SURFACE MOUNT top hat®

RF Transformer

TCM2-33X+

50Ω 30 to 3000 MHz

FEATURES

- Wide Bandwidth 30 to 3000 MHz
- Balanced Transmission Line
- Excellent Return Loss
- Aqueous Washable
- Protected by US Patent 8,576,037

Generic photo used for illustration purposes only

CASE STYLE: DB1627

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

APPLICATIONS

- PCS
- Wideband Push-Pull Amplifiers
- Cellular

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio (Secondary/Primary)			2		
Frequency Range		30		3000	MHz
Insertion Loss[1]	30-3000		1.5	3.0	dB
Amplitude Unbalance	30-3000		0.5	—	dB
Phase Unbalance	30-3000		4	—	Degree

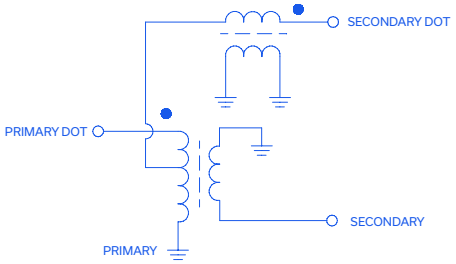
1. Insertion Loss is referenced to mid-band loss, 0.8 dB typ.

ABSOLUTE MAXIMUM RATINGS

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

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

CONFIGURATION N



REV. B
ECO-013812
TCM2-33X+
MCL NY
251120

SURFACE MOUNT top hat

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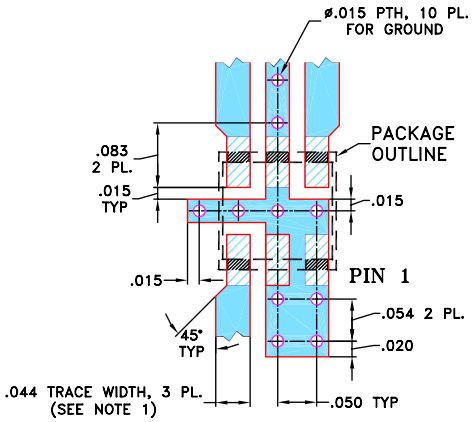
PAD CONNECTIONS

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

PRODUCT MARKING: FC

DEMO BOARD MCL P/N: TB-TCM2-33X+

SUGGESTED PCB LAYOUT (PL-364)



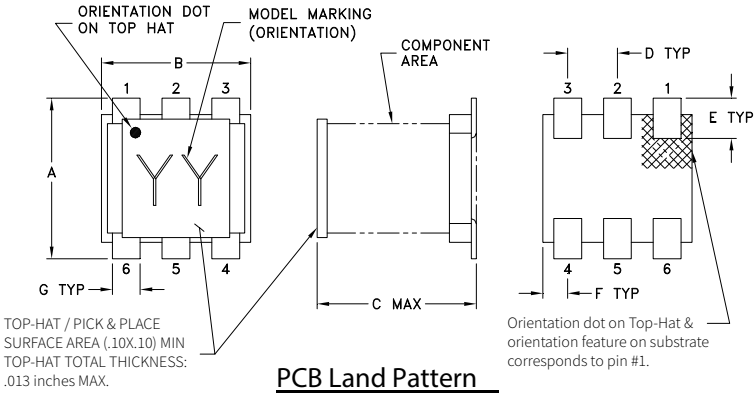
NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

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

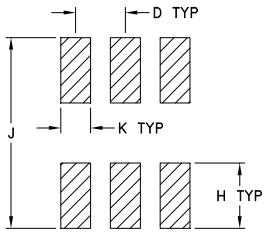
OUTLINE DRAWING



TOP-HAT / PICK & PLACE SURFACE AREA (.10X.10) MIN
TOP-HAT TOTAL THICKNESS: .013 inches MAX.

Orientation dot on Top-Hat & orientation feature on substrate corresponds to pin #1.

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

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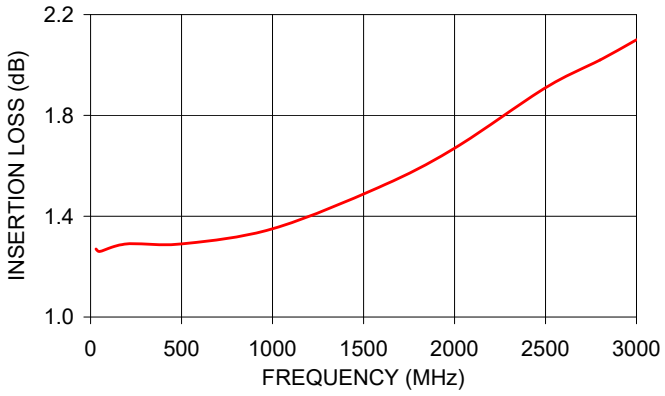
50Ω 30 to 3000 MHz

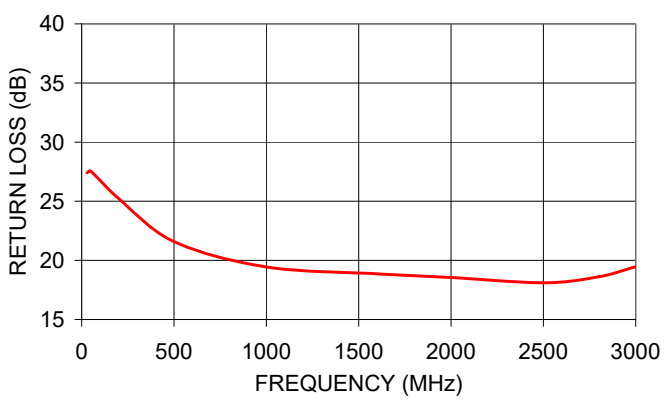
TYPICAL PERFORMANCE DATA

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Amplitude Unbalance (dB)	Phase Unbalance (deg)
30	1.27	27.41	0.04	0.10
50	1.26	27.54	0.03	0.16
200	1.29	25.23	0.08	0.68
500	1.29	21.59	0.21	0.86
1000	1.35	19.44	0.17	0.96
1600	1.52	18.86	0.41	2.96
2000	1.67	18.55	0.68	3.79
2500	1.91	18.11	0.97	4.02
2800	2.02	18.61	1.07	4.52
3000	2.10	19.46	1.10	5.38

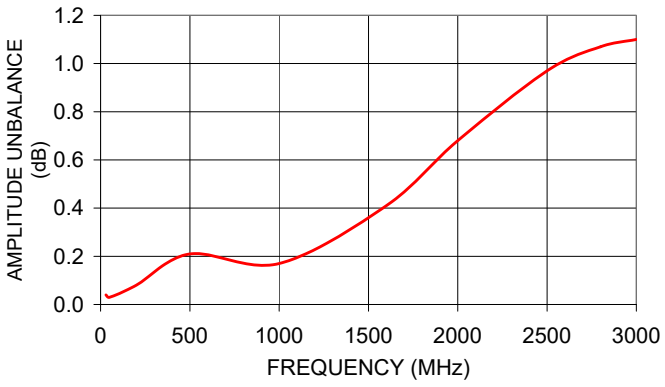
INSERTION LOSS



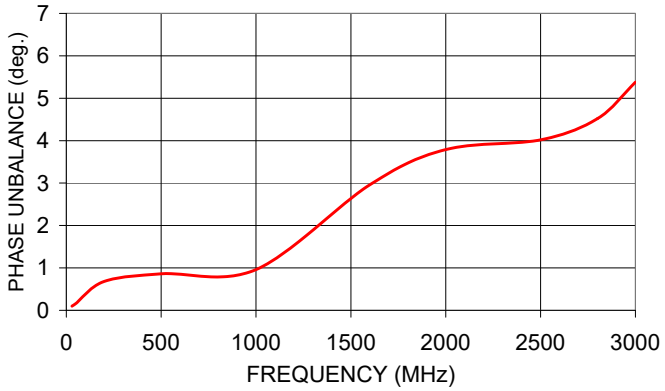
INPUT RETURN LOSS



AMPLITUDE UNBALANCE



PHASE UNBALANCE



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

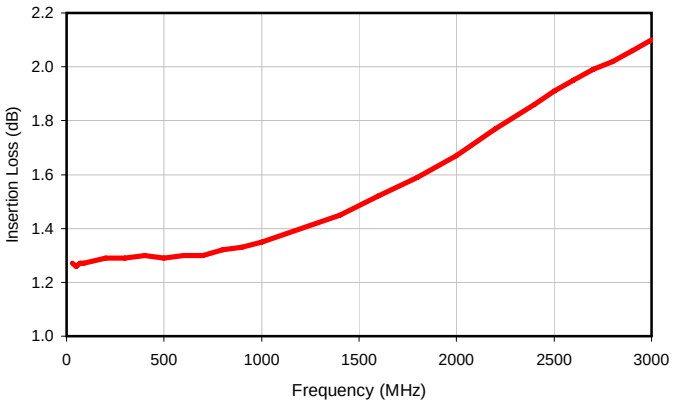
RF Transformer TCM2-33X+

Typical Performance Data

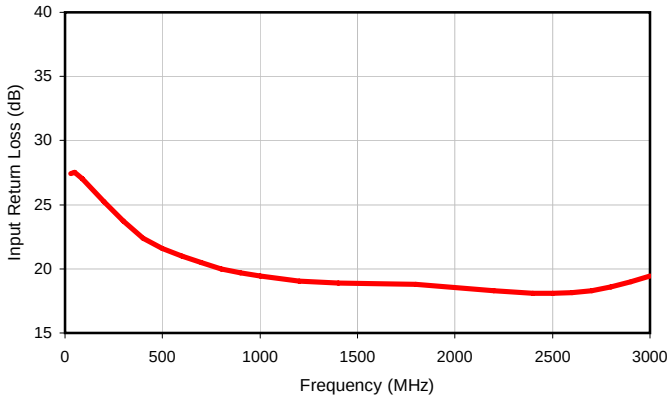
FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
30.0	1.27	27.41	0.04	0.10
50.0	1.26	27.54	0.03	0.16
70.0	1.27	27.28	0.03	0.23
90.0	1.27	27.01	0.04	0.32
200.0	1.29	25.23	0.08	0.68
300.0	1.29	23.71	0.13	0.83
400.0	1.30	22.39	0.18	0.89
500.0	1.29	21.59	0.21	0.86
600.0	1.30	20.98	0.22	0.83
700.0	1.30	20.48	0.24	0.78
800.0	1.32	20.01	0.23	0.76
900.0	1.33	19.70	0.20	0.82
1000.0	1.35	19.44	0.17	0.96
1200.0	1.40	19.03	0.14	1.53
1400.0	1.45	18.87	0.25	2.30
1600.0	1.52	18.86	0.41	2.96
1800.0	1.59	18.77	0.56	3.40
2000.0	1.67	18.55	0.68	3.79
2200.0	1.77	18.31	0.77	3.76
2400.0	1.86	18.08	0.91	3.84
2500.0	1.91	18.11	0.97	4.02
2600.0	1.95	18.13	1.02	4.24
2700.0	1.99	18.28	1.05	4.32
2800.0	2.02	18.61	1.07	4.52
2900.0	2.06	18.99	1.08	4.87
3000.0	2.10	19.46	1.10	5.38

Typical Performance Data

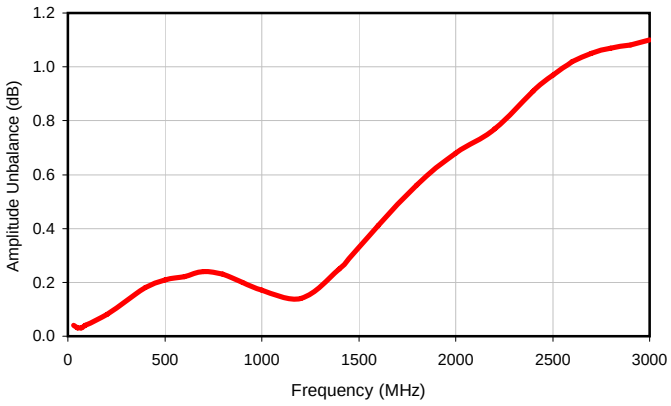
Average Insertion Loss



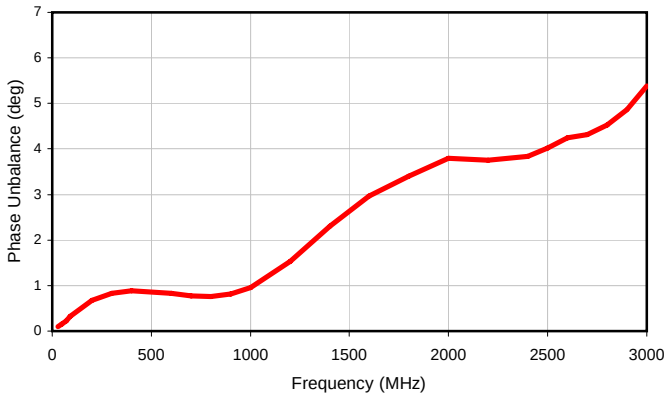
Input Return Loss



Amplitude Unbalance



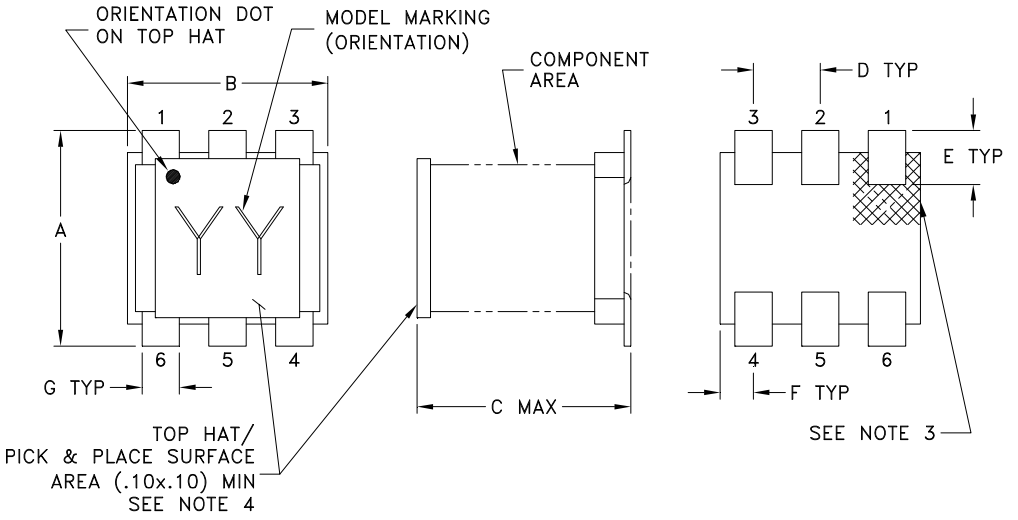
Phase Unbalance



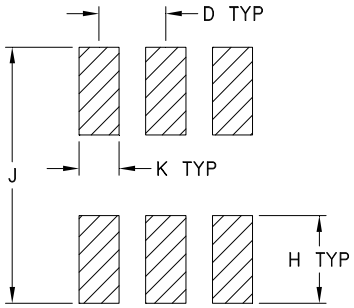
Case Style DB

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.

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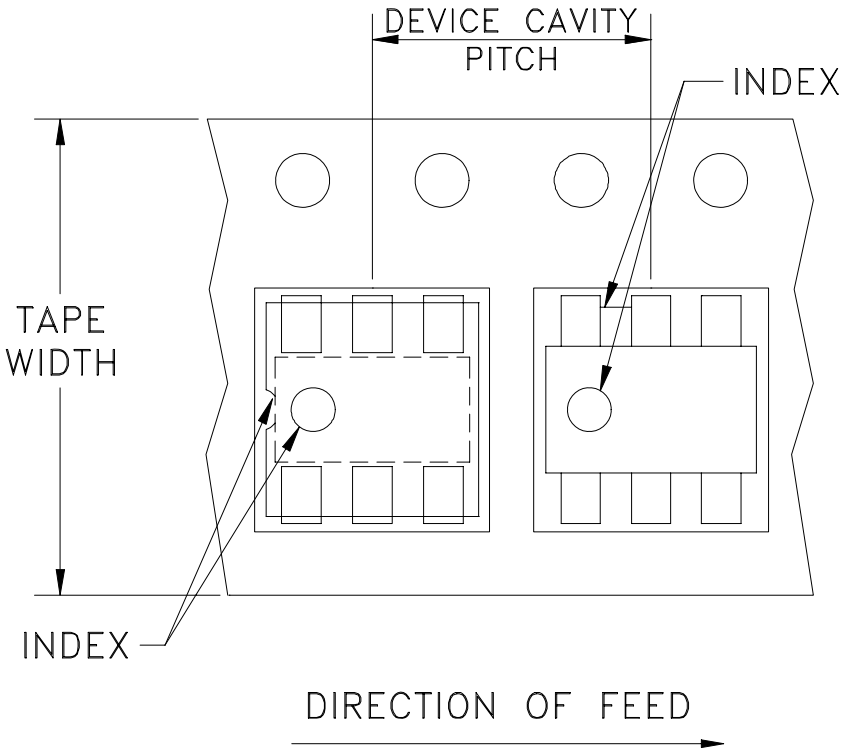
Tape & Reel Packaging TR-F47

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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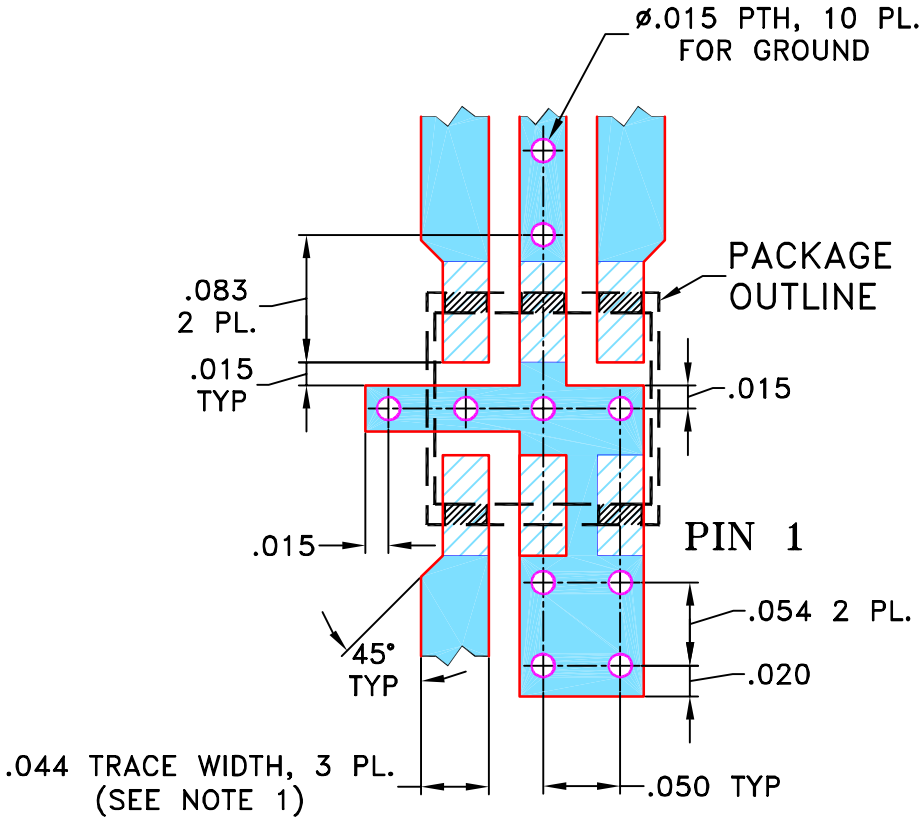
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M136032	NEW RELEASE	03/07/12	GF	DJ
A	M141464	ADDED PIN CODE "06TK04"	05/06/13	IL	DJ

SUGGESTED MOUNTING CONFIGURATION
FOR DB1627 CASE STYLE, "06TN01" & "06TK04" PIN CODES



NOTES:
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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	DRAWN	GF	02/17/12
TOLERANCES ON:	CHECKED	IL	03/07/12
2 PL DECIMALS ±	APPROVED	DJ	03/07/12
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

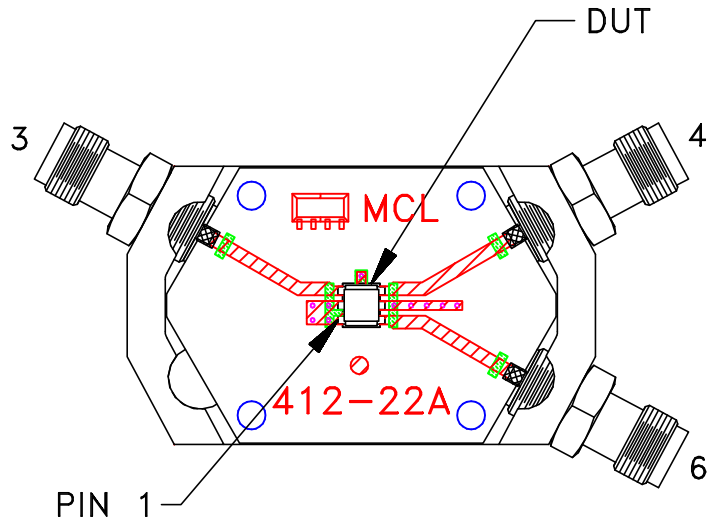
PL, 06TN01/06TK04, DB1627, TB-654+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-364	A

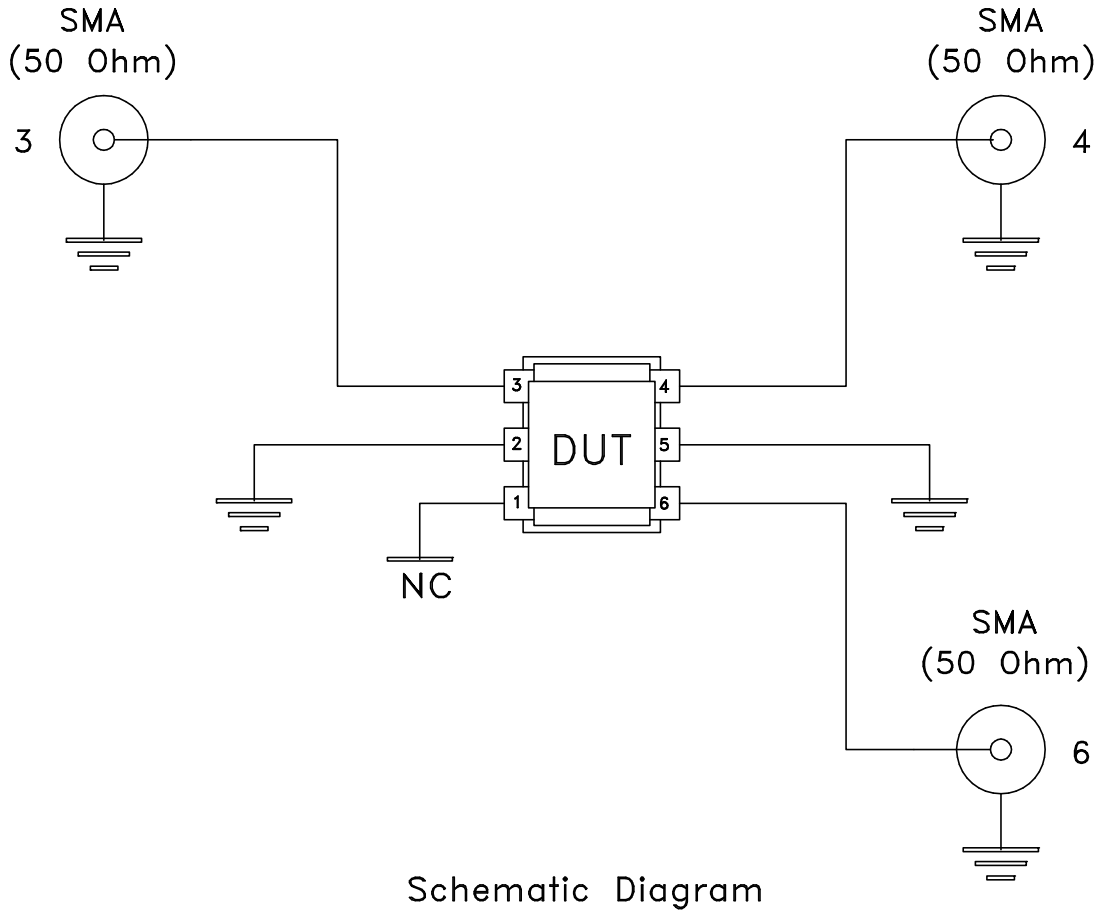
FILE:	SCALE:	SHEET:
98PL364	8:1	1 OF 1

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-654+



Schematic Diagram

Notes:

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

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Environmental Specifications ENV02

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	-20° 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

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