Surface Mount

Power Splitter/Combiner

2 Way-90° 50Ω 150 to 350 MHz

JSPQ-350+
JSPQ-350



Generic photo used for illustration purposes only

CASE STYLE: BK276

+RoHS Compliant

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

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W max.

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

Pin Connections

SUM PORT	1
PORT 1 (0°)	3
PORT 2 (+90°)	12
GROUND	5,7,8,10
50 OHM TERM. EXTERNAL	14
NOT USED	2,4,6,9,11,13

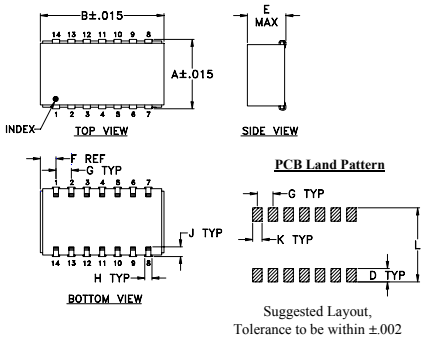
Features

- wideband, 150 to 350 MHz
- low insertion loss, 0.5 dB typ.
- good isolation, 20 dB typ.
- aqueous washable

Applications

- VHF-TV
- IF signal processing
- modulators

Outline Drawing

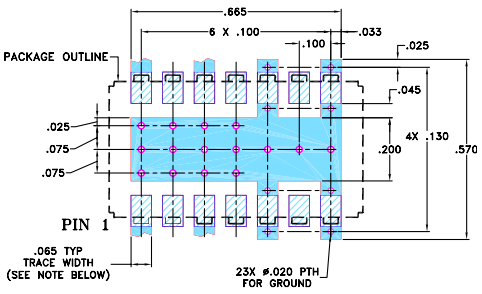


Outline Dimensions (inch / mm)

A	B	C	D	E	F	G
.450	.803	--	.100	.250	.102	.100
11.43	20.40	--	2.54	6.35	2.59	2.54

H	J	K	L	wt
.047	.065	.065	.470	grams
1.19	1.65	1.65	11.94	3.0

Demo Board MCL P/N: TB-59
Suggested PCB Layout (PL-061)



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .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

Electrical Specifications

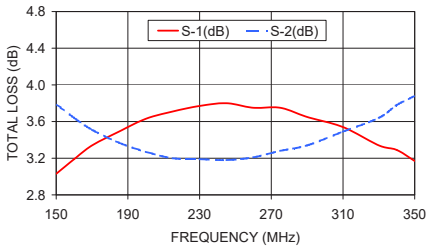
FREQ. RANGE (MHz)	ISOLATION (dB)		INSERTION LOSS (dB) Avg. of Coupled Outputs ABOVE 3 dB		PHASE UNBALANCE (Degrees)	AMPLITUDE UNBALANCE (dB)
f_L-f_U	Typ.	Min.	Typ.	Max.	Max.	Max.
150-350	20	13	0.5	1.0	5	1.5

Typical Performance Data

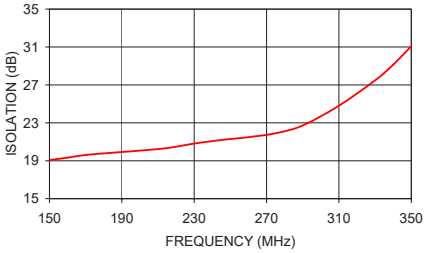
Frequency (MHz)	Total Loss[1] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
150.00	3.03	3.79	0.76	19.08	89.51	1.22	1.19	1.19
160.00	3.19	3.64	0.45	19.33	89.70	1.24	1.20	1.20
170.00	3.34	3.51	0.17	19.61	89.85	1.24	1.20	1.21
185.00	3.49	3.37	0.12	19.85	89.85	1.24	1.21	1.22
200.00	3.63	3.27	0.36	20.07	90.15	1.26	1.22	1.22
215.00	3.71	3.20	0.50	20.34	89.84	1.24	1.23	1.23
230.00	3.77	3.19	0.58	20.81	89.96	1.27	1.24	1.23
245.00	3.80	3.18	0.61	21.19	89.86	1.25	1.25	1.23
260.00	3.75	3.21	0.54	21.49	89.84	1.26	1.25	1.22
275.00	3.75	3.28	0.47	21.90	89.63	1.24	1.25	1.22
290.00	3.65	3.34	0.31	22.73	89.53	1.24	1.24	1.22
310.00	3.54	3.49	0.05	24.81	89.09	1.22	1.22	1.20
330.00	3.34	3.64	0.30	27.48	88.88	1.20	1.21	1.18
340.00	3.29	3.78	0.49	29.15	88.73	1.19	1.19	1.17
350.00	3.17	3.88	0.72	31.08	88.52	1.16	1.18	1.17

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

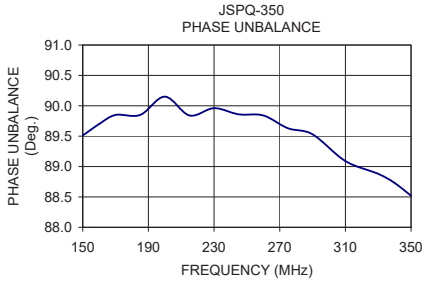
JSPQ-350
TOTAL LOSS



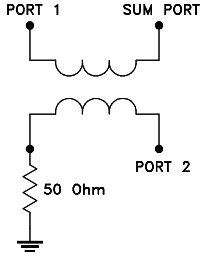
JSPQ-350
ISOLATION



JSPQ-350
PHASE UNBALANCE



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.
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2 Way-90° Power Splitter/Combiner JSPQ-350+

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			1-2	S	1	2
50	0.77	9.20	8.43	1.70	18.62	1.18	1.17	1.19
60	1.01	8.01	7.01	1.77	17.88	1.19	1.19	1.21
70	1.24	7.09	5.84	1.79	17.49	1.21	1.20	1.23
80	1.49	6.34	4.85	1.68	17.34	1.21	1.21	1.23
90	1.72	5.75	4.03	1.54	17.40	1.21	1.21	1.24
100	1.94	5.26	3.32	1.36	17.61	1.21	1.20	1.23
110	2.16	4.85	2.69	1.16	17.98	1.20	1.20	1.23
120	2.35	4.51	2.15	0.92	18.44	1.20	1.19	1.22
130	2.54	4.22	1.68	0.68	19.01	1.19	1.18	1.21
140	2.71	3.98	1.27	0.46	19.67	1.18	1.18	1.21
150	2.86	3.78	0.92	0.24	20.40	1.17	1.17	1.20
160	3.01	3.61	0.61	0.03	21.21	1.16	1.17	1.19
170	3.13	3.47	0.34	0.16	22.02	1.15	1.16	1.18
180	3.24	3.36	0.12	0.33	22.88	1.14	1.16	1.18
190	3.34	3.28	0.07	0.45	23.72	1.14	1.16	1.17
200	3.41	3.20	0.21	0.58	24.48	1.14	1.16	1.17
210	3.48	3.15	0.33	0.70	25.15	1.13	1.17	1.17
220	3.53	3.11	0.42	0.79	25.64	1.13	1.17	1.17
230	3.57	3.09	0.48	0.82	25.97	1.13	1.17	1.17
240	3.59	3.08	0.51	0.88	26.16	1.13	1.18	1.17
250	3.60	3.09	0.51	0.89	26.22	1.13	1.18	1.17
260	3.60	3.11	0.49	0.89	26.22	1.14	1.19	1.17
270	3.58	3.14	0.44	0.91	26.19	1.14	1.19	1.16
280	3.55	3.17	0.38	0.88	26.20	1.14	1.19	1.16
290	3.51	3.22	0.29	0.86	26.28	1.14	1.20	1.16
300	3.46	3.28	0.19	0.82	26.47	1.14	1.20	1.16
310	3.41	3.35	0.06	0.78	26.81	1.14	1.20	1.15
320	3.35	3.43	0.08	0.72	27.30	1.14	1.19	1.15
330	3.27	3.51	0.23	0.66	27.98	1.14	1.19	1.14
340	3.19	3.60	0.41	0.59	28.96	1.13	1.18	1.13
350	3.10	3.70	0.60	0.53	30.35	1.12	1.18	1.12
360	3.01	3.81	0.80	0.46	32.31	1.12	1.17	1.12
370	2.92	3.94	1.02	0.35	35.13	1.10	1.15	1.11
380	2.82	4.08	1.26	0.24	39.55	1.09	1.14	1.11
390	2.72	4.22	1.51	0.17	42.05	1.07	1.12	1.12
400	2.62	4.39	1.77	0.11	36.71	1.05	1.10	1.13
425	2.37	4.87	2.50	0.04	27.29	1.02	1.08	1.22
450	2.13	5.47	3.34	0.04	22.19	1.11	1.13	1.37
475	1.96	6.26	4.30	0.63	18.78	1.25	1.26	1.59
500	1.88	7.25	5.37	2.11	16.36	1.46	1.47	1.92
525	1.94	8.47	6.53	5.07	14.67	1.75	1.77	2.37

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

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2 Way-90° Power Splitter/Combiner JSPQ-350+

Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = -40°C

FREQ. (MHz)	TOTAL LOSS[1] (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2			1-2	S	1	2
50	0.74	9.20	8.46	1.76	18.61	1.18	1.18	1.19
60	0.98	8.00	7.02	1.85	17.86	1.20	1.19	1.21
70	1.21	7.08	5.86	1.89	17.46	1.21	1.20	1.22
80	1.45	6.33	4.88	1.80	17.31	1.21	1.21	1.23
90	1.68	5.73	4.05	1.67	17.37	1.21	1.21	1.23
100	1.90	5.23	3.33	1.50	17.58	1.21	1.20	1.24
110	2.11	4.82	2.71	1.31	17.94	1.20	1.20	1.24
120	2.31	4.48	2.17	1.09	18.39	1.19	1.19	1.23
130	2.49	4.19	1.70	0.87	18.94	1.19	1.18	1.22
140	2.66	3.95	1.29	0.65	19.58	1.18	1.18	1.21
150	2.81	3.74	0.93	0.48	20.27	1.17	1.17	1.20
160	2.96	3.57	0.62	0.29	21.03	1.16	1.17	1.20
170	3.08	3.43	0.35	0.13	21.79	1.16	1.17	1.19
180	3.19	3.32	0.13	0.01	22.58	1.15	1.17	1.19
190	3.28	3.23	0.05	0.12	23.36	1.15	1.17	1.19
200	3.36	3.15	0.21	0.23	24.07	1.15	1.17	1.18
210	3.43	3.10	0.33	0.33	24.69	1.14	1.17	1.18
220	3.47	3.07	0.41	0.38	25.17	1.14	1.17	1.18
230	3.51	3.04	0.47	0.41	25.53	1.14	1.18	1.18
240	3.53	3.03	0.50	0.42	25.77	1.14	1.18	1.18
250	3.53	3.03	0.50	0.43	25.89	1.14	1.18	1.17
260	3.53	3.05	0.48	0.40	25.96	1.14	1.18	1.17
270	3.51	3.08	0.43	0.40	26.01	1.14	1.19	1.17
280	3.48	3.10	0.38	0.36	26.09	1.14	1.19	1.17
290	3.44	3.14	0.30	0.32	26.24	1.14	1.19	1.17
300	3.39	3.21	0.19	0.28	26.46	1.14	1.19	1.16
310	3.34	3.27	0.06	0.22	26.84	1.14	1.19	1.16
320	3.27	3.34	0.07	0.13	27.36	1.13	1.18	1.15
330	3.19	3.43	0.23	0.06	28.07	1.13	1.18	1.14
340	3.11	3.51	0.40	0.04	29.07	1.12	1.17	1.13
350	3.02	3.61	0.59	0.13	30.49	1.12	1.17	1.12
360	2.93	3.72	0.79	0.22	32.52	1.11	1.16	1.12
370	2.84	3.85	1.01	0.34	35.50	1.10	1.14	1.11
380	2.74	3.98	1.24	0.47	40.70	1.08	1.13	1.11
390	2.64	4.12	1.49	0.57	45.44	1.06	1.12	1.11
400	2.53	4.28	1.75	0.65	37.87	1.04	1.10	1.13
425	2.28	4.75	2.47	0.85	27.59	1.02	1.07	1.22
450	2.04	5.36	3.31	0.83	22.37	1.12	1.13	1.37
475	1.86	6.13	4.27	0.34	18.90	1.25	1.26	1.59
500	1.77	7.10	5.33	1.06	16.45	1.46	1.46	1.92
525	1.81	8.30	6.50	3.90	14.73	1.74	1.76	2.38

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

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2 Way-90° Power Splitter/Combiner JSPQ-350+

Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = +85°C

FREQ. (MHz)	TOTAL LOSS[1] (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2			1-2	S	1	2
50	0.78	9.21	8.43	1.69	18.69	1.17	1.17	1.19
60	1.02	8.02	7.00	1.77	17.95	1.19	1.19	1.22
70	1.26	7.10	5.84	1.80	17.56	1.20	1.20	1.23
80	1.50	6.36	4.86	1.70	17.40	1.21	1.21	1.24
90	1.74	5.77	4.03	1.54	17.45	1.21	1.21	1.24
100	1.96	5.28	3.32	1.36	17.66	1.21	1.20	1.23
110	2.18	4.87	2.69	1.18	18.02	1.20	1.20	1.22
120	2.38	4.54	2.16	0.95	18.48	1.19	1.19	1.21
130	2.56	4.26	1.70	0.73	19.04	1.19	1.19	1.21
140	2.73	4.02	1.29	0.47	19.71	1.18	1.18	1.20
150	2.88	3.82	0.94	0.26	20.45	1.17	1.17	1.19
160	3.03	3.65	0.63	0.05	21.27	1.16	1.16	1.19
170	3.15	3.52	0.37	0.15	22.11	1.15	1.16	1.18
180	3.26	3.41	0.15	0.33	22.99	1.14	1.16	1.17
190	3.35	3.33	0.03	0.48	23.86	1.13	1.16	1.17
200	3.43	3.25	0.18	0.61	24.66	1.13	1.16	1.16
210	3.50	3.20	0.30	0.73	25.35	1.13	1.16	1.16
220	3.54	3.17	0.37	0.83	25.87	1.13	1.17	1.16
230	3.58	3.16	0.42	0.87	26.22	1.13	1.17	1.16
240	3.61	3.15	0.46	0.92	26.41	1.13	1.18	1.16
250	3.61	3.16	0.45	0.96	26.47	1.13	1.18	1.16
260	3.61	3.18	0.43	0.95	26.46	1.14	1.19	1.16
270	3.60	3.22	0.38	0.97	26.43	1.14	1.19	1.16
280	3.57	3.25	0.32	0.96	26.44	1.14	1.20	1.16
290	3.53	3.30	0.23	0.93	26.53	1.14	1.20	1.16
300	3.48	3.37	0.12	0.91	26.72	1.15	1.20	1.16
310	3.43	3.44	0.01	0.88	27.09	1.15	1.20	1.15
320	3.37	3.52	0.15	0.82	27.60	1.14	1.20	1.15
330	3.29	3.61	0.31	0.78	28.33	1.14	1.19	1.14
340	3.22	3.70	0.49	0.69	29.37	1.13	1.19	1.13
350	3.13	3.81	0.68	0.64	30.87	1.13	1.18	1.13
360	3.04	3.92	0.89	0.58	33.03	1.12	1.17	1.12
370	2.94	4.06	1.11	0.48	36.27	1.10	1.16	1.12
380	2.85	4.20	1.35	0.37	41.68	1.09	1.14	1.12
390	2.75	4.35	1.60	0.30	42.91	1.07	1.13	1.13
400	2.65	4.52	1.87	0.25	36.19	1.05	1.11	1.15
425	2.40	5.01	2.61	0.10	26.96	1.02	1.08	1.23
450	2.17	5.65	3.47	0.25	22.01	1.12	1.14	1.39
475	2.02	6.46	4.44	0.90	18.69	1.27	1.28	1.61
500	1.95	7.49	5.54	2.51	16.33	1.48	1.50	1.94
525	2.03	8.75	6.72	5.70	14.71	1.78	1.81	2.40

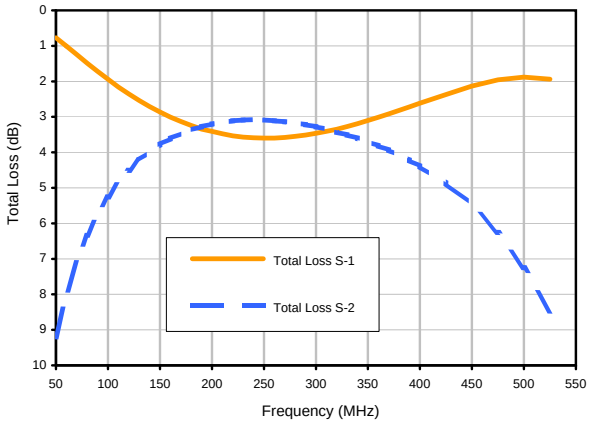
[1]Total Loss = Insertion Loss + 3dB Splitter Loss

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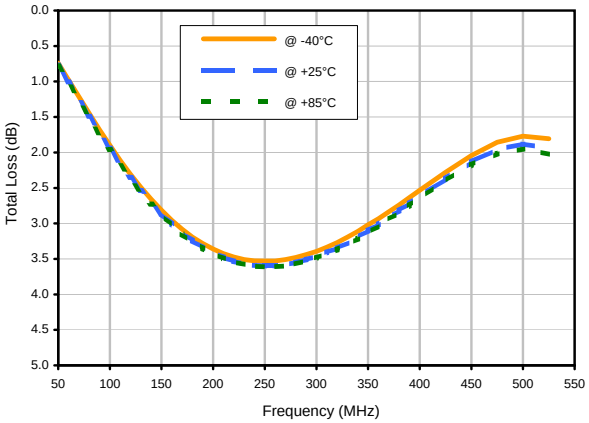
2 Way-90° Power Splitter/Combiner JSPQ-350+

Typical Performance Curves

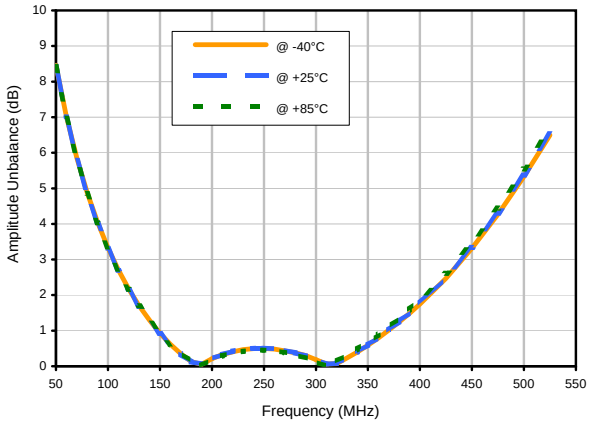
Total Loss



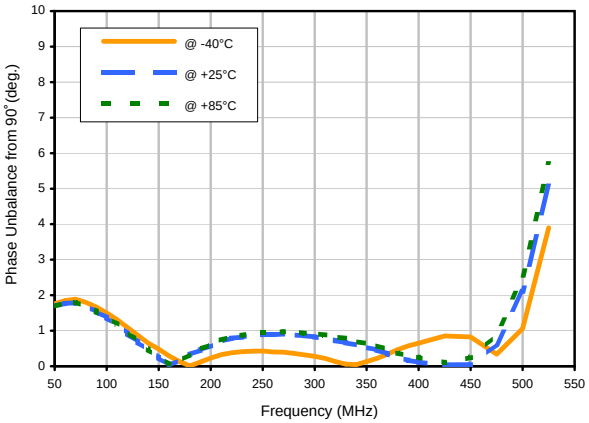
Total Loss S-1 vs. TEMPERATURE



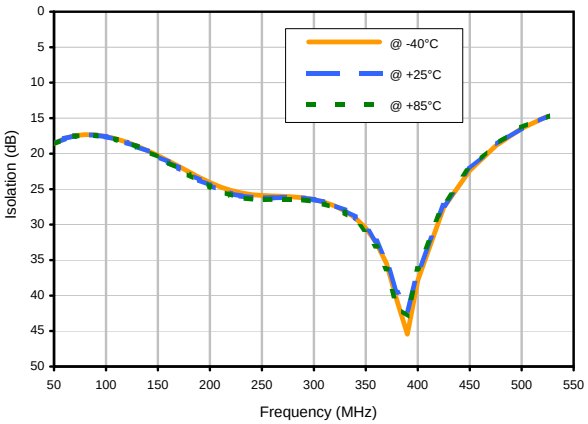
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE



Isolation 1-2 vs. TEMPERATURE

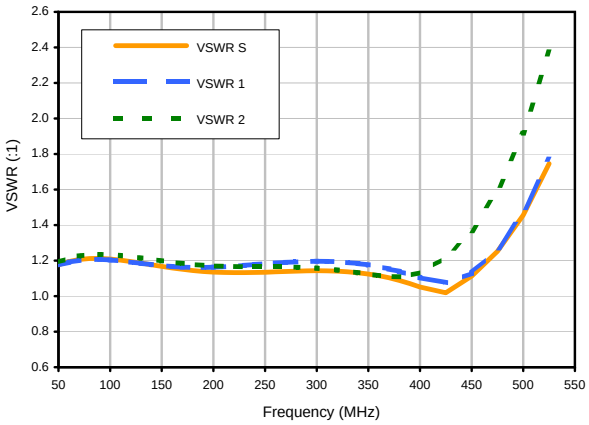


REV. X2
JSPQ-350+
100622
Page 1 of 2

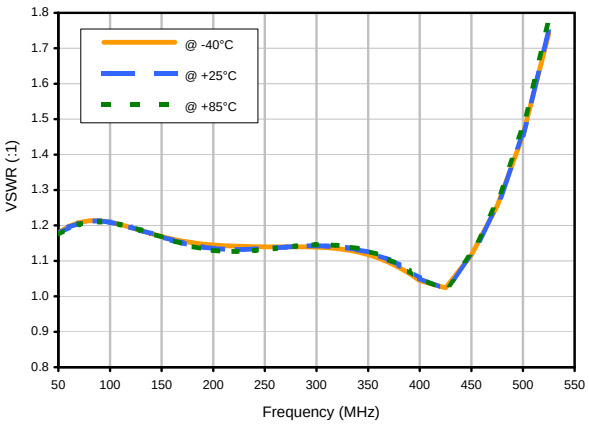
2 Way-90° Power Splitter/Combiner JSPQ-350+

Typical Performance Curves

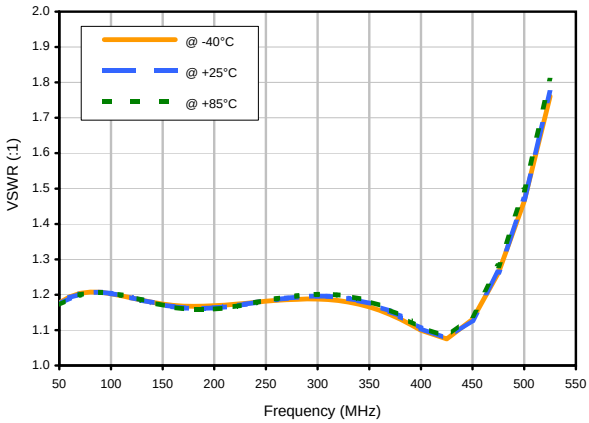
VSWR



VSWR SUM vs. TEMPERATURE



VSWR OUT1 vs. TEMPERATURE

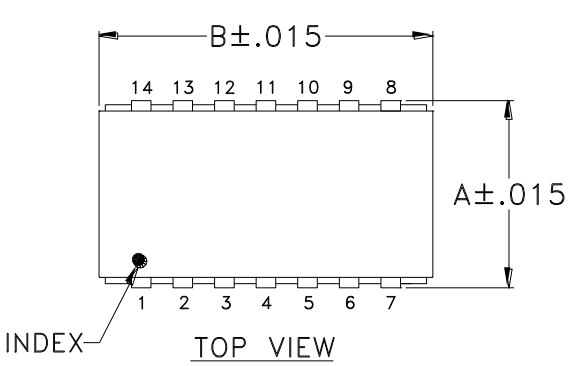


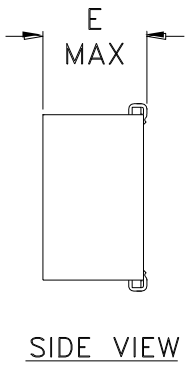
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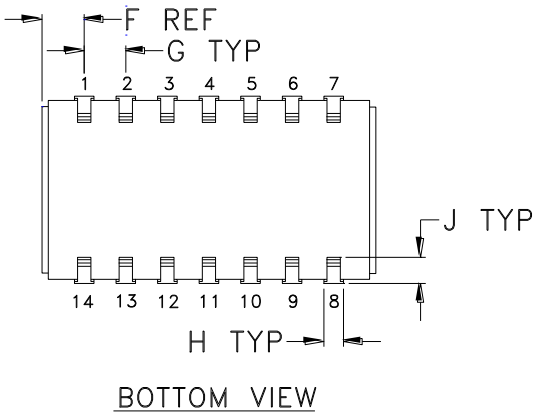
Case Style BK

BK276

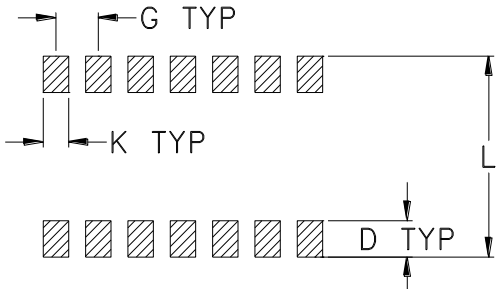
Outline Dimensions







PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	L	WT. GRAM
BK276	.450 (11.43)	.803 (20.40)	-- --	.100 (2.54)	.250 (6.35)	.102 (2.59)	.100 (2.54)	.047 (1.19)	.065 (1.65)	.065 (1.65)	.470 (11.94)	2.0 MAX.

Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3Pl. ± .005

Notes:

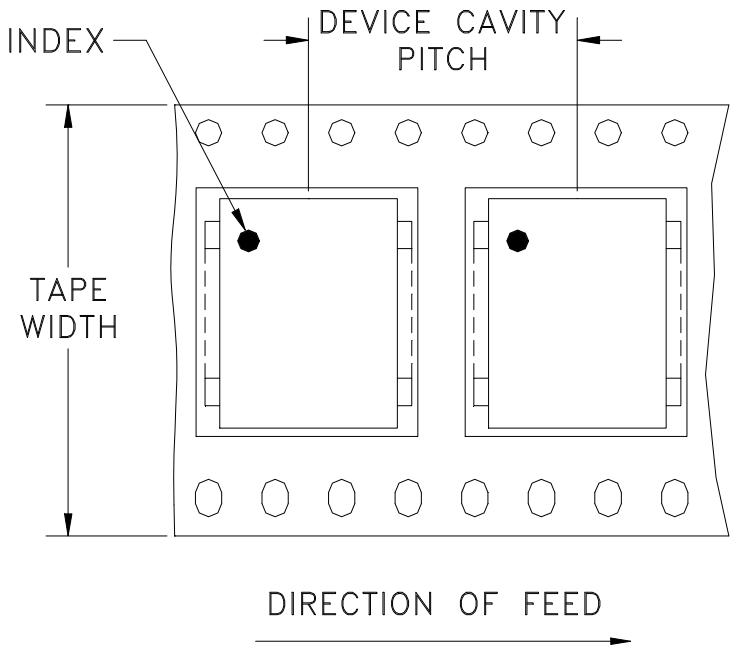
1. Case material: Copper Nickel alloy.
2. Base material: Printed wiring laminate.
3. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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Tape & Reel Packaging TR-F5

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.

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

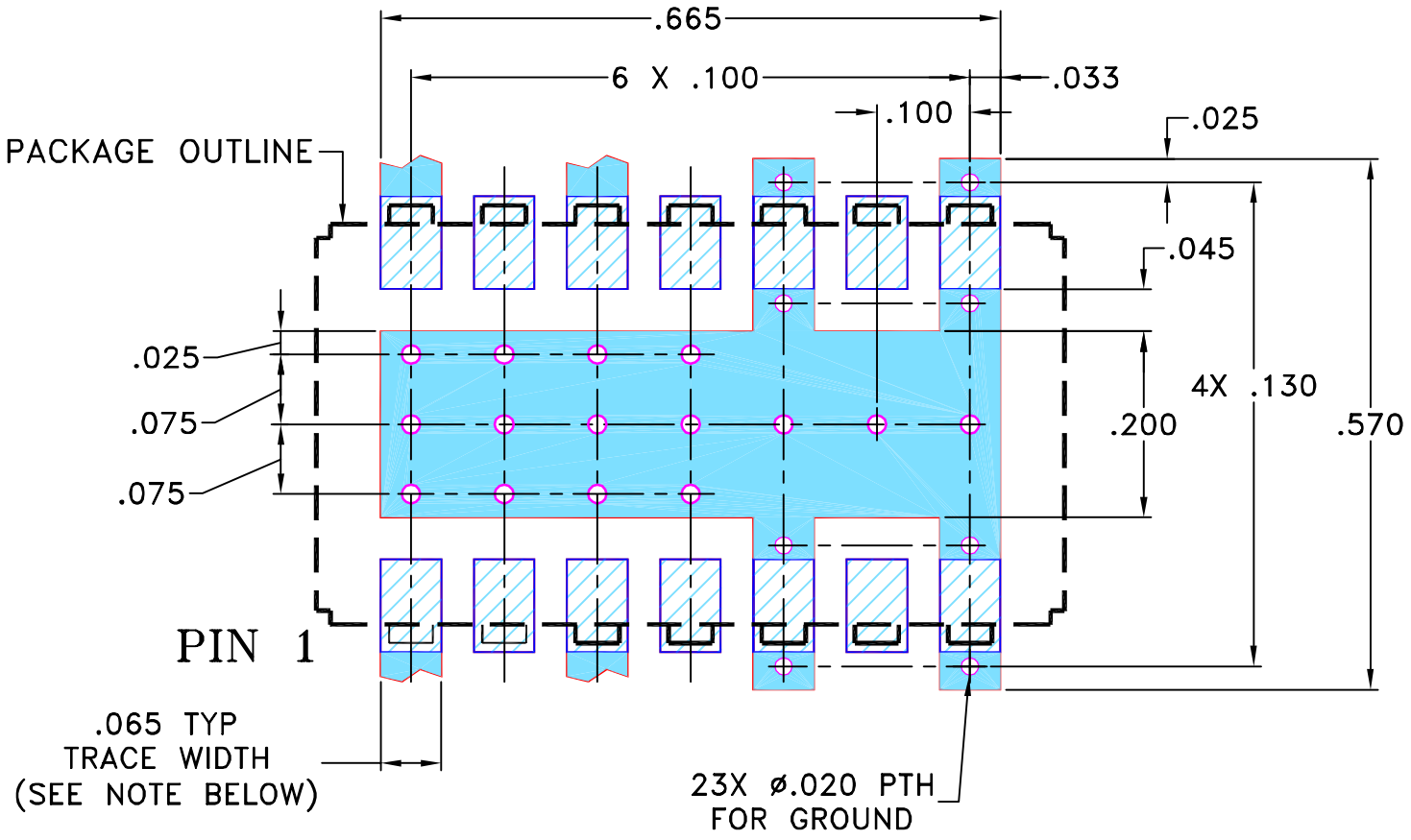
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/05/02	MMG	DJ
A	M102713	MODIFIED PATTERN,UPDATED DIM, NOTES, ADDED "...WITH SMOBC"	01/16/06	GT	IL

SUGGESTED MOUNTING CONFIGURATION
FOR BK276 CASE STYLE, "lu" PIN CONNECTION



NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .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	MMG	07/18/02
TOLERANCES ON:	CHECKED	HY	08/01/02
2 PL DECIMALS ±	APPROVED	DJ	08/05/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

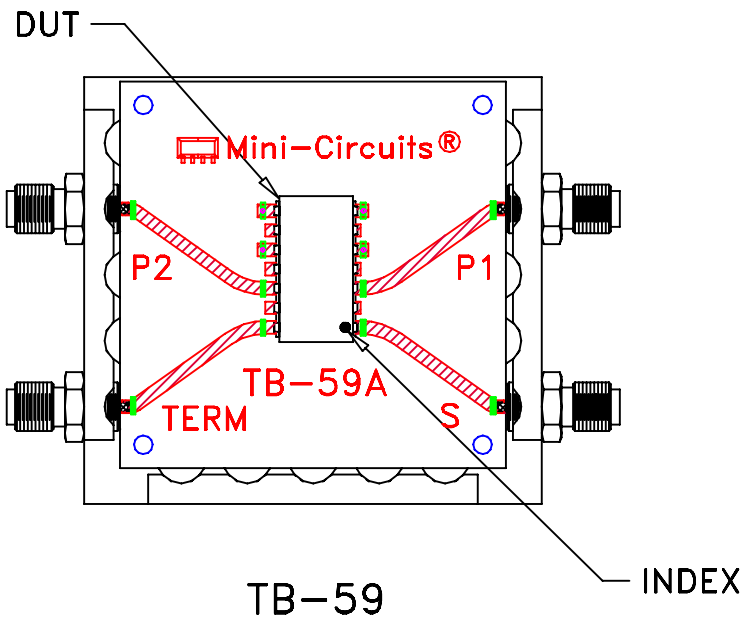
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PL, lu, BK276, JSPQ, TB-59

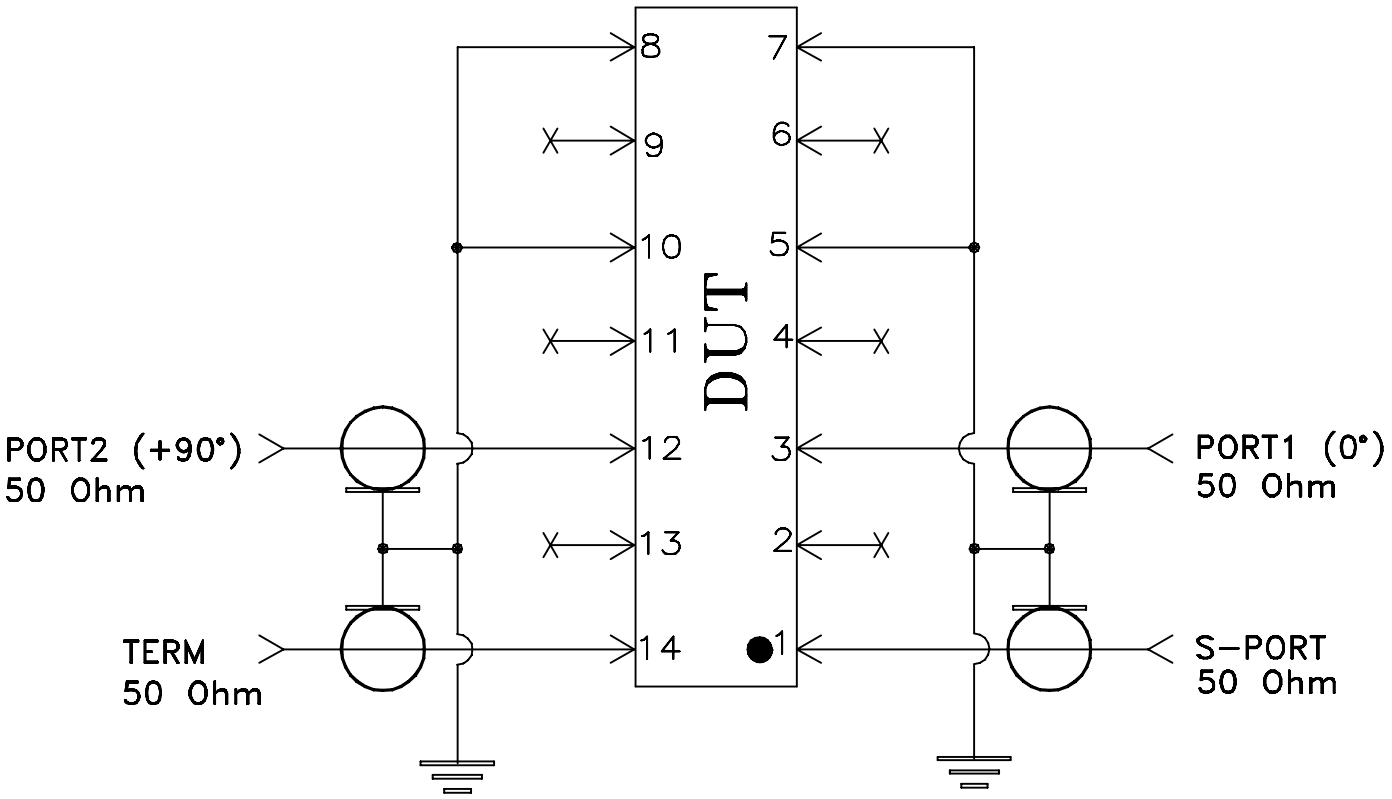
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-061	A

FILE:	SCALE:	SHEET:
98PL061	5:1	1 OF 1

Evaluation Board and Circuit



TB-59



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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Environmental Specifications ENV02T1

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
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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