LUMPED LC SURFACE MOUNT

High Pass Filter

RHP-27+

50Ω 50 to 2000 MHz

KEY FEATURES

- Low Insertion Loss, 0.6 dB Typ.
- High Rejection 80 dB Typ.
- Miniature Shielded Case
- Aqueous Washable

Generic photo used for illustration purposes only

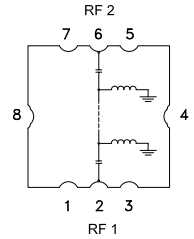
APPLICATIONS

- Transmitters / Receivers
- Sub-Harmonic Rejection
- Military Communications

PRODUCT OVERVIEW

RHP-27+ is a 50Ω high pass filter fabricated using SMT technology. It covers 50-2000 MHz and is built with high-Q capacitors and inductors for superior performance. It has repeatable performance across lots and consistent performance across temperatures. The filter comes with a shielded case in a miniature package with 0.35" SQ. It is ideal for circuit board layouts.

FUNCTIONAL DIAGRAM



ELECTRICAL SPECIFICATIONS[1,2,3] AT +25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	F3-F4	50 - 2000	—	0.6	1	dB
	Return Loss	F4-F5	50 - 2000	10	20	—	dB
Stopband	Rejection	DC-F1	DC - 10	60	80	—	dB
		F1-F2	10 - 18	20	30	—	
	Freq. Cut-Off	Fc	27	—	3	—	dB

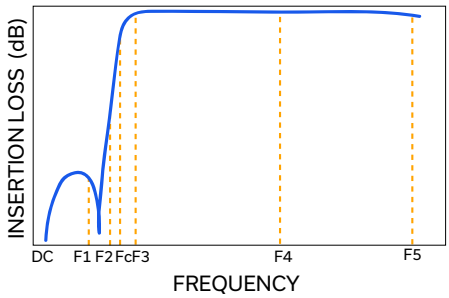
1. Tested in Evaluation Board P/N TB-RHP-27+.
2. This filter is bi-directional RF1 and RF2 ports may be interchanged, see S-Parameters for actual performance.
3. This component should not be used as a DC block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.

ABSOLUTE MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Input Power[5]	1 W

4. Permanent damage may occur if any of these limits are exceeded.
5. Power rating applies only to signals within the passband.

TYPICAL FREQUENCY RESPONSE AT +25°C



REV. OR
ECO-024893
RHP-27+
EDU5070
URJ
250318

High Pass Filter

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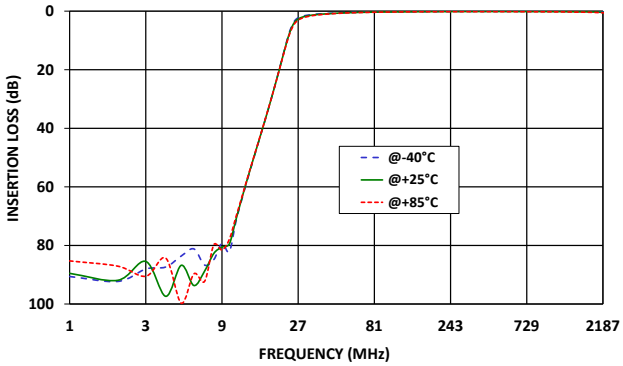
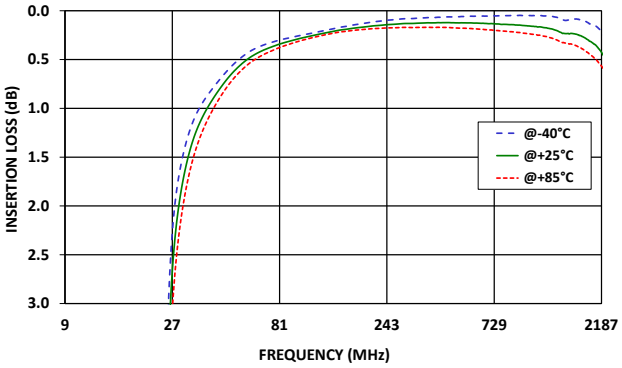
TYPICAL PERFORMANCE GRAPHS

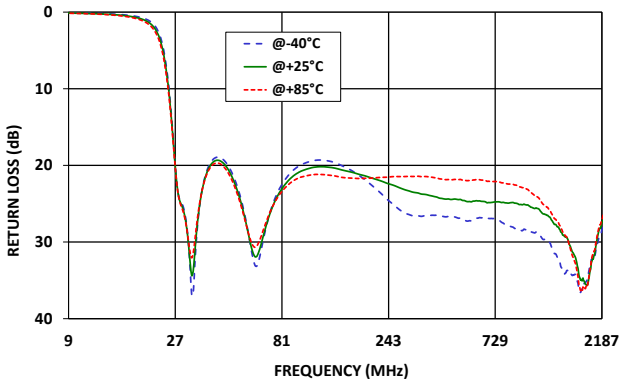
RHP-27+
INSERTION LOSS



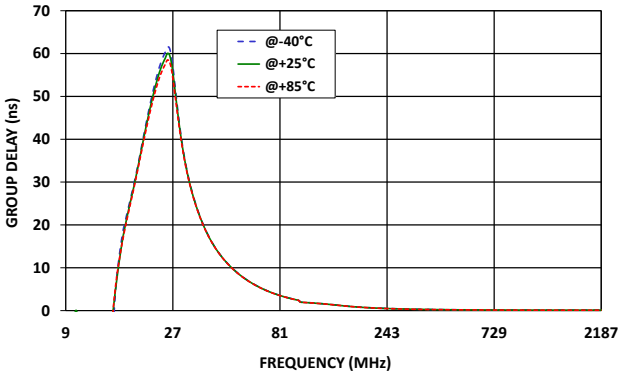
RHP-27+
INSERTION LOSS (Zoomed)



RHP-27+
RETURN LOSS (Zoomed)



RHP-27+
GROUP DELAY



High Pass Filter

RHP-27+

50Ω 50 to 2000 MHz

FUNCTIONAL DIAGRAM

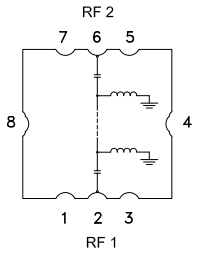


Figure 1. RHP-27+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1[2]	2	Connects to RF Input Port
RF2[2]	6	Connects to RF Output Port
GROUND	1,3,4,5,7,8	Connects to Ground on PCB, (See drawing PL-176)
NC	—	No connection, not used internally. See drawing PL-176 for connection to PCB

SUGGESTED PCB LAYOUT (PL-176)

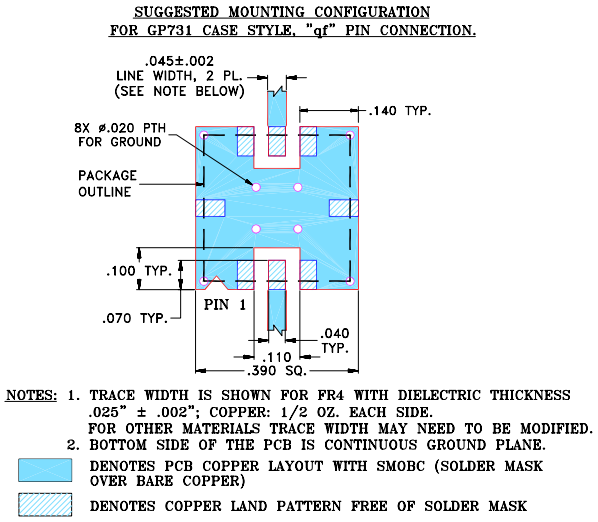
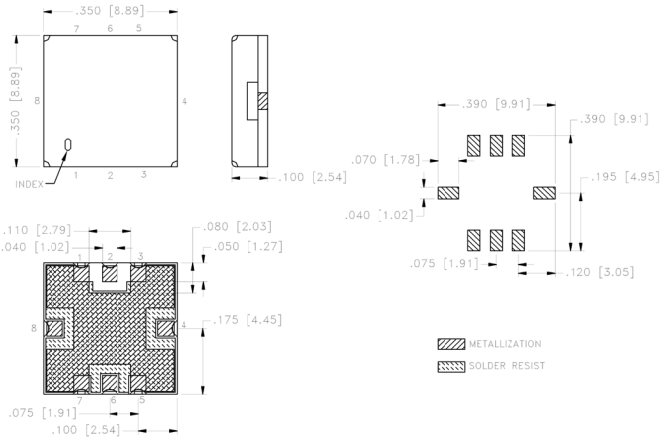


Figure 2. Suggested PCB Layout PL-176

CASE STYLE DRAWING



Weight: 0.5 gram
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

PRODUCT MARKING*: RHP-27

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

High Pass Filter

RHP-27+

50Ω 50 to 2000 MHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD. CLICK HERE

Performance Data and Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	GP731 Lead Finish: Gold over Nickel
RoHS Status	Compliant
Tape and Reel	TR-F78
Suggested Layout for PCB Design	PL-176
Evaluation Board	TB-RHP-27+
	Gerber File
Environmental Rating	ENV03T2

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

Surface mount High Pass Filter RHP-27+

Typical Performance Data

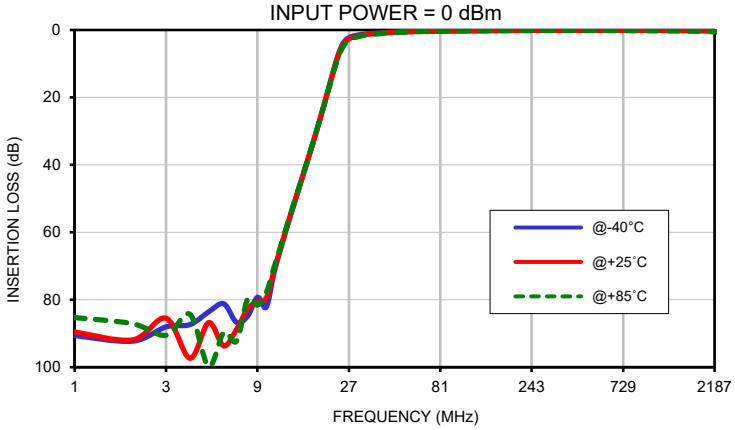
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	90.61	89.53	85.28	0.05	0.05	0.05	0.06	0.06	0.06
5	83.62	86.79	99.71	0.06	0.07	0.07	0.06	0.06	0.07
10	82.20	79.51	77.91	0.13	0.15	0.18	0.13	0.16	0.19
18	31.36	31.33	31.29	0.56	0.69	0.83	0.59	0.73	0.89
26	2.96	3.41	3.86	13.74	14.17	14.57	16.12	16.94	17.69
27	2.27	2.67	3.07	20.00	20.11	20.24	29.43	30.85	31.54
28	1.90	2.24	2.59	24.07	24.12	24.21	29.42	29.24	28.93
29	1.67	1.97	2.27	25.05	25.38	25.66	24.17	24.19	24.19
30	1.50	1.76	2.03	26.73	27.11	27.31	23.37	23.30	23.20
31	1.36	1.60	1.84	30.50	30.51	30.04	23.91	23.62	23.35
33	1.17	1.36	1.56	33.16	31.50	29.92	24.47	23.94	23.47
35	1.03	1.20	1.36	24.51	24.47	24.33	22.30	22.16	22.00
36	0.98	1.13	1.29	22.49	22.61	22.67	21.17	21.19	21.18
37	0.93	1.08	1.22	21.12	21.34	21.50	20.27	20.41	20.51
38	0.89	1.03	1.16	20.18	20.46	20.69	19.62	19.84	20.02
39	0.86	0.98	1.10	19.56	19.89	20.17	19.18	19.45	19.70
40	0.82	0.94	1.05	19.18	19.53	19.85	18.90	19.23	19.52
41	0.79	0.90	1.01	18.98	19.37	19.70	18.78	19.14	19.48
50	0.56	0.64	0.71	21.96	22.47	22.93	22.02	22.62	23.28
100	0.25	0.28	0.31	19.84	20.68	21.49	19.94	20.79	21.61
200	0.12	0.16	0.19	22.37	21.56	21.67	22.47	21.66	21.76
300	0.08	0.13	0.17	26.41	23.33	21.43	26.60	23.40	21.47
400	0.07	0.12	0.17	26.51	24.14	21.65	26.56	24.21	21.69
440	0.06	0.12	0.17	26.71	24.40	21.86	26.65	24.46	21.92
460	0.06	0.12	0.17	26.77	24.45	21.89	26.61	24.44	21.92
480	0.06	0.12	0.17	26.73	24.39	21.83	26.62	24.43	21.90
500	0.06	0.12	0.18	26.90	24.46	21.86	26.72	24.46	21.89
520	0.06	0.12	0.18	27.09	24.57	21.92	26.90	24.53	21.95
540	0.06	0.12	0.18	27.24	24.69	21.98	27.01	24.59	21.97
560	0.06	0.12	0.18	27.22	24.72	21.97	27.01	24.63	21.96
580	0.06	0.12	0.18	27.07	24.66	21.91	26.93	24.62	21.90
600	0.06	0.13	0.19	26.88	24.61	21.85	26.79	24.56	21.85
620	0.06	0.13	0.19	26.81	24.63	21.87	26.70	24.55	21.84
640	0.06	0.13	0.19	26.82	24.70	21.92	26.64	24.59	21.84
660	0.06	0.13	0.19	26.85	24.76	21.97	26.64	24.64	21.88
680	0.05	0.13	0.20	26.92	24.85	22.07	26.73	24.72	21.96
700	0.05	0.13	0.20	26.92	24.84	22.10	26.64	24.62	21.94
720	0.05	0.13	0.20	26.93	24.78	22.10	26.65	24.61	21.95
740	0.05	0.13	0.20	27.02	24.76	22.11	26.78	24.64	22.00
760	0.05	0.14	0.20	27.17	24.76	22.16	26.88	24.61	22.04
780	0.05	0.14	0.21	27.44	24.85	22.27	27.13	24.69	22.16
800	0.05	0.14	0.21	27.63	24.86	22.33	27.32	24.75	22.24
820	0.05	0.14	0.21	27.82	24.90	22.39	27.36	24.72	22.25
840	0.05	0.14	0.21	27.95	24.91	22.44	27.34	24.64	22.23
860	0.05	0.14	0.21	27.99	24.86	22.45	27.43	24.63	22.29
880	0.05	0.14	0.22	28.09	24.86	22.49	27.56	24.70	22.37
900	0.05	0.14	0.22	28.23	24.93	22.56	27.69	24.77	22.44
950	0.05	0.15	0.22	28.48	25.10	22.83	27.90	24.91	22.71
980	0.05	0.15	0.23	28.32	25.05	22.89	27.74	24.85	22.73
1000	0.05	0.15	0.23	28.39	25.14	23.03	27.78	24.88	22.84
1100	0.05	0.16	0.24	28.79	25.61	23.95	28.05	25.32	23.69
1200	0.05	0.17	0.26	29.67	26.35	25.12	28.51	25.91	24.65
1300	0.06	0.18	0.28	30.60	27.11	26.24	29.12	26.35	25.38
1400	0.07	0.21	0.30	32.12	28.08	27.52	30.06	26.98	26.23
1500	0.10	0.23	0.33	34.04	29.31	29.13	29.79	27.29	26.77
1600	0.09	0.23	0.34	34.25	31.01	31.42	30.21	28.17	27.56
1700	0.08	0.24	0.36	35.17	33.17	34.17	31.15	28.90	27.91
1800	0.10	0.26	0.39	35.46	34.69	35.86	30.65	28.62	27.34
1900	0.12	0.30	0.43	34.33	35.21	35.06	28.06	27.01	25.78
2000	0.14	0.33	0.47	32.34	32.21	31.64	26.52	25.57	24.47

Typical Performance Data

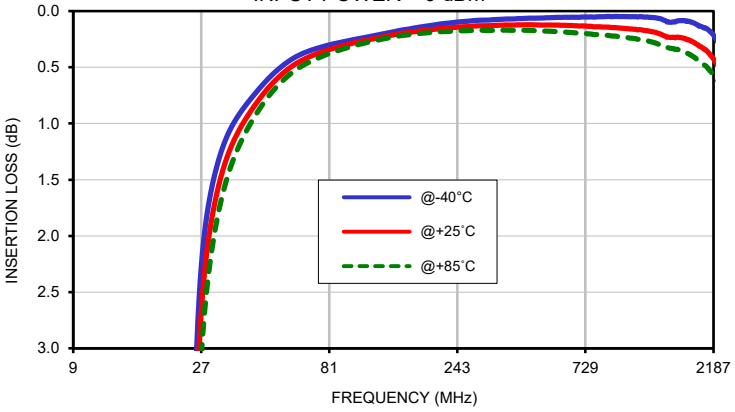
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
50	9.76	9.73	9.70
100	1.98	1.97	1.96
180	0.84	0.83	0.83
200	0.69	0.69	0.68
280	0.40	0.39	0.38
300	0.36	0.35	0.34
380	0.26	0.25	0.25
400	0.25	0.24	0.23
480	0.20	0.19	0.19
500	0.20	0.19	0.18
580	0.17	0.16	0.16
600	0.17	0.16	0.15
650	0.16	0.15	0.14
680	0.15	0.15	0.14
700	0.15	0.14	0.14
780	0.14	0.13	0.13
790	0.14	0.13	0.13
800	0.14	0.13	0.13
820	0.14	0.13	0.12
830	0.14	0.13	0.12
840	0.14	0.13	0.12
850	0.14	0.13	0.12
880	0.14	0.13	0.12
900	0.13	0.12	0.12
920	0.13	0.12	0.12
940	0.13	0.12	0.12
980	0.13	0.12	0.11
1000	0.13	0.12	0.11
1100	0.12	0.12	0.11
1200	0.12	0.11	0.11
1300	0.12	0.11	0.11
1400	0.12	0.11	0.10
1500	0.11	0.10	0.10
1600	0.12	0.11	0.10
1650	0.12	0.11	0.10
1700	0.12	0.11	0.10
1750	0.12	0.11	0.10
1800	0.12	0.11	0.10
1900	0.11	0.11	0.10
2000	0.12	0.11	0.10

Typical Performance Curves

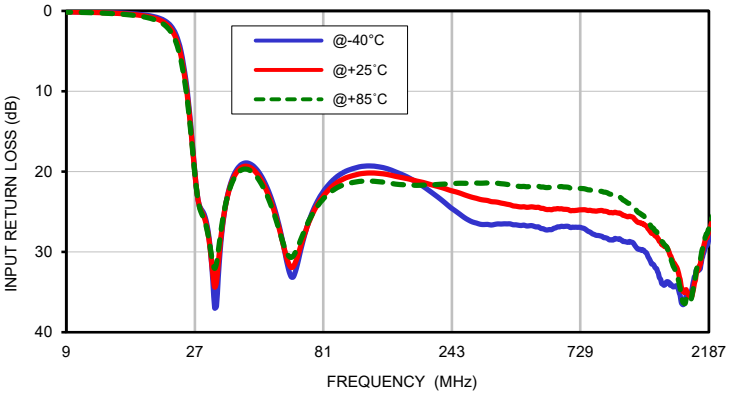
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



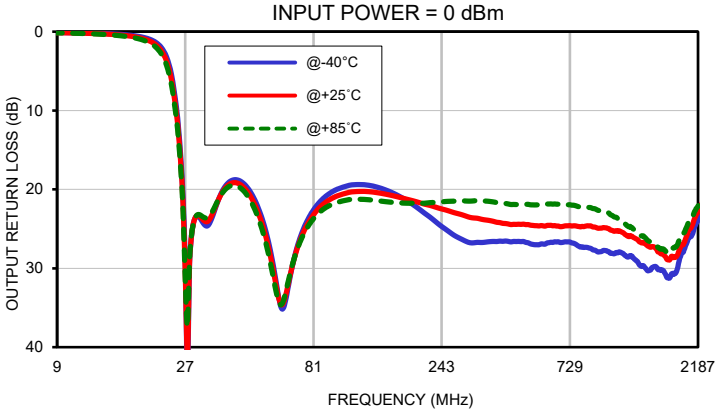
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



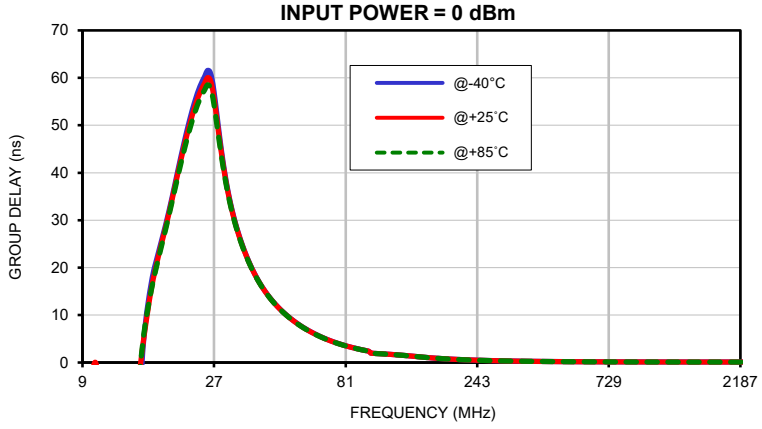
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

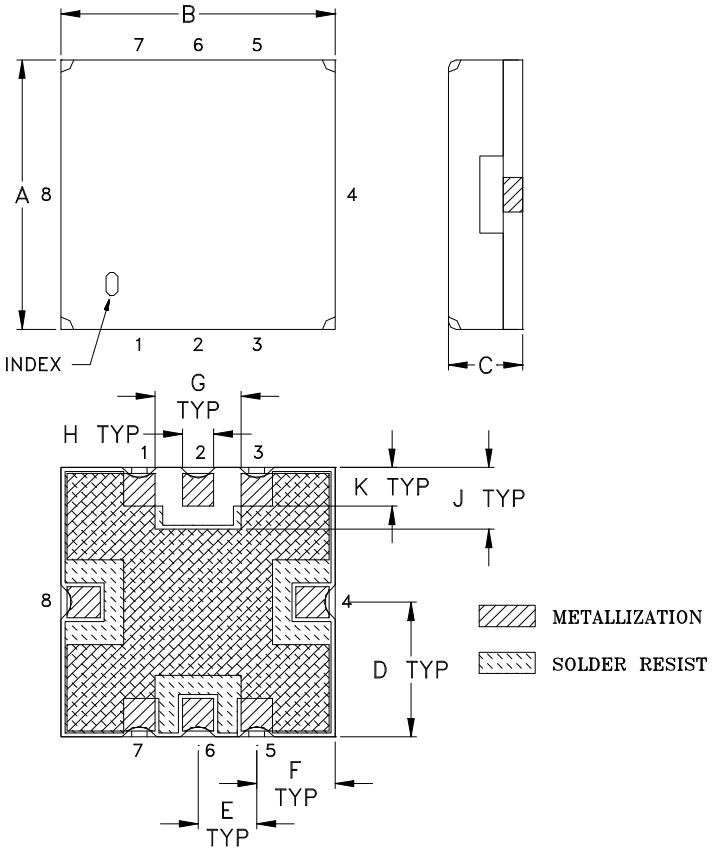


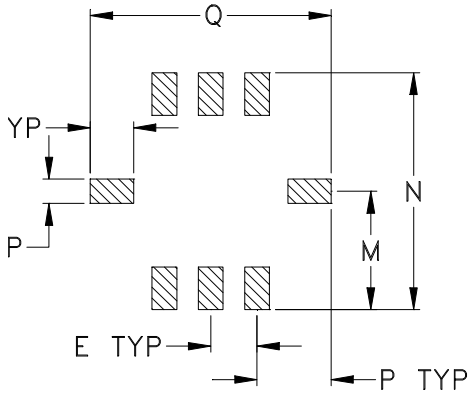
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style GP

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. ± .03; 3Pl. ± .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. 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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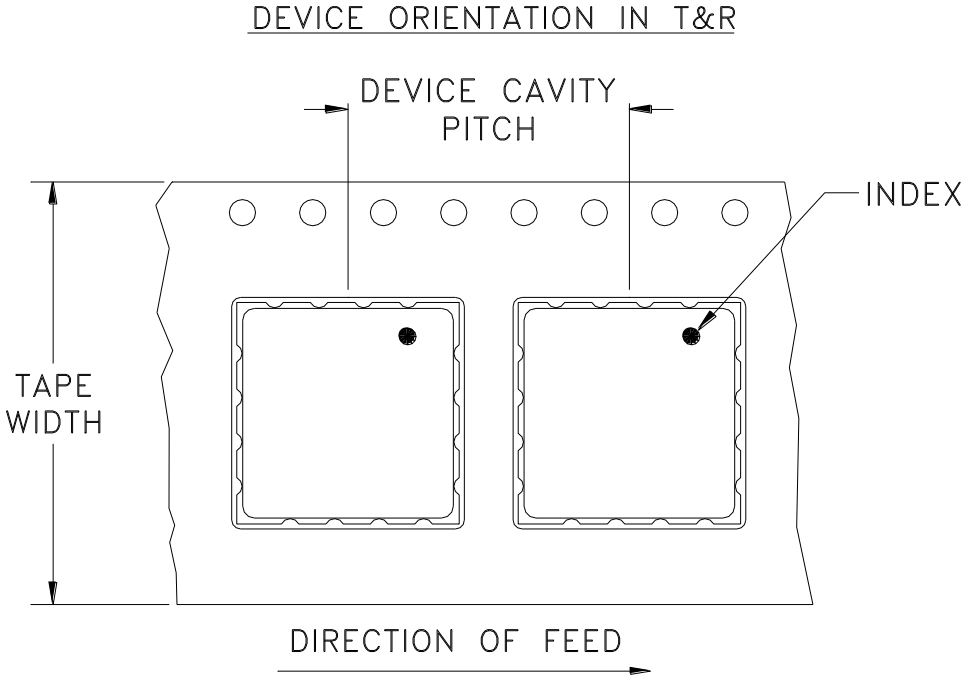
Tape & Reel Packaging TR-F78



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.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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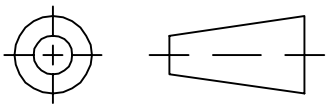
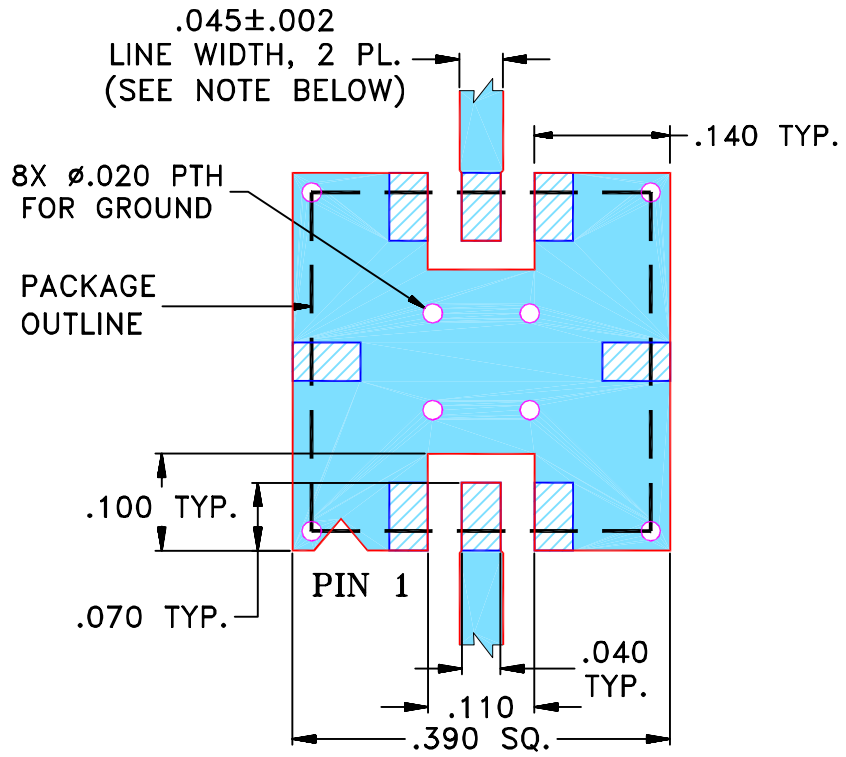
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	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		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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ASHEETA1.DWG REV:A DATE:01/12/95

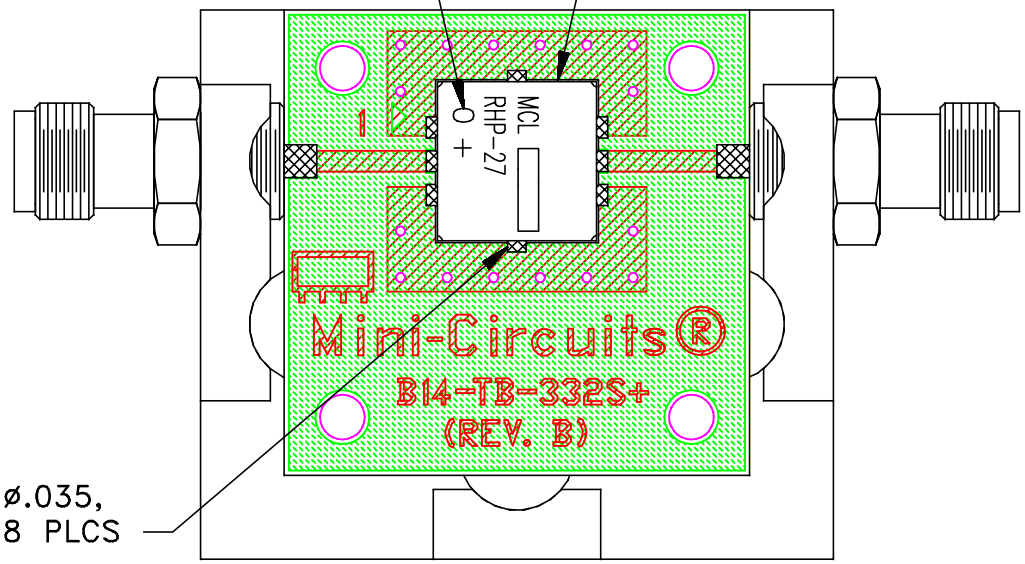
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, qf, GP731, RBP, TB-332

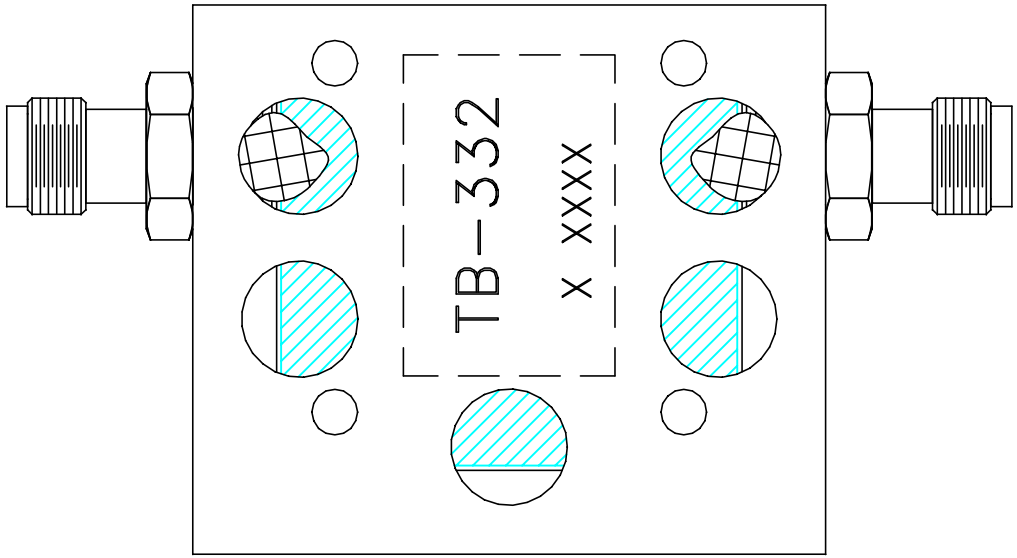
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-176	B

FILE:	SCALE:	SHEET:
98PL176	5:1	1 OF 1

TOP VIEW



BOTTOM VIEW



NOTES:

1. DENOTES METALLIZATION.
2. DENOTES SOLDER MASK.
3. DENOTES SOLDER.

THIRD ANGLE PROJECTION

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	NPO-005046	NEW RELEASE	FEB 25	SPM	VR

REVISIONS

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± ANGLES ± FRACTIONS ±	DRAWN	SPM	13 FEB 25
	CHECKED	DDR	17 FEB 25
	APPROVED	KSK	17 FEB 25

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BSHEETA1.DWG REV:A DATE:01/12/94

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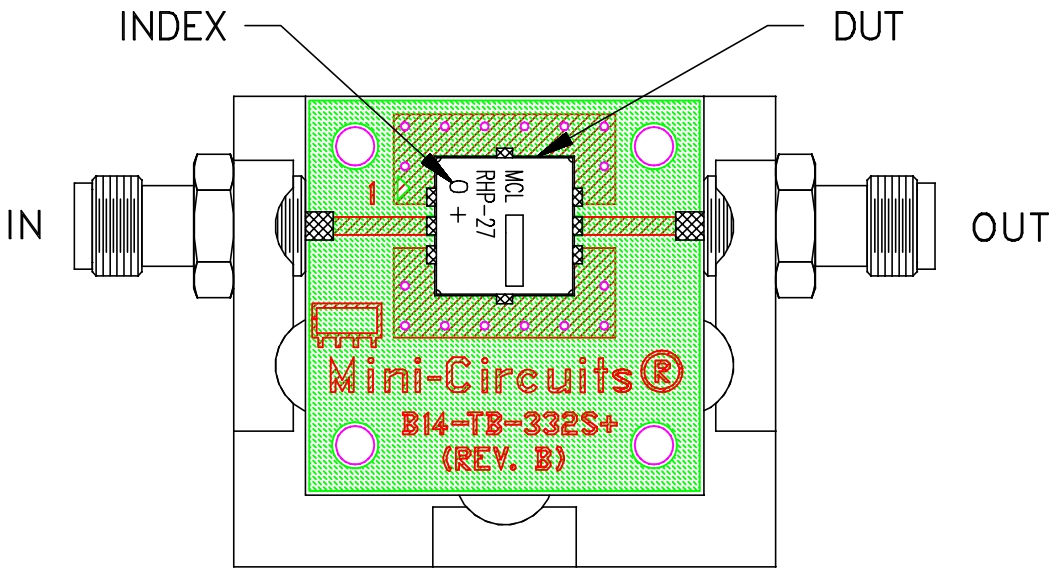
EVAL BOARD FOR RHP-27+

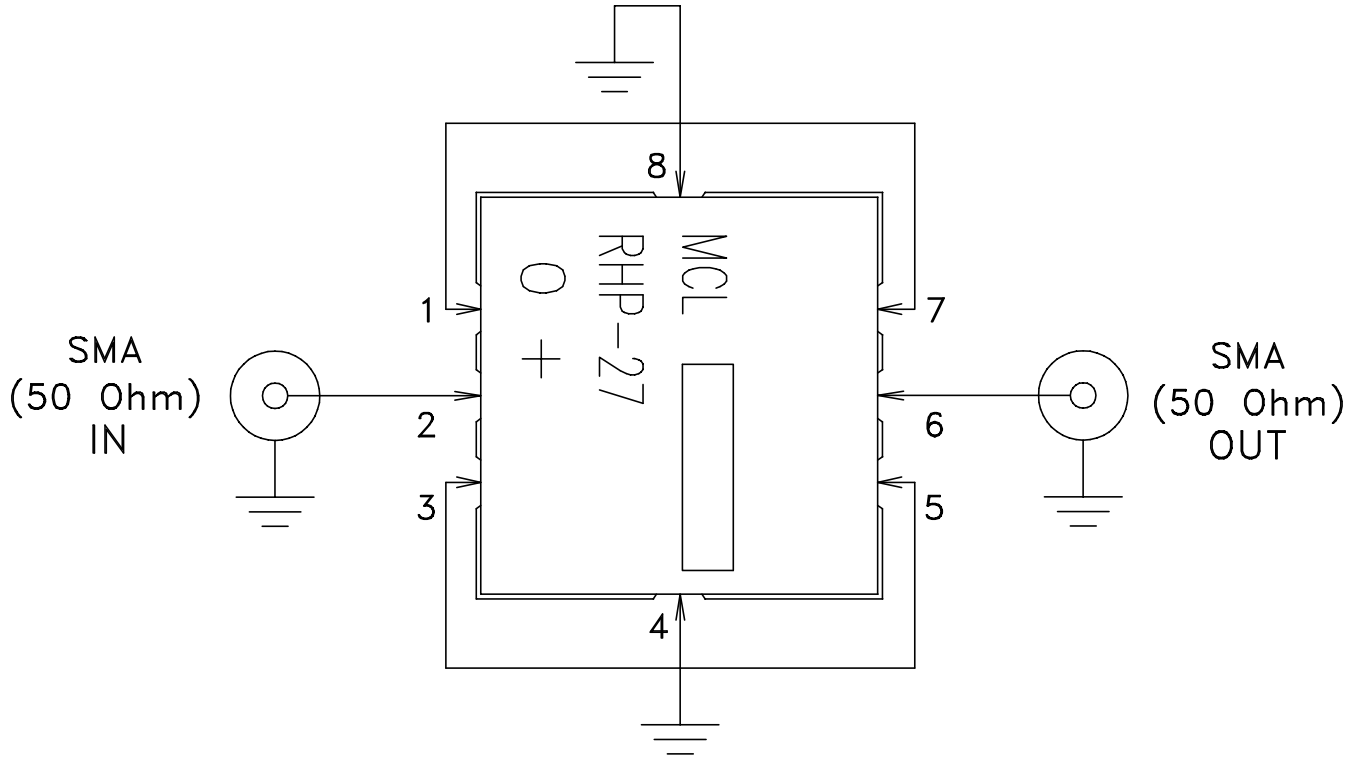
SIZE	CODE IDENT	DRAWING NO:	REV:
B	15542	TB-RHP-27-20+	OR

FILE: WTB-RHP-27+ SCALE: 3:1 SHEET: 1 OF 2

Evaluation Board and Circuit

TB-RHP-27+





Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent,
   Dielectric Constant=4.7, Thickness=.025 ± .002 inch.

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Environmental Specifications ENV03T2

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

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