

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



Surface mount Thin Film Bandpass Filter

ABF-28G+

50Ω 26500 to 29500 MHz



Generic photo used for illustration purposes only
CASE STYLE: VG3044

Features

- Low mid band insertion loss of 1.6 dB typ.
- 15 dB typ. return loss in entire passband
- 60 dB typ. rejection
- Shielded component

Applications

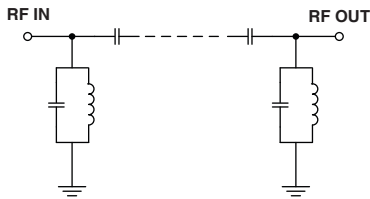
- n257
- 5G Telecommunication

Electrical Specifications⁽¹⁾ at 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	Fc	28000	—	1.6	3.0	dB
	Insertion Loss	F1-F2	26500 - 29500	—	3.5	—	dB
Stop Band, Lower	Return Loss	F1-F2	26500 - 29500	—	15	—	dB
	Insertion Loss	DC-F3	DC - 23000	30	45	—	dB
Stop Band, Upper	Insertion Loss	F3-F4	23000 - 24500	25	45	—	dB
	Insertion Loss	F5-F6	31500 - 32500	25	55	—	dB
Stop Band, Upper	Insertion Loss	F6-F7	32500 - 36000	40	60	—	dB
	Insertion Loss	F7-F8	36000 - 40000	—	40	—	dB

1. Measured on Mini-Circuits Characterization Test Board TB-ABF-28G+

Functional Schematic



Maximum Ratings

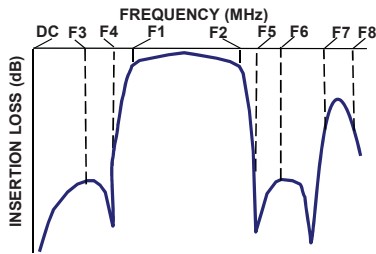
Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
RF Power Input	1W Max. @ 25°C

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

Typical Performance Data at 25°C

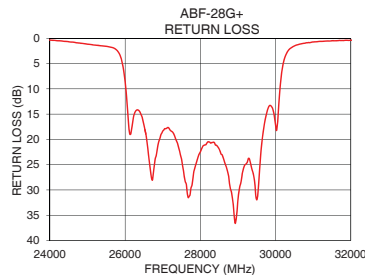
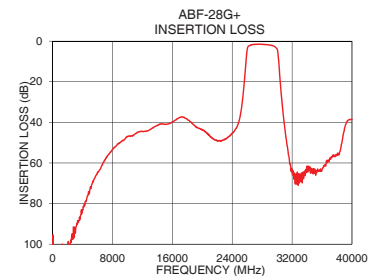
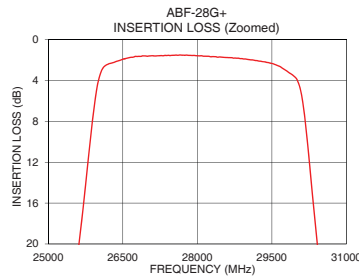
Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	107.70	0.03
1000	104.11	0.19
10000	47.03	0.07
23000	48.45	0.06
24500	43.04	0.68
25350	29.81	1.47
25600	20.76	1.72
26100	2.78	17.77
26500	1.92	17.16
27000	1.63	18.35
28000	1.58	22.45
29000	1.93	31.81
29500	2.33	31.96
29800	3.07	13.85
30425	20.51	1.83
30650	30.02	1.14
31500	55.78	0.48
32500	65.52	0.34
36000	63.14	0.06
40000	38.60	1.13

Typical Frequency Response



+RoHS Compliant

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



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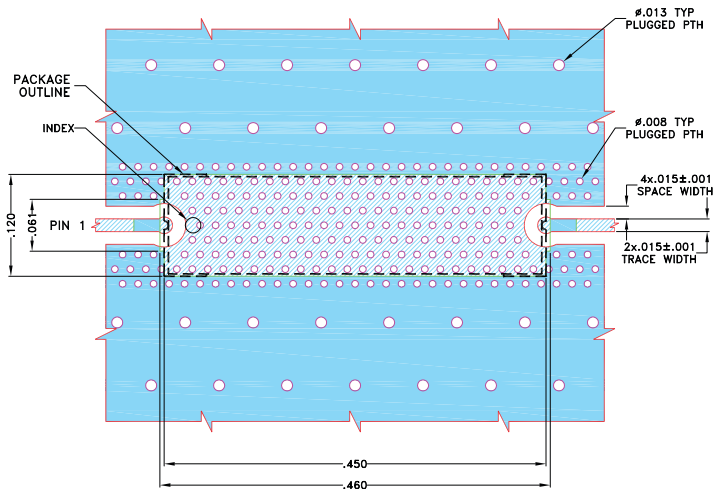


Pad Connections

RF IN	1
RF OUT	2
GROUND	3

Demo Board MCL P/N: TB-ABF-28G+
Suggested PCB Layout (PL-713)

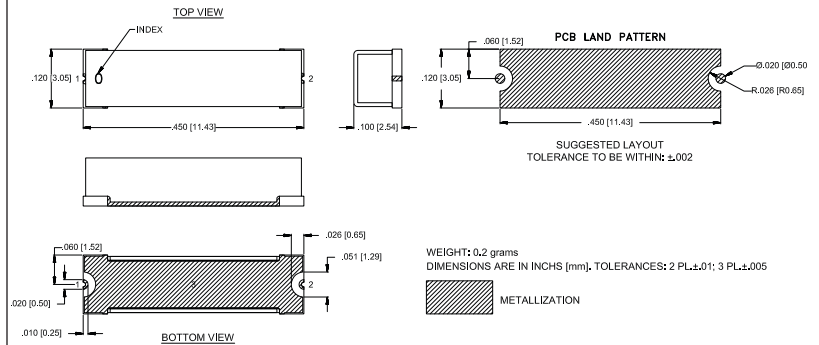
SUGGESTED MOUNTING CONFIGURATION FOR VG3044 CASE STYLE



NOTES:

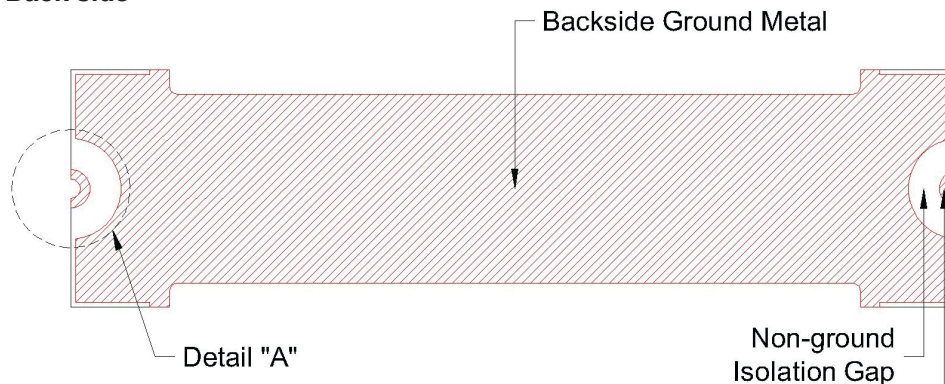
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .0066±.0007. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

Outline Drawing



Recommendations of PCB pattern at customer board

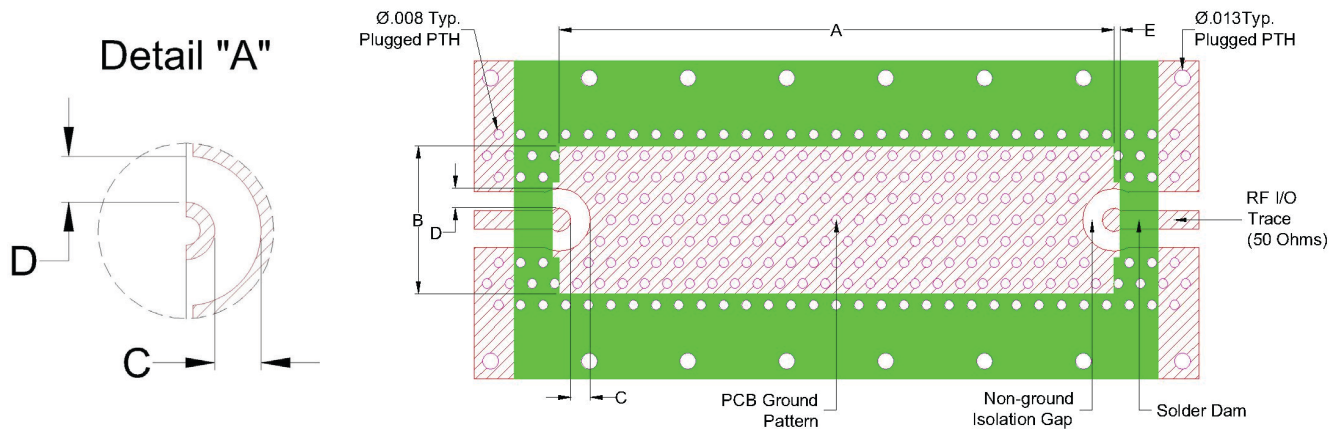
Filter Back side



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

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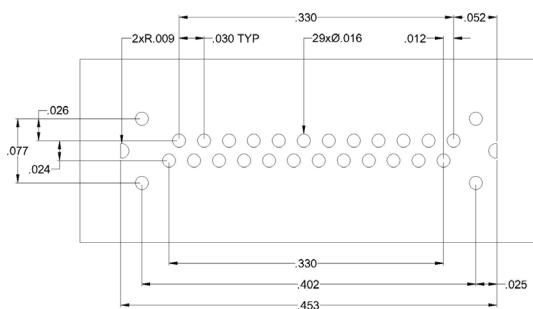


- 1) Customer PCB's ground pattern length (dimension A) can be similar to filter length.
- 2) Customer PCB's ground pattern width (dimension B) can be similar filter width.
- 3) Dimensions C and D on Filter RF I/O detail and Customer PCB pattern can be closely match. The dimensions of C and D on the 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 without any clearance.
- 5) Recommended to use Solder mask at I/O of Customer PCB with 5 mil clearance from filter I/O edge (dimension E)

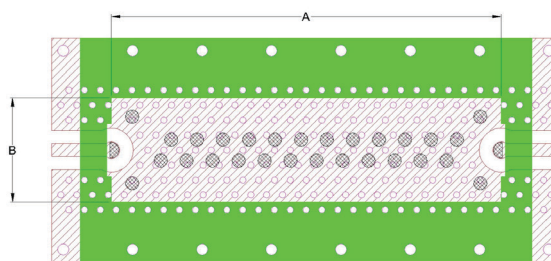
Comments on component handling and solder attach

- 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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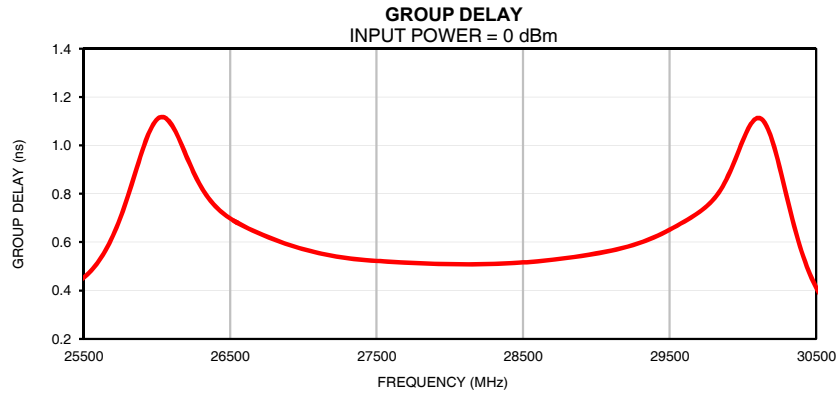
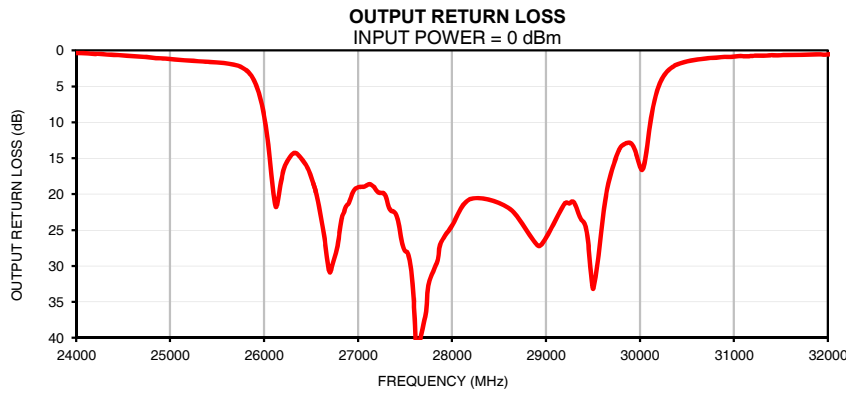
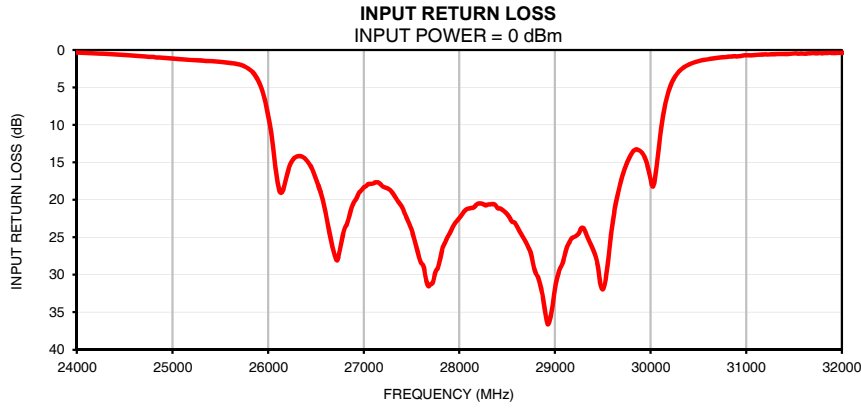
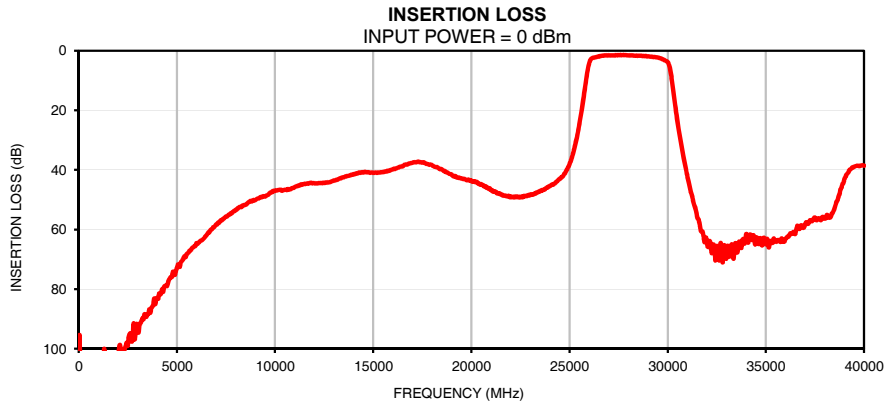
Thin-Film Bandpass Filter

ABF-28G+

Typical Performance Data

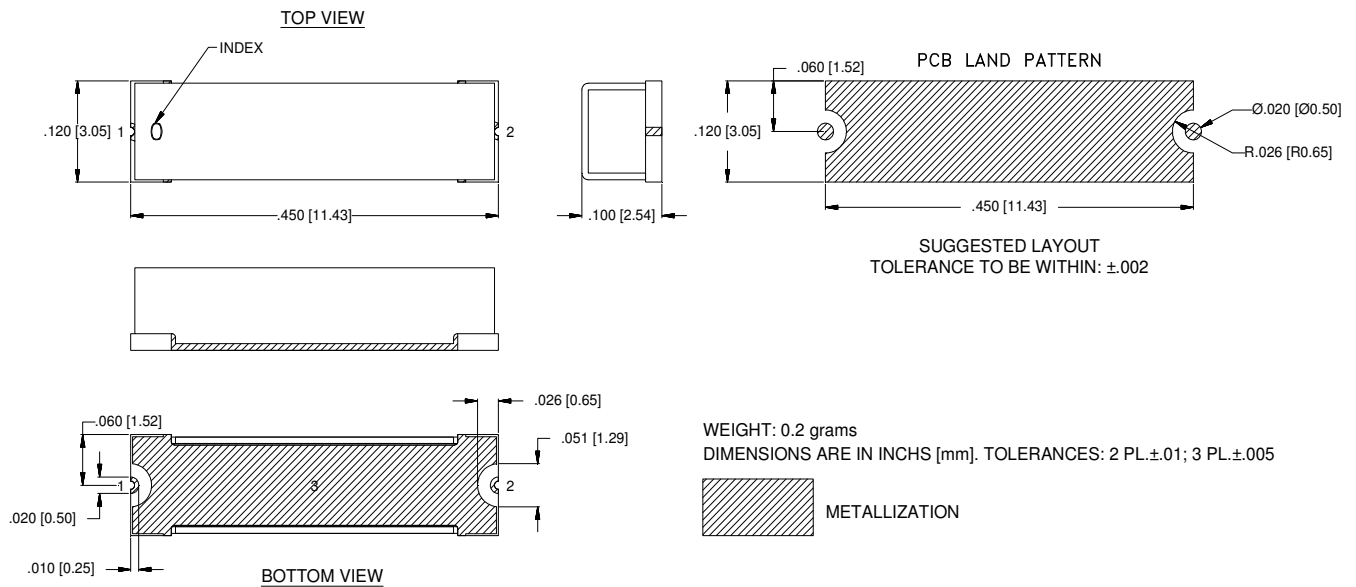
FREQ.	Insertion Loss	Input Return Loss	Output Return Loss	FREQ.	Group Delay
(MHz)	(dB)	(dB)	(dB)	(MHz)	(ns)
10	107.70	0.03	0.03	26500	0.70
50	95.69	0.06	0.07	26550	0.68
100	113.58	0.12	0.11	26600	0.66
500	122.33	0.18	0.18	26650	0.65
1000	104.11	0.19	0.18	26700	0.64
2000	103.58	0.13	0.14	26750	0.62
3000	94.21	0.03	0.05	26800	0.61
4000	82.99	0.10	0.10	26850	0.60
5000	73.00	0.04	0.06	26900	0.59
6000	64.60	0.03	0.02	26950	0.58
7000	58.34	0.00	0.04	27000	0.57
8000	53.39	0.09	0.04	27050	0.56
9000	50.09	0.06	0.03	27100	0.56
10000	47.03	0.07	0.07	27150	0.55
11000	45.81	0.10	0.10	27200	0.54
12000	44.47	0.05	0.05	27250	0.54
13000	43.58	0.03	0.02	27300	0.53
14000	41.41	0.07	0.05	27350	0.53
15000	41.00	0.12	0.11	27400	0.53
18000	38.42	0.36	0.40	27450	0.52
20000	43.82	0.30	0.30	27500	0.52
20500	44.78	0.23	0.22	27550	0.52
21000	46.76	0.17	0.14	27600	0.52
22000	49.11	0.05	0.05	27650	0.52
23000	48.45	0.06	0.06	27700	0.52
24500	43.04	0.68	0.71	27750	0.51
25350	29.81	1.47	1.54	27800	0.51
25600	20.76	1.72	1.79	27850	0.51
25825	10.78	2.80	2.92	27900	0.51
26100	2.78	17.77	19.97	27950	0.51
26500	1.92	17.16	17.54	28000	0.51
27000	1.63	18.35	19.06	28050	0.51
27500	1.54	23.93	27.89	28100	0.51
27800	1.53	27.88	27.99	28150	0.51
28000	1.58	22.45	24.38	28200	0.51
28200	1.63	20.48	20.67	28250	0.51
28500	1.72	21.91	20.53	28300	0.51
29000	1.93	31.81	24.42	28350	0.51
29500	2.33	31.96	33.18	28400	0.51
29800	3.07	13.85	13.37	28450	0.51
30225	10.50	4.29	4.17	28500	0.52
30425	20.51	1.83	1.80	28550	0.52
30650	30.02	1.14	1.22	28600	0.52
31000	42.14	0.73	0.87	28650	0.52
31200	47.81	0.59	0.76	28700	0.53
31500	55.78	0.48	0.65	28750	0.53
31800	61.50	0.45	0.60	28800	0.53
32000	63.53	0.39	0.56	28850	0.54
32300	65.07	0.35	0.50	28900	0.54
32500	65.52	0.34	0.48	28950	0.55
32800	71.01	0.31	0.41	29000	0.55
33000	68.79	0.27	0.38	29050	0.56
33500	66.81	0.27	0.28	29100	0.57
34000	61.52	0.22	0.16	29150	0.57
34500	63.33	0.17	0.07	29200	0.58
35000	64.94	0.10	0.02	29250	0.59
36000	63.14	0.06	0.04	29300	0.60
38000	56.32	0.79	1.29	29350	0.61
39000	42.99	4.26	4.69	29400	0.62
40000	38.60	1.13	0.89	29500	0.65

Typical Performance Curves



Outline Dimensions

VG3044



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.



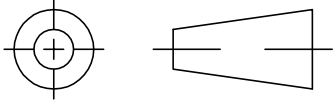
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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

RF/IF MICROWAVE COMPONENTS

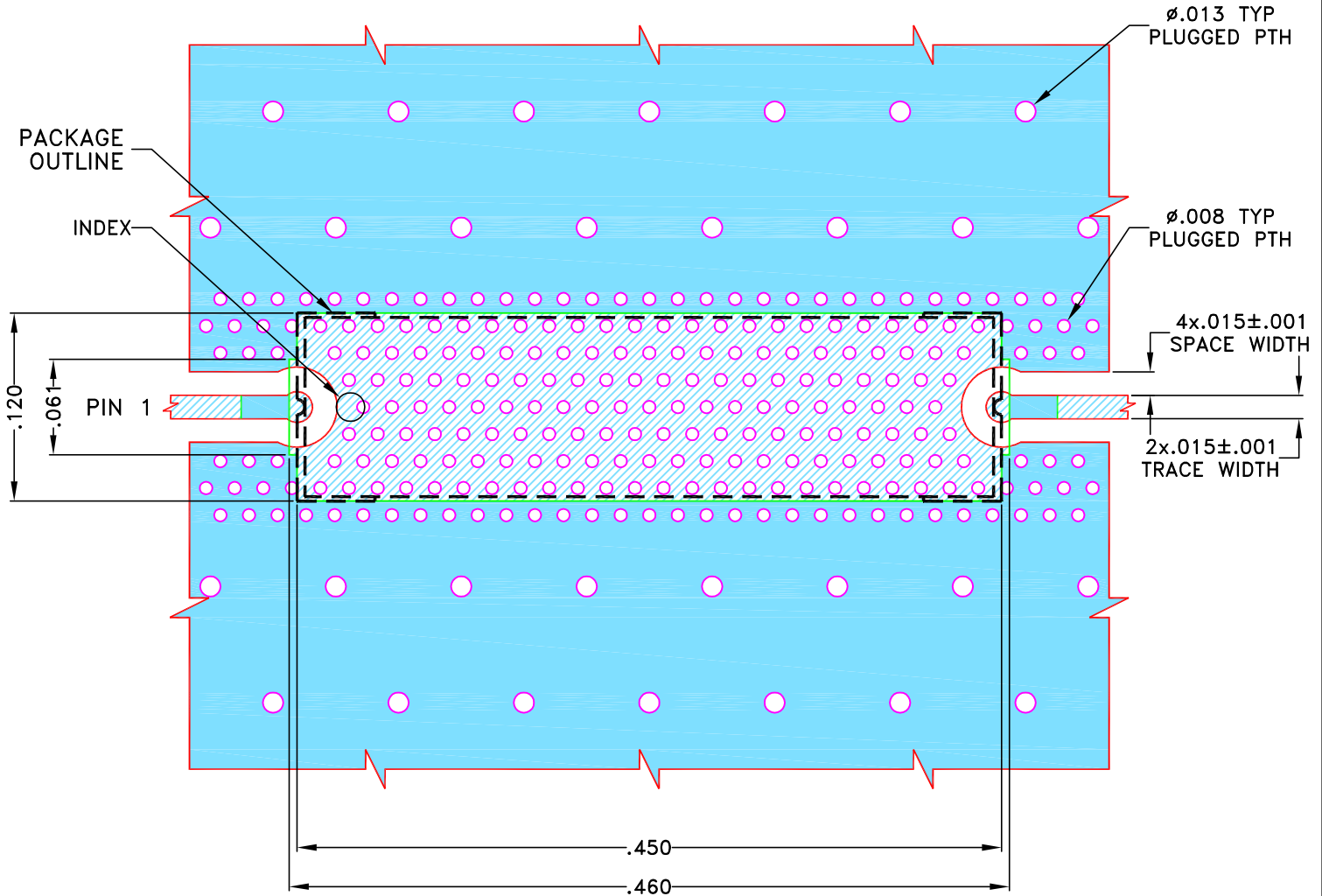
THIRD ANGLE PROJECTION



REVISIONS



REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	NPO-001850	NEW RELEASE	JUL 21	DDR	VC

SUGGESTED MOUNTING CONFIGURATION FOR VG3044 CASE STYLE



NOTES:

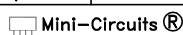
- COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS .0066±.0007. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	06 JUL 21
TOLERANCES ON:	CHECKED	06 JUL 21
2 PL DECIMALS ±	APPROVED	06 JUL 21
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

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

PL DWG, VG3044 C.S, 50 OHM, ABF

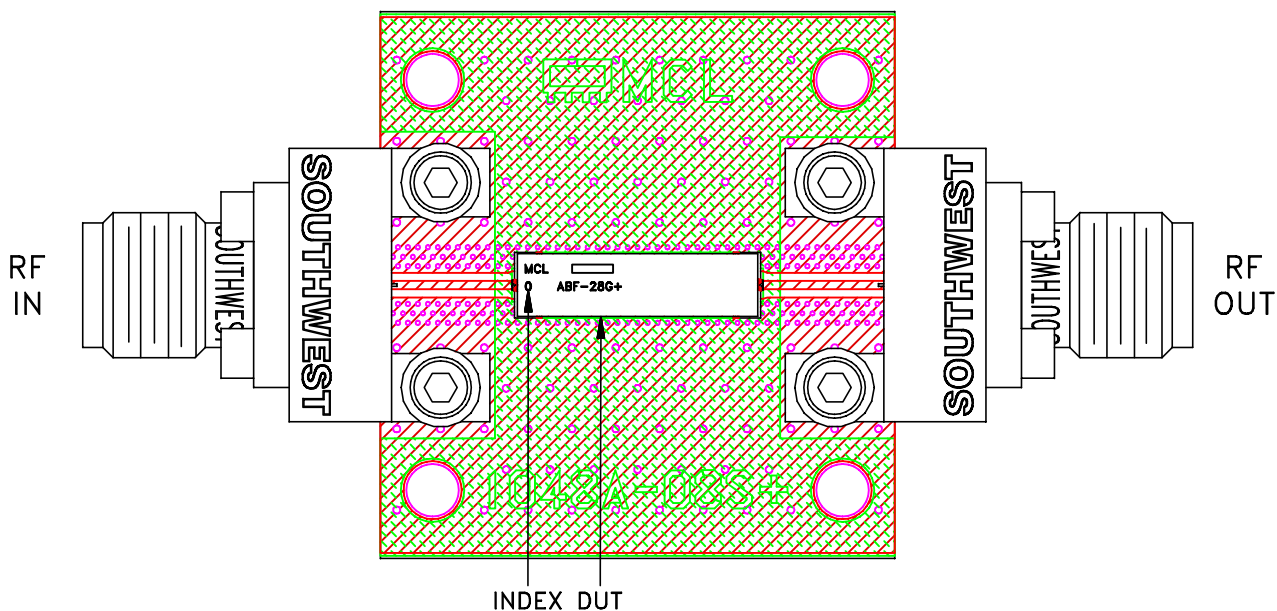
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ASHEETA1.DWG REV:A DATE:01/12/95

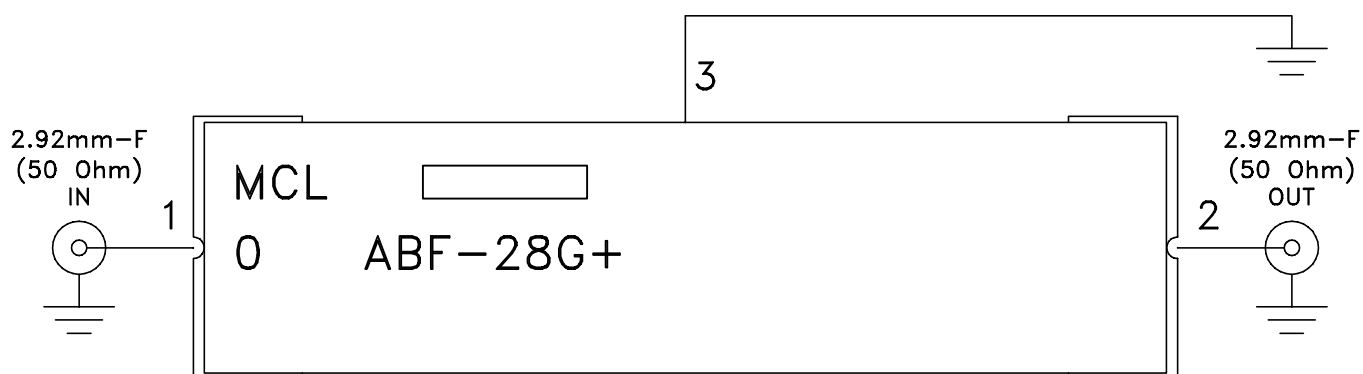
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-713	OR
FILE:	98-PL-713	SCALE:	9:1
SHEET:	1	OF	1

Evaluation Board and Circuit

TB-ABF-28G+




Schematic diagram



Notes:

1. PCB Material: ROGERS (R04350B) OR Equivalent, Dielectric Constant=3.48±.05
Dielectric Thickness: .0066" ± .0007"
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