



Mini-Circuits

THIN FILM SURFACE MOUNT

Low Pass Filter

ALF-12000+

50 Ω DC to 12 GHz

KEY FEATURES

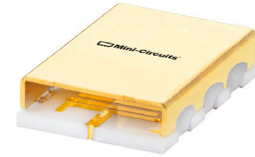
- Low Passband Insertion Loss of 0.5 dB Typ.
- High Rejection of 47 dB Typ.
- Good Return Loss of 17 dB Typ.
- Small Size, 5.59 x 8.13 x 2.03 mm

APPLICATIONS

- Telecommunications and broad band wireless systems.
- Military applications.
- SATCOM modems.
- Test and measurements

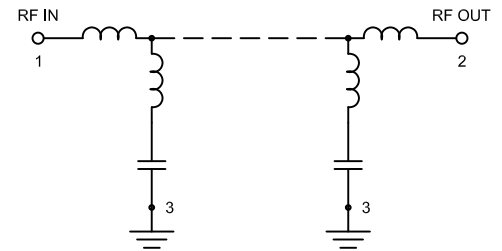
PRODUCT OVERVIEW

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 - 12	—	0.5	1.2	dB
	Freq. Cut-Off ³	Fc	13.95	—	3	—	dB
	Return Loss	DC-F1	DC - 12	—	17	—	dB
Stop Band	Rejection	F2-F3	15.6 - 17	25	38	—	dB
		F3-F4	17 - 20	35	47	—	
		F4-F5	20 - 25	—	30	—	

1. Tested in Evaluation Board P/N TB-ALF-12000+ with feedline losses removed by normalization of S12 and S21 traces to measurement of TB thru-line.

2. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required

3. Typical variation $\pm 3\%$

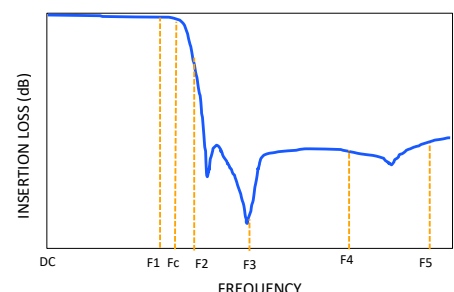
ABSOLUTE MAXIMUM RATINGS⁴

Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Input Power ⁵	12 W 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. Derated power at +125 degC is 4 W.

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-021047
ALF-12000+
EDU4653
URJ
240301

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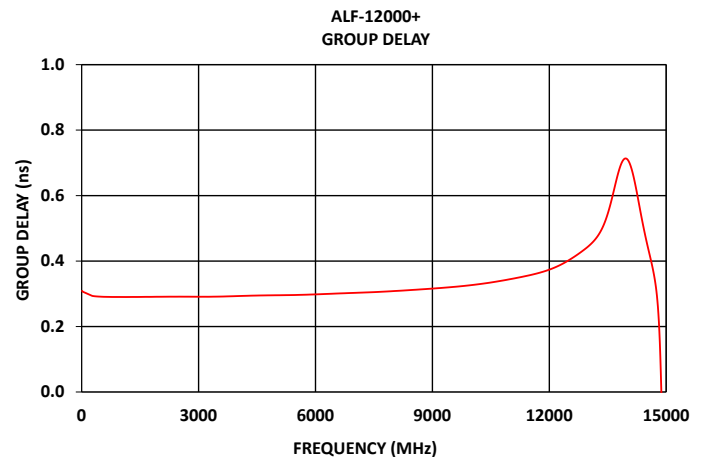
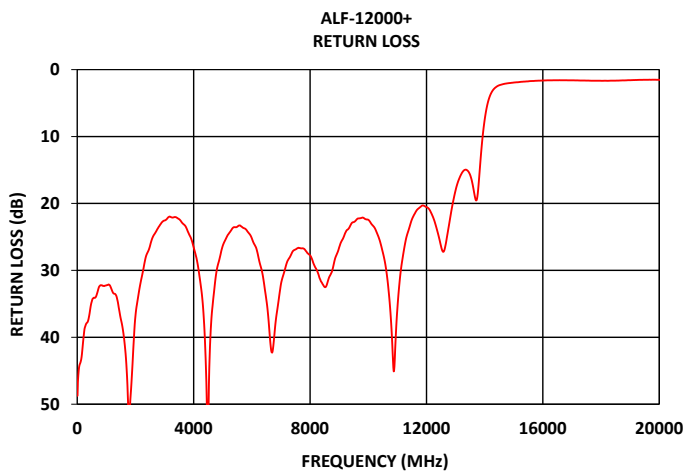
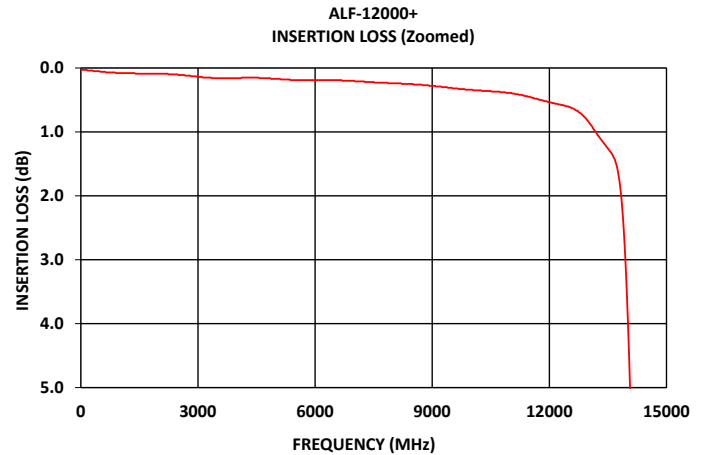
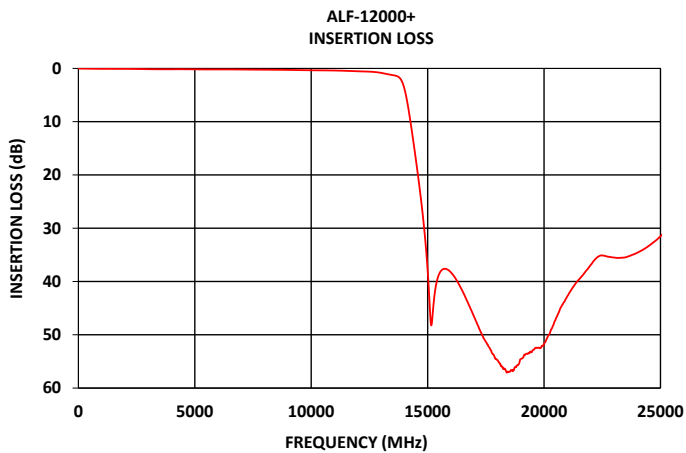
THIN FILM SURFACE MOUNT

Low Pass Filter

ALF-12000+

50 Ω DC to 12 GHz

TYPICAL PERFORMANCE GRAPHS AT +25°C





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THIN FILM SURFACE MOUNT

Low Pass Filter

ALF-12000+

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FUNCTIONAL DIAGRAM

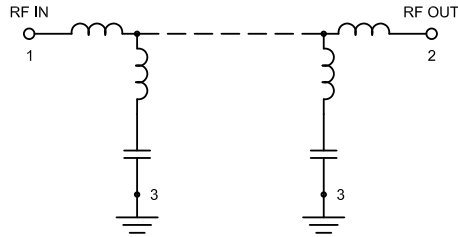
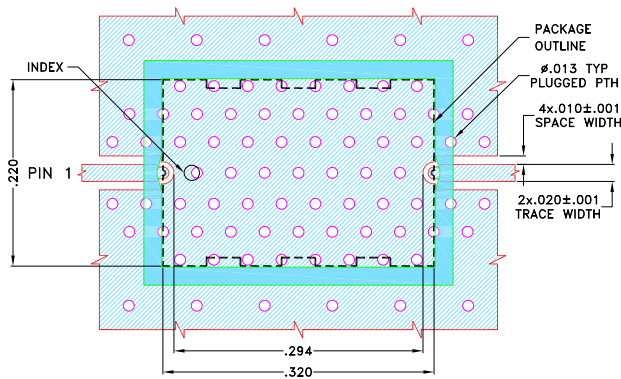


Figure 1. ALF-12000+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1	1	Connects to RF Input Port
RF2	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)

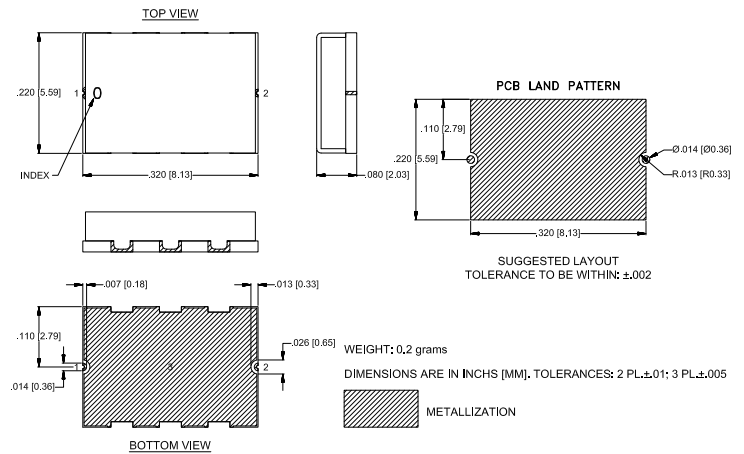


NOTES:

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

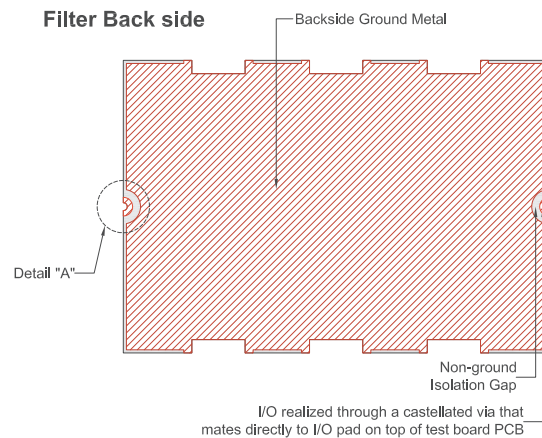


PRODUCT MARKING*: ALF-12000

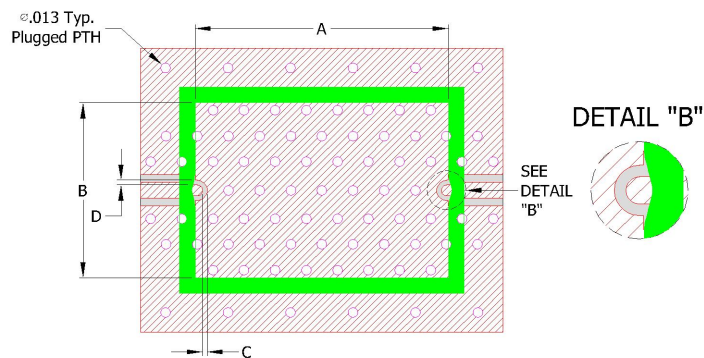
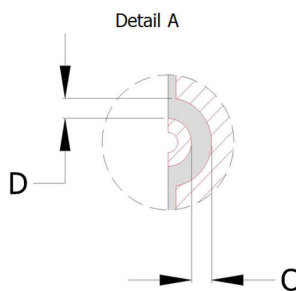
*Marking may contain other features or characters for internal lot control.



RECOMMENDED PCB LAYOUT PATTERN FOR FILTER



PCB Pattern Recommendations

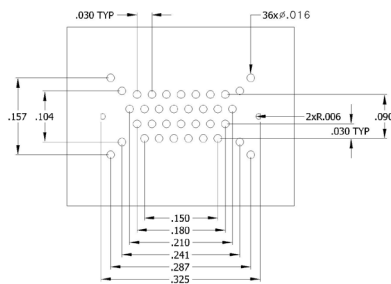
Filter RF I/O Detail
(Filter Back Side)

- 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).

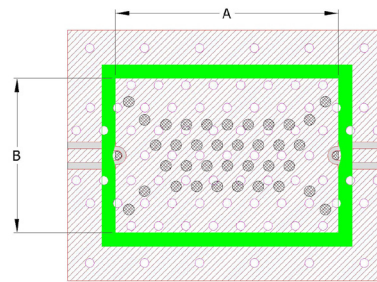
**COMMENTS ON COMPONENT HANDLING AND SOLDER ATTACH**

- 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-12000+
	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



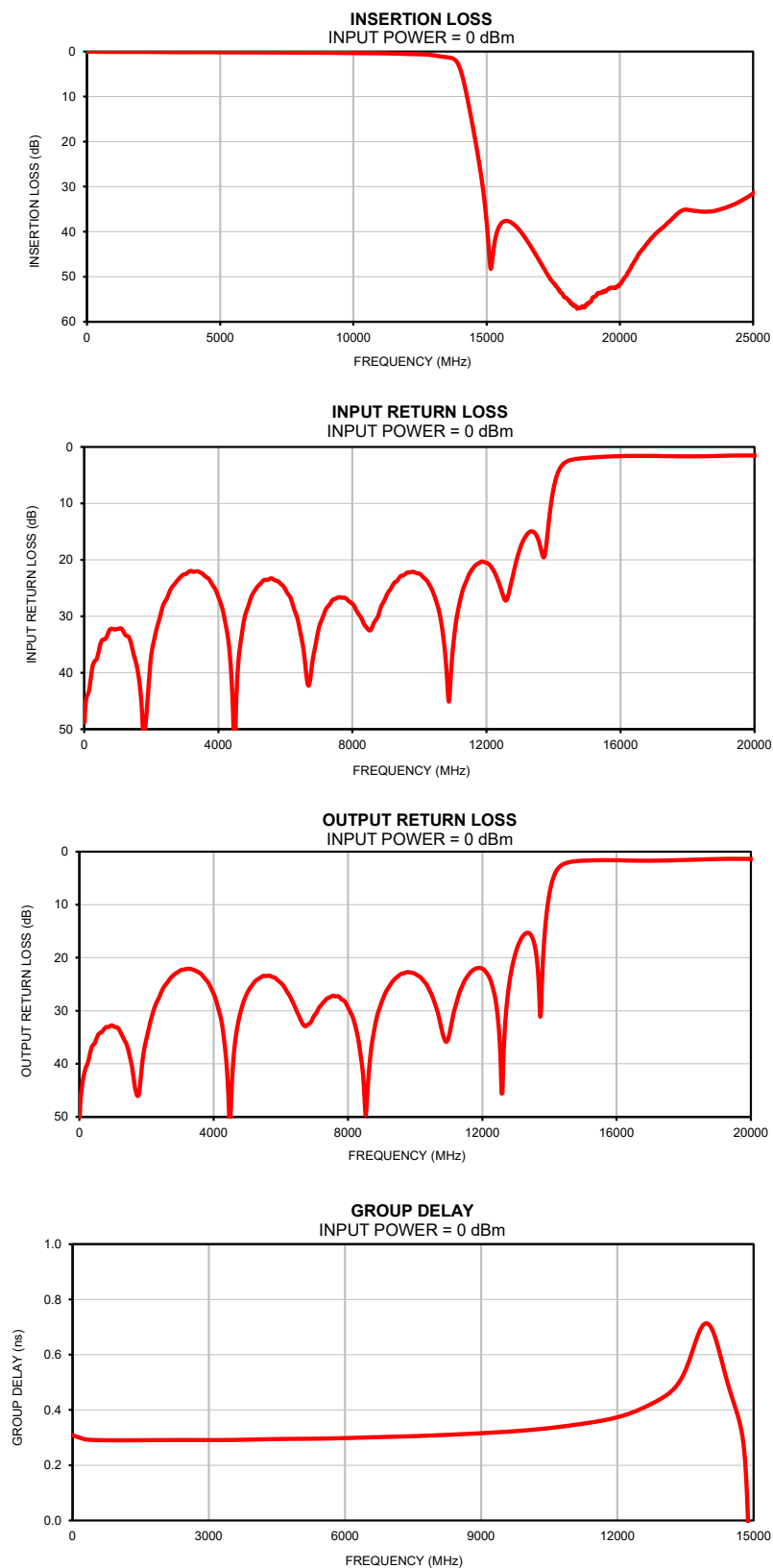
Thin-Film Lowpass Filter

ALF-12000+

Typical Performance Data

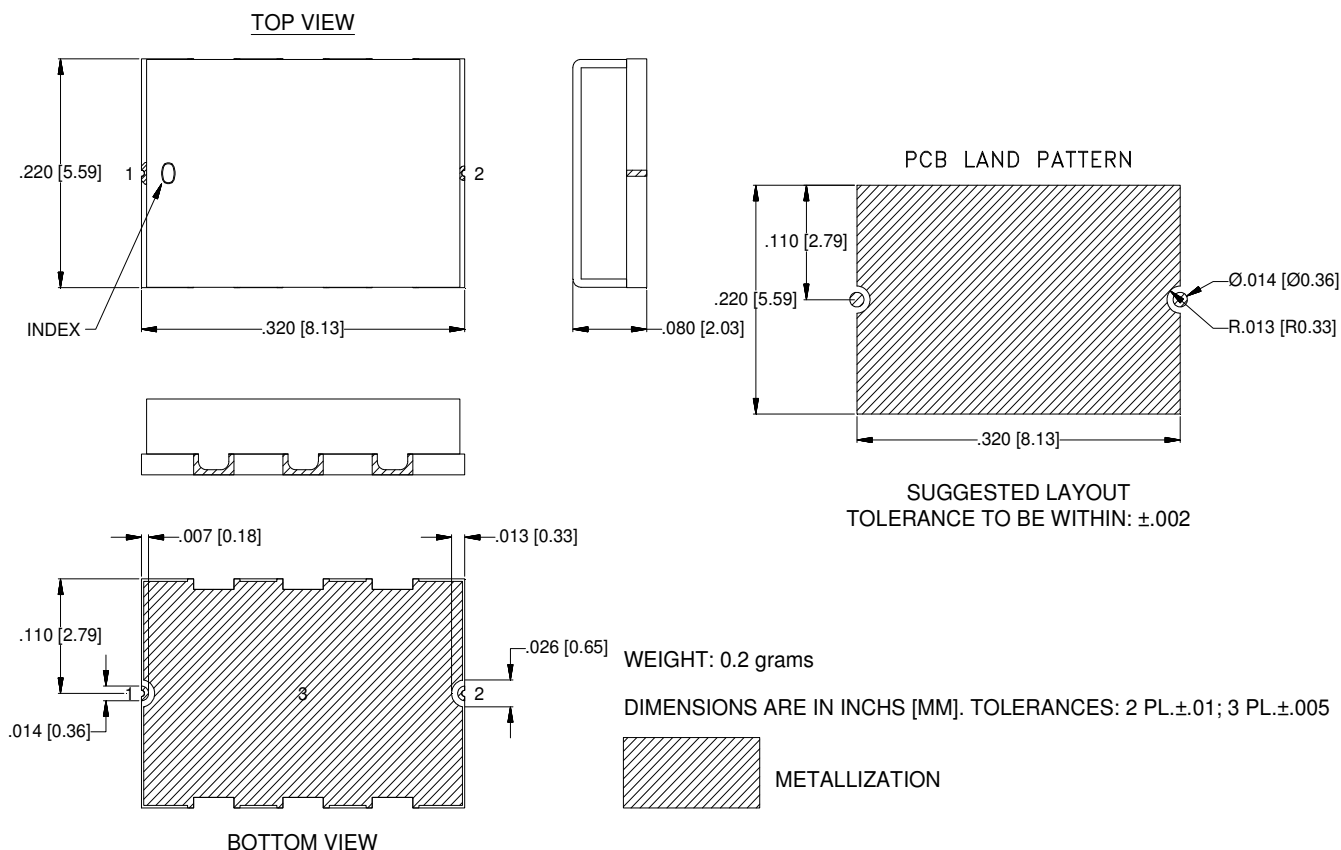
FREQ.	Insertion Loss	Input Return Loss	Output Return Loss	FREQ.	Group Delay
(MHz)	(dB)	(dB)	(dB)	(MHz)	(ns)
10	0.02	48.75	49.99	10	0.31
20	0.03	47.17	48.61	20	0.31
50	0.03	44.99	45.66	50	0.31
100	0.03	43.90	43.25	100	0.30
500	0.06	34.65	35.38	500	0.29
800	0.07	32.22	33.05	700	0.29
1000	0.08	32.24	32.83	900	0.29
1200	0.08	33.06	33.74	1000	0.29
1400	0.09	34.84	36.24	1200	0.29
1800	0.09	51.29	44.42	1400	0.29
2000	0.09	36.84	35.19	1600	0.29
2500	0.11	26.36	25.70	1800	0.29
3000	0.14	22.55	22.42	1900	0.29
3500	0.16	22.34	22.56	2000	0.29
4000	0.16	26.54	26.80	2100	0.29
4300	0.15	34.32	34.93	2300	0.29
4500	0.15	54.02	50.39	2500	0.29
5000	0.17	26.33	26.63	2600	0.29
5500	0.19	23.47	23.40	2800	0.29
6000	0.19	25.22	24.74	3000	0.29
6500	0.19	34.44	30.42	3200	0.29
7000	0.20	32.05	30.87	3400	0.29
7500	0.22	26.87	27.31	3600	0.29
8000	0.24	27.76	29.35	3800	0.29
8500	0.25	32.48	47.38	4000	0.29
9000	0.28	26.58	28.43	4200	0.29
9500	0.31	22.79	23.46	4400	0.29
10000	0.34	22.44	23.04	4600	0.29
10500	0.36	27.31	27.09	4800	0.30
11000	0.39	35.76	34.92	5000	0.30
11500	0.45	22.39	24.04	5100	0.30
12000	0.54	20.54	22.05	5200	0.30
12500	0.61	26.38	33.95	5400	0.30
12700	0.67	25.12	30.89	5800	0.30
13000	0.84	18.05	18.92	6000	0.30
13500	1.26	15.73	16.36	6200	0.30
13950	3.04	9.21	9.96	6400	0.30
14000	3.77	7.50	7.93	6600	0.30
14500	17.29	2.34	2.14	6800	0.30
14600	20.58	2.21	1.97	7000	0.30
14850	30.00	2.01	1.76	7200	0.30
15375	40.35	1.79	1.63	7400	0.30
15500	38.54	1.75	1.62	7600	0.31
15600	37.87	1.71	1.61	7800	0.31
16000	38.28	1.63	1.63	8000	0.31
16500	41.82	1.59	1.69	8300	0.31
17000	46.66	1.60	1.71	8500	0.31
18000	54.78	1.67	1.58	8800	0.31
19000	54.55	1.58	1.40	9000	0.32
19500	52.94	1.52	1.35	9400	0.32
20000	51.65	1.53	1.38	9600	0.32
21000	42.75	1.69	1.59	9800	0.32
21500	39.60	1.79	1.76	10000	0.33
22000	36.92	1.93	1.94	10300	0.33
22500	35.10	2.03	2.06	10500	0.33
23000	35.50	1.99	2.01	10800	0.34
23500	35.46	1.90	1.91	11000	0.34
24000	34.61	1.80	1.77	11300	0.35
24500	33.30	1.69	1.66	11500	0.36
25000	31.50	1.65	1.57	12000	0.37

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.



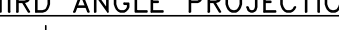
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



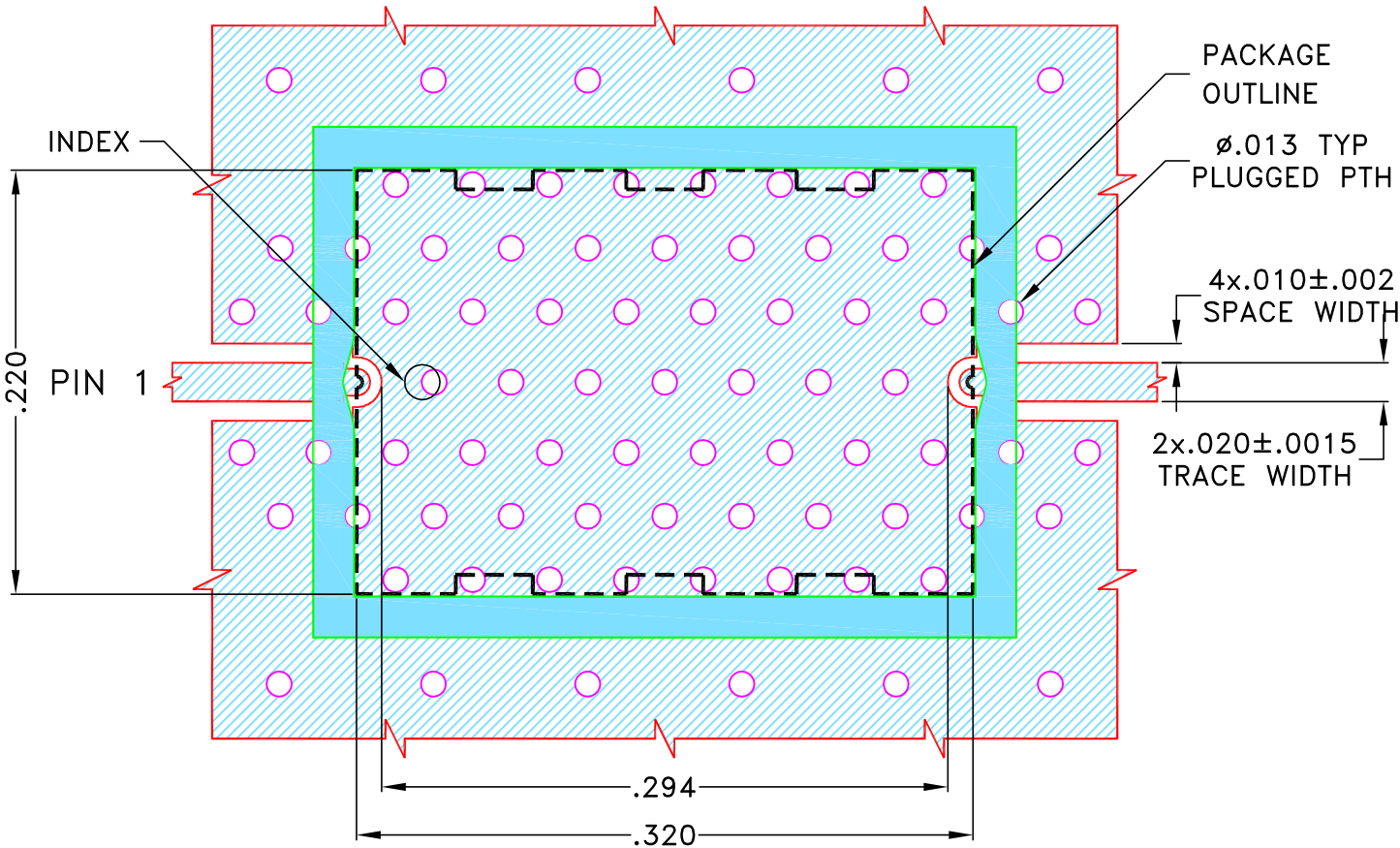
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS



THIRD ANGLE PROJECTION		REVISIONS					
		REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
		OR	ECO-007104	NEW RELEASE	MAR 21	DDR	VC
		A	ECO-010633	UPDATED AS PER CURRENT TEST BOARD	NOV 21	DDR	VC

SUGGESTED MOUNTING CONFIGURATION FOR UC2731 CASE STYLE



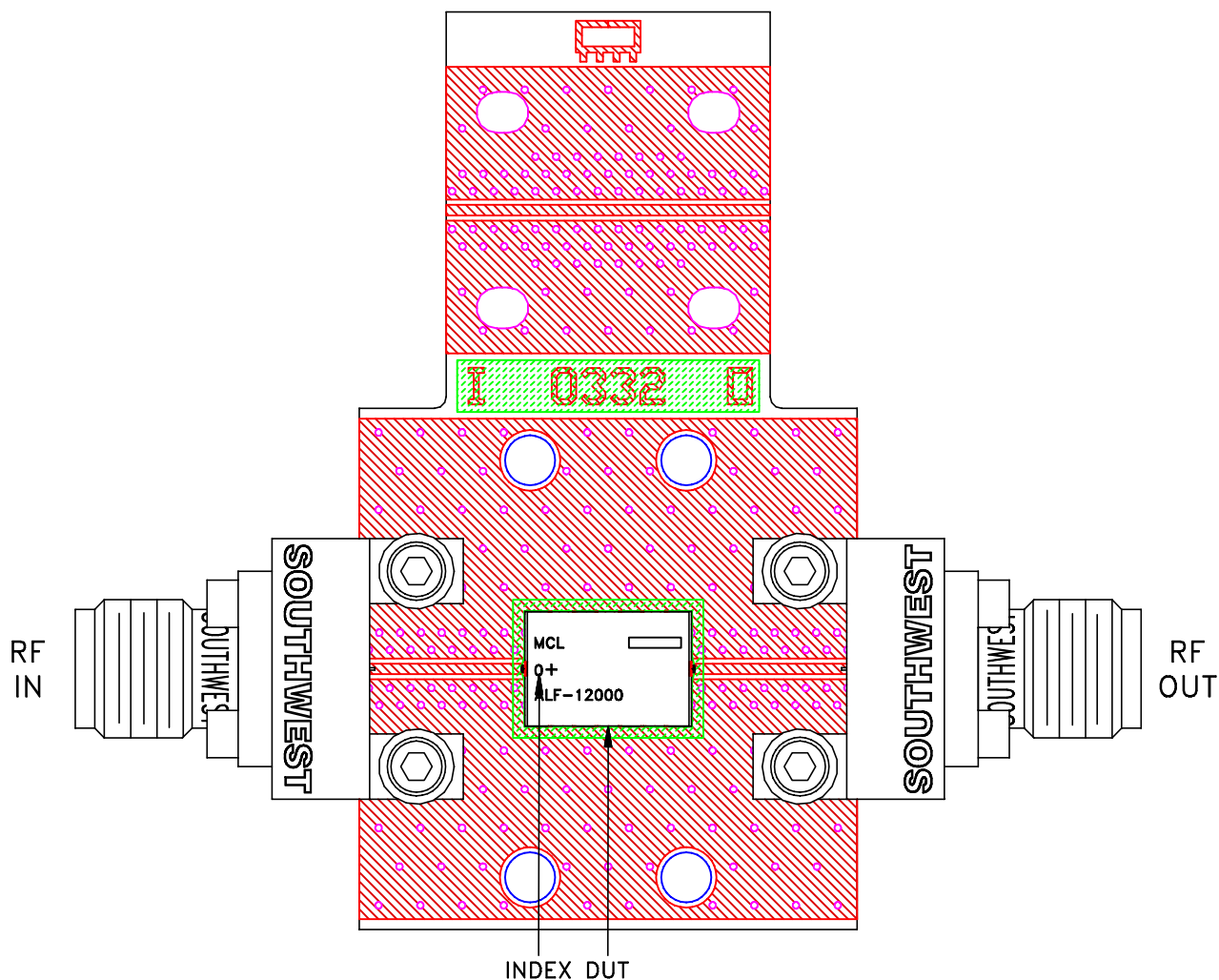
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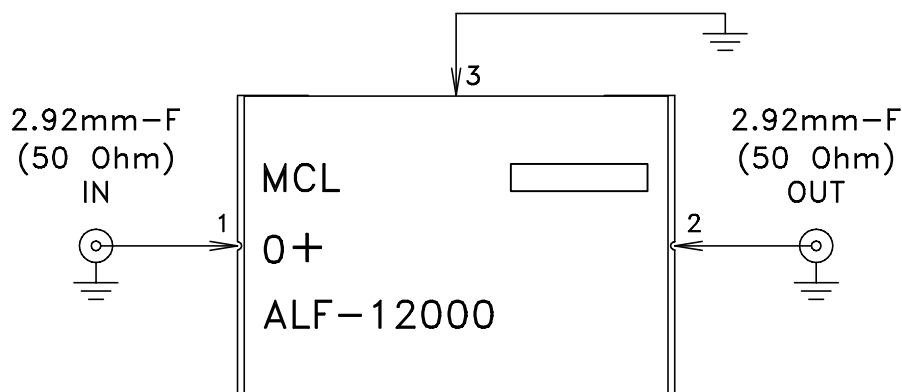
UNLESS OTHERWISE SPECIFIED		INITIALS		DATE		Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235					
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ± 		DRAWN	DDR	29 MAR 21							
		CHECKED	RR	29 MAR 21							
		APPROVED	NN	29 MAR 21							
						PL DWG, UC2731 C.S, 50 OHM, ABF					
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ASHEETA1.DWG REV:A DATE:01/12/95											
SIZE		CODE IDENT		DRAWING NO:		REV:					
A		15542		98-PL-652		A					
FILE:		98-PL-652		SCALE:		10:1		SHEET:		1 OF 1	

Evaluation Board and Circuit

TB-ALF-12000+



Schematic diagram



Notes:

1. PCB Material: ROGERS (R04350B) OR Equivalent, Dielectric Constant= 3.48 ± 0.05
Dielectric Thickness: $.010 \pm .001$ 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