LTCC SURFACE MOUNT

Bandpass Filter

BFTC-415+

50Ω 330 to 500 MHz

THE BIG DEAL

- Insertion Loss, 4 dB Typ.
- Passband Return Loss, 14 dB Typ.
- Power Handling: 4 W

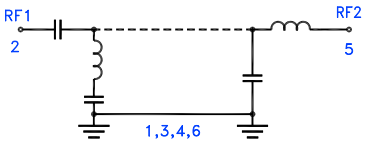


Generic photo used for illustration purposes only

APPLICATIONS

- Test and Measurement Equipment
- Harmonic Rejection
- Transmitters / Receiver

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' BFTC-415+ LTCC Bandpass Filter covers the 330 to 500 MHz passband with 25 dB upper / lower stopband rejection. This model handles up to 4 W RF input power and provides a wide operating temperature range from -40 to +85°C. Utilizing LTCC multi-layer construction, the filter achieves excellent repeatability of performance and comes in a tiny ceramic package saving space in dense PCB layouts.

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

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Passband	Center Frequency[3]	—	—	—	415	—	MHz
	Insertion Loss	F1-F2	330 - 500	—	4	5.5	dB
	Return Loss	F1-F2	330 - 500	—	14	—	dB
Stopband, Lower	Rejection	DC-F3	DC - 240	25	36	—	dB
Stopband, Upper	Rejection	F4-F5	650 - 1800	25	36	—	dB

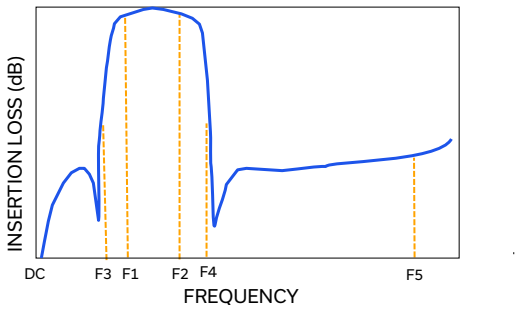
1. Tested in Evaluation Board P/N TB-BFTC-415+.
2. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.
3. Typical variation ± 5%.

ABSOLUTE MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Input Power[5]	4 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 2 W at +85°C.

TYPICAL FREQUENCY RESPONSE AT +25°C



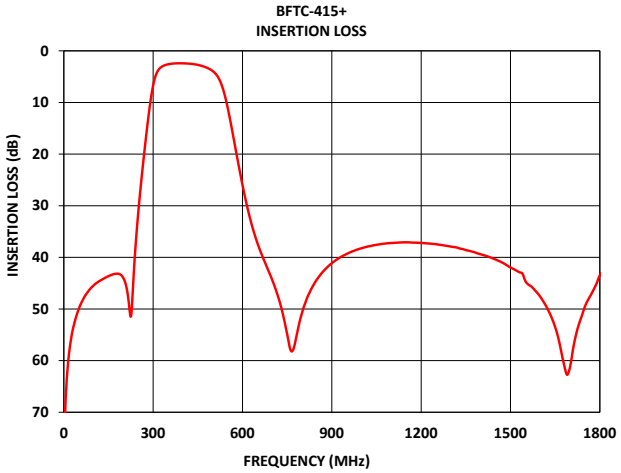
REV. D
ECO-030198
BFTC-415+
EDU2824
MCINU
260717

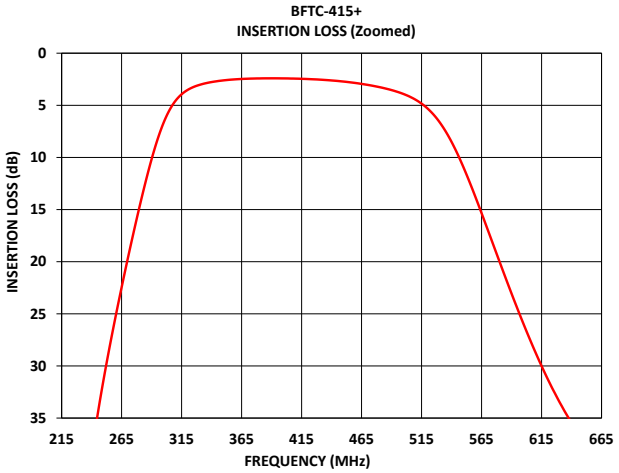
Bandpass Filter

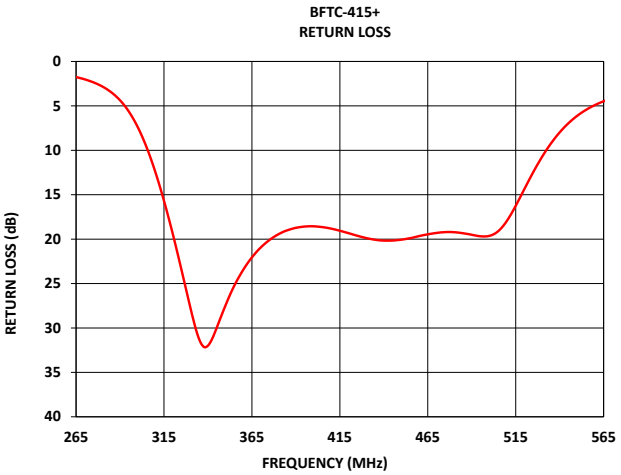
BFTC-415+

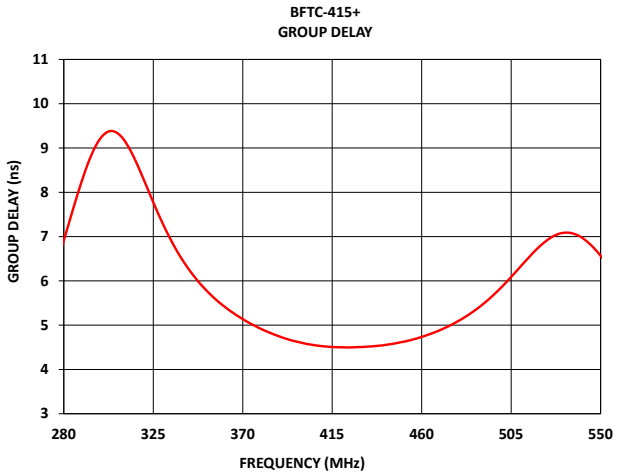
50Ω 330 to 500 MHz

TYPICAL PERFORMANCE GRAPHS









LTCC SURFACE MOUNT

Bandpass Filter

BFTC-415+

50Ω 330 to 500 MHz

FUNCTIONAL DIAGRAM

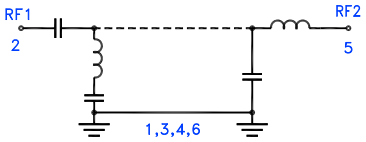
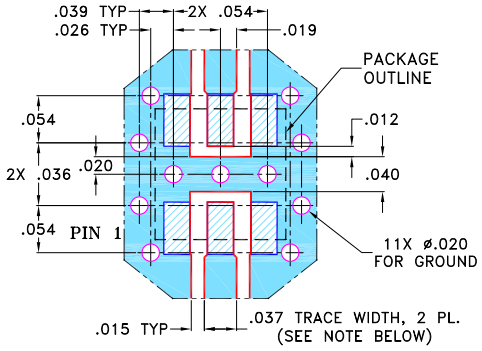


Figure 1. BFTC-415+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1	2	Connects to RF Input Port
RF2	5	Connects to RF Output Port
GROUND	1,3,4,6	Connects to Ground on PCB, (See drawing PL-112)

SUGGESTED PCB LAYOUT (PL-112)



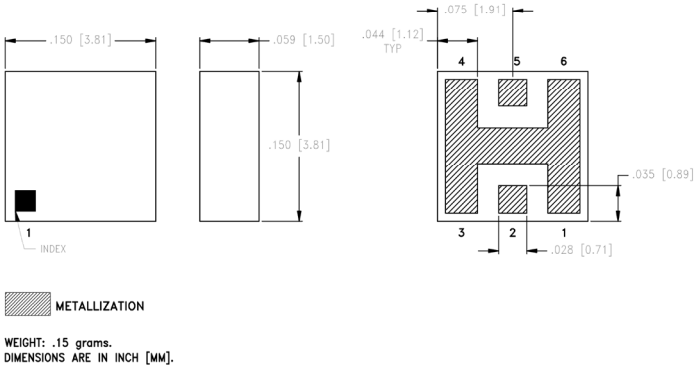
NOTES: 1.TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2.BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Figure 2. Suggested PCB Layout

CASE STYLE DRAWING



WEIGHT: .15 grams.
DIMENSIONS ARE IN INCH [MM].

PRODUCT MARKING*: L347

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

LTCC SURFACE MOUNT

Bandpass Filter

BFTC-415+

50 330 to 500 MHz

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	FR933-1 Lead Finish: Palladium Silver
RoHS Status	Compliant
Tape and Reel	F68
Suggested Layout for PCB Design	PL-112
Evaluation Board	TB-BFTC-415+ Gerber File
Environmental Rating	ENV02T1

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 BFTC-415+

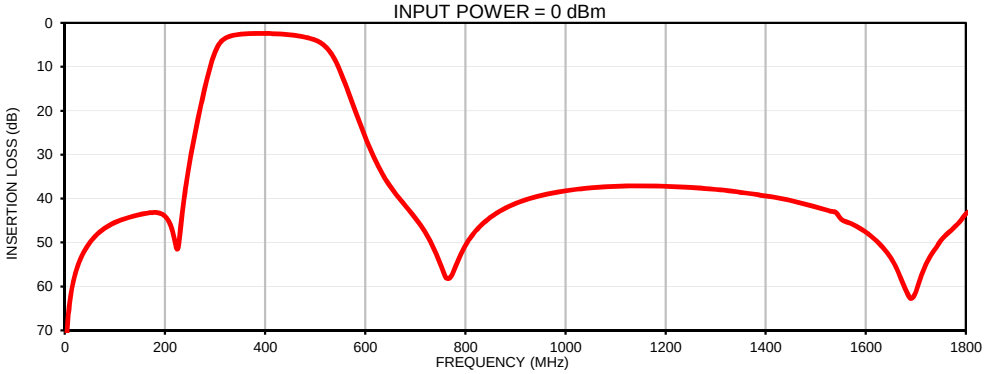
Typical Performance Data

FREQ. (MHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
1	82.97	0.00	0.00
10	63.43	0.00	0.01
20	57.48	0.00	0.02
50	49.99	0.02	0.12
100	45.44	0.08	0.48
150	43.64	0.23	1.04
175	43.17	0.34	1.33
200	44.01	0.52	1.61
220	49.75	0.72	1.83
240	38.50	1.02	2.06
250	31.29	1.24	2.21
252	30.02	1.29	2.25
268	20.84	1.91	2.70
286	11.89	3.63	4.16
290	10.17	4.37	4.85
296	7.91	5.94	6.34
300	6.67	7.36	7.73
320	3.53	19.43	20.83
330	3.04	27.72	34.49
340	2.77	31.99	40.66
350	2.61	27.45	33.86
360	2.51	23.47	29.25
380	2.42	19.46	23.40
400	2.42	18.56	21.70
415	2.46	19.06	22.38
440	2.62	20.17	27.08
460	2.86	19.66	28.20
480	3.26	19.22	25.15
500	3.92	19.63	26.92
520	5.31	14.34	16.55
540	8.51	7.98	8.17
560	13.83	4.91	4.50
580	20.00	3.59	2.98
600	25.98	2.87	2.25
618	30.74	2.42	1.86
620	31.22	2.37	1.82
630	33.47	2.17	1.67
640	35.46	1.99	1.54
650	37.22	1.82	1.43
700	44.42	1.25	1.05
750	54.87	0.93	0.82
800	50.75	0.75	0.69
850	44.27	0.66	0.58
900	41.12	0.61	0.52
950	39.33	0.60	0.47
1000	38.23	0.60	0.44
1050	37.57	0.62	0.41
1100	37.22	0.64	0.39
1150	37.08	0.67	0.38
1200	37.21	0.71	0.36
1250	37.45	0.75	0.36
1300	37.92	0.78	0.35
1350	38.59	0.83	0.34
1400	39.41	0.87	0.34
1450	40.42	0.91	0.33
1500	41.96	0.97	0.33
1600	47.63	1.07	0.32
1700	61.22	1.22	0.32
1760	48.28	1.29	0.32
1800	43.43	1.36	0.32

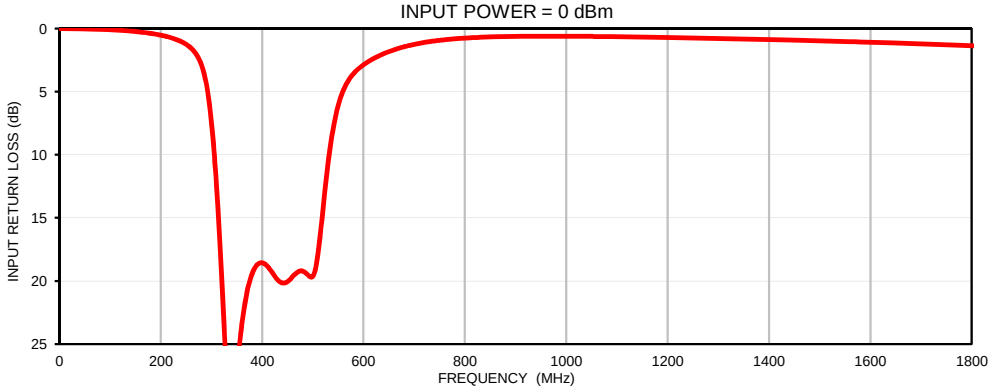
FREQ. (MHz)	Group Delay (ns)
330	7.27
332	7.09
334	6.91
336	6.75
338	6.59
340	6.45
342	6.32
344	6.19
346	6.08
348	5.97
350	5.87
352	5.77
354	5.68
356	5.60
358	5.52
360	5.45
362	5.38
364	5.31
366	5.25
368	5.19
370	5.14
372	5.08
374	5.03
376	4.99
378	4.94
380	4.90
382	4.86
384	4.82
386	4.79
388	4.75
390	4.72
394	4.66
398	4.62
402	4.58
406	4.55
410	4.53
414	4.51
415	4.51
422	4.50
426	4.50
430	4.51
434	4.52
438	4.53
442	4.56
446	4.58
450	4.62
454	4.66
458	4.71
462	4.76
466	4.83
470	4.90
474	4.99
478	5.08
482	5.19
486	5.31
490	5.44
494	5.59
496	5.68
498	5.76
500	5.85

Typical Performance Curves

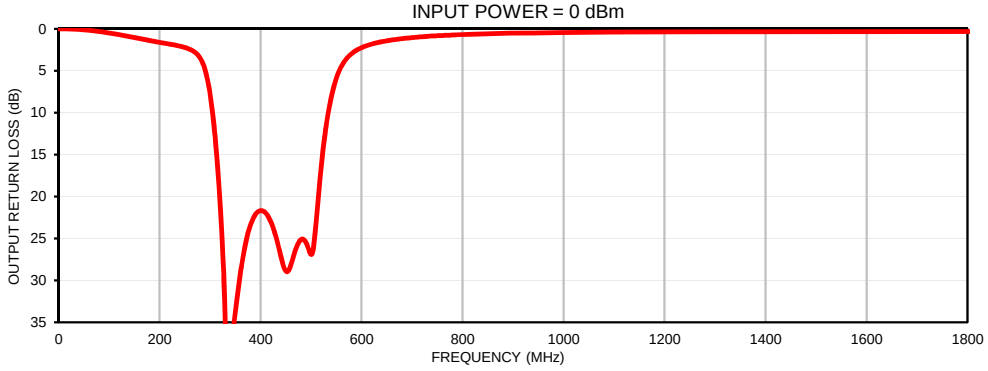
INSERTION LOSS
INPUT POWER = 0 dBm



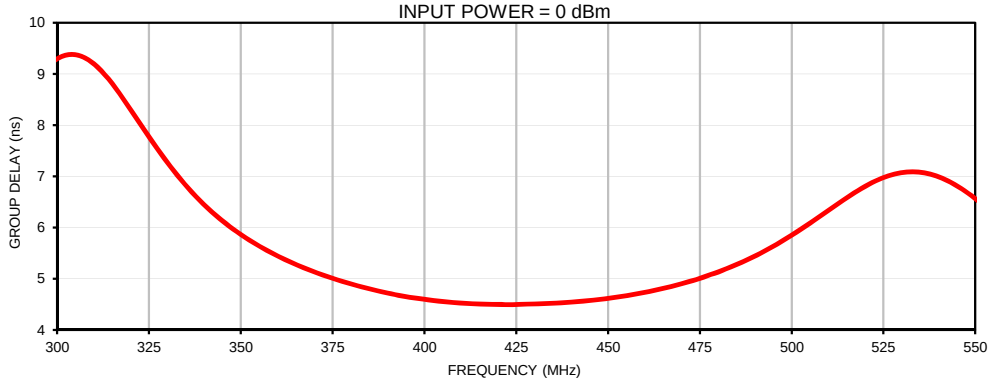
INPUT RETURN LOSS
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS
INPUT POWER = 0 dBm



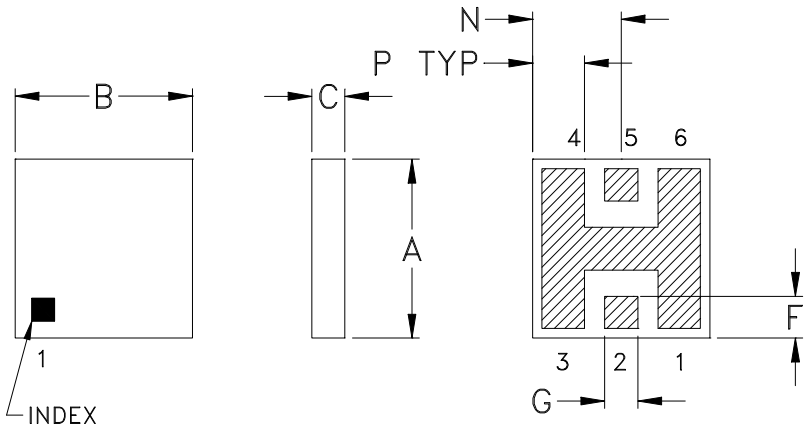
GROUP DELAY
INPUT POWER = 0 dBm



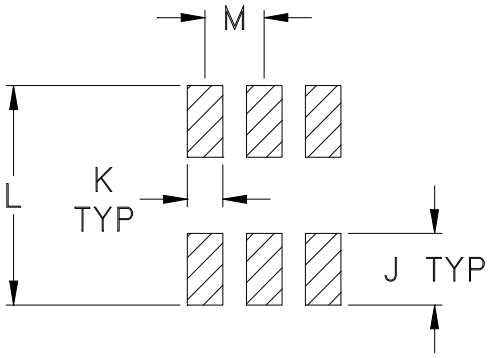
Case Style FR

FR933-1

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
FR933-1	.150 (3.81)	.150 (3.81)	.059 (1.50)	-- --	-- --	.035 (0.89)	.028 (0.71)	-- --	.060 (1.52)	.030 (0.76)	.184 (4.67)	.050 (1.27)

CASE #	N	P	WT. GRAM
FR933-1	.075 (1.91)	.044 (1.12)	0.15

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

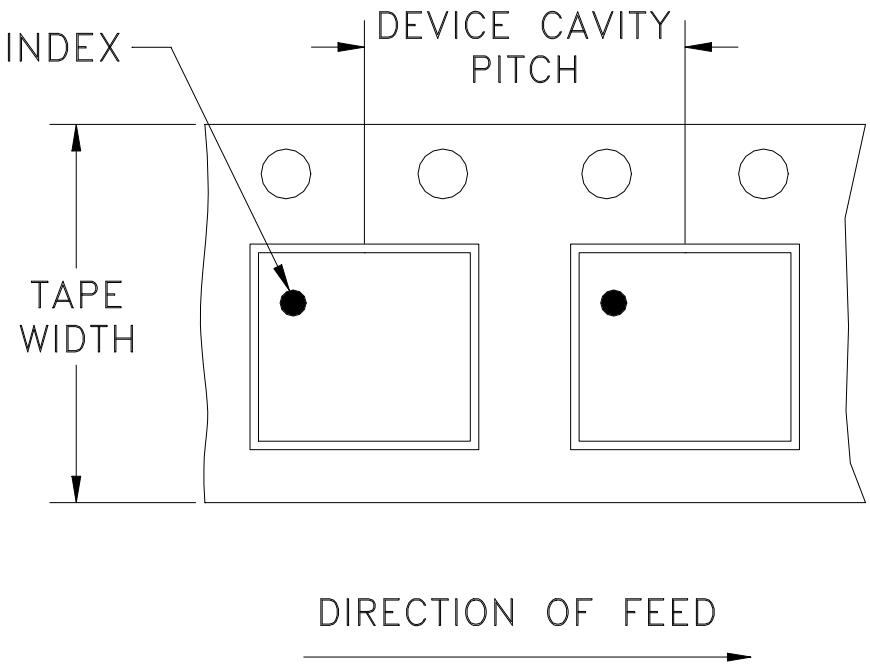
Notes:
1. Open style, Ceramic Base.
2. Termination finish: Palladium Silver.

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Tape & Reel Packaging TR-F68

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
12	8	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000
		13	Standard	2000
				3000
				4000

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

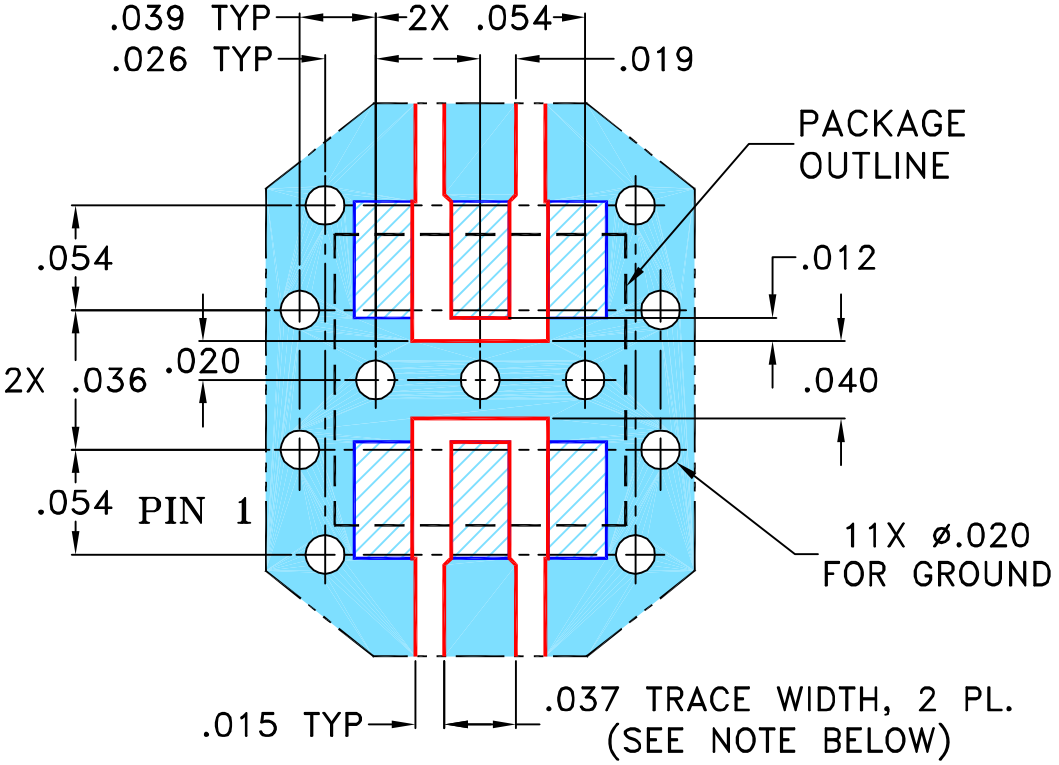
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M83007	NEW RELEASE	09/04/02	MMG	LER
A	M83501	CNG LAYOUT AS PER B14-TB-233	10/01/02	MMG	ABD
B	M102713	ADDED "...WITH SMOBC"	01/14/06	GF	IL
C	M164713	ADDED "933-1 & 06FL03"	11/15/17	CA	IL

SUGGESTED MOUNTING CONFIGURATION
FOR FR932/933/933-1 CASE STYLE, "06FL03" PIN CONNECTION



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	DRAWN	MMG	09/04/02
TOLERANCES ON:	CHECKED		
2 PL DECIMALS ±	APPROVED	LER(BC)	09/04/02
3 PL DECIMALS ±			
ANGLES ±			
FRACTIONS ±			

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

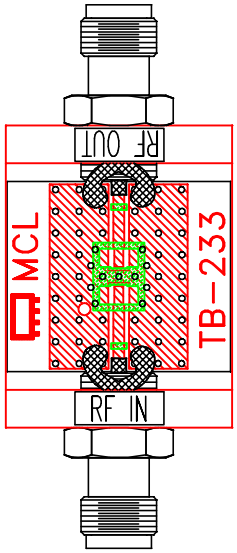
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 06FL03, FR932/933/933-1, TB-233

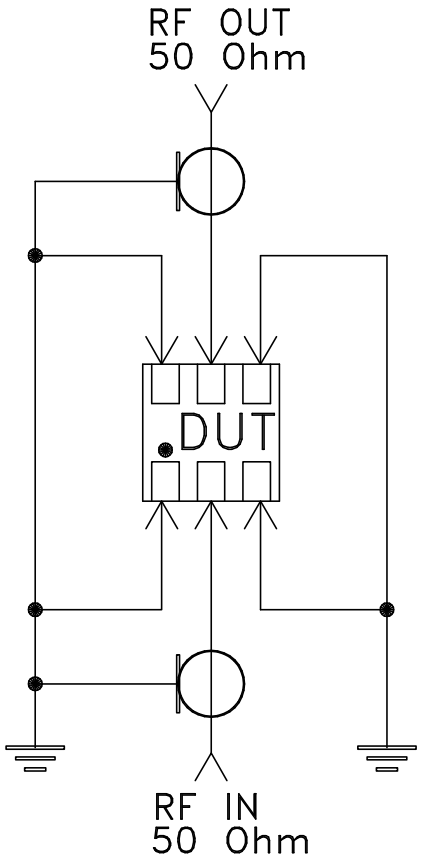
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-112	C

FILE:	SCALE:	SHEET:
98PL112	10:1	1 OF 1

Evaluation Board and Circuit



TB-233



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.

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Environmental Specifications ENV02T1

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	-40° to 85°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
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
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, 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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215

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