QM28005

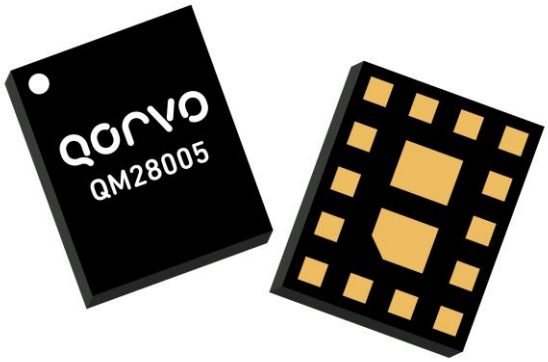
L5 GPS, GNSS, 2.4G WiFi, and 5G WiFi6E Antennaplexer

Product Overview

The QM28005 is part of Qorvo's family of antennaplexers using patented technology to meet the high performance expectations of insertion loss and rejection for L5 GPS, GNSS and WLAN systems under all operating conditions

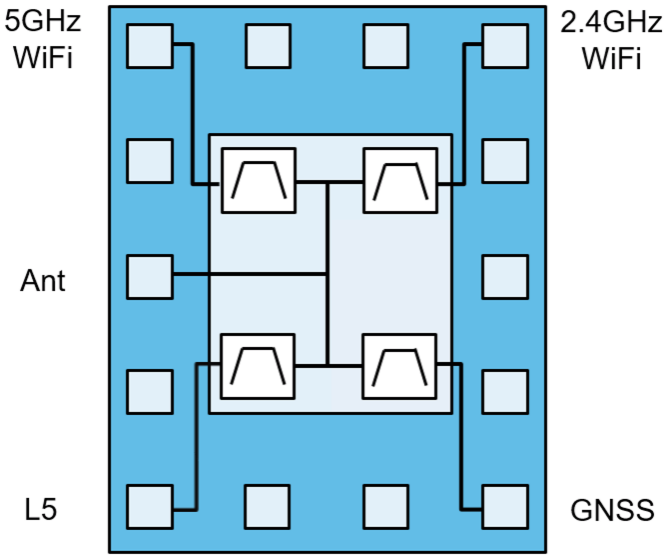
The QM28005 is a compact filter module designed to meet the strict requirements of out of band attenutation while optimizing for insertion loss of L5 GPS, GNSS, 2.4G WLAN and 5G WLAN from 1166.22 MHz – 1186.68 MHz, 1559.05 MHz – 1605.89 MHz, 2403 MHz – 2481 MHz, and 5150 MHz – 7125 MHz respectively.

The QM28005 uses common module packaging techniques to achieve a compact 2.0 mm x 1.6 mm footprint.



16 Pin 2.0mm x 1.6mm x 0.57mm leadless SMT package

Functional Block Diagram



Top View

Key Features

- Compact Form-Factor: 2.0 mm x 1.6 mm
- Highly selective filters achieving low insertion loss and high attenuation over full bandwidth
- Single antenna port quadplexing
- RoHS Compliant, Pb-Free Module Package

Applications

- For L5 GPS, GNSS, 2.4GHz WLAN and 5GHz WLAN to include WiFi6E

Ordering Information

Part Number	Description
QM28005EVB	Evaluation Board (EVB)
QM28005SB	Sample bag of 5 pieces
QM28005SR	Sample reel of 100 pieces
QM28005TR13	13 inch reel of 10k pieces

Absolute Maximum Ratings

Parameter	Conditions	Rating	Units
Storage Temperature		-40 to +90	°C
Operating Case Temperature		-30 to +85	°C
RF Input Power (Pin5, 2.4GHz WiFi)	2403 MHz – 2481 MHz	+24	dBm
RF Input Power (Pin8, 5GHz WiFi6E)	5150 MHz – 5925 MHz	+24	dBm
	5925 MHz – 6425 MHz		
	6425 MHz – 7125 MHz		
RF Input Power (Pin10, ANT)	1166 MHz – 1187 MHz	+15	dBm
	1559 MHz – 1606 MHz		
	2403 MHz – 2481 MHz		
	5150 MHz – 5925 MHz		
	5925 MHz – 6425 MHz		
	6425 MHz – 7125 MHz		

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

Electrical Specifications[1] L5 GPS - Antenna

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	1166.22 MHz – 1186.68 MHz	-	1.2[2]	1.45	dB
VSWR (L5 GPS)	1166.22 MHz – 1186.68 MHz	-	1.2:1	2:1	-
VSWR (ANT)		-	1.2:1	2:1	
Attenuation	10 MHz – 915 MHz	39	40	-	dB
	1427.9 MHz – 1462.9 MHz	38	44	-	
	1710 MHz – 1980 MHz	45	52	-	
	2300 MHz – 2400 MHz	49	51	-	
	2329.9 MHz – 2375.9 MHz	51	55	-	
	2403 MHz – 2481 MHz	49	51	-	
	2496 MHz – 2690 MHz	43	46	-	
	3300 MHz – 4200 MHz	50	53	-	
	4400 MHz – 5000 MHz	51	54	-	
	5150 MHz – 5925 MHz	54	58	-	
	5925 MHz – 6425 MHz	54	62	-	
	6425 MHz – 7125 MHz	49	65	-	

Notes:
1. All specifications are based on the applications circuit and Min/Max is specified over -30˚C to +85˚C unless otherwise noted.
2. Typical specified as average at room temperature

Electrical Specifications[1] L1 GNSS - Antenna

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	1559.05 MHz – 1563.15 MHz	-	1.2 [2]	1.6	dB
	1574.39 MHz – 1576.45 MHz	-	0.9 [2]	1.1	
	1597.55 MHz – 1605.89 MHz	-	1.1 [2]	1.8	
VSWR (GNSS)	1559.05 MHz – 1563.15 MHz	-	1.3:1	2:1	-
	1574.39 MHz – 1576.45 MHz	-	1.1:1	2:1	
	1597.55 MHz – 1605.89 MHz	-	1.2:1	2:1	
VSWR (ANT)	1559.05 MHz – 1563.15 MHz	-	1.4:1	2:1	
	1574.39 MHz – 1576.45 MHz	-	1.2:1	2:1	
	1597.55 MHz – 1605.89 MHz	-	1.4:1	2:1	
Attenuation	10 MHz – 960 MHz	50	52	-	dB
	777 MHz – 787 MHz	57	61	-	
	1427.9 MHz – 1462.9 MHz	41	44	-	
	1640 MHz – 1695 MHz	29	50	-	
	1695 MHz – 1710 MHz	50	66	-	
	1710 MHz – 1785 MHz	51	62	-	
	1786 MHz – 1797 MHz	51	63	-	
	1850 MHz – 1910 MHz	49	65	-	
	1910 MHz – 1980 MHz	48	58	-	
	2010 MHz – 2025 MHz	47	55	-	
	2305 MHz – 2315 MHz	45	49	-	
	2403 MHz – 2481 MHz	43	46	-	
	2500 MHz – 2570 MHz	38	40	-	
	2570 MHz – 2690 MHz	39	41	-	
	3400 MHz – 3600 MHz	39	41	-	
	4400 MHz – 4900 MHz	43	50	-	
	5150 MHz – 5925 MHz	11	35	-	
	5925 MHz – 6425 MHz	34	44	-	
	6425 MHz – 7125 MHz	19	26	-	

Notes:
1. All specifications are based on the applications circuit and Min/Max is specified over -30˚C to +85˚C unless otherwise noted.
2. Typical specified as average at room temperature

Electrical Specifications[1] 2.4GHz WiFi - Antenna

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	2403 MHz – 2421 MHz[2] (WiFi CH1)	-	2	2.1	dB
	2408 MHz – 2426 MHz[2] (WiFi CH2)	-	1.5	1.7	
	2413 MHz – 2456 MHz[2] (WiFi CH3-8)	-	1.3	1.6	
	2443 MHz – 2471 MHz[2] (WiFi CH9-11)	-	1.3	1.6	
	2458 MHz – 2476 MHz[2] (WiFi CH12)	-	1.2	1.6	
	2463 MHz – 2481 MHz[2] (WiFi CH13)	-	1.4	2	
VSWR (WiFi)	2403 MHz – 2481 MHz	-	1.7:1	2:1	-
VSWR (ANT)	2403 MHz – 2481 MHz	-	1.6:1	2.5:1	
Attenuation	925 MHz – 960 MHz	37	41	-	dB
	1559 MHz – 1606 MHz	35	37	-	
	2110 MHz – 2170 MHz	32	34	-	
	2300 MHz – 2370 MHz	38	42	-	
	2500 MHz – 2505 MHz[3]	16	24	-	
	2505 MHz – 2690 MHz	27	41	-	
	4800 MHz – 5000 MHz	37	45	-	
	7200 MHz – 7500 MHz	27	38	-	

Notes:
1. All specifications are based on the applications circuit and Min/Max is specified over -30˚C to +85˚C unless otherwise noted.
2. Integrated over each 18MHz WiFi Channel
3. Integrated over 5MHz Channel

Electrical Specifications[1] 5GHz WiFi6E - Antenna

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	5150 MHz – 5925 MHz	-	1.2[2]	1.7	dB
	5925 MHz – 6425 MHz	-	1.3[2]	2	
	6425 MHz – 7125 MHz	-	2.6[2]	5	
VSWR (5GHz WiFi6E)	5150 MHz – 5925 MHz	-	1.6:1	2:1	-
	5925 MHz – 6425 MHz	-	1.6:1	2:1	
	6425 MHz – 7125 MHz	-	1.6:1	2:1	
VSWR (ANT)	5150 MHz – 5925 MHz	-	1.7:1	2.2:1	
	5925 MHz – 6425 MHz	-	2.2:1	3.2:1	
	6425 MHz – 7125 MHz	-	2.9:1	4.6:1	
Attenuation	824 MHz – 1166 MHz	29	30	-	dB
	1166 MHz – 1187 MHz	29	30	-	
	1187 MHz – 1559 MHz	29	30	-	
	1559 MHz – 1606 MHz	29	30	-	
	1606 MHz – 2170 MHz	29	30	-	
	2400 MHz – 2500 MHz	21	28	-	
	10300 MHz – 11850 MHz	12	39	-	
	15450 MHz – 17775 MHz	21	31	-	

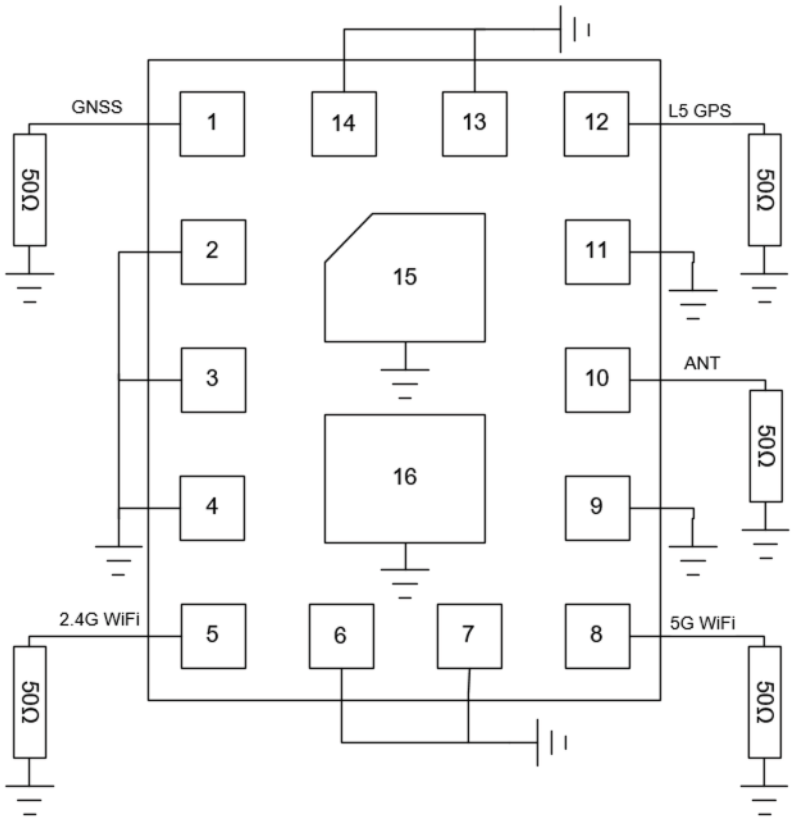
Notes:
1. All specifications are based on the applications circuit and Min/Max is specified over -30˚C to +85˚C unless otherwise noted.
2. Typical specified as average at room temperature

Electrical Specifications[1] Isolation

Parameter		Conditions	Min.	Typ.	Max.	Units
Isolation	GNSS – L5 GPS	1559.05 MHz – 1605.89 MHz	46	48	-	dB
		1166.22 MHz – 1186.68 MHz	49	50	-	
	GNSS – 2.4G WiFi	1559.05 MHz – 1605.89 MHz	37	38	-	
		2403 MHz – 2481 MHz	43	47	-	
	GNSS – 5G WiFi6E	1559.05 MHz – 1605.89 MHz	34	36	-	
		5150 MHz – 5925 MHz	20	33	-	
		5925 MHz – 6425 MHz	35	45	-	
		6425 MHz – 7125 MHz	22	28	-	
	L5 GPS – 2.4G WiFi	1166.22 MHz – 1186.68 MHz	39	40	-	
		2403 MHz – 2481 MHz	48	50	-	
	L5 GPS – 5G WiFi6E	1166.22 MHz – 1186.68 MHz	34	36	-	
		5150 MHz – 5925 MHz	55	62	-	
		5925 MHz – 6425 MHz	53	69	-	
		6425 MHz – 7125 MHz	50	68	-	
	2.4 G WiFi – 5G WiFi6E	2403 MHz – 2481 MHz	27	34	-	
		5150 MHz – 5925 MHz	23	35	-	
		5925 MHz – 6425 MHz	30	41	-	
		6425 MHz – 7125 MHz	36	42	-	

Notes:
1. All specifications are based on the applications circuit and Min/Max is specified over -30˚C to +85˚C unless otherwise noted.

Application Circuit Schematic



Note:

1. All RF ports internally matched to 50 ohm impedance
2. Recommend connecting all ground pins together on PCB
3. Recommend adding Pi network close to each RF port for phone level tuning/optimization

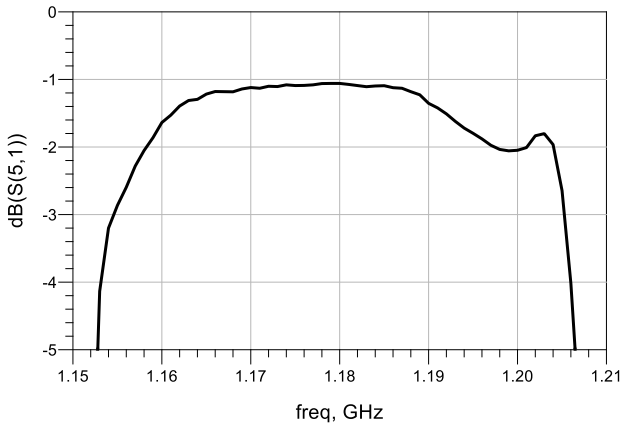
Bill of Materials

Ref. Des.	Value	Description	Manuf.	Part number
U1	N/A	L5 GPS, GNSS, 2.4G WiFi, and 5G WiFi6E Antennaplexer	Qorvo	QM28005
PCB	N/A	4-layer Printed Circuit Board		QM28005-4000

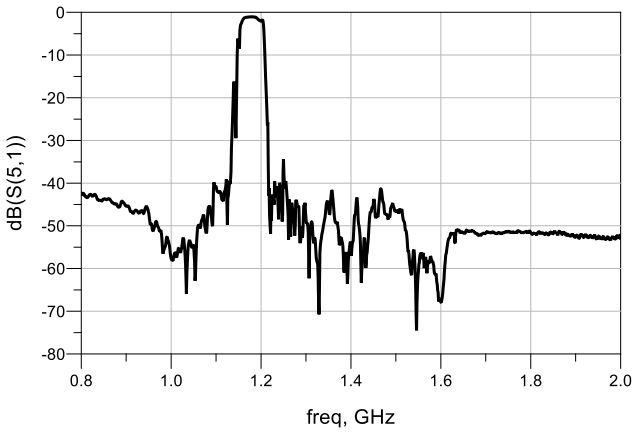
L5 GPS Insertion Loss and Attenuation Plots

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

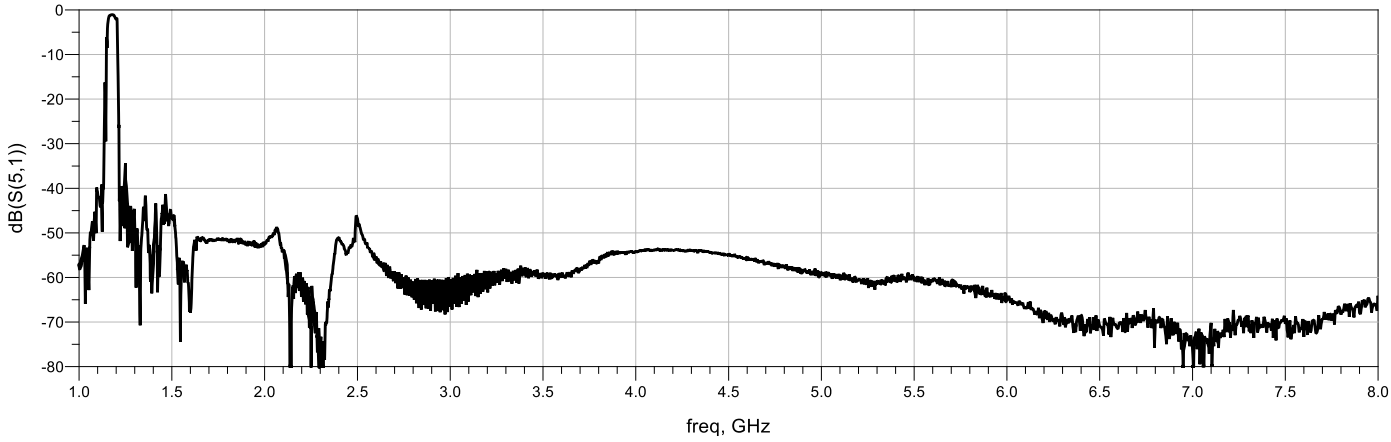
L5 GPS Pass Band



L5 GPS Narrow Band

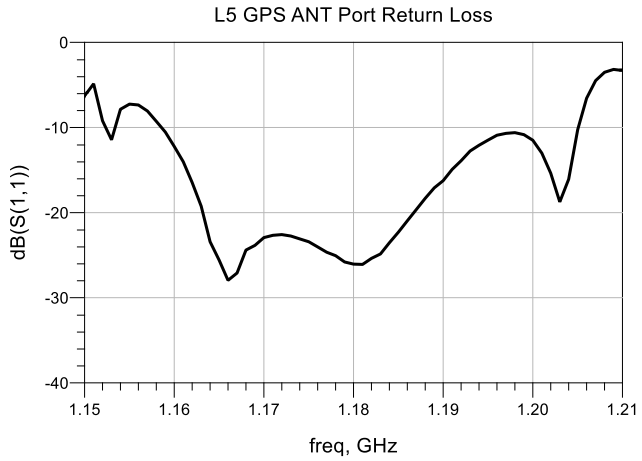


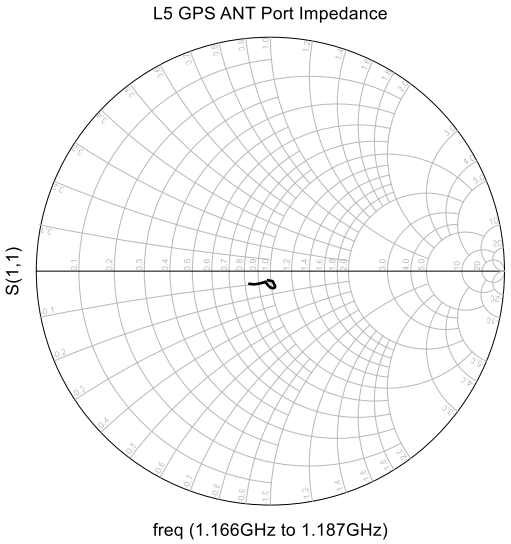
L5 GPS Wide Band

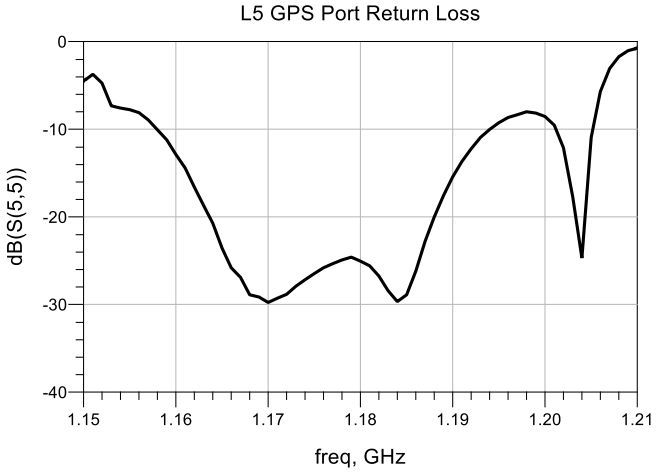


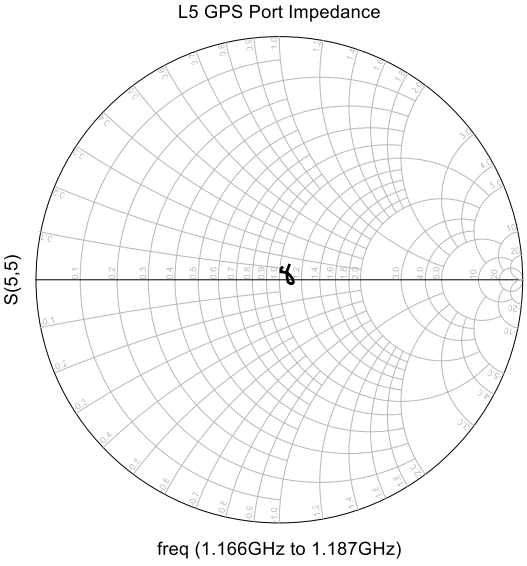
L5 GPS Return Loss and Impedance Plots

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



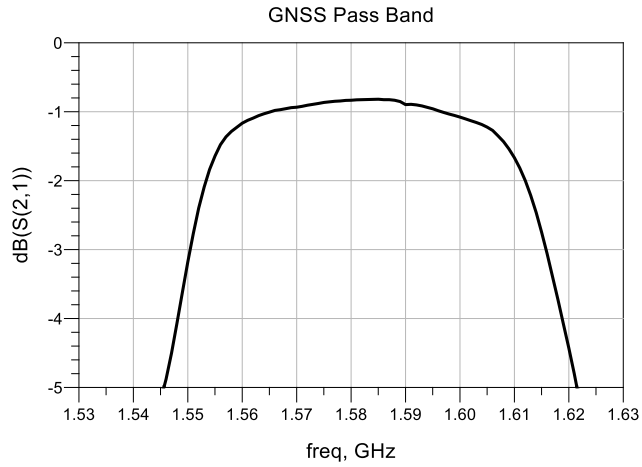


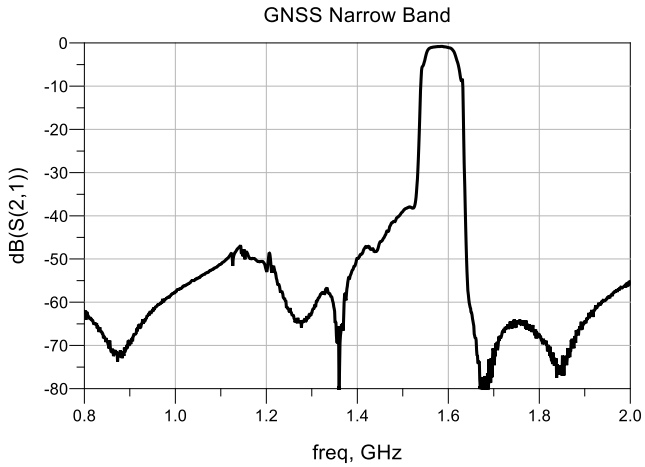


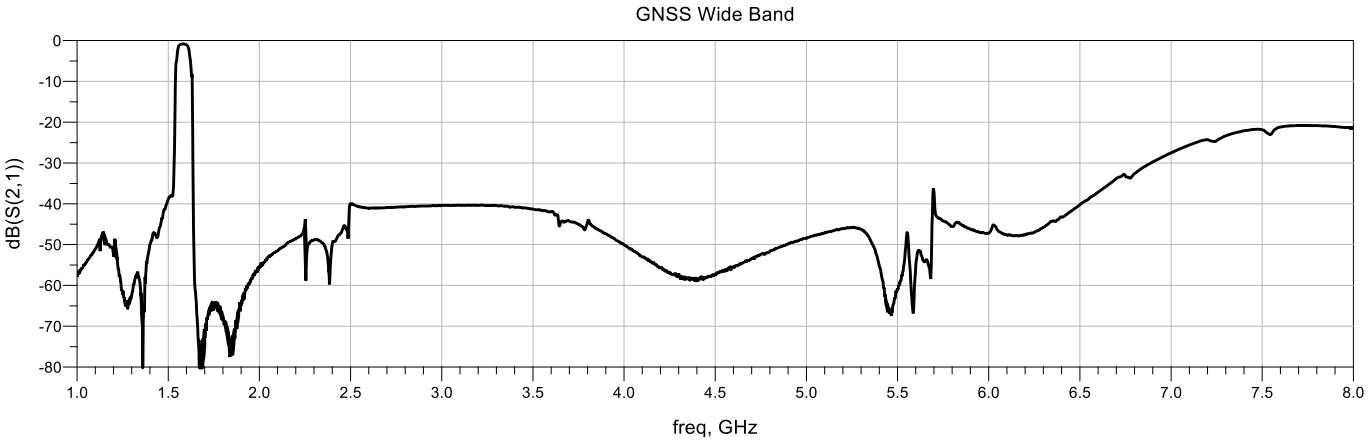


GNSS Insertion Loss and Attenuation Plots

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



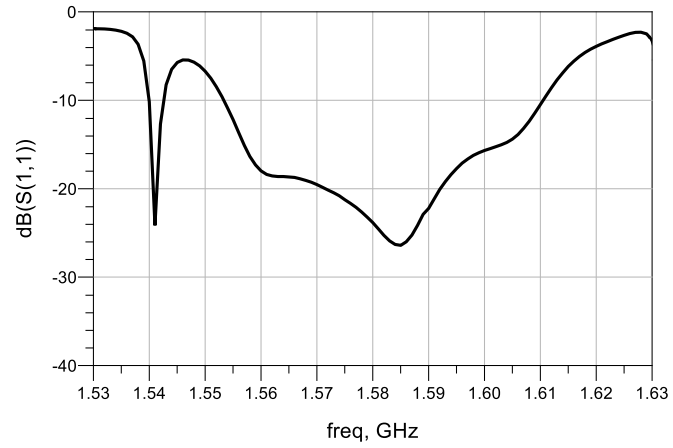




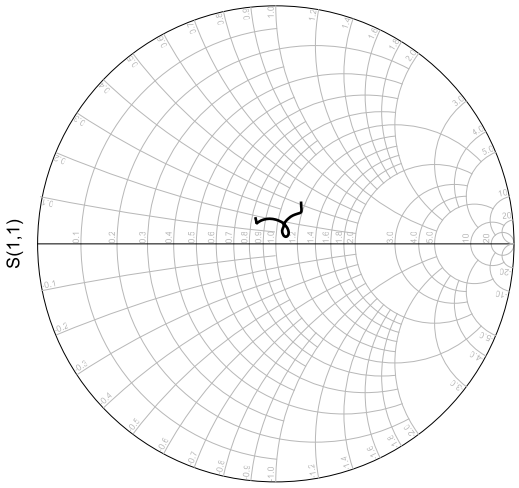
GNSS Return Loss and Impedance Plots

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

GNSS ANT Port Return Loss

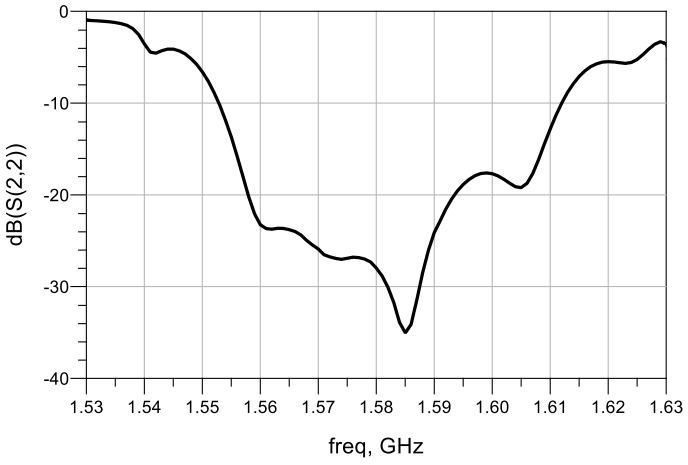


GNSS ANT Port Impedance

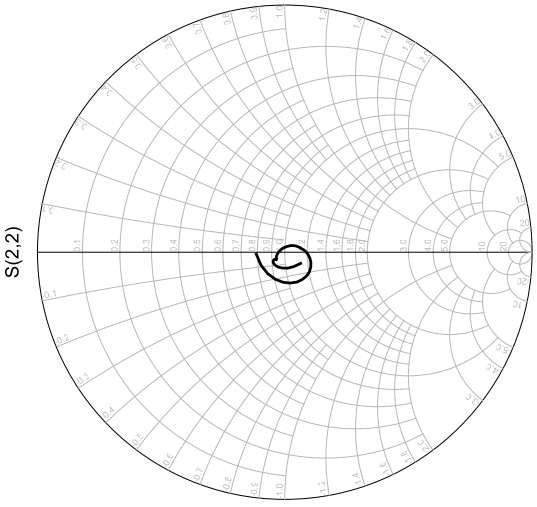


freq (1.559GHz to 1.606GHz)

GNSS Port Return Loss



GNSS Port Impedance

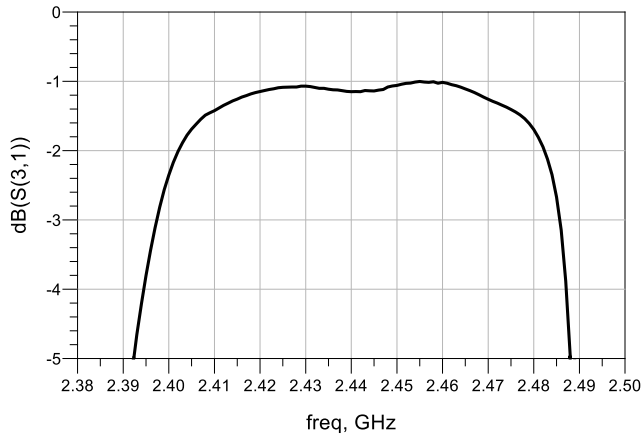


freq (1.559GHz to 1.606GHz)

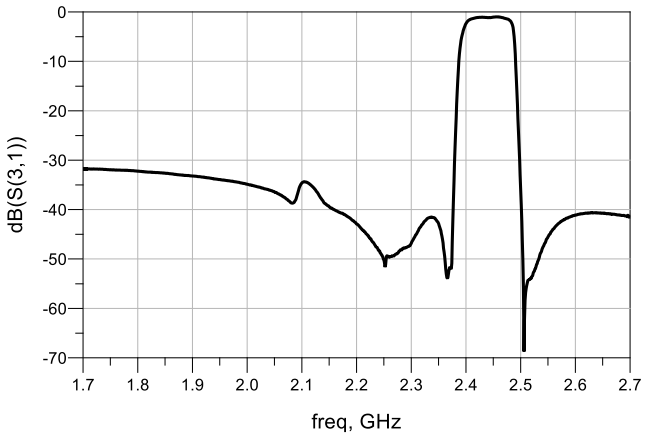
2.4GHz WiFi Insertion Loss and Attenuation Plots

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

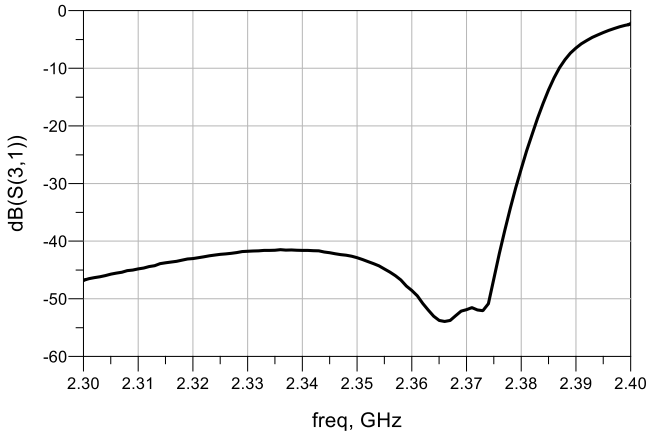
2.4G WiFi Pass Band



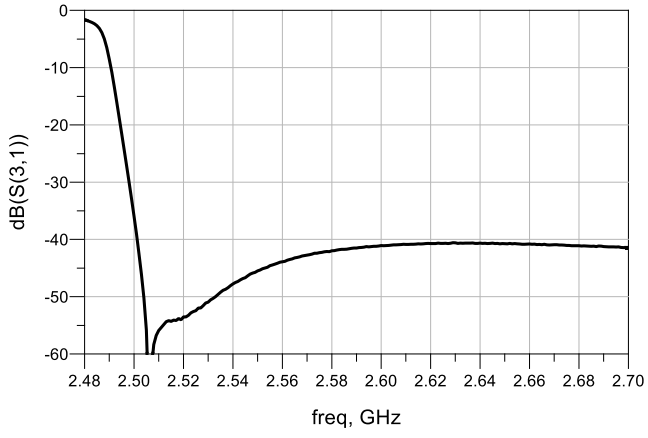
2.4G WiFi Narrow Band



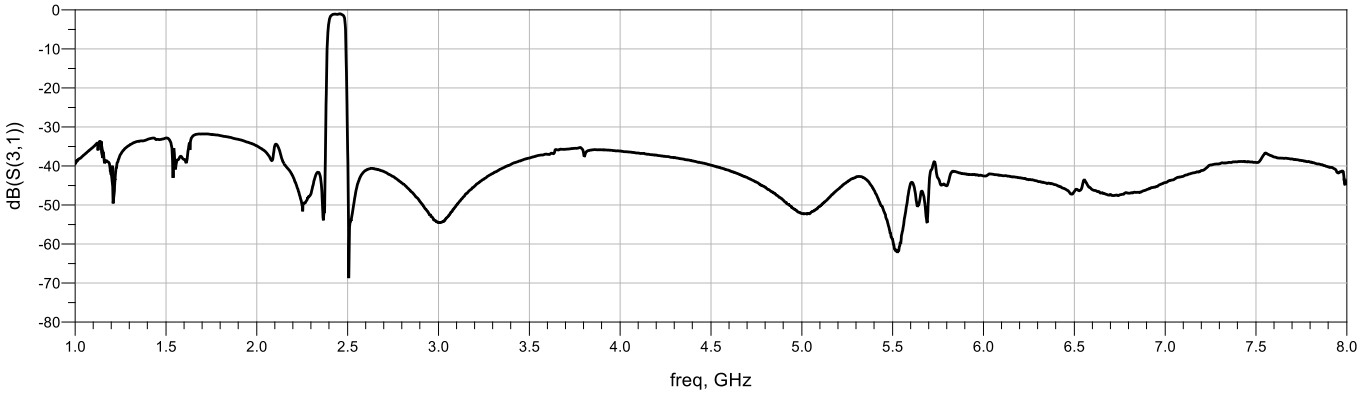
2.4G WiFi B40 Attenuation



2.4G WiFi B41 Attenuation



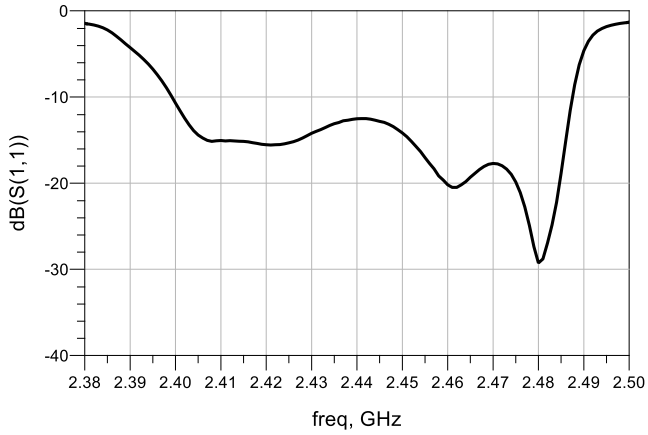
2.4G WiFi Wide Band



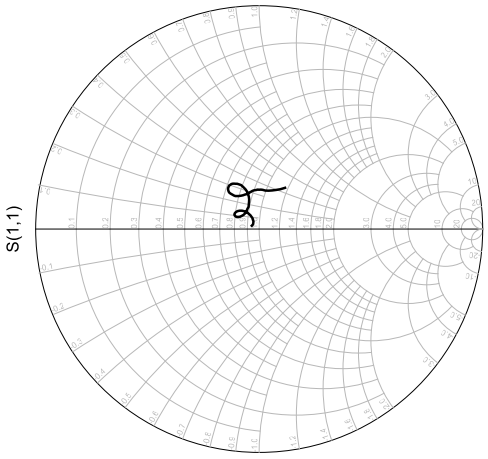
2.4GHz WiFi Return Loss and Impedance Plots

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

2.4G WiFi ANT Port Return Loss

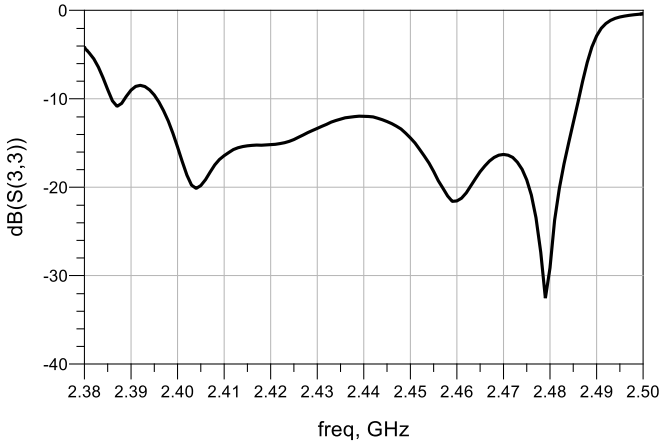


2.4G WiFi ANT Port Impedance

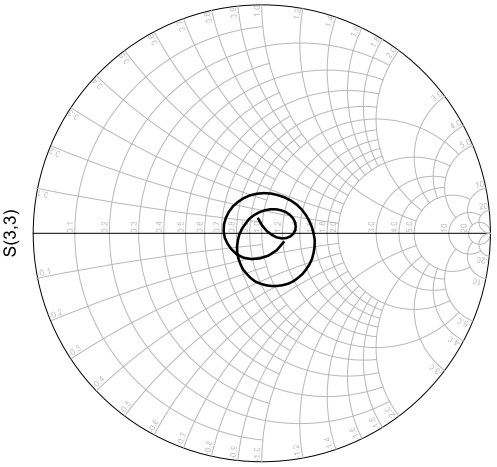


freq (2.403GHz to 2.481GHz)

2.4G WiFi Port Return Loss



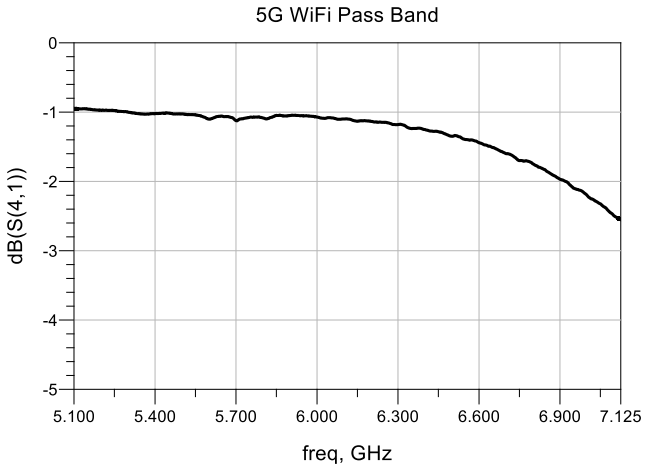
2.4G WiFi Port Impedance

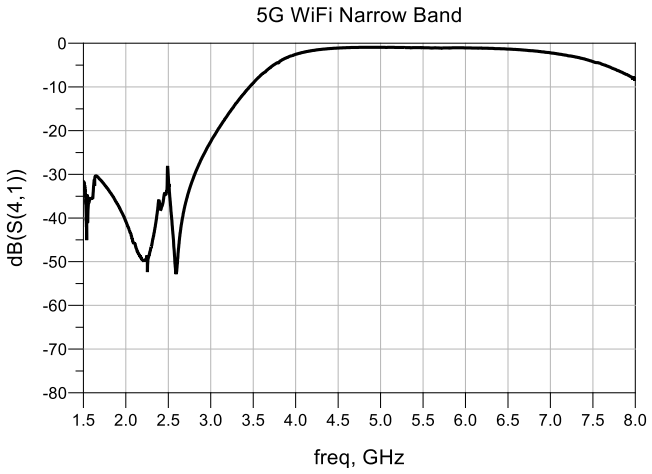


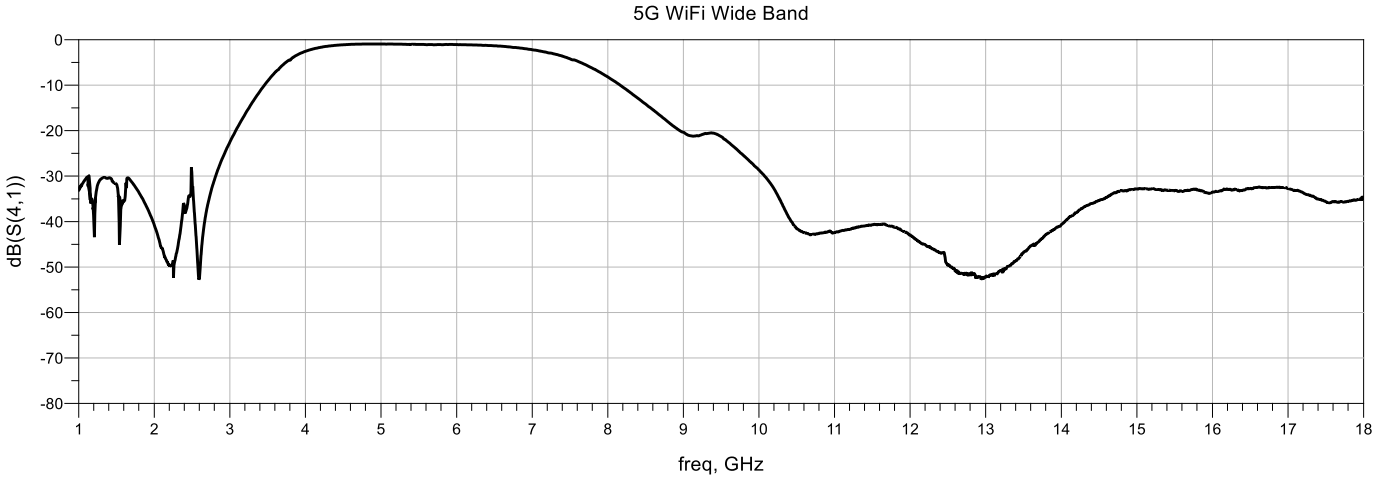
freq (2.403GHz to 2.481GHz)

5GHz WiFi6E Insertion Loss and Attenuation Plots

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



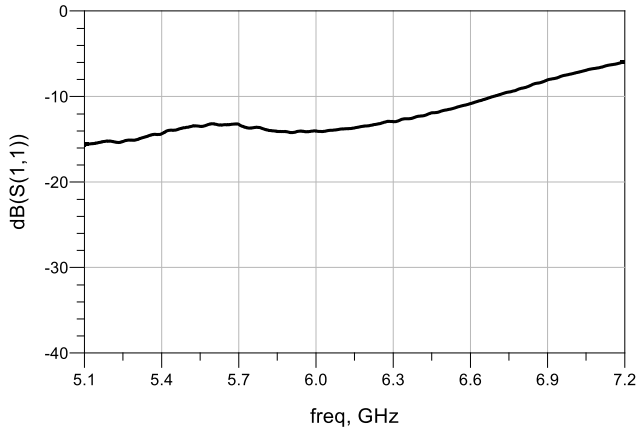




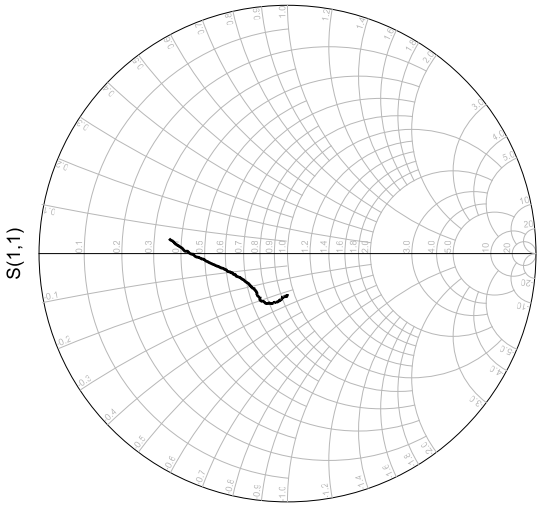
5GHz WiFi6E Return Loss and Impedance Plots

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

5G WiFi ANT Port Return Loss

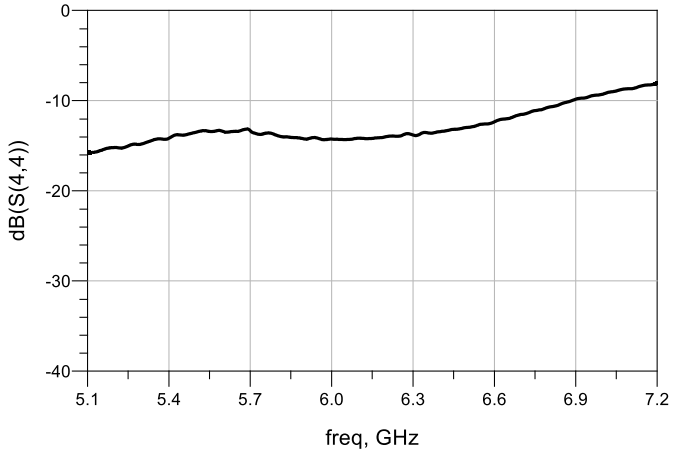


5G WiFi ANT Port Impedance

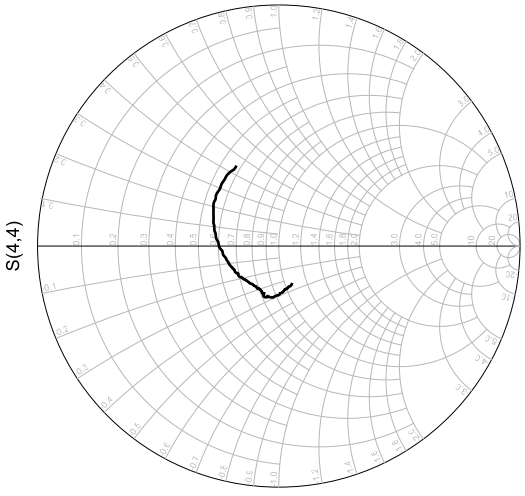


freq (5.150GHz to 7.125GHz)

5G WiFi Port Return Loss



5G WiFi Port Impedance

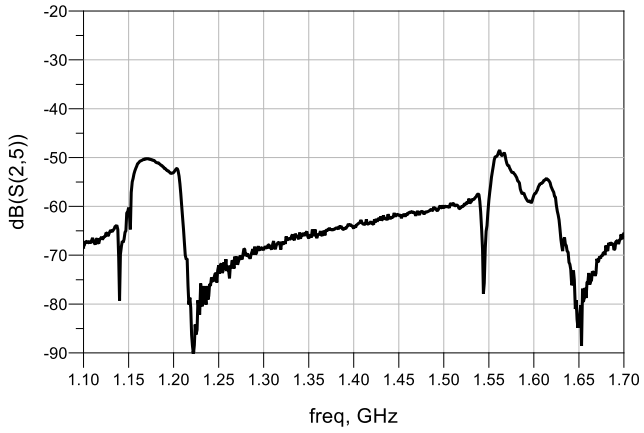


freq (5.150GHz to 7.125GHz)

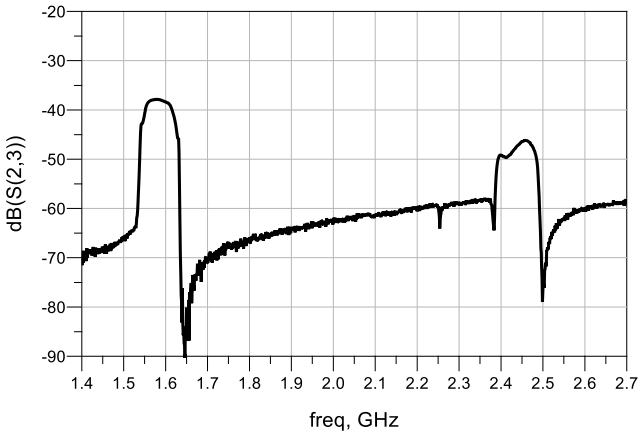
Isolation Plots

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

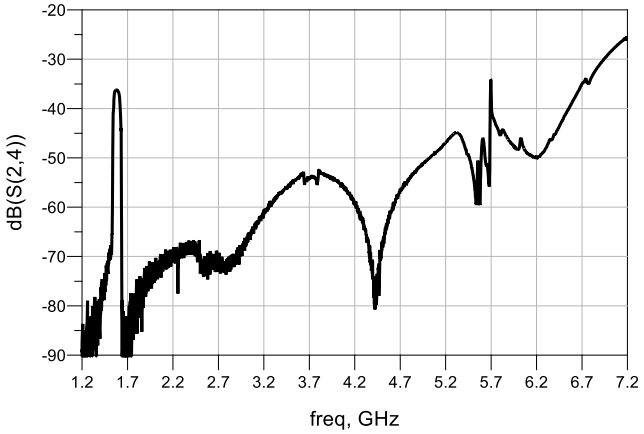
GNSS to L5 GPS Isolation



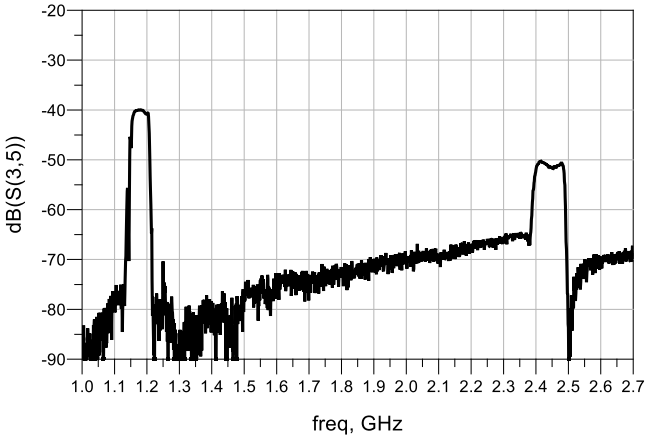
GNSS to 2.4GHz WiFi Isolation



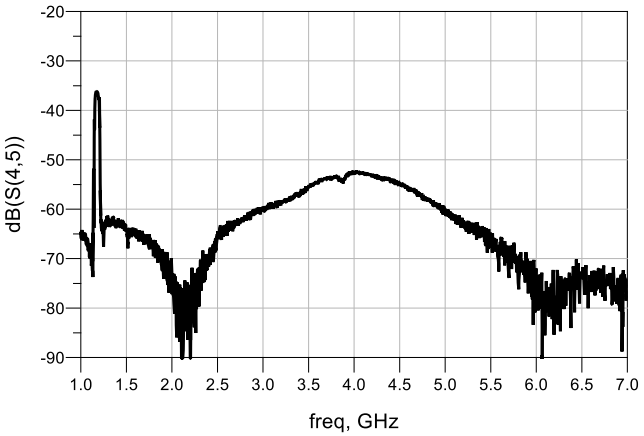
GNSS to 5G WiFi Isolation



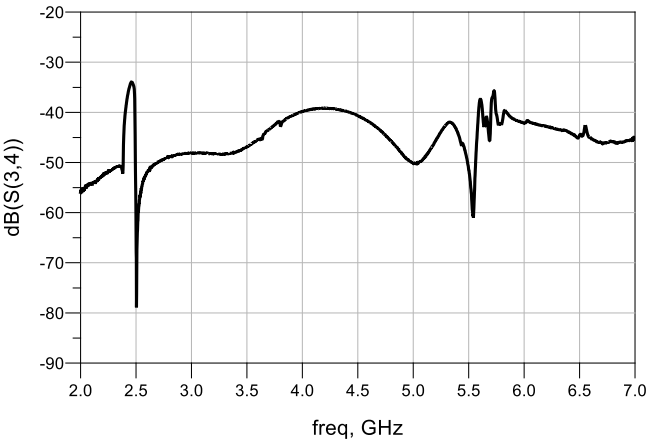
2.4GHz WiFi to L5 Isolation



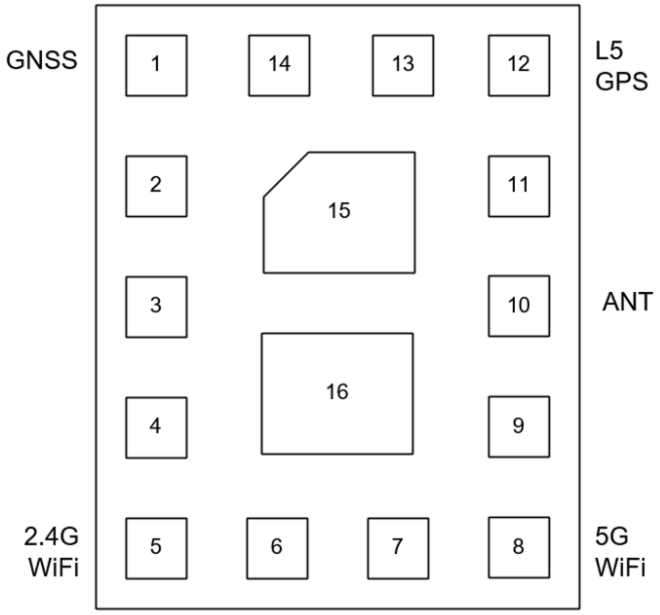
5GHz WiFi to L5 Isolation



2.4GHz WiFi to 5GHz WiFi Isolation



Pin Configuration and Description

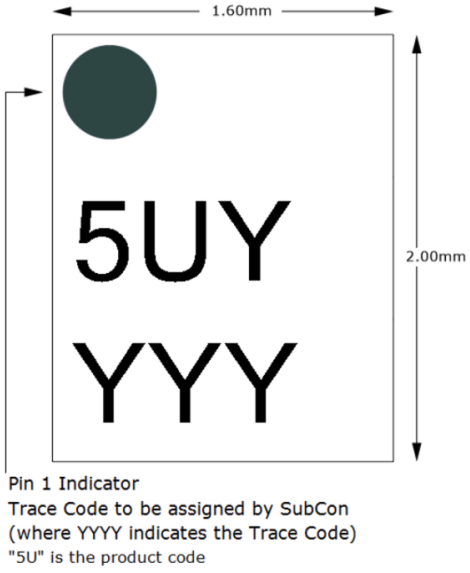


Top View

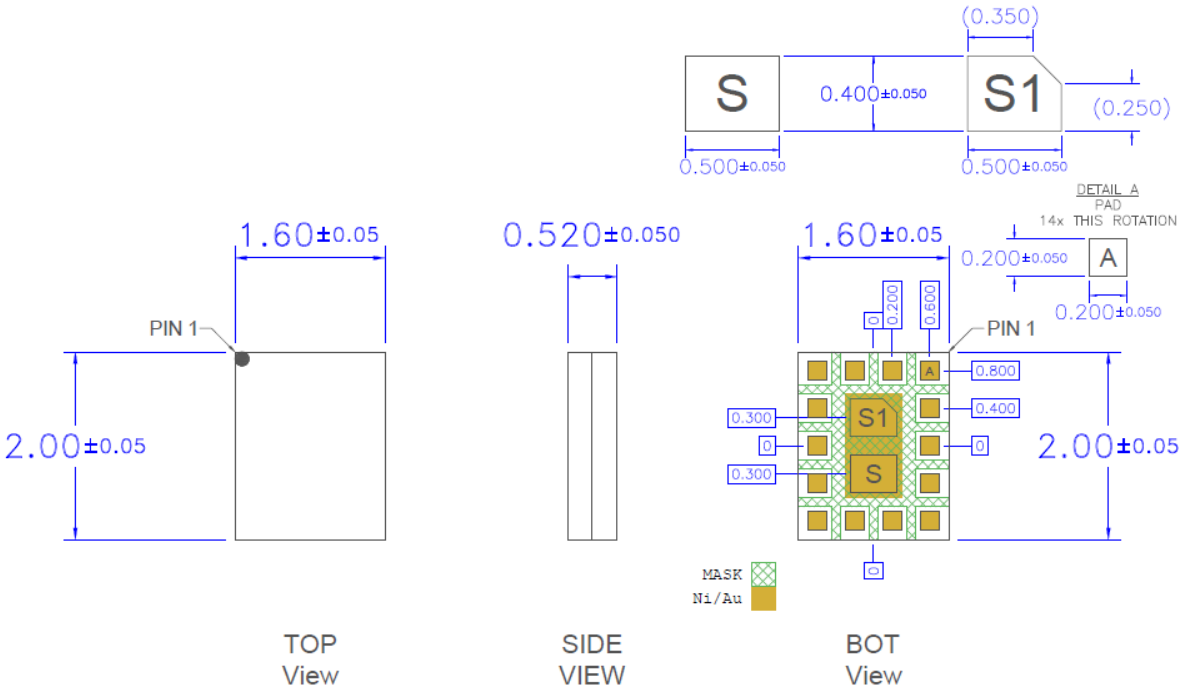
Pin Number	Label	Description
1	GNSS	GNSS Port
5	2.4G WiFi	2.4 GHz WiFi Port
8	5G WiFi	5 GHz WiFi Port
10	ANT	Antenna Port
12	L5 GPS	L5 GPS Port
2, 3, 4, 6, 7, 9, 11, 13, and 14	GND	Ground
15 and 16	GND	Package Ground

Part Marking and Dimensions

Part Marking Diagram – Top View



Package Outline Dimension Drawing

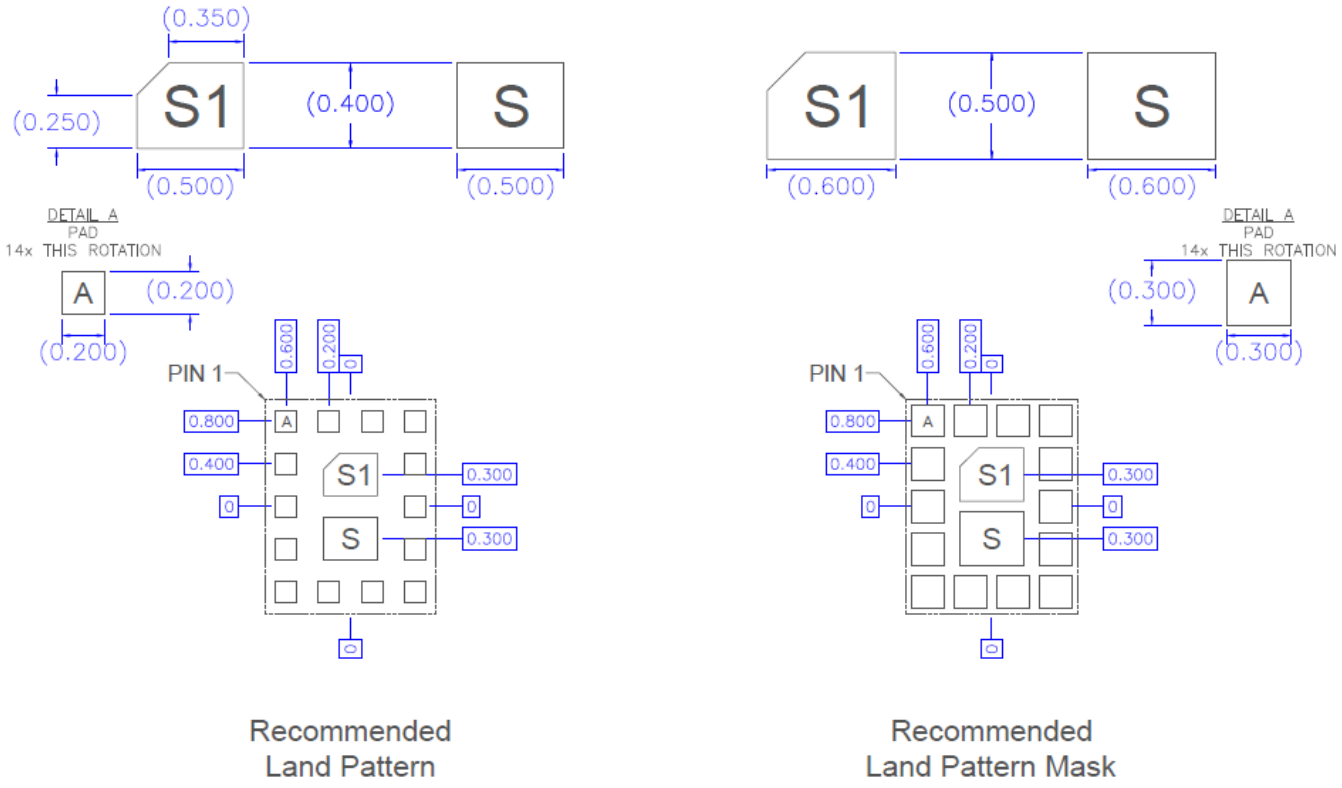


Notes:

1. All dimensions are in millimeters.
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

Land Pattern and Mask Dimensions

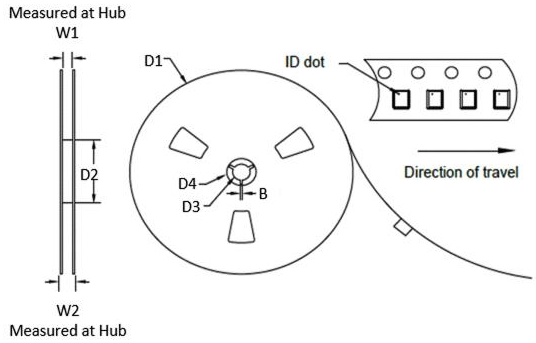
Recommended Land Pattern and Land Pattern Mask Drawing – Top View

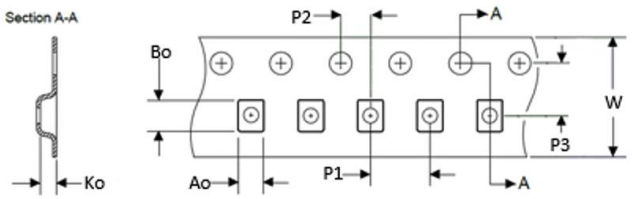


Notes:

1. All dimensions are in millimeters.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.

Tape and Reel Information





Feature	Measure	Symbol	Size (mm)
Flange	Diameter	D1	330.0
	Thickness	W2	14.2 (max)
	Space Between Flange	W1	8.8 (min)
Hub	Outer Diameter	D2	102.0
	Arbor Hole Diameter	D3	13.0
	Key Slit Width	B	2.0
	Key Slit Diameter	D4	20.0

Feature	Measure	Symbol	Size (mm)
Cavity	Length	Ao	1.8
	Width	Bo	2.2
	Depth	Ko	0.8
	Pitch	P1	4.0
Centerline Distance	Cavity to Perforation (Length)	P2	2.0
	Cavity to Perforation (Width)	P3	3.5
Carrier Tape	Width	W	8.0

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

Handling Precautions

PARAMETER	RATING	STANDARD
ESD – Human Body Model (HBM)	Class 1A	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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free
- Qorvo Green

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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REVISION HISTORY

Revision	Date (MMDDYYYY)	Description
E	06162021	Production Release