



Mini-Circuits

THIN FILM SURFACE MOUNT

## Low Pass Filter

ALF-9000+

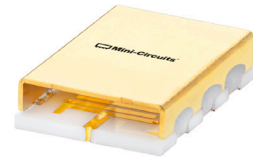
50Ω DC to 9GHz

## KEY FEATURES

- Low Passband Insertion Loss of 1dB Typ.
- High Rejection of 43dB Typ.
- Good Return Loss of 16dB Typ.
- Small Size, 5.59 x 8.13 x 2.03 mm

## APPLICATIONS

- Electronic Warfare (EW)
- Transmitters/Receivers.
- Test and Measurement Equipment

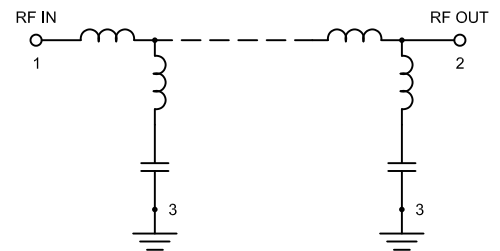


Generic photo used for illustration purposes only

## PRODUCT OVERVIEW

Mini-Circuits' Surface Mount Thin-Film filters offer low insertion loss and high rejection realized via Thin-Film on Alumina substrate, using a sputtering process that can guarantee an enhanced Q and repeatable performance. Low pass, high pass, and bandpass surface mount thin-film designs can be realized with this technology up to 40GHz in a small form factor helping customers achieve their SWaP objectives. Using our high quality thin-film manufacturing process we can guarantee repeatability on large batches of filters.

## FUNCTIONAL DIAGRAM

ELECTRICAL SPECIFICATIONS<sup>1,2</sup> AT +25°C

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Pass Band	Insertion Loss	DC-F1	DC - 9	—	1	1.7	dB
	Freq. Cut-Off <sup>3</sup>	Fc	10.325	—	3	—	dB
	Return Loss	DC-F1	DC - 9	—	16	—	dB
Stop Band	Rejection	F2-F3	11.9 - 15	22	40	—	dB
		F3-F4	15 - 20	35	43	—	
		F4-F5	20 - 23	—	40	—	

1. Tested in Evaluation Board P/N TB-ALF-9000+ with feedline losses removed by normalization of S12 and S21 traces to measurement of TB thru-line.

2. This filter is bi-directional RF1 and RF2 ports may be interchanged, see S-Parameters for actual performance.

3. Typical variation  $\pm 3\%$

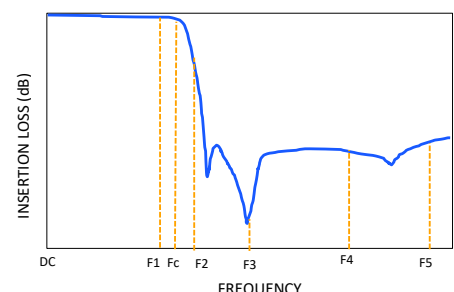
ABSOLUTE MAXIMUM RATINGS<sup>4</sup>

Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Input Power <sup>5</sup>	9W Max. at 25°C

4. Permanent damage may occur if any of these limits are exceeded.

5. Power rating applies only to signals within the passband.

## TYPICAL FREQUENCY RESPONSE



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www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

REV. OR  
ECO-020317  
ALF-9000+  
EDU4571  
URJ  
231219

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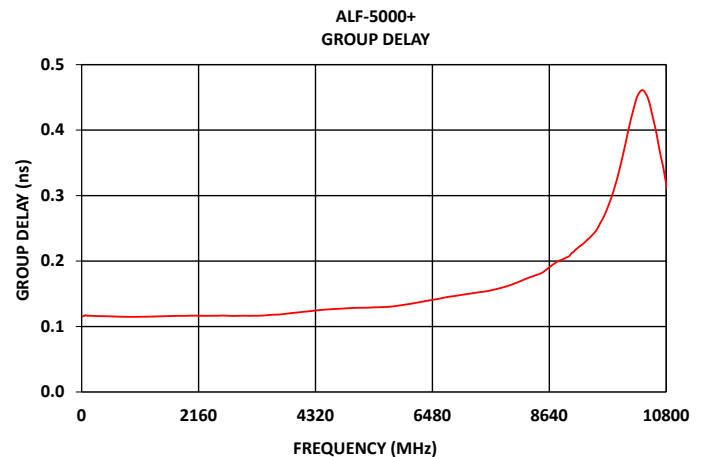
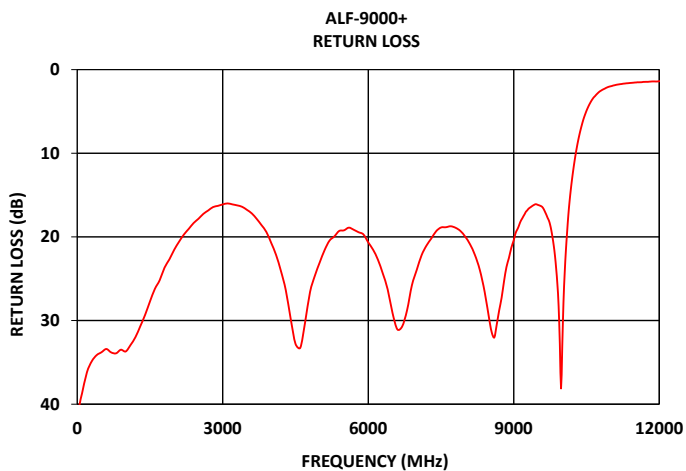
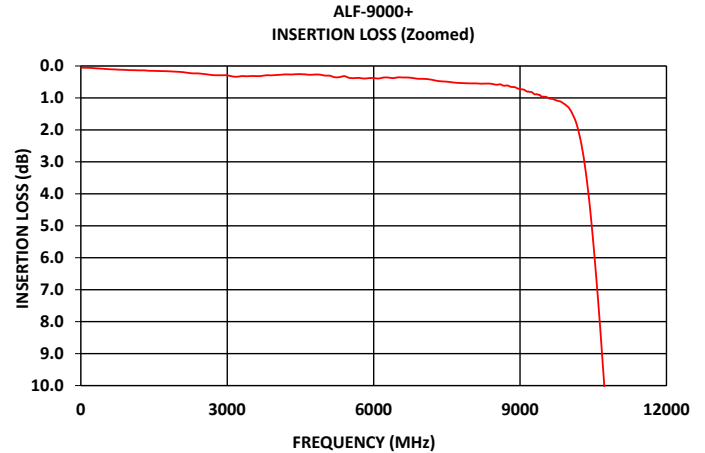
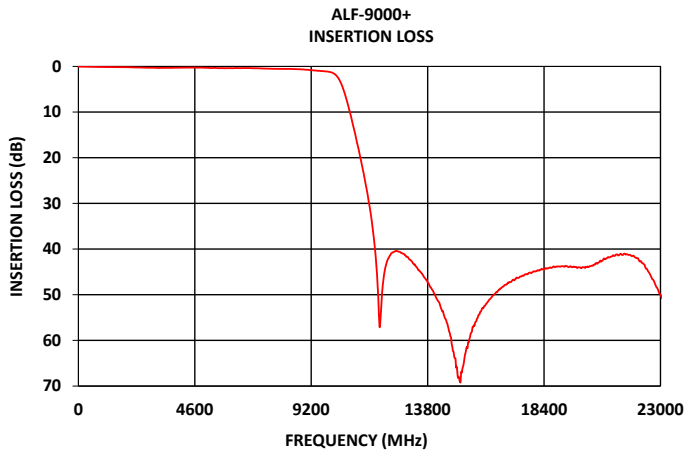
# Low Pass Filter

**ALF-9000+**

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50 $\Omega$  DC to 9GHz

## TYPICAL PERFORMANCE GRAPHS AT +25°C





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## FUNCTIONAL DIAGRAM

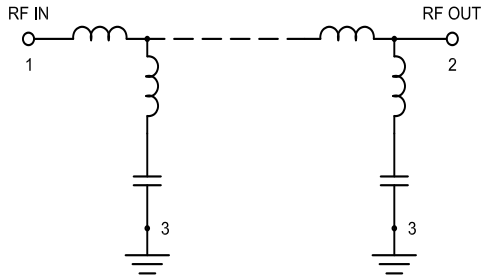
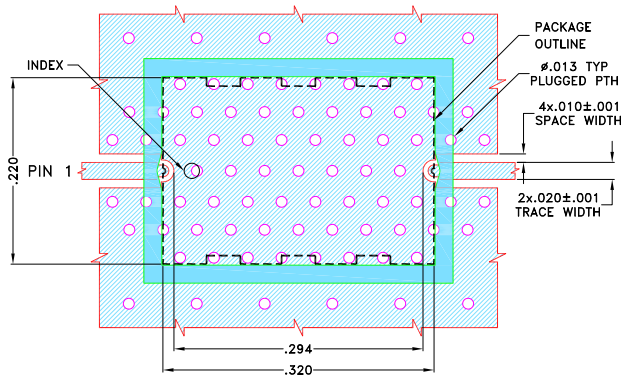


Figure 1. ALF-9000+ Functional Diagram

## PAD DESCRIPTION

Function	Pad Number	Description
RF1 <sup>2</sup>	1	Connects to RF Input Port
RF2 <sup>2</sup>	2	Connects to RF Output Port
GROUND	3	Connects to Ground on PCB, (See drawing PL-652)
NC	—	No connection, not used internally. See drawing PL-652 for connection to PCB

## SUGGESTED PCB LAYOUT (PL-652)

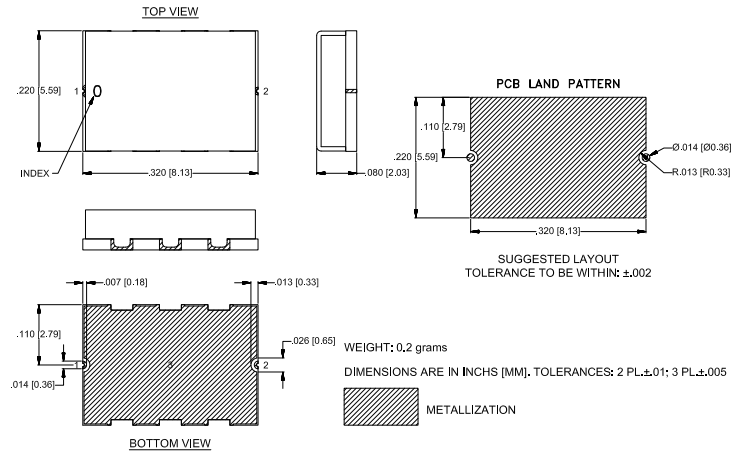


## NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS .010±.0010. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
  2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
 DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

Figure 2. Suggested PCB Layout PL-652

## CASE STYLE DRAWING

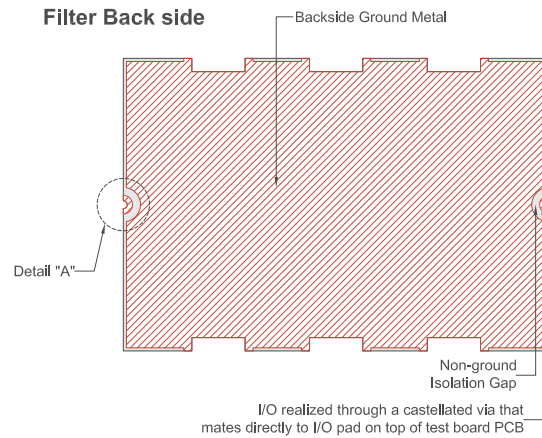


## PRODUCT MARKING\*: ALF-9000

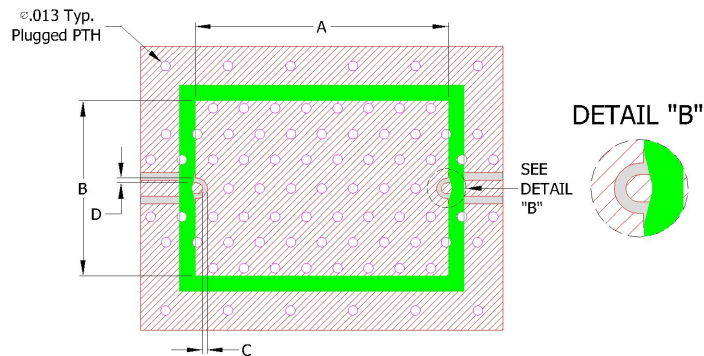
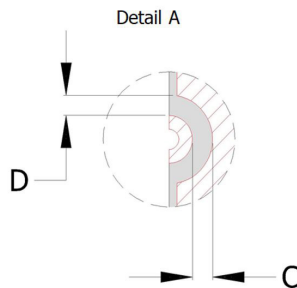
\*Marking may contain other features or characters for internal lot control.



## RECOMMENDED PCB LAYOUT PATTERN FOR FILTER



## PCB Pattern Recommendations

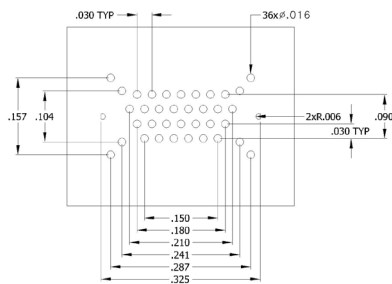
Filter RF I/O Detail  
(Filter Back Side)

- 1) Customer PCB's ground pattern length (dimension A) can be similar to filter length.
- 2) Customer PCB's ground pattern width (dimension B) can be similar filter width.
- 3) Dimensions C and D on Filter RF I/O detail and Customer PCB pattern can be closely match. The dimensions of C and D on the Customer PCB pattern can be slightly larger to account for component alignment tolerance (ground metal can be pulled back from RF I/O trace).
- 4) Recommend to use Solder mask at Customer PCB at outer area of filter pattern/ footprint with a clearance of about 1.25mil at each side. (Tighter registration tolerance required for solder mask)
- 5) Recommended to use Solder mask at I/O of Customer PCB as per above diagram (refer detail B).

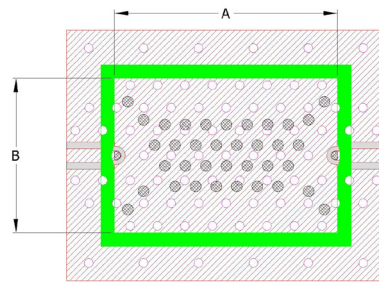
**COMMENTS ON COMPONENT HANDLING AND SOLDER ATTACH**

- 1) Avoid using soldering iron directly to the ceramic filter. This would lead to development of crack in the component due to thermal shock.
- 2) Vacuum pick-up tool or plastic tweezers are recommended for handling the components. Extra care should be taken not to scratch the filter or metal area.
- 3) Use 2-3 mil thickness stencil plate and screen print the solder. Refer below picture for recommended stencil pattern to get the best solder attachment.

Stencil opening drawing



Solder location after screen print



- 4) Plugged ground vias in the PWB will improve attachment consistency.
- 5) Recommended to have a similar or closer test board material and thickness (refer Mini-Circuits evaluation board for details) to minimize the CTE over the temperature range.



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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD.

[CLICK HERE](#)

Performance Data and Graphs	Data
	Graphs
	S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	UC2731    Lead Finish: Gold over Nickel plate.
RoHS Status	Compliant
Tape and Reel	TR-F003
Suggested Layout for PCB Design	PL-652
Evaluation Board	TB-ALF-9000+
	Gerber File
Environmental Rating	ENV120

## NOTES

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits' standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



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