CERAMIC

# Bandpass Filter & Balun BBFCG1-252+

50Ω 2400 to 2500 MHz

## THE BIG DEAL

- Tiny size, (0805)
- Compact design includes Balun & Filter in one package
- Low cost

*Generic photo used for illustration purposes only*

CASE STYLE: GE0805C-2

***+RoHS Compliant***

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

## APPLICATIONS

- ISM Band
- Bluetooth
- Zigbee
- WiFi / WLAN

## PRODUCT OVERVIEW

Mini-Circuits' BBFCG1-252+ is a tiny ceramic RF balun filter with an impedance ratio of 1:1, covering a variety of wireless communications applications from 2400 to 2500 MHz. This model provides low insertion loss, low phase unbalance (relative to 180°), low amplitude unbalance, and RF input power handling up to 1W. It provides DC isolation from input to output allowing it to be used for DC biasing of external circuits at the output. Fabricated using LTCC technology, the unit comes housed in a tiny, rugged ceramic package (0.079" x 0.049" x 0.037") suitable for harsh operating environments.

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Compact Design | Integrates fiter and balun in one tiny package |
| 1W power handling | Supports a wide range of power requirements |
| DC Isolated from input to output | Can be used to DC bias external circuits at the output. |
| Tiny size, 0805 | Accommodates tight space requirements for dense PCB layouts. |
| LTCC construction | LTCC process enables tiny size and low cost, suitable for high-volume production. Rugged ceramic package provides excellent reliability in harsh operating environments. |

# Bandpass Filter & Balun BBFCG1-252+

## ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter | | F# | Frequency (MHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Impedance Ratio | | | | | 1 | | |
| Pass Band | Insertion Loss[1] | F1-F2 | 2400 - 2500 | — | — | 3.5 | dB |
| | Return Loss | F1-F2 | 2400 - 2500 | 7.5 | 15 | — | |
| Stop Band, Lower | Rejection | DC- F3 | DC - 1800 | 29 | 35 | — | dB |
| Stop Band, Upper | Rejection | F4-F5 | 3500 - 6600 | 24 | — | — | dB |
| | | F5-F6 | 6600 - 8000 | 20 | — | — | |
| Amplitude Unbalance | | F1-F2 | 2400 - 2500 | — | — | 1.8 | dB |
| Phase Unbalance | | F1-F2 | 2400 - 2500 | — | — | 12 | Degree |

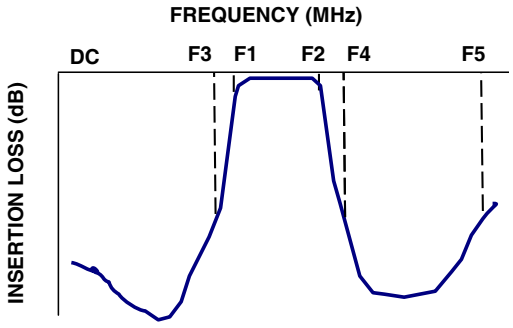
1.Tested on Evaluation Board TB-BBFCG1-252+

## MAXIMUM RATINGS

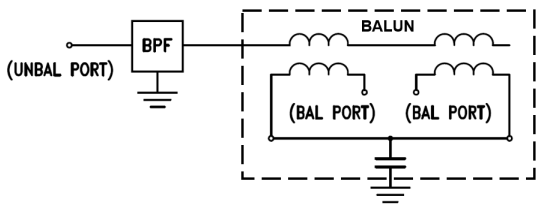
| Parameter | Ratings |
|---|---|
| Operating Temperature | -55°C to 125°C |
| Storage Temperature[2] | -55°C to 125°C |
| RF Power Input[3] | 1W at 25°C |

2.Refer to product storage temperature after installation
Suggestion for T&R unused product storage condition:
+5 ~ +35 °C, Humidity 45~75%RH, 12 month Max
3.Derate linearly to 0.25W at 125°C.
Permanent damage may occur if any of these limits exceeded.

## TYPICAL FREQUENCY RESPONSE




## FUNCTIONAL SCHEMATIC



# Bandpass Filter & Balun BBFCG1-252+

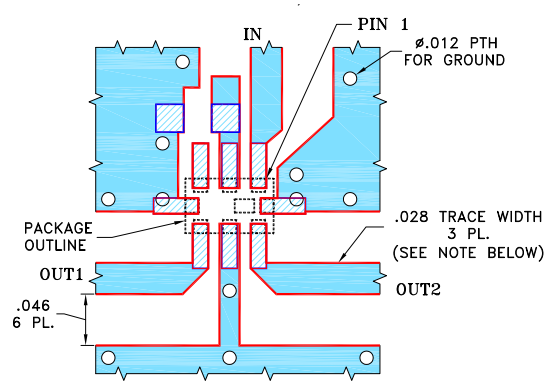
## PAD CONNECTIONS

| | |
|---|---|
| UNBALANCED PORT | 1 |
| BALANCED PORT | 5,7 |
| GROUND | 4,6,8 |
| NC | 3 |
| NC or DC Feed | 2 |

## PRODUCT MARKING: N/A

## DEMO BOARD MCL P/N: TB-BBFCG1-252+

## SUGGESTED PCB LAYOUT (PL-551)



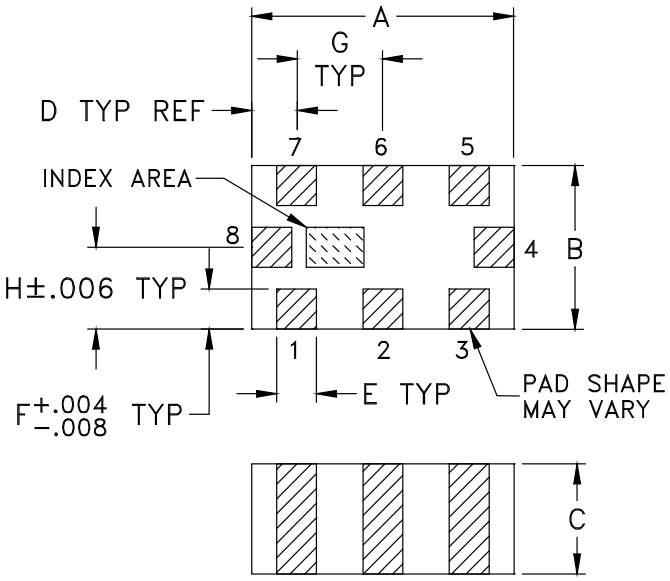

NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS .016±.0015. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

## OUTLINE DRAWING




## OUTLINE DIMENSIONS (Inches / mm)

| A | B | C | D | E |
|---|---|---|---|---|
| .079 | .049 | .037 | .014 | .012 |
| 2.01 | 1.24 | 0.94 | 0.36 | 0.30 |

| F | G | H | wt |
|---|---|---|---|
| .012 | .026 | .025 | grams |
| 0.30 | 0.66 | 0.64 | .008 |

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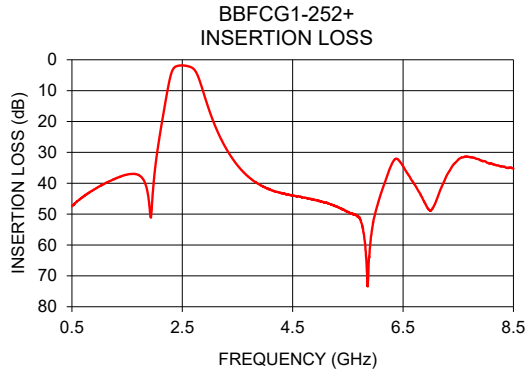
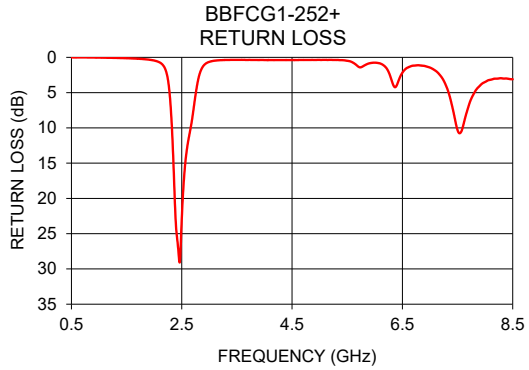
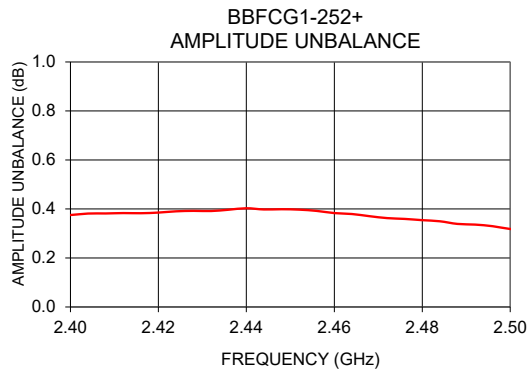
# Bandpass Filter & Balun BBFCG1-252+

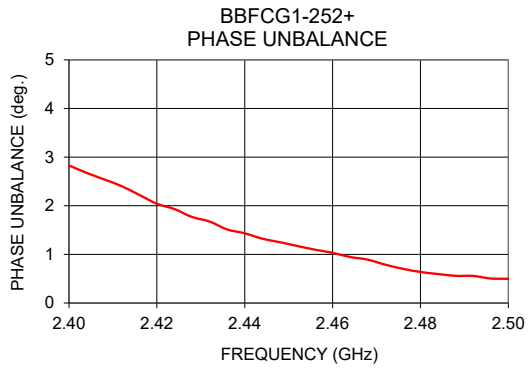
## TYPICAL PERFORMANCE DATA

| Frequency (MHz) | Insertion Loss (dB) | Return Loss (dB) | Amplitude Unbalance (dB) | Phase Unbalance (Deg.) |
|---|---|---|---|---|
| 0.50 | 47.45 | 0.01 | 5.69 | 156.12 |
| 0.70 | 44.41 | 0.01 | 5.95 | 161.63 |
| 1.00 | 41.01 | 0.04 | 6.31 | 165.18 |
| 1.50 | 37.18 | 0.13 | 6.50 | 167.44 |
| 2.00 | 36.33 | 0.45 | 3.63 | 156.15 |
| 2.40 | 2.05 | 24.38 | 0.38 | 2.83 |
| 2.45 | 1.87 | 28.71 | 0.40 | 1.17 |
| 2.50 | 1.83 | 22.94 | 0.32 | 0.50 |
| 3.50 | 34.20 | 0.35 | 3.82 | 175.71 |
| 4.80 | 45.05 | 0.37 | 1.36 | 179.32 |
| 4.90 | 45.38 | 0.37 | 1.36 | 179.13 |
| 5.00 | 45.90 | 0.36 | 1.35 | 178.90 |
| 5.90 | 60.87 | 0.85 | 0.25 | 177.26 |
| 7.20 | 41.18 | 2.70 | 0.24 | 174.36 |
| 7.50 | 32.30 | 10.33 | 0.14 | 174.80 |
| 8.50 | 35.24 | 3.11 | 0.42 | 175.67 |




**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

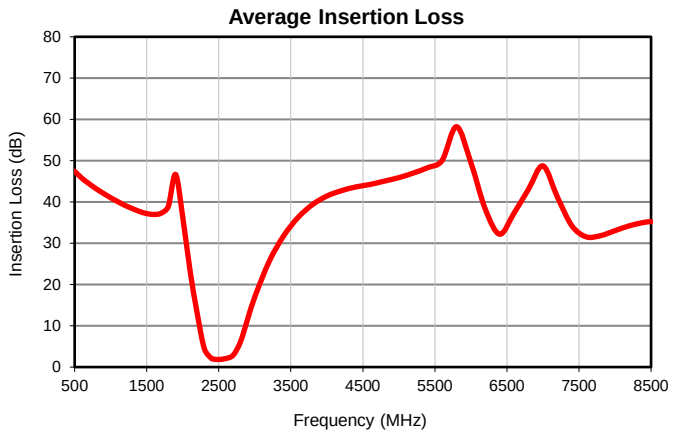
# Ceramic Balance Filter BBFCG1-252+

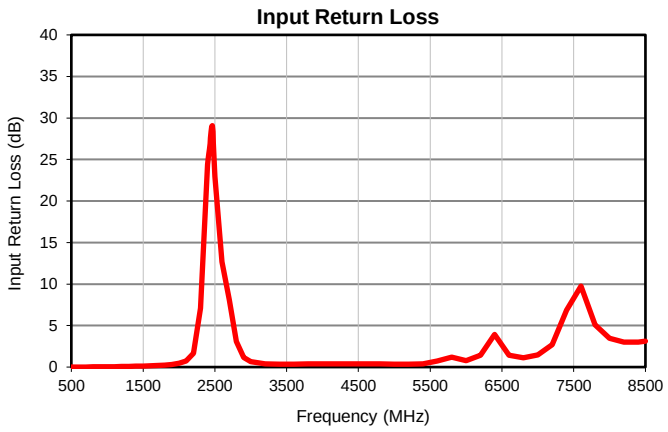
*Typical Performance Data*

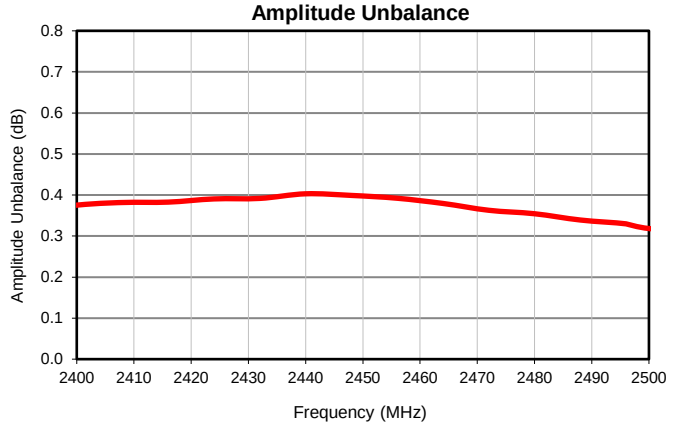
| FREQUENCY (MHz) | INSERTION LOSS (dB) | RETURN LOSS (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE (deg.) |
|---|---|---|---|---|
| 500 | 47.45 | 0.01 | 5.69 | 156.12 |
| 600 | 45.76 | 0.01 | 5.85 | 159.31 |
| 700 | 44.41 | 0.01 | 5.95 | 161.63 |
| 800 | 43.17 | 0.02 | 6.08 | 163.27 |
| 900 | 42.07 | 0.03 | 6.14 | 164.44 |
| 1000 | 41.01 | 0.04 | 6.31 | 165.18 |
| 1100 | 40.06 | 0.05 | 6.35 | 165.87 |
| 1200 | 39.15 | 0.06 | 6.45 | 166.29 |
| 1300 | 38.41 | 0.08 | 6.56 | 166.73 |
| 1400 | 37.69 | 0.10 | 6.56 | 167.07 |
| 1500 | 37.18 | 0.13 | 6.50 | 167.44 |
| 1600 | 36.98 | 0.16 | 6.27 | 167.99 |
| 1700 | 37.28 | 0.19 | 5.66 | 169.78 |
| 1800 | 38.94 | 0.25 | 4.45 | 173.13 |
| 1900 | 46.68 | 0.32 | 1.83 | 178.66 |
| 2000 | 36.33 | 0.45 | 3.63 | 156.15 |
| 2100 | 23.57 | 0.72 | 8.21 | 72.13 |
| 2200 | 13.08 | 1.64 | 2.62 | 23.18 |
| 2300 | 4.45 | 7.09 | 0.24 | 8.92 |
| 2400 | 2.05 | 24.38 | 0.38 | 2.83 |
| 2408 | 2.01 | 25.09 | 0.38 | 2.54 |
| 2416 | 1.97 | 25.69 | 0.38 | 2.22 |
| 2424 | 1.94 | 26.23 | 0.39 | 1.93 |
| 2432 | 1.92 | 26.88 | 0.39 | 1.68 |
| 2440 | 1.90 | 27.59 | 0.40 | 1.43 |
| 2448 | 1.88 | 28.37 | 0.40 | 1.25 |
| 2456 | 1.86 | 28.98 | 0.39 | 1.10 |
| 2464 | 1.85 | 29.08 | 0.38 | 0.95 |
| 2472 | 1.84 | 28.35 | 0.36 | 0.79 |
| 2480 | 1.84 | 26.99 | 0.35 | 0.64 |
| 2488 | 1.83 | 25.36 | 0.34 | 0.56 |
| 2496 | 1.83 | 23.71 | 0.33 | 0.50 |
| 2500 | 1.83 | 22.94 | 0.32 | 0.50 |
| 2600 | 2.08 | 12.67 | 0.18 | 0.40 |
| 2700 | 2.89 | 8.10 | 0.29 | 1.30 |
| 2800 | 6.07 | 3.08 | 0.96 | 0.22 |
| 2900 | 11.57 | 1.14 | 3.67 | 12.16 |
| 3000 | 16.99 | 0.64 | 13.14 | 31.29 |
| 3200 | 25.59 | 0.40 | 10.18 | 172.09 |
| 3400 | 31.77 | 0.35 | 4.96 | 174.56 |
| 3600 | 36.23 | 0.36 | 3.08 | 176.83 |
| 3800 | 39.35 | 0.37 | 2.19 | 177.89 |
| 4000 | 41.43 | 0.38 | 1.79 | 178.90 |
| 4200 | 42.71 | 0.38 | 1.58 | 179.40 |
| 4400 | 43.63 | 0.38 | 1.44 | 179.90 |
| 4600 | 44.24 | 0.38 | 1.39 | 179.63 |
| 4800 | 45.05 | 0.37 | 1.36 | 179.32 |
| 5000 | 45.90 | 0.36 | 1.35 | 178.90 |
| 5200 | 47.00 | 0.35 | 1.42 | 178.48 |
| 5400 | 48.31 | 0.40 | 1.62 | 177.26 |
| 5600 | 50.07 | 0.73 | 1.05 | 167.81 |
| 5800 | 58.23 | 1.20 | 0.09 | 176.80 |
| 6000 | 49.51 | 0.75 | 1.14 | 179.71 |
| 6200 | 38.23 | 1.43 | 1.01 | 176.69 |
| 6400 | 32.18 | 3.92 | 0.88 | 175.90 |
| 6600 | 37.35 | 1.43 | 0.78 | 175.42 |
| 6800 | 43.11 | 1.12 | 0.72 | 174.87 |
| 7000 | 48.74 | 1.45 | 0.56 | 172.88 |
| 7200 | 41.18 | 2.70 | 0.24 | 174.36 |
| 7400 | 34.26 | 6.86 | 0.19 | 174.58 |
| 7600 | 31.54 | 9.74 | 0.10 | 174.92 |
| 7800 | 31.84 | 5.08 | 0.00 | 175.01 |
| 8000 | 33.05 | 3.49 | 0.12 | 175.19 |
| 8200 | 34.23 | 3.02 | 0.24 | 175.46 |
| 8400 | 35.04 | 3.01 | 0.37 | 175.61 |
| 8500 | 35.24 | 3.11 | 0.42 | 175.67 |

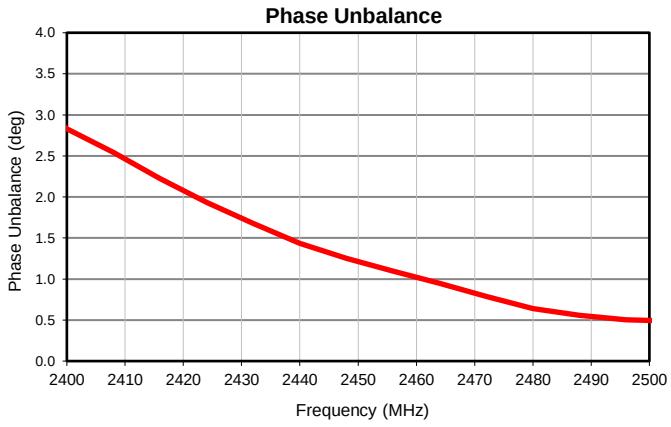
# Ceramic Balance Filter BBFCG1-252+

## *Typical Performance Data*



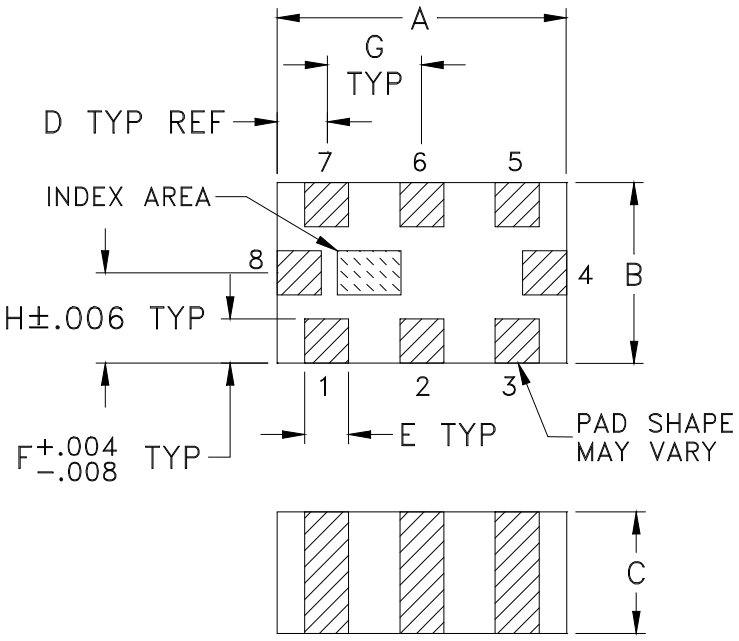



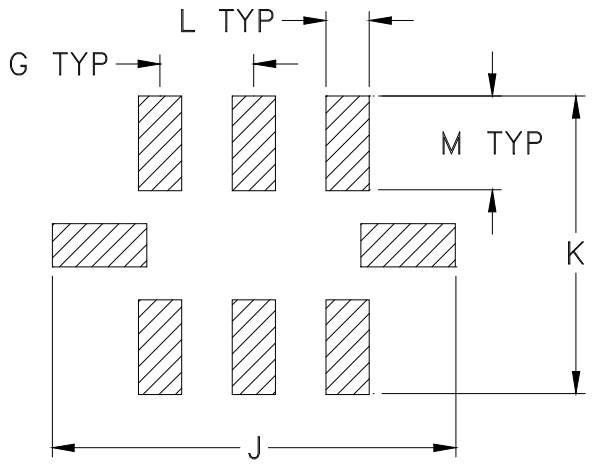
# Case Style GE

**GE0805C-2**

## Outline Dimensions




### PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002

| CASE # | A | B | C | D | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GE0805C-2 | .079 (2.00) | .049 (1.25) | .037 (0.95) | .014 (0.35) | .012 (0.30) | .012 (0.30) | .026 (0.65) | .025 (0.63) | .134 (3.40) | .110 (2.80) | .014 (0.35) |

| CASE # | M | WT. GRAM |
|---|---|---|
| GE0805C-2 | .039 (1.00) | .008 |

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

### Notes:

1. Open style, ceramic base.
2. Termination finish: For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate over Nickel plate. All models, no (+) suffix.
3. Pad tolerance to be non-cumulative. Minimum spacing between each pad is .004 (0.1).

# Tape & Reel Packaging TR-F114

DEVICE ORIENTATION IN T&R

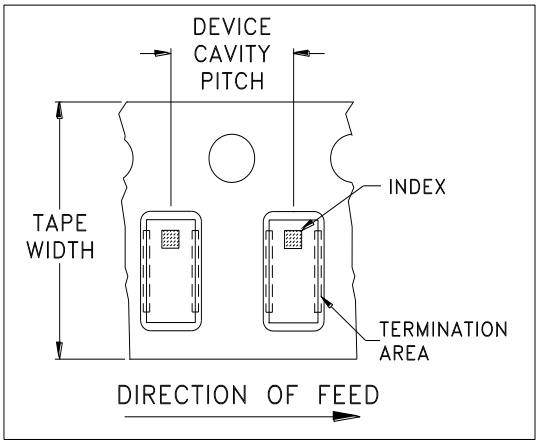



ILLUSTRATION 1

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

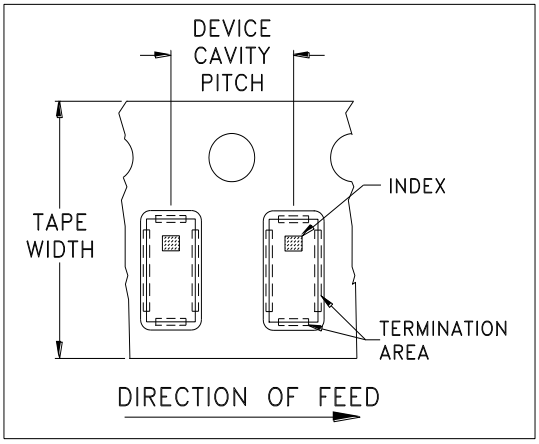



ILLUSTRATION 2

| 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 | |
| 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

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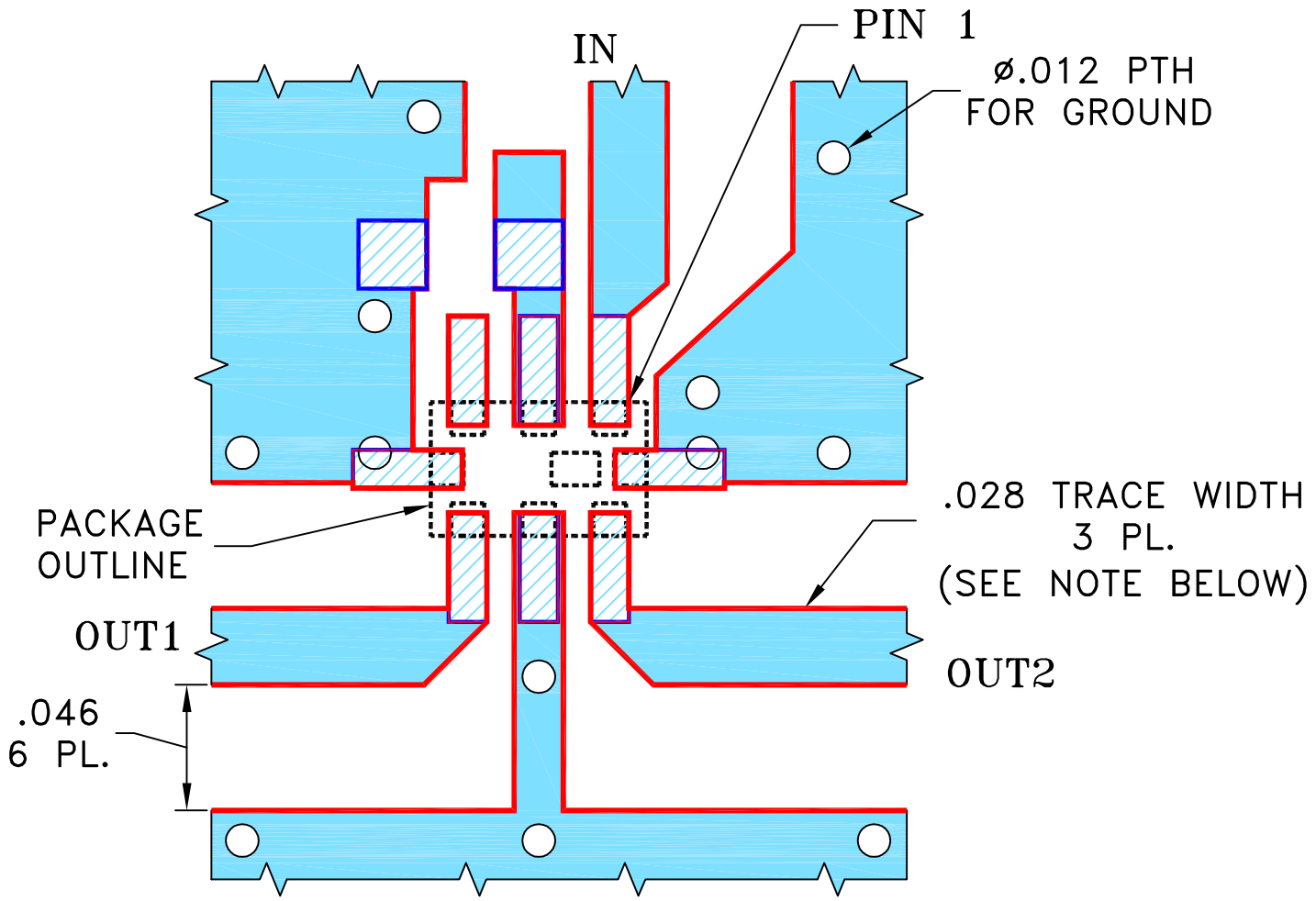
THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M168200 | NEW RELEASE | 05/31/18 | NP | SL |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION
# FOR GE0805C-2 CASE STYLE, "08TJ01" PIN CODE




## NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS .016±.0015. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS 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 | NP | 05/30/18 |
| TOLERANCES ON: | CHECKED | GF | 05/30/18 |
| 2 PL DECIMALS ± | APPROVED | SL | 05/31/18 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



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

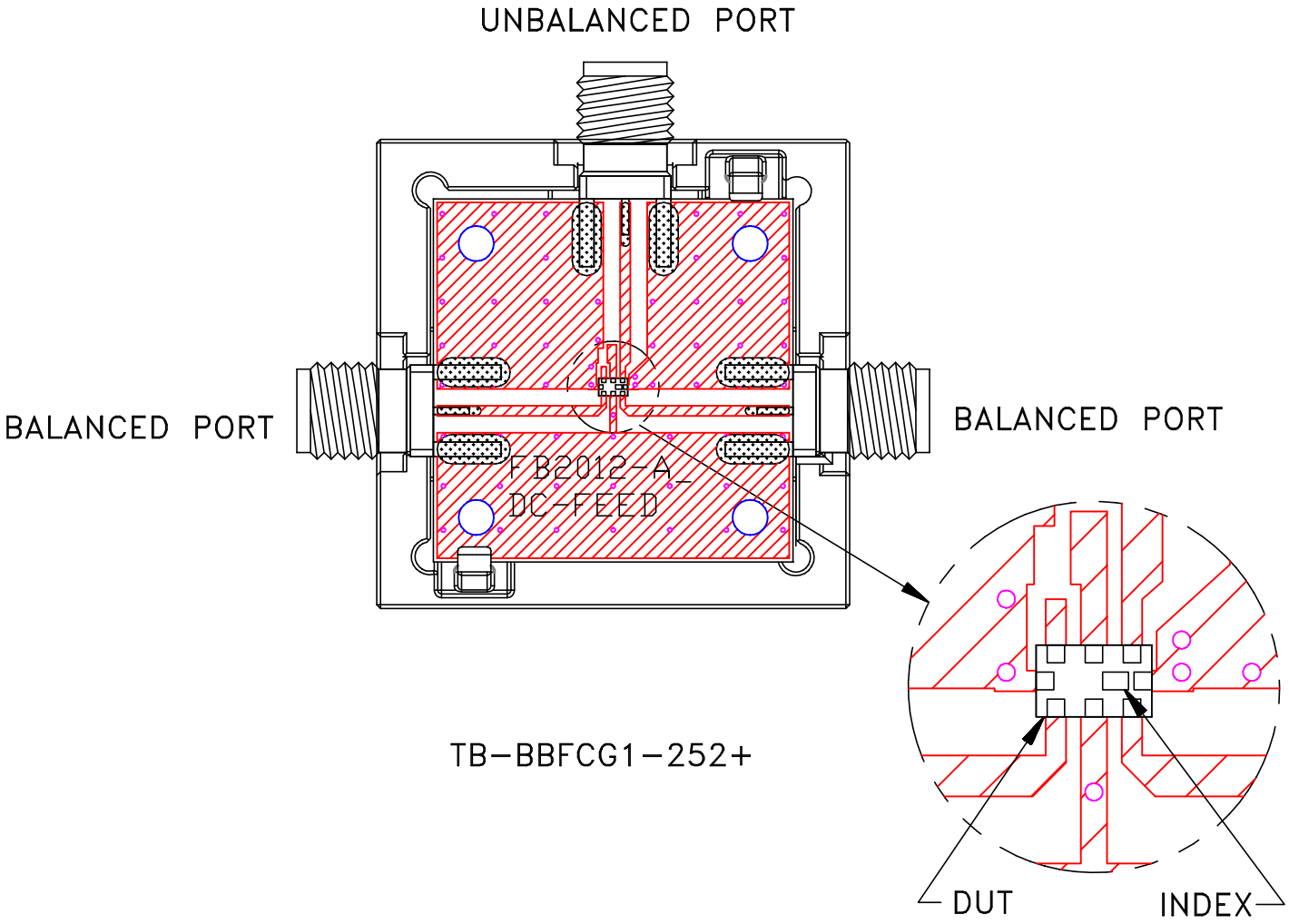
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 08TJ01, GE0805C-2, TB-1034+

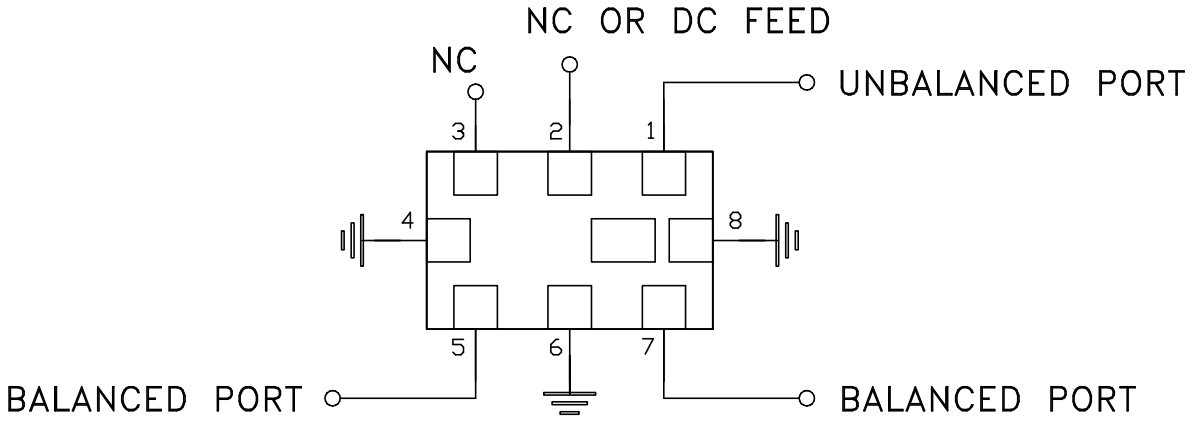
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-551 | OR |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL551 | 15:1 | 1 OF 1 |

# Evaluation Board and Circuit




TB-BBFCG1-252+




Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent,
   Dielectric Constant=4.5, Thickness=.016 inch.

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: 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 |