



LTCC SURFACE MOUNT

# Bandpass Filter & Balun

## BBFCG2-252+

50Ω 2300 to 2690 MHz 1:2 Ratio

### THE BIG DEAL

- Tiny Size, 0805
- Compact Design includes Balun and Filter in One Package
- Low Cost
- Temperature Stable
- Hermetically Sealed

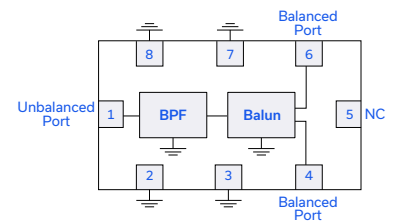


Generic photo used for illustration purposes only

### APPLICATIONS

- Telecommunications
- 5G Sub-6GHz
- ISM band

### FUNCTIONAL DIAGRAM



### PRODUCT OVERVIEW

Mini-Circuits' BBFCG2-252+ is a tiny ceramic RF balun filter with an impedance ratio of 1:2, covering a variety of wireless communications applications from 2300 to 2690 MHz. This model provides low insertion loss, low phase unbalance (relative to 180°), and low amplitude unbalance. 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

Features	Advantages
Compact Design	Integrates filter and balun in one tiny package.
Tiny Size, 0805	Accommodates tight space requirements for dense PCB layouts.
LTCC Construction	The use of LTCC technology allows for repeatable performance in a rugged ceramic package, well suited for tough environments such as high humidity and temperature extremes. See Mini-Circuits Environmental Rating ENV06T10 for more information.



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

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Units	
Impedance Ratio				1:2		—	
Center Frequency <sup>4</sup>	—	—	—	2495	—	MHz	
Passband	Insertion Loss	F2-F3	2300 - 2690	—	2.0	2.7	dB
	Return Loss - Unbalanced Port	F2-F3	2300 - 2690	9.5	14.5	—	dB
	Return Loss - Balanced Port <sup>5</sup>	F2-F3	2300 - 2690	9.5	14.5	—	dB
Stopband, Lower Rejection	DC-F1	10 - 1500	—	25.0	—	dB	
Stopband, Upper Rejection	F4-F5	3300-5640	25	29.3	—	dB	
		5640-6550	20	40.4	—	dB	
		6550-9500	10	33.4	—	dB	
Amplitude Unbalance (±)	F2-F3	2300 - 2690	-1.5	±0.6	+1.5	dB	
Phase Unbalance (relative to 180°)	F2-F3	2300 - 2690	-13	±8	+13	Deg.	
CMRR	F1-F2	2300 - 2690	—	20	—	dB	

1. Tested on Evaluation Board P/N TB-BBFCG2-252+.

2. 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.

3. Measured in mixed mode (Sds21).

4. Typical variation ±3%.

5. Measured in mixed mode (Sdd22).

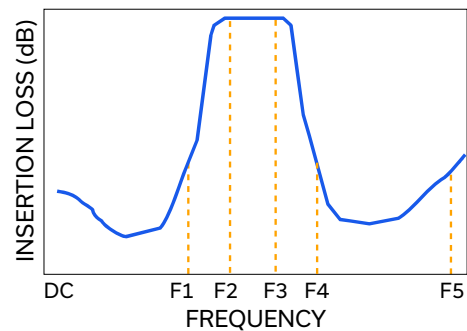
### ABSOLUTE MAXIMUM RATINGS<sup>5</sup>

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
RF Input Power <sup>6</sup>	2 W

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

7. 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





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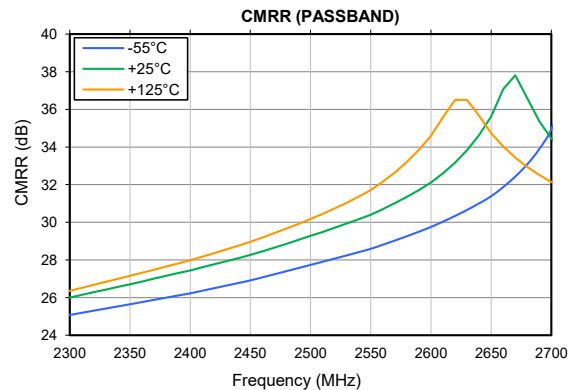
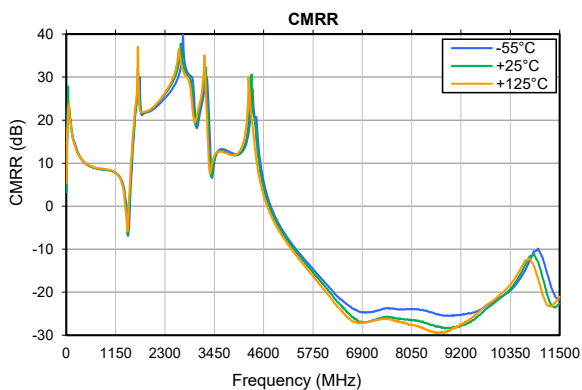
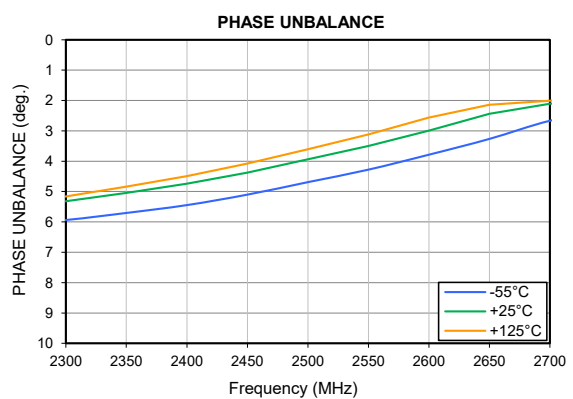
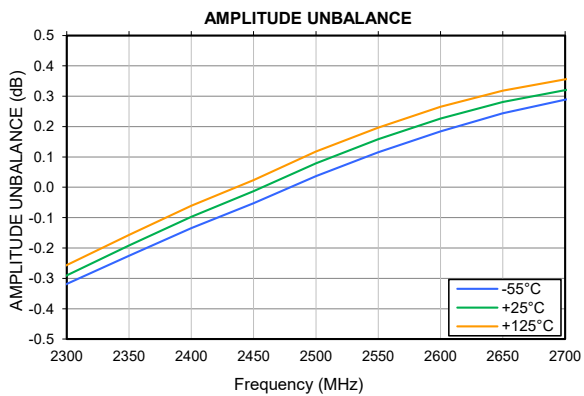
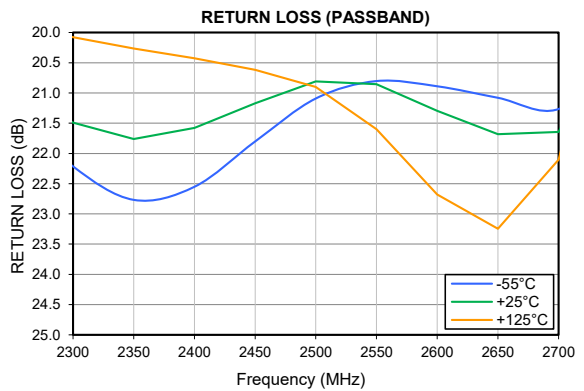
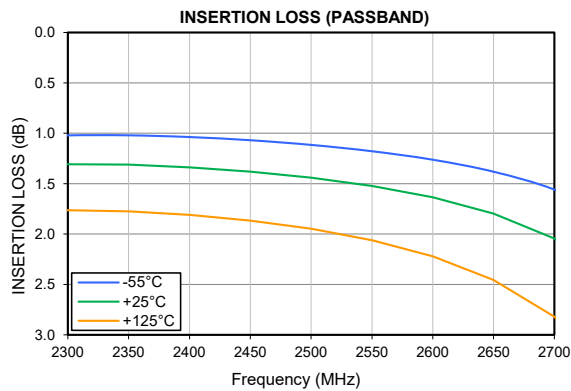
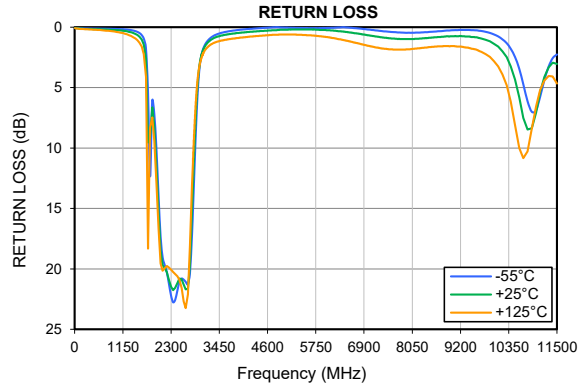
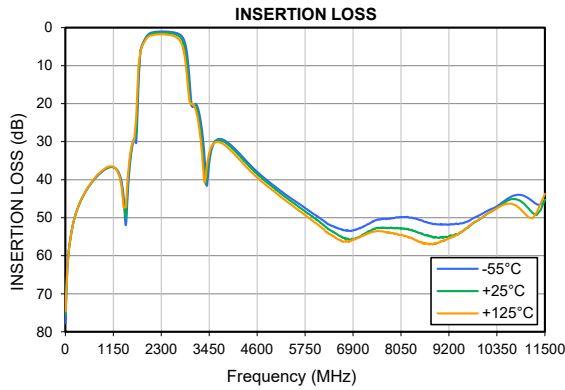
# Bandpass Filter & Balun

## BBFCG2-252+

Mini-Circuits

50Ω 2300 to 2690 MHz 1:2 Ratio

### TYPICAL PERFORMANCE GRAPHS





### FUNCTIONAL DIAGRAM

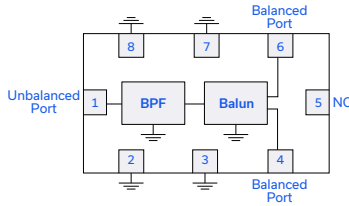


Figure 1. BBFCG2-252+ Functional Diagram

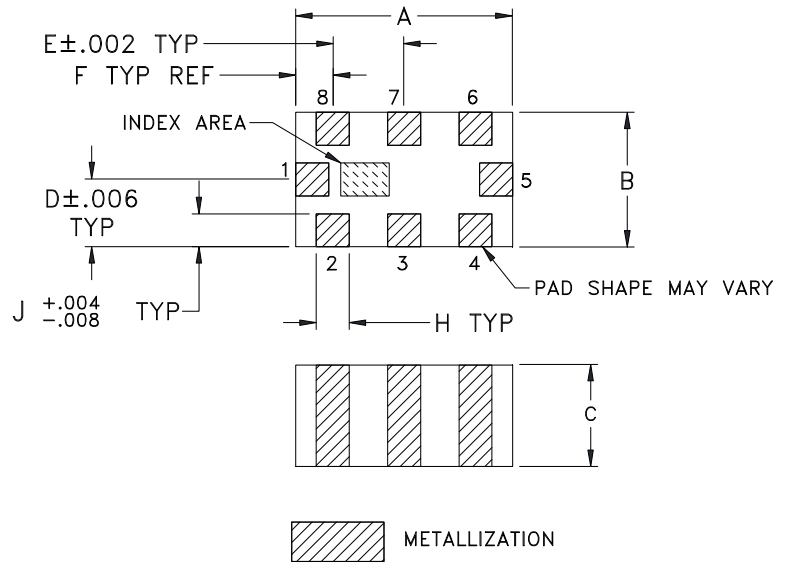
### PAD DESCRIPTION

Function	Pad Number	Description
Unbalanced Port	1	Unbalanced Input Port
Balanced Port	4,6	Balanced Output Ports
Ground	2, 3, 7, 8	Connects to Ground on PCB, (See drawing PL-724)
NC	5	No connection, not used internally. See drawing PL-724 for connection to PCB

### DC RESISTANCE PORT-PORT

Function	Pad Number
Unbalanced Port to Ground	DC Short
Unbalanced Port to Balanced Port	DC Open
Balanced Port to Ground	DC Open

### CASE STYLE DRAWING



### OUTLINE DIMENSIONS (Inches/mm)

A	B	C	D	E	F	G	H	J	wt
.079	.049	.037	.025	.026	.014	.110	.012	.012	grams
2.01	1.24	0.94	0.64	0.66	0.36	2.79	0.30	0.30	.008

### PRODUCT MARKING\*: No Marking

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

### SUGGESTED PCB LAYOUT (PL-724)

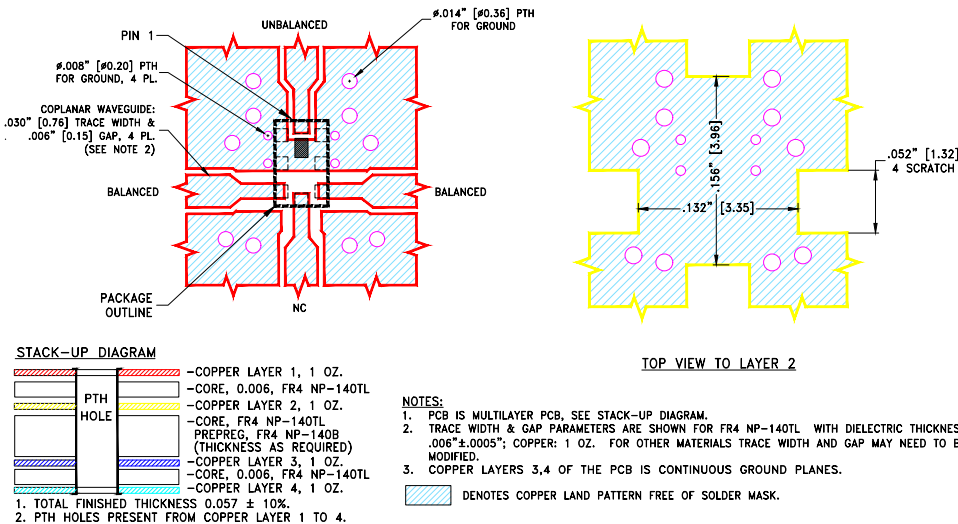


Figure 2. Suggested PCB Layout PL-724



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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD.

[CLICK HERE](#)

Performance Data & Graphs	Data
	Graphs
	S-Parameter (S3P Files) Data Set (.zip file) De-embedded to device pads
Case Style	GE0805C-15    Lead Finish: Tin over Nickel plating
RoHS Status	Compliant
Tape and Reel	F114
Suggested Layout for PCB Design	PL-724
Evaluation Board	TB-BBFCG2-252+
	Gerber File
Environmental Rating	ENV06T10

### 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](http://www.minicircuits.com/terms/viewterm.html)



# Low Pass Filter

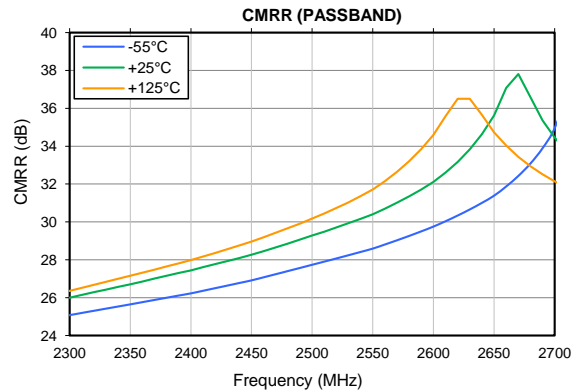
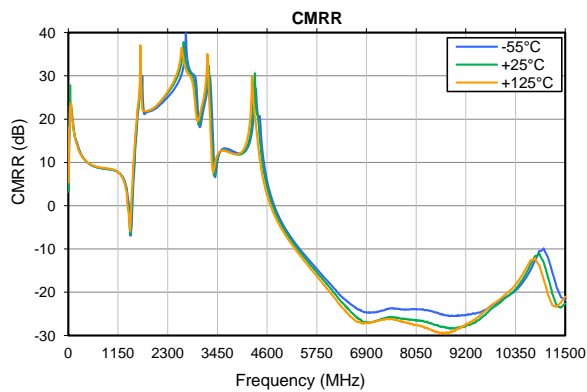
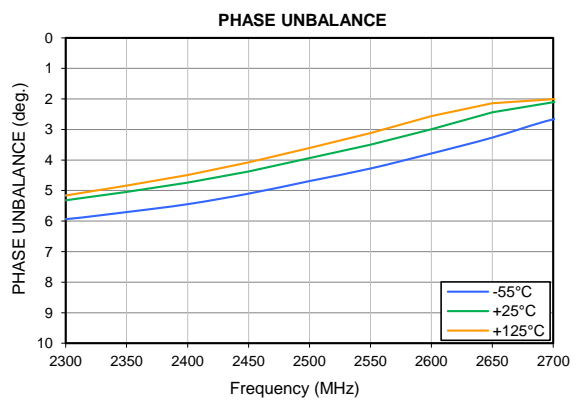
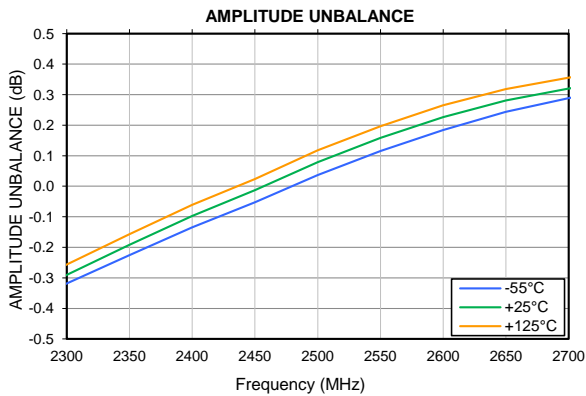
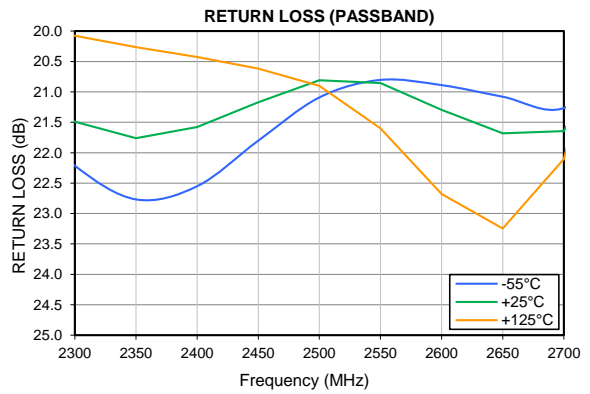
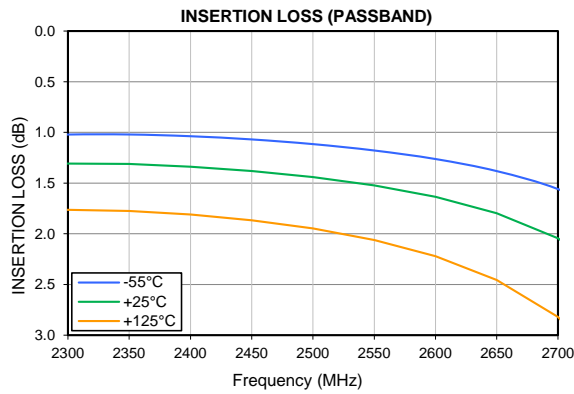
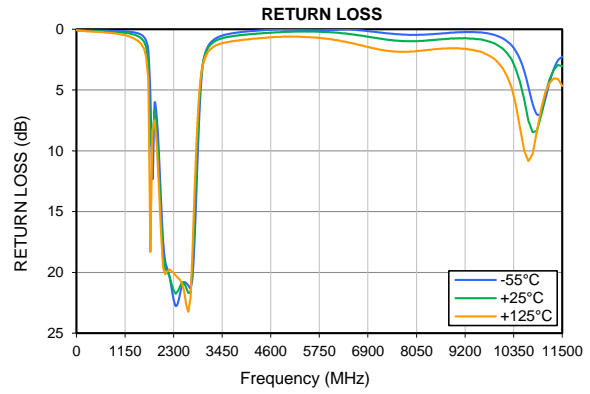
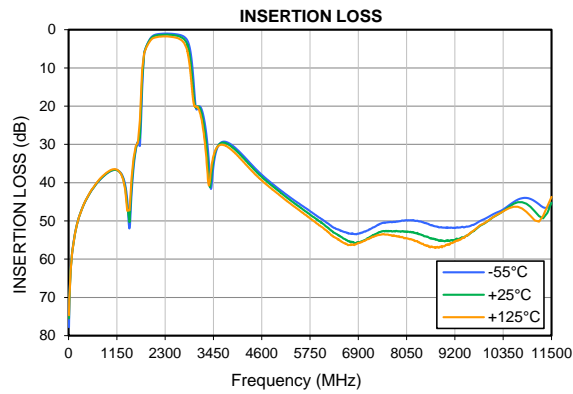
# BBFCG2-252+

## Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	RETURN LOSS (dB)
10.00	77.60	0.06
1000.0	38.04	0.10
1360.0	56.37	0.34
1550.0	37.64	1.39
1600.0	22.79	3.71
2300.0	0.83	24.74
2490.0	0.90	25.90
2690.0	1.27	22.97
3000.0	10.37	3.08
3320.0	50.12	0.40
4000.0	33.54	0.11
4500.0	41.76	0.01
5000.0	38.17	0.01
5500.0	48.61	0.00
6000.0	47.18	0.00
6500.0	44.42	0.09
7000.0	41.91	0.31
7500.0	40.05	0.60
8000.0	38.25	0.93
8500.0	37.33	1.30
9000.0	47.39	0.73
9500.0	41.14	0.98
10000.0	40.39	2.95

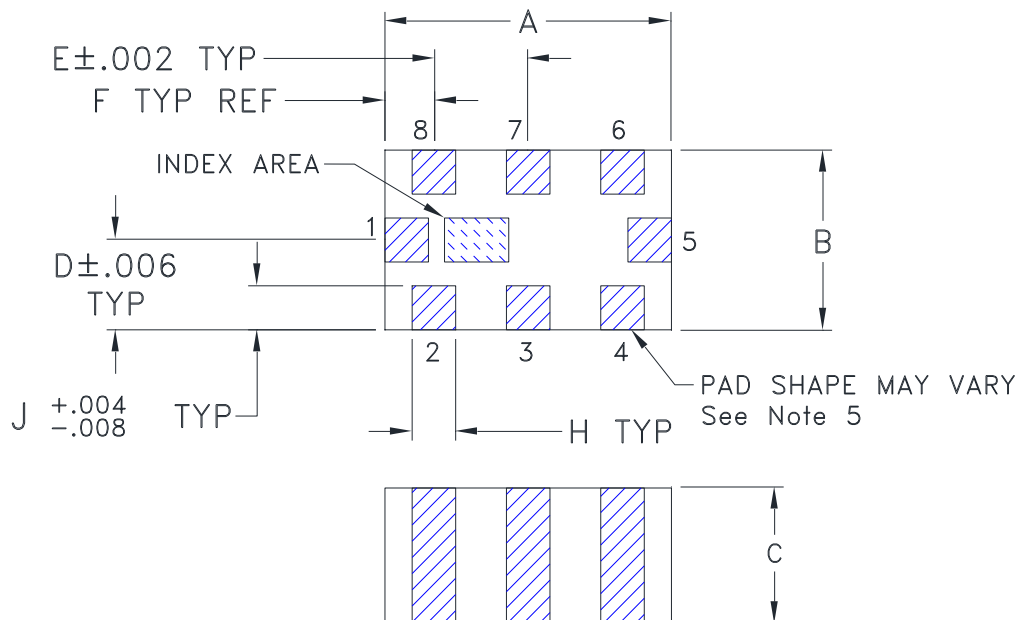


## Typical Performance Curves



### Outline Dimensions

#### Top View



CASE#	A	B	C	D	E	F	G	H	J	WT, GRAM
GE0805C-15	.079 (2.00)	.049 (1.25)	.037 (0.95)	.025 (0.63)	.026 (0.65)	.014 (0.35)	.110 (2.80)	.012 (0.30)	.010 (0.25)	.008

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .01(.25)$ ; 3 Pl.  $\pm .005(.100)$

#### Notes:

- Open style, ceramic base
- Termination finish: For RoHS Case Styles: Tin plate over Nickel plate. All model , (+) suffix.  
For RoHS-5 Case Styles: Tin-lead plate over Nickel plate. All model ,no (+) suffix.
- Pad tolerance to be non-cumulative. Minimum spacing between each pad is .004(0.1).
- Pin numbers do not appear on unit. For reference only.
- During the manufacturing process, the pad shape may not be rectangular and may take on a more semi-circle shape. However, the pad dimensions reflect this, with the pad shape being within the specified lengths. The metallization compensates accordingly and so performance will not be affected. In addition, solderability will not be influenced by the pad shape



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# Tape & Reel Packaging TR-F114

## DEVICE ORIENTATION IN T&R

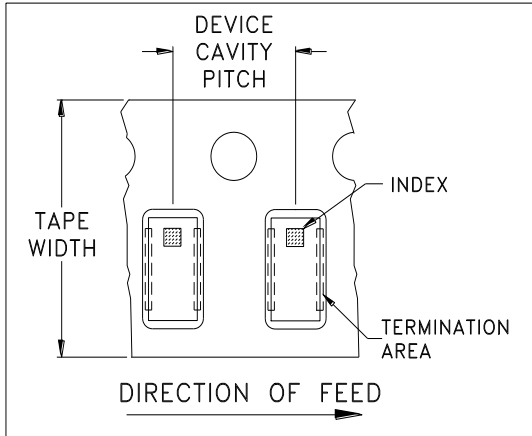


ILLUSTRATION 1

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

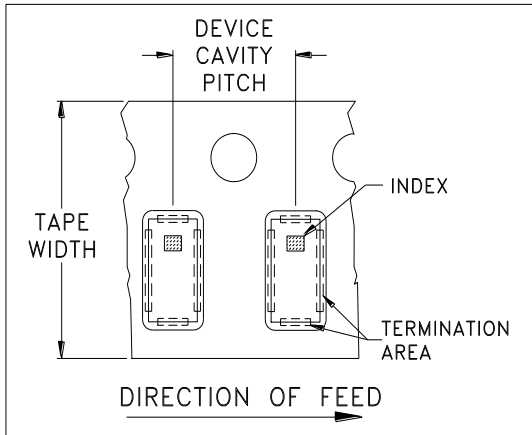


ILLUSTRATION 2

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
			Standard	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)



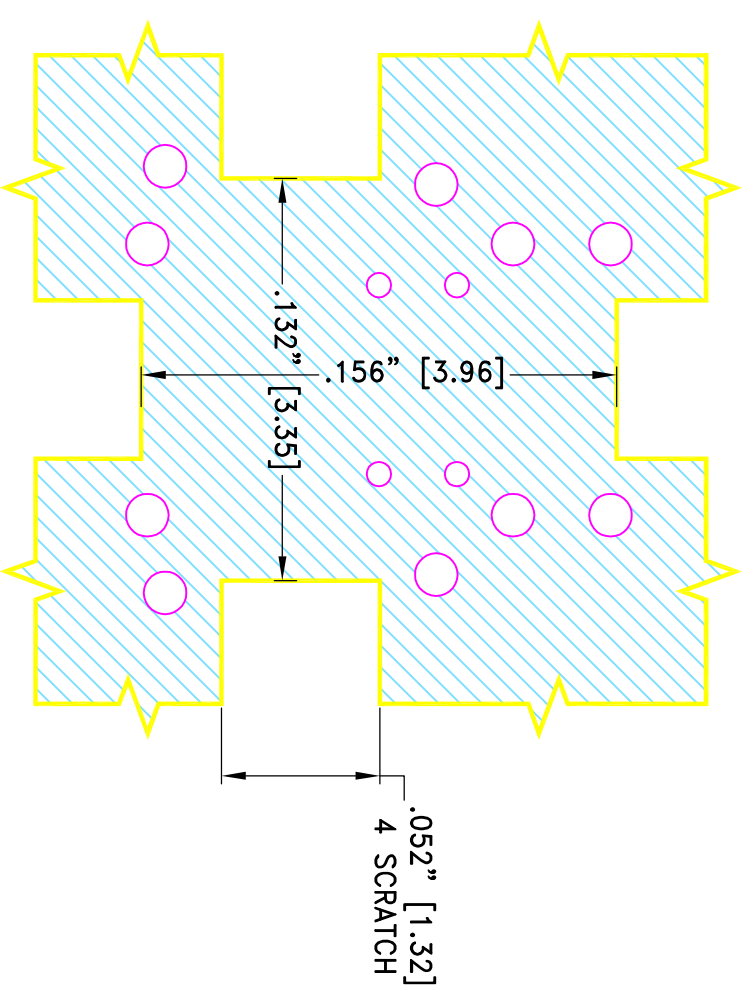
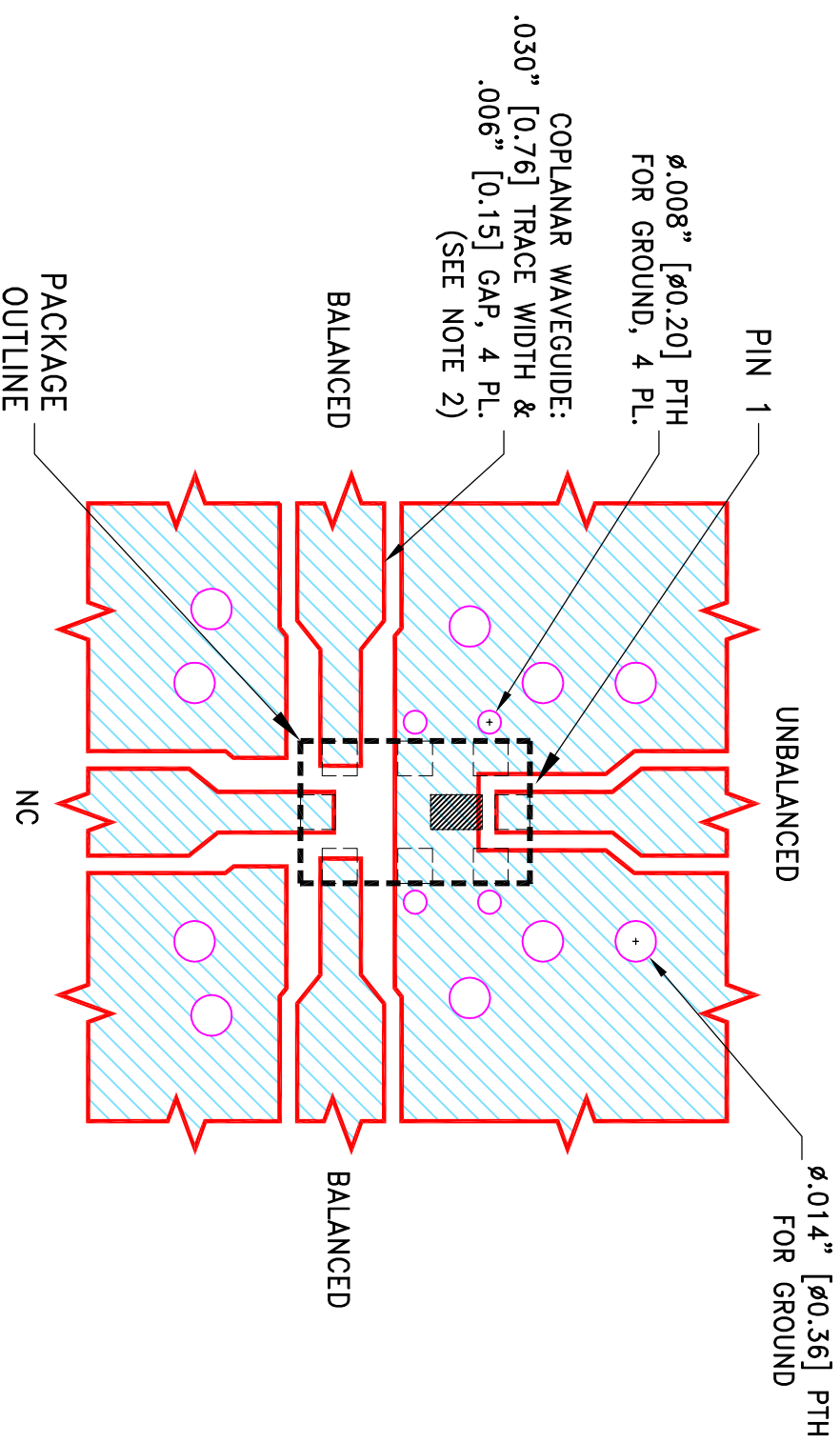
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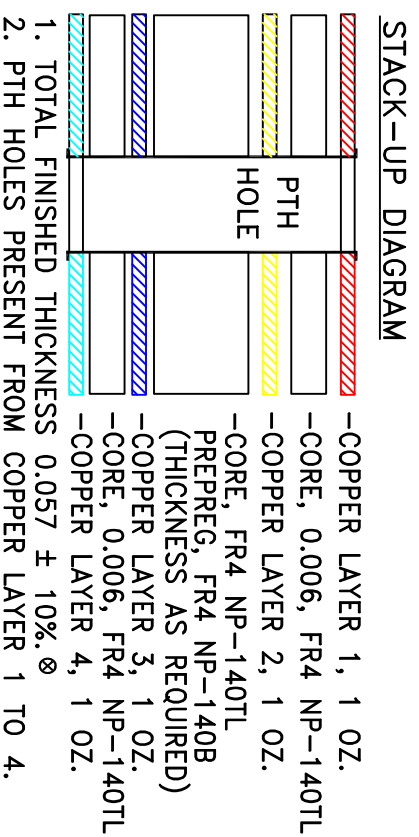
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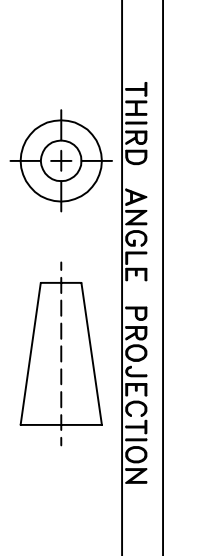
**SUGGESTED MOUNTING CONFIGURATION  
FOR GE0805C-15 CASE STYLE**



**TOP VIEW TO LAYER 2**



- NOTES:**
- PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
  - TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR FR4 NP-140TL WITH DIELECTRIC THICKNESS .006"±.0005"; COPPER: 1 OZ. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
  - COPPER LAYERS 3,4 OF THE PCB IS CONTINUOUS GROUND PLANES.
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.



OR	ECN	NO.	DESCRIPTION	DATE	DR	AUTH
ECO-010908			NEW RELEASE	12/02/21	ITG	IL

UNLESS OTHERWISE SPECIFIED		INITIALS		DATE	
DIMENSIONS ARE IN INCHES		DRAWN	ITG	12/02/21	
TOLERANCES ON:		CHECKED	GF	12/02/21	
2 PL DECIMALS ± .005		APPROVED	IL	12/02/21	
3 PL DECIMALS ± .005					
ANGLES ± 1°					
FRACTIONS ±					

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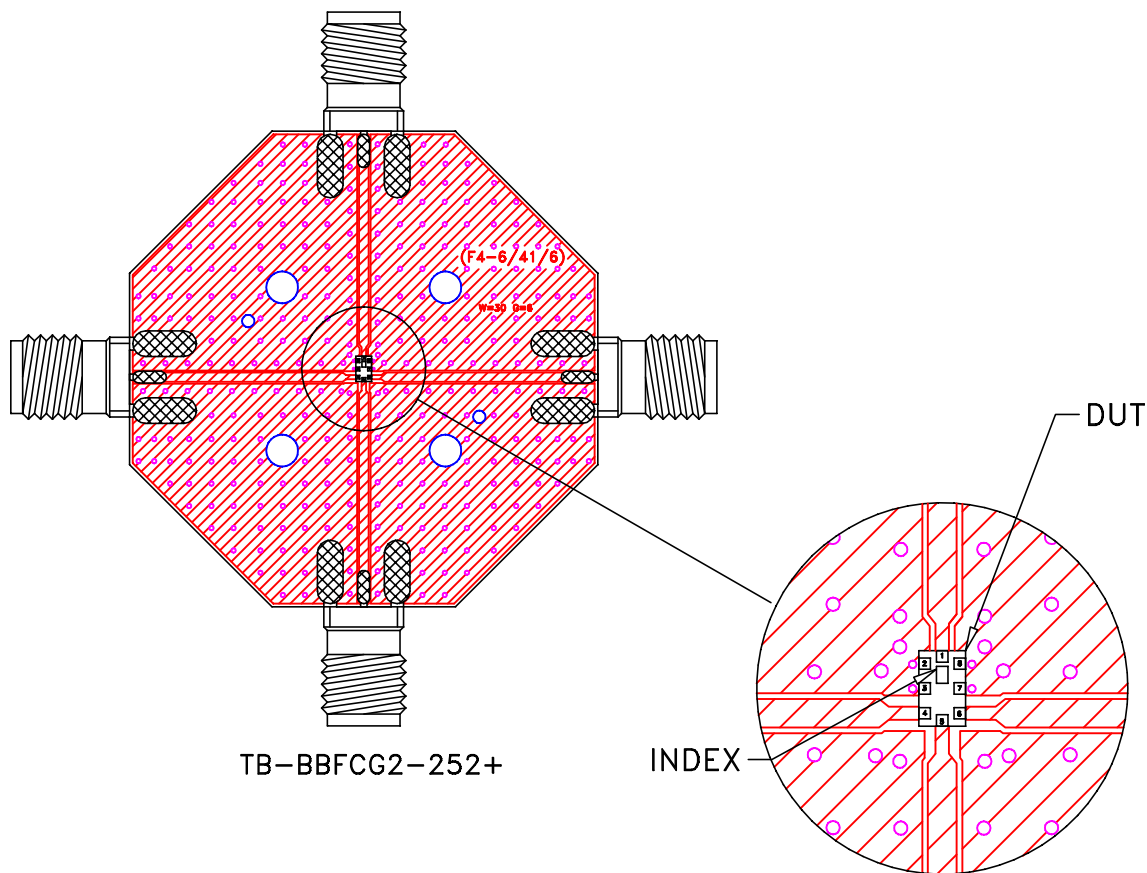
**PL, GE0805C-15, TB-1233+**

SIZE	CODE IDENT	DRAWING NO:	REV:
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FILE:	98PL724	SCALE:	15:1
		SHEET:	1 OF 1

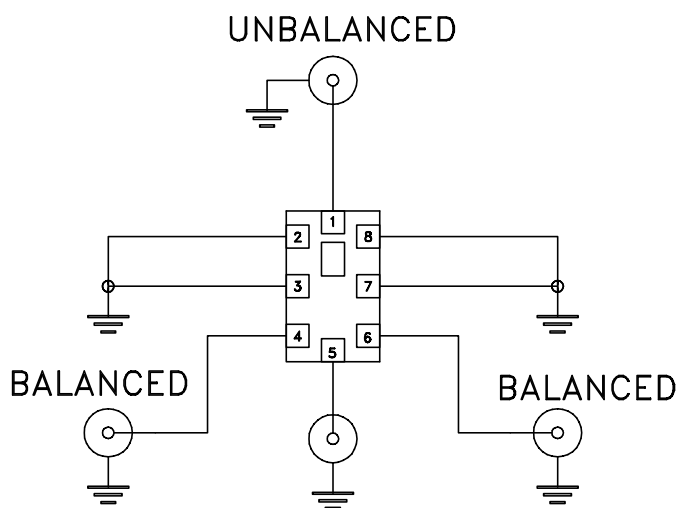
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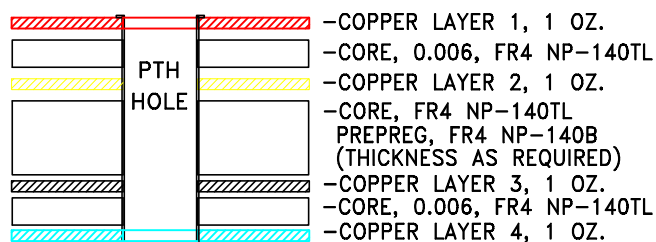
# Evaluation Board and Circuit



TB-BBFCG2-252+




Schematic Diagram



Stack-up Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent, Dielectric Constant=4.5, Total finished Thickness = .057 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 Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 125° C 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 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, Test B,B1, 95% Coverage
Thermal Shock	-55° to +125°C, 15 min dwell,250 cycles	MIL-STD-202, Method 107
Bend Test	1mm, deflection for 5 seconds Span of bending: 2.75"	--
High Temp Storage	125°C to 1000 Hrs	---