SURFACE MOUNT top hat®

# RF Transformer

# TCM2-182-75X+

75Ω 50 to 1800 MHz

## THE BIG DEAL

- Wide bandwidth 50 to 1800 MHz
- Balanced transmission line
- Excellent return loss
- Aqueous washable
- Patent pending



*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

## PRODUCT OVERVIEW

Mini-Circuits' TCM2-182-75X+ is a 75Ω surface-mount transmission line transformer covering a wide range of applications from 50 to 1800 MHz. The transformer provides input power handling up to 0.4W, low insertion loss, good input return loss and low amplitude and phase unbalance. Featuring core and wire construction on a 6-lead plastic base with tin over nickel termination finish, the unit measures 0.16 x 0.15 x 0.16", accommodating dense circuit board layouts. It also incorporates Mini-Circuits' Top Hat® feature for faster, more accurate pick-and-place assembly and easy visual inspection.

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Wideband, 50 to 1800 MHz | Wide frequency range covers bandwidth requirements for many broadband applications. |
| Good power handling, 0.4W | Supports a wide range of system power requirements. |
| Low insertion loss, 1.0 dB | TCM2-182-75X+ provides excellent signal transmission from input to output |
| Good input return loss, 14 dB min. | Provides good matching with minimal signal reflection. |
| Low amplitude unbalance, 1.1 dB typ. | Low amplitude unbalance can improve a system's electromagnetic compatibility by rejecting unwanted common-mode noise. |
| 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. |

REV. A
ECO-013812
TCM2-182-75X+
IG/CP/AM
220620

## ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Impedance Ratio (secondary/primary) | | | 2 | | Ohm |
| Frequency Range | | 50 | | 1800 | MHz |
| Insertion Loss[1] | 50-1800 | | | 1.0 | dB |
| Amplitude Unbalance | 50-1800 | | 1.1 | 1.5 | dB |
| Phase Unbalance | 50-1800 | | | 9 | Degree |
| Primary Return Loss | 50-1800 | 14 | | | dB |

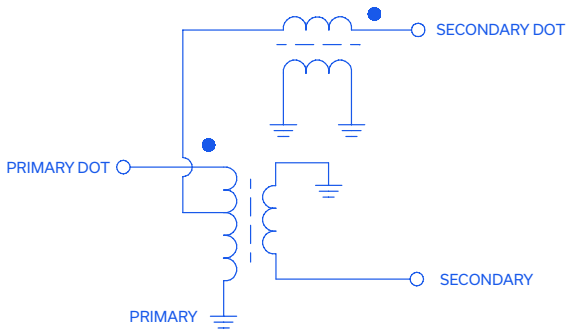
1. Insertion Loss is referenced to mid-band loss, 1.5 dB typ.

## MAXIMUM RATINGS

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

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

## CONFIGURATION N



SURFACE MOUNT top hat

# RF Transformer

# TCM2-182-75X+

75Ω 50 to 1800 MHz

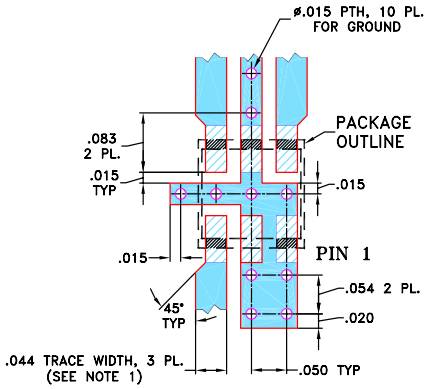
## PIN CONNECTIONS

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

## PRODUCT MARKING: WQ

## EVAL BOARD MCL P/N: TB-TCM218275X+

## SUGGESTED PCB LAYOUT (PL-364)



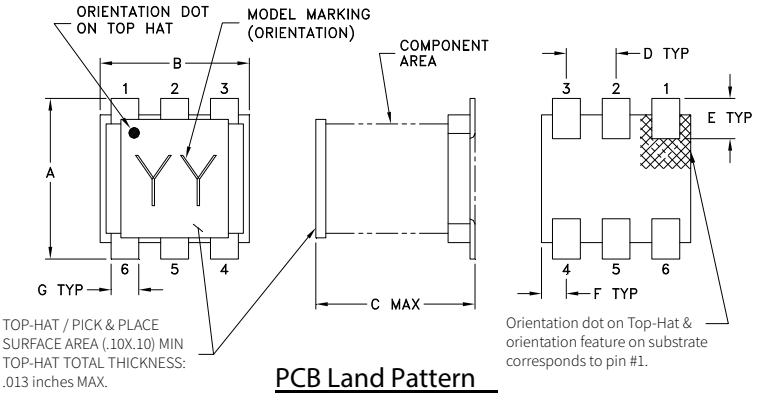

NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

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

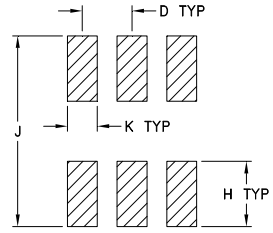
## OUTLINE DRAWING




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: F17

SURFACE MOUNT top hat®

# RF Transformer

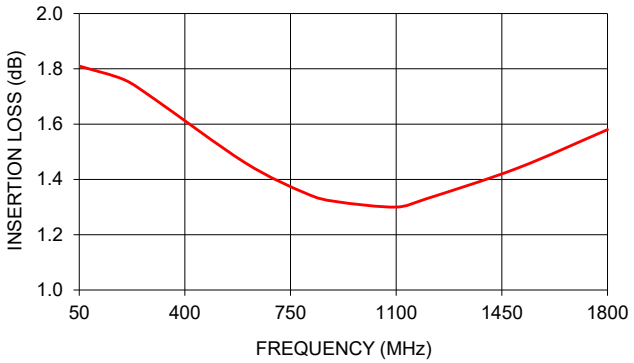
# TCM2-182-75X+

75Ω 50 to 1800 MHz

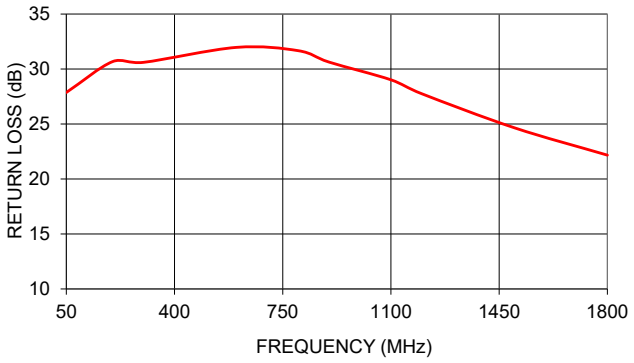
## TYPICAL PERFORMANCE DATA

| Frequency (MHz) | Insertion Loss (dB) | Return Loss (dB) | Amplitude Unbalance (dB) | Phase Unbalance (deg) |
|---|---|---|---|---|
| 50 | 1.81 | 27.87 | 0.02 | 0.53 |
| 200 | 1.76 | 30.68 | 0.10 | 2.25 |
| 300 | 1.69 | 30.61 | 0.20 | 3.04 |
| 600 | 1.46 | 31.97 | 0.49 | 4.35 |
| 800 | 1.35 | 31.67 | 0.63 | 4.51 |
| 900 | 1.32 | 30.63 | 0.69 | 4.32 |
| 1100 | 1.30 | 29.02 | 0.72 | 3.61 |
| 1200 | 1.33 | 27.75 | 0.70 | 3.22 |
| 1500 | 1.44 | 24.65 | 0.62 | 2.11 |
| 1800 | 1.58 | 22.17 | 0.54 | 1.70 |

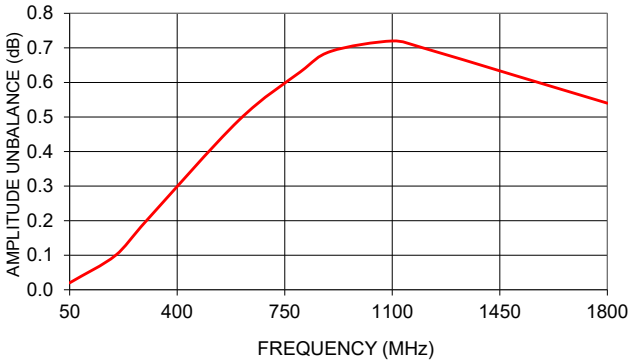
TCM2-182-75X+
INSERTION LOSS



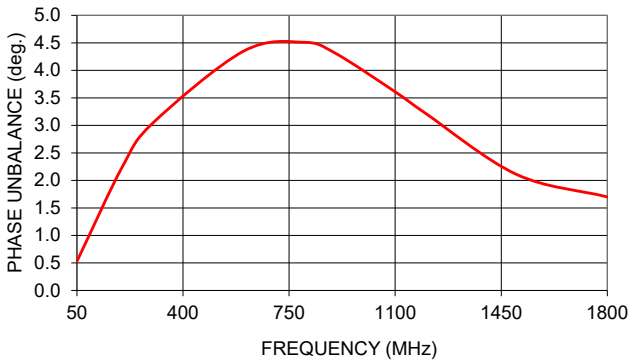

TCM2-182-75X+
INPUT RETURN LOSS




TCM2-182-75X+
AMPLITUDE UNBALANCE




TCM2-182-75X+
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

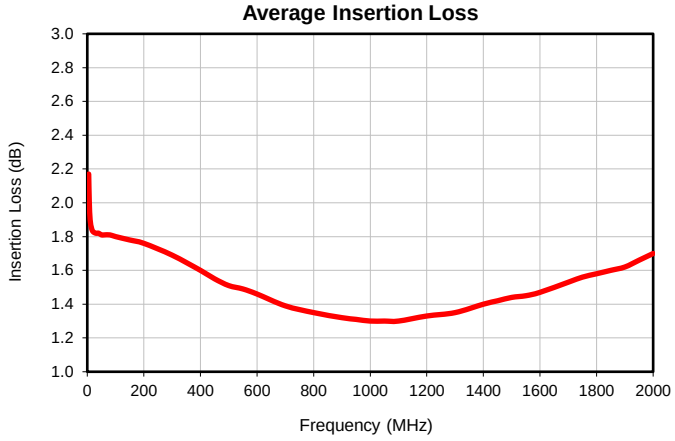
# RF Transformer TCM2-182-75X+

## *Typical Performance Data*

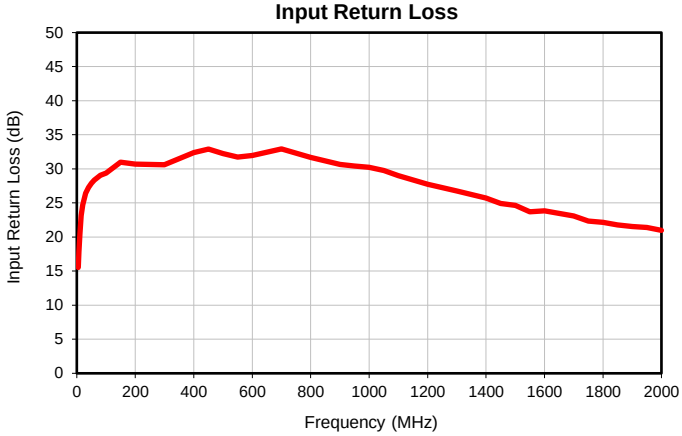
| FREQUENCY (MHz) | AVERAGE INSERTION LOSS (dB) | INPUT RETURN LOSS (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE (deg.) |
|---|---|---|---|---|
| 5 | 2.17 | 15.53 | 0.00 | 0.06 |
| 7 | 2.01 | 17.85 | 0.01 | 0.11 |
| 10 | 1.90 | 20.39 | 0.01 | 0.13 |
| 15 | 1.85 | 23.15 | 0.01 | 0.17 |
| 20 | 1.83 | 24.72 | 0.02 | 0.23 |
| 30 | 1.82 | 26.42 | 0.02 | 0.33 |
| 40 | 1.82 | 27.27 | 0.02 | 0.43 |
| 50 | 1.81 | 27.87 | 0.02 | 0.53 |
| 60 | 1.81 | 28.34 | 0.01 | 0.67 |
| 80 | 1.81 | 29.05 | 0.03 | 0.92 |
| 100 | 1.80 | 29.38 | 0.02 | 0.97 |
| 150 | 1.78 | 30.97 | 0.06 | 1.73 |
| 200 | 1.76 | 30.68 | 0.10 | 2.25 |
| 300 | 1.69 | 30.61 | 0.20 | 3.04 |
| 400 | 1.60 | 32.40 | 0.30 | 3.66 |
| 450 | 1.55 | 32.90 | 0.36 | 3.85 |
| 500 | 1.51 | 32.27 | 0.41 | 4.00 |
| 550 | 1.49 | 31.72 | 0.45 | 4.18 |
| 600 | 1.46 | 31.97 | 0.49 | 4.35 |
| 700 | 1.39 | 32.93 | 0.57 | 4.51 |
| 800 | 1.35 | 31.67 | 0.63 | 4.51 |
| 900 | 1.32 | 30.63 | 0.69 | 4.32 |
| 950 | 1.31 | 30.44 | 0.70 | 4.24 |
| 1000 | 1.30 | 30.22 | 0.71 | 4.06 |
| 1050 | 1.30 | 29.75 | 0.72 | 3.85 |
| 1100 | 1.30 | 29.02 | 0.72 | 3.61 |
| 1200 | 1.33 | 27.75 | 0.70 | 3.22 |
| 1300 | 1.35 | 26.75 | 0.68 | 2.80 |
| 1400 | 1.40 | 25.71 | 0.65 | 2.40 |
| 1450 | 1.42 | 24.94 | 0.63 | 2.24 |
| 1500 | 1.44 | 24.65 | 0.62 | 2.11 |
| 1550 | 1.45 | 23.72 | 0.62 | 1.96 |
| 1600 | 1.47 | 23.83 | 0.60 | 1.80 |
| 1700 | 1.53 | 23.08 | 0.57 | 1.67 |
| 1750 | 1.56 | 22.33 | 0.55 | 1.68 |
| 1800 | 1.58 | 22.17 | 0.54 | 1.70 |
| 1850 | 1.60 | 21.79 | 0.53 | 1.78 |
| 1900 | 1.62 | 21.56 | 0.51 | 1.89 |
| 1950 | 1.66 | 21.38 | 0.49 | 2.03 |
| 2000 | 1.70 | 20.97 | 0.48 | 2.14 |

## *Typical Performance Data*

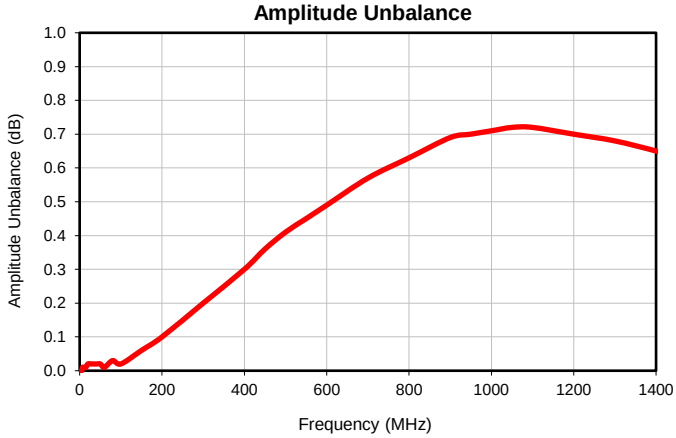
**Average Insertion Loss**



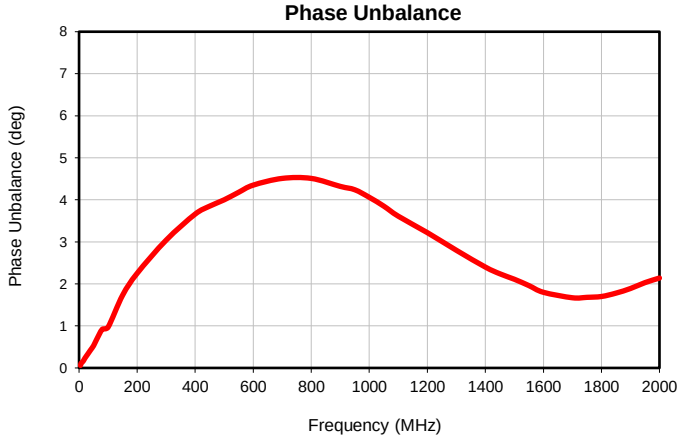

**Input Return Loss**




**Amplitude Unbalance**



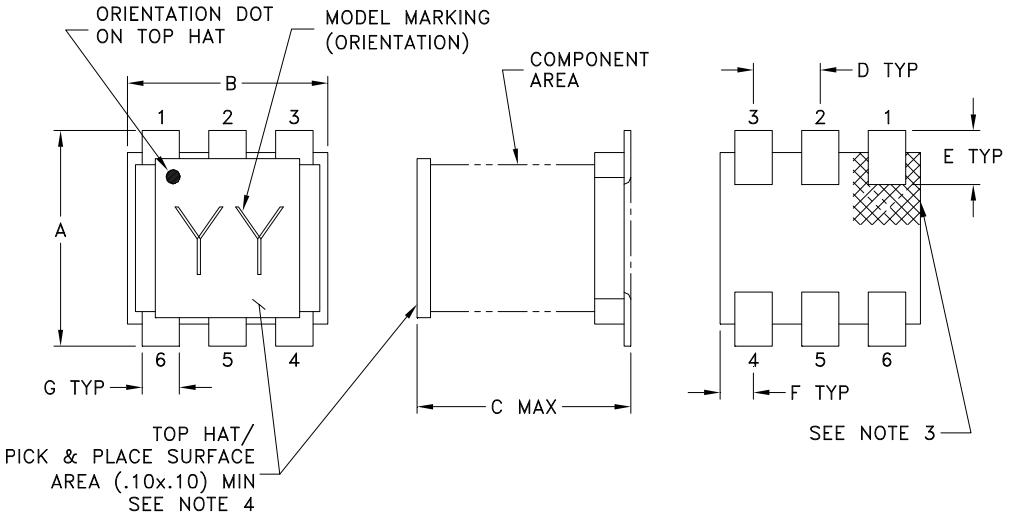

**Phase Unbalance**



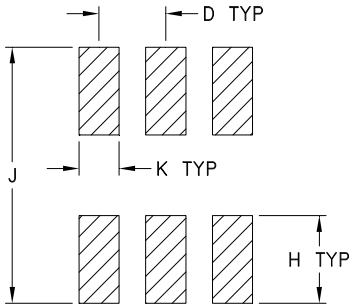
# Case Style DB

**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**

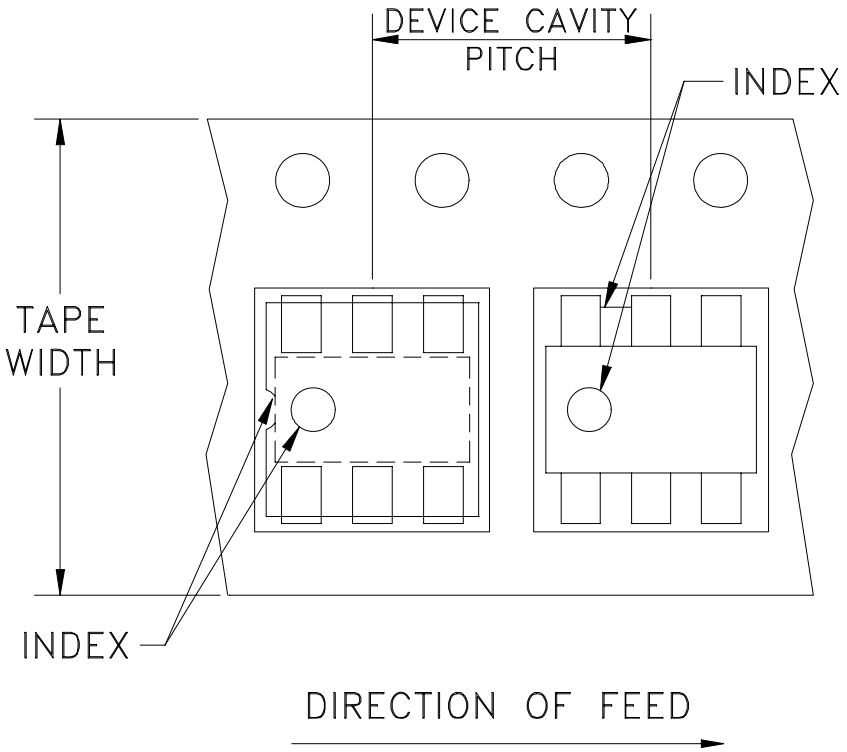
### Notes:

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

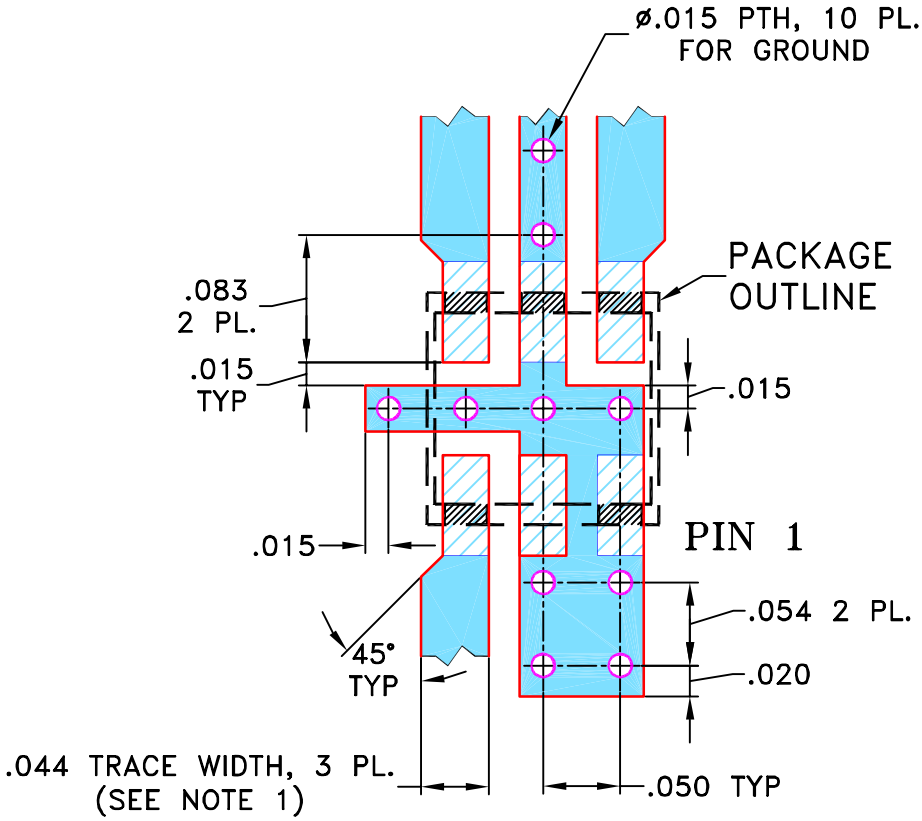
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THIRD ANGLE PROJECTION

| 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:
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

| 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

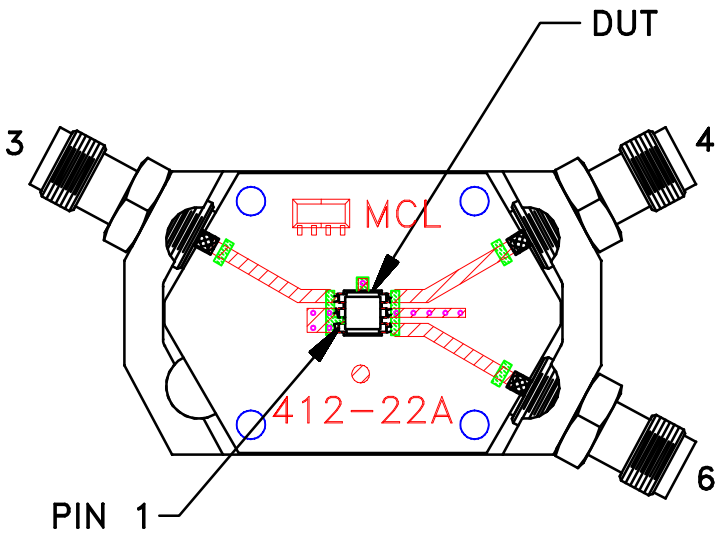

PL, 06TN01/06TK04, DB1627, TB-654+

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

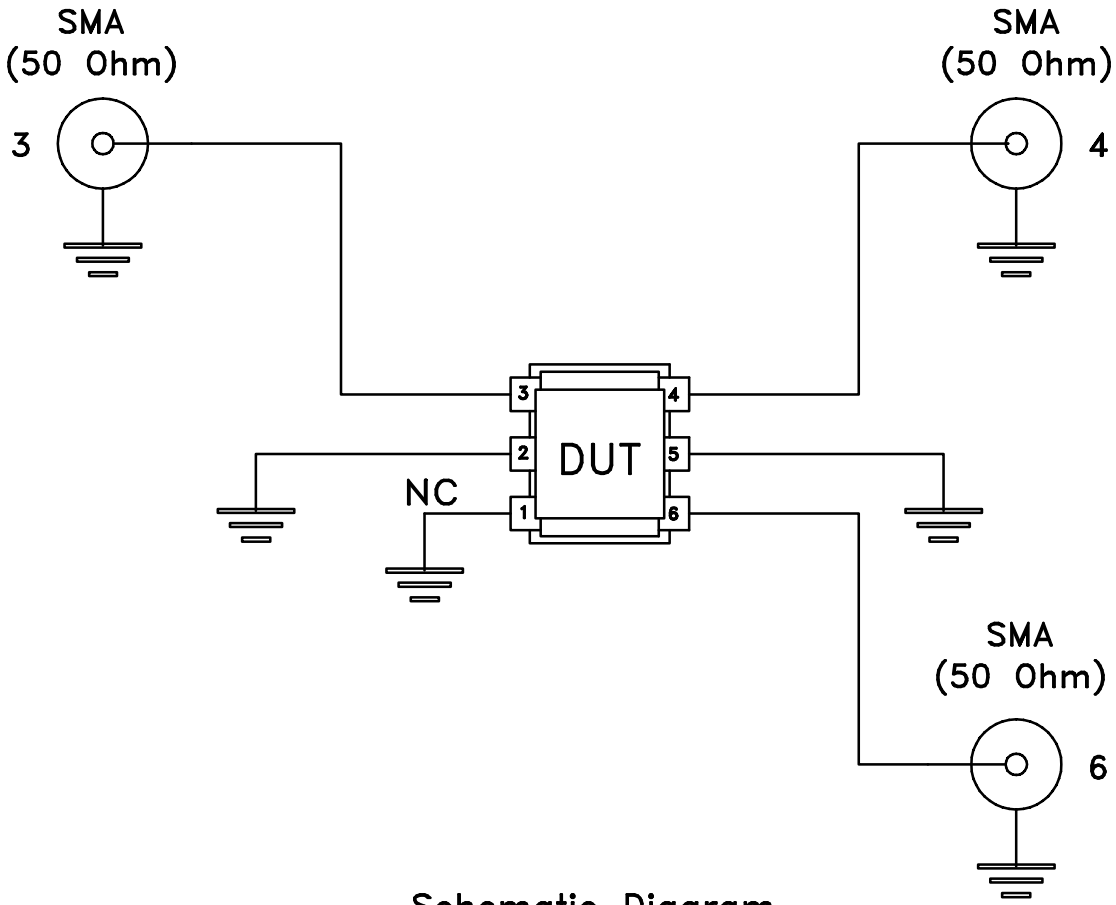
| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL364 | 8:1 | 1 OF 1 |

# Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT




TB-TCM218275X+




Schematic Diagram

Note:

50 Ohm SMA Female connectors.

Mini-Circuits®

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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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