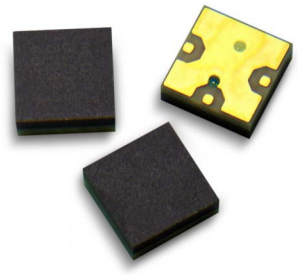
ACMD-7601
Miniature UMTS Band I Duplexer

Data Sheet



Description

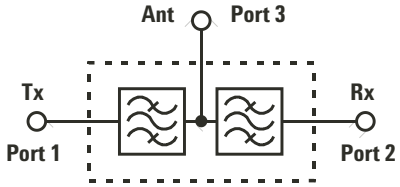
The Avago Technologies ACMD-7601 is a miniature duplexer designed for UMTS Band I handsets.

The ACMD-7601 is designed with Avago Technologies Film Bulk Acoustic Resonator (FBAR) technology, which makes possible ultra-small, high-Q filters at a fraction of their usual size.

The ACMD-7601 also utilizes Avago Technologies innovative Microcap bonded-wafer, chip scale packaging technology. This process allows the filters to be assembled in a molded chip-on-board module that is less than 1.3 mm high with a footprint of only 3.8 mm x 3.8 mm.

The ACMD-7601 enhances the sensi-tivity and dynamic range of UMTS Band I receivers by providing more than 51 dB attenuation of the transmitted signal at the receiver input and more than 45 dB rejection of transmit-generated noise in the receive band.

Functional Block Diagram



Maximum Insertion Loss in the Tx channel is only 1.6 dB, which minimizes current drain from the power amplifier. Insertion Loss in the Rx channel is a maximum of 2.0 dB, improving receiver sensitivity.

The excellent power handling capability of the FBAR bulk-mode resonators supports the high output power levels needed in UMTS Band I handsets while adding virtually no distortion.

Features

- Miniature Size
  3.8 x 3.8 mm footprint
  1.3 mm maximum height
- High Power Rating
  33 dBm Abs Max Tx Power
- Lead-Free Construction

Specifications

- Rx Band Performance, 2110-2170 MHz, –30 to +85°C
  - Rx Noise Blocking: 45 dB min
  - Insertion Loss: 2.0 dB max
- Tx Band Performance, 1920-1980 MHz, –30 to +85°C
  - Tx Interferer Blocking: 51 dB min
  - Insertion Loss: 1.6 dB max

Applications

- Handsets or data terminals operating in the UMTS band I

ACMD-7601 Electrical Specifications, Z_0=50 &!, T_C [1] as indicated

			-30 to +85°C [2]		
Symbol	**Parameter**	**Units**	**Min**	**Typ [3]**	**Max**
	Antenna Port to Receive Port				
S23	Insertion Loss in Receive Band (2110 - 2170 MHz)	dB		1.6	2.0
ΔS23	Ripple (p-p) in Receive Band	dB		0.4	1.0
ΔS23	Ripple (p-p) in any 5 MHz Channel within Receive Band	dB		–	0.5
S22	Return Loss of Receive Port in Receive Band	dB	10	15	
S23	Attenuation 0 - 1900 MHz [4]	dB	25	33	
S23	Attenuation in Transmit Band (1920 - 1980 MHz)	dB	51	66	
S23	Attenuation in Bluetooth Band (2400 - 2500 MHz) [4]	dB	37	46	
S23	Attenuation 2500 - 4150 MHz [4]	dB	15	31	
S23	Attenuation in Receive 2nd Harmonic Band (4220 - 4340 MHz) [4]	dB	15	31	
	Transmit Port to Antenna Port				
S31	Insertion Loss in Transmit Band (1920 - 1980 MHz)	dB		1.2	1.6
ΔS31	Ripple (p-p) in Transmit Band	dB		0.4	1.0
ΔS31	Ripple (p-p) in any 5 MHz Channel within Transmit Band	dB		–	0.5
S11	Return Loss of Transmit Port in Transmit Band	dB	10	13	
S31	Attenuation 0 - 1800 MHz [4]	dB	30	40	
S31	Attenuation in Receive Band (2110 - 2170 MHz)	dB	45	54	
S31	Attenuation in Bluetooth Band (2400 - 2500 MHz) [4]	dB	32	35	
S31	Attenuation in Transmit 2nd Harmonic Band (3840 - 3960 MHz) [4]	dB	20	28	
	Antenna Port				
S33	Return Loss of Antenna Port in Transmit and Receive Bands	dB	10	13	
	Isolation Transmit Port to Receive Port				
S21	Tx-Rx Isolation in Transmit Band (1920 - 1980 MHz)	dB	51	60	
S21	Tx-Rx Isolation in Receive Band (2110 - 2170 MHz)	dB	48	56	

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. Specifications are guaranteed over –30 to 85°C temperature range 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 25°C. Refer to “Characterization” section for measurement details.
4. Specification guaranteed at 25°C.

Absolute Maximum Ratings [1]

Parameter	Unit	Value
Storage temperature	°C	-65 to +125
Maximum RF Input Power to Tx Port	dBm	+33

Maximum Recommended Operating Conditions [2]

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

ACMD-7601 Typical Performance at Tc = 25°C.

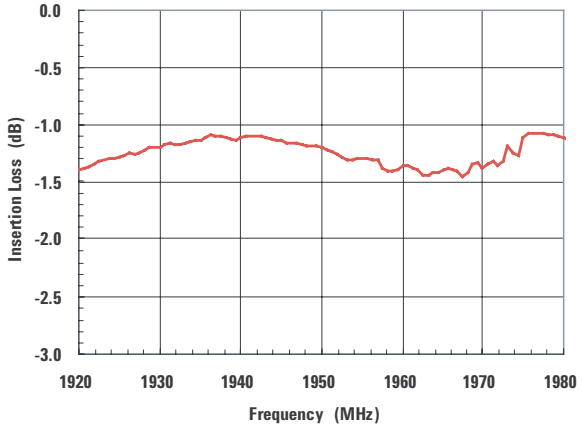


Figure 1. Tx Band Insertion Loss.

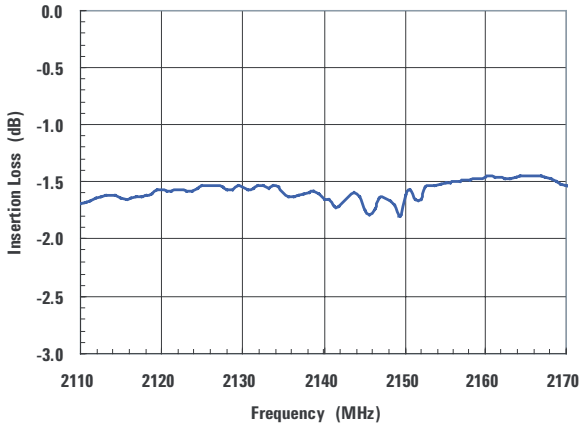


Figure 2. Rx Band Insertion Loss.

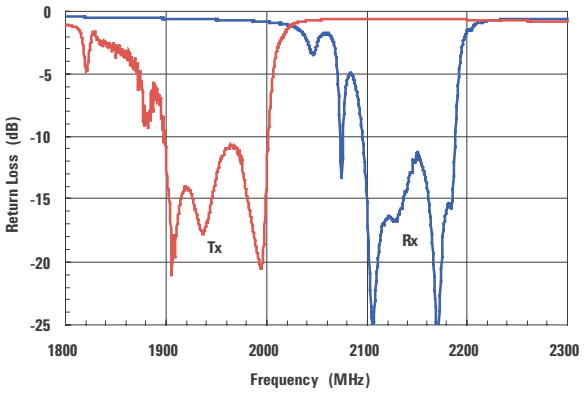


Figure 3. Tx and Rx Port Return Loss.

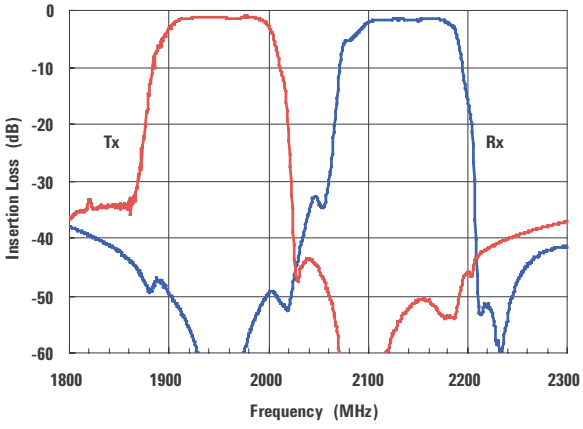


Figure 4. Tx Rejection in Rx Band and Rx Rejection in Tx Band.

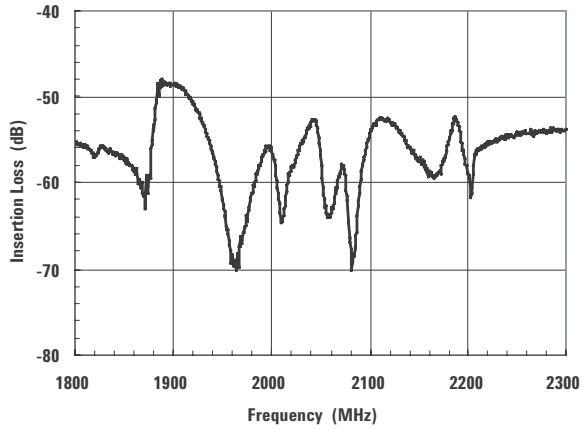


Figure 5. Tx to Rx Isolation.

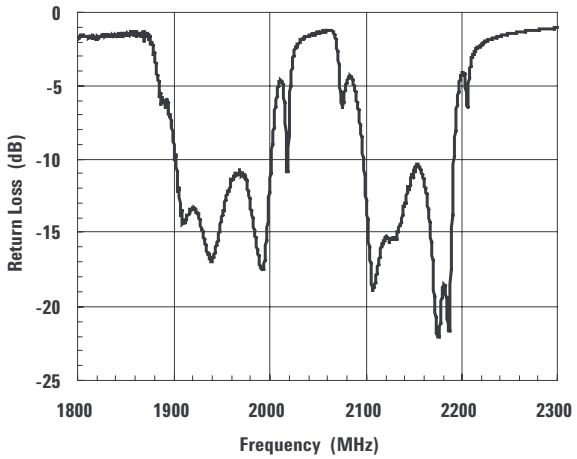


Figure 6. Antenna Port Return Loss.

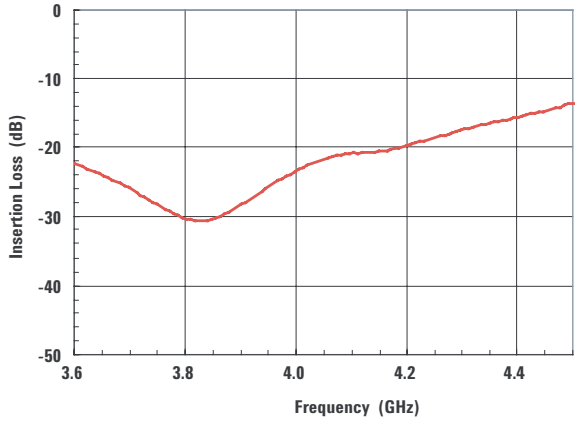


Figure 7. Tx Second Harmonic Rejection.

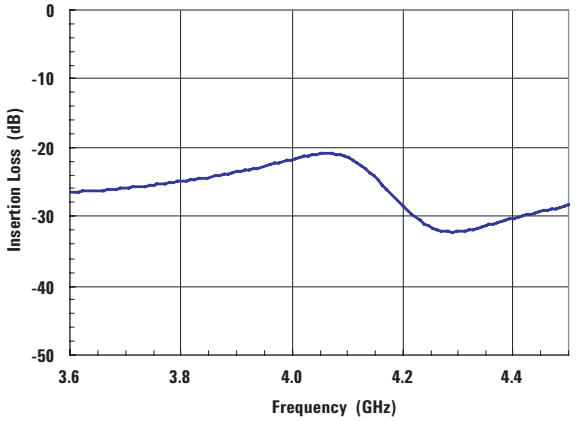


Figure 8. Rx Second Harmonic Rejection.

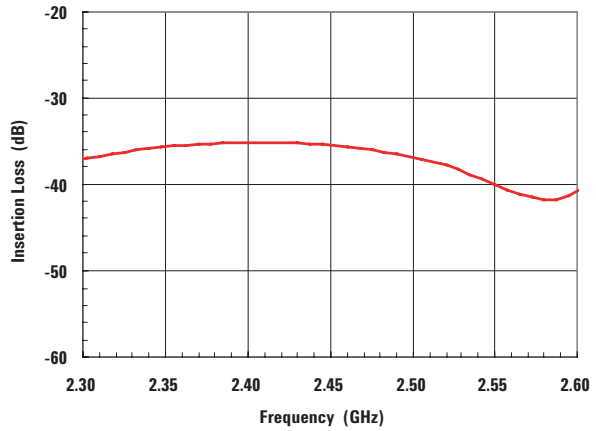


Figure 9. Tx Bluetooth Rejection, 2400–2500 MHz.

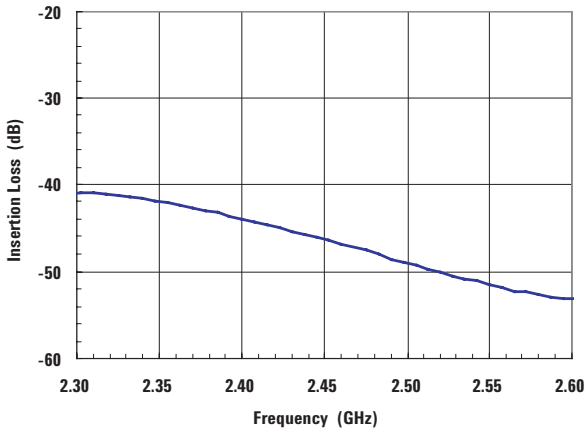


Figure 10. Rx Bluetooth Rejection, 2400–2500 MHz.

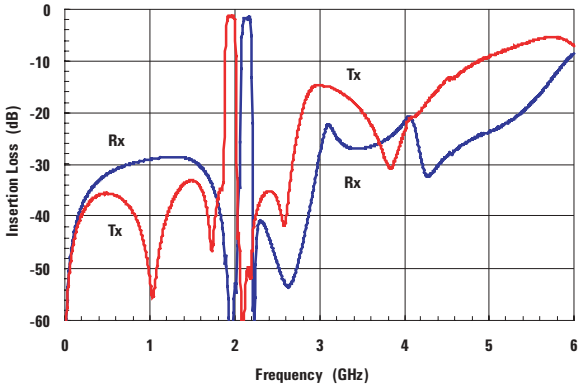


Figure 11. Tx and Rx Wideband Response.

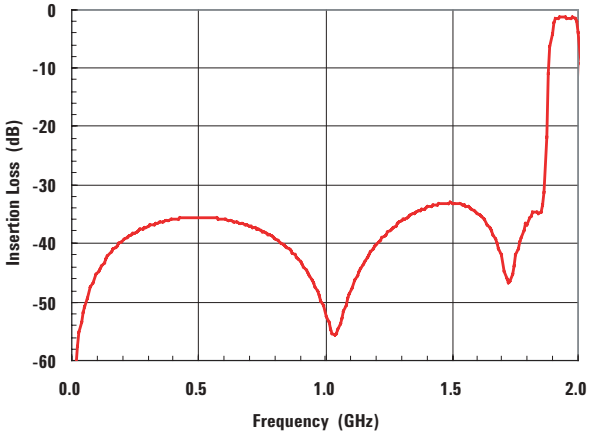


Figure 12. Tx Rejection, 0–1800 MHz.

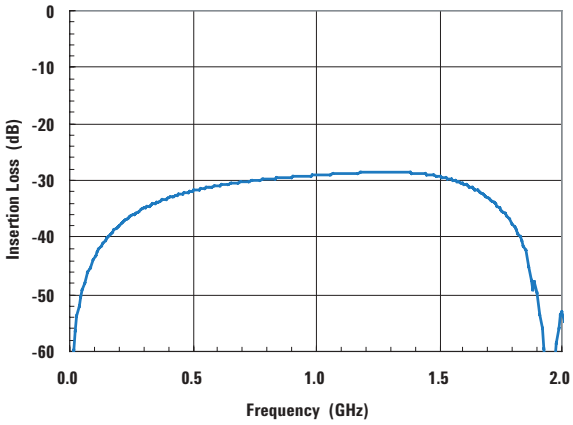


Figure 13. Rx Rejection, 0–1900 MHz.

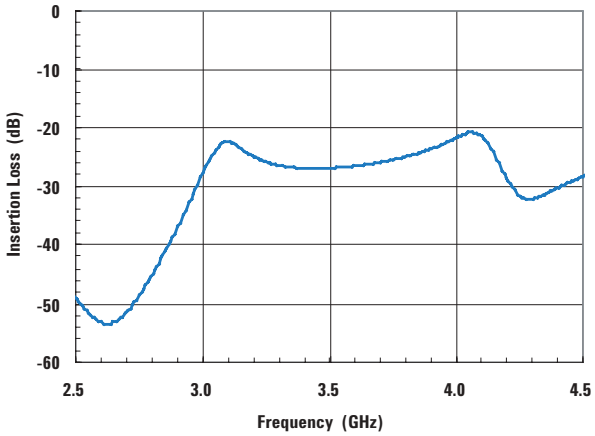


Figure 14. Rx Rejection, 2500–4150 MHz.

Characterization

The test circuit shown in Figure 15 was used to measure typical device performance. This circuit is designed to interface with coplanar Ground-Signal-Ground (GSG) RF probes of the type used to test semiconductor wafers.

The test circuit is a 7 x 7 mm PCB with a well-grounded pad to which the device under test (DUT) is solder-mounted.

Short lengths of 50-ohm microstripline connect the DUT to GSG probe patterns on the board.

A test circuit with the DUT mounted in place is shown in Figure 16. S-parameters are then measured using a network analyzer and calibrated GSG probe set.

Phase data for s-parameters measured with GSG probe circuits are adjusted to place the reference plane at the edge of the duplexer.

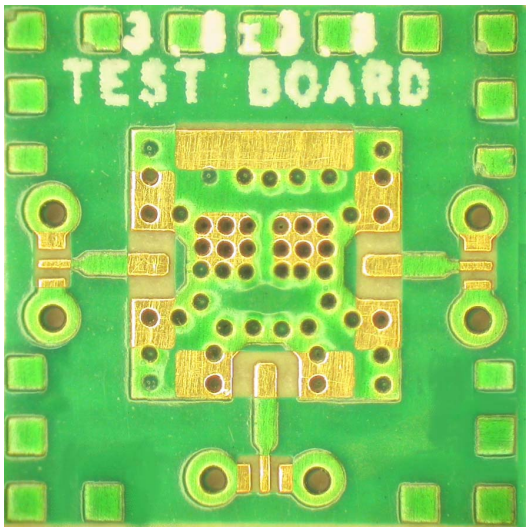


Figure 15. GSG Probe Test Circuit.

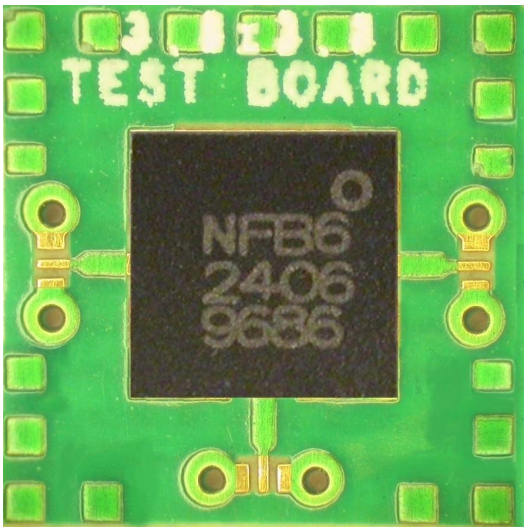
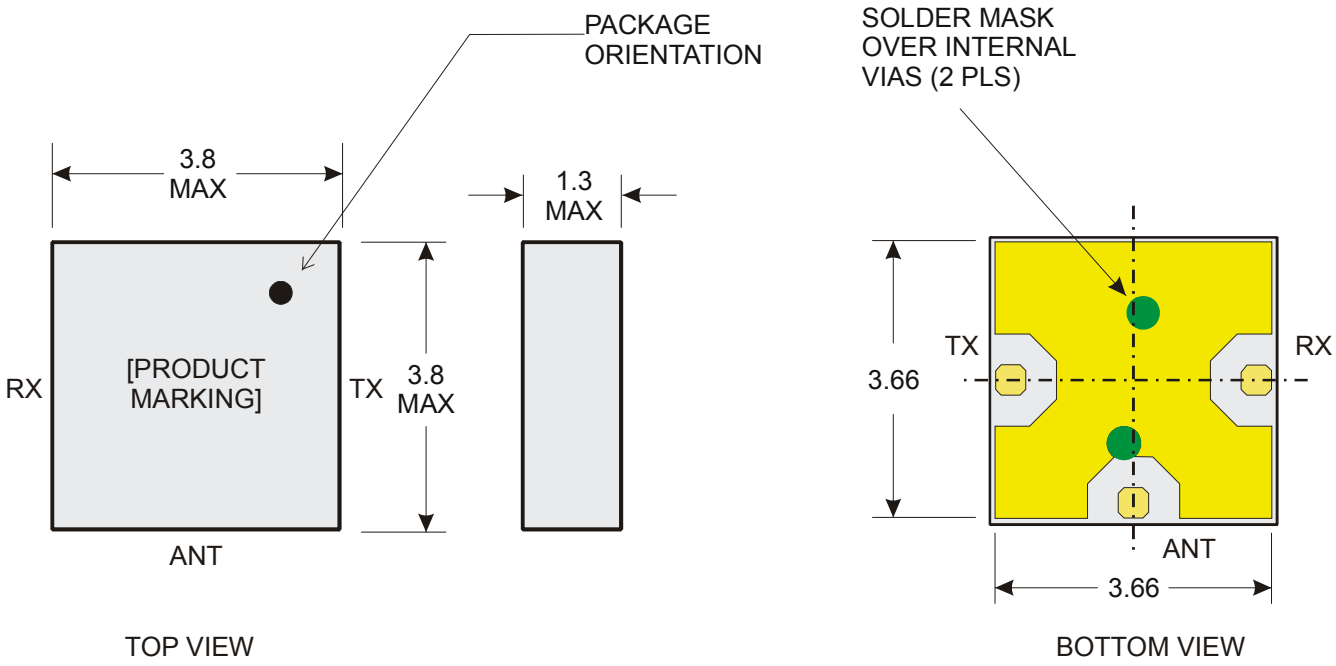


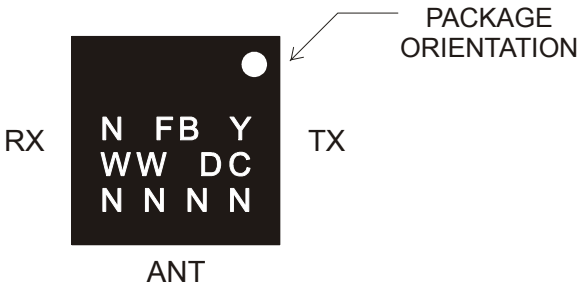
Figure 16. Test Circuit with Duplexer.



Notes:
1. Dimensions in millimeters
2. Dimensions nominal unless otherwise noted
3. Tolerance:
   X.X = ± 0.1
   X.XX = ±0.05
4. I/O pads (3 ea)
   Size: 0.40 x 0.40
   Spacing to ground plane: 0.40
   Ground inside corner chamfers: 0.35 x 0.35
5. Contact areas are gold plated
6. Internal vias (2 ea) shown for reference only; covered with Ø 0.51 mm solder mask

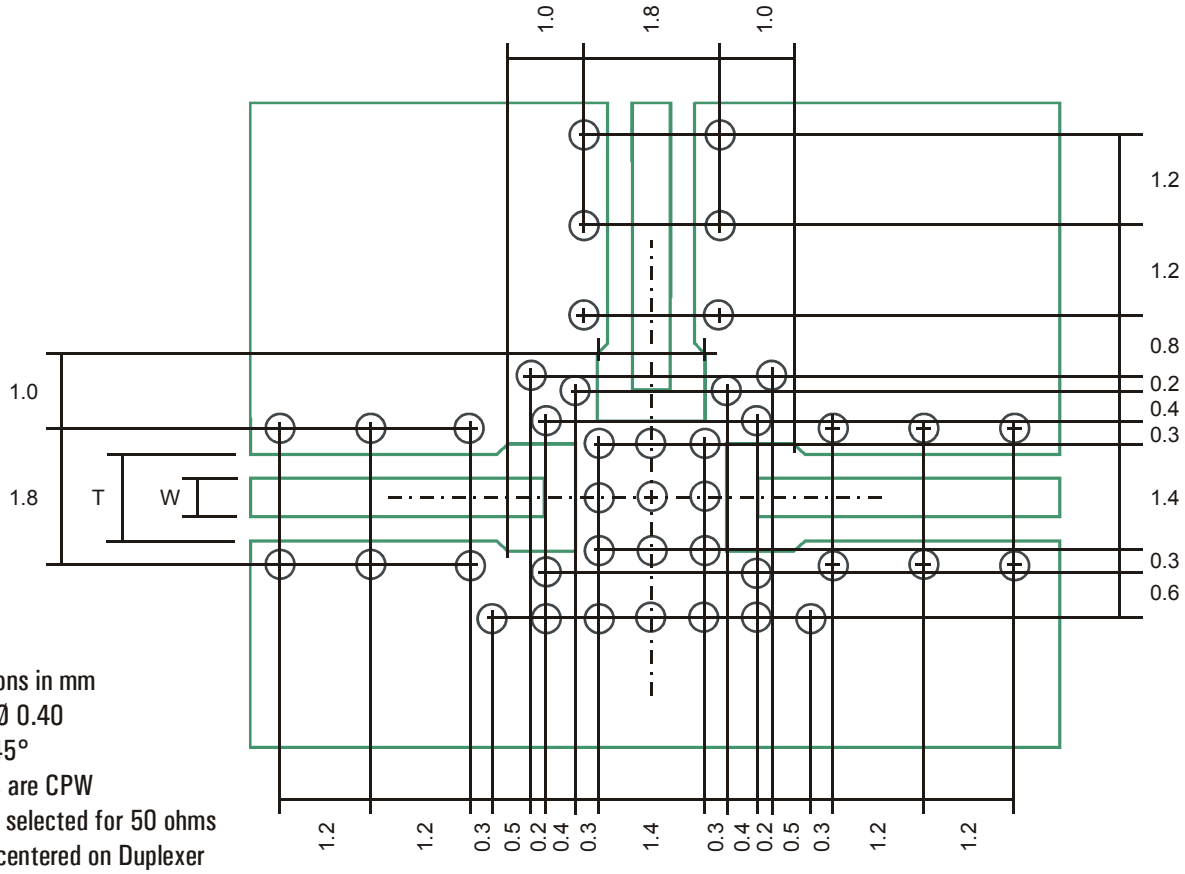
Lead Free

Figure 17. Package Outline Drawing.



N = ACMD-7601
FB = Avago ID
Y = Year
WW = Work Week
DC = Date Code
NNNN = Lot Number

Figure 18. Product Marking.



Notes:

Dimensions in mm
All vias Ø 0.40
Angles 45°
RF ports are CPW
T and W selected for 50 ohms
Pattern centered on Duplexer

Figure 19. Recommended PCB Land Print.

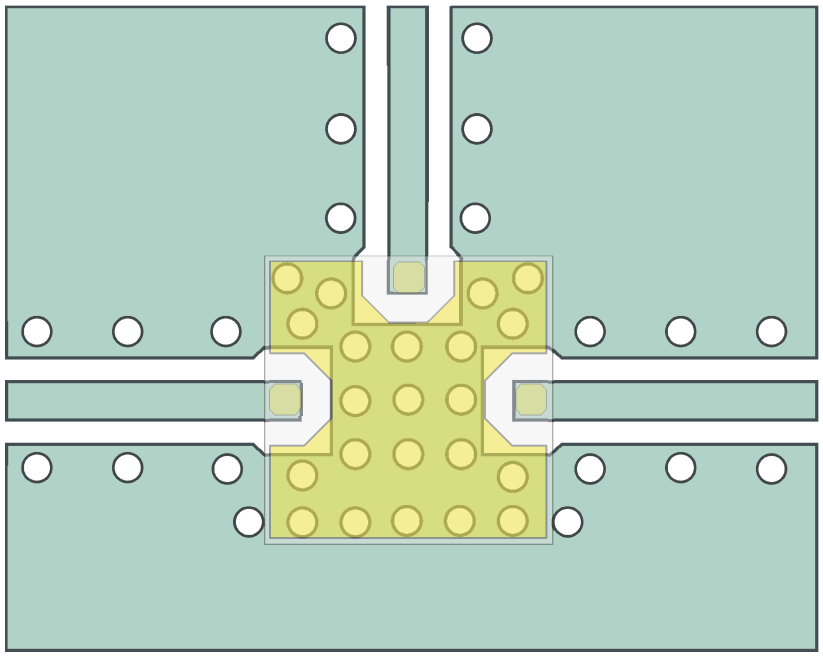
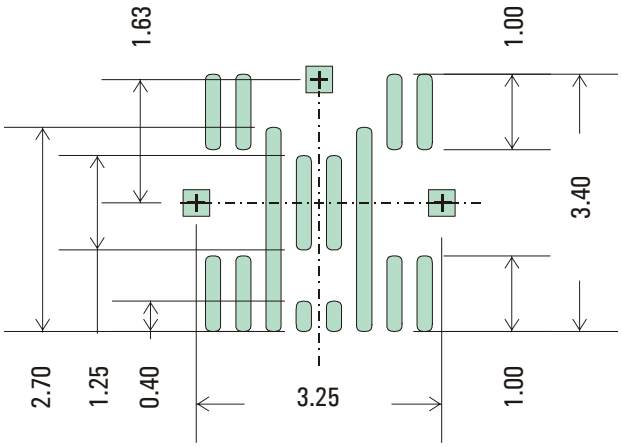


Figure 20. Duplexer Superposed on PCB Land Print.



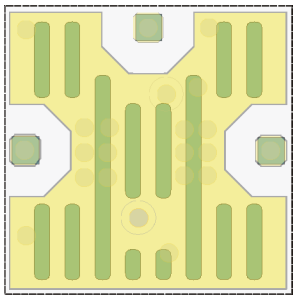


Figure 22. Duplexer Superposed on Solder Stencil.

Notes:

Dimensions in mm

Solder stripes (14 pls) are 0.20 wide, pitch = 0.40

Solder pads for I/O are 0.35 X 0.35

Stencil pattern is centered on duplexer

Figure 21. Recommended Solder Stencil.

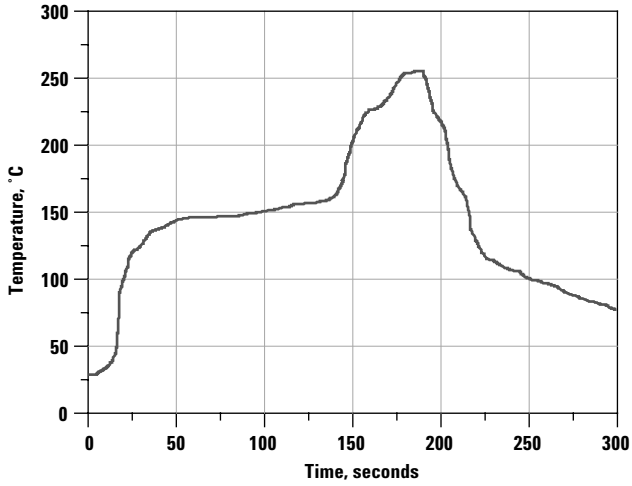


Figure 23. Verified SMT Solder Profile.

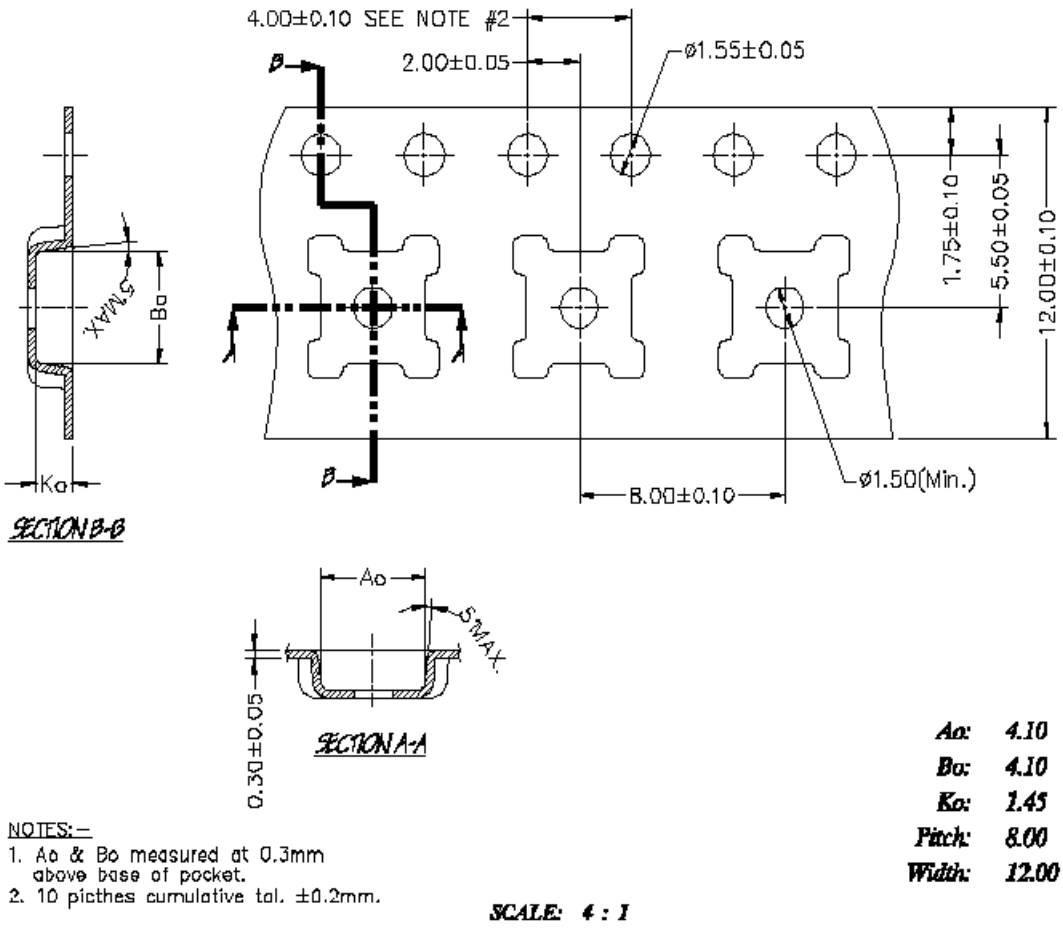


Figure 24. SMD Tape Packing.

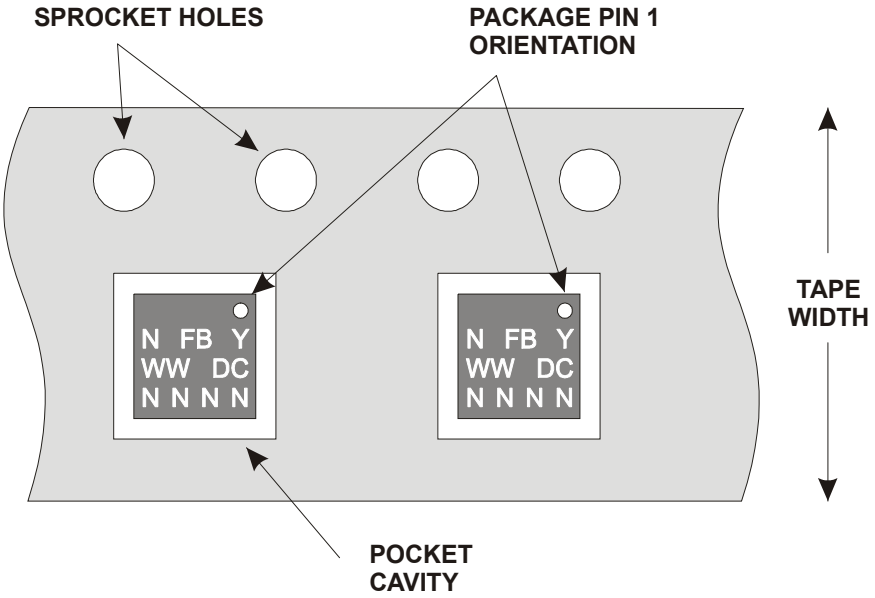


Figure 25. Unit Orientation In Tape.

Ordering Information

Part Number	No. of Devices	Container
ACMD-7601-BLK	25	Anti-static Bag
ACMD-7601-TR1	1000	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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