

#### LTCC SURFACE MOUNT

## Bandpass Filter

50Ω 7.5 to 8.8 GHz

#### **BFHKI-8501+**

#### THE BIG DEAL

- LTCC Band Pass Filter with Integrated Interposer Board
- Wide Stopband Rejection, Typ. 33 dB Up to 25 GHz
- Shielded Construction
- Protected by US Patents 11,638,370 and 11,744,057

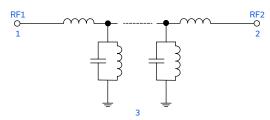


Generic photo used for illustration purposes only

#### **APPLICATIONS**

- Test & Measurement Equipment
- Radar
- SATCOM
- Point-to-Point Radios

#### **FUNCTIONAL DIAGRAM**



#### **PRODUCT OVERVIEW**

BFHKI-8501+ is a miniature low temperature co-fired ceramic (LTCC) ultra-high stopband rejection band pass filter with a 7.5 to 8.8 GHz passband that supports a variety of applications. This model achieves 33 dB typical stopband rejection up to 25 GHz, when mounted on coplanar waveguide layouts. Housed in a small 4.95 mm by 3.65 mm ceramic form factor, the filter is ideal for dense signal chain PCB layouts where it complements MMIC size and performance. The BFHKI family with integrated interposer board enables installation onto PCB layouts with automated manufacturing equipment. This model provides 3.6 dB typical insertion loss over a wide band due to its rugged monolithic construction. The LTCC fabrication process assures minimal RF performance variation while delivering a product that is well suited for environmental extremes of high humidity and temperature.

#### **KEY FEATURES**

Features	Advantages
Surface Mountable Due to Integrated Interposer Board	Enables installation with automated manufacturing equipment, making this suitable for high-volume processes.
Wide Rejection	Provides high stopband rejection of 33 dB typical up to 25 GHz.
Small Size (4.95x3.65 mm)	Allows for high layout density of circuit boards, while minimizing effects of parasitics.
Wide Operating and Storage Temperature (-55 to +125°C)	Enables use in high reliability and extreme environment conditions, such as in aerospace & defense applications.
Cost Effective	LTCC is a scalable technology that is cost effective due to ease of production in high volume.

REV. A ECO-023357 BFHKI-8501+ MCL NY 250626



## Bandpass Filter

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#### **ELECTRICAL SPECIFICATIONS**<sup>1,2,3</sup> AT +25°C

Parameter		F#	Frequency (GHz)	Min.	Тур.	Max.	Units	
	Center Frequency⁴				8.15		GHz	
Passband	Insertion Loss	F2-F3	7.5-8.8		3.6	5	dB	
	Return Loss	F2-F3	7.5-8.8		12		dB	
Stopband, Lower	Rejection	DC-F1	0.1-4.7	62	72		dB	
Charles and Illeran	<b>5</b>	D : .:	54.55	11.9-17	40	50		.ID
Stopband, Upper	Rejection	F4-F5	17-25	28	33		dB	

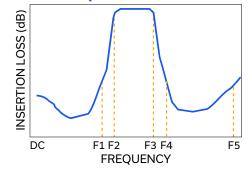
- 1. Tested on Evaluation Board P/N TB-BFHKI-8501C+. Measured with the connector and feedline effects de-embedded using the 2XThru IEEE P370 method.
- 2. Bi-directional RF1 and RF2 ports can be interchanged.
- 3. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.
- 4. Typical variation ±5%.

#### **ABSOLUTE MAXIMUM RATINGS<sup>5</sup>**

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power <sup>6</sup>	1 W

- 5. Permanent damage may occur if any of these limits are exceeded.
- 6. Power rating applies only to signals within the passband. Power rating above +25°C operating temperature decreases linearly to 0.5 W at +125°C.

#### **TYPICAL FREQUENCY RESPONSE AT +25°C**



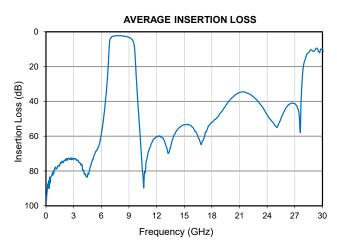
#### LTCC SURFACE MOUNT

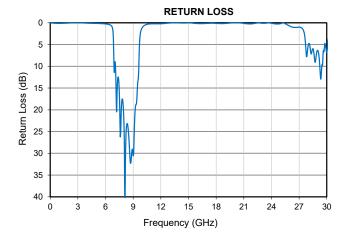
## Bandpass Filter

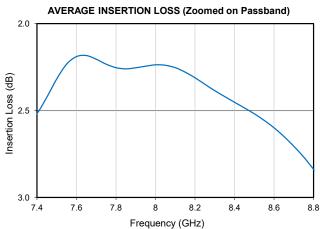
**BFHKI-8501+** 

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#### **TYPICAL PERFORMANCE GRAPHS AT +25°C**







#### LTCC SURFACE MOUNT

## Bandpass Filter

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#### **FUNCTIONAL DIAGRAM**

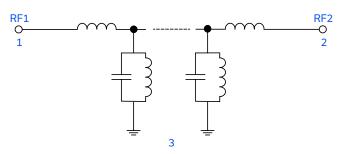
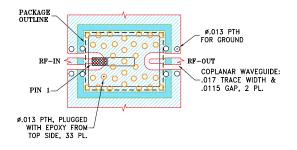


Figure 1. BFHKI-8501+ Functional Diagram

#### PAD DESCRIPTION

Function	Pad Number	Description
RF1 <sup>2</sup>	1	Connects to RF Input Port
RF2 <sup>2</sup>	2	Connects to RF Output Port
GROUND	3	Connects to Ground on PCB, (See drawing PL-753)

#### **SUGGESTED PCB LAYOUT (PL-753)**



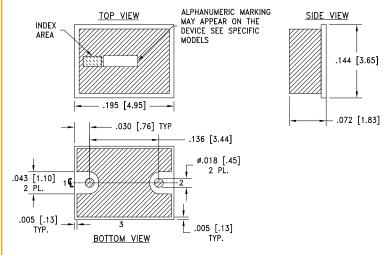
#### NOTES:

- 1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"; COPPER: 1/2 0Z. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED. 2. BOTTOM SIDE 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

Figure 2. Suggested PCB Layout BFHKI-8501+

#### **CASE STYLE DRAWING**



METALLIZATION

Weight: .135 grams.

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

#### **PRODUCT MARKING\*: F440**

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



# Bandpass Filter

**BFHKI-8501+** 

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#### ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD.

**CLICK HERE** 

	Data
Performance Data & Graphs	Graphs
	S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	NM3237 Finish: Gold over Nickel Plating
RoHS Status	Compliant
Tape and Reel	TR-F77
Suggested Layout for PCB Design	PL-753
Evaluation Board	TB-BFHKI-8501C+
Lvaluation board	Gerber File
Environmental Rating	ENV06T12

#### 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



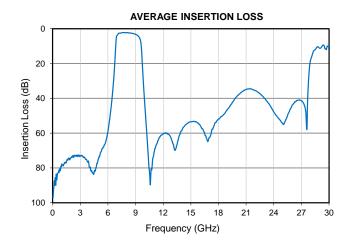
#### LTCC Bandnass Filter

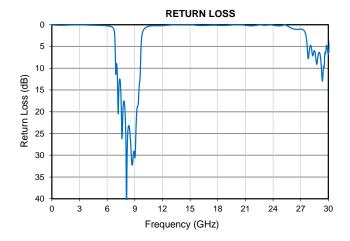
#### **RFHKI-8501**±

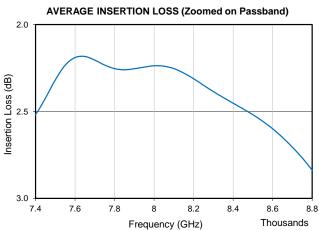
cal Performanc	Brnki-83	
	1	
FREQUENCY (MHz)	INSERTION LOSS (dB)	RETURN LOSS (dB)
100	92.92	0.04
1000	77.75	0.13
1500	76.33	0.10
2000	74.11	0.05
2500	73.25	0.01
3000	72.95	0.00
3500	74.09	0.02
4000	79.84	0.09
4500	82.85	0.12
4700	79.96	0.13
5000	74.56	0.14
5500	68.11	0.18
6000	59.09	0.25
6500	37.33	0.48
7000	3.87	8.96
7500	2.32	16.27
8000	2.24	23.26
8500	2.52	25.50
8800	2.84	30.97
9000	3.19	30.61
9500	6.06	13.60
10000	43.17	1.05
11000	71.40	0.22
11900	60.76	0.22
12000	60.52	0.21
13000	65.16	0.05
14000	58.66	0.03
15000	53.52	0.01
16000	55.44	0.17
17000	62.62	0.14
18000	51.99	0.14
20000	38.87	0.01
22000	35.54	0.20
24000	47.81	0.11
25000	54.60	0.18



#### Typical Performance Data





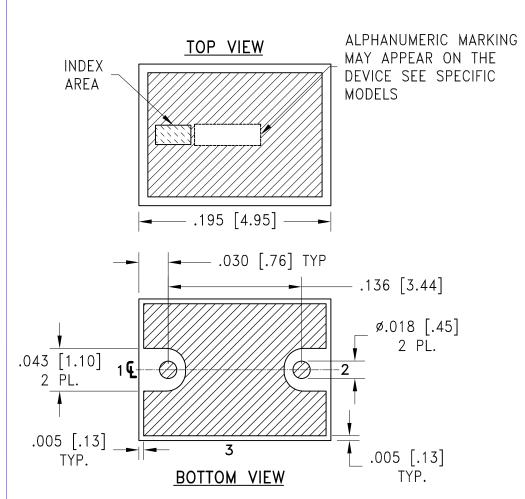


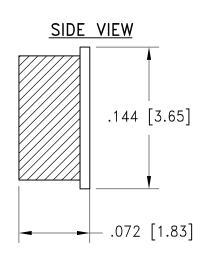


## NM

### **Outline Dimensions**

NM3237







Weight: .135 grams.

Dimensions are in inches (mm). Tolerances: 2 Pl.±.01; 3 Pl. ±.005

#### Notes:

1. Case material: LTCC on printed circut board base.

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



INTERNET http://www.minicircuits.com

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Mini-Circuits ISO 9001 & ISO 14001 Certified

## Tape & Reel Packaging TR-F77

# DEVICE ORIENTATION IN T&R INDEX DEVICE CAVITY PITCH TAPE WIDTH

INDEX -

Note: The location and shape of the metallization may differ

Note: The shape of the pocket may differ

Applicable Case Styles

DIRECTION OF FEED

GU1604, GU1804, GU2644, TT1618-2 TAPE WIDTH

**DEVICE ORIENTATION IN T&R** 

DEVICE CAVITY

Applicable Case Styles

DIRECTION OF FEED

MZ4532C, NM1812C, NM1812C-1, NM1812C-2, NM1812C-3, NM1812C-5, NM1812C-6, NM3237

Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices pe	er Reel
12	8	7	Small quantity standards (see note)	20 50 100 200 500 1000
		13	Standard	2000

Note: Please Consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf



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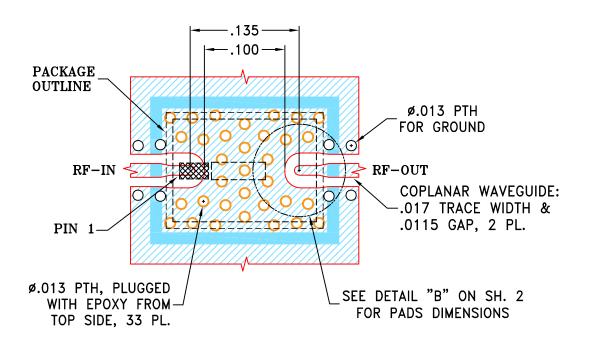
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# THIRD ANGLE PROJECTION

	REVISIONS							
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH			
OR	ECO-017025	NEW RELEASE	03/30/23	ITG	IL			
OR1	ECO-018201	CORRECTED TYPO IN NOTE 2	06/16/23	ITG	IL			
A	ECO-020890	ADDED DETAIL "A" (SH.2) & DIMENSIONS	02/16/24	ITG	IL			

## SUGGESTED MOUNTING CONFIGURATION FOR NM3237 CASE STYLE



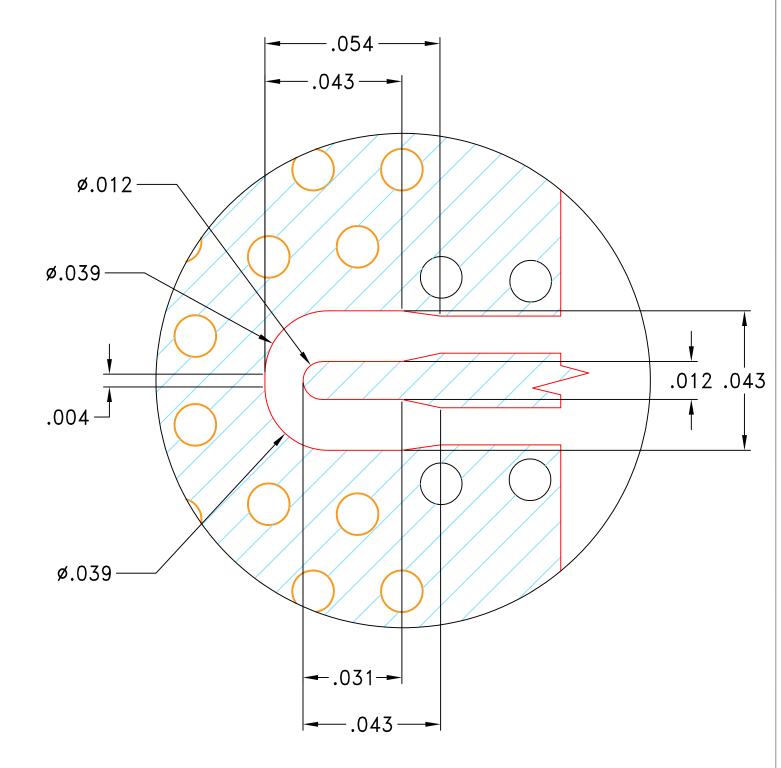
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DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

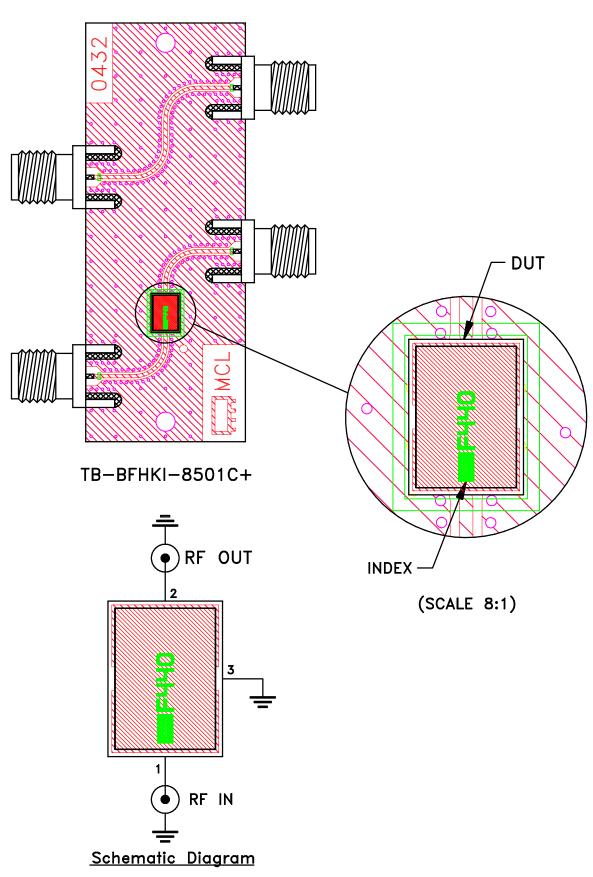
UNLESS OTHERWISE SPECIFIED		INITIALS	DATE									
DIMENSIONS ARE IN INCHES	DRAWN	ITG	03/30/23	Mini-Circuits® 13 Neptune Avenu					Mini-Circuits 13 Neptune Ave			
TOLERANCES ON: 2 PL DECIMALS ±	CHECKED	GF	03/30/23						235			
3 PL DECIMALS ± .005 ANGLES ±	APPROVED	IL	03/30/23									
FRACTIONS ±				PL, NM3237, TB-1200								
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PARTY, IN WHOLE OR IN PART, WITHO			TE:01/12/95	FILE:	9	8PL753	SCALE:	8:1	SHEET:	1	OF	2



DETAIL "A". SOLDER MASK IS NOT SHOWN FOR CLARITY

(SCALE 4:1)

## Evaluation Board and Circuit



#### Notes:

- 1. SMA Female connectors.
- 2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

III Mini-Circuits®



**ENV06T12** 



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
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	
Bend Test	1mm, deflection for 5 seconds Span of bending: 2.75"	

ENV06T12 Rev: OR

06/27/23

DCO-1237 File: ENV06T12.pdf