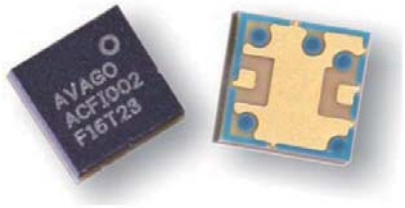
ACPF-7025

Bandpass Filter for 2496 – 2690 MHz WiMAX Band

Data Sheet

Lead (Pb) Free
RoHS 6 fully compliant



Description

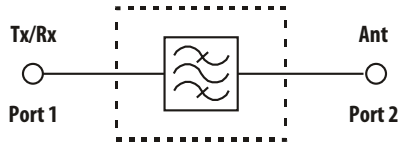
The Avago ACPF-7025 is a highly miniaturized 2496 – 2690 MHz WiMAX band pass filter combined with a WLAN/Wi-Fi band reject filter.

The ACPF-7025 is designed to operate in WiMAX transceiver applications which coexist with WLAN, Wi-Fi and/or Bluetooth transmitters.

The ACPF-7025 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 ACPF-7025 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
- Environmental
  - RoHS 6 Compliant
  - Halogen free
  - TBBPA Free

Specifications

- Performance, – 20 to +85°C
  - WiMAX Band Insertion Loss
    2496.5 – 2502 MHz: 4.8 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

Mobile or portable communications systems and pico/femto cell applications operating in the 2496 – 2690 MHz WiMAX band.

ACPF-7025 Electrical Specifications [2], Z_0=50 Ω, T_C [1] as indicated

			–20°C			+25°C			+85°C		
Symbol	**Parameter**	**Units**	**Min**	**Typ [3]**	**Max**	**Min**	**Typ [3]**	**Max**	**Min**	**Typ [3]**	**Max**
	Ant (Tx/Rx) Port to Tx/Rx (Ant) Port										
S21 (S12)	Insertion Loss in WiMAX Band	dB									
	2496.50 – 2502.00 MHz				4.8		2.4	4.0			4.0
	2502.00 – 2689.25 MHz				3.8		2.3	3.5			3.8
S21 (S12)	Insertion Loss Ripple (p-p) in WiMAX Band (2502.0 – 2689.25 MHz)	dB			2.0		0.7	2.0			2.0
S21 (S12)	Attenuation in Cell Tx Band (824 – 849 MHz)	dB	30			30	62		30		
S21 (S12)	Attenuation in Cell Rx Band (869 – 894 MHz)	dB	30			30	60		30		
S21 (S12)	Attenuation in GPS Band (1574.4 – 1576.4 MHz)	dB	30			30	35		30		
S21 (S12)	Attenuation in PCS Tx Band (1850.5 – 1909.5 MHz)	dB	20			20	48		20		
S21 (S12)	Attenuation in PCS Rx Band (1930.5 – 1989.5 MHz)	dB	20			20	43		20		
S21 (S12)	Attenuation in WLAN/Wi-Fi/ Bluetooth Bands	dB									
	2400 – 2468 MHz		30			30	43		30	–	
	2468 – 2473 MHz		20			20	47		–	32	
S21 (S12)	Attenuation in WiMAX 2nd Harmonic Band (4993 – 5379 MHz)	dB	20			20	30		20		
S21 (S12)	Attenuation in WiMAX 3rd Harmonic Band (7489 – 8068 MHz)	dB	8			8	13		8		
S11	Return Loss (SWR) of Ant Port	dB					17				
	2496.5 – 2689.25 MHz		8.0		(2.3)	8.0	(1.3)	(2.3)	8.0		(2.3)
S22	Return Loss (SWR) of Tx/Rx Port	dB					12				
	2496.5 – 2689.25 MHz		8.0		(2.3)	8.0	(1.7)	(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.

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 ACPF-7025 is a 2496 – 2690 MHz WiMAX band pass filter combined with a WLAN/Wi-Fi band reject filter.

The ACPF-7025 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 ACPF-7025 allows WiMAX 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 ACPF-7025 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 ACPF-7025 is connected to components having a DC voltage present, blocking capacitors should be used.

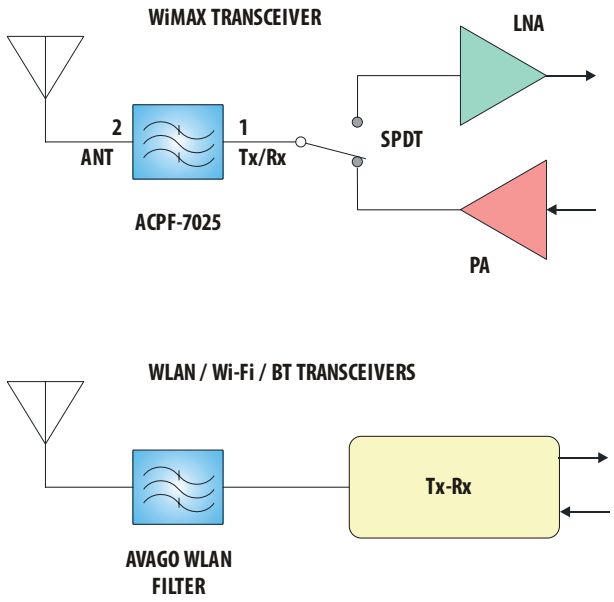


Figure 1. Typical Multi-Radio Application.

ACPF-7025 Typical Performance at $T_C = 25°C$

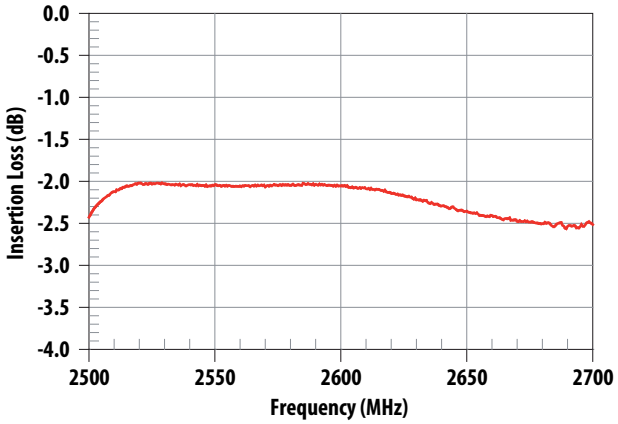


Figure 2. Insertion Loss in WiMAX Band.

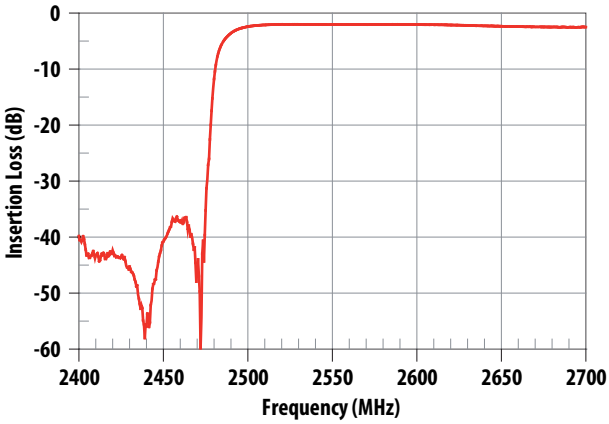


Figure 3. Insertion Loss in WLAN/Wi-Fi/WiMAX Band.

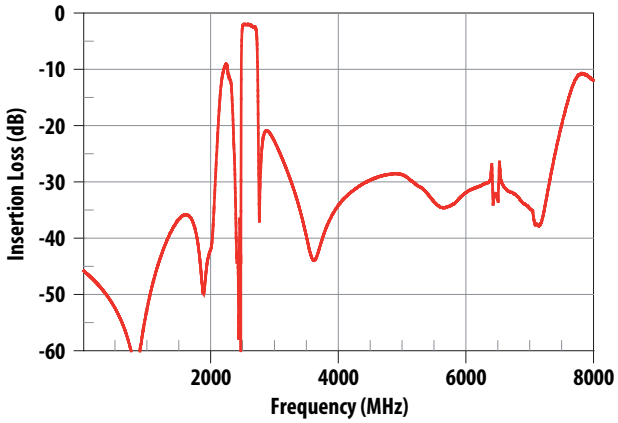


Figure 4. Wideband Insertion Loss.

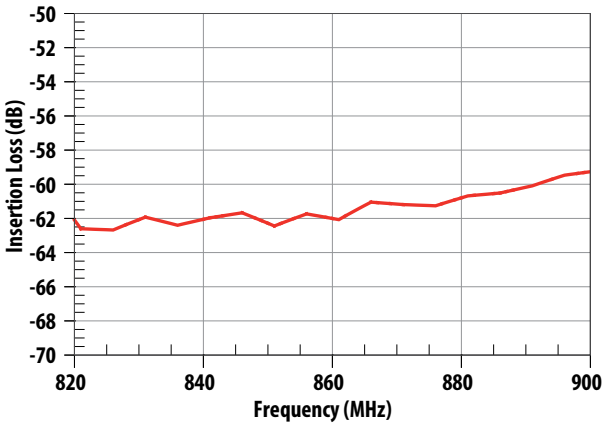


Figure 5. Rejection in Cell Tx-Rx Band.

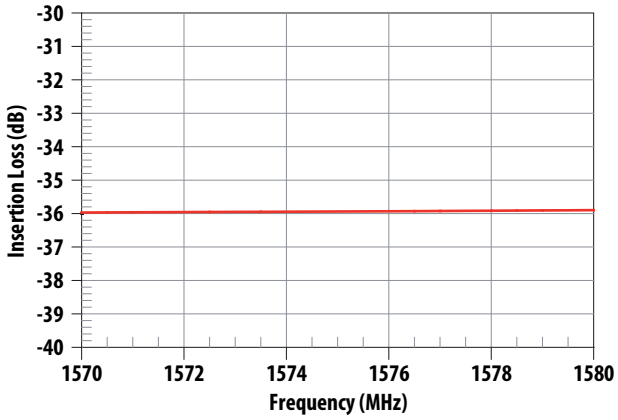


Figure 6. Rejection in GPS Band.

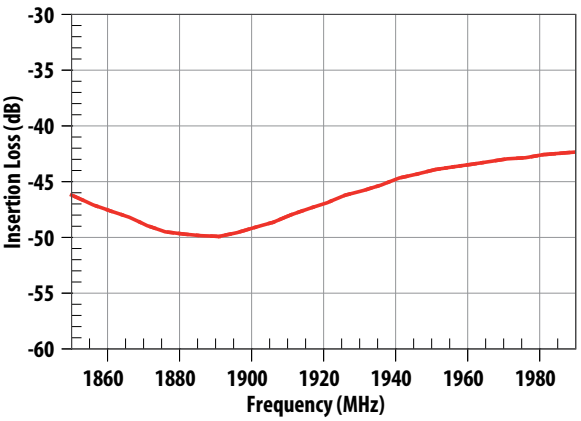


Figure 7. Rejection in PCS Tx-Rx Band.

ACPF-7025 Typical Performance at $T_C = 25°C$

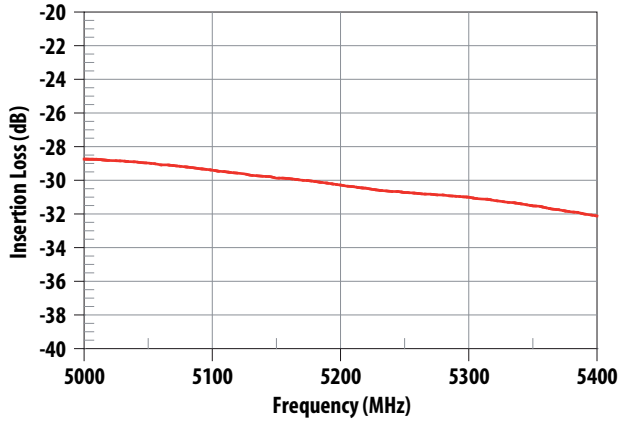


Figure 8. Rejection at WiMAX Second Harmonic.

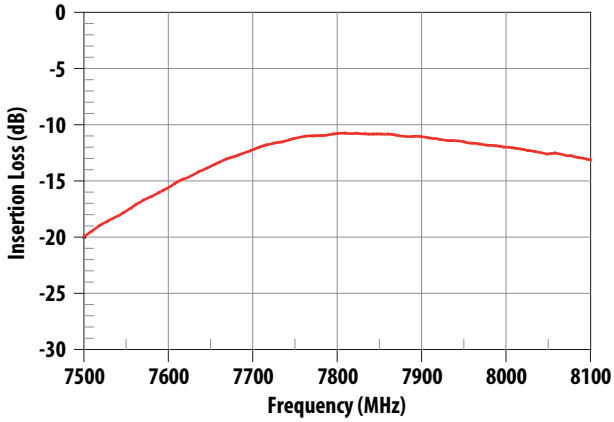


Figure 9. Rejection at WiMAX Third Harmonic.

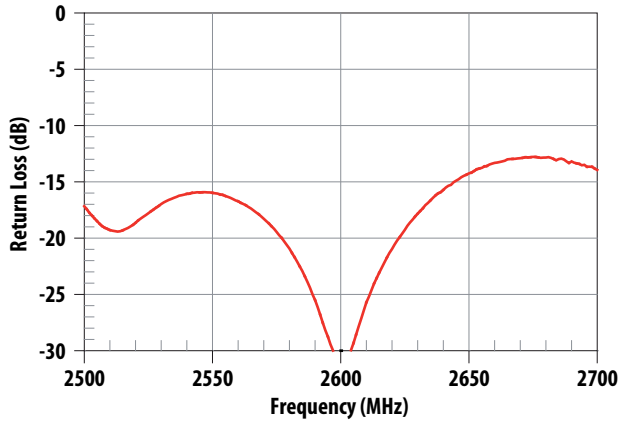


Figure 10. Ant Port Return Loss in WiMAX Band.

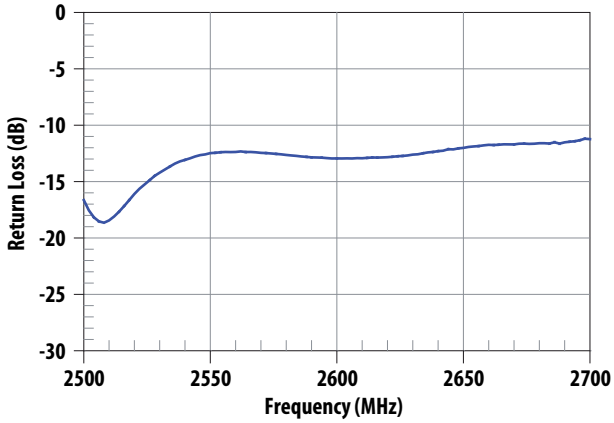


Figure 11. Tx/Rx Port Return Loss in WiMAX Band.

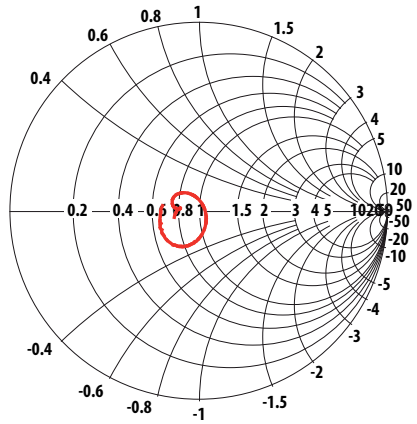


Figure 12. S11 (Ant Port) Impedance in WiMAX Band.

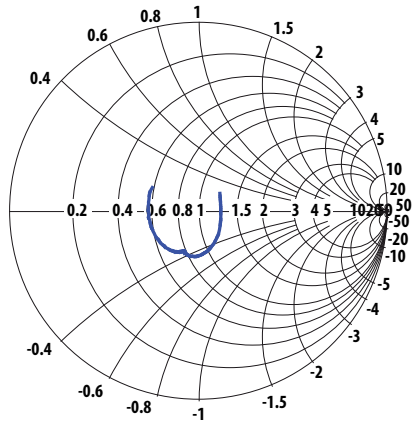
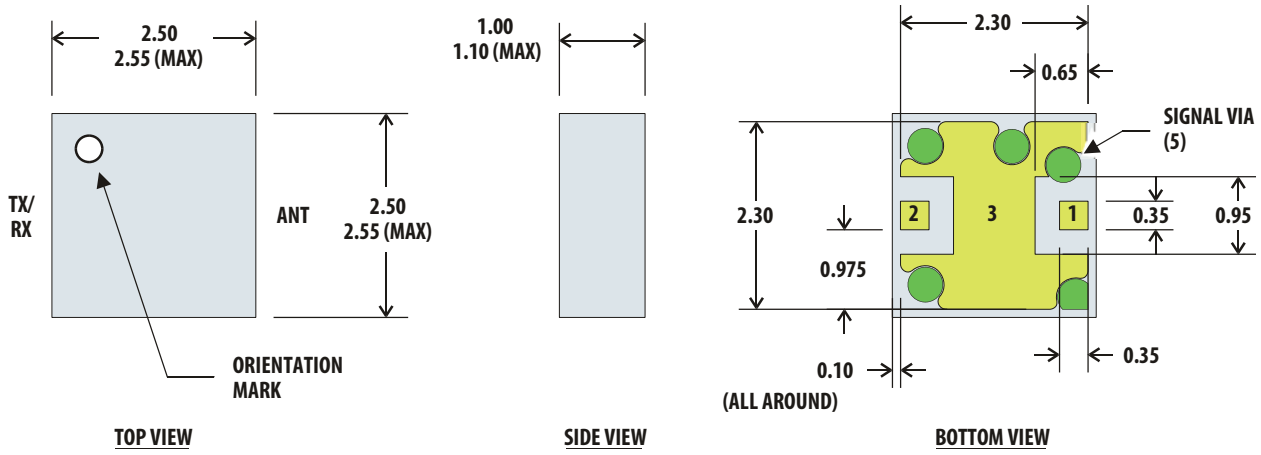


Figure 13. S22 (Tx/Rx Port) Impedance in WiMAX Band.

ACPF-7025



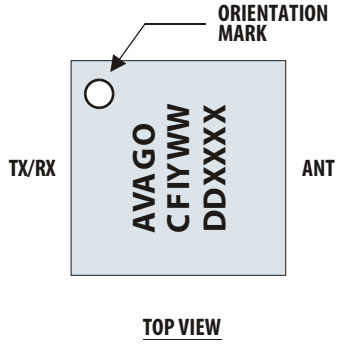
Notes:

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 14. 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 15. Product Marking and Pin Orientation.

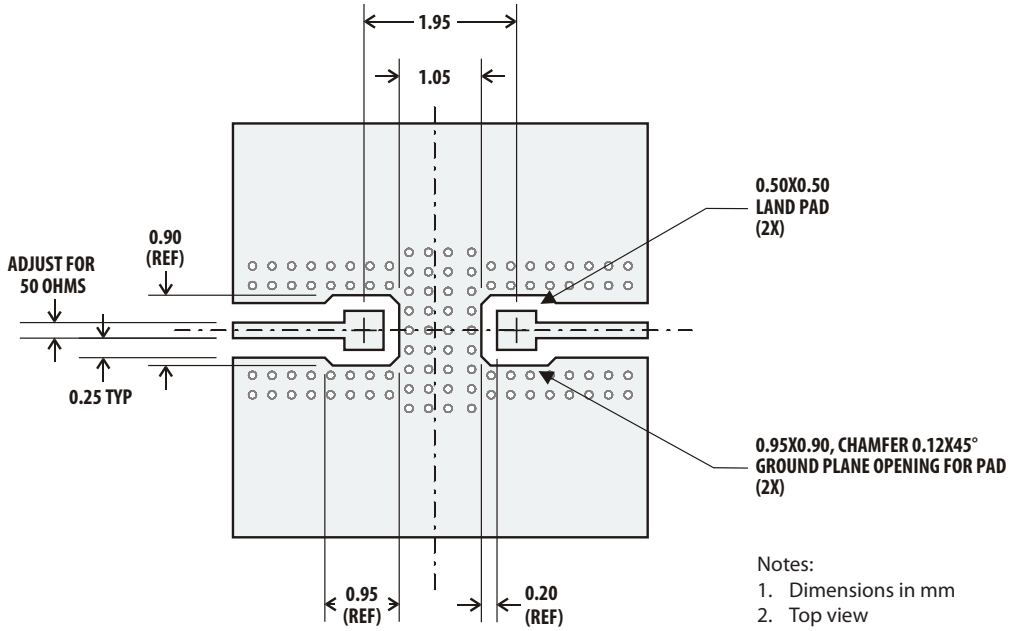


Figure 16. Suggested PCB Land Pattern.

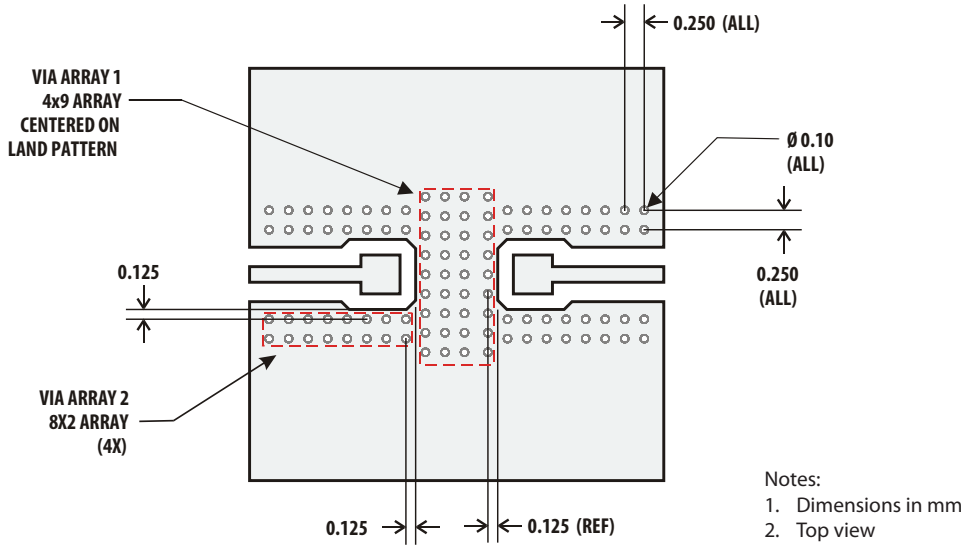


Figure 17. PCB Layout, Via Detail.

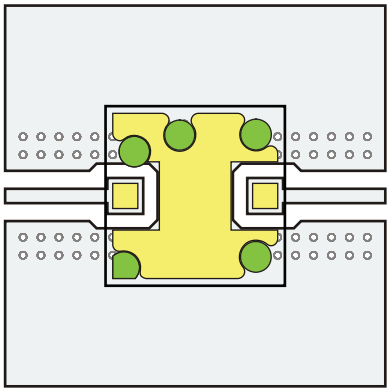
A PCB layout using the principles illustrated in the figure above is recommended to optimize performance of the ACPF-7025.

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.

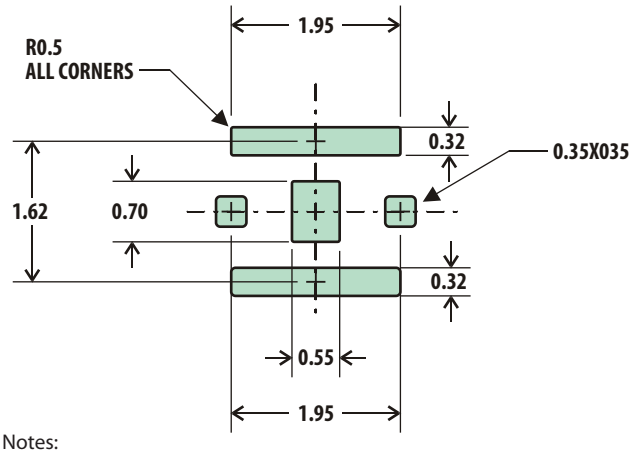
High isolation is achieved by: (1) maintaining a continuous ground plane around the I/O connections and filter mounting area, and (2) surrounding the I/O ports with sufficient ground vias to enclose the connections in a "Faraday cage."

Ground vias under the ACPF-7025 mounting area also provide heat sinking for the device to minimize shifting of the pass band over temperature.



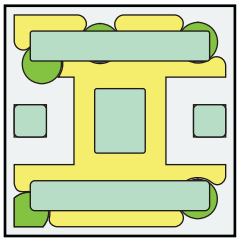
Note:
1. Top view

Figure 18. ACPF-7025 Superposed on PCB Layout.



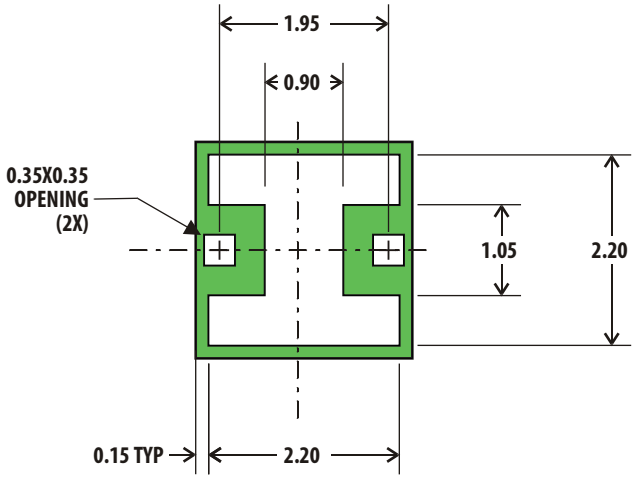
Notes:
1. Dimensions in mm
2. Top view
3. Chamfer or radius all corners 0.05 mm min

Figure 19. Recommended Solder Stencil.



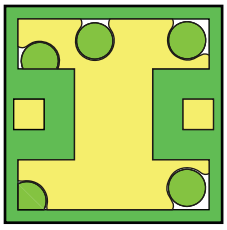
Notes:
1. Top view
2. I/O pad apertures match device pad 1:1

Figure 20. Solder Stencil Superposed on ACPF-7025.



Notes:
1. Dimensions in mm
2. Top view

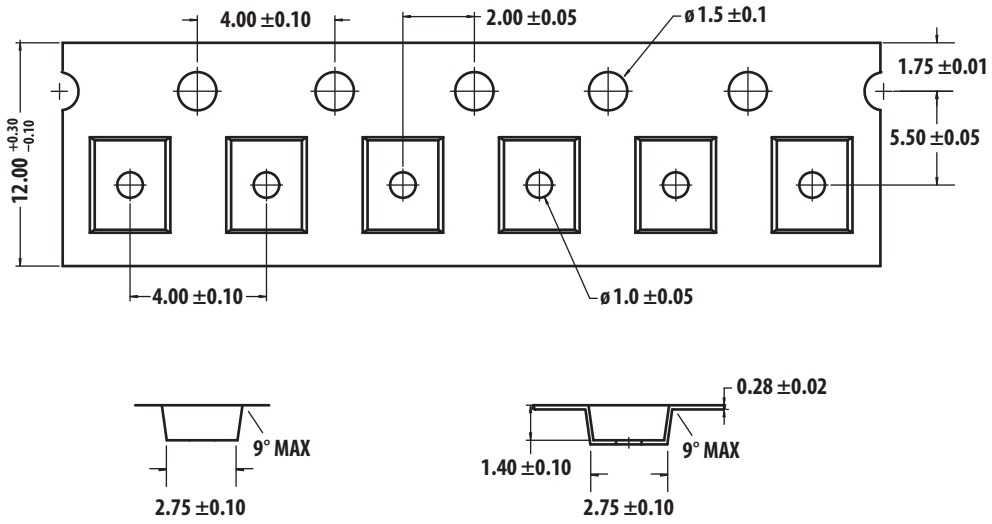
Figure 21. Recommended Solder Mask.



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

Figure 22. Solder Mask Superposed on ACPF-7025.

ACPF-7025



Note:
1. Dimensions in mm

Figure 23. SMD Tape Drawing.

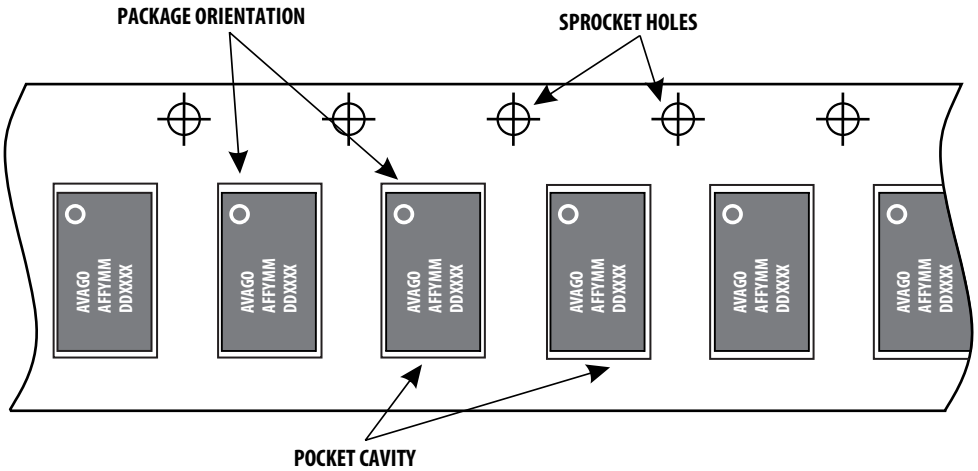
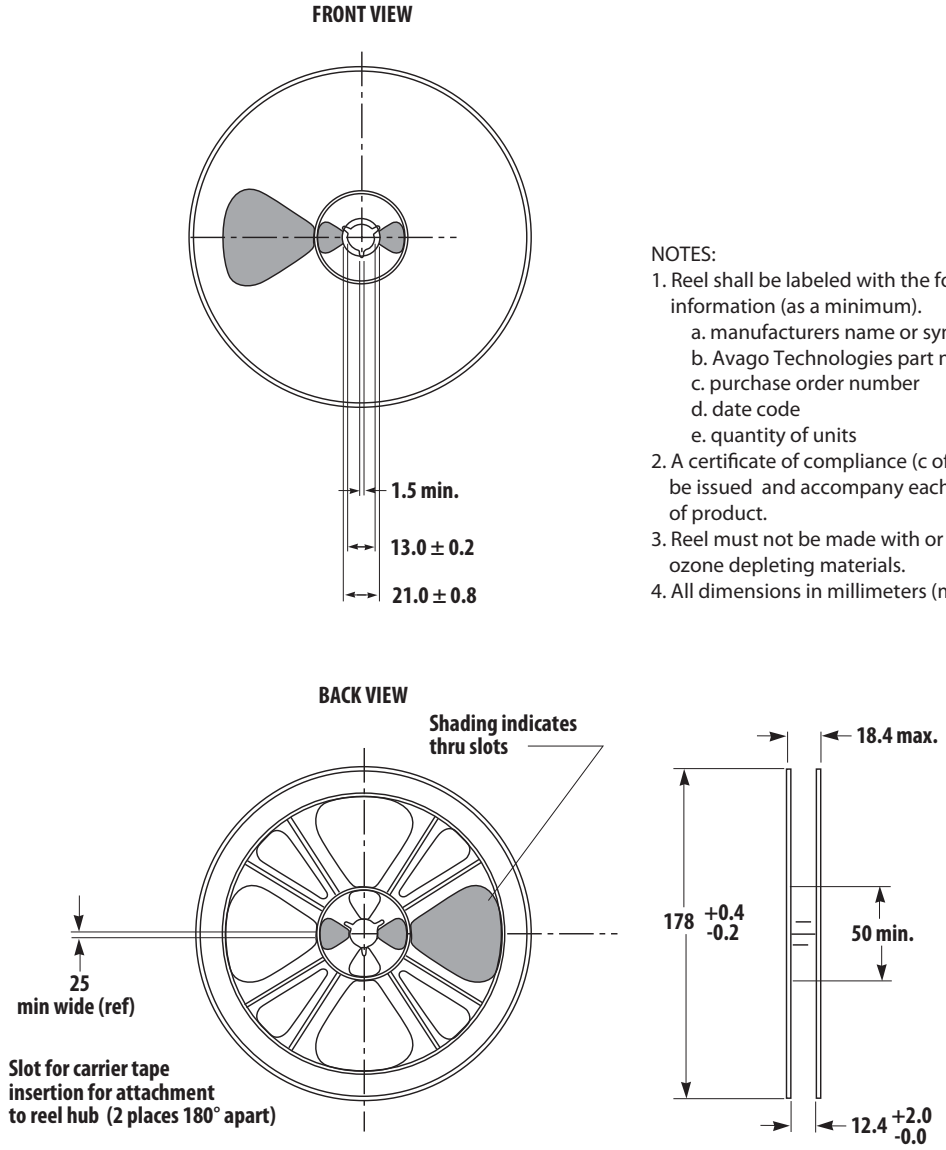


Figure 24. Unit Orientation in SMT Tape.



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 25. SMT Reel Drawing.

Package Moisture Sensitivity

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

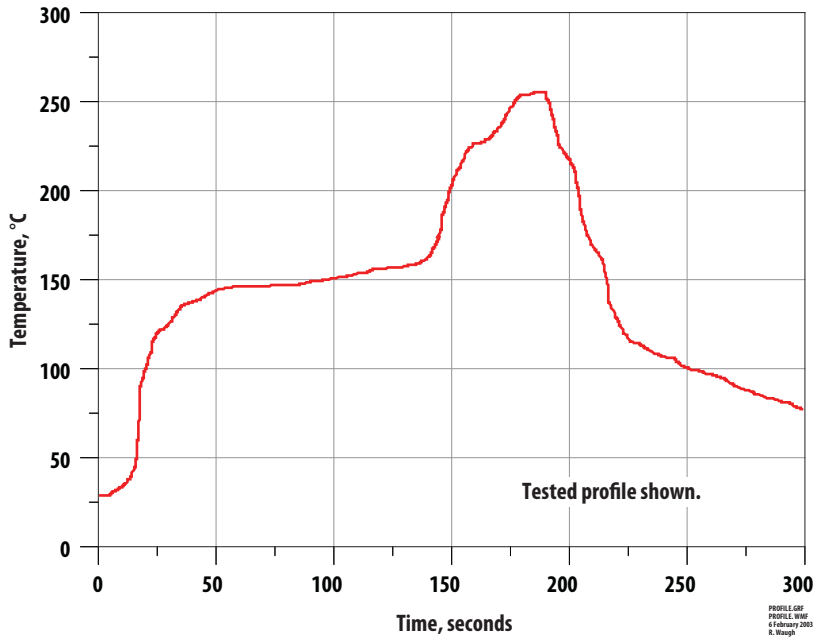


Figure 26. Verified SMT Solder Profile.

Ordering Information

Part Number	No. of Devices	Container
ACPF-7025-BLK	100	Tape Strip or Anti-static Bag
ACPF-7025-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**

AV02-2569EN - April 7, 2011