

Low Pass Filter

50Ω DC to 190 MHz

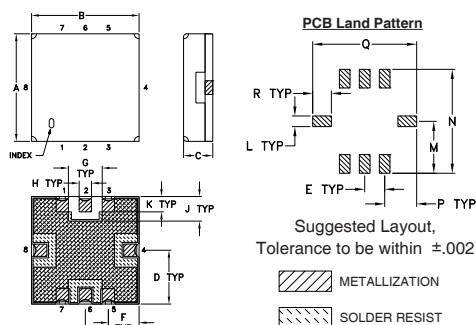
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W Max
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

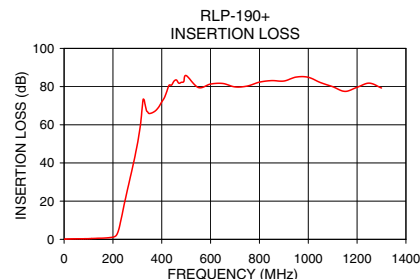
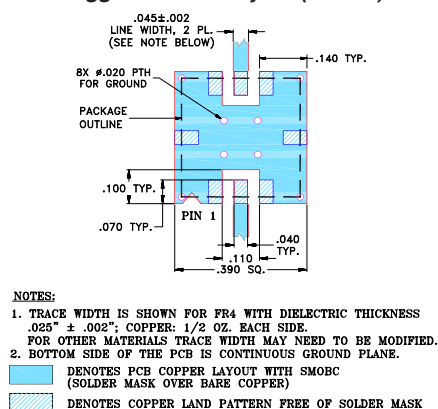


Outline Dimensions (inch/mm)

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		0.25

Note: Please refer to case style drawing for details

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



Features

- high rejection
- sharp insertion loss roll off
- excellent VSWR, 1.1:1 typ. @ passband
- aqueous washable

Applications

- wireless communications
- receivers / transmitters
- TV distribution / digital TV



Generic photo used for illustration purposes only
CASE STYLE: GP731

+RoHS Compliant

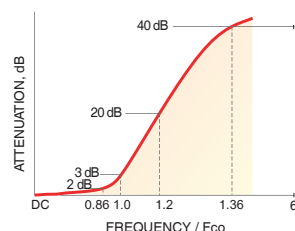
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Reel Size	Devices/Reel
7"	10, 20, 50, 100, 200
13"	500, 1000

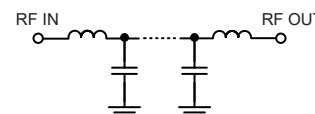
Low Pass Filter Electrical Specifications (T_{AMB} = 25°C)

PASSBAND (MHz)	f _{co} , MHz Nom.	STOPBAND (MHz)	VSWR (:1)
(Loss < 2dB)	(Loss 3dB)	(Loss > 20dB) (Loss > 40dB)	Passband Typ. Stopband Typ.
DC - 190	220	264 - 300 300 - 1300	1.1 20

Typical Frequency Response

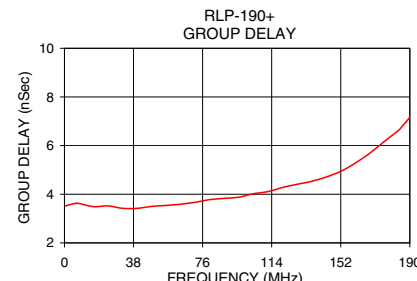
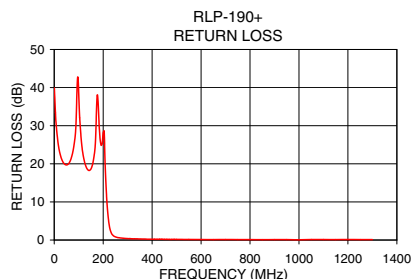


Functional Schematic



Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Frequency (MHz)	Group Delay (nSec)
$\bar{x}$	σ			
0.5	0.09	0.00	0.5	3.52
5.0	0.10	0.00	5.0	3.61
40.0	0.26	0.01	16.0	3.49
120.0	0.47	0.01	32.0	3.42
160.0	0.65	0.01	56.0	3.54
190.0	0.95	0.02	72.0	3.67
208.0	1.46	0.04	88.0	3.83
216.0	2.49	0.12	112.0	4.11
220.0	3.62	0.19	128.0	4.41
224.0	5.25	0.27	136.0	4.53
228.0	7.30	0.34	144.0	4.71
240.0	14.50	0.43	160.0	5.28
252.0	21.68	0.45	168.0	5.69
264.0	28.50	0.44	176.0	6.17
300.0	49.86	0.65	184.0	6.64
500.0	85.78	8.95	186.0	6.81
1000.0	84.88	4.71	188.0	6.98
1300.0	79.26	5.38	190.0	7.17



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



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Metal Shield Low Pass Filter

RLP-190+

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
0.5	0.07	0.09	0.11	42.26	39.84	37.94	42.31	39.84	37.98
5	0.08	0.10	0.13	34.43	33.36	32.46	34.46	33.40	32.50
40	0.22	0.26	0.30	19.85	19.93	20.03	19.86	19.96	20.03
50	0.25	0.29	0.32	19.17	19.54	19.87	19.17	19.54	19.84
100	0.30	0.38	0.44	48.41	47.45	46.30	44.81	43.67	43.48
110	0.34	0.42	0.48	27.38	27.75	28.10	27.46	27.88	28.25
120	0.39	0.47	0.54	22.21	22.50	22.78	22.26	22.59	22.89
130	0.45	0.54	0.61	19.74	19.93	20.10	19.75	19.99	20.18
140	0.50	0.60	0.68	18.75	18.93	19.05	18.75	18.96	19.10
160	0.56	0.68	0.77	21.17	21.70	22.12	21.20	21.72	22.15
180	0.68	0.81	0.93	36.22	33.14	31.31	38.67	34.53	32.24
190	0.80	0.96	1.09	25.18	24.50	24.11	25.00	24.31	23.87
208	1.22	1.48	1.70	23.33	21.51	20.14	21.39	19.92	18.83
216	2.10	2.51	2.85	10.38	9.86	9.40	10.22	9.69	9.25
220	3.13	3.62	4.04	6.84	6.59	6.35	6.78	6.52	6.28
224	4.66	5.21	5.69	4.47	4.39	4.30	4.43	4.37	4.27
228	6.62	7.20	7.70	2.95	2.98	2.98	2.93	2.96	2.97
230	7.71	8.29	8.80	2.42	2.49	2.53	2.42	2.49	2.52
240	13.61	14.14	14.62	1.13	1.25	1.34	1.13	1.26	1.34
250	19.62	20.09	20.53	0.72	0.84	0.93	0.72	0.84	0.93
252	20.77	21.26	21.68	0.67	0.79	0.89	0.69	0.80	0.89
260	25.43	25.87	26.28	0.56	0.66	0.75	0.56	0.67	0.75
264	27.70	28.13	28.54	0.50	0.61	0.70	0.52	0.63	0.71
270	31.08	31.50	31.90	0.45	0.56	0.64	0.45	0.57	0.64
280	36.61	37.09	37.44	0.39	0.50	0.57	0.40	0.50	0.57
290	42.25	42.68	43.10	0.35	0.44	0.52	0.35	0.45	0.52
300	48.36	48.86	49.25	0.32	0.41	0.48	0.32	0.42	0.49
400	71.85	73.69	72.95	0.17	0.26	0.32	0.16	0.25	0.31
500	91.96	80.96	85.55	0.11	0.21	0.28	0.10	0.20	0.27
600	79.75	82.73	83.75	0.07	0.20	0.27	0.06	0.19	0.25
700	81.36	87.07	78.10	0.06	0.19	0.27	0.06	0.18	0.25
800	92.46	75.73	79.18	0.06	0.20	0.30	0.04	0.19	0.26
900	82.91	79.99	83.82	0.03	0.19	0.29	0.04	0.17	0.27
1000	87.00	93.37	99.11	0.05	0.21	0.32	0.03	0.20	0.29
1100	80.48	78.17	85.04	0.03	0.22	0.33	0.02	0.20	0.30
1200	80.41	76.53	76.20	0.04	0.23	0.35	0.02	0.22	0.32
1300	87.39	80.36	80.67	0.03	0.24	0.37	0.02	0.23	0.34
1400	60.76	60.50	59.78	0.06	0.28	0.40	0.04	0.25	0.37
1500	44.86	45.80	46.43	0.04	0.26	0.41	0.08	0.29	0.42
1600	48.66	49.10	49.33	0.05	0.29	0.44	0.03	0.25	0.38
1700	46.39	46.83	47.13	0.08	0.32	0.48	0.05	0.30	0.43
1800	36.67	36.38	36.14	0.12	0.38	0.57	0.07	0.35	0.49
1900	41.43	42.51	43.58	0.09	0.34	0.49	0.08	0.32	0.46
2000	50.60	51.08	51.87	0.07	0.33	0.51	0.04	0.30	0.44
2100	56.09	56.80	57.17	0.10	0.36	0.53	0.07	0.34	0.49
2200	57.46	61.14	59.20	0.09	0.36	0.53	0.07	0.34	0.50
2300	60.62	60.25	62.77	0.10	0.37	0.54	0.09	0.36	0.52
2400	60.65	66.48	62.95	0.11	0.37	0.55	0.10	0.36	0.52
2500	57.98	59.70	63.33	0.11	0.39	0.57	0.09	0.37	0.54
2600	62.43	63.01	58.64	0.13	0.40	0.59	0.10	0.40	0.58
2700	55.97	61.84	59.81	0.13	0.39	0.59	0.12	0.40	0.58
2800	61.79	57.77	55.44	0.13	0.40	0.62	0.11	0.40	0.60
2900	49.78	55.12	53.22	0.14	0.41	0.62	0.15	0.43	0.62
3000	58.02	57.48	60.57	0.11	0.40	0.63	0.09	0.40	0.58

REV. X2

RLP-190+

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Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
0.5	3.61	3.56	3.60
5	3.59	3.55	3.58
10	3.52	3.54	3.55
20	3.51	3.51	3.52
30	3.47	3.46	3.48
40	3.51	3.50	3.51
50	3.52	3.52	3.54
60	3.58	3.58	3.60
70	3.64	3.65	3.66
80	3.76	3.76	3.77
90	3.88	3.85	3.87
100	3.98	3.98	3.99
110	4.11	4.11	4.13
120	4.25	4.25	4.25
130	4.42	4.42	4.43
140	4.60	4.61	4.63
150	4.89	4.89	4.93
160	5.25	5.28	5.30
170	5.74	5.75	5.79
180	6.34	6.35	6.39
185	6.69	6.72	6.77
190	7.14	7.17	7.22
200	8.23	8.31	8.41
210	10.97	11.05	11.20
220	12.98	12.74	12.53
230	10.35	10.00	9.69
240	7.01	6.81	6.67
250	4.89	4.65	4.65
260	3.50	3.51	3.38
270	2.71	2.63	2.42
280	2.22	2.05	2.08
281	2.08	1.98	2.00
282	2.05	1.94	2.06
283	1.75	2.18	1.91
284	2.05	1.93	1.84
285	1.75	1.88	1.62
286	1.87	1.91	1.72
287	1.85	1.90	1.81
288	2.19	1.77	1.88
289	1.75	1.62	1.57
290	2.00	2.03	1.78
291	1.61	1.60	1.75
292	1.98	1.70	1.52
293	1.68	1.32	1.61
294	1.86	1.55	1.27
295	1.44	1.16	1.32
296	1.61	2.21	1.25
297	1.29	1.76	0.74
298	0.90	0.94	0.40
299	1.07	0.48	1.29
300	1.03	1.14	1.46
306	1.59	0.10	0.65

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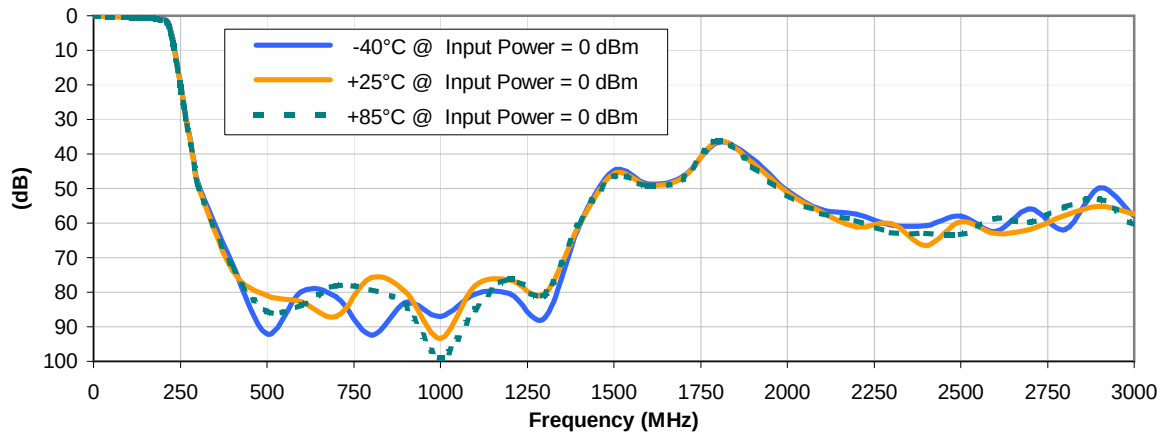


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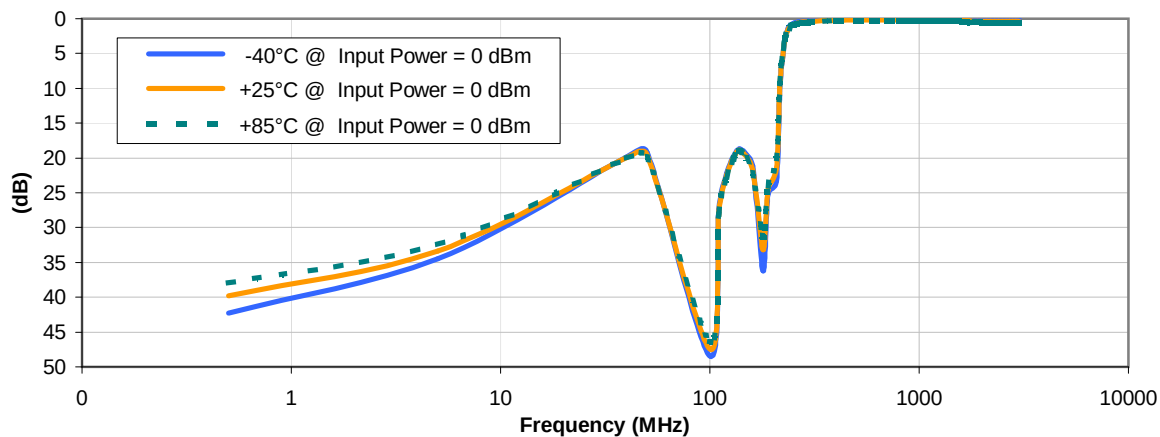


Typical Performance Curves

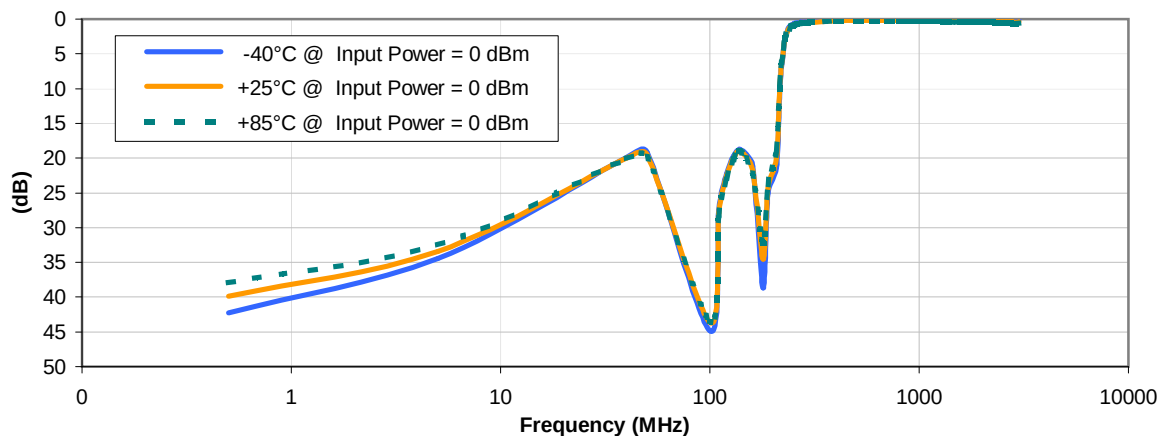
INSERTION LOSS vs. TEMPERATURE



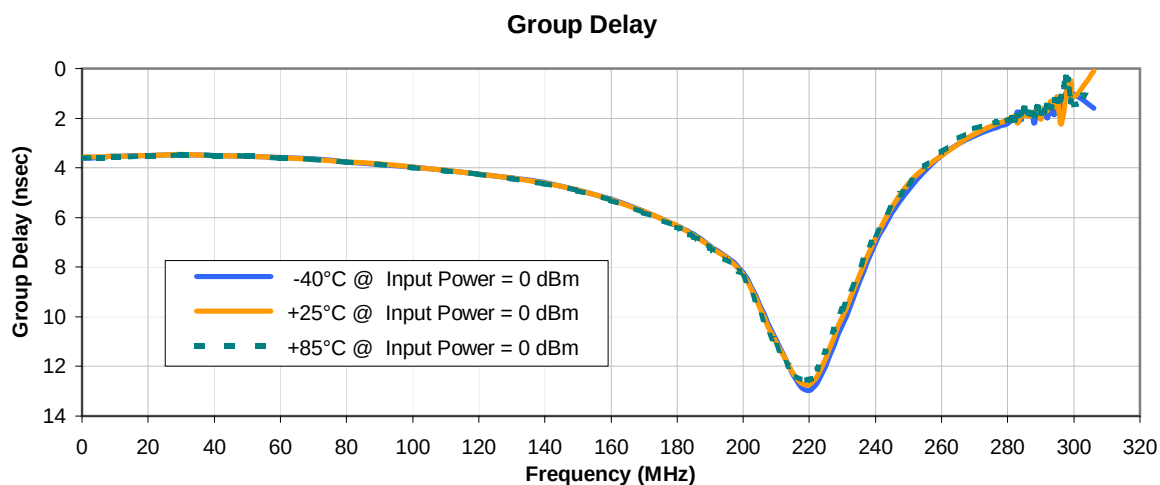
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



Typical Performance Curves



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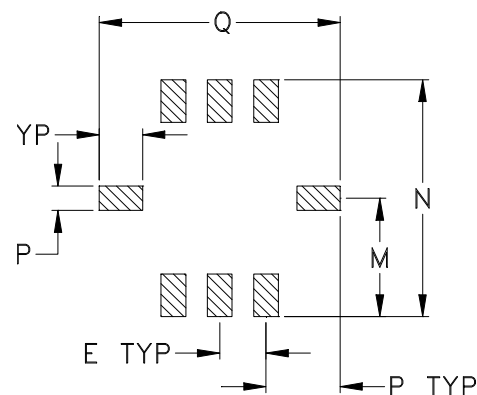
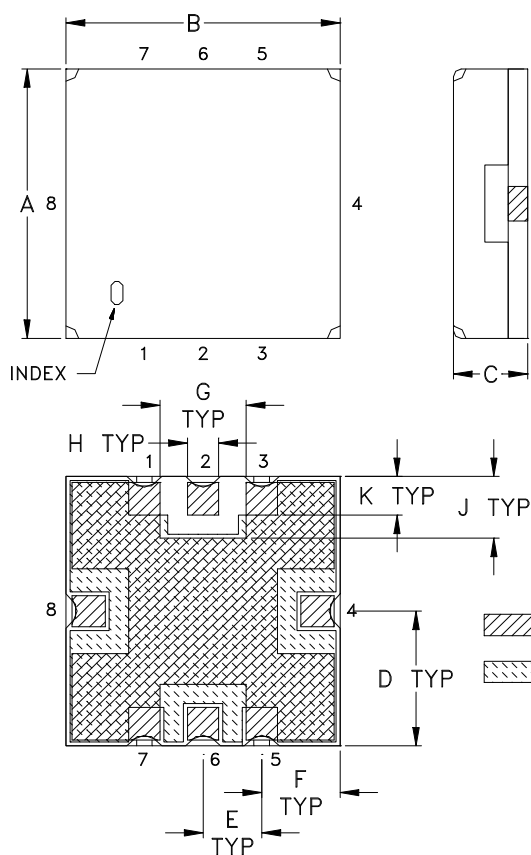


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Outline Dimensions

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:

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

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



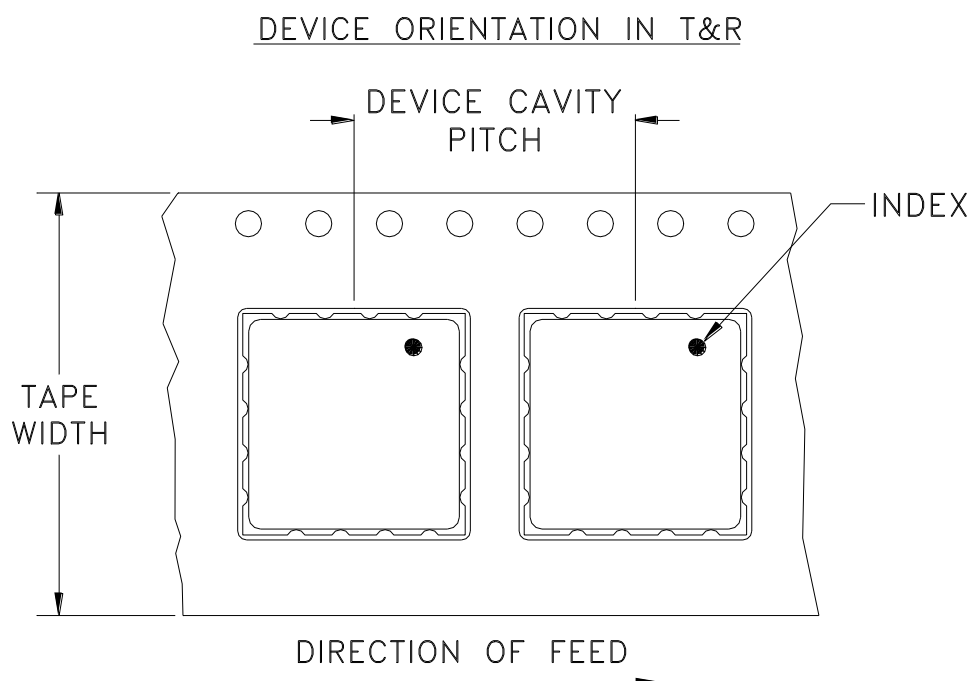
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RF/IF MICROWAVE COMPONENTS

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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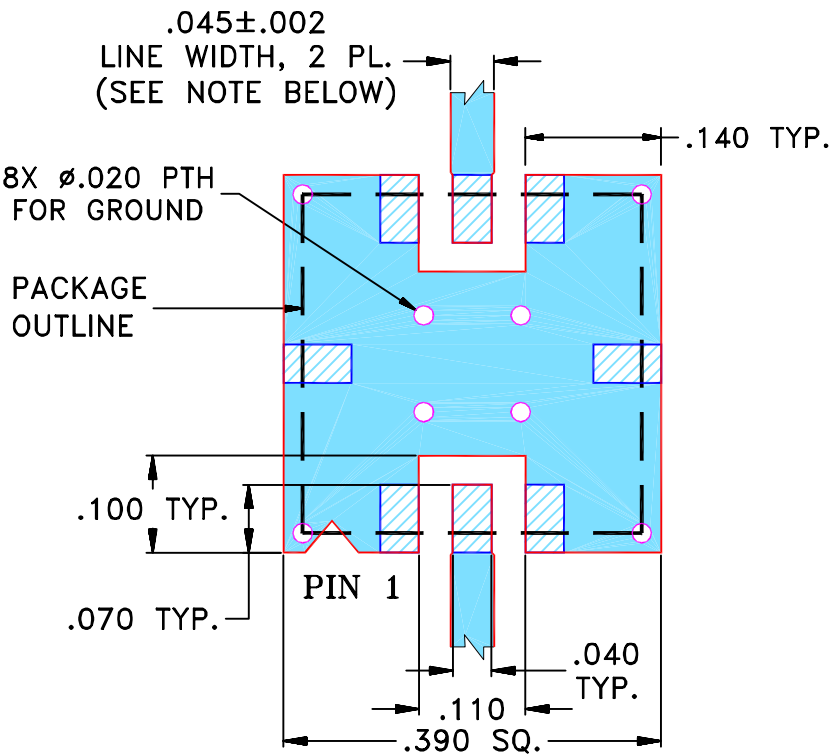
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THIRD ANGLE PROJECTION

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

SUGGESTED MOUNTING CONFIGURATION

FOR GP731 CASE STYLE, "qf" PIN CONNECTION.



- NOTES:

1. 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.

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

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS ±

3 PL DECIMALS ± .005

ANGLES ±

FRACTIONS ±

INITIALS

DATE

DRAWN DK (RAVON) 10 FEB 05

CHECKED RZ (RAVON) 10 FEB 05

APPROVED HH (RAVON) 10 FEB 05

Mini-Circuits®

13 Neptune Avenue

Brooklyn NY 11235

PL, qf, GP731, RBP, TB-332

SIZE A

CODE IDENT 15542

DRAWING NO: 98-PL-176

REV: B

FILE: 98PL176

SCALE: 5:1

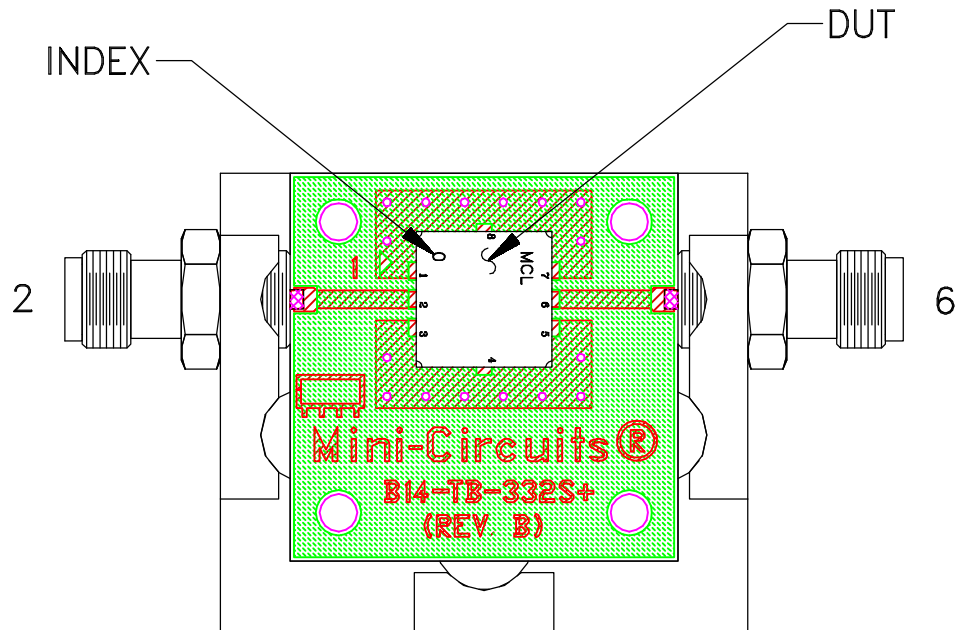
SHEET: 1 OF 1

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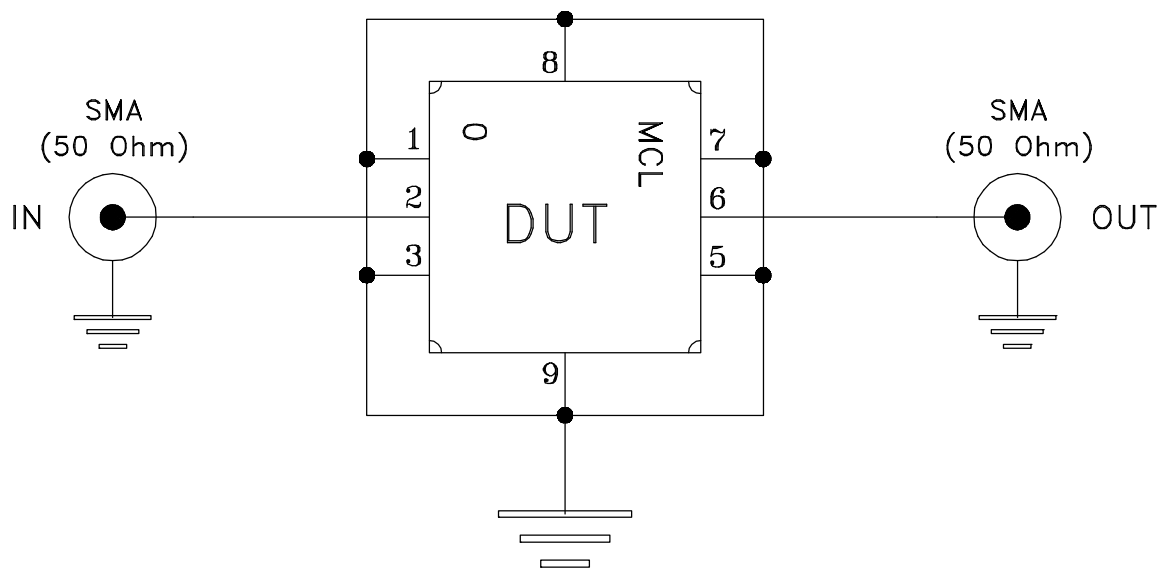
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ASHEETA1.DWG REV:A DATE:01/12/95

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.

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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