CERAMIC

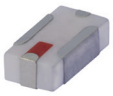
Low Pass Filter

LFCN-123+

50Ω DC[1] to 12000 MHz

FEATURES

- Excellent power handling, 8W
- Small size, 0.12" x .06"
- 7 sections
- Temperature stable
- Hermetically sealed
- LTCC construction
- Protected by U.S. Patent 6,943,646



Generic photo used for illustration purposes only

CASE STYLE: FV1206-4

+RoHS Compliant

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

APPLICATIONS

- Harmonic rejection
- VHF/UHF transmitters/receivers
- Lab use

PRODUCT OVERVIEW

The LFCN-123+ Low Pass Filter gives microwave communication system designers the ability to reject unwanted harmonics using defined RF parameters. The multilayer construction gives high repeatability of performance. Small wrap-around terminations minimize variations in performance due to parasitics. Covering DC-12000 MHz, these units offer low insertion loss and good rejection.

KEY FEATURES

Feature	Advantages
Small Size (3.20mm x1.6 mm)	Allows for high layout density of circuit boards, while minimizing affects of parasitics.
Rejection peaks at harmonic frequencies	Provides good rejection of signals at harmonic frequencies, for improved system performance.
Wrap around termination	Provides excellent solderability and easy visual inspection capability.
LTCC construction	Provides a rugged package that is well suited for tough environments including high humidity and high temperature extremes.

REV. E
ECO-013867
LFCN-123+
AD/CP/AM
220622

Low Pass Filter

LFCN-123+

ELECTRICAL SPECIFICATIONS[1,2] AT 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC-F1	DC-12000	—	—	2.5	dB
	Freq. Cut-Off	F2	13000	—	3.0	—	dB
	VSWR	DC-F1	DC-12000	—	1.6	—	:1
Stop Band	Rejection Loss	F3	15000	20	—	—	dB
		F4-F5	15500-20000	—	40	—	
	VSWR	F3-F6	15500-20000	—	17	—	:1

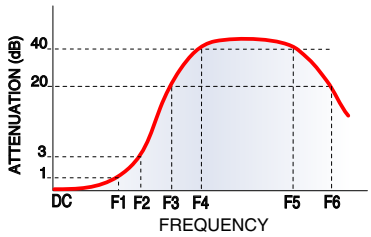
1. In Application where DC voltage is present at either input or output ports, coupling capacitors are required.
2. Measured on Mini-Circuits Characterization Test Board TB-860+.

MAXIMUM RATINGS

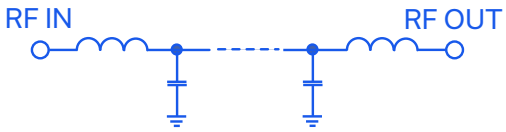
Parameter	Ratings
Operating temperature	-55°C to 100°C
Storage temperature	-55°C to 100°C
RF Power Input[3]	8 W max. at 25°C

3. Passband rating, derate linearly to 3W at 100°C ambient.
Permanent damage may occur if any of these limits are exceeded.

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL SCHEMATIC



Low Pass Filter

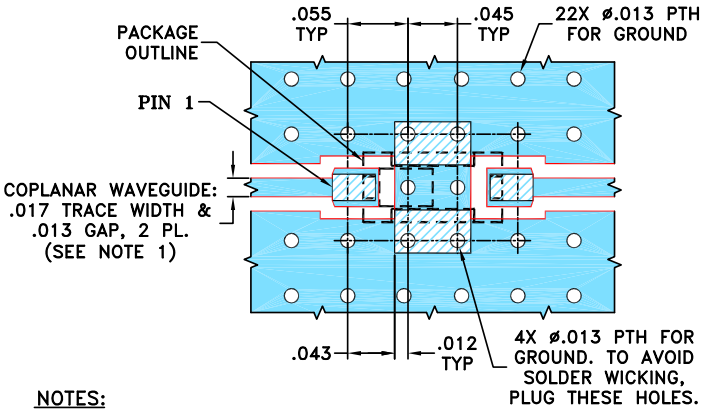
LFCN-123+

PIN CONNECTIONS

RF IN	1
RF OUT	3
GROUND	2,4

PRODUCT MARKING: AP

DEMO BOARD MCL P/N: TB-860+
SUGGESTED PCB LAYOUT (PL-487)



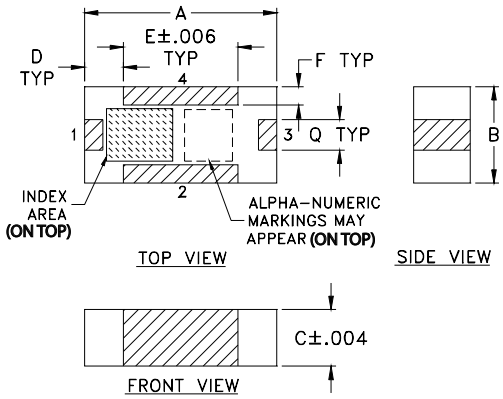
NOTES:

1. TRACE WIDTH AND GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .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.

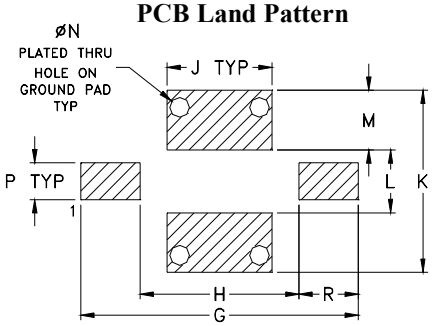
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

OUTLINE DRAWING



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

OUTLINE DIMENSIONS (Inches / mm)

A	B	C	D	E	F	G	H	J
.126	.063	.037	.026	.075	.012	.182	.104	.069
3.20	1.60	0.94	0.66	1.91	0.30	4.62	2.64	1.75

K	L	M	N	P	Q	R	wt
.119	.041	.039	.013	.024	.020	.039	grams
3.02	1.04	0.99	0.33	0.61	0.51	0.99	.020

TAPE & REEL INFORMATION: F75

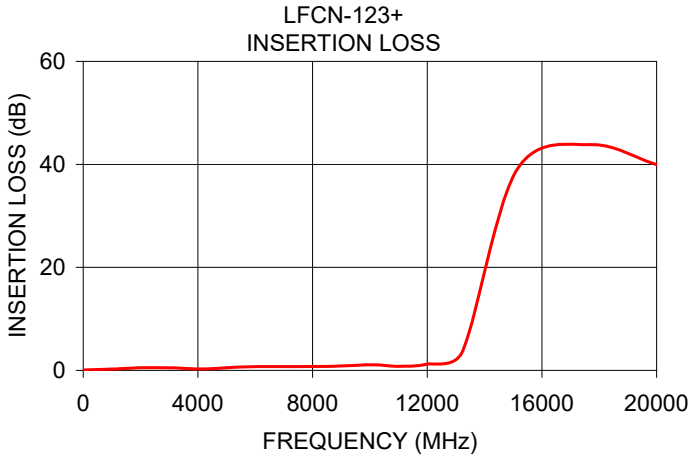
CERAMIC

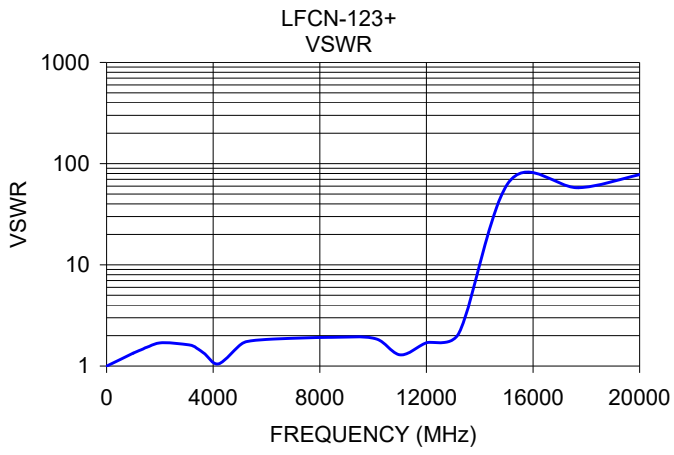
Low Pass Filter

LFCN-123+

TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)
10.00	0.07	1.00
1280.00	0.31	1.44
1550.00	0.39	1.55
2080.00	0.51	1.70
3140.00	0.48	1.61
4200.00	0.26	1.05
5000.00	0.48	1.61
5330.00	0.62	1.76
6260.00	0.73	1.85
8450.00	0.77	1.92
10070.00	1.07	1.87
11020.00	0.78	1.29
12010.00	1.23	1.70
13220.00	3.56	2.12
15120.00	38.92	67.22
17710.00	43.82	57.85
20000.00	39.95	78.02





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 Low Pass Filter LFCN-123+

Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@ -55°C	@+25°C	@+100°C	@ -55°C	@+25°C	@+100°C	@ -55°C	@+25°C	@+100°C
10.0	0.05	0.06	0.06	68.48	66.32	58.60	63.06	66.52	59.19
50.0	0.05	0.06	0.07	44.38	48.75	54.68	44.14	48.15	52.18
100.0	0.06	0.07	0.08	37.95	40.55	44.13	37.84	40.41	43.72
340.0	0.07	0.10	0.12	29.41	28.01	26.73	29.35	28.00	26.73
390.0	0.08	0.11	0.13	28.14	26.95	25.63	28.06	26.95	25.61
500.0	0.09	0.12	0.15	24.78	24.38	23.64	24.89	24.52	23.75
610.0	0.09	0.14	0.17	22.69	22.50	22.12	22.79	22.60	22.21
720.0	0.11	0.16	0.19	21.35	20.79	20.29	21.48	20.92	20.41
830.0	0.12	0.18	0.23	20.27	19.39	18.68	20.33	19.46	18.75
940.0	0.13	0.20	0.24	19.13	18.49	17.87	19.20	18.57	17.93
1000.0	0.14	0.21	0.25	18.43	18.03	17.58	18.40	18.05	17.61
1280.0	0.19	0.28	0.33	16.16	15.69	15.41	16.16	15.71	15.43
1550.0	0.25	0.34	0.39	14.43	14.28	14.22	14.43	14.31	14.26
1810.0	0.30	0.41	0.48	13.05	12.92	12.86	12.99	12.89	12.84
2080.0	0.36	0.47	0.53	12.11	12.11	12.27	12.07	12.09	12.28
2610.0	0.43	0.55	0.62	11.30	11.46	11.83	11.19	11.38	11.79
3670.0	0.20	0.36	0.48	15.28	15.61	16.16	15.25	15.61	16.25
4200.0	0.07	0.25	0.40	25.23	25.42	25.67	25.36	25.75	26.35
4460.0	0.07	0.25	0.41	33.11	31.74	31.05	34.13	33.00	32.88
5000.0	0.13	0.32	0.47	16.26	16.90	17.96	16.15	16.80	17.90
5640.0	0.25	0.45	0.60	12.75	13.29	14.31	12.71	13.25	14.32
6260.0	0.29	0.52	0.70	12.32	12.71	13.67	12.40	12.81	13.80
6580.0	0.22	0.47	0.68	14.12	14.46	15.41	14.11	14.43	15.31
7200.0	0.07	0.35	0.61	20.90	21.00	21.83	20.73	20.70	21.28
7510.0	0.08	0.36	0.61	30.59	30.60	29.61	31.60	30.71	29.91
8140.0	0.17	0.47	0.74	18.89	18.93	19.32	19.97	20.07	21.56
8760.0	0.26	0.60	0.88	15.55	15.10	15.26	15.85	15.54	16.34
9380.0	0.41	0.78	1.09	15.73	15.68	16.16	16.32	16.75	17.78
9700.0	0.51	0.94	1.20	14.98	14.88	15.31	16.38	16.56	16.77
9830.0	0.50	0.83	1.27	16.57	17.14	17.49	17.66	18.19	18.92
10070.0	0.62	1.01	1.34	14.65	15.50	15.84	15.95	16.60	16.39
10550.0	0.62	1.03	1.37	16.34	17.31	18.46	18.09	18.76	18.66
11020.0	0.52	0.91	1.31	17.79	19.15	20.62	21.92	23.62	22.77
11520.0	0.88	1.26	1.66	14.98	15.70	16.93	25.43	23.88	23.21
11660.0	0.89	1.26	1.70	14.42	15.14	16.08	21.57	20.38	19.34
11800.0	0.88	1.32	1.78	13.93	14.46	15.05	18.69	18.03	17.27
11940.0	0.88	1.31	1.78	12.92	13.23	13.19	15.68	15.31	15.29
12010.0	0.89	1.34	1.82	12.74	12.83	12.64	14.61	14.41	14.18
12150.0	0.94	1.45	1.92	12.29	12.40	12.28	12.63	12.59	12.56
12360.0	1.07	1.61	2.15	11.65	11.55	10.95	11.34	11.22	11.19
12500.0	1.17	1.76	2.30	11.49	11.47	10.94	10.24	10.14	10.23
12750.0	1.54	2.21	2.84	11.13	11.02	10.58	8.66	8.59	8.76
12990.0	2.30	3.20	4.05	9.04	8.55	8.34	6.58	6.19	6.21
13220.0	4.02	5.19	6.34	5.53	5.40	5.62	3.77	3.69	3.84
14170.0	18.61	20.46	22.27	0.43	0.82	1.24	0.18	0.59	0.99
14640.0	27.91	30.47	32.59	0.11	0.49	0.85	0.07	0.33	0.68
14880.0	34.00	36.92	40.42	0.00	0.33	0.64	0.09	0.26	0.54
15120.0	42.47	45.71	44.95	0.07	0.35	0.70	0.15	0.27	0.61
15350.0	44.28	42.57	41.38	0.11	0.25	0.56	0.14	0.23	0.50
15590.0	39.43	38.54	38.10	0.08	0.39	0.76	0.19	0.29	0.63
16060.0	35.83	35.73	35.88	0.11	0.38	0.79	0.10	0.35	0.72
17010.0	36.25	37.06	37.48	0.06	0.52	1.11	0.02	0.46	0.93
18010.0	42.63	43.53	43.18	0.18	0.32	0.99	0.09	0.34	0.94
19010.0	53.25	49.59	49.51	0.41	0.09	0.82	0.34	0.21	1.01
19260.0	45.77	47.23	46.72	0.42	0.18	1.00	0.40	0.22	1.03
19500.0	43.27	43.75	44.79	0.47	0.07	0.79	0.37	0.21	1.02
19750.0	40.67	40.72	41.86	0.50	0.14	0.93	0.41	0.20	0.94
20000.0	39.11	38.83	38.80	0.45	0.19	0.88	0.33	0.27	1.02

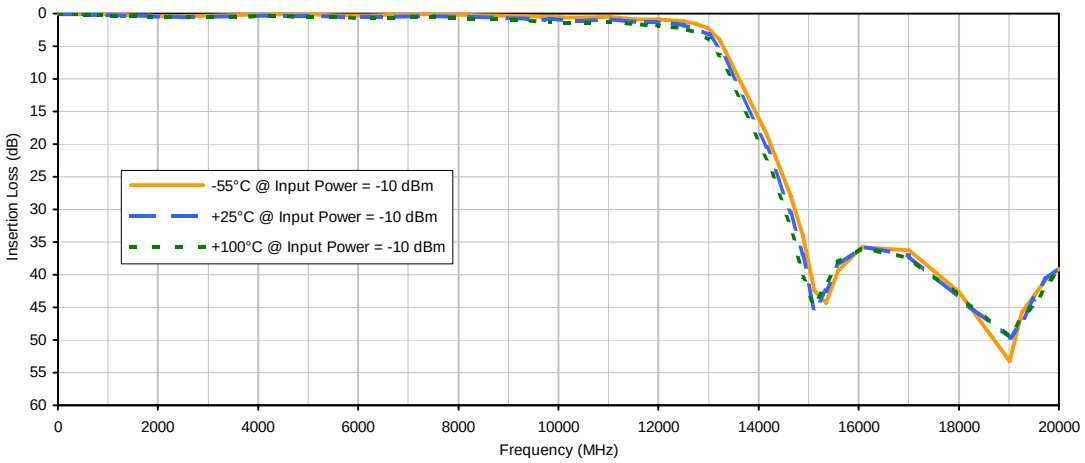
Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -55°C	@+25°C	@+100°C
10.0	0.07	0.07	0.07
50.0	0.07	0.07	0.06
100.0	0.07	0.06	0.06
170.0	0.06	0.06	0.06
230.0	0.07	0.06	0.06
280.0	0.06	0.05	0.03
340.0	0.07	0.06	0.06
450.0	0.06	0.06	0.06
500.0	0.06	0.06	0.06
610.0	0.06	0.06	0.06
720.0	0.06	0.06	0.05
830.0	0.07	0.06	0.06
940.0	0.06	0.06	0.06
1000.0	0.05	0.06	0.06
1550.0	0.06	0.05	0.06
2080.0	0.05	0.04	0.05
2610.0	0.08	0.08	0.08
3140.0	0.06	0.05	0.04
4200.0	0.07	0.06	0.06
4730.0	0.07	0.06	0.06
5000.0	0.06	0.06	0.06
5640.0	0.07	0.07	0.06
6260.0	0.06	0.06	0.06
7200.0	0.10	0.09	0.08
7510.0	0.08	0.07	0.08
8140.0	0.09	0.06	0.07
8450.0	0.12	0.11	0.05
8760.0	0.12	0.12	0.09
9070.0	0.13	0.04	0.06
9380.0	0.11	0.07	0.05
9700.0	0.18	0.04	0.13
9830.0	0.11	0.14	0.12
10550.0	0.14	0.23	0.13
10780.0	0.10	0.12	0.13
11020.0	0.22	0.20	0.04
11140.0	0.12	0.21	0.13
11520.0	0.10	0.10	0.12
11590.0	0.08	0.18	0.13
11660.0	0.11	0.14	0.02
11730.0	0.15	0.12	0.22
11870.0	0.14	0.17	0.19
11940.0	0.19	0.14	0.23
12010.0	0.09	0.12	0.13

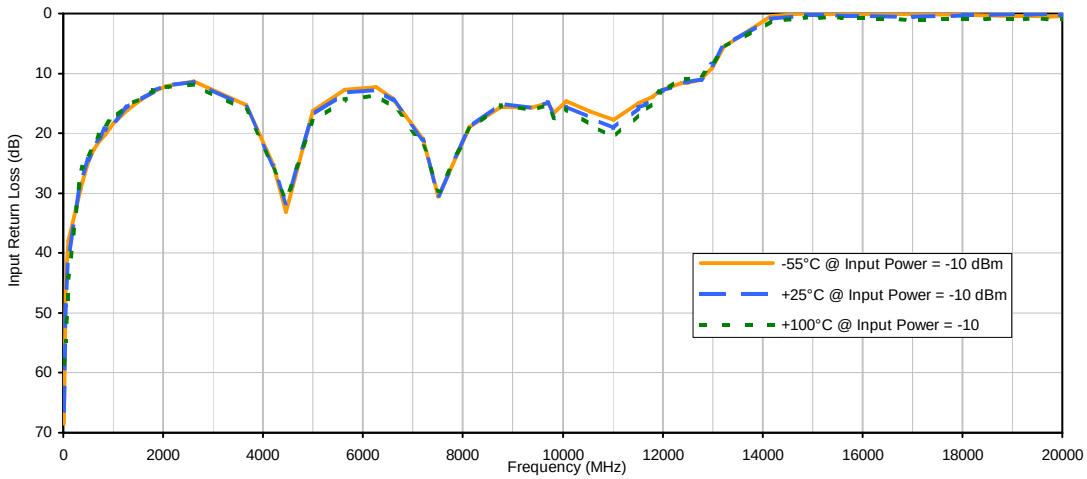
Ceramic Low Pass Filter LFCN-123+

Typical Performance Data

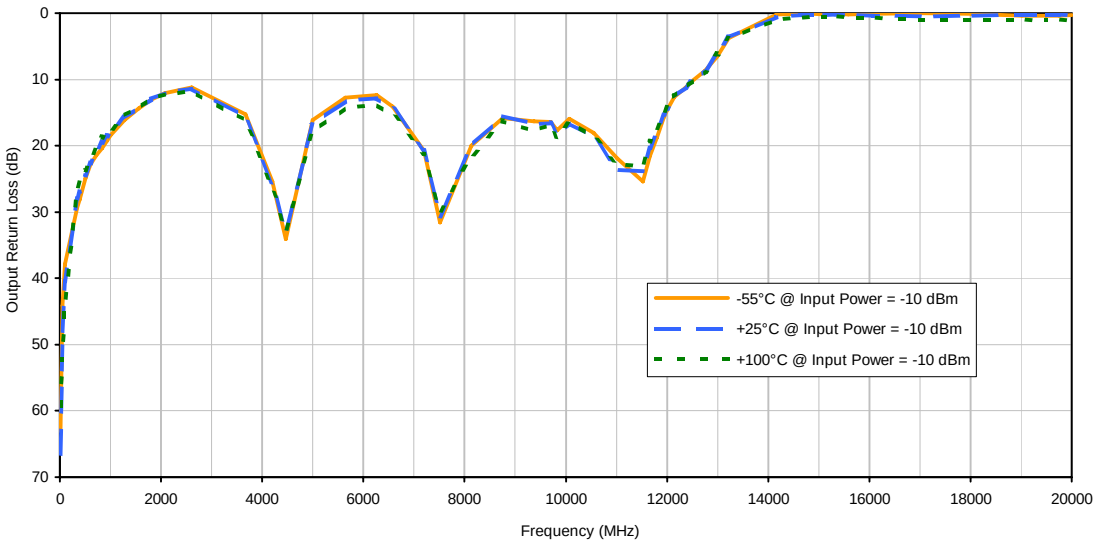
INSERTION LOSS vs. TEMPERATURE



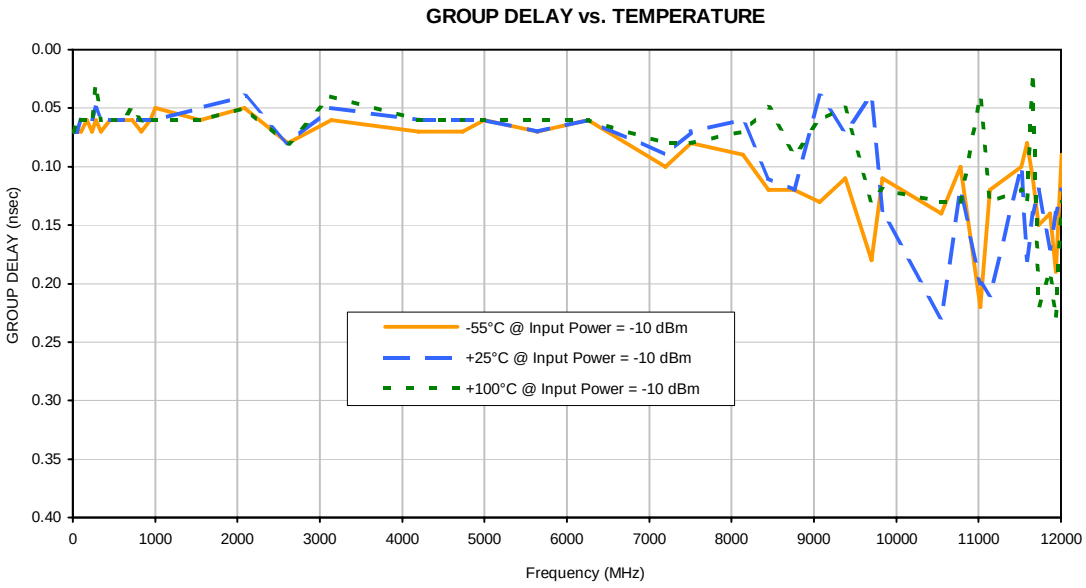
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



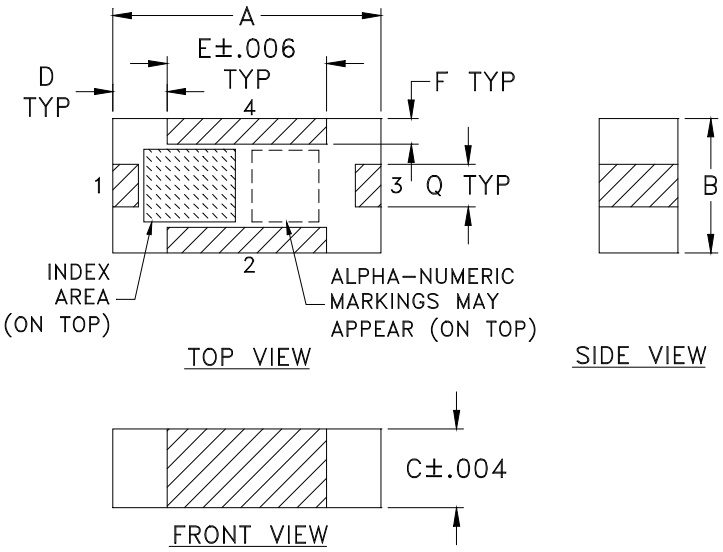
Typical Performance Data



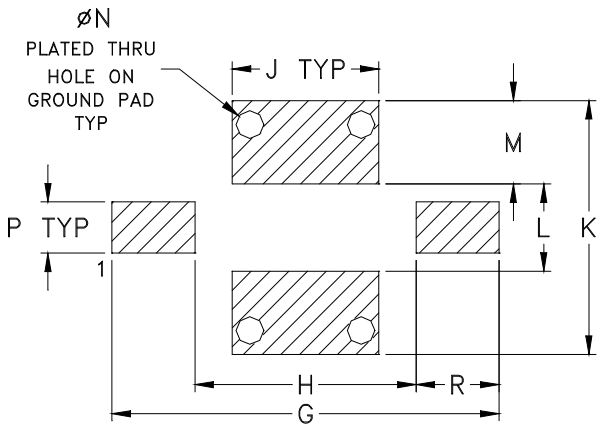
Case Style FV

FV1206-4

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	L	M
FV1206-4	.126 (3.20)	.063 (1.60)	.037 (0.94)	.026 (0.66)	.075 (1.91)	.012 (0.30)	.182 (4.62)	.104 (2.64)	.069 (1.75)	.119 (3.02)	.041 (1.04)	.039 (0.99)

CASE #	N	P	Q	R	WT. GRAM
FV1206-4	.013 (0.33)	.024 (0.61)	.020 (0.51)	.039 (0.99)	.020

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

Notes:

1. Open style, ceramic base.
2. Termination finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

Tape & Reel Packaging TR-F75

DEVICE ORIENTATION IN T&R

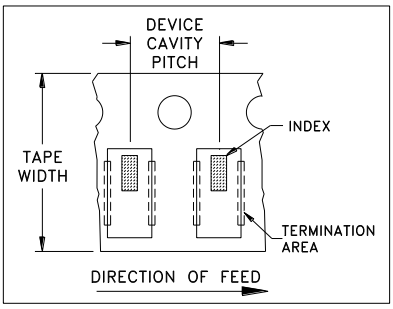


ILLUSTRATION 1

Applicable Case Styles
FV1206-1
FV1206-3

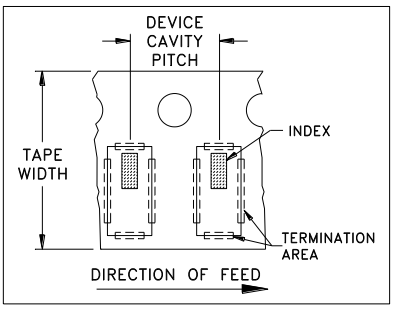


ILLUSTRATION 2

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

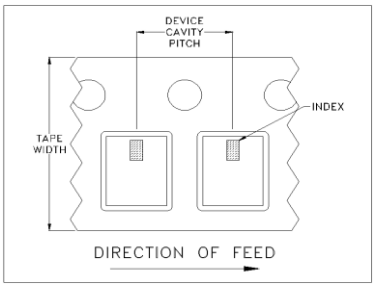


ILLUSTRATION 3

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

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.

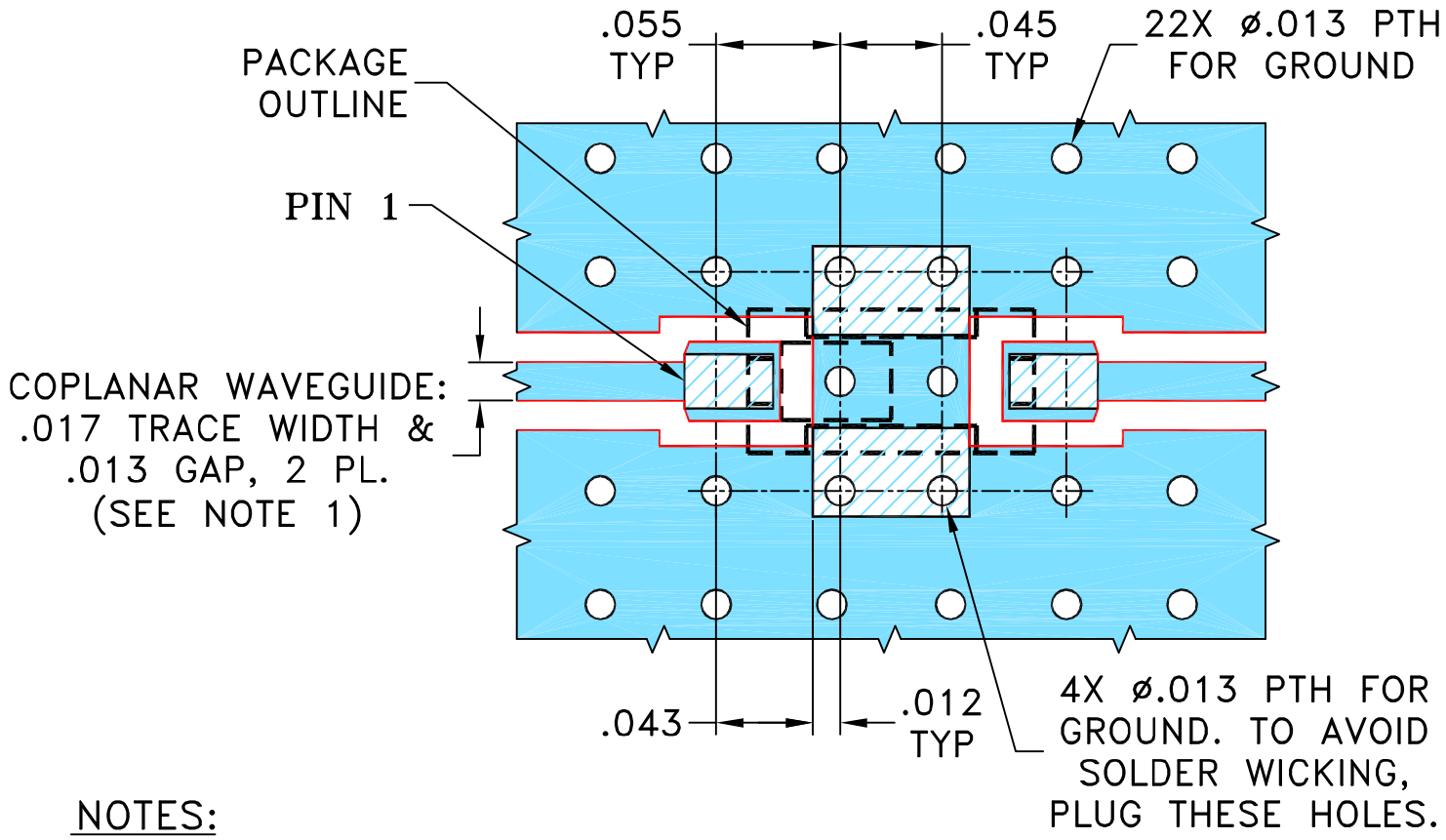
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M158043	NEW RELEASE	09/28/16	CA	ZL

SUGGESTED MOUNTING CONFIGURATION FOR FV1206-4 CASE STYLE, "04FL01" PIN CODE



NOTES:

1. TRACE WIDTH AND GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .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 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	CA	09/23/16
TOLERANCES ON:	CHECKED	IL	09/27/16
2 PL DECIMALS ±	APPROVED	ZL	09/28/16
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

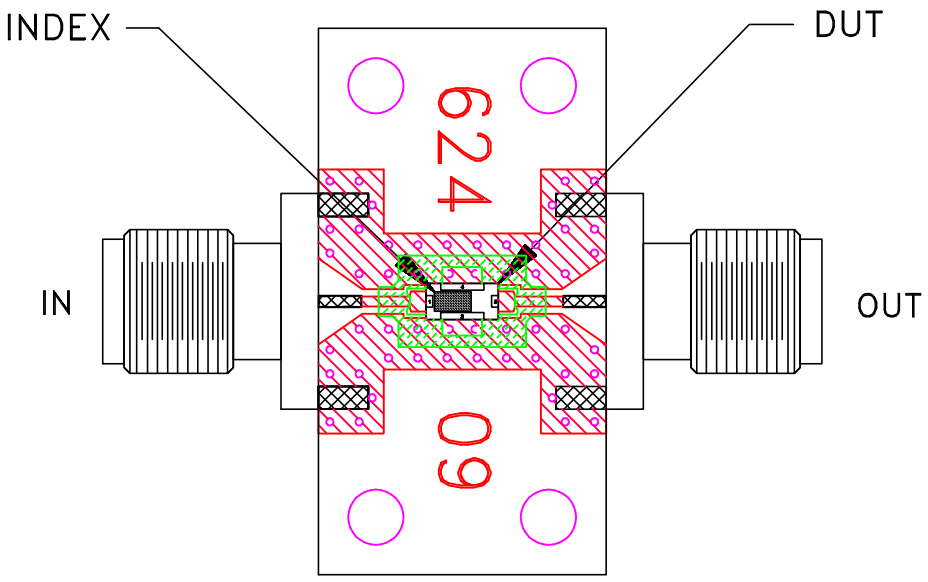
ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

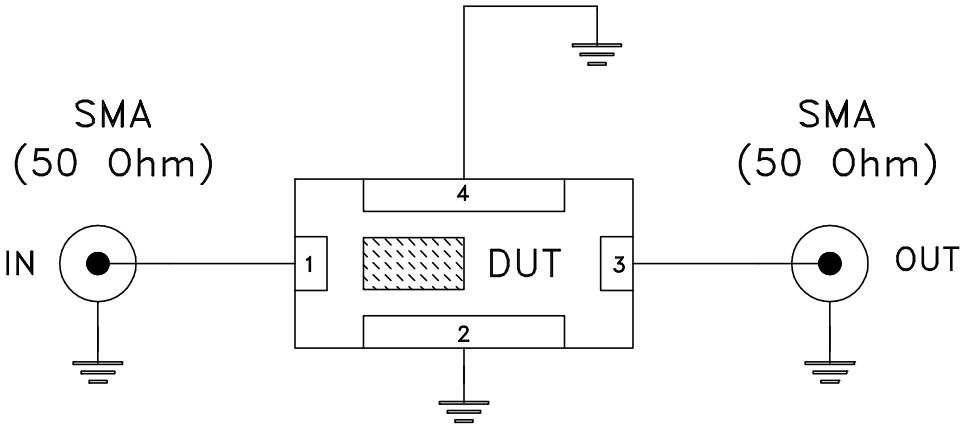
PL, 04FL01, FV1206-4, TB-860+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-487	OR
FILE: 98PL487	SCALE: 12:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



TB-860+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.010 inch.

Mini-Circuits®

Mini-Circuits

Environmental Specifications ENV06

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 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° 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 Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, 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