



CERAMIC

# Low Pass Filter

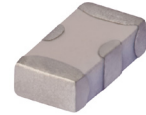
## LFCN-190+

Mini-Circuits

50Ω DC<sup>1</sup> to 190 MHz

### FEATURES

- Excellent power handling, 8W
- Small size
- 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

**+RoHS Compliant**

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

### APPLICATIONS

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

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

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Units	
Passband	Insertion Loss	DC-F1	DC-190	—	—	1.0	dB
	Freq. Cut-Off	F2	280	—	3.0	—	dB
	VSWR	DC-F1	DC-190	—	1.2	—	:1
Stop Band	Rejection Loss	F3-F4	400-510	20	—	—	—
		F4-F5	510-2850	—	40	—	dB
	VSWR	F5-F6	2850-6550	—	20	—	—
		F3-F6	400-6550	—	17	—	:1

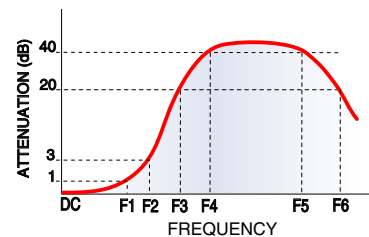
1. In Application where DC voltage is present at either input or output ports, coupling capacitors are required.  
 2. Measured on Mini-Circuits Characterization Test Board TB-270.

### ABSOLUTE MAXIMUM RATINGS

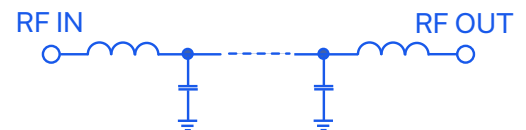
Parameter	Ratings
Operating temperature	-55°C to 100°C
Storage temperature	-55°C to 100°C
RF Power Input <sup>3</sup>	8 W max. at 25°C

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



REV. F  
 ECO-023234  
 LFCN-190+  
 MCL NY  
 241010





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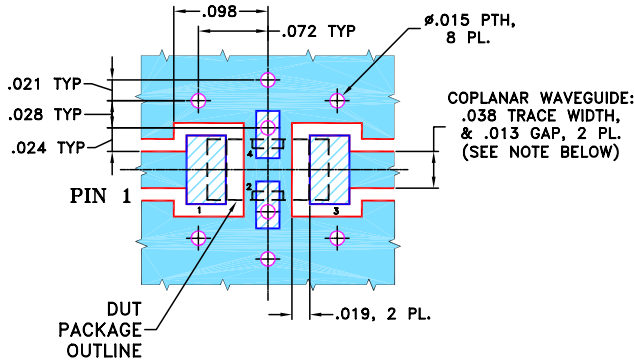
# LFCN-190+

### PIN CONNECTIONS

RF IN	1
RF OUT	3
GROUND	2,4

PRODUCT MARKING: RA

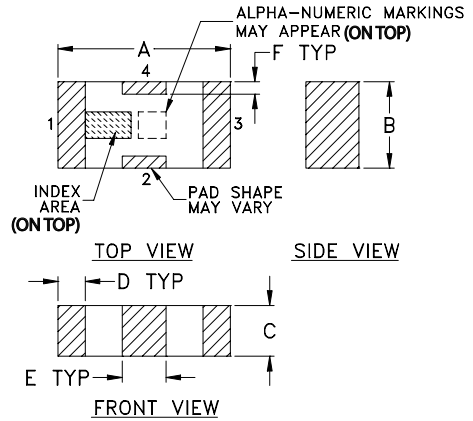
DEMO BOARD MCL P/N: TB-270  
SUGGESTED PCB LAYOUT (PL-137)



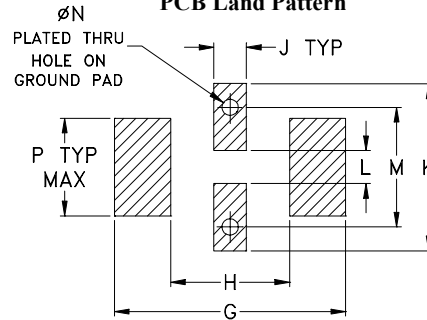
- NOTES:**
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH THICKNESS .020" ± .0015". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
  2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

### OUTLINE DRAWING



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within ±.002

### OUTLINE DIMENSIONS (Inches mm)

A	B	C	D	E	F	G
.126	.063	.037	.020	.032	.009	.169
3.20	1.60	0.94	0.51	0.81	0.23	4.29

H	J	K	L	M	N	P	wt
.087	.024	.122	.024	.087	.012	.071	grams
2.21	0.61	3.10	0.61	2.21	0.30	1.80	.020

TAPE & REEL INFORMATION: F71



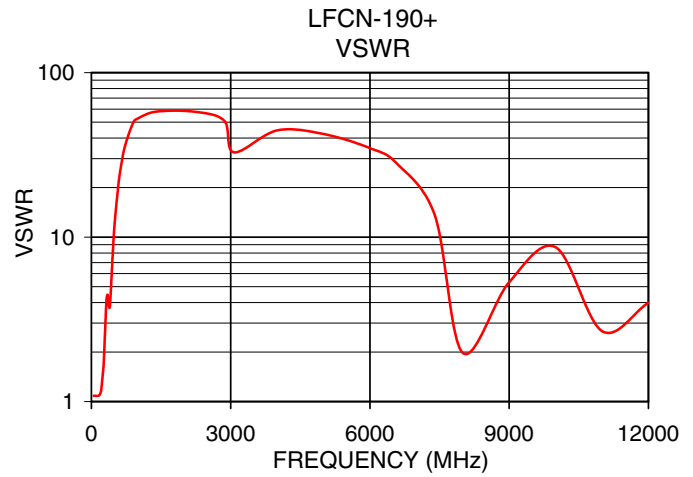
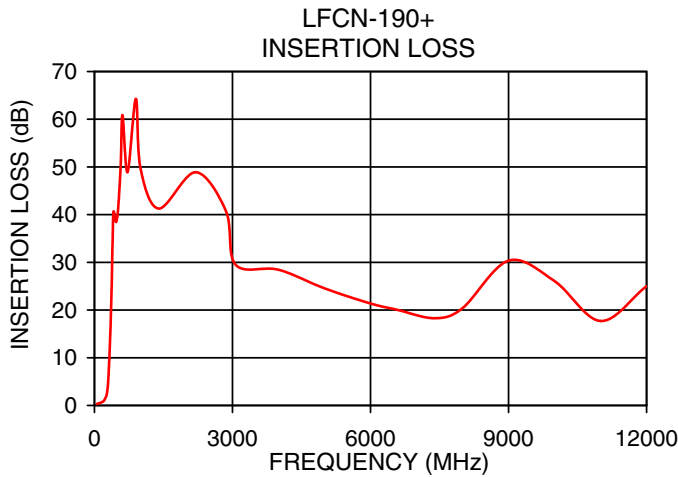
CERAMIC

# Low Pass Filter

## LFCN-190+

### TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)
40	0.27	1.09
100	0.47	1.08
170	0.73	1.09
190	0.85	1.12
250	1.66	1.46
280	3.17	2.13
310	6.90	3.47
340	13.56	4.48
375	25.53	3.86
400	36.91	3.86
510	40.53	12.89
850	58.06	46.96
1500	41.31	56.04
2850	41.87	49.64
6550	20.11	28.49
9000	30.37	5.31
12000	25.01	3.99



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



# Ceramic Low Pass Filter

# LFCN-190+

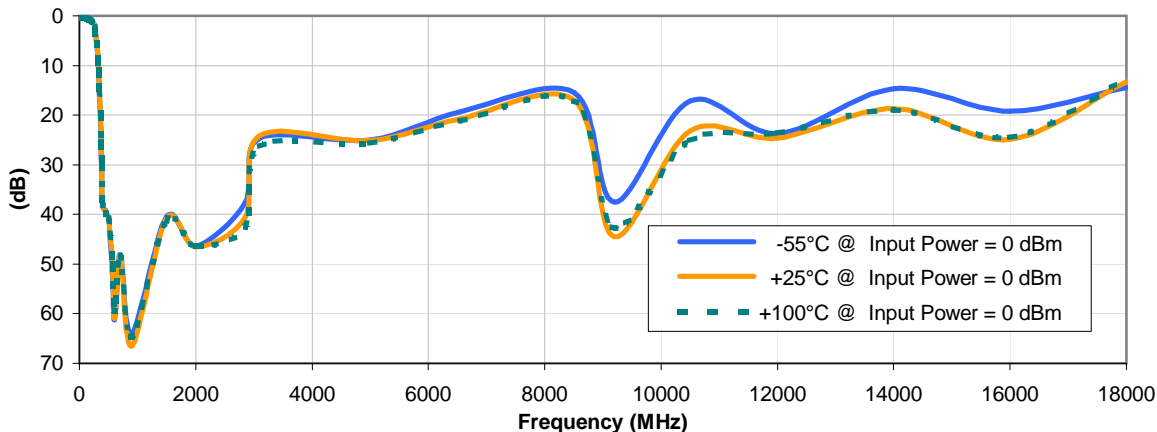
## Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURNLOSS (dB)		
	@ -55° C	@ +25° C	@ +100° C	@ -55° C	@ +25° C	@ +100° C	@ -55° C	@ +25° C	@ +100° C
40	0.20	0.25	0.35	32.80	30.27	27.56	32.97	30.31	27.25
50	0.24	0.29	0.38	32.11	29.55	27.00	32.26	29.63	26.65
70	0.29	0.35	0.44	30.61	28.36	26.32	30.65	28.47	25.89
85	0.33	0.39	0.48	30.11	28.07	26.39	29.86	28.03	25.82
100	0.37	0.43	0.53	30.00	28.05	26.73	29.39	27.83	26.01
120	0.43	0.50	0.59	29.84	28.15	27.38	28.76	27.65	26.44
130	0.46	0.54	0.63	29.67	28.23	27.78	28.35	27.54	26.66
145	0.51	0.59	0.69	29.39	28.47	28.58	27.74	27.41	26.98
155	0.55	0.63	0.74	29.17	28.70	29.32	27.27	27.23	27.09
170	0.61	0.70	0.82	28.77	29.09	30.91	26.35	26.63	26.82
185	0.69	0.79	0.91	27.77	28.73	31.79	25.10	25.46	25.86
190	0.72	0.82	0.95	27.19	28.23	31.25	24.58	24.93	25.35
200	0.78	0.89	1.03	25.54	26.48	28.63	23.35	23.65	24.09
210	0.86	0.98	1.12	23.34	24.02	25.21	21.85	22.09	22.51
260	1.86	1.99	2.18	10.99	11.32	11.40	11.88	12.44	12.95
280	3.08	3.17	3.35	6.98	7.39	7.55	8.08	8.79	9.41
300	5.40	5.34	5.46	4.10	4.50	4.72	5.30	6.00	6.65
330	11.37	11.03	10.97	1.93	2.22	2.41	3.49	3.99	4.49
345	15.47	14.97	14.84	1.48	1.72	1.88	3.41	3.81	4.22
360	20.46	19.76	19.57	1.24	1.45	1.59	3.70	4.04	4.40
375	26.59	25.62	25.34	1.10	1.30	1.43	4.09	4.50	4.89
385	31.32	30.20	29.88	1.04	1.23	1.36	4.18	4.72	5.22
400	38.37	37.66	37.52	0.97	1.15	1.28	3.87	4.60	5.30
450	39.16	39.57	39.85	0.85	1.00	1.13	2.08	2.51	3.00
510	41.26	40.93	40.71	0.73	0.87	0.99	1.14	1.34	1.53
570	52.64	50.83	49.90	0.64	0.76	0.87	0.73	0.87	1.00
600	61.27	60.99	59.52	0.59	0.71	0.81	0.61	0.73	0.85
700	48.13	48.26	48.46	0.47	0.56	0.66	0.39	0.49	0.63
900	64.01	66.47	64.69	0.31	0.39	0.46	0.27	0.35	0.54
1500	40.50	40.91	41.27	0.17	0.22	0.26	0.27	0.31	0.51
2000	46.43	46.51	46.40	0.19	0.22	0.25	0.22	0.28	0.41
2850	37.66	40.65	42.57	4.67	2.15	1.60	0.26	0.33	0.41
3100	24.65	24.11	26.25	0.86	1.32	1.46	0.60	0.76	0.78
5000	25.01	25.17	25.60	0.94	1.26	1.62	0.25	0.58	1.08
6550	19.31	20.80	21.17	0.43	0.59	0.80	0.50	0.53	0.80
8500	15.49	17.05	17.10	1.32	1.25	1.54	4.52	4.65	7.98
9200	37.52	44.50	42.72	0.72	0.74	0.92	2.59	1.30	2.00
10500	17.11	23.20	25.14	1.24	1.10	1.21	3.66	1.49	2.51
12000	23.70	24.56	23.56	4.44	6.56	6.00	5.20	9.87	13.13
14000	14.67	18.66	18.89	4.35	6.06	5.21	2.83	3.60	3.71
16000	19.17	24.92	24.49	2.37	2.53	3.62	10.24	12.46	18.70
18000	14.42	13.30	12.90	5.09	4.45	4.04	3.35	5.41	5.83

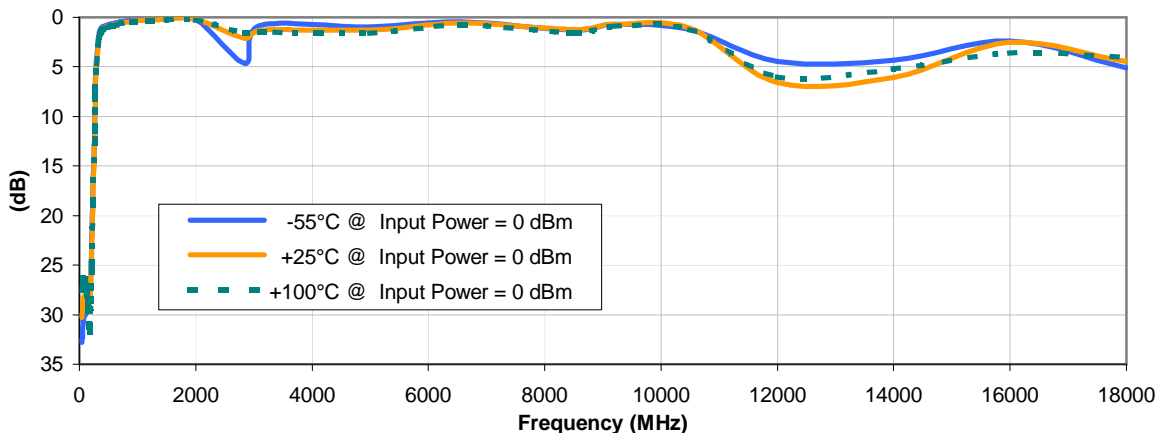


## Typical Performance Curves

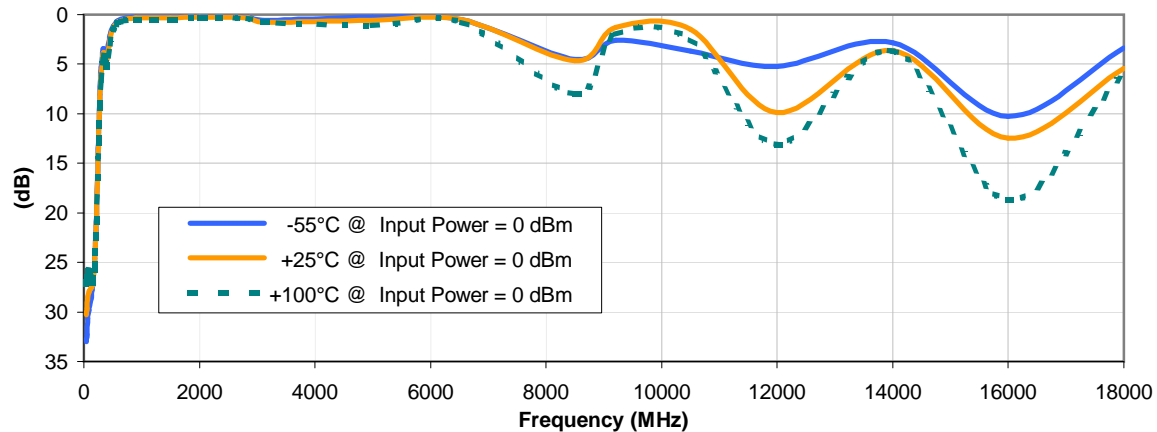
### INSERTION LOSS vs. TEMPERATURE



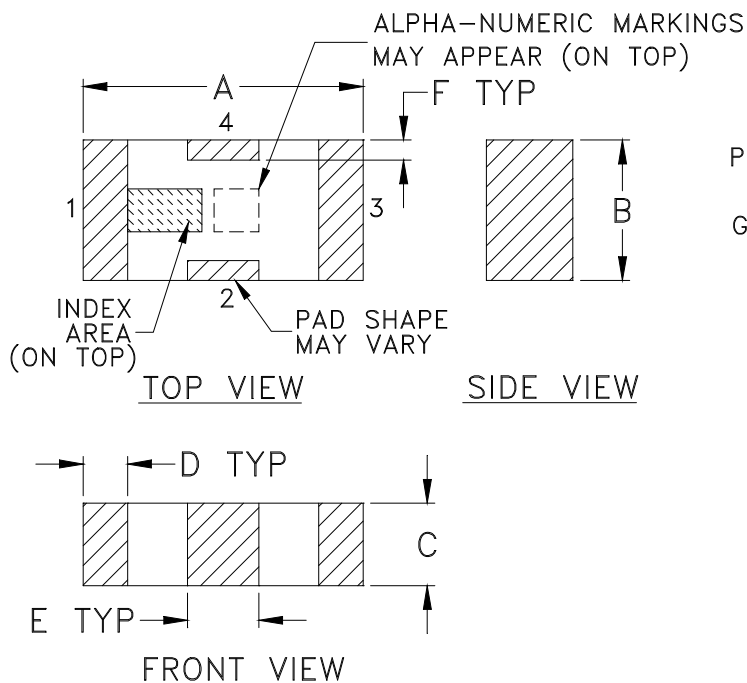
### INPUT RETURN LOSS vs. TEMPERATURE



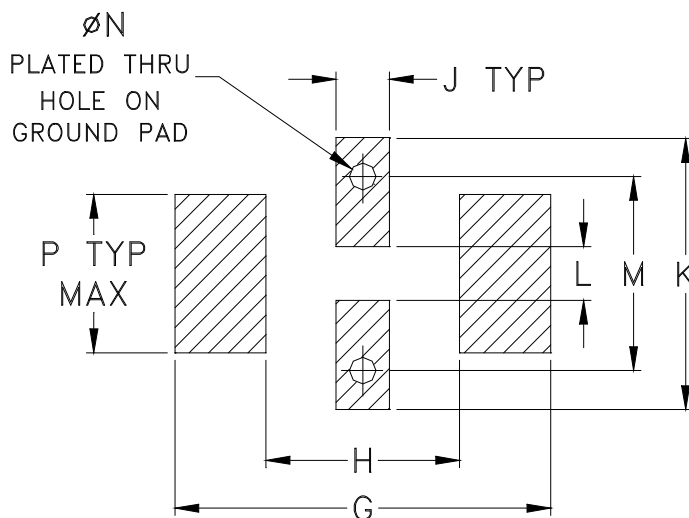
### OUTPUT RETURN LOSS vs. TEMPERATURE



### Outline Dimensions



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT. GRAM
FV1206	.126 (3.20)	.063 (1.60)	.037 (0.94)	.020 (0.51)	.032 (0.81)	.009 (0.23)	.169 (4.29)	.087 (2.21)	.024 (0.61)	.122 (3.10)	.024 (0.61)	.087 (2.21)	.012 (0.30)	.071 (1.80)	.020

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

#### Notes:

- Open style, ceramic base.
- 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.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F71

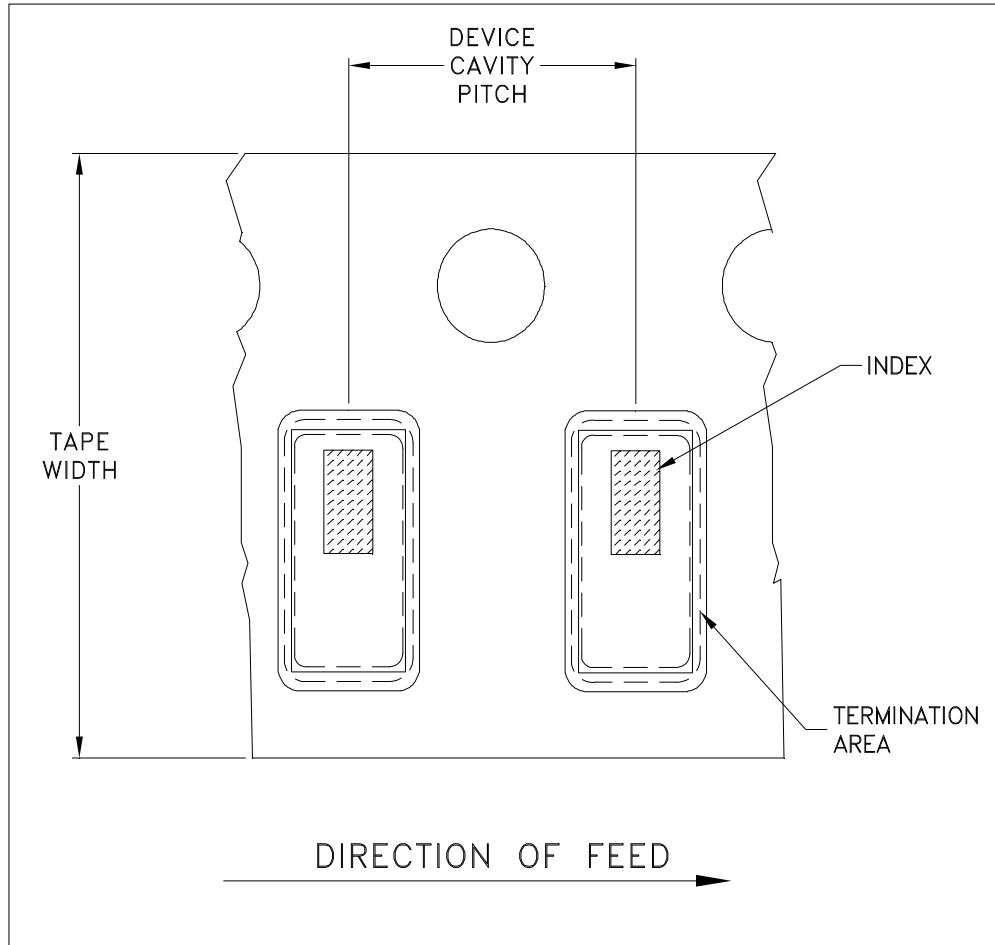


ILLUSTRATION 1

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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



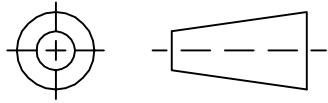
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS

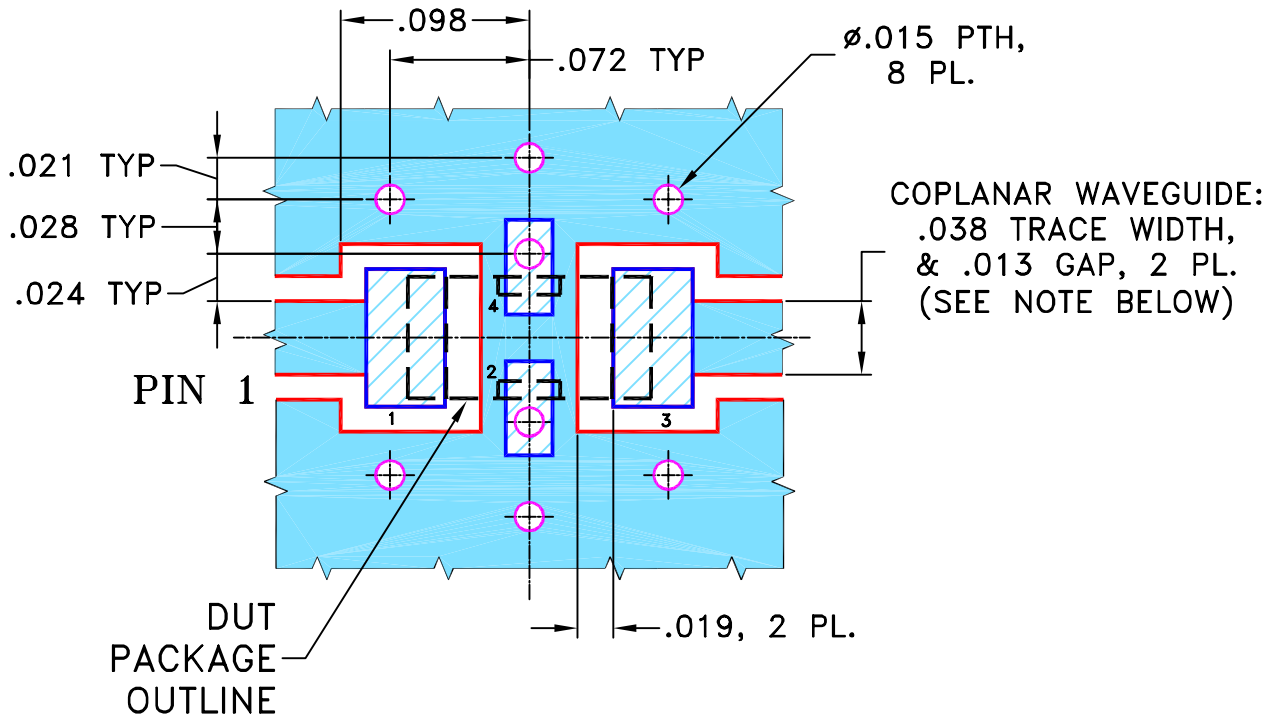
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M88634	NEW RELEASE	08/28/03	GF	ABD
A	M102713	ADDED "...WITH SMOBC"	01/17/06	MMG	IL

SUGGESTED MOUNTING CONFIGURATION  
FOR FV1206 CASE STYLE, "nx" PIN CONNECTION

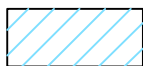


- NOTES:**
- COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH THICKNESS .020" ± .0015".  
 COPPER: 1/2 OZ. EACH SIDE.  
 FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.

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 TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	GF 08/27/03
	CHECKED	AV 08/28/03
	APPROVED	ABD 08/28/03



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 Brooklyn NY 11235

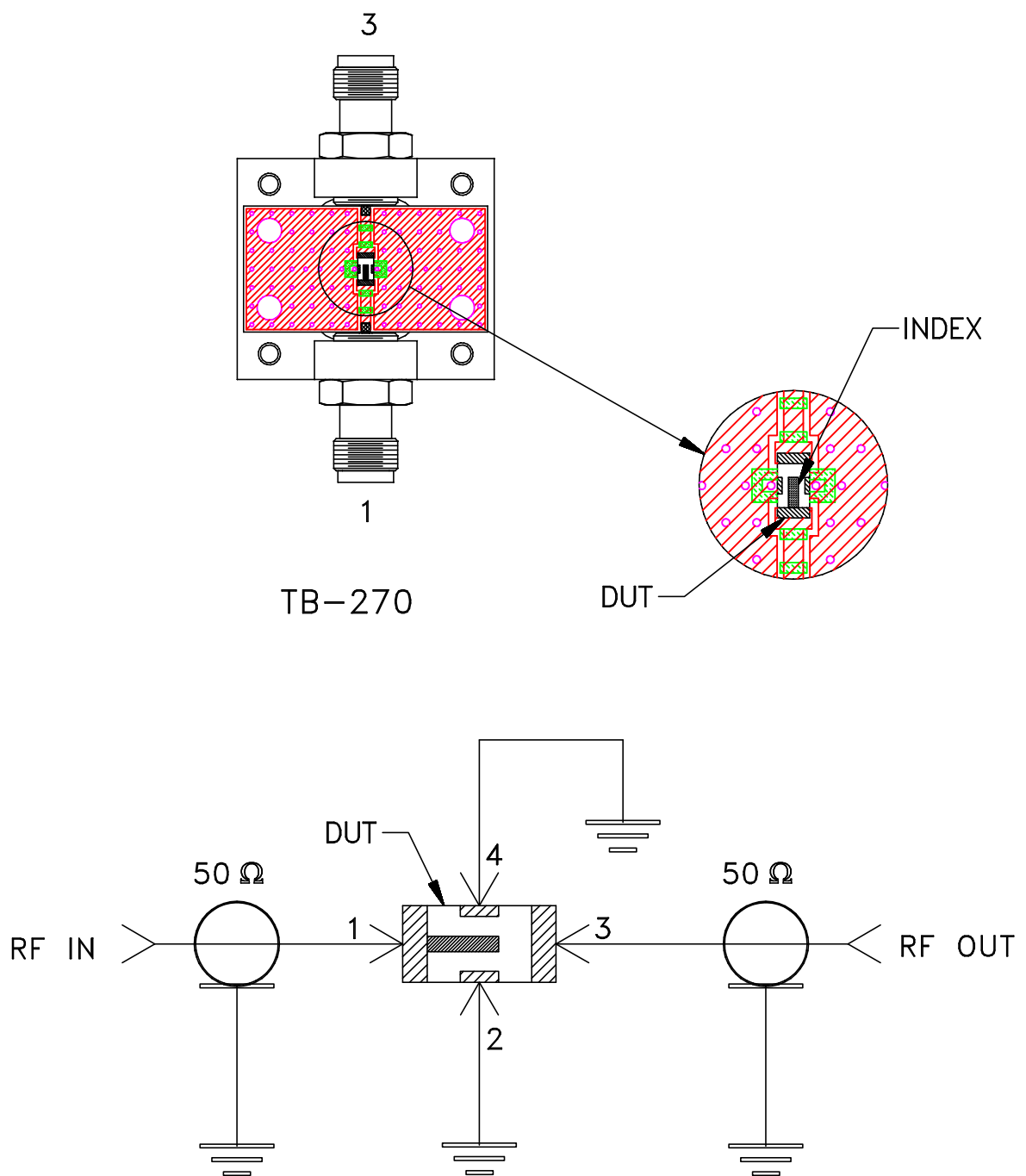
PL, nx, FV1206, LFCN/HFCN, TB-270

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-137	REV: A
FILE: 98PL137	SCALE: 10:1	SHEET: 1 OF 1	

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# Evaluation Board and Circuit




TB-270

Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: ROGERS R04350 or equivalent, Dielectric Constant=3.5, Thickness=.020 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 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