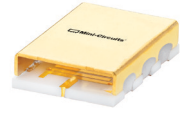


# Surface Mount Thin-Film Filters

50Ω DC to 40 GHz

## The Big Deal

- Low passband insertion loss
- High rejection
- Good power handling
- Temperature stability -55°C to 125°C
- High repeatability
- RoHS complaint
- Small size



## 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. Using thin-film manufacturing, we can guarantee repeatability on large batches of filters. Thin-film filters are small in size with high-quality, precise machining for applications where size is critical.

## Key Features

Feature	Advantages
Low insertion loss	High Q material and sputtering process results in lower insertion loss, better SNR is obtained.
Fast roll-off (steeper skirts)	High selectivity results in better adjacent channel rejection and dynamic range
Wider stopband	Wide spur-free stopband results in better adjacent channel rejection and dynamic range
Temperature stability	Very minimal change in electrical performance across temperature makes these filters suitable for a wide range of operating conditions.
Small Size	Various design techniques are employed to realize small size.

### Notes

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B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



# Surface mount Thin Film Bandpass Filter

## ABF-11R5G+

50Ω 9600 to 13200 MHz



Generic photo used for illustration purposes only

CASE STYLE: UC2731

### Features

- Low passband insertion loss of 1.5dB typical
- High rejection of 50dB typical
- Good Return loss of 12dB typical in the Passband
- Small size

### Applications

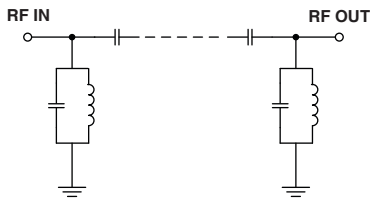
- Receivers
- Satellite

### Electrical Specifications<sup>(1)</sup> at 25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Pass Band	Insertion Loss	F1-F2	9600 - 13200	—	1.5	2.5	dB
	Return Loss	F1-F2	9600 - 13200	—	12	—	dB
Stop Band, Lower	Insertion Loss	DC-F3	DC - 5000	40	50	—	dB
		F3-F4	5000 - 7250	20	30	—	dB
Stop Band, Upper	Insertion Loss	F5-F6	15600 - 17000	20	30	—	dB
		F6-F7	17000 - 30000	—	35	—	dB

1. Measured on Mini-Circuits Characterization Test Board TB-ABF-11R5G+ with feedline loss removed by normalization of S12 and S21 traces to measurement of TB thru-line.

### Functional Schematic



### Maximum Ratings

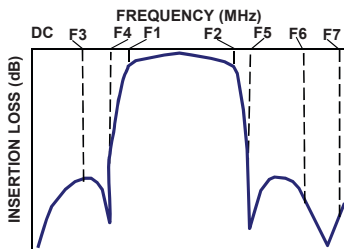
Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
RF Power Input	1W Max. @ 25°C

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

### Typical Performance Data at 25°C

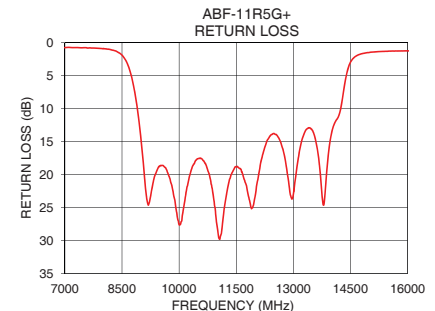
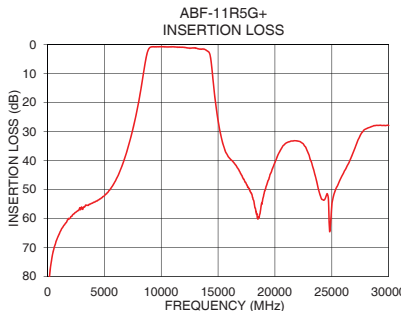
Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	99.93	0.05
500	71.35	0.27
1000	65.59	0.33
5000	52.20	0.50
7250	33.11	0.73
7400	30.84	0.76
7950	21.16	0.87
8720	3.67	4.52
9600	0.79	18.74
10500	0.81	17.56
11500	0.92	18.82
12300	1.15	14.99
13200	1.39	15.32
14120	2.36	11.79
14720	18.17	1.80
15150	29.55	1.39
15600	36.37	1.26
17000	44.52	1.29
20000	40.65	1.50
30000	27.89	3.94

### Typical Frequency Response



### +RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications



### Notes

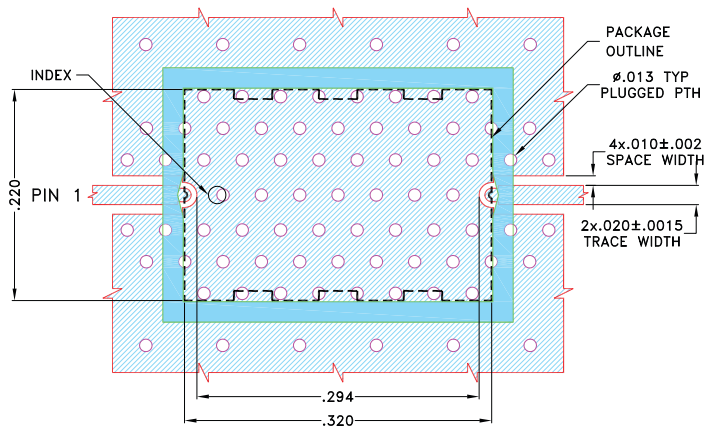
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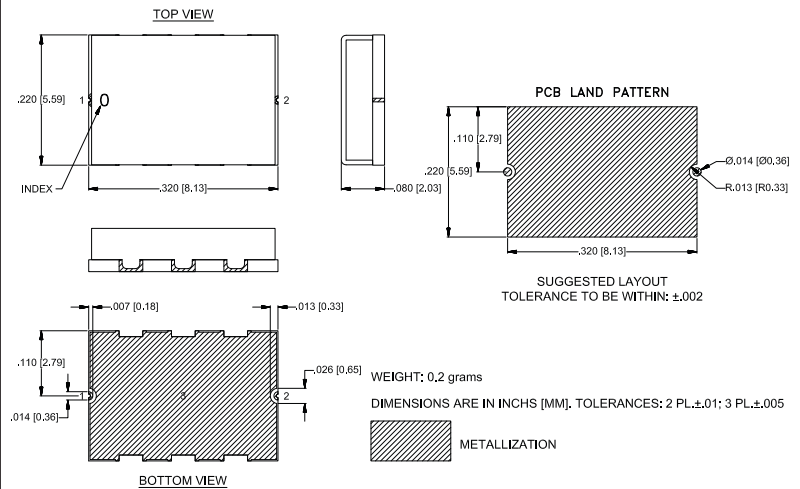
## Pad Connections

RF IN	1
RF OUT	2
GROUND	3

**Demo Board MCL P/N: TB-ABF-11R5G+**  
**Suggested PCB Layout (PL-652)**



## Outline Drawing

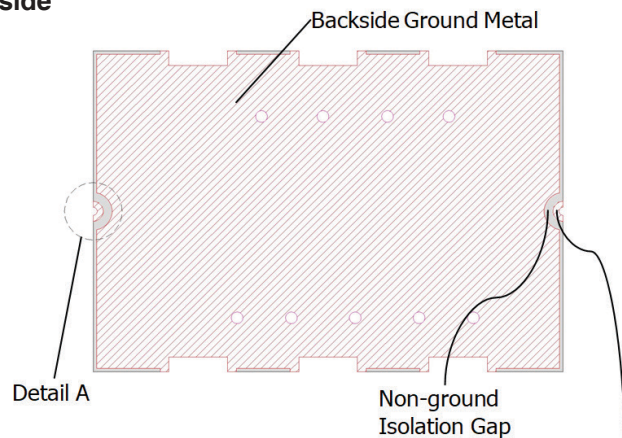


### NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS  $.010 \pm .0010$ . 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

## Recommendations of PCB pattern at customer board

### Filter Back side



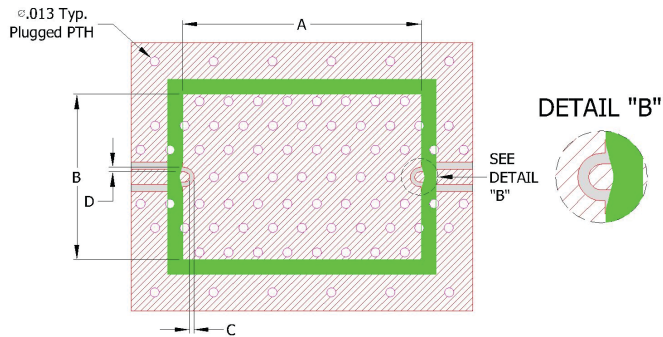
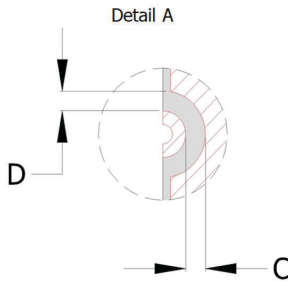
I/O realized through a castellated via that mates directly to I/O pad on top of test board PCB

### Notes

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## PCB Pattern Recommendations

Filter RF I/O Detail  
(Filter Back Side)

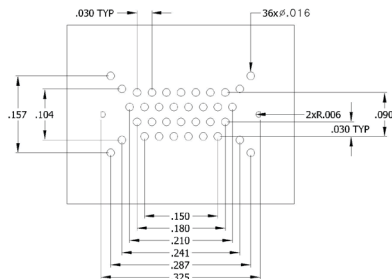


- 1) Customer PCB's ground pattern length (dimension A) can be similar to filter length.
- 2) Customer PCB's ground pattern width (dimension B) can be similar filter width.
- 3) Dimensions C and D on Filter RF I/O detail and Customer PCB pattern can be closely match. The dimensions of C and D on the 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).

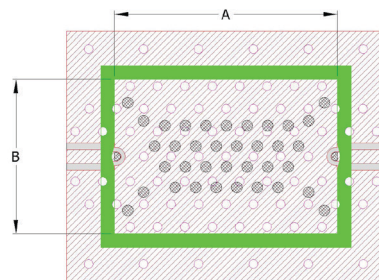
## Comments on component handling and solder attach

- 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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# Thin-Film Bandpass Filter

# ABF-11R5G+

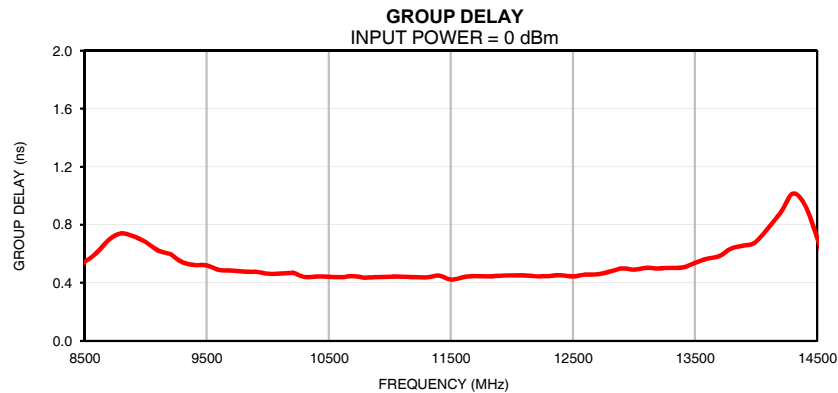
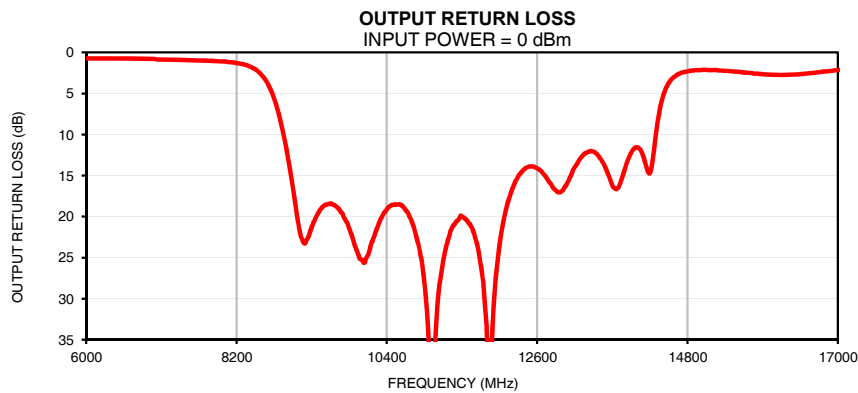
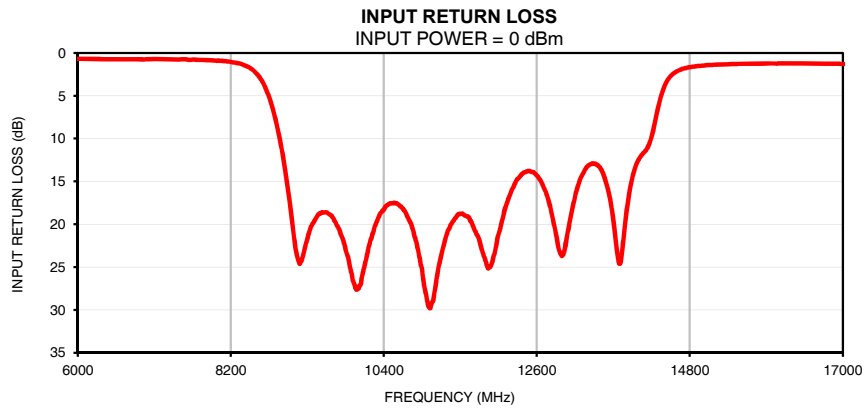
## Typical Performance Data

FREQ.	Insertion Loss	Input Return Loss	Output Return Loss
(MHz)	(dB)	(dB)	(dB)
10	99.93	0.05	0.15
50	89.41	0.08	0.20
100	84.99	0.05	0.14
500	71.35	0.27	0.37
1000	65.59	0.33	0.42
1500	62.15	0.35	0.37
2000	59.80	0.34	0.33
2500	57.81	0.27	0.33
3000	56.02	0.24	0.37
3500	55.40	0.26	0.48
4000	54.55	0.32	0.60
4500	53.58	0.41	0.68
5000	52.20	0.50	0.72
5250	51.12	0.55	0.73
5500	50.03	0.61	0.73
5750	48.56	0.65	0.74
6000	46.83	0.68	0.75
6250	44.77	0.72	0.73
6500	42.38	0.73	0.73
7000	36.56	0.74	0.80
7250	33.11	0.73	0.88
7400	30.84	0.76	0.91
7950	21.16	0.87	1.08
8400	10.94	1.47	1.72
8720	3.67	4.52	4.92
9600	0.79	18.74	18.47
10000	0.74	27.59	25.08
10500	0.81	17.56	18.55
11000	0.77	27.91	33.06
11500	0.92	18.82	19.97
12000	0.95	23.12	26.98
12500	1.22	13.81	13.89
12700	1.19	15.74	14.88
13000	1.19	22.94	16.43
13200	1.39	15.32	13.33
14120	2.36	11.79	11.97
14400	6.24	4.68	6.73
14720	18.17	1.80	2.45
15150	29.55	1.39	2.14
15600	36.37	1.26	2.42
16000	39.17	1.23	2.71
16500	41.30	1.23	2.61
17000	44.52	1.29	2.14
17500	48.19	1.36	1.85
18000	52.11	1.41	1.75
18500	60.17	1.45	1.72
19000	52.24	1.48	1.69
19500	45.81	1.49	1.64
20000	40.65	1.50	1.61
20500	36.31	1.60	1.58
21000	33.91	1.68	1.57
21500	33.26	1.70	1.59
22000	33.28	1.71	1.67
22500	34.29	1.77	1.75
23000	38.13	1.69	1.74
23500	44.65	1.59	1.67
24000	52.24	1.52	1.59
25000	55.33	1.56	1.53
27000	36.05	2.82	1.79
30000	27.89	3.94	2.10

FREQ.	Group Delay
(MHz)	(ns)
9600	0.49
9680	0.49
9760	0.48
9840	0.48
9920	0.48
10000	0.46
10080	0.47
10160	0.45
10240	0.46
10320	0.45
10400	0.44
10480	0.44
10550	0.44
10600	0.44
10650	0.43
10700	0.45
10750	0.44
10800	0.44
10850	0.45
10900	0.44
10950	0.44
11000	0.44
11050	0.45
11100	0.44
11150	0.44
11200	0.44
11250	0.44
11300	0.44
11350	0.43
11400	0.45
11450	0.43
11500	0.42
11550	0.45
11600	0.44
11650	0.43
11700	0.45
11750	0.44
11800	0.44
11850	0.45
11900	0.45
11950	0.45
12000	0.45
12050	0.45
12100	0.45
12150	0.45
12200	0.44
12250	0.45
12300	0.45
12350	0.44
12400	0.45
12450	0.44
12500	0.44
12550	0.45
12600	0.46
12700	0.46
12800	0.48
12900	0.50
13000	0.49
13100	0.50
13200	0.50

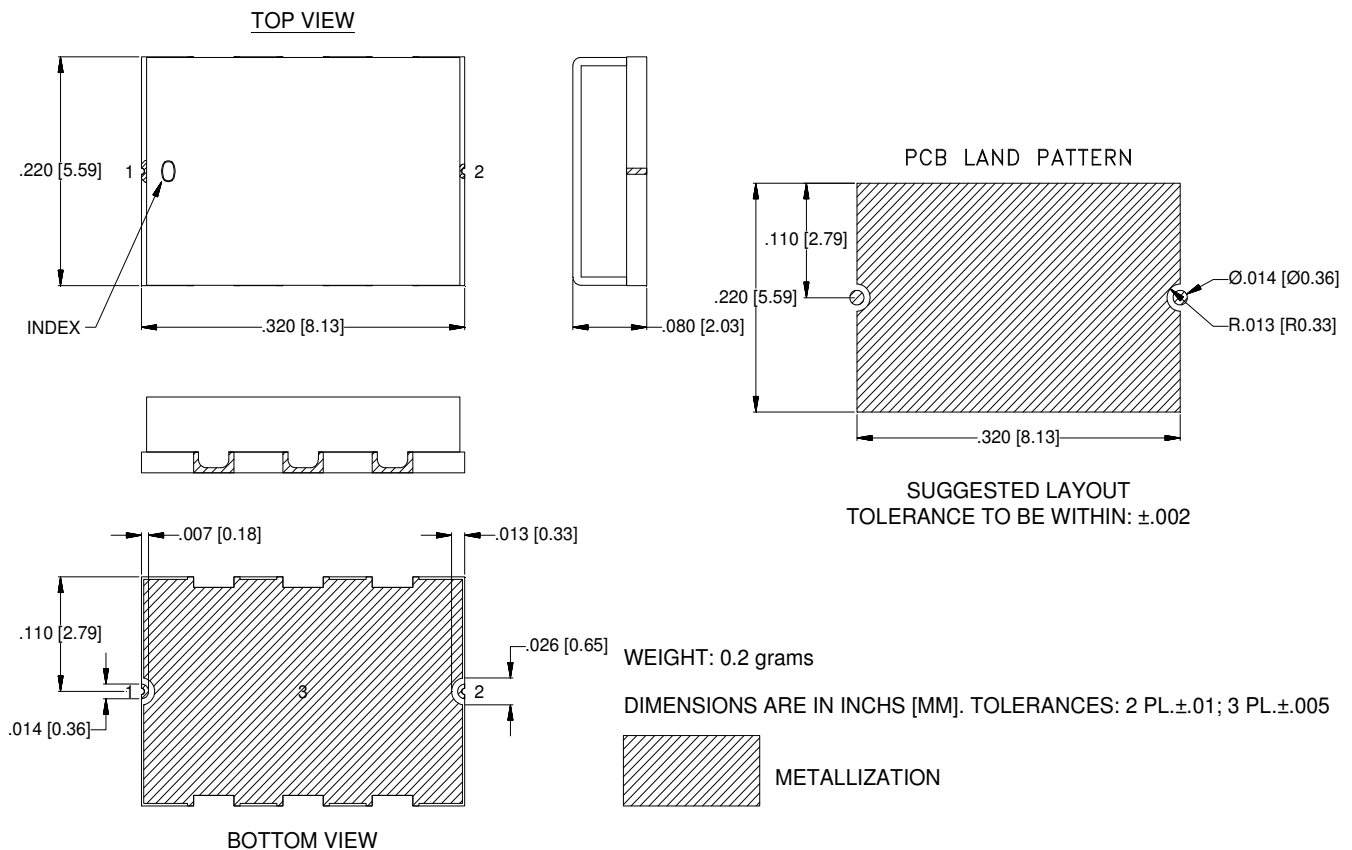


Typical Performance Curves



## 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

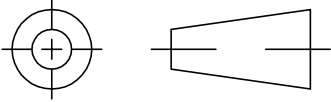


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS



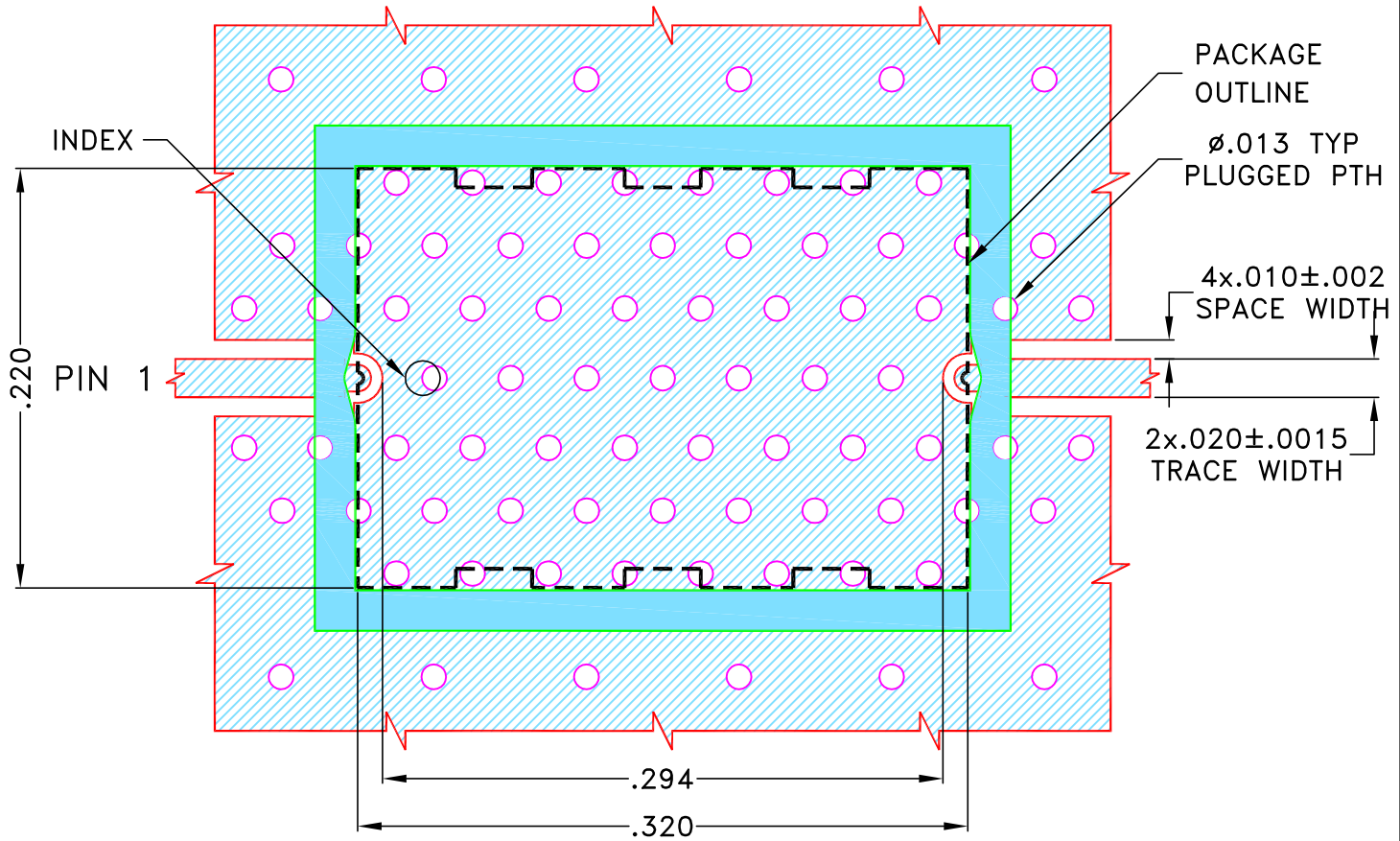
THIRD ANGLE PROJECTION



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**



**NOTES:**

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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

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN: DDR	29 MAR 21
TOLERANCES ON:	CHECKED: RR	29 MAR 21
2 PL DECIMALS ±	APPROVED: NN	29 MAR 21
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

PL DWG, UC2731 C.S, 50 OHM, ABF

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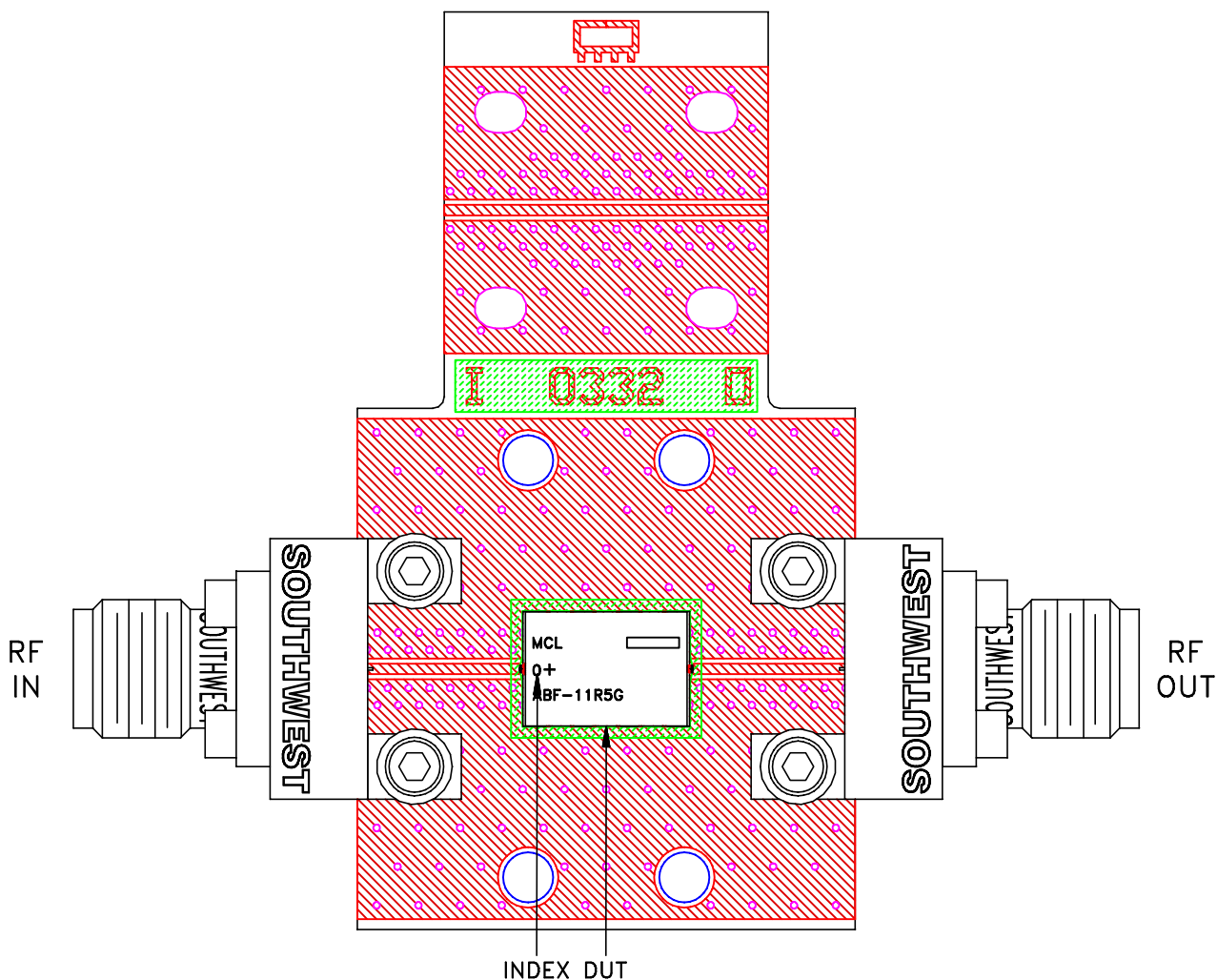
ASHEETA1.DWG REV:A DATE:01/12/95

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FILE: 98-PL-652	SCALE: 10:1	SHEET: 1 OF 1	

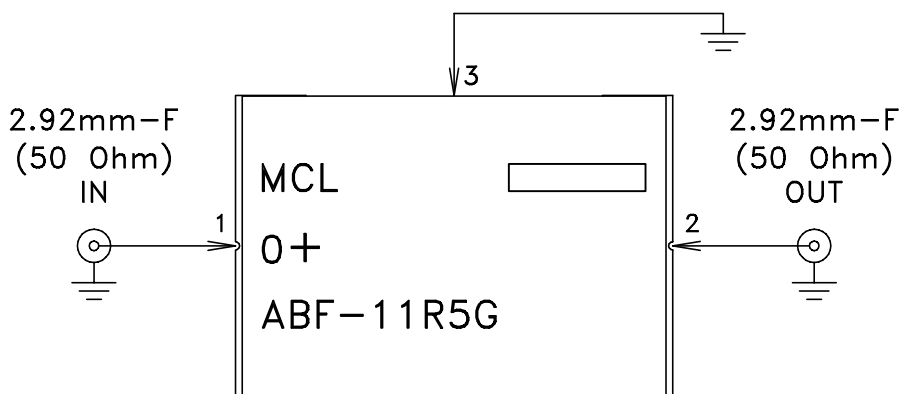


# Evaluation Board and Circuit

TB-ABF-11R5G+




Schematic diagram



**Notes:**

1. PCB Material: ROGERS (R04350B) OR Equivalent, Dielectric Constant=3.48±.05  
Dielectric Thickness: .010±.001
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.

<b>Specification</b>	<b>Test/Inspection Condition</b>	<b>Reference/Spec</b>
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