SURFACE MOUNT METAL SHIELD

Bandpass Filter

RBP-650A+

50Ω 624 to 680 MHz

THE BIG DEAL

- High Rejection
- Miniature shielded package
- Good return loss, 14dB typ. @ passband
- Small size 0.35" x 0.35" x 0.10"
- Shielded case
- Aqueous washable

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

APPLICATIONS

- Transmitters / Receivers
- Navigation

PRODUCT OVERVIEW

The RBP-650A+ is a broad band filter in a small shielded package (size of 0.35" x 0.35" x 0.10") fabricated using SMT technology. This filter offers outstanding close in rejection and finds application in transmitter and receivers circuits.

KEY FEATURES

Feature	Advantages
High Rejection	The high rejection enables the filter to reject adjacent channels effectively.
Low Passband return loss	This filter maintains good typical return loss over passband frequency range making this filter easier to integrate into receiver and transmitter RF chains with less concerns for in-band frequency ripple.
Small size, 0.35" x 0.35" x 0.10"	The small surface mount package enables the RBP-650A+ to be used in compact designs.

REV. OR
ECO-012897
RBP-650A+
EDU4354
URJ
220420

Bandpass Filter

RBP-650A+

ELECTRICAL SPECIFICATIONS AT 25°C

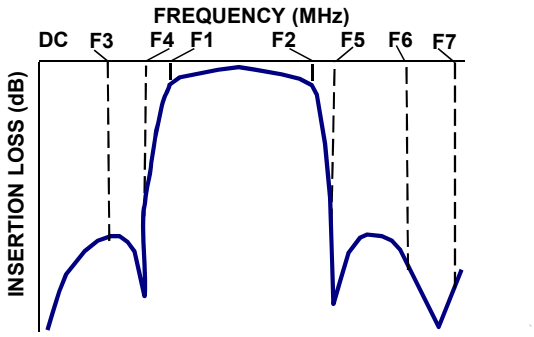
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Passband	Center Frequency	—	—	—	652	—	MHz
	Insertion Loss	F1-F2	624 - 680	—	—	7	dB
	Return Loss	F1-F2	624 - 680	—	14	—	dB
Stop Band, Lower	Insertion Loss	F3	520	35	—	—	dB
		F4	550	20	—	—	
Stop Band, Upper	Insertion Loss	F5	760	20	—	—	dB
		F6-F7	810 - 1000	35	—	—	

MAXIMUM RATINGS

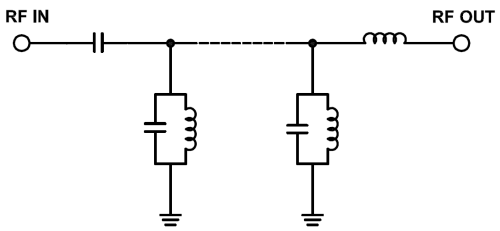
Parameter	Ratings
Operating temperature	-40°C to +85°C
Storage temperature	-55°C to +100°C
RF Power Input	0.5W at 25°C

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

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL SCHEMATIC



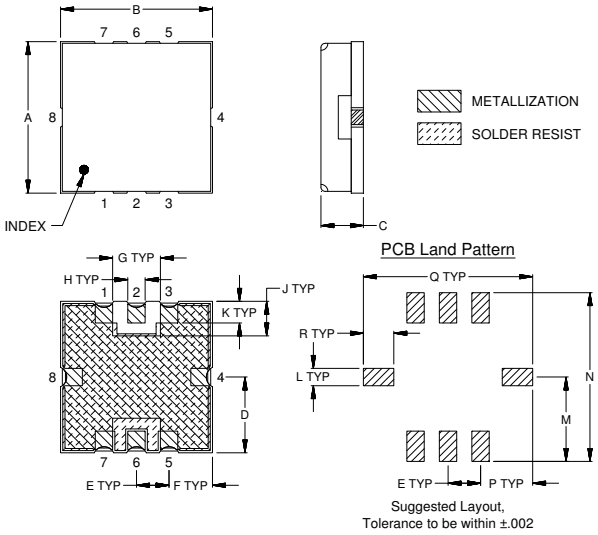
Bandpass Filter

RBP-650A+

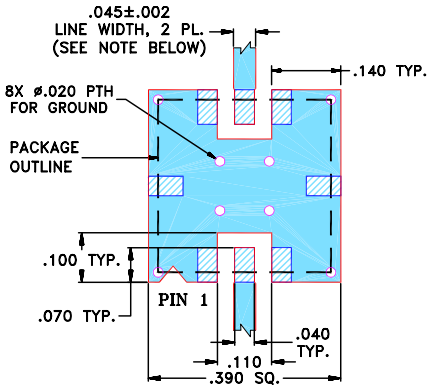
PAD CONNECTIONS

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

OUTLINE DRAWING



DEMO BOARD MCL P/N: TB-RBP-650A+
SUGGESTED PCB LAYOUT (PL-176)



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

OUTLINE DIMENSIONS (Inches / 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

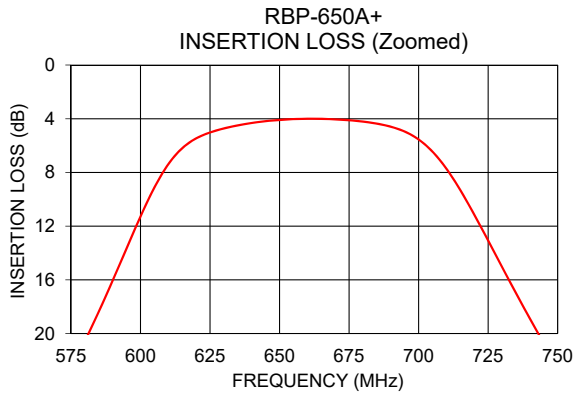
Note: Please refer to case style drawing for details

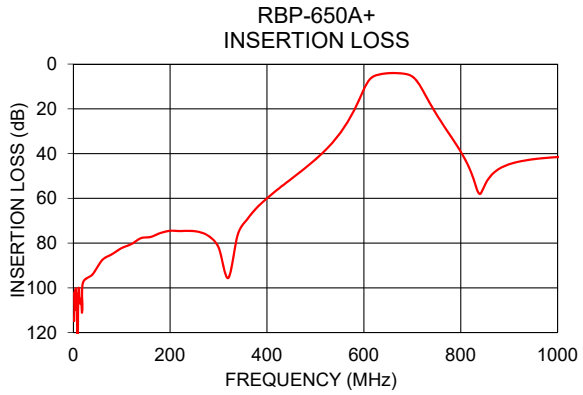
Bandpass Filter

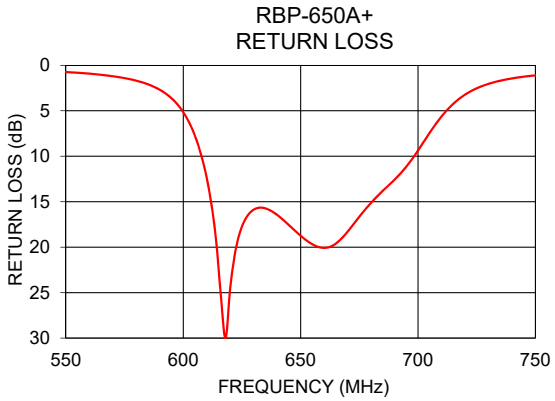
RBP-650A+

TYPICAL PERFORMANCE DATA

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
1	113.30	0.06
200	74.50	0.07
520	38.59	0.47
550	31.13	0.74
580	20.57	1.69
610	7.39	12.40
624	5.10	18.50
630	4.72	15.87
650	4.09	18.74
652	4.06	19.16
680	4.21	15.12
760	25.93	0.90
776	31.15	0.70
810	43.00	0.49
1000	41.53	0.27







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-Circuit's 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/MCLStore/terms.jsp

Band Pass Filter RBP-650A+

Typical Performance Data

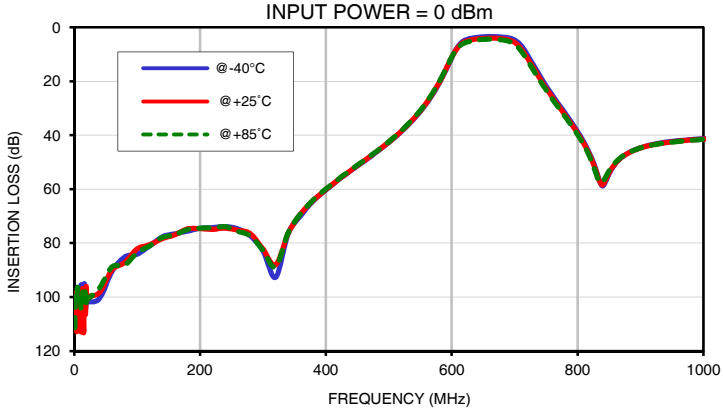
FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	99.81	103.38	111.41	0.06	0.06	0.06	0.60	0.61	0.62
10	103.16	105.79	102.25	0.06	0.05	0.05	0.25	0.26	0.27
20	101.69	99.38	101.13	0.05	0.05	0.05	0.28	0.29	0.30
40	100.58	98.35	96.70	0.05	0.05	0.04	0.29	0.30	0.32
60	90.55	89.95	88.83	0.05	0.05	0.05	0.31	0.32	0.33
80	85.18	87.24	88.20	0.05	0.05	0.05	0.33	0.34	0.35
200	74.50	74.69	74.44	0.04	0.07	0.07	0.35	0.39	0.41
260	74.73	75.25	75.64	0.06	0.09	0.10	0.33	0.38	0.41
300	82.85	82.18	82.71	0.07	0.10	0.11	0.32	0.38	0.42
320	92.71	88.14	88.82	0.08	0.11	0.12	0.32	0.38	0.42
340	76.53	76.39	76.18	0.09	0.12	0.13	0.32	0.38	0.42
360	69.81	69.11	69.09	0.10	0.14	0.15	0.31	0.38	0.42
380	64.31	64.20	63.97	0.11	0.15	0.17	0.31	0.38	0.43
400	60.35	60.14	59.94	0.13	0.17	0.19	0.32	0.39	0.44
420	56.54	56.43	56.28	0.15	0.19	0.21	0.32	0.39	0.44
440	53.14	52.97	52.80	0.17	0.22	0.24	0.33	0.40	0.46
460	49.75	49.60	49.46	0.20	0.25	0.28	0.34	0.42	0.48
480	46.35	46.18	46.05	0.23	0.30	0.33	0.36	0.45	0.52
500	42.72	42.55	42.38	0.29	0.36	0.40	0.39	0.49	0.57
505	41.75	41.59	41.41	0.31	0.38	0.42	0.40	0.51	0.58
510	40.76	40.59	40.42	0.33	0.40	0.44	0.41	0.52	0.60
515	39.74	39.57	39.39	0.35	0.43	0.47	0.43	0.54	0.63
520	38.68	38.51	38.33	0.37	0.45	0.50	0.45	0.57	0.65
525	37.60	37.40	37.21	0.40	0.48	0.54	0.47	0.59	0.68
530	36.46	36.27	36.06	0.43	0.52	0.58	0.49	0.62	0.71
535	35.25	35.05	34.85	0.46	0.56	0.62	0.52	0.65	0.75
540	34.00	33.78	33.58	0.50	0.61	0.68	0.55	0.69	0.79
545	32.68	32.46	32.24	0.55	0.67	0.74	0.58	0.73	0.84
550	31.30	31.05	30.83	0.60	0.73	0.82	0.62	0.78	0.90
555	29.82	29.56	29.33	0.67	0.81	0.91	0.67	0.85	0.98
560	28.25	27.98	27.74	0.75	0.91	1.02	0.74	0.92	1.06
565	26.57	26.29	26.04	0.86	1.04	1.17	0.81	1.02	1.17
570	24.78	24.48	24.22	0.99	1.20	1.35	0.91	1.14	1.31
575	22.86	22.55	22.28	1.16	1.41	1.60	1.03	1.29	1.49
580	20.80	20.48	20.20	1.39	1.70	1.94	1.20	1.50	1.73
590	16.25	15.95	15.70	2.21	2.72	3.14	1.77	2.20	2.54
624	4.51	5.10	5.51	20.15	18.25	17.09	12.31	12.67	12.94
636	3.89	4.47	4.87	15.66	15.85	15.86	16.63	17.80	18.60
650	3.53	4.10	4.50	18.19	18.91	19.46	24.49	25.30	25.26
652	3.50	4.07	4.47	18.52	19.34	20.01	23.58	23.90	23.79
680	3.63	4.24	4.68	14.73	15.09	15.41	14.94	15.84	16.86
700	4.69	5.61	6.31	9.72	9.25	8.89	23.29	20.22	17.67
724	11.62	12.78	13.65	2.52	2.61	2.64	3.49	3.58	3.61
744	19.50	20.42	21.13	1.11	1.27	1.34	1.43	1.60	1.71
760	25.19	25.97	26.59	0.74	0.88	0.95	0.92	1.07	1.17
774	29.82	30.53	31.11	0.58	0.71	0.77	0.70	0.83	0.92
800	38.55	39.22	39.75	0.41	0.52	0.58	0.47	0.59	0.66
810	42.49	43.05	43.62	0.37	0.48	0.53	0.42	0.53	0.60
840	58.83	58.43	57.32	0.30	0.39	0.44	0.32	0.43	0.49
860	50.64	50.50	50.16	0.26	0.36	0.40	0.28	0.38	0.44
880	46.67	46.72	46.64	0.24	0.32	0.37	0.25	0.35	0.41
900	44.66	44.72	44.71	0.22	0.30	0.34	0.23	0.33	0.39
910	43.93	44.02	44.10	0.22	0.30	0.33	0.22	0.32	0.38
920	43.40	43.53	43.60	0.21	0.29	0.33	0.20	0.31	0.37
930	42.95	43.11	43.20	0.21	0.28	0.32	0.20	0.30	0.36
940	42.59	42.77	42.86	0.20	0.28	0.32	0.18	0.29	0.35
950	42.27	42.47	42.57	0.20	0.27	0.31	0.18	0.29	0.35
960	42.03	42.23	42.32	0.19	0.27	0.30	0.17	0.28	0.34
970	41.81	42.00	42.09	0.19	0.27	0.30	0.17	0.27	0.33
1000	41.33	41.51	41.56	0.18	0.25	0.29	0.15	0.26	0.32

Typical Performance Data

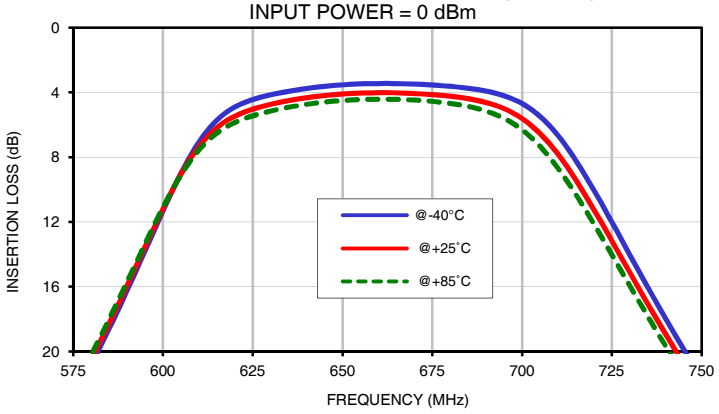
FREQ. (MHz)	GROUP DELAY (ns)		
	@-40°C	@+25˚C	@+85˚C
600	9.69	10.13	10.44
602	10.40	10.79	11.03
604	11.10	11.40	11.57
608	12.32	12.39	12.38
610	12.77	12.71	12.61
620	12.95	12.51	12.20
624	12.34	11.95	11.67
626	12.02	11.66	11.42
628	11.70	11.39	11.17
630	11.41	11.15	10.96
632	11.15	10.92	10.76
634	10.92	10.73	10.59
636	10.72	10.56	10.44
638	10.55	10.41	10.31
640	10.40	10.27	10.18
642	10.26	10.15	10.07
644	10.14	10.04	9.97
646	10.03	9.94	9.87
648	9.93	9.85	9.78
650	9.83	9.76	9.71
652	9.75	9.68	9.63
654	9.66	9.61	9.56
656	9.59	9.54	9.50
658	9.52	9.48	9.45
660	9.46	9.43	9.40
662	9.41	9.38	9.36
664	9.36	9.34	9.33
666	9.32	9.31	9.31
668	9.29	9.29	9.29
670	9.27	9.28	9.29
672	9.26	9.27	9.29
674	9.26	9.28	9.31
676	9.27	9.30	9.34
678	9.30	9.34	9.38
680	9.34	9.39	9.44
682	9.40	9.46	9.51
684	9.48	9.54	9.60
686	9.58	9.65	9.71
688	9.70	9.77	9.82
690	9.85	9.90	9.94
700	10.62	10.47	10.32

Typical Performance Curves

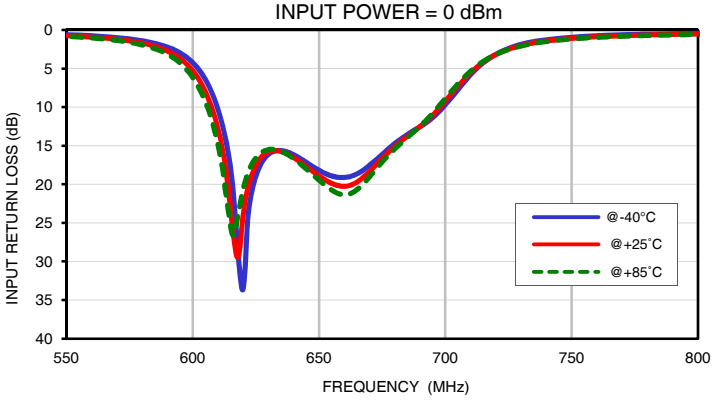
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



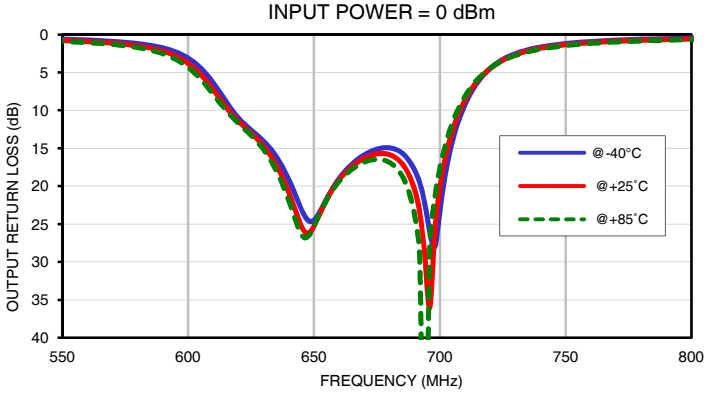
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



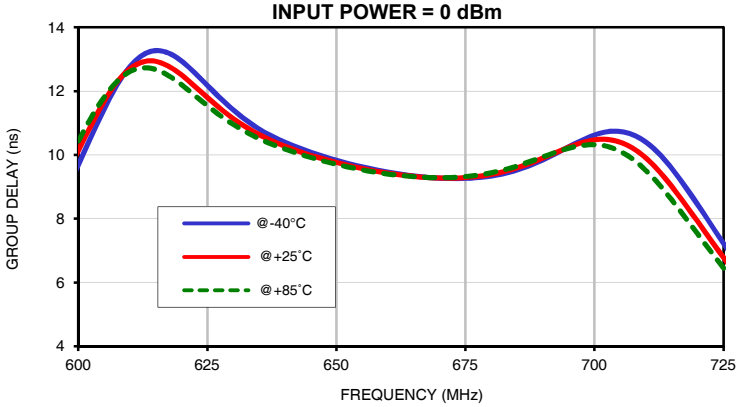
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

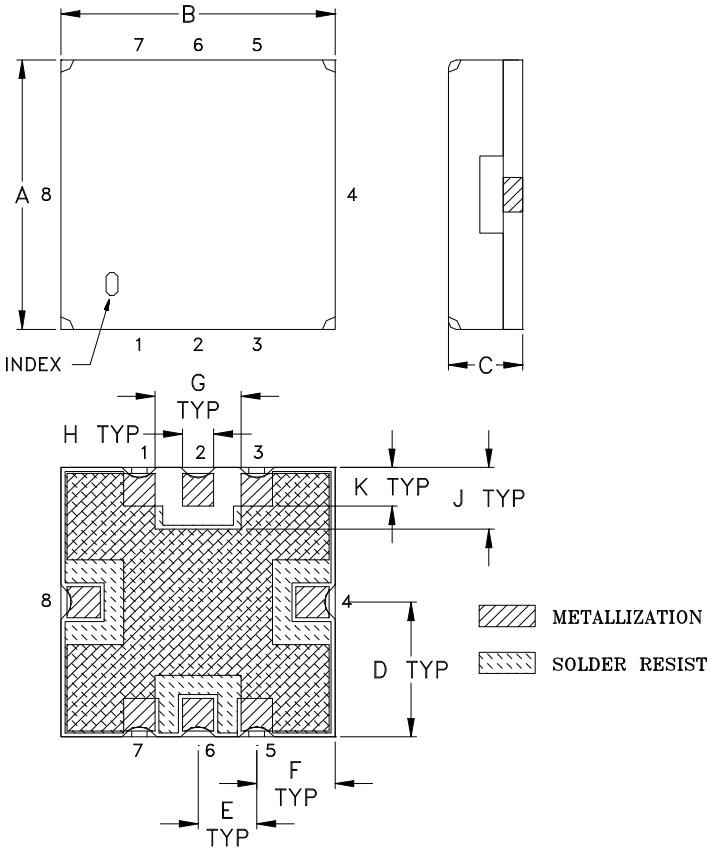


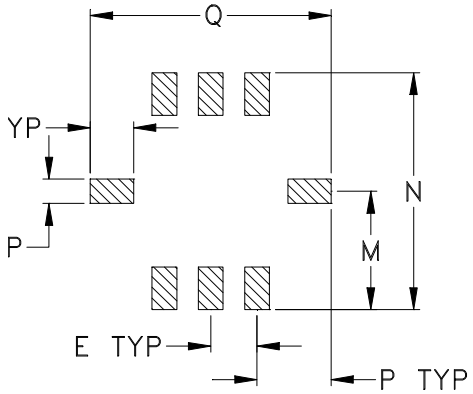
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



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)

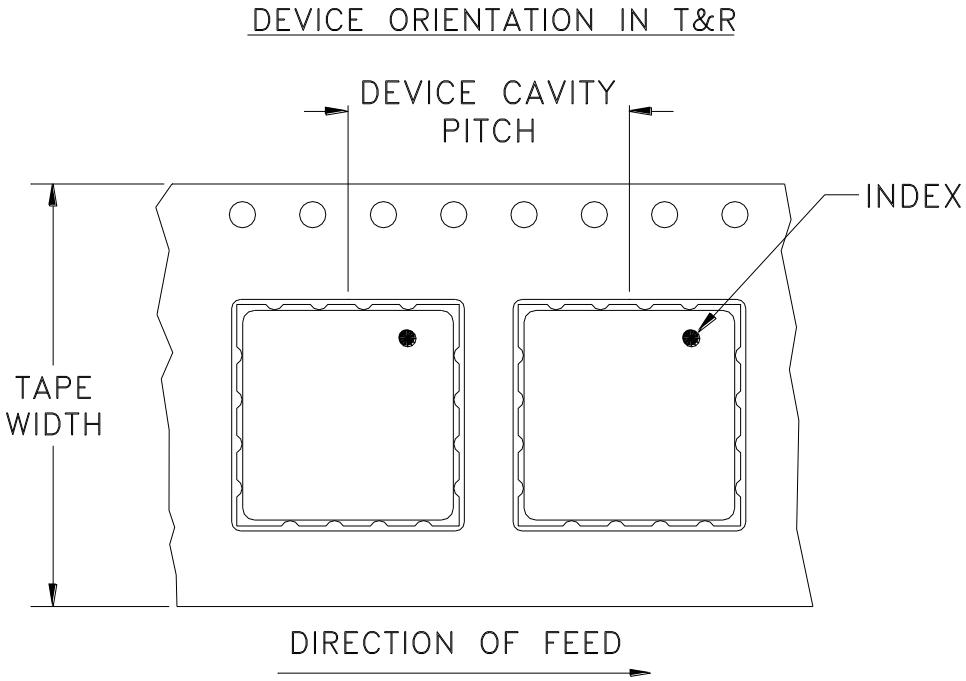
CASE #	N	P	Q	R	WT. GRAM	
GP731	.390 (9.91)	.120 (3.05)	.390 (9.91)	.070 (1.78)	.4	+0.3
						-0.0

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.

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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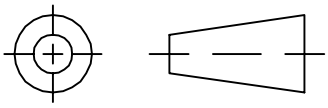
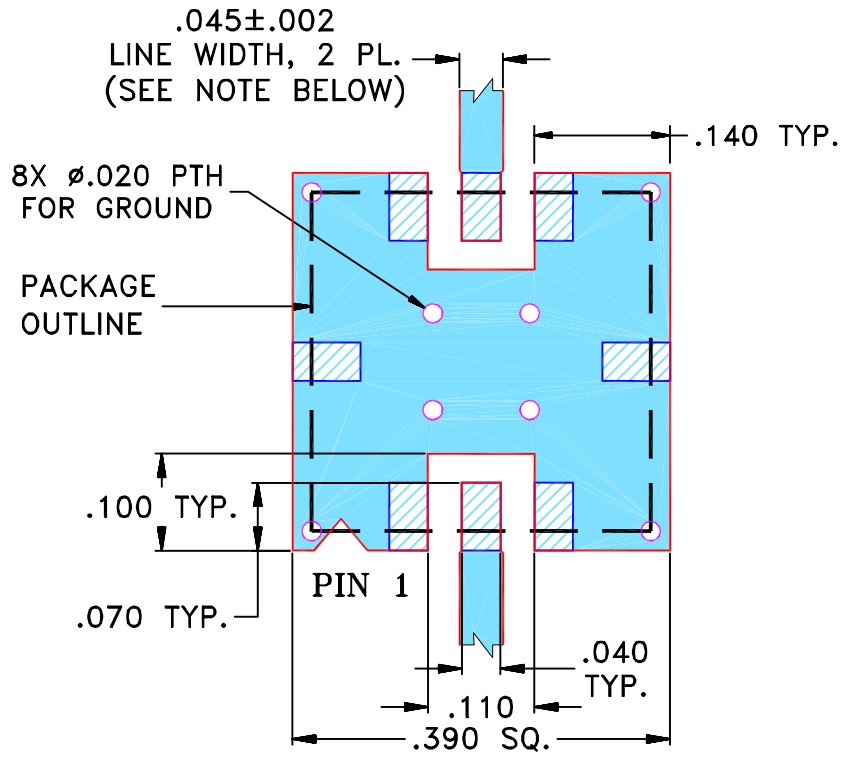
THIRD ANGLE PROJECTION



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 ±			

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

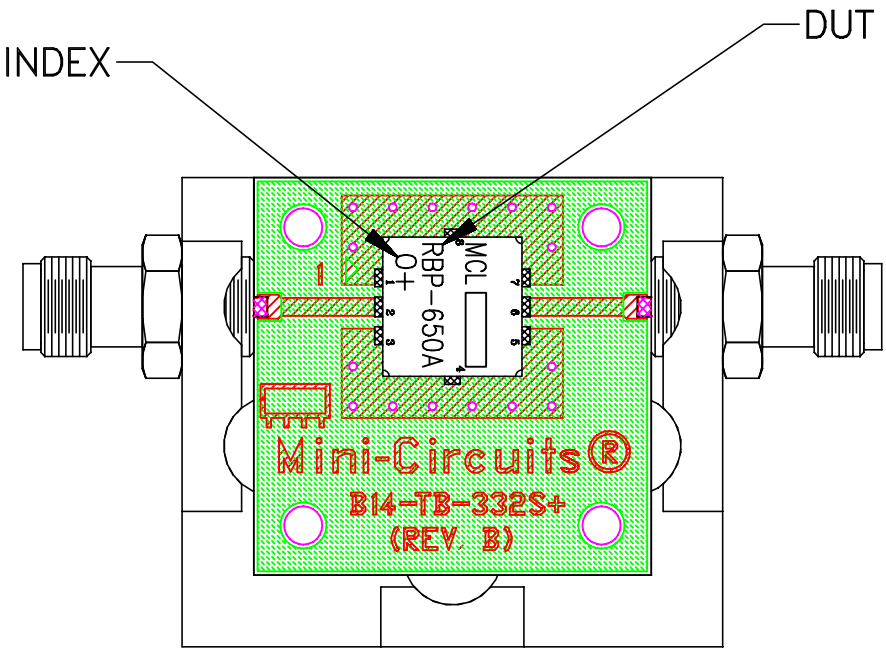
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, qf, GP731, RBP, TB-332

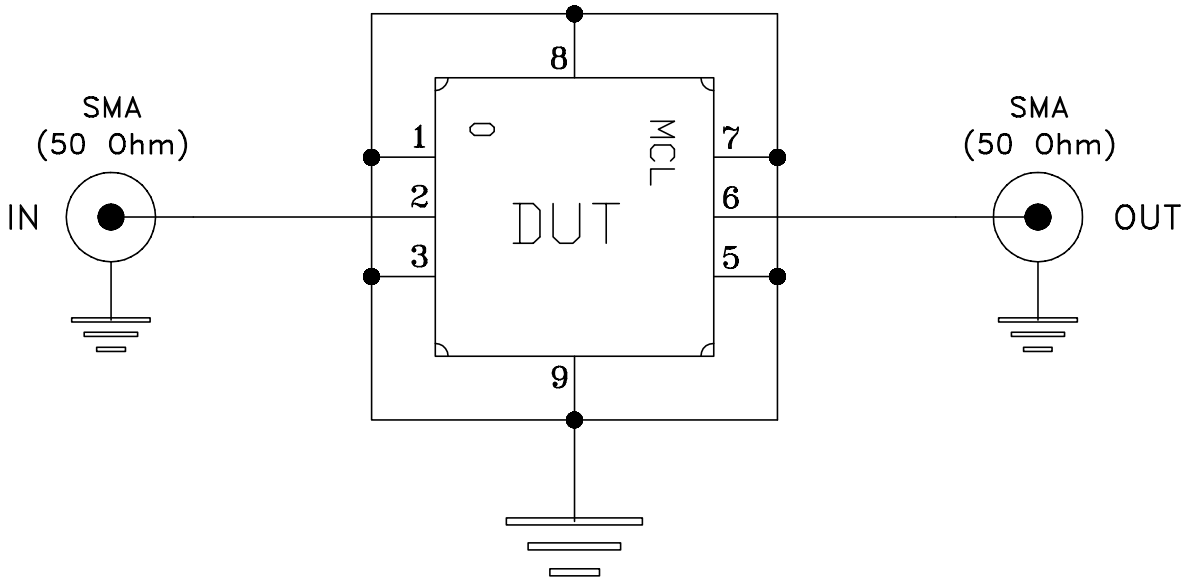
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-176	B

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

Evaluation Board and Circuit



TB-RBP-650A+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.020 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