



### THE BIG DEAL

- Low loss, 0.9 dB typ.
- Return loss, 11 dB typ.
- Stop Band Rejection, 36 dB typ.
- Small size 0603 (0.063" x 0.032" x 0.024")



Generic photo used for illustration purposes only

CASE STYLE: JC0603C

### +RoHS Compliant

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

### APPLICATIONS

- Test and measurements
- Military applications
- Telecommunications and broadband wireless systems

### PRODUCT OVERVIEW

HFCW-8400+ is a high pass filter with passband from 9200 MHz to 18000 MHz supporting a variety of applications. This model provides good insertion loss over a wide band due to strategically constructed layout. Housed in a tiny 0603 ceramic form factor with wraparound terminations, the filter is ideal for dense PCB layouts.

### KEY FEATURES

| Feature                                     | Advantages                                                                                                                                      |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Wide passband                               | This filter has a very wide passband from 9.2 GHz to 18 GHz.                                                                                    |
| LTCC Construction                           | Provides repeatable performance in a rugged, ceramic package well suited for tough environments such as high humidity and temperature extremes. |
| Small size, 0603 (0.063" X 0.032" X 0.024") | Saves space in dense circuit board layouts and minimizes the effects of parasitics.                                                             |
| Wrap-around terminations                    | Provides excellent solderability and easy visual inspection.                                                                                    |

REV. OR  
ECO-015161  
HFCW-8400+  
EDU4353  
URJ  
220924



Mini-Circuits

CERAMIC

# High Pass Filter

HFCW-8400+

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

| Parameter |                | F#    | Frequency (MHz) | Min. | Typ. | Max. | Units |
|-----------|----------------|-------|-----------------|------|------|------|-------|
| Stopband  | Rejection Loss | DC-F1 | DC - 5200       | 29   | 36   | —    | dB    |
|           |                | F1-F2 | 5200 - 6500     | 23   | 37   | —    | dB    |
|           | Freq. Cut-Off  | F3*   | 8400            | —    | 3    | —    | dB    |
| Passband  | Insertion Loss | F4-F5 | 9200 - 11500    | —    | 1.8  | —    | dB    |
|           |                | F5-F6 | 11500 - 17000   | —    | 0.9  | 1.6  | dB    |
|           |                | F6-F7 | 17000 - 18000   | —    | 1.8  | —    | dB    |
|           | Return Loss    | F4-F5 | 9200 - 11500    | —    | 11   | —    | dB    |
|           |                | F5-F6 | 11500 - 17000   | —    | 11   | —    | dB    |
|           |                | F6-F7 | 17000 - 18000   | —    | 8    | —    | dB    |

1 This component should not be employed as a DC-block. DC de-coupling capacitors are required in Applications where DC voltage and/or current is present at either input or output ports. Please contact Mini-Circuits for further support.

2 Measured on Mini-Circuits Characterization Test Board TB-HFCW-8400+

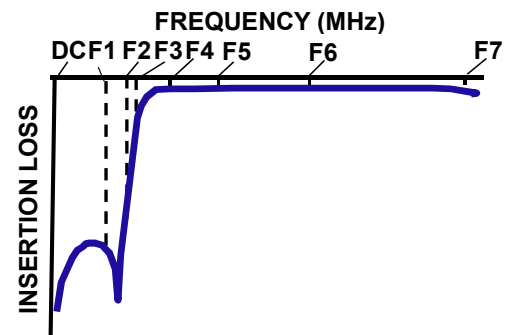
\* Typically, a  $\pm 5\%$  frequency deviation from the stated value may occur on a unit-to-unit basis.

## MAXIMUM RATINGS

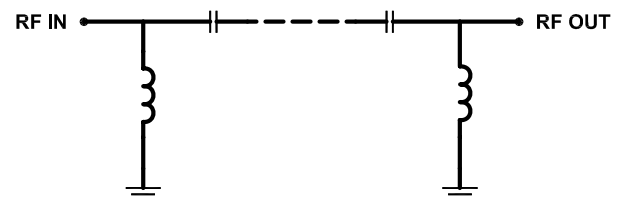
| Parameter             | Ratings        |
|-----------------------|----------------|
| Operating temperature | -55°C to 125°C |
| Storage temperature   | -55°C to 125°C |
| RF Power Input*       | 2.5W @25°C     |

\*Passband rating, derate linearly to 0.6W at 125°C ambient  
Permanent damage may occur if any of these limits are exceeded.

## TYPICAL FREQUENCY RESPONSE



## FUNCTIONAL SCHEMATIC





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## High Pass Filter

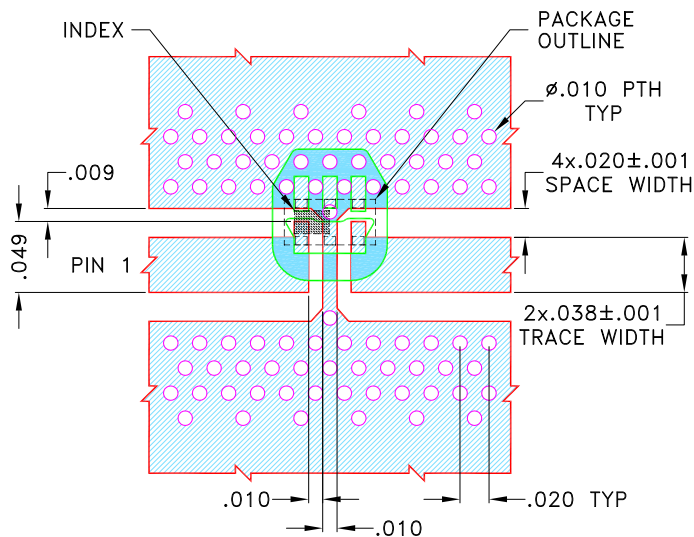
HFCW-8400+

## PAD CONNECTIONS

|        |         |
|--------|---------|
| INPUT  | 1       |
| OUTPUT | 3       |
| GROUND | 2,4,5,6 |

PRODUCT MARKING: VB

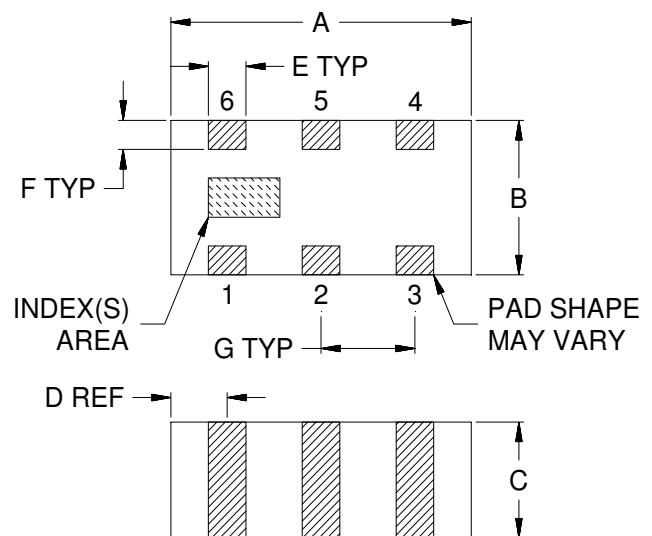
DEMO BOARD MCL P/N: TB-HFCW-8400+  
SUGGESTED PCB LAYOUT (PL-704)



## NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R03003) WITH DIELECTRIC THICKNESS  $.020 \pm .001$  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



## OUTLINE DIMENSIONS (Inches/mm)

| A    | B    | C    | D    | E    | F    | G    | Wt.   |
|------|------|------|------|------|------|------|-------|
| .063 | .032 | .024 | .012 | .008 | .006 | .020 | grams |
| 1.60 | 0.80 | 0.60 | 0.30 | 0.20 | 0.15 | 0.50 | .005  |

Note: Please refer to case style drawing for details



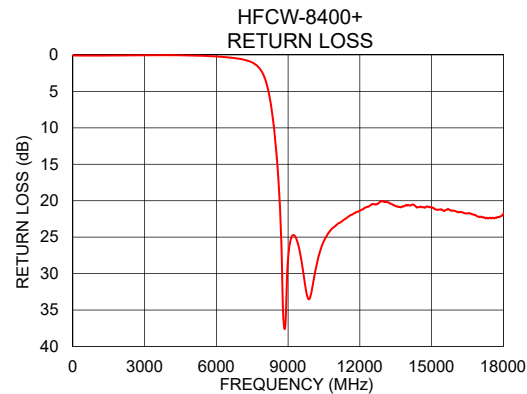
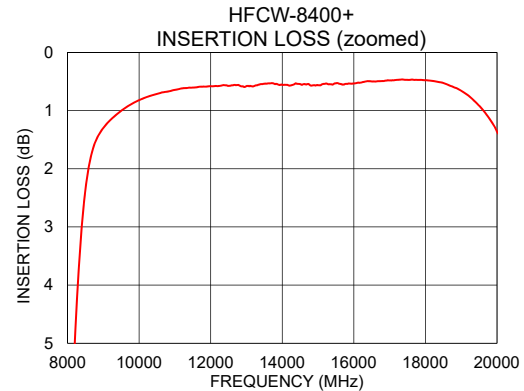
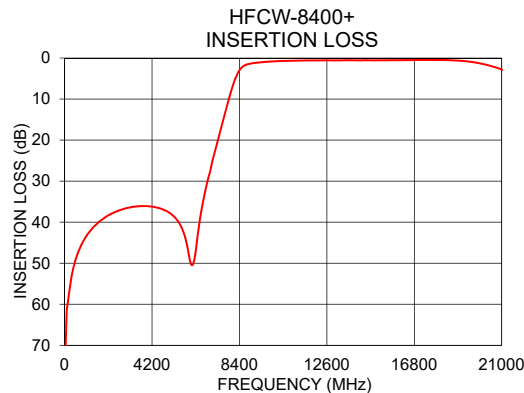
CERAMIC

## High Pass Filter

HFCW-8400+

## TYPICAL PERFORMANCE DATA AT 25°C

| Frequency (MHz) | Insertion Loss (dB) | Return Loss (dB) |
|-----------------|---------------------|------------------|
| 10              | 76.70               | 0.06             |
| 100             | 61.42               | 0.07             |
| 3000            | 36.55               | 0.04             |
| 5200            | 38.35               | 0.09             |
| 6500            | 39.32               | 0.33             |
| 6800            | 31.38               | 0.45             |
| 7300            | 21.22               | 0.78             |
| 7900            | 9.82                | 2.29             |
| 8400            | 2.97                | 9.72             |
| 9200            | 1.16                | 24.73            |
| 10000           | 0.82                | 32.13            |
| 11500           | 0.60                | 22.24            |
| 15000           | 0.56                | 20.93            |
| 17000           | 0.48                | 22.24            |
| 18000           | 0.48                | 21.80            |



## NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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](http://www.minicircuits.com/MCLStore/terms.jsp)



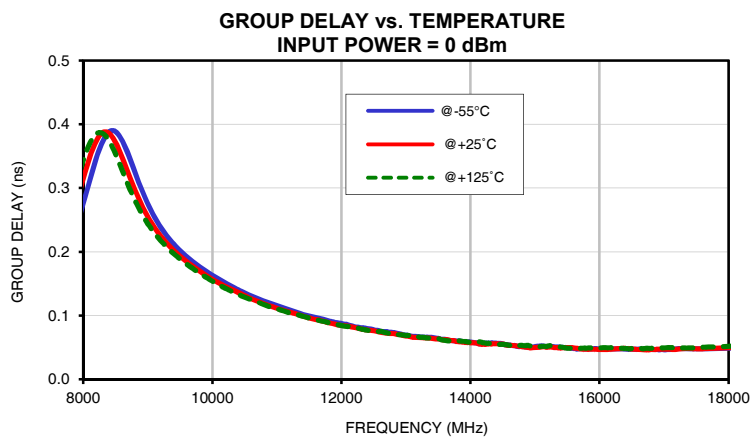
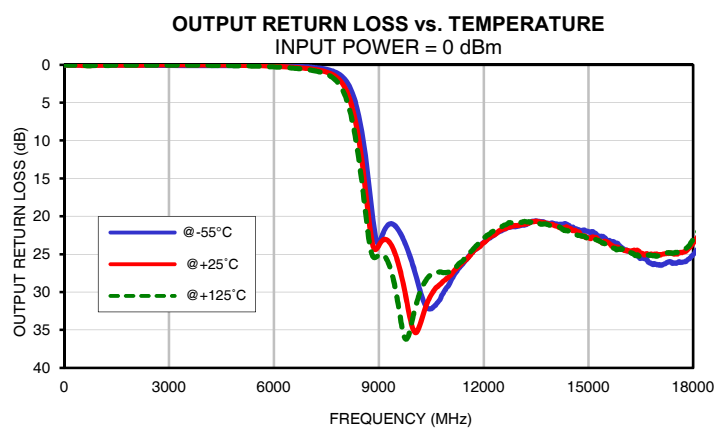
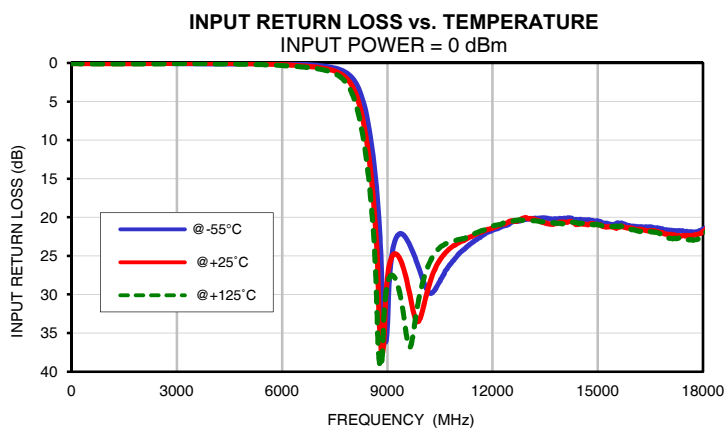
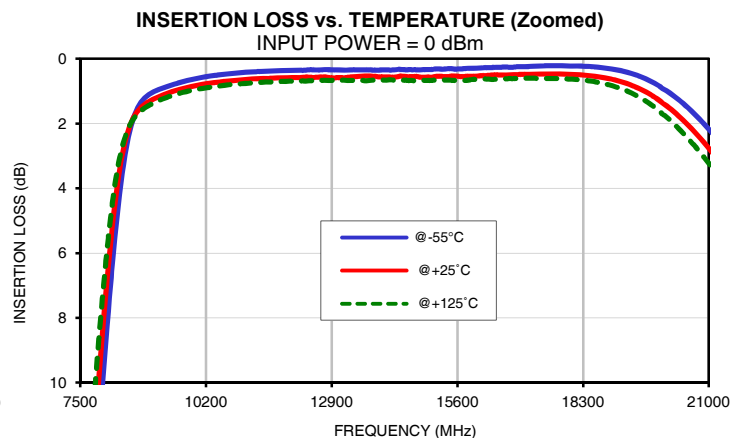
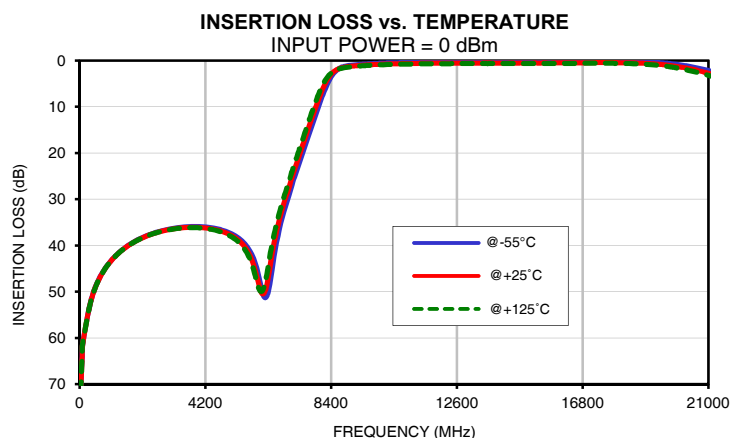
## Typical Performance Data

| FREQ. | INSERTION LOSS |        |         | INPUT RETURN LOSS |        |         | OUTPUT RETURN LOSS |        |         |
|-------|----------------|--------|---------|-------------------|--------|---------|--------------------|--------|---------|
| (MHz) | (dB)           |        |         | (dB)              |        |         | (dB)               |        |         |
|       | @-55°C         | @+25°C | @+125°C | @-55°C            | @+25°C | @+125°C | @-55°C             | @+25°C | @+125°C |
| 10    | 76.39          | 76.70  | 71.66   | 0.03              | 0.06   | 0.07    | 0.02               | 0.02   | 0.03    |
| 100   | 61.43          | 61.42  | 61.35   | 0.01              | 0.07   | 0.08    | 0.03               | 0.03   | 0.04    |
| 300   | 54.22          | 54.21  | 54.26   | 0.02              | 0.07   | 0.09    | 0.01               | 0.04   | 0.06    |
| 500   | 49.54          | 49.58  | 49.60   | 0.02              | 0.08   | 0.11    | 0.01               | 0.07   | 0.10    |
| 700   | 46.64          | 46.68  | 46.70   | 0.02              | 0.08   | 0.12    | 0.02               | 0.08   | 0.11    |
| 900   | 44.54          | 44.59  | 44.60   | 0.01              | 0.08   | 0.12    | 0.00               | 0.07   | 0.10    |
| 1000  | 43.69          | 43.73  | 43.75   | 0.01              | 0.08   | 0.12    | 0.01               | 0.06   | 0.09    |
| 1200  | 42.25          | 42.28  | 42.30   | 0.01              | 0.08   | 0.12    | 0.03               | 0.04   | 0.08    |
| 1400  | 41.08          | 41.11  | 41.13   | 0.00              | 0.08   | 0.11    | 0.04               | 0.03   | 0.06    |
| 1600  | 40.10          | 40.15  | 40.16   | 0.01              | 0.08   | 0.11    | 0.05               | 0.03   | 0.05    |
| 1800  | 39.29          | 39.34  | 39.35   | 0.01              | 0.07   | 0.11    | 0.05               | 0.03   | 0.06    |
| 2000  | 38.59          | 38.65  | 38.66   | 0.02              | 0.07   | 0.10    | 0.05               | 0.03   | 0.06    |
| 2200  | 38.00          | 38.06  | 38.07   | 0.03              | 0.06   | 0.10    | 0.06               | 0.03   | 0.06    |
| 2400  | 37.51          | 37.57  | 37.59   | 0.04              | 0.05   | 0.10    | 0.06               | 0.02   | 0.06    |
| 2600  | 37.09          | 37.16  | 37.18   | 0.05              | 0.05   | 0.09    | 0.07               | 0.02   | 0.05    |
| 2800  | 36.73          | 36.82  | 36.85   | 0.06              | 0.04   | 0.09    | 0.08               | 0.02   | 0.05    |
| 3000  | 36.45          | 36.55  | 36.59   | 0.06              | 0.04   | 0.09    | 0.08               | 0.01   | 0.05    |
| 3200  | 36.22          | 36.33  | 36.39   | 0.07              | 0.03   | 0.08    | 0.09               | 0.01   | 0.05    |
| 3400  | 36.05          | 36.18  | 36.25   | 0.08              | 0.03   | 0.08    | 0.10               | 0.00   | 0.04    |
| 3600  | 35.95          | 36.10  | 36.17   | 0.08              | 0.03   | 0.08    | 0.10               | 0.00   | 0.04    |
| 3800  | 35.90          | 36.07  | 36.14   | 0.09              | 0.03   | 0.09    | 0.11               | 0.00   | 0.04    |
| 4000  | 35.91          | 36.10  | 36.19   | 0.09              | 0.03   | 0.09    | 0.11               | 0.00   | 0.05    |
| 4500  | 36.26          | 36.52  | 36.65   | 0.09              | 0.04   | 0.11    | 0.09               | 0.04   | 0.09    |
| 5000  | 37.24          | 37.60  | 37.83   | 0.08              | 0.07   | 0.15    | 0.08               | 0.06   | 0.12    |
| 5200  | 37.93          | 38.35  | 38.65   | 0.06              | 0.09   | 0.17    | 0.07               | 0.07   | 0.14    |
| 6000  | 47.02          | 48.84  | 49.51   | 0.03              | 0.20   | 0.31    | 0.02               | 0.18   | 0.27    |
| 6500  | 42.13          | 39.32  | 37.50   | 0.13              | 0.33   | 0.46    | 0.13               | 0.31   | 0.41    |
| 6800  | 33.23          | 31.38  | 30.05   | 0.22              | 0.45   | 0.60    | 0.21               | 0.41   | 0.54    |
| 7300  | 22.84          | 21.22  | 19.96   | 0.47              | 0.78   | 1.02    | 0.43               | 0.71   | 0.92    |
| 7900  | 11.43          | 9.82   | 8.64    | 1.47              | 2.29   | 3.06    | 1.34               | 2.10   | 2.80    |
| 8400  | 3.55           | 2.97   | 2.72    | 6.56              | 9.72   | 12.37   | 6.19               | 9.11   | 11.49   |
| 9200  | 0.94           | 1.16   | 1.28    | 23.31             | 24.73  | 27.73   | 21.51              | 23.04  | 25.46   |
| 9400  | 0.84           | 1.05   | 1.17    | 22.11             | 25.78  | 30.84   | 21.01              | 24.16  | 27.97   |
| 9600  | 0.75           | 0.96   | 1.08    | 23.20             | 29.11  | 36.53   | 22.08              | 26.92  | 32.89   |
| 9800  | 0.67           | 0.88   | 1.00    | 25.30             | 33.11  | 33.20   | 24.09              | 31.19  | 36.16   |
| 10000 | 0.60           | 0.82   | 0.95    | 27.91             | 32.13  | 28.60   | 26.81              | 35.06  | 32.86   |
| 10200 | 0.55           | 0.77   | 0.90    | 29.77             | 28.65  | 25.90   | 30.08              | 34.01  | 29.81   |
| 10400 | 0.51           | 0.73   | 0.86    | 29.04             | 26.28  | 24.37   | 32.12              | 31.26  | 28.12   |
| 10600 | 0.47           | 0.70   | 0.82    | 27.45             | 24.89  | 23.59   | 31.79              | 29.64  | 27.43   |
| 10800 | 0.45           | 0.67   | 0.79    | 26.02             | 23.96  | 23.21   | 30.43              | 28.79  | 27.35   |
| 11000 | 0.42           | 0.64   | 0.76    | 24.93             | 23.38  | 22.91   | 29.09              | 28.00  | 27.34   |
| 11200 | 0.40           | 0.62   | 0.74    | 24.09             | 22.95  | 22.74   | 27.45              | 26.98  | 26.72   |
| 11500 | 0.38           | 0.60   | 0.72    | 23.00             | 22.24  | 22.07   | 25.69              | 25.69  | 25.43   |
| 11800 | 0.37           | 0.59   | 0.70    | 22.06             | 21.68  | 21.54   | 24.27              | 24.25  | 23.83   |
| 12000 | 0.36           | 0.58   | 0.69    | 21.66             | 21.39  | 21.16   | 23.45              | 23.47  | 22.90   |
| 12200 | 0.35           | 0.58   | 0.69    | 21.33             | 20.99  | 20.91   | 22.80              | 22.67  | 22.20   |
| 12400 | 0.34           | 0.57   | 0.68    | 20.99             | 20.72  | 20.66   | 22.13              | 22.08  | 21.69   |
| 12600 | 0.35           | 0.57   | 0.67    | 20.50             | 20.48  | 20.44   | 21.67              | 21.61  | 21.15   |
| 12800 | 0.33           | 0.57   | 0.67    | 20.44             | 20.29  | 20.34   | 21.37              | 21.28  | 20.86   |
| 13000 | 0.34           | 0.58   | 0.66    | 20.19             | 20.14  | 20.35   | 21.29              | 21.20  | 20.77   |
| 13500 | 0.34           | 0.54   | 0.66    | 20.09             | 20.75  | 20.61   | 20.58              | 20.65  | 20.61   |
| 14000 | 0.34           | 0.56   | 0.66    | 20.16             | 20.61  | 20.83   | 20.97              | 21.13  | 21.25   |
| 14500 | 0.34           | 0.55   | 0.66    | 20.25             | 20.85  | 20.80   | 21.45              | 21.65  | 21.98   |
| 15000 | 0.33           | 0.56   | 0.66    | 20.51             | 20.93  | 20.96   | 21.99              | 22.82  | 22.77   |
| 15500 | 0.31           | 0.53   | 0.67    | 20.86             | 21.36  | 21.12   | 22.97              | 23.33  | 23.80   |
| 16000 | 0.29           | 0.53   | 0.64    | 21.13             | 21.43  | 21.58   | 24.29              | 24.42  | 24.49   |
| 16500 | 0.26           | 0.50   | 0.62    | 21.22             | 21.72  | 21.84   | 25.54              | 24.86  | 25.15   |
| 17000 | 0.24           | 0.48   | 0.60    | 21.66             | 22.24  | 22.63   | 26.39              | 25.05  | 25.16   |
| 17500 | 0.22           | 0.47   | 0.61    | 21.86             | 22.41  | 22.81   | 26.19              | 24.97  | 24.78   |
| 18000 | 0.22           | 0.48   | 0.63    | 21.50             | 21.80  | 22.31   | 25.05              | 23.53  | 23.00   |

## Typical Performance Data

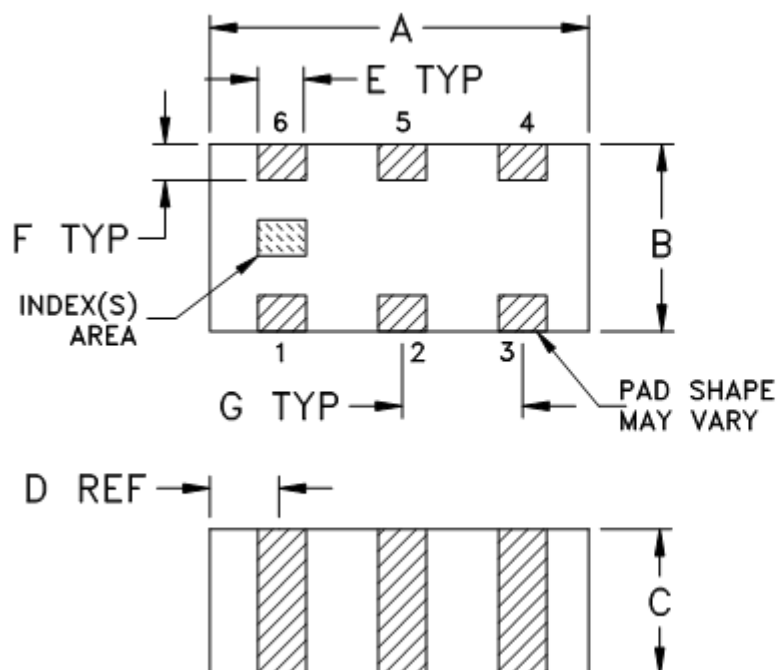
| FREQ. | GROUP DELAY |        |         |
|-------|-------------|--------|---------|
| (MHz) | (nsec)      |        |         |
|       | @-55°C      | @+25°C | @+125°C |
| 9200  | 0.24        | 0.22   | 0.22    |
| 9400  | 0.21        | 0.20   | 0.20    |
| 9600  | 0.19        | 0.18   | 0.18    |
| 9800  | 0.18        | 0.17   | 0.17    |
| 10000 | 0.16        | 0.16   | 0.15    |
| 10200 | 0.15        | 0.15   | 0.14    |
| 10400 | 0.14        | 0.14   | 0.13    |
| 10600 | 0.13        | 0.13   | 0.13    |
| 10800 | 0.12        | 0.12   | 0.12    |
| 11000 | 0.12        | 0.11   | 0.11    |
| 11200 | 0.11        | 0.11   | 0.10    |
| 11500 | 0.10        | 0.10   | 0.10    |
| 11800 | 0.09        | 0.09   | 0.09    |
| 12000 | 0.09        | 0.08   | 0.08    |
| 12200 | 0.08        | 0.08   | 0.08    |
| 12400 | 0.08        | 0.08   | 0.08    |
| 12600 | 0.08        | 0.07   | 0.08    |
| 12800 | 0.07        | 0.07   | 0.07    |
| 13000 | 0.07        | 0.07   | 0.07    |
| 13200 | 0.07        | 0.07   | 0.07    |
| 13400 | 0.07        | 0.06   | 0.07    |
| 13600 | 0.06        | 0.06   | 0.06    |
| 13800 | 0.06        | 0.06   | 0.06    |
| 14000 | 0.06        | 0.06   | 0.06    |
| 14200 | 0.06        | 0.05   | 0.06    |
| 14400 | 0.06        | 0.06   | 0.06    |
| 14600 | 0.05        | 0.05   | 0.05    |
| 14800 | 0.05        | 0.05   | 0.05    |
| 15000 | 0.05        | 0.05   | 0.05    |
| 15200 | 0.05        | 0.05   | 0.05    |
| 15400 | 0.05        | 0.05   | 0.05    |
| 15600 | 0.05        | 0.05   | 0.05    |
| 15800 | 0.05        | 0.05   | 0.05    |
| 16000 | 0.05        | 0.05   | 0.05    |
| 16200 | 0.05        | 0.05   | 0.05    |
| 16500 | 0.05        | 0.05   | 0.05    |
| 16800 | 0.05        | 0.05   | 0.05    |
| 17000 | 0.05        | 0.05   | 0.05    |
| 17500 | 0.05        | 0.05   | 0.05    |
| 18000 | 0.05        | 0.05   | 0.05    |

## Typical Performance Curves

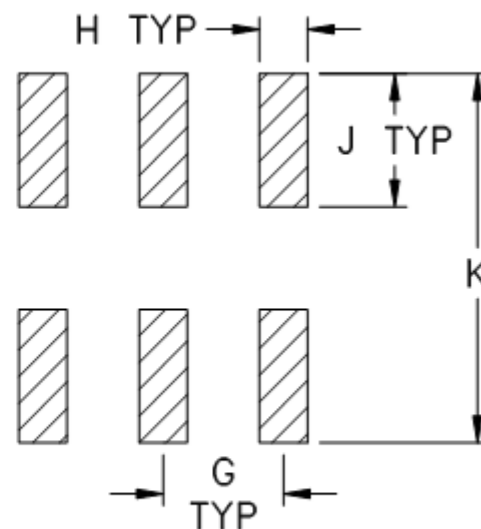


## Outline Dimensions

JC0603C



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

| CASE #  | A              | B              | C              | D              | E              | F              | G              | H              | J              | K               | WT. GRAM |
|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|----------|
| JC0603C | .063<br>(1.60) | .031<br>(0.80) | .024<br>(0.60) | .012<br>(0.30) | .008<br>(0.20) | .006<br>(0.15) | .020<br>(0.50) | .010<br>(0.25) | .022<br>(0.55) | 0.053<br>(1.35) | .005     |

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

### Notes:

1. Open style, ceramic base.
2. Termination finish:  
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



# Tape & Reel Packaging TR-F114

## DEVICE ORIENTATION IN T&R

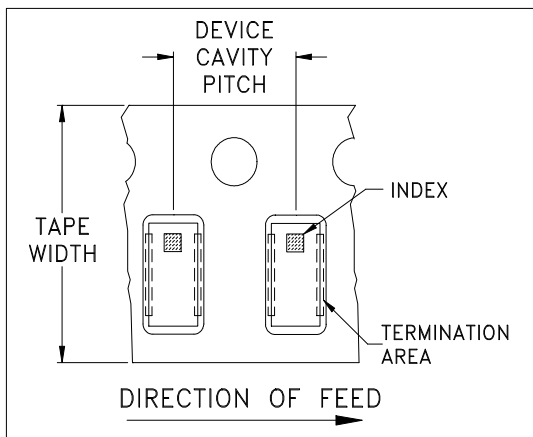


ILLUSTRATION 1

| Applicable Case Styles |           |
|------------------------|-----------|
| GE0805C                | JC0603C   |
| GE0805C-1              | JC0603C-4 |
| GE0805C-1AP            | JC0603C-6 |
| GE0805C-7              |           |
| GE0805C-9              |           |
| GE0805C-10             |           |
| GE0805C-11             |           |
| GE0805C-12             |           |

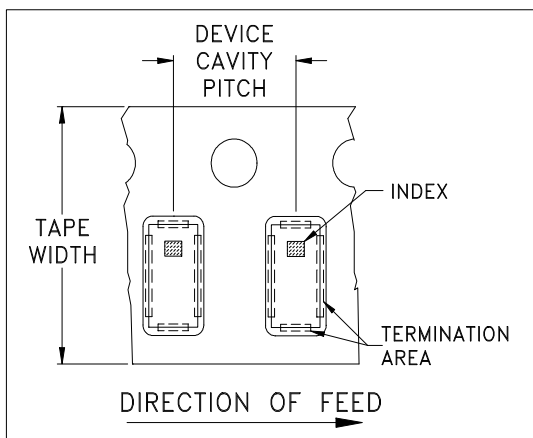


ILLUSTRATION 2

| Applicable Case Styles |           |
|------------------------|-----------|
| GE0805C-2              | JC0603C-1 |
| GE0805C-3              | JC0603C-2 |
| GE0805C-4              | JC0603C-3 |
| GE0805C-5              | JC0603C-5 |
| GE0805C-6              | JC0603C-7 |
| GE0805C-8              | JV1210C-1 |
| GE0805C-15             |           |

| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel                    |      |
|----------------|-------------------------|-------------------|-------------------------------------|------|
| 8              | 4                       | 7                 | Small quantity standards (see note) | 20   |
|                |                         |                   |                                     | 50   |
|                |                         |                   |                                     | 100  |
|                |                         |                   |                                     | 200  |
|                |                         |                   |                                     | 500  |
|                |                         |                   |                                     | 1000 |
|                |                         |                   | Standard                            | 4000 |

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](http://www.minicircuits.com/pages/pdfs/tape.pdf)

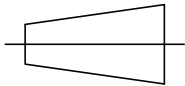


INTERNET <http://www.minicircuits.com>

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| REV | ECN No.    | DESCRIPTION | DATE   | DR  | AUTH |
|-----|------------|-------------|--------|-----|------|
| OR  | ECO-006344 | NEW RELEASE | FEB 21 | KKR | VC   |
|     |            |             |        |     |      |
|     |            |             |        |     |      |
|     |            |             |        |     |      |

## INDEX

## PACKAGE OUTLINE

Ø.010 PTH  
TYP

4x.020±.001  
SPACE WIDTH

2x.038±.001  
TRACE WIDTH

0.009

.049

PIN 1

.010

→ | | ← .020 TYP

-.010

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (RO3003) WITH DIELECTRIC THICKNESS  $.020 \pm .001$  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.

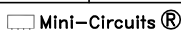
 DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
 DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

DATE \_\_\_\_\_

17 FEB 21

17 FEB 21

17 FEB 21



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Mini-Circuits® 13 Neptune Avenue  
Brooklyn NY 11235

PL DWG, JC0603C C.S, 50 OHM, HFCW

SIZE  
A

CODE IDENT  
15542

|             |           |
|-------------|-----------|
| DRAWING NO: | 98-PL-704 |
|-------------|-----------|

|      |    |
|------|----|
| REV: | OR |
|------|----|

FILE: 98PL704

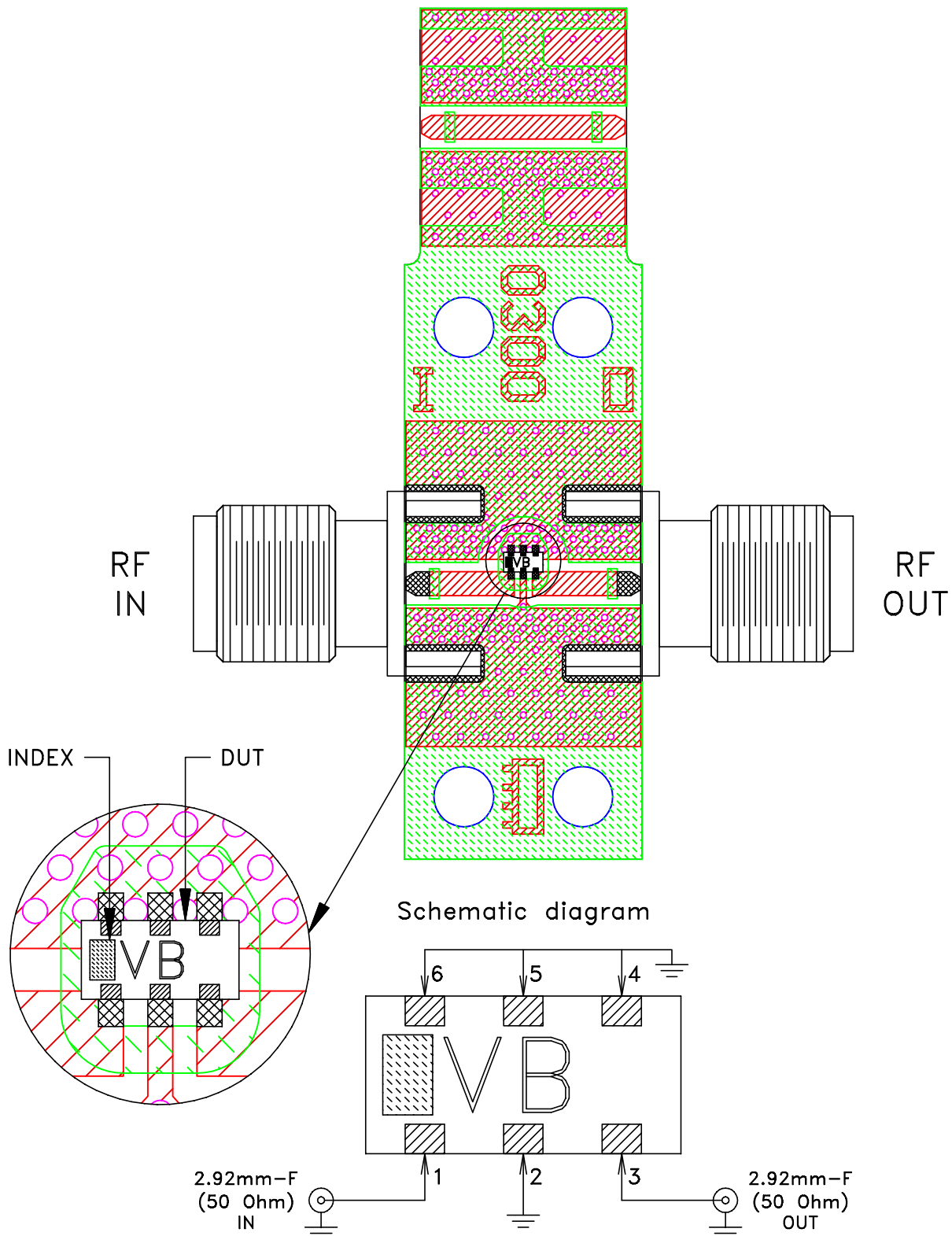
SCALE: 15:1

SHEET: 1 OF 1

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

# Evaluation Board and Circuit

TB-HFCW-8400+



## Notes:

1. PCB Material: ROGERS (R03003) OR Equivalent, Dielectric Constant= $3.00 \pm 0.04$

Dielectric Thickness:  $.020 \pm .001$

2. 50 Ohm 2.92mm Female Connectors.

3. Connectors on the test board shall not be subjected to temperature greater than 200°C to avoid permanent damage to the 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<br>Ambient Environment                                               | Individual Model Data Sheet                                                                          |
| Storage Temperature        | -55° to 125° C<br>Ambient Environment                                               | Individual Model Data Sheet                                                                          |
| Humidity                   | 90 to 95% RH, 240 hours, 50°C                                                       | MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours |
| Solder Reflow Heat         | Sn-Pb Eutectic Process 225°C peak<br>Pb-Free Process 245° - 250°C peak              | J-STD-020C, Table 4-1, 4-2 and 5-2, Figure 5-1                                                       |
| Solderability              | 10X Magnification                                                                   | J-STD-002, Para 4.2.5, Test S, 95% Coverage                                                          |
| Vibration (High Frequency) | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36) | MIL-STD-202, Method 204, Condition D                                                                 |
| Mechanical Shock           | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes                   | MIL-STD-202, Method 213, Condition A                                                                 |