LTCC SURFACE MOUNT

Low Pass Filter

LFCN-3602+

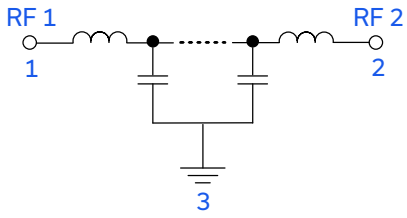
50Ω DC to 36 GHz

THE BIG DEAL

- Low Insertion Loss, Typ. 2.9 dB
- Stopband Rejection, Typ. 37 dB
- Passband Return Loss, Typ. 11 dB
- Rugged Ceramic Construction
- 1206 Surface Mount Footprint

Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



APPLICATIONS

- Communications
- Radar, EW, and ECM Defense Systems
- Test & Measurement Equipment

PRODUCT OVERVIEW

Mini-Circuits' LFCN-3602+ is a miniature low-temperature co-fired ceramic (LTCC) low pass filter with a DC to 36 GHz passband that supports a variety of applications. This model provides 2.9 dB typical insertion loss over a wide band, due to its rugged monolithic construction. Housed in a small 1206 ceramic form factor, the filter is ideal for dense signal chain PCB layouts, where it complements MMIC size and performance. The LTCC fabrication process assures minimal RF performance variation while delivering a product that is well-suited for environmental extremes of high humidity and temperature.

KEY FEATURES

Feature	Advantages
Ultra-Wide Stopband	Provides excellent stopband rejection to 67 GHz, suitable for wideband applications.
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.
Excellent Performance for Size	Offers best in class performance relative to larger-size alternative technologies. This mmWave multi-layer surface mount LTCC filter in a 1206 package allows for space to be saved in dense circuit board layouts, while also minimizing the effects of parasitics.

REV. OR
ECO-022510
LFCN-3602+
MCL NY
240912

Low Pass Filter

LFCN-3602+

50Ω DC to 36 GHz

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

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC - F1	DC-36	—	2.9	3.6	dB
	Freq. Cut-Off[4]	Fc	37.4	—	3	—	dB
	Return Loss	DC - F1	DC-36	—	11	—	dB
Stopband	Rejection	F2 - F3	45-60	21	31	—	dB
		F3 - F4	60-67	27	37	—	

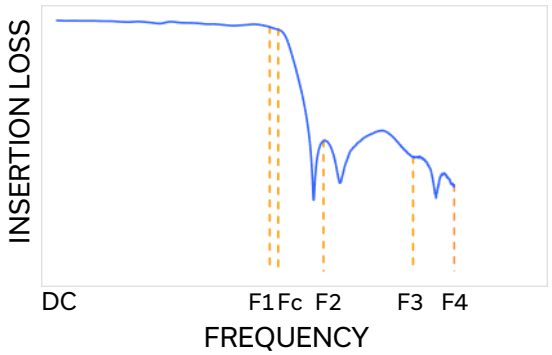
1. Tested on Evaluation Board P/N TB-LFCN-3602C+ with the connector and feedline effects de-embedded using the 2XThru IEEE P370 method.
2. Bi-directional, RF1 and RF2 ports can be interchanged.
3. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.
4. Cut-off frequency has typical variation of ±4%.

ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Input Power[6]	1 W

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 0.5 W at +125°C.

TYPICAL FREQUENCY RESPONSE AT +25°C

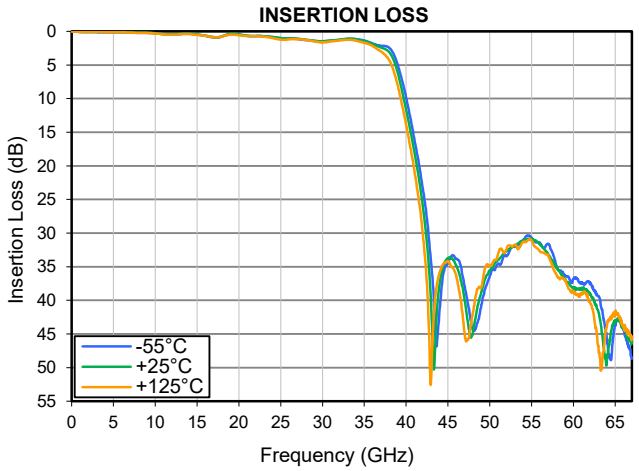


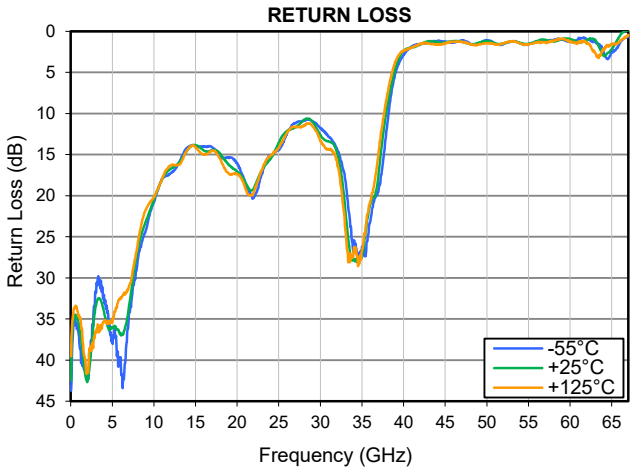
Low Pass Filter

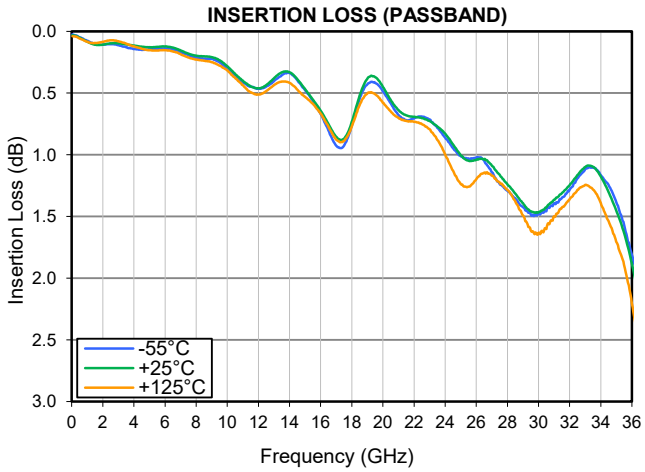
LFCN-3602+

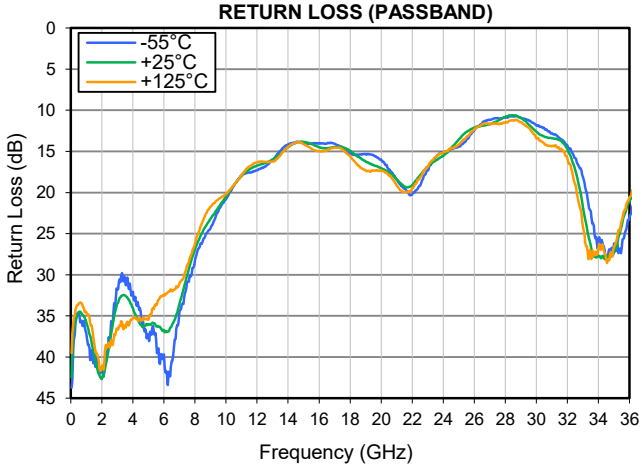
50Ω DC to 36 GHz

TYPICAL PERFORMANCE GRAPHS









Low Pass Filter

LFCN-3602+

50Ω DC to 36 GHz

FUNCTIONAL DIAGRAM

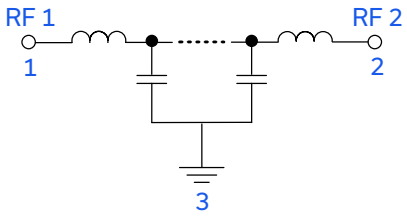
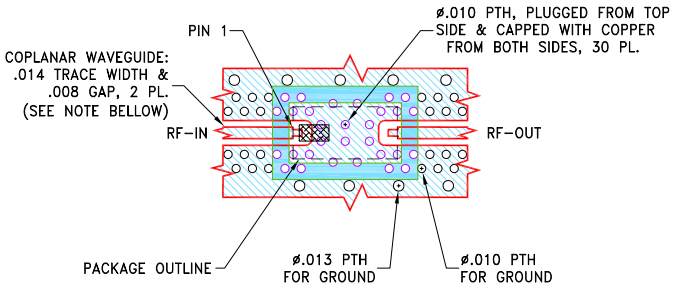


Figure 1. LFCN-3602+ Functional Diagram

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-748)

SUGGESTED PCB LAYOUT (PL-748)



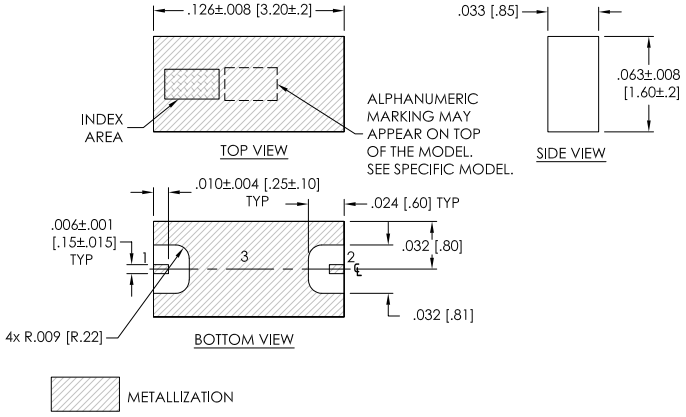
NOTES:
1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON-7 R5785(N); DIELECTRIC THICKNESS: .0079±.001; COPPER: HVLP/HVLP. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

Figure 2. Suggested PCB Layout PL-748

CASE STYLE DRAWING



Weight: .017 grams
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3Pl.±.015

PRODUCT MARKING*: ZD

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

Low Pass Filter

LFCN-3602+

50Ω DC to 36 GHz

ADDITIONAL 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	FV1206-12 Lead Finish: Gold over Nickel Plating
RoHS Status	Compliant
Tape and Reel	F75
Suggested Layout for PCB Design	PL-748
Evaluation Board	TB-LFCN-3602C+ 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-Circuit's applicable established test performance criteria and measurement instructions.

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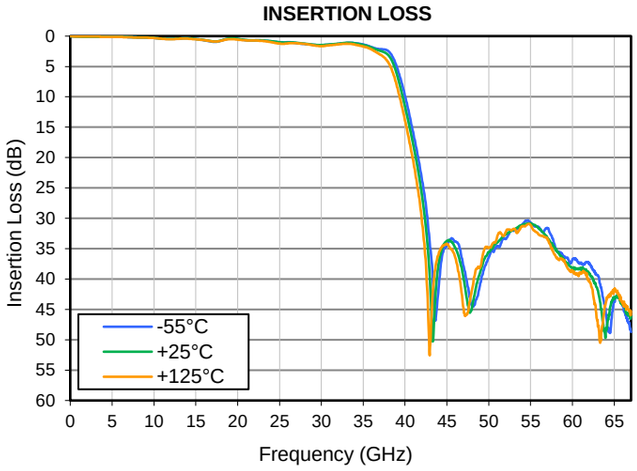
LTCC Lowpass Filter LFCN-3602+

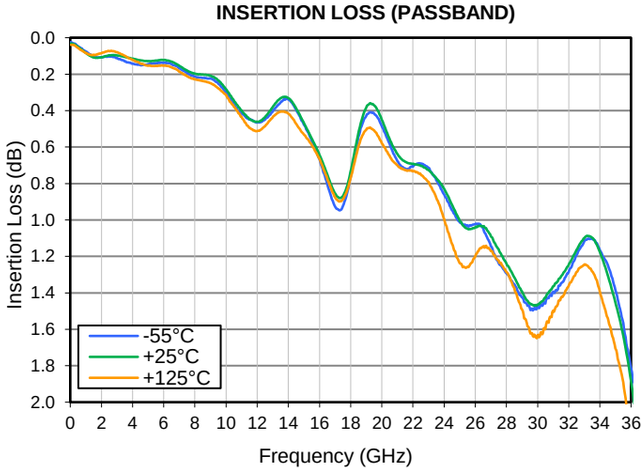
Typical Performance Data

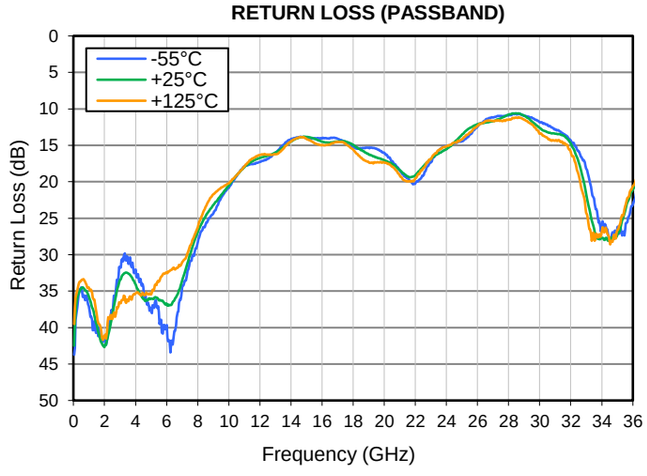
FREQUENCY (GHz)	INSERTION LOSS (dB)			RETURN LOSS (dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
0.1	0.03	0.03	0.04	42.76	39.29	37.11
1.0	0.08	0.08	0.08	37.03	35.78	34.50
2.0	0.11	0.11	0.08	41.36	42.68	41.19
3.0	0.11	0.10	0.08	31.83	33.48	36.58
4.0	0.14	0.11	0.12	32.06	34.05	35.28
5.0	0.15	0.13	0.15	37.56	36.03	35.46
6.0	0.14	0.12	0.15	39.65	36.70	32.43
7.0	0.17	0.15	0.19	34.33	33.53	31.02
8.0	0.21	0.20	0.23	28.26	26.94	26.23
9.0	0.22	0.21	0.25	24.34	23.20	21.72
10.0	0.30	0.28	0.32	20.84	20.52	20.21
11.0	0.41	0.40	0.44	17.93	18.01	17.91
12.0	0.47	0.46	0.51	17.29	16.72	16.32
13.0	0.40	0.38	0.44	15.98	16.00	16.24
14.0	0.34	0.33	0.42	14.16	14.49	14.46
15.0	0.48	0.47	0.53	14.00	13.85	14.12
16.0	0.67	0.64	0.67	14.03	14.50	14.98
17.0	0.93	0.85	0.88	14.10	14.49	14.52
18.0	0.76	0.73	0.77	15.25	14.93	15.58
19.0	0.43	0.38	0.51	15.33	16.24	17.32
20.0	0.49	0.45	0.58	15.99	17.04	17.35
21.0	0.68	0.64	0.70	18.45	18.39	19.14
22.0	0.71	0.69	0.73	20.25	19.11	19.52
23.0	0.71	0.73	0.79	17.35	16.87	16.89
24.0	0.86	0.83	1.00	15.11	15.55	15.14
25.0	1.01	1.01	1.24	14.40	13.54	14.20
26.0	1.02	1.04	1.20	12.46	12.10	12.35
27.0	1.14	1.09	1.17	11.19	11.69	11.63
28.0	1.29	1.24	1.28	10.92	10.80	11.53
29.0	1.42	1.39	1.49	10.95	10.94	11.47
30.0	1.47	1.47	1.63	11.84	12.61	13.41
31.0	1.39	1.36	1.50	12.80	13.42	14.37
32.0	1.28	1.25	1.36	14.27	14.74	15.80
33.0	1.12	1.10	1.24	18.16	21.75	24.24
34.0	1.16	1.18	1.39	25.86	27.73	26.74
35.0	1.38	1.45	1.70	26.20	27.26	26.61
36.0	1.81	1.88	2.20	23.07	21.07	20.58
37.0	2.13	2.41	3.01	19.36	17.31	14.65
38.0	2.48	3.13	4.35	11.69	9.38	7.95
39.0	5.00	6.18	8.08	5.10	4.56	3.71
40.0	9.85	11.64	13.88	2.84	2.37	2.39
41.0	16.13	18.02	20.79	1.79	1.95	1.94
41.5	19.50	21.63	24.91	1.63	1.85	1.75
42.0	23.43	26.02	30.18	1.56	1.59	1.54
43.0	34.68	40.86	51.19	1.40	1.20	1.48
44.0	41.47	37.58	35.92	1.23	1.31	1.61
45.0	34.44	33.71	34.17	1.24	1.35	1.49
46.0	33.85	34.85	36.43	1.33	1.20	1.28
47.0	37.91	40.03	44.92	1.12	1.26	1.27
48.0	44.45	44.66	41.78	1.50	1.55	1.58
49.0	40.65	38.76	37.93	1.52	1.39	1.60
50.0	36.40	35.53	34.90	1.07	1.18	1.43
51.0	34.53	34.01	33.10	1.51	1.44	1.60
52.0	33.45	32.69	32.37	1.54	1.47	1.46
53.0	32.05	31.86	31.74	1.22	1.23	1.22
54.0	31.04	31.16	31.32	1.45	1.40	1.50
55.0	30.68	30.83	31.12	1.57	1.51	1.61
56.0	31.45	31.67	32.69	1.21	1.18	1.37
57.0	31.55	33.17	33.31	1.21	1.02	1.30
58.0	35.02	35.25	36.26	1.10	1.23	1.17
59.0	36.24	36.80	37.09	0.96	0.96	0.92
60.0	36.74	38.17	38.59	1.26	0.93	1.30
61.0	37.44	38.15	39.14	0.86	1.32	1.28
62.0	37.62	39.01	40.28	1.01	1.13	1.49
63.0	39.41	41.79	46.76	1.29	1.00	2.60
64.0	45.75	48.09	43.92	2.34	2.93	2.09
65.0	43.56	43.33	41.87	2.57	2.17	1.61
67.0	48.69	46.15	45.35	0.71	-0.13	0.56

LTCC Lowpass Filter LFCN-3602+

Typical Performance Data



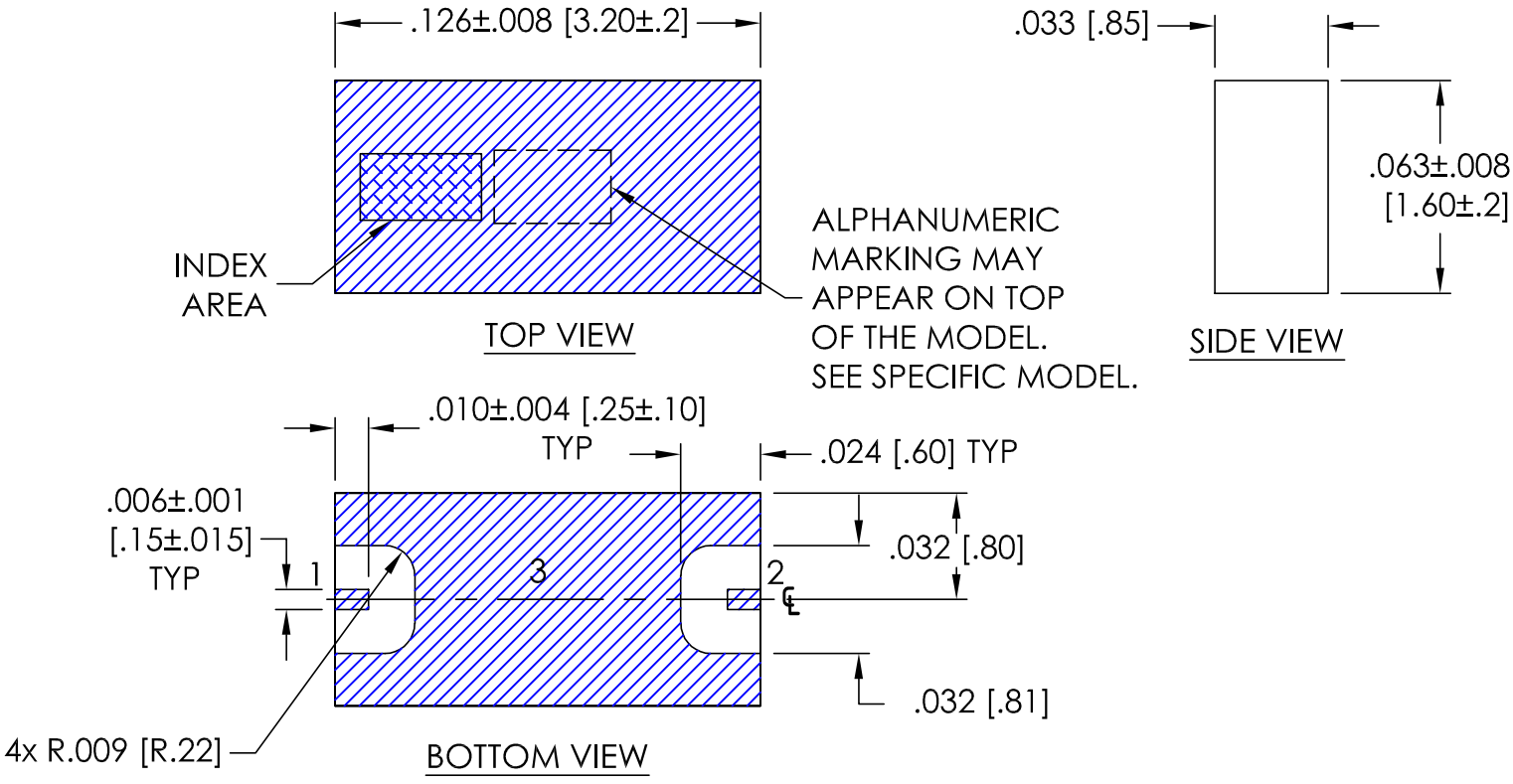




Case Style FV

Outline Dimensions

FV1206-12



Weight: .017 grams.

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

Notes:

1. Case material: Ceramic.
2. Termination Finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Gold plate over Nickel plate All models, (+) suffix.

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RF/IF MICROWAVE COMPONENTS

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Tape & Reel Packaging TR-F75

DEVICE ORIENTATION IN T&R

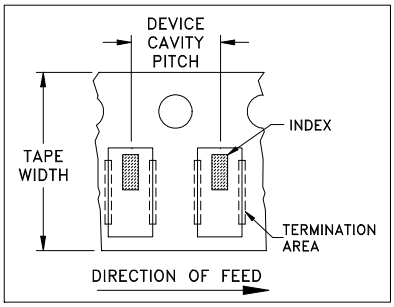

ILLUSTRATION 1

Applicable Case Styles
FV1206-1
FV1206-3

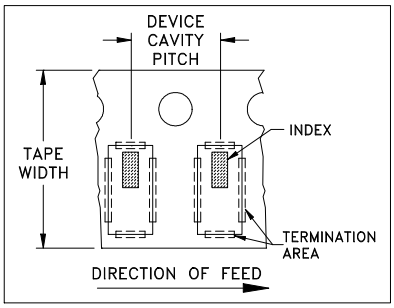

ILLUSTRATION 2

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

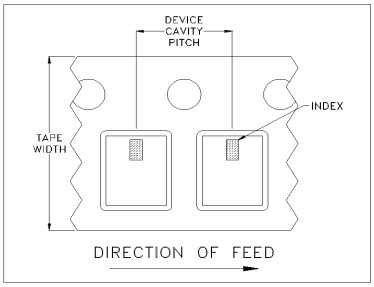

ILLUSTRATION 3

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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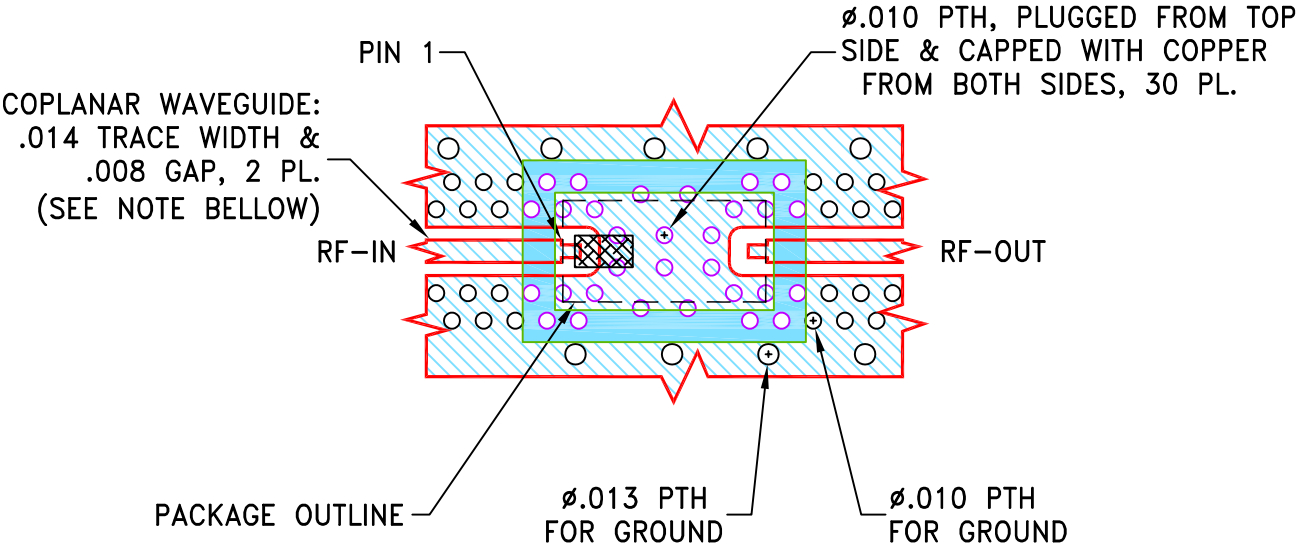
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-016075	NEW RELEASE	12/09/22	ITG	IL

SUGGESTED MOUNTING CONFIGURATION
FV1206-12 CASE STYLE



NOTES:
1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON-7 R5785(N); DIELECTRIC THICKNESS: .0079±.001; COPPER: HVLP/HVLP. 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	ITG	12/09/22
TOLERANCES ON:	CHECKED	GF	12/09/22
2 PL DECIMALS ±	APPROVED	IL	12/09/22
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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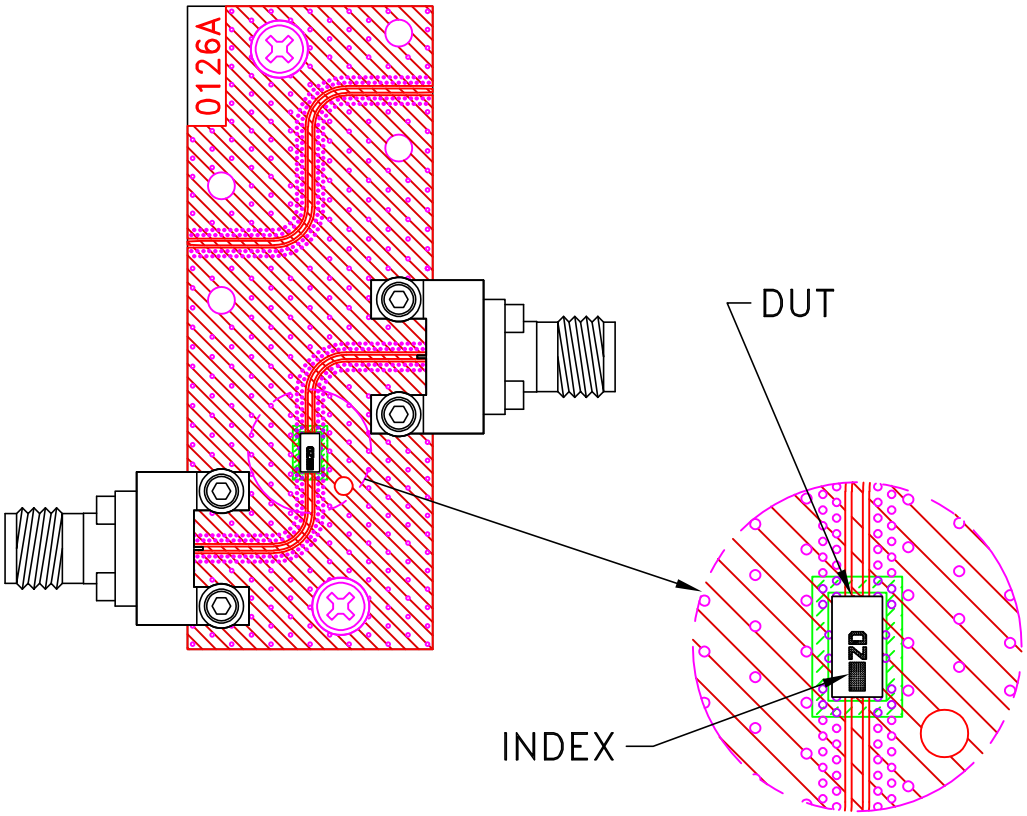
ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

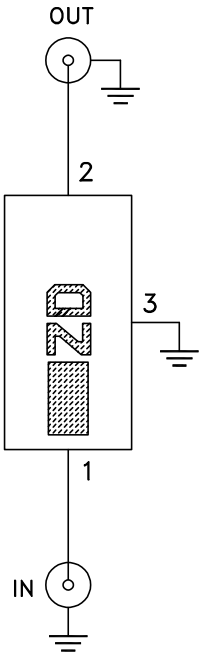
PL, FV1206-12, TB-HFCN-2502+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-748	OR
FILE: 98PL748	SCALE: 8:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



TB-LFCN-3602C+



Schematic Diagram

1. 50 Ohm 1.85 End Launch Female connectors.
2. PCB Material: Megtron 7(N) or equivalent, Dielectric Constant=3.4, Thickness=.0079 inch.

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Mini-Circuits

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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