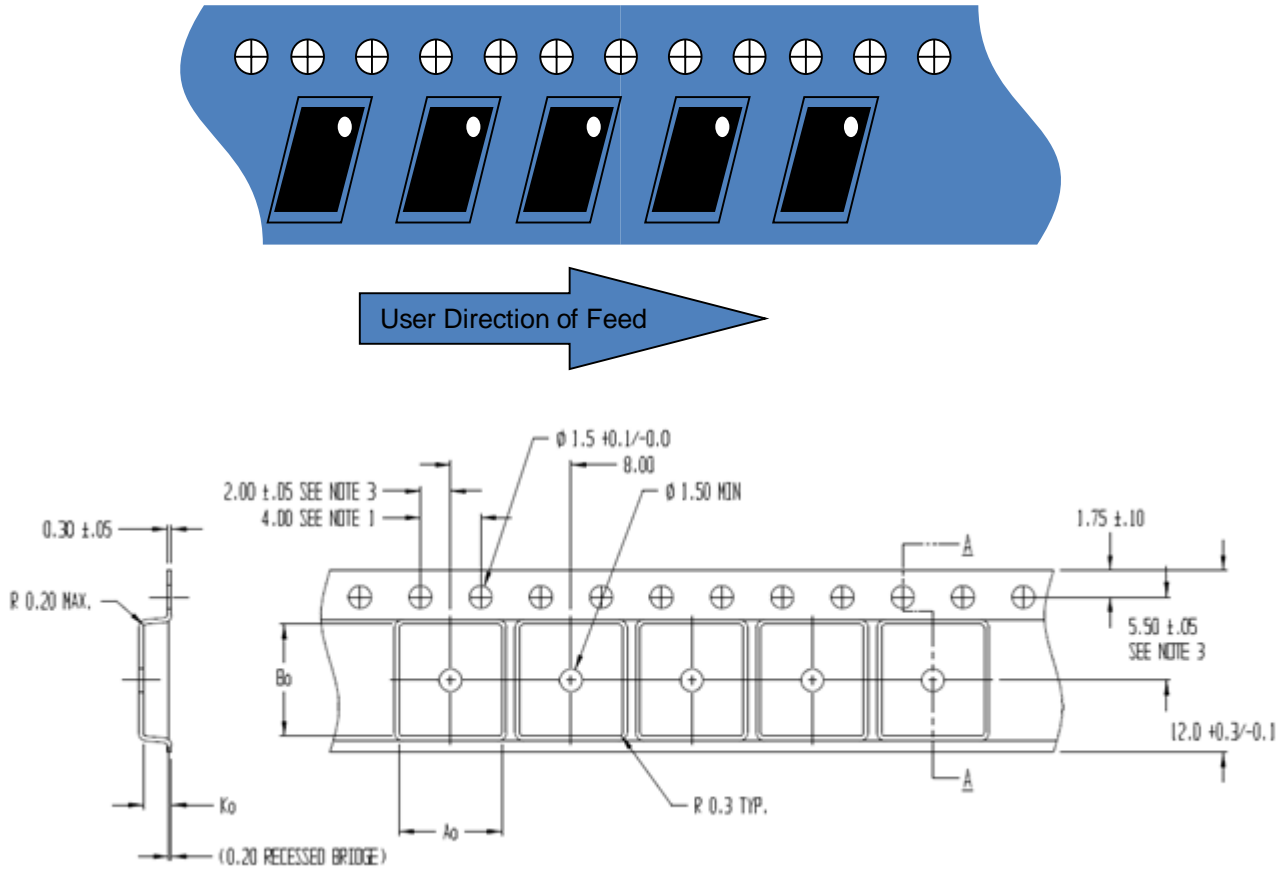
Marking: Qorvo Logo
 Part Number and Package Version – QPD0060
 Date Code – YYWW
 Production Lot Number – MXXX
 Serial Number – ZZZ



Notes:

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

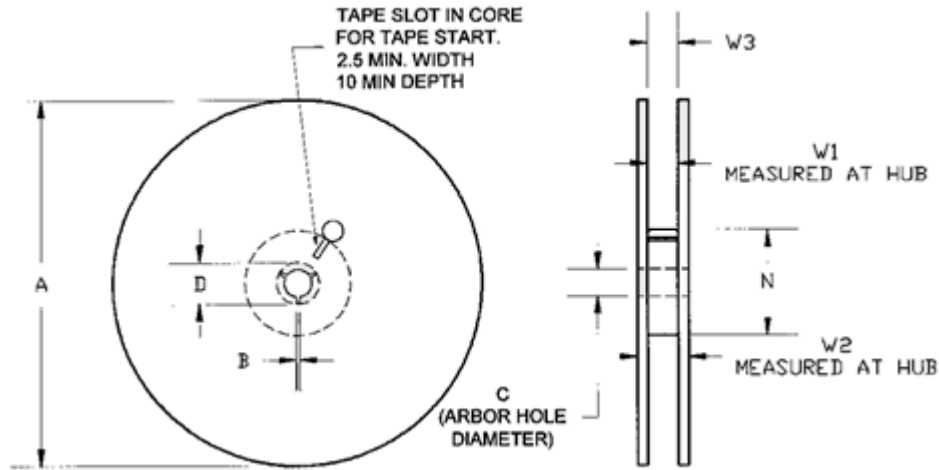
Tape and Reel Information – Carrier and Cover Tape Dimensions



Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.269	6.83
	Width	B0	0.292	7.42
	Depth	K0	0.074	1.88
	Pitch	P1	0.315	8.0
Centerline Distance	Cavity to Perforation – Length Direction	P2	0.079	2.00
	Cavity to Perforation – Width Direction	F	0.217	5.5
Cover Tape	Width	C	0.472	12.0
Carrier Tape	Width	W	0.362	9.2

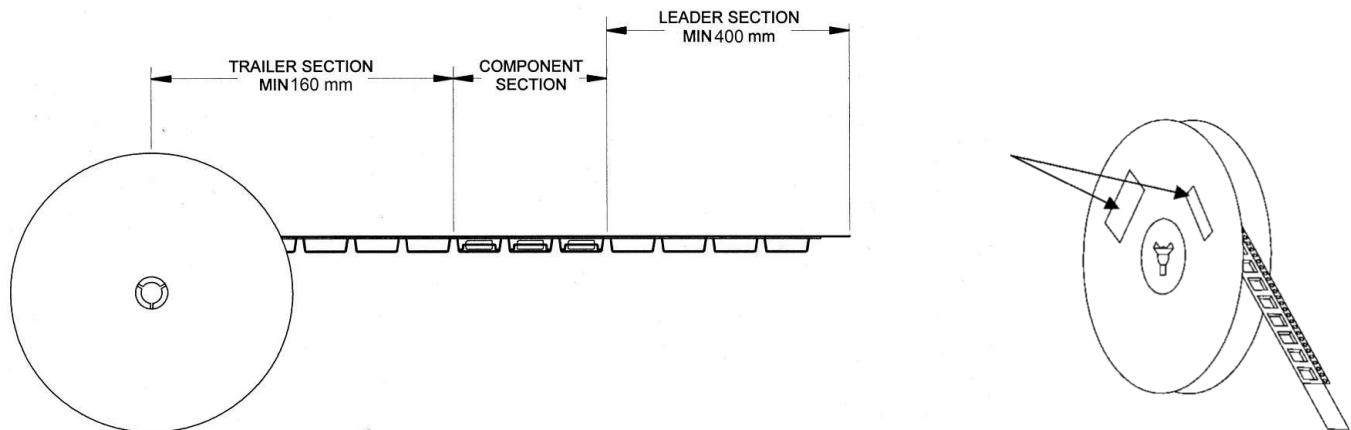
Tape and Reel Information – Reel Dimensions

Standard T/R size = 250 pieces on a 7" reel.



Feature	Measure	Symbol	Size (in)	Size (mm)
Flange	Diameter	A	6.969	177.0
	Thickness	W2	0.717	18.2
	Space Between Flange	W1	0.504	12.8
Hub	Outer Diameter	N	2.283	58.0
	Arbor Hole Diameter	C	0.512	13.0
	Key Slit Width	B	0.079	2.0
	Key Slit Diameter	D	0.787	20.0

Tape and Reel Information – Tape Length and Label Placement



Notes:

1. Empty part cavities at the trailing and leading ends are sealed with cover tape. See EIA 481-1-A.
2. Labels are placed on the flange opposite the sprockets in the carrier tape.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	TBD	JEDEC Standard JS-001-2012
ESD – Charged Device Model (CDM)	TBD	JEDEC Standard JESD22-C101F
MSL – 260 °C Convection Reflow	MSL3	JEDEC standard IPC/JEDEC J-STD-020.



Caution!
ESD-Sensitive Device

Solderability

Compatible with both lead-free (260 °C maximum reflow temperature) and tin/lead (245 °C maximum reflow temperature) soldering processes.

Contact plating: NiAu

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:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

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