



Mini-Circuits

THIN FILM SURFACE MOUNT

Low Pass Filter

ALF-6000+

50Ω DC to 6GHz

KEY FEATURES

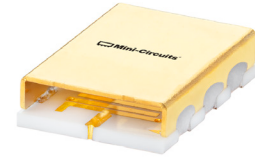
- Low Passband Insertion Loss of 0.7dB Typ.
- High Rejection of 38dB Typ.
- Good Return Loss of 16dB Typ.
- Small Size, 5.59 x 8.13 x 2.03 mm

APPLICATIONS

- Harmonic Rejection
- VHF/UHF Transmitters/Receivers.
- Test and Measurement Equipment.

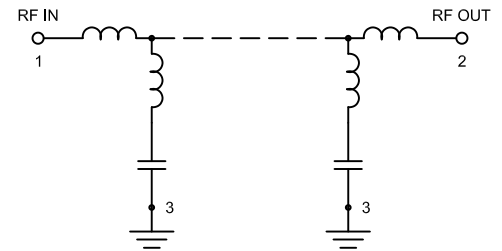
PRODUCT OVERVIEW

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.



Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM

ELECTRICAL SPECIFICATIONS^{1,2} AT +25°C

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Pass Band	Insertion Loss	DC-F1	DC - 6	—	0.7	1.2	dB
	Freq. Cut-Off ³	Fc	6.93	—	3.0	—	dB
	Return Loss	DC-F1	DC - 6	—	16	—	dB
Stop Band	Rejection	F2-F3	8.2 - 9.4	25	37	—	dB
		F3-F4	9.4 - 13	32	37	—	
		F4-F5	13 - 14	—	38	—	
		F5-F6	14 - 15.5	—	15	—	

1. Tested in Evaluation Board P/N TB-ALF-6000+ 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 ±3%

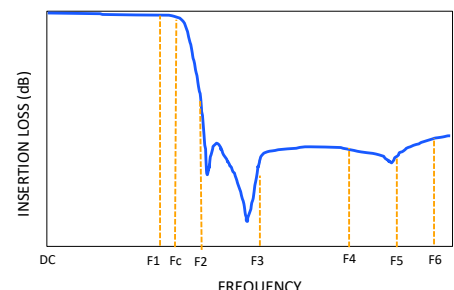
ABSOLUTE MAXIMUM RATINGS⁴

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power ⁵	15 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



Mini-Circuits

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

REV. OR
ECO-020314
ALF-6000+
EDU4721
URJ
231017

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THIN FILM SURFACE MOUNT

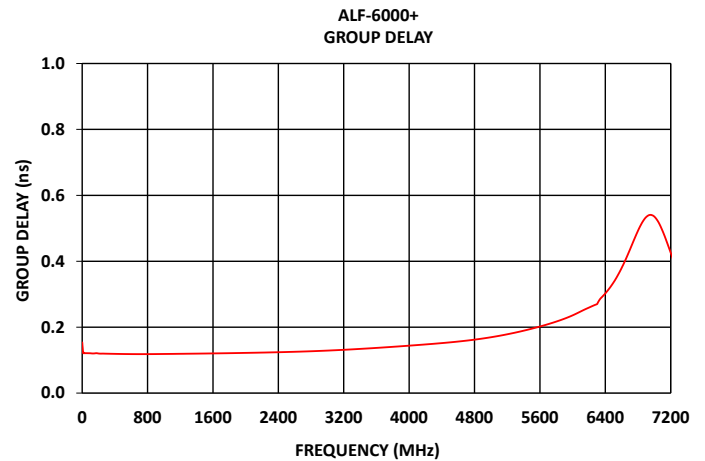
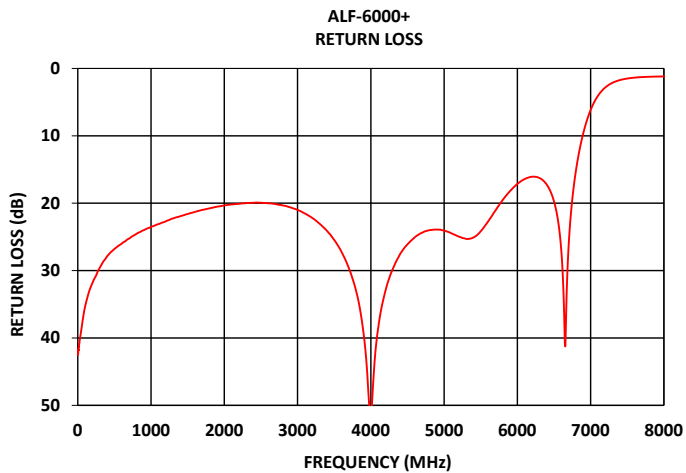
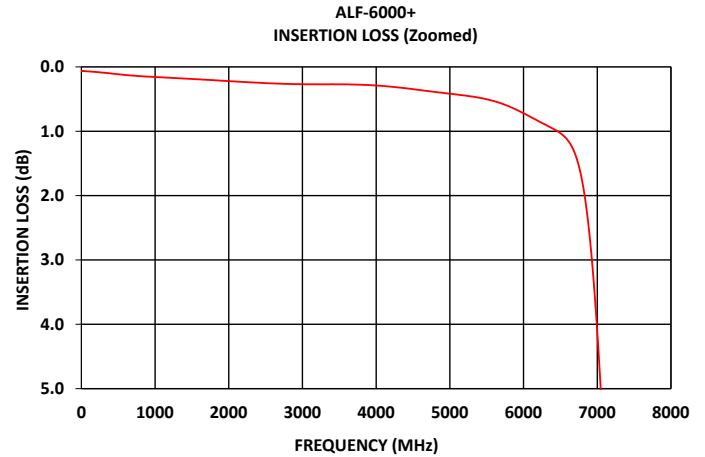
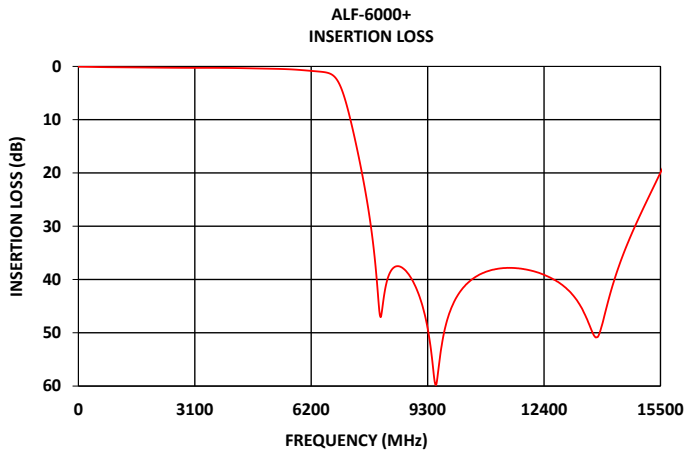
Low Pass Filter

ALF-6000+

Mini-Circuits

50 Ω DC to 6GHz

TYPICAL PERFORMANCE GRAPHS AT +25°C





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THIN FILM SURFACE MOUNT

Low Pass Filter

ALF-6000+

50Ω DC to 6GHz

FUNCTIONAL DIAGRAM

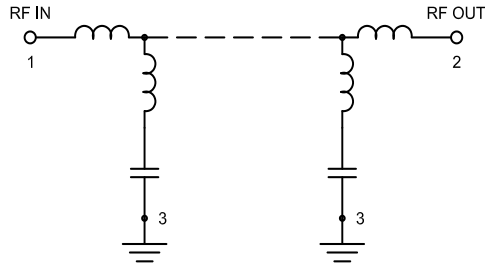
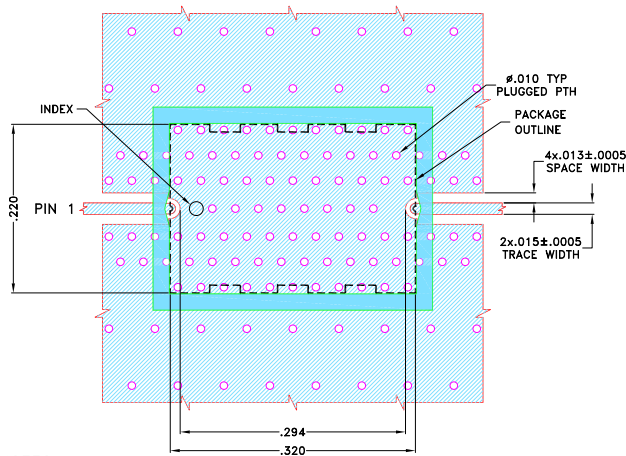


Figure 1. ALF-6000+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1 ²	1	Connects to RF Input Port
RF2 ²	2	Connects to RF Output Port
GROUND	3	Connects to Ground on PCB, (See drawing PL-764)
NC	—	No connection, not used internally. See drawing PL-764 for connection to PCB

SUGGESTED PCB LAYOUT (PL-764)

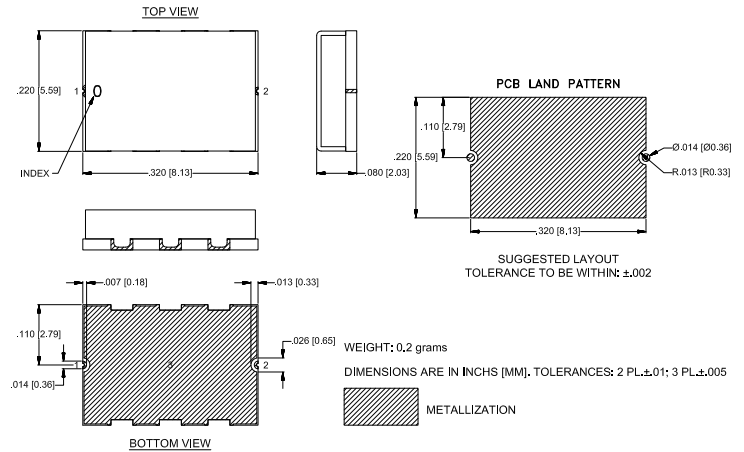


NOTES:

- COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B Lo Pro) WITH DIELECTRIC THICKNESS .0073±.0007, COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
 - 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-764

CASE STYLE DRAWING

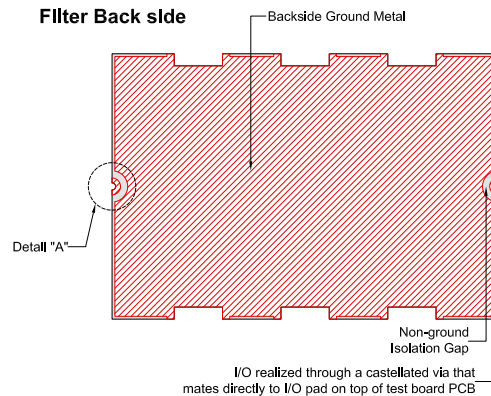
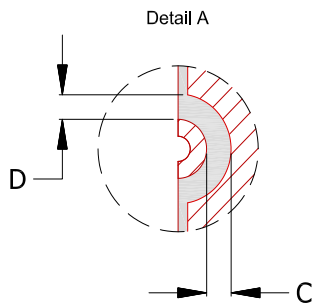


PRODUCT MARKING*: ALF-6000

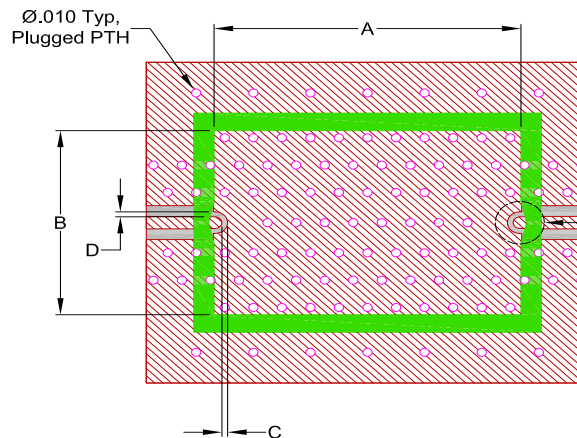
*Marking may contain other features or characters for internal lot control.



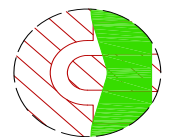
RECOMMENDED PCB LAYOUT PATTERN FOR FILTER

Filter RF I/O Detail
(Filter Back Side)

PCB Pattern Recommendations



DETAIL "B"

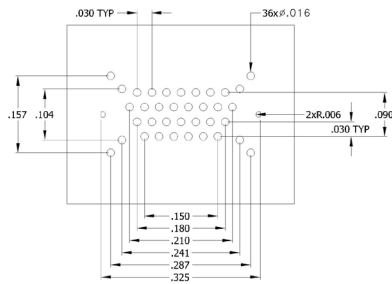
SEE
DETAIL "B"

- 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).

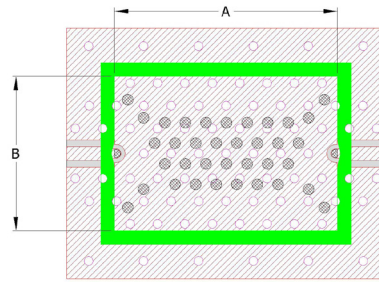
**COMMENTS ON COMPONENT HANDLING AND SOLDER ATTACH**

- 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.



Mini-Circuits

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Low Pass Filter

ALF-6000+

50Ω DC to 6GHz

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-764
Evaluation Board	TB-ALF-6000+
	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



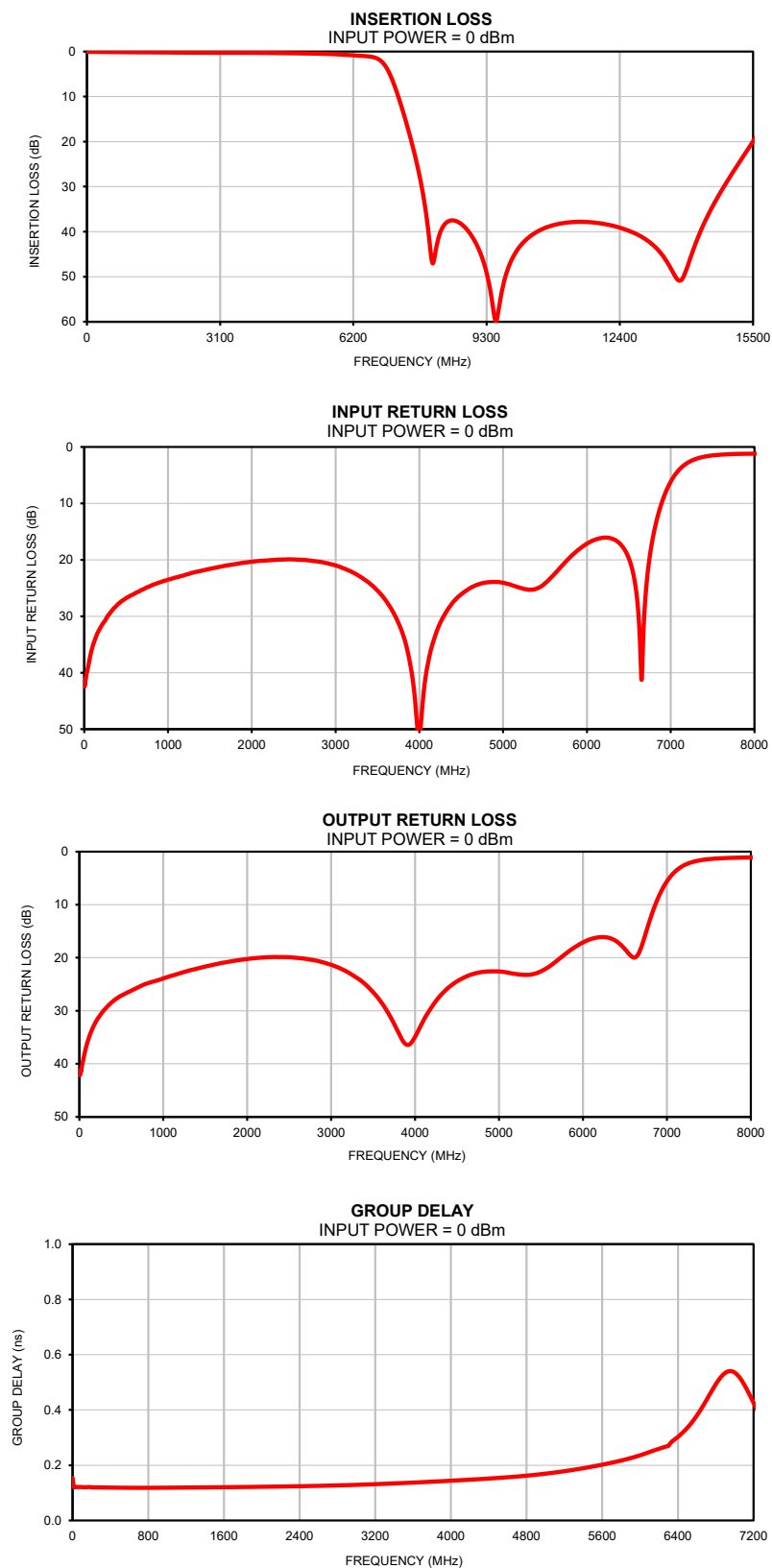
Thin-Film Lowpass Filter

ALF-6000+

Typical Performance Data

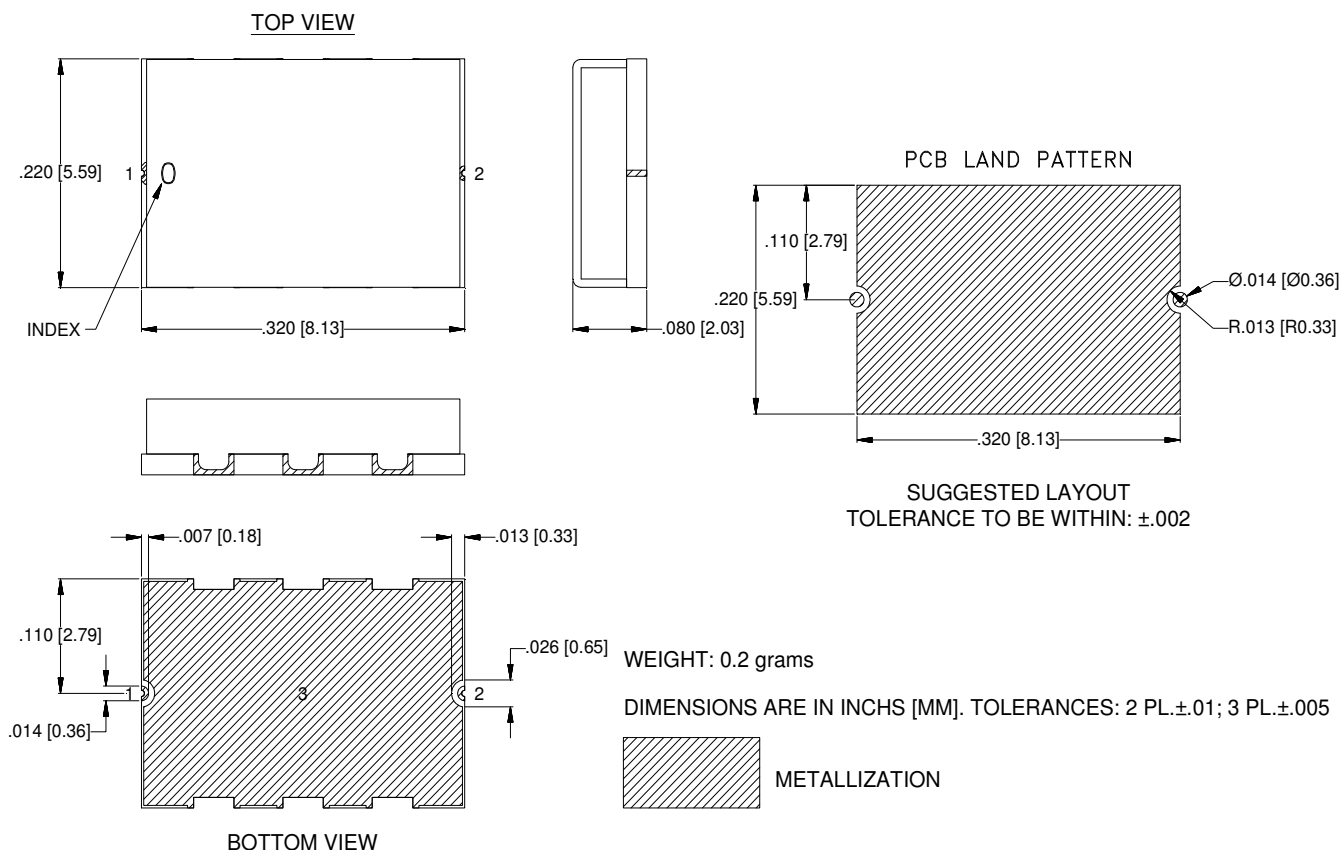
FREQ.	Insertion Loss	Input Return Loss	Output Return Loss	FREQ.	Group Delay
(MHz)	(dB)	(dB)	(dB)	(MHz)	(ns)
1	0.06	42.40	41.99	10	0.13
10	0.06	41.77	41.76	20	0.12
20	0.06	40.86	41.30	25	0.12
50	0.07	38.68	38.92	50	0.12
75	0.07	36.79	37.16	75	0.12
100	0.07	35.33	35.74	100	0.12
125	0.07	34.25	34.56	125	0.12
150	0.07	33.25	33.56	150	0.12
175	0.08	32.50	32.71	175	0.12
200	0.08	31.83	31.97	200	0.12
300	0.09	29.59	29.76	225	0.12
400	0.10	27.88	28.21	250	0.12
500	0.11	26.78	27.13	300	0.12
600	0.13	26.00	26.35	400	0.12
700	0.13	25.25	25.57	500	0.12
800	0.14	24.55	24.88	600	0.12
900	0.15	24.00	24.40	700	0.12
1000	0.16	23.52	23.89	800	0.12
1100	0.16	23.10	23.38	900	0.12
1200	0.17	22.69	22.92	1000	0.12
1500	0.19	21.60	21.66	1100	0.12
2000	0.22	20.34	20.23	1200	0.12
2500	0.25	19.92	19.90	1300	0.12
3000	0.27	20.99	21.33	1400	0.12
3500	0.27	25.45	26.50	1500	0.12
4000	0.29	51.94	34.89	1600	0.12
5000	0.42	24.05	22.59	1700	0.12
6000	0.72	17.13	17.11	1800	0.12
6930	3.03	8.39	7.54	1900	0.12
7000	4.11	6.16	5.60	2000	0.12
7100	6.18	4.06	3.72	2100	0.12
7300	11.67	2.12	1.97	2200	0.12
7500	18.20	1.50	1.41	2300	0.12
7700	25.88	1.28	1.21	2400	0.12
7900	36.60	1.21	1.12	2500	0.12
8000	44.85	1.19	1.09	2600	0.13
8100	45.03	1.18	1.07	2700	0.13
8200	40.75	1.17	1.06	2800	0.13
8300	38.66	1.17	1.04	2900	0.13
8500	37.49	1.16	1.02	3000	0.13
8700	38.23	1.16	0.99	3100	0.13
9000	41.69	1.13	0.96	3200	0.13
9400	53.84	1.07	0.92	3300	0.13
9500	59.60	1.05	0.91	3400	0.13
10000	44.24	0.93	0.87	3500	0.14
10100	42.97	0.91	0.86	3600	0.14
10300	41.13	0.86	0.86	3700	0.14
10500	39.87	0.83	0.85	3800	0.14
10900	38.44	0.81	0.87	3900	0.14
11000	38.23	0.81	0.87	4000	0.14
11300	37.86	0.83	0.90	4200	0.15
11500	37.82	0.87	0.93	4400	0.15
12000	38.24	0.97	1.00	4600	0.16
12300	38.84	1.04	1.04	4800	0.16
12500	39.43	1.08	1.06	5000	0.17
12700	40.15	1.12	1.09	5200	0.18
13000	41.71	1.16	1.11	5400	0.19
13500	46.76	1.20	1.16	5600	0.20
14000	46.99	1.20	1.20	5800	0.22
15500	19.93	1.12	1.87	6000	0.24

Typical Performance Curves



Outline Dimensions

UC2731



Notes:

1. Case material: Gold over Nickel over Annealed Stainless Steel.
2. Base: Ceramic
3. Termination finish: **as shown below or indicated on Data Sheet.**
For RoHS Case Styles: Gold over Nickel plate. All models, (+) suffix.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



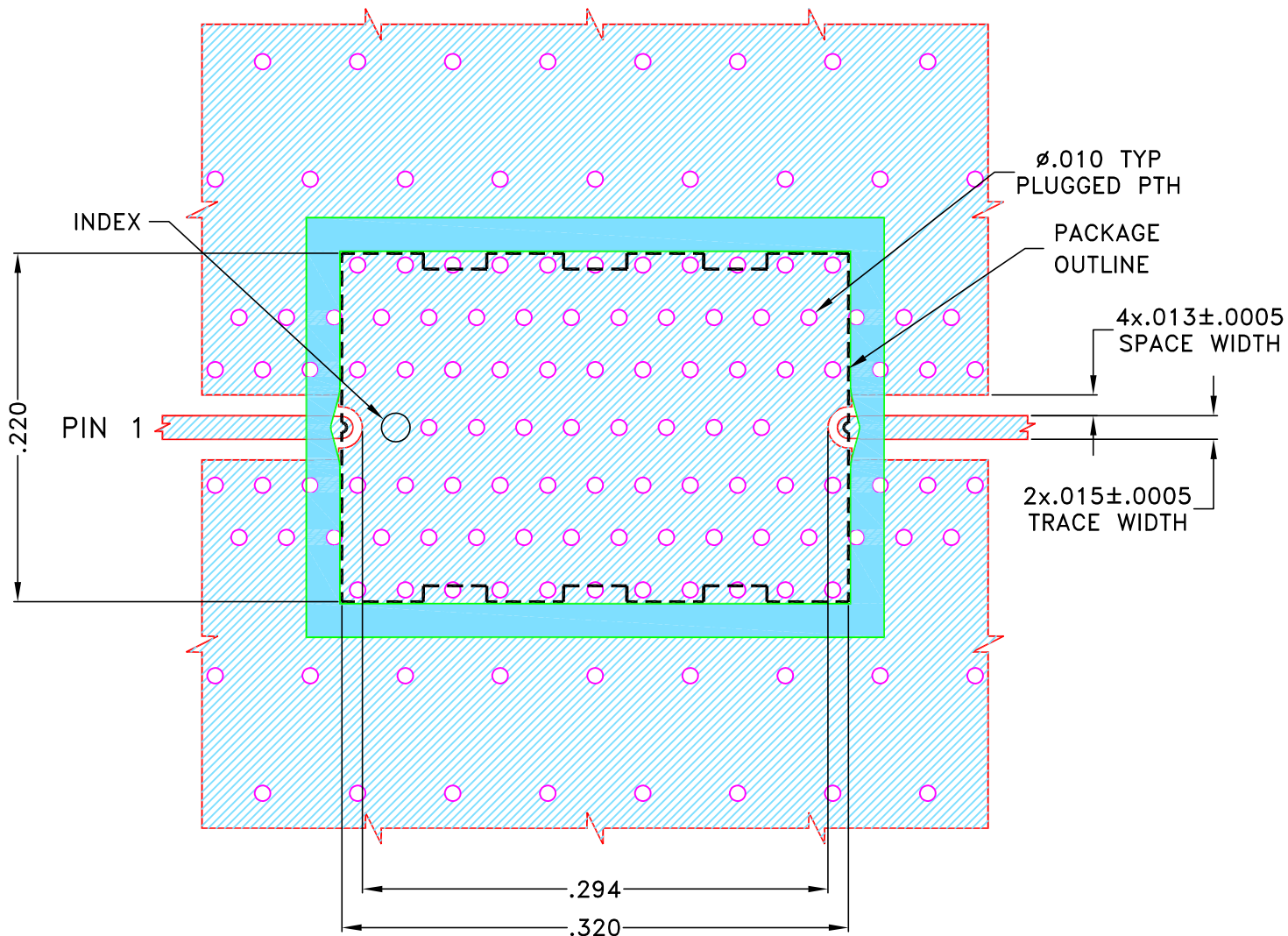
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS



THIRD ANGLE PROJECTION		REVISIONS				
	REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
	OR	NP0-003903	NEW RELEASE	OCT 23	LK	VC

SUGGESTED MOUNTING CONFIGURATION
FOR UC2731 CASE STYLE



NOTES:

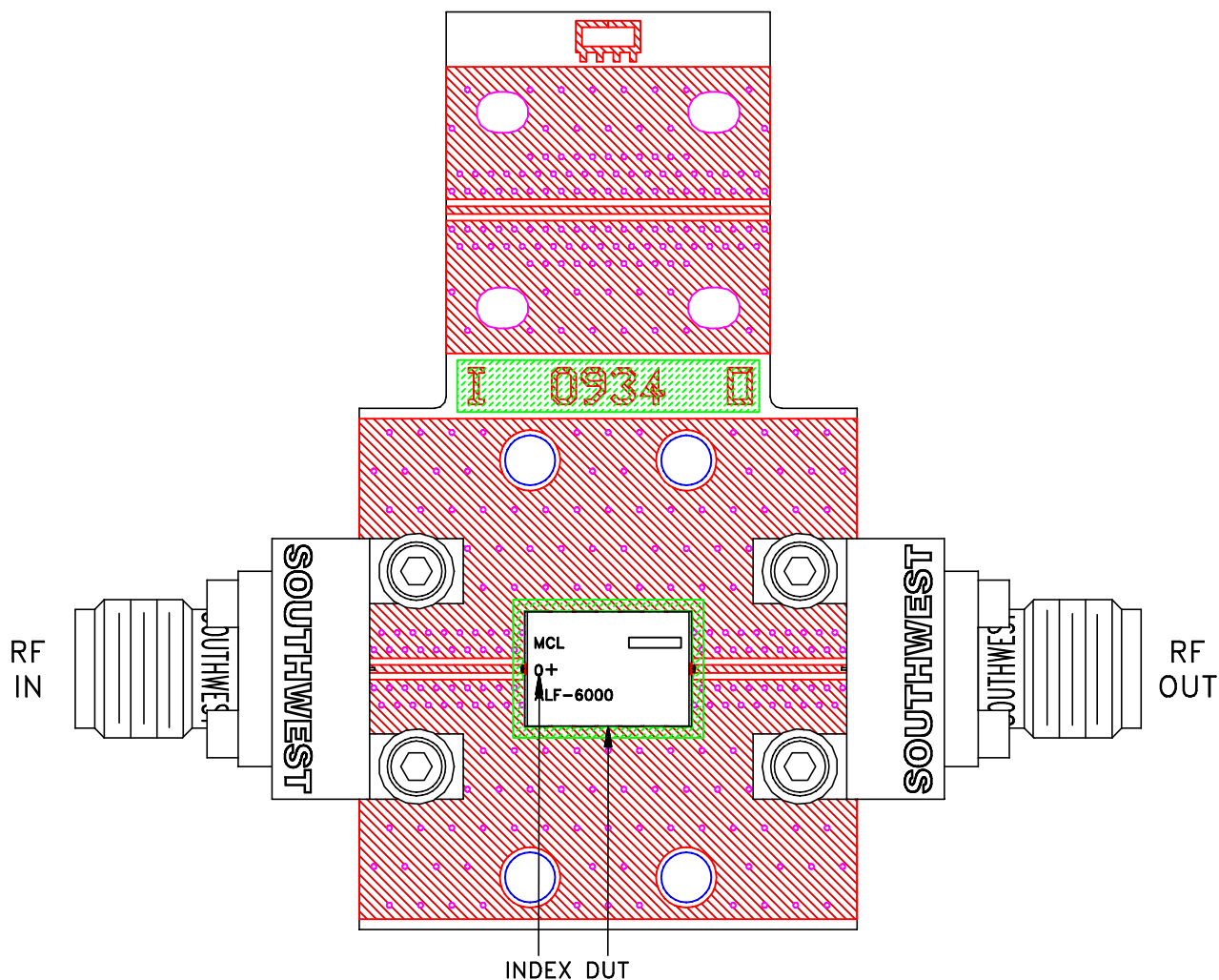
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 DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

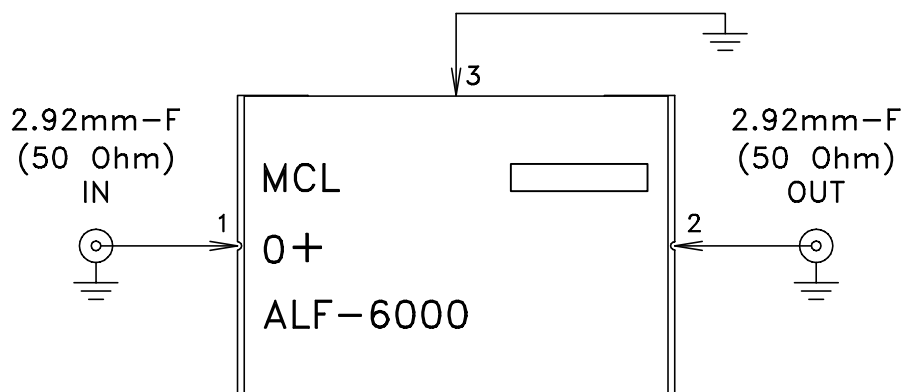
UNLESS OTHERWISE SPECIFIED		INITIALS		DATE		Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235							
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ± 		DRAWN	LK	09 OCT 23									
		CHECKED	MD	09 OCT 23									
		APPROVED	RR	13 OCT 23									
						PL DWG, UC2731 C.S, 50 OHM, ALF							
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ASHEETA1.DWG REV:A DATE:01/12/95						FILE: 98-PL-764		SCALE: 9.1:1		SHEET: 1 OF 1			

Evaluation Board and Circuit

TB-ALF-6000+



Schematic diagram



Notes:

1. PCB Material: ROGERS (R04350B Lo Pro) OR Equivalent, Dielectric Constant= $3.48 \pm .05$
Dielectric Thickness: $.0073 \pm .0007$ inch
2. 50 Ohm 2.92mm Female Connectors.

 **Mini-Circuits®**



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-55° to 125° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 125° C Ambient Environment	Individual Model Data Sheet
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Thermal Shock	-55° to 125°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, Except +125°C