MMIC WIDEBAND

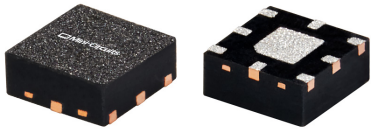
# Bias Tee

## MBT-44+

50Ω 10 to 40 GHz

### THE BIG DEAL

- Ultra Wideband, 10-40 GHz
- Low Insertion Loss, 1 dB Typ.
- Good Return Loss, 15 dB Typ.
- Excellent Isolation, 46 dB Typ.



*Generic photo used for illustration purposes only*

CASE STYLE: JV3002

***+RoHS Compliant***

*The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications*

### APPLICATIONS

- Biasing Amplifiers
- Biasing Laser Diodes
- Biasing of Active Antennas

### PRODUCT OVERVIEW

Mini-Ciruits' MBT-44+ is an ultra-wideband MMIC Surface mount bias tee covering applications from 10 GHz to 40 GHz with low insertion loss, good return loss, and high DC-RF isolation over its entire operating frequency range. This model is capable of handling up to +30 dBm (1W) RF Input power and DC input current up to 500 mA. MBT-44+ is enclosed in a 2.5 mm x 2.5 mm 8L MCLP package.

### KEY FEATURES

| Feature | Advantages |
|---|---|
| Ultra-Wideband, 10 to 40 GHz | Supports a wide range of applications with a single device, including biasing broadband amplifier, laser diodes, active antennas and more. |
| Excellent DC-RF isolation<br>• 35 dB, 10-25 GHz<br>• 43 dB, 25-30 GHz<br>• 46 dB, 30-40 GHz | Minimizes RF Leakage and Interference with other elements in the system. |
| Good Return Loss, 15 dB Typ. | Provides excellent matching for 50 Ohm system with minimal signal reflection |
| RF power handling up to 1W | This model supports applications with a variety of power requirements. |
| Low Insertion Loss, 1dB Typ. | Minimizes RF leakage and interference with other elements in the system. |

REV. A
ECO-010382
MBT-44+
GY/CP/PS
211102

## ELECTRICAL SPECIFICATIONS[1] AT 25°C, UNLESS NOTED

| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | 10000 | | 40000 | MHz |
| Insertion Loss | 10000-25000 | - | 0.5 | 1.2 | dB |
| | 25000-30000 | - | 0.8 | 1.6 | |
| | 30000-35000 | - | 1.1 | 2.1 | |
| | 35000-40000 | - | 1.0 | 2.1 | |
| Return Loss | 10000-25000 | - | 24.4 | - | dB |
| | 25000-30000 | - | 17.9 | - | |
| | 30000-35000 | - | 13.1 | - | |
| | 35000-40000 | - | 15.3 | - | |
| Isolation (RF Port to DC Port) | 10000-25000 | 20 | 34.2 | - | dB |
| | 25000-30000 | 20 | 43.0 | - | |
| | 30000-35000 | 20 | 46.2 | - | |
| | 35000-40000 | 20 | 45.4 | - | |
| DC resistance from DC to RF & DC port | | - | 1.3 | - | Ohm |

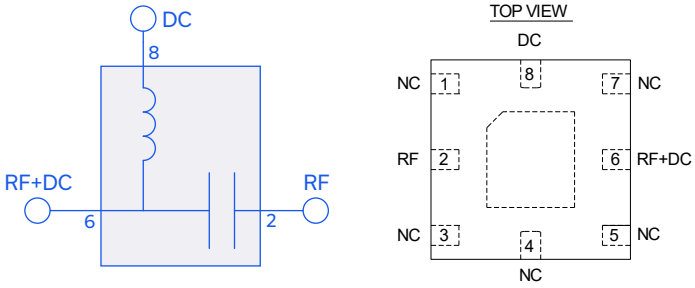
1. Measured on Mini-Circuits Characterization test Board TB-MBT-44+. See Characterization Test Circuit. (Figure 1)

## MAXIMUM RATINGS[2]

| Parameter | Ratings |
|---|---|
| Operating Temperature | -40°C to 85°C |
| Storage Temperature | -65°C to 150°C |
| RF Power at DC & RF Port | 30 dBm |
| Voltage at DC Port | 35V |
| Current at DC Port | 500 mA |

2. Permanent damage may occur if any of those limits are exceeded.
Electrical maximum ratings are not intended for continuous normal operation.

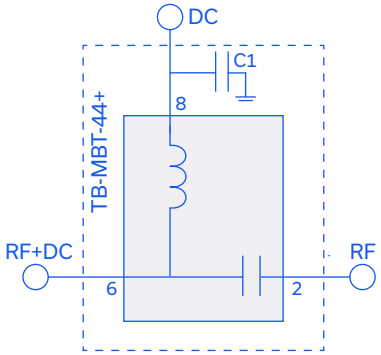
## SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION




## PAD CONNECTIONS

| Function | Pad Number | Description (Fig. 1) |
|---|---|---|
| RF | 2 | RF Pad |
| RF + DC | 6 | RF + DC Pad |
| DC | 8 | DC Pad, Connects DC Port Via C1 |
| N/C | 1,3,4,5,7 | No connection, grounded on Test Board. |
| GROUND | Paddle | Ground |

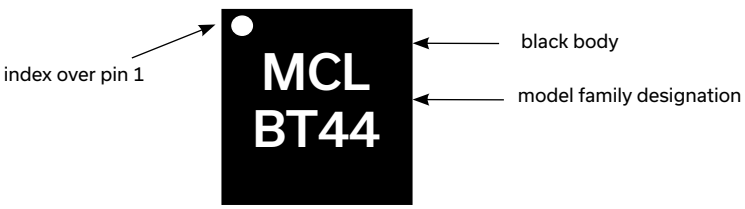
## CHARACTERIZATION TEST & APPLICATION CIRCUIT




| Component | Value | Size | Part Number | Manufacturer |
|---|---|---|---|---|
| C1 | 100pF | 0402 | GRM1555C1H101JA01D | Murata |

Fig 1. Block Diagram of Test Circuit used for characterization. Test Board TB-MBT-44+
Parameter to measure: Insertion Loss, Isolation, Return Loss
Condition: Pin = 0 dBm

## PRODUCT MARKING




Marking may contain other features or characters for internal lot control

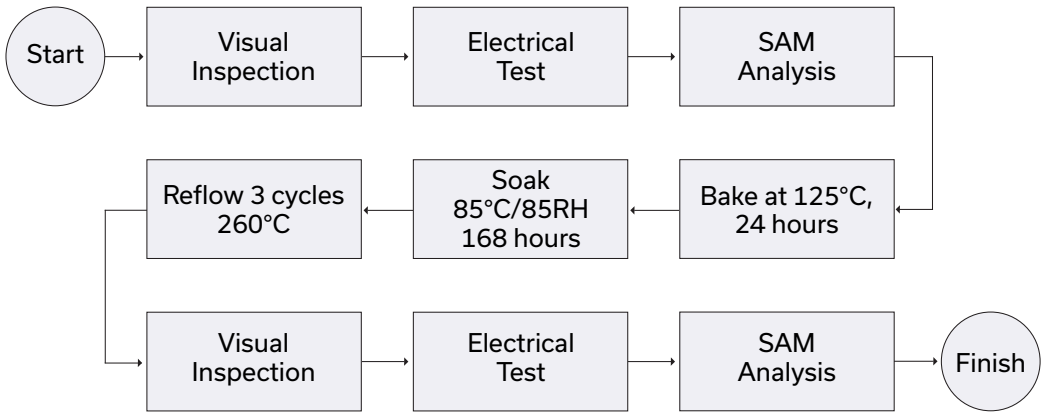
## ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS CLICK HERE

| | |
|---|---|
| **Performance Data** | Data Table<br>Swept Graphs<br>S-Parameter (S3P Files) Data Set (.zip file) |
| **Case Style** | JV3002 Plastic package, exposed paddle, lead finish: Matt Tin |
| **Tape & Reel**<br>**Standard quantities available on reel** | TR-F68<br>7" reels with 20, 50, 100, 200, 500 or 1K devices |
| **Suggested Layout for PCB Design** | PL-717 |
| **Evaluation Board** | TB-MBT-44+ & TB-MBT-44C+ |
| **Environmental Ratings** | ENV129 |

## ESD RATING
Human Body Model (HBM): Class 1B (500 V) in accordance with ANSI/ESD STM 5.1 - 2001

## MSL RATING
Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

## MSL TEST FLOW CHART



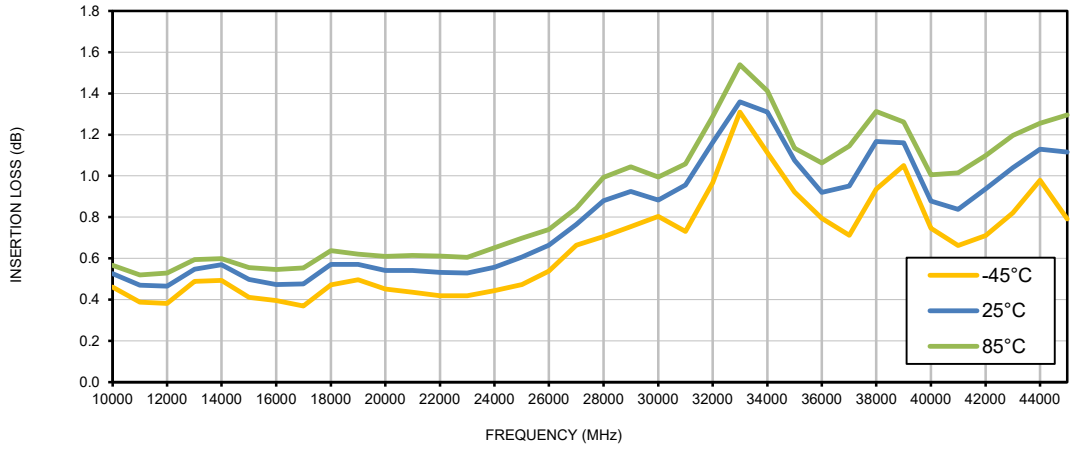

NOTES
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's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

*Typical Performance Curves*

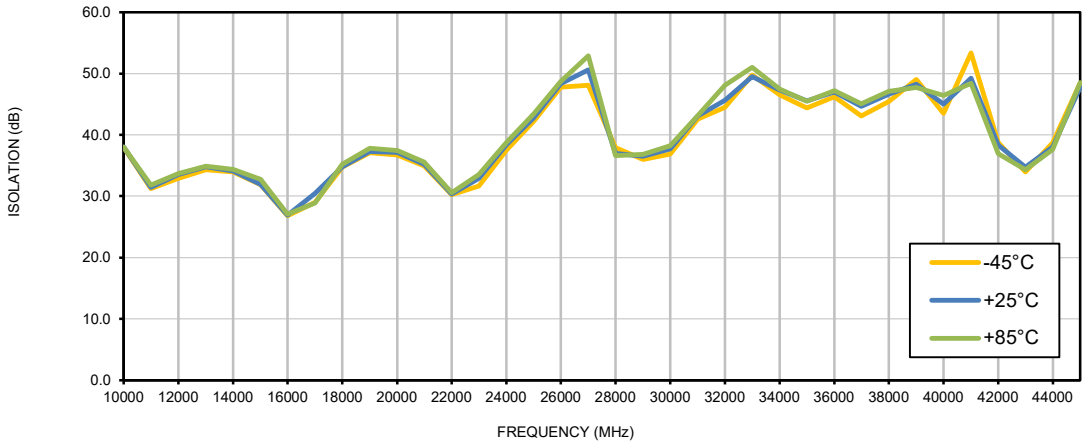
| FREQ. | INSERTION LOSS RF - RF&DC (dB) | | | ISOLATION RF&DC - DC (dB) | | | VSWR RF&DC (:1) | | |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | -45°C | 25°C | 85°C | -45°C | 25°C | 85°C | -45°C | 25°C | 85°C |
| 10000 | 0.46 | 0.53 | 0.57 | 37.98 | 38.04 | 38.06 | 1.35 | 1.32 | 1.28 |
| 11000 | 0.39 | 0.47 | 0.52 | 31.24 | 31.45 | 31.81 | 1.11 | 1.12 | 1.12 |
| 12000 | 0.38 | 0.46 | 0.53 | 32.91 | 33.54 | 33.66 | 1.23 | 1.21 | 1.23 |
| 13000 | 0.49 | 0.55 | 0.59 | 34.36 | 34.76 | 34.90 | 1.39 | 1.33 | 1.29 |
| 14000 | 0.49 | 0.57 | 0.60 | 33.94 | 34.12 | 34.39 | 1.27 | 1.26 | 1.19 |
| 15000 | 0.41 | 0.50 | 0.56 | 31.87 | 31.95 | 32.74 | 1.09 | 1.09 | 1.10 |
| 16000 | 0.39 | 0.47 | 0.55 | 26.78 | 26.93 | 27.07 | 1.05 | 1.04 | 1.06 |
| 17000 | 0.37 | 0.48 | 0.55 | 29.03 | 30.47 | 28.90 | 1.10 | 1.12 | 1.13 |
| 18000 | 0.47 | 0.57 | 0.64 | 34.71 | 34.78 | 35.22 | 1.27 | 1.26 | 1.25 |
| 19000 | 0.50 | 0.57 | 0.62 | 37.08 | 37.30 | 37.78 | 1.30 | 1.23 | 1.18 |
| 20000 | 0.45 | 0.54 | 0.61 | 36.72 | 37.13 | 37.48 | 1.11 | 1.11 | 1.11 |
| 21000 | 0.44 | 0.54 | 0.61 | 34.98 | 35.20 | 35.59 | 1.16 | 1.13 | 1.14 |
| 22000 | 0.42 | 0.53 | 0.61 | 30.24 | 30.35 | 30.57 | 1.10 | 1.09 | 1.09 |
| 23000 | 0.42 | 0.53 | 0.60 | 31.68 | 32.89 | 33.54 | 1.09 | 1.06 | 1.03 |
| 24000 | 0.44 | 0.56 | 0.65 | 37.51 | 38.38 | 38.78 | 1.11 | 1.07 | 1.12 |
| 25000 | 0.47 | 0.61 | 0.70 | 42.23 | 42.82 | 43.43 | 1.14 | 1.15 | 1.19 |
| 26000 | 0.54 | 0.67 | 0.74 | 47.80 | 48.36 | 48.71 | 1.19 | 1.21 | 1.18 |
| 27000 | 0.66 | 0.76 | 0.85 | 48.10 | 50.61 | 52.90 | 1.38 | 1.31 | 1.27 |
| 28000 | 0.71 | 0.88 | 0.99 | 37.92 | 36.98 | 36.59 | 1.45 | 1.47 | 1.48 |
| 29000 | 0.75 | 0.92 | 1.04 | 35.98 | 36.48 | 36.86 | 1.52 | 1.52 | 1.53 |
| 30000 | 0.80 | 0.88 | 0.99 | 36.88 | 37.71 | 38.23 | 1.53 | 1.42 | 1.41 |
| 31000 | 0.73 | 0.96 | 1.06 | 42.54 | 43.07 | 43.14 | 1.36 | 1.41 | 1.36 |
| 32000 | 0.97 | 1.16 | 1.29 | 44.53 | 45.63 | 48.13 | 1.54 | 1.56 | 1.54 |
| 33000 | 1.31 | 1.36 | 1.54 | 49.76 | 49.51 | 51.02 | 1.99 | 1.79 | 1.84 |
| 34000 | 1.11 | 1.31 | 1.41 | 46.56 | 47.33 | 47.43 | 1.76 | 1.74 | 1.71 |
| 35000 | 0.92 | 1.08 | 1.13 | 44.37 | 45.54 | 45.50 | 1.50 | 1.48 | 1.36 |
| 36000 | 0.79 | 0.92 | 1.06 | 46.19 | 47.00 | 47.23 | 1.41 | 1.30 | 1.28 |
| 37000 | 0.71 | 0.95 | 1.15 | 43.10 | 44.67 | 45.03 | 1.32 | 1.38 | 1.46 |
| 38000 | 0.94 | 1.17 | 1.31 | 45.44 | 46.63 | 47.13 | 1.61 | 1.60 | 1.61 |
| 39000 | 1.05 | 1.16 | 1.26 | 49.04 | 48.27 | 47.72 | 1.69 | 1.53 | 1.46 |
| 40000 | 0.75 | 0.88 | 1.01 | 43.50 | 45.00 | 46.45 | 1.27 | 1.19 | 1.10 |
| 41000 | 0.66 | 0.84 | 1.01 | 53.37 | 49.25 | 48.43 | 1.17 | 1.11 | 1.17 |
| 42000 | 0.71 | 0.94 | 1.10 | 38.75 | 38.35 | 36.94 | 1.13 | 1.15 | 1.18 |
| 43000 | 0.82 | 1.04 | 1.20 | 33.97 | 34.71 | 34.35 | 1.20 | 1.14 | 1.14 |
| 44000 | 0.98 | 1.13 | 1.26 | 38.69 | 38.05 | 37.59 | 1.32 | 1.14 | 1.09 |
| 45000 | 0.79 | 1.12 | 1.30 | 48.44 | 47.75 | 48.52 | 1.12 | 1.15 | 1.16 |

*Typical Performance Curves*

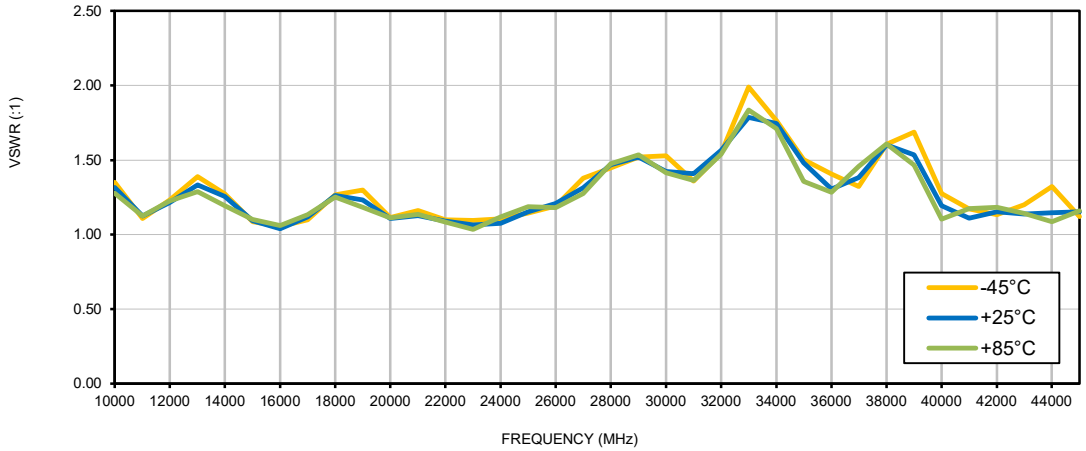
**INSERTION LOSS**
(RF - RF&DC)




**ISOLATION**
(RF&DC - DC)



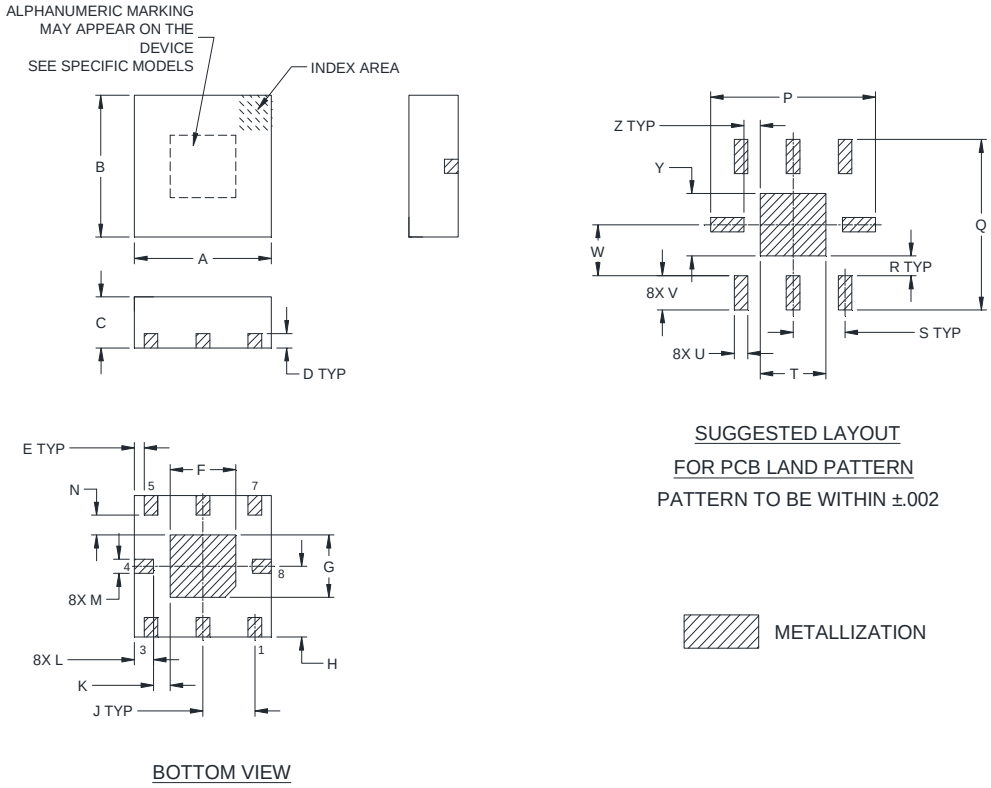

**VSWR**
(RF&DC)



# Case Style JV

## Outline Dimensions

**JV3002**




| CASE # | A | B | C | D | E | F | G | H | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JV3002 | .098 (2.50) | .098 (2.50) | .035 (.90) | .010 (.25) | .007 (.18) | .047 (1.20) | .043 (1.10) | .049 (1.25) | .037 (.95) | .012 (.30) | .014 (.35) | .010 (.25) |

| CASE # | N | P | Q | R | S | T | U | V | W | Y | Z | WEIGHT (GRAMS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JV3002 | .014 (.35) | .118 (3.01) | .118 (3.01) | .014 (.35) | .037 (.95) | .047 (1.20) | .010 (.25) | .024 (.60) | .035 (.90) | .043 (1.10) | .012 (.30) | 0.016 |

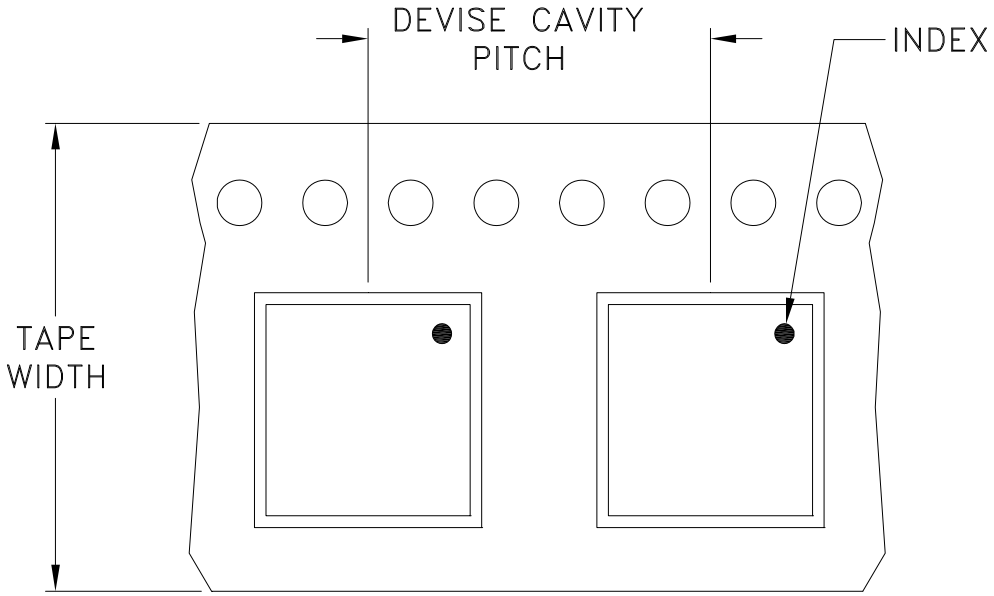
**Dimensions are in inches (mm). Tolerances: 3 Pl. ±.002[.050]**

**Notes:**

1. Open style, Plastic.
2. Termination finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Matte-Tin plate.
3. Pad tolerance is non-cumulative. Minimum spacing between each pad is .004.
4. Pin numbers do not appear on unit. For reference only.


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# Tape & Reel Packaging TR-F66-1




| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel see note | |
|---|---|---|---|---|
| 8 | 4 | 7 | Small quantity standard | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | 7 | 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

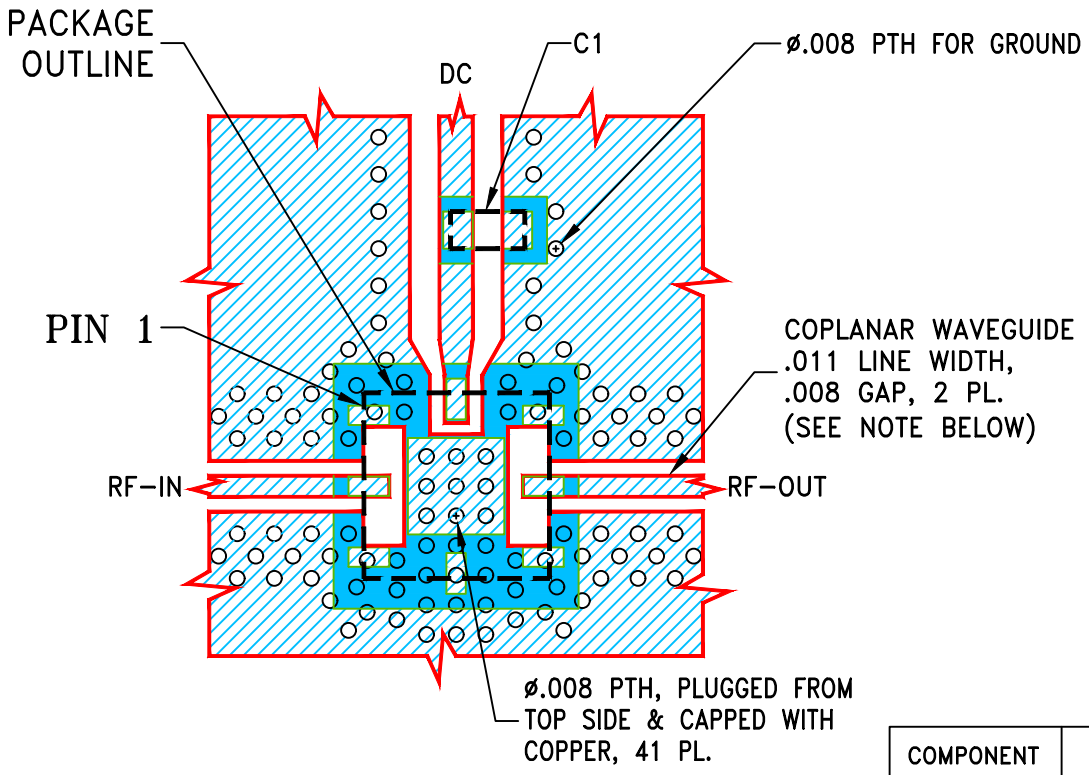
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THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | ECO-010195 | NEW RELEASE | 10/19/21 | ITG | IL |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION FOR JV3002 CASE STYLE




| COMPONENT | SIZE |
|---|---|
| C1 | 0402 |

NOTES:

1. TRACE WIDTH AND GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .0066±.0007"; COPPER: 1/2 OZ. EACH SIDE.
   FOR OTHER MATERIALS LINE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINT SHOWN FOR REFERENCE. FOR COMPONENT VALUE REFER TO TB-MBT-44+.
3. 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 | ITG | 10/19/21 |
| TOLERANCES ON: | CHECKED | GF | 10/19/21 |
| 2 PL DECIMALS ± | APPROVED | IL | 10/19/21 |
| 3 PL DECIMALS ± .003 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |

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

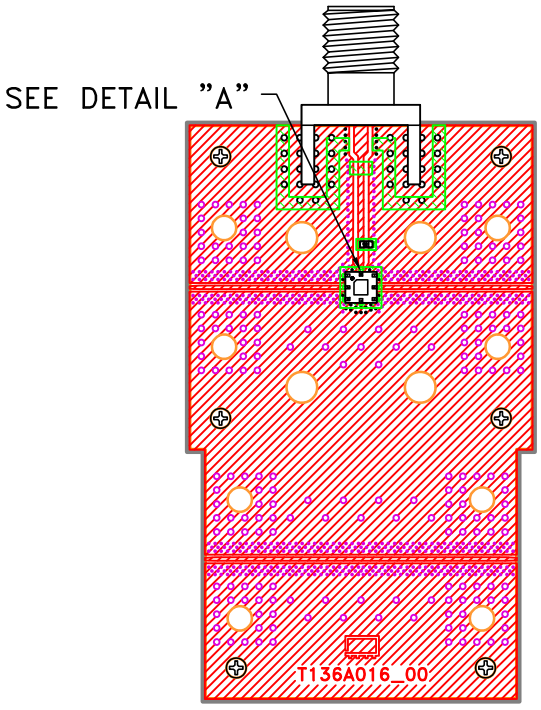
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

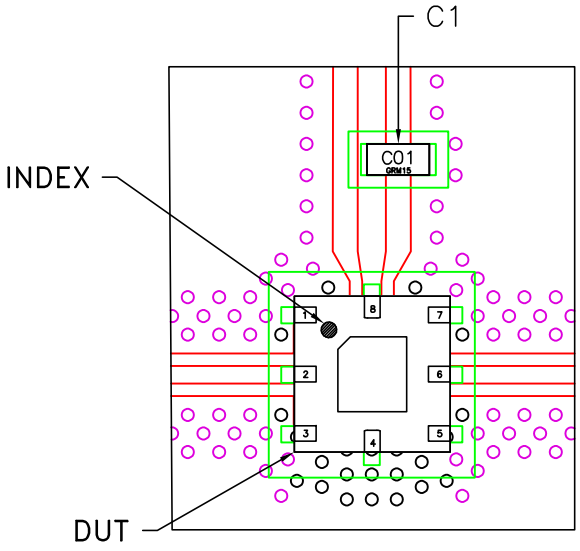
PL, JV3002, TB-MBT-44+

| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-717 | OR |

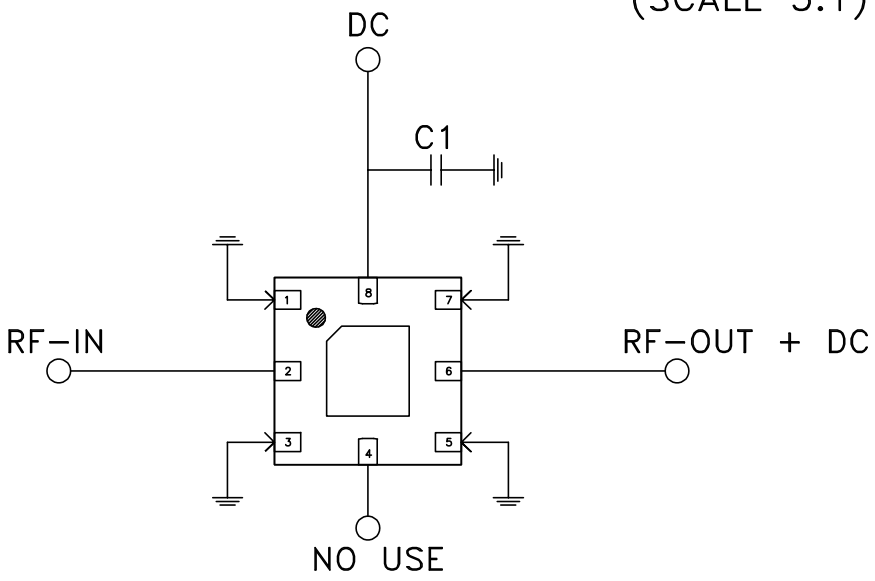
| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL717 | 10:1 | 1 OF 1 |

# Evaluation Board and Circuit




DETAIL "A"
(SCALE 5:1)




SCHEMATIC DIAGRAM
(SCALE 5:1)

| Component | Size | Value | Part Number | Manufacturer |
|---|---|---|---|---|
| C1 | 0402 | 100pF | GRM1555C1H101JA01D | Murata |

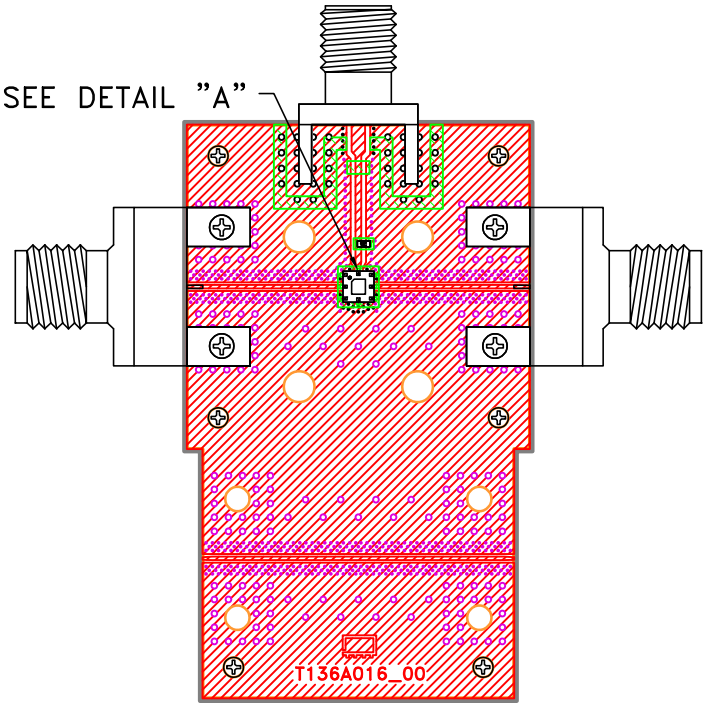
NOTES:

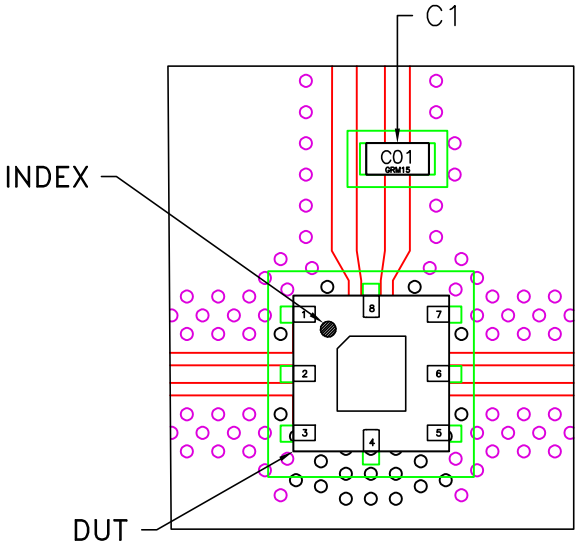
1. 2.4mm Female Connectors.
2. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.0066 inch

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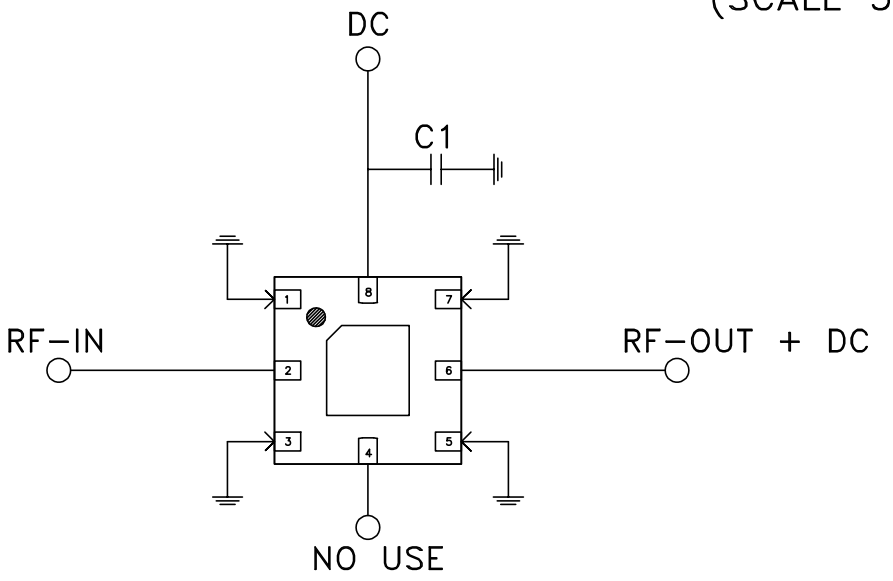

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# Evaluation Board and Circuit




DETAIL "A"
(SCALE 5:1)




SCHEMATIC DIAGRAM
(SCALE 5:1)

| Component | Size | Value | Part Number | Manufacturer |
|---|---|---|---|---|
| C1 | 0402 | 100pF | GRM1555C1H101JA01D | Murata |

NOTES:

1. 2.4mm Female Connectors.
2. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.0066 inch

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Mini-Circuits

# Environmental Specifications ENV129

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 | -65° to 150° C<br>Ambient Environment | Individual Model Data Sheet |
| Temperature Cycling | -65° C to 150°C, 500 cycles<br>Dwell Time: 10 min | JESD22-A104E,Test Condition C |
| Autoclave | 29.7 psia, 100% RH, 121°C, 96 Hours | JESD22-A102E, Test Condition C |
| HAST | 150°C, 168 Hours | JESD22-A103E, Test Condition B |
| Solderability (Dip&Look Method | SnAgCu Solder Pot: 245°C, Steam: 93°C, 8 Hours | JESD22-B102E, Method 1 |
| Moisture Sensitivity: Level 1 | Bake at 125°C for 24 hours<br>Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak | J-STD-020E, Level 1 |


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