CERAMIC

Bandpass Filter

BFHK-9901+

50Ω 8.6 to 10.9 GHz

THE BIG DEAL

- Ultra-High Stopband Rejection Structure – 80 dB typical
- Surface mountable pick and place standard case style
- Standard small 1812 (4.5mm x 3.2mm) case style
- High quality distributed filter topology
- Wide rejection band
- Shielded construction preventing filter from de-tuning
- Reduced footprint area by employing LGA (land grid array)
- Suited for very high-volume production
- Protected by US Patents 11,638,370 and 11,744,057

Generic photo used for illustration purposes only

CASE STYLE: NM1812C-3

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

APPLICATIONS

- Test and Measurement
- Aerospace and Defense Signal Conditioning

PRODUCT OVERVIEW

The BFHK-9901+ LTCC Band Pass Filter achieves a miniature size and high repeatability of performance by utilizing a proprietary LTCC material system and distributed filter topology. The passband loss at 8.6 – 10.9 GHz is as low as 3.0 dB, with typical stopband rejections at 80 dB up to 23.4 GHz. This model handles up to 1W RF input power, and provides a wide operating temperature range from -55 to +125°C. Utilizing a proprietary LTCC material system and a distributed filter topology, this filter is able to achieve repeatable performance on a lot-to-lot basis.

KEY FEATURES

Feature	Advantages
Ultra-High Rejection	Typical stopband rejections at 80 dB up to 23.4 GHz
Cost effective	LTCC is scalable technology that is cost effective due to ease of production in high quantities.
Small size (4.5mm x 3.2mm)	Allows for high layout density of circuit boards, while minimizing effects of parasitics.
Surface Mountable	Suitable for very high volume automated assembly process.

REV. B
ECO-019695
BFHK-9901+
WY/CP/AM
231102

ELECTRICAL SPECIFICATIONS[1] AT 25°C

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
	Center Frequency	—	—	—	9.7	—	GHz
Pass Band	Insertion Loss	F1-F2	8.6 - 10.9	—	3.0	4.2	dB
	Return Loss	F1-F2	8.6 - 10.9	—	13.0	—	dB
Stop Band, Lower	Insertion Loss	DC-F3	0.1 - 5.8	70	80	—	dB
Stop Band, Upper	Insertion Loss	F4-F5	13.9 - 23.4	70	80	—	dB

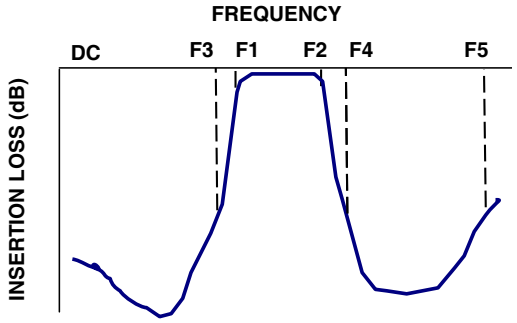
1. Measured on Mini-Circuits Test Board TB-BFHK-9901C+ with feedline losses removed by normalization of S12 and S21 traces to measurements of TB thru-line

MAXIMUM RATINGS

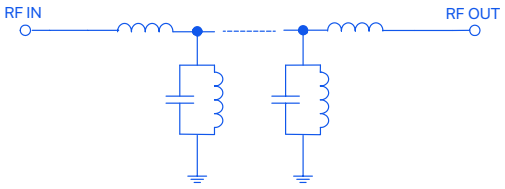
Parameter	Ratings
Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
RF Power Input	1W max.

Permanent damage may occur if any of these limits are exceeded

TYPICAL FREQUENCY RESPONSE

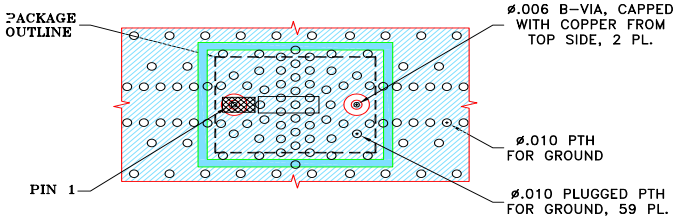


FUNCTIONAL SCHEMATIC

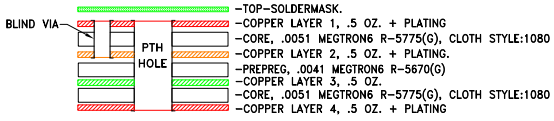


EVALUATION BOARD MCL P/N: TB-BFHK-9901C+
SUGGESTED PCB LAYOUT: PL-730

TOP VIEW



STACK-UP DIAGRAM



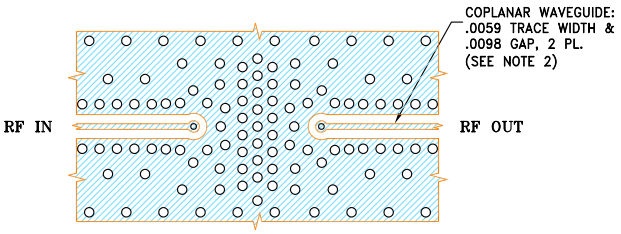
1. TOTAL FINISHED THICKNESS 0.0228±.004.
2. B-VIA PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 2.
3. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
4. INDICATED PLUGGED PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
5. LAYER 4 IS CONTINUOUS GROUND PLANE.

NOTES:
1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON6 R-5775(G), CLOTH STYLE:1080 WITH DIELECTRIC THICKNESS .0051; COPPER: 1/2 OZ.+PLATING. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
3. COPPER LAYER 4 OF THE PCB ARE CONTINUOUS GROUND PLANE.

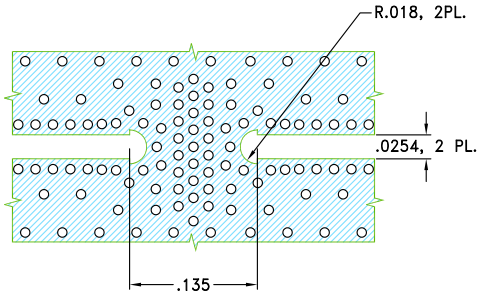
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

LAYER 2, B-VIA & PTH



LAYER 3 & PTH

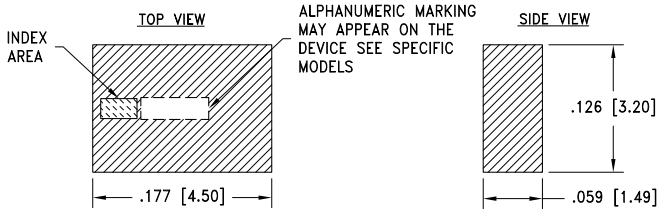


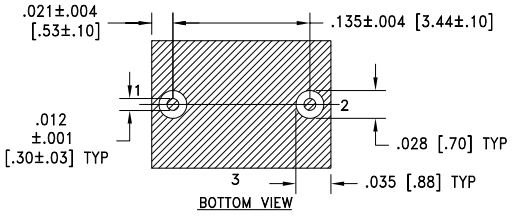
PAD CONNECTIONS

INPUT	1
OUTPUT	2
GROUND	3

PRODUCT MARKING: F476

OUTLINE DRAWING





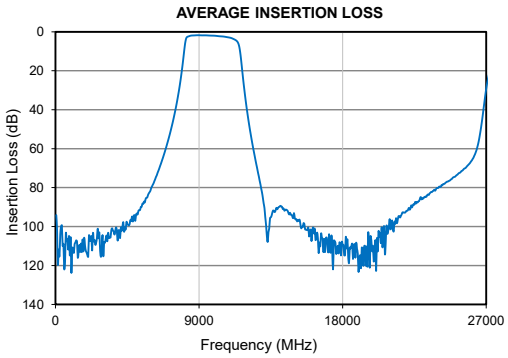
METALLIZATION

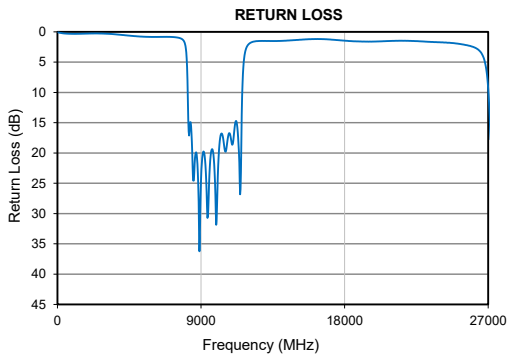
Weight: .126 grams.

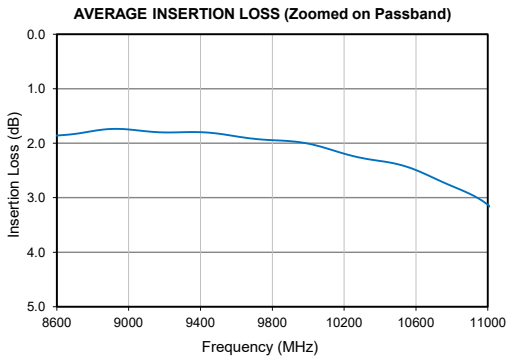
Dimensions are in inches [mm]. Tolerances: 2Pl.±.01; 3Pl. ±.005

TYPICAL PERFORMANCE DATA

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
100	101.79	0.13
5500	88.35	0.81
6500	70.32	0.83
8600	1.86	21.70
9700	1.92	19.36
10900	2.93	18.05
12000	39.99	2.00
13000	85.20	1.50
14000	89.95	1.50
15000	95.53	1.34
16000	101.68	1.20
17000	105.58	1.25
18000	109.46	1.45
19000	123.33	1.59
20000	113.62	1.59
21000	101.33	1.49
22000	91.91	1.48
23000	85.42	1.60
24000	80.11	1.73
25000	74.51	1.92
26000	67.18	2.44
27000	29.27	9.37







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

LTCC Bandpass Filter BFHK-9901+

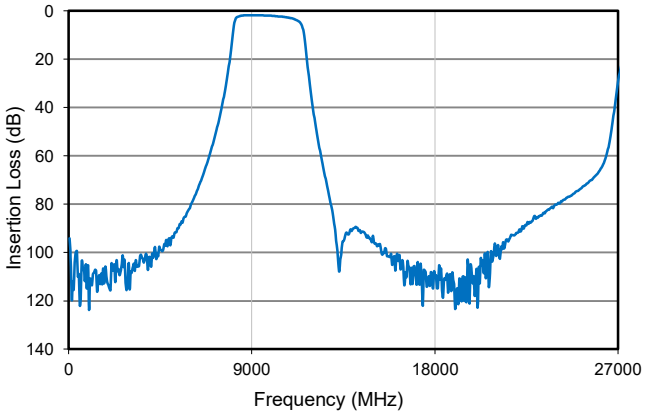
Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	RETURN LOSS (dB)
50	94.11	0.09
100	101.79	0.13
500	108.92	0.28
1000	123.82	0.33
1500	109.41	0.32
2000	114.63	0.27
2500	109.40	0.27
3000	115.28	0.30
3500	101.89	0.38
4000	102.00	0.50
4500	98.60	0.62
5000	97.09	0.74
5500	88.35	0.81
6000	80.25	0.84
6500	70.32	0.83
7000	57.54	0.83
7500	40.81	0.93
7600	36.67	0.98
7700	32.10	1.06
7800	27.02	1.19
7900	21.27	1.43
8000	14.66	2.05
8100	7.62	4.45
8200	3.24	14.57
8300	2.46	15.00
8400	2.16	16.70
8500	1.93	24.52
8600	1.86	21.70
8700	1.83	19.91
8800	1.78	23.38
8900	1.74	36.23
9000	1.75	24.37
9100	1.78	20.29
9200	1.80	20.02
9300	1.80	23.16
9400	1.80	30.65
9500	1.82	25.24
9600	1.87	20.49
9700	1.92	19.36
9800	1.94	20.94
9900	1.96	26.93
10000	2.01	28.89
10100	2.09	20.71
10200	2.19	17.49
10300	2.27	16.78
10400	2.33	17.84
10500	2.39	19.67
10600	2.49	19.08
10700	2.64	17.22
10800	2.79	16.77
10900	2.93	18.05
11000	3.13	18.38
11500	6.94	23.10
12000	39.99	2.00
12500	64.28	1.53
13000	85.20	1.50
14000	89.95	1.50
15000	95.53	1.34
16000	101.68	1.20
17000	105.58	1.25
18000	109.46	1.45
19000	123.33	1.59
20000	113.62	1.59
21000	101.33	1.49
22000	91.91	1.48
23000	85.42	1.60
24000	80.11	1.73
25000	74.51	1.92
26000	67.18	2.44
27000	29.27	9.37

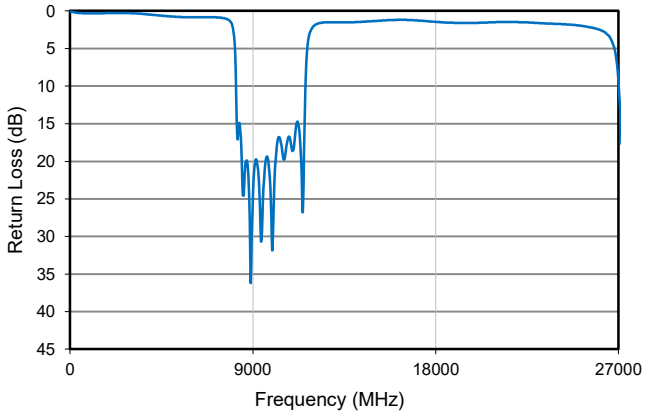
LTCC Bandpass Filter BFHK-9901+

Typical Performance Data

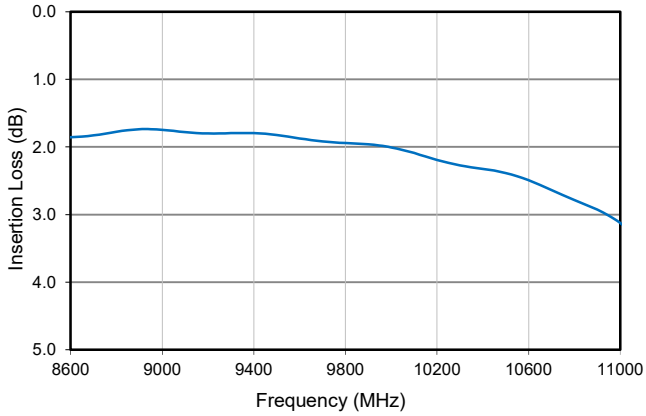
AVERAGE INSERTION LOSS



RETURN LOSS



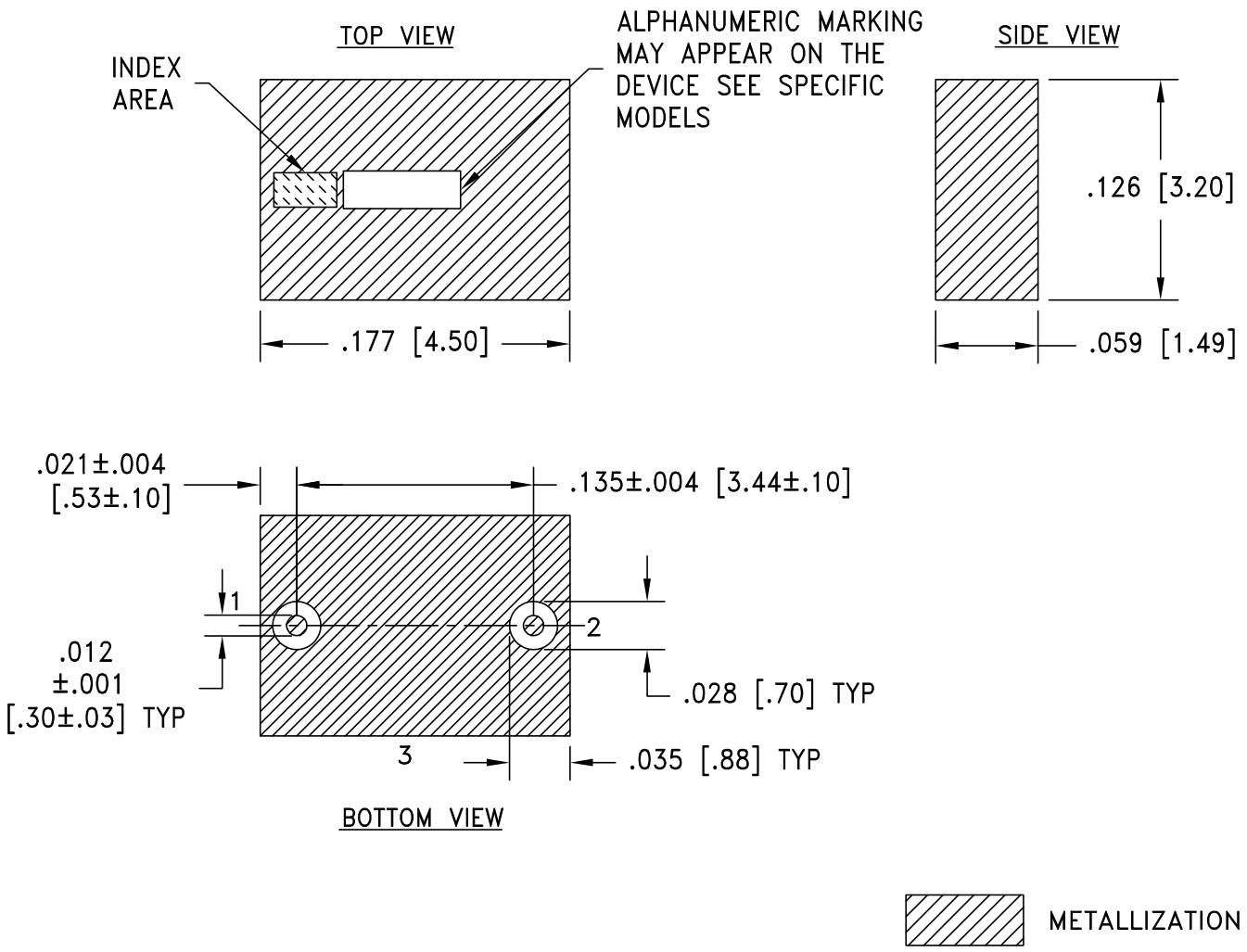
AVERAGE INSERTION LOSS (Zoomed on Passband)



Case Style NM

Outline Dimensions

NM1812C-3



Weight: .126 grams.

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl. ±.005 Inches

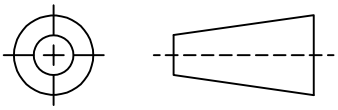
Notes:

1. Case material: Ceramic.
2. Termination Finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Tin Plate over Nickel plate. All models, (+) suffix.

Mini-Circuits®
ISO 9001 ISO 14001 CERTIFIED
ALL NEW minicircuits.com
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

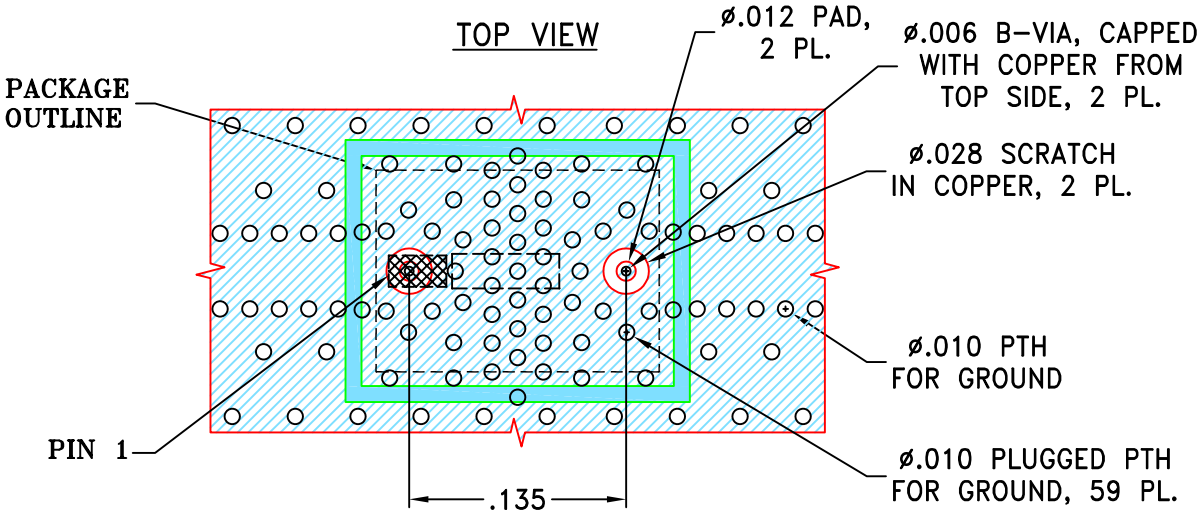
This document and its contents are the property of Mini-Circuits

THIRD ANGLE PROJECTION

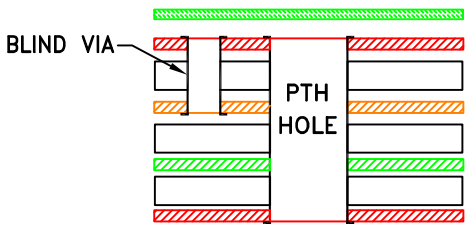


REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-013254	NEW RELEASE	05/16/22	ITG	IL
A	ECO-015587	UPDATED STACK-UP DIAGRAM	11/01/22	ITG	IL
B	ECO-020890	ADDED DIMENSIONS	02/16/24	ITG	IL

SUGGESTED MOUNTING CONFIGURATION FOR NM1812C-3 CASE STYLE



STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS 0.0228±.004.
2. B-VIA PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 2.
3. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
4. INDICATED PLUGGED PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
5. LAYER 4 IS CONTINUOUS GROUND PLANE.

NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON6 R-5775(G), CLOTH STYLE:1080 WITH DIELECTRIC THICKNESS .0051; COPPER: 1/2 OZ.+PLATING. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
3. COPPER LAYER 4 OF THE PCB ARE CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	ITG	05/16/22
TOLERANCES ON:	CHECKED	GF	05/16/22
2 PL DECIMALS ±	APPROVED	IL	05/16/22
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE , MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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

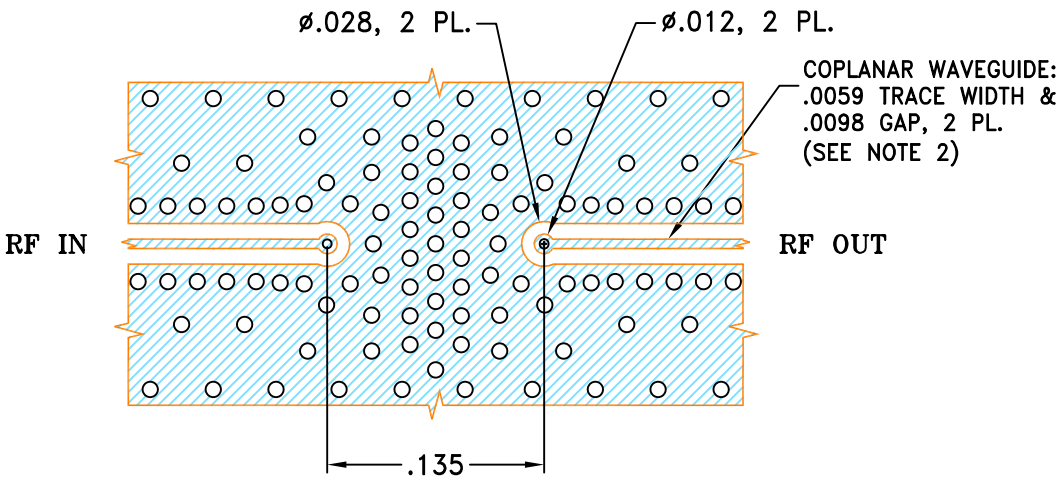
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, NM1812C-3, TB-1239

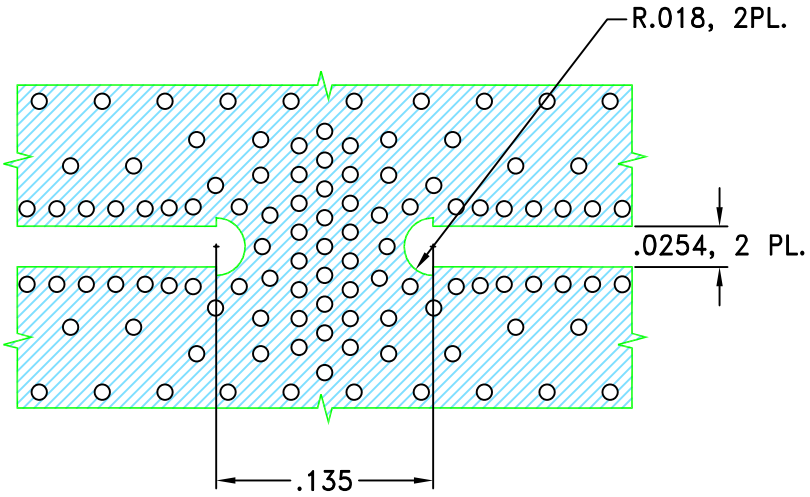
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-730	B

FILE:	SCALE:	SHEET:
98PL730	8:1	1 OF 2

LAYER 2, B-VIA & PTH



LAYER 3 & PTH



Mini-Circuits

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS.
EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE , MANUFACTURING AND REPRODUCTION RIGHTS THERETO.
THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

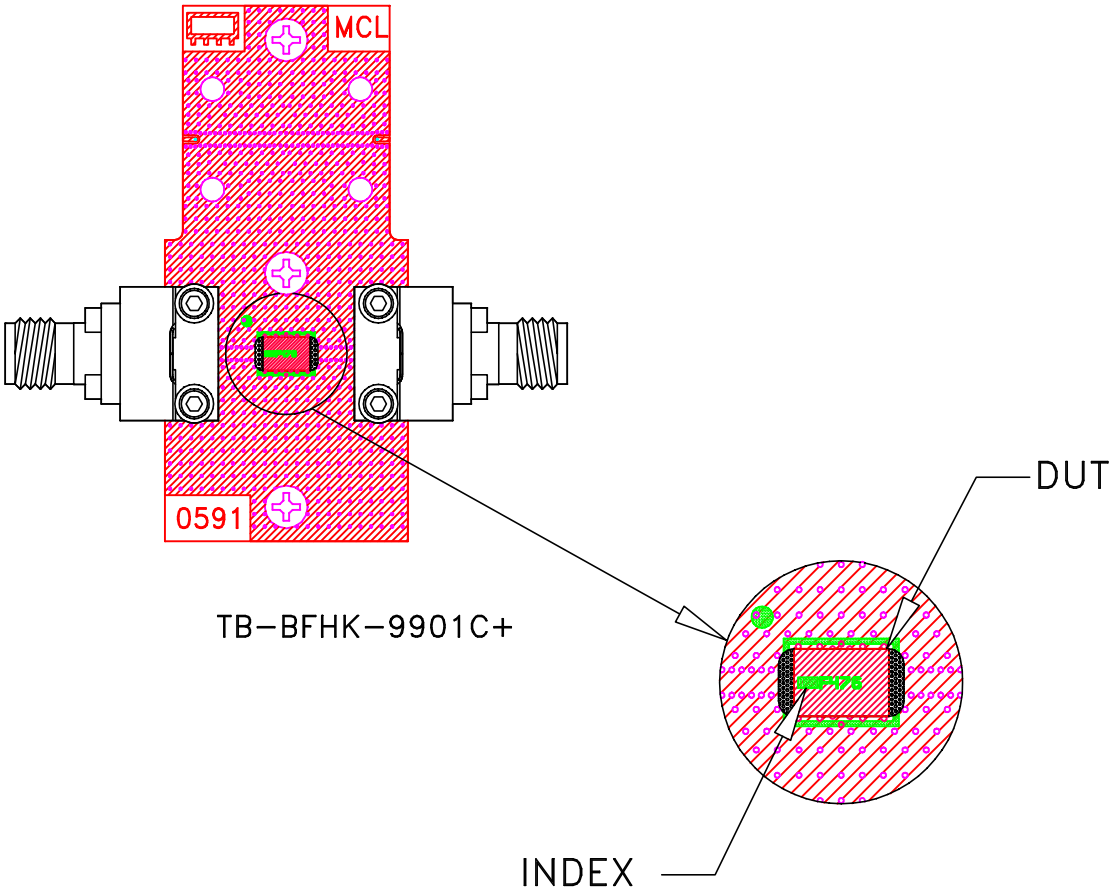
ASHEETA2.DWG REV:A DATE: 01/12/94

ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

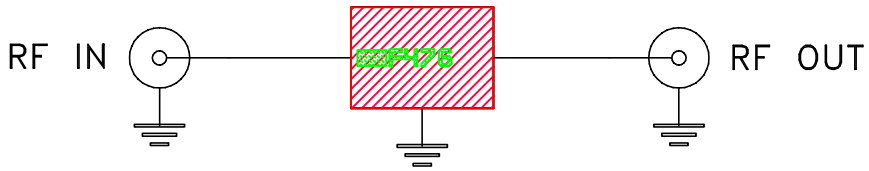
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-730	B

FILE:	SCALE:	SHEET:
98PL730	8:1	2 OF 2

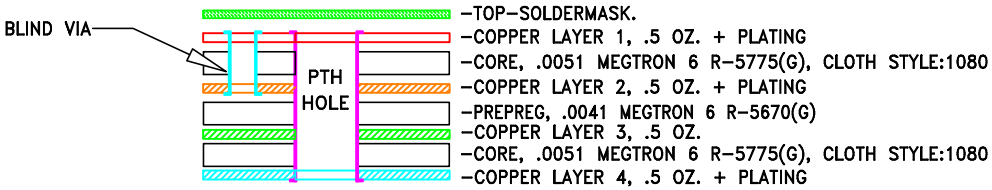
Evaluation Board and Circuit



TB-BFHK-9901C+



Schematic Diagram



STACK-UP DIAGRAM

Notes:

1. 2.92 mm Female End Launch Connector.
2. PCB Material: Megtron 6 R5775(N).
   Dielectric Constant=3.6.
3. Total finished thickness .023".

Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS.

Mini-Circuits

Environmental Specifications ENV06T8

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
Thermal Cycling	-55 to 125°C, 100 cycles, Dwell Time 15 minutes.	MIL-STD-202, Method 107, Condition A-3
Mechanical Shock	50g, 11ms half-sine, 18 shocks applied each to 3 axes	MIL-STD-202 Method 213, Condition A
Vibration	10-2000Hz sine, 20g, 12 cycles applied each to 3 axes	MIL-STD-202, Method 204, Condition D
Constant Acceleration	30Kg, Y1 Direction	MIL-STD-883, Method 2001, Condition E
Humidity	85°C, 90-95% Relative Humidity, 250hours	
Solderability	10X / 30X Magnification	J-STD-002C Test S, J-STD-002C Test S1
High Temp Storage	125°C, 250 hours	

This document and its contents are the property of Mini-Circuits.