

# Bandpass Filter

50Ω 160 to 185 MHz

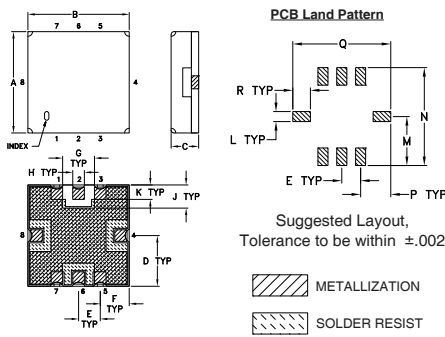
## Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W at 25°C
Permanent damage may occur if any of these limits are exceeded.	

## Pin Connections

RF IN	2
RF OUT	6
GROUND	1,3,4,5,7,8

## Outline Drawing

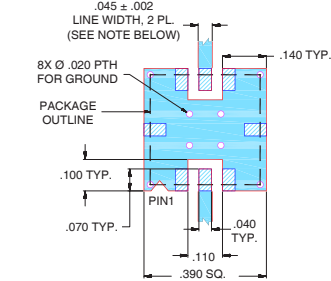


## Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J
.350	.350	.100	.175	.075	.100	.110	.040	.080
8.89	8.89	2.54	4.45	1.91	2.54	2.79	1.02	2.03
K	L	M	N	P	Q	R		wt
.050	.040	.195	.390	.120	.390	.070		grams
1.27	1.02	4.95	9.91	3.05	9.91	1.78		

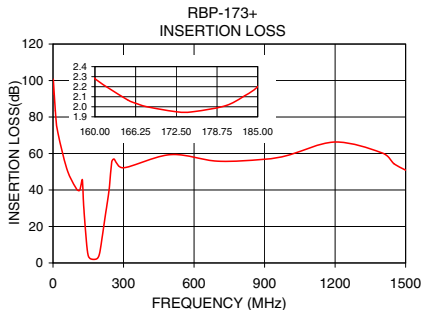
Note: Please refer to case style drawing for details

## Demo Board MCL P/N: TB-332 Suggested PCB Layout (PL-176)



### NOTES:

- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  - 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



### Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuit's 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-Circuit's website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

## Features

- linear phase, up to ±4 deg typ. @ Fc ±15MHz
- good VSWR, 1.2:1 typ. @ passband
- small size 0.35" x 0.35"
- shielded case
- aqueous washable

## Applications

- harmonic rejection
- transmitters / receivers
- WiMAX

# RBP-173+



Generic photo used for illustration purposes only

CASE STYLE: GP731

## +RoHS Compliant

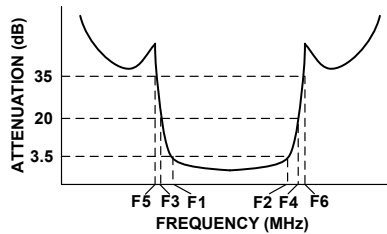
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Available Tape and Reel at no extra cost	
Reel Size	Devices/Reel
7"	10, 20, 50, 100, 200
13"	500, 1000

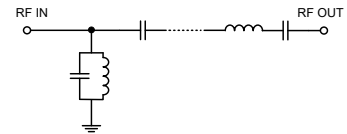
## Bandpass Filter Electrical Specifications (T<sub>AMB</sub> = 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 3.5dB)	STOPBANDS (MHz)				MAXIMUM DEVIATION FROM LINEAR PHASE (deg.)	VSWR (:1)	
		Loss > 20dB	Loss > 35dB				Passband	Stopband
Fc	F1 - F2	F3	F4	F5	F6	Fc ± 15MHz	Max.	Typ.
172.5	160 - 185	129	230	80	245-1500	±10	1.8	18

## Typical Frequency Response

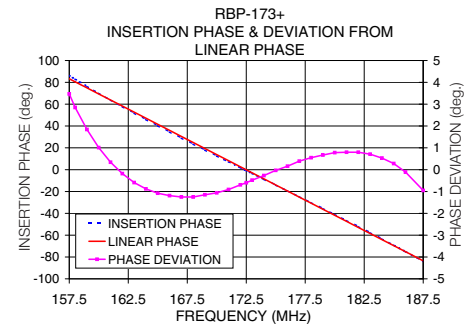
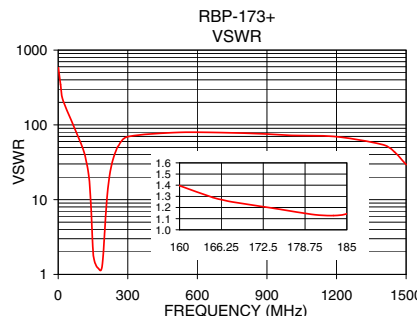


## Functional Schematic



## Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Deviation from Linear Phase (deg)
0.3	102.77	579.06	157.5	3.47
20.0	70.70	217.15	159.0	1.84
80.0	45.56	78.97	160.0	1.01
129.0	33.58	24.14	162.0	-0.18
135.0	22.36	16.89	164.0	-0.88
142.0	11.22	7.63	166.0	-1.19
147.0	5.37	3.21	168.0	-1.25
160.0	2.37	1.40	170.0	-1.06
172.5	1.93	1.21	172.5	-0.60
185.0	2.24	1.14	175.0	-0.03
198.0	5.23	2.77	177.0	0.39
207.0	11.55	7.80	179.0	0.67
220.0	22.78	19.32	181.0	0.80
230.0	31.33	28.96	183.0	0.71
245.0	45.94	42.38	185.0	0.28
700.0	56.26	78.97	186.0	-0.11
1500.0	51.03	29.46	187.5	-0.95



# Metal Shield Band Pass Filter

# RBP-173+

## Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C
0.3	85.87	87.42	89.09	0.03	0.05	0.05	0.00	0.00	0.01
10	83.31	82.94	82.86	0.05	0.07	0.06	0.00	0.00	0.00
20	71.76	71.41	71.59	0.07	0.09	0.09	0.00	0.00	0.00
80	45.75	45.72	45.66	0.21	0.25	0.25	0.04	0.05	0.05
100	41.45	41.44	41.42	0.30	0.35	0.35	0.10	0.13	0.14
129	31.82	31.27	30.75	0.68	0.77	0.83	0.61	0.72	0.81
135	20.99	20.64	20.29	1.00	1.14	1.24	1.16	1.36	1.53
142	9.88	9.77	9.64	2.59	2.91	3.19	3.88	4.47	5.02
147	4.47	4.65	4.79	7.05	7.44	7.73	14.46	16.53	18.60
160	2.15	2.36	2.53	13.10	13.35	13.56	13.53	13.95	14.36
170	1.75	1.97	2.14	22.81	22.83	22.27	35.09	37.77	38.71
185	2.15	2.41	2.64	16.36	16.77	16.88	16.94	16.95	16.86
198	5.64	6.09	6.49	5.29	5.46	5.60	5.34	5.42	5.40
207	12.40	12.87	13.28	1.99	2.12	2.23	2.02	2.17	2.25
220	23.76	24.16	24.52	0.84	0.92	0.97	0.86	0.98	1.05
230	32.45	32.84	33.19	0.58	0.64	0.67	0.58	0.68	0.74
240	42.20	42.62	43.05	0.45	0.50	0.52	0.44	0.51	0.56
245	48.55	49.07	49.54	0.40	0.45	0.47	0.38	0.46	0.51
260	54.11	53.99	53.63	0.32	0.36	0.37	0.28	0.34	0.38
270	50.42	50.48	50.38	0.29	0.33	0.34	0.24	0.29	0.33
280	49.62	49.73	49.66	0.27	0.31	0.31	0.21	0.25	0.29
290	49.83	49.97	49.94	0.25	0.29	0.30	0.18	0.22	0.26
300	50.57	50.74	50.63	0.24	0.28	0.28	0.16	0.20	0.23
400	71.09	71.01	70.17	0.20	0.24	0.25	0.08	0.12	0.14
500	61.25	61.40	61.79	0.19	0.24	0.25	0.06	0.10	0.13
700	56.94	57.14	57.42	0.19	0.24	0.25	0.07	0.12	0.16
800	57.54	57.28	57.91	0.19	0.24	0.25	0.09	0.14	0.18
900	58.16	58.23	58.81	0.20	0.24	0.26	0.10	0.16	0.20
1000	59.81	60.10	60.55	0.20	0.25	0.27	0.12	0.17	0.23
1200	69.53	70.74	70.59	0.19	0.25	0.28	0.15	0.21	0.27
1400	58.49	57.87	57.44	0.24	0.31	0.36	0.18	0.26	0.32
1500	50.58	49.97	49.96	0.46	0.56	0.63	0.20	0.28	0.35
1800	57.99	57.81	58.82	0.26	0.34	0.43	0.24	0.33	0.42
2000	62.20	60.53	59.17	0.16	0.25	0.33	0.25	0.34	0.42
2200	55.48	52.44	52.90	0.16	0.26	0.37	0.25	0.34	0.41
2400	48.27	47.60	47.44	0.19	0.30	0.41	0.24	0.35	0.41
2500	45.32	45.78	45.08	0.19	0.32	0.42	0.23	0.35	0.41
2800	43.12	42.84	46.42	0.27	0.41	0.54	0.22	0.37	0.49
3000	40.17	40.49	41.15	0.35	0.50	0.64	0.21	0.39	0.49
3200	38.83	38.69	39.95	0.47	0.62	0.76	0.30	0.39	0.57
3400	39.32	35.97	35.45	0.73	0.92	1.08	0.57	1.00	1.11
3500	33.04	33.57	33.67	1.21	1.44	1.63	0.40	0.49	0.68
3800	34.17	33.83	34.12	1.04	1.24	1.40	0.27	0.45	0.68
4000	31.85	31.73	31.70	0.76	0.98	1.19	0.34	0.53	0.78
4200	31.08	31.11	31.23	1.11	1.29	1.55	0.41	0.62	0.91
4400	32.87	32.75	33.08	0.57	0.85	1.09	0.56	0.76	0.96
4500	31.72	31.50	31.56	0.46	0.74	0.98	0.57	0.86	1.16
4800	26.41	25.07	25.27	0.37	0.67	0.94	1.26	1.68	2.33
5000	19.90	22.42	23.80	0.51	0.75	1.07	6.09	4.74	4.47
5200	35.04	36.16	36.70	0.42	0.68	1.02	1.33	1.58	1.93
5400	41.71	41.58	39.12	0.46	0.81	1.13	1.10	1.35	1.54
5500	30.64	36.31	35.86	0.65	0.93	1.25	1.21	1.32	1.52
5800	30.80	28.64	30.66	0.94	1.47	1.83	0.99	1.33	1.57
6000	25.83	25.10	25.13	1.65	2.37	3.10	1.20	1.48	1.88

REV. X2  
RBP-173+  
101010  
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# Metal Shield Band Pass Filter

# RBP-173+

## Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
160	16.90	16.76	16.67
170	15.24	15.17	15.15
185	16.43	16.46	16.52
198	18.92	18.64	18.27
200	17.95	17.56	17.23
207	12.59	12.32	12.01
220	5.76	5.74	5.62
230	3.29	3.13	3.24
240	0.68	0.87	0.14
245	2.31	3.81	6.18
260	3.91	4.61	0.43
270	0.11	0.36	1.83
280	0.26	1.38	0.62
290	0.12	0.34	1.85
300	0.10	1.38	0.53
320	1.34	3.39	1.30
340	0.62	0.55	0.15
350	3.31	1.14	1.13
360	1.43	0.39	3.28
370	2.46	7.78	1.75
380	0.08	0.48	11.76
400	4.90	12.23	4.72
420	7.24	0.35	39.75
430	9.84	20.22	14.23
440	13.21	7.98	2.10
450	0.42	7.46	6.18
460	7.04	3.50	6.12
470	1.98	1.93	7.48
480	5.48	1.11	6.36
500	3.18	0.26	0.90
520	2.71	0.47	2.94
530	1.30	2.46	1.44
540	0.53	0.42	1.41
550	1.16	0.51	4.00
560	2.46	3.08	0.51
570	4.14	0.49	3.94
580	2.28	1.06	0.37
600	1.32	1.97	0.38
620	2.82	1.35	2.75
630	0.81	2.56	2.99
640	0.20	1.26	2.31
650	0.15	3.04	2.59
660	1.30	0.01	3.84
670	1.78	2.34	1.32
680	0.43	0.24	4.10
690	4.74	1.18	5.08
720	1.53	3.20	0.32
730	0.70	1.24	1.18
740	0.16	4.79	1.08
750	0.46	2.22	2.79
760	2.91	0.65	0.21
770	0.25	0.22	2.54
780	0.13	2.71	4.31
800	2.29	0.71	1.28

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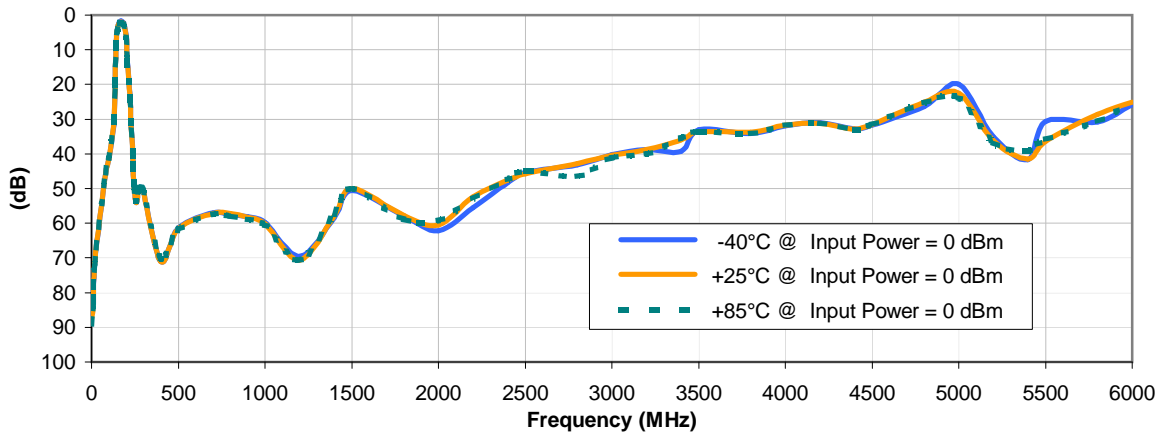


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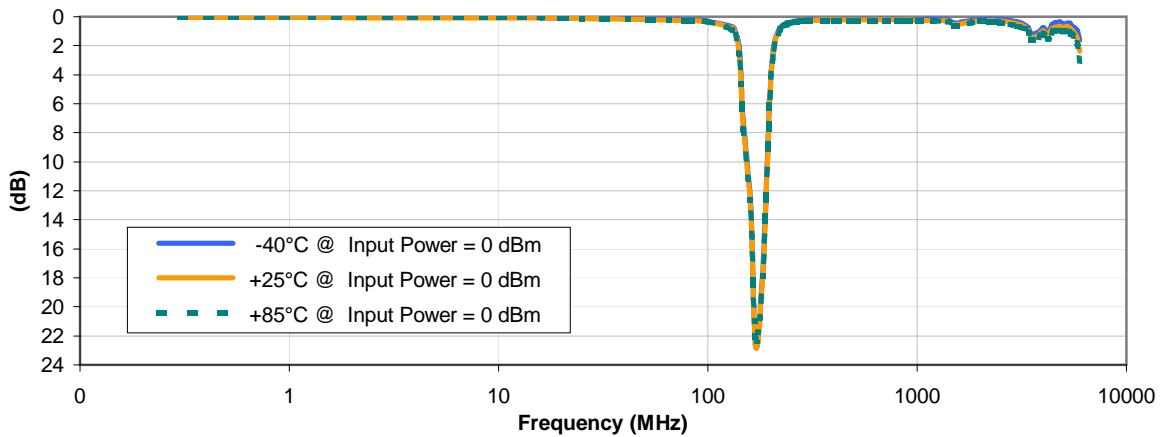


## Typical Performance Curves

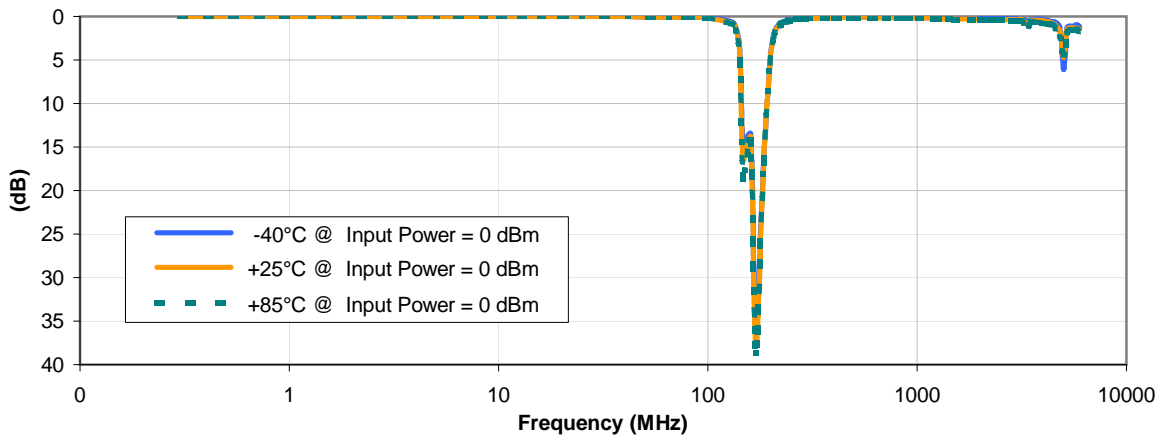
### INSERTION LOSS vs. TEMPERATURE



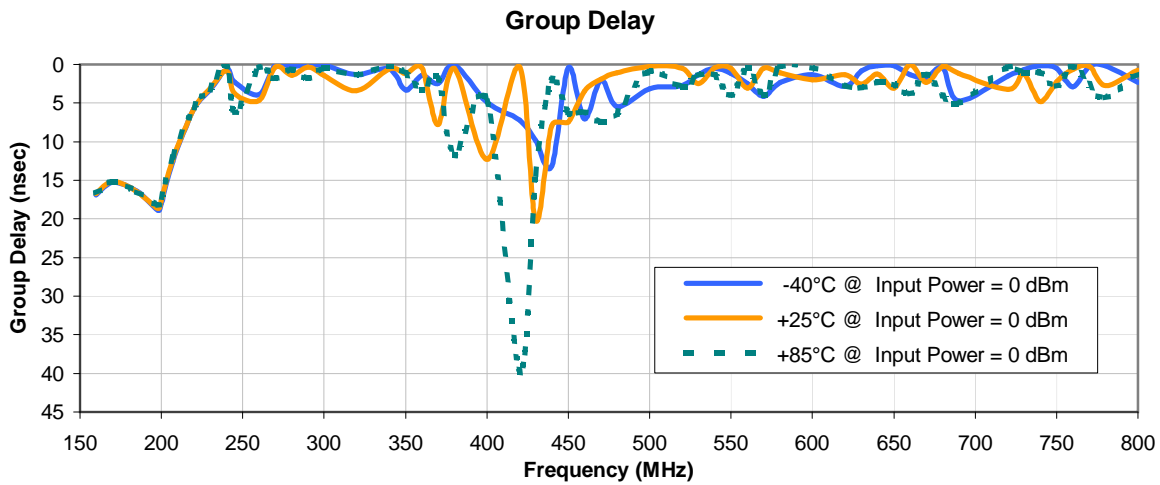
### INPUT RETURN LOSS vs. TEMPERATURE



### OUTPUT RETURN LOSS vs. TEMPERATURE



## Typical Performance Curves



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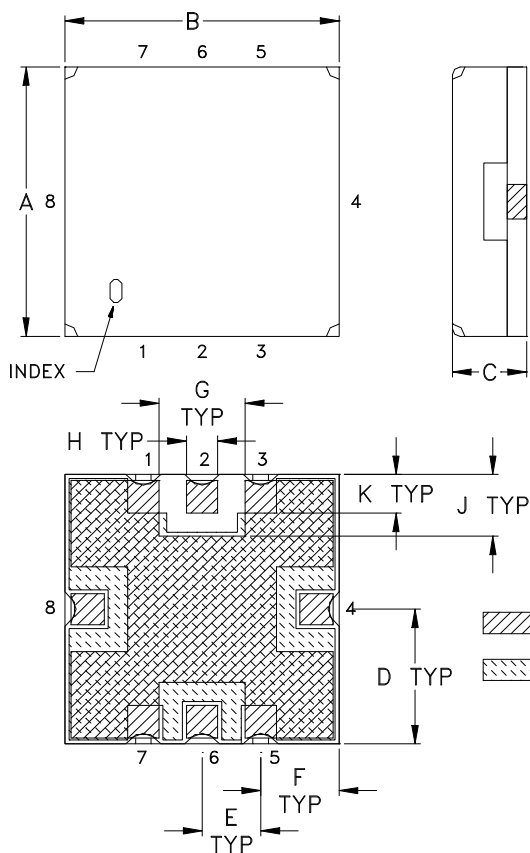


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## Outline Dimensions

## GP731



CASE #	A	B	C	D	E	F	G	H	J	K	L	M
GP731	.350 (8.89)	.350 (8.89)	.100 (2.54)	.175 (4.45)	.075 (1.91)	.100 (2.54)	.110 (2.79)	.040 (1.02)	.080 (2.03)	.050 (1.27)	.040 (1.02)	.195 (4.95)

CASE #	N	P	Q	R	WT. GRAM
GP731	.390 (9.91)	.120 (3.05)	.390 (9.91)	.070 (1.78)	.4 +0.3 -0.0

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3Pl.  $\pm .015$

### Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:

For RoHS Case Styles: 3-5  $\mu$  inch (.08-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate.  
 For RoHS-5 Case Styles: Tin-Lead plate.



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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F78



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note
16	12	7	10
			20
			50
			100
			200
		13	500, 1000

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.

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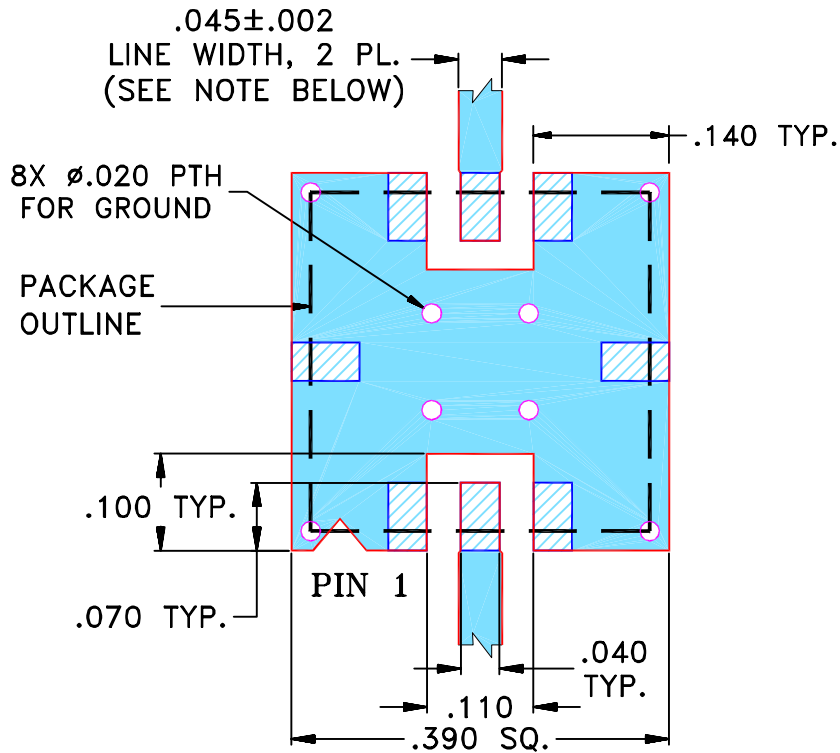
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	R59289	NEW RELEASE (FROM RAVON)	02/05	DK	HH
A	M101151	ADDED "RBP" & CORRECTED PIN CONNECTION TO DESCRIPTION OF PL-DWG.	10/10/05	MMG	DJ
B	M102713	UPDATED NOTES, ADDED "...WITH SMOBC"	01/20/06	GT	IL

**SUGGESTED MOUNTING CONFIGURATION  
FOR GP731 CASE STYLE, "qf" PIN CONNECTION.**



- NOTES:**
- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  - 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 DK (RAVON)	10 FEB 05
TOLERANCES ON:	CHECKED RZ (RAVON)	10 FEB 05
2 PL DECIMALS ±	APPROVED HH (RAVON)	10 FEB 05
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		



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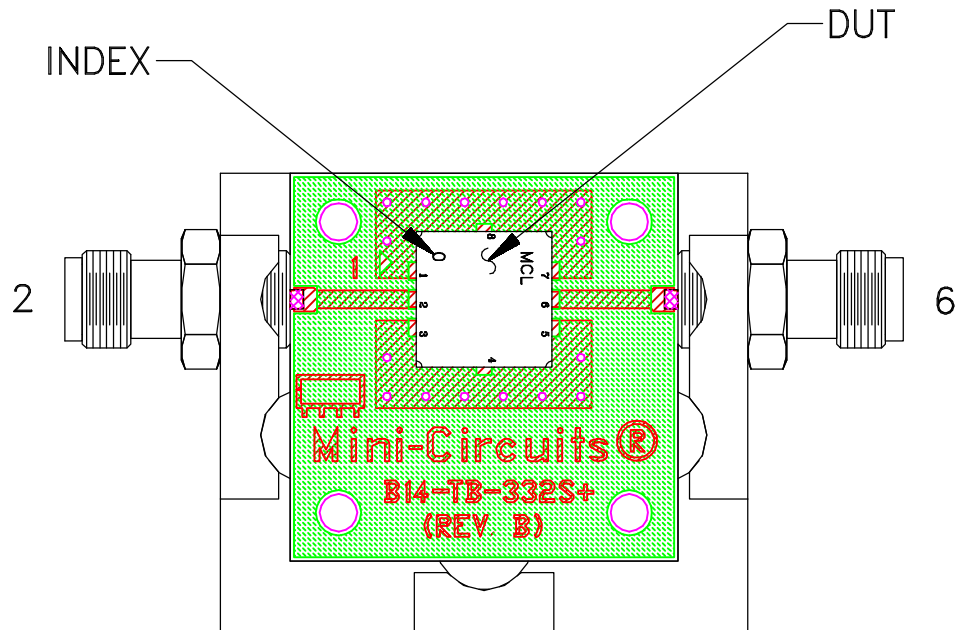
**PL, qf, GP731, RBP, TB-332**

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-176	REV: B
FILE: 98PL176	SCALE: 5:1	SHEET: 1 OF 1	

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# Evaluation Board and Circuit




TB-332



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: 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	-40° to 85° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
HAST	130°C, 85% RH, 96 hours	JESD22-A110
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 Eutectic Process: 225°C peak Pb-Free Process, 245°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, 20-2000 Hz, 4 times in each of three axes (total 12)	MIL-STD-883, Method 2007.3, Condition A
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