

Surface Mount

NON-CATALOG

Power Splitter/Combiner

LRPS-2-11

2 Way-0° 50Ω 20 to 2000 MHz



CASE STYLE: QQQ130

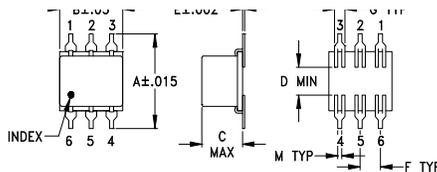
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W max.
Internal Dissipation	0.125W max.

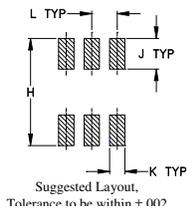
Pin Connections

SUM PORT	6
PORT 1	4
PORT 2	3
GROUND	1,2,5

Outline Drawing



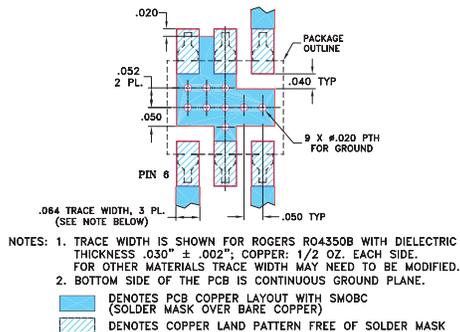
PCB Land Pattern



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G
.400	.31	.200	.10	.010	.100	.050
10.16	7.87	5.08	2.54	0.25	2.54	1.27
H	J	K	L	M		wt
.420	.120	.060	.100	.020		grams
10.67	3.05	1.52	2.54	0.51		0.55

Demo Board MCL P/N: TB-100 Suggested PCB Layout (PL-057)



Features

- very wideband, 20 to 2000 MHz
- low insertion loss, 0.7 dB typ.
- good isolation, 21 dB typ.

Applications

- cellular
- GPS
- communications systems

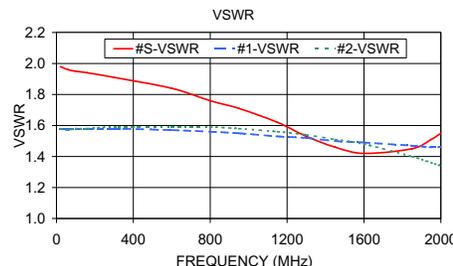
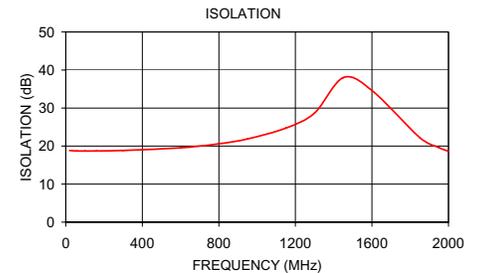
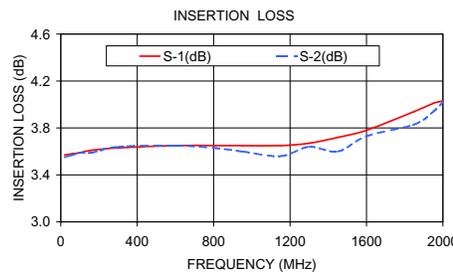
Electrical Specifications

FREQ. RANGE (MHz)	ISOLATION (dB)						INSERTION LOSS (dB) ABOVE 3.0 dB						PHASE UNBALANCE (Degrees)			AMPLITUDE UNBALANCE (dB)		
	L		M		U		L		M		U		L	M	U	L	M	U
	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.	Max.	Max.
20-2000	19	15	21	15	30	15	0.6	0.8	0.7	1.0	0.8	1.5	2.0	3.0	5.0	0.2	0.3	0.7

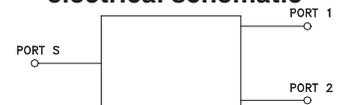
L = 20-200 MHz M = 200-1000 MHz U = 1000-2000 MHz

Typical Performance Data

Frequency (MHz)	Insertion Loss (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
20.00	3.57	3.55	0.01	18.82	0.10	1.98	1.58	1.58
60.00	3.58	3.57	0.01	18.71	0.18	1.96	1.58	1.57
100.00	3.59	3.59	0.01	18.70	0.29	1.95	1.58	1.58
160.00	3.61	3.59	0.02	18.72	0.45	1.94	1.58	1.58
300.00	3.63	3.64	0.01	18.84	0.77	1.91	1.58	1.59
600.00	3.65	3.65	0.00	19.55	1.46	1.84	1.57	1.59
800.00	3.65	3.63	0.02	20.59	1.76	1.76	1.56	1.59
950.00	3.65	3.60	0.05	21.89	1.90	1.71	1.55	1.58
1150.00	3.65	3.56	0.09	24.73	1.89	1.62	1.53	1.56
1300.00	3.67	3.64	0.03	28.68	1.70	1.53	1.52	1.54
1450.00	3.72	3.60	0.12	37.99	1.45	1.46	1.50	1.51
1600.00	3.78	3.73	0.05	34.62	1.03	1.42	1.49	1.48
1850.00	3.94	3.83	0.11	22.22	0.16	1.45	1.47	1.40
1950.00	4.01	3.94	0.07	19.58	0.70	1.51	1.46	1.36
2000.00	4.03	4.02	0.01	18.65	0.98	1.55	1.46	1.34



electrical schematic



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2 Way-0° Power Splitter/Combiner

LRPS-2-11

Typical Performance Data

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

FREQ. (MHz)	INSERTION LOSS (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2				S	1	2
10	3.54	3.54	0.00	0.03	18.03	1.99	1.54	1.53
20	3.55	3.55	0.00	0.08	18.11	1.98	1.54	1.53
30	3.55	3.55	0.00	0.12	18.10	1.98	1.54	1.54
40	3.56	3.56	0.00	0.15	18.10	1.98	1.54	1.54
50	3.57	3.57	0.00	0.18	18.12	1.97	1.54	1.54
100	3.59	3.59	0.00	0.36	18.25	1.96	1.55	1.55
150	3.61	3.60	0.01	0.56	18.38	1.95	1.56	1.56
200	3.61	3.61	0.00	0.75	18.50	1.94	1.57	1.57
250	3.63	3.62	0.01	0.94	18.65	1.93	1.57	1.57
300	3.64	3.62	0.02	1.11	18.84	1.92	1.58	1.58
350	3.65	3.63	0.02	1.28	19.03	1.92	1.58	1.58
400	3.66	3.63	0.03	1.43	19.22	1.91	1.59	1.59
450	3.67	3.63	0.04	1.56	19.44	1.90	1.59	1.59
500	3.68	3.63	0.05	1.71	19.70	1.90	1.60	1.60
550	3.69	3.64	0.05	1.85	19.98	1.89	1.60	1.60
600	3.70	3.64	0.06	2.00	20.28	1.88	1.61	1.60
650	3.71	3.63	0.08	2.08	20.63	1.87	1.62	1.61
700	3.72	3.63	0.09	2.17	20.99	1.87	1.63	1.61
750	3.73	3.63	0.10	2.27	21.46	1.86	1.63	1.62
800	3.74	3.63	0.11	2.33	21.93	1.85	1.64	1.62
850	3.75	3.62	0.13	2.46	22.48	1.83	1.65	1.63
900	3.76	3.61	0.15	2.45	23.06	1.82	1.66	1.63
950	3.77	3.60	0.17	2.42	23.74	1.81	1.66	1.64
1000	3.79	3.60	0.19	2.48	24.51	1.80	1.67	1.64
1050	3.79	3.59	0.20	2.46	25.38	1.78	1.68	1.65
1100	3.80	3.58	0.22	2.44	26.35	1.76	1.69	1.65
1150	3.82	3.57	0.25	2.39	27.48	1.75	1.69	1.65
1200	3.83	3.55	0.28	2.33	28.75	1.73	1.70	1.66
1250	3.83	3.55	0.28	2.27	30.38	1.71	1.71	1.66
1300	3.84	3.53	0.31	2.13	32.15	1.69	1.71	1.65
1350	3.85	3.53	0.32	2.05	34.11	1.67	1.71	1.65
1400	3.86	3.52	0.34	1.92	35.37	1.65	1.72	1.65
1450	3.87	3.52	0.35	1.82	35.00	1.62	1.72	1.65
1500	3.87	3.50	0.37	1.55	33.60	1.60	1.72	1.64
1550	3.88	3.50	0.38	1.35	31.55	1.58	1.72	1.64
1600	3.89	3.49	0.40	1.07	29.57	1.55	1.72	1.63
1650	3.89	3.48	0.41	0.85	27.62	1.53	1.72	1.63
1700	3.90	3.47	0.43	0.52	26.09	1.50	1.72	1.62
1750	3.93	3.47	0.46	0.25	24.71	1.48	1.70	1.61
1800	3.92	3.48	0.44	0.06	23.28	1.46	1.70	1.60
1850	3.93	3.48	0.45	0.40	22.13	1.44	1.70	1.59
1900	3.95	3.47	0.48	0.89	21.18	1.42	1.69	1.58
1950	3.95	3.49	0.46	1.20	20.15	1.40	1.68	1.56
2000	3.96	3.51	0.45	1.48	19.20	1.39	1.66	1.55
2050	3.97	3.53	0.44	2.11	18.40	1.39	1.66	1.53
2100	3.97	3.55	0.42	2.54	17.59	1.39	1.64	1.52
2150	4.00	3.58	0.42	3.02	16.84	1.39	1.62	1.50
2200	4.00	3.62	0.38	3.77	16.17	1.41	1.62	1.48
2250	4.04	3.66	0.38	4.52	15.49	1.43	1.60	1.46
2300	4.06	3.70	0.36	4.86	14.84	1.46	1.58	1.44
2400	4.17	3.82	0.35	6.10	13.70	1.53	1.54	1.40
2500	4.22	3.96	0.26	7.04	12.64	1.63	1.51	1.36
2600	4.29	4.16	0.13	8.71	11.63	1.77	1.51	1.32



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REV. X1

LRPS-2-11

080204

Page 1 of 3

2 Way-0° Power Splitter/Combiner

LRPS-2-11

Typical Performance Data

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

FREQ. (MHz)	INSERTION LOSS (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2				S	1	2
10	3.53	3.53	0.00	0.04	17.18	1.99	1.55	1.54
20	3.54	3.54	0.00	0.11	18.68	1.99	1.58	1.58
30	3.54	3.54	0.00	0.15	19.13	1.99	1.59	1.60
40	3.55	3.55	0.00	0.20	19.38	1.99	1.60	1.61
50	3.56	3.56	0.00	0.25	19.53	1.98	1.61	1.62
100	3.57	3.56	0.01	0.50	19.84	1.96	1.62	1.62
150	3.58	3.57	0.01	0.79	19.93	1.95	1.63	1.62
200	3.59	3.58	0.01	1.06	19.93	1.95	1.63	1.64
250	3.60	3.57	0.03	1.33	19.99	1.94	1.63	1.63
300	3.60	3.57	0.03	1.61	20.16	1.93	1.63	1.64
350	3.61	3.57	0.04	1.87	20.37	1.92	1.64	1.64
400	3.61	3.57	0.04	2.12	20.52	1.92	1.64	1.64
450	3.63	3.57	0.06	2.37	20.70	1.91	1.65	1.65
500	3.64	3.57	0.07	2.60	20.92	1.91	1.65	1.65
550	3.64	3.56	0.08	2.85	21.23	1.90	1.65	1.65
600	3.65	3.56	0.09	3.09	21.52	1.89	1.66	1.65
650	3.66	3.55	0.11	3.29	21.87	1.88	1.66	1.66
700	3.67	3.54	0.13	3.45	22.24	1.87	1.67	1.66
750	3.67	3.53	0.14	3.67	22.74	1.87	1.68	1.67
800	3.68	3.53	0.15	3.83	23.27	1.86	1.68	1.67
850	3.69	3.51	0.18	4.05	23.84	1.84	1.69	1.67
900	3.70	3.51	0.19	4.18	24.49	1.83	1.70	1.68
950	3.71	3.49	0.22	4.33	25.23	1.82	1.70	1.68
1000	3.72	3.49	0.23	4.41	26.18	1.80	1.71	1.69
1050	3.73	3.47	0.26	4.58	27.11	1.79	1.72	1.69
1100	3.73	3.45	0.28	4.59	28.35	1.78	1.72	1.69
1150	3.75	3.45	0.30	4.79	29.71	1.76	1.73	1.70
1200	3.74	3.44	0.30	4.78	31.66	1.74	1.74	1.70
1250	3.76	3.42	0.34	4.81	33.49	1.73	1.74	1.70
1300	3.76	3.41	0.35	4.78	35.92	1.71	1.75	1.70
1350	3.77	3.40	0.37	4.86	37.51	1.69	1.75	1.69
1400	3.77	3.39	0.38	4.81	36.84	1.67	1.75	1.69
1450	3.78	3.37	0.41	4.71	34.51	1.65	1.76	1.68
1500	3.79	3.36	0.43	4.66	31.99	1.62	1.76	1.68
1550	3.79	3.35	0.44	4.58	29.69	1.60	1.76	1.67
1600	3.79	3.34	0.46	4.41	27.79	1.57	1.76	1.67
1650	3.80	3.32	0.48	4.26	26.21	1.55	1.76	1.66
1700	3.80	3.32	0.48	4.13	24.63	1.53	1.75	1.66
1750	3.82	3.30	0.52	3.81	23.51	1.50	1.74	1.65
1800	3.80	3.31	0.49	3.78	22.10	1.47	1.74	1.64
1850	3.83	3.30	0.52	3.80	21.06	1.45	1.71	1.63
1900	3.82	3.30	0.52	3.28	20.20	1.43	1.72	1.62
1950	3.83	3.32	0.51	3.18	19.28	1.41	1.69	1.61
2000	3.85	3.33	0.52	3.07	18.44	1.39	1.68	1.59
2050	3.81	3.34	0.47	2.38	17.60	1.39	1.69	1.57
2100	3.85	3.36	0.49	1.85	16.91	1.39	1.68	1.55
2150	3.84	3.39	0.45	1.66	16.19	1.39	1.65	1.54
2200	3.87	3.42	0.45	0.96	15.56	1.40	1.64	1.52
2250	3.91	3.45	0.46	0.64	14.87	1.42	1.61	1.49
2300	3.91	3.50	0.42	0.30	14.21	1.44	1.60	1.47
2400	3.98	3.60	0.38	1.12	13.04	1.50	1.57	1.42
2500	4.01	3.73	0.27	2.07	12.08	1.59	1.54	1.38
2600	4.12	3.89	0.23	3.28	11.23	1.71	1.52	1.34



2 Way-0° Power Splitter/Combiner

LRPS-2-11

Typical Performance Data

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

FREQ. (MHz)	INSERTION LOSS (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2				S	1	2
10	3.54	3.54	0.00	0.03	15.75	1.98	1.42	1.42
20	3.55	3.55	0.00	0.10	15.80	1.98	1.42	1.42
30	3.55	3.55	0.00	0.13	15.79	1.97	1.42	1.42
40	3.56	3.57	0.01	0.18	15.80	1.97	1.43	1.42
50	3.57	3.57	0.00	0.21	15.81	1.97	1.43	1.42
100	3.60	3.60	0.00	0.41	15.93	1.96	1.44	1.44
150	3.62	3.62	0.00	0.57	16.09	1.95	1.44	1.45
200	3.63	3.63	0.00	0.75	16.28	1.93	1.45	1.45
250	3.64	3.64	0.00	0.92	16.49	1.93	1.46	1.47
300	3.65	3.65	0.00	1.08	16.69	1.92	1.47	1.47
350	3.66	3.67	0.01	1.24	16.89	1.91	1.48	1.48
400	3.68	3.67	0.01	1.38	17.09	1.91	1.49	1.49
450	3.69	3.68	0.01	1.51	17.33	1.90	1.50	1.50
500	3.70	3.69	0.01	1.63	17.59	1.89	1.50	1.50
550	3.72	3.69	0.03	1.75	17.91	1.89	1.51	1.51
600	3.72	3.70	0.02	1.86	18.23	1.88	1.52	1.52
650	3.73	3.70	0.03	1.93	18.60	1.87	1.53	1.52
700	3.75	3.70	0.05	1.97	18.97	1.86	1.54	1.53
750	3.76	3.70	0.06	2.08	19.41	1.85	1.55	1.54
800	3.77	3.71	0.06	2.10	19.85	1.84	1.56	1.55
850	3.78	3.70	0.08	2.19	20.34	1.82	1.57	1.55
900	3.79	3.70	0.09	2.18	20.86	1.81	1.58	1.56
950	3.80	3.70	0.10	2.20	21.44	1.79	1.59	1.57
1000	3.81	3.70	0.11	2.17	22.09	1.78	1.60	1.57
1050	3.83	3.69	0.14	2.17	22.75	1.76	1.60	1.58
1100	3.84	3.69	0.15	2.06	23.54	1.74	1.61	1.58
1150	3.85	3.68	0.16	2.10	24.45	1.72	1.62	1.59
1200	3.85	3.69	0.16	2.02	25.41	1.70	1.62	1.59
1250	3.86	3.67	0.19	1.90	26.45	1.68	1.63	1.59
1300	3.87	3.67	0.20	1.75	27.72	1.66	1.63	1.59
1350	3.88	3.67	0.21	1.73	29.13	1.63	1.64	1.58
1400	3.89	3.67	0.22	1.58	30.79	1.61	1.64	1.58
1450	3.90	3.65	0.25	1.37	32.50	1.58	1.64	1.57
1500	3.92	3.64	0.28	1.20	34.21	1.56	1.64	1.57
1550	3.92	3.65	0.27	1.04	35.03	1.53	1.64	1.56
1600	3.93	3.65	0.29	0.76	34.52	1.51	1.64	1.56
1650	3.94	3.64	0.30	0.50	32.79	1.48	1.64	1.55
1700	3.94	3.65	0.29	0.30	30.62	1.45	1.63	1.54
1750	3.97	3.64	0.33	0.09	29.10	1.43	1.62	1.54
1800	3.96	3.66	0.30	0.22	27.02	1.41	1.62	1.53
1850	3.97	3.67	0.30	0.32	25.30	1.38	1.61	1.52
1900	3.99	3.66	0.33	0.89	24.34	1.37	1.61	1.51
1950	4.00	3.69	0.31	1.19	23.04	1.35	1.59	1.50
2000	4.04	3.70	0.34	1.21	22.02	1.33	1.56	1.49
2050	4.00	3.73	0.27	1.87	20.92	1.33	1.57	1.47
2100	4.03	3.76	0.27	2.38	20.04	1.32	1.56	1.46
2150	4.06	3.78	0.27	2.77	19.24	1.33	1.54	1.44
2200	4.06	3.81	0.25	3.37	18.41	1.34	1.54	1.43
2250	4.09	3.85	0.24	3.57	17.63	1.35	1.50	1.41
2300	4.12	3.89	0.22	4.18	16.96	1.37	1.50	1.40
2400	4.15	4.02	0.13	5.58	15.60	1.44	1.49	1.37
2500	4.20	4.14	0.06	6.53	14.45	1.51	1.47	1.34
2600	4.26	4.30	0.04	7.68	13.42	1.60	1.45	1.31

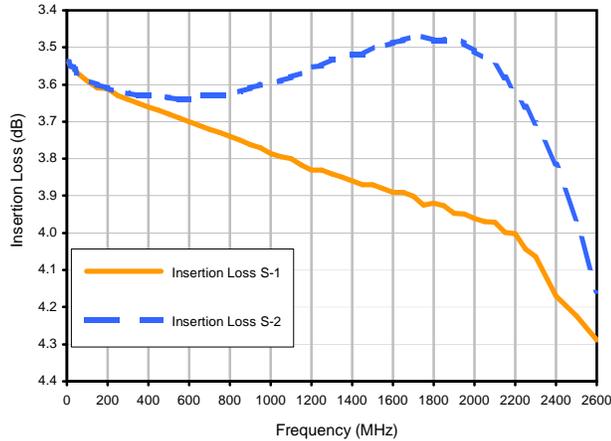


2 Way-0° Power Splitter/Combiner

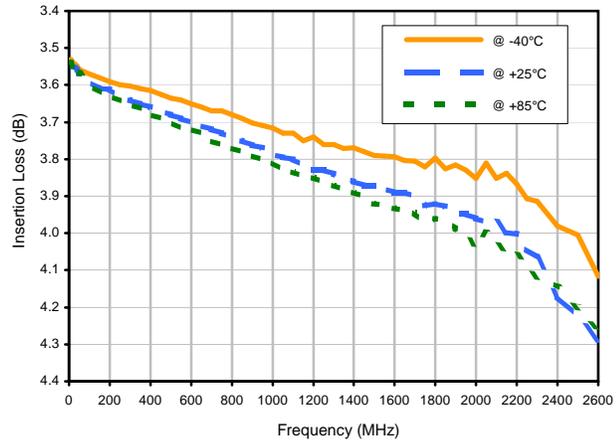
LRPS-2-11

Typical Performance Curves

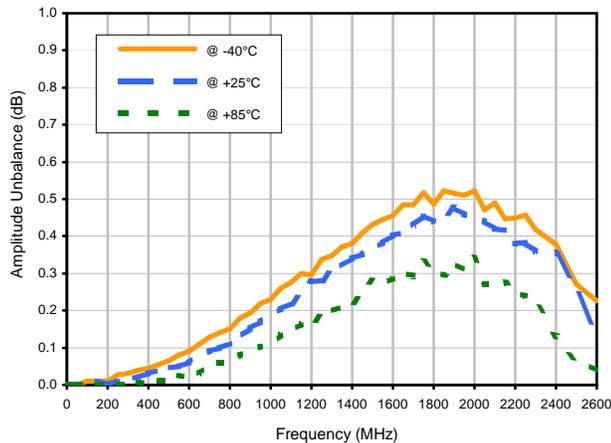
Insertion Loss



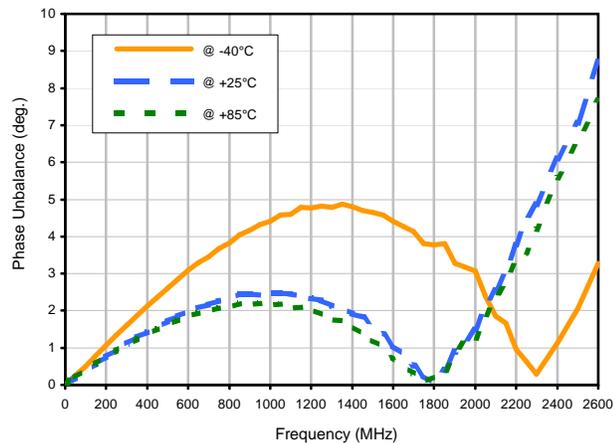
Insertion Loss S-1 vs. TEMPERATURE



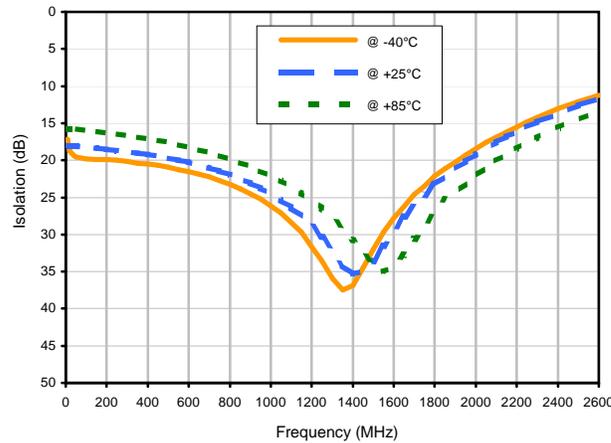
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE



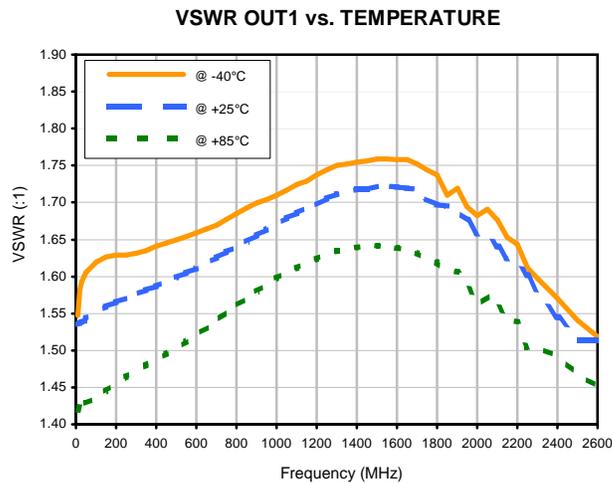
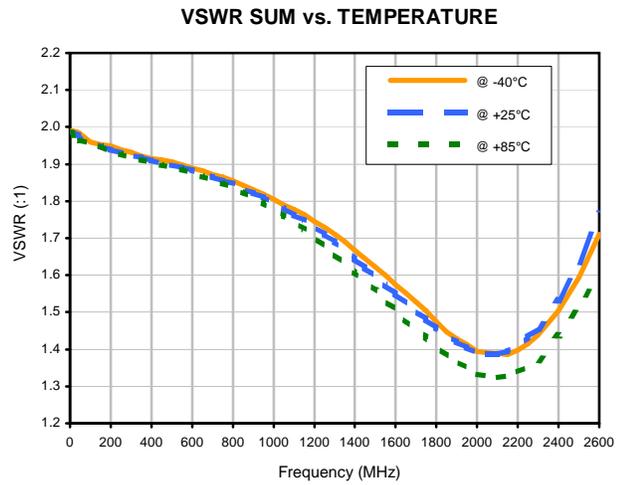
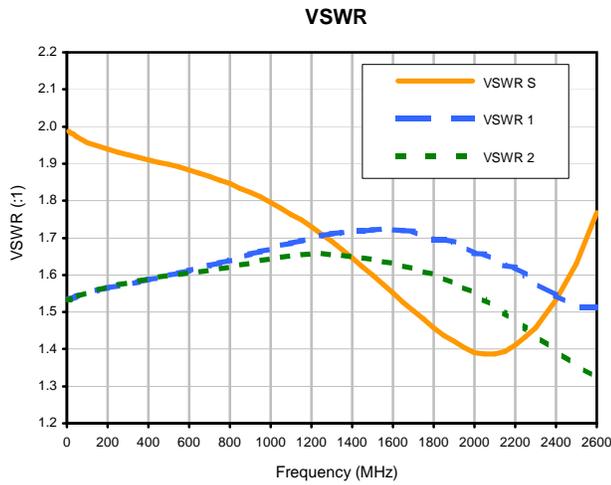
Isolation 1-2 vs. TEMPERATURE



2 Way-0° Power Splitter/Combiner

LRPS-2-11

Typical Performance Curves

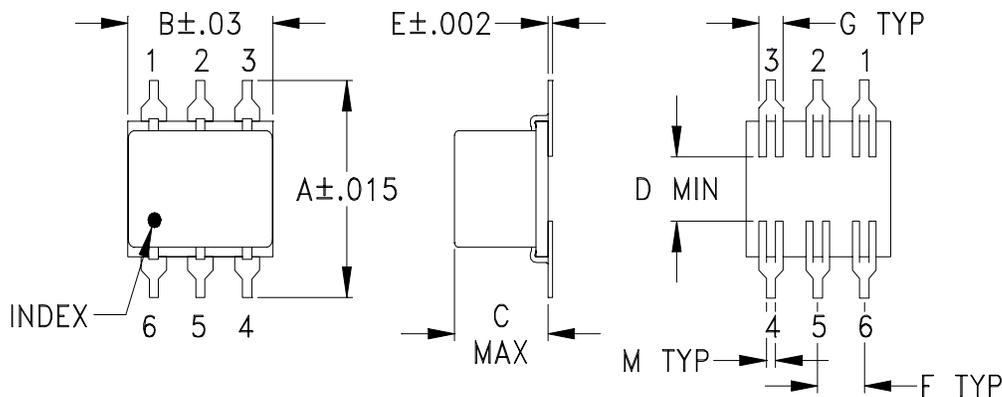


Case Style

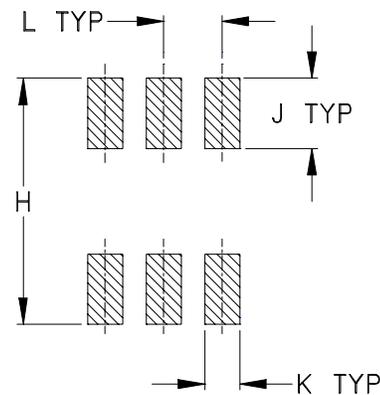
QQQ

QQQ130 (non-waterproof)
QQQ828 (washable)

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	WT, GRAM
QQQ130	.400 (10.16)	.31 (7.87)	.200 (5.08)	.10 (2.54)	.010 (.25)	.100 (2.54)	.050 (1.27)	.420 (10.67)	.120 (3.05)	.060 (1.52)	.100 (2.54)	.020 (.51)	.55
QQQ828			.050 (1.27)										.20

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

Notes:

- Case material: Ceramic.
- Termination finish:
 - For RoHS Case Styles: Tin plate over Nickel plate.
 - For RoHS-5 Case Styles: Tin-Lead plate.



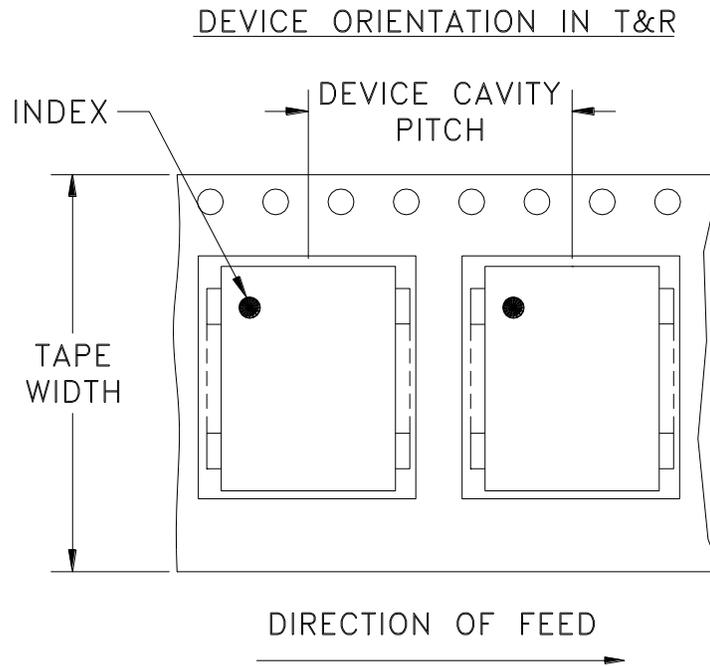
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Tape & Reel Packaging TR-F10



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
24	16	7	10,20,50,100
		13	200,500

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

Note: Please consult individual model data sheet to determine device per reel availability.



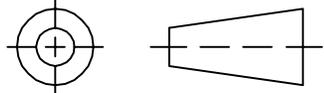
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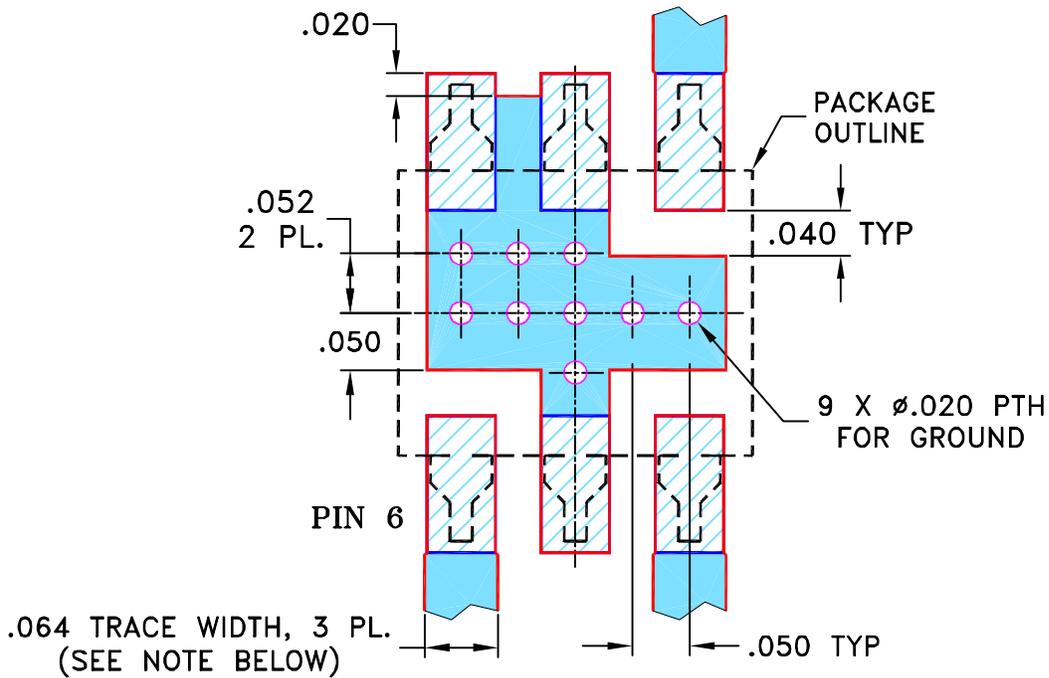
THIRD ANGLE PROJECTION



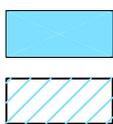
REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/05/02	GF	DJ
A	M102713	ADDED NOTE 2 & "...WITH SMOBC", QQQ130/828 WAS QQQ569/828 CASE STYLE	01/18/06	MMG	LC

SUGGESTED MOUNTING CONFIGURATION FOR
QQQ130/828 CASE STYLE, "gn" PIN CONNECTION



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B 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 GF	07/17/02
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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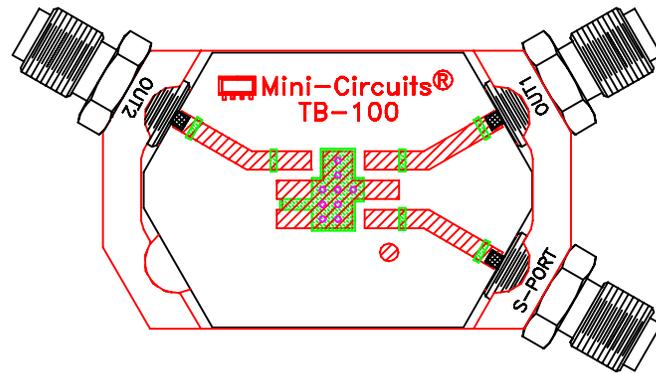
13 Neptune Avenue
Brooklyn NY 11235

PL, gn, QQQ130/828, LRPS/SCL, TB-100

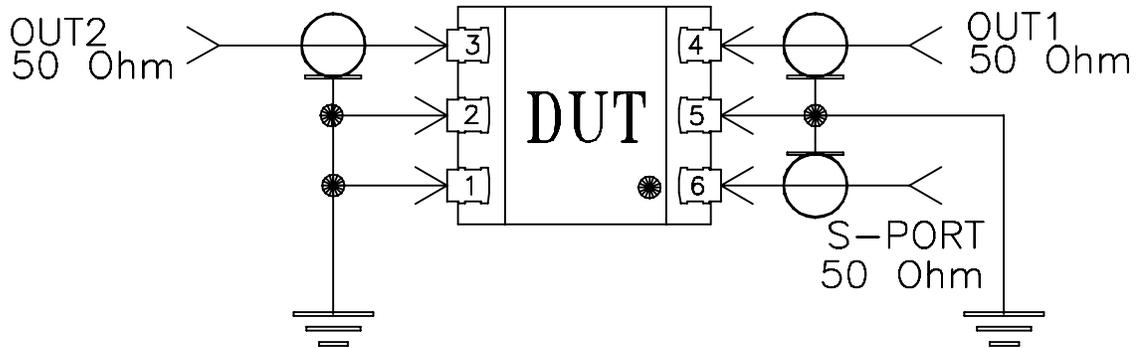
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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-057	A
FILE:	98PL057	SCALE:	6:1
SHEET:	1	OF	1

Evaluation Board and Circuit



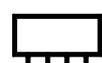
TB-100



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.030 inch.

 **Mini-Circuits®**

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