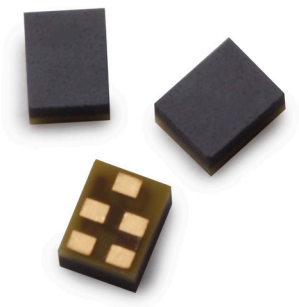
ACFF-1024

ISM Bandpass Filter (2401 – 2482 MHz)

Data Sheet

Lead (Pb) Free
RoHS 6 fully
compliant



Description

The Avago ACFF-1024 is a miniaturized Bandpass Filter designed for use in the 2.4 GHz Industrial, Scientific and Medical (ISM) band.

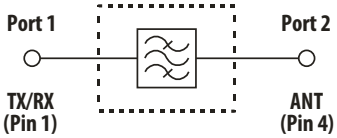
The ACFF-1024 is designed to enable concurrent operation of Wireless LAN and Bluetooth applications that coexist with other wireless standards, such as 2.5 GHz WiMAX, PCS, and LTE Bands 7 and 40, without performance degradations due to interference.

The ACFF-1024 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 ACFF-1024 also utilizes Avago Technologies' advanced Microcap bonded-wafer technology. This chip scale miniaturization process results in a package size of only 1.4 x 1.1 mm and maximum height of 0.80 mm.

The ACFF-1024 is compatible with high volume, lead-free SMT soldering processes and can be direct surface mounted to a PCB or a transfer molded module.

Functional Block Diagram



Features

- 50 Ω Input/Output
- No external matching required
- Low Insertion Loss, High Interference Rejection
  - Enables concurrent use of other 2.5 GHz Bands
- Subminiature Size
  - 1.1 x 1.4 mm Footprint
  - 0.80 mm Max Height
- High Power Rating
  - +27 dBm Abs Max Input Power
- Environmental
  - RoHS 6 Compliant
  - Halogen free
  - TBBPA Free

Specifications

- Performance guaranteed –30 °C to +85 °C
- Low Insertion Loss
- High Interferer Rejection

Applications

802.11 b/g/n WLAN or Bluetooth datacom in handsets, mobile and portable communications devices.

ACFF-1024 Electrical Specifications [2], $Z_0 = 50\ \Omega$, T_c [1] –30 °C to +85 °C, unless otherwise specified

Symbol	Parameter	Units	Min	Typ [3]	Max
S21	Insertion Loss [4]	dB			
	2402.5 – 2421.5 MHz (Wi-Fi Ch 1)			1.6	2.6
	2407.5 – 2426.5 MHz (Wi-Fi Ch 2)			1.4	2.2
	2412.5 – 2471.5 MHz (Wi-Fi Ch 3 – 11)			1.3	2.0
	2457.5 – 2476.5 MHz (Wi-Fi Ch 12)			1.5	2.1
	2462.5 – 2481.5 MHz (Wi-Fi Ch 13)			1.7	3.0
ΔS21	Amplitude Ripple (p-p) [4], +25 °C	dB			
	2402.5 – 2421.5 MHz (Wi-Fi Ch 1)			1.0	
	2407.5 – 2426.5 MHz (Wi-Fi Ch 2)			0.8	
	2412.5 – 2471.5 MHz (Wi-Fi Ch 3 – 11)			0.7	
	2457.5 – 2476.5 MHz (Wi-Fi Ch 12)			0.6	
	2462.5 – 2481.5 MHz (Wi-Fi Ch 13)			1.0	
S21	Attenuation, 800 – 2300 MHz	dB	45	54	
S21	Attenuation [5] in LTE Band 40, 2300 – 2365 MHz	dB	50	53	
S21	Attenuation [5] in LTE Band 40, 2365 – 2370 MHz	dB			
	–30 °C to +25 °C		50	58	
	+25 °C to +55 °C		43	58	
	+55 °C to +85 °C		30	53	
S21	Attenuation [5] in LTE Band 7 (WiMAX), 2500 – 2505 MHz	dB			
	–30 °C to –10 °C		42	56	
	–10 °C to +25 °C		52	59	
	+25 °C to +85 °C		55	64	
S21	Attenuation [5] in LTE Band 7 (WiMAX), 2505 – 2690 MHz	dB	57	67	
S21	Attenuation [5] in LTE Band 38, 2570 – 2620 MHz	dB	55	68	
S21	Attenuation, 2690 – 7500 MHz	dB	40	55	
2H	2nd Harmonic Level, CW Tone, 2442 MHz, 22.5 dBm at Port 1	dBc	57	67	
S11, S22	Return Loss (SWR), 2402.5 – 2481.5 MHz, +25 °C	dB	9	16 (1.4)	(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, unless otherwise noted.
3. Unless otherwise noted, Typical data is the average value (arithmetic mean) of the parameter over the indicated band at 25 °C.
4. Channel average Insertion Loss, which is obtained by averaging |S21| over the center 19 MHz of channels and converting to dB value.
5. Channel average Insertion Loss, which is obtained by averaging |S21| over 5 MHz channels and converting to dB value.

Absolute Maximum Ratings [1]

Parameter	Unit	Value
Storage temperature	°C	–40 to +125
Maximum RF Input Power to Pin 1 (Port 1, Tx/Rx) [4]	dBm	+27

Maximum Recommended Operating Conditions [2]

Parameter	Unit	Value
Operating temperature, T_c [3]	°C	–30 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. The ACFF-1024 is not symmetrical. Port 1 (Pin 1) is designed for higher power handling and is connected to the Tx/Rx blocks; Port 2 (Pin 4) is connected to the system Antenna.

ACFF-1024 Typical Performance at Tc = 25 °C

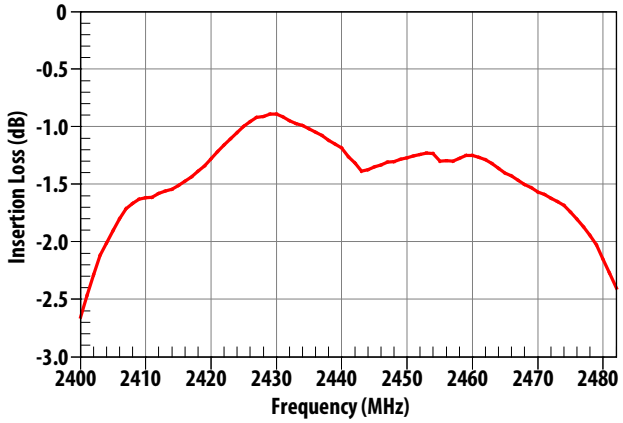


Figure 1. Insertion Loss, 2400 – 2482 MHz

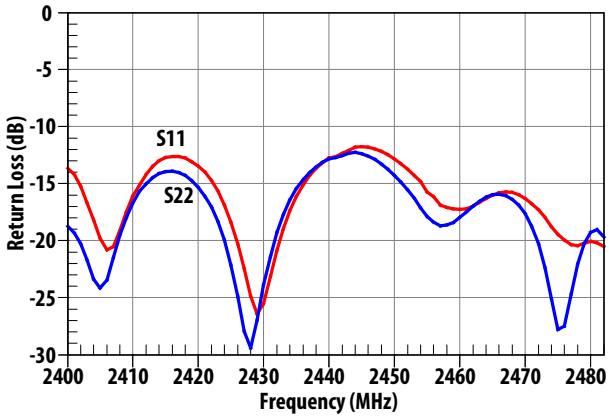


Figure 2. Input, Output Port Return Loss, 2400 – 2482 MHz

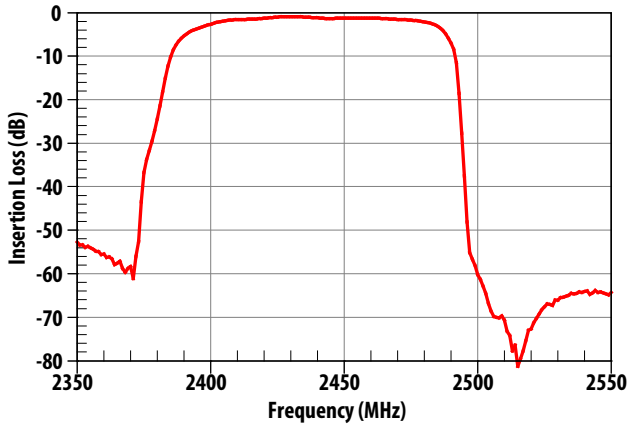


Figure 3. Attenuation, 2350 – 2550 MHz

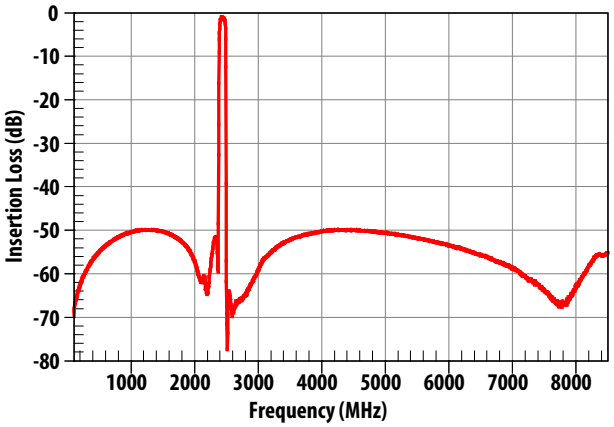


Figure 4. Wideband Attenuation, 100 – 8000 MHz

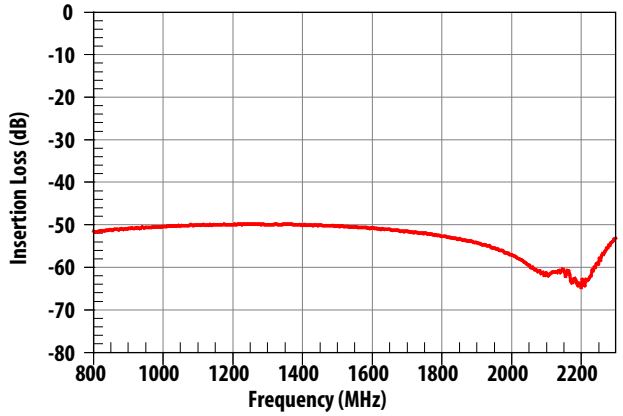


Figure 5. Attenuation, 800 – 2300 MHz

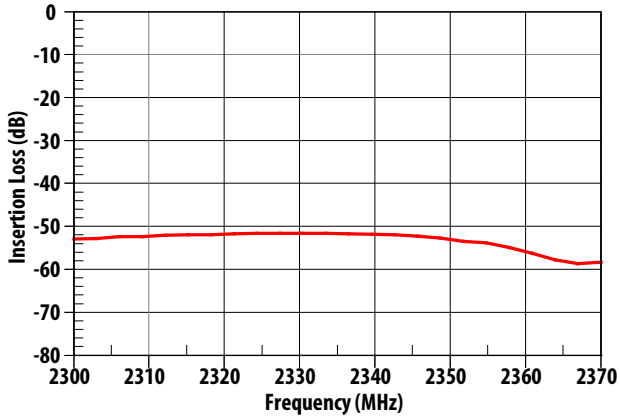


Figure 6. Rejection in LTE Band 40 (2300 – 2370 MHz)

ACFF-1024 Typical Performance at Tc = 25 °C

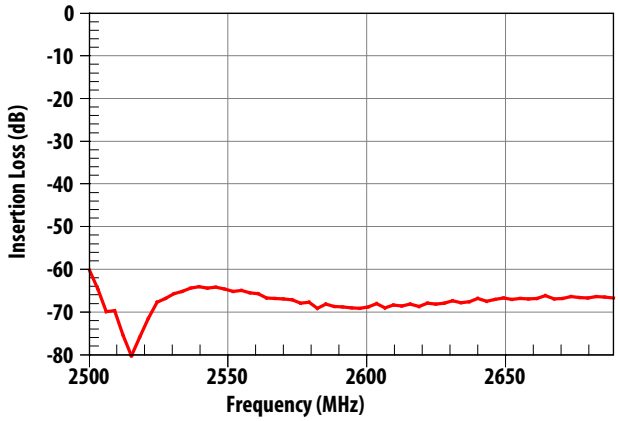


Figure 7. Rejection in 2.5 GHz WiMAX and LTE Band 7 (2500 – 2690 MHz)

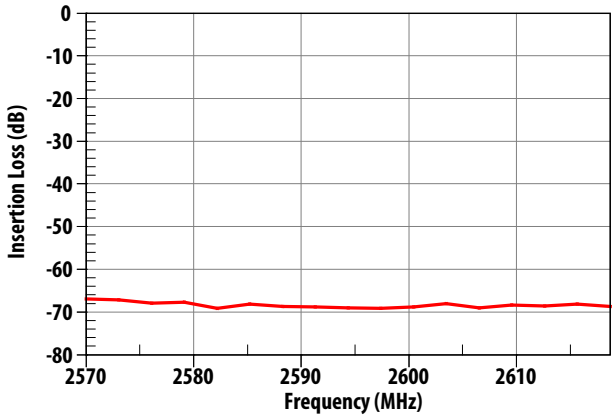


Figure 8. Rejection in LTE Band 38 (2570 – 2620 MHz)

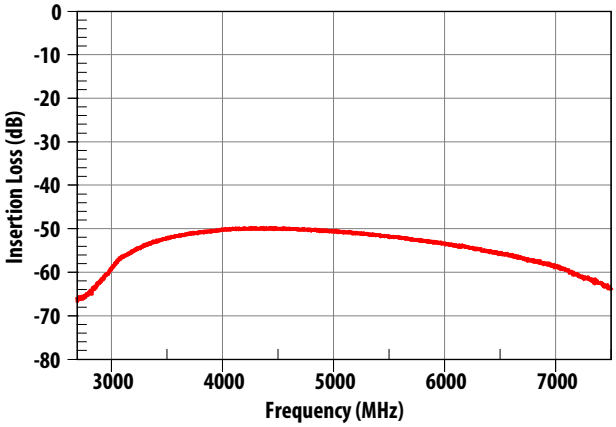


Figure 9. Attenuation, 2690 – 7500 MHz

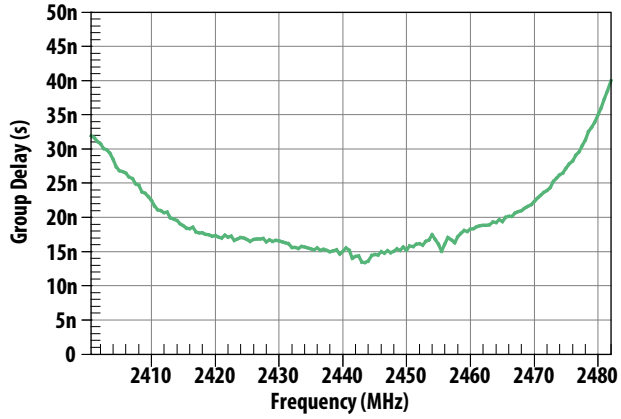


Figure 10. Group Delay (ns), 2400 – 2482 MHz

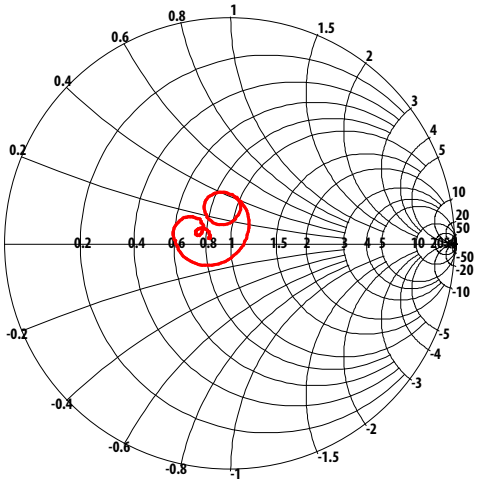


Figure 11. Input Port Impedance, 2400 – 2482 MHz

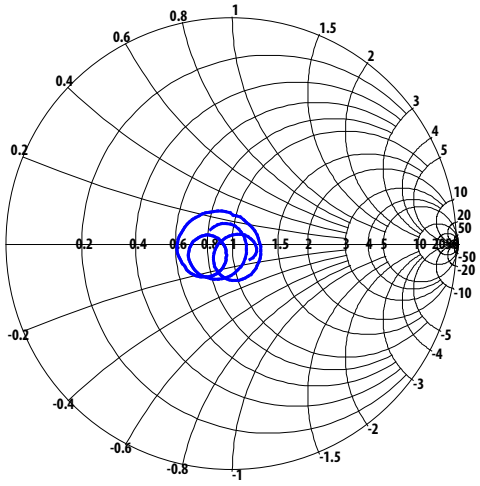


Figure 12. Output Port Impedance, , 2400 – 2482 MHz

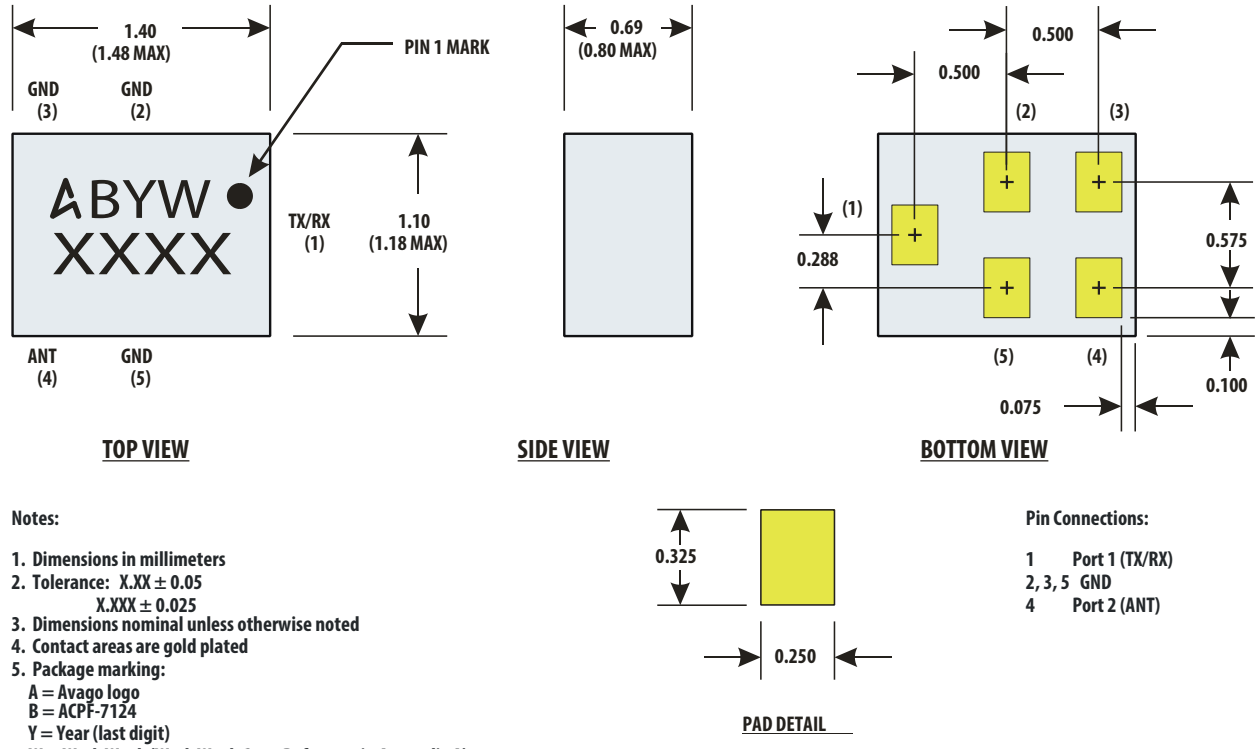


Figure 13. Package Outline Drawing and Marking

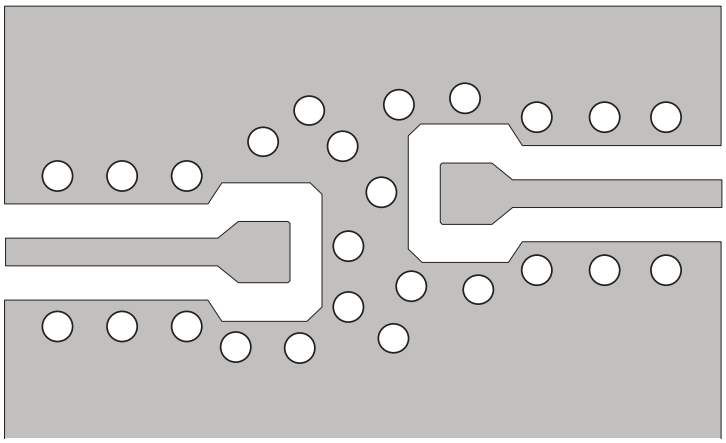


Figure 14. PCB Layout

A circuit board layout using the principles illustrated in Figure 14 is recommended to optimize performance of the ACFF-1024.

Note: The ACFF-1024 is not symmetrical. Pin 1 (Port 1) is designed for higher power handling and should be connected to the Tx/Rx block, Pin 4 (Port 2) is connected to the system Antenna.

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

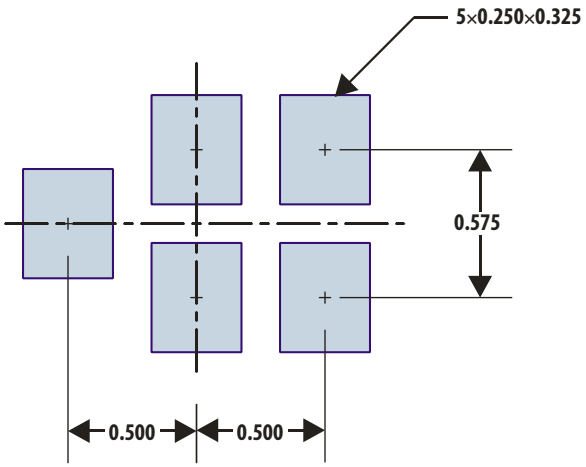


Figure 15. Recommended PCB Land Pattern (Dimensions in mm)

A recommended PCB land pattern design is shown in Figure 15. The pads of this land print pattern are 100 µm larger than the ACFF-1024 bottom metal pads. The solderable, contact areas are defined by the solder mask.

The suggested solder mask shown in Figure 16 is a Solder Mask Defined design with openings that match the ACFF-1024 bottom metal pads 1:1. Each side of the Land Print metal pattern is 50 µm larger than the mask openings.

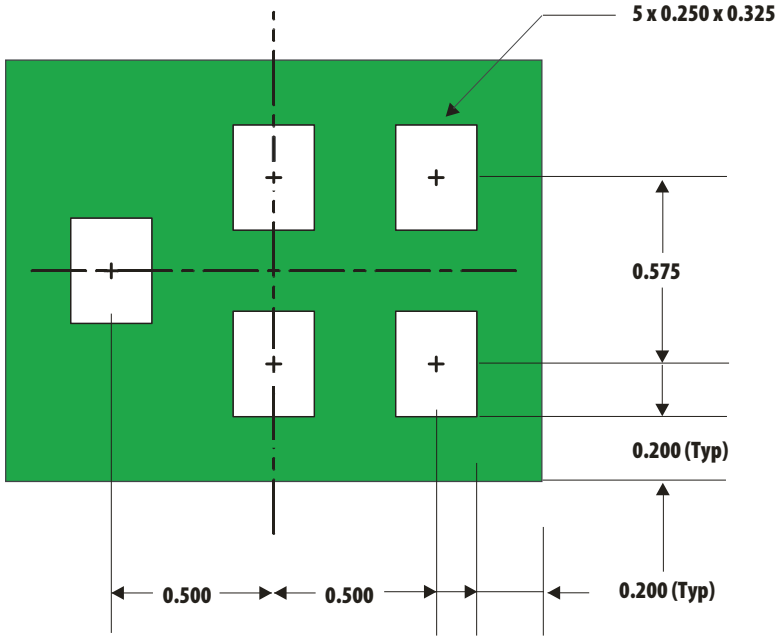


Figure 16. Recommended Solder Mask (Dimensions in mm)

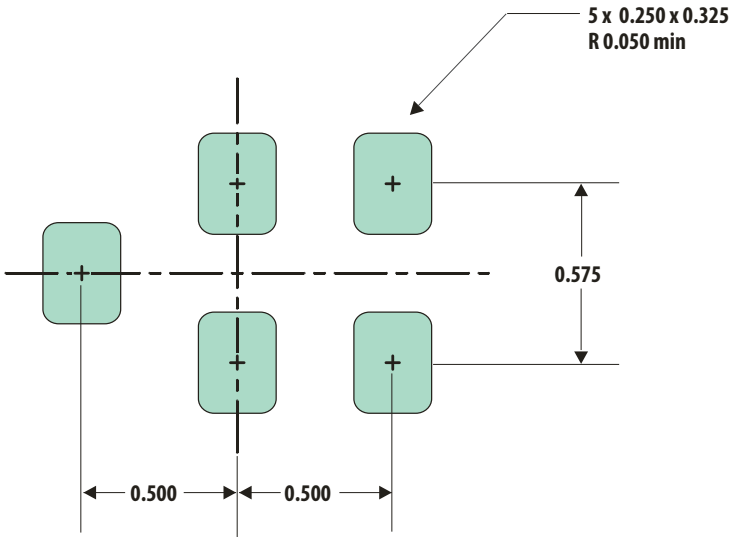


Figure 17. Recommended Solder Stencil (Dimensions in mm)

The recommended solder stencil is designed such that the apertures match the opening in the solder mask 1:1.

A minimum corner radius of 50 µm is recommended to increase reliability of solder paste release from the stencil.

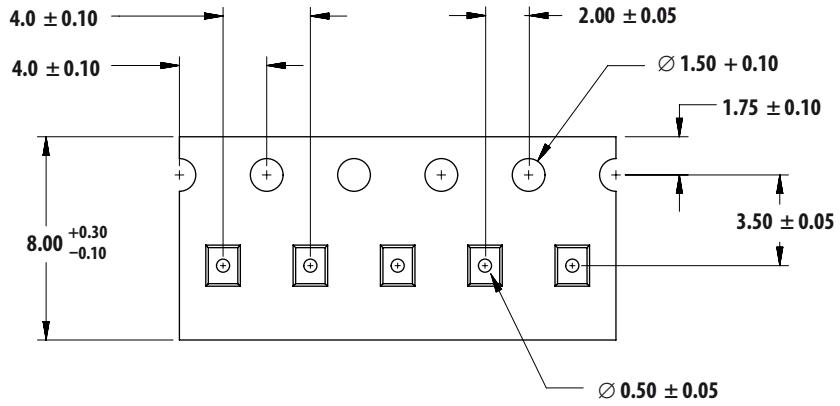


Figure 18. SMT Tape Packing

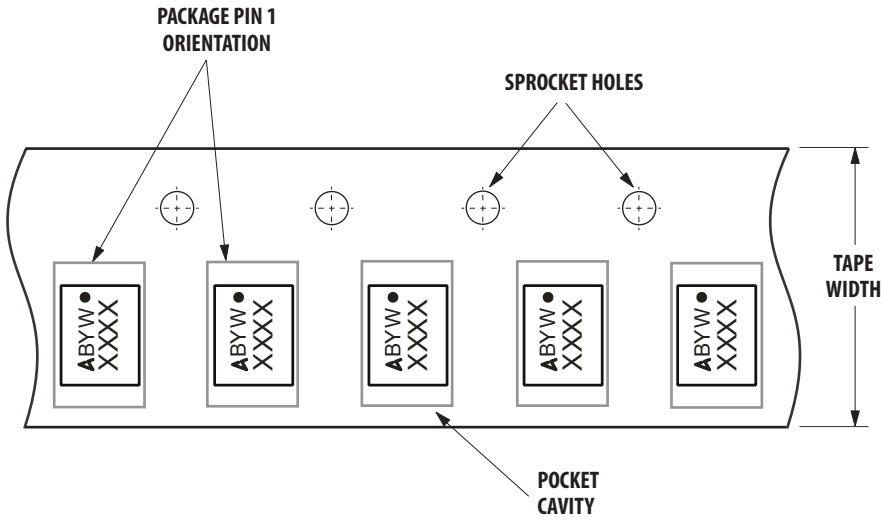
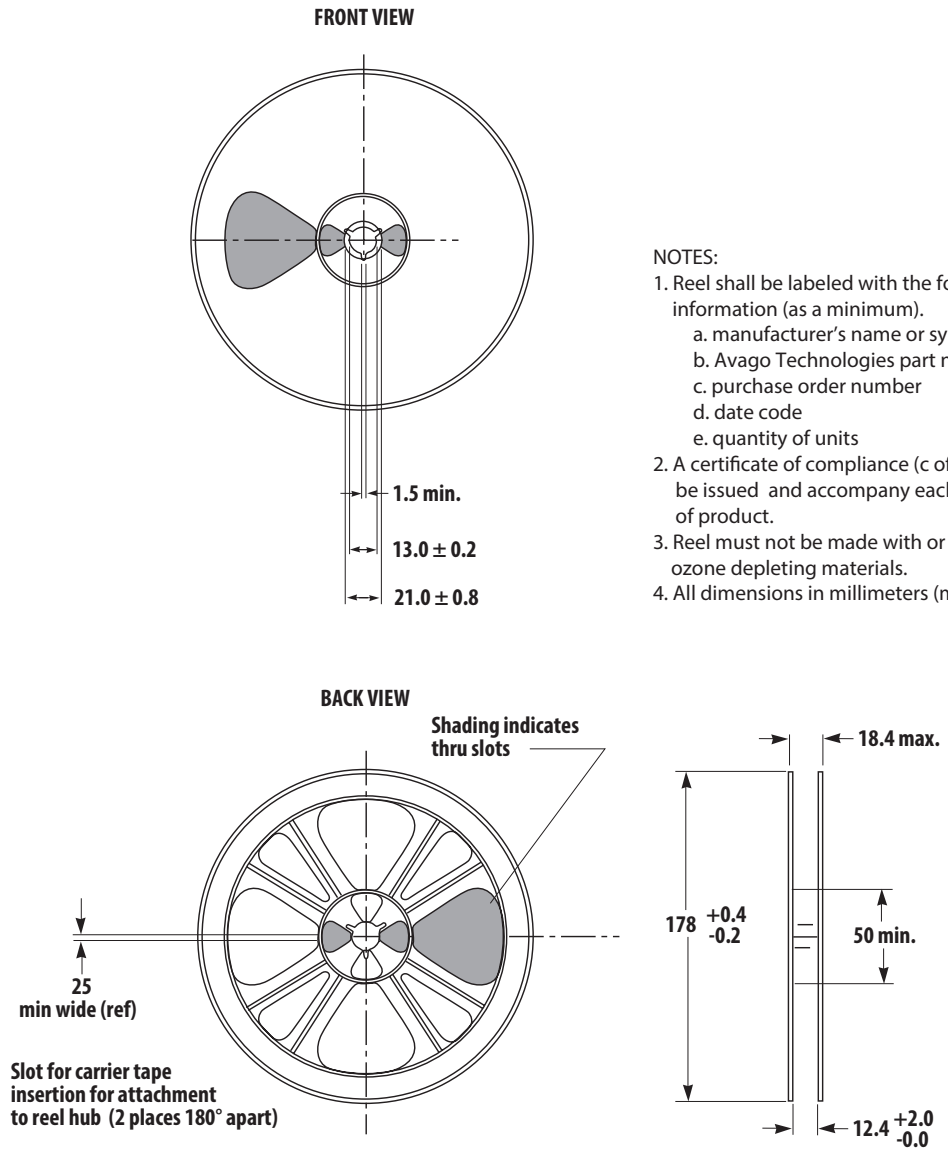


Figure 19. Orientation in Tape



NOTES:
1. Reel shall be labeled with the following information (as a minimum).
   a. manufacturer's 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 20. SMT Reel Drawing

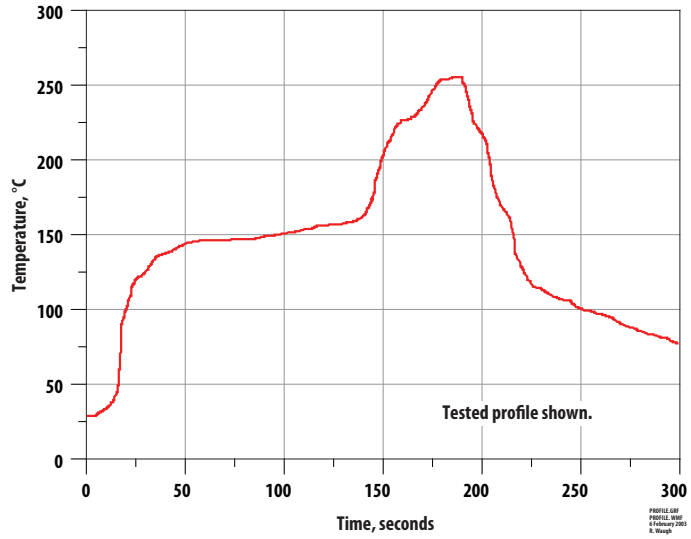


Figure 21. Verified SMT Solder Profile

Package Moisture Sensitivity

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

Ordering Information

Part Number	No. of Devices	Container
ACFF-1024-BLK	100	Tape strip or Gel-Pack
ACFF-1024-TR1	3000	7-inch (178 mm) Reel

Appendix A – Package Marking Cross Reference

Marking "W"	Work Week	Marking "W"	Work Week
1	1	S	27
2	2	T	28
3	3	U	29
4	4	V	30
5	5	W	31
6	6	X	32
7	7	Y	33
8	8	Z	34
9	9	a	35
A	10	b	36
B	11	c	37
C	12	d	38
D	13	e	39
E	14	f	40
F	15	g	41
G	16	m	42
H	17	n	43
J	18	q	44
K	19	r	45
L	20	t	46
M	21	<	47
N	22	>	48
O	23	/	49
P	24	\	50
Q	25	(	51
R	26	)	52

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