SURFACE MOUNT top hat

Power Splitter/Combiner TCP-2-182-75X+

75Ω 2 Way-0° 10 to 1800 MHz

FEATURES

- Wideband, 10 to 1800 MHz
- Usable down to 5 MHz frequency
- Low insertion, 0.8 dB typ.
- Optimized for the upper end of the downstream band
- Excellent amplitude unbalance, 0.15 dB typ.
- Very good phase unbalance, 2.0 deg. typ.
- External resistor & capacitor required
- Aqueous washable
- Low cost

Generic photo used for illustration purposes only

CASE STYLE: DB1627

+RoHS Compliant

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

APPLICATIONS

- DOCSIS® 3.1 Systems
- VHF/UHF
- CATV

PRODUCT OVERVIEW

Mini-Circuits' TCP-2-182-75X+ is a 75Ω 2-way 0˚ surface-mount power splitter/combiner covering the 50 to 1800 MHz frequency range, supporting bandwidth requirements for DOCSIS® 3.1 systems and equipment, as well as other broadband applications. This model can handle up to 0.5W RF input power as a splitter, and provides low insertion loss and low phase and amplitude unbalance. It features core and wire construction mounted on a 6-lead plastic base (0.16 x 0.15 x 0.16") with Mini-Circuits' TopHat® feature to improve speed and accuracy of pick and place assembly. This design requires external capacitors and resistors for impedance matching and cycling isolation between the output signals (refer to electrical schematic).

KEY FEATURES

Feature	Advantages
Wideband, 10 to 1800 MHz	Optimized for low insertion loss at the high end of the downstream band, this device is suitable for many broadband applications including DOCSIS® 3.1 systems and equipment, VHF/UHF, CATV, cellular, and more.
Low insertion loss, 0.8 dB	The combination of 0.5W power handling and low insertion loss makes it a suitable candidate for distributing signals while maintaining signal power.
Good isolation, 26 dB	Minimizes interference between ports
Low unbalance: • 0.15 dB amplitude unbalance • 2.0˚ phase unbalance	This model produces nearly equal output signals, making it ideal for use in parallel path /multichannel systems.
Top Hat® feature	Improves speed and accuracy of pick and place assembly and provides clear device marking for visual inspection.

ELECTRICAL SPECIFICATIONS AT 25°C

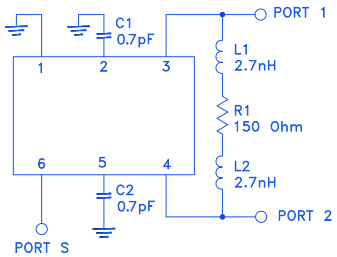
Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		1800	MHz
Insertion Loss, above 3.0 dB	10-1800 50-1000 1000-1250 1250-1500	— — —	1.7 0.5 0.7 0.9	2.9 0.9 1.2 1.5	dB
Isolation	10-1800 50-1000 1000-1250 1250-1500	13 20 20 17	25 26 30 26	— — — —	dB
Phase Unbalance	10-1800 50-1000 1000-1250 1250-1500	— — — —	3.0 1.5 2.0 2.0	9.0 5.0 6.0 7.0	Degree
Amplitude Unbalance	10-1800 50-1000 1000-1250 1250-1500	— — — —	0.5 0.2 0.1 0.2	1.2 0.7 0.6 0.7	dB
VSWR (Port S)	10-1800 50-1000 1000-1250 1250-1500	— — — —	1.3 1.15 1.15 1.25	1.6 1.3 1.3 1.35	:1
VSWR (Port 1-2)	10-1800 50-1000 1000-1250 1250-1500	— — — —	1.5 1.20 1.2 1.25	2.0 1.4 1.3 1.40	:1
Power Input (as a splitter)	10-1800 50-1250	— —	— —	0.5 1.0	Watt

MAXIMUM RATINGS

Parameter	Ratings
Operating temperature	-40°C to 85°C
Storage temperature	-55°C to 100°C
RF Power Input (as splitter)	0.5 W max.

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

FUNCTIONAL SCHEMATIC



SURFACE MOUNT top hat

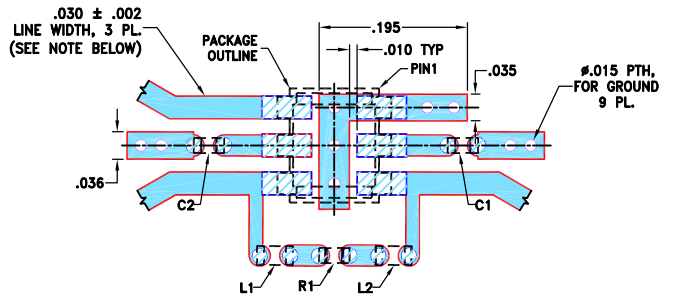
Power Splitter/Combiner TCP-2-182-75X+

PIN CONNECTIONS

SUM PORT	6
PORT 1	3
PORT 2	4
GROUND	1
EXT. CAPACITOR 0.7 pF	2 TO GND
EXT. CAPACITOR 0.7pF	5 TO GND
EXT. COMPONENTS (INDUCTOR 2.7 nH, RESISTOR 150Ω, INDUCTOR 2.7nH IN SERIES	3,4

PRODUCT MARKING: VA

DEMO BOARD MCL P/N: TB-908+
SUGGESTED PCB LAYOUT (PL-457)



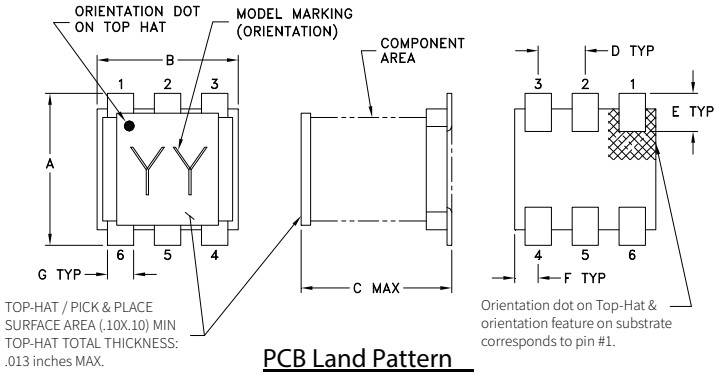
COMPONENT	SIZE
L1, L2	0402
C1,C2	0402
R1	0402

NOTES:
1. TRACE WIDTH PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030"±.002". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

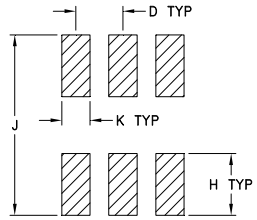
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

OUTLINE DRAWING



PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

OUTLINE DIMENSIONS (Inches / mm)

A	B	C	D	E	F
.160	.150	.160	.050	.040	.025
4.06	3.81	4.06	1.27	1.02	0.64

G	H	J	K		wt
.028	.065	.190	.030		grams
0.71	1.65	4.83	0.76		0.15

TAPE & REEL INFORMATION: F47

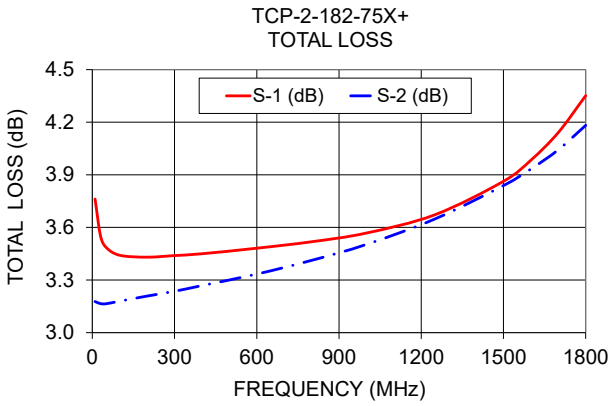
SURFACE MOUNT top hat

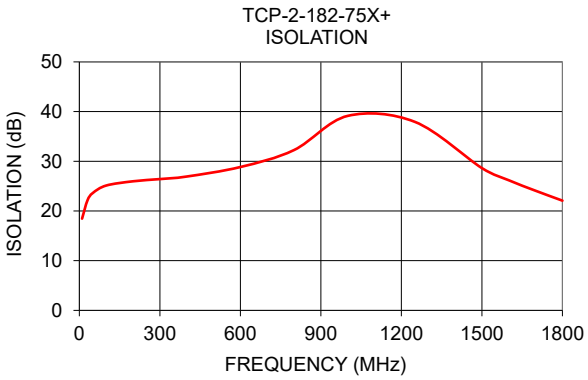
Power Splitter/Combiner TCP-2-182-75X+

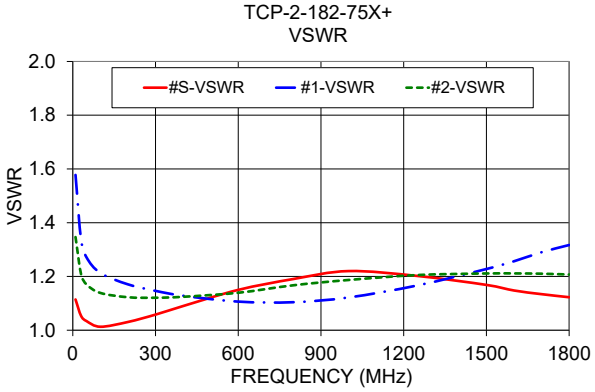
TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Total Loss[1] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR (:1)		
	S-1	S-2				S	1	2
5	3.93	3.16	0.76	16.08	3.47	1.18	1.86	1.49
10	3.76	3.18	0.58	18.46	2.56	1.11	1.58	1.35
30	3.55	3.17	0.39	22.11	1.53	1.05	1.34	1.21
50	3.49	3.16	0.32	23.61	1.12	1.03	1.27	1.17
100	3.44	3.18	0.26	25.12	0.60	1.01	1.21	1.14
200	3.43	3.21	0.22	25.97	0.01	1.03	1.17	1.12
300	3.44	3.24	0.20	26.42	0.39	1.06	1.15	1.12
400	3.45	3.27	0.18	26.93	0.67	1.09	1.13	1.12
600	3.48	3.33	0.15	28.85	1.16	1.15	1.11	1.14
800	3.52	3.41	0.11	32.26	1.60	1.19	1.10	1.17
1000	3.57	3.50	0.06	39.14	1.94	1.22	1.12	1.19
1250	3.67	3.65	0.02	37.94	2.29	1.20	1.17	1.21
1500	3.86	3.84	0.02	28.63	2.59	1.17	1.23	1.21
1600	3.98	3.93	0.05	26.18	2.77	1.15	1.26	1.21
1700	4.14	4.04	0.10	24.07	2.99	1.13	1.29	1.21
1800	4.35	4.18	0.17	22.08	3.38	1.12	1.32	1.21

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







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/terms/viewterm.html

2 Way-0° Power Splitter/Combiner TCP-2-182-75X+

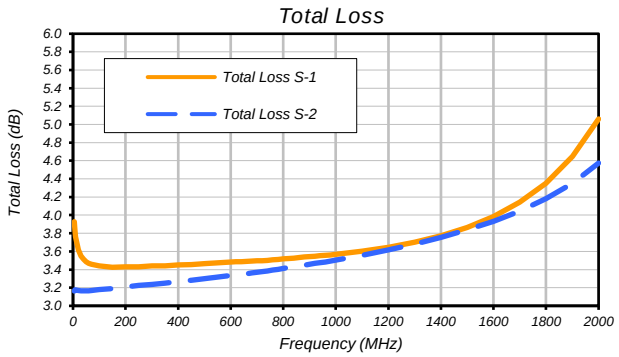
Typical Performance Data

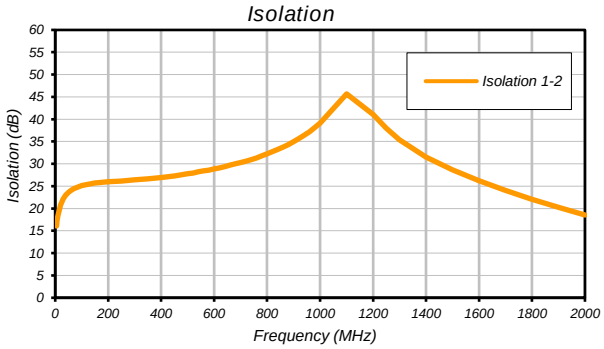
FREQUENCY (MHz)	TOTAL LOSS[1] (dB)		AMPLITUDE UNBALANCE (dB)	ISOLATION (dB)	PHASE UNBALANCE (deg.)	FREQUENCY (MHz)	VSWR (:1)		
	S-1	S-2		1-2			S	1	2
5	3.93	3.16	0.76	16.08	3.47	5	1.18	1.84	1.49
7	3.84	3.18	0.67	17.29	2.98	7	1.14	1.69	1.41
10	3.76	3.18	0.58	18.46	2.56	10	1.11	1.58	1.35
20	3.62	3.17	0.45	20.77	1.89	20	1.07	1.41	1.25
30	3.55	3.17	0.39	22.11	1.53	30	1.05	1.34	1.21
40	3.51	3.17	0.35	22.99	1.31	40	1.04	1.30	1.19
50	3.49	3.16	0.32	23.61	1.12	50	1.03	1.27	1.17
60	3.47	3.17	0.30	24.08	0.98	60	1.03	1.25	1.16
70	3.46	3.17	0.29	24.44	0.86	70	1.02	1.24	1.15
100	3.44	3.18	0.26	25.12	0.60	100	1.01	1.21	1.14
150	3.43	3.19	0.23	25.69	0.27	150	1.01	1.19	1.13
200	3.43	3.21	0.22	25.97	0.01	200	1.03	1.17	1.12
250	3.43	3.22	0.21	26.17	0.18	250	1.05	1.15	1.12
300	3.44	3.24	0.20	26.42	0.39	300	1.06	1.15	1.12
350	3.44	3.25	0.19	26.67	0.52	350	1.08	1.14	1.12
400	3.45	3.27	0.18	26.93	0.67	400	1.09	1.13	1.12
450	3.46	3.28	0.17	27.29	0.80	450	1.11	1.12	1.13
500	3.46	3.30	0.17	27.77	0.93	500	1.12	1.12	1.13
520	3.47	3.31	0.16	27.97	0.99	520	1.13	1.11	1.14
540	3.47	3.31	0.16	28.19	1.04	540	1.14	1.11	1.14
560	3.47	3.32	0.15	28.40	1.08	560	1.14	1.11	1.14
580	3.48	3.33	0.15	28.61	1.12	580	1.15	1.11	1.14
600	3.48	3.33	0.15	28.85	1.16	600	1.15	1.11	1.14
620	3.49	3.34	0.14	29.09	1.20	620	1.15	1.11	1.14
640	3.49	3.35	0.14	29.38	1.26	640	1.16	1.10	1.14
660	3.49	3.35	0.14	29.69	1.31	660	1.16	1.10	1.15
680	3.49	3.36	0.13	30.00	1.35	680	1.17	1.10	1.15
700	3.50	3.37	0.13	30.29	1.40	700	1.17	1.10	1.15
720	3.50	3.38	0.12	30.59	1.43	720	1.18	1.10	1.15
740	3.50	3.38	0.12	30.93	1.47	740	1.18	1.10	1.16
760	3.51	3.39	0.11	31.30	1.51	760	1.19	1.10	1.16
780	3.51	3.40	0.11	31.77	1.56	780	1.19	1.10	1.16
800	3.52	3.41	0.11	32.26	1.60	800	1.19	1.10	1.17
820	3.52	3.42	0.10	32.72	1.64	820	1.19	1.10	1.17
840	3.53	3.43	0.10	33.21	1.68	840	1.20	1.11	1.17
860	3.53	3.44	0.09	33.73	1.72	860	1.20	1.11	1.17
880	3.54	3.45	0.09	34.29	1.74	880	1.21	1.11	1.18
900	3.54	3.46	0.08	34.95	1.78	900	1.21	1.11	1.18
920	3.55	3.47	0.08	35.67	1.81	920	1.21	1.11	1.18
940	3.55	3.47	0.08	36.40	1.84	940	1.21	1.12	1.18
960	3.56	3.48	0.07	37.15	1.87	960	1.21	1.12	1.18
980	3.56	3.49	0.07	38.08	1.91	980	1.22	1.12	1.18
1000	3.57	3.50	0.06	39.14	1.94	1000	1.22	1.12	1.19
1100	3.60	3.56	0.04	45.67	2.07	1100	1.22	1.14	1.19
1200	3.65	3.62	0.03	41.03	2.23	1200	1.21	1.15	1.20
1250	3.67	3.65	0.02	37.94	2.29	1250	1.20	1.17	1.21
1300	3.70	3.68	0.02	35.37	2.35	1300	1.20	1.18	1.21
1400	3.77	3.75	0.02	31.55	2.45	1400	1.18	1.20	1.21
1500	3.86	3.84	0.02	28.63	2.59	1500	1.17	1.23	1.21
1600	3.98	3.93	0.05	26.18	2.77	1600	1.15	1.26	1.21
1700	4.14	4.04	0.10	24.07	2.99	1700	1.13	1.29	1.21
1800	4.35	4.18	0.17	22.08	3.38	1800	1.12	1.32	1.21
1900	4.65	4.35	0.29	20.24	4.02	1900	1.11	1.35	1.20
2000	5.06	4.57	0.49	18.58	5.13	2000	1.10	1.39	1.17

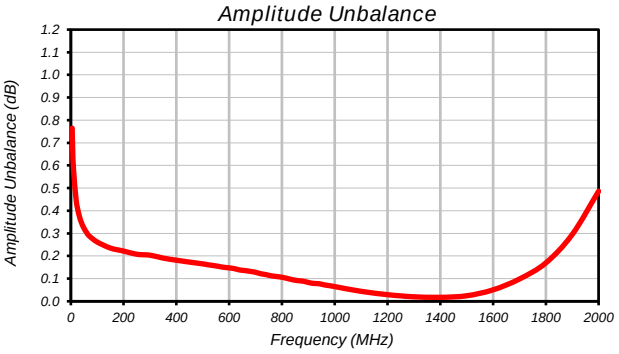
[1]Total Loss = Insertion Loss + 3dB Splitter Loss

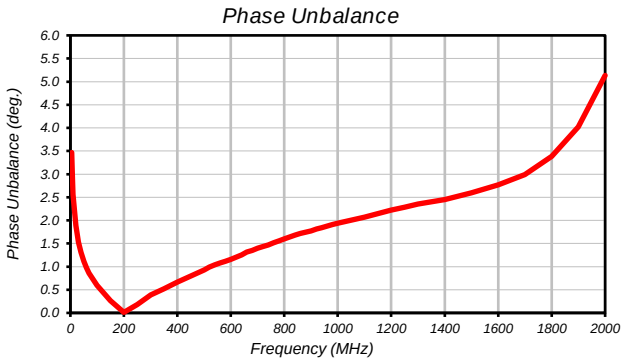
2 Way-0° Power Splitter/Combiner TCP-2-182-75X+

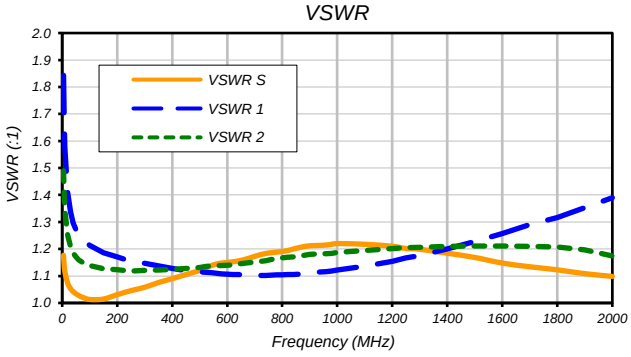
Typical Performance Curves







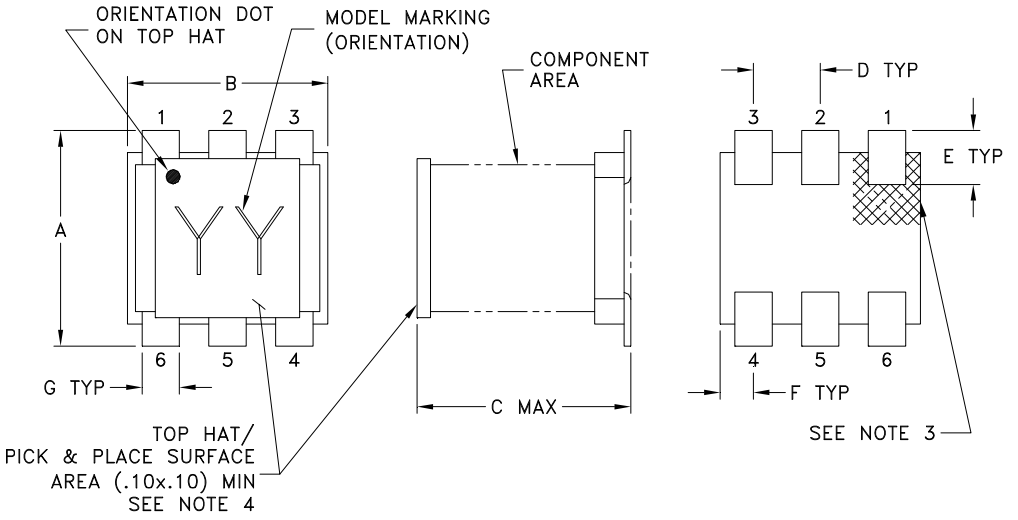




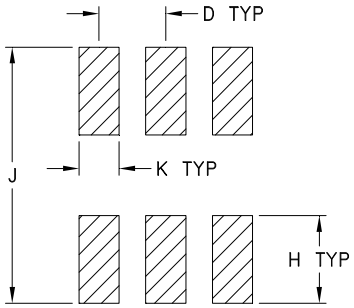
Case Style DB

DB1627

Outline Dimensions



PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAM
DB1627	.160 (4.06)	.150 (3.81)	.160 (4.06)	.050 (1.27)	.040 (1.02)	.025 (0.64)	.028 (0.71)	.065 (1.65)	.190 (4.83)	.030 (0.76)	.15

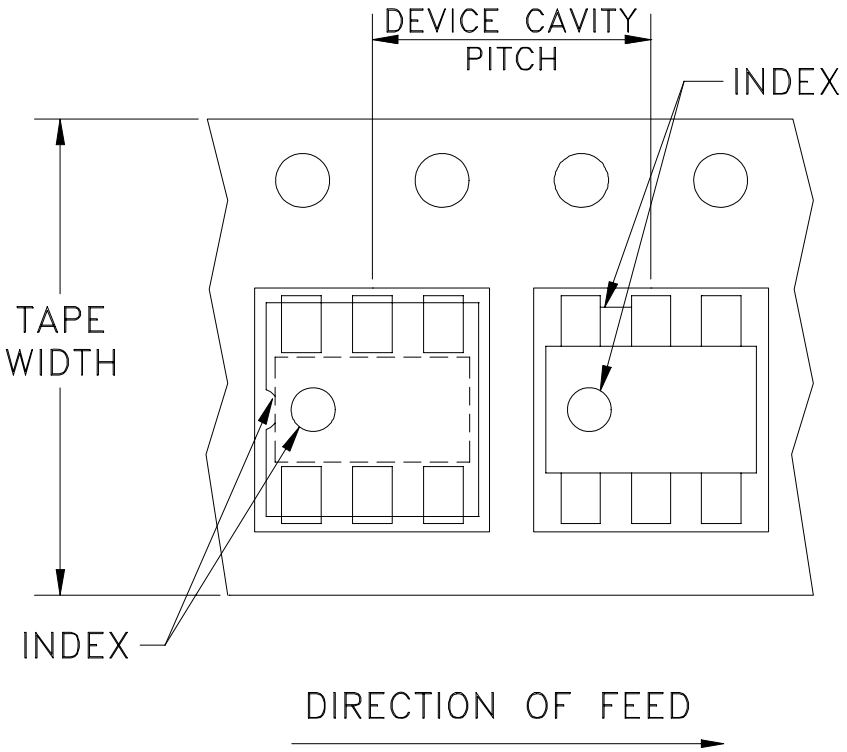
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3Pl. ± .005

Notes:

1. Case material: Plastic.
2. 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.
3 Orientation dot on top hat & orientation feature on substrate correspondence to pin #1.
4 Top-Hat total thickness: .013 inches MAX.

Tape & Reel Packaging TR-F47

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note
12	8	13	1000, 2000
		7	20, 50, 100, 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.

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

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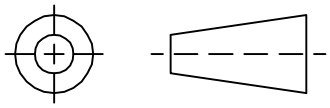
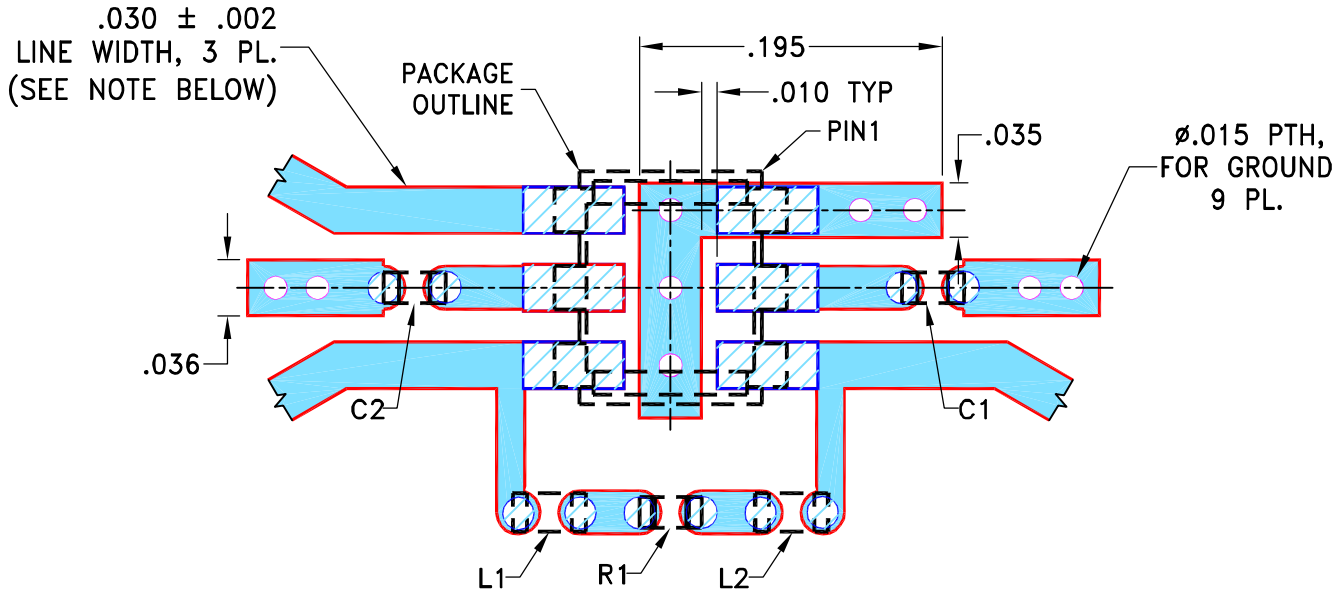
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M153610	NEW RELEASE	11/13/15	GF	JC

SUGGESTED MOUNTING CONFIGURATION FOR DB1627 CASE STYLE, "06SP15" PIN CODE



COMPONENT	SIZE
L1, L2	0402
C1,C2	0402
R1	0402

NOTES:

1. TRACE WIDTH PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030"±.002". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP 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	10/30/15
TOLERANCES ON:	CHECKED	IL	11/12/15
2 PL DECIMALS ±	APPROVED	JC	11/13/15
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

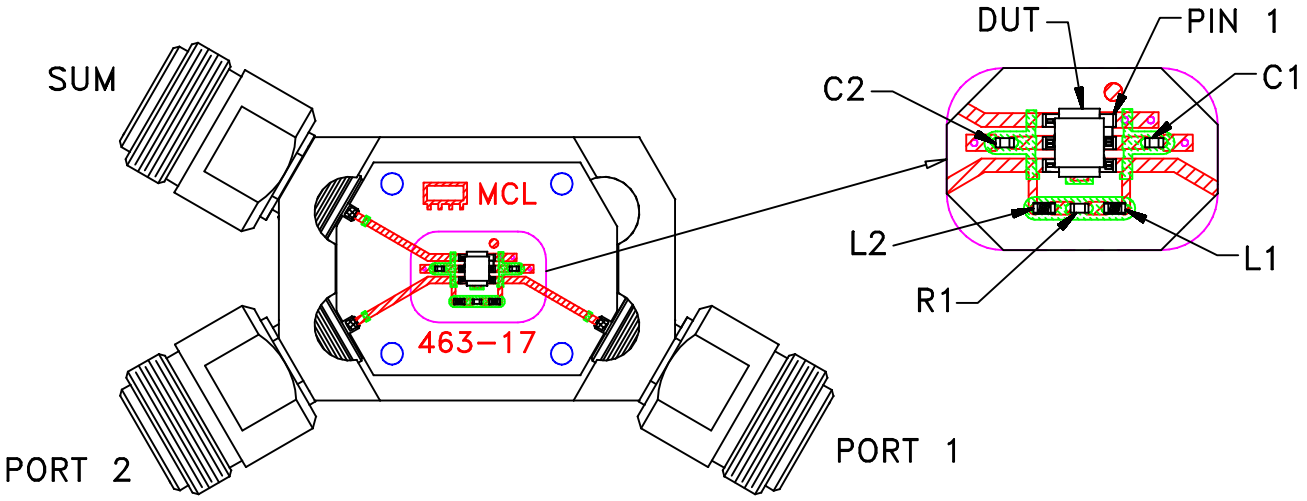
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 06SP15, DB1627, TB-835+

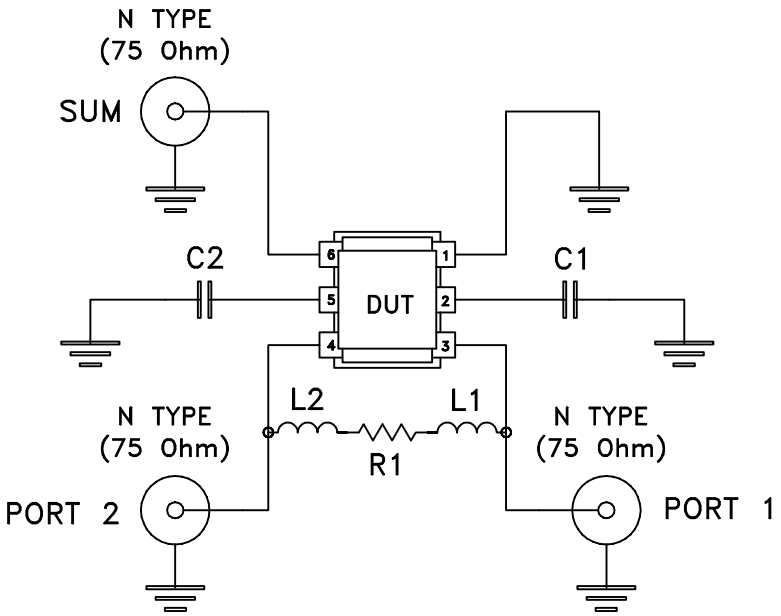
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-457	OR

FILE:	SCALE:	SHEET:
98PL457	8:1	1 OF 1

Evaluation Board and Circuit



TB-908+



ITEM	DESCRIPTION	SIZE
DUT	TCP-2-10-75-13+	-
C1,C2	CAP, 0.7 pF	0402
L1,L2	IND, 2.7 nH	
R1	RES, 150 Ohm	

Schematic Diagram

Notes:

1. 75 Ohm N type Female connectors.
2. PCB Material: 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