SURFACE MOUNT top hat

RF Transformer

TC1.33-1T-75X+

75Ω 3 to 500 MHz

THE BIG DEAL

- Wideband, 3 to 500 MHz
- Highly accurate 75ΩΩ to 100ΩΩ balanced transition
- DC isolated
- Good return loss
- Excellent amplitude unbalance, 0.5 dB typ. and phase unbalance, 3 deg typ. in 1 dB bandwidth
- Plastic base with leads
- Aqueous washable

Generic photo used for illustration purposes only

CASE STYLE: AT1521

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

APPLICATIONS

- Balanced to unbalanced transformation
- Push-pull amplifiers
- Impedance matching
- CATV

PRODUCT OVERVIEW

This high-performance, low-cost transformer is ideal for use with push-pull amplifiers where balanced-to-unbalanced RF signal transformation is required. It is an ideal match for the inputs of Mini-Circuits dual MMIC amplifiers. When used in this configuration, the high phase and amplitude accuracy provides excellent IP2 and IP3 performance, making it ideal for use in 75Ω CATV return applications or any single-ended 75Ω to balanced 50Ω application.

KEY FEATURES

Feature	Advantages
Wideband	Usable range of 3MHz to 500MHz makes this transformer suitable for multiple applications and covers the entire spectrum of CATV return path applications.
Excellent phase and amplitude performance	Typical amplitude unbalance of 0.5dB and phase unbalance of 3° in a 1dB bandwidth is unmatched for a transformer in this price range.
DC isolation	This feature enables the TC1 series to work in applications down to very low frequencies and when isolation of the primary and secondary windings is required.
Highly accurate impedance matching	The very accurate matching makes this product ideal for CATV applications running parallel 75Ω single-ended signals into 100Ω circuits in a differential configuration.
Extremely low cost	Mini-Circuits's unique design approach enables a high-performance transformer to be available in the market at a low cost for high-volume production.

REV. A
ECO-021646
TC1.33-1T-75X+
MCL NY
240424

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Condition	Min.	Typ.	Max.	Unit
Impedance Ratio (Secondary/Primary)			1.33		
Frequency Range		3		500	MHz
Insertion Loss*	3-500	—	2	—	dB
	5-300	—	1	—	
Amplitude Unbalance	1 dB bandwidth	—	0.5	—	dB
	2 dB bandwidth	—	0.9	—	
Phase Unbalance	1 dB bandwidth	—	3	—	Degree
	2 dB bandwidth	—	5	—	

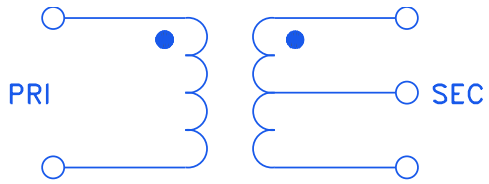
*Insertion Loss is referenced to mid-band loss, 0.5 dB typ.

MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	250mW
DC Current	30mA

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

CONFIG. A



SURFACE MOUNT top hat

RF Transformer

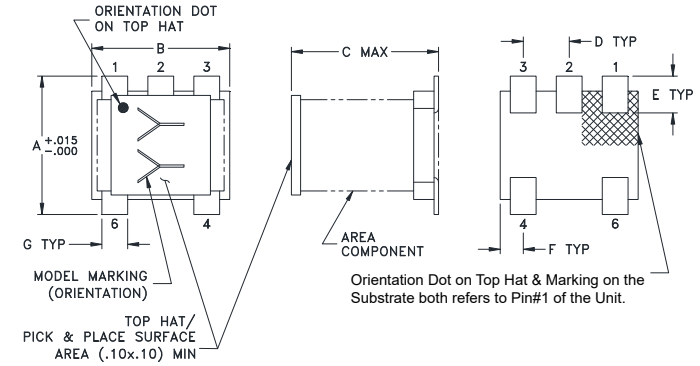
TC1.33-1T-75X+

75Ω 3 to 500 MHz

PIN CONNECTIONS

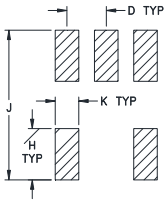
Function	Pin Number
PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
SECONDARY CT	2

OUTLINE DRAWING



Top-hat total thickness: .013 inches MAX.

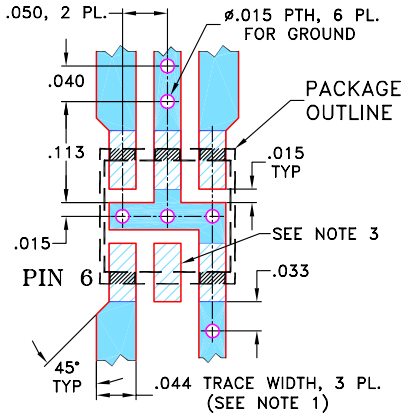
PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

PRODUCT MARKING: AR

DEMO BOARD MCL P/N: TB-145
SUGGESTED PCB LAYOUT: PL-244



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.
3. THIS PAD IS NOT REQUIRED FOR AT224 CASE STYLE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

OUTLINE DIMENSIONS (Inch / mm)

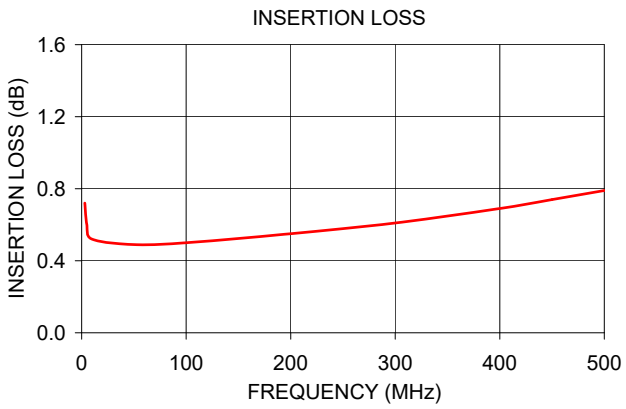
A	B	C	D	E	F	G	H	J	K
.150	.150	.160	.050	.040	.025	.028	.065	.190	.030
3.81	3.81	4.06	1.27	1.02	0.64	0.71	1.65	4.83	0.76

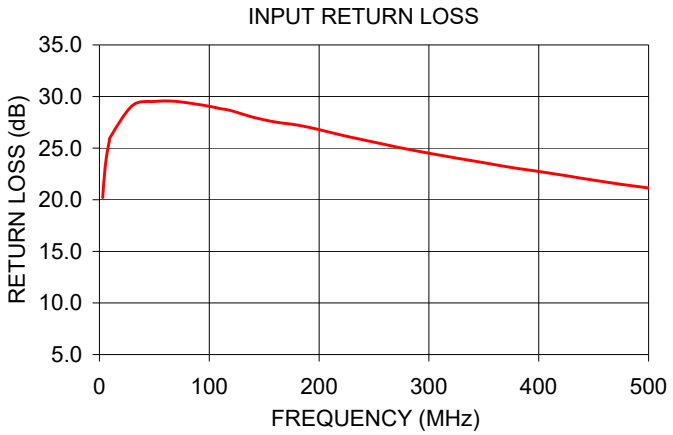
Weight: 0.15 grams

TAPE & REEL INFORMATION: F17

TYPICAL PERFORMANCE DATA

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
3.00	0.72	20.21	0.03	0.05
5.00	0.60	22.88	0.03	0.08
10.00	0.52	26.09	0.02	0.17
50.00	0.49	29.53	0.00	0.67
100.00	0.50	29.06	0.05	1.30
200.00	0.55	26.79	0.25	2.48
300.00	0.61	24.51	0.56	3.37
400.00	0.69	22.74	0.96	4.07
450.00	0.74	21.90	1.18	4.37
500.00	0.79	21.14	1.44	4.62





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 TC1.33-1T-75X+

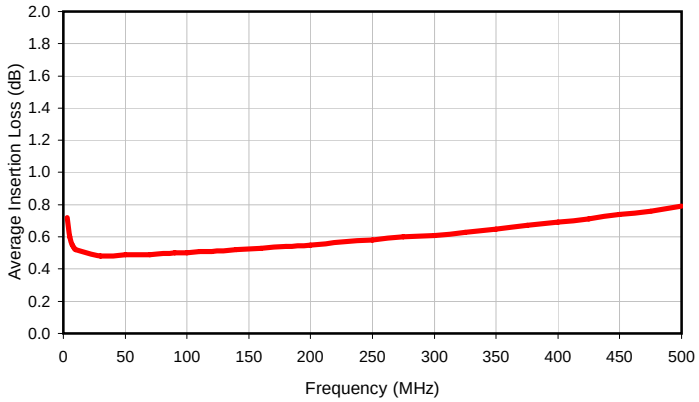
Typical Performance Data

FREQUENCY MHz	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
3.0	0.72	20.21	0.03	0.05
5.0	0.60	22.88	0.03	0.08
7.0	0.55	24.52	0.03	0.10
9.0	0.53	25.65	0.02	0.15
10.0	0.52	26.09	0.02	0.17
30.0	0.48	29.13	0.02	0.43
50.0	0.49	29.53	0.00	0.67
70.0	0.49	29.53	0.01	0.91
90.0	0.50	29.23	0.04	1.18
100.0	0.50	29.06	0.05	1.30
110.0	0.51	28.83	0.06	1.43
120.0	0.51	28.63	0.08	1.56
140.0	0.52	28.00	0.12	1.85
160.0	0.53	27.53	0.16	2.10
180.0	0.54	27.24	0.20	2.23
200.0	0.55	26.79	0.25	2.48
225.0	0.57	26.15	0.32	2.70
250.0	0.58	25.58	0.40	2.95
275.0	0.60	25.01	0.47	3.12
300.0	0.61	24.51	0.56	3.37
325.0	0.63	24.04	0.65	3.56
350.0	0.65	23.59	0.75	3.76
375.0	0.67	23.13	0.85	3.88
400.0	0.69	22.74	0.96	4.07
425.0	0.71	22.33	1.07	4.21
450.0	0.74	21.90	1.18	4.37
475.0	0.76	21.49	1.31	4.46
500.0	0.79	21.14	1.44	4.62

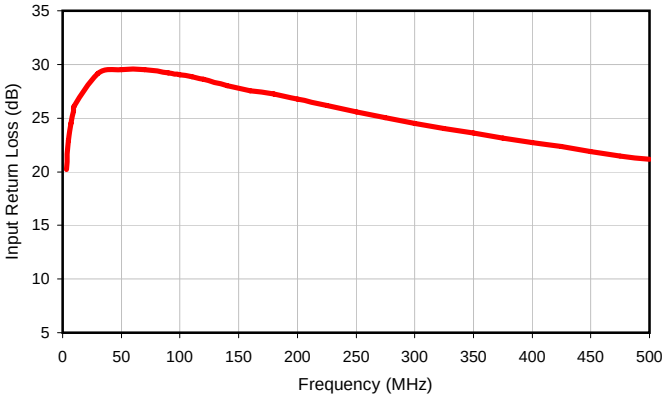
RF Transformer TC1.33-1T-75X+

Typical Performance Data

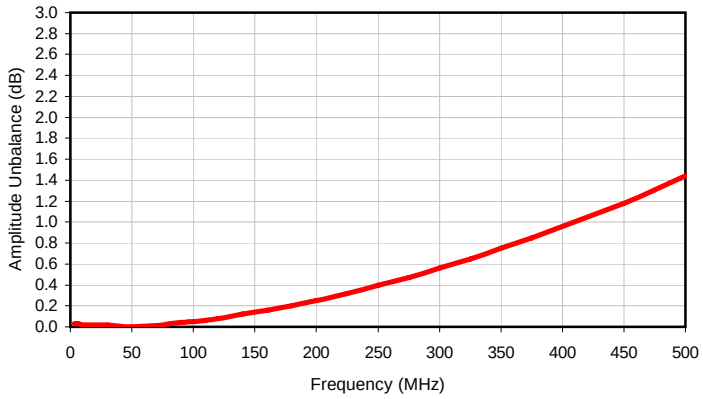
Average Insertion Loss



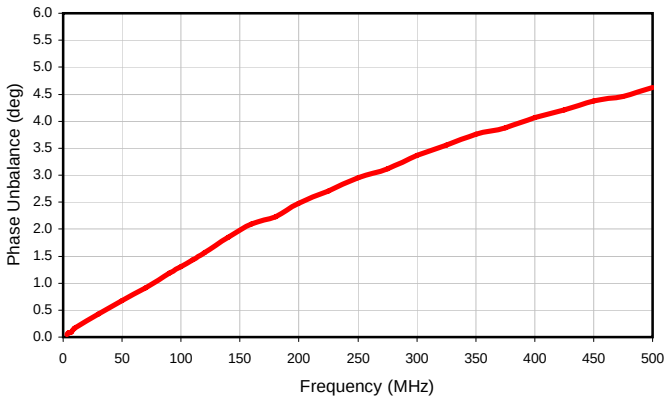
Input Return Loss



Amplitude Unbalance



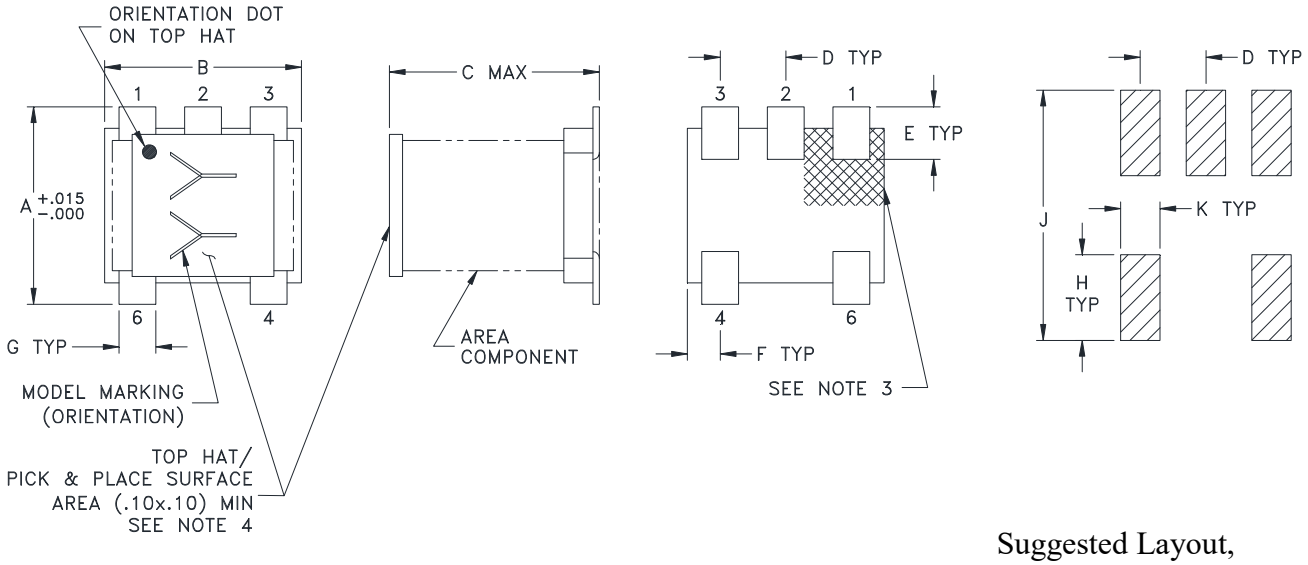
Phase Unbalance



Case Style AT

Outline Dimensions

AT1521



PCB Land Pattern

Suggested Layout,
Tolerance to be within ±.002

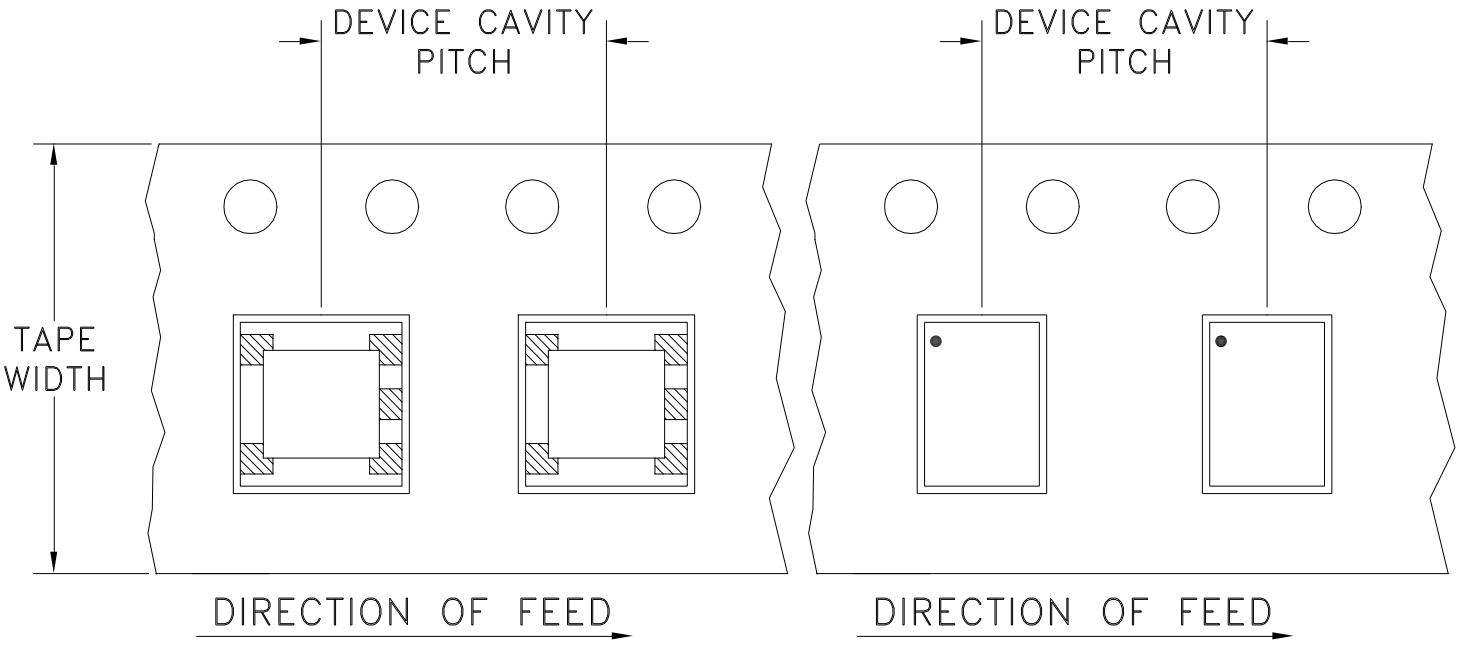
CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAMS
AT1521	.150 (3.81)	.150 (3.81)	.160 (4.06)	.050 (1.27)	.040 (1.02)	.025 (.64)	.028 (.71)	.065 (1.65)	.190 (4.83)	.030 (.76)	.15

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

Notes:
1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
3. Orientation Dot on Top Hat & Marking on the Substrate both refers to Pin #1 of the Unit.
4. Top-Hat total thickness: .013 inches MAX.

Tape & Reel Packaging TR-F17

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.

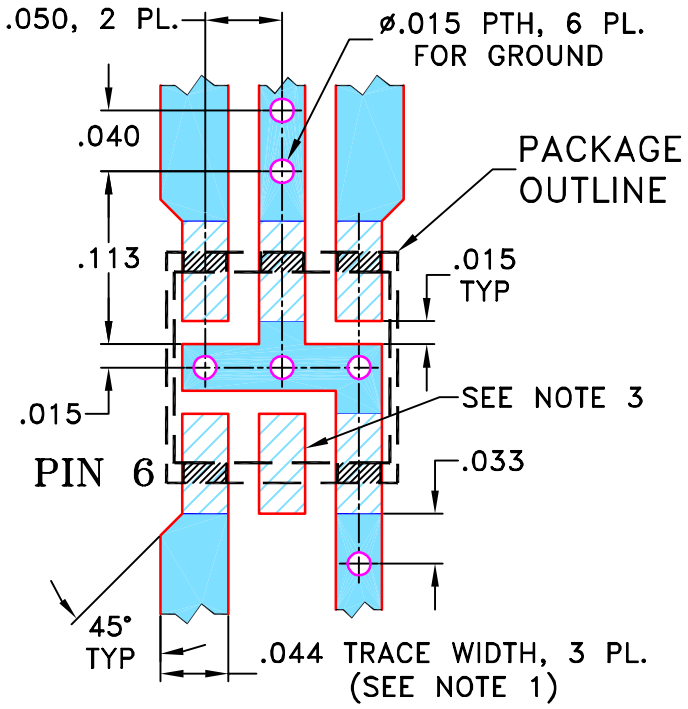
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M106563	NEW RELEASE	08/23/06	AV	IG

SUGGESTED MOUNTING CONFIGURATION FOR AT224/DB714 CASE STYLE, "gs/ha/hd" PIN CONNECTIONS (FOR SINGLE ENDED TO BALANCED APPLICATION)



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3. THIS PAD IS NOT REQUIRED FOR AT224 CASE STYLE.

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	AV	07/28/06
TOLERANCES ON:	CHECKED	IL	08/23/06
2 PL DECIMALS ±	APPROVED	IG	08/23/06
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

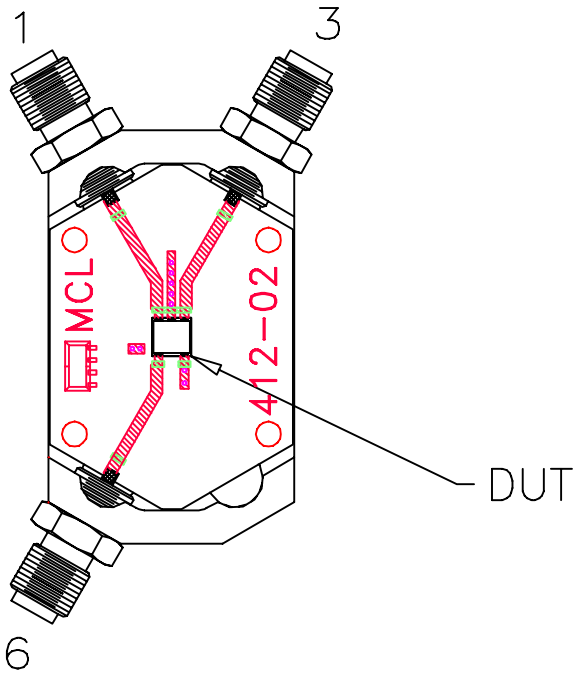
PL, gs/ha/hd, AT224/DB714, TC/TCM, TB-145

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-244	OR

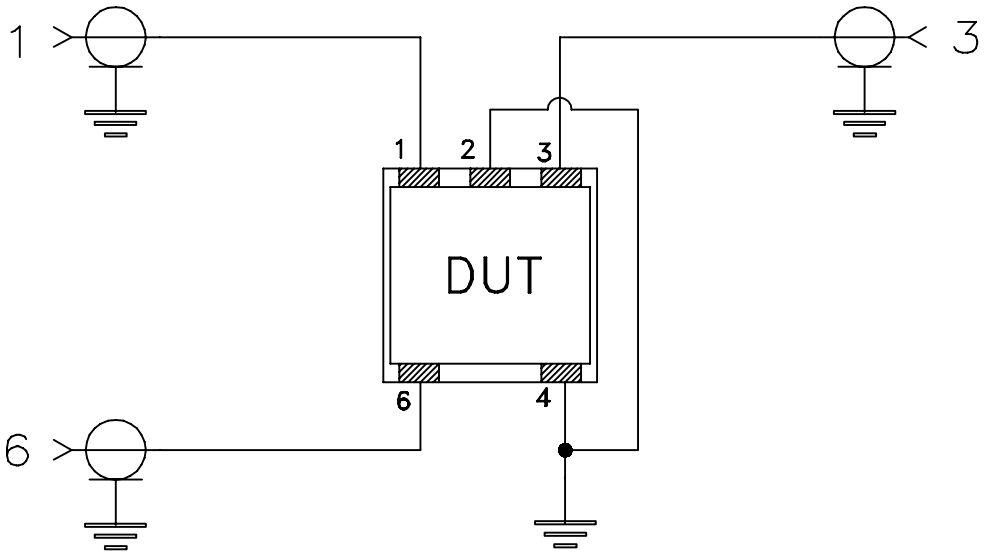
FILE:	SCALE:	SHEET:
98PL244	8:1	1 OF 1

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-145



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers RO4350B or its equivalent, Dielectric Constant=3.5, Thickness=.020"

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