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 a 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.

Surface mount Thin Film

Bandpass Filter

ABF-26G+

50Ω 24250 to 27500 MHz

Generic photo used for illustration purposes only

CASE STYLE: VG3044

Features

- Low mid band insertion loss of 1.8 dB typ.
- 15 dB typ. return loss in entire passband
- 60 dB typ. rejection
- Shielded component

Applications

- n258
- 5G Telecommunication

Electrical Specifications[1] at 25°C

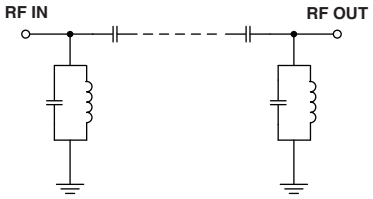
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	Fc	25875	—	1.8	3.0	dB
	Insertion Loss	F1-F2	24250 - 27500	—	3.5	—	dB
	Return Loss	F1-F2	24250 - 27500	—	15	—	dB
Stop Band, Lower	Insertion Loss	DC-F3	DC - 20000	30	45	—	dB
		F3-F4	20000 - 22500	25	45	—	dB
Stop Band, Upper	Insertion Loss	F5-F6	29250 - 31000	25	45	—	dB
		F6-F7	31000 - 35000	40	60	—	dB
		F7-F8	35000 - 40000	—	40	—	dB

1. Measured on Mini-Circuits Characterization Test Board TB-ABF-26G+

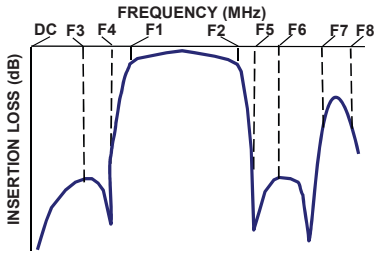
Maximum Ratings	
Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
RF Power Input	1W Max. @ 25°C

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

Functional Schematic



Typical Frequency Response

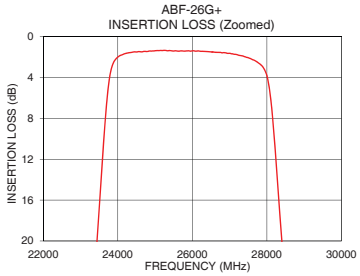


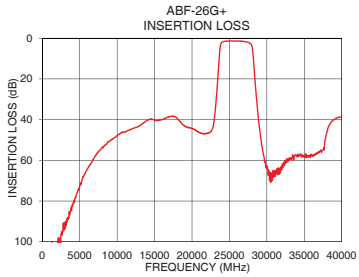
Typical Performance Data at 25°C

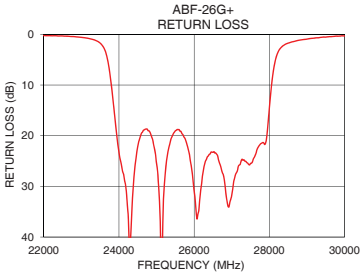
Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	114.71	0.03
1000	105.71	0.21
10000	47.76	0.06
20000	44.38	0.23
22500	45.94	0.32
23225	30.43	0.87
23450	19.55	1.45
23825	3.17	11.78
24250	1.61	36.24
25875	1.40	23.68
26000	1.39	30.94
27000	1.63	31.78
27500	2.07	25.48
27900	3.01	21.48
28400	19.95	2.08
28625	30.01	1.46
29250	50.51	0.68
31000	65.18	0.05
35000	57.52	0.50
40000	38.60	0.74

+RoHS Compliant

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







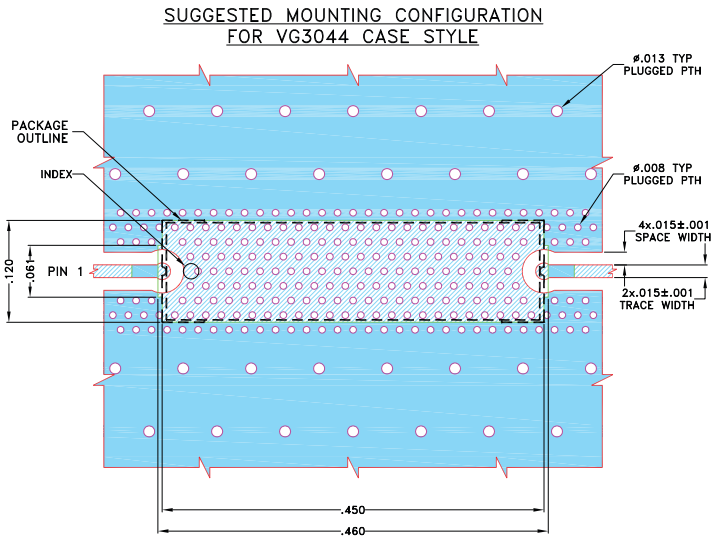
Notes

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-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

Pad Connections

RF IN	1
RF OUT	2
GROUND	3

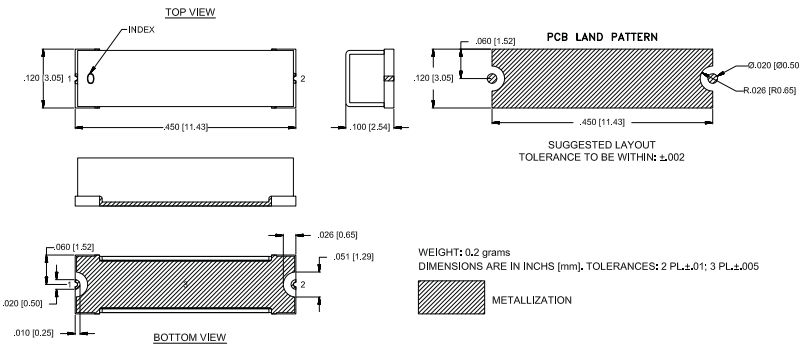
Demo Board MCL P/N: TB-ABF-26G+
Suggested PCB Layout (PL-713)



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.

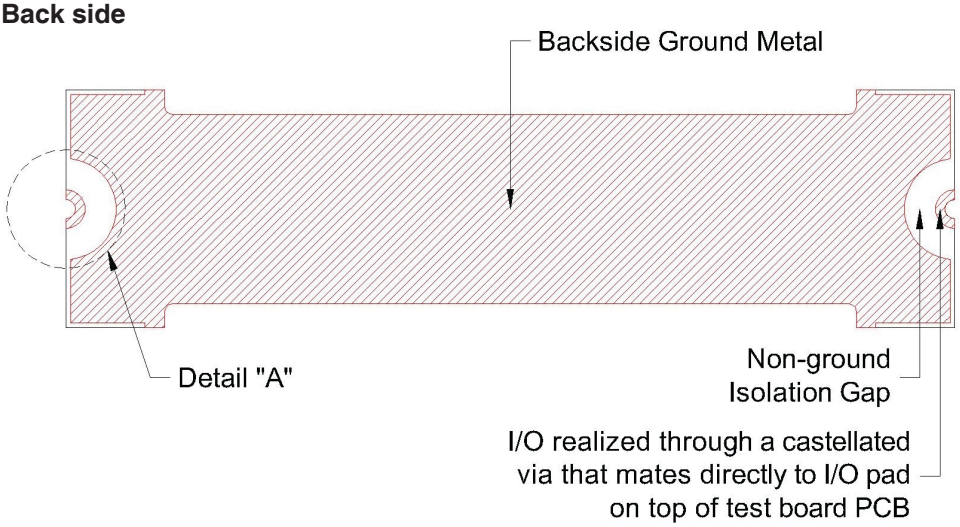
DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)
DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

Outline Drawing



Recommendations of PCB pattern at customer board

Filter Back side



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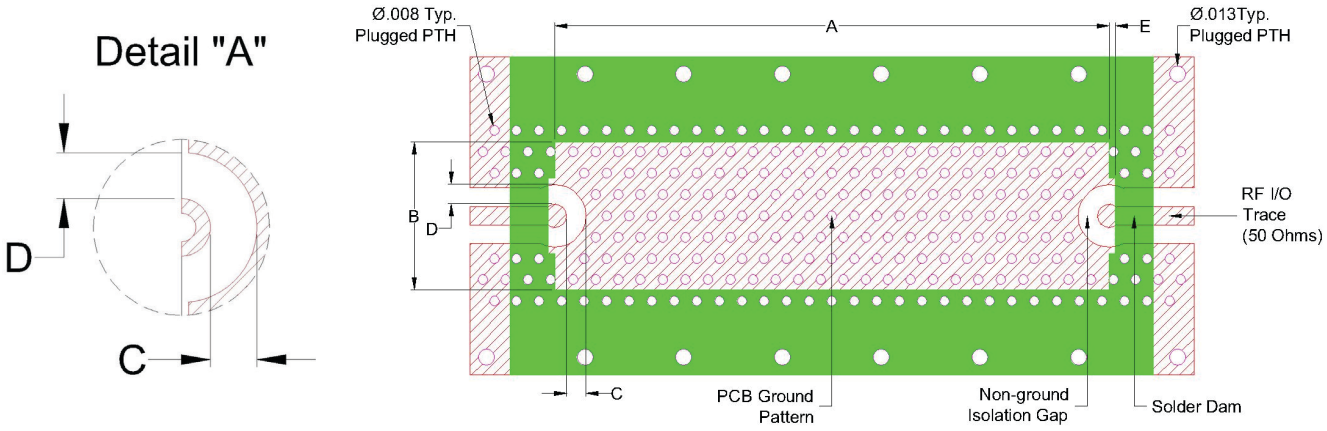
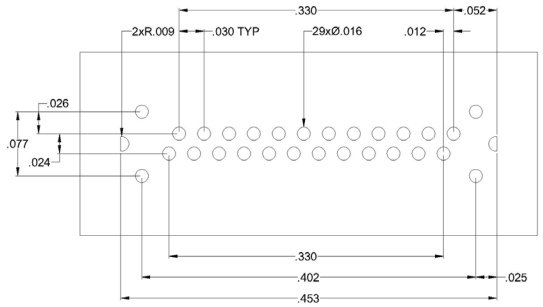


1) Customer PCB's ground pattern length (dimension A) can be similar to filter length.
2) Customer PCB's ground pattern width (dimension B) can be similar filter width.
3) Dimensions C and D on Filter RF I/O detail and Customer PCB pattern can be closely match. The dimensions of C and D on the Customer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

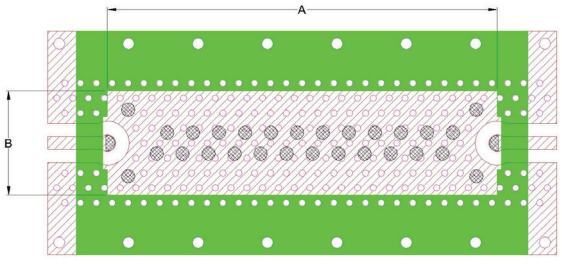
Comments on component handling and solder attach

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.

Thin-Film Bandpass Filter ABF-26G+

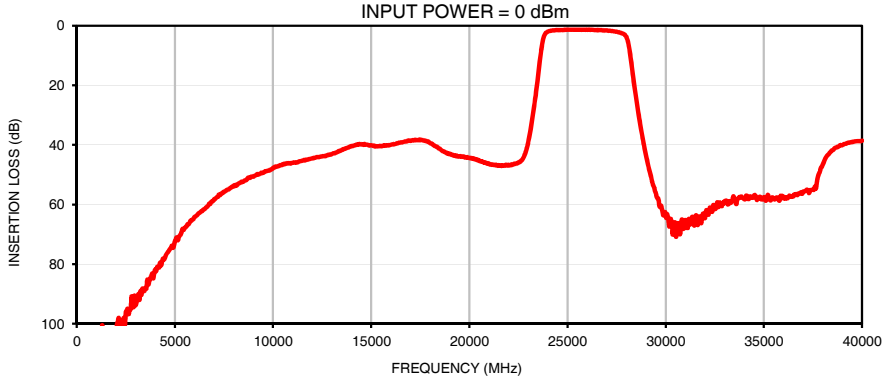
Typical Performance Data

FREQ. (MHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
10	114.71	0.03	0.03
50	114.25	0.07	0.08
100	111.74	0.12	0.11
500	120.14	0.19	0.20
1000	105.71	0.21	0.22
2000	107.46	0.13	0.20
3000	93.70	0.02	0.02
4000	81.81	0.06	0.04
5000	72.46	0.05	0.06
6000	64.18	0.01	0.04
7000	58.24	0.00	0.07
8000	53.65	0.04	0.00
9000	50.65	0.01	0.00
10000	47.76	0.06	0.08
11000	46.01	0.12	0.11
12000	44.52	0.12	0.10
13000	43.09	0.08	0.08
14000	40.45	0.12	0.13
15000	40.16	0.16	0.15
18000	39.41	0.23	0.26
20000	44.38	0.23	0.26
20400	44.98	0.25	0.25
20800	45.88	0.23	0.25
21200	46.64	0.23	0.26
21600	46.93	0.23	0.28
22000	46.73	0.24	0.28
22500	45.94	0.32	0.37
23200	31.51	0.82	0.82
23425	20.88	1.35	1.36
23625	10.05	3.07	3.15
23825	3.17	11.78	12.36
24250	1.61	36.24	29.45
24800	1.46	19.04	19.13
25200	1.37	30.50	26.93
25875	1.40	23.68	22.33
26000	1.39	30.94	25.38
26400	1.47	23.70	25.20
27000	1.63	31.78	27.84
27500	2.07	25.48	30.34
27900	3.01	21.48	34.66
28000	3.82	14.56	18.15
28200	10.00	4.07	4.51
28400	19.95	2.08	2.13
28625	30.01	1.46	1.38
29000	43.67	0.94	0.85
29250	50.51	0.68	0.67
30200	66.85	0.22	0.29
30800	65.65	0.07	0.21
31000	65.18	0.05	0.21
31600	66.03	0.05	0.24
32000	64.56	0.07	0.28
32400	61.13	0.14	0.32
33000	58.89	0.25	0.43
33400	58.41	0.36	0.46
35000	57.52	0.50	0.51
36000	57.91	0.48	0.62
37000	55.68	1.08	1.62
38000	46.51	2.75	2.32
39000	40.06	0.92	0.83
40000	38.60	0.74	0.75

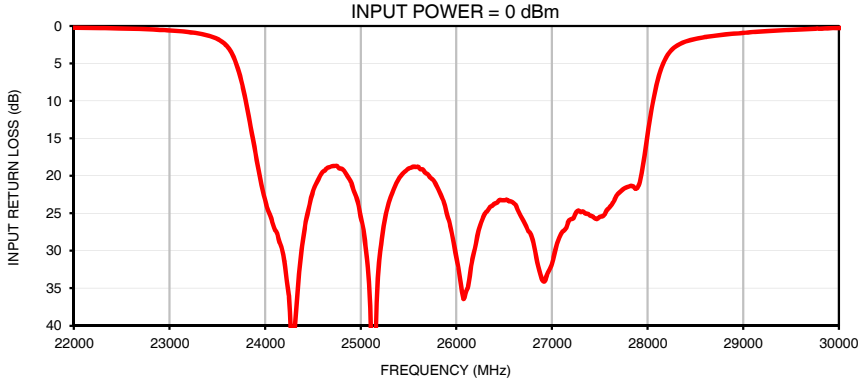
FREQ. (MHz)	Group Delay (ns)
24250	0.73
24300	0.70
24350	0.68
24400	0.66
24450	0.64
24500	0.63
24550	0.62
24600	0.60
24650	0.59
24700	0.58
24750	0.57
24800	0.56
24850	0.56
24900	0.55
24950	0.55
25000	0.54
25050	0.54
25100	0.53
25150	0.53
25200	0.53
25250	0.52
25300	0.52
25350	0.51
25400	0.51
25450	0.51
25500	0.50
25550	0.50
25600	0.50
25650	0.50
25700	0.50
25750	0.50
25800	0.50
25875	0.50
25900	0.50
25950	0.50
26000	0.50
26050	0.50
26100	0.50
26150	0.50
26200	0.50
26250	0.50
26300	0.50
26350	0.50
26400	0.50
26450	0.51
26500	0.51
26550	0.51
26600	0.51
26650	0.52
26700	0.52
26750	0.53
26800	0.53
26850	0.54
26900	0.54
26950	0.55
27000	0.55
27050	0.56
27100	0.57
27300	0.60
27500	0.66

Typical Performance Curves

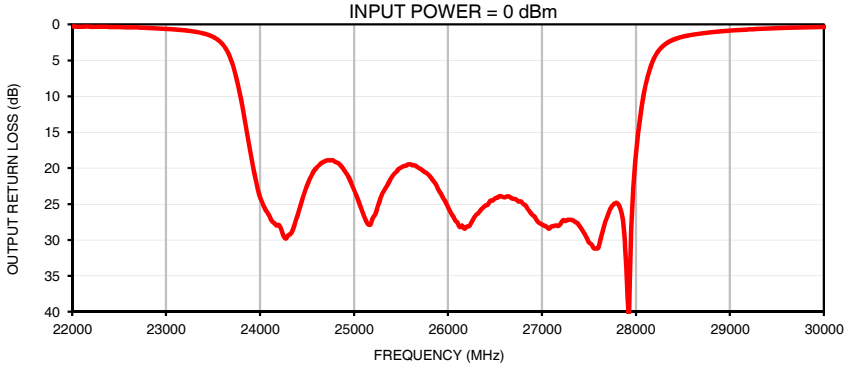
INSERTION LOSS
INPUT POWER = 0 dBm



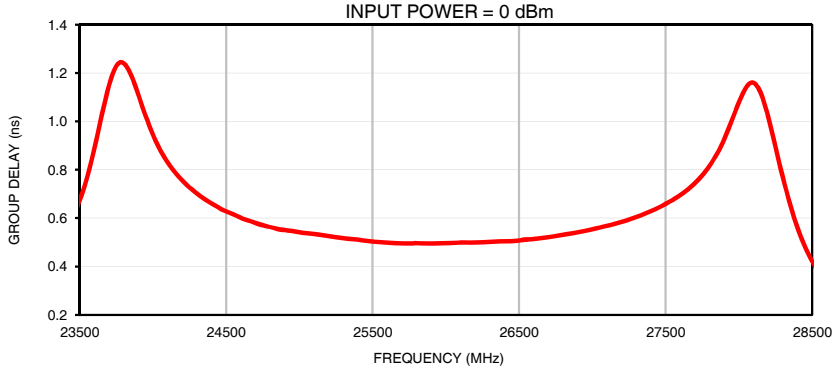
INPUT RETURN LOSS
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS
INPUT POWER = 0 dBm

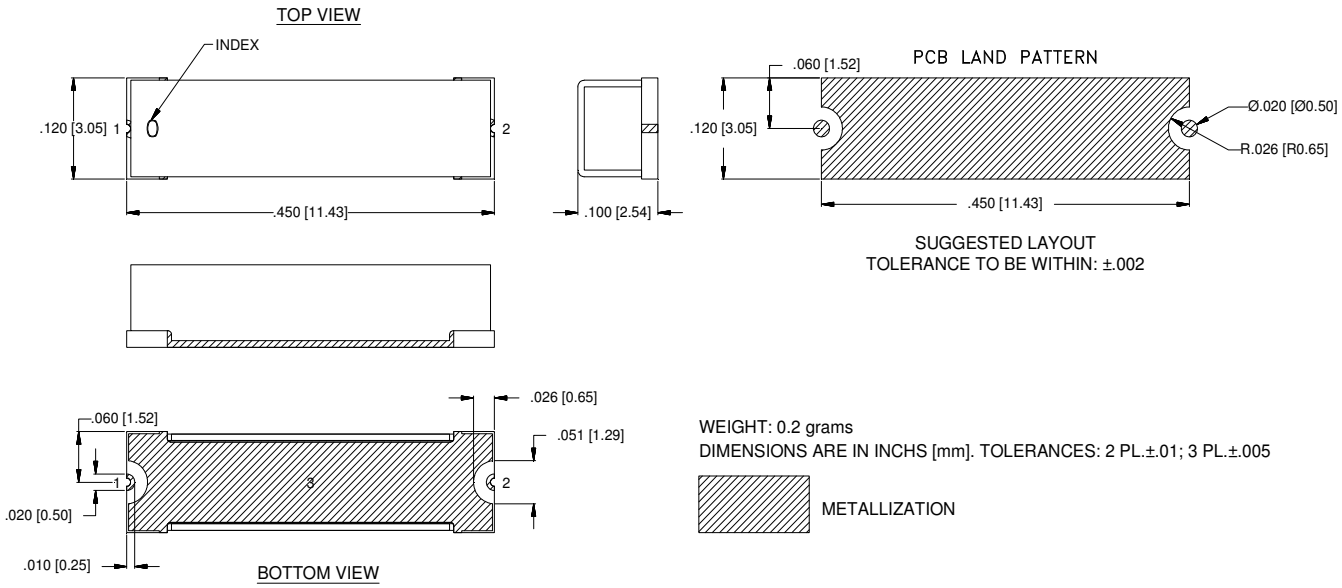


GROUP DELAY
INPUT POWER = 0 dBm



Case Style VG

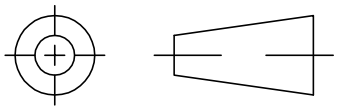
Outline Dimensions VG3044



Notes:

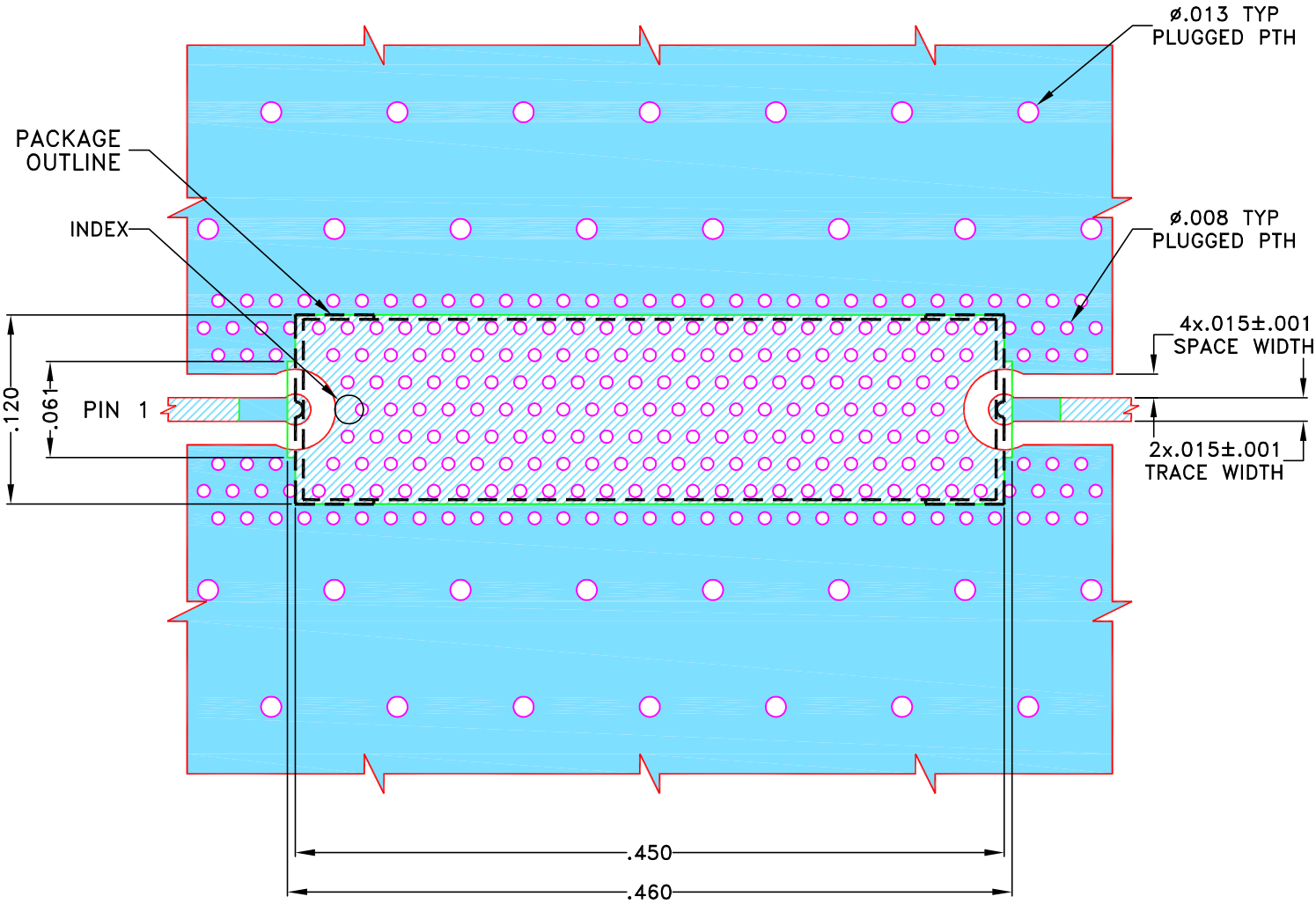
1. Case material: Gold over Nickel over Annealed Stainless Steel.
2. Base: Ceramic
3. Termination finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Gold over Nickel plate. All models, (+) suffix.

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:

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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	06 JUL 21
TOLERANCES ON:	CHECKED	RR	06 JUL 21
2 PL DECIMALS ±	APPROVED	NN	06 JUL 21
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

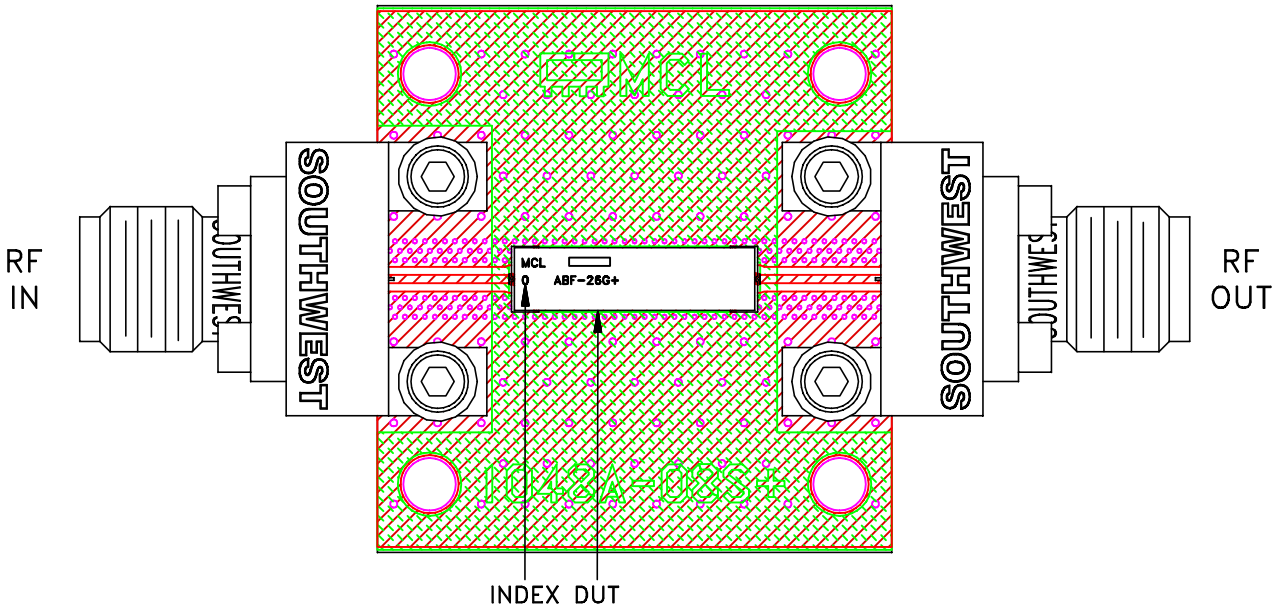
PL DWG, VG3044 C.S, 50 OHM, ABF

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-713	OR

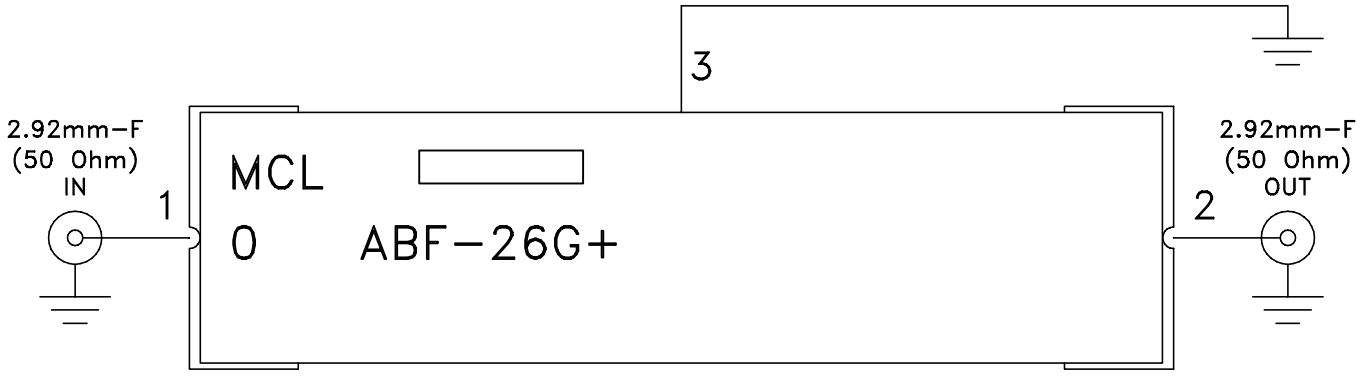
FILE:	SCALE:	SHEET:
98-PL-713	9:1	1 OF 1

Evaluation Board and Circuit

TB-ABF-26G+



Schematic diagram



Notes:

1. PCB Material: ROGERS (RO4350B) OR Equivalent, Dielectric Constant=3.48±.05
Dielectric Thickness: .0066" ± .0007"
2. 50 Ohm 2.92mm Female Connectors.

Mini-Circuits®

Mini-Circuits

Environmental Specifications **ENV120**

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