

# Bandpass Filter

# BPF-B190+

50Ω 185 to 195 MHz

## Maximum Ratings

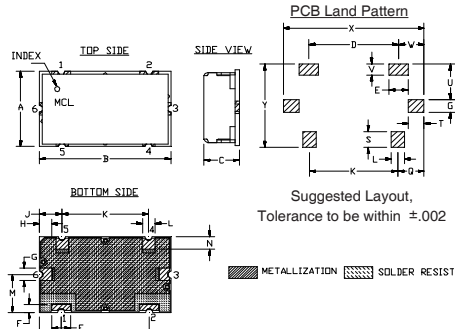
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W Max.

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

## Pin Connections

INPUT	1
OUTPUT	2
GROUND	3, 4, 5, 6

## Outline Drawing

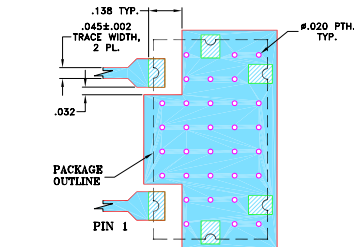


## Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J	K	L	M
.472"	.826"	.220"	.551"	.118"	.047"	.078"	.076"	.142"	.543"	.078"	.236"
11.99	20.98	5.59	14.00	3.00	1.19	1.98	1.92	3.61	13.79	1.98	5.99
N	P	Q	S	T	U	V	W	X	Y		wt
.079"	.138"	.162"	.098"	.096"	.217"	.067"	.157"	.866"	.512"		grams
2.01	3.51	4.11	2.49	2.44	5.51	1.70	3.99	22.00	13.00		6.0

Note: Please refer to case style drawing for details

## Demo Board MCL P/N: TB-400+ Suggested PCB Layout (PL-247)



## Features

- Excellent rejection
- Flat Group Delay @ Passband
- Good VSWR, 1.15:1 typ. @ Passband

## Applications

- Receivers / Transmitters
- Radio microphones
- Military communication



Generic photo used for illustration purposes only  
CASE STYLE: HZ1198

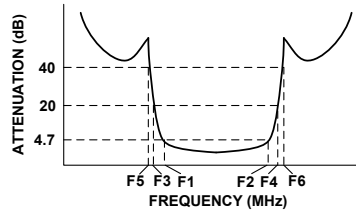
## +RoHS Compliant

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

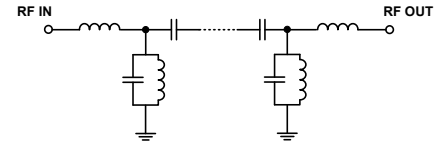
## Bandpass Filter Electrical Specifications (T<sub>AMB</sub> = 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 4.7dB) F1 - F2	STOPBANDS (MHz)				VSWR (:1)	
		Loss > 20dB F3	Loss > 40dB F4	Loss > 40dB F5	Loss > 40dB F6	Passband Max.	Stopband Typ.
190	185 - 195	170	212	155	230 - 2000	1.5	30

## Typical Frequency Response

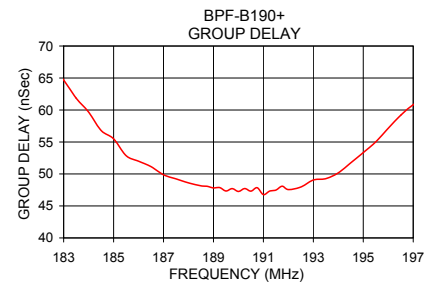
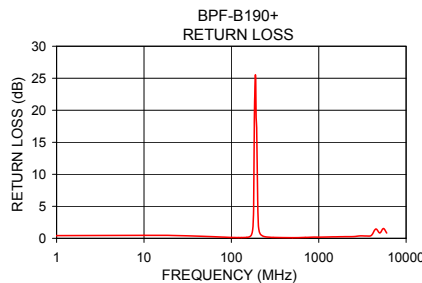
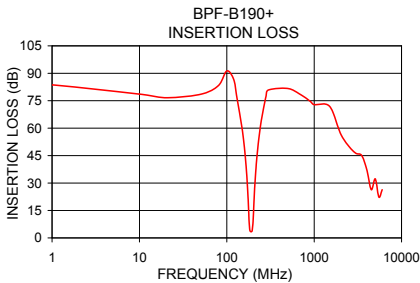


## Functional Schematic



## Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)		Return Loss (dB)	Frequency (MHz)	Group Delay (nsec)
	$\bar{x}$	$\sigma$			
1.0	83.66	0.86	0.42	183.0	66.14
155.0	54.14	0.72	0.18	184.0	60.77
170.0	32.66	0.88	0.55	185.0	56.86
175.0	22.01	1.08	1.21	186.0	52.82
179.0	11.55	1.21	3.47	187.0	50.61
182.0	5.48	0.57	11.84	188.0	49.31
185.0	3.75	0.09	21.84	188.5	48.83
190.0	3.37	0.03	24.85	189.0	48.56
195.0	3.85	0.13	17.06	189.5	48.12
198.0	5.70	0.73	14.31	190.0	47.85
201.0	11.44	1.32	4.25	190.5	47.87
205.0	20.72	1.15	1.71	191.0	47.74
212.0	33.12	0.82	0.80	192.0	47.53
230.0	52.25	0.54	0.34	193.0	49.08
500.0	81.70	0.63	0.10	194.0	50.24
700.0	78.33	0.57	0.14	195.0	53.06
1000.0	72.87	0.33	0.18	196.0	56.55
2000.0	57.07	0.29	0.26	197.0	60.98



## 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.
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# Surface Mount Band Pass Filter

# BPF-B190+

## Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURNLOSS (dB)		
	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C
0.5	99.11	97.96	96.94	0.34	0.43	0.50	0.34	0.44	0.52
1	100.04	91.28	95.28	0.33	0.43	0.51	0.35	0.44	0.53
5	83.91	85.66	85.43	0.37	0.46	0.55	0.37	0.47	0.56
10	85.72	79.45	80.71	0.40	0.48	0.57	0.39	0.50	0.59
15	79.04	82.95	77.87	0.41	0.49	0.57	0.38	0.47	0.56
20	81.82	77.15	79.18	0.40	0.47	0.54	0.39	0.46	0.54
30	77.55	77.54	76.73	0.35	0.41	0.46	0.35	0.40	0.46
40	80.09	77.58	77.61	0.31	0.35	0.40	0.30	0.35	0.38
50	82.39	77.40	77.07	0.26	0.30	0.33	0.26	0.30	0.32
60	79.63	78.54	78.94	0.22	0.26	0.28	0.22	0.25	0.27
70	85.32	80.20	82.93	0.19	0.23	0.25	0.18	0.21	0.24
80	83.14	89.83	86.70	0.17	0.20	0.22	0.14	0.18	0.21
90	82.53	90.00	83.20	0.14	0.18	0.20	0.12	0.16	0.18
100	82.76	82.28	88.41	0.13	0.17	0.18	0.10	0.14	0.17
110	84.46	88.23	96.05	0.12	0.15	0.16	0.09	0.13	0.15
120	89.32	95.27	87.55	0.10	0.15	0.16	0.07	0.12	0.14
130	81.20	80.65	82.07	0.11	0.15	0.17	0.08	0.13	0.14
140	70.92	70.66	70.29	0.11	0.17	0.18	0.08	0.13	0.15
150	61.09	60.69	60.83	0.13	0.19	0.21	0.10	0.15	0.20
155	55.93	55.67	55.38	0.16	0.22	0.25	0.13	0.19	0.22
160	50.08	49.65	49.10	0.20	0.28	0.31	0.17	0.25	0.29
170	34.70	34.07	33.36	0.43	0.58	0.67	0.45	0.60	0.71
180	11.23	10.62	9.97	3.30	4.32	5.47	3.69	4.89	6.20
185	3.58	4.05	4.36	24.79	23.62	22.28	35.24	30.85	28.58
190	2.97	3.50	3.90	23.84	24.87	26.67	30.75	28.50	26.92
195	3.23	3.89	4.45	23.82	24.12	25.24	21.31	20.72	20.52
200	6.63	8.32	9.89	8.56	7.52	6.64	7.24	6.31	5.56
210	27.98	29.11	30.15	1.01	1.14	1.19	0.87	0.99	1.05
212	31.20	32.23	33.19	0.83	0.96	1.02	0.73	0.84	0.90
220	41.58	42.34	43.05	0.49	0.60	0.64	0.43	0.52	0.57
230	50.97	51.50	52.16	0.32	0.42	0.45	0.27	0.36	0.39
240	58.13	58.72	59.10	0.25	0.34	0.36	0.20	0.28	0.30
250	63.76	64.11	65.20	0.21	0.29	0.32	0.16	0.23	0.27
260	67.85	69.26	70.95	0.18	0.28	0.29	0.12	0.20	0.22
270	73.30	73.07	74.33	0.17	0.26	0.28	0.11	0.18	0.20
280	76.62	74.80	77.82	0.14	0.24	0.27	0.09	0.16	0.19
290	80.43	79.31	79.86	0.14	0.24	0.26	0.08	0.15	0.18
300	85.95	86.75	77.96	0.13	0.23	0.25	0.07	0.15	0.17
400	86.39	84.92	87.70	0.11	0.23	0.27	0.04	0.12	0.15
500	81.84	97.09	89.81	0.12	0.26	0.32	0.04	0.13	0.17
600	106.76	89.39	88.42	0.16	0.31	0.37	0.04	0.15	0.19
700	80.59	81.60	95.20	0.18	0.35	0.42	0.06	0.18	0.23
800	87.67	94.98	87.73	0.21	0.39	0.48	0.08	0.21	0.27
900	78.89	86.35	84.62	0.24	0.43	0.52	0.09	0.23	0.28
1000	79.16	79.64	81.09	0.26	0.47	0.57	0.11	0.27	0.33
1100	73.38	76.04	73.21	0.30	0.49	0.62	0.13	0.28	0.36
1200	71.68	70.75	68.31	0.31	0.52	0.63	0.15	0.30	0.39
1300	67.15	68.63	68.27	0.32	0.53	0.66	0.16	0.32	0.40
1400	72.23	67.00	67.35	0.33	0.54	0.68	0.17	0.34	0.43
1500	70.76	67.41	65.87	0.35	0.55	0.68	0.18	0.36	0.44
1600	59.32	61.74	58.11	0.34	0.55	0.69	0.19	0.38	0.48
1700	61.61	56.74	59.83	0.30	0.54	0.67	0.16	0.34	0.43
1800	62.70	62.64	60.40	0.33	0.54	0.71	0.18	0.36	0.49
1900	51.42	55.22	51.98	0.34	0.56	0.72	0.20	0.39	0.50
2000	55.27	53.90	53.36	0.30	0.51	0.70	0.12	0.35	0.47

REV. X1

BPF-B190+

090301

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# Surface Mount Band Pass Filter

# BPF-B190+

## Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
185.0	62.17	59.71	57.69
185.5	59.84	57.69	55.95
186.0	57.76	55.99	54.51
186.5	55.85	54.38	53.24
187.0	54.41	53.20	52.19
187.5	53.02	52.06	51.29
188.0	51.99	51.24	50.62
188.5	51.09	50.53	50.02
189.0	50.30	49.92	49.53
189.5	49.74	49.50	49.26
190.0	49.42	49.20	49.07
190.5	49.00	48.92	48.90
191.0	48.81	48.83	48.94
191.5	48.76	48.81	49.06
192.0	48.80	48.87	49.25
192.5	48.85	49.15	49.63
193.0	49.13	49.53	50.13
193.5	49.49	49.97	50.75
194.0	50.01	50.70	51.63
194.5	50.59	51.57	52.59
195.0	51.44	52.58	53.83

REV. X1  
BPF-B190+  
090301  
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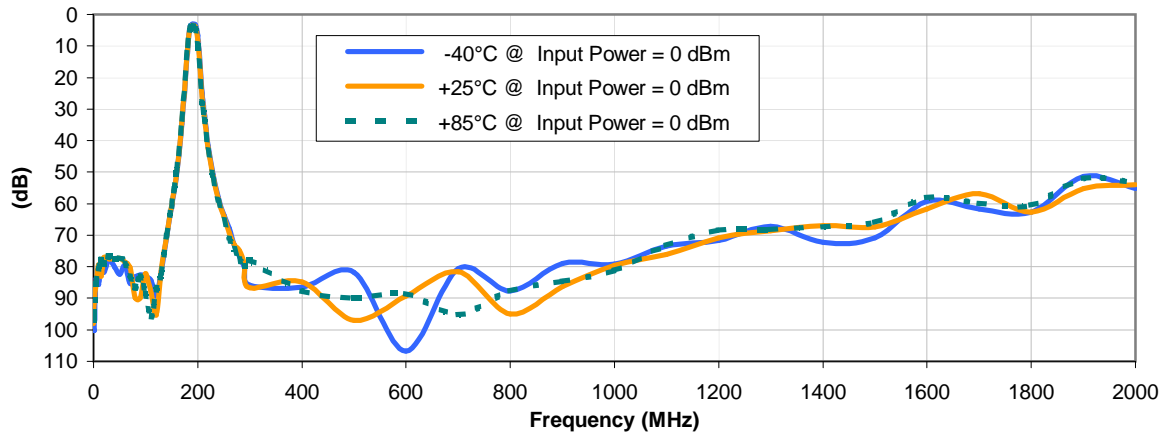


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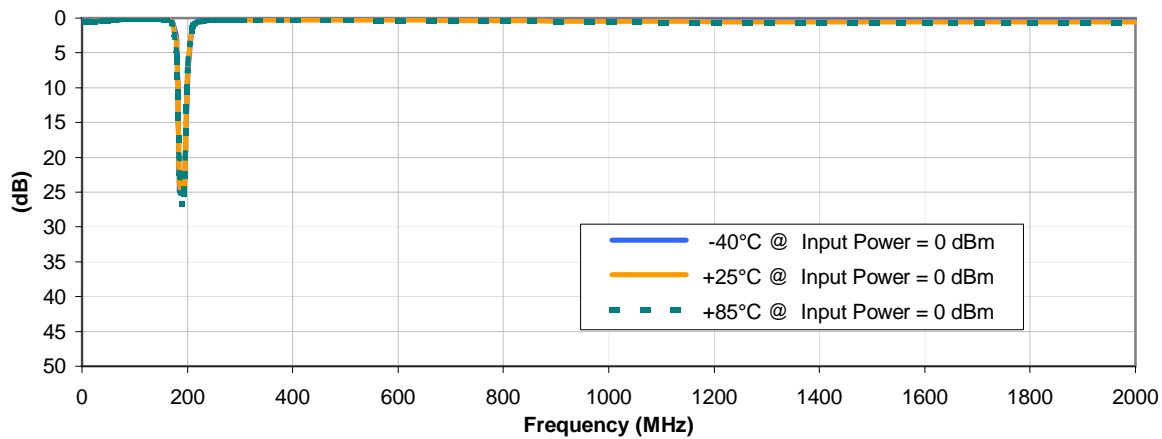


## Typical Performance Curves

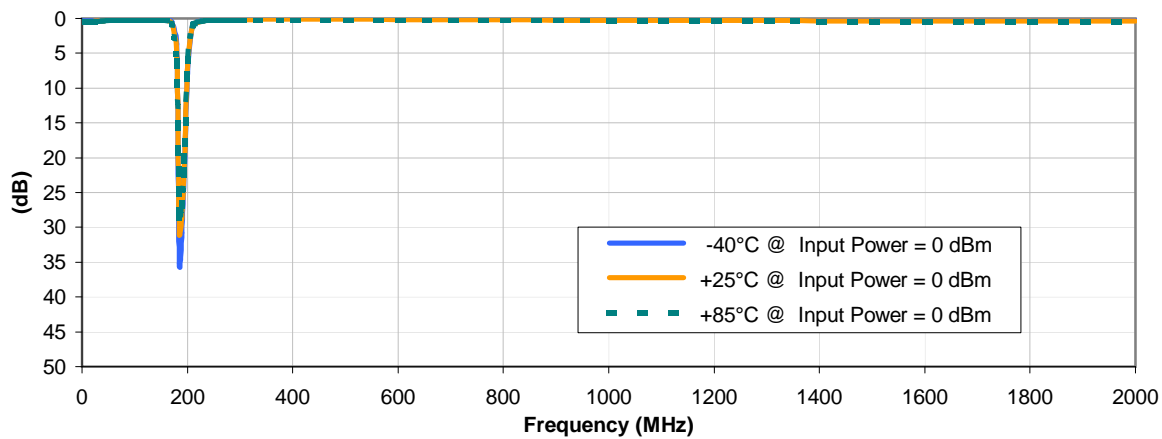
### INSERTION LOSS vs. TEMPERATURE



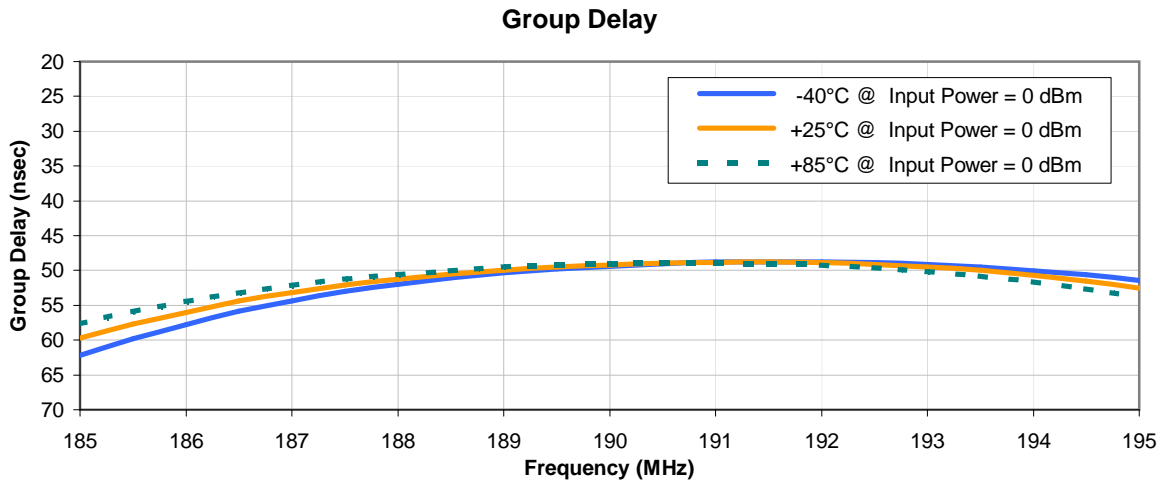
### INPUT RETURN LOSS vs. TEMPERATURE



### OUTPUT RETURN LOSS vs. TEMPERATURE



## Typical Performance Curves

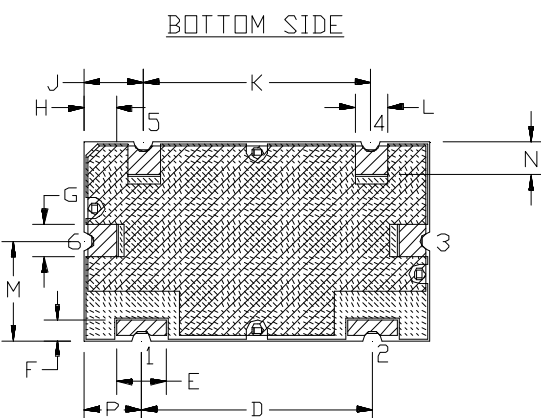
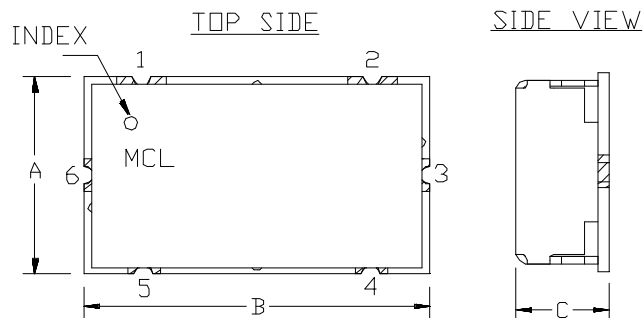


# Case Style

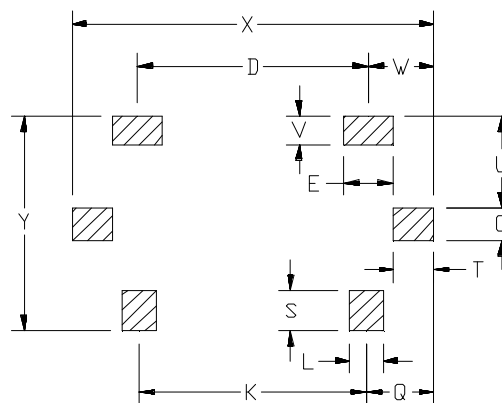
# HZ

## Outline Dimensions

## HZ1198



## PCB Land Pattern



 METALLIZATION  SOLDER RESIST

Suggested Layout,  
Tolerance to be within  $\pm 0.002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M
HZ1198	.472" (11.99)	.826" (20.98)	.220" (5.59)	.551" (14.00)	.118" (3.00)	.047" (1.19)	.078" (1.98)	.076" (1.92)	.142" (3.61)	.543" (13.79)	.078" (1.98)	.236" (5.99)

CASE #	N	P	Q	S	T	U	V	W	X	Y	WT GRAMS	NOTES
HZ1198	.079" (2.01)	.138" (3.51)	.162" (4.11)	.098" (2.49)	.096" (2.44)	.217" (5.51)	.067" (1.70)	.157" (3.99)	.866" (22.00)	.512" (13.00)	6.0	A35

Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .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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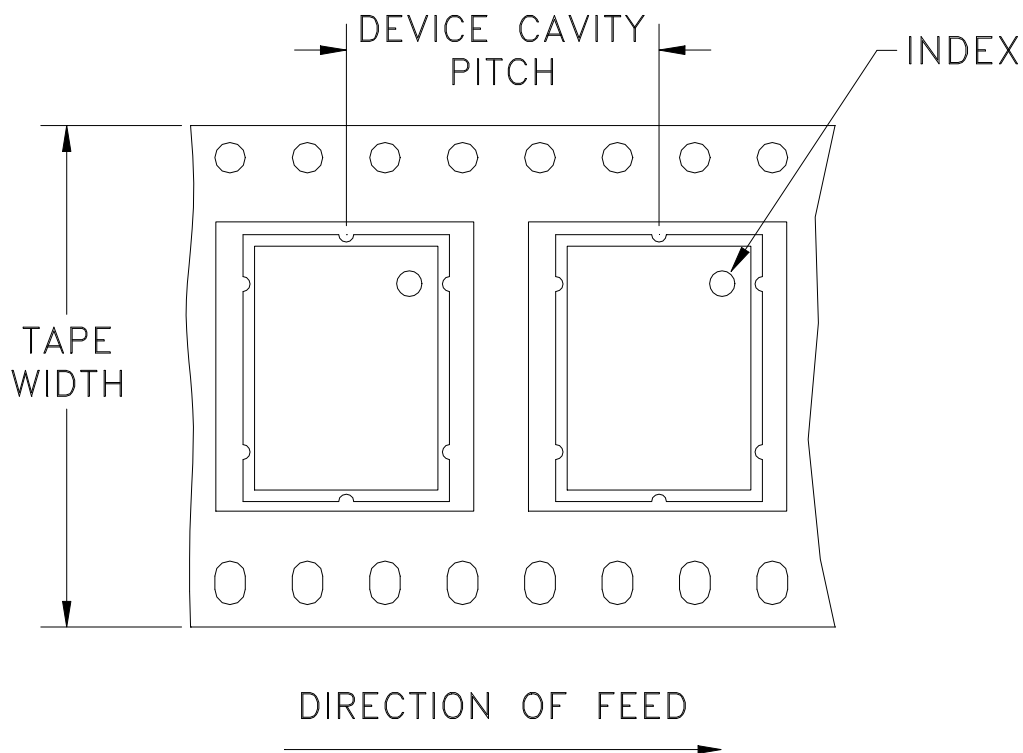


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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F6

## DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
32	16	13	500

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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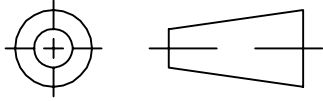
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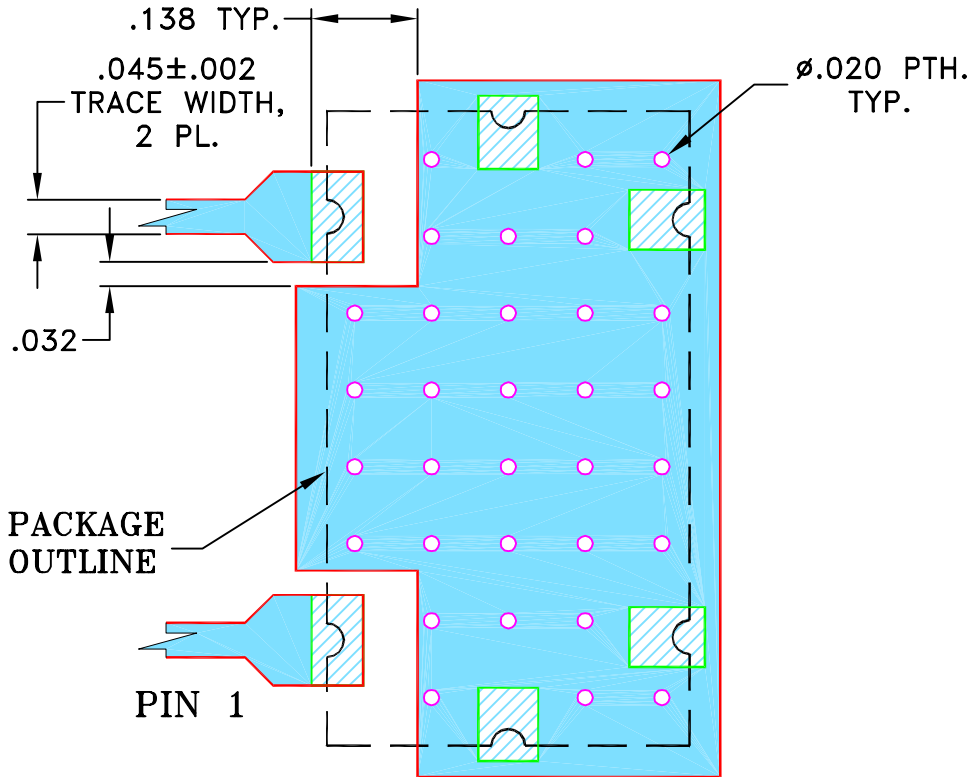
THIRD ANGLE PROJECTION



REVISIONS

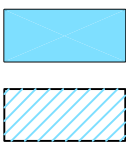
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M107879	NEW RELEASE (FROM RAVON)	11/06	DK	HH
OR	R66100	NEW RELEASE (FROM RAVON)	11/06	DK	HH

SUGGESTED MOUNTING CONFIGURATION FOR  
HZ1198 CASE STYLE, "rg" PIN CONNECTION, 50 Ω



NOTES:

- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS  $.025 \pm .002$ ". 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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	DK (RAVON) 14 NOV 06
	CHECKED	RZ (RAVON) 14 NOV 06
	APPROVED	HH (RAVON) 14 NOV 06

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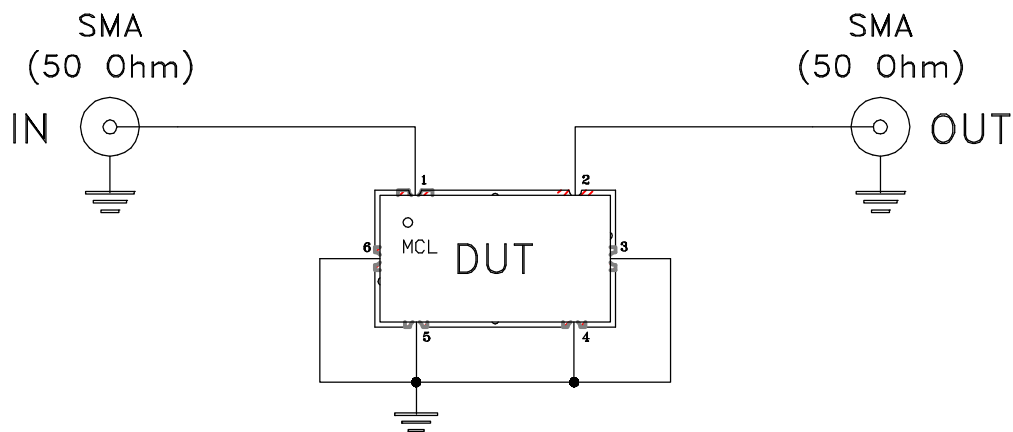
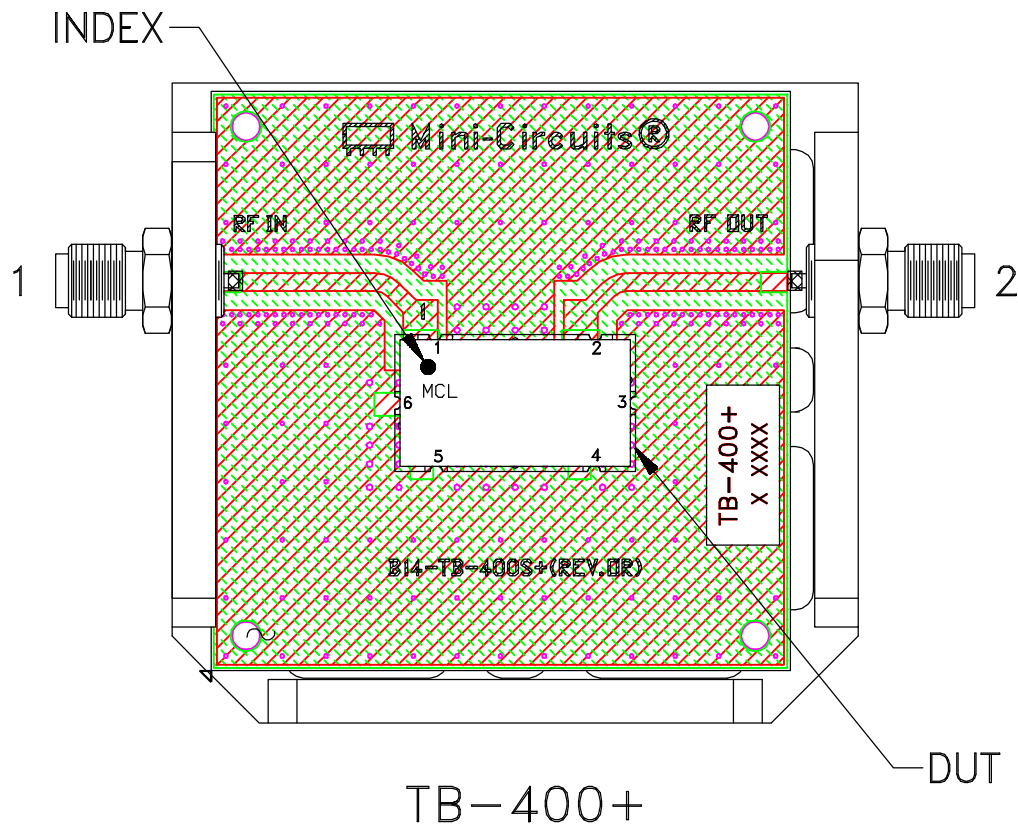
PL, rg, HZ1198, DPLX, TB-400+  
50 Ω

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-247	REV: OR
FILE: 98PL247	SCALE: 4:1	SHEET: 1 OF 1	




# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent.  
Dielectric Constant=3.5, Thickness=.030 inch.

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Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
Temperature Cycling	-65° to 150°C, 100 cycles	JESD22-A104
Temperature Humidity	85°C/ 85% RH, 168 hours	JESD22-113
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 240°C peak (Non-RoHS) or 260°C (RoHS)	J-STD-020
Solderability	10X magnification, 95% coverage	JESD22-B102, Method 1: Dip and Look Test
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
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