



QPQ1031Q

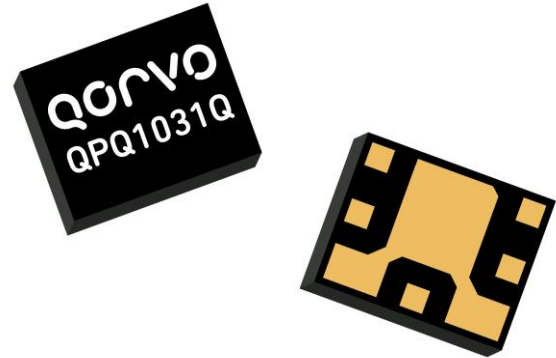
Band 1/3 Multiplexer

Product Overview

The QPQ1031Q is a compact, high-performance multiplexer module fabricated using a patented LowDrift™ BAW technology with performance optimized to enable carrier aggregation of LTE bands 1 & 3.

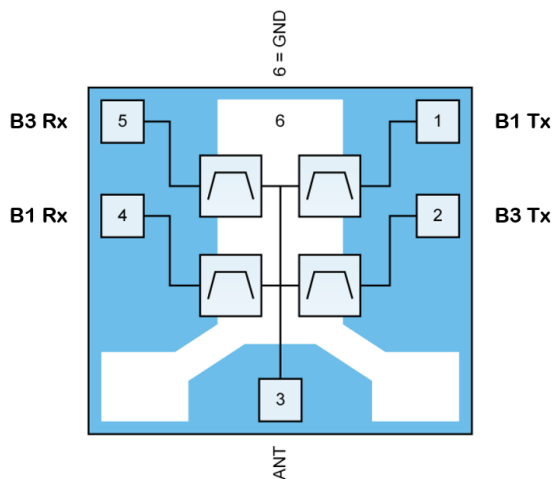
The QPQ1031Q leverages the high-Q properties of the LowDrift™ BAW technology to ensure minimal transmit insertion loss in all bands being multiplexed without loading each other. The QPQ1031Q module has also been designed with high cross-isolation which is critical to ensure good receive performance.

The QPQ1031Q uses unique Wafer Level Packaging (WLP) techniques to enable a compact 2.5 mm x 2.0 mm footprint.



6 Pin 2.5 x 2.0 x 0.685mm leadless SMT package

Functional Block Diagram



Bottom View

Key Features

- Qualified to AEC-Q200 Grade 3
- Industry leading compact form-factor: 2.5mm x 2.0mm
- Minimizes PA current drain with excellent TX IL
- Improved RX sensitivity with low RX IL
- Single-Ended (SE) Ant, TRx Ports
- RoHS Compliant, Pb-Free Module Package

Applications

- LTE Telematics Units
- Carrier Aggregation

Ordering Information

Part Number	Description
QPQ1031QSR	Sample reel of 100 pieces
QPQ1031QTR13	13 inch reel of 2500 pieces
QPQ1031QEVb	Evaluation Board (EVb)
QPQ1031QPCK	Fully Assembled EVb + Sample Bag with 5 pieces

Absolute Maximum Ratings

Parameter	Conditions	Rating
Storage Temperature		– 40 to +100°C
RF Input Power, B1, Pin 1	CW, 1920 – 1980MHz, 25 °C	+38 dBm
RF Input Power, B3, Pin 2	CW, 1710 – 1785MHz, 25 °C	+36.5 dBm

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

Recommended Operating Conditions⁽¹⁾

Parameter	Min.	Typ.	Max.	Units
Tambient ⁽²⁾	-40		+85	°C

¹ Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

² Case temperature allows 10°C max rise over Ambient

Minimum Lifetime Ratings

Conditions	Rating
RF CW input signal of 31dBm in the 1920 MHz – 1980 MHz at max temp of 85°C	87.6 KHrs
RF CW input signal of 31dBm in the 1710 MHz – 1785 MHz at max temp of 85°C	87.6 KHrs

Electrical Specifications⁽¹⁾ Band 1 Uplink - Antenna

UNLESS OTHERWISE NOTED: OPERATING TEMP = -40 °C to +85 °C

PARAMETER	CONDITIONS	MIN.	TYP ⁽²⁾	MAX.	UNITS
Insertion Loss	1950 MHz		1.6 ⁽³⁾		dB
	1920 – 1980 MHz		2.0 ⁽⁴⁾	2.6	
VSWR (Uplink Port)	1920 – 1980 MHz		1.9	2.5	Ratio
VSWR (ANT Port)			1.6	2.3	
Attenuation ⁽⁵⁾	1495.9 – 1510.9 MHz	31	55		dB
	1559 – 1605 MHz	41	56		
	1605.8 – 1680 MHz	45	52		
	1805 – 1880 MHz	49	62		
	2010 – 2025 MHz	10	49		
	2110 – 2170 MHz	53	65		
	2400 – 2500 MHz	39	63		

Notes:

1. Recommended EVB schematic/layout/BOM/PCB should be followed in order to achieve specified performance.
2. Data at 25 °C
3. Insertion Loss of the linear s-parameter at specified frequency
4. Integrated Insertion Loss over every 5MHz sliding windows
5. Absolute Attenuation referenced to 0 dB between specified frequency range

Electrical Specifications⁽¹⁾ Band 1 Antenna - Downlink

UNLESS OTHERWISE NOTED: OPERATING TEMP = -40 °C to +85 °C

Parameter	Conditions	Min.	TYP ⁽²⁾	Max.	Units
Insertion Loss	2140 MHz		1.6 ⁽³⁾		dB
	2110 – 2170 MHz		1.8 ⁽⁴⁾	2.5	
VSWR (Downlink Port)	2110 – 2170 MHz		1.5	2.2	Ratio
VSWR (ANT Port)			1.4	2.2	
Attenuation ⁽⁵⁾	1447 – 1463 MHz	47	51	-	dB
	1710 - 1785 MHz	48	56	-	
	1757.5 – 1832.5 MHz	44	51	-	
	1920 – 1980 MHz	43	58	-	
	2400 – 2500 MHz	41	59	-	

Notes:

1. Recommended EVB schematic/layout/BOM/PCB should be followed in order to achieve specified performance.
2. Data at 25 °C
3. Insertion Loss of the linear s-parameter at specified frequency
4. Integrated Insertion Loss over every 5MHz sliding windows
5. Absolute Attenuation referenced to 0 dB between specified frequency range

Electrical Specifications⁽¹⁾ Band 3 Antenna – Uplink

UNLESS OTHERWISE NOTED: OPERATING TEMP = -40 °C to +85 °C

Parameter	Conditions	Min.	TYP ⁽²⁾	Max.	Units
Insertion Loss	1747.5 MHz		1.8 ⁽³⁾		dB
	1710 – 1785 MHz		2.8 ⁽⁴⁾	4.2	
VSWR (Uplink Port)	1710 – 1785 MHz		1.8	2.4	Ratio
VSWR (ANT Port)			1.5	1.9	
Attenuation ⁽⁵⁾	1565 – 1586 MHz	49	57		dB
	1805 – 1880 MHz	48	62		
	2110 – 2170 MHz	47	58		
	2400 – 2500 MHz	35	50		

Notes:

1. Recommended EVB schematic/layout/BOM/PCB should be followed in order to achieve specified performance.
2. Data at 25 °C
3. Insertion Loss of the linear s-parameter at specified frequency
4. Integrated Insertion Loss over every 5MHz sliding windows
5. Absolute Attenuation referenced to 0 dB between specified frequency range

Electrical Specifications⁽¹⁾ Band 3 Antenna – Downlink

UNLESS OTHERWISE NOTED: OPERATING TEMP = -40 °C to +85 °C

Parameter	Conditions	Min.	TYP ⁽²⁾	Max.	Units
Insertion Loss	1842.5 MHz		1.8 ⁽³⁾		dB
	1805 – 1880 MHz		2.5 ⁽⁴⁾	3.4	
VSWR (Downlink Port)	1805 – 1880 MHz		1.5	2.2	Ratio
VSWR (ANT Port)			1.4	1.8	
Attenuation ⁽⁵⁾	1710 – 1785 MHz	51	55		dB
	1920 – 1980 MHz	52	55		
	2015 – 2075 MHz	45	48		
	2400 – 2500 MHz	45	48		

Notes:

1. Recommended EVB schematic/layout/BOM/PCB should be followed in order to achieve specified performance.
2. Data at 25 °C
3. Insertion Loss of the linear s-parameter at specified frequency
4. Integrated Insertion Loss over every 5MHz sliding windows
5. Absolute Attenuation referenced to 0 dB between specified frequency range

Electrical Specifications⁽¹⁾ Isolation












Unless Otherwise Noted: Operating Temp = -40 °C to +85 °C

Parameter	Conditions	Min.	TYP ⁽²⁾	Max.	Units
TX-RX Isolation in B3 RX	1805 – 1808 MHz, B3 Tx Isolation in B3 Rx ⁽³⁾	55	65		dB
	1805 – 1880 MHz, B3 Tx Isolation in B3 Rx	44	64		
TX-RX Isolation in B3 TX	1710 – 1785 MHz, B3 Rx Isolation in B3 Tx	52	56		
TX-RX Isolation in B1 RX	2110 – 2170 MHz, B1 Tx Isolation in B1 Rx	59	66		
TX-RX Isolation in B1 TX	1920 – 1980 MHz, B1 Rx Isolation in B1 Tx	50	64		
B1 TX to B3 RX Isolation in B3 RX	1805 – 1870 MHz	48	64		
	1870 – 1880 MHz	43	64		
B1 TX to B3 RX Isolation in B1 TX	1920 – 1980 MHz	52	56		
B3 TX to B1 RX Isolation in B3 TX	1710 – 1785 MHz	50	58		
B3 TX to B1 RX Isolation in B1 RX	2110 – 2170 MHz	56	65		

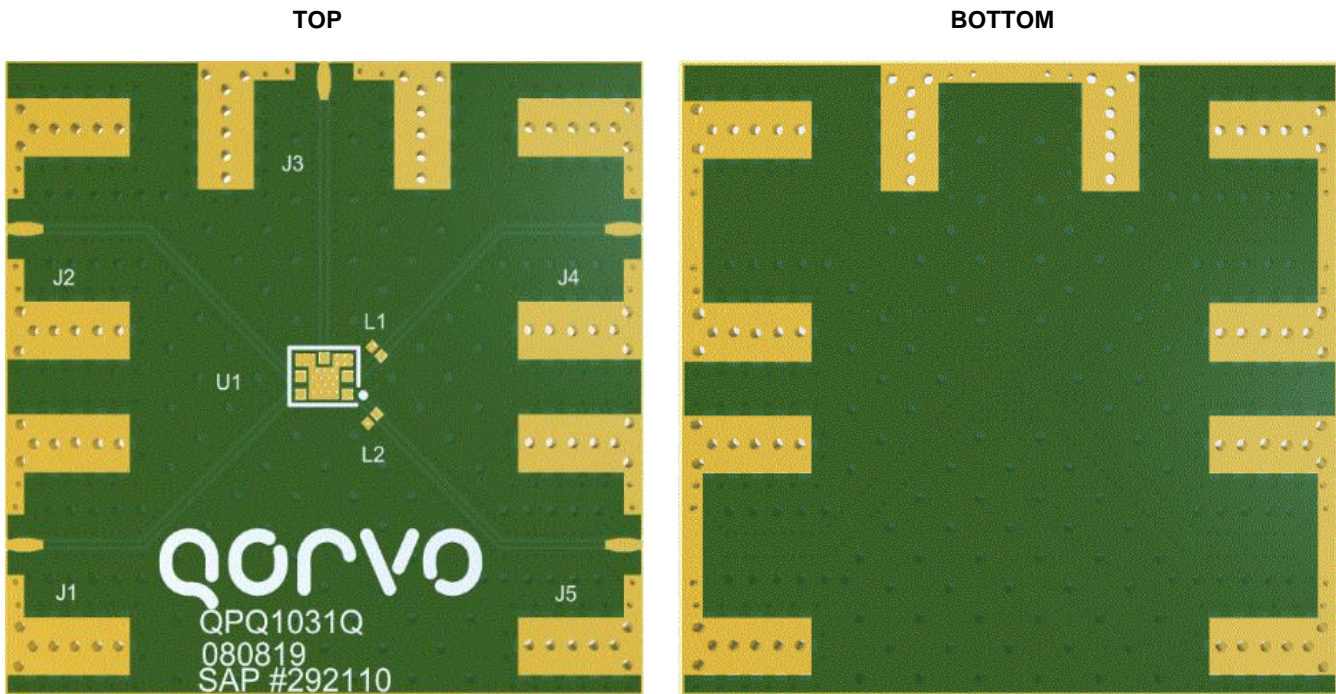
Notes:

1. Recommended EVB schematic/layout/BOM/PCB should be followed in order to achieve specified performance.
2. Data at 25 °C
3. Integrated over 2.7MHz BW

Evaluation Board PCB Information

LAYER STACK LEGEND					
Material	Layer	Thickness	Dielectric Material	Type	
	Silkscreen Top			Legend	
	Surface Material Soldermask Top	0.0008in	Taiyo PSR400	Solder Mask	
	Metal 1 Top	0.0014in		Signal	
	Core	0.0039in	FR-408HR	Dielectric	
	Signal Layer 1	0.0014in		Signal	
	Prepreg	0.0270in	FR-408HR	Dielectric	
	Signal Layer 2	0.0014in		Signal	
	Core	0.0039in	FR-408HR	Dielectric	
	Metal 4 Bottom	0.0014in		Signal	
	Surface Material Bottom Solder 1	0.0008in	Taiyo PSR400	Solder Mask	
	Bottom Overlay 1			Legend	
Total thickness: 0.0420in					

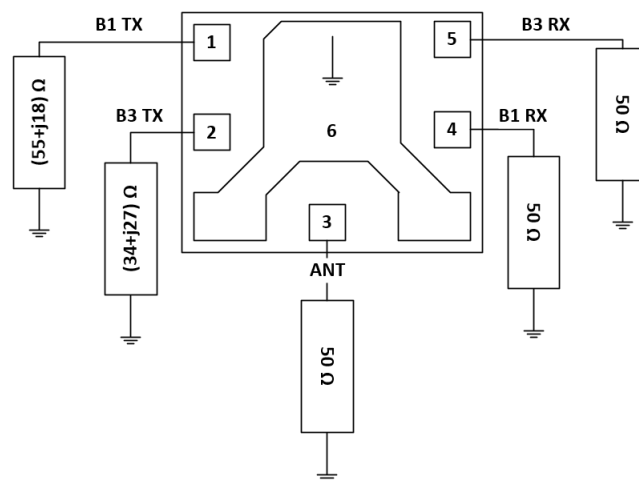
Evaluation Board



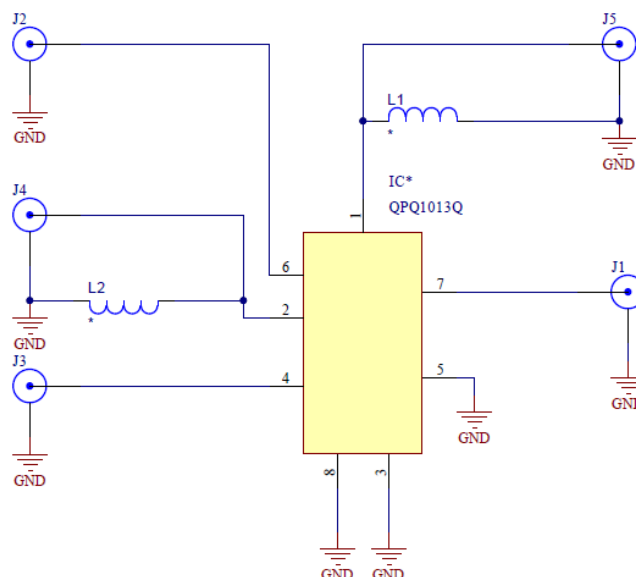
Evaluation Board BOM

Item No	Material#	Rev	Qty	Ref Des	Description
50	292211	A	1		QPQ1031Q-4000 EVB PCB
30	268171		1	L2	IND, 6.8nH, 3%, T/F, HI-Q, 0201
20	273892	A	1	L1	IND, 13nH, 3%, T/F, HI-Q, 0201
10	281934	A	5	J1,J2,J3,J4,J5	CONN, RF COAXIAL, EDGE MNT, SMA

Application Circuit Schematic



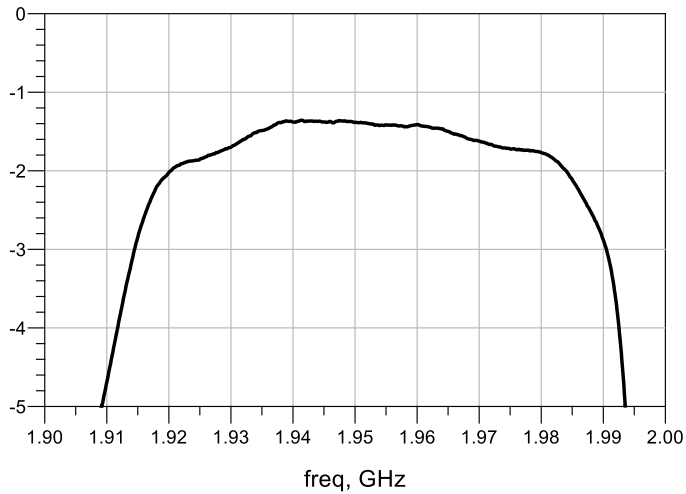
Note : B1 TX (pin 1) and B3 TX (pin 2) are terminated with complex impedance to provide flexible matching options for optimizing TX performance between PA and QPQ1031Q. All other ports are matched to 50 ohm impedance.



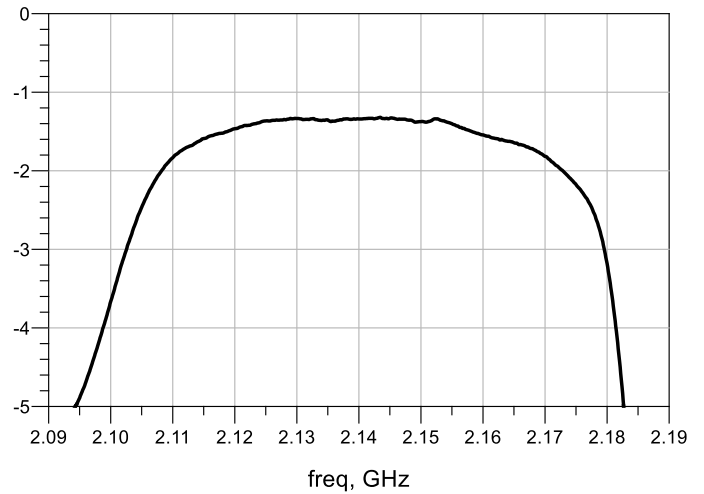
Performance Plots – Passband

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

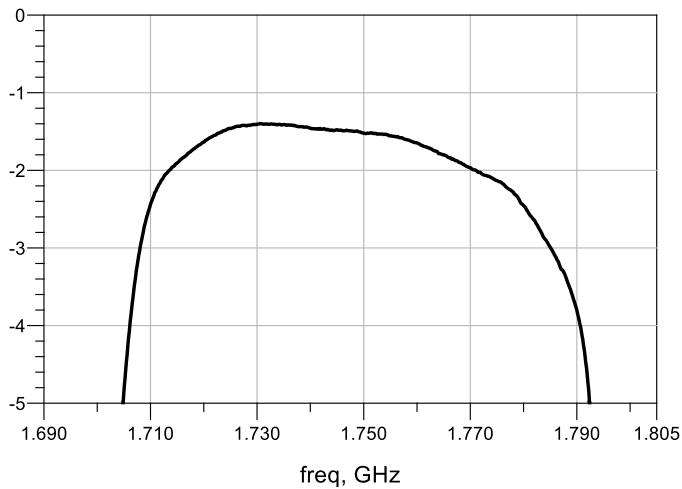
B1 TX Passband



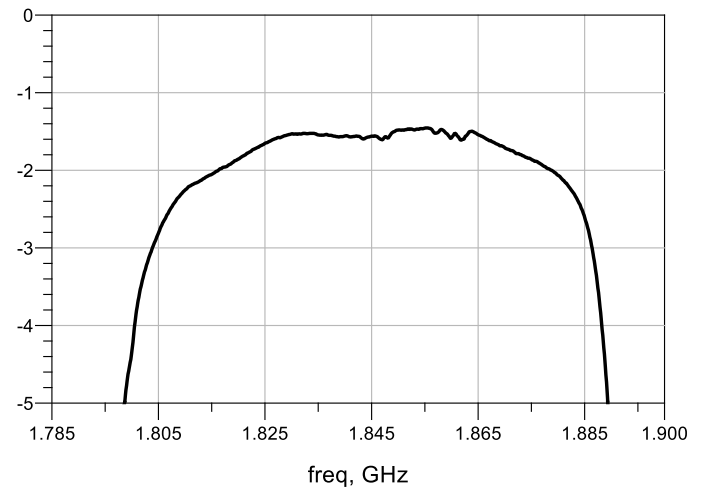
B1 RX Passband



B3 TX Passband

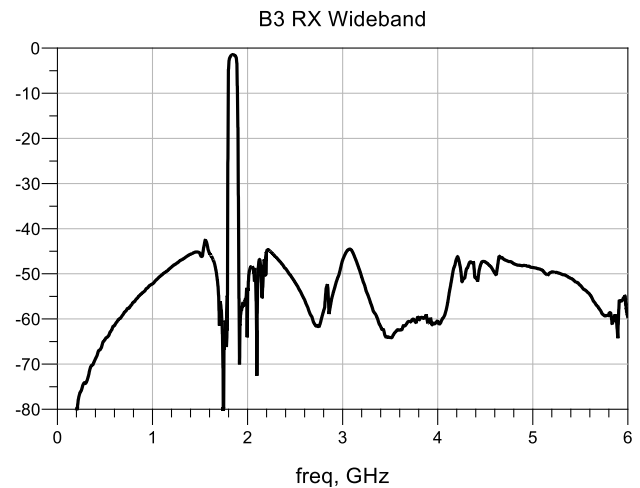
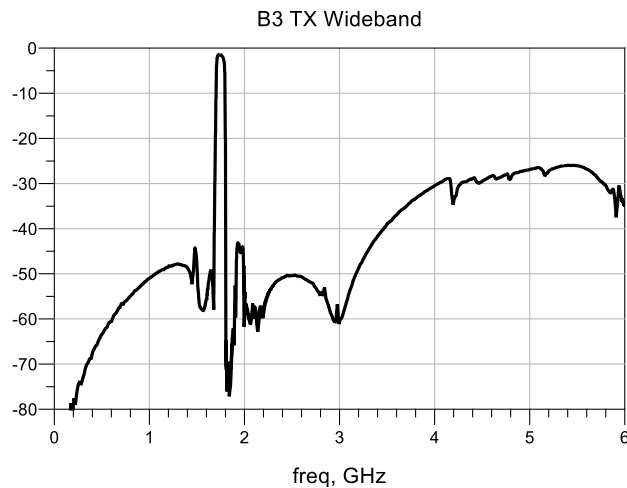
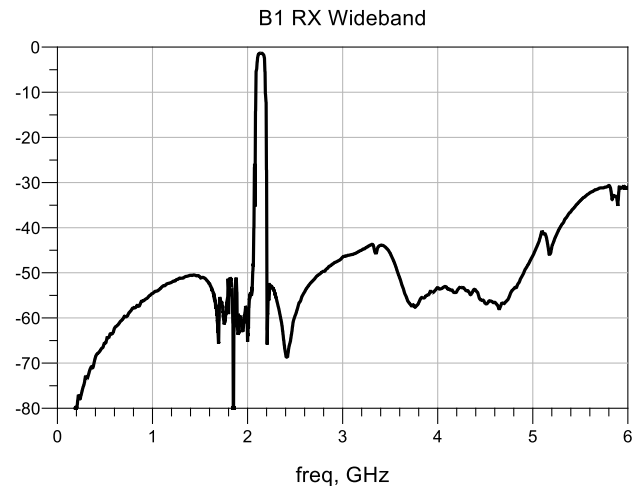
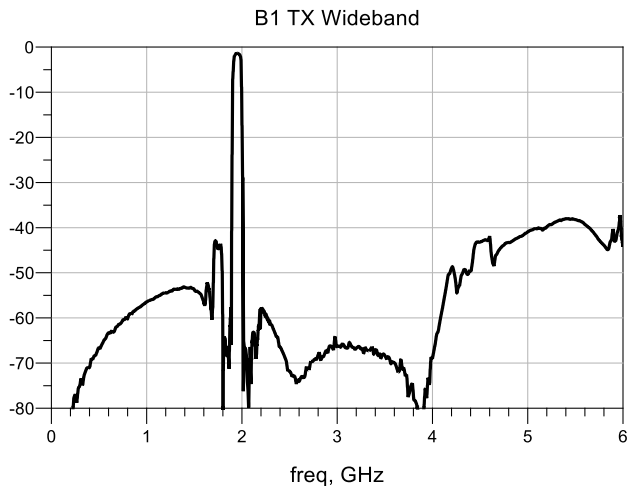


B3 RX Passband



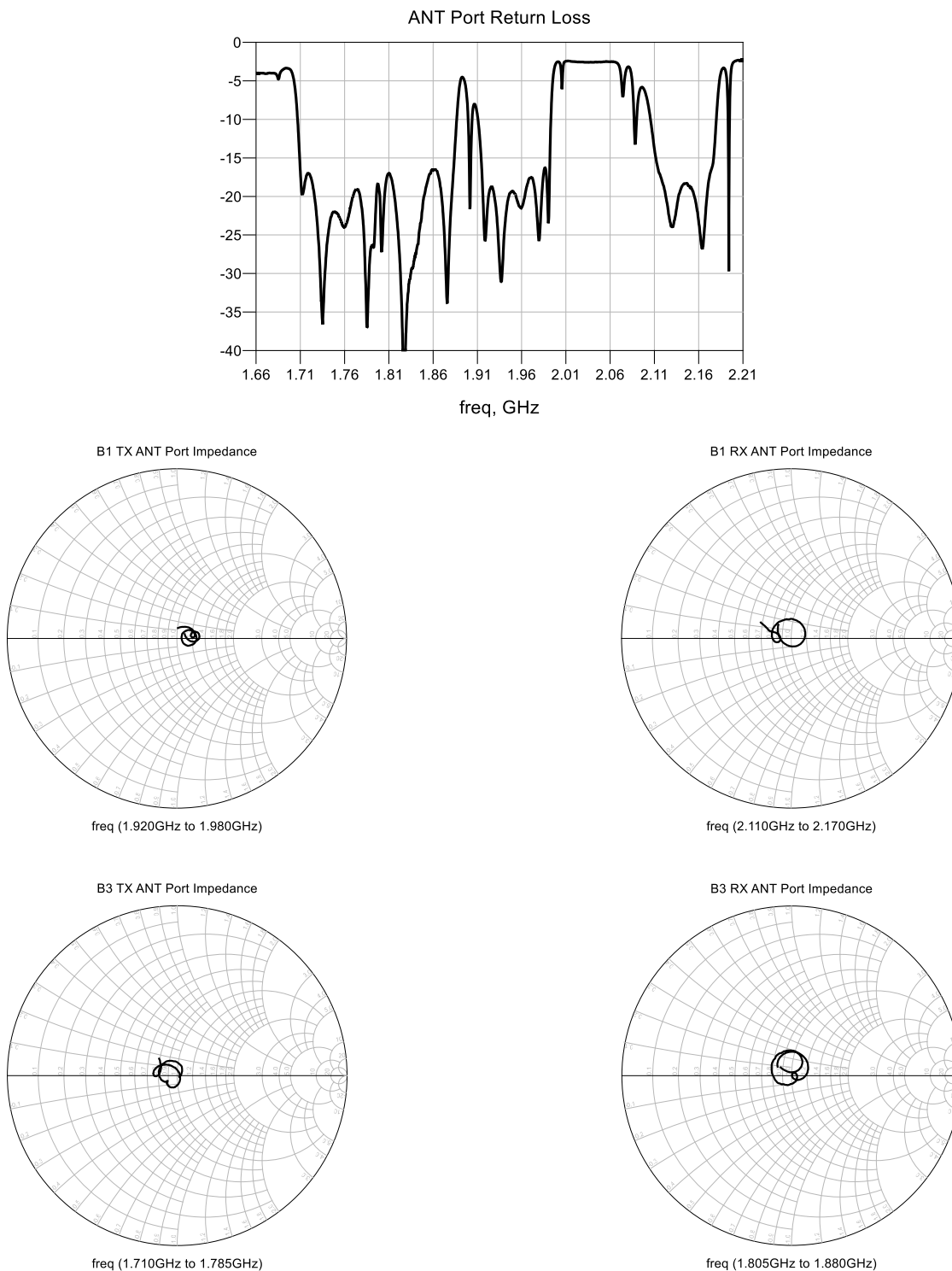
Performance Plots – TX & RX Wideband

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



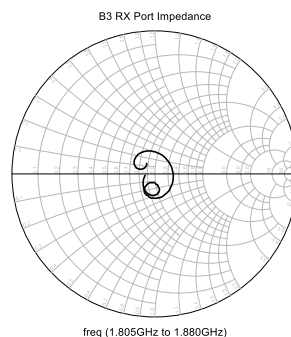
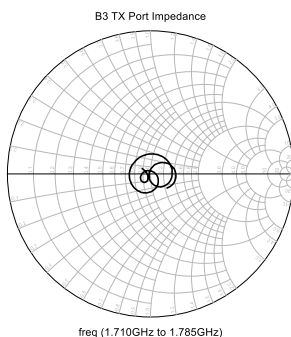
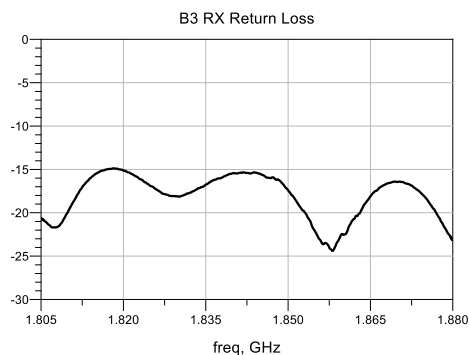
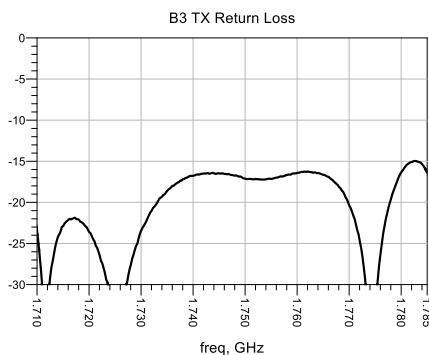
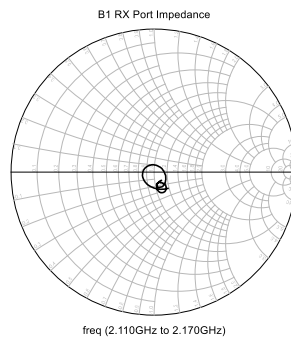
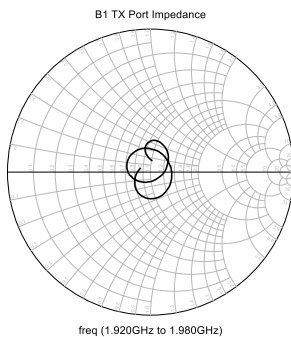
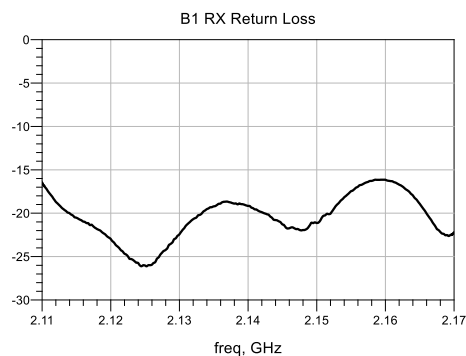
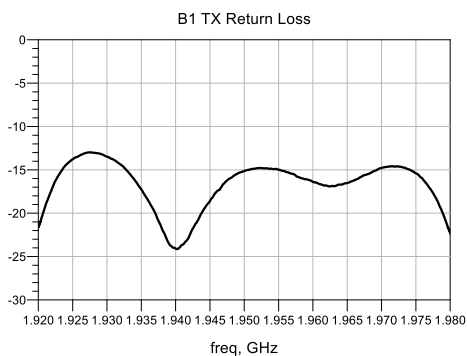
Performance Plots – ANT Port Return Loss/Impedance

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



Performance Plots – Return Loss/Impedance

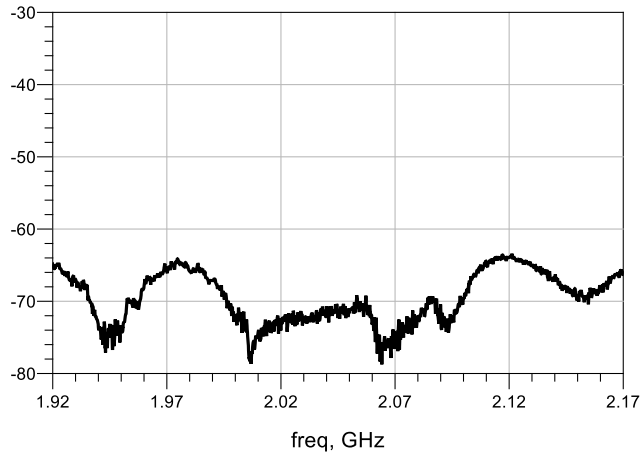
Test conditions unless otherwise noted: Temp. = +25 °C



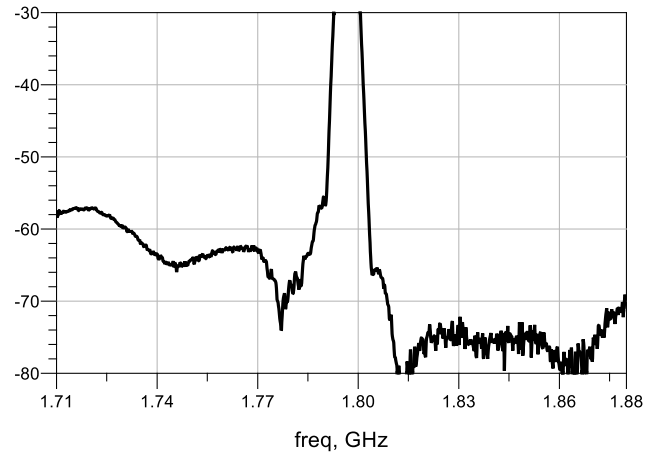
Performance Plots – Isolation

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

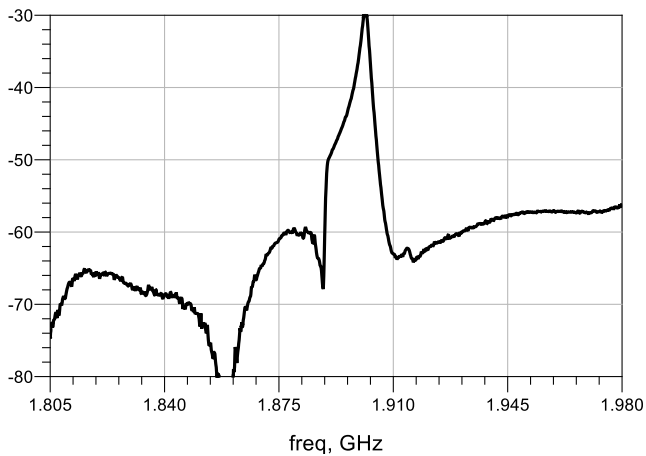
B1 TX-RX Isolation



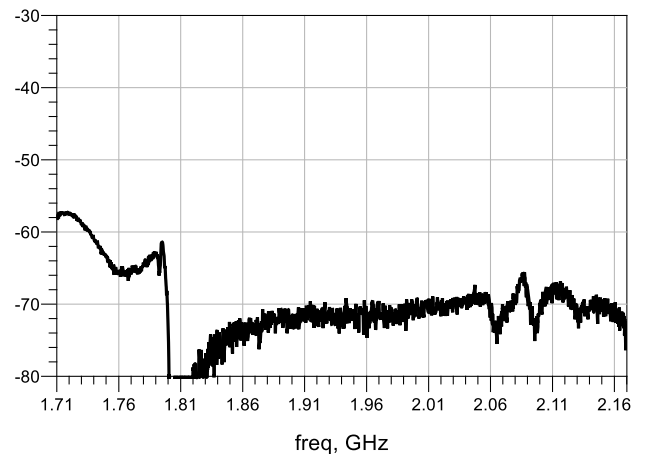
B3 TX-RX Isolation



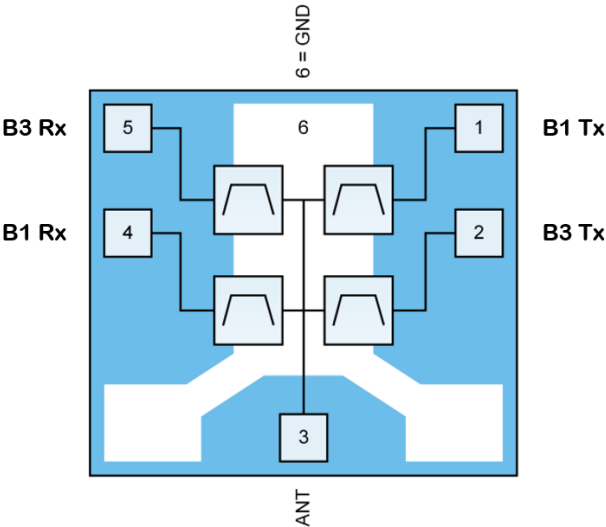
B1 TX - B3 RX Cross-Isolation



B3 TX - B1 RX Cross-Isolation



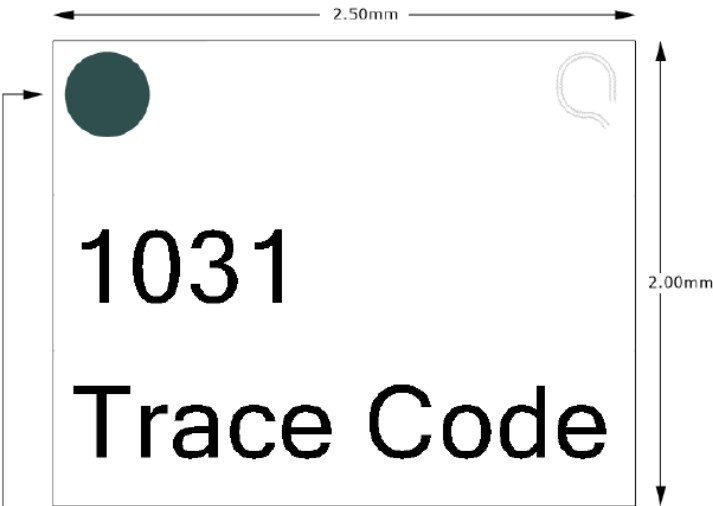
Pin Configuration and Description



Bottom View

Pin Number	Label	Description
1	B1 TX	Band 1 Transmit Port
2	B3 TX	Band 3 Transmit Port
3	ANT	Band 1/3 Antenna Port
4	B1 RX	Band 1 Receive Port
5	B3 RX	Band 3 Receive Port
6	GND	Package Ground

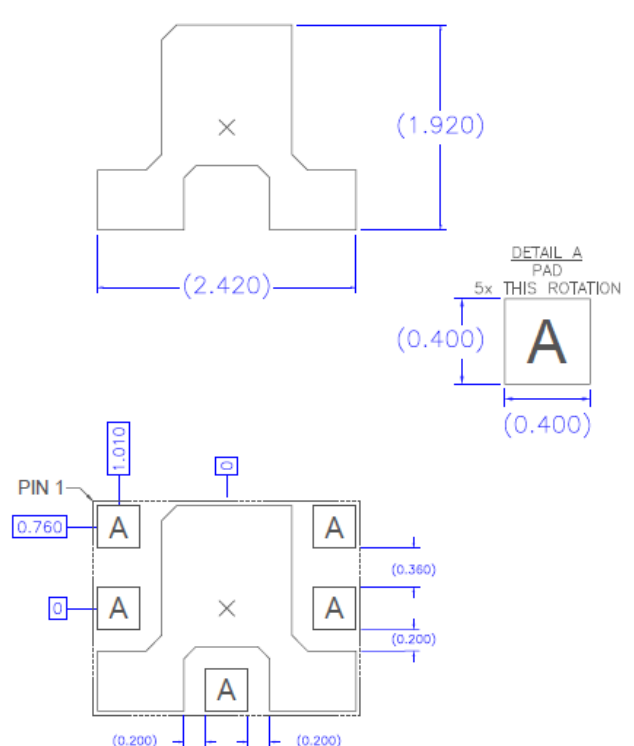
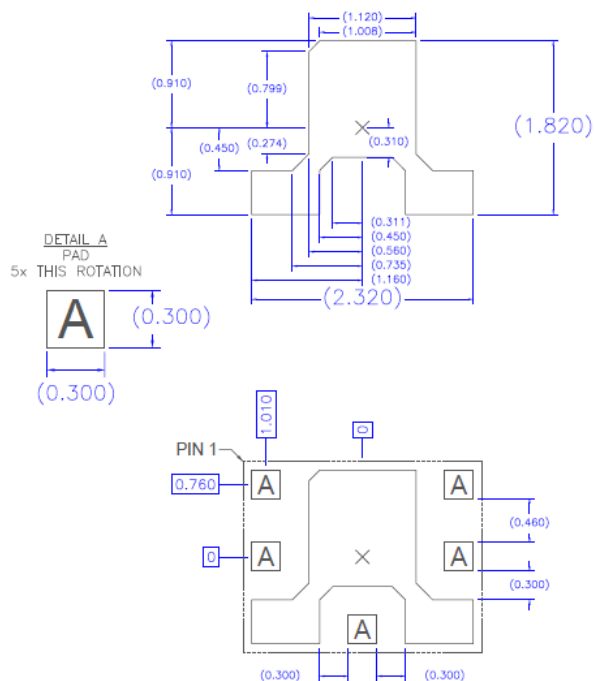
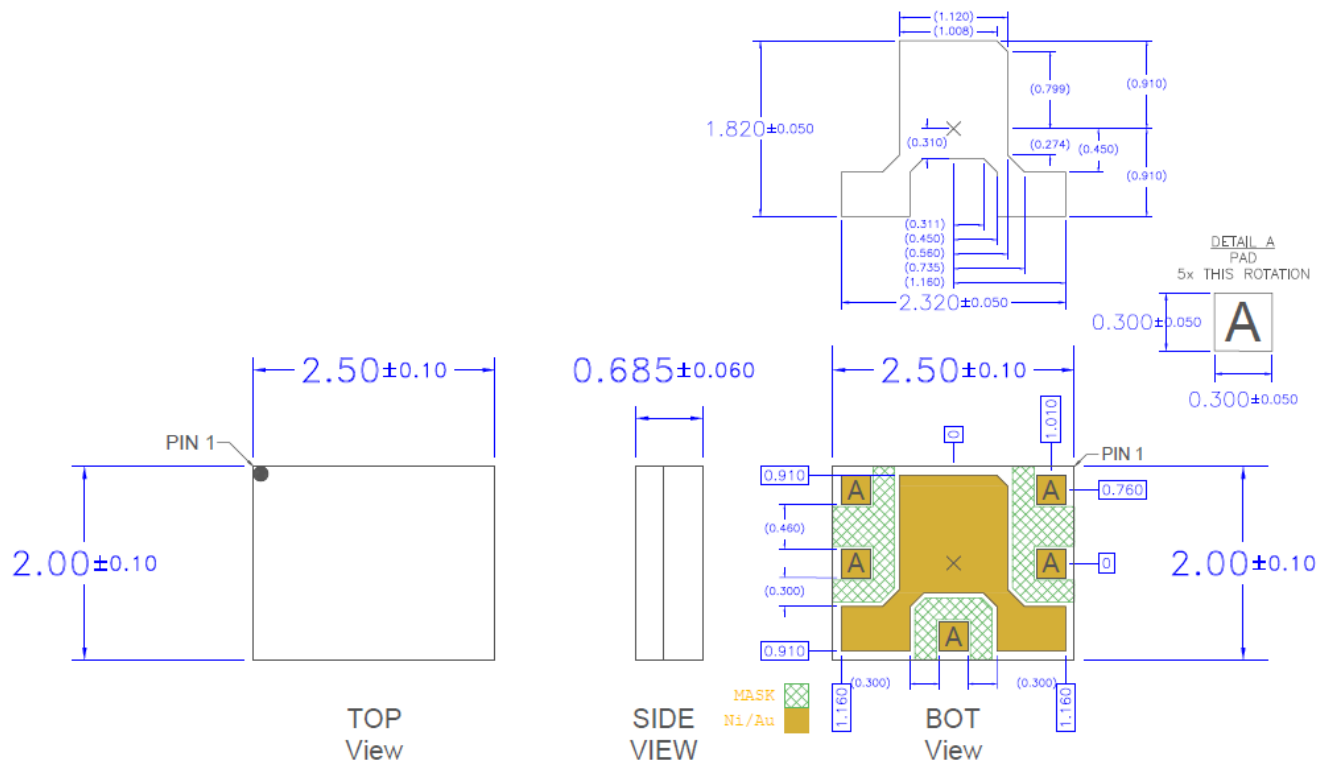
Marking Diagram



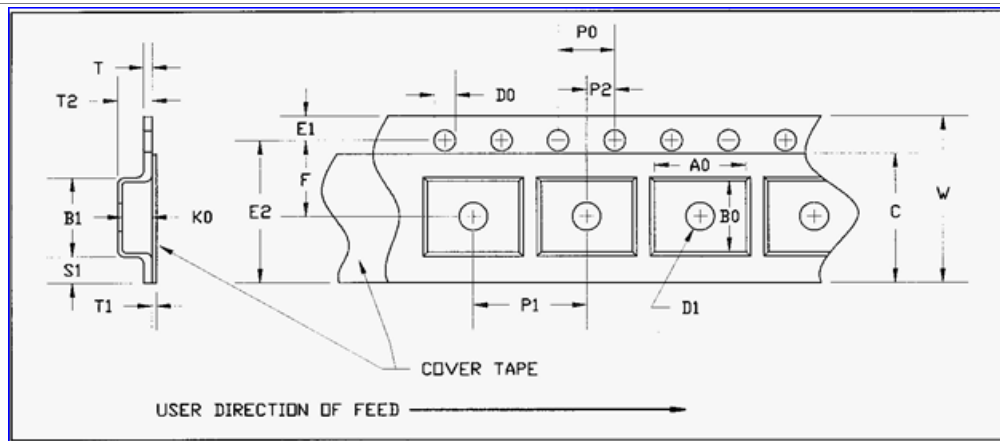
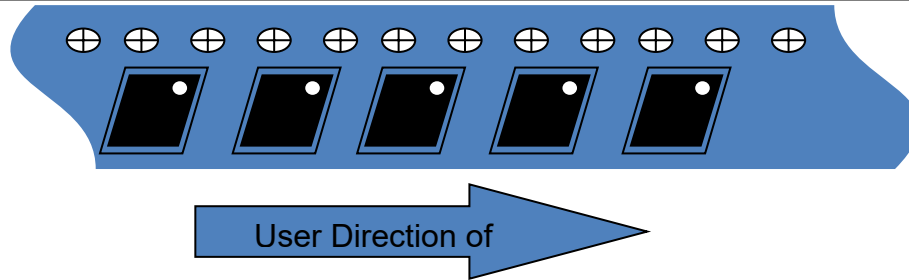
Pin 1 Indicator
Qorvo Logo - Use Q5D
Trace Code to be assigned by SubCon

Package Outline Drawings

Package Outline Dimension Drawing



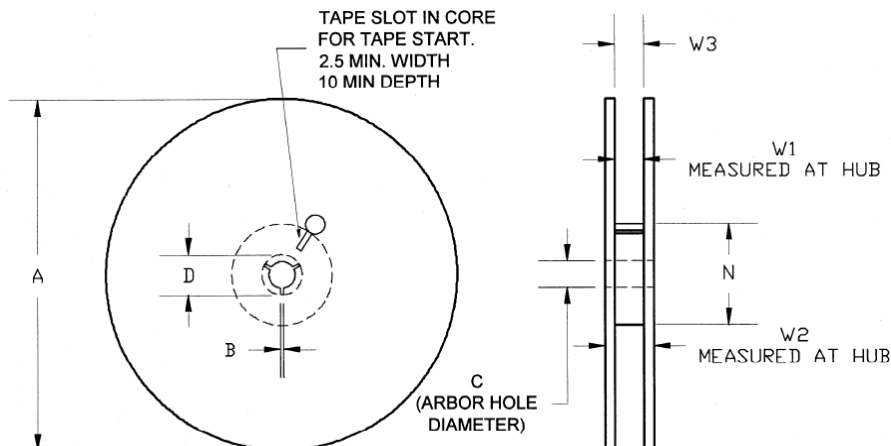
Tape and Reel Information – Carrier and Cover tape Dimensions



Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.087	2.20
	Width	B0	0.106	2.70
	Depth	K0	0.043	1.10
	Pitch	P1	0.157	4.0
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.0
	Cavity to Perforation - Width Direction	F	0.138	3.50
Cover Tape	Width	C	0.213	5.40
Carrier Tape	Width	W	0.315	8.0

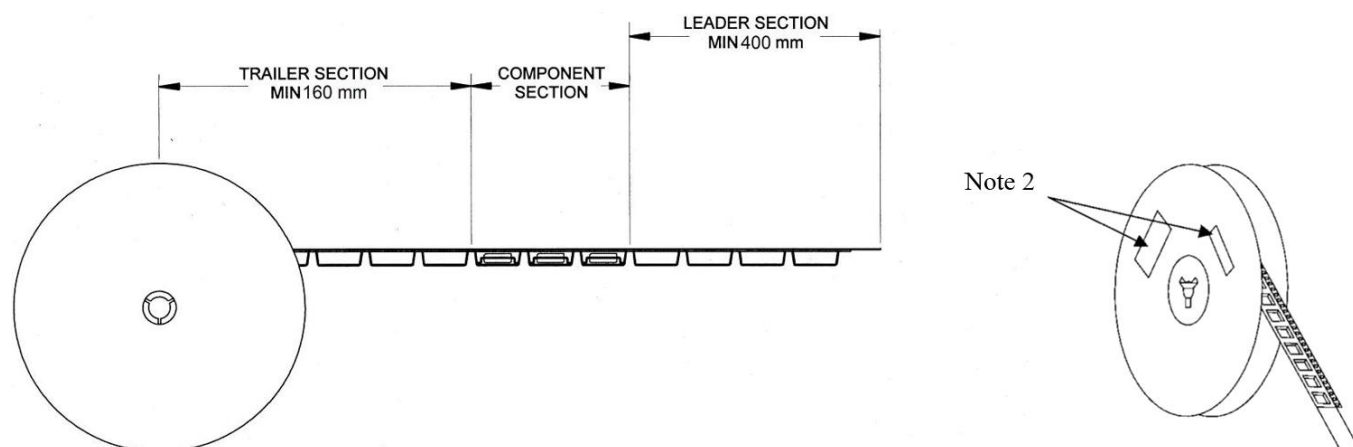
Tape and Reel Information – Reel Dimensions

Packaging reels are used to prevent damage to devices during shipping and storage, loaded carrier tape is typically wound onto a plastic take-up reel. The reel size is 13" diameter. The reels are made from high-impact injection-molded polystyrene (HIPS), which offers mechanical and ESD protection to packaged devices.



Feature	Measure	Symbol	Size (in)	Size (mm)
Flange	Diameter	A	12.992	330.0
	Thickness	W2	0.559	14.2
	Space Between Flange	W1	0.346	8.8
Hub	Outer Diameter	N	4.016	102.0
	Arbor Hole Diameter	C	0.512	13.0
	Key Slit Width	B	0.079	2.0
	Key Slit Diameter	D	0.795	20.2

Tape and reel specifications for this part are also available on the Qorvo website.
Standard T/R size = 5000 pieces on a 13" reel.



Notes:

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

Handling Precautions

PARAMETER	RATING	STANDARD
ESD – Human Body Model (HBM)	Class 1C	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: Electrolytic plated Au over Ni

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 (C₁₅H₁₂Br₄O₂) Free
- SVHC Free
- PFOS Free





QPQ1031Q Band 1/3 Multiplexer

REVISION HISTORY

Revision	Description	DATE
A	<ul style="list-style-type: none">Updated spec table, plots and EVB informationUpdated specifications based on product yield analysis	
B	<ul style="list-style-type: none">Added EVB detailsUpdated package marking drawingGeneral formatting updates	
C	<ul style="list-style-type: none">Updated SpecificationAdded EVB Information	
D	<ul style="list-style-type: none">Updated Typical Specification to align with PRD	Aug 20, 2020

Contact Information

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

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Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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