



### THE BIG DEAL

- Ultra-High Stopband Rejection Structure – 75 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
- Patent Pending



Generic photo used for illustration purposes only

CASE STYLE: NM1812C-3

#### +RoHS Compliant

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

### APPLICATIONS

- Test and Measurement
- Aerospace and Defense Signal Conditioning

### PRODUCT OVERVIEW

The BFHK-3142+ 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 28 – 36 GHz is as low as 2.8 dB, with typical stopband rejections at 75 dB up to 54 GHz and 40 dB up to 67 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 75 dB up to 54 GHz and 40 dB up to 67 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.                                        |

ELECTRICAL SPECIFICATIONS<sup>1</sup> AT 25°C

| Parameter        |                  | F#    | Frequency (GHz) |    | Min. | Typ. | Max. | Units |
|------------------|------------------|-------|-----------------|----|------|------|------|-------|
| Pass Band        | Center Frequency | —     | —               | —  | —    | 31.7 | —    | GHz   |
|                  | Insertion Loss   | F1-F2 | 28              | 36 | —    | 2.8  | 4.0  | dB    |
|                  | Return Loss      | F1-F2 | 28              | 36 | —    | 8.0  | —    | dB    |
| Stop Band, Lower | Insertion Loss   | DC-F3 | 0.1             | 20 | 70   | 85   | —    | dB    |
| Stop Band, Upper | Insertion Loss   | F4-F5 | 44              | 54 | 60   | 75   | —    | dB    |
|                  |                  |       | 54              | 67 | 30   | 40   | —    |       |

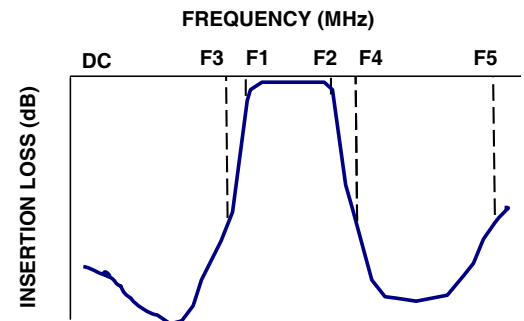
1. Measured on Mini-Circuits Test Board TB-BFHK-3142C+ with connectors and feedlines de-embedded.

## MAXIMUM RATINGS

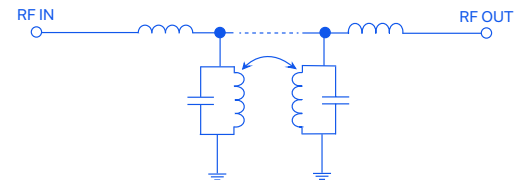
| Parameter             | Ratings        |
|-----------------------|----------------|
| Operating Temperature | -55°C to 125°C |
| Storage Temperature   | -55°C to 125°C |
| RF Power Input        | 1W max.        |

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

## TYPICAL FREQUENCY RESPONSE



## FUNCTIONAL SCHEMATIC

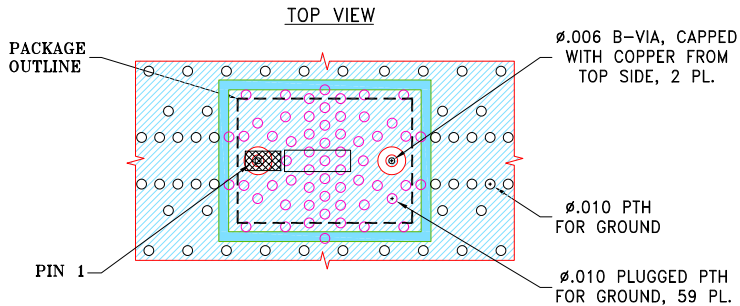




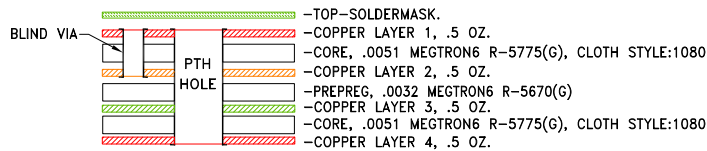
CERAMIC

## Bandpass Filter

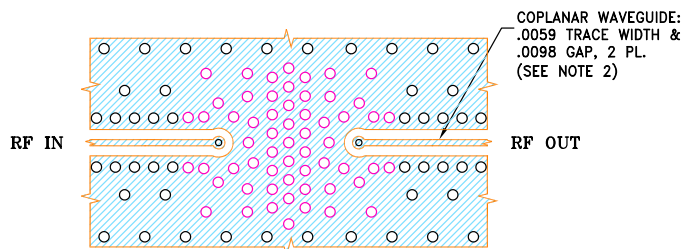
BFHK-3142+

EVALUATION BOARD MCL P/N: TB-BFHK-3142C+  
SUGGESTED PCB LAYOUT: PL-730

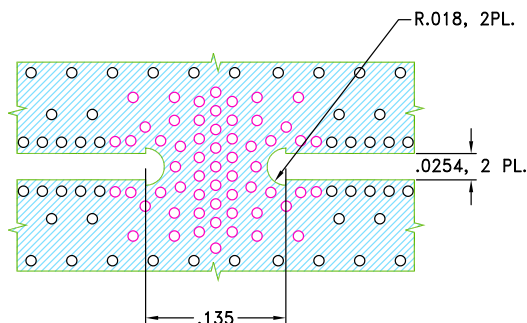
## STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS  $0.019 \pm 10\%$ .
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.



## LAYER 3 &amp; PTH

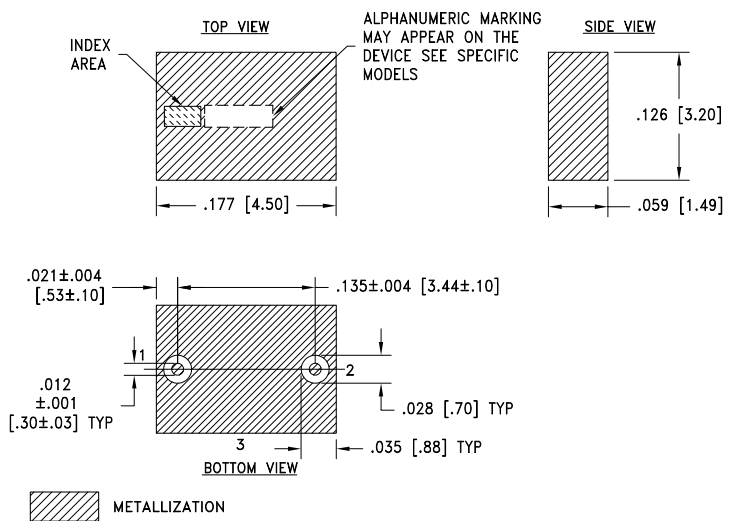


## PAD CONNECTIONS

|        |   |
|--------|---|
| INPUT  | 1 |
| OUTPUT | 2 |
| GROUND | 3 |

## PRODUCT MARKING: F473

## OUTLINE DRAWING



Weight: .126 grams.

Dimensions are in inches [mm]. Tolerances: 2PL  $\pm .01$ ; 3PL  $\pm .005$



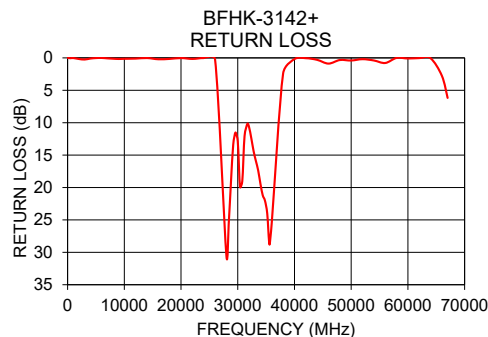
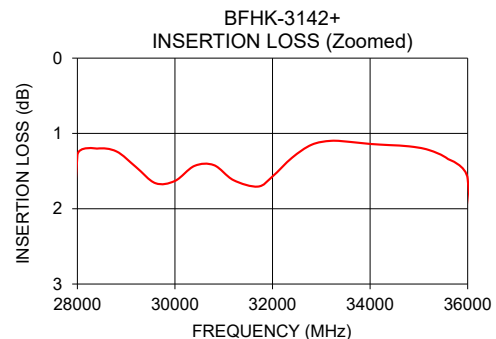
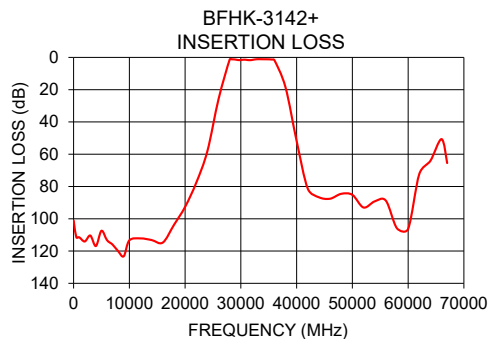
CERAMIC

# Bandpass Filter

BFHK-3142+

## TYPICAL PERFORMANCE DATA

| Frequency (MHz) | Insertion Loss (dB) | Return Loss (dB) |
|-----------------|---------------------|------------------|
| 25              | 101.18              | 0.01             |
| 100             | 103.28              | 0.00             |
| 1000            | 111.44              | 0.02             |
| 2000            | 114.07              | 0.17             |
| 6000            | 113.29              | 0.01             |
| 8000            | 120.13              | 0.12             |
| 10000           | 113.38              | 0.14             |
| 12000           | 112.16              | 0.11             |
| 14000           | 113.19              | 0.02             |
| 16000           | 114.74              | 0.21             |
| 18000           | 103.80              | 0.15             |
| 20000           | 92.64               | 0.03             |
| 22000           | 77.66               | 0.16             |
| 24000           | 58.04               | 0.02             |
| 28000           | 1.29                | 30.54            |
| 31700           | 1.71                | 10.16            |
| 36000           | 1.60                | 25.39            |
| 44000           | 86.68               | 0.30             |
| 54000           | 89.22               | 0.40             |
| 67000           | 65.47               | 6.17             |



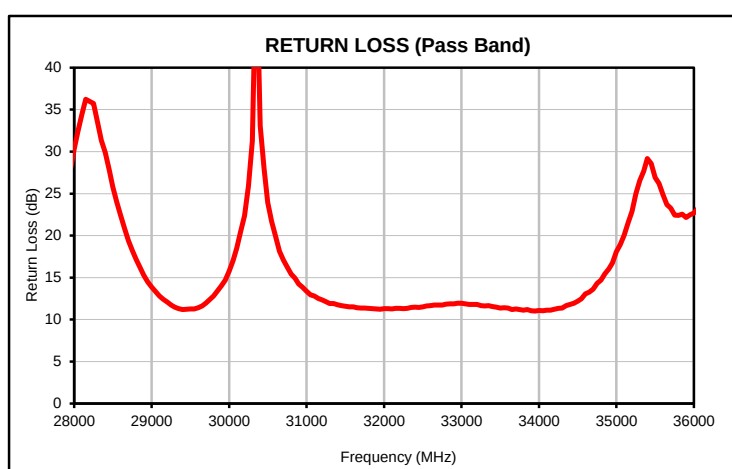
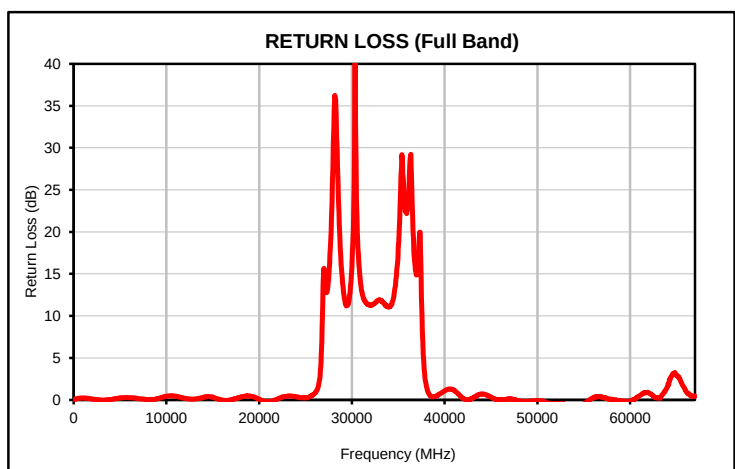
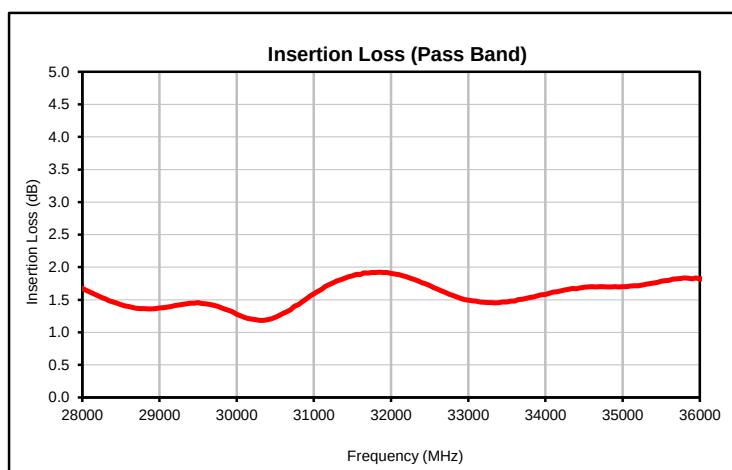
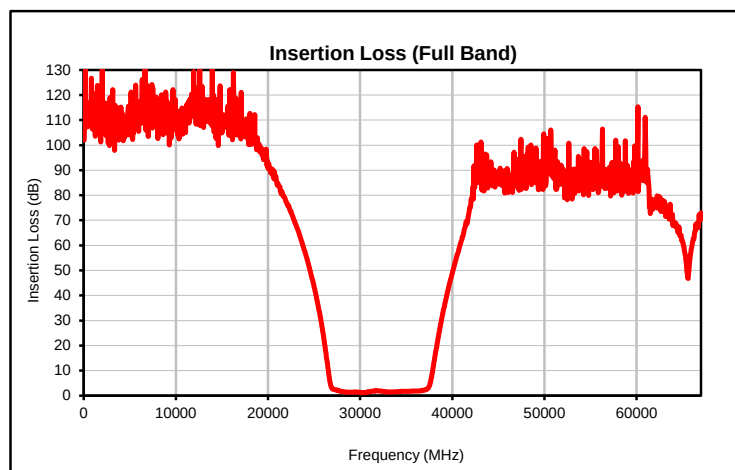
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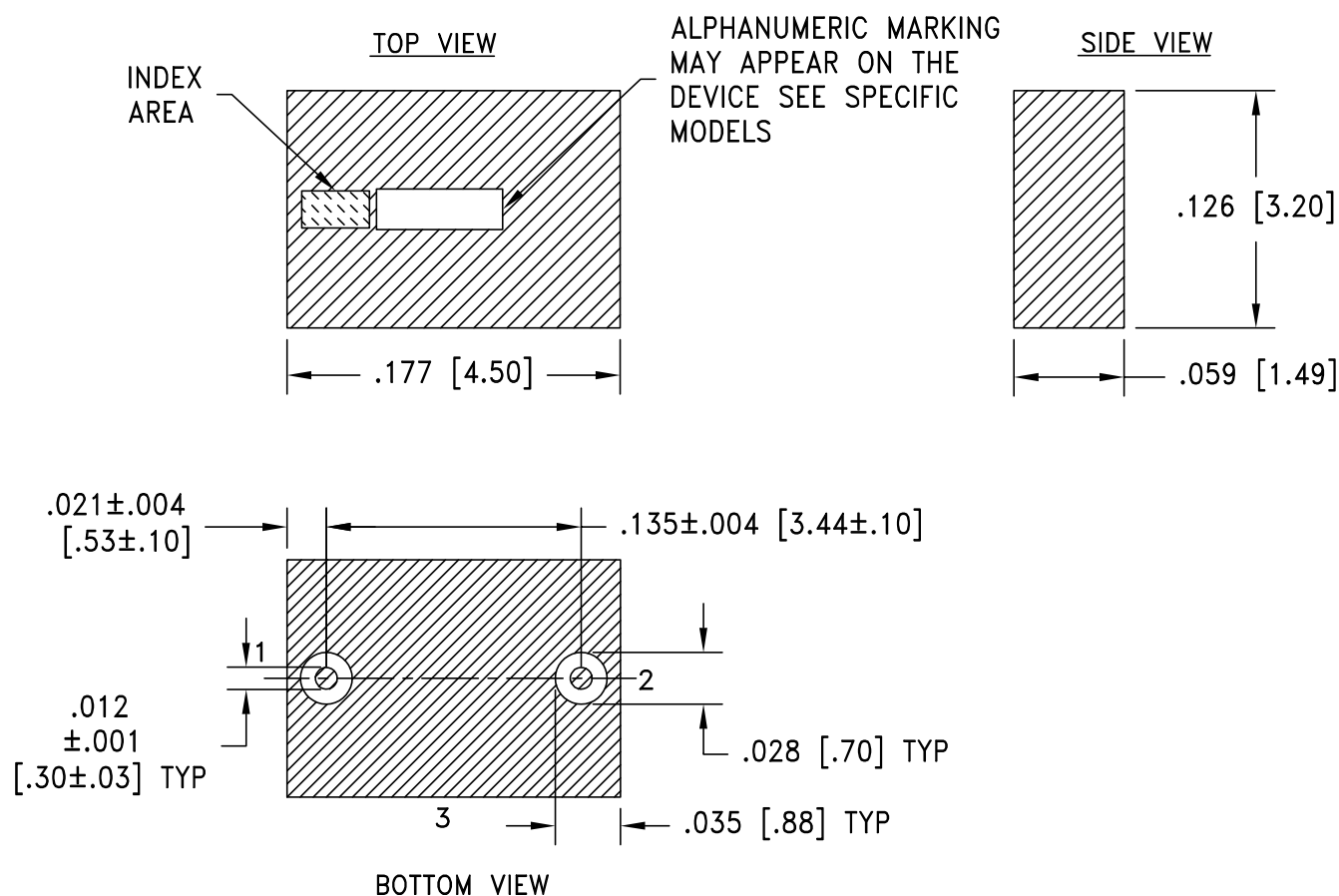


*Typical Performance Data*

| FREQUENCY<br>(MHz) | INSERTION LOSS<br>(dB) | RETURN LOSS<br>(dB) |
|--------------------|------------------------|---------------------|
| 100                | 107.61                 | 0.07                |
| 500                | 113.00                 | 0.19                |
| 1000               | 108.59                 | 0.23                |
| 2000               | 130.32                 | 0.10                |
| 4000               | 112.99                 | 0.06                |
| 6000               | 116.33                 | 0.27                |
| 8000               | 109.93                 | 0.04                |
| 10000              | 107.25                 | 0.43                |
| 12000              | 111.28                 | 0.19                |
| 14000              | 107.52                 | 0.31                |
| 16000              | 103.84                 | -0.02               |
| 18000              | 104.12                 | 0.34                |
| 20000              | 90.65                  | 0.08                |
| 22000              | 77.23                  | 0.11                |
| 24000              | 57.52                  | 0.37                |
| 26000              | 24.39                  | 0.78                |
| 28000              | 1.67                   | 30.37               |
| 28500              | 1.43                   | 25.82               |
| 29000              | 1.37                   | 13.89               |
| 29500              | 1.46                   | 11.27               |
| 30000              | 1.27                   | 15.80               |
| 30500              | 1.23                   | 23.95               |
| 31000              | 1.59                   | 13.39               |
| 31500              | 1.87                   | 11.60               |
| 32000              | 1.90                   | 11.30               |
| 32500              | 1.72                   | 11.52               |
| 33000              | 1.49                   | 11.95               |
| 33500              | 1.47                   | 11.39               |
| 34000              | 1.58                   | 11.08               |
| 34500              | 1.69                   | 12.21               |
| 35000              | 1.70                   | 18.09               |
| 35500              | 1.78                   | 26.90               |
| 36000              | 1.82                   | 22.69               |
| 37000              | 2.26                   | 14.88               |
| 38000              | 12.84                  | 1.81                |
| 39000              | 33.25                  | 0.41                |
| 40000              | 48.93                  | 1.09                |
| 41000              | 61.83                  | 1.16                |
| 42000              | 75.95                  | 0.14                |
| 43000              | 87.21                  | 0.19                |
| 44000              | 86.29                  | 0.72                |
| 45000              | 87.23                  | 0.32                |
| 46000              | 89.24                  | -0.02               |
| 47000              | 88.63                  | 0.12                |
| 48000              | 82.72                  | -0.13               |
| 49000              | 87.56                  | -0.26               |
| 50000              | 89.19                  | -0.10               |
| 52000              | 88.27                  | -0.54               |
| 54000              | 94.30                  | -0.89               |
| 56000              | 90.10                  | 0.24                |
| 58000              | 99.49                  | 0.07                |
| 60000              | 99.96                  | -0.15               |
| 62000              | 76.92                  | 0.85                |
| 64000              | 69.01                  | 1.53                |
| 66000              | 59.53                  | 1.11                |
| 67000              | 72.94                  | 0.46                |

## Typical Performance Curves





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.



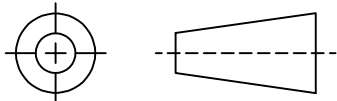
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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RF/IF MICROWAVE COMPONENTS

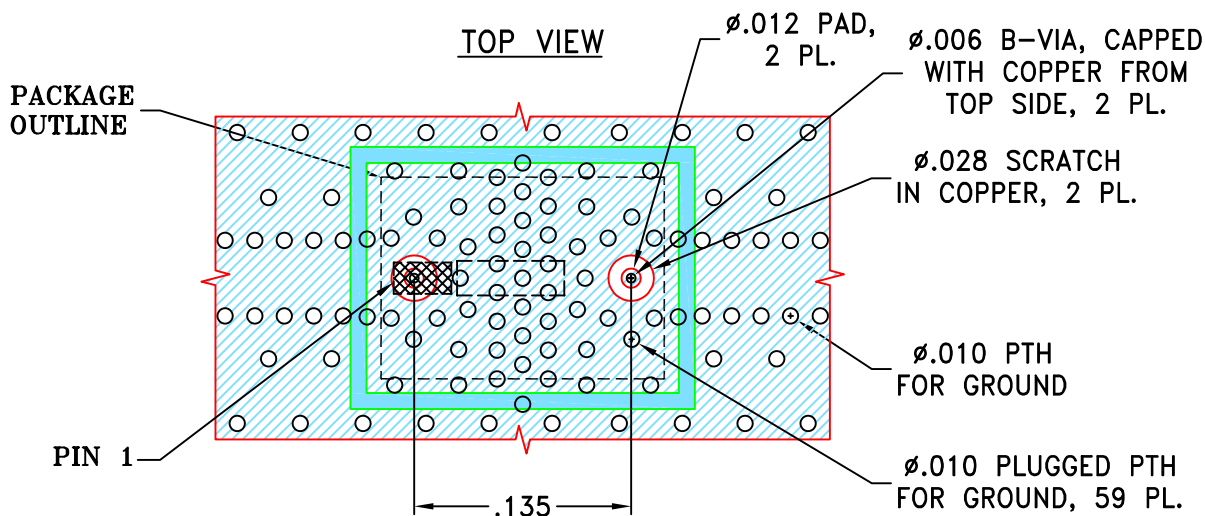
## THIRD ANGLE PROJECTION



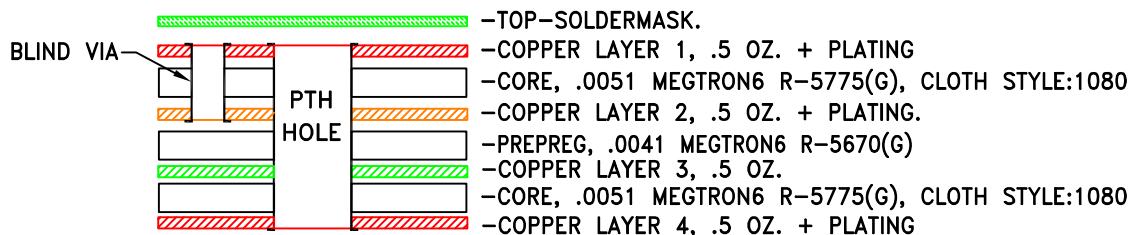
## REVISIONS

| 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



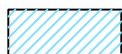
1. TOTAL FINISHED THICKNESS 0.0228±.004.
2. B-VIA PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 2.
3. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
4. INDICATED PLUGGED PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
5. LAYER 4 IS CONTINUOUS GROUND PLANE.

## 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<br>TOLERANCES ON:<br>2 PL DECIMALS ±<br>3 PL DECIMALS ± .005<br>ANGLES ±<br>FRACTIONS ± | DRAWN    | ITG | 05/16/22 |
|                                                                                                                  | CHECKED  | GF  | 05/16/22 |
|                                                                                                                  | APPROVED | IL  | 05/16/22 |
|                                                                                                                  |          |     |          |

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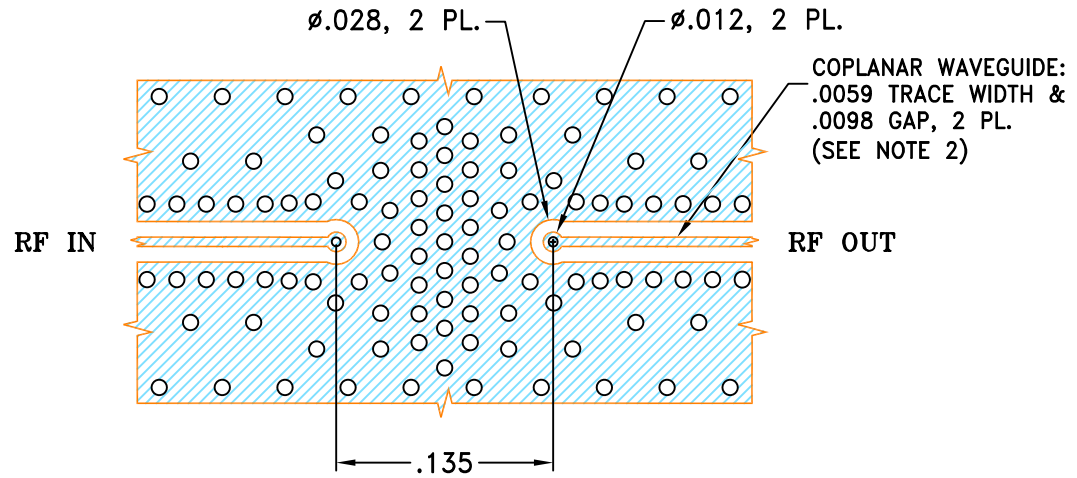
Mini-Circuits® 13 Neptune Avenue  
Brooklyn NY 11235

PL, NM1812C-3, TB-1239

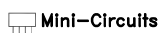
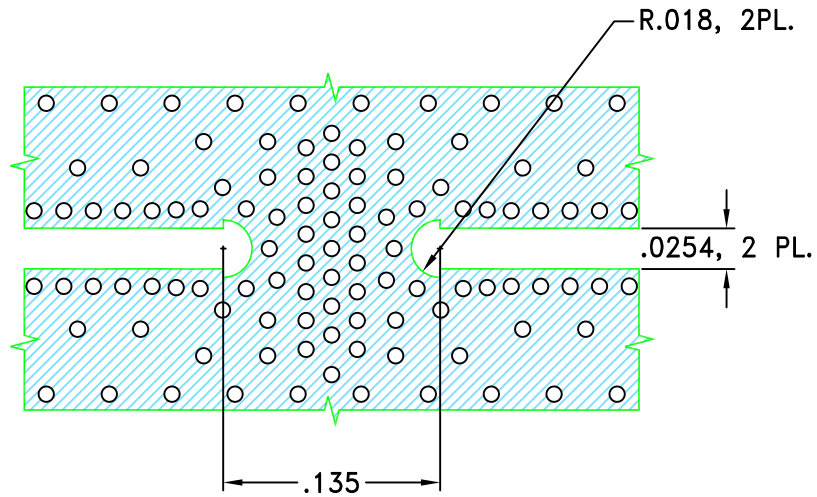
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|-------|------------|-------------|--------|
| A     | 15542      | 98-PL-730   | B      |
| FILE: | 98PL730    | SCALE:      | 8:1    |
|       |            | SHEET:      | 1 OF 2 |



## LAYER 2, B-VIA & PTH



## LAYER 3 & PTH



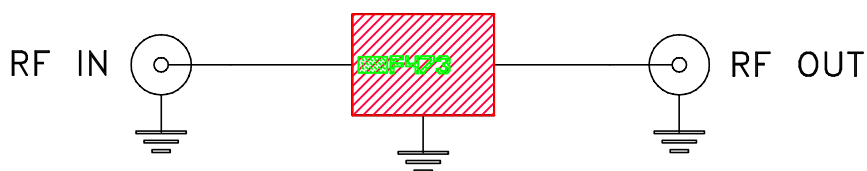
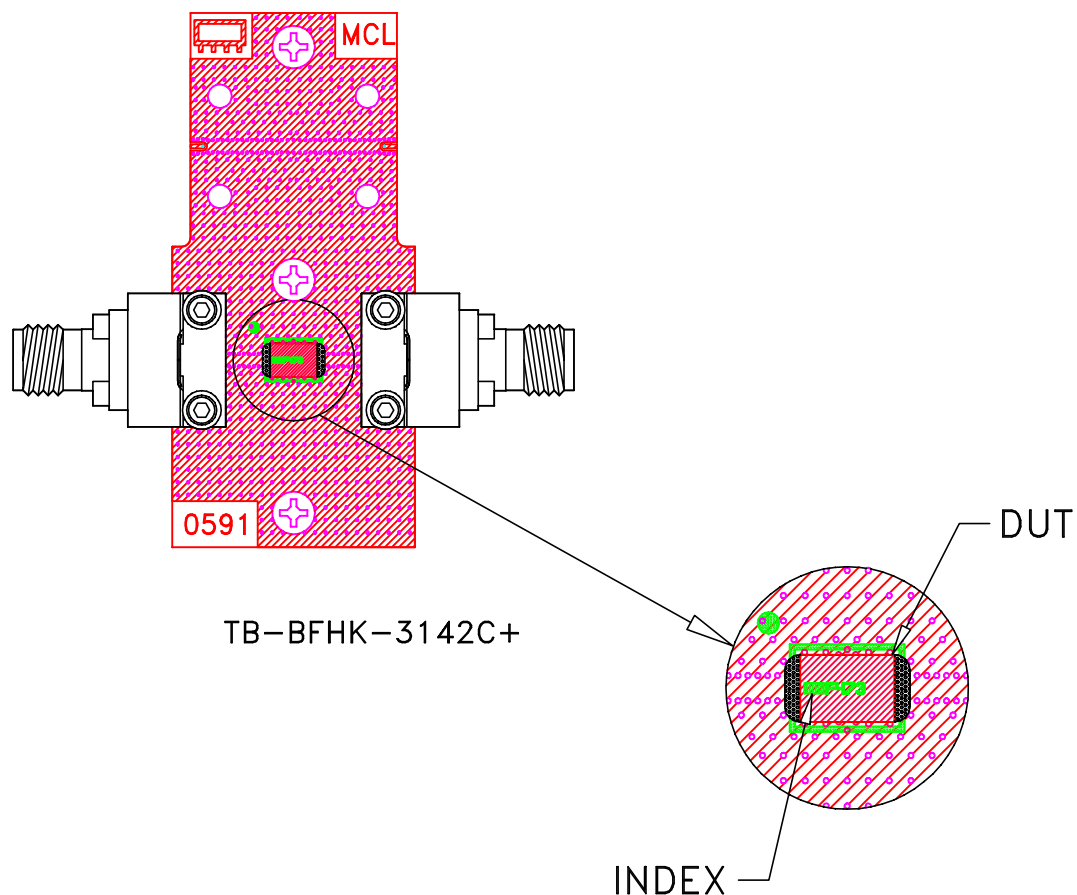
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ASHEETA2.DWG REV:A DATE: 01/12/94

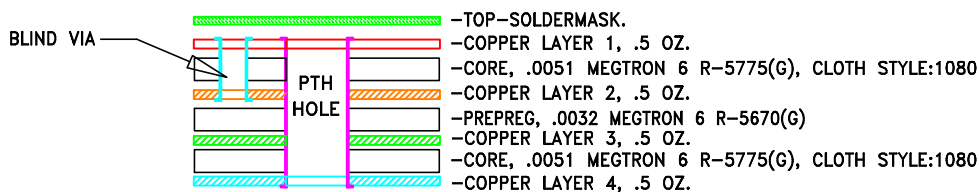
ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

| SIZE  | CODE IDENT | DRAWING NO: | REV:          |
|-------|------------|-------------|---------------|
| A     | 15542      | 98-PL-730   | B             |
| FILE: | 98PL730    | SCALE: 8:1  | SHEET: 2 OF 2 |

# Evaluation Board and Circuit



Schematic Diagram



STACK-UP DIAGRAM

## Notes:

1. 1.85 mm Female End Launch Connector.
2. PCB Material: Megtron 6 R5775(N).  
Dielectric Constant=3.6.
3. Total finished thickness .019".

 **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<br>Ambient Environment                 | Individual Model Data Sheet            |
| Storage Temperature   | -55° to 125° C<br>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                                      |                                        |