



LTCC SURFACE MOUNT

Differential Low Pass Filter

DLFCN-290+

50Ω

DC to 290 MHz

THE BIG DEAL

- Differential Operation
- Low Insertion Loss, 2.0 dB Typ.
- Passband Return Loss, 20 dB Typ.
- Stopband Rejection, 45 dB Typ.
- 1206 Surface Mount Footprint
- Power Handling: 2 W

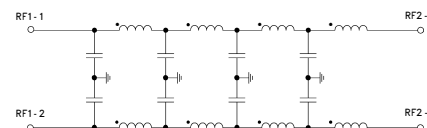


Generic photo used for illustration purposes only

APPLICATIONS

- Test and Measurement Equipment
- VHF/UHF Transmitters / Receivers
- Harmonic Rejection
- Used with PMC-Sierra's PM8910/11/12/13

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' DLFCN-290+ is a LTCC dual low pass filter with a passband from DC to 290 MHz. This can operate as balanced input / output filter. This model is ideal for applications requiring filtering of balanced signals on dual 50Ω lines such as DACs/ ADCs, systems with very low noise requirements and more. The filter provides low insertion loss in the passband, and a very wide stopband up to 2000 MHz, making it suitable for use in wideband systems with many harmonics and spurious products. The unit comes housed in a tiny, rugged 1206 ceramic package, with wraparound terminations for excellent solderability.

KEY FEATURES

Features	Advantages
Differential Filter	Allows filtering of balanced signals in a single, tiny component. Eliminates the need for binning and matching of separate discrete components.
Tiny Size (0.126" x 0.063" x 0.035")	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Wide Stopband	Provides excellent rejection over a wide band, ideal for blocking harmonics in wide band communications systems.
Wrap-around Terminations	Provides excellent solderability and easy visual inspection.



ELECTRICAL SPECIFICATIONS^{1,2} AT +25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Units	
Passband	Insertion Loss	DC-F1	DC - 290	—	2.0	3.5	dB
	Freq. Cut-Off ³	Fc	325	—	3	—	
	Return Loss	DC-F1	DC - 290	—	20	—	
Stopband	Rejection	F2	460	20	25	—	dB
		F3-F4	600 - 2000	37	45	—	

1. Tested in Evaluation Board P/N TB-DLFCN-290+.

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. Typical variation ± 5%.

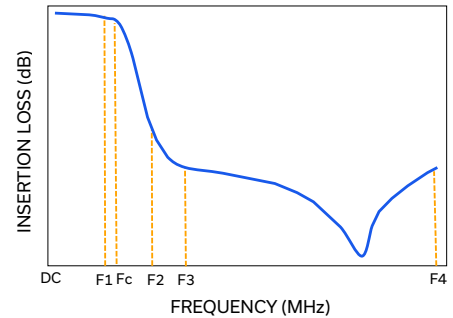
ABSOLUTE MAXIMUM RATINGS⁴

Operating Temperature	-55°C to +100°C
Storage Temperature	-55°C to +100°C
Input Power ⁵	2 W @ +25°C

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

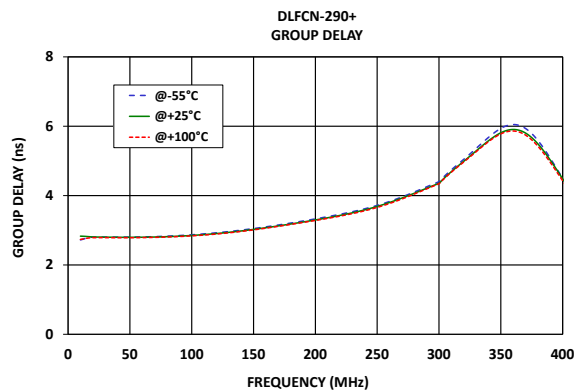
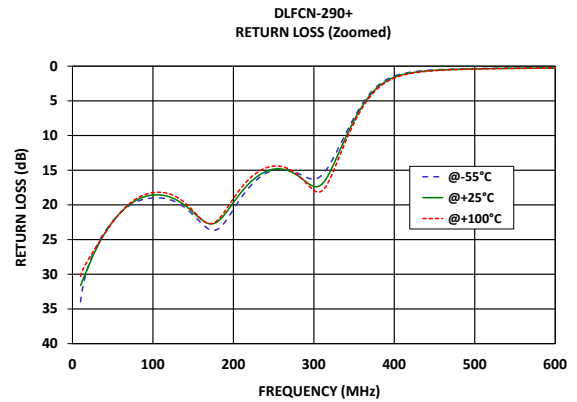
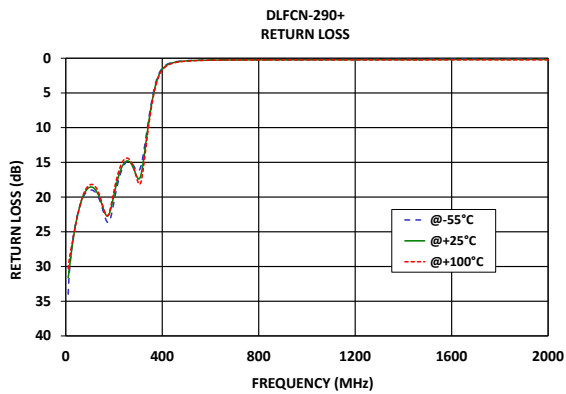
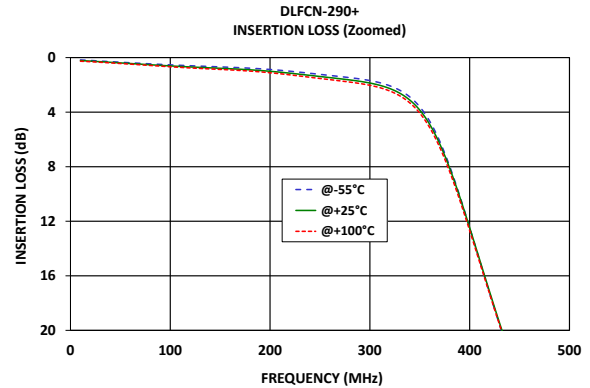
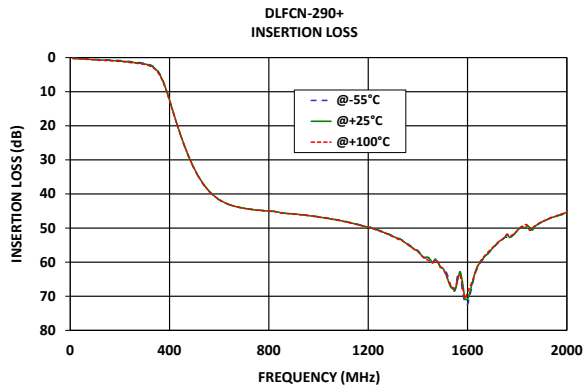
5. Power rating applies only to signals within the passband. Power rating above +25°C operating temperature decreases linearly to 1 W at +100°C.

TYPICAL FREQUENCY RESPONSE





TYPICAL PERFORMANCE GRAPHS





FUNCTIONAL DIAGRAM

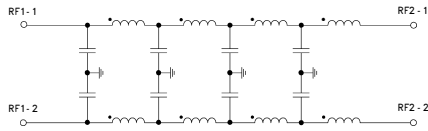
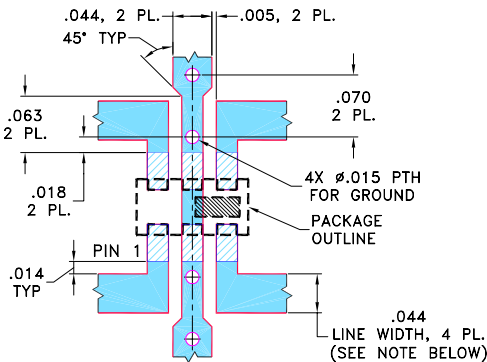


Figure 1. DLFCN-290+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1-1, RF1-2	1,6	Connects to RF Input Port
RF2-1, RF2-2	3,4	Connects to RF Output Port
GROUND	2,5	Connects to Ground on PCB, (See drawing PL-131)

SUGGESTED PCB LAYOUT

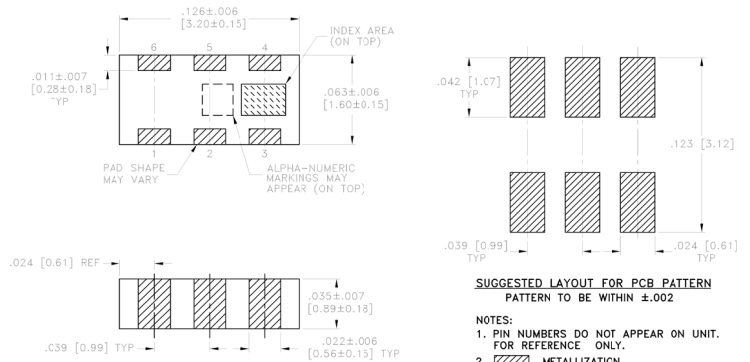


NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

Figure 2. Suggested PCB Layout

CASE STYLE DRAWING



Weight: .020 grams
Dimensions are in inches (mm). Tolerances: 2Pl. ± .01 [254]; 3Pl. ± .005 [127]

PRODUCT MARKING*: W6

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



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DLFCN-290+

50Ω

DC to 290 MHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD

[CLICK HERE](#)

Performance Data & Graphs	Data Graphs S-Parameter (S4P Files) Data Set (.zip file) De-embedded to device pads
Case Style	FV1206-1 Lead Finish: Tin over Nickel Plate
RoHS/REACH Status	Compliant
Tape and Reel	F75
Suggested Layout for PCB Design	PL-131
Evaluation Board	TB-DLFCN-290+ Gerber File
Environmental Rating	ENV06

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



Typical Performance Data

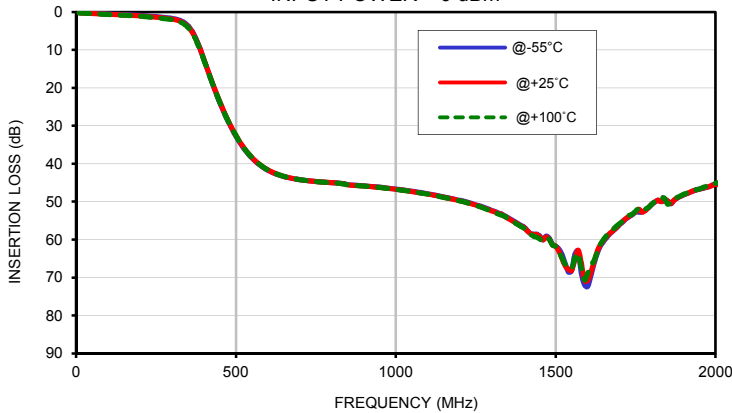
FREQ. (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-55°C	@+25°C	@+100°C	@-55°C	@+25°C	@+100°C	@-55°C	@+25°C	@+100°C
10	0.17	0.22	0.27	33.98	31.62	30.31	34.42	32.36	30.45
40	0.30	0.35	0.39	23.91	24.11	24.15	27.66	29.41	30.46
70	0.42	0.48	0.53	20.15	20.04	19.90	25.72	26.82	27.87
80	0.46	0.53	0.58	19.52	19.29	19.06	25.35	26.13	26.57
90	0.50	0.57	0.63	19.17	18.81	18.52	25.12	25.66	25.60
100	0.53	0.61	0.67	19.01	18.57	18.24	25.15	25.46	25.12
120	0.60	0.69	0.76	19.22	18.83	18.39	25.22	25.64	25.15
130	0.63	0.72	0.80	19.68	19.34	18.90	25.38	26.12	25.81
150	0.68	0.78	0.87	21.44	21.08	20.85	26.37	27.59	28.47
180	0.78	0.90	0.99	23.53	22.43	22.24	26.59	25.72	26.17
200	0.87	1.00	1.11	20.67	19.68	19.09	22.88	21.90	21.30
250	1.23	1.39	1.53	15.00	14.85	14.41	16.40	16.70	16.36
290	1.57	1.74	1.90	15.99	16.65	16.79	15.63	16.59	17.02
300	1.68	1.87	2.03	16.28	17.34	17.90	15.45	16.49	17.16
320	2.07	2.27	2.45	14.12	15.26	16.26	14.06	15.04	15.94
325	2.22	2.43	2.61	13.07	14.05	14.94	13.46	14.38	15.26
338	2.77	3.00	3.20	10.09	10.69	11.26	11.53	12.23	12.96
436	20.97	20.82	20.93	0.66	0.74	0.80	1.40	1.61	1.76
460	25.98	25.80	25.87	0.48	0.54	0.59	1.10	1.27	1.40
486	30.63	30.44	30.48	0.39	0.43	0.46	0.91	1.06	1.17
500	32.79	32.60	32.62	0.36	0.39	0.42	0.84	0.98	1.08
520	35.43	35.26	35.28	0.32	0.35	0.37	0.75	0.88	0.98
530	36.58	36.40	36.42	0.30	0.33	0.35	0.71	0.84	0.94
550	38.52	38.38	38.38	0.29	0.31	0.33	0.65	0.78	0.87
600	41.76	41.66	41.66	0.25	0.27	0.29	0.53	0.65	0.73
620	42.54	42.48	42.45	0.24	0.26	0.28	0.50	0.61	0.69
630	42.88	42.80	42.80	0.24	0.26	0.28	0.48	0.59	0.67
680	43.94	43.92	43.91	0.23	0.25	0.26	0.41	0.51	0.58
700	44.21	44.20	44.20	0.23	0.24	0.26	0.38	0.48	0.56
710	44.34	44.32	44.33	0.23	0.24	0.26	0.37	0.47	0.54
720	44.42	44.43	44.43	0.22	0.24	0.26	0.36	0.46	0.53
730	44.52	44.53	44.56	0.22	0.24	0.25	0.35	0.45	0.52
740	44.61	44.62	44.63	0.22	0.24	0.25	0.34	0.44	0.51
750	44.68	44.71	44.72	0.22	0.24	0.25	0.33	0.43	0.49
780	44.86	44.91	44.92	0.21	0.24	0.25	0.30	0.40	0.46
800	45.00	45.02	45.05	0.21	0.24	0.25	0.29	0.38	0.45
820	45.07	45.10	45.16	0.21	0.24	0.25	0.27	0.37	0.43
830	45.15	45.22	45.25	0.21	0.23	0.25	0.26	0.36	0.42
840	45.27	45.34	45.39	0.21	0.23	0.25	0.26	0.35	0.41
850	45.52	45.57	45.52	0.21	0.23	0.24	0.25	0.35	0.40
860	45.61	45.66	45.66	0.21	0.23	0.24	0.24	0.34	0.40
870	45.67	45.70	45.72	0.21	0.23	0.24	0.24	0.34	0.39
880	45.71	45.76	45.76	0.21	0.23	0.24	0.23	0.33	0.39
890	45.78	45.81	45.83	0.21	0.23	0.25	0.23	0.32	0.38
900	45.82	45.87	45.87	0.20	0.23	0.25	0.22	0.32	0.37
1000	46.68	46.75	46.77	0.20	0.22	0.24	0.17	0.27	0.32
1050	47.26	47.33	47.36	0.20	0.23	0.24	0.16	0.26	0.31
1100	47.90	47.99	48.05	0.19	0.22	0.24	0.15	0.24	0.29
1150	48.73	48.83	48.90	0.19	0.22	0.24	0.14	0.23	0.28
1200	49.65	49.75	49.81	0.18	0.22	0.24	0.13	0.23	0.27
1250	50.82	50.93	51.00	0.17	0.21	0.23	0.12	0.22	0.26
1300	52.32	52.46	52.51	0.17	0.22	0.24	0.12	0.22	0.26
1350	54.17	54.32	54.44	0.17	0.21	0.23	0.12	0.22	0.26
1400	56.62	56.75	56.94	0.17	0.21	0.24	0.13	0.22	0.26
1450	59.04	59.25	59.85	0.17	0.21	0.24	0.13	0.22	0.26
1500	61.75	61.75	61.81	0.16	0.21	0.24	0.13	0.22	0.25
1550	68.19	68.12	67.56	0.15	0.20	0.23	0.14	0.22	0.26
1600	72.36	70.82	68.88	0.14	0.20	0.23	0.14	0.23	0.26
1800	50.65	50.74	50.77	0.13	0.19	0.23	0.17	0.25	0.28
2000	45.44	45.34	45.15	0.11	0.19	0.23	0.20	0.28	0.29

Typical Performance Data

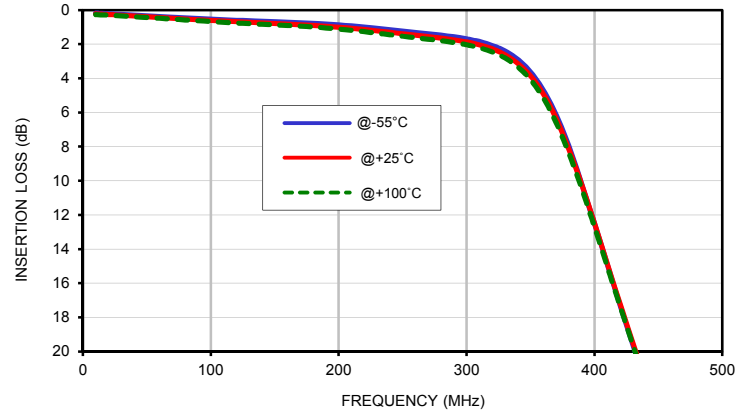
FREQ. (MHz)	GROUP DELAY		
	(nsec)		
	@-55°C	@+25°C	@+100°C
10	2.72	2.83	2.74
16	2.78	2.82	2.77
20	2.80	2.81	2.79
25	2.80	2.80	2.79
30	2.80	2.80	2.79
35	2.80	2.80	2.79
40	2.80	2.80	2.78
45	2.80	2.80	2.78
50	2.80	2.80	2.79
55	2.80	2.80	2.79
60	2.81	2.80	2.79
65	2.81	2.80	2.79
70	2.82	2.81	2.79
75	2.82	2.81	2.80
80	2.83	2.82	2.81
85	2.84	2.82	2.81
90	2.85	2.83	2.82
95	2.86	2.84	2.83
100	2.87	2.85	2.84
105	2.88	2.86	2.85
110	2.90	2.88	2.86
115	2.91	2.89	2.88
120	2.93	2.90	2.89
130	2.96	2.94	2.93
140	3.00	2.98	2.97
150	3.05	3.02	3.01
160	3.10	3.07	3.06
170	3.15	3.13	3.11
180	3.21	3.18	3.17
190	3.27	3.24	3.22
200	3.33	3.30	3.28
210	3.39	3.36	3.34
220	3.46	3.43	3.41
230	3.54	3.50	3.48
240	3.62	3.59	3.56
250	3.72	3.69	3.66
260	3.83	3.80	3.77
270	3.96	3.93	3.90
275	4.03	4.00	3.97
280	4.10	4.07	4.04
290	4.25	4.21	4.19

Typical Performance Curves

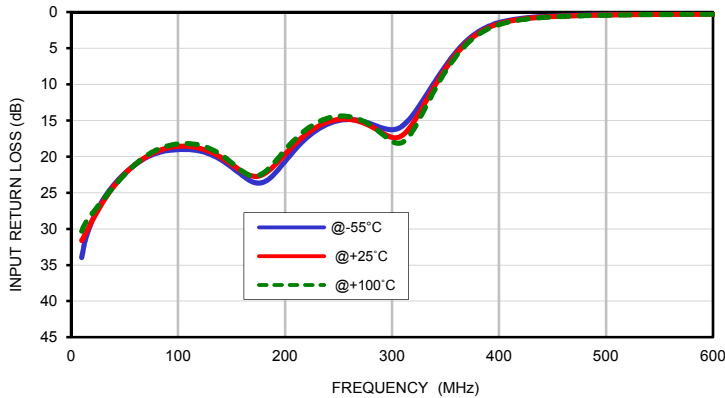
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



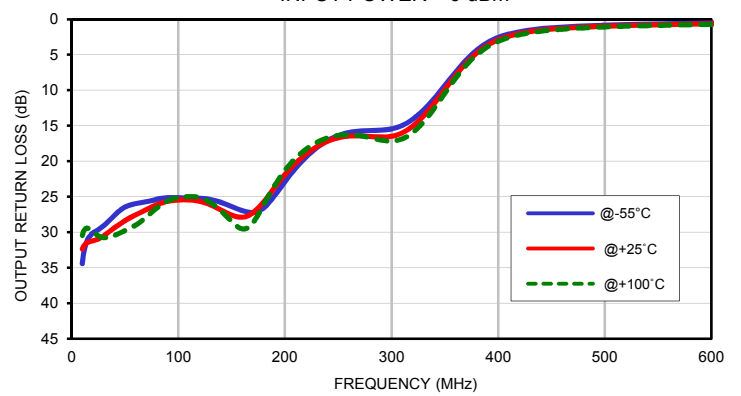
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



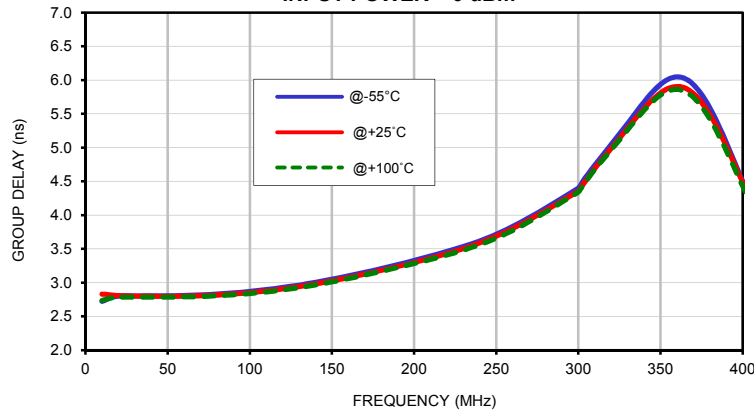
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



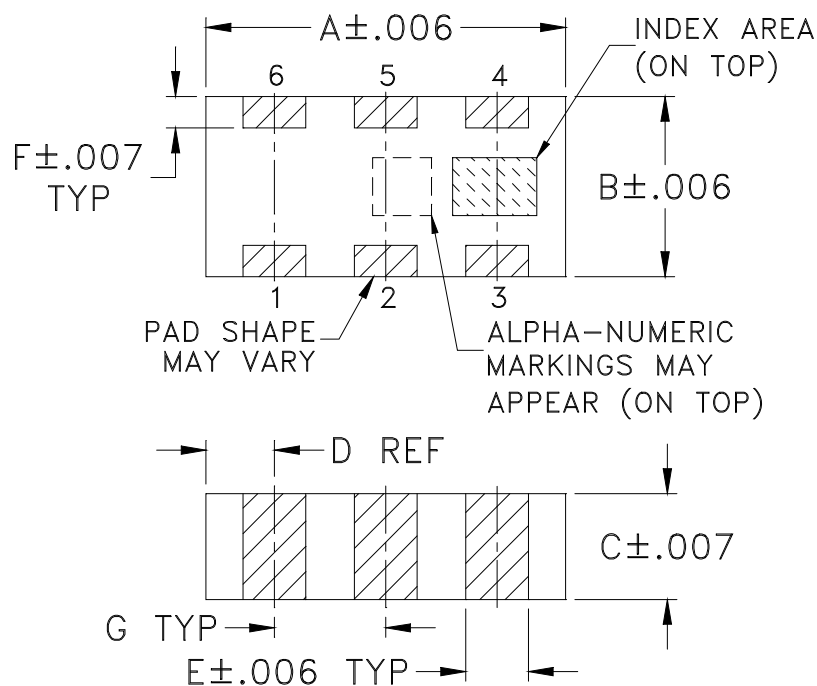
OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



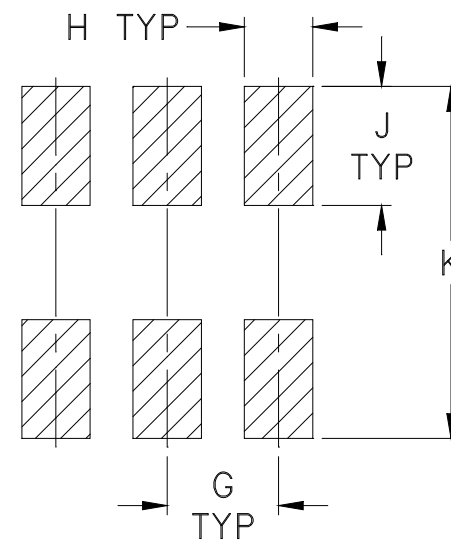
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



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
FV1206-1	.126 (3.20)	.063 (1.60)	.035 (0.89)	.024 (0.61)	.022 (0.56)	.011 (0.28)	.039 (0.99)	.024 (0.61)	.042 (1.07)	.123 (3.12)	--	--	--	--	.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

RF/IF MICROWAVE COMPONENTS

DEVICE ORIENTATION IN T&R

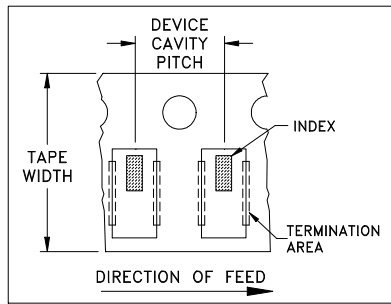


ILLUSTRATION 1

Applicable Case Styles
FV1206-1 FV1206-3

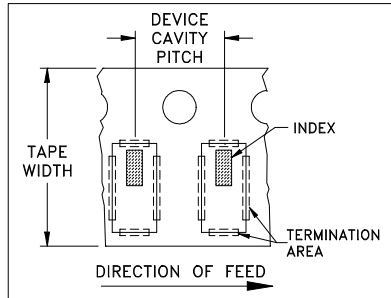


ILLUSTRATION 2

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

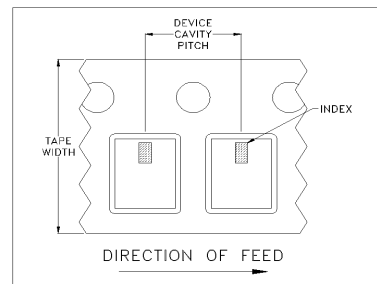


ILLUSTRATION 3

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

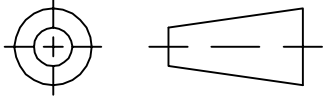


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P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

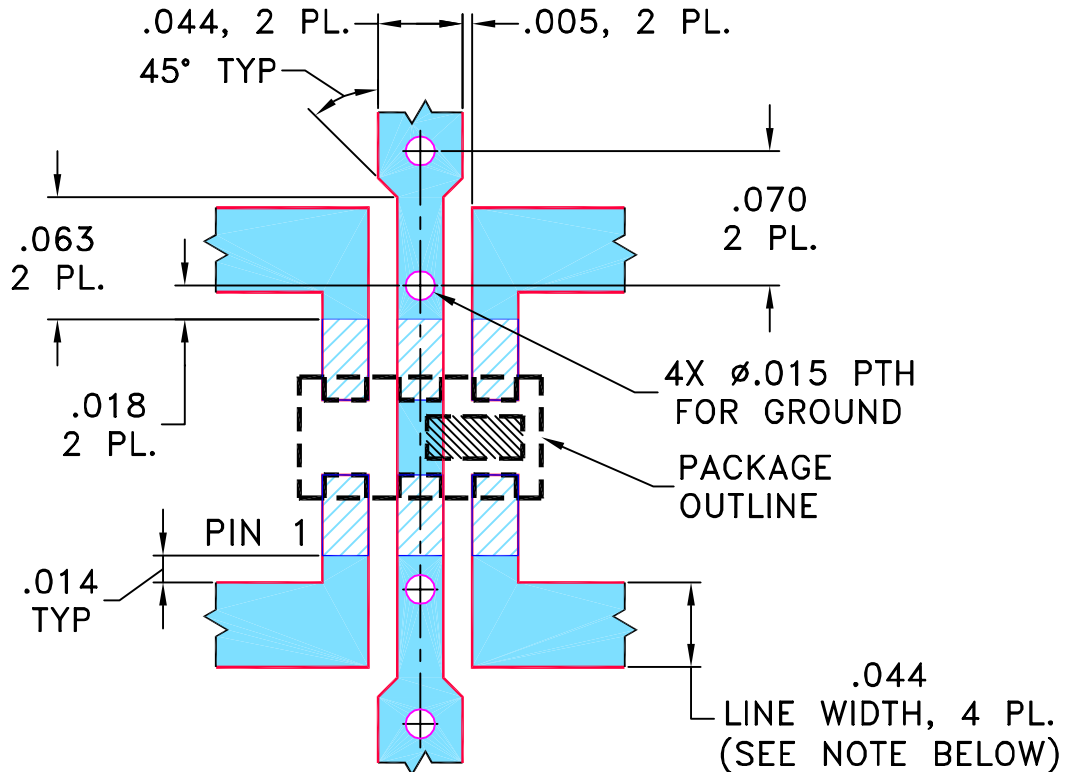
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M87001	NEW RELEASE	05/20/03	MMG	ABD
A	M87231	CORRECTED DWG.	05/28/03	MMG	ABD
B	M91636	ADDED "pn" PIN CONNECTION	04/07/04	AV	ABD
C	M102713	ADDED "...WITH SMOBC"	01/16/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION
FOR FV1206-1 CASE STYLE, "pb/pn" PIN CONNECTIONS

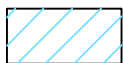


NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

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	MMG 05/14/03
	CHECKED	AV 05/19/03
	APPROVED	ABD 05/20/03



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

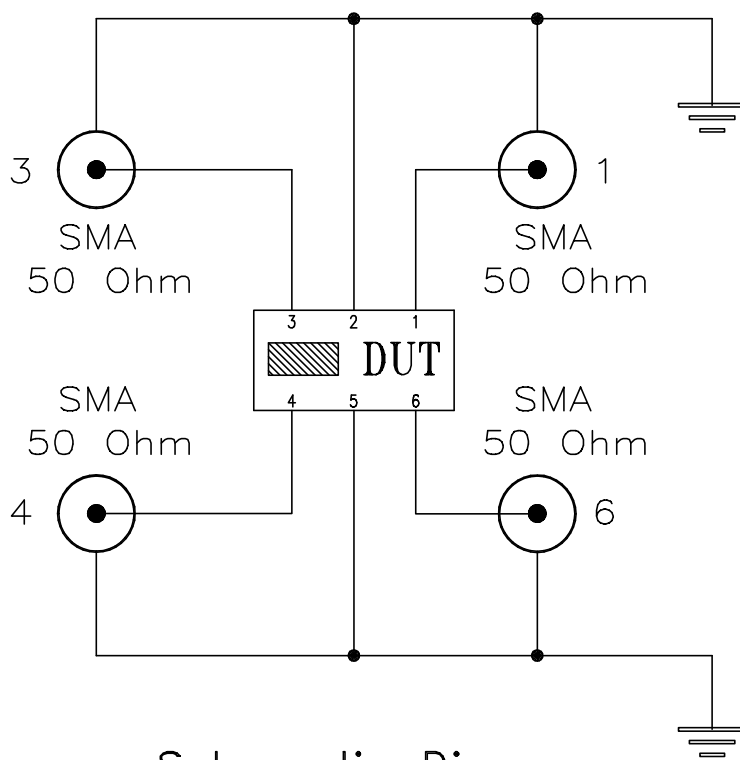
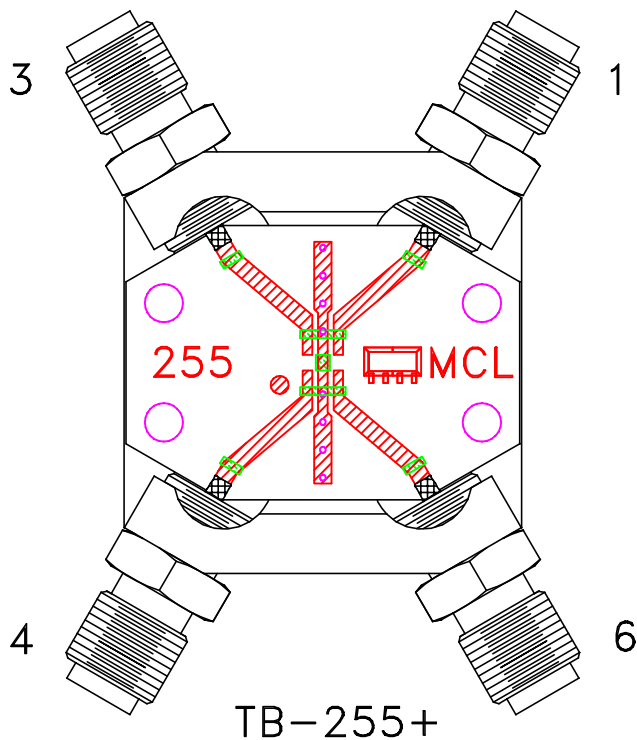
PL, pb/pn, FV1206-1, QCN/BDCN, TB-255

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-131	REV: C
FILE: 98PL131	SCALE: 10:1	SHEET: 1 OF 1	

Evaluation Board and Circuit


For Pin Connections refer to Data Sheet of the DUT



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