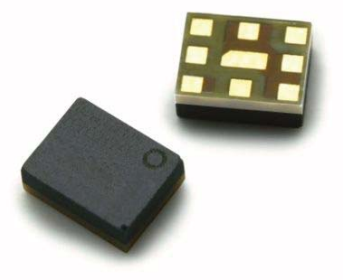
ACMD-4102

UMTS/NCDMA/Co-band GSM Rx Band 2 Duplexer with Balanced Rx Port

Data Sheet

Lead (Pb) Free RoHS 6 fully compliant



Description

The Avago ACMD-4102 is a highly miniaturized duplexer designed for use in UMTS and NCDMA Band 2 (1850.48 – 1909.52 MHz UL, 1930.48 – 1989.52 MHz DL) handsets and mobile data terminals.

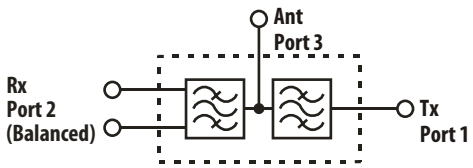
Low Insertion Loss in the Tx channel minimizes current drain from the power amplifier, while low Rx channel Insertion Loss improves receiver sensitivity. The Rx port is balanced to preserve CMR and simplify the interface to baseband chipsets.

The ACMD-4102 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-4102 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-4102 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 1.05 mm. The ACMD-4102 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 size
  - 1.05 mm Max Height
  - Standard 2 x 2.5 mm PCB footprint
- Balanced Rx Port, 150 Ω
- High Isolation enables elimination of interstage filter
- Co-banding enables elimination of the GSM Rx filter
- High Power Rating
  - 33 dBm Abs Max Tx Power
- Environmental
  - RoHS 6 Compliant
  - Halogen free
  - TBBPA Free

Specifications

- Rx Band Performance, -20 to +85° C
  - Insertion Loss (UMTS): 3.6 dB Max
  - Rx Noise Blocking: 50 dB Min
- Tx Band Performance, -20 to +85° C
  - Insertion Loss (UMTS): 2.8 dB Max
  - Tx Interferer Blocking: 55 dB Min

Applications

UMTS and NCDMA handsets or data terminals operating in the Band 2 frequency range.

ACMD-4102 Electrical Specifications [2], $Z_0 = 50\ \Omega$ (unless otherwise noted), T_C [1] as indicated. Includes Rx inductor [7]

			-20° C		+25° C			+85° C	
Symbol	**Parameter**	**Units**	**Min**	**Max**	**Min**	**Typ [3]**	**Max**	**Min**	**Max**
Antenna Port to Receive Port									
Z_{Rx}	Impedance of Rx Port, Real Part (Balanced)	Ohms				150			
CMR	Common Mode Rejection Ratio (1930.48 – 1989.52 MHz)	dB	18		18			18	
S23	Insertion Loss in UMTS Receive Band [4] (1930.48 – 1989.52 MHz)	dB		3.6		1.9	3.4		3.3
S23	Insertion Loss in NCDMA Receive Band [5] (1930.6 – 1989.4 MHz)	dB		4.4		1.9	3.4		3.6
S23	Attenuation in Transmit Band (1850.48 – 1909.52 MHz)	dB	50		50	64		50	
S22	Return Loss (SWR) of Receive Port in Rx Band (1930.48 – 1989.52 MHz)	dB	8	(2.3)	8	19 (1.3)	(2.3)	8	(2.3)
Transmit Port to Antenna Port									
Z_{Tx}	Impedance of Tx Port, Real Part	Ohms				50			
S31	Insertion Loss in UMTS Transmit Band [4] (1850.48 – 1909.52 MHz)	dB		2.8		1.3	2.5		2.8 [6]
S31	Insertion Loss in NCDMA Transmit Band [5] (1850.6 – 1909.4 MHz)	dB		3.4		1.3	2.5		3.5
S31	Attenuation in Receive Band (1930.48 – 1989.52 MHz)	dB	44		44	62		44	
S31	Attenuation in GPS Band (1574.4 – 1576.4 MHz)	dB	40		40			40	
S31	Attenuation in Bluetooth Band (2400 – 2483.5 MHz)	dB	40		40			40	
S31	Attenuation in Transmit 2nd Harmonic Band (3701 – 3819 MHz)	dB	30		30			30	
S31	Attenuation in Transmit 3rd Harmonic Band (5551.5 – 5728.5 MHz)	dB	10		10			10	
S11	Return Loss (SWR) of Transmit Port in Tx Band (1850.48 – 1909.52 MHz)	dB	9	(2.1)	9	19 (1.3)	(2.1)	9	(2.1)
Antenna Port									
Z_{Ant}	Impedance of Ant Port, Real Part	Ohms				50			
S33	Return Loss (SWR) of Ant Port in Rx Band (1930.48 – 1989.52 MHz)	dB	8	(2.3)	8	19 (1.3)	(2.3)	8	(2.3)
S33	Return Loss (SWR) of Ant Port in Tx Band (1850.48 – 1909.52 MHz)	dB	9	(2.1)	9	19 (1.3)	(2.1)	9	(2.1)
Isolation, Tx Port to Rx Port									
S21	Tx-Rx Isolation in UMTS Receive Band [4] (1930.48 – 1989.52 MHz)	dB	50		50	63		50	
S21	Tx-Rx Isolation in NCDMA Receive Band [5] (1930.6 – 1989.4 MHz)	dB	44		50	63		50	
S21	Tx-Rx Isolation in UMTS Transmit Band [4] (1850.48 – 1909.52 MHz)	dB	55		55	62		55	
S21	Tx-Rx Isolation in NCDMA Transmit Band [5] (1850.6 – 1909.4 MHz)	dB	55		55	62		54	
S21	Tx-Rx Common Mode Isolation in Transmit Band, (1850.5 – 1909.5 MHz)	dB				67			

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 any 3.84 MHz channel within the band.
5. Integrated Insertion Loss over any 1.25 MHz channel within the band.
6. The maximum Tx Insertion Loss specification at T_C = +85° C is guaranteed for input power ≤ +27 dBm. For Tx input power between +27 dBm and +29 dBm, the Tx Insertion Loss is higher by 0.2 dB. Alternatively, the Tx Insertion Loss specification is compliant to +29 dBm input power for $T_C \leq 79°$ C.
7. Specifications include effect of 12 nH inductor added via simulation in parallel with Rx port as shown in Figure 1.

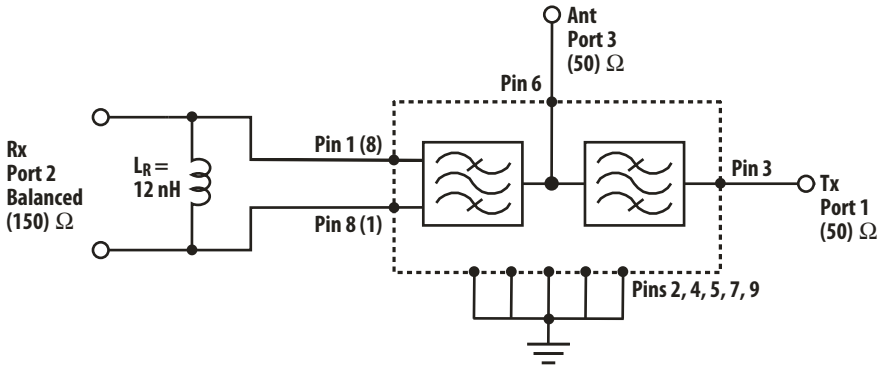


Figure 1. Rx Port Impedance Match

ACMD-4102 Typical Performance at $T_c = 25°$ C. Includes Rx inductor [7]

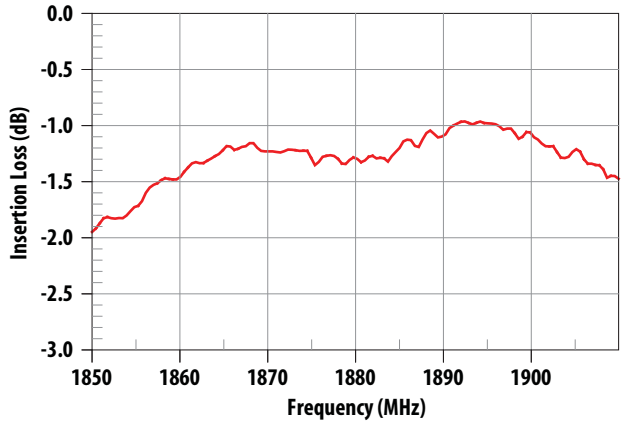


Figure 2. Tx–Ant Insertion Loss

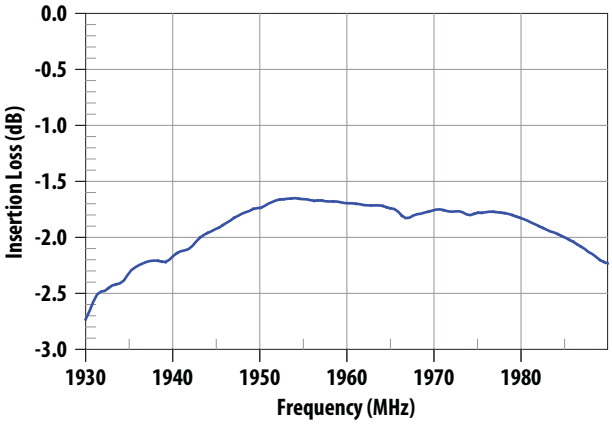


Figure 3. Ant–Rx Insertion Loss

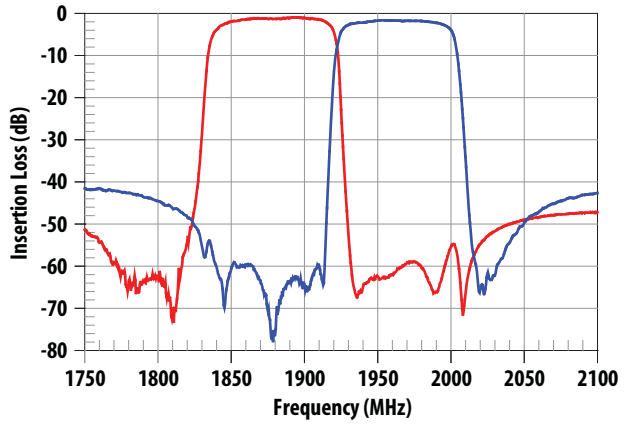


Figure 4. Tx Rejection in Rx Band and Rx Rejection in Tx Band

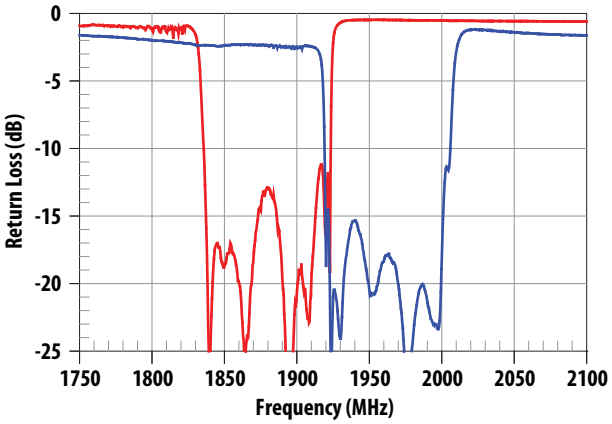


Figure 5. Tx and Rx Port Return Loss. (Tx Zo = 50 ohms, Rx Zo = 150 ohms)

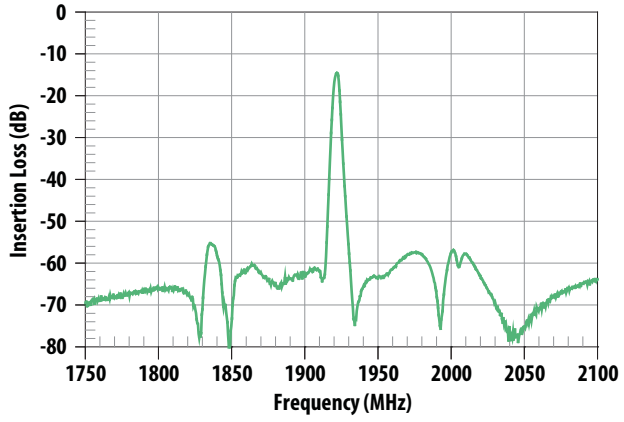


Figure 6. Tx–Rx Isolation

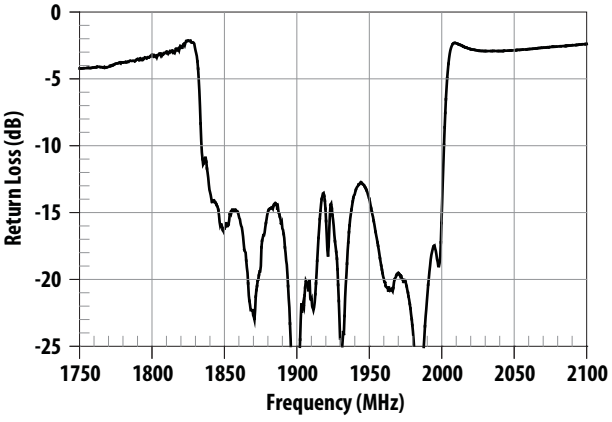


Figure 7. Antenna Port Return Loss

ACMD-4102 Typical Performance at T_c = 25° C. Includes Rx inductor [7]

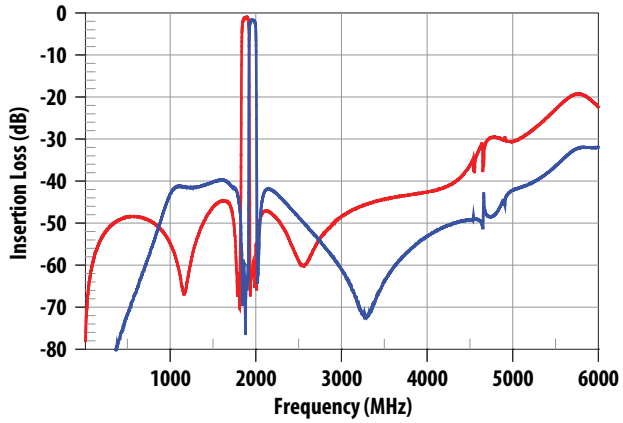


Figure 8. Tx–Ant and Ant–Rx Wideband Insertion Loss

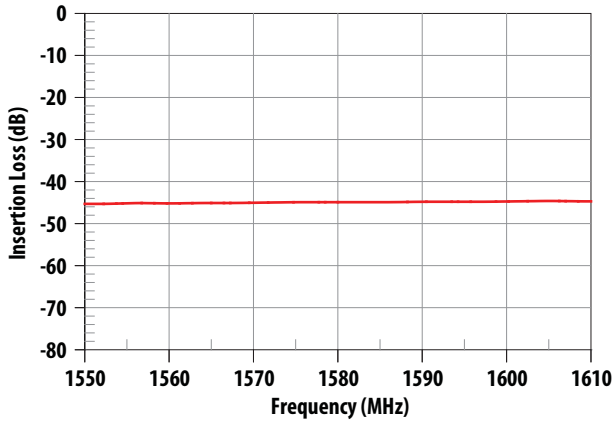


Figure 9. Tx–Ant Rejection in GPS/GLONASS Bands

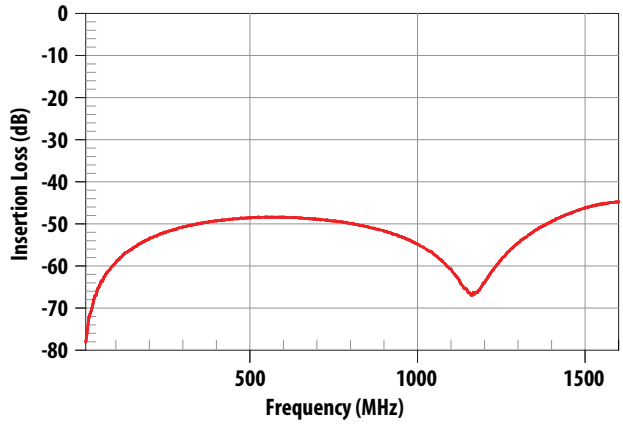


Figure 10. Tx–Ant Low Frequency Rejection

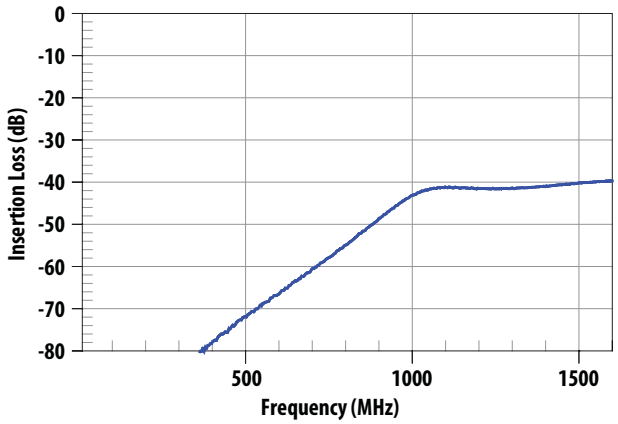


Figure 11. Ant–Rx Low Frequency Rejection

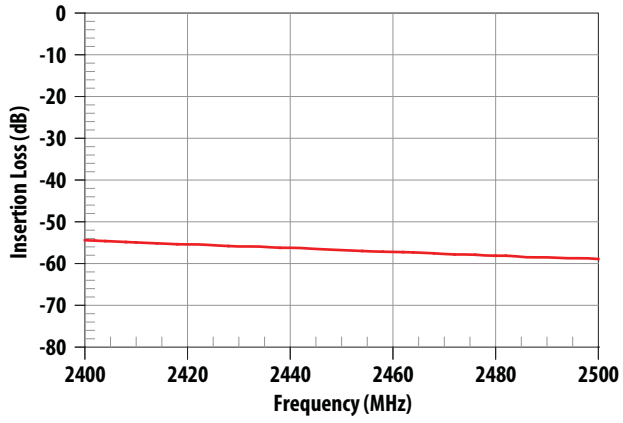


Figure 12. Tx–Ant Rejection in Bluetooth Band

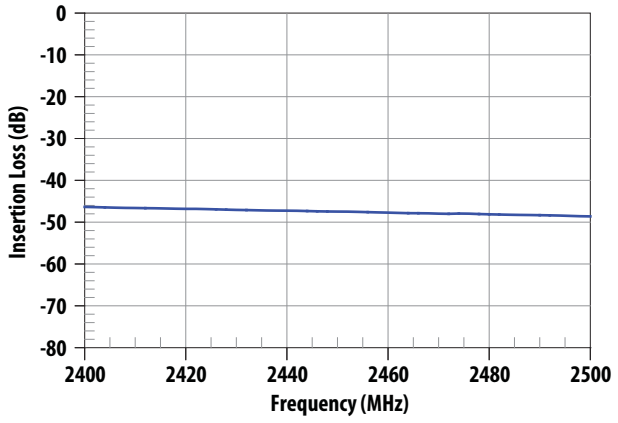


Figure 13. Ant–Rx Rejection in Bluetooth Band

ACMD-4102 Typical Performance at T_c = 25° C. Includes Rx inductor [7]

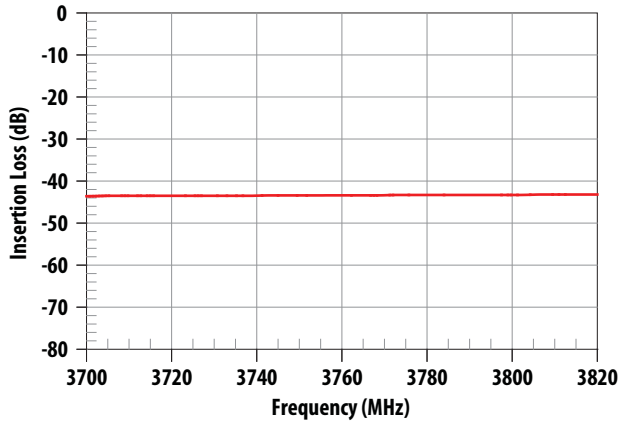


Figure 14. Tx–Ant Rejection at Tx Second Harmonic

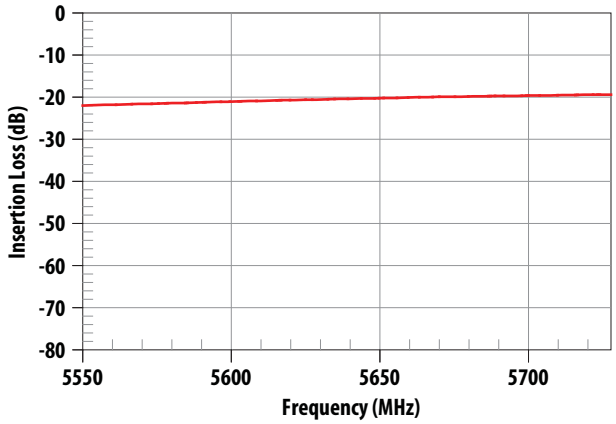


Figure 15. Tx–Ant Rejection at Tx Third Harmonic

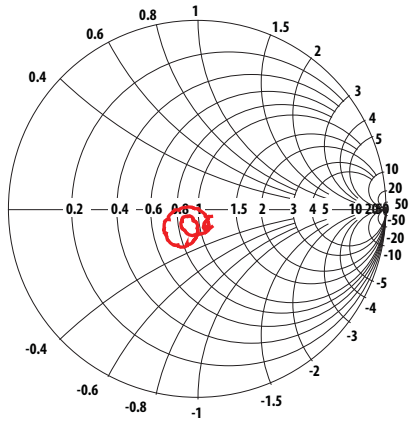


Figure 16. Tx Port Impedance in Tx Band

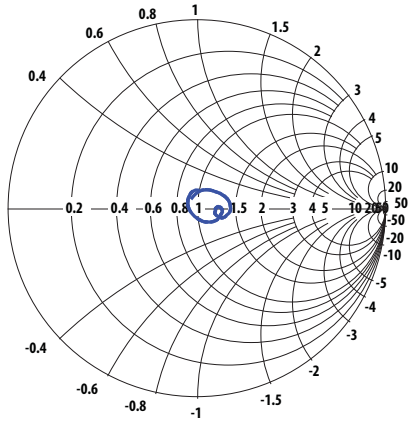


Figure 17. Rx Port Impedance in Rx Band (Zo = 150 ohms)

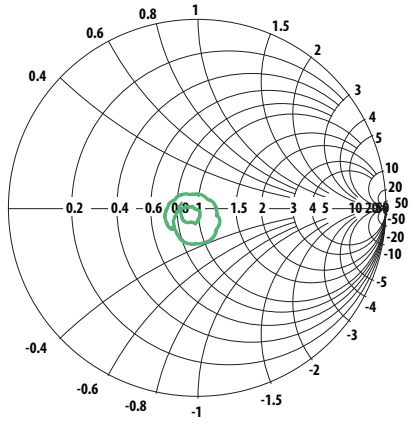


Figure 18. Ant Port Impedance in Tx Band

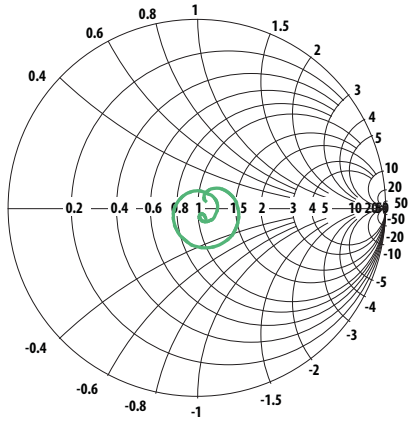


Figure 19. Ant Port Impedance in Rx Band

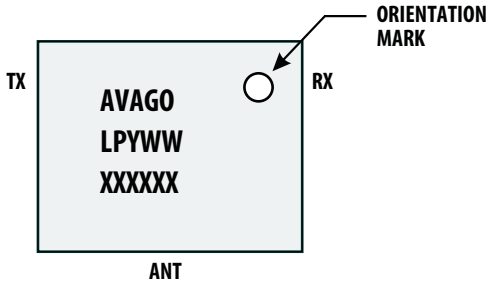
ACMD-4102
Absolute Maximum Ratings [1]

Parameter	Unit	Value
Storage temperature	°C	-65 to +125
Maximum RF Input Power to Tx Port	dBm	+33
Maximum DC Voltage (all terminals)	V	5.0

Maximum Recommended Operating Conditions [2]

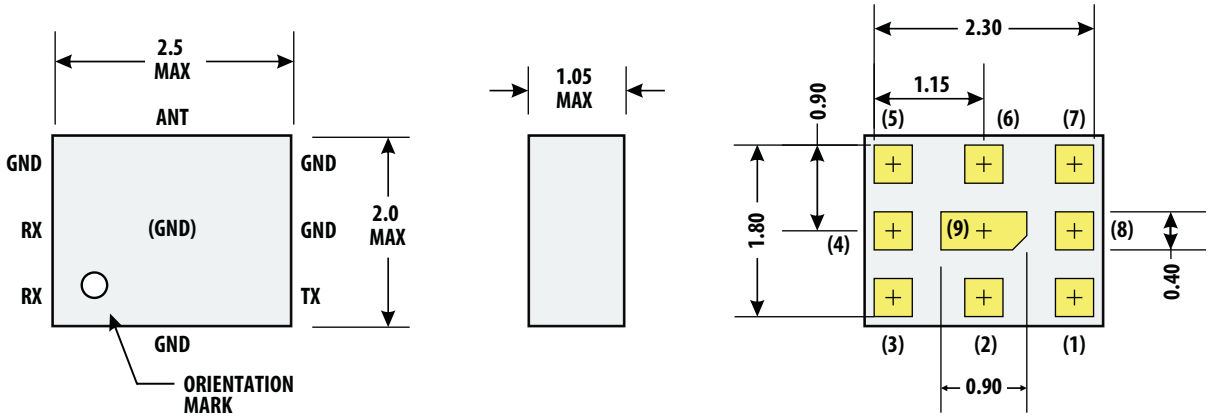
Parameter	Unit	Value
Operating temperature, Tc [3] , Tx Power ≤ 29 dBm, CW	°C	-40 to +100
Operating temperature, Tc [3] , Tx Power ≤ 30 dBm, CW	°C	-40 to +85

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 duplexer where it makes contact with the circuit board.



L = ACMD-4102
FI = Mfg Information
Y = Year
WW = Work Week
DD = Date Code
XXXX = Assembly Lot

Figure 20. Product Marking and Pin Orientation



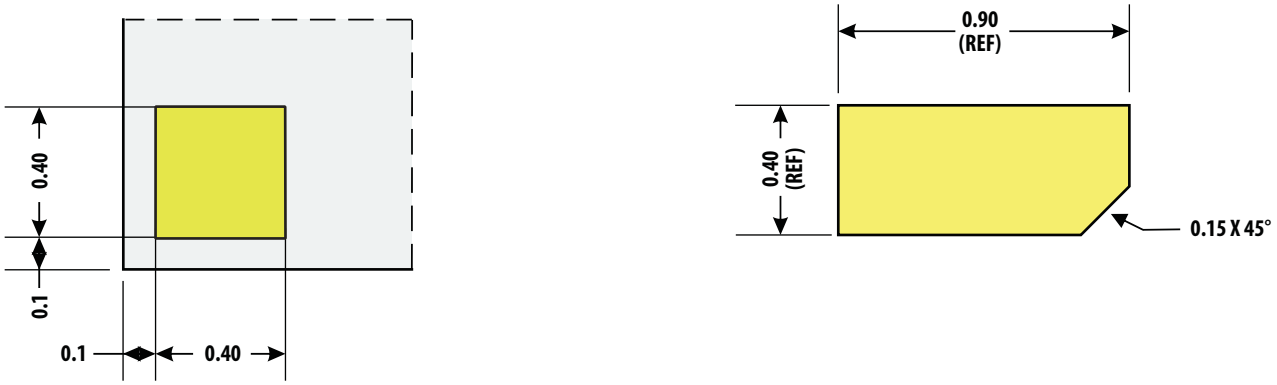
TOP VIEW **SIDE VIEW** **BOTTOM VIEW**

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 (4 ea)
   Size: 0.40 X 0.40 mm
   Spacing to ground metal: 0.30 mm
5. Contact areas are gold plated

Pin Connections:

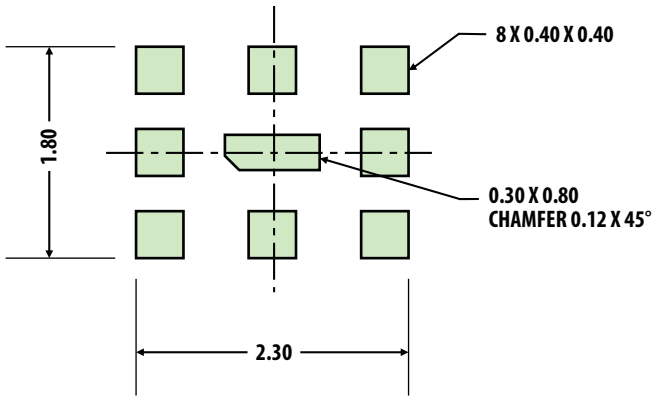
1	Rx
2, 4, 5, 7, 9	Gnd
3	Tx
6	Ant
8	Rx

Figure 21. Package Outline Drawing



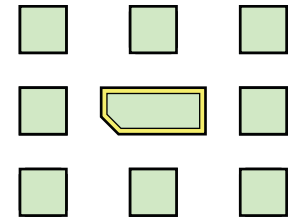
I/O & PERIPHERAL GND PADS **CENTER GROUND PAD**

Figure 22. Pad Detail



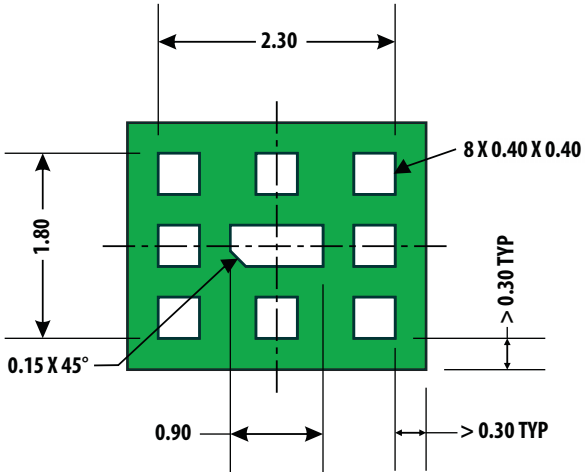
Notes:
1. Dimensions in mm
2. Top view
3. Chamfer or radius all corners 0.05 mm min

Figure 23. Recommended Solder Stencil



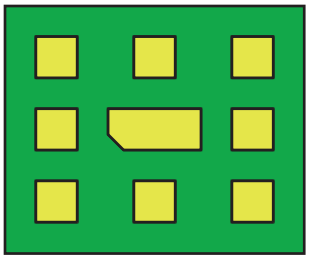
Notes:
1. Top view
2. Peripheral clearance of stencil aperture for center device pad is 0.05 mm. All other apertures match device pad 1:1

Figure 24. Solder Stencil Superposed on ACMD-4102 Foot Print



Notes:
1. Dimensions in mm
2. Top view

Figure 25. Recommended Solder Mask



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

Figure 26. Solder Mask Superposed on ACMD-4102 Foot Print

ACMD-4102

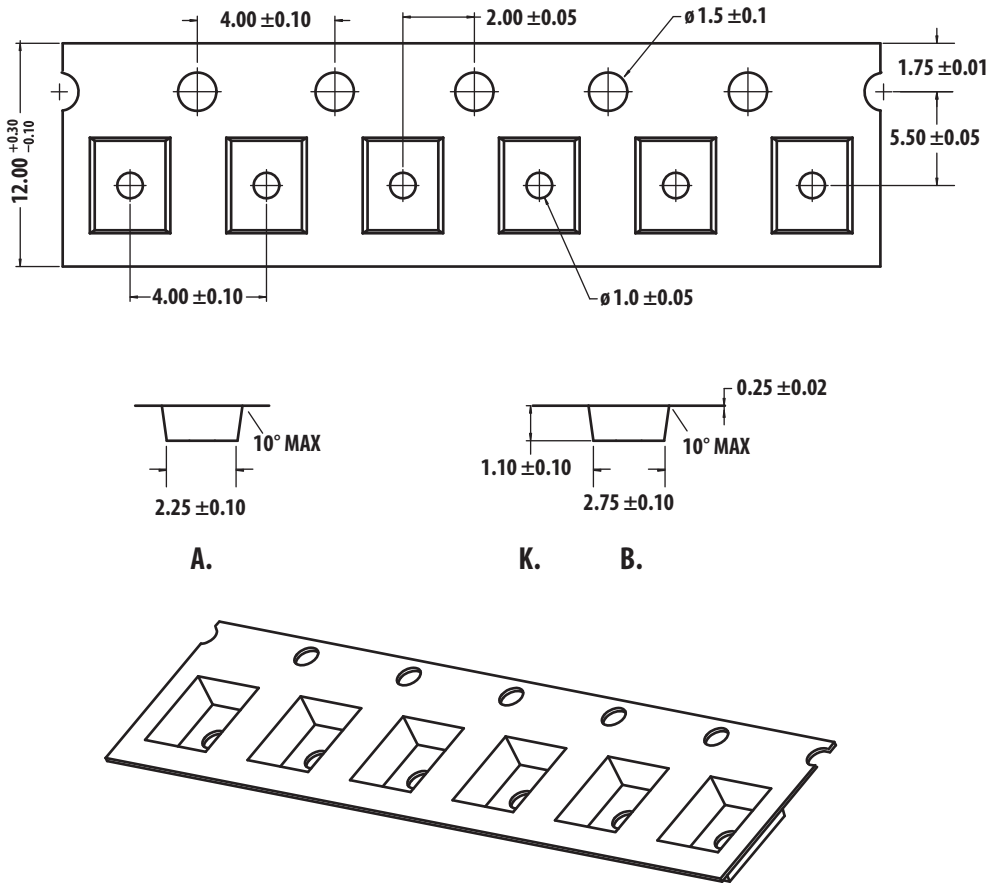


Figure 27. SMD Tape Packing (Dimensions for actual tape carrier may vary slightly)

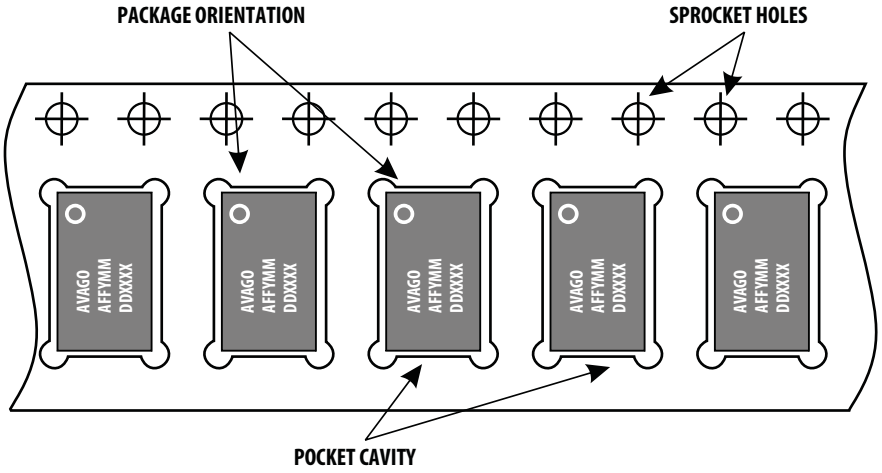
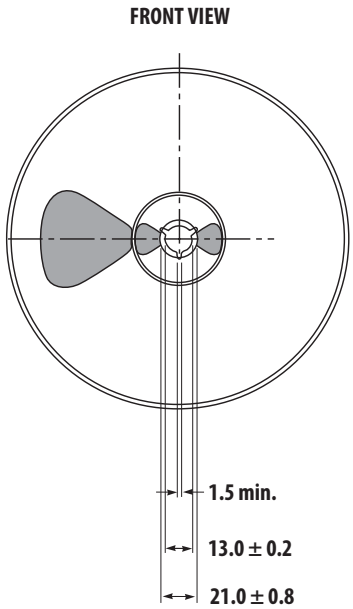


Figure 28. Unit Orientation in SMT Tape



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)

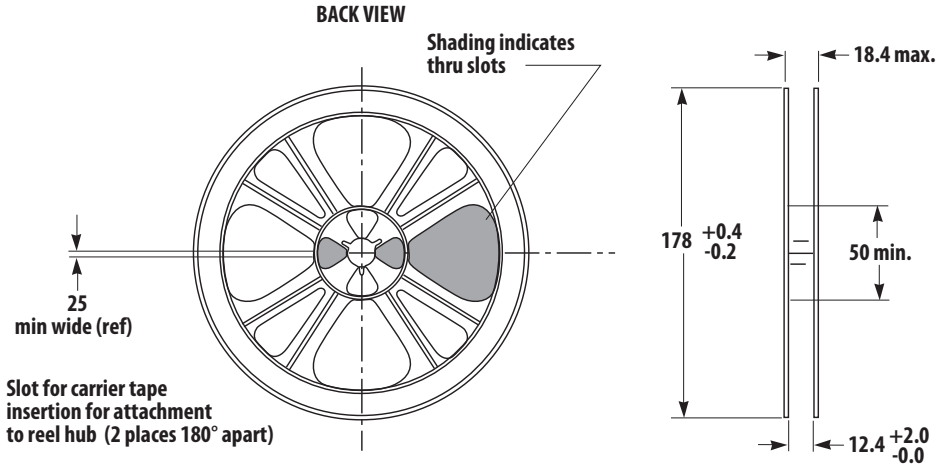


Figure 29. SMT Reel Drawing

ACMD-4102
Package Moisture Sensitivity

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

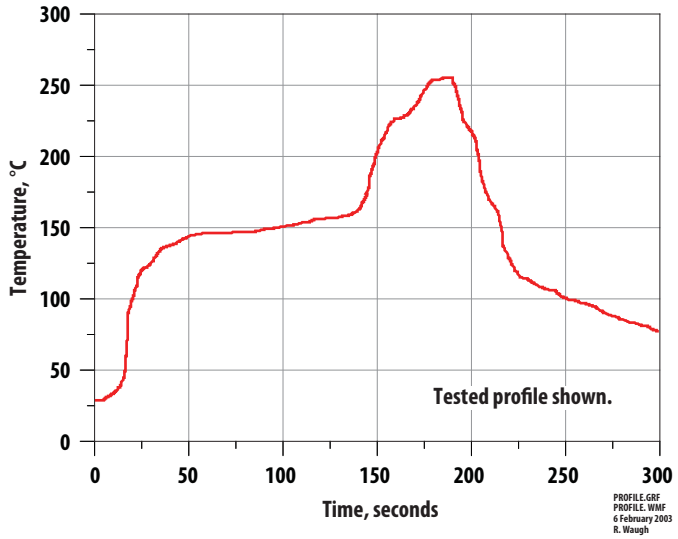


Figure 30. Verified SMT Solder Profile

Ordering Information

Part Number	No. of Devices	Container
ACMD-4102-BLK	100	Tape Strip or Anti-static Bag
ACMD-4102-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**

AV02-2862EN - July 27, 2011