SURFACE MOUNT top hat

# RF Transformer

# TC2-72T+

50Ω 10 to 700 MHz

## FEATURES

- Wideband, 10 to 700 MHz
- Good Return Loss
- Excellent Amplitude Unbalance, 0.5 dB Typ. and Phase Unbalance, 1.3 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

- Impedance Matching
- Balanced to Unbalanced Transformation
- Push-Pull Amplifier

## ELECTRICAL SPECIFICATIONS AT +25°C

| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Impedance Ratio (Secondary/Primary) | | | 2 | | |
| Frequency Range | | 10 | | 700 | MHz |
| Insertion Loss[1] | 10-400 | | 0.4 | 1.3 | dB |
| | 400-700 | | 0.9 | 1.8 | |
| Amplitude Unbalance | 10-400 | | 0.5 | 0.8 | dB |
| | 400-700 | | 1.3 | 2.0 | |
| Phase Unbalance | 10-400 | | 1.5 | 7.0 | Degree |
| | 400-700 | | 2.25 | 9.0 | |

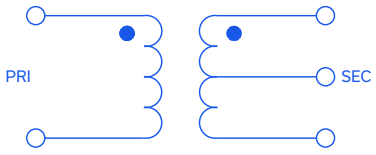
1. Insertion Loss is referenced to mid-band loss, 0.5 dB.

## ABSOLUTE MAXIMUM RATINGS

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

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

## CONFIG. A




REV. C
ECO-014884
TC2-72T+
MCL NY
251110

SURFACE MOUNT top hat

# RF Transformer

# TC2-72T+

50Ω 10 to 700 MHz

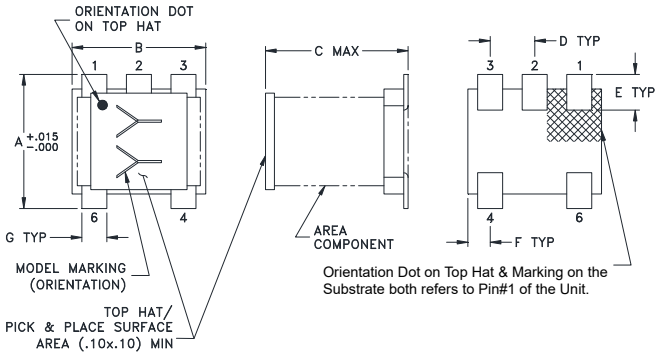
## PIN CONNECTIONS

| | |
|---|---|
| PRIMARY DOT | 6 |
| PRIMARY | 4 |
| SECONDARY DOT | 1 |
| SECONDARY | 3 |
| SECONDARY CT | 2 |

**PRODUCT MARKING:** AH

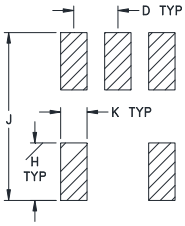
**DEMO BOARD MCL P/N:** TB-TC2-72T+

## OUTLINE DRAWING




Top-hat total thickness: .013 inches MAX.

### PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002 in

## OUTLINE DIMENSIONS (Inch / mm)

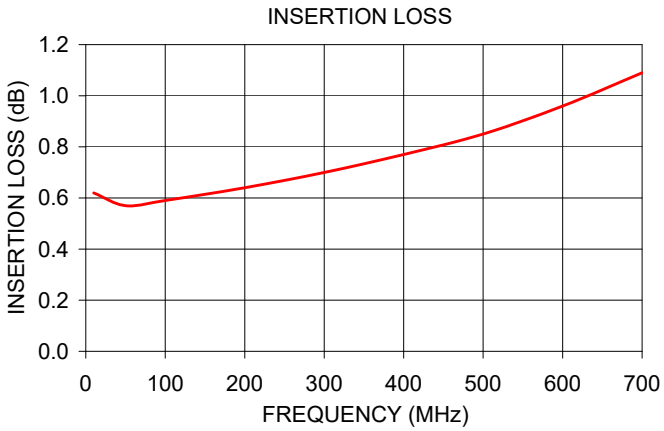
| A | B | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .150 | .160 | .050 | .040 | .025 | .028 | .065 | .190 | .030 |
| 3.81 | 3.81 | 4.06 | 1.27 | 1.02 | 0.64 | 0.71 | 1.65 | 4.83 | 0.76 |

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.) |
|---|---|---|---|---|
| 10 | 0.62 | 24.14 | 0.00 | 0.01 |
| 50 | 0.57 | 25.87 | 0.01 | 0.24 |
| 100 | 0.59 | 24.32 | 0.03 | 0.52 |
| 200 | 0.64 | 20.68 | 0.11 | 1.01 |
| 300 | 0.70 | 18.00 | 0.26 | 1.53 |
| 400 | 0.77 | 16.01 | 0.46 | 2.04 |
| 500 | 0.85 | 14.49 | 0.71 | 2.49 |
| 600 | 0.96 | 13.28 | 1.02 | 2.88 |
| 700 | 1.09 | 12.30 | 1.39 | 3.17 |







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 TC2-72T+

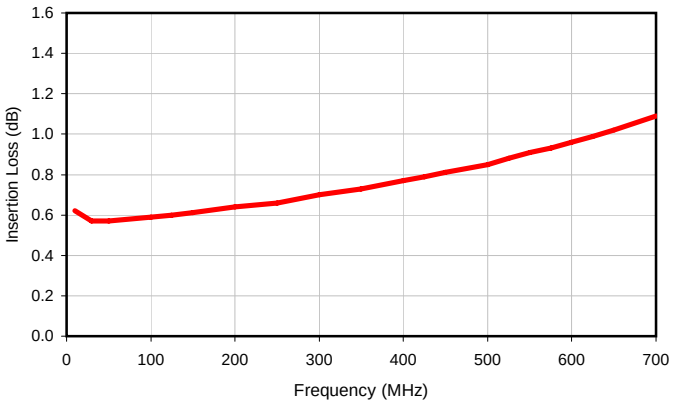
## *Typical Performance Data*

| FREQUENCY MHz | AVERAGE INSERTION LOSS (dB) | INPUT RETURN LOSS (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE (deg.) |
|---|---|---|---|---|
| 10.0 | 0.62 | 24.14 | 0.00 | 0.01 |
| 30.0 | 0.57 | 26.08 | 0.01 | 0.15 |
| 50.0 | 0.57 | 25.87 | 0.01 | 0.24 |
| 75.0 | 0.58 | 25.17 | 0.02 | 0.39 |
| 100.0 | 0.59 | 24.32 | 0.03 | 0.52 |
| 125.0 | 0.60 | 23.31 | 0.05 | 0.61 |
| 150.0 | 0.61 | 22.50 | 0.07 | 0.90 |
| 200.0 | 0.64 | 20.68 | 0.11 | 1.01 |
| 250.0 | 0.66 | 19.25 | 0.18 | 1.28 |
| 300.0 | 0.70 | 18.00 | 0.26 | 1.53 |
| 350.0 | 0.73 | 16.95 | 0.36 | 1.79 |
| 400.0 | 0.77 | 16.01 | 0.46 | 2.04 |
| 425.0 | 0.79 | 15.59 | 0.52 | 2.17 |
| 450.0 | 0.81 | 15.19 | 0.58 | 2.29 |
| 475.0 | 0.83 | 14.84 | 0.64 | 2.40 |
| 500.0 | 0.85 | 14.49 | 0.71 | 2.49 |
| 525.0 | 0.88 | 14.16 | 0.78 | 2.56 |
| 550.0 | 0.91 | 13.84 | 0.86 | 2.68 |
| 575.0 | 0.93 | 13.55 | 0.94 | 2.79 |
| 600.0 | 0.96 | 13.28 | 1.02 | 2.88 |
| 625.0 | 0.99 | 13.01 | 1.11 | 2.95 |
| 650.0 | 1.02 | 12.76 | 1.20 | 3.02 |
| 700.0 | 1.09 | 12.30 | 1.39 | 3.17 |

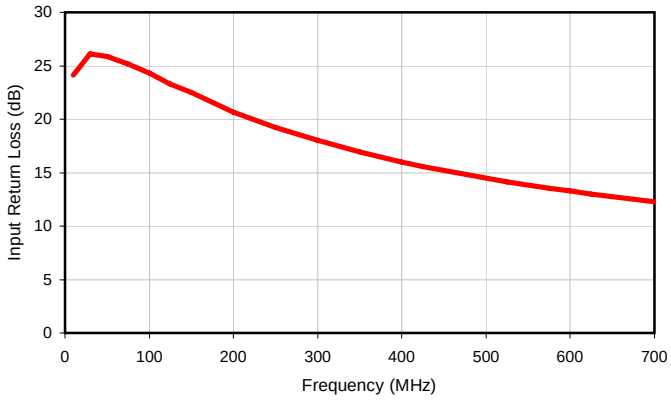
# RF Transformer TC2-72T+

## *Typical Performance Data*

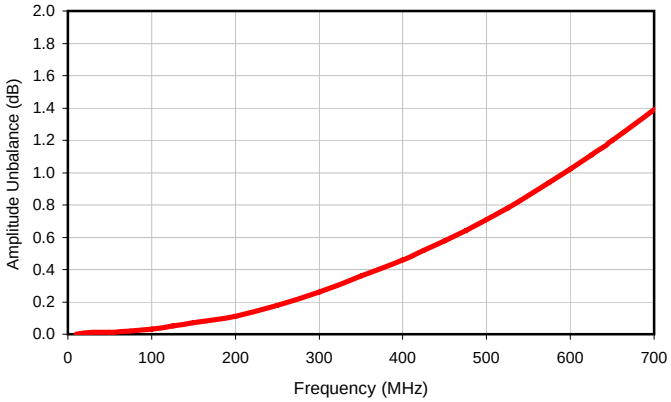
**Average Insertion Loss**



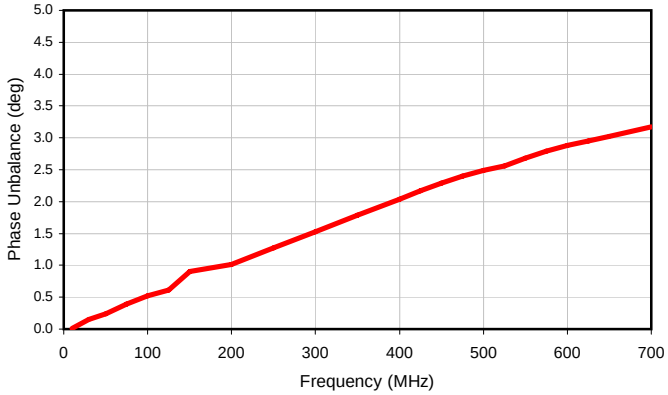

**Input Return Loss**




**Amplitude Unbalance**




**Phase Unbalance**

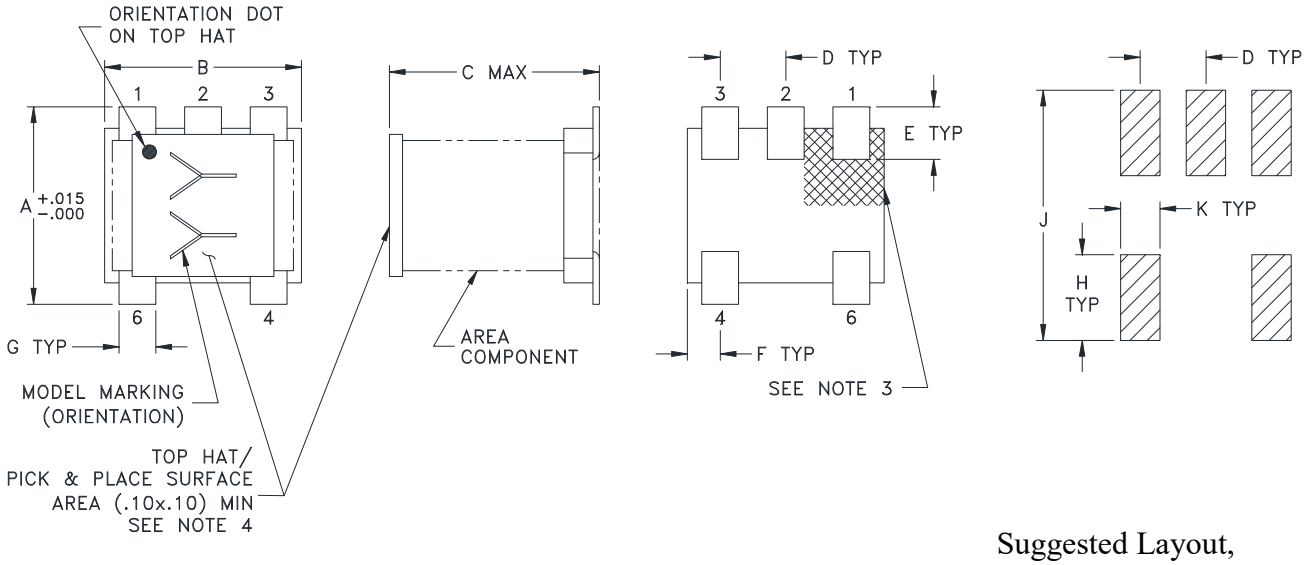


# Case Style AT

## 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 |

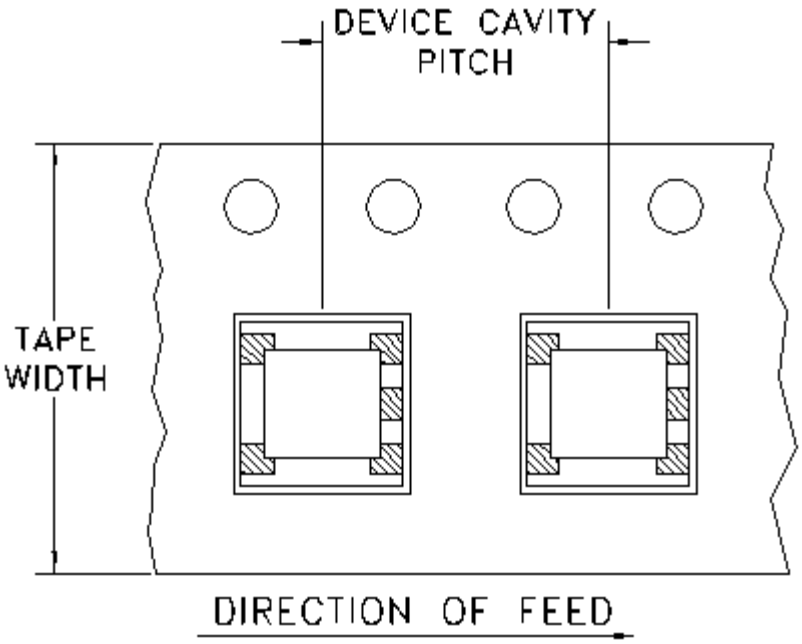
**Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005**

**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.


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# 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.

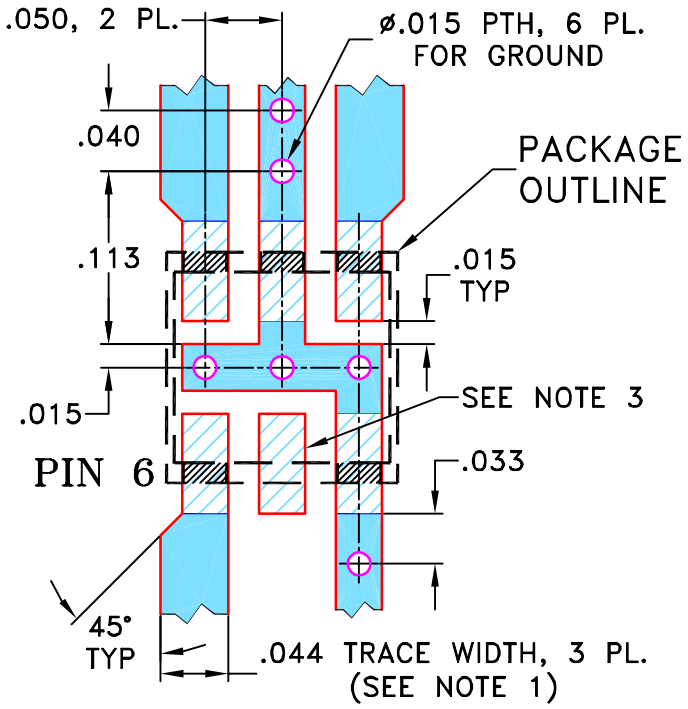
Go to: www.minicircuits.com/pages/pdfs/tape.pdf


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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)




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.
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 ± | | | |

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

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Brooklyn NY 11235

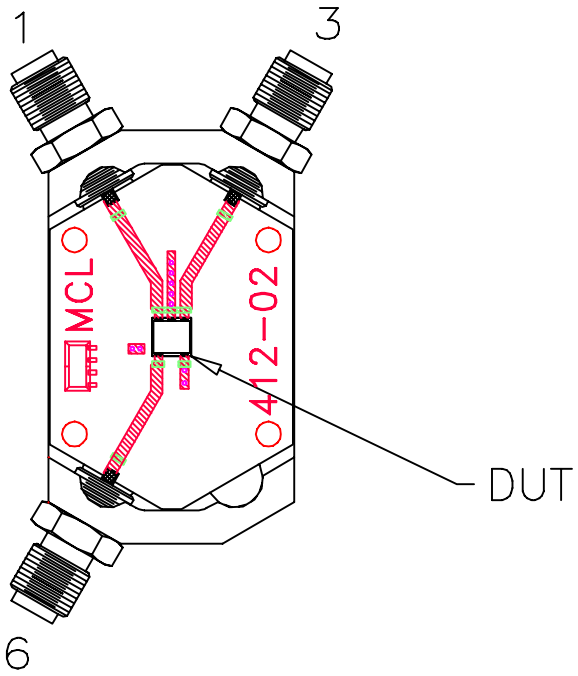
PL, gs/ha/hd, AT224/DB714, TC/TCM, TB-145

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

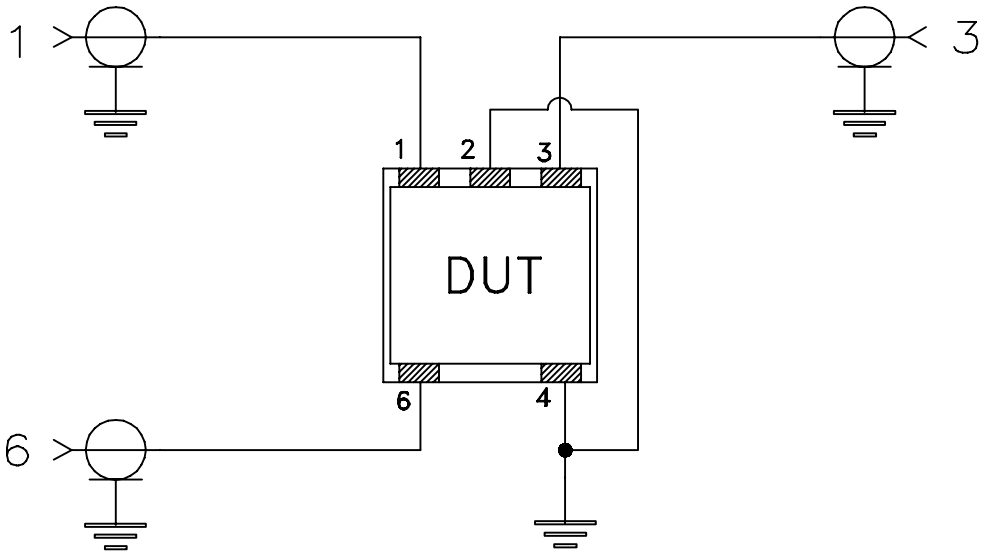
| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL244 | 8:1 | 1 OF 1 |

# 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"

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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<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>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<br>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;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |


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