

LUMPED LC SURFACE MOUNT top hat

Low Pass Filter

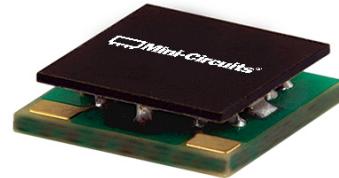
ULP-1094+

50Ω

DC to 1094 MHz

KEY FEATURES

- Low Insertion Loss, 1.2 dB Typ.
- High Rejection, 40 dB Typ.
- Sharp Insertion Loss Roll-off
- Good Return Loss, 11.7 dB Typ.
- Ultra Miniature Surface Mount Package



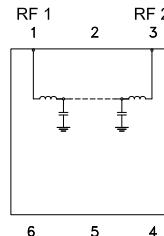
Generic photo used for illustration purposes only

APPLICATIONS

- Wireless Communications
- Receivers / Transformers
- Lab Use

PRODUCT OVERVIEW

The ULP-1094+ is a low pass filter in a top hat package (size of 0.25" x 0.25") fabricated using SMT technology. Covering DC to 1094 MHz band width, these units offer good matching within the passband and high rejection. This model uses a miniature high Q capacitors and chip inductors for high reliability. In addition it has repeatable performance across production lots and consistent performance across temperature.

FUNCTIONAL DIAGRAM**ELECTRICAL SPECIFICATIONS^{1,2,3} AT +25°C**

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC-F1	DC - 1094	—	1.2	dB
	Freq. Cut-Off	Fc	1380	—	3.0	dB
	Return Loss	DC-F1	DC - 1094	—	11.7	dB
Stopband	Rejection	F2-F3	1700 - 2200	20	25	dB
		F3-F4	2200 - 3300	30	35	dB

1. Tested in Evaluation Board P/N TB-ULP-1094+

2. This filter is bi-directional RF1 and RF2 ports may be interchanged, see S-Parameters for actual performance.

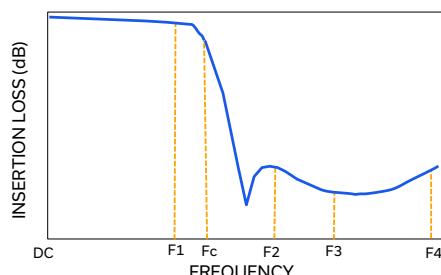
3. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.

ABSOLUTE MAXIMUM RATINGS⁴

Parameter	Ratings
Operating Temperature	-40°C to + 85°C
Storage Temperature	-55°C to +100°C
Input Power ⁵	1.6 W max.

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. A
 ECO-025420
 ULP-1094+
 EDU2399
 URJ
 250519
Mini-Circuits®

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LUMPED LC SURFACE MOUNT



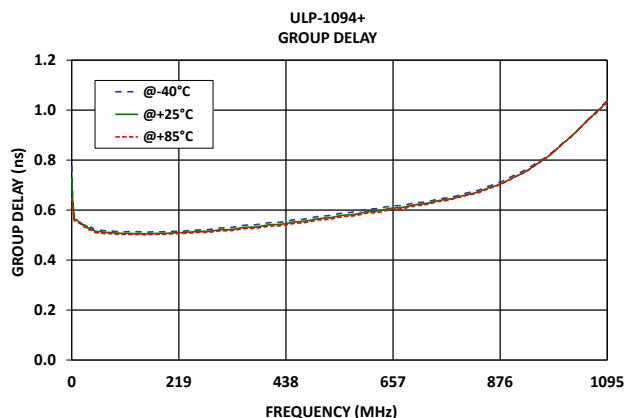
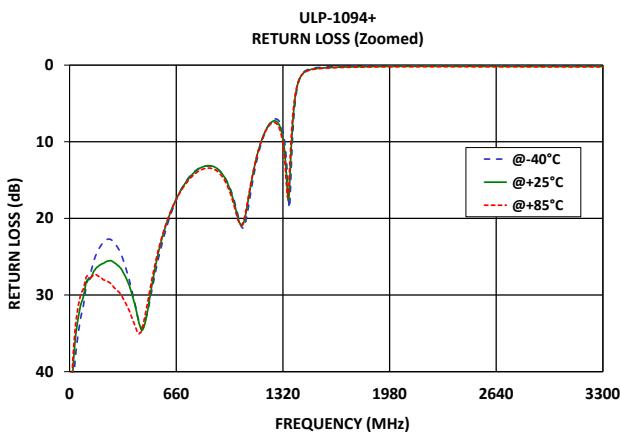
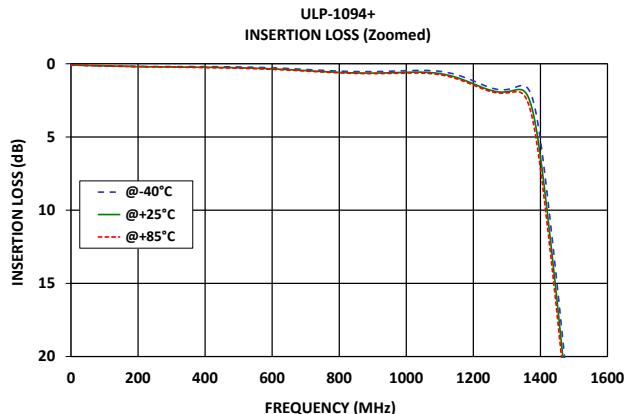
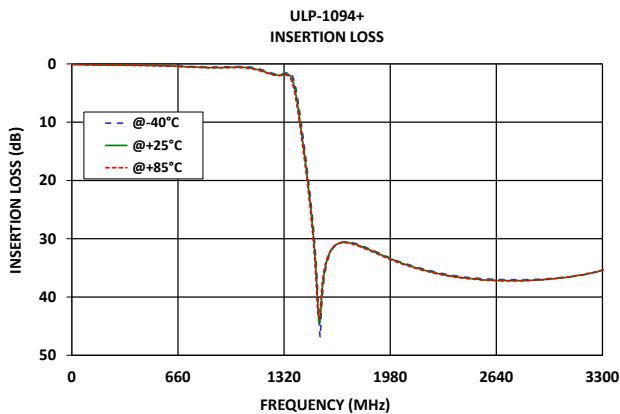
Low Pass Filter

ULP-1094+

50Ω

DC to 1094 MHz

TYPICAL PERFORMANCE GRAPHS





LUMPED LC SURFACE MOUNT



Low Pass Filter

ULP-1094+

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50Ω

DC to 1094 MHz

FUNCTIONAL DIAGRAM

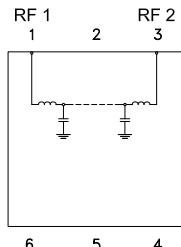
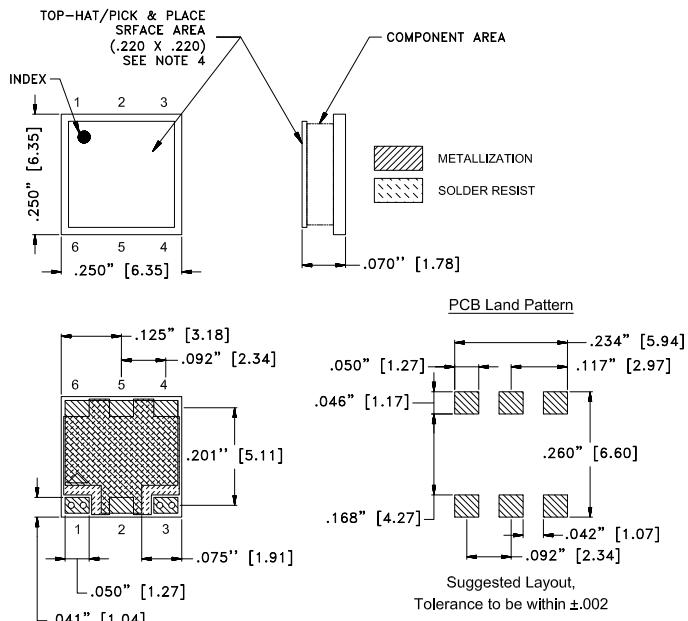


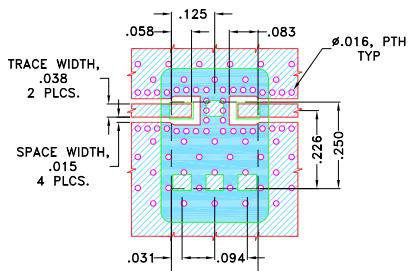
Figure 1. ULP-1094+ Functional Diagram

CASE STYLE DRAWING



SUGGESTED PCB LAYOUT (PL-484)

SUGGESTED MOUNTING CONFIGURATION FOR QA2224 CASE STYLE "06FL09" PIN CODE



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 DENOTES COPPER LAND PATTERN FREE OF SODERMASK

Figure 2. Suggested PCB Layout PL-484

Weight: .25 gram

Dimensions are in inches (mm). Tolerances: 2PI. ± .03; 3PI. ± .015

PRODUCT MARKING*: ULP-1094

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

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LUMPED LC SURFACE MOUNT



Low Pass Filter

ULP-1094+

50Ω

DC to 1094 MHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD.**CLICK HERE**

Performance Data and Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	QA2224 Lead Finish: Gold over Nickel Plate
RoHS Status	Compliant
Tape and Reel	TR-F34
Suggested Layout for PCB Design	PL-484
Evaluation Board	TB-ULP-1094+ 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.
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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
	0.08	0.09	0.09	48.11	46.63	45.63	50.88	48.86	47.53
2	0.08	0.08	0.09	49.93	47.99	46.79	52.54	50.01	48.47
5	0.08	0.08	0.08	50.97	48.15	46.77	53.59	49.94	48.27
10	0.08	0.08	0.09	47.12	44.42	43.07	48.60	45.46	43.93
15	0.08	0.09	0.09	44.57	41.93	40.54	45.78	42.74	41.17
20	0.09	0.09	0.09	42.85	40.07	38.57	43.62	40.59	38.99
25	0.09	0.09	0.10	41.13	38.41	36.87	41.65	38.75	37.14
50	0.11	0.12	0.12	35.55	33.41	31.89	35.87	33.59	32.01
100	0.14	0.15	0.15	29.18	28.59	27.87	30.20	29.45	28.66
150	0.16	0.17	0.17	25.53	26.89	27.34	25.45	26.80	27.25
200	0.18	0.19	0.19	23.36	25.92	27.82	23.57	26.30	28.39
250	0.19	0.21	0.21	22.71	25.51	28.41	22.92	25.94	29.27
300	0.19	0.22	0.23	23.88	26.16	29.51	24.30	26.86	31.08
400	0.20	0.24	0.26	30.70	30.92	33.72	33.01	33.06	38.96
500	0.22	0.28	0.30	30.40	29.91	29.00	30.54	29.94	29.04
600	0.28	0.35	0.38	21.17	20.66	20.51	20.93	20.41	20.27
700	0.39	0.47	0.50	15.87	15.92	16.06	15.68	15.73	15.86
800	0.50	0.59	0.62	13.48	13.53	13.81	13.37	13.44	13.71
900	0.54	0.64	0.67	13.39	13.32	13.66	13.33	13.30	13.65
1000	0.47	0.58	0.63	16.44	16.68	17.09	16.69	17.12	17.67
1094	0.50	0.65	0.73	19.99	18.98	18.63	22.43	21.40	21.07
1100	0.52	0.67	0.75	19.32	18.28	17.94	21.45	20.33	20.01
1200	1.17	1.37	1.46	9.33	9.15	9.21	9.61	9.44	9.50
1300	1.76	1.91	1.99	7.42	7.93	8.36	7.57	8.07	8.49
1380	2.67	3.54	4.18	9.37	7.78	6.87	9.51	7.89	6.93
1400	5.21	6.34	7.16	4.12	3.67	3.39	4.19	3.75	3.45
1450	15.13	16.29	17.18	0.89	0.98	1.02	0.93	1.03	1.06
1470	19.61	20.79	21.73	0.62	0.72	0.77	0.66	0.77	0.82
1500	27.37	28.78	29.98	0.42	0.53	0.58	0.46	0.57	0.62
1505	28.92	30.40	31.69	0.40	0.51	0.56	0.43	0.55	0.60
1600	32.95	32.68	32.49	0.22	0.32	0.37	0.24	0.35	0.40
1650	30.94	30.93	30.92	0.18	0.28	0.32	0.19	0.30	0.35
1700	30.53	30.61	30.69	0.16	0.25	0.30	0.16	0.27	0.31
1750	30.71	30.84	30.95	0.13	0.22	0.27	0.13	0.24	0.28
1800	31.18	31.32	31.45	0.11	0.20	0.25	0.11	0.21	0.26
1850	31.71	31.87	32.01	0.10	0.20	0.24	0.10	0.21	0.25
1900	32.32	32.46	32.61	0.09	0.18	0.23	0.08	0.19	0.24
1950	32.94	33.06	33.20	0.08	0.17	0.22	0.07	0.18	0.23
2000	33.50	33.64	33.78	0.07	0.17	0.22	0.06	0.18	0.23
2050	34.06	34.17	34.30	0.06	0.16	0.21	0.05	0.17	0.22
2100	34.49	34.62	34.73	0.06	0.16	0.21	0.04	0.16	0.21
2150	34.92	35.06	35.16	0.06	0.16	0.21	0.05	0.16	0.21
2200	35.29	35.46	35.55	0.06	0.15	0.20	0.04	0.15	0.20
2250	35.63	35.79	35.89	0.06	0.16	0.21	0.04	0.15	0.21
2300	35.93	36.10	36.18	0.06	0.16	0.21	0.04	0.16	0.21
2350	36.20	36.35	36.44	0.05	0.15	0.20	0.03	0.15	0.20
2400	36.42	36.58	36.66	0.06	0.16	0.21	0.03	0.15	0.21
2450	36.60	36.76	36.82	0.06	0.16	0.21	0.04	0.16	0.21
2500	36.72	36.89	36.95	0.06	0.16	0.21	0.04	0.15	0.21
2550	36.87	37.04	37.09	0.07	0.17	0.22	0.04	0.16	0.21
2600	36.93	37.10	37.15	0.06	0.16	0.21	0.04	0.16	0.22
2650	37.00	37.17	37.21	0.06	0.17	0.22	0.04	0.16	0.22
2700	37.02	37.17	37.24	0.07	0.17	0.22	0.04	0.16	0.21
2800	37.04	37.19	37.22	0.07	0.17	0.22	0.04	0.17	0.22
2900	36.95	37.09	37.10	0.07	0.17	0.22	0.05	0.17	0.22
3000	36.75	36.84	36.85	0.07	0.18	0.22	0.05	0.17	0.22
3100	36.50	36.55	36.52	0.07	0.18	0.22	0.05	0.17	0.22
3150	36.27	36.27	36.28	0.07	0.18	0.22	0.05	0.17	0.22
3200	36.08	36.07	36.04	0.07	0.18	0.22	0.05	0.17	0.21
3300	35.43	35.41	35.37	0.07	0.18	0.22	0.05	0.17	0.21



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IF/RF MICROWAVE COMPONENTS



REV. OR

ULP-1094+

170512

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Typical Performance Data

FREQ. (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
1	0.72	0.67	0.62
2	0.65	0.63	0.61
3	0.62	0.62	0.60
4	0.60	0.59	0.58
5	0.57	0.56	0.56
10	0.56	0.56	0.56
20	0.55	0.54	0.54
25	0.54	0.54	0.53
50	0.52	0.51	0.51
75	0.52	0.51	0.51
100	0.51	0.51	0.50
125	0.51	0.51	0.50
150	0.51	0.50	0.50
175	0.51	0.51	0.50
200	0.51	0.51	0.50
225	0.52	0.51	0.51
250	0.52	0.51	0.51
275	0.52	0.52	0.51
300	0.53	0.52	0.52
325	0.53	0.52	0.52
350	0.54	0.53	0.53
375	0.54	0.53	0.53
400	0.55	0.54	0.53
425	0.55	0.54	0.54
450	0.56	0.55	0.55
475	0.56	0.56	0.55
500	0.57	0.56	0.56
525	0.58	0.57	0.56
550	0.59	0.58	0.57
575	0.59	0.58	0.58
600	0.60	0.59	0.59
625	0.61	0.60	0.59
650	0.61	0.61	0.60
675	0.62	0.61	0.61
700	0.63	0.62	0.62
725	0.63	0.63	0.62
750	0.64	0.64	0.63
775	0.65	0.64	0.64
800	0.66	0.66	0.65
825	0.68	0.67	0.67
850	0.69	0.69	0.68
875	0.71	0.70	0.70
900	0.73	0.73	0.73
910	0.74	0.74	0.74
920	0.75	0.75	0.74
930	0.76	0.76	0.76
940	0.78	0.77	0.77
950	0.79	0.78	0.78
960	0.80	0.80	0.79
970	0.81	0.81	0.81
980	0.83	0.82	0.82
990	0.84	0.84	0.84
1000	0.86	0.86	0.86
1010	0.88	0.88	0.88
1025	0.90	0.90	0.90
1050	0.95	0.95	0.95
1070	0.99	0.99	0.98
1080	1.01	1.00	1.00
1090	1.03	1.03	1.02
1094	1.04	1.03	1.03

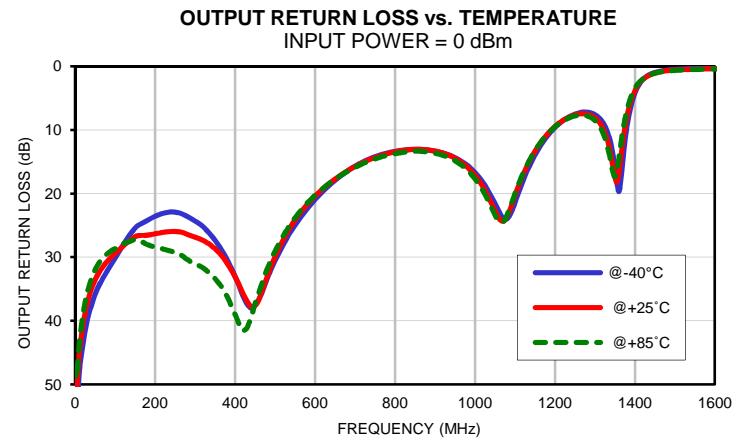
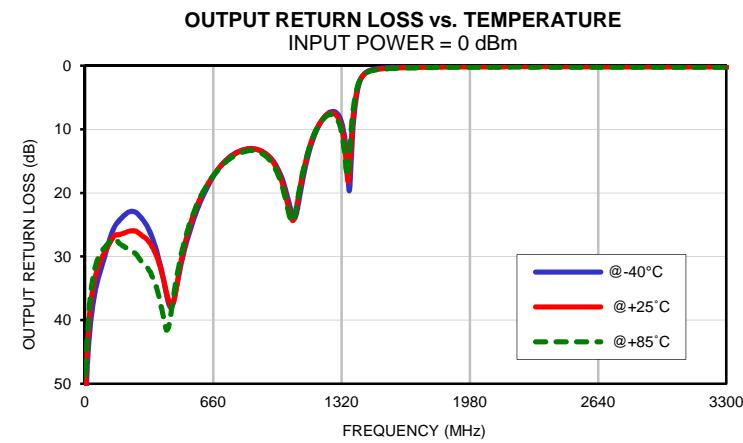
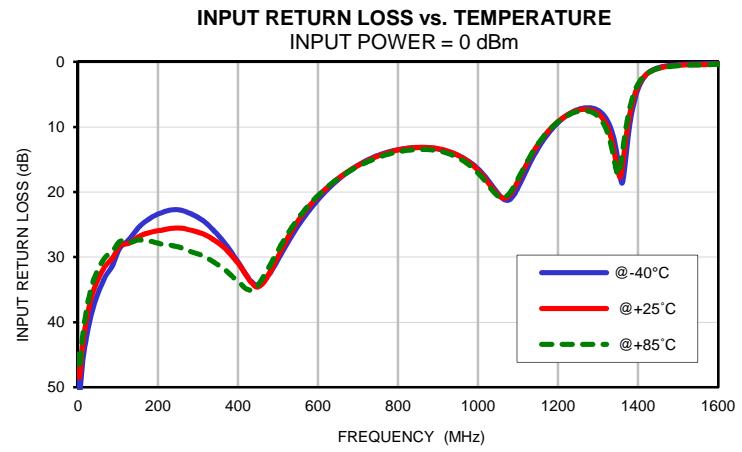
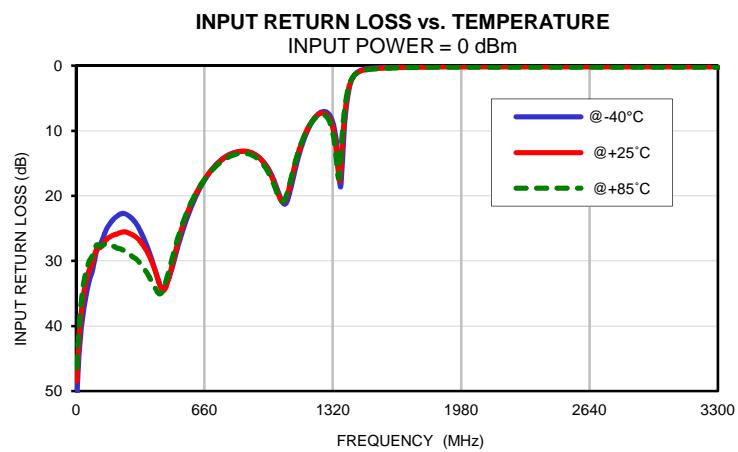
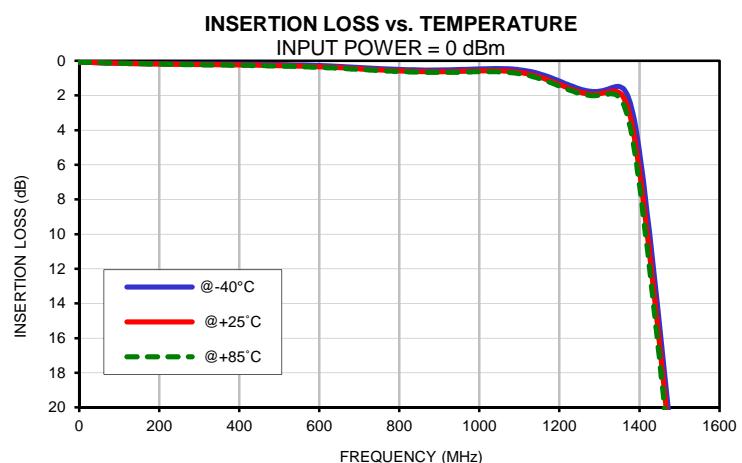
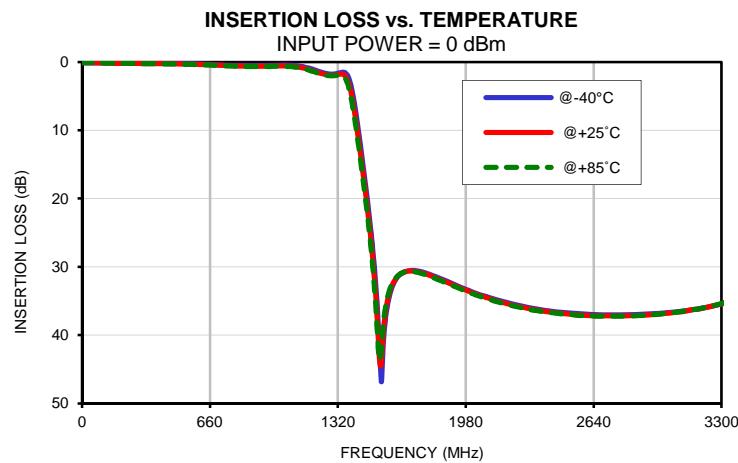


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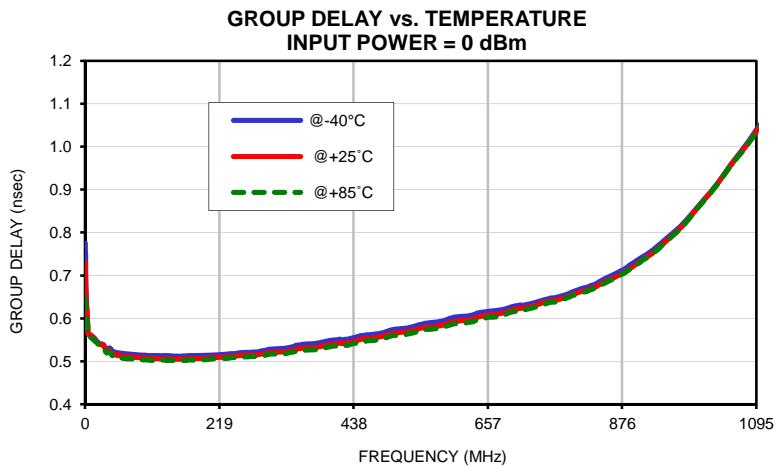
IF/RF MICROWAVE COMPONENTS



Typical Performance Curves



Typical Performance Curves

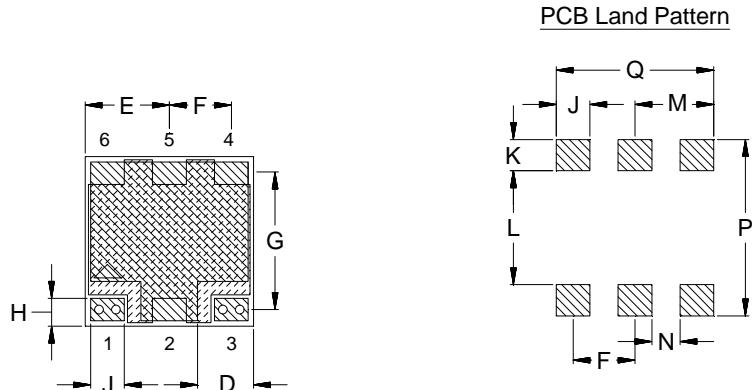
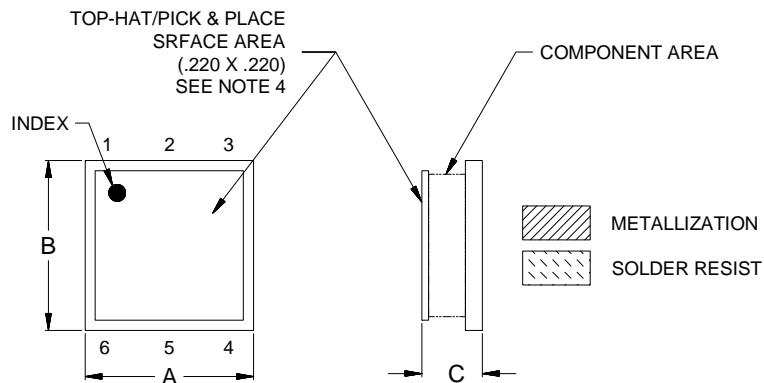


Case Style

QA

Outline Dimensions

QA2224



CASE#	A	B	C	D	E	F	G	H	J	K	L	M
QA2224	.250 (6.35)	.250 (6.35)	.070 (1.78)	.075 (1.91)	.125 (3.18)	.092 (2.34)	.201 (5.11)	.041 (1.04)	.050 (1.27)	.046 (1.17)	.168 (4.27)	.117 (2.97)

CASE#	N	P	Q	WT. GRAM
QA2224	.042 (1.07)	.260 (6.60)	.234 (5.94)	0.25

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

Notes:

1. Case material: Ceramic base.
2. Base: Printed wiring laminate.
3. Termination finish:
For RoHS Case Styles: 3-5 μ inch Gold over 120-240 μ inch Nickel plate.
For RoHS-5 Case Styles: Tin-Lead plate.
4. Top-Hat total thickness: .013 inches MAX

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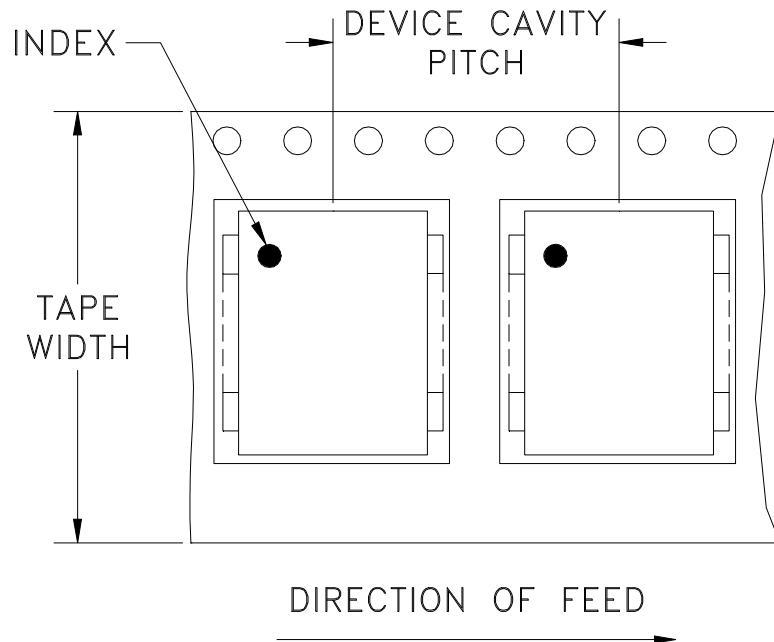


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RF/F MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F34

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
16	12	7	Small quantity standard (see note)	20
				50
				100
				200
		13	Standard	500
				1000

Note: Availability of small reel quantity varies by model.

Refer to pricing and availability on individual model dashboard.

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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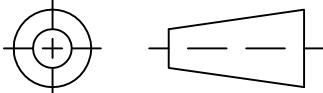
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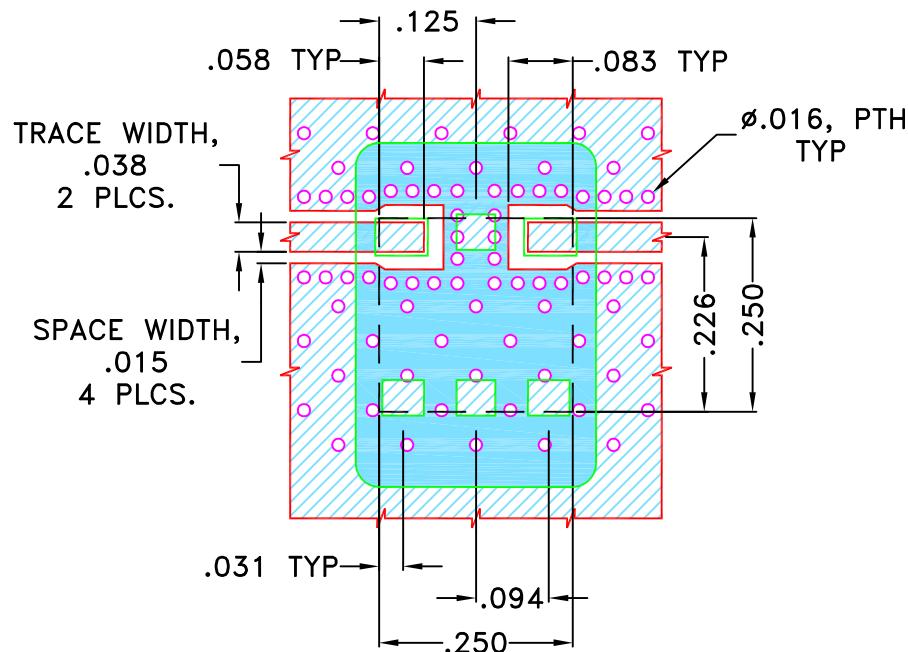
THIRD ANGLE PROJECTION



REVISONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M156213	NEW RELEASE	MAY 16	TM	MD
A	M161508	COPPER LAND PATTERN UPDATED	APR 17	EJ	MD

SUGGESTED MOUNTING CONFIGURATION FOR
QA2224 CASE STYLE "06FL09" PIN CODE



NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS $.020 \pm .0015$ ". 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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS \pm 3 PL DECIMALS $\pm .005$ "ANGLES \pm FRACTIONS \pm 

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



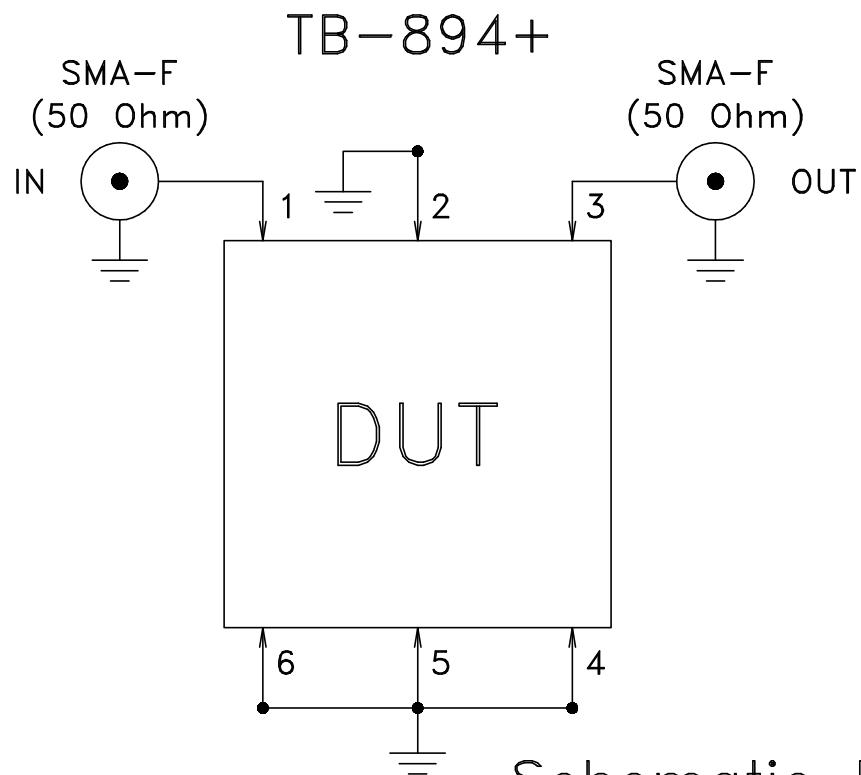
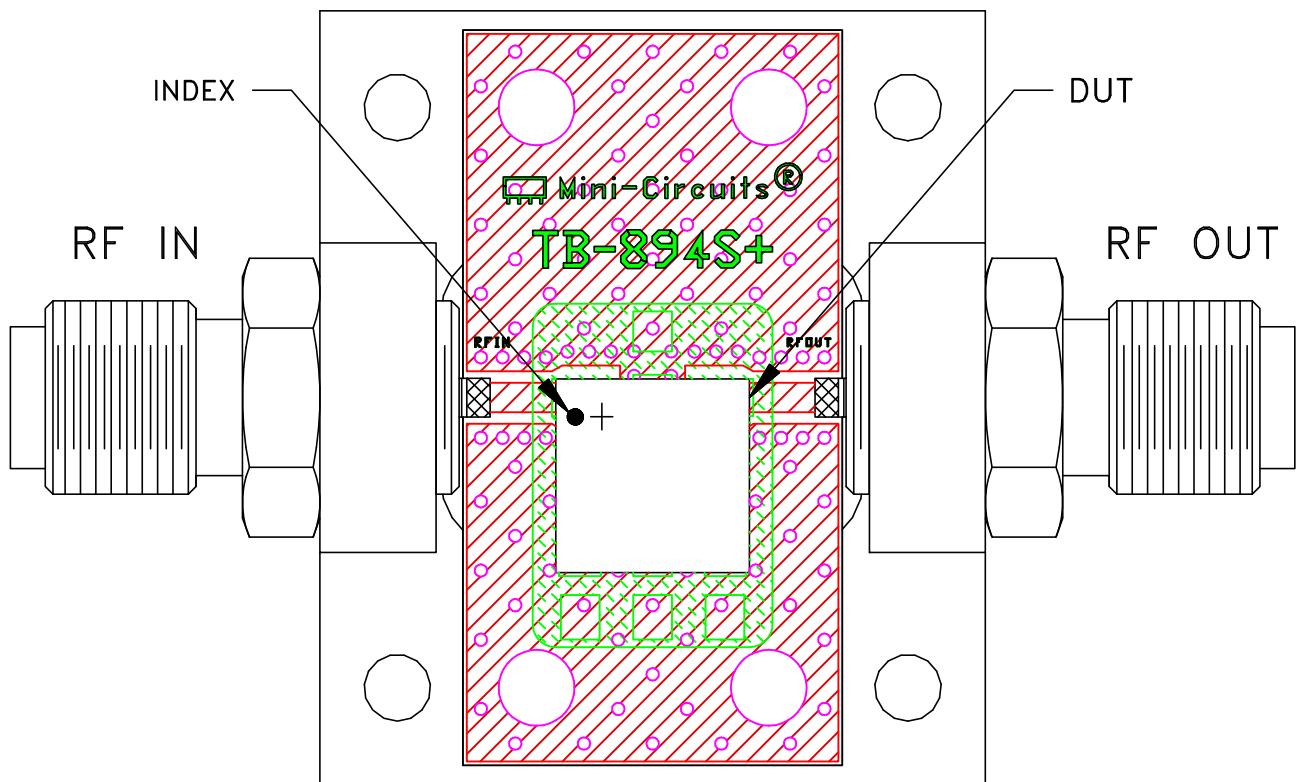
Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL, 06FL09, QA2224, ULP,
TB-894+, 50 Ohm

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-484	A
FILE:	98PL484	SCALE: 4:1	SHEET: 1 OF 1

Evaluation Board and Circuit



NOTES:

1. 50 Ohm SMA Female connectors.
2. PCB Material: ROGERS (R04350B) OR Equivalent
Dielectric Constant= 3.48 ± 0.05 , Thickness=.020 inch.

Schematic Diagram

Mini-Circuits®



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 + propylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215