QPQ2601

Band 1/3/7 Multiplexer

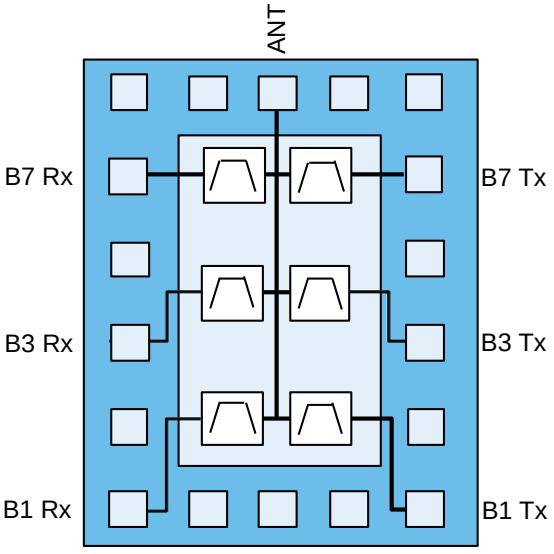
Product Overview

The QPQ2601 is a compact, high-performance multiplexer module fabricated using a patented technology with performance optimized to enable carrier aggregation of bands 1, 3, and 7 for LTE/NR.

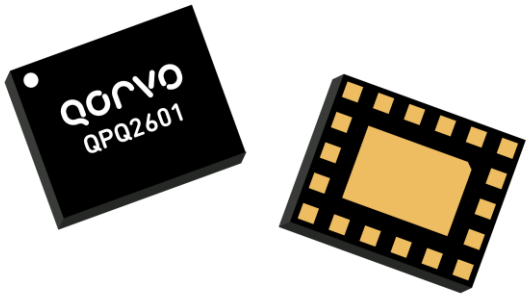
The QPQ2601 leverages the high-Q properties to ensure minimal transmit insertion loss in all bands being multiplexed without loading each other. The QPQ2601 module has also been designed with high cross-isolation which is critical to ensure good receive performance.

The QPQ2601 uses unique Wafer Level Packaging (WLP) techniques to enable a compact 2.6mm x 3.2mm x 0.8mm footprint.

Functional Block Diagram



Bottom View



19 Pin 2.6 x 3.2mm leadless SMT package

Key Features

- Compact Form-Factor: 2.6mm x 3.2mm
- Minimizes PA current drain with excellent TX IL
- Improved RX sensitivity with low RX IL
- Single-Ended
- RoHS Compliant, Pb-Free Module Package

Applications

- Base Station Infrastructure
- Small Cells
- Repeaters
- Routers
- LTE Dongles
- General Purpose Wireless

Ordering Information

Part Number	Description
QPQ2601TR13	5000 pieces on a 13” Reel
QPQ2601EVB	Evaluation Board (EVB)

Absolute Maximum Ratings

Parameter	Pin	Conditions	Rating	Units
Storage Temperature			-40 to +105	°C
RF Input Power	6, 8, or 10	CW, +55°C for 5k hours	+31	dBm
Peak RF Input Power	6, 8, or 10	Max duration 500ms, +25°C	+36.5	dBm
Peak RF Input Power	14, 16 or 18	Max duration 500ms, +25°C	+36	dBm

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

Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
T_{CASE}	-40		+105	°C

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

Electrical Specifications[1] Band 1 Transmit - Antenna

Unless Otherwise Noted: Operating Temp = −30 °C to +85 °C

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	1920 MHz – 1980 MHz	-	1.88[2]	3.1	dB
VSWR (TX Port)	1920 MHz – 1980 MHz	-	1.4:1	2:1[3]	-
VSWR (ANT Port)			1.4:1	2:1	
Attenuation	600 MHz – 1000 MHz	44	60	-	dB
	1452 MHz – 1496 MHz	44	57	-	
	1559 MHz – 1606 MHz	44	60	-	
	1805 MHz – 1880 MHz	46	61	-	
	2110 MHz – 2170 MHz	50	60	-	
	2400 MHz – 2500 MHz	45	67	-	
	2620 MHz – 2690 MHz	50	70	-	
	3840 MHz – 3960 MHz	35	72	-	
	4900 MHz – 5940 MHz	30	60	-	

Notes:
1. All specifications are based on the Qorvo schematic for the main reference design
2. Typical specified as average at room temperature
3. Specified from -15°C to +85°C

Electrical Specifications[1] Band 1 Antenna - Receive

Unless Otherwise Noted: Operating Temp = −30 °C to +85 °C

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	2110 MHz – 2170 MHz	-	1.86[2]	3	dB
VSWR (RX Port)	2110 MHz – 2170 MHz	-	1.4:1	2:1	-
VSWR (ANT Port)			1.4:1	2:1	
Attenuation	600 MHz – 1000 MHz	40	55	-	dB
	1710 MHz – 1785 MHz	48	61	-	
	1920 MHz – 1980 MHz	48	59	-	
	2400 MHz – 2500 MHz	45	69	-	
	2500 MHz – 2570 MHz	48	66	-	
	4900 MHz – 5150 MHz	27	35	-	
	5150 MHz – 5950 MHz	35	41	-	

Notes:
1. All specifications are based on the Qorvo schematic for the main reference design
2. Typical specified as average at room temperature

Electrical Specifications[1] Band 3 Transmit - Antenna

Unless Otherwise Noted: Operating Temp = −30 °C to +85 °C

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	1710 MHz – 1785 MHz	-	1.85[2]	3.6	dB
VSWR (TX Port)	1710 MHz – 1785 MHz	-	1.3:1	2:1	-
VSWR (ANT Port)			1.3:1	2:1	
Attenuation	600 MHz – 1000 MHz	40	50	-	dB
	1452 MHz – 1496 MHz	40	44	-	
	1559 MHz – 1606 MHz	45	56	-	
	1805 MHz – 1880 MHz	50[3]	62	-	
	2110 MHz – 2170 MHz	45	56	-	
	2400 MHz – 2500 MHz	40	56	-	
	2620 MHz – 2690 MHz	45	64	-	
	3420 MHz – 3570 MHz	40	65	-	
	4900 MHz – 5900 MHz	30	43	-	

Notes:
1. All specifications are based on the Qorvo schematic for the main reference design
2. Typical specified as average at room temperature
3. Specified from +25°C to +85°C

Electrical Specifications[1] Band 3 Antenna - Receive

Unless Otherwise Noted: Operating Temp = −30 °C to +85 °C

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	1805 MHz – 1880 MHz	-	1.87[2]	3.9[3]	dB
VSWR (RX Port)	1805 MHz – 1880 MHz	-	1.6:1	2:1	-
VSWR (ANT Port)			1.5:1	2:1	
Attenuation	600 MHz – 1000 MHz	40	52	-	dB
	1710 MHz – 1785 MHz	44	60	-	
	1920 MHz – 1980 MHz	45	58	-	
	2400 MHz – 2500 MHz	45	53	-	
	2500 MHz – 2570 MHz	45	63	-	
	4900 MHz – 5950 MHz	35	62	-	

Notes:
1. All specifications are based on the Qorvo schematic for the main reference design
2. Typical specified as average at room temperature
3. Integrated over any 5MHz bandwidth

Electrical Specifications[1] Band 7 Transmit - Antenna

Unless Otherwise Noted: Operating Temp = −30 °C to +85 °C

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	2500 MHz – 2570 MHz	-	1.67[2]	3.4[3]	dB
VSWR (TX Port)	2500 MHz – 2570 MHz	-	1.5:1	2:1	-
VSWR (ANT Port)	2500 MHz – 2570 MHz	-	1.4:1	2:1	
Attenuation	600 MHz – 1000 MHz	35	47	-	dB
	1452 MHz – 1496 MHz	35	49	-	
	1559 MHz – 1606 MHz	35	55	-	
	1805 MHz – 1880 MHz	45	53	-	
	2110 MHz – 2170 MHz	44	52	-	
	2402.5 MHz – 2471.5 MHz[4] WiFi CH1-11	43	46	-	
	2457.5 MHz – 2476.5 MHz[4] WiFi CH12	36	46	-	
	2620 MHz – 2690 MHz	45	61	-	
	4900 MHz – 5900 MHz	28	31	-	

Notes:
1. All specifications are based on the Qorvo schematic for the main reference design
2. Typical specified as average at room temperature
3. Specified from +25°C to +85°C
4. Each channel integrated over 19MHz

Electrical Specifications[1] Band 7 Antenna - Receive

Unless Otherwise Noted: Operating Temp = −30 °C to +85 °C

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	2620 MHz – 2690 MHz	-	1.6[2]	2.7	dB
VSWR (RX Port)	2620 MHz – 2690 MHz	-	1.5:1	2:1	-
VSWR (ANT Port)	2620 MHz – 2690 MHz	-	1.6:1	2:1	
Attenuation	600 MHz – 1000 MHz	40	53	-	dB
	1710 MHz – 1785 MHz	45	55	-	
	1920 MHz – 1980 MHz	45	58	-	
	2400 MHz – 2500 MHz	40	55	-	
	2500 MHz – 2570 MHz	45	59	-	
	4900 MHz – 5950 MHz	30	53	-	

Notes:
1. All specifications are based on the Qorvo schematic for the main reference design
2. Typical specified as average at room temperature

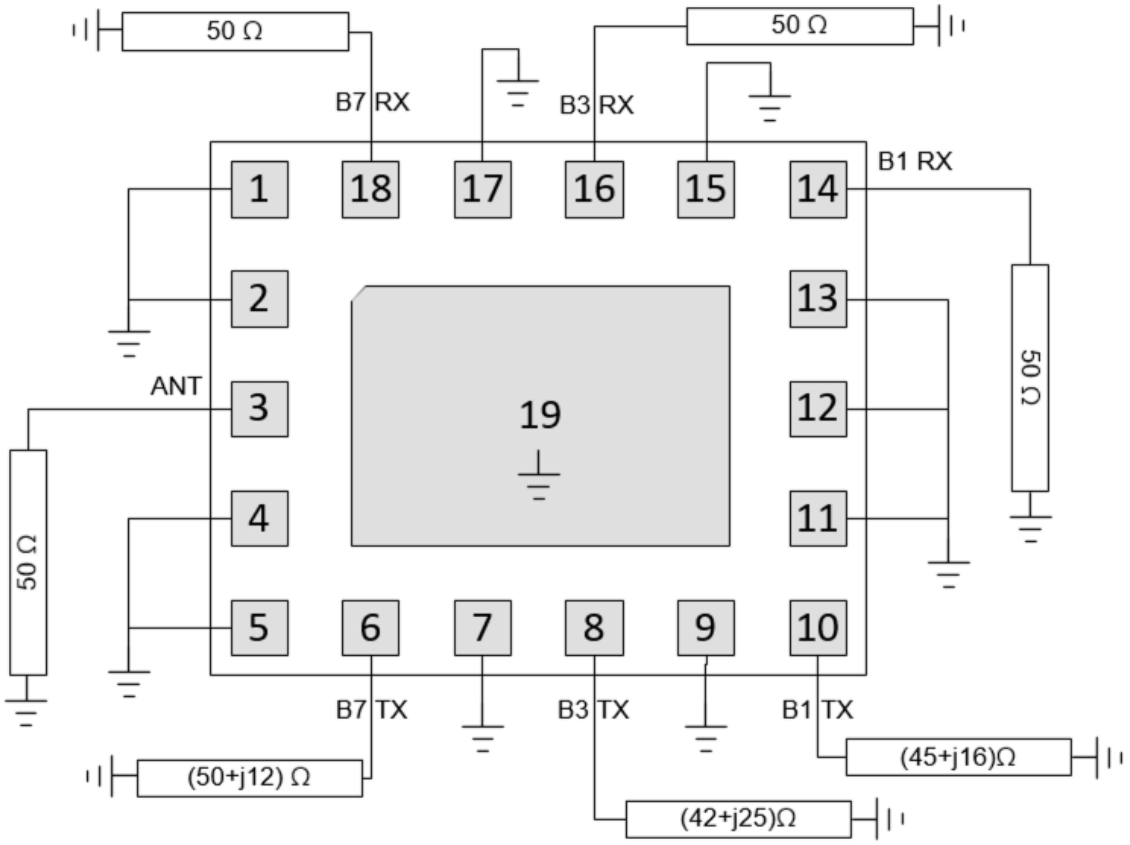
Electrical Specifications[1] Isolation

Unless Otherwise Noted: Operating Temp = −30 °C to +85 °C

Parameter	Conditions	Min.	Typ.	Max.	Units
TX-RX Isolation in B1 RX	2110 MHz – 2170 MHz	55	60	-	dB
TX-RX Isolation in B1 TX	1920 MHz – 1980 MHz	55	59	-	
TX-RX Isolation in B3 RX	1805 MHz – 1880 MHz	55[2][3]	59	-	
TX-RX Isolation in B3 TX	1710 MHz – 1785 MHz	55[3]	62	-	
TX-RX Isolation in B7 TX	2500 MHz – 2570 MHz	55	61	-	
TX-RX Isolation in B7 RX	2620 MHz – 2690 MHz	55	63	-	
B1 TX to B3 RX Isolation in B3 RX	1805 MHz – 1880 MHz	55	58	-	
B1 TX to B3 RX Isolation in B1 TX	1920 MHz – 1980 MHz	55	64	-	
B3 TX to B1 RX Isolation in B3 TX	1710 MHz – 1785 MHz	55	63	-	
B3 TX to B1 RX Isolation in B1 RX	2110 MHz – 2170 MHz	54	57	-	
B1 TX to B7 RX Isolation in B1 TX	1920 MHz – 1980 MHz	55	60	-	
B1 TX to B7 RX Isolation in B7 RX	2620 MHz – 2690 MHz	55	69	-	
B7 TX to B1 RX Isolation in B7 TX	2500 MHz – 2570 MHz	55	66	-	
B7 TX to B1 RX Isolation in B1 RX	2110 MHz – 2170 MHz	50	62	-	
B3 TX to B7 RX Isolation in B3 TX	1710 MHz – 1785 MHz	55	57	-	
B3 TX to B7 RX Isolation in B7 RX	2620 MHz – 2690 MHz	55	66	-	
B7 TX to B3 RX Isolation in B7 TX	2500 MHz – 2570 MHz	55	62	-	
B7 TX to B3 RX Isolation in B3 RX	1805 MHz – 1880 MHz	54[3]	57	-	

Notes:
1. All specifications are based on the Qorvo schematic for the main reference design
2. Specified from +25°C to +85°C
3. Integrated over any 5MHz bandwidth

Application Circuit Schematic



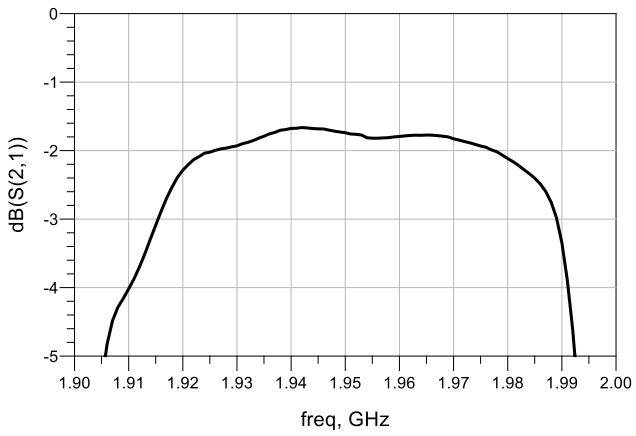
Note:

B1 TX (pin 10), B3 TX (pin 8), and B7 TX (pin 6) are terminated with complex impedance to provide flexible matching options for optimizing TX performance between PA and QPQ2601. All other ports are matched to 50 ohm impedance

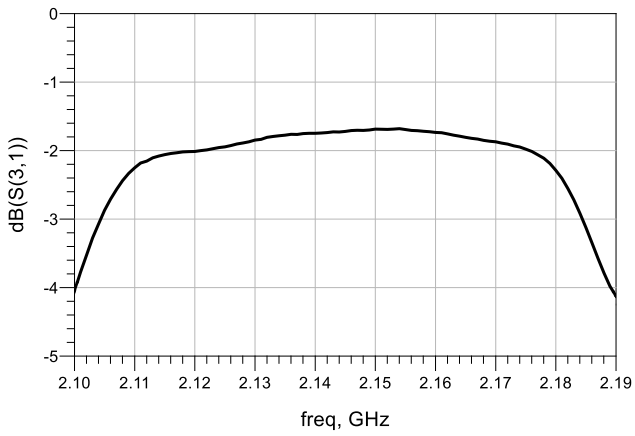
Performance Plots – Pass Band

Test conditions unless otherwise noted: Temp. = +25 °C

B1 TX



B1 RX



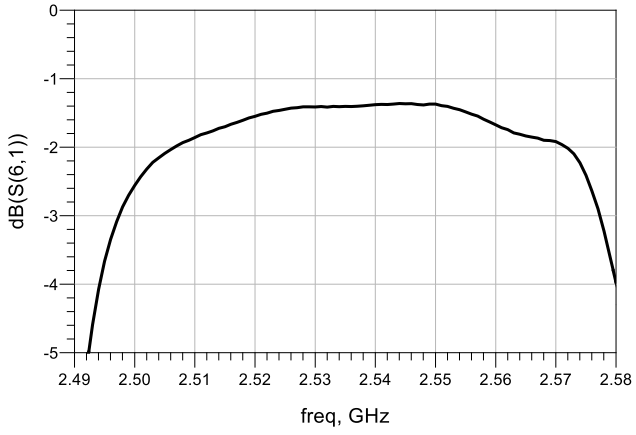
B3 TX



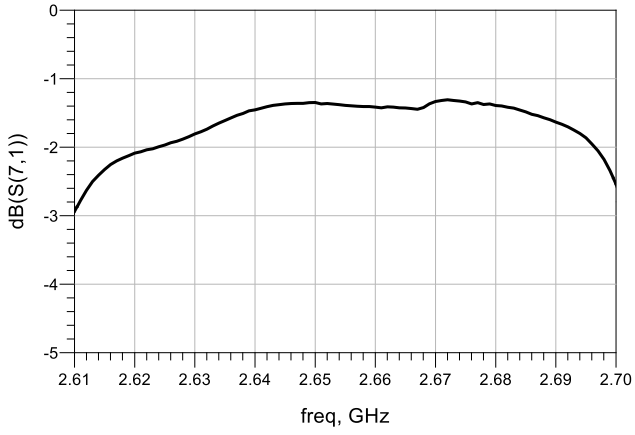
B3 RX



B7 TX



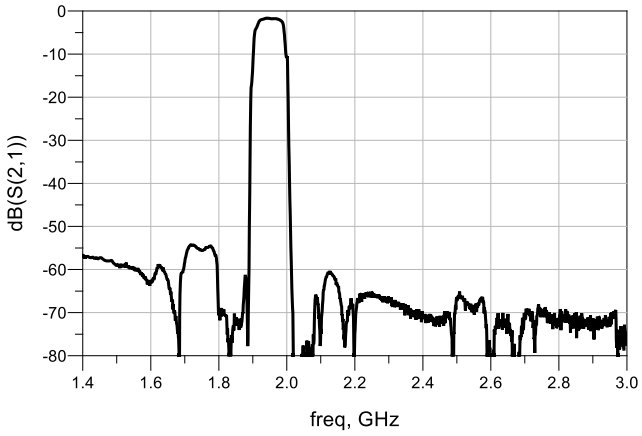
B7 RX



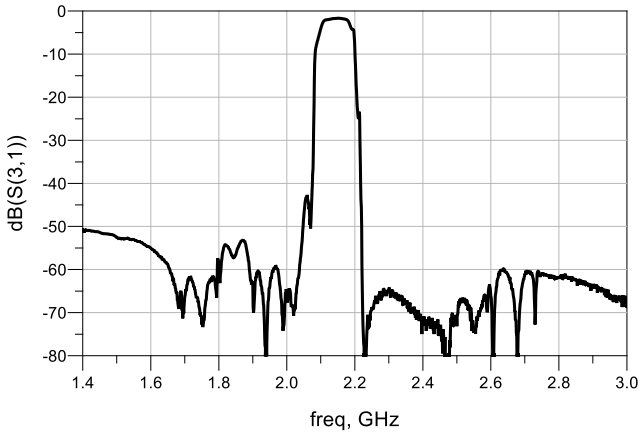
Performance Plots – Narrow Band

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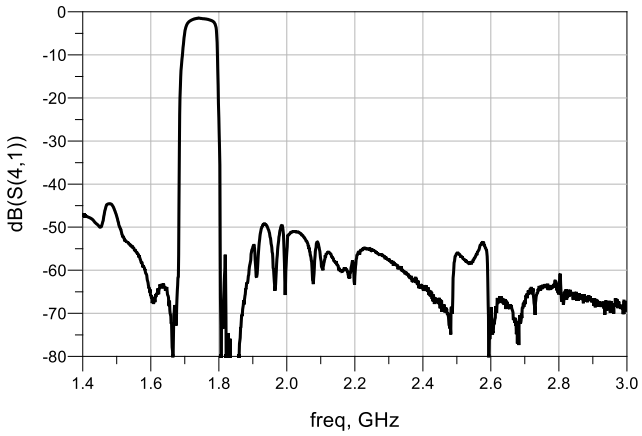
B1 TX NB



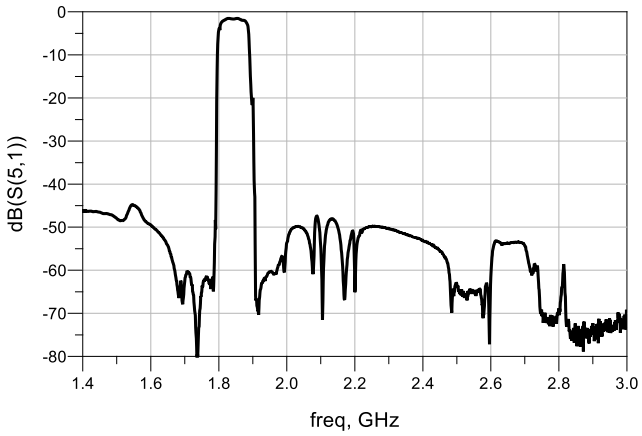
B1 RX NB



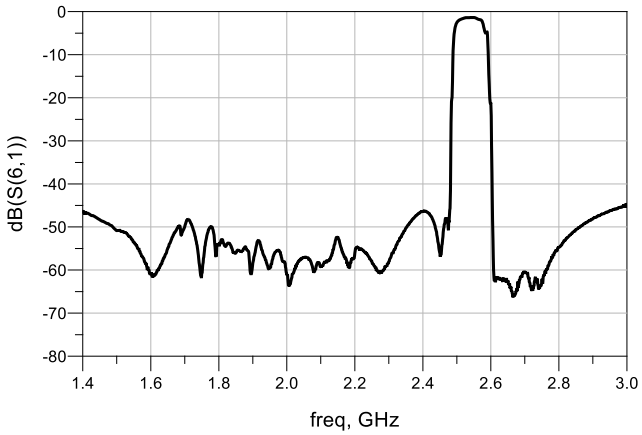
B3 TX NB



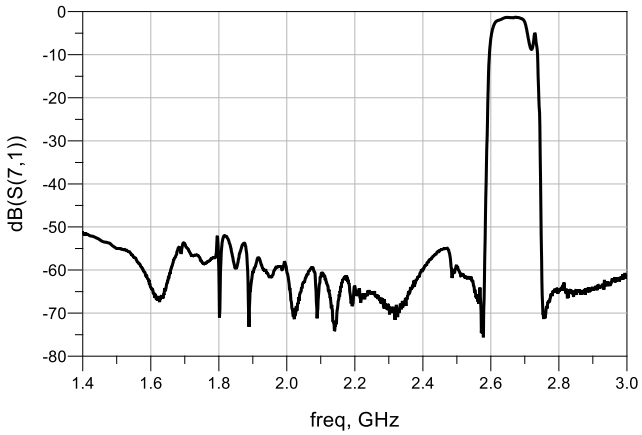
B3 RX NB



B7 TX NB



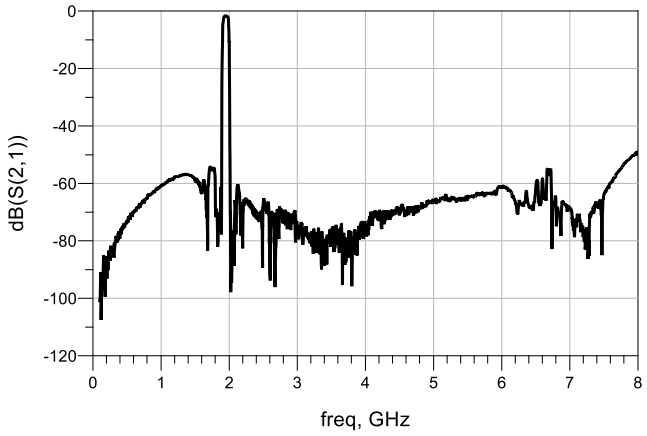
B7 RX NB



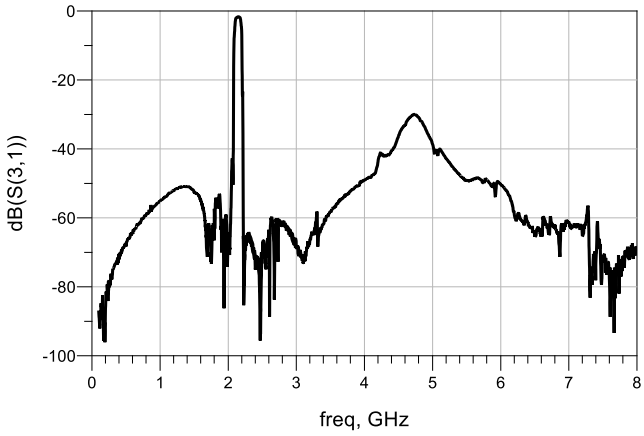
Performance Plots – Wide Band

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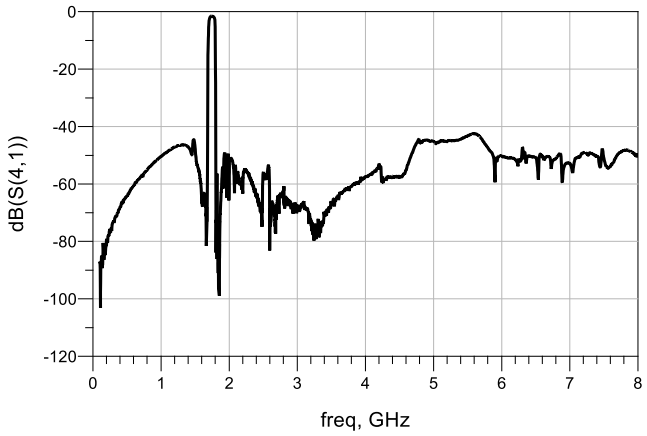
B1 TX WB



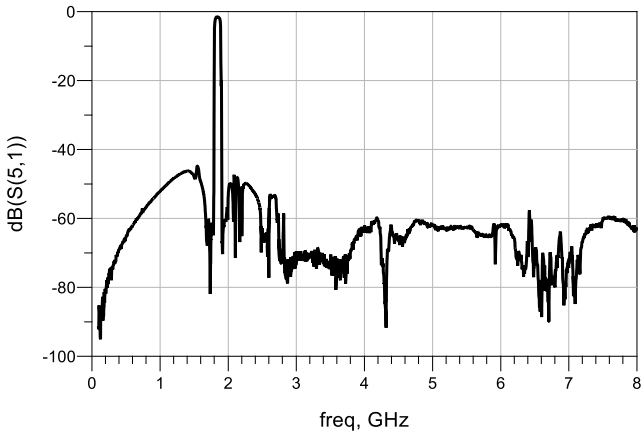
B1 WB



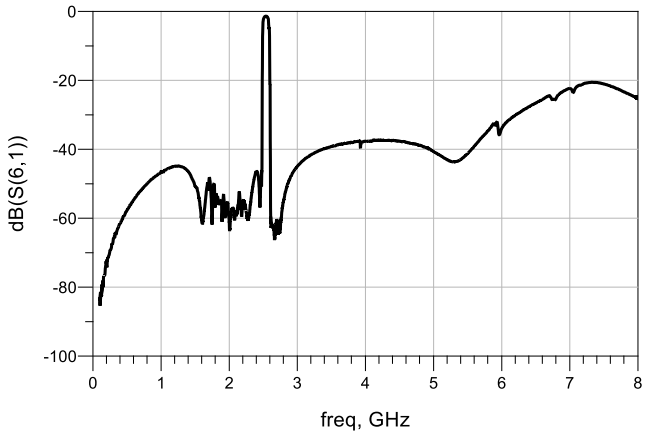
B3 TX WB



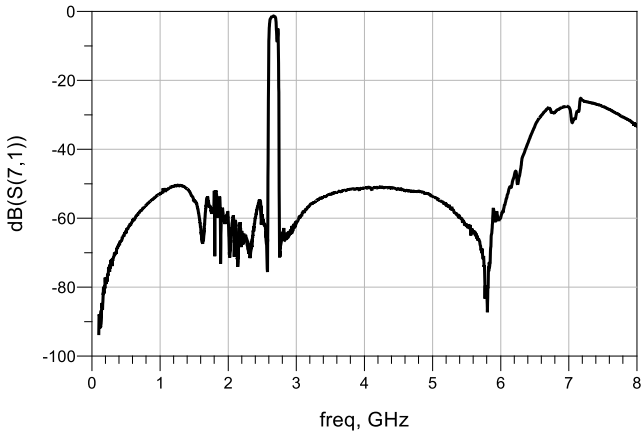
B3 RX WB



B7 TX WB

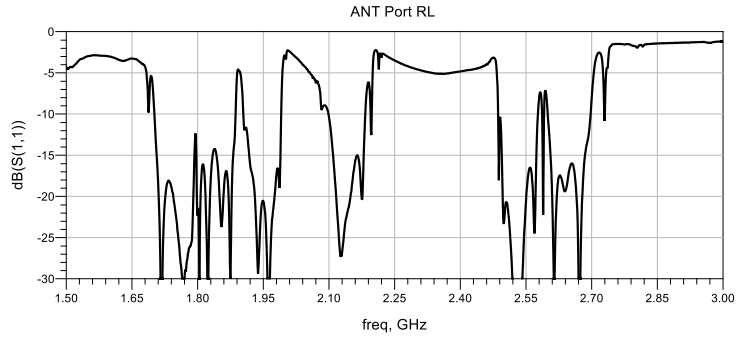


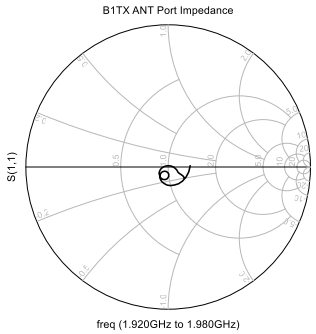
B7 RX WB

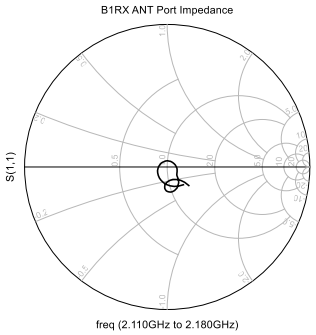


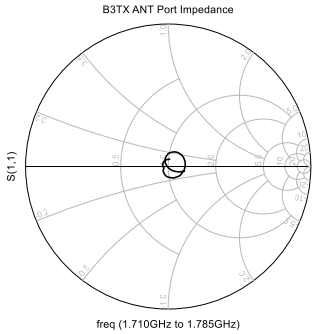
Performance Plots – ANT Port Return Loss/Impedance

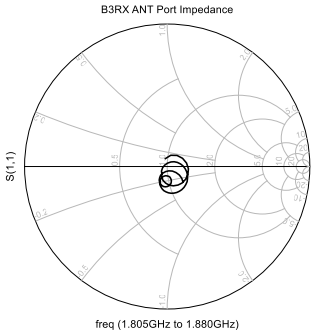
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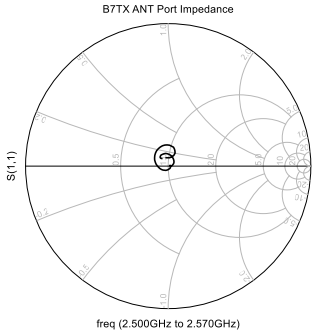


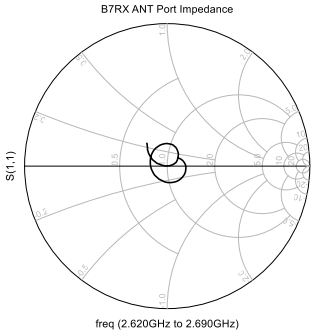






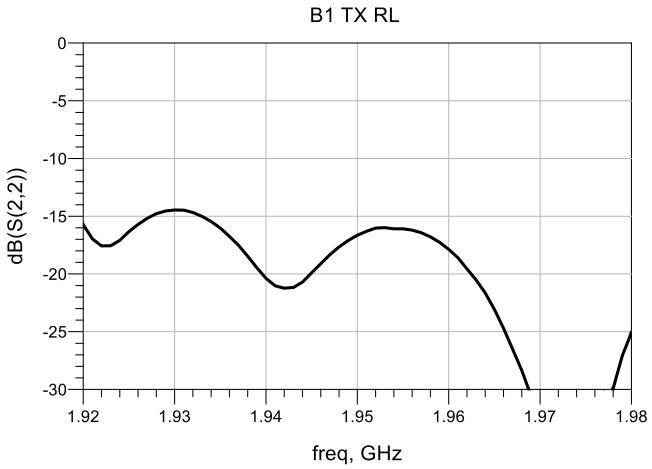


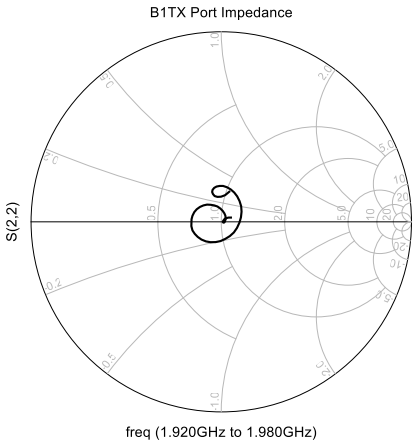


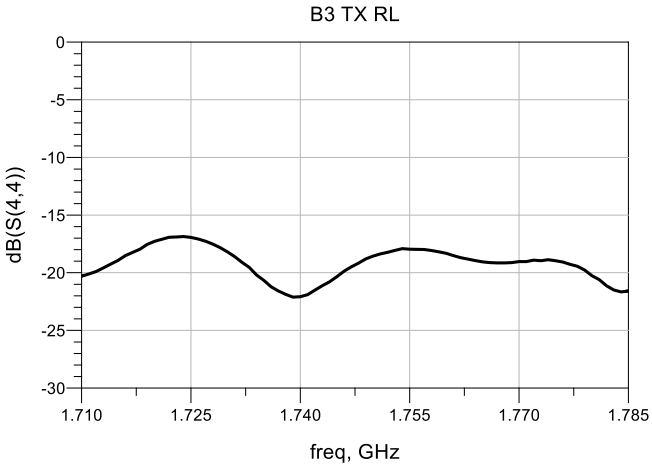


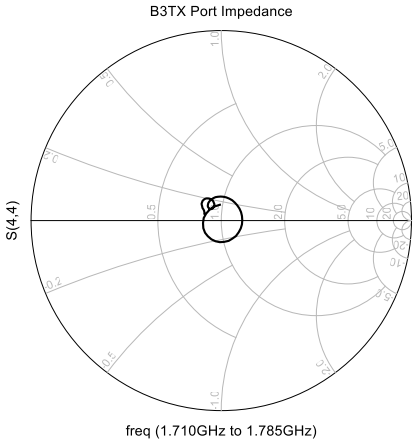
Performance Plots – TX Port Return Loss/Impedance

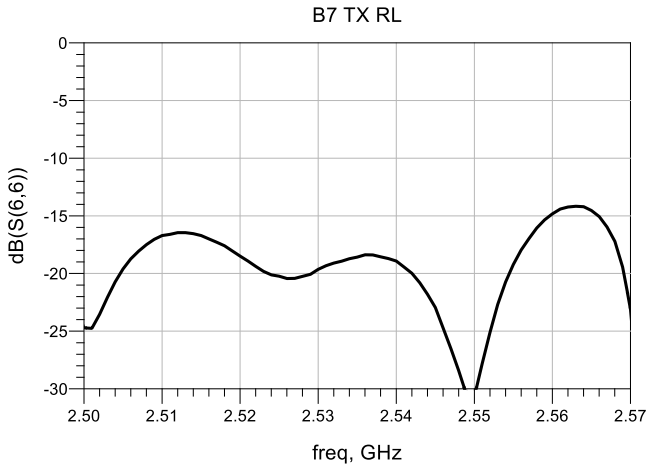
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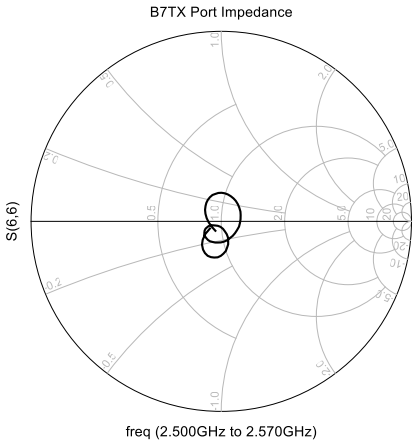






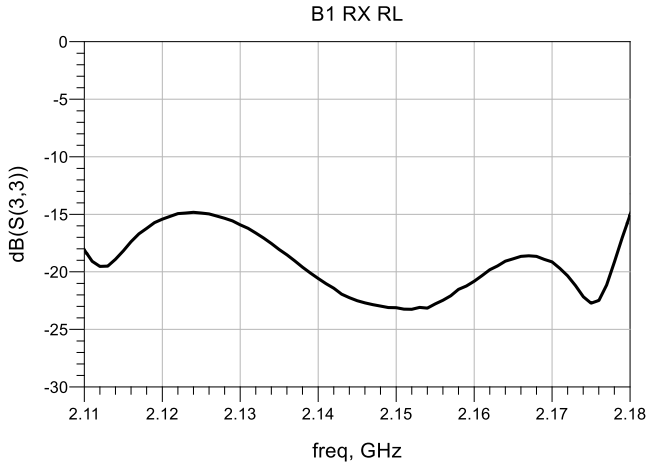


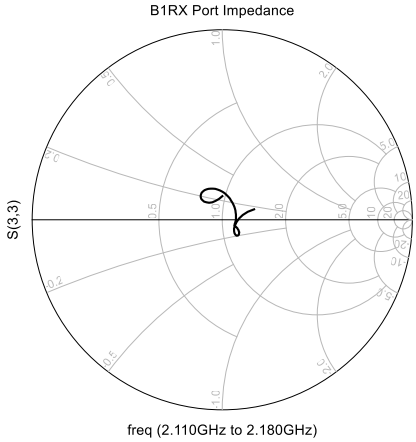


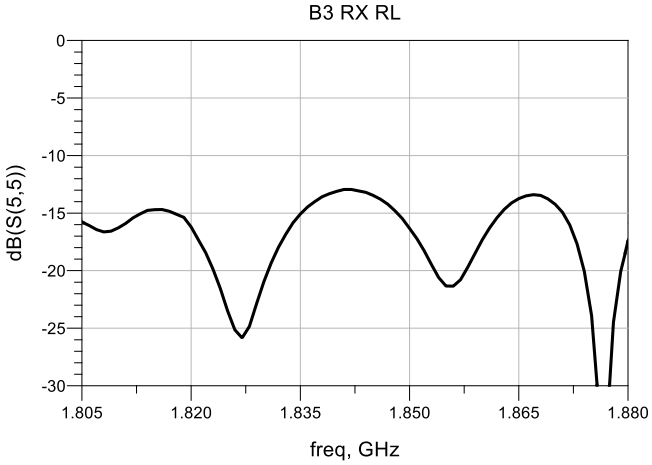


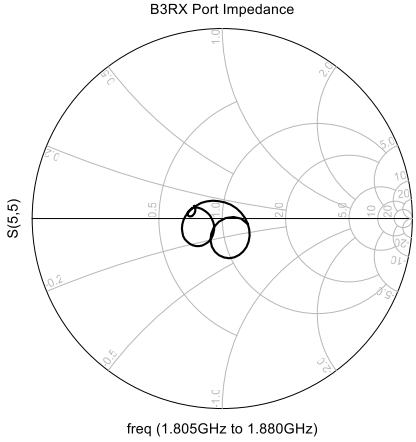
Performance Plots – RX Port Return Loss/Impedance

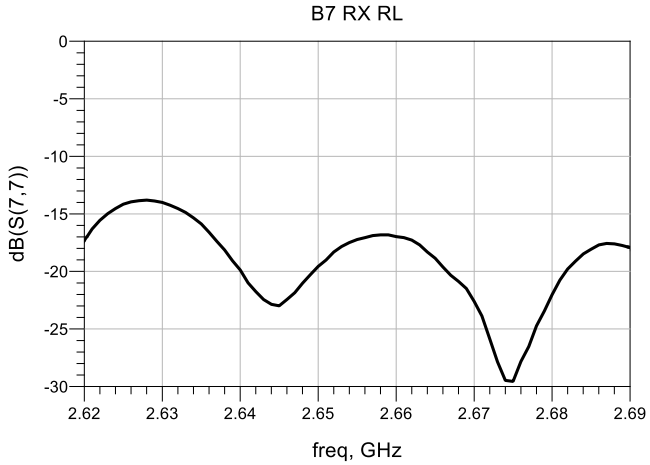
Test conditions unless otherwise noted: Temp. = +25 °C

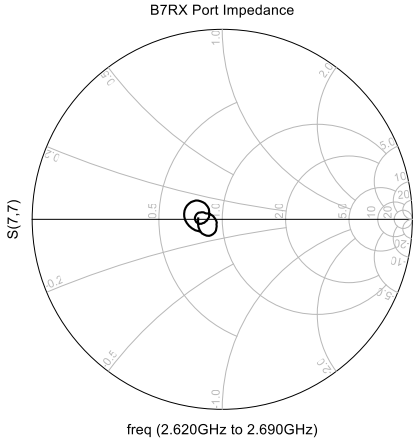






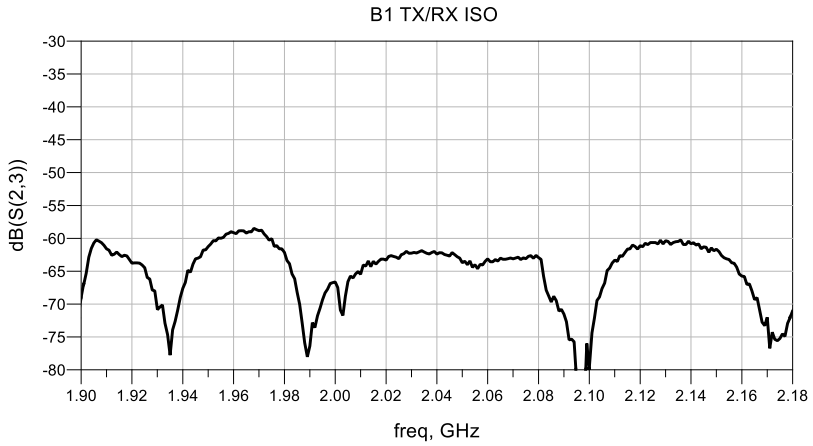


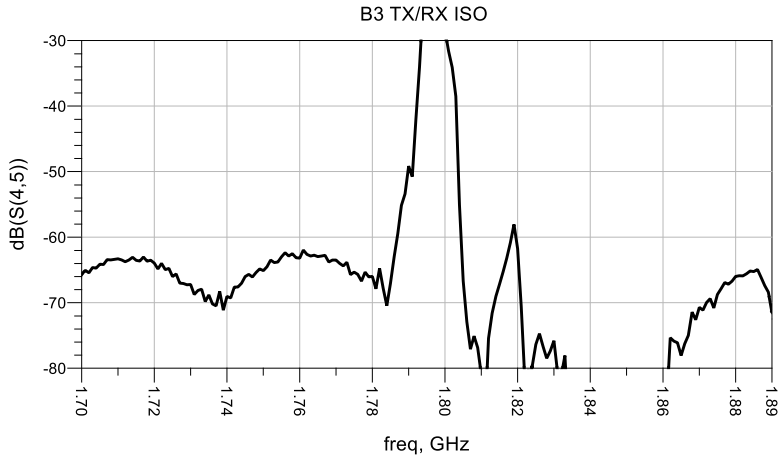


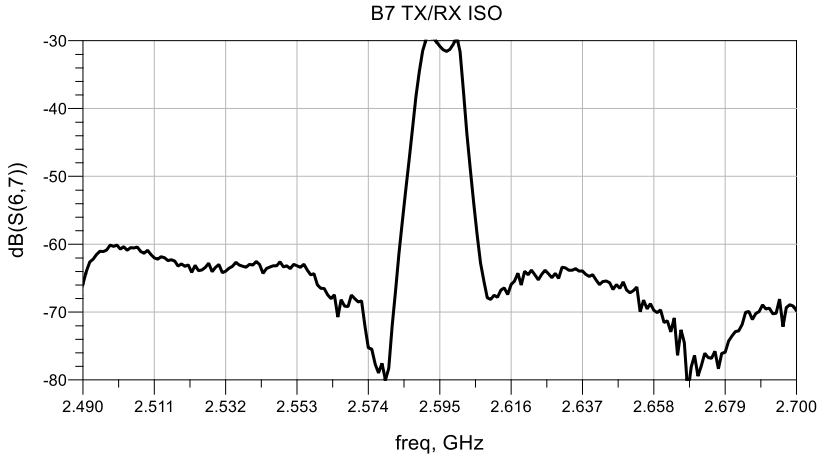


Performance Plots – Isolation

Test conditions unless otherwise noted: Temp. = +25 °C



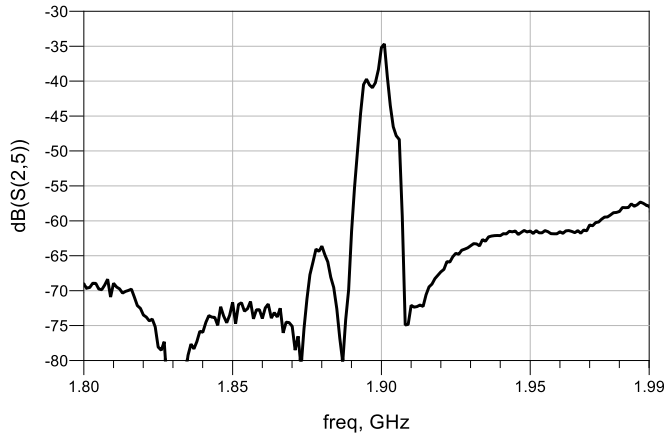




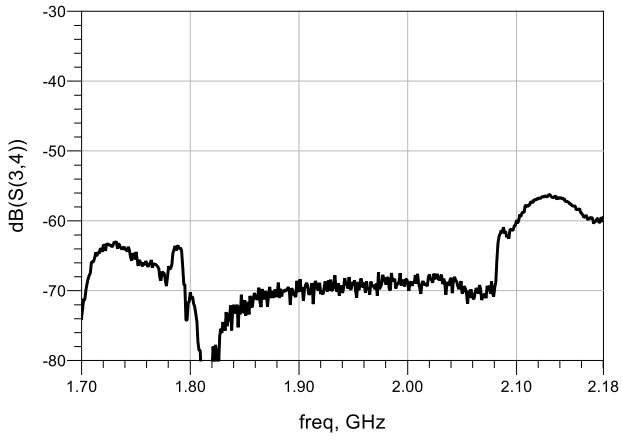
Performance Plots – Cross-Isolation

Test conditions unless otherwise noted: Temp. = +25 °C

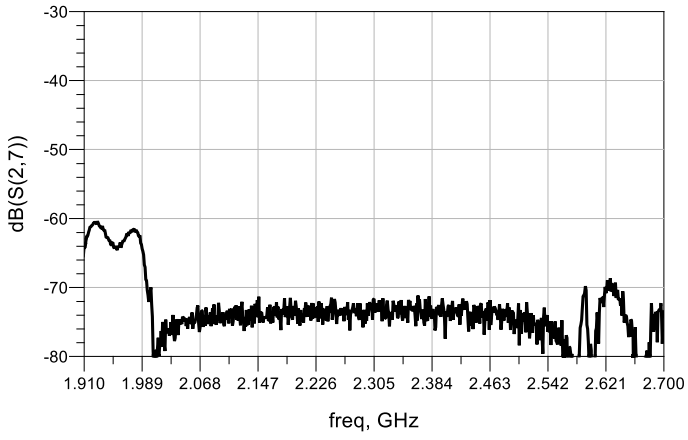
B1 TX - B3RX Cross-ISO



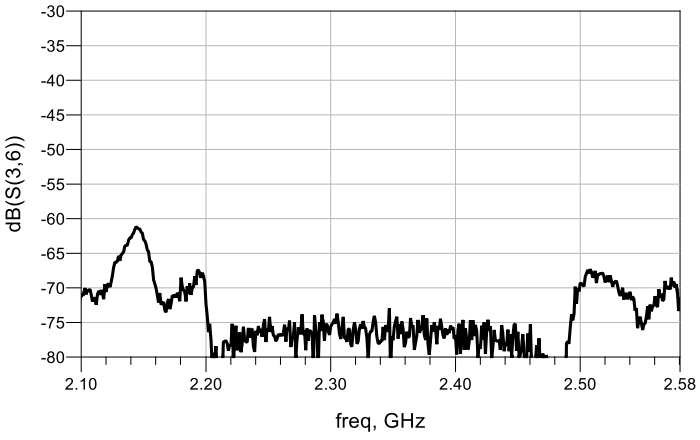
B1RX - B3TX Cross-ISO



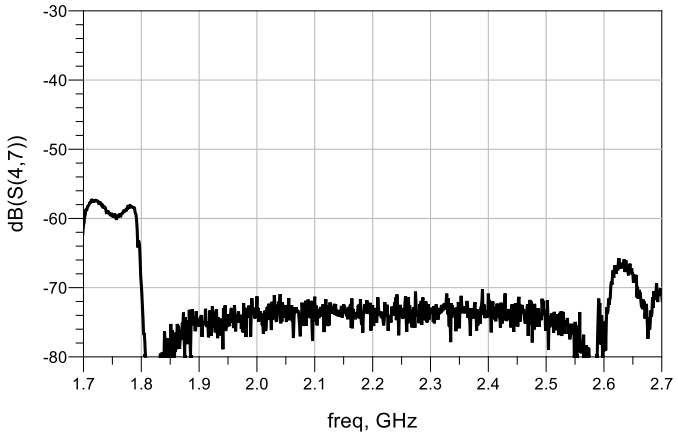
B1TX - B7RX Cross-ISO



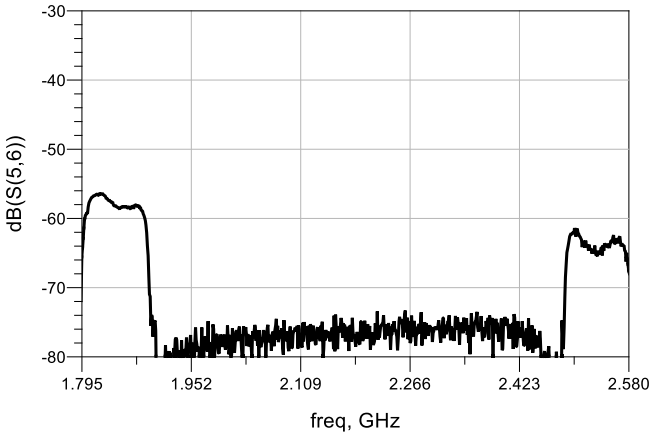
B1RX - B7TX Cross-ISO



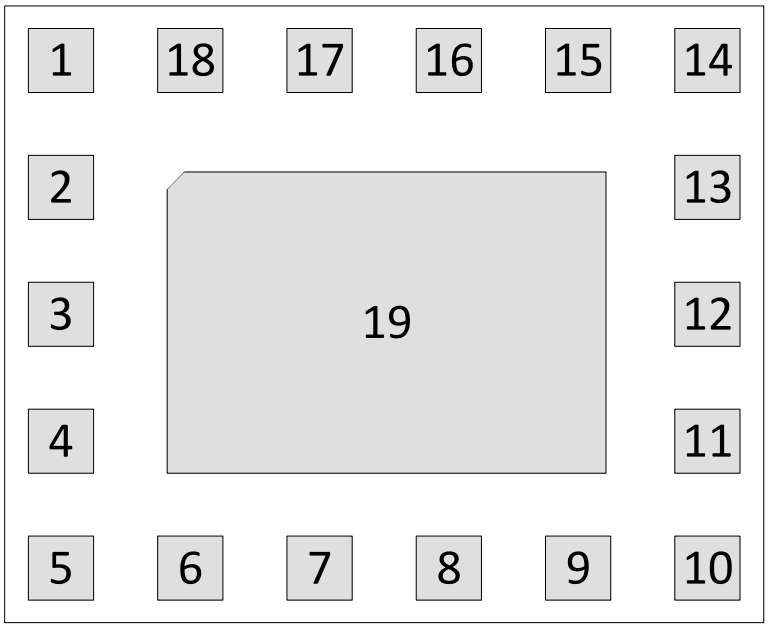
B3TX -B7RX Cross-ISO



B3RX-B7TX Cross-ISO



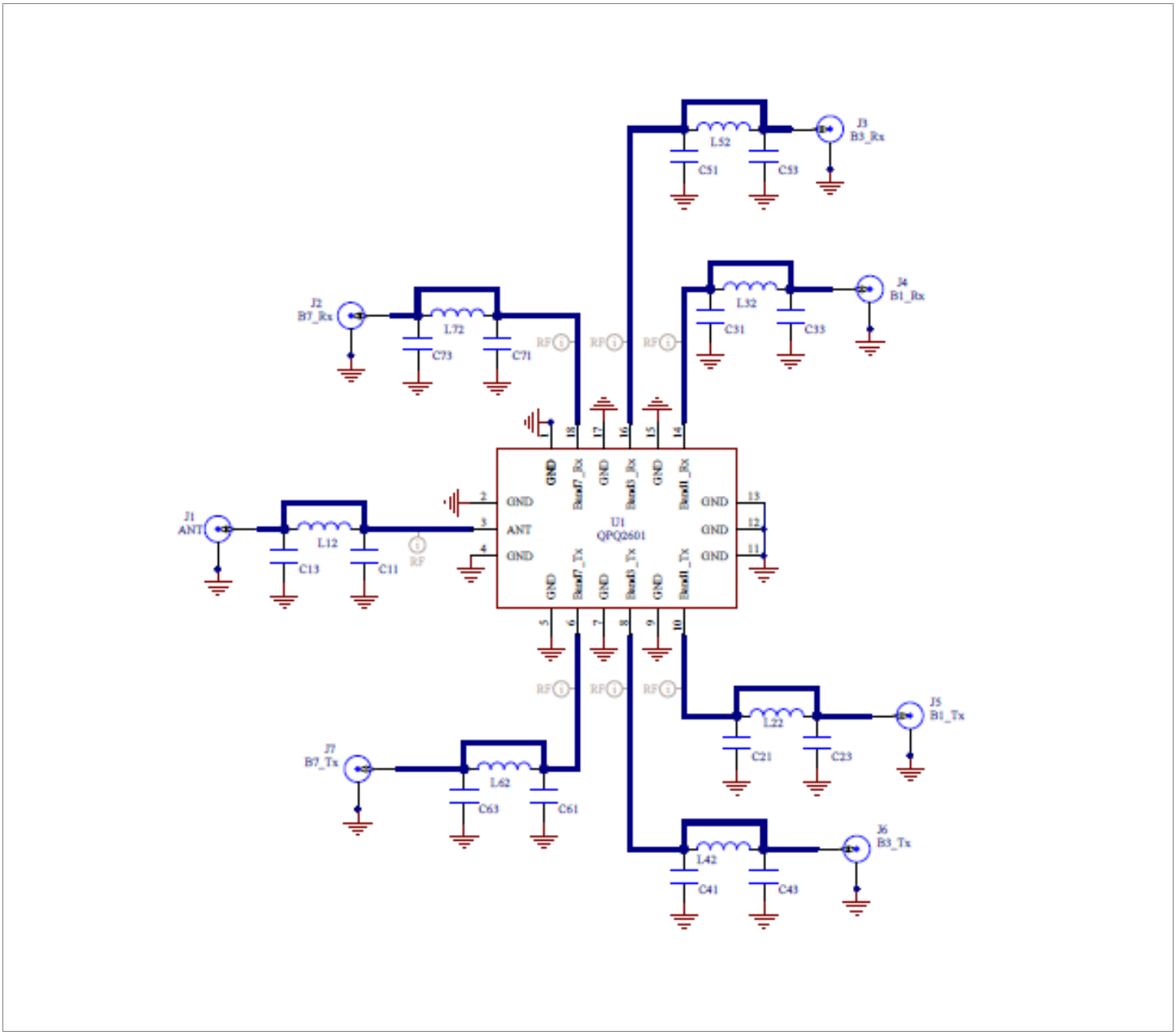
Pin Configuration and Description



Top View

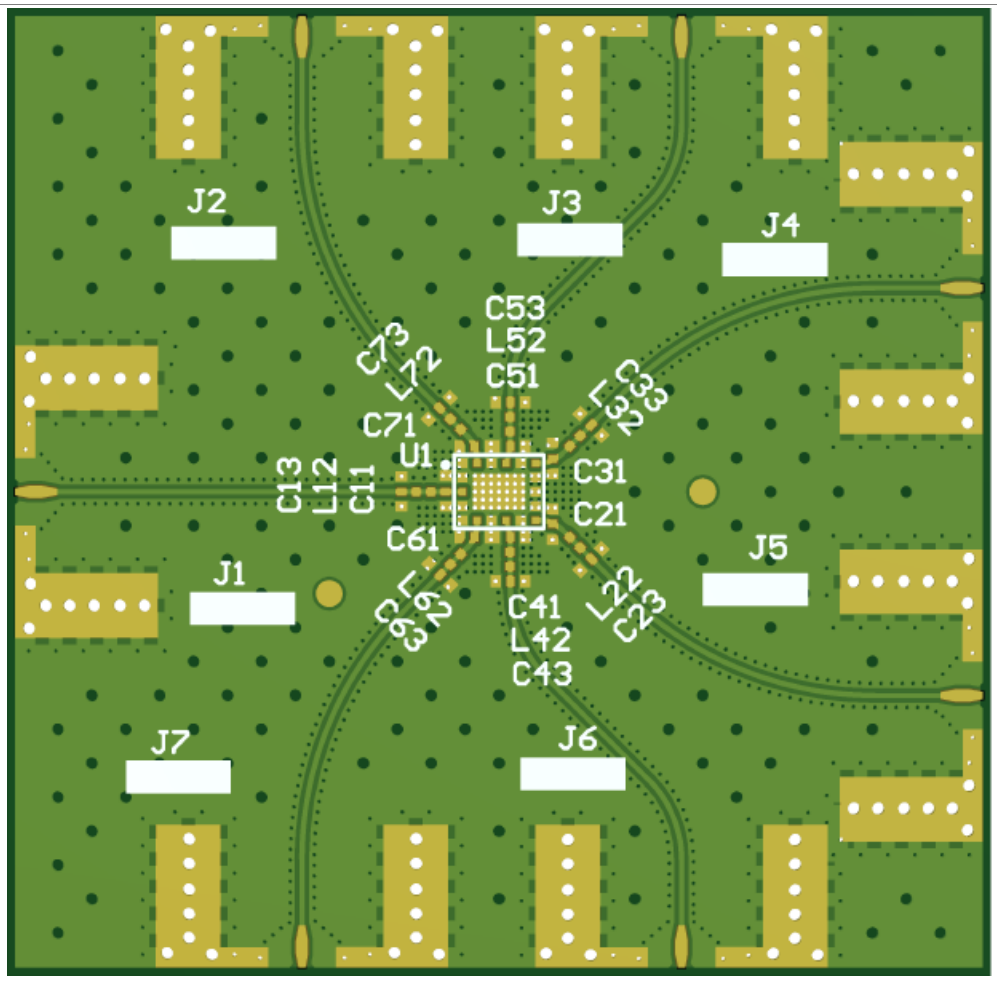
Pin Number	Label	Description
3	ANT	Band 1/3/7 Antenna Port
6	B7 TX	Band 7 Transmit Port
8	B3 TX	Band 3 Transmit Port
10	B1 TX	Band 1 Transmit Port
14	B1 RX	Band 1 Receive Port
16	B3 RX	Band 3 Receive Port
18	B7 RX	Band 7 Receive Port
1,2,4,5,7,9,11, 12,13,15,17,19	GND	Package Ground

Application Circuit



No external components are needed.

Evaluation Board (EVB) Assembly Layout.



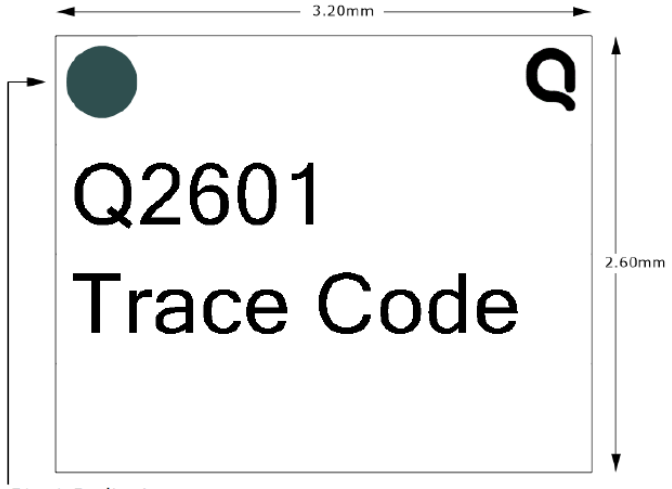
Bill of Materials for EVB

Reference Des.	Value	Description	Manuf.	Part Number
U1	N/A	Band 1/3/7 Multiplexer	Qorvo	QPQ2601
Ji,J2,J3,J4,J5,J6,J7	N/A	RF Connectors	Various	–
PCB	N/A	4-layer Printed Circuit Board	Various	–

No external components are needed.

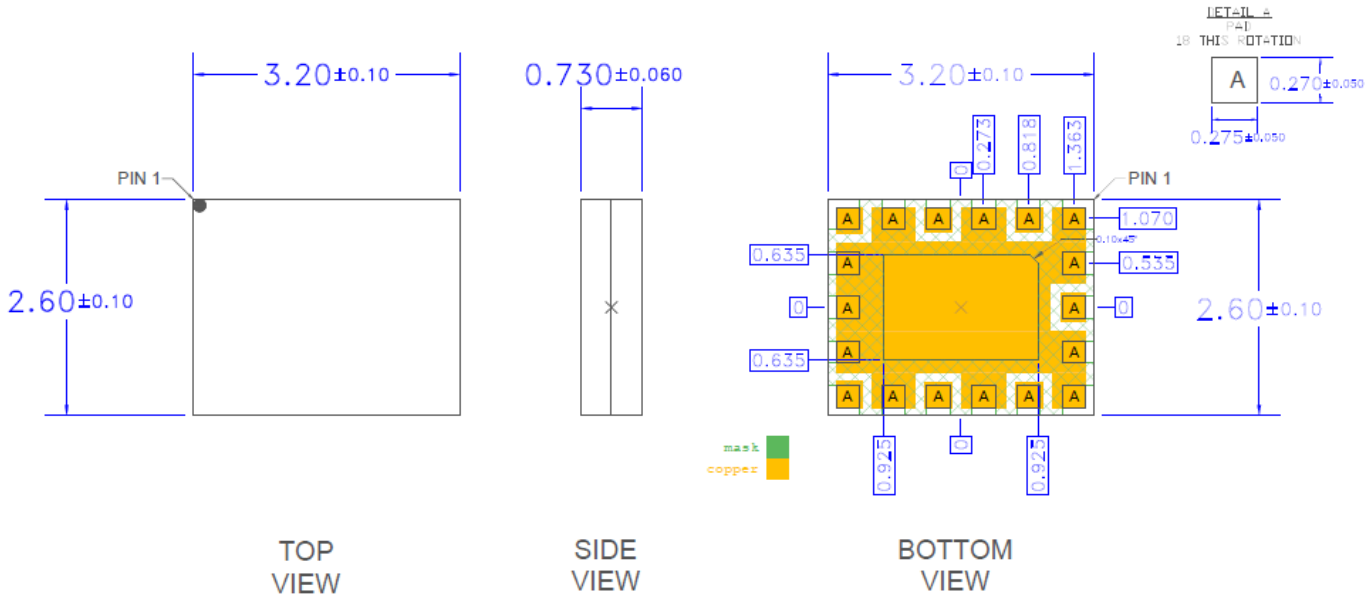
Package Marking and Dimensions

Package Marking Diagram



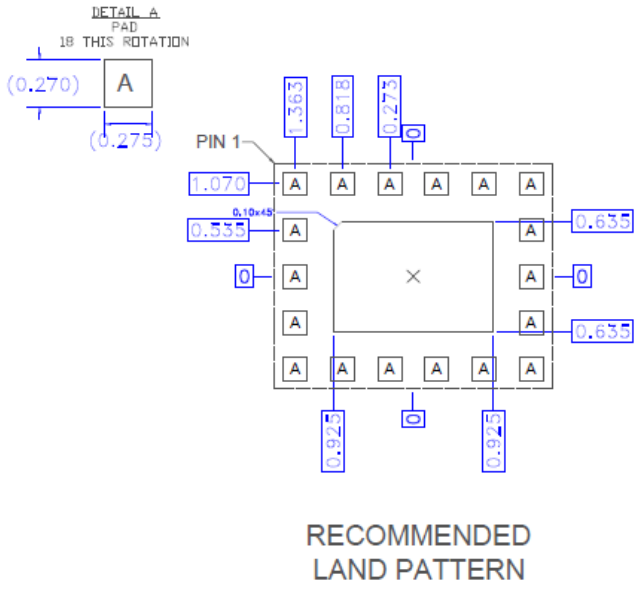
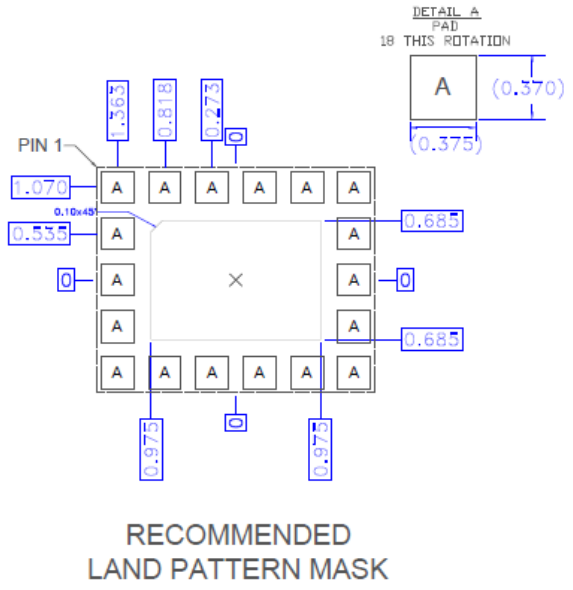
Pin 1 Indicator
Qorvo Logo - Use Q5D
Trace Code to be assigned by subcon

Package Outline Dimension Drawing

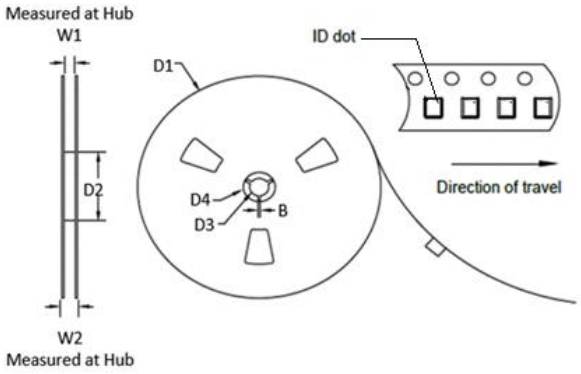


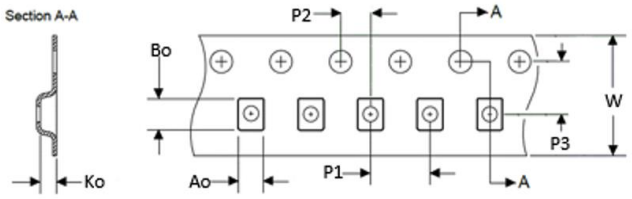
Notes:
1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012

Package Mechanical Information

Recommended Land Pattern – Top View	Recommended Land Pattern Mask – Top View
	

Tape and Reel Information – Carrier and Cover tape Dimensions





Feature	Measure	Symbol	Size (mm)
Flange	Diameter	D1	330.0
	Thickness	W2	18.2
	Space Between Flange	W1	12.8
Hub	Outer Diameter	D2	102.0
	Arbor Hole Diameter	D3	13.0
	Key Slit Width	B	2.0
	Key Slit Diameter	D4	20.2

Feature	Measure	Symbol	Size (mm)
Cavity	Length	Ao	2.8
	Width	Bo	3.5
	Depth	Ko	1.16
	Pitch	P1	4.0
Centerline Distance	Cavity to Perforation (Length)	P2	2.0
	Cavity to Perforation (Width)	P3	5.5
Carrier Tape	Width	W	12.0

(Unless otherwise specified, all dimension tolerances per EIA-481)

Handling Precautions

PARAMETER	RATING	STANDARD
ESD – Human Body Model (HBM)	Class 1B	ESDA/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3	ESDA/JEDEC JS-002
MSL – Moisture Sensitivity Level	Level 3	IPC/JEDEC J-STD-020



Caution!

ESD sensitive device

Solderability

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

Package lead plating: Thin Ni ENEPIG

RoHS Compliance

This part 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 ($C_{15}H_{12}Br_4O_2$) Free
- SVHC Free
- PFOS

Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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