# ACMD-7606 UMTS Band 8 Duplexer

# **Data Sheet**





# Description

The Avago ACMD-7606 is a highly miniaturized duplexer designed for use in UMTS Band 8 (880 – 915 MHz UL, 925 – 960 MHz DL) handsets and mobile data terminals.

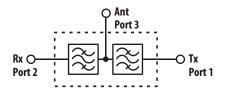
Low Insertion Loss in the Tx channel minimizes current drain from the power amplifier, while low Rx channel Insertion Loss improves receiver sensitivity.

The ACMD-7606 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-7606 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-7606 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 maximum size of 2.0 x 2.5 mm and maximum height of 0.95 mm. The ACMD-7606 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
  - 31 dBm Abs Max Tx Power
- Environmental
  - RoHS Compliant
  - Halogen free
  - TBBPA Free

## **Specifications**

- Rx Band Performance, -20 to +85°C
  - Insertion Loss: 3.0 dB Max
  - Rx Noise Blocking: 50 dB Min
- Tx Band Performance, -20 to +85°C
  - Insertion Loss: 2.7 dB Max
  - Tx Interferer Blocking: 55 dB Min

### **Applications**

Handsets or data terminals operating in the Band 8 frequency range.



			–20°C			+25°C	+25°C		+85°C		
Symbol	Parameter	Units	Min	<b>Typ</b> [3]	Мах	Min	<b>Typ</b> [3]	Мах	Min	<b>Typ</b> <sup>[3]</sup>	Мах
	Antenna Port to Receive Port										
S23	Insertion Loss in Receive Channels <sup>[4]</sup> (927.4 – 957.6 MHz)	dB			3.0		2.2	3.0			3.0
S22	Return Loss (SWR) of Receive Port in Receive Band	dB	8.5		(2.2)	8.5	10 (1.9)	(2.2)	8.5		(2.2)
S23	Attenuation in Transmit Band (880 – 915 MHz)	dB	45			45	55		45		
S23	Attenuation, 0 – 835 MHz	dB	28			28	32		28		
S23	Attenuation, 835 – 870 MHz	dB	30			30	32		30		
S23	Attenuation, 1805 – 1875 MHz	dB	35			35	37		35		
S23	Attenuation in Bluetooth Band (2400 – 2483.5 MHz)	dB	30			30	40		30		
S23	Attenuation, 2685 – 2790 MHz	dB	22			22	27		22		
	Transmit Port to Antenna Port										
\$31	Insertion Loss in Transmit Channels <sup>[4]</sup> (882.4 – 912.6 MHz)	dB			2.7		2.2	2.7			2.7
S11	Return Loss (SWR) of Transmit Port in Transmit Band	dB	8.5		(2.2)	8.5	10 (1.9)	(2.2)	8.5		(2.2)
\$31	Attenuation in Receive Band (925 – 960 MHz)	dB	44			44	56		44		
S31	Attenuation, 0 – 820 MHz	dB	32			32	39		32		
S31	Attenuation in GPS Rx Band (1574.42 – 1576.42 MHz)	dB	27			27	30		27		
S31	Attenuation in Transmit 2 <sup>nd</sup> Harmonic Band (1760 – 1830 MHz)	dB	25			25	30		25		
\$31	Attenuation in Bluetooth Band (2400 – 2483.5 MHz)	dB	27			27	30		27		
S31	Attenuation, 2640 – 2745 MHz	dB	22			22	30		22		
	Antenna Port										
\$33	Return Loss (SWR) of Ant Port in Rx Band (925 – 960 MHz)	dB	8.5		(2.2)	8.5	10 (1.9)				
S33	Return Loss (SWR) of Ant Port in Tx Band (880 – 915 MHz)	dB	8.5		(2.2)	8.5	10 (1.9)				
	Isolation Transmit Port to Receive Port										
S21	Tx-Rx Isolation in Receive Band (925 – 960 MHz)	dB	50			50	55				
S21	Tx-Rx Isolation in Transmit Band (880 – 915 MHz)	dB	52			52	60				

# ACMD-7606 Electrical Specifications <sup>[2]</sup>, $Z_0$ =50 $\Omega$ , $T_C$ <sup>[1]</sup> as indicated

Notes:

1. T<sub>C</sub> 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.

## Absolute Maximum Ratings<sup>[1]</sup>

Parameter	Unit	Value	
Storage temperature	°C	-65 to +125	
Maximum RF Input Power to Tx Port	dBm	+31	

# Maximum Recommended Operating Conditions<sup>[2]</sup>

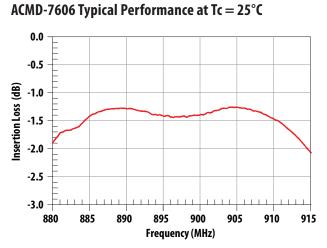
Parameter	Unit	Value
Operating temperature, $T_C$ <sup>[3]</sup> , Tx Power $\leq$ 29 dBm	°C	-40 to +100
Operating temperature, $T_C$ <sup>[3]</sup> , Tx Power $\leq$ 30 dBm	°C	-40 to +85

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<sub>C</sub> is defined as case temperature, the temperature of the underside of the duplexer where it makes contact with the circuit board.



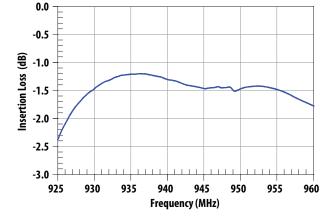


Figure 1. Tx–Ant Insertion Loss

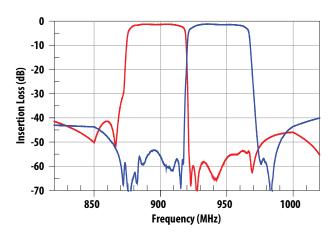


Figure 3. Tx Rejection in Rx Band and Rx Rejection in Tx Band

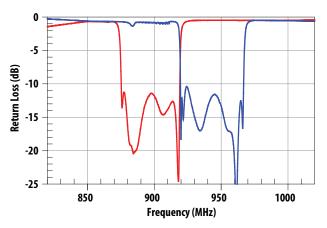


Figure 5. Tx and Rx Port Return Loss

Figure 2. Ant–Rx Insertion Loss

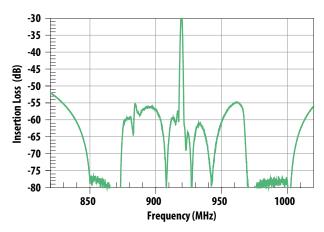


Figure 4. Tx–Rx Isolation

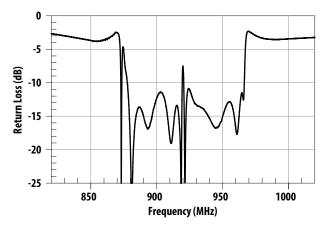
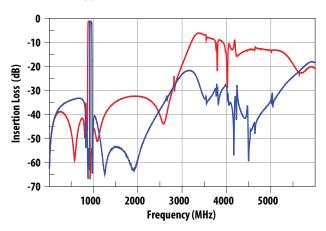
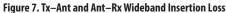
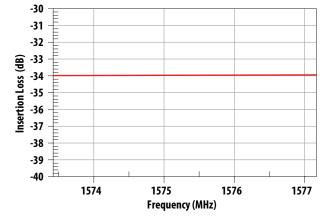


Figure 6. Antenna Port Return Loss











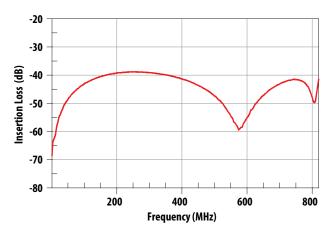


Figure 9. Tx–Ant Low Frequency Rejection, 1 – 820 MHz

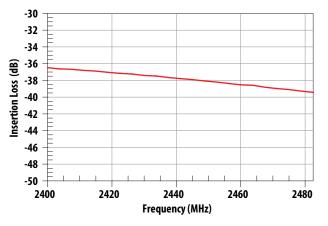


Figure 11. Tx-Ant Rejection in Bluetooth Band

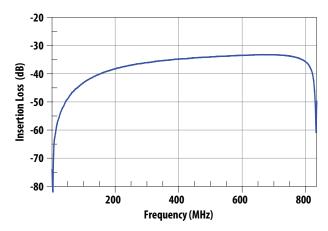


Figure 10. Ant-Rx Low Frequency Rejection, 1 – 835 MHz

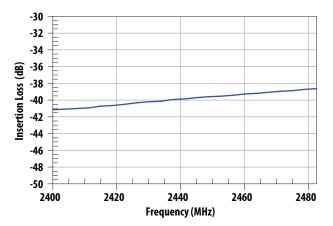


Figure 12. Ant-Rx Rejection in Bluetooth Band

# ACMD-7606 Typical Performance at $Tc = 25^{\circ}C$

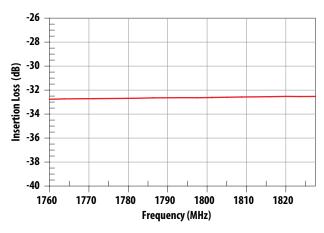


Figure 13. Tx–Ant Rejection at Tx Second Harmonic

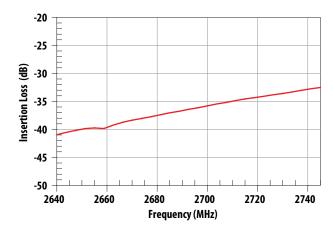


Figure 14. Tx-Ant Rejection, 2640 – 2745 MHz

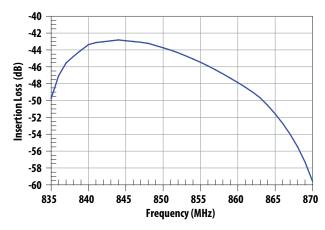


Figure 15. Ant-Rx Rejection, 835 -870 MHz

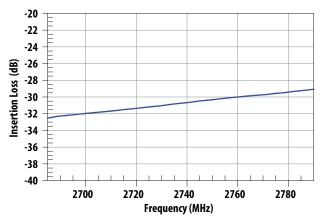


Figure 17. Ant-Rx Rejection, 2685 –2790 MHz

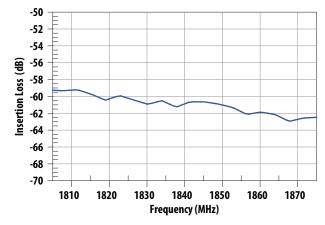


Figure 16. Ant-Rx Rejection, 1805 –1875 MHz

# ACMD-7606 Typical Performance at $Tc = 25^{\circ}C$

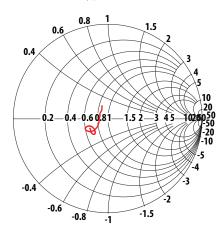


Figure 18. Tx Port Impedance in Tx Band

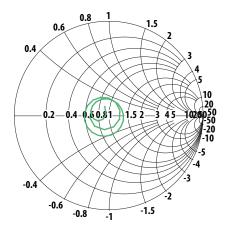


Figure 20. Ant Port Impedance in Tx Band

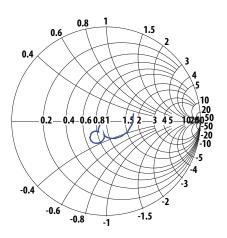


Figure 19. Rx Port Impedance in Rx Band

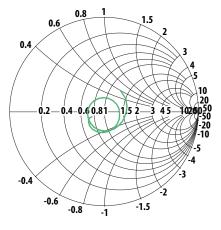
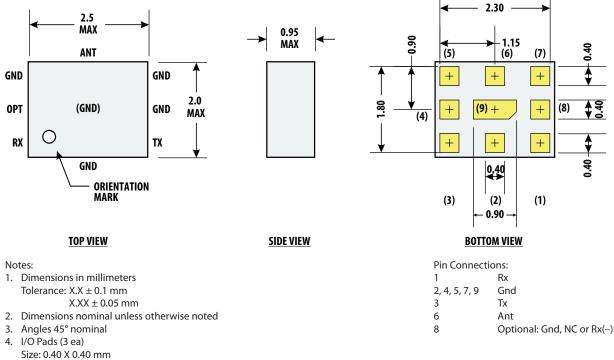
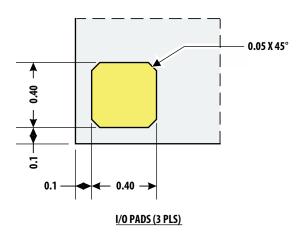


Figure 21. Ant Port Impedance in Rx Band



- Spacing to ground metal: 0.30 mm
- 5. Contact areas are gold plated

### Figure 22. Package Outline Drawing

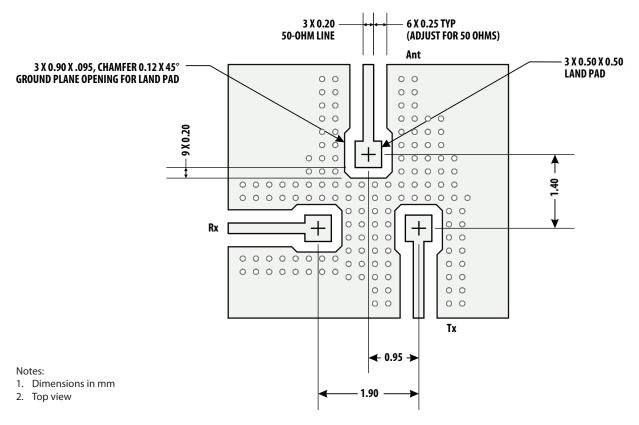


(REF)

0.90

**CENTER GROUND PAD** 

Figure 23. Pad Detail



#### Figure 24. Suggested PCB Layout

A PCB layout using the principles illustrated in the figure above is recommended to optimize performance of the ACMD-7606.

The transmission line dimensions shown are designed to achieve an impedance of 50 ohms for an  $80\mu$ m 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-7606 mounting area are also needed to provide adequate heat sinking for the device.

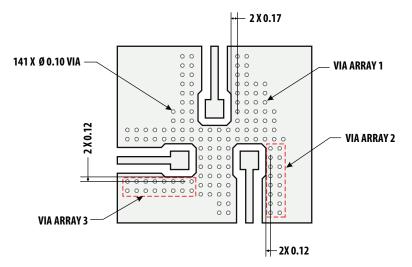


Figure 25. PCB Layout, Via Detail

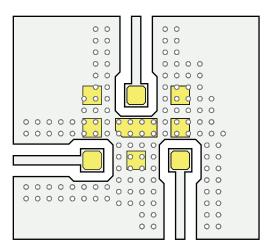
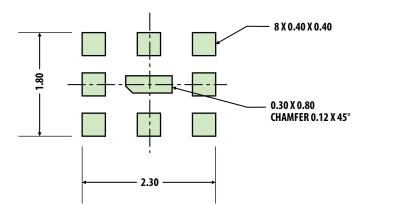
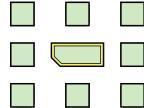


Figure 26. ACMD-7606 Superposed on PCB Layout





Notes:

Note:

1. Top view

- 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 27. Recommended Solder Stencil

3. Chamfer or radius all corners 0.05 mm min

Notes:

2. Top view

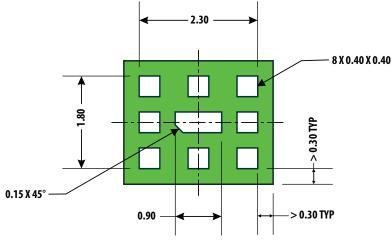
Figure 28. Solder Stencil Superposed on ACMD-7606

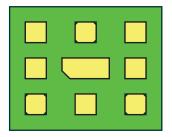
# Downloaded from Elcodis.com electronic components distributor

1. Dimensions in mm

Notes:

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





Notes:

- 1. Dimensions in mm
- 2. Top view



2. Mask apertures match device pads 1:1





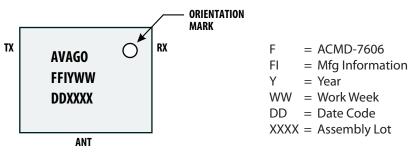


Figure 31. Product Marking and Pin Orientation

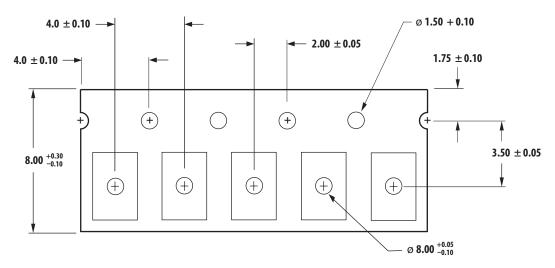


Figure 32. SMD Tape Packing

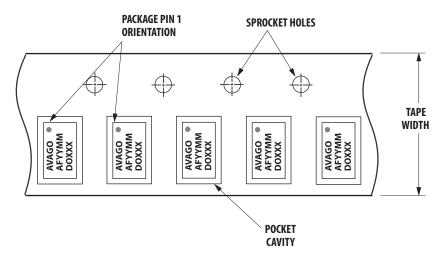
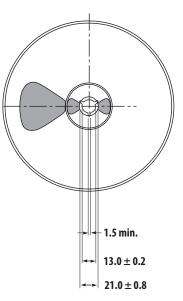


Figure 33. Unit Orientation in SMT Tape





NOTES:

- 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)

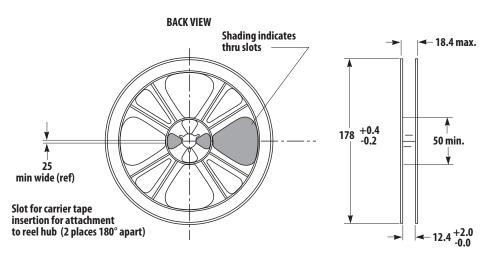


Figure 34. SMT Reel Drawing

## Package Moisture Sensitivity

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

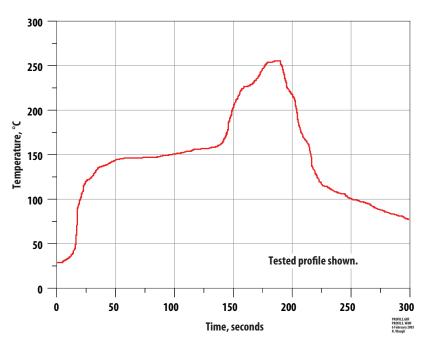


Figure 35. Verified SMT Solder Profile

#### **Ordering Information**

Part Number	No. of Devices	Container		
ACMD-7606-BLK	100	Anti-static Bag		
ACMD-7606-TR1	3000	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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