

Surface Mount Power Splitter/Combiner

4 Way Quadrifilar 50Ω 1700 to 2300 MHz

SCQA-4-232+

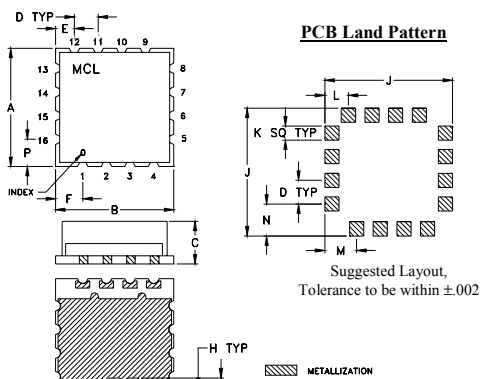
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	1W max.
Internal Dissipation	0.20W max.
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

SUM PORT	10
PORT 1 (0°)	1
PORT 2 (90°)	2
PORT 3 (180°)	3
PORT 4 (270°)	4
GROUND	5,6,7,8,9,11,12

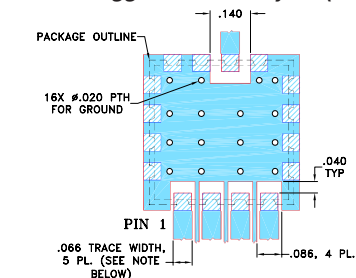
Outline Drawing



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J
.500	.500	.180	.100	.080	.115	.060	.040	.540
12.70	12.70	4.57	2.54	2.03	2.92	1.52	1.02	13.72
K	L	M	N	P	Q	T	wt.	
.060	.100	.135	.135	.115	.140	.080	grams	
1.52	2.54	3.43	3.43	2.92	3.56	2.03	grams	1.0

Demo Board MCL P/N: TB-652+ Suggested PCB Layout (PL-368)



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

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

Features

- good isolation, 24 dB typ.
- good phase unbalance, 5 deg.
- good matching VSWR, 1.2:1 typ.

Applications

- GPS phase array antenna



Generic photo used for illustration purposes only

CASE STYLE: CK1704

+RoHS Compliant

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

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		1700	—	2300	MHz
Insertion Loss Above 6.0 dB	1700 - 2300	—	1.6	2.8	dB
Isolation	1700 - 2300	16	24	—	dB
Phase Unbalance*	1700 - 2300	—	5.0	12.0	Degree
Amplitude Unbalance	1700 - 2300	—	1.3	1.8	dB
VSWR (Port S)	1700 - 2300	—	1.3	1.55	:1
VSWR (Port 1-4)	1700 - 2300	—	1.35	1.65	:1

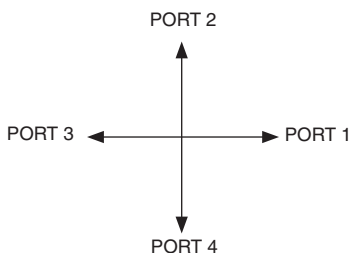
*Phase Unbalance is referenced insertion phase at 0° port.

Typical Performance Data

Freq. (MHz)	Total Loss ¹ (dB)	Amp. Unbal. (dB)	Insertion Phase (deg)	Phase Unbalance (deg.)				Isolation (dB)			VSWR S	VSWR 1	VSWR 2	VSWR 3	VSWR 4
	S-1		S-1	0°	90°	180°	270°	1-2	2-3	3-4					
1700.0	8.25	1.39	-174.46	0.00	91.94	180.76	271.29	23.36	17.36	21.66	1.19	1.08	1.14	1.12	1.15
1750.0	8.15	1.32	164.43	0.00	92.16	180.55	271.18	25.14	17.69	23.15	1.15	1.09	1.16	1.11	1.16
1800.0	8.07	1.27	143.68	0.00	92.39	180.27	270.98	26.75	18.07	24.93	1.11	1.12	1.18	1.11	1.17
1850.0	8.02	1.22	123.20	0.00	92.64	179.90	290.71	27.77	18.48	26.95	1.07	1.15	1.19	1.10	1.18
1900.0	7.99	1.19	102.98	0.00	92.87	179.49	270.41	27.90	18.82	29.08	1.05	1.18	1.20	1.11	1.19
2000.0	7.99	1.18	63.21	0.00	93.29	178.51	269.41	27.00	19.13	33.28	1.10	1.24	1.18	1.13	1.19
2050.0	8.02	1.19	43.65	0.00	93.52	177.93	269.05	26.77	19.03	35.75	1.14	1.27	1.16	1.15	1.18
2160.0	8.12	1.27	1.31	0.00	94.01	176.44	267.49	27.33	18.46	42.23	1.20	1.32	1.09	1.17	1.13
2180.0	8.14	1.29	-6.32	0.00	94.08	176.15	267.17	27.54	18.36	39.91	1.21	1.33	1.07	1.18	1.12
2190.0	8.15	1.30	-10.13	0.00	94.13	176.00	267.01	27.63	18.31	38.53	1.21	1.33	1.07	1.18	1.12
2200.0	8.17	1.31	-13.93	0.00	94.17	175.86	266.84	27.73	18.26	37.19	1.22	1.33	1.06	1.18	1.11
2240.0	8.21	1.35	-29.07	0.00	94.33	175.22	266.12	27.95	18.08	32.59	1.23	1.33	1.03	1.18	1.10
2260.0	8.24	1.37	-36.63	0.00	94.40	174.93	265.75	27.91	18.01	30.74	1.23	1.33	1.02	1.18	1.10
2280.0	8.26	1.40	-44.19	0.00	94.49	174.62	265.37	27.71	17.97	29.13	1.23	1.33	1.02	1.18	1.10
2300.0	8.29	1.43	-51.73	0.00	94.54	174.30	264.99	27.36	17.94	27.69	1.23	1.33	1.04	1.18	1.11

1. Total Loss = Insertion Loss + 6dB splitter loss.

Phase Diagram



Electrical Configuration



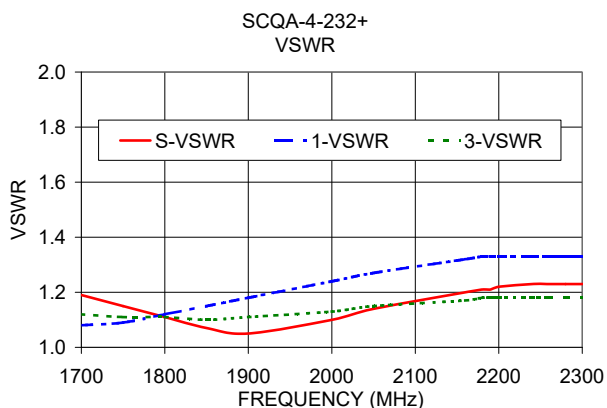
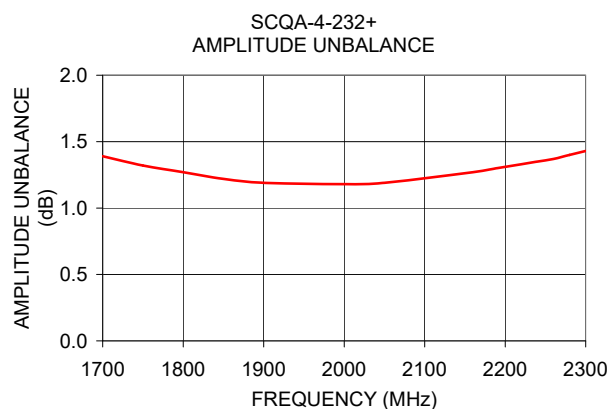
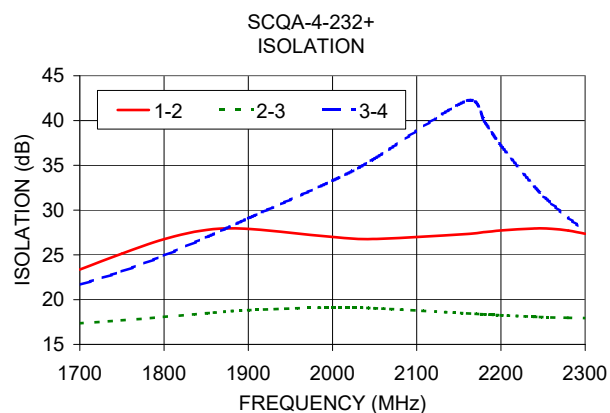
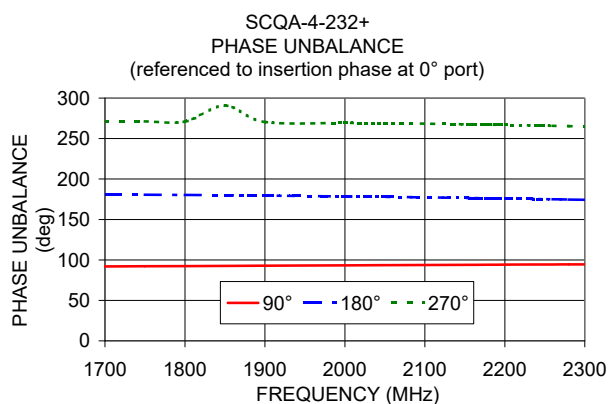
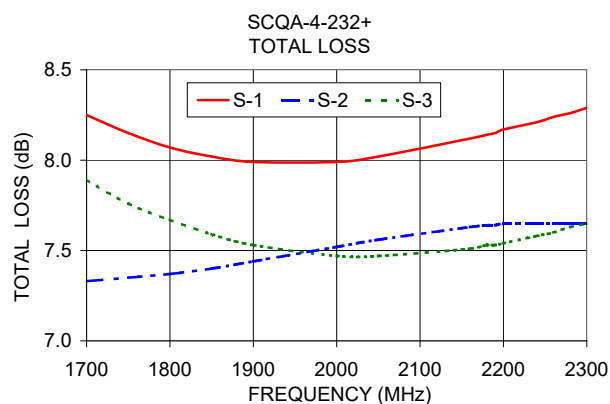
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Performance Charts

SCQA-4-232+



Notes

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4 Way-Quadrifilar Power Splitter/Combiner

SCQA-4-232+

Typical Performance Data

FREQ. (MHz)	TOTAL LOSS ¹				AMP. UNBAL. (dB)	INSERTION PHASE (Deg.) S-1	ISOLATION			PHASE UNBALANCE				FREQ. (MHz)	VSWR				
	(dB)						(dB)			(Deg.)					(:1)				
	S-1	S-2	S-3	S-4			1-2	2-3	3-4	@ 0° Port	@ 90° Port	@ 180° Port	@ 270° Port		S	1	2	3	4
1700.0	8.25	7.33	7.89	6.86	1.39	-174.46	23.36	17.36	21.66	0.00	91.94	180.76	271.29	1700.0	1.19	1.08	1.14	1.12	1.15
1750.0	8.15	7.35	7.76	6.83	1.32	164.43	25.14	17.69	23.15	0.00	92.16	180.55	271.18	1750.0	1.15	1.09	1.16	1.11	1.16
1800.0	8.07	7.37	7.67	6.81	1.27	143.68	26.75	18.07	24.93	0.00	92.39	180.27	270.98	1800.0	1.11	1.12	1.18	1.11	1.17
1850.0	8.02	7.40	7.59	6.80	1.22	123.20	27.77	18.48	26.95	0.00	92.64	179.90	290.71	1850.0	1.07	1.15	1.19	1.10	1.18
1900.0	7.99	7.44	7.53	6.80	1.19	102.98	27.90	18.82	29.08	0.00	92.87	179.49	270.41	1900.0	1.05	1.18	1.20	1.11	1.19
1950.0	7.98	7.48	7.49	6.80	1.17	82.97	27.48	19.05	31.18	0.00	93.08	179.02	270.05	1950.0	1.07	1.21	1.20	1.12	1.20
2000.0	7.99	7.52	7.47	6.81	1.18	63.21	27.00	19.13	33.28	0.00	93.29	178.51	269.41	2000.0	1.10	1.24	1.18	1.13	1.19
2050.0	8.02	7.56	7.47	6.82	1.19	43.65	26.77	19.03	35.75	0.00	93.52	177.93	269.05	2050.0	1.14	1.27	1.16	1.15	1.18
2100.0	8.06	7.60	7.48	6.84	1.22	24.31	26.84	18.82	39.30	0.00	93.75	177.29	268.38	2100.0	1.17	1.30	1.13	1.16	1.16
2120.0	8.08	7.61	7.49	6.84	1.23	16.61	26.96	18.69	41.17	0.00	93.84	177.01	268.12	2120.0	1.18	1.31	1.12	1.17	1.15
2140.0	8.10	7.62	7.50	6.84	1.25	8.95	27.13	18.58	42.66	0.00	93.93	176.71	267.82	2140.0	1.19	1.31	1.10	1.17	1.14
2160.0	8.12	7.63	7.51	6.85	1.27	1.31	27.33	18.46	42.23	0.00	94.01	176.44	267.49	2160.0	1.20	1.32	1.09	1.17	1.13
2180.0	8.14	7.64	7.53	6.85	1.29	-6.32	27.54	18.36	39.91	0.00	94.08	176.15	267.17	2180.0	1.21	1.33	1.07	1.18	1.12
2190.0	8.15	7.64	7.53	6.86	1.30	-10.13	27.63	18.31	38.53	0.00	94.13	176.00	267.01	2190.0	1.21	1.33	1.07	1.18	1.12
2200.0	8.17	7.65	7.54	6.86	1.31	-13.93	27.73	18.26	37.19	0.00	94.17	175.86	266.84	2200.0	1.22	1.33	1.06	1.18	1.11
2201.0	8.17	7.65	7.54	6.86	1.31	-14.30	27.74	18.25	37.04	0.00	94.18	175.85	266.82	2201.0	1.22	1.33	1.06	1.18	1.11
2205.0	8.17	7.65	7.54	6.86	1.31	-15.83	27.77	18.23	36.55	0.00	94.18	175.79	266.76	2205.0	1.22	1.33	1.05	1.18	1.11
2210.0	8.18	7.65	7.55	6.86	1.32	-17.72	27.81	18.21	35.91	0.00	94.21	175.71	266.66	2210.0	1.22	1.33	1.05	1.18	1.11
2220.0	8.19	7.65	7.56	6.86	1.33	-21.50	27.87	18.16	34.72	0.00	94.26	175.54	266.48	2220.0	1.22	1.33	1.04	1.18	1.11
2240.0	8.21	7.65	7.58	6.86	1.35	-29.07	27.95	18.08	32.59	0.00	94.33	175.22	266.12	2240.0	1.23	1.33	1.03	1.18	1.10
2260.0	8.24	7.65	7.60	6.86	1.37	-36.63	27.91	18.01	30.74	0.00	94.40	174.93	265.75	2260.0	1.23	1.33	1.02	1.18	1.10
2280.0	8.26	7.65	7.63	6.86	1.40	-44.19	27.71	17.97	29.13	0.00	94.49	174.62	265.37	2280.0	1.23	1.33	1.02	1.18	1.10
2300.0	8.29	7.65	7.65	6.86	1.43	-51.73	27.36	17.94	27.69	0.00	94.54	174.30	264.99	2300.0	1.23	1.33	1.04	1.18	1.11

¹Total Loss = Insertion Loss + 6dB Splitter Loss



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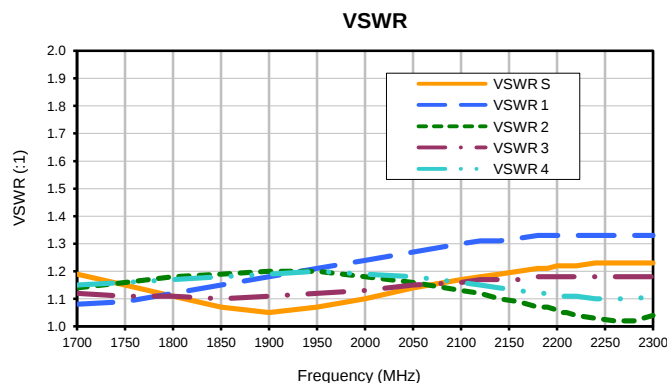
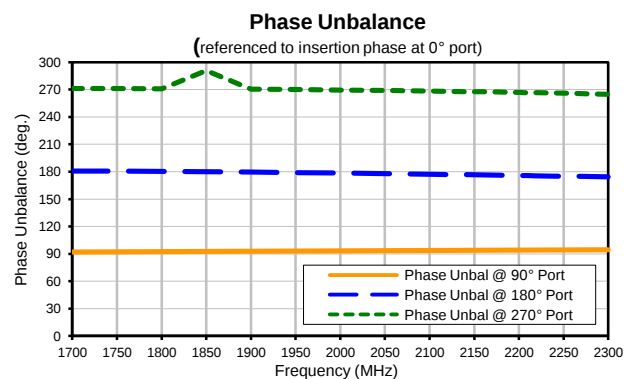
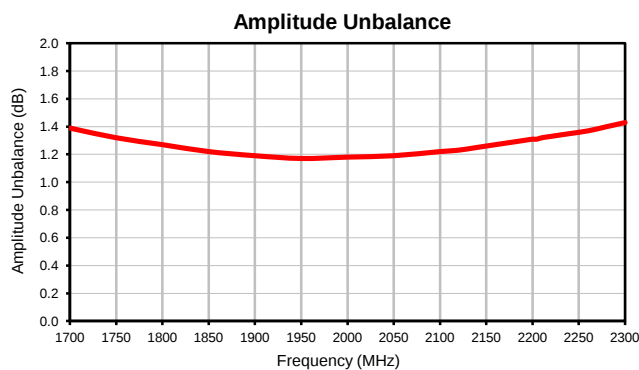
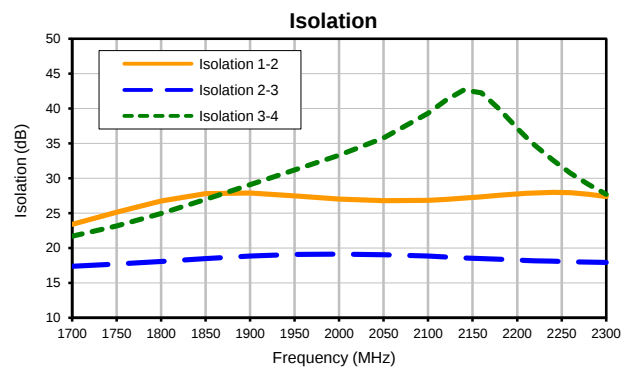
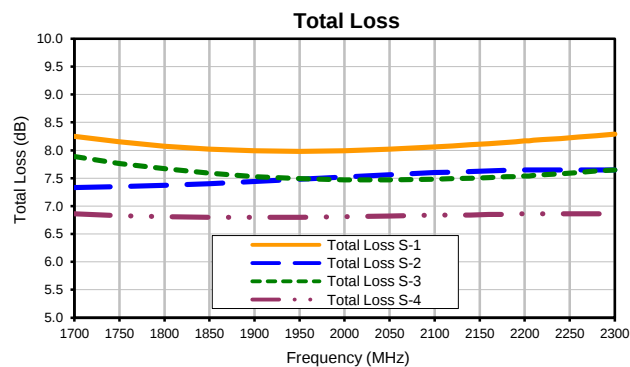
IF/RF MICROWAVE COMPONENTS

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4 Way-Quadrifilar Power Splitter/Combiner

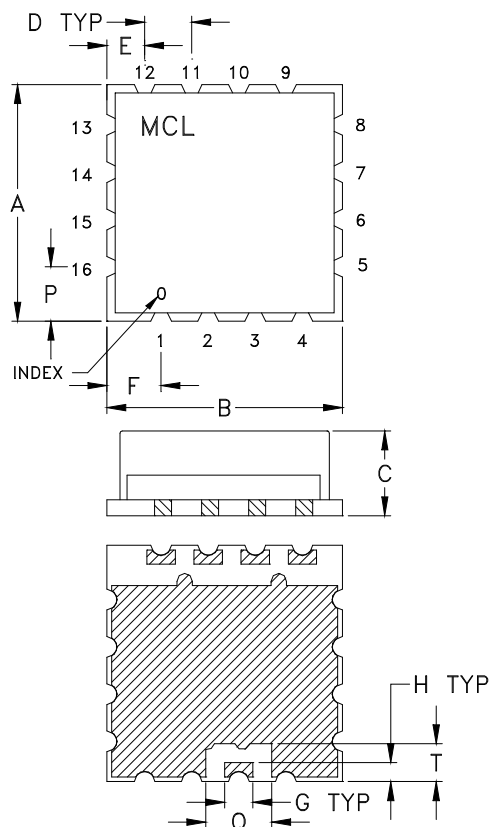
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Typical Performance Curves

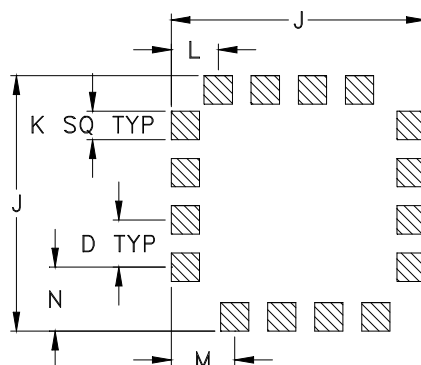


Outline Dimensions

CK1704



PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K
CK1704	.500 (12.70)	.500 (12.70)	.180 (4.57)	.100 (2.54)	.080 (2.03)	.115 (2.92)	.060 (1.52)	.040 (1.02)	.540 (13.72)	.060 (1.52)

CASE #	L	M	N	P	Q	R	S	T	WT. GRAM
CK1704	.100 (2.54)	.135 (3.43)	.135 (3.43)	.115 (2.92)	.140 (3.56)	-	-	.080 (2.03)	1.0

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

Notes:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- Termination finish:
For RoHS Case Styles: 3-5 μ inch (.08-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate.
All models, (+) suffix.



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RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F37



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	16	7	Small quantity standards (see note)	10
				20
				50
				100
		13	Standard	200
				500

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.

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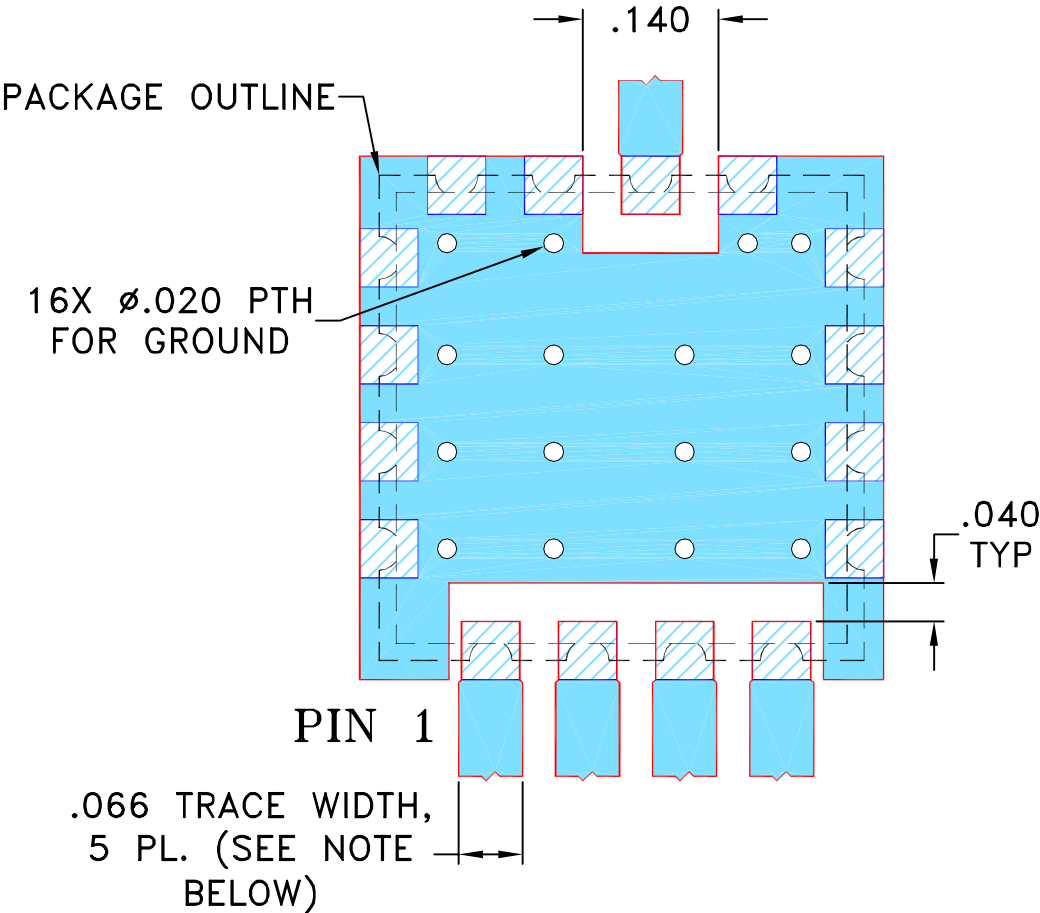
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M136731	NEW RELEASE	05/14/12	AV	ABD
A	M145165	UPDATED PCB PATTERN	02/28/14	AV	JC

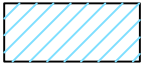
SUGGESTED MOUNTING CONFIGURATION FOR
CK1704 CASE STYLE, "16SP01" PIN CONNECTION



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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 TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	AV	04/17/12
	CHECKED	IL	05/14/12
	APPROVED	ABD	05/14/12



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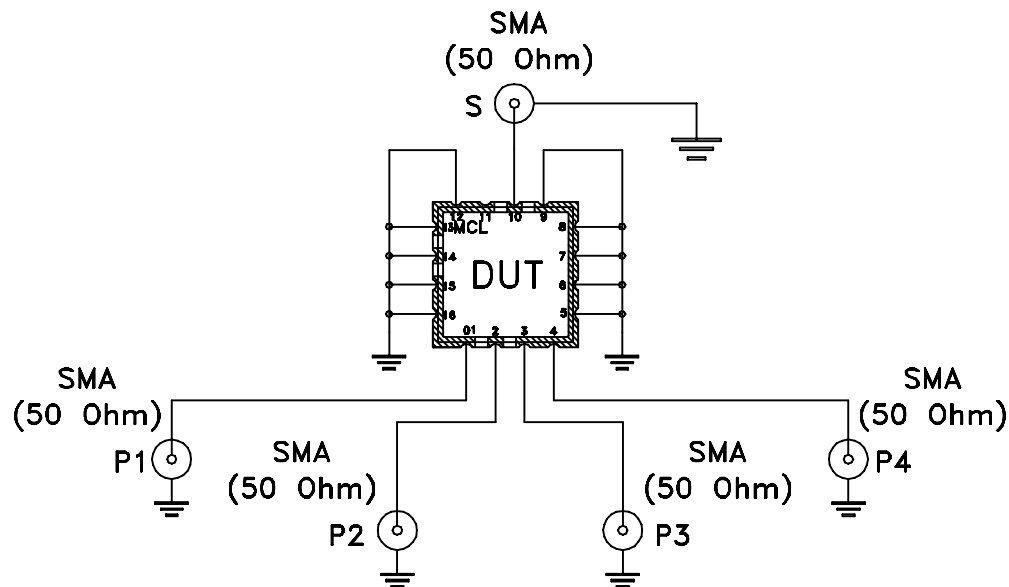
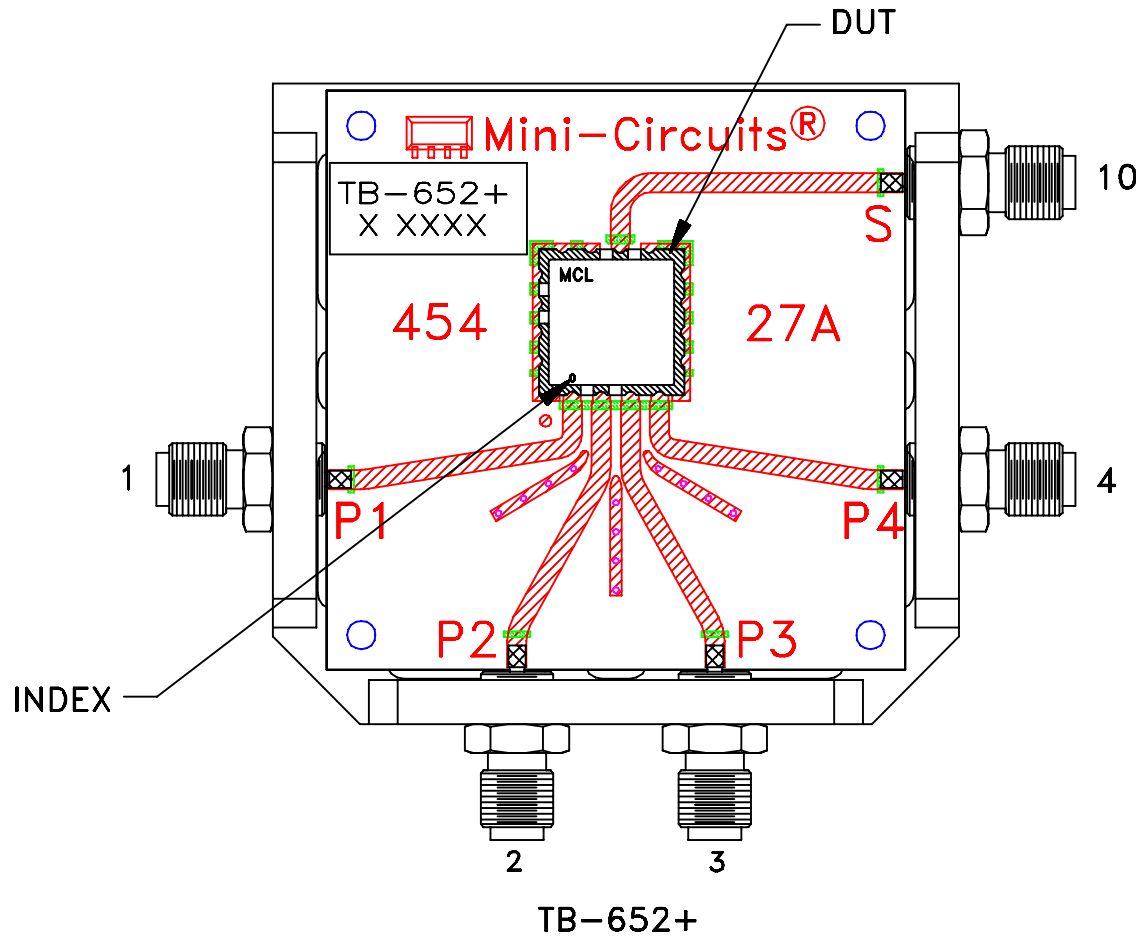
PL, 16SP01, CK1704, TB-652+

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

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-368	A
FILE:	98PL368	SCALE:	SHEET:
		5:1	1 OF 1

Evaluation Board and Circuit



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 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