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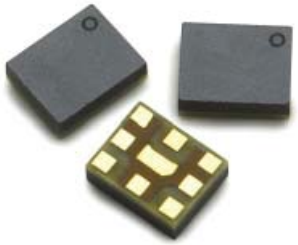
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

ACMD-7617
UMTS Band 1 Duplexer

Data Sheet

Lead (Pb) Free
RoHS 6 fully
compliant



Description

The Avago ACMD-7617 is a highly miniaturized duplexer designed for use in Digital Enhanced Cordless Telecommunications (DECT) applications operating in UMTS Band 1 (1920 – 1980 MHz UL, 2110 – 2170 MHz DL).

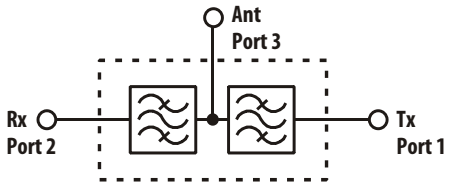
Low Insertion Loss in the Tx channel minimizes current drain from the power amplifier, while low Rx channel Insertion Loss improves receiver sensitivity.

The ACMD-7617 enhances the sensitivity and dynamic range of handset receivers by providing high isolation of the transmitted signal from the receiver input and high rejection of transmit-generated noise in the receive band.

The ACMD-7617 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 ACMD-7617 also utilizes Avago Technologies' advanced Microcap bonded-wafer, chip scale packaging technology. This process allows the filters to be assembled into a molded chip-on-board module with an overall size of only 2.0 x 2.5 mm and maximum height of 0.95 mm. The ACMD-7617 is compatible with standard 2.0 x 2.5 mm duplexer PCB footprints.

Functional Block Diagram



Features

- Miniature Size
  - 2.0 x 2.5 mm Max size
  - 0.95 mm Max Height
  - Standard 2 x 2.5 mm PCB footprint
- High Power Rating
  - 30 dBm Abs Max Tx Power in Tx Band
- Environmental
  - RoHS 6 Compliant
  - Halogen free
  - TBBPA Free

Specifications

- Rx Band Performance, -20 to +90° C
  - Insertion Loss: 2.2 dB Max
  - Rx Noise Blocking: 50 dB Min
- Tx Band Performance, -20 to +90° C
  - Insertion Loss: 2.5 dB Max
  - Tx Interferer Blocking: 55 dB Min

Applications

Digital Enhanced Cordless Telecommunications (DECT) systems operating in the UMTS Band 1 frequency range.

ACMD-7617 Electrical Specifications [2], $Z_0 = 50\ \Omega$, T_C [1] as indicated

			-20° C		+25° C			+90° C	
Symbol	**Parameter**	**Units**	**Min**	**Max**	**Min**	**Typ [3]**	**Max**	**Min**	**Max**
	Antenna Port to Receive Port								
S23	Insertion Loss in Receive Band (2110 – 2170 MHz)	dB		2.2		1.4	2.2		2.2
S22	Return Loss (SWR) of Receive Port in Receive Band (2110 – 2170 MHz)	dB	9	(2.1)	9	20 (1.2)	(2.1)	9	(2.1)
S23	Attenuation, 10 – 1920 MHz	dB	30		30	38		30	
S23	Attenuation in Transmit Band (1920 – 1980 MHz)	dB	48		48	67		48	
S23	Attenuation, 1980 – 2025 MHz	dB	35		35	50		35	
S23	Attenuation, 2255 – 2400 MHz	dB	30		30	50		30	
S23	Attenuation in Bluetooth Band (2400 – 2483.5 MHz)	dB	35		35	55		35	
S23	Attenuation, 4030 – 4150 MHz	dB	15		15	31		15	
S23	Attenuation, 5950 – 6130 MHz	dB	15		15	20		15	
	Transmit Port to Antenna Port								
S31	Insertion Loss in UMTS Tx Channel Center [4]	dB							
	1922.4 MHz			2.5		1.9	2.3		2.3
	1924.4 MHz			2.3		1.5	2.1		2.1
	1926.4 – 1971.6 MHz			2.1		1.3	2.0		2.0
	1973.6 MHz			2.0		1.3	2.0		2.1
	1975.6 MHz			2.0		1.3	2.0		2.3
	1977.6 MHz			2.0		1.3	2.0		2.5
S11	Return Loss (SWR) of Transmit Port in Transmit Band (1920 – 1980 MHz)	dB	9	(2.1)	9	20 (1.2)	(2.1)	9	(2.1)
S31	Attenuation, 10 – 1574 MHz	dB	30		30	45		30	
S31	Attenuation in GPS Rx Band (1574.42 – 1576.42 MHz)	dB	35		35	38		35	
S31	Attenuation, 1800 – 1900 MHz	dB	27		27	41		27	
S31	Attenuation, 2010 – 2025 MHz	dB	28		28	52		28	
S31	Attenuation in Receive Band (2110 – 2170 MHz)	dB	45		45	51		45	
S31	Attenuation in Bluetooth Band (2400 – 2483.5 MHz)	dB	30		30	38		30	
S31	Attenuation in Transmit 2nd Harmonic Band (3840 – 3960 MHz)	dB	30		30	39		30	
S31	Attenuation in Transmit 3rd Harmonic Band (5760 – 5940 MHz)	dB	5		5	16		5	
	Antenna Port								
S33	Return Loss (SWR) of Ant Port in Rx Band (2110 – 2170 MHz)	dB	9	(2.1)	9	21 (1.2)	(2.1)	9	(2.1)
S33	Return Loss (SWR) of Ant Port in Tx Band (1920 – 1980 MHz)	dB	9	(2.1)	9	20 (1.2)	(2.1)	9	(2.1)
	Isolation Transmit Port to Receive Port								
S21	Tx-Rx Isolation in Receive Band (2110 – 2170 MHz)	dB	50		50	61		50	
S21	Tx-Rx Isolation in Transmit Band (1920 – 1980 MHz)	dB	55		55	64		55	

Notes:

1. T_C is the case temperature and is defined as the temperature of the underside of the Duplexer 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 port equal to or less than +29 dBm over all Tx 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.
4. Integrated Insertion Loss over 3.8 MHz UMTS channel(s).

Absolute Maximum Ratings [1]

Parameter	Unit	Value
Storage temperature	°C	-65 to +125
Maximum RF Input Power to Tx Port		
1920–1980 MHz	dBm	+30
All other frequencies		+25

Maximum Recommended Operating Conditions [2]

Parameter	Unit	Value
Operating temperature, Tc [3]	°C	–40 to +100
Maximum CW RF Input Power to Tx Port		
1920–1980 MHz	dBm	+28
All other frequencies		+23

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 duplexer where it makes contact with the circuit board.

ACMD-7617 Typical Performance at $T_C = 25° C$

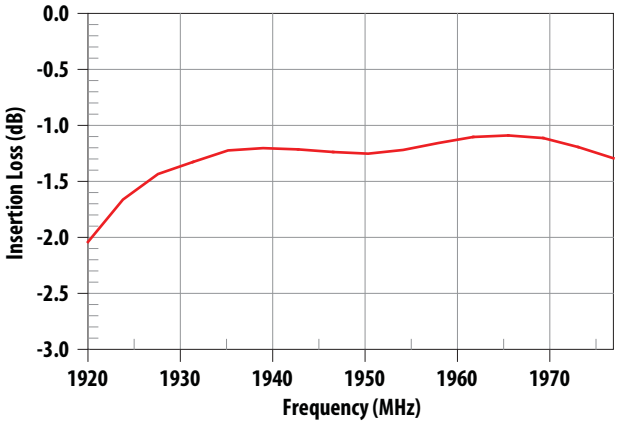


Figure1. Tx–Ant Insertion Loss

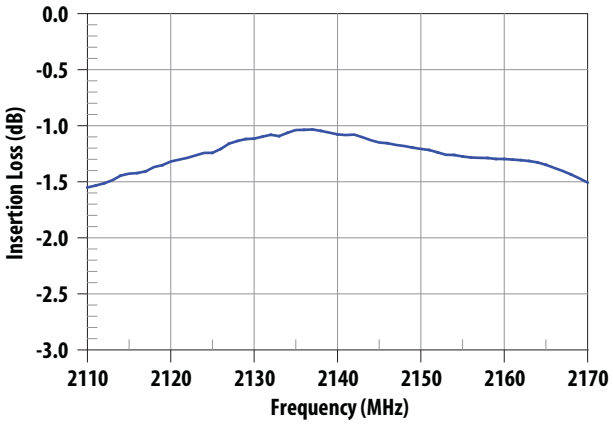


Figure 2. Ant–Rx Insertion Loss

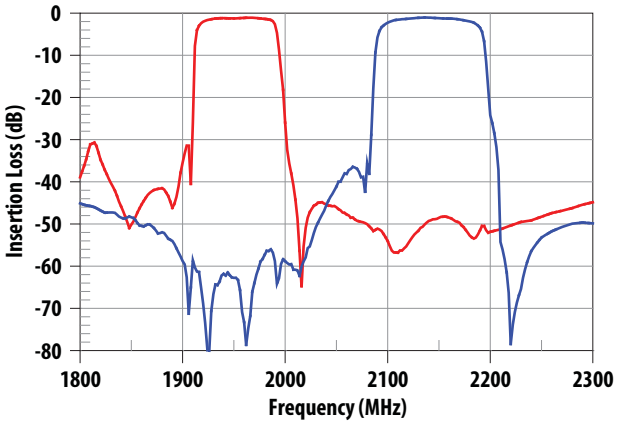


Figure 3. Tx Rejection in Rx Band and Rx Rejection in Tx Band

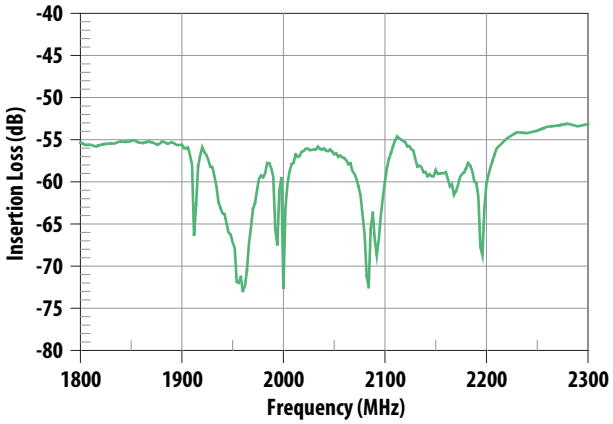


Figure 4. Tx–Rx Isolation

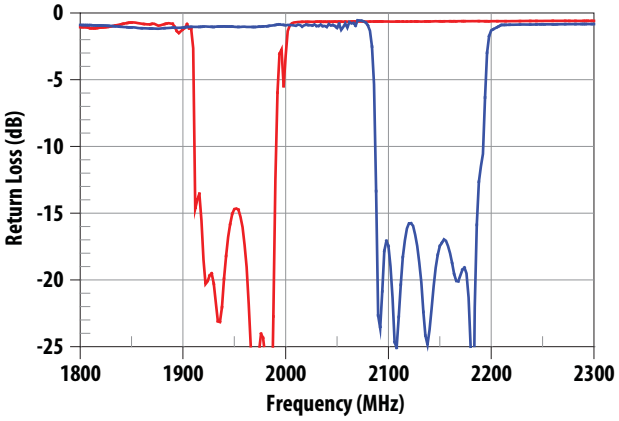


Figure 5. Tx and Rx Port Return Loss

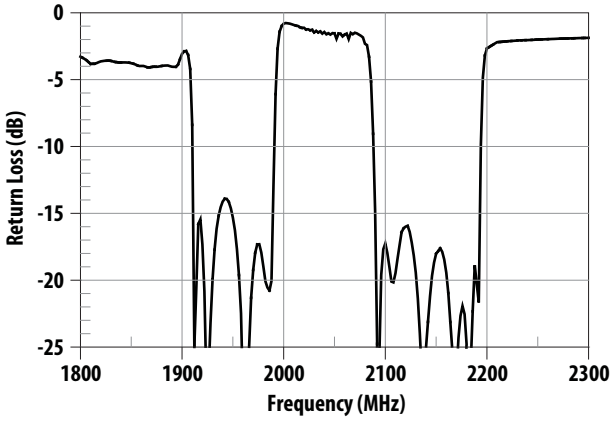


Figure 6. Antenna Port Return Loss

ACMD-7617 Typical Performance at $T_C = 25° C$

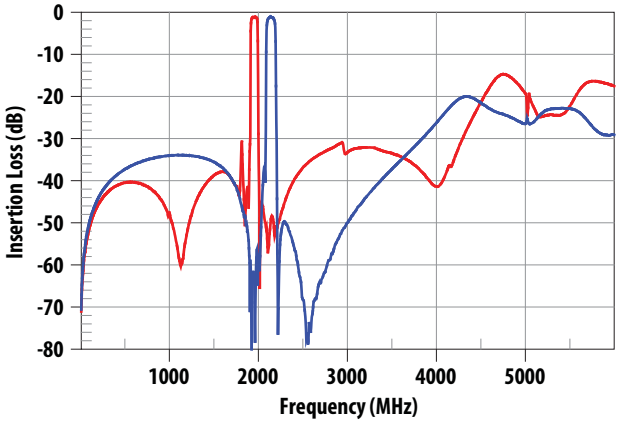


Figure 7. Tx–Ant and Ant–Rx Wideband Insertion Loss

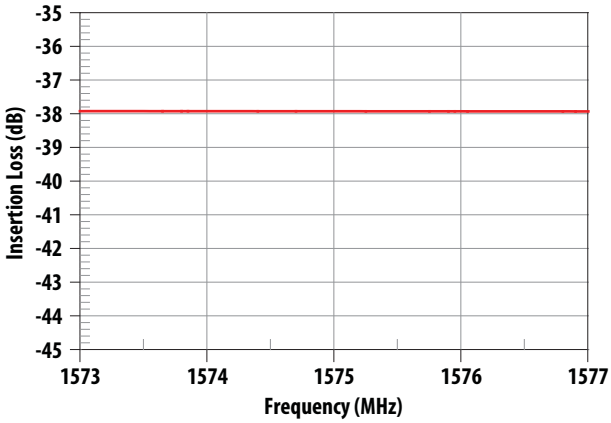


Figure 8. Tx–Ant Rejection in GPS Band

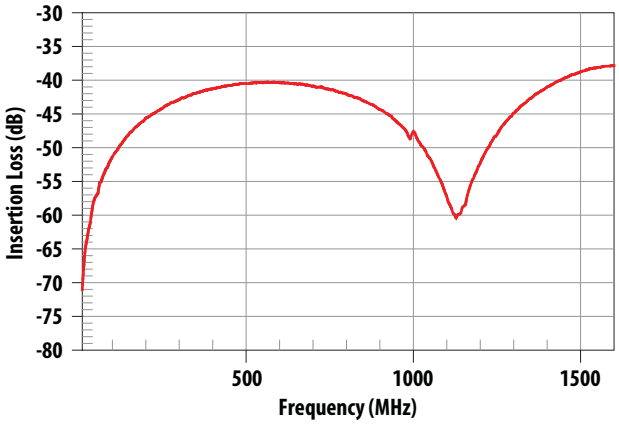


Figure 9. Tx–Ant Low Frequency Rejection

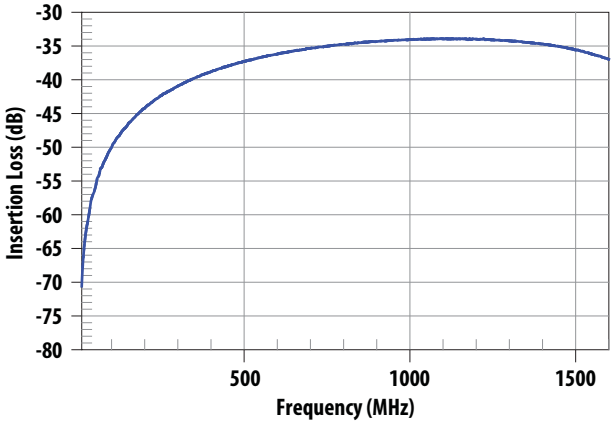


Figure 10. Ant–Rx Low Frequency Rejection

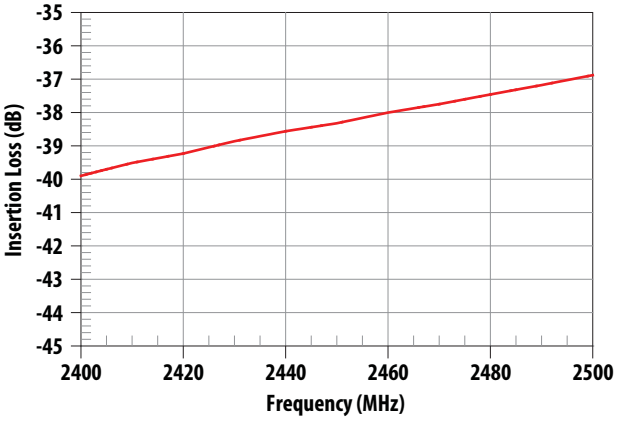


Figure 11. Tx–Ant Rejection in Bluetooth Band

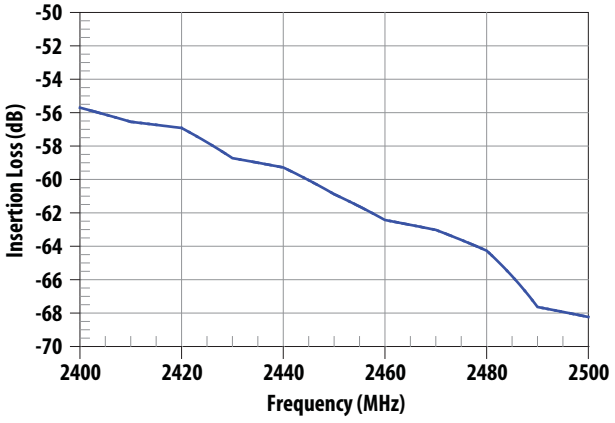


Figure 12. Ant–Rx Rejection in Bluetooth Band

ACMD-7617 Typical Performance at T_C = 25° C

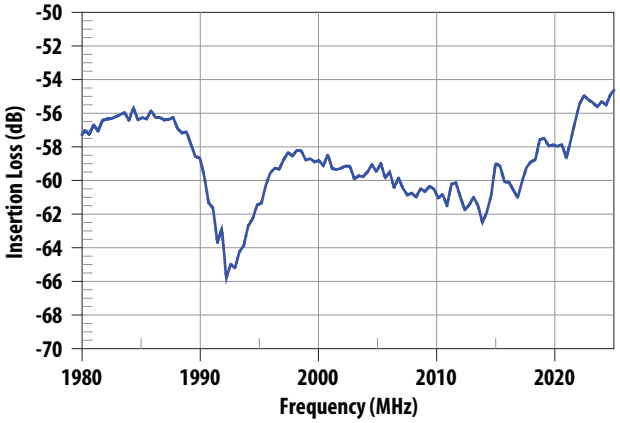


Figure 13. Ant–Rx Rejection, 1980 –2025 MHz

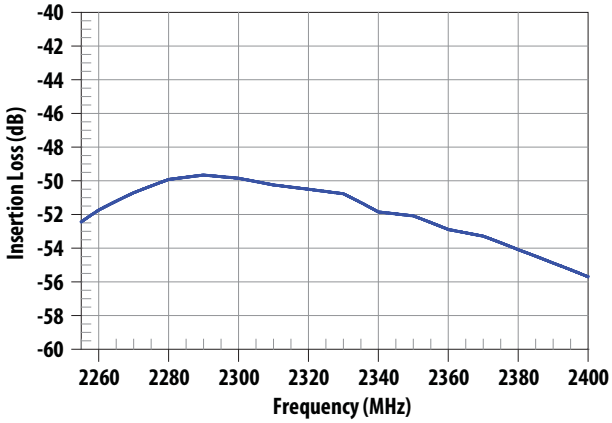


Figure 14. Ant–Rx Rejection, 2255 –2400 MHz

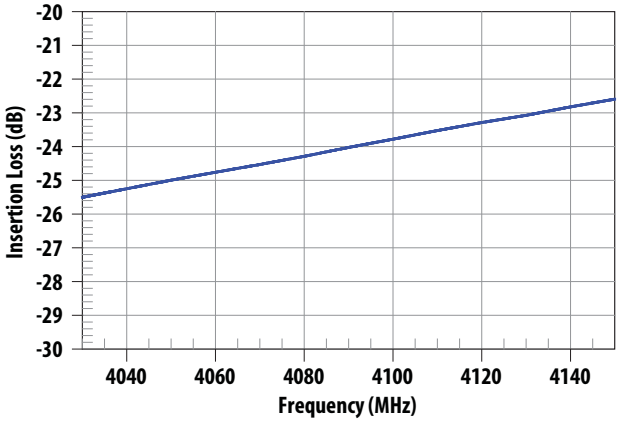


Figure 15. Ant–Rx Rejection, 4030 –4150 MHz

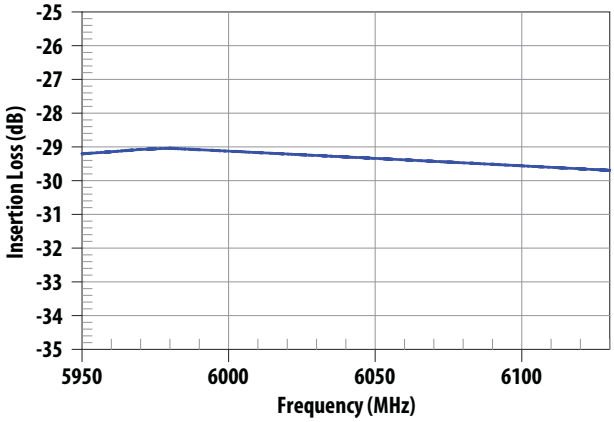


Figure 16. Ant–Rx Rejection, 5950 –6130 MHz

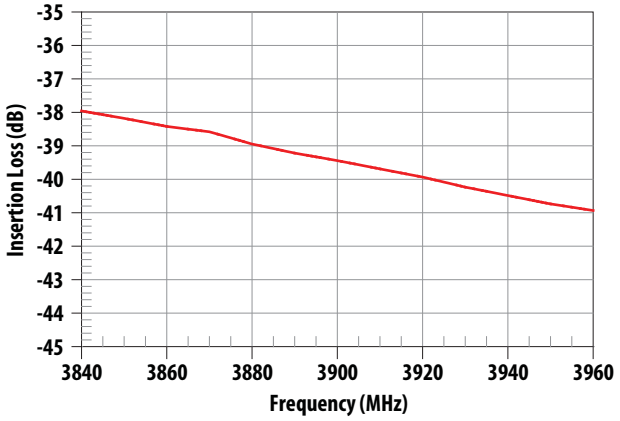


Figure 17. Tx–Ant Rejection at Tx Second Harmonic

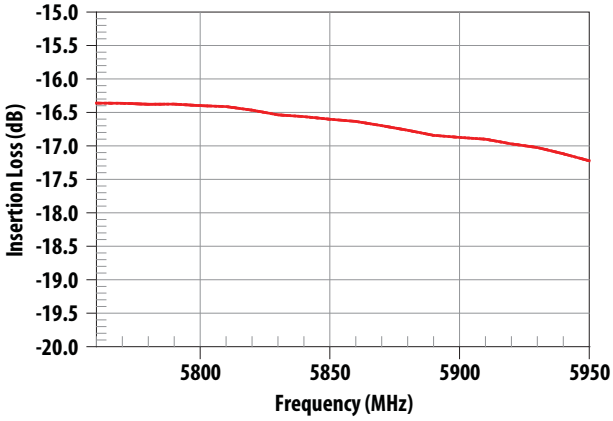


Figure 18. Tx–Ant Rejection at Tx Third Harmonic

ACMD-7617 Typical Performance at $T_C = 25° C$

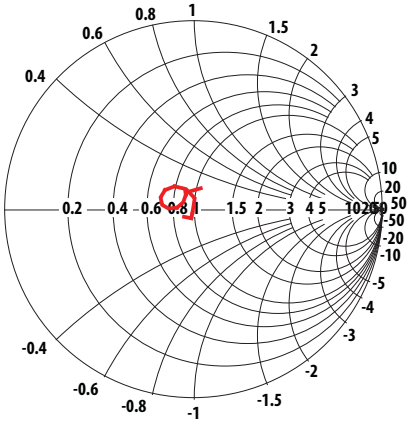


Figure 19. Tx Port Impedance in Tx Band

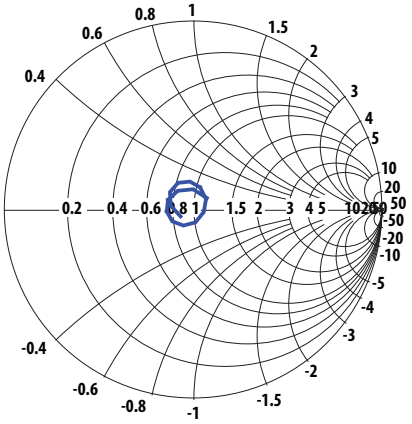


Figure 20. Rx Port Impedance in Rx Band

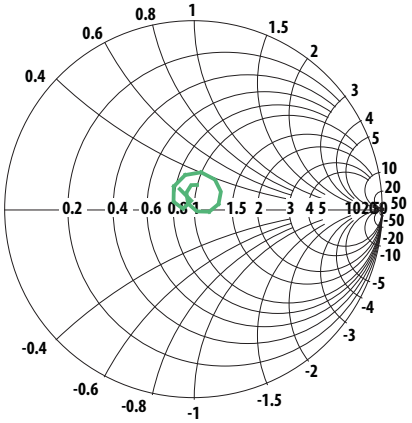


Figure 21. Ant Port Impedance in Tx Band

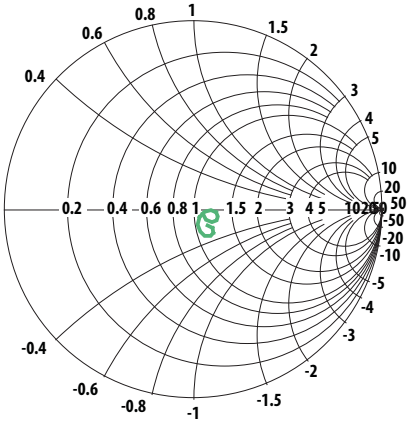
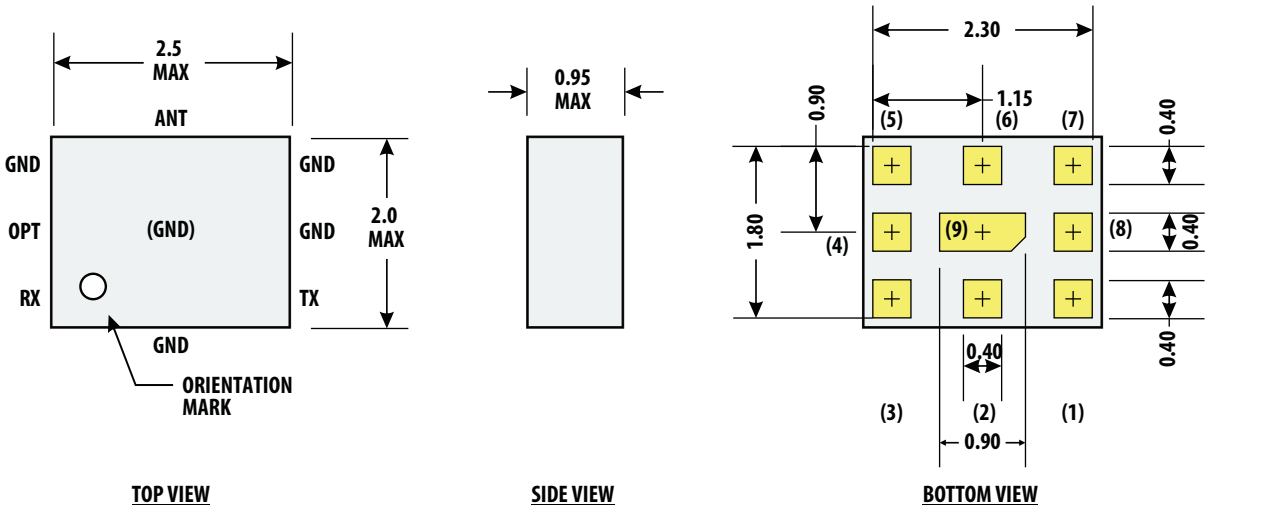


Figure 22. Ant Port Impedance in Rx Band



Notes:
1. Dimensions in millimeters
   Tolerance: X.X ± 0.1 mm
   X.XX ± 0.05 mm
2. Dimensions nominal unless otherwise noted
3. Angles 45° nominal
4. I/O Pads (3 ea)
   Size: 0.40 X 0.40 mm
   Spacing to ground metal: 0.30 mm
5. Contact areas are gold plated

Pin Connections:

1	Rx (or Rx(+))
2, 4, 5, 7, 9	Gnd
3	Tx
6	Ant
8	Optional: Gnd, NC or Rx(–)

Figure 23. Package Outline Drawing

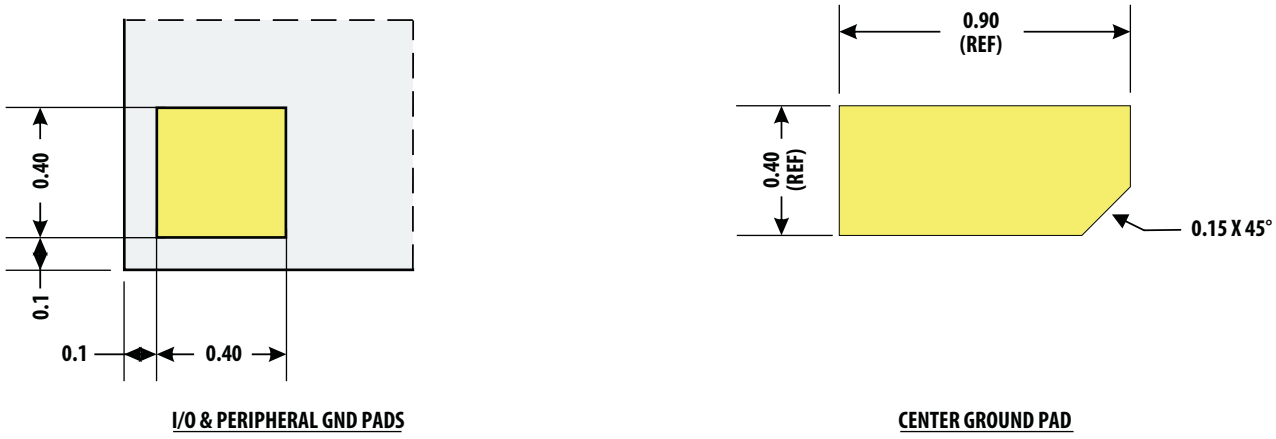
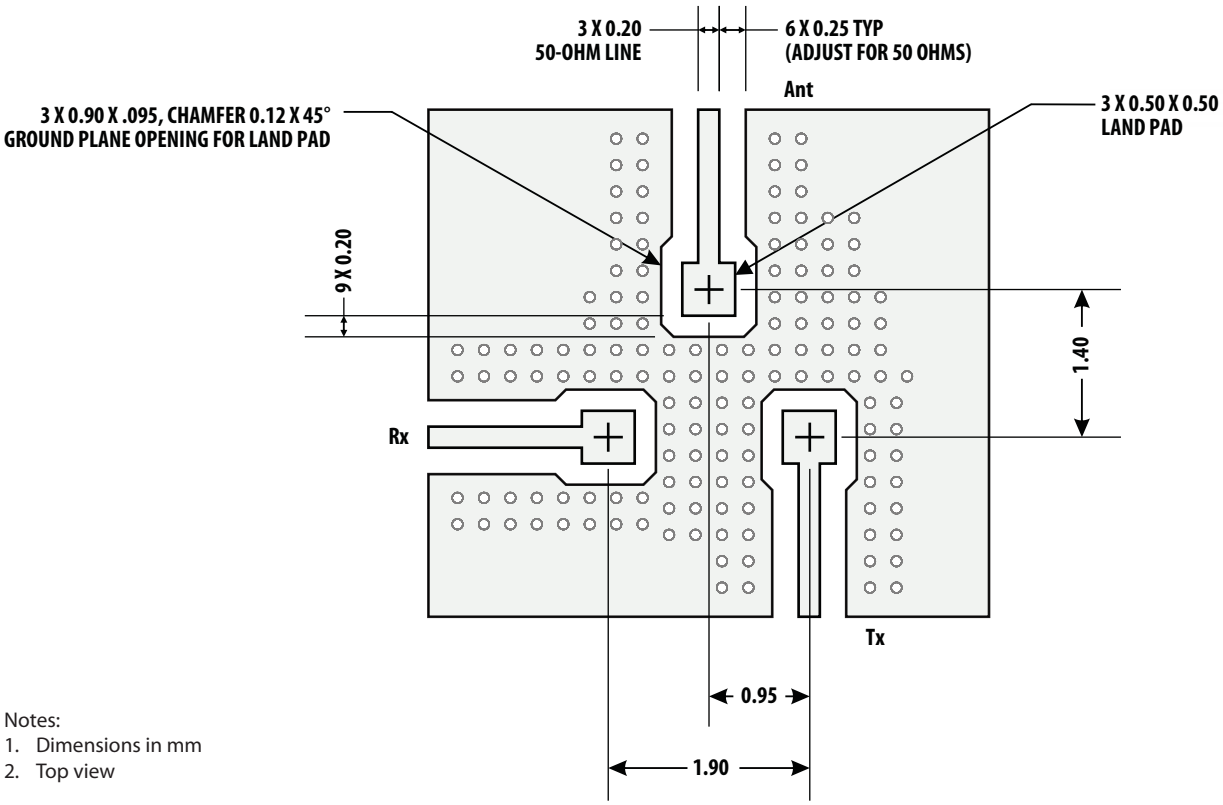


Figure 24. Pad Detail



Notes:
1. Dimensions in mm
2. Top view

Figure 25. Suggested PCB Layout

A PCB layout using the principles illustrated in the figure above is recommended to optimize performance of the ACMD-7617.

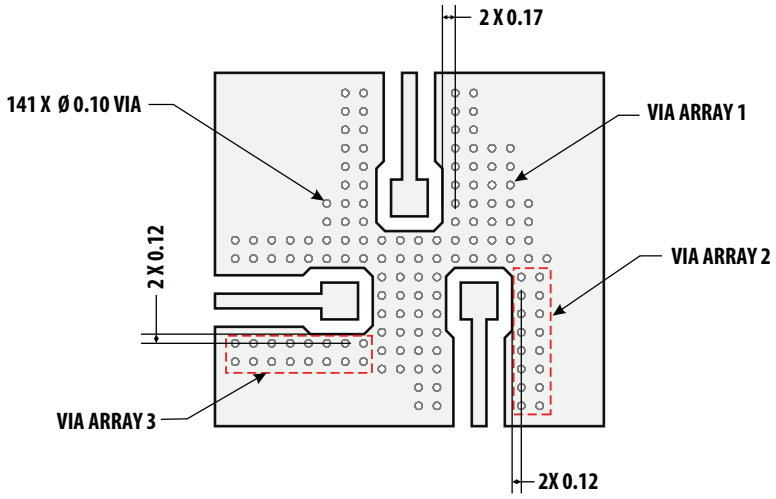
Note: Pin 8 grounded in this example.

The transmission line dimensions shown are designed to achieve an impedance of 50 ohms for an 80 μm thick PCB layer with a dielectric constant of 3.4. If other PCB materials or thicknesses are used, the 0.25 mm gap spacing may need to be adjusted to retain a Zo of 50 ohms.

It is important to maximize isolation between the Tx and Rx ports.

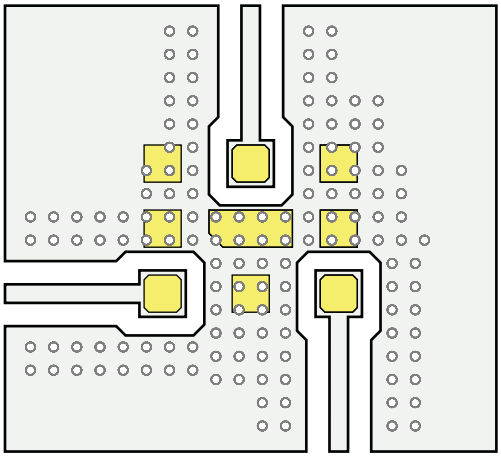
High isolation is achieved by: (1) maintaining a continuous ground plane around the I/O connections and duplexer mounting area, and (2) surrounding the I/O ports with sufficient ground vias to enclose the connections in a "Faraday cage."

The ground vias under the ACMD-7617 mounting area are also needed to provide adequate heat sinking for the device.



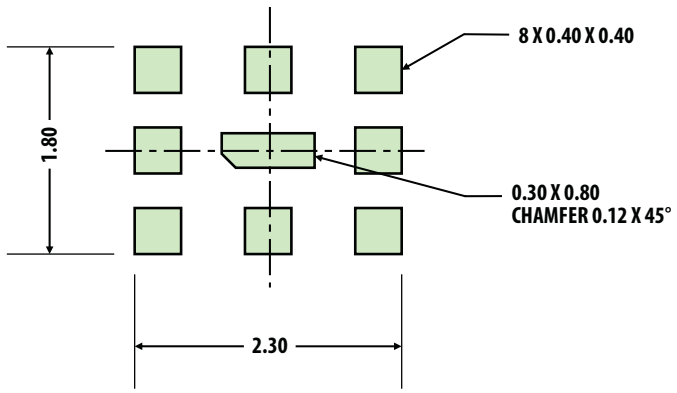
Notes:
1. Dimensions in mm
2. Top view
3. Via arrays: horiz pitch = 0.25, vert pitch = 0.25

Figure 26. PCB Layout, Via Detail



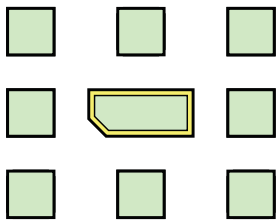
Note:
1. Top view

Figure 27. ACMD-7617 Superposed on PCB Layout



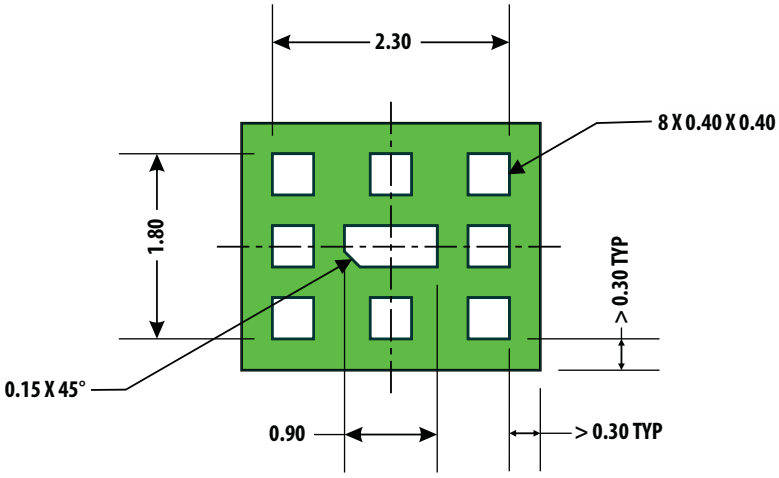
Notes:
1. Dimensions in mm
2. Top view
3. Chamfer or radius all corners 0.05 mm min

Figure 28. Recommended Solder Stencil



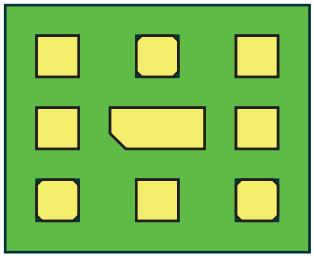
Notes:
1. Top view
2. Peripheral clearance of stencil aperture for center device pad is 0.05 mm. All other apertures match device pad 1:1

Figure 29. Solder Stencil Superposed on ACMD-7617



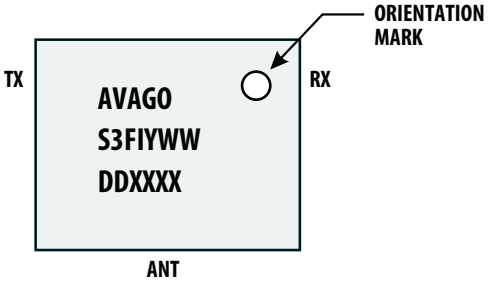
Notes:
1. Dimensions in mm
2. Top view

Figure 30. Recommended Solder Mask



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

Figure 31. Solder Mask Superposed on ACMD-7617



S = ACMD-7617
FI = Mfg Information
Y = Year
WW = Work Week
DD = Date Code
XXXX = Assembly Lot

Figure 32. Product Marking and Pin Orientation

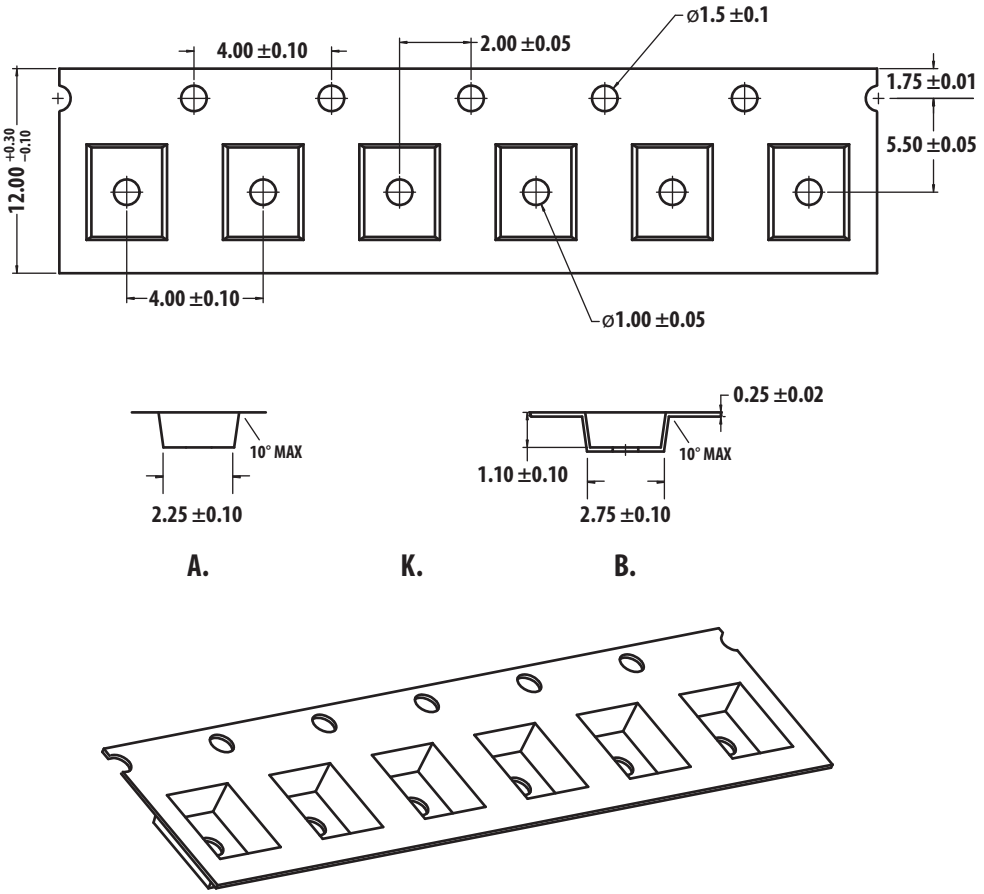


Figure 33. SMD Tape Packing

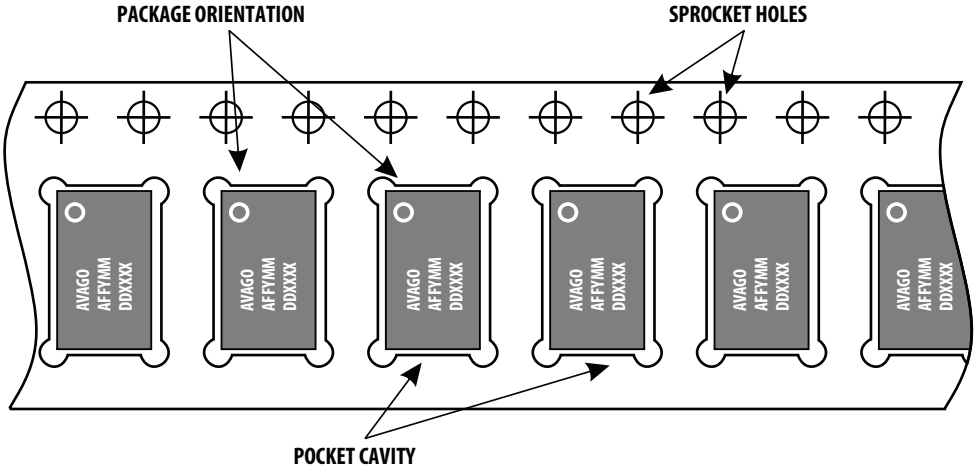
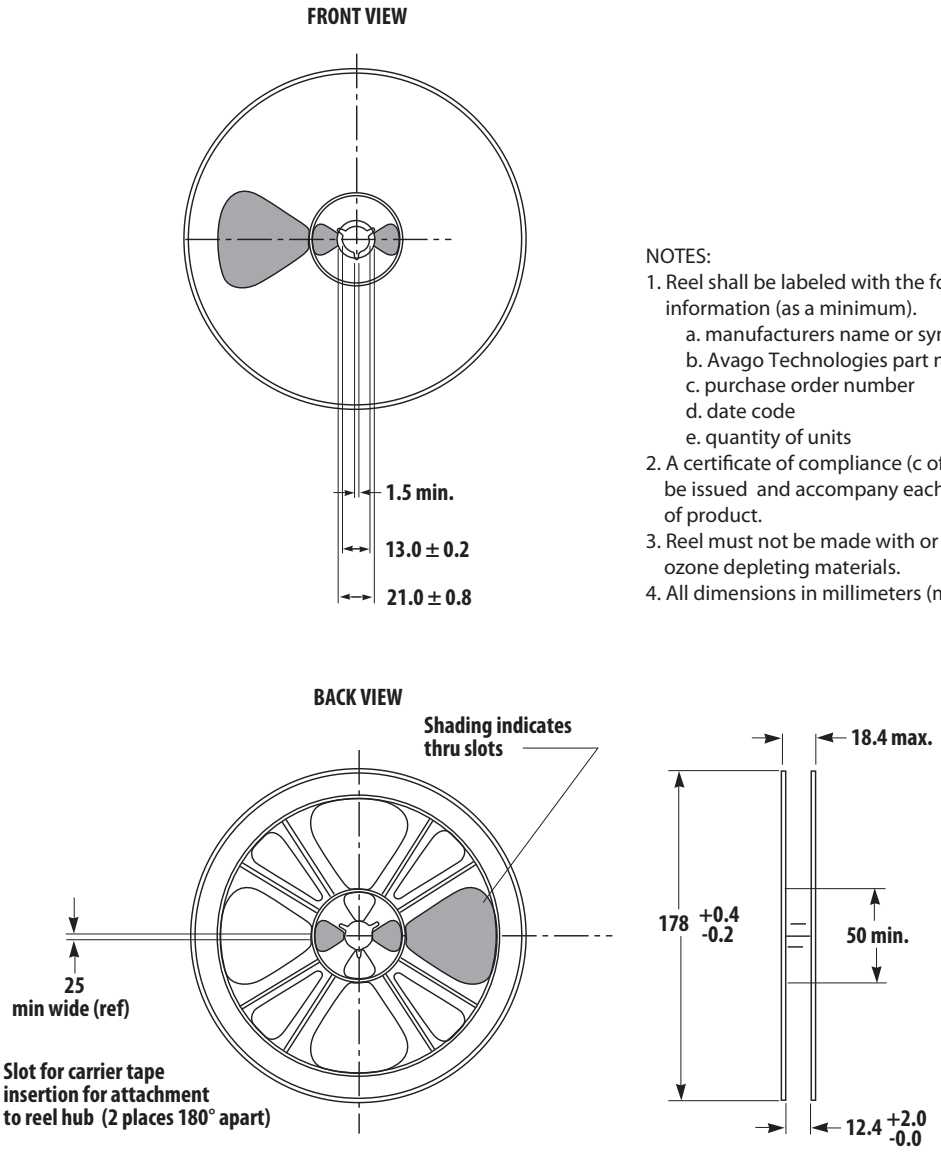


Figure 34. Unit Orientation in SMT Tape



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 35. SMT Reel Drawing

Package Moisture Sensitivity

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

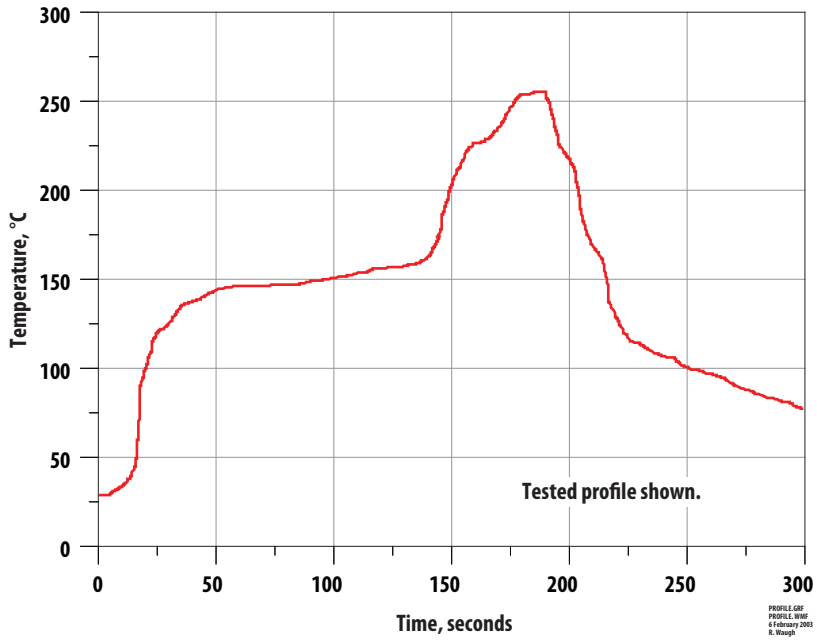


Figure 36. Verified SMT Solder Profile

Ordering Information

Part Number	No. of Devices	Container
ACMD-7617-BLK	100	Tape Strip or Anti-static Bag
ACMD-7617-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**

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