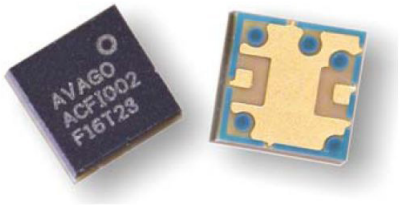
ACFF-1025

LTE Band 41 Bandpass Filter

Data Sheet

Lead (Pb) Free
RoHS 6 fully compliant



Description

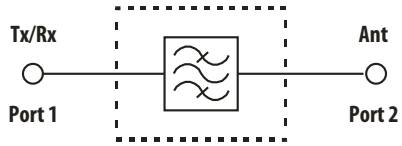
The Avago ACFF-1025 is a highly miniaturized LTE Band 41 (2496 – 2690 MHz) bandpass filter combined with a WLAN/Wi-Fi band reject filter.

The ACFF-1025 is designed to operate in WiMAX transceiver applications which coexist with WLAN, Wi-Fi and/or Bluetooth transmitters.

The ACFF-1025 is designed with Avago Technologies' innovative Film Bulk Acoustic Resonator (FBAR) technology, which makes possible ultra-small, high-Q filters at a fraction of their usual size. The excellent power handling capability of FBAR bulk-mode resonators supports the high output power levels used in mobile communications applications, while adding virtually no distortion.

The ACFF-1025 also utilizes Avago Technologies' advanced Microcap bonded-wafer, chip scale packaging technology. This process allows the filter to be assembled into a molded chip-on-board module with an overall size of 2.5 x 2.5 mm and height of 1.0 mm.

Functional Block Diagram



Features

- 50 Ω Input/Output
- WLAN/Wi-Fi Reject Notch
- Miniature Size
  - 2.5 x 2.5 mm
  - 1.0 mm Height
- High Power Rating
  - 33 dBm Abs Max Power
- Extended Operating Temperature Range
  - – 40 to +85°C
- Environmental
  - RoHS 6 Compliant
  - Halogen free
  - TBBPA Free

Specifications

- Performance, – 20 to +85°C
  - LTE Band 41 Insertion Loss
    2496.5 – 2502 MHz: 4.0 dB Max
    2502 – 2689.25 MHz: 3.8 dB Max
  - Cell Rx Band Rej: 30 dB Min
  - PCS Rx Band Rej: 20 dB Min
  - WLAN/Wi-Fi/BT Rej: 20 dB Min

Applications

Bandpass filter for cellular base station receivers and indoor small cell applications operating in LTE Band 41.

ACFF-1025 Electrical Specifications [2], Z_0=50 Ω, T_C [1] as indicated

			– 40°C	– 20°C			+25°C			+85°C	
Symbol	**Parameter**	**Units**	**Typ [3]**	**Min**	**Typ [3]**	**Max**	**Min**	**Typ [3]**	**Max**	**Min**	**Typ [3]**	**Max**
	Ant (Tx/Rx) Port to Tx/Rx (Ant) Port											
S21	Insertion Loss in Band 41	dB										
(S12)	2496.50 – 2502.00 MHz		2.1		2.1	4.0		2.2	3.5		2.3	4.0
	2502.00 – 2689.25 MHz		2.1		2.3	3.8		2.5	3.5		2.7	3.4
S21	Insertion Loss Ripple (p-p) in Band 41	dB	0.7		0.8	2.0		0.8	2.0		1.0	2.0
(S12)	(2502.0 – 2689.25 MHz)											
S21	Attenuation in Cell Tx Band	dB	57	35	57		35	57		35	57	
(S12)	(824 – 849 MHz)											
S21	Attenuation in Cell Rx Band	dB	54	30	54		30	54		30	53	
(S12)	(869 – 894 MHz)											
S21	Attenuation in GPS Band	dB	34	30	34		30	34		30	34	
(S12)	(1574.4 – 1576.4 MHz)											
S21	Attenuation in PCS Rx Band	dB	44	20	44		20	43		20	43	
(S12)	(1930.5 – 1989.5 MHz)											
S21	Attenuation in WLAN/Wi-Fi/	dB										
(S12)	Bluetooth Bands											
	2400 – 2468 MHz		45	30	45		30	45		30	45	
	2468 – 2473 MHz		45	20	49		20	48		–	30	
S21	Attenuation in Band 41	dB	28	21	28		20	28		20	28	
(S12)	2nd Harmonic Band											
	(4993 – 5379 MHz)											
S21	Attenuation in Band 41	dB	12	8	12		8	13		8	13	
(S12)	3rd Harmonic Band											
	(7489 – 8068 MHz)											
S11	Return Loss (SWR) of Ant Port	dB						12				
	2496.5 – 2689.25 MHz			8.0		(2.3)	8.0	(1.7)	(2.3)	8.0		(2.3)
S22	Return Loss (SWR) of Tx/Rx Port	dB						17				
	2496.5 – 2689.25 MHz			8.0		(2.3)	8.0	(1.3)	(2.3)	8.0		(2.3)

Notes:
1. T_C is the case temperature and is defined as the temperature of the underside of the filter where it makes contact with the circuit board.
2. Min/Max specifications are guaranteed at the indicated temperature with the input power to the Tx/Rx port equal to or less than +25 dBm over all Tx/Rx frequencies unless otherwise noted.
3. Typical data is the average value of the parameter over the indicated band at the specified temperature. Typical values may vary over time.

ACFF-1025

Absolute Maximum Ratings [1]

Parameter	Unit	Value
Storage temperature	°C	–65 to +125
Maximum RF Input Power to Tx Port	dBm	+33
Maximum DC Voltage, any Port to Gnd or between ports [4]	V_{DC}	0

Maximum Recommended Operating Conditions [2]

Parameter	Unit	Value
Operating temperature, T_C [3], Tx Power ≤ 29 dBm, CW	°C	–40 to +100
Operating temperature, T_C [3], Tx Power ≤ 30 dBm, CW	°C	–40 to +85

Notes:
1. Operation in excess of any one of these conditions may result in permanent damage to the device.
2. The device will function over the recommended range without degradation in reliability or permanent change in performance, but is not guaranteed to meet electrical specifications.
3. T_C is defined as case temperature, the temperature of the underside of the filter where it makes contact with the circuit board.
4. Internal DC resistance of ports is approximately a short circuit.

Applications Information

The Avago ACFF-1025 is an LTE Band 41 (2496 – 2690 MHz) bandpass filter combined with a WLAN/Wi-Fi band reject filter.

The ACFF-1025 is designed to operate in multi-radio system architectures such as illustrated in the simplified diagram in Figure 1. The steep, WLAN/Wi-Fi band-reject characteristic of the ACFF-1025 allows Band 41 transceivers to successfully coexist in close proximity to WLAN, Wi-Fi and/or Bluetooth radios.

Use of Avago's companion Wi-Fi filter in the WLAN transceiver completes the architecture.

Note: The ACFF-1025 is not symmetrical. As shown in Figure 1, Port 2 is connected to the system Antenna and Port 1, which is designed for higher power handling, is connected to the Tx/Rx blocks. If either port of the ACFF-1025 is connected to components having a DC voltage present, blocking capacitors should be used.

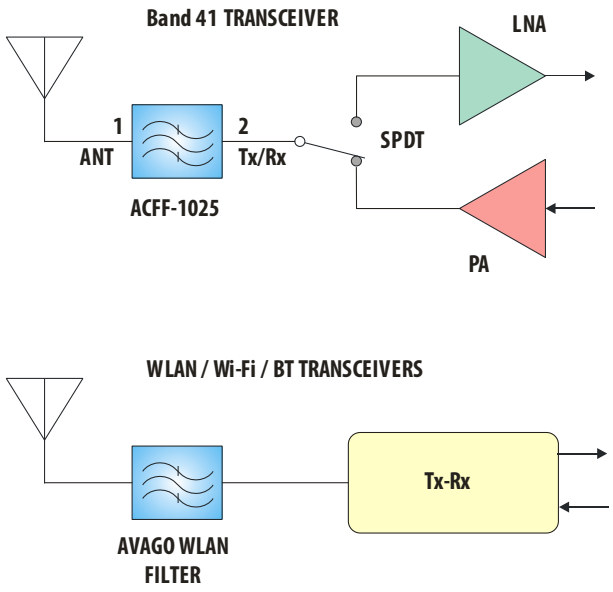


Figure 1. Typical Multi-Radio Application.

ACFF-1025 Typical Performance at Tc = 25°C

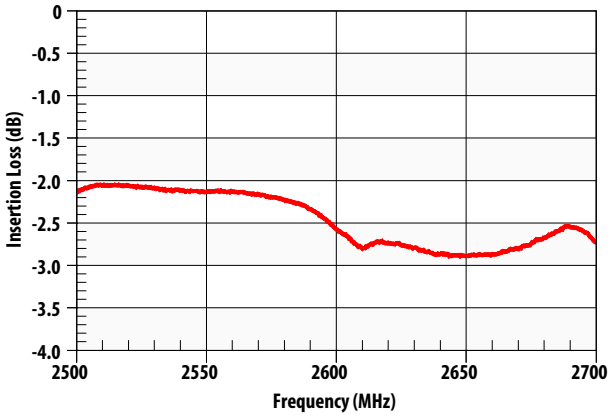


Figure 2. Insertion Loss in Band 41

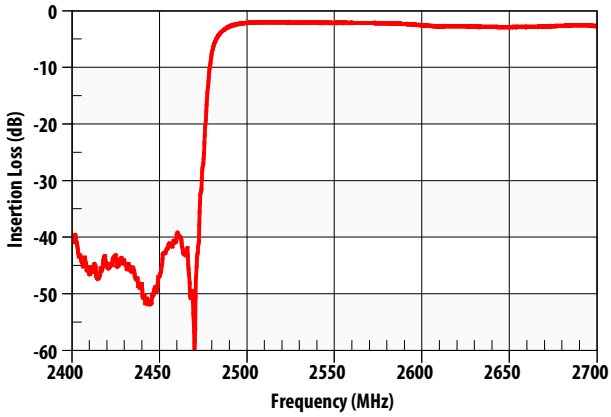


Figure 3. Insertion Loss in WLAN/Wi-Fi/Band 41

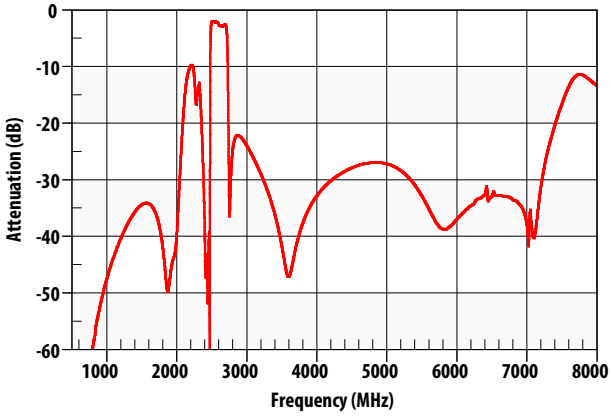


Figure 4. Wideband Insertion Loss

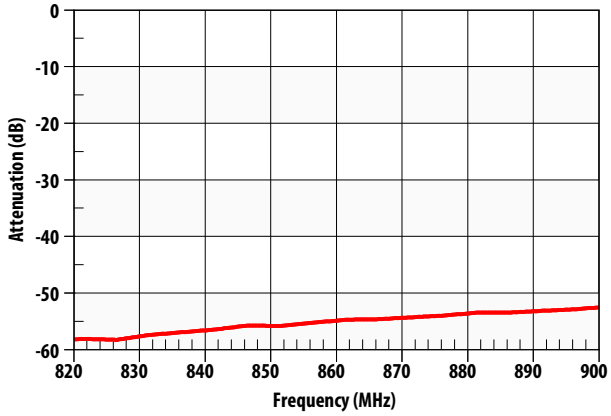


Figure 5. Rejection in Cell Tx-Rx Band

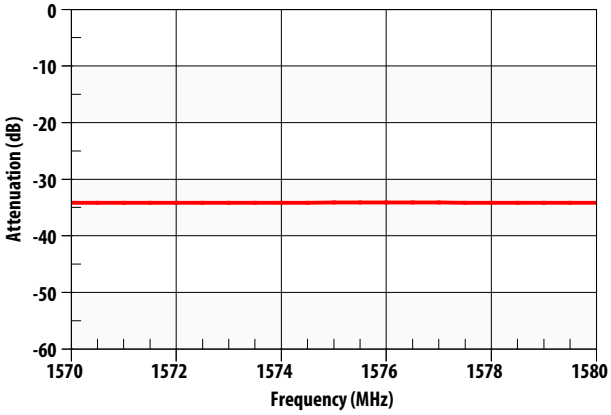


Figure 6. Rejection in GPS Band

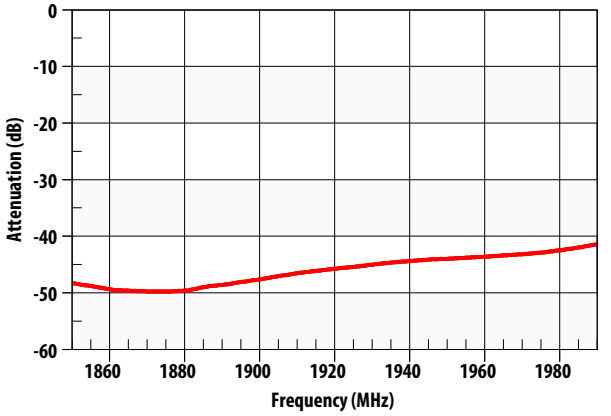


Figure 7. Rejection in PCS Tx-Rx Band

ACFF-1025 Typical Performance at Tc = 25°C

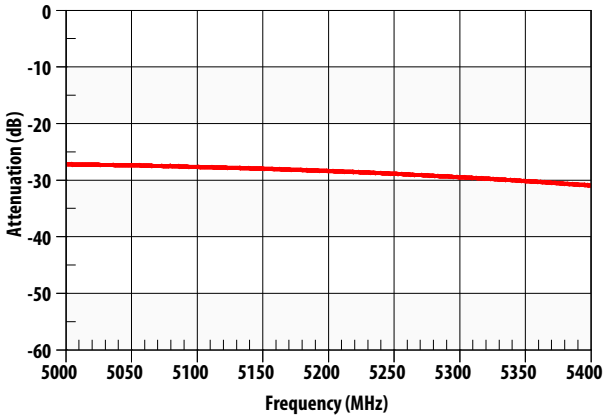


Figure 8. Rejection at Band 41 Second Harmonic

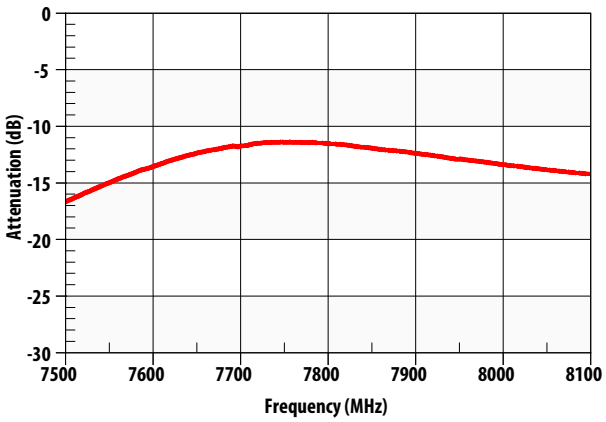


Figure 9. Rejection at Band 41 Third Harmonic

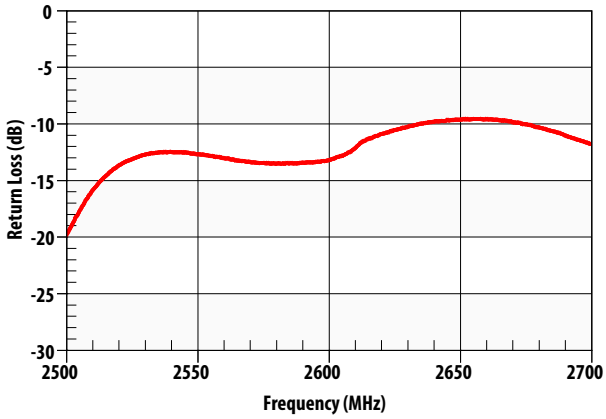


Figure 10. Ant Port Return Loss in Band 41

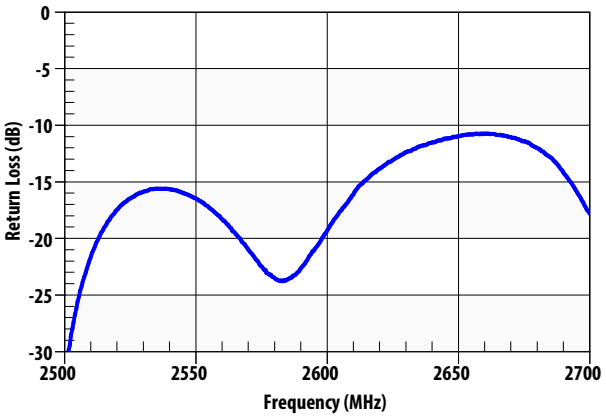


Figure 11. Tx/Rx Port Return Loss in Band 41

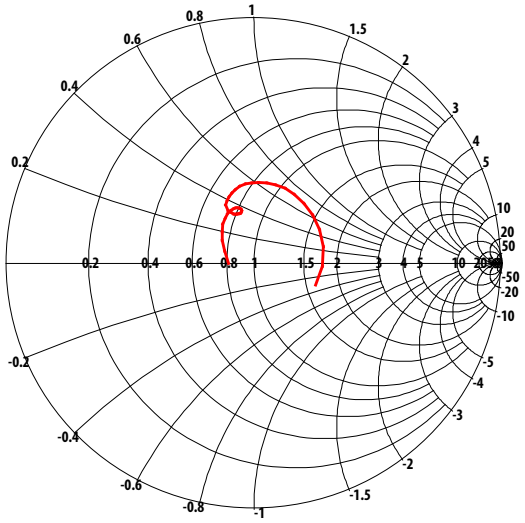


Figure 12. S11 (Ant Port) Impedance in Band 41

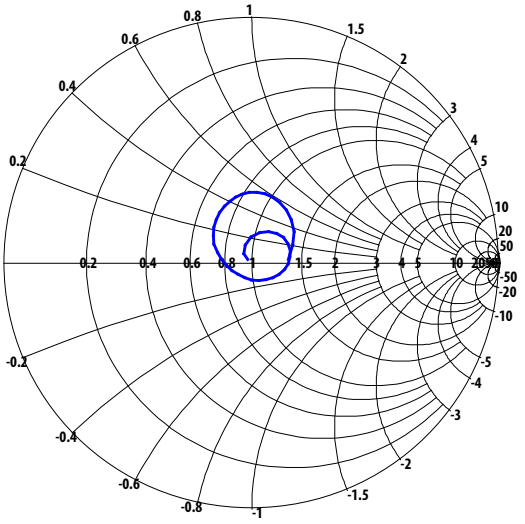


Figure 13. S22 (Tx/Rx Port) Impedance in Band 41

ACFF-1025 Typical Performance over Operating Temperature Range, –40° to +85°C

Blue = –40°, Magenta = –20°, Green = +25°, Red = +85°C

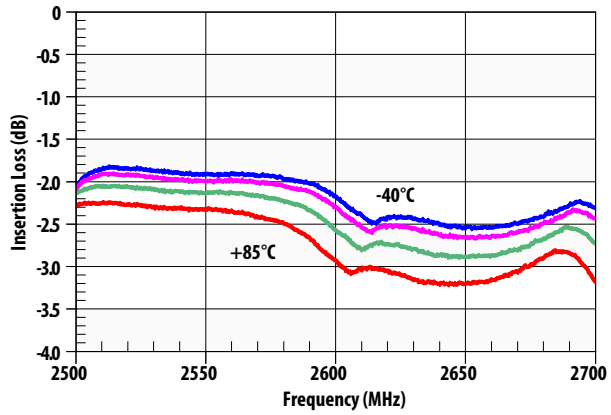


Figure 14. Insertion Loss in Band 41

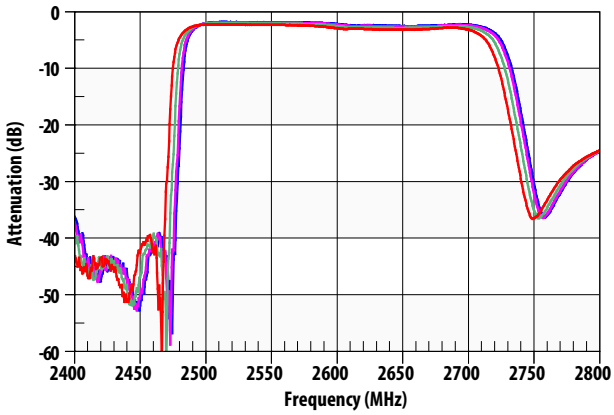


Figure 15. Insertion Loss in WLAN/Wi-Fi/Band 41

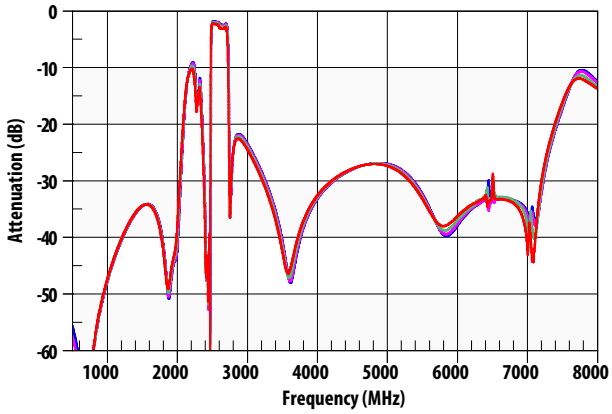


Figure 16. Wideband Insertion Loss

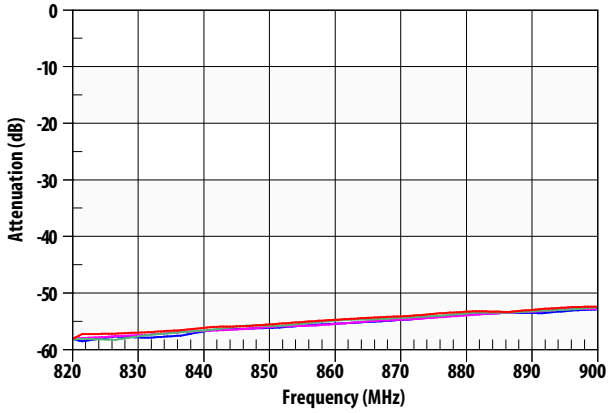


Figure 17. Rejection in Cell Tx-Rx Band

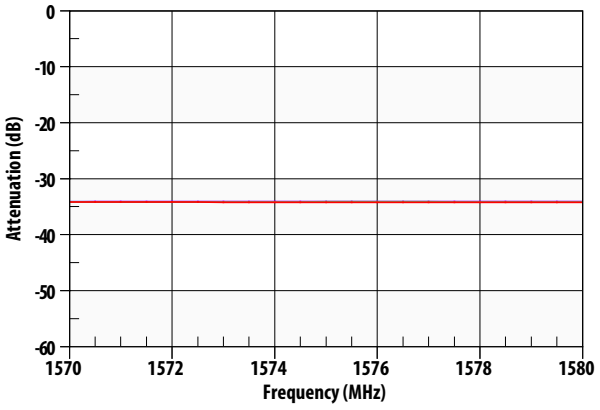


Figure 18. Rejection in GPS Band

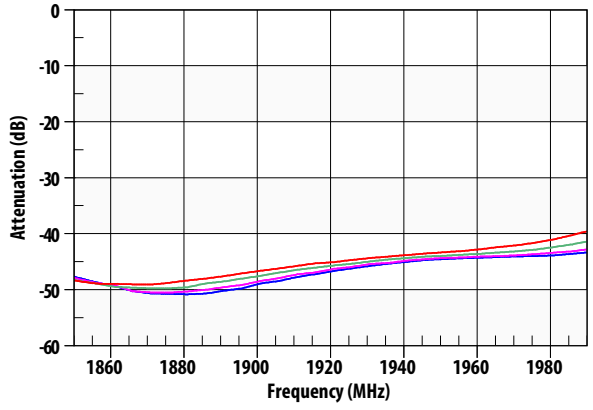
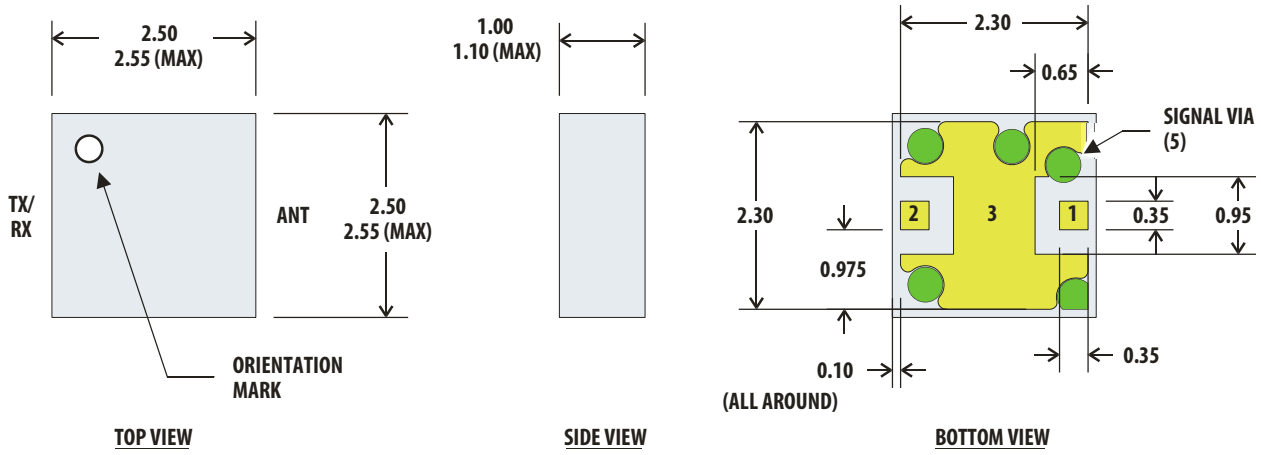


Figure 19. Rejection in PCS Tx-Rx Band

ACFF-1025



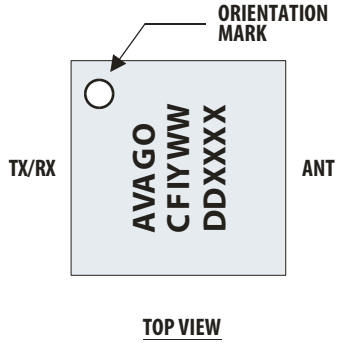
Notes:

1. Dimensions in millimeters
   Tolerance: X.X ± 0.1 mm
   X.XX ± 0.05 mm
2. Dimensions nominal unless otherwise noted
3. I/O Pads (2 ea)
   Size: 0.35 X 0.35 mm
   Spacing to ground metal: 0.30 mm
4. Signal Vias (5 ea), Ø 0.15; covered with 0.42 Ø solder mask.
   Shown for reference only. PCB metal under signal via
   does not need to be voided.
5. Contact areas are gold plated

Pin Connections:

1 Tx/Rx
2 Ant
3 Ground

Figure 20. Package Outline Drawing.



Package Marking

C = ACPF-7025
F = FBAR product
I = Mfg Reference
Y = Year
WW = Work week
DD = Date Code
XXXX = Lot Number

Figure 21. Product Marking and Pin Orientation.

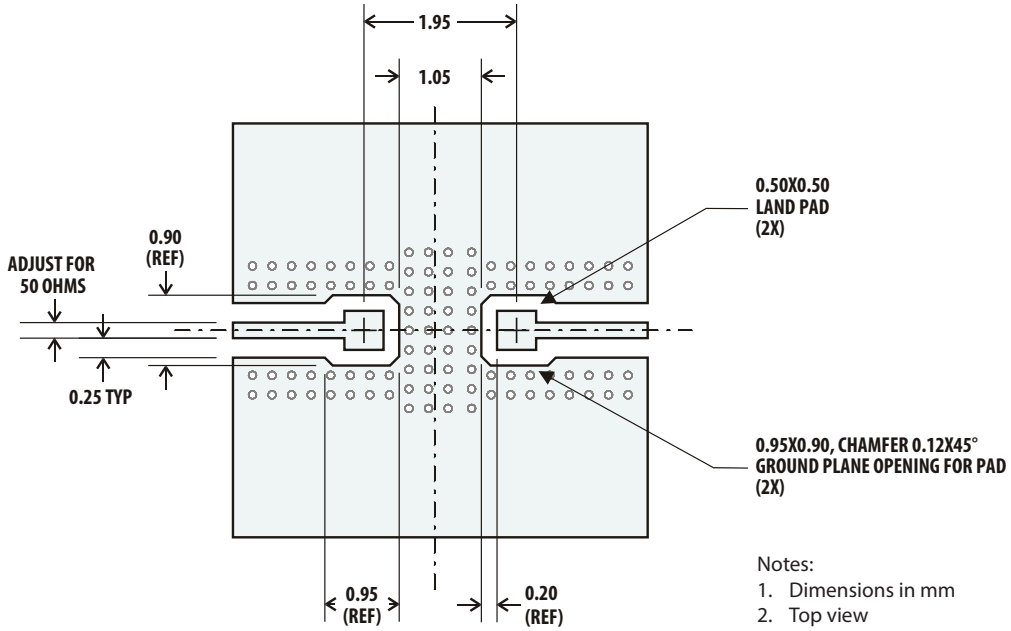


Figure 22. Suggested PCB Land Pattern.

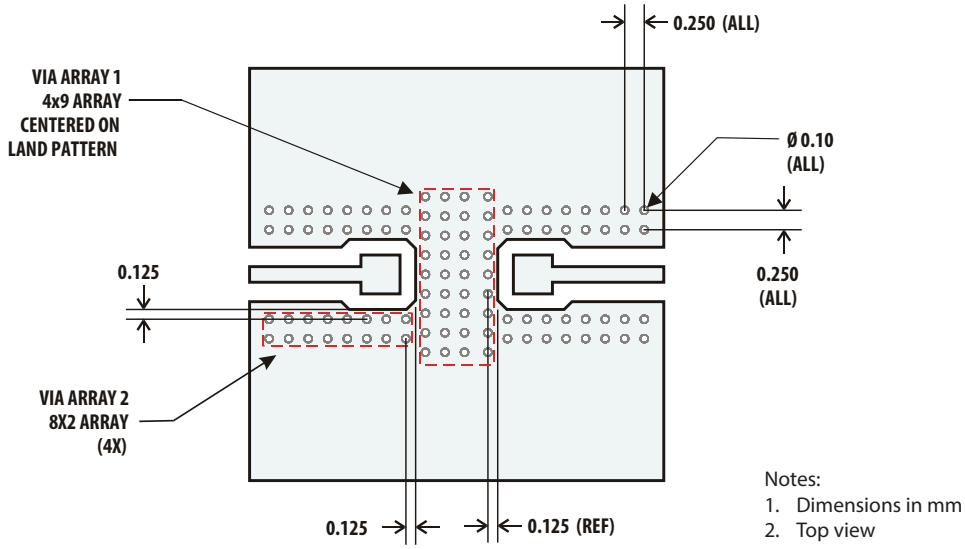


Figure 23. PCB Layout, Via Detail.

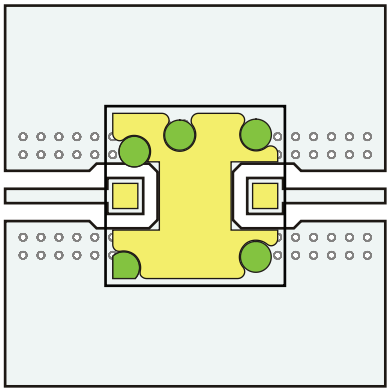
A PCB layout using the principles illustrated in the figure above is recommended to optimize performance of the ACFF-1025.

Transmission line dimensions should be adjusted to maintain a Zo of 50 ohms.

It is important to maximize isolation between the filter Input and Output ports.

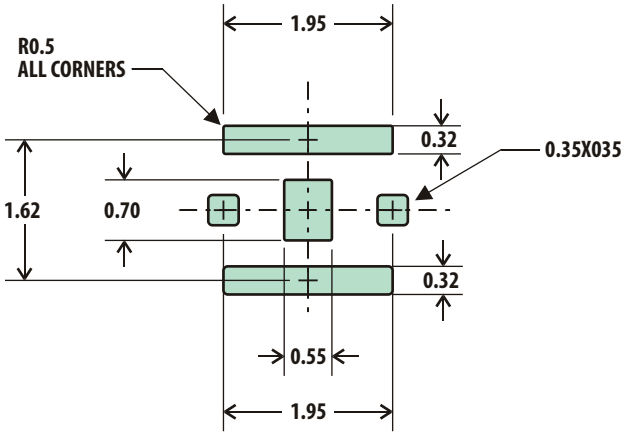
High isolation is achieved by: (1) maintaining a continuous ground plane around the I/O connections and filter mounting area, and (2) surrounding the I/O ports with sufficient ground vias to enclose the connections in a "Faraday cage."

Ground vias under the ACFF-1025 mounting area also provide heat sinking for the device to minimize shifting of the pass band over temperature.



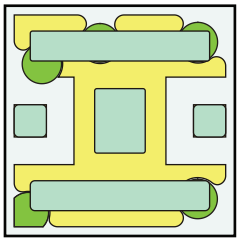
Note:
1. Top view

Figure 24. ACFF-1025 Superposed on PCB Layout.



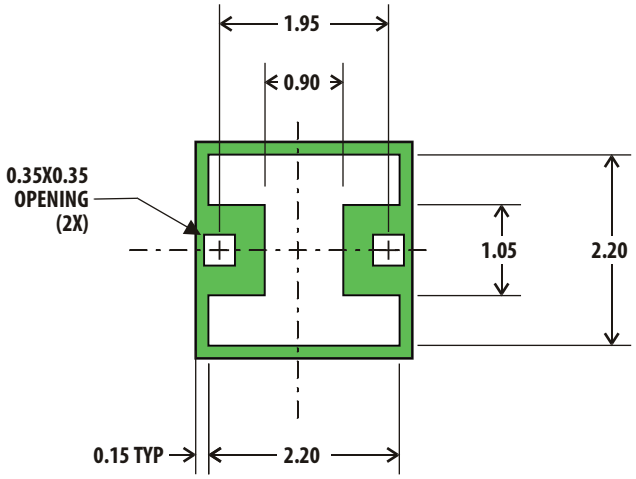
Notes:
1. Dimensions in mm
2. Top view
3. Chamfer or radius all corners 0.05 mm min

Figure 25. Recommended Solder Stencil.



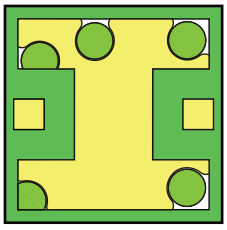
Notes:
1. Top view
2. I/O pad apertures match device pad 1:1

Figure 26. Solder Stencil Superposed on ACFF-1025.



Notes:
1. Dimensions in mm
2. Top view

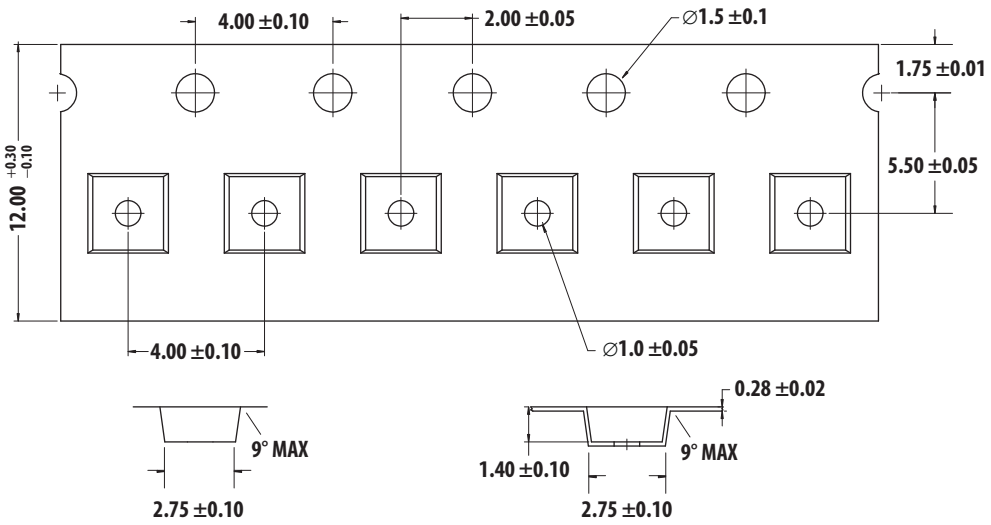
Figure 27. Recommended Solder Mask.



Notes:
1. Top view
2. Mask apertures match device pads 1:1

Figure 28. Solder Mask Superposed on ACFF-1025.

ACFF-1025



Note:
1. Dimensions in mm

Figure 29. SMD Tape Drawing.

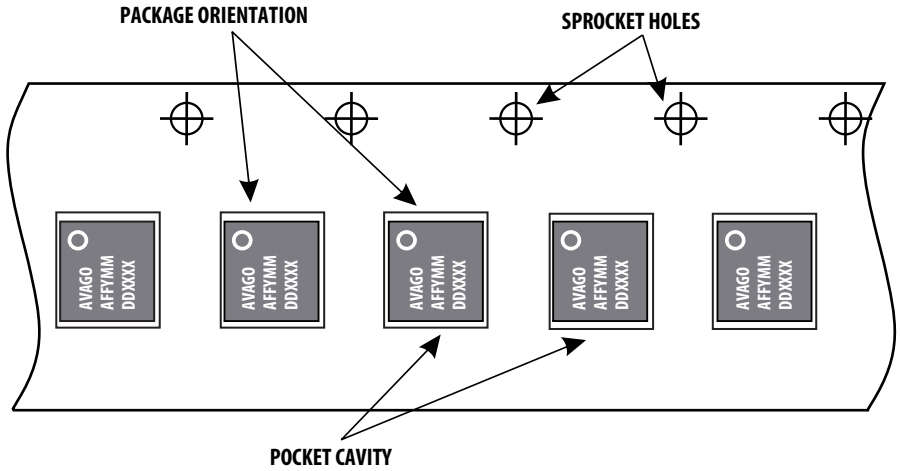
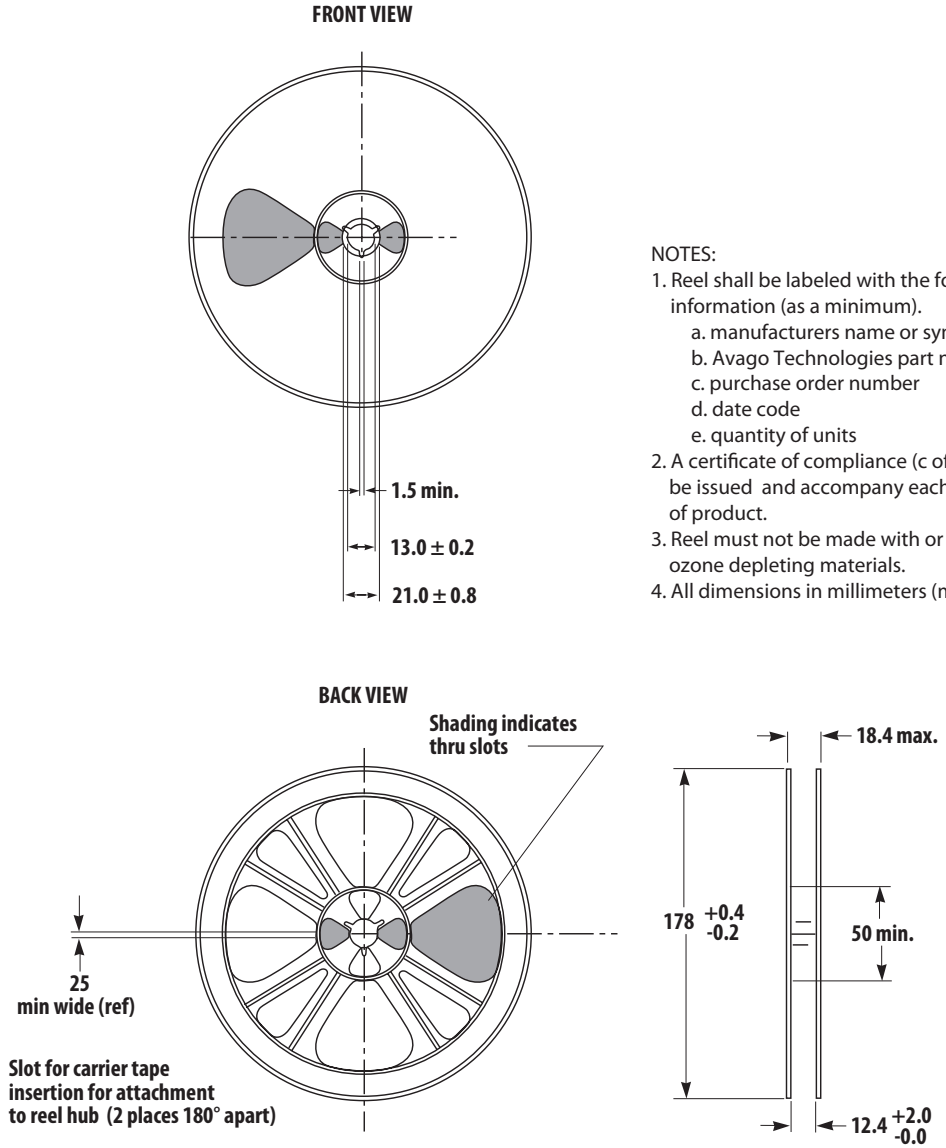


Figure 30. Unit Orientation in SMT Tape.

ACFF-1025



NOTES:
1. Reel shall be labeled with the following information (as a minimum).
   a. manufacturers name or symbol
   b. Avago Technologies part number
   c. purchase order number
   d. date code
   e. quantity of units
2. A certificate of compliance (c of c) shall be issued and accompany each shipment of product.
3. Reel must not be made with or contain ozone depleting materials.
4. All dimensions in millimeters (mm)

Figure 31. SMT Reel Drawing.

Package Moisture Sensitivity

Feature	Test Method	Performance
Moisture Sensitivity Level (MSL) at 260°C	JESD22-A113D	Level 3

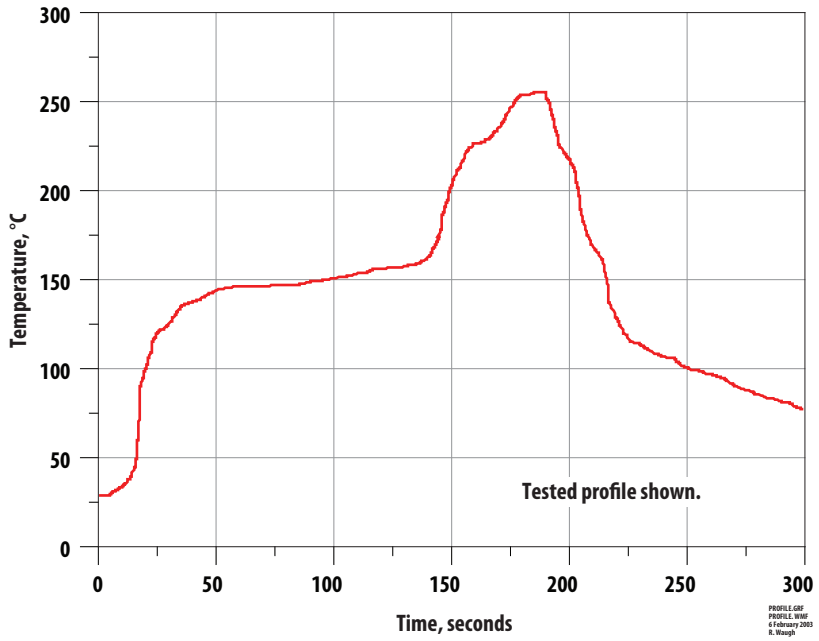


Figure 32. Verified SMT Solder Profile.

Ordering Information

Part Number	No. of Devices	Container
ACFF-1025-BLK	100	Tape Strip or Anti-static Bag
ACFF-1025-TR1	3000	178 mm (7-inch Reel

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

AV02-4302EN - September 24, 2013