Surface Mount

Power Splitter/Combiner

QBA-07+

2 Way-90° 50Ω 340 to 680 MHz



Generic photo used for illustration purposes only

CASE STYLE: SM1L

Maximum Ratings

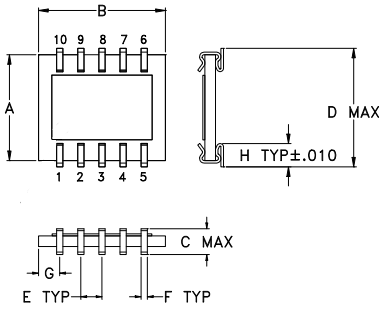
Operating Temperature	-55°C to +100°C
Storage Temperature	-55°C to +100°C

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

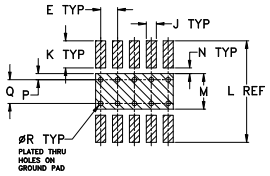
Pin Connections

SUM PORT	1
PORT 1 (+90°)	10
PORT 2 (0°)	6
GROUND	2,3,4,7,8,9
50 OHM TERM EXTERNAL	5

Outline Drawing



PCB Land Pattern



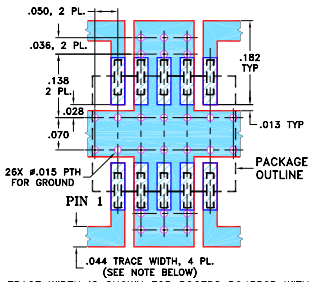
Suggested Layout,
Tolerance to be within ±.002

ADJACENT GROUND PINS SHALL BE CONNECTED TO EACH OTHER AND TO GROUND PAD

Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	
.250	.300	.070	.320	.050	.015	.050	.075	
6.35	7.62	1.78	8.12	1.27	0.38	1.27	1.91	
J	K	L	M	N	P	Q	R	wt
.030	.095	.330	.100	.020	.015	.070	.014	grams
0.76	2.41	8.38	2.54	0.51	0.38	1.78	0.36	0.3

Demo Board MCL P/N: TB-115+
Suggested PCB Layout (PL-004)



NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020 ± .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 SOLDER MASK

Features

- low insertion loss, 0.5 dB typ.
- high power capability, 27W
- hermetically sealed
- low variation with temperature
- low profile, 0.07" height
- aqueous washable
- protected by U.S. Patent 5,534,830

Applications

- NMT
- land mobile radio
- broadcasting

+RoHS Compliant

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

Available Tape and Reel at no extra cost

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

Electrical Specifications

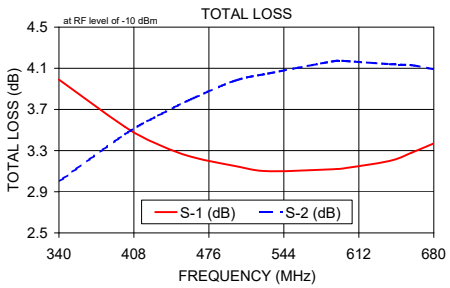
FREQ. RANGE (MHz)	ISOLATION (dB)		INSERTION LOSS (dB) Avg. of Coupled Outputs ABOVE 3 dB		PHASE UNBALANCE (Degrees)		AMPLITUDE UNBALANCE (dB)		THERMAL RESISTANCE θjc, °C/W	POWER (W)
f_L-f_U	Typ.	Min.	$\overline{X}$	σ	Typ.	Max.	Typ.	Max.	Typ.	
340-680	22	16	0.8	0.1	3.0	7.0	0.7	2.0	20	21*
340-530	23	18	0.5	0.1	1.7	4.0	0.7	2.0	20	27**

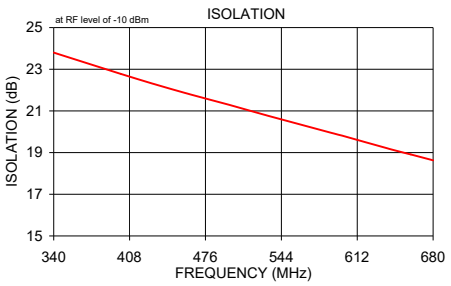
* Derate linearly to 9W at 100°C
** Derate linearly to 12W at 100°C

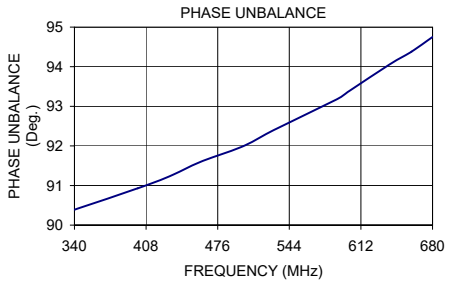
Typical Performance Data

Frequency (MHz)	Total Loss[1] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
340.00	3.99	3.00	0.99	23.80	90.39	1.14	1.08	1.12
400.00	3.53	3.46	0.07	22.78	90.93	1.17	1.10	1.14
430.00	3.36	3.64	0.27	22.29	91.23	1.19	1.11	1.14
460.00	3.24	3.80	0.56	21.83	91.60	1.20	1.12	1.15
500.00	3.15	3.98	0.83	21.25	91.99	1.22	1.14	1.17
530.00	3.10	4.05	0.96	20.80	92.41	1.24	1.15	1.18
590.00	3.12	4.17	1.05	19.93	93.19	1.27	1.18	1.20
600.00	3.13	4.17	1.04	19.79	93.37	1.27	1.19	1.21
640.00	3.20	4.14	0.94	19.19	94.07	1.29	1.21	1.22
660.00	3.28	4.13	0.85	18.91	94.38	1.30	1.22	1.23
680.00	3.37	4.09	0.73	18.63	94.75	1.31	1.23	1.24

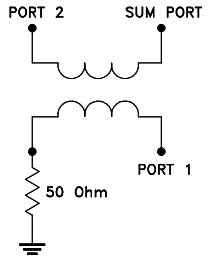
1. Total Loss = Insertion Loss + 3dB splitter loss.







electrical schematic



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

2 Way-90° Power Splitter/Combiner QBA-07+

Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = +25°C

FREQ. (MHz)	TOTAL LOSS[1] (dB)			AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2	AVG.			1-2	S	1	2
100	10.49	0.64	5.56	9.85	1.94	31.23	1.09	1.09	1.11
125	8.89	0.87	4.88	8.01	1.80	29.74	1.11	1.10	1.12
150	7.67	1.13	4.40	6.54	1.67	28.68	1.13	1.11	1.13
175	6.72	1.39	4.05	5.33	1.56	27.92	1.13	1.11	1.13
200	5.96	1.66	3.81	4.30	1.47	27.39	1.14	1.11	1.13
225	5.34	1.93	3.64	3.41	1.33	26.99	1.14	1.10	1.12
250	4.84	2.19	3.51	2.65	1.19	26.76	1.14	1.09	1.11
275	4.43	2.45	3.44	1.98	1.04	26.46	1.13	1.08	1.11
300	4.09	2.68	3.38	1.41	0.90	26.27	1.13	1.07	1.10
320	3.86	2.87	3.36	0.99	0.80	26.14	1.13	1.06	1.09
340	3.67	3.04	3.35	0.63	0.67	26.01	1.13	1.06	1.09
360	3.49	3.19	3.34	0.30	0.58	25.88	1.12	1.05	1.09
380	3.35	3.34	3.34	0.01	0.47	25.76	1.12	1.05	1.09
400	3.23	3.48	3.35	0.25	0.39	25.61	1.13	1.05	1.09
420	3.12	3.61	3.37	0.48	0.31	25.43	1.13	1.06	1.10
440	3.04	3.72	3.38	0.67	0.22	25.23	1.13	1.07	1.11
460	2.98	3.81	3.39	0.83	0.16	25.05	1.14	1.08	1.12
480	2.93	3.90	3.42	0.97	0.10	24.85	1.15	1.09	1.13
500	2.89	3.96	3.43	1.07	0.04	24.64	1.15	1.10	1.14
520	2.87	4.01	3.44	1.14	0.01	24.43	1.16	1.11	1.14
530	2.86	4.04	3.45	1.17	0.05	24.31	1.16	1.11	1.15
560	2.87	4.07	3.47	1.20	0.11	23.94	1.17	1.13	1.16
580	2.89	4.08	3.49	1.19	0.17	23.68	1.18	1.14	1.17
600	2.93	4.06	3.50	1.14	0.23	23.41	1.19	1.15	1.18
620	2.98	4.04	3.51	1.06	0.29	23.15	1.19	1.16	1.19
640	3.06	3.99	3.53	0.94	0.34	22.88	1.20	1.17	1.19
660	3.15	3.94	3.54	0.79	0.41	22.62	1.21	1.18	1.20
680	3.25	3.86	3.56	0.61	0.51	22.37	1.21	1.19	1.21
700	3.38	3.76	3.57	0.38	0.62	22.14	1.22	1.21	1.21
750	3.83	3.47	3.65	0.36	1.03	21.69	1.25	1.24	1.24
800	4.50	3.08	3.79	1.42	1.77	21.40	1.29	1.30	1.28
850	5.52	2.65	4.08	2.88	2.95	21.50	1.36	1.36	1.34
900	7.08	2.20	4.64	4.89	4.95	22.29	1.43	1.44	1.41

[1] Total Loss = Insertion Loss+ 3dB Splitter Loss

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2 Way-90° Power Splitter/Combiner QBA-07+

Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = -55°C

FREQ. (MHz)	TOTAL LOSS[1] (dB)			AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2	AVG.			1-2	S	1	2
100	10.49	0.55	5.52	9.94	1.94	32.09	1.06	1.07	1.08
125	8.88	0.78	4.83	8.10	1.82	30.77	1.11	1.10	1.12
150	7.65	1.03	4.34	6.62	1.71	30.30	1.11	1.10	1.11
175	6.67	1.28	3.97	5.39	1.63	29.51	1.10	1.09	1.09
200	5.90	1.54	3.72	4.36	1.60	28.39	1.11	1.09	1.10
225	5.28	1.81	3.54	3.47	1.53	27.70	1.13	1.09	1.11
250	4.77	2.06	3.41	2.71	1.42	27.83	1.13	1.08	1.10
275	4.34	2.31	3.33	2.04	1.33	27.85	1.11	1.07	1.08
300	3.99	2.54	3.26	1.45	1.27	27.44	1.10	1.07	1.07
320	3.76	2.72	3.24	1.04	1.19	26.95	1.11	1.06	1.08
340	3.56	2.89	3.23	0.66	1.09	26.58	1.12	1.05	1.08
360	3.38	3.05	3.22	0.33	1.04	26.46	1.12	1.04	1.08
380	3.23	3.20	3.22	0.03	1.00	26.40	1.11	1.03	1.09
400	3.10	3.33	3.21	0.23	0.96	26.16	1.11	1.03	1.09
420	2.99	3.46	3.23	0.46	0.93	25.80	1.11	1.03	1.10
440	2.91	3.57	3.24	0.65	0.89	25.43	1.12	1.05	1.10
460	2.84	3.66	3.25	0.82	0.86	25.19	1.13	1.06	1.11
480	2.78	3.74	3.26	0.96	0.82	25.00	1.13	1.06	1.12
500	2.73	3.80	3.27	1.07	0.77	24.75	1.14	1.07	1.12
520	2.71	3.85	3.28	1.14	0.72	24.40	1.15	1.09	1.13
530	2.70	3.88	3.29	1.18	0.70	24.21	1.15	1.09	1.13
560	2.69	3.91	3.30	1.22	0.69	23.77	1.17	1.11	1.15
580	2.70	3.92	3.31	1.22	0.67	23.51	1.17	1.13	1.16
600	2.74	3.90	3.32	1.17	0.68	23.25	1.18	1.14	1.16
620	2.78	3.88	3.33	1.10	0.67	22.90	1.19	1.15	1.17
640	2.84	3.84	3.34	1.00	0.63	22.46	1.20	1.17	1.17
660	2.92	3.78	3.35	0.86	0.62	22.16	1.21	1.18	1.18
680	3.01	3.70	3.36	0.69	0.57	21.93	1.21	1.18	1.19
700	3.12	3.61	3.36	0.49	0.56	21.76	1.21	1.19	1.20
750	3.52	3.31	3.42	0.22	0.36	21.16	1.24	1.23	1.22
800	4.14	2.93	3.53	1.20	0.07	20.77	1.28	1.27	1.26
850	5.08	2.49	3.78	2.59	0.82	20.71	1.34	1.35	1.31
900	6.52	2.02	4.27	4.50	2.39	21.24	1.42	1.41	1.39

[1] Total Loss = Insertion Loss+ 3dB Splitter Loss

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2 Way-90° Power Splitter/Combiner QBA-07+

Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = +100°C

FREQ. (MHz)	TOTAL LOSS[1] (dB)			AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2	AVG.			1-2	S	1	2
100	10.47	0.71	5.59	9.76	2.07	30.27	1.12	1.11	1.14
125	8.89	0.94	4.91	7.94	1.88	28.73	1.12	1.11	1.13
150	7.68	1.21	4.44	6.47	1.78	27.21	1.14	1.12	1.14
175	6.74	1.48	4.11	5.26	1.65	26.25	1.17	1.14	1.17
200	5.99	1.75	3.87	4.24	1.49	26.07	1.18	1.13	1.17
225	5.38	2.02	3.70	3.36	1.33	25.94	1.16	1.11	1.15
250	4.88	2.28	3.58	2.60	1.15	25.63	1.15	1.11	1.13
275	4.48	2.54	3.51	1.95	0.93	25.10	1.16	1.10	1.13
300	4.15	2.78	3.46	1.37	0.78	24.95	1.16	1.09	1.13
320	3.92	2.96	3.44	0.96	0.63	25.06	1.15	1.08	1.12
340	3.72	3.13	3.42	0.59	0.48	25.08	1.14	1.07	1.11
360	3.55	3.29	3.42	0.26	0.37	25.02	1.14	1.07	1.10
380	3.41	3.44	3.43	0.03	0.24	24.88	1.14	1.07	1.10
400	3.30	3.58	3.44	0.28	0.14	24.69	1.15	1.08	1.11
420	3.19	3.71	3.45	0.51	0.05	24.59	1.15	1.09	1.11
440	3.12	3.82	3.47	0.70	0.00	24.53	1.15	1.09	1.12
460	3.06	3.92	3.49	0.86	0.06	24.45	1.16	1.10	1.13
480	3.01	4.00	3.50	0.99	0.19	24.30	1.16	1.11	1.14
500	2.97	4.06	3.52	1.08	0.29	24.11	1.17	1.12	1.15
520	2.96	4.11	3.54	1.15	0.40	23.92	1.18	1.13	1.16
530	2.95	4.13	3.54	1.18	0.43	23.81	1.18	1.14	1.17
560	2.96	4.16	3.56	1.20	0.51	23.59	1.19	1.15	1.18
580	2.99	4.16	3.58	1.17	0.60	23.33	1.20	1.17	1.19
600	3.04	4.14	3.59	1.11	0.68	23.14	1.21	1.17	1.20
620	3.10	4.12	3.61	1.02	0.76	22.96	1.21	1.18	1.21
640	3.18	4.07	3.62	0.90	0.87	22.70	1.22	1.19	1.21
660	3.28	4.00	3.64	0.72	0.98	22.56	1.22	1.20	1.22
680	3.39	3.92	3.66	0.53	1.12	22.35	1.23	1.21	1.23
700	3.54	3.83	3.68	0.29	1.24	22.16	1.24	1.23	1.24
750	4.02	3.53	3.77	0.49	1.80	21.85	1.27	1.26	1.27
800	4.75	3.16	3.95	1.59	2.69	21.76	1.32	1.32	1.31
850	5.86	2.74	4.30	3.13	4.06	22.03	1.39	1.40	1.37
900	7.55	2.30	4.92	5.25	6.58	23.17	1.46	1.47	1.44

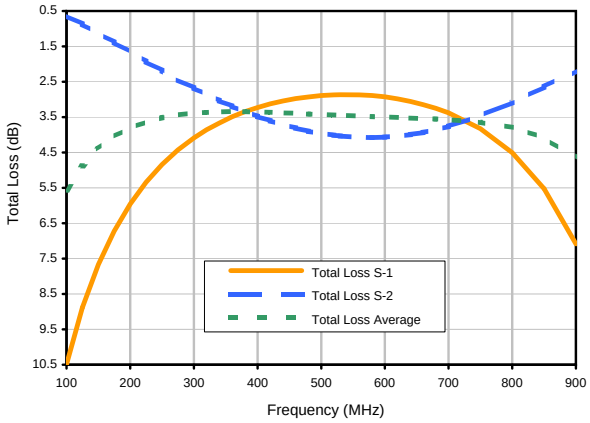
[1] Total Loss = Insertion Loss+ 3dB Splitter Loss

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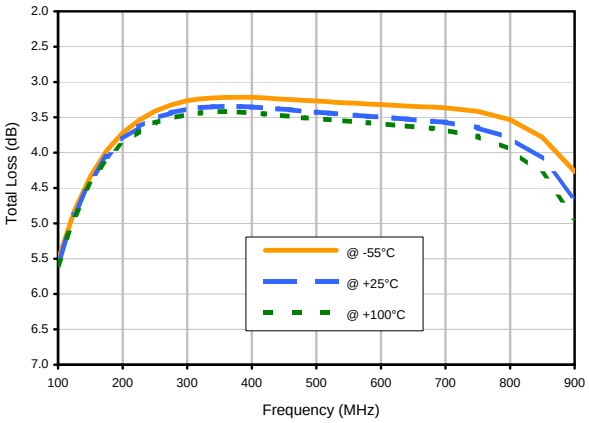
2 Way-90° Power Splitter/Combiner QBA-07+

Typical Performance Curves

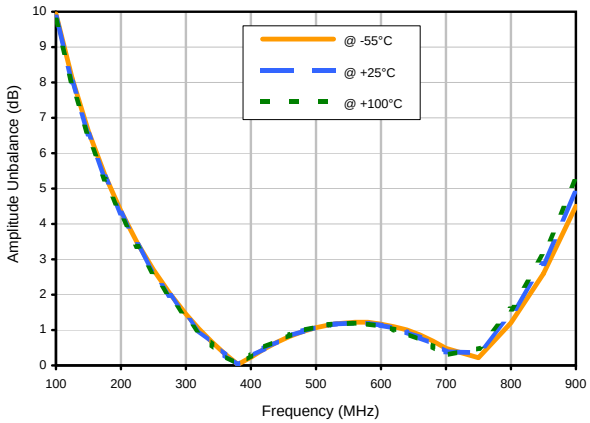
Total Loss



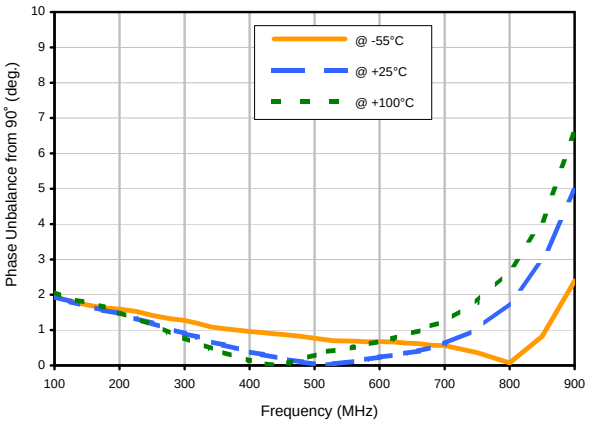
Average Total Loss vs. TEMPERATURE



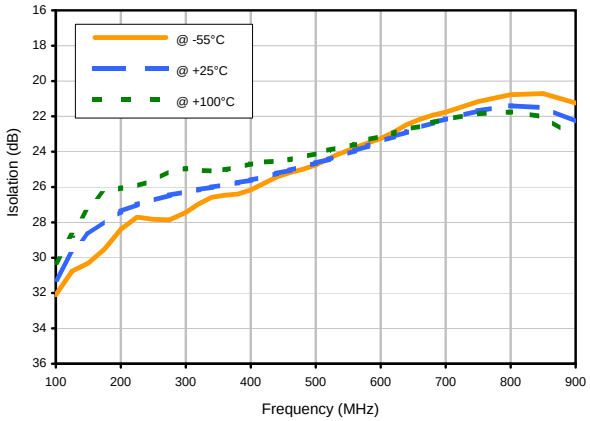
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE



Isolation 1-2 vs. TEMPERATURE

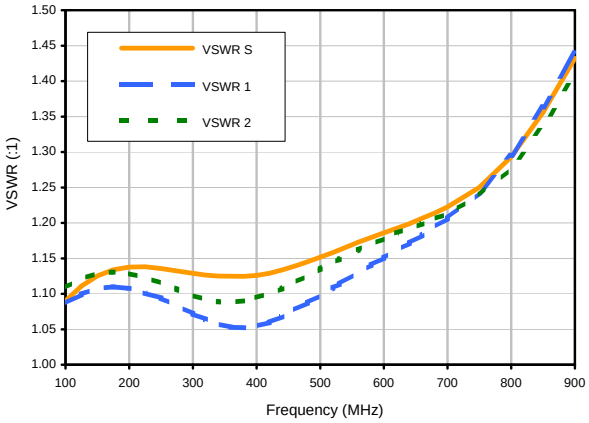


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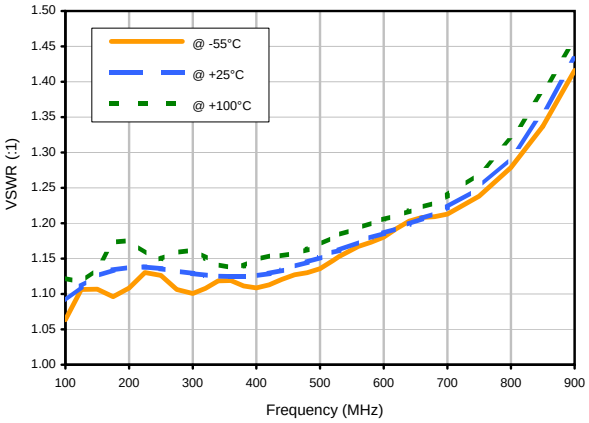
2 Way-90° Power Splitter/Combiner QBA-07+

Typical Performance Curves

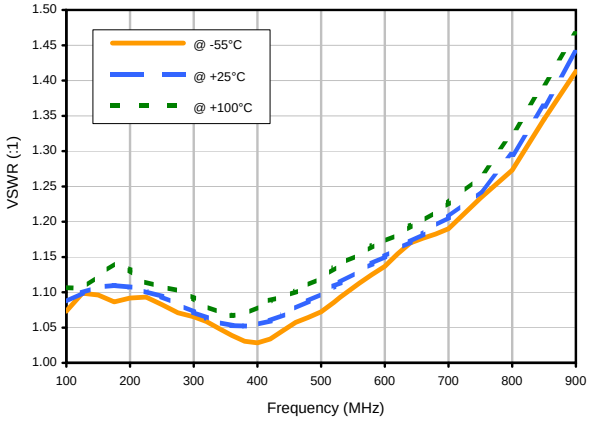
VSWR



VSWR SUM vs. TEMPERATURE



VSWR OUT1 vs. TEMPERATURE

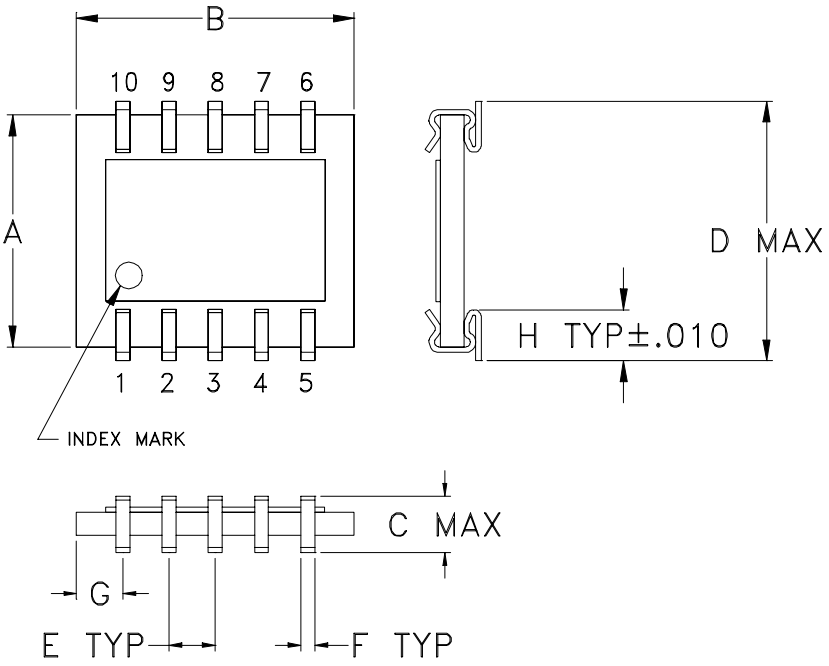


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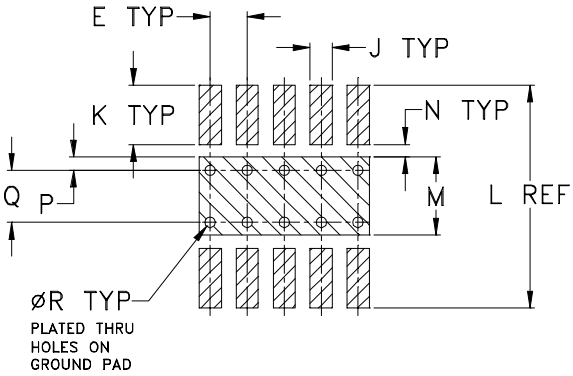
Case Style SM1L

SM1L

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

ADJACENT GROUND PINS SHALL BE CONNECTED TO EACH OTHER AND TO GROUND PAD

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P
SM1L	.250 (6.35)	.300 (7.62)	.070 (1.78)	.320 (8.12)	.050 (1.27)	.015 (0.38)	.050 (1.27)	.075 (1.91)	.030 (0.76)	.095 (2.41)	.330 (8.38)	.100 (2.54)	.020 (0.51)	.015 (0.38)

CASE #	Q	R	WT. GRAM
SM1L	.070 (1.78)	.014 (0.36)	.3

Dimensions are in inches (mm). Tolerances: ± .005

Notes:

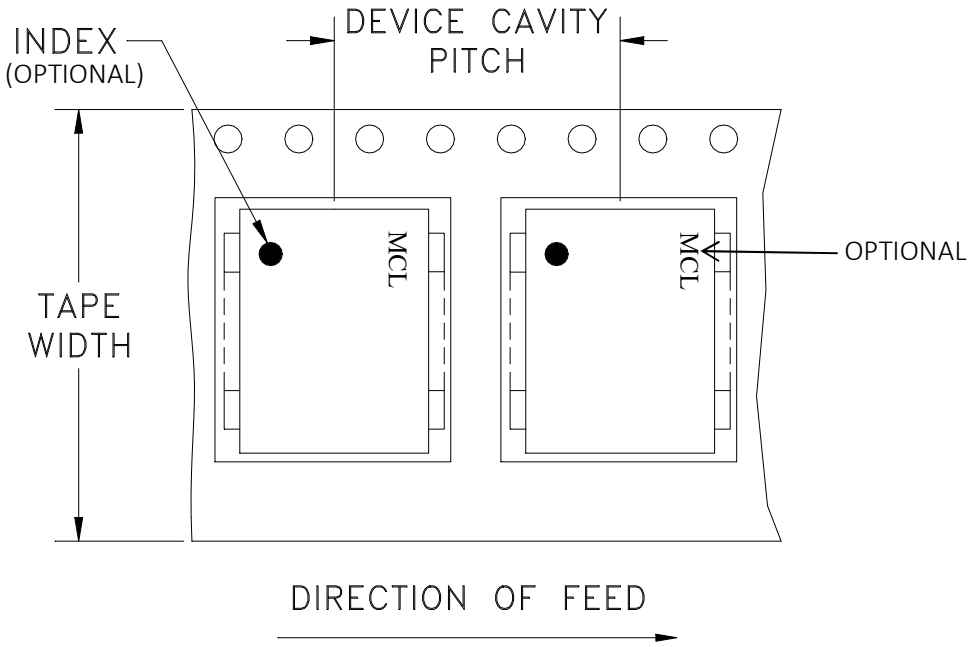
1. Open style, ceramic base.
2. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate.
   For RoHS-5 Case Styles: Tin-Lead plate.

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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.

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

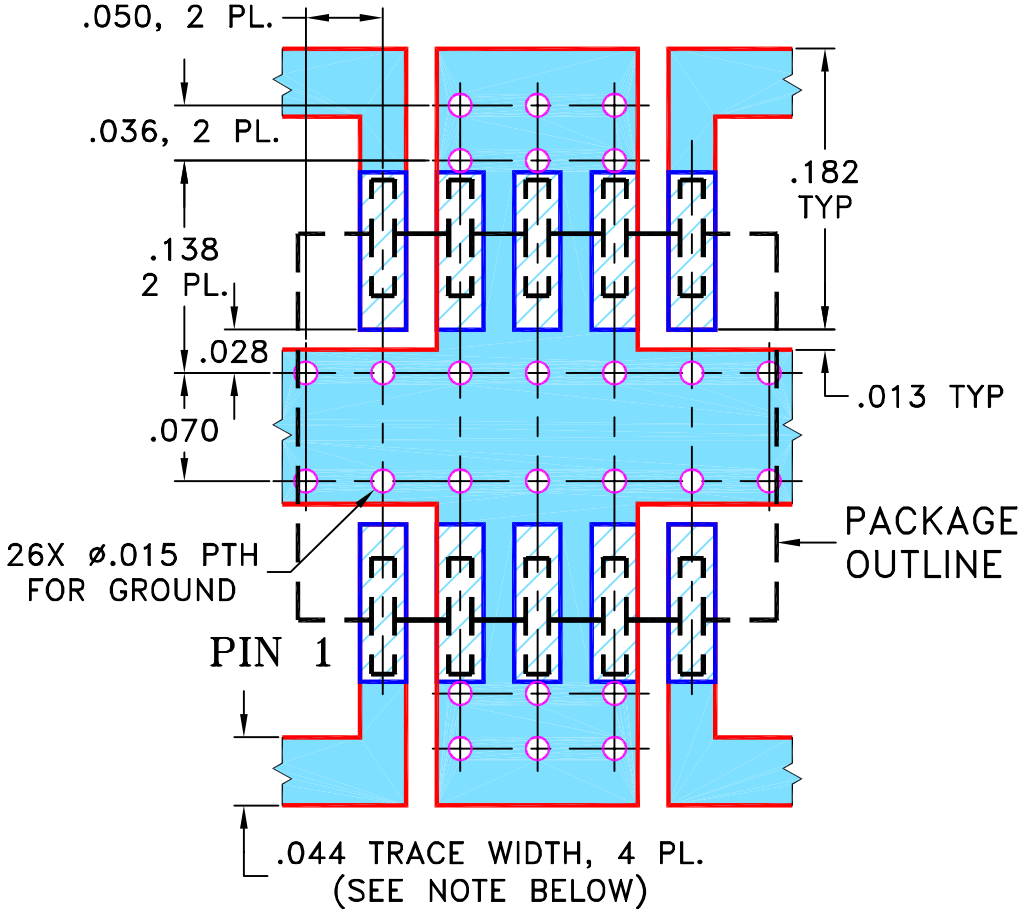
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
A	M82377	UPDATED DRAWING	07/31/02	AV	DB
B	M101085	UPDATED DRAWING, ADDED	10/06/05	MMG	HY
		DZ944 CASE STYLE & NOTE 2			
C	M102713	UPDATED NOTES	01/10/06	MMG	ABD

SUGGESTED MOUNTING CONFIGURATION FOR SM1L/SM33/DZ944 CASE STYLES, "lf/nl" PIN CONNECTIONS



NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020 ± .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 SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	MMG	04/12/00
TOLERANCES ON:	CHECKED	WP	04/27/00
2 PL DECIMALS ±	APPROVED	DB	04/27/00
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

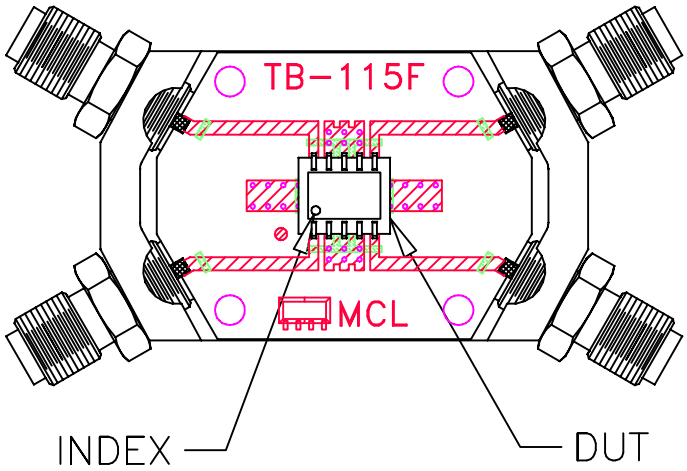
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PL, lf/nl, SM1L/SM33/DZ944, BDCA/QBA, TB-115

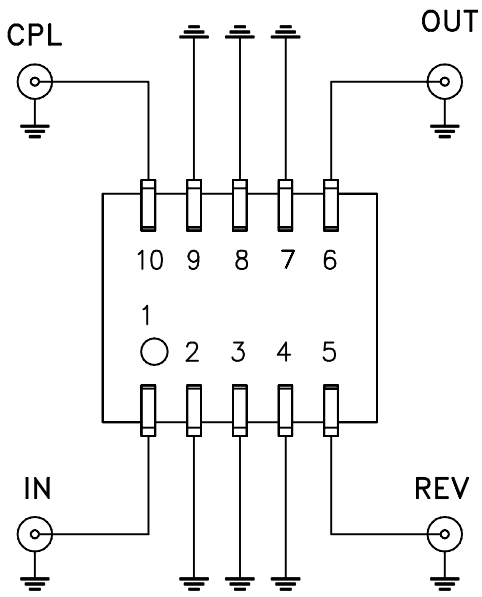
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-004	C

FILE:	SCALE:	SHEET:
98PL004	8:1	1 OF 1

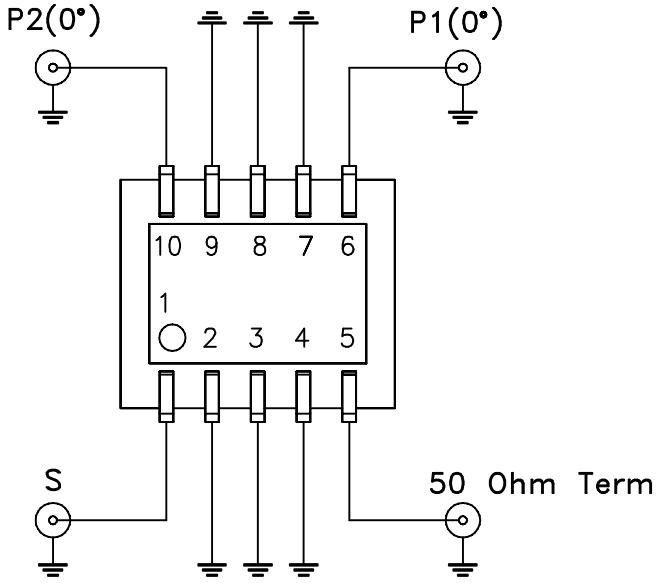
Evaluation Board and Circuit



TB-115+



BDCA MODELS



QBA MODELS

SCHEMATIC DIAGRAM

Notes:

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

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Environmental Specifications ENV02T2

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	-55° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
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 Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, 95% Coverage
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
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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