LTCC SURFACE MOUNT

Bandpass Filter

BFCQ-12600+

50Ω 10.7 to 14.2 GHz

THE BIG DEAL

- Low Insertion Loss, Typ. 1.5 dB
- Stopband Rejection, Typ. 34 dB
- Passband Return Loss, Typ. 15 dB
- Standard Small 1008 (2.5mm x 2.0mm) Case Style
- Power Handling: 4 W

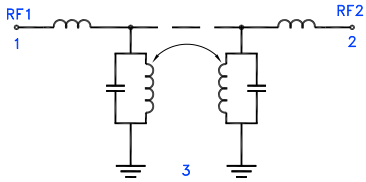


Generic photo used for illustration purposes only

APPLICATIONS

- Satellite Communication
- Test and Measurement
- Aerospace and Defense

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

The BFCQ-12600+ LTCC Bandpass Filter achieves a miniature size and highly repeatable performance by utilizing a proprietary LTCC material system and distributed filter topology. The typical passband loss at 10.7-14.2 GHz is as low as 1.5 dB, with typical stopband rejection of 42 dB up to 26 GHz. This model handles up to 4 W of RF input power and has a wide operating temperature range from -55°C to +125°C.

KEY FEATURES

Features	Advantages
Small Size, 1008	Allows for highly desnse circuit board layouts, while minimizing the effects of parasitics.
LTCC Construction	Provides a rugged package that is well suited for tough environments including high humidity and high temperature extremes.
Rugged Power Handling	Handles up to 4 Watts in a small package.

REV. OR
ECO-022142
BFCQ-12600+
EDU4746
URJ
240611

Bandpass Filter

BFCQ-12600+

50Ω 10.7 to 14.2 GHz

ELECTRICAL SPECIFICATIONS[1,2,3] AT +25°C

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband	Center Frequency[4]	—	—	—	12.45	—	GHz
	Insertion Loss	F1-F2	10.7 - 14.2	—	1.5	2.9	dB
	Return Loss	F1-F2	10.7 - 14.2	—	15	—	dB
Stopband, Lower	Rejection	DC-F3	DC - 3.5	55	64	—	dB
		F3-F4	3.5 - 9	20	34	—	
Stopband, Upper	Rejection	F5-F6	16.5 - 21	20	28	—	dB
		F6-F7	21 - 26	32	42	—	

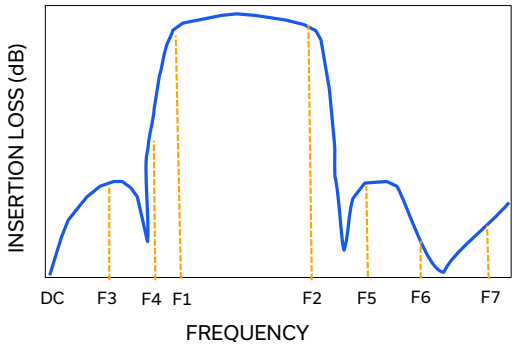
1. Measured on Mini-Circuits Test Board TB-BFCQ-12600+ with connectors and feedline de-embedded with thru-line compensation.
2. Bi-directional, RF1 and RF2 ports can be interchanged.
3. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.
4. Typical variation ±3.5%

ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Input Power[6]	4 W @ +25°C

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 0.8 W at +125°C.

TYPICAL FREQUENCY RESPONSE AT +25°C

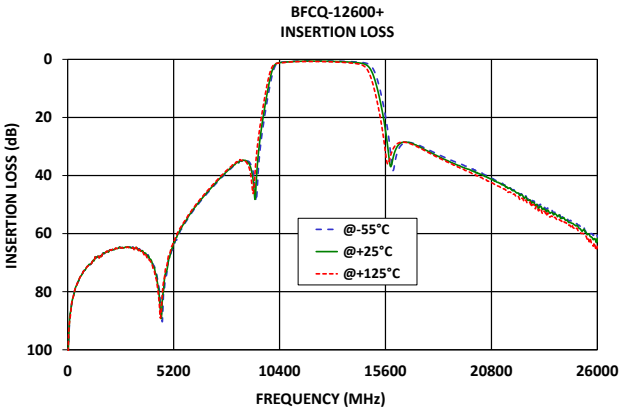


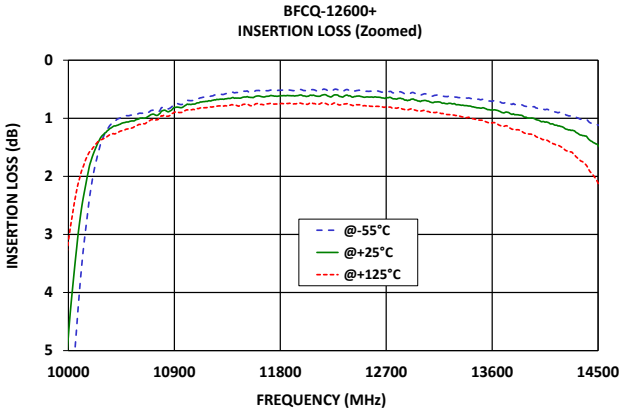
Bandpass Filter

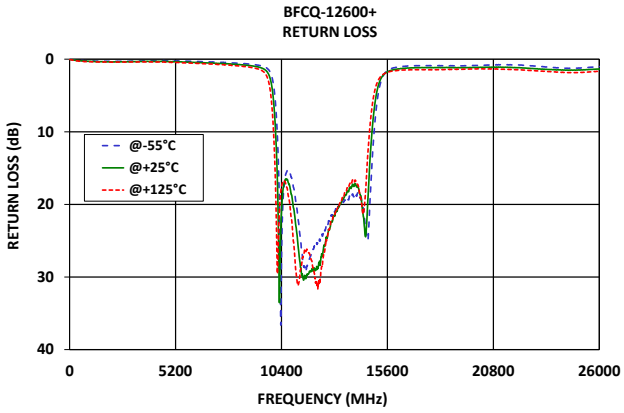
BFCQ-12600+

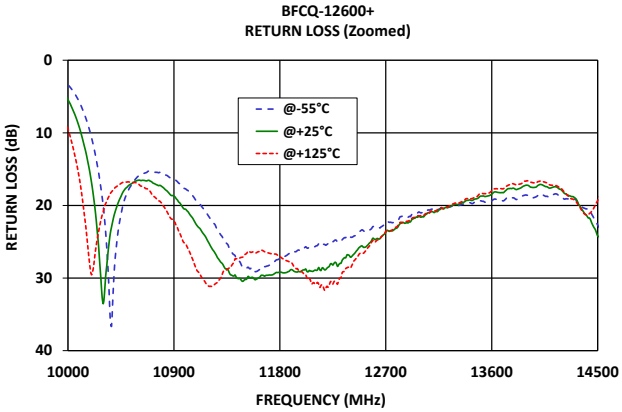
50Ω 10.7 to 14.2 GHz

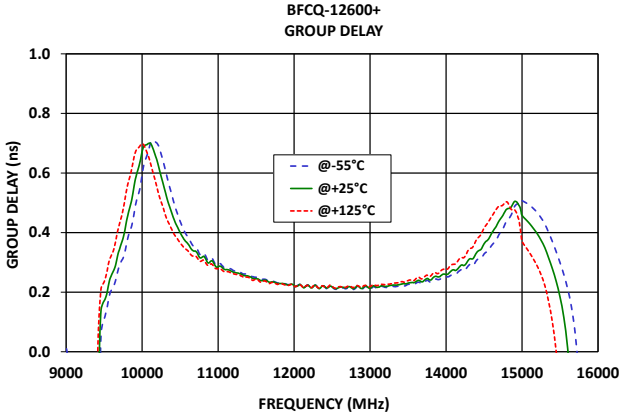
TYPICAL PERFORMANCE GRAPHS











Bandpass Filter

BFCQ-12600+

50Ω 10.7 to 14.2 GHz

FUNCTIONAL DIAGRAM

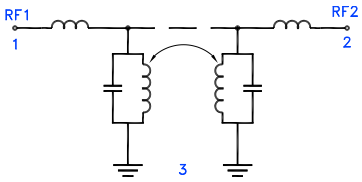
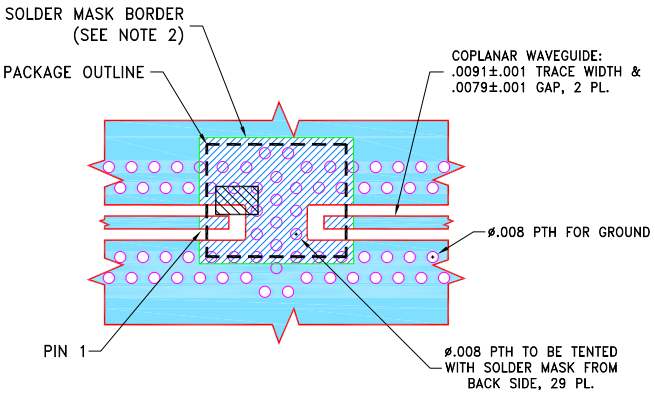


Figure 1. BFCQ-12600+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1[2]	1	Connects to RF Input Port
RF2[2]	2	Connects to RF Output Port
GROUND	3	Connects to Ground on PCB, (See drawing PL-707)

SUGGESTED PCB LAYOUT (PL-707)



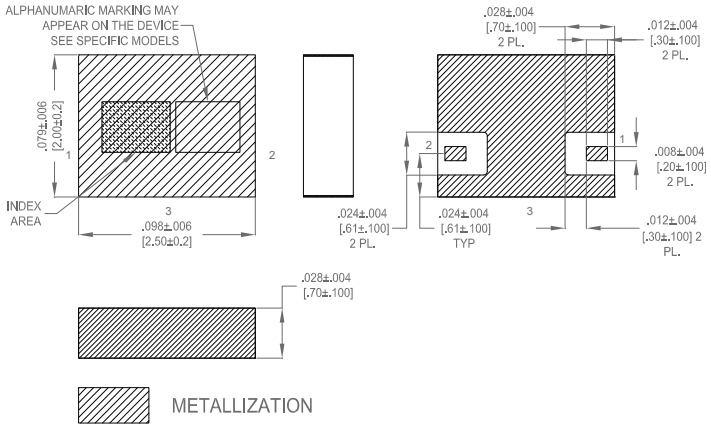
NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR MEGTRON-7 R5785(N); DIELECTRIC THICKNESS: .0049±.001; CLOTH STYLE: 2116; COPPER: HVLP/HVLP. FOR OTHER MATERIALS LINE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. SOLDER MASK OPENING FOR COMPONENT SOLDERING HAS BEEN INCREASED AGAINST PCB LAND PATTERN RECOMMENDATIONS PER NL1008C-6 AND CAN BE DEVIATED FROM THIS DRAWING TO COMPLY WITH CUSTOMERS' DESIGN RULES.
3. 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.

Figure 2. Suggested PCB Layout PL-707

CASE STYLE DRAWING



Weight : .019 grams.
Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3Pl. ± .005

PRODUCT MARKING*: ZU

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

Bandpass Filter

BFCQ-12600+

50Ω 10.7 to 14.2 GHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD. CLICK HERE

Performance Data & Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	NL1008C-7 Lead Finish: Nickel-Tin
RoHS Status	Compliant
Tape and Reel	F75
Suggested Layout for PCB Design	PL-707
Evaluation Board	TB-BFCQ-12600+ 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

Ceramic Band Pass Filter BFCQ-12600+

Typical Performance Data

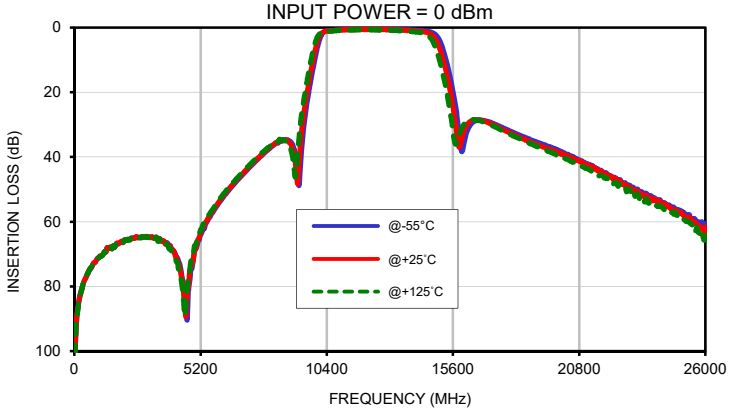
FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
10	117.39	114.80	107.40	0.01	0.02	0.03	0.00	0.00	0.02
50	96.75	96.14	93.71	0.02	0.05	0.07	0.00	0.01	0.04
100	89.50	88.76	89.97	0.05	0.07	0.10	0.01	0.02	0.06
500	76.69	76.70	76.77	0.17	0.21	0.28	0.16	0.19	0.27
1000	71.21	71.11	71.14	0.23	0.29	0.35	0.14	0.19	0.25
1100	70.75	70.58	70.64	0.24	0.31	0.36	0.19	0.24	0.30
1200	69.83	69.88	69.80	0.25	0.32	0.37	0.20	0.25	0.31
1300	69.37	69.32	69.32	0.28	0.34	0.39	0.21	0.27	0.32
1400	68.34	68.31	68.30	0.27	0.34	0.38	0.21	0.27	0.32
1500	67.86	67.80	67.75	0.27	0.34	0.38	0.19	0.25	0.29
1800	66.92	66.79	66.92	0.28	0.35	0.39	0.17	0.22	0.26
2000	66.43	66.41	66.45	0.30	0.37	0.40	0.21	0.26	0.30
2200	65.49	65.48	65.38	0.32	0.39	0.42	0.24	0.29	0.34
2400	65.19	65.14	65.11	0.30	0.36	0.40	0.21	0.26	0.31
2600	64.83	64.98	64.92	0.30	0.36	0.40	0.19	0.24	0.29
2800	64.57	64.79	64.71	0.30	0.36	0.41	0.20	0.24	0.30
3000	64.57	64.80	64.80	0.28	0.34	0.39	0.19	0.23	0.30
3200	64.61	64.74	64.82	0.27	0.33	0.40	0.18	0.22	0.29
3400	65.00	64.90	65.13	0.26	0.32	0.38	0.15	0.20	0.28
3500	65.16	65.41	65.60	0.25	0.31	0.38	0.13	0.18	0.26
3700	66.16	66.12	66.44	0.23	0.30	0.37	0.13	0.19	0.28
3900	67.44	67.95	68.35	0.24	0.31	0.39	0.13	0.19	0.28
4000	68.32	68.45	69.08	0.23	0.31	0.39	0.13	0.20	0.29
4200	70.74	71.55	72.27	0.24	0.32	0.42	0.09	0.17	0.26
4400	75.33	76.75	78.03	0.21	0.30	0.38	0.05	0.14	0.23
4600	87.17	89.16	85.45	0.20	0.29	0.38	0.07	0.17	0.27
4800	74.80	73.74	72.13	0.23	0.33	0.43	0.09	0.20	0.30
5000	68.47	68.29	67.07	0.25	0.36	0.46	0.11	0.22	0.33
5200	64.05	63.22	62.47	0.24	0.35	0.45	0.10	0.21	0.33
5400	60.72	60.26	59.59	0.25	0.37	0.47	0.09	0.21	0.33
5600	58.37	57.78	57.25	0.28	0.40	0.51	0.11	0.23	0.36
5800	55.92	55.55	55.04	0.28	0.41	0.52	0.14	0.26	0.39
6000	53.76	53.31	52.81	0.29	0.43	0.55	0.13	0.26	0.39
6200	51.69	51.34	50.93	0.31	0.45	0.57	0.14	0.27	0.41
6400	49.96	49.54	49.09	0.33	0.48	0.60	0.17	0.30	0.44
6600	48.18	47.83	47.38	0.35	0.49	0.62	0.18	0.31	0.45
6800	46.57	46.13	45.70	0.37	0.52	0.65	0.18	0.32	0.46
7000	44.96	44.57	44.16	0.37	0.52	0.66	0.17	0.30	0.45
7200	43.40	43.04	42.58	0.40	0.56	0.70	0.21	0.35	0.49
7800	39.01	38.71	38.27	0.47	0.64	0.80	0.25	0.39	0.55
8000	37.68	37.39	36.98	0.52	0.70	0.87	0.32	0.45	0.63
8500	34.93	34.86	34.77	0.59	0.78	0.99	0.40	0.54	0.73
9000	36.36	37.67	40.47	0.72	0.94	1.18	0.55	0.71	0.93
9460	30.09	26.31	22.18	0.95	1.25	1.61	0.68	0.90	1.22
9650	20.39	17.50	13.98	1.17	1.60	2.20	0.84	1.17	1.71
10700	0.87	0.94	1.03	15.32	16.67	18.10	14.20	15.22	16.12
12450	0.52	0.62	0.77	24.01	26.28	27.25	23.33	25.86	26.29
14200	0.92	1.15	1.52	18.91	18.01	17.83	21.41	19.90	19.92
14970	3.00	4.92	8.21	9.24	6.48	4.46	9.40	6.49	4.51
15500	15.87	20.10	26.83	1.83	1.91	1.92	1.78	1.76	1.75
16000	37.96	33.17	30.50	1.14	1.40	1.59	0.90	1.10	1.29
16500	28.86	28.47	28.48	0.96	1.24	1.48	0.74	1.00	1.27
17000	28.94	29.22	29.57	0.90	1.18	1.45	0.60	0.89	1.21
17500	30.43	30.95	31.33	0.89	1.17	1.45	0.61	0.90	1.22
18000	32.12	32.72	33.15	0.90	1.16	1.46	0.68	0.99	1.30
19000	35.20	35.96	36.46	0.93	1.20	1.42	0.74	1.01	1.21
21000	41.61	41.94	43.22	0.80	1.13	1.38	0.48	0.74	1.00
22000	45.50	45.77	47.21	0.80	1.18	1.45	0.53	0.81	1.14
24000	53.26	53.61	55.18	1.19	1.47	1.78	1.02	1.25	1.56
26000	60.62	61.69	64.39	1.02	1.36	1.67	0.56	0.91	1.22

Typical Performance Data

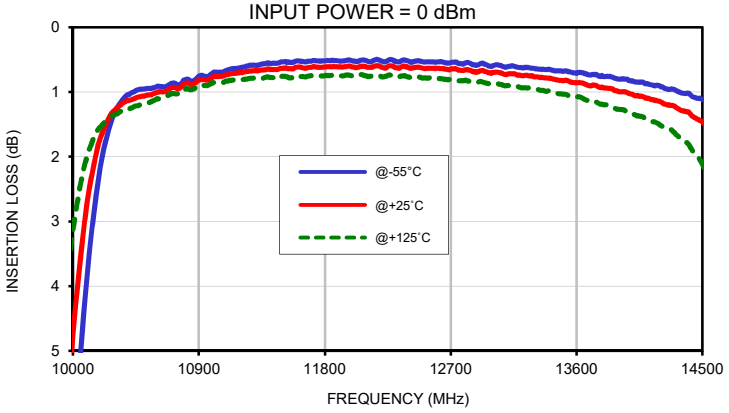
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-55°C	@+25°C	@+125°C
10700	0.35	0.34	0.32
10800	0.33	0.32	0.31
10900	0.31	0.30	0.29
11000	0.29	0.29	0.28
11100	0.28	0.28	0.27
11200	0.27	0.27	0.26
11300	0.27	0.26	0.25
11400	0.26	0.25	0.25
11500	0.25	0.25	0.24
11600	0.24	0.24	0.24
11700	0.24	0.23	0.23
11800	0.23	0.23	0.23
11900	0.23	0.23	0.22
12000	0.22	0.22	0.22
12100	0.22	0.22	0.22
12200	0.22	0.22	0.22
12300	0.22	0.22	0.22
12400	0.22	0.22	0.22
12450	0.21	0.22	0.22
12600	0.22	0.22	0.22
12700	0.21	0.22	0.22
12800	0.21	0.21	0.22
12900	0.21	0.21	0.22
13000	0.21	0.21	0.22
13050	0.22	0.22	0.22
13100	0.21	0.22	0.22
13150	0.22	0.22	0.23
13200	0.22	0.22	0.23
13250	0.22	0.22	0.23
13300	0.22	0.22	0.23
13350	0.22	0.22	0.23
13400	0.22	0.23	0.23
13450	0.22	0.23	0.23
13500	0.23	0.23	0.24
13600	0.23	0.24	0.24
13700	0.23	0.24	0.25
13800	0.23	0.24	0.25
13900	0.24	0.25	0.26
14000	0.25	0.26	0.28
14100	0.26	0.28	0.29
14200	0.28	0.29	0.32

Typical Performance Curves

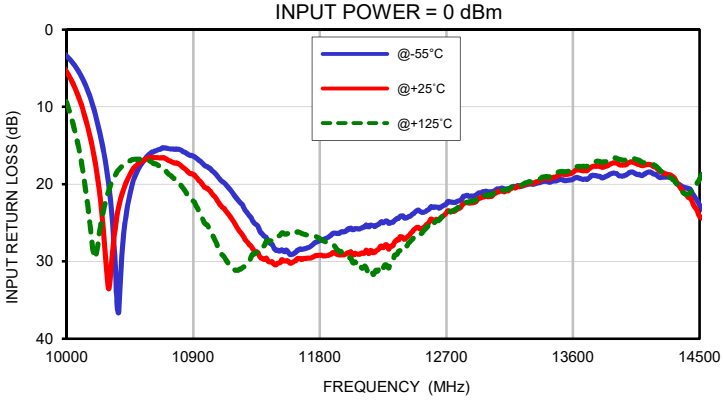
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



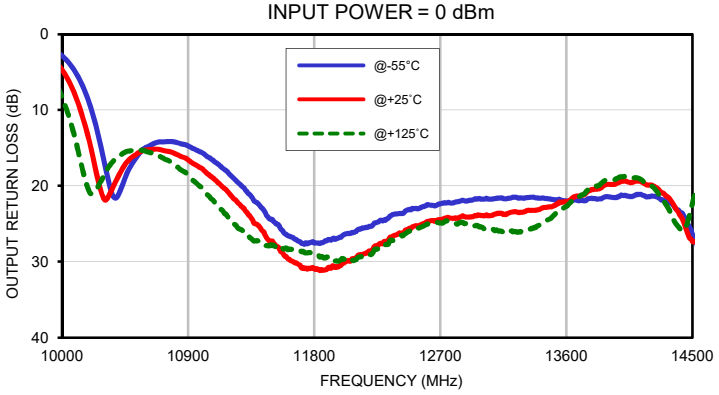
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



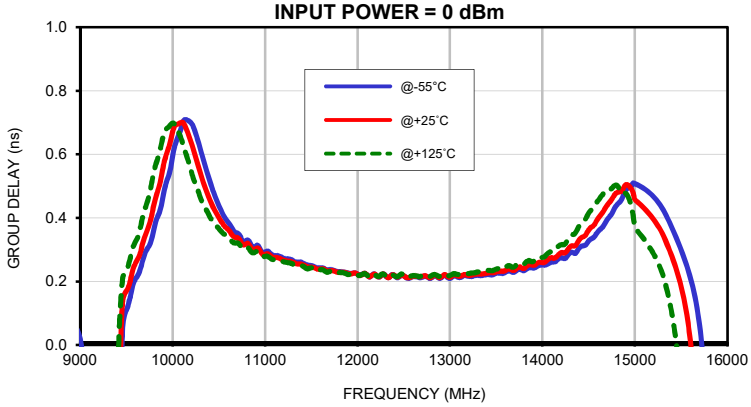
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

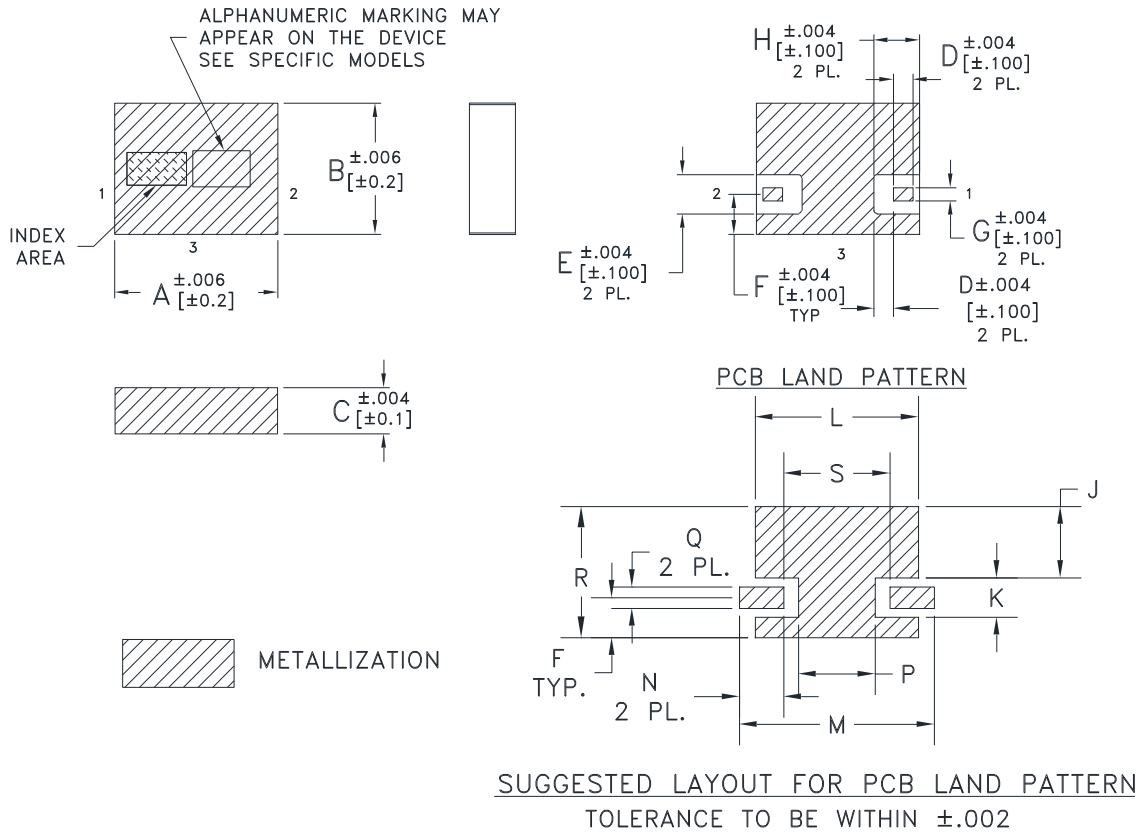


GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style NL

Outline Dimensions NL1008C-7



CASE#	A	B	C	D	E	F	G	H	J	K	L
NL1008C-7	.098 (2.50)	.079 (2.00)	.028 (.70)	.012 (.30)	.024 (.61)	.024 (.61)	.008 (.20)	.028 (.70)	.043 (1.09)	.024 (.60)	.098 (2.50)

CASE#	M	N	P	Q	R	S	WT, GRAM
NL1008C-7	.118 (3.00)	.027 (.70)	.046 (1.20)	.013 (.30)	.079 (2.00)	.064 (1.63)	.019

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .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. All models, no (+) suffix.
3. **Pad tolerance is non-cumulative. Minimum spacing between each pad is .004.**
4. **Line width should be designed to match 50Ω characteristic depending on PCB material and thickness.**

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Tape & Reel Packaging TR-F75

DEVICE ORIENTATION IN T&R

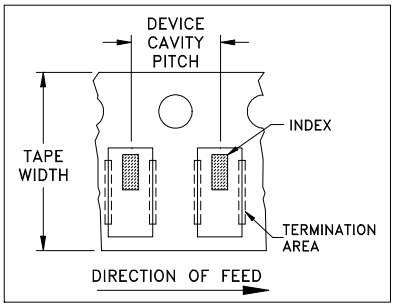


ILLUSTRATION 1

Applicable Case Styles
FV1206-1
FV1206-3

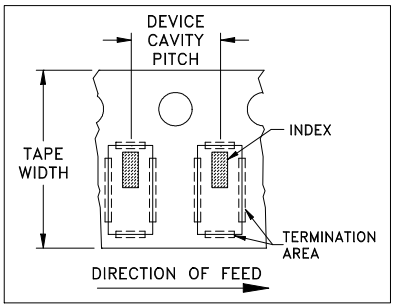


ILLUSTRATION 2

Applicable Case Styles
FV1206-4
FV1206-5
FV1206-6
FV1206-7
FV1206-9

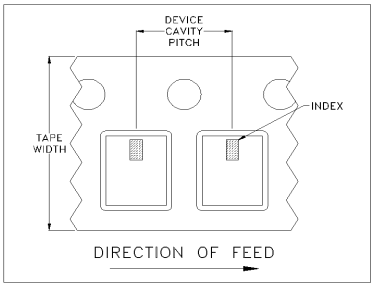


ILLUSTRATION 3

Applicable Case Styles
FV1206-11
FV1206-12
GE0805C-18
NL1008C-6
NL1008C-7
NL1008C-9
NL1008C-10
NL1008C-12

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	3000

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

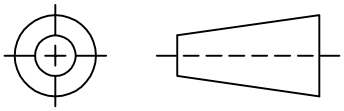
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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

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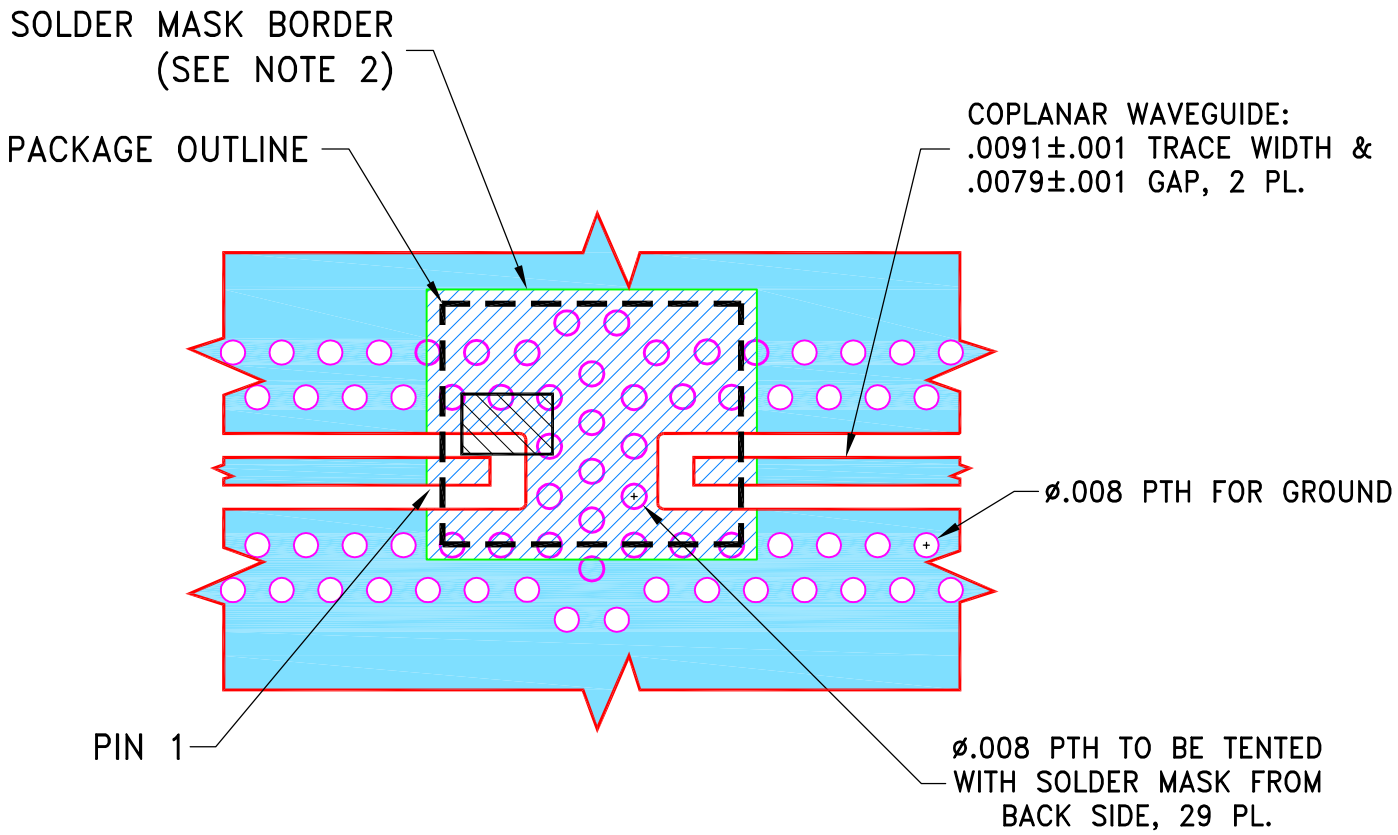
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THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
0R	ECO-007756	NEW RELEASE	05/12/21	ITG	IL

SUGGESTED MOUNTING CONFIGURATION FOR NL1008C-6 CASE STYLE



NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR MEGTRON-7 R5785(N); DIELECTRIC THICKNESS: .0049±.001; CLOTH STYLE: 2116; COPPER: HVLP/HVLP. FOR OTHER MATERIALS LINE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. SOLDER MASK OPENING FOR COMPONENT SOLDERING HAS BEEN INCREASED AGAINST PCB LAND PATTERN RECOMMENDATIONS PER NL1008C-6 AND CAN BE DEVIATED FROM THIS DRAWING TO COMPLY WITH CUSTOMERS' DESIGN RULES.
3. 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	ITG	05/12/21
TOLERANCES ON:	CHECKED	GF	05/12/21
2 PL DECIMALS ±	APPROVED	IL	05/12/21
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

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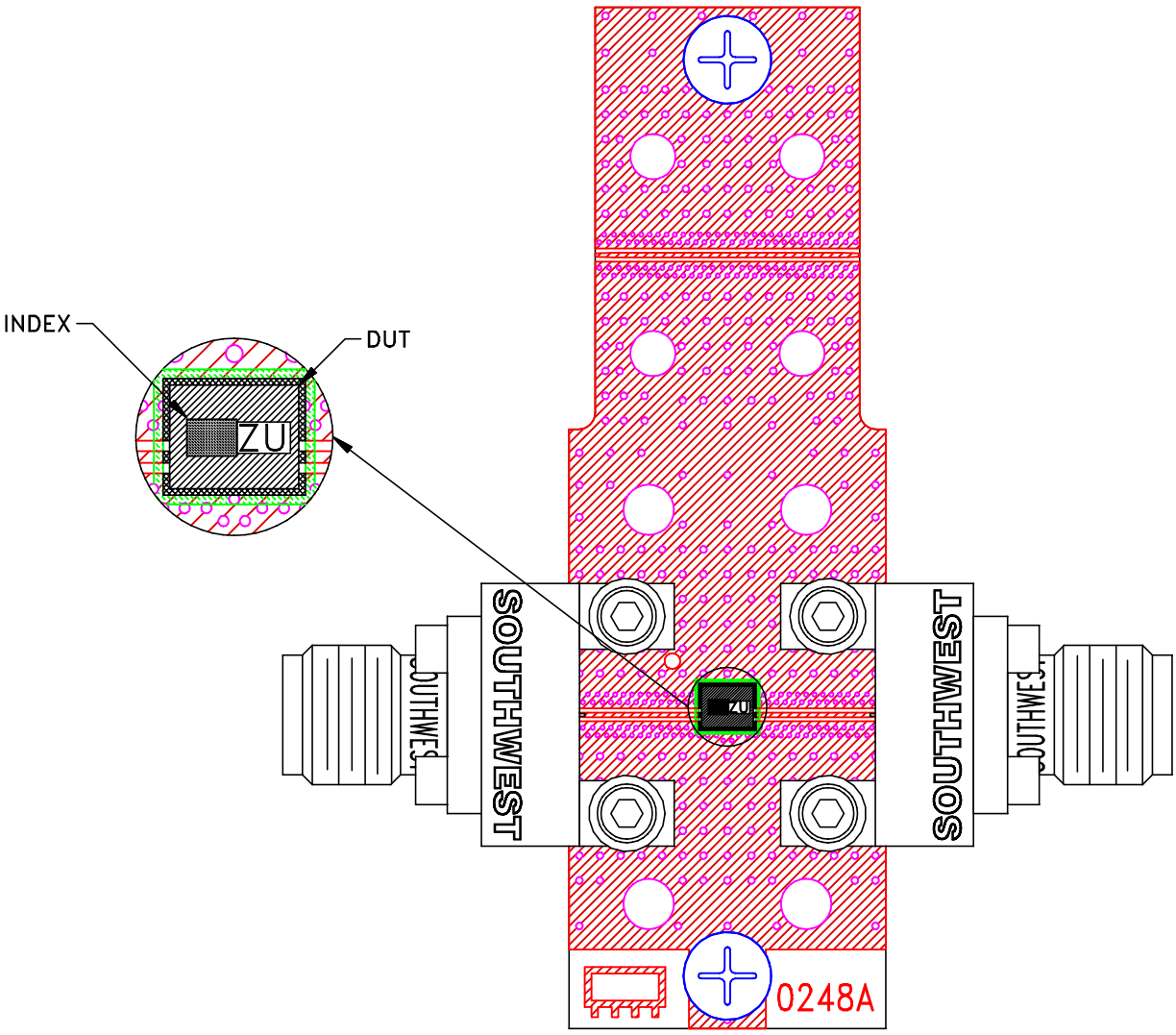
PL, NL1008C-6, TB-BFCQ-XXXX+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-707	0R

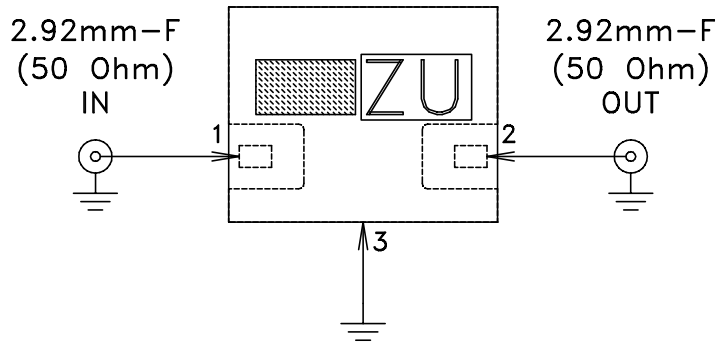
FILE:	SCALE:	SHEET:
98PL707	15:1	1 OF 1

Evaluation Board and Circuit

TB-BFCQ-12600+



Schematic diagram



Notes:

1. PCB Material: MEGTRON-7 R5785(N) OR Equivalent, Dielectric Constant=3.4
Dielectric Thickness: .0049±.001
2. 50 Ohm 2.92mm Female Connectors.

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Environmental Specifications ENV06T10

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	---

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