Surface Mount

Power Splitter/Combiner

HPQ-10+
HPQ-10

2 Way-90° 50Ω 900 to 970 MHz

CASE STYLE: AT577
PRICE: Contact Sales Dept.

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

Maximum Ratings

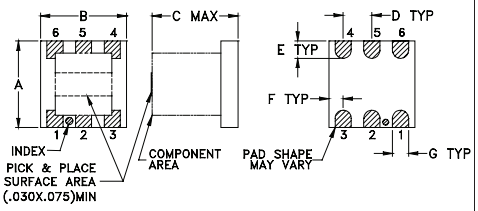
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W max.

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

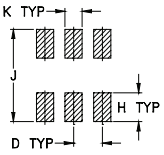
Pin Connections

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

Outline Drawing



PCB Land Pattern



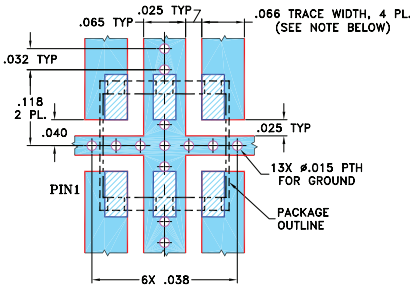
Suggested Layout,
Tolerance to be within ±.002

Outline Dimensions (inch / mm)

A	B	C	D	E	F
.200	.200	.200	.075	.050	.025
5.08	5.08	5.08	1.91	1.27	0.64

G	H	J	K	wt
.026	.070	.220	.035	grams
0.66	1.78	5.59	0.89	0.15

Demo Board MCL P/N: TB-43
Suggested PCB Layout (PL-114)



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

Features

- low insertion loss, 0.25 dB typ.
- good isolation, 20 dB typ.
- excellent input VSWR, 1.17:1 typ.; output VSWR, 1.25:1 typ.
- aqueous washable

Applications

- cellular
- GSM
- modulators
- matching amplifiers

Electrical Specifications

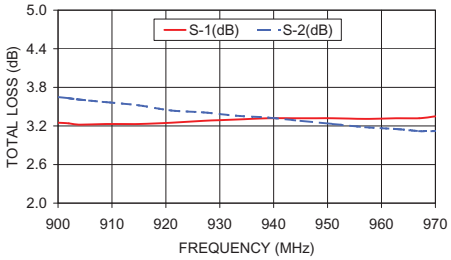
FREQ. RANGE (MHz)	ISOLATION (dB)		INSERTION LOSS (dB) Avg. of Coupled Outputs ABOVE 3 dB		PHASE UNBALANCE (Degrees)		AMPLITUDE UNBALANCE (dB)		VSWR (:1)	
f_L-f_U	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	S-Port Typ.	Output Typ.
900-970	22	17	0.25	0.45	0.7	4.0	0.5	1.2	1.17	1.17

Typical Performance Data

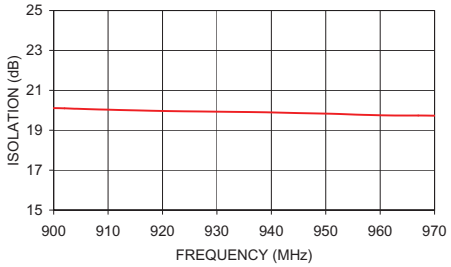
Frequency (MHz)	Total Loss[1] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
900.00	3.25	3.65	0.40	20.11	89.44	1.25	1.18	1.25
902.00	3.24	3.63	0.39	20.10	89.50	1.25	1.18	1.25
904.00	3.22	3.61	0.38	20.08	89.46	1.25	1.18	1.25
909.00	3.23	3.57	0.34	20.04	89.62	1.25	1.18	1.25
915.00	3.23	3.52	0.28	20.00	89.90	1.26	1.19	1.25
921.00	3.25	3.44	0.20	19.96	90.03	1.26	1.19	1.26
927.00	3.28	3.41	0.13	19.94	89.97	1.26	1.19	1.26
933.00	3.30	3.36	0.06	19.92	89.82	1.26	1.19	1.26
939.00	3.32	3.33	0.01	19.90	89.83	1.27	1.19	1.26
945.00	3.32	3.28	0.05	19.86	89.72	1.27	1.20	1.26
951.00	3.32	3.23	0.10	19.83	89.76	1.27	1.20	1.27
957.00	3.31	3.18	0.13	19.77	89.72	1.27	1.20	1.27
963.00	3.32	3.15	0.17	19.74	89.75	1.28	1.20	1.27
967.00	3.32	3.12	0.20	19.74	89.72	1.28	1.20	1.28
970.00	3.35	3.12	0.23	19.73	89.70	1.28	1.21	1.28

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

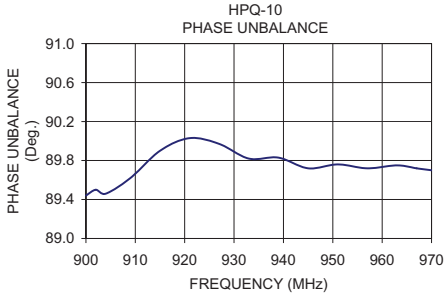
HPQ-10
TOTAL LOSS



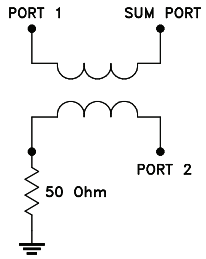
HPQ-10
ISOLATION



HPQ-10
PHASE UNBALANCE



electrical schematic



For detailed performance specs & shopping online see web site

REV. B
M127604
HPQ-10
ED-7075
RVN/TD/CP
130313

2 Way-90° Power Splitter/Combiner HPQ-10

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
400	0.90	8.01	7.11	0.41	26.10	1.05	1.04	1.04
500	1.29	6.50	5.20	0.38	24.99	1.07	1.06	1.07
600	1.73	5.38	3.65	0.32	24.20	1.10	1.08	1.10
700	2.18	4.53	2.35	0.18	23.60	1.13	1.10	1.13
750	2.41	4.17	1.76	0.15	23.30	1.15	1.11	1.14
800	2.65	3.87	1.22	0.08	23.01	1.16	1.12	1.16
850	2.88	3.60	0.71	0.01	22.71	1.17	1.13	1.17
860	2.93	3.54	0.61	0.00	22.64	1.18	1.14	1.17
870	2.97	3.50	0.52	0.00	22.57	1.18	1.14	1.18
880	3.02	3.44	0.43	0.03	22.50	1.18	1.14	1.18
890	3.07	3.40	0.33	0.06	22.44	1.19	1.14	1.18
900	3.11	3.36	0.24	0.05	22.39	1.19	1.14	1.18
910	3.16	3.30	0.14	0.06	22.32	1.19	1.15	1.19
920	3.21	3.26	0.05	0.11	22.26	1.19	1.15	1.19
930	3.25	3.22	0.04	0.15	22.18	1.20	1.15	1.19
940	3.30	3.17	0.12	0.13	22.11	1.20	1.15	1.20
950	3.34	3.14	0.20	0.15	22.04	1.20	1.16	1.20
960	3.39	3.10	0.30	0.17	21.98	1.20	1.16	1.20
970	3.44	3.06	0.38	0.20	21.92	1.21	1.16	1.20
980	3.48	3.02	0.46	0.22	21.86	1.21	1.16	1.21
990	3.53	2.98	0.55	0.23	21.79	1.21	1.17	1.21
1000	3.58	2.94	0.63	0.24	21.71	1.21	1.17	1.21
1010	3.63	2.91	0.71	0.26	21.63	1.22	1.17	1.21
1020	3.67	2.88	0.80	0.30	21.56	1.22	1.17	1.22
1030	3.72	2.84	0.87	0.32	21.50	1.22	1.17	1.22
1040	3.76	2.80	0.96	0.32	21.45	1.22	1.18	1.22
1050	3.80	2.78	1.03	0.34	21.37	1.23	1.18	1.22
1100	4.03	2.62	1.41	0.47	21.01	1.24	1.19	1.24
1200	4.48	2.36	2.12	0.73	20.31	1.27	1.22	1.26
1300	4.91	2.15	2.76	1.08	19.64	1.29	1.25	1.28
1400	5.33	1.98	3.35	1.43	19.01	1.32	1.29	1.31
1500	5.74	1.84	3.90	1.85	18.43	1.35	1.32	1.34
1600	6.13	1.73	4.40	2.33	17.89	1.38	1.36	1.36
1700	6.51	1.65	4.87	2.87	17.40	1.41	1.41	1.40
1800	6.89	1.59	5.30	3.45	16.93	1.45	1.45	1.43
1900	7.25	1.55	5.70	4.15	16.52	1.49	1.50	1.47
2000	7.60	1.51	6.09	4.89	16.16	1.53	1.55	1.51

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

2 Way-90° Power Splitter/Combiner HPQ-10

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
400	0.82	8.10	7.28	0.73	26.86	1.06	1.05	1.04
500	1.20	6.57	5.37	1.02	25.66	1.08	1.07	1.07
600	1.61	5.43	3.82	1.33	24.70	1.10	1.09	1.10
700	2.05	4.56	2.51	1.73	23.93	1.13	1.11	1.13
750	2.28	4.20	1.93	1.88	23.55	1.14	1.11	1.14
800	2.50	3.89	1.39	2.08	23.18	1.16	1.12	1.16
850	2.73	3.61	0.88	2.27	22.80	1.17	1.13	1.17
860	2.78	3.56	0.79	2.32	22.70	1.17	1.13	1.17
870	2.82	3.52	0.69	2.36	22.61	1.18	1.14	1.18
880	2.87	3.46	0.59	2.39	22.53	1.18	1.14	1.18
890	2.91	3.41	0.50	2.44	22.46	1.18	1.14	1.18
900	2.95	3.37	0.41	2.47	22.38	1.19	1.14	1.19
910	3.00	3.32	0.32	2.52	22.29	1.19	1.14	1.19
920	3.05	3.27	0.22	2.57	22.21	1.19	1.15	1.19
930	3.09	3.23	0.13	2.64	22.12	1.20	1.15	1.19
940	3.14	3.19	0.05	2.64	22.02	1.20	1.15	1.20
950	3.18	3.15	0.03	2.70	21.94	1.20	1.15	1.20
960	3.23	3.11	0.13	2.75	21.88	1.20	1.15	1.20
970	3.28	3.06	0.21	2.80	21.80	1.21	1.16	1.20
980	3.32	3.02	0.30	2.84	21.72	1.21	1.16	1.21
990	3.36	2.99	0.38	2.88	21.64	1.21	1.16	1.21
1000	3.41	2.95	0.46	2.93	21.56	1.22	1.16	1.21
1010	3.46	2.91	0.55	2.97	21.48	1.22	1.16	1.21
1020	3.50	2.87	0.63	3.01	21.38	1.22	1.16	1.22
1030	3.55	2.84	0.70	3.08	21.34	1.22	1.17	1.22
1040	3.59	2.80	0.79	3.11	21.27	1.23	1.17	1.22
1050	3.63	2.77	0.86	3.15	21.20	1.23	1.17	1.22
1100	3.86	2.62	1.24	3.42	20.84	1.24	1.19	1.24
1200	4.29	2.34	1.95	3.92	20.11	1.26	1.22	1.26
1300	4.71	2.12	2.60	4.55	19.41	1.29	1.25	1.28
1400	5.13	1.94	3.19	5.15	18.76	1.32	1.28	1.30
1500	5.52	1.80	3.72	5.82	18.16	1.34	1.32	1.33
1600	5.91	1.68	4.22	6.57	17.62	1.37	1.36	1.36
1700	6.28	1.60	4.69	7.35	17.14	1.41	1.41	1.39
1800	6.65	1.52	5.13	8.18	16.69	1.44	1.45	1.42
1900	7.01	1.48	5.53	9.18	16.31	1.48	1.50	1.46
2000	7.38	1.46	5.93	9.89	15.87	1.51	1.55	1.50

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

2 Way-90° Power Splitter/Combiner HPQ-10

Typical Performance Data

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

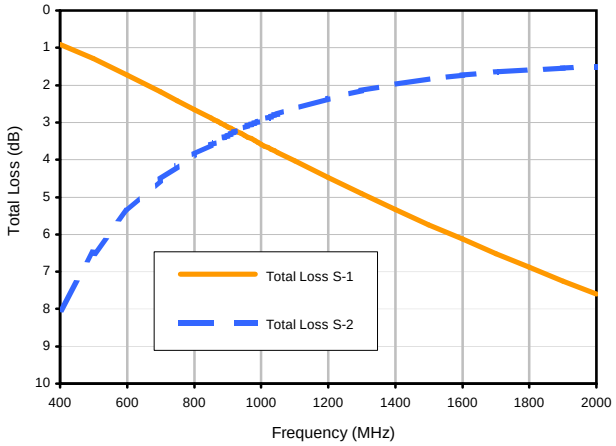
FREQ. (MHz)	TOTAL LOSS[1] (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB)	VSWR (:1)		
	S-1	S-2			1-2	S	1	2
400	0.91	8.14	7.23	0.57	27.18	1.05	1.04	1.04
500	1.30	6.62	5.32	0.57	26.03	1.07	1.06	1.06
600	1.73	5.49	3.76	0.54	25.15	1.09	1.08	1.09
700	2.17	4.63	2.46	0.43	24.38	1.12	1.10	1.12
750	2.40	4.28	1.88	0.42	23.96	1.14	1.11	1.13
800	2.63	3.97	1.34	0.39	23.55	1.15	1.12	1.15
850	2.87	3.70	0.83	0.34	23.13	1.16	1.13	1.16
860	2.91	3.64	0.73	0.33	23.03	1.17	1.13	1.16
870	2.96	3.60	0.63	0.32	22.95	1.17	1.13	1.17
880	3.01	3.54	0.54	0.30	22.86	1.17	1.13	1.17
890	3.05	3.50	0.45	0.29	22.79	1.18	1.14	1.17
900	3.09	3.46	0.36	0.29	22.71	1.18	1.14	1.17
910	3.15	3.40	0.26	0.28	22.63	1.18	1.14	1.18
920	3.19	3.36	0.17	0.24	22.54	1.18	1.14	1.18
930	3.23	3.32	0.08	0.21	22.44	1.19	1.14	1.18
940	3.28	3.27	0.01	0.22	22.34	1.19	1.15	1.19
950	3.33	3.24	0.09	0.21	22.26	1.19	1.15	1.19
960	3.37	3.20	0.18	0.18	22.19	1.20	1.15	1.19
970	3.42	3.16	0.26	0.16	22.11	1.20	1.15	1.19
980	3.47	3.12	0.35	0.14	22.02	1.20	1.16	1.20
990	3.51	3.08	0.44	0.12	21.94	1.20	1.16	1.20
1000	3.56	3.04	0.52	0.11	21.85	1.21	1.16	1.20
1010	3.61	3.01	0.60	0.09	21.76	1.21	1.16	1.20
1020	3.65	2.97	0.68	0.08	21.66	1.21	1.16	1.21
1030	3.70	2.93	0.76	0.05	21.59	1.21	1.17	1.21
1040	3.75	2.90	0.85	0.04	21.52	1.22	1.17	1.21
1050	3.78	2.87	0.92	0.04	21.44	1.22	1.17	1.21
1100	4.01	2.72	1.30	0.09	21.01	1.23	1.18	1.23
1200	4.46	2.45	2.01	0.30	20.20	1.26	1.21	1.25
1300	4.89	2.24	2.66	0.62	19.48	1.29	1.24	1.28
1400	5.32	2.06	3.26	0.91	18.83	1.31	1.28	1.30
1500	5.73	1.93	3.80	1.31	18.26	1.34	1.31	1.33
1600	6.12	1.82	4.30	1.72	17.75	1.37	1.36	1.36
1700	6.51	1.74	4.78	2.20	17.27	1.41	1.40	1.39
1800	6.89	1.67	5.22	2.74	16.83	1.44	1.44	1.43
1900	7.26	1.63	5.63	3.35	16.45	1.49	1.49	1.47
2000	7.63	1.62	6.01	3.65	16.03	1.53	1.53	1.51

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

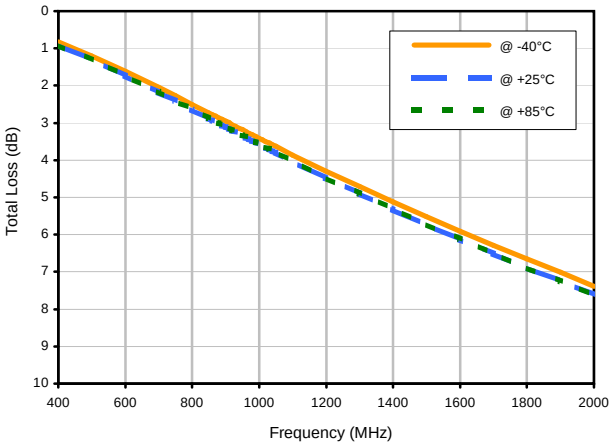
2 Way-90° Power Splitter/Combiner HPQ-10

Typical Performance Curves

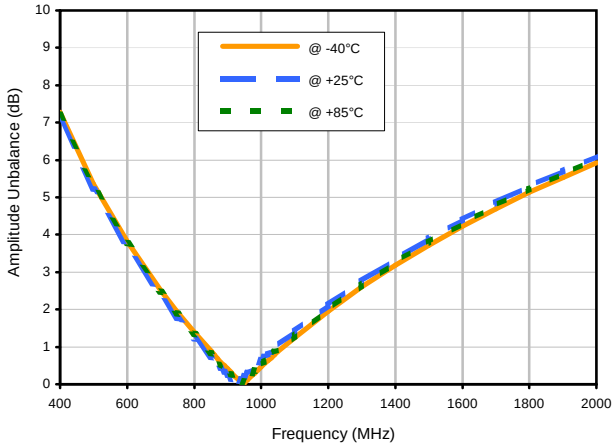
Total Loss



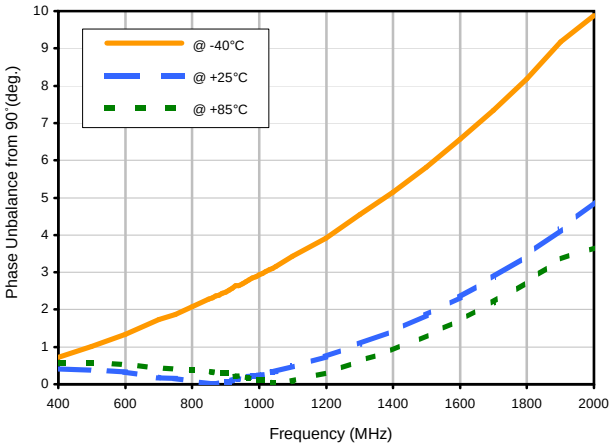
Total Loss S-1 vs. TEMPERATURE



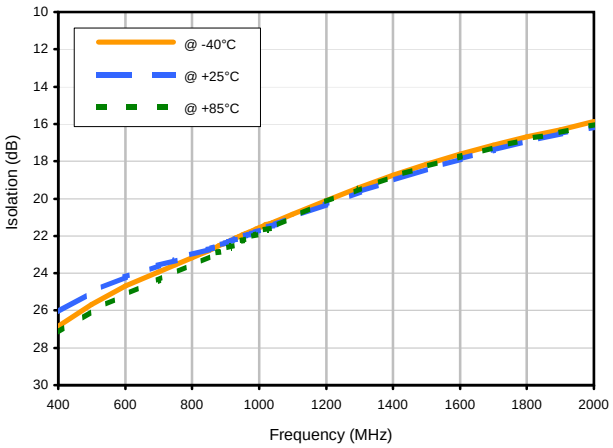
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE

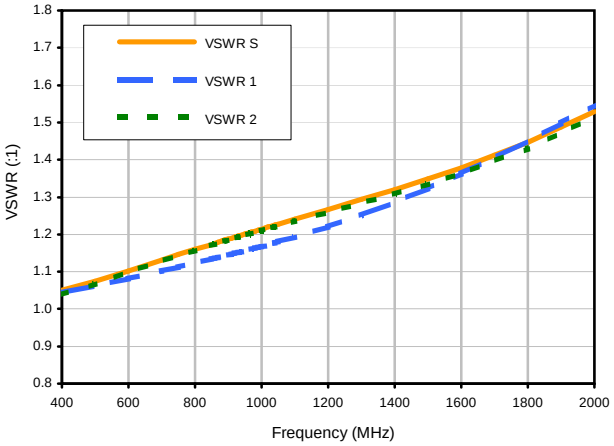


Isolation 1-2 vs. TEMPERATURE

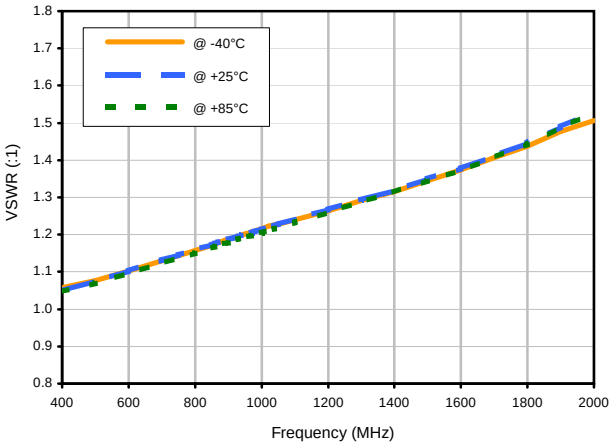


Typical Performance Curves

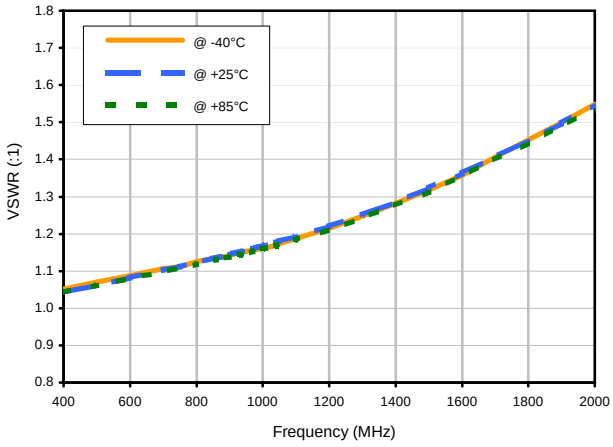
VSWR



VSWR SUM vs. TEMPERATURE



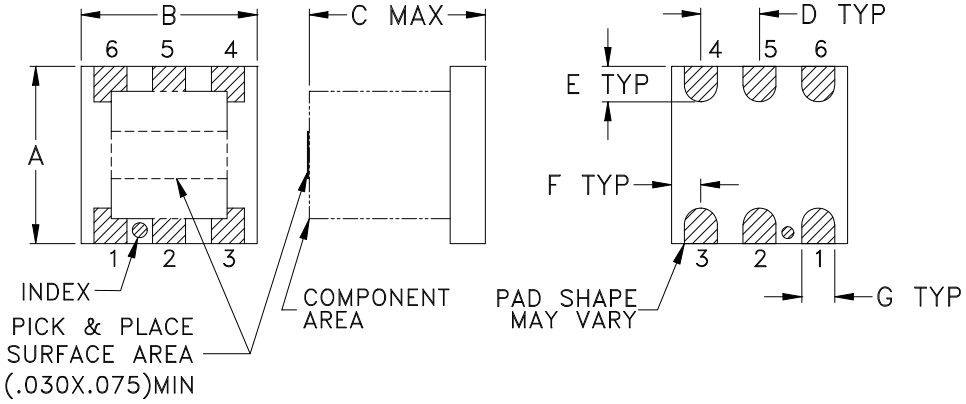
VSWR OUT1 vs. TEMPERATURE



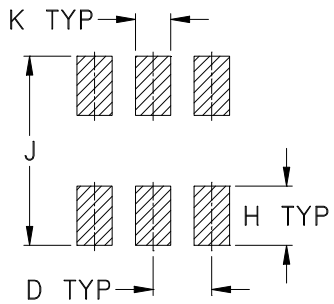
Case Style AT

Outline Dimensions

AT577



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	L	WT. GRAMS
AT577	.200 (5.08)	.200 (5.08)	.200 (5.08)	.075 (1.91)	.050 (1.27)	.025 (0.64)	.026 (0.66)	.070 (1.78)	.220 (5.59)	.035 (0.89)	-- --	.15

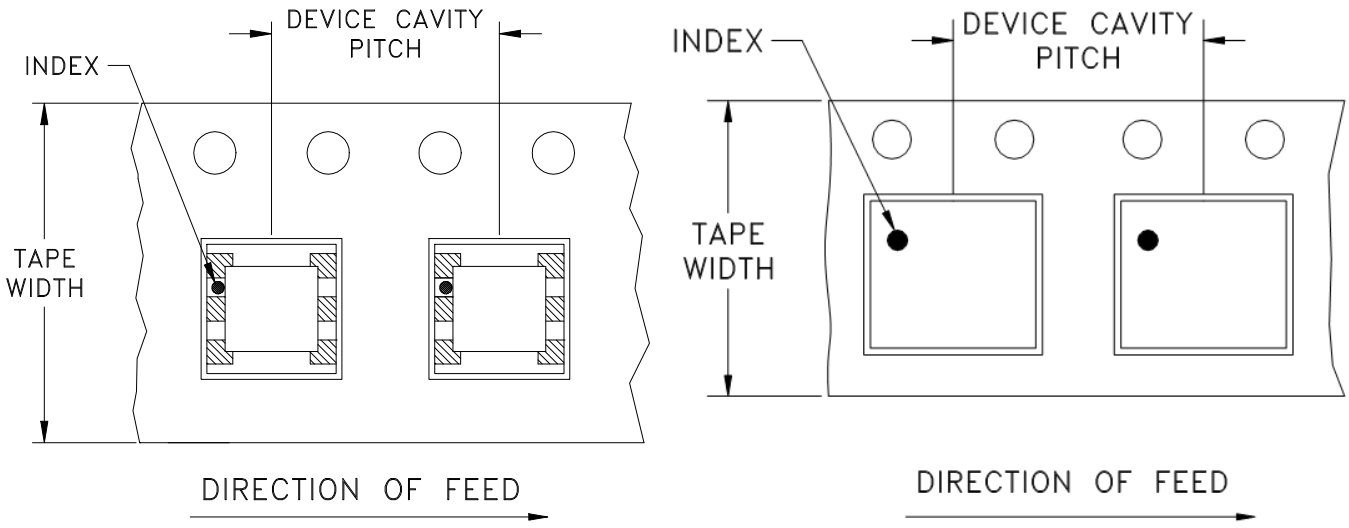
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Open style, ceramic base.
2. Termination finish:
   For RoHS Case Style: 2-10 µ inch (.05-.25 microns) Gold over 100-300 µ inch (2.54-7.62 microns) Nickel plate.
   For RoHS-5 Case Style: Tin-Lead plate

Tape & Reel Packaging TR-F73

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
12	8	7	Small quantity standards (see note)	20
				50
				100
				200
				500
		13	Standard	1000
				2000

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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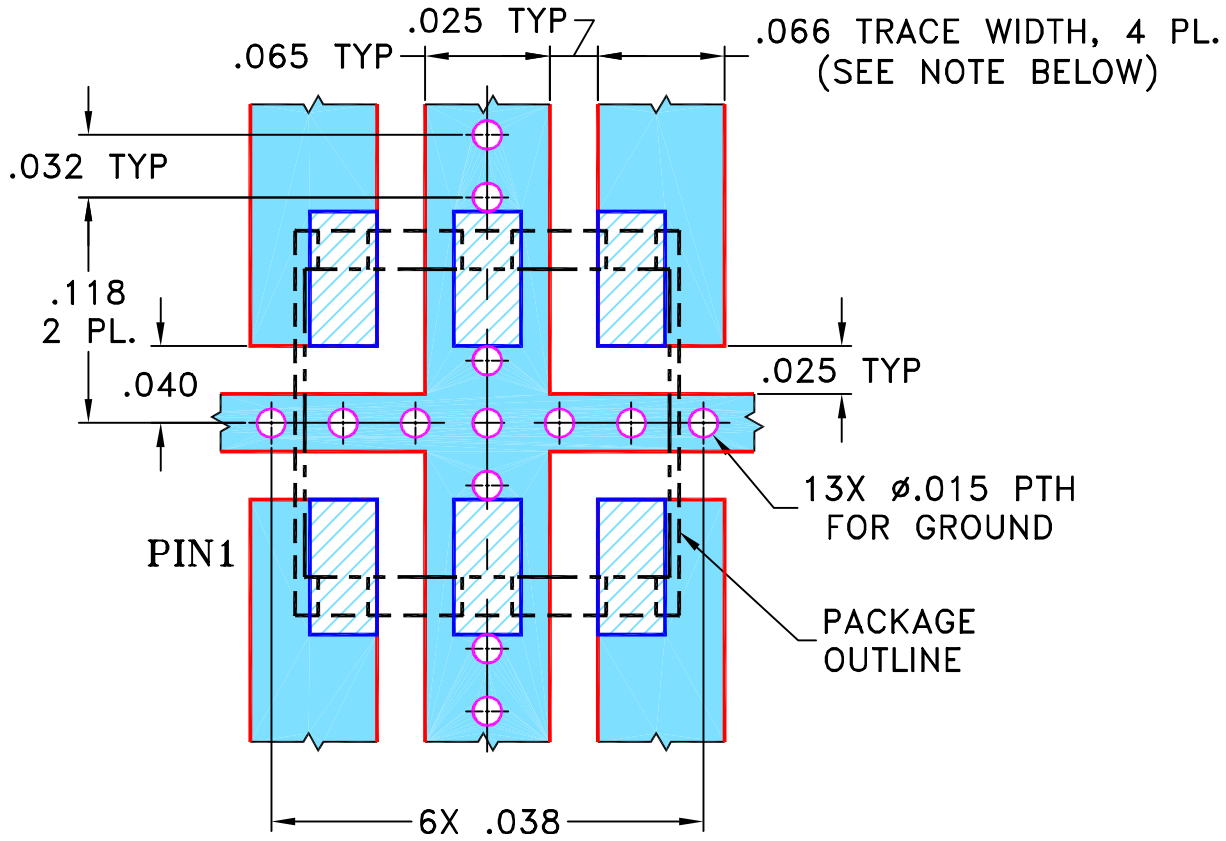
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M83147	NEW RELEASE	11/26/02	MMG	HY
A	M102713	ADDED "...WITH SMOBC"	01/17/06	MMG	IL

SUGGESTED MOUNTING CONFIGURATION FOR AT577 CASE STYLE, "km" 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	11/19/02
TOLERANCES ON:	CHECKED	AV	11/25/02
2 PL DECIMALS ±	APPROVED	HY	11/26/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

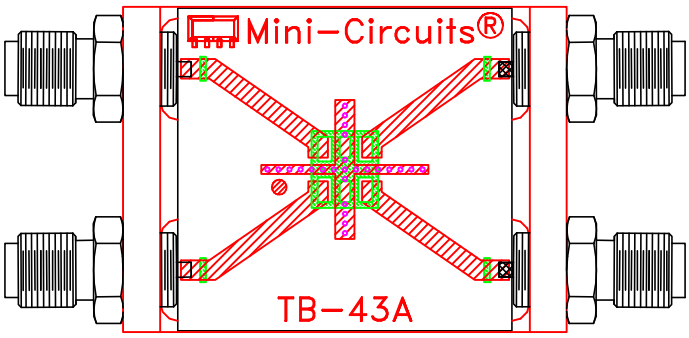
PL, km, AT577, HPQ, TB-43

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-114	A

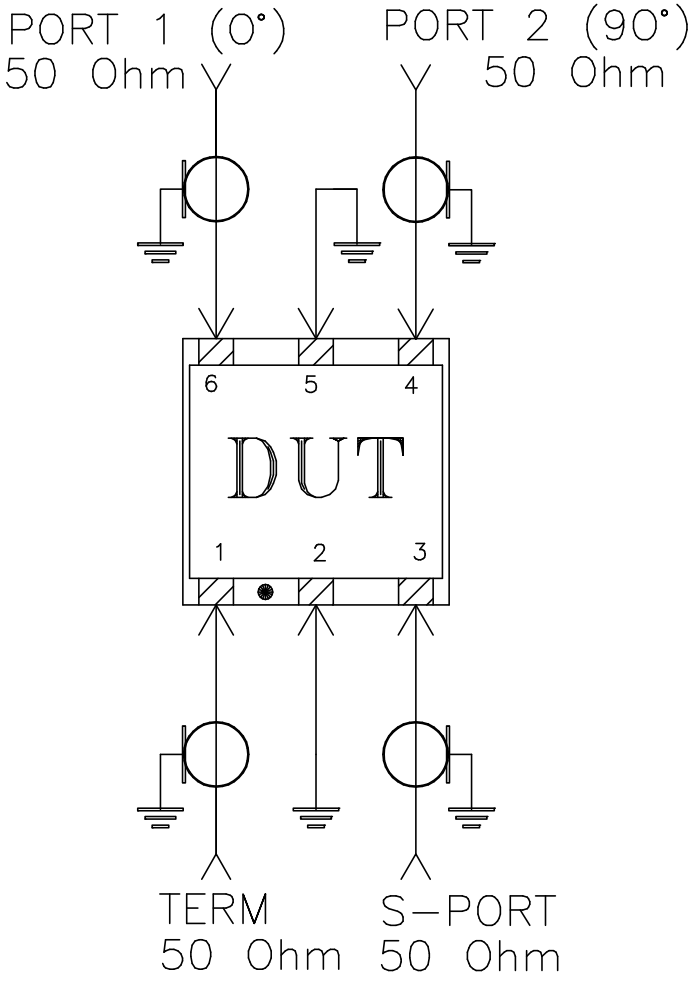
FILE:	SCALE:	SHEET:
98PL114	10:1	1 OF 1

Evaluation Board and Circuit

For Pin Connection refer to Data Sheet of the DUT



TB-43



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