Surface Mount top hat®

RF Transformer

TCM3-452X+

50Ω 20 to 4500 MHz

The Big Deal

- Low insertion loss, 1.5 dB typ.
- Low unbalance, 0.2 dB, 2°
- Power handling up to 0.4W

CASE STYLE: DB1627

Product Overview

Mini-Circuits TCM3-452X+ is a 50Ω surface mount balanced transmission line transformer with a 3:1 secondary/primary impedance ratio covering the 20 to 4500 MHz band. This model handles RF input power up to 0.4W and provides low insertion loss, good return loss, and low amplitude unbalance. Measuring only 0.16 x 0.15 x 0.16", the unit features core and wire, all-welded construction mounted on a six-lead plastic base. The unit also includes Mini-Circuits' Top Hat® feature for faster, more accurate pick-and-place assembly.

Key Features

Feature	Advantages
Wideband, 20 to 4500 MHz	Supports a variety of applications including PCS, SatCom and more.
Power Handling up to 0.4W	Supports a variety of RF input power requirements.
Low insertion loss, 1.5 dB	Enables excellent signal power transmission from input to output.
Low unbalance • 0.5 dB amplitude unbalance • 4° phase unbalance	Produces nearly equal output signals, ideal for parallel path / multichannel systems.
Small footprint, 0.16 x 0.15"	Accommodates tight space requirements for dense PCB layouts.
Top Hat® feature	Improves speed and accuracy of pick and place assembly and provides clear device marking for visual inspection

top hat®

Surface Mount

RF Transformer

TCM3-452X+

50Ω 20 to 4500 MHz

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

Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7”	20, 50, 100, 200, 500
13”	1000, 2000

Features

- wide bandwidth 20 to 4500 MHz
- balanced transmission line
- good return loss
- aqueous washable

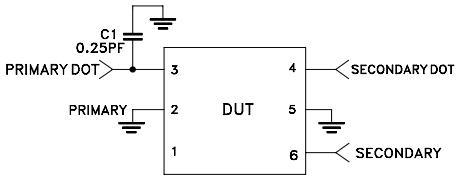
Applications

- PCS
- wideband push-pull amplifiers
- cellular

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Impedance Ratio (secondary/primary)			3		
Frequency Range		20	—	4500	MHz
Insertion Loss	20 - 4500	—	1.5	3.0	dB
Amplitude Unbalance	20 - 4500	—	0.5	—	dB
Phase Unbalance	20 - 4500	—	4	—	Degree

Electrical Schematic



Maximum Ratings

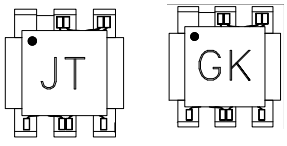
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.4W
DC Current	30mA

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

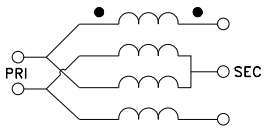
Pin Connections

Function	Pin Number
PRIMARY DOT	3
PRIMARY	2
SECONDARY DOT	4
SECONDARY	6
GND	2,5
NOT USED	1

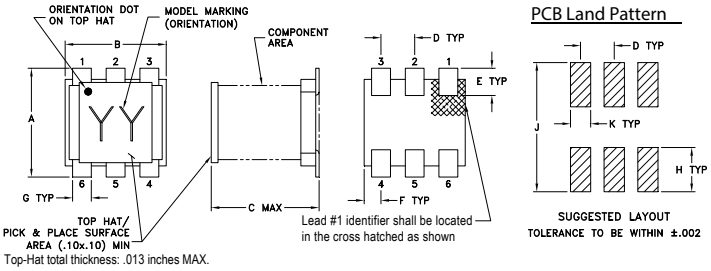
Internal Optional Product Marking



Config. H



Outline Drawing



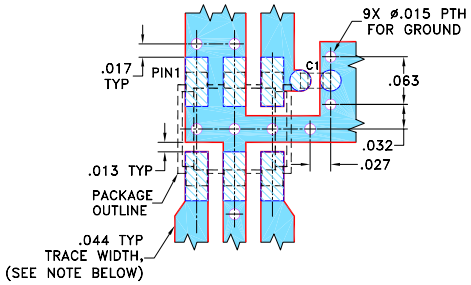
PCB Land Pattern

Outline Dimensions (inch / 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

Demo Board MCL P/N: TB-697+
Suggested PCB Layout (PL-381)



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; 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.
3. 0402 SIZE CHIP COMPONENT FOOTPRINT IS SHOWN FOR REFERENCE. FOR COMPONENT VALUE REFER TO TB-697+.

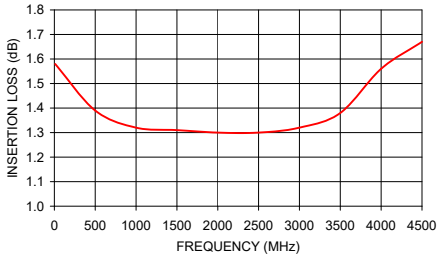
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

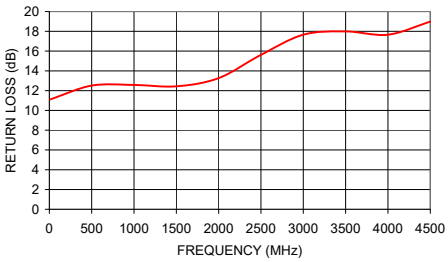
Typical Performance Data

Frequency (MHz)	Insertion Loss (dB)	Input R. Loss (dB)	Amplitude Unbalance (dB)	Phase Unbalance (Deg.)
10	1.58	11.11	0.01	0.07
500	1.39	12.51	0.03	3.37
1000	1.32	12.58	0.09	5.92
1500	1.31	12.44	0.14	7.91
2000	1.30	13.27	0.17	9.03
2500	1.30	15.62	0.18	8.53
3000	1.32	17.66	0.21	8.24
3500	1.38	17.99	0.46	6.49
4000	1.56	17.66	0.67	3.78
4500	1.67	18.98	0.76	4.17

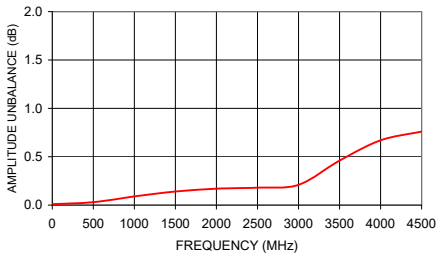
TCM3-452X+
INSERTION LOSS



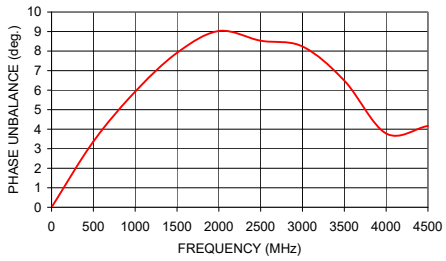
TCM3-452X+
INPUT RETURN LOSS



TCM3-452X+
AMPLITUDE UNBALANCE



TCM3-452X+
PHASE UNBALANCE



Additional Notes

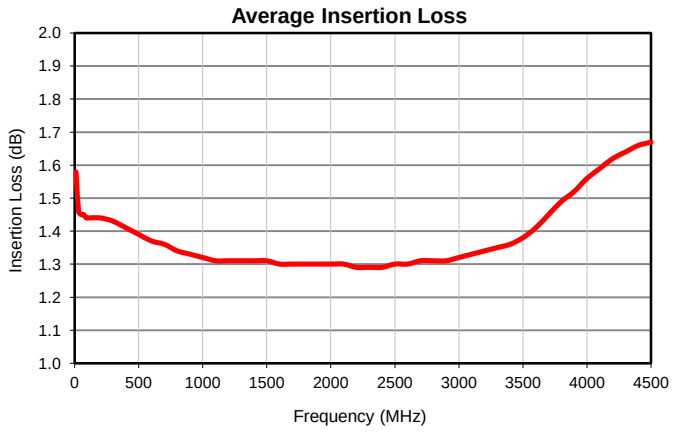
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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

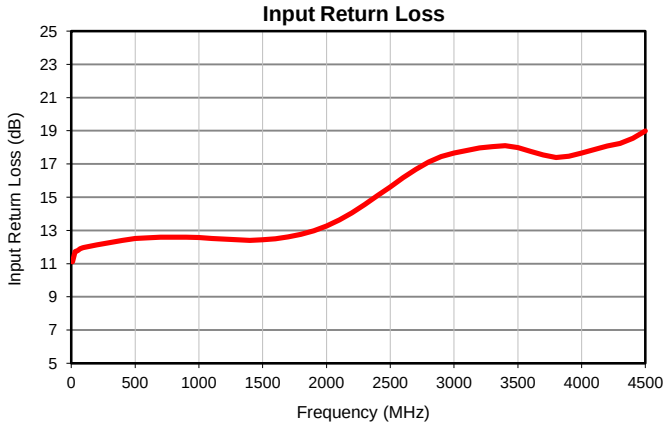
RF Transformer TCM3-452X+

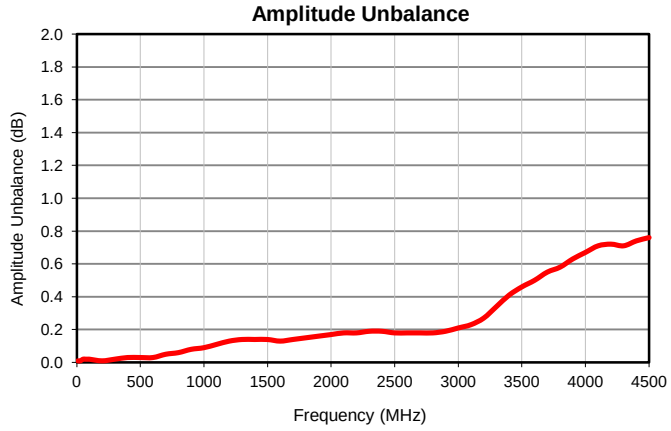
Typical Performance Data

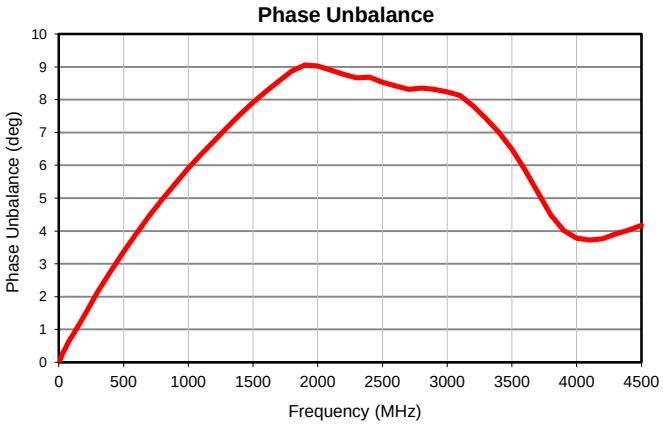
FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
10.0	1.58	11.11	0.01	0.07
30.0	1.46	11.72	0.01	0.27
50.0	1.45	11.79	0.02	0.43
70.0	1.45	11.89	0.02	0.59
90.0	1.44	11.95	0.02	0.73
100.0	1.44	11.98	0.02	0.78
200.0	1.44	12.13	0.01	1.44
300.0	1.43	12.26	0.02	2.15
400.0	1.41	12.40	0.03	2.77
500.0	1.39	12.51	0.03	3.37
600.0	1.37	12.56	0.03	3.93
700.0	1.36	12.59	0.05	4.46
800.0	1.34	12.60	0.06	4.97
900.0	1.33	12.60	0.08	5.44
1000.0	1.32	12.58	0.09	5.92
1100.0	1.31	12.51	0.11	6.34
1200.0	1.31	12.47	0.13	6.74
1300.0	1.31	12.43	0.14	7.15
1400.0	1.31	12.40	0.14	7.55
1500.0	1.31	12.44	0.14	7.91
1600.0	1.30	12.50	0.13	8.26
1700.0	1.30	12.61	0.14	8.57
1800.0	1.30	12.77	0.15	8.87
1900.0	1.30	12.98	0.16	9.05
2000.0	1.30	13.27	0.17	9.03
2100.0	1.30	13.64	0.18	8.90
2200.0	1.29	14.06	0.18	8.77
2300.0	1.29	14.56	0.19	8.66
2400.0	1.29	15.09	0.19	8.68
2500.0	1.30	15.62	0.18	8.53
2600.0	1.30	16.17	0.18	8.42
2700.0	1.31	16.68	0.18	8.31
2800.0	1.31	17.12	0.18	8.35
2900.0	1.31	17.45	0.19	8.31
3000.0	1.32	17.66	0.21	8.24
3100.0	1.33	17.81	0.23	8.13
3200.0	1.34	17.97	0.27	7.81
3300.0	1.35	18.04	0.34	7.43
3400.0	1.36	18.10	0.41	7.00
3500.0	1.38	17.99	0.46	6.49
3600.0	1.41	17.75	0.50	5.86
3700.0	1.45	17.55	0.55	5.18
3800.0	1.49	17.39	0.58	4.48
3900.0	1.52	17.46	0.63	4.02
4000.0	1.56	17.66	0.67	3.78
4100.0	1.59	17.87	0.71	3.72
4200.0	1.62	18.08	0.72	3.76
4300.0	1.64	18.23	0.71	3.91
4400.0	1.66	18.55	0.74	4.03
4500.0	1.67	18.98	0.76	4.17

Typical Performance Data





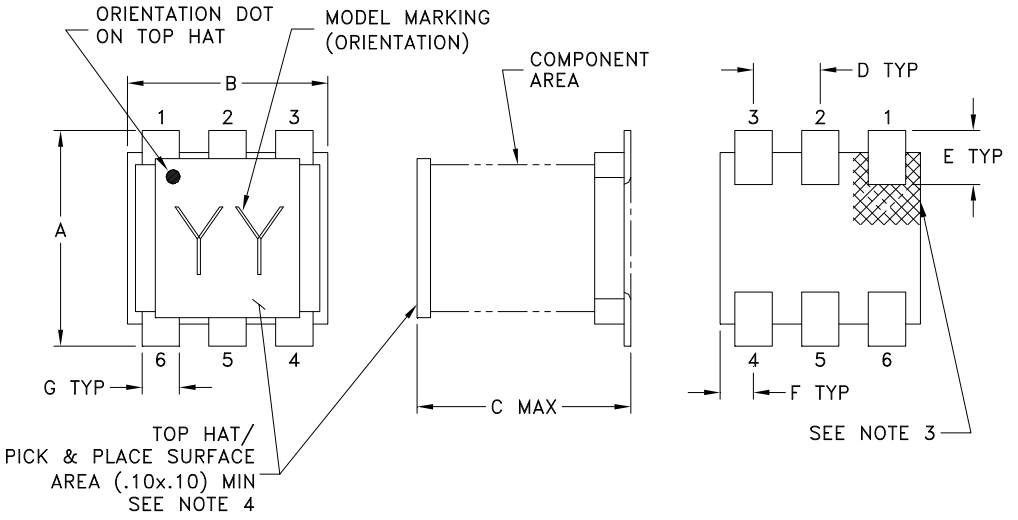




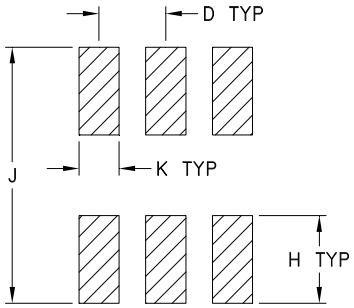
Case Style DB

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

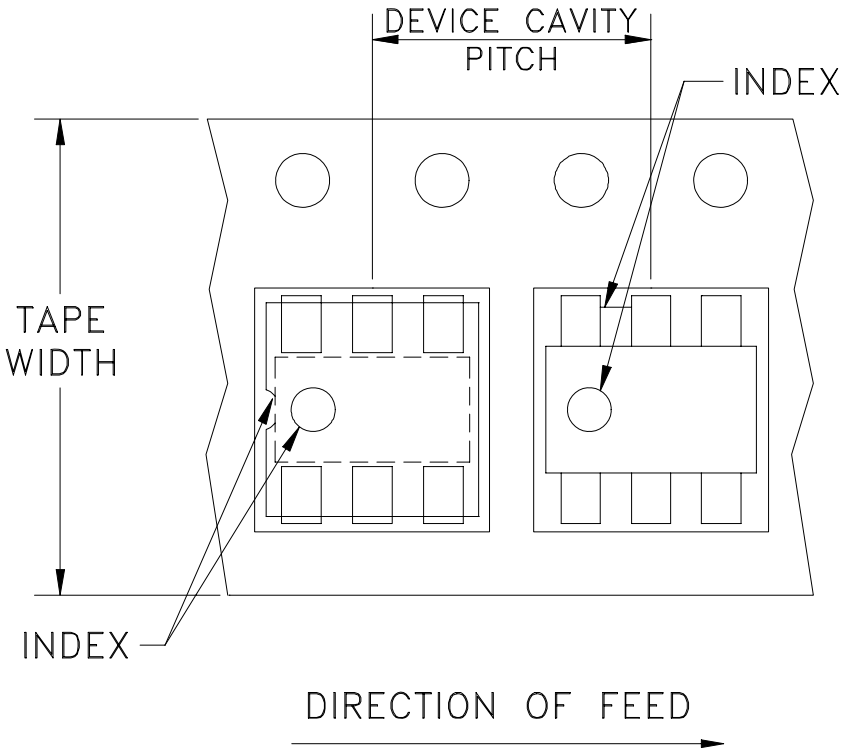
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3Pl. ± .005

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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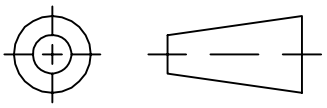
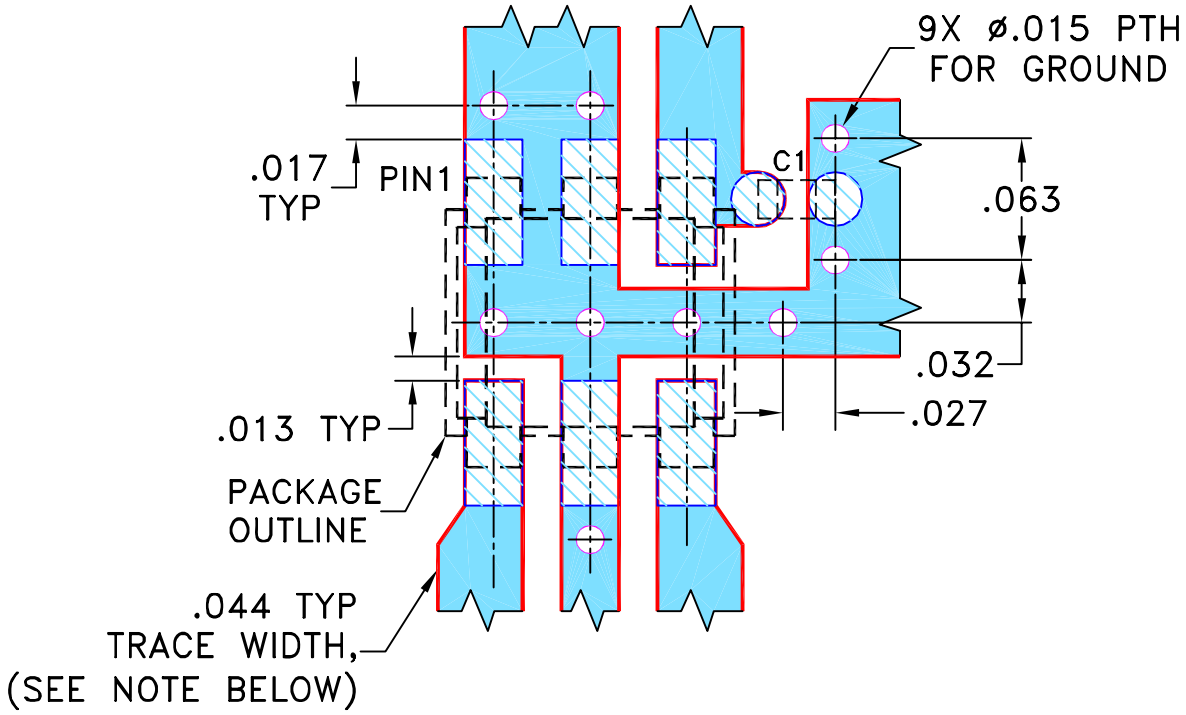
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M138571	NEW RELEASE	10/02/12	GF	DJ

SUGGESTED MOUNTING CONFIGURATION FOR DB1627 CASE STYLE, "06TH02" PIN CONNECTION



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; 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.
3. 0402 SIZE CHIP COMPONENT FOOTPRINT IS SHOWN FOR REFERENCE. FOR COMPONENT VALUE REFER TO TB-697+.

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	09/28/12
TOLERANCES ON:	CHECKED	IL	10/02/12
2 PL DECIMALS ±	APPROVED	DJ	10/02/12
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

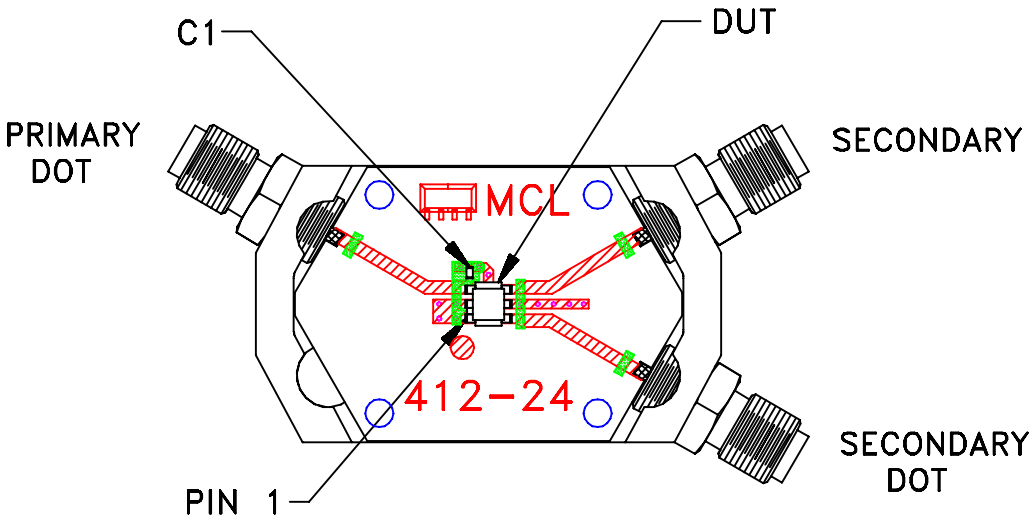
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 06TH02, DB1627, TB-697+

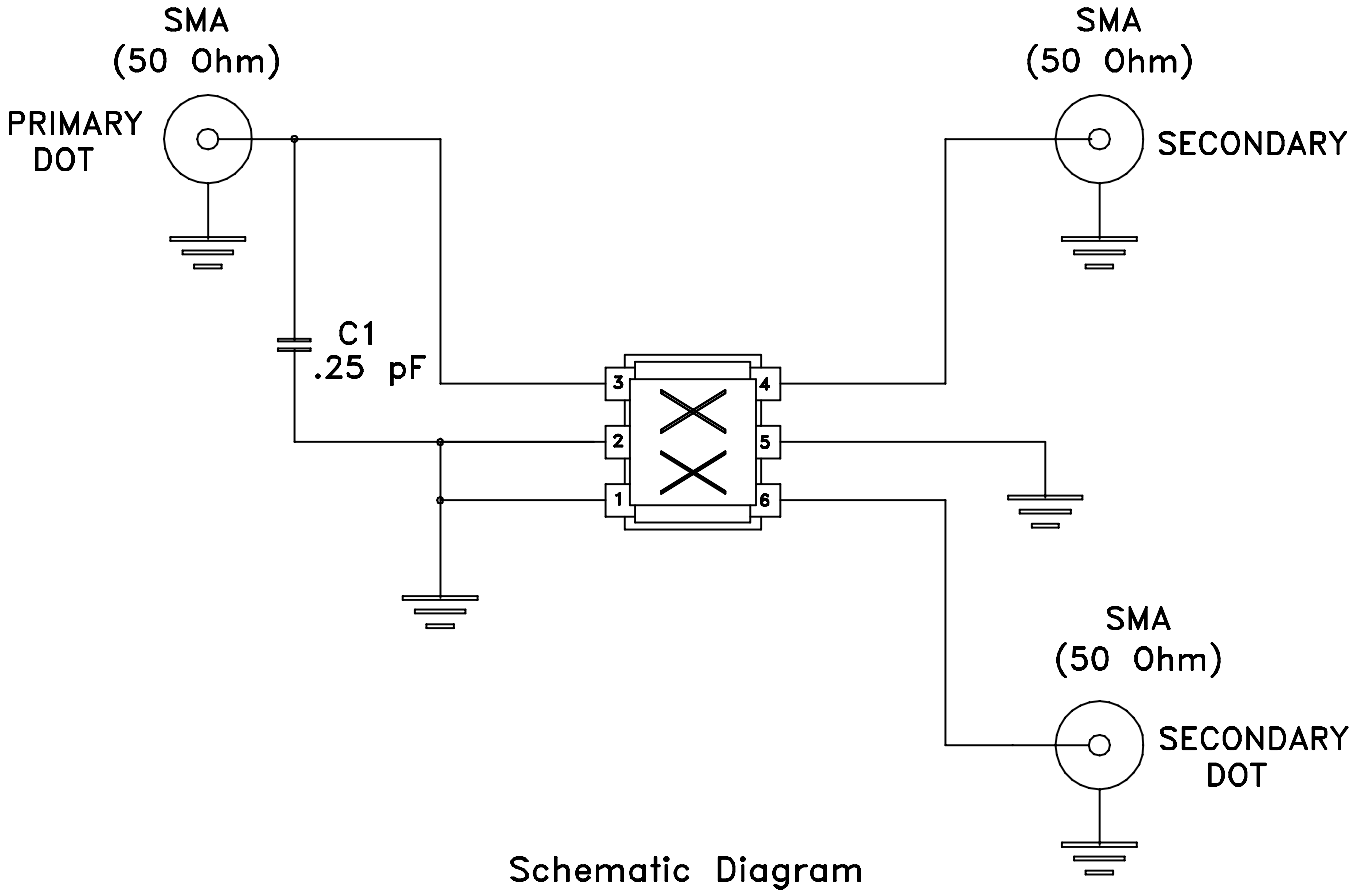
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-381	OR

FILE:	SCALE:	SHEET:
98PL381	10:1	1 OF 1

Evaluation Board and Circuit



TB-697+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.

Mini-Circuits®

Mini-Circuits

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