MICROWAVE PRECISION

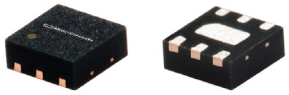
# Fixed Attenuator

# YAT-3A+

50Ω 2 W 3 dB DC to 18 GHz

## THE BIG DEAL

- Exceptional Power Handling
- Wide Bandwidth, DC to 18 GHz
- Miniature Package MCLP™ 2 x 2 mm
- Excellent Attenuation Accuracy & Flatness



*Generic photo used for illustration purposes only*

CASE STYLE: MC1630

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

## APPLICATIONS

- Cellular
- PCS
- Communications
- Radar
- Defense

## PRODUCT OVERVIEW

YAT-3A+ (RoHS compliant) is a fixed value, absorptive MMIC attenuator fabricated using highly repetitive IPD process technology with thin film resistors on GaAs substrates. This design incorporates through-wafer metallization vias to realize low thermal resistance and wideband operation with outstanding attenuation accuracy and flatness over its full operating bandwidth. YAT-A family attenuators are available with nominal attenuation values of 0 to 10 dB (in 1 dB steps), 12, 15, 20, and 30 dB. Packaged in a tiny 2 x 2 mm MCLP™ package, it's ideal for tight spaces in crowded board layouts. Also available in die form (YAT-3A-DG+).

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Wideband Operation, DC to 18 GHz | Supports a wide array of applications including wireless cellular, microwave communications, satellite, defense and aerospace, medical broadband and optic applications. |
| Small Size and Simple to Use (2 x 2 mm) | As a single chip solution, the YAT-A series occupies less board space than a "T" or "Pi" pad configuration, and ensures repeatable performance over wide frequency ranges. |
| High Power, Up to 2 W | High power handling in a small size package. |
| Wide Range of Nominal Attenuation Values 0 to 10 dB (in 1 dB steps), and 12, 15, 20, and 30 dB | Small increment offering enables circuit designer to change attenuation values without motherboard redesign making the YAT-A series ideal for select at test application. |
| MCLP™ Package | Low Inductance, repeatable transitions, excellent thermal path make the YAT-A series an ideal solution as an alternative to "do it yourself" resistor based attenuators. |

REV. B
ECO-024948
YAT-3A+
MCL NY
250318

# Fixed Attenuator

## YAT-3A+

50Ω 2 W 3 dB DC to 18 GHz

## ELECTRICAL SPECIFICATIONS[1] AT +25°C, 50Ω (CPW)

| Parameter | Frequency (GHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Frequency Range | | DC | | 18 | GHz |
| Attenuation | DC - 5 | 2.6 | 2.90 | 3.3 | dB |
| | 5 - 15 | 2.5 | 2.98 | 3.5 | |
| | 15 - 18 | 2.5 | 3.11 | 3.8 | |
| VSWR | DC - 5 | | 1.11 | 1.25 | :1 |
| | 5 - 15 | | 1.20 | 1.7 | |
| | 15 - 18 | | 1.37 | 1.9 | |

1. Tested on Mini-Circuits test board TB-YAT-3A+ using coplanar wave guide (CPW) input and output traces (see suggested PCB layout on page 3 of this data sheet).

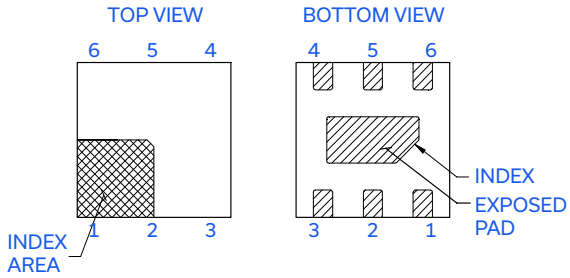
## ABSOLUTE MAXIMUM RATINGS[2]

| Parameter | Ratings |
|---|---|
| Operating Case Temperature[3] | -40°C to +85°C |
| Storage Temperature | -65°C to +150°C |
| RF Input Power[4] | 2 W |

2. Permanent damage may occur if any of these limits are exceeded.
3. Case is defined as ground lead.
4. RF Power at +25°C case temperature: 2.0 Watt. Derate linearly to 1.0 W at +85°C.

## PAD DESCRIPTION

| Function | Pad Number | Description |
|---|---|---|
| RF-IN | 2 | RF input pad |
| RF-OUT | 5 | RF output pad |
| GND | 1,3,4,6 Bottom Exposed Pad | Connected to ground externally |




## CHARACTERIZATION TEST CIRCUIT

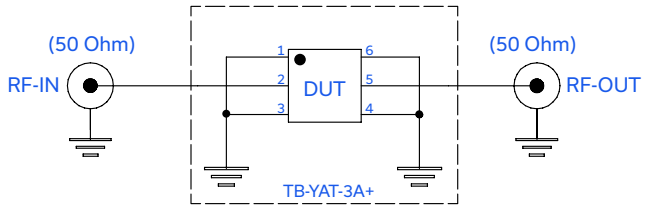
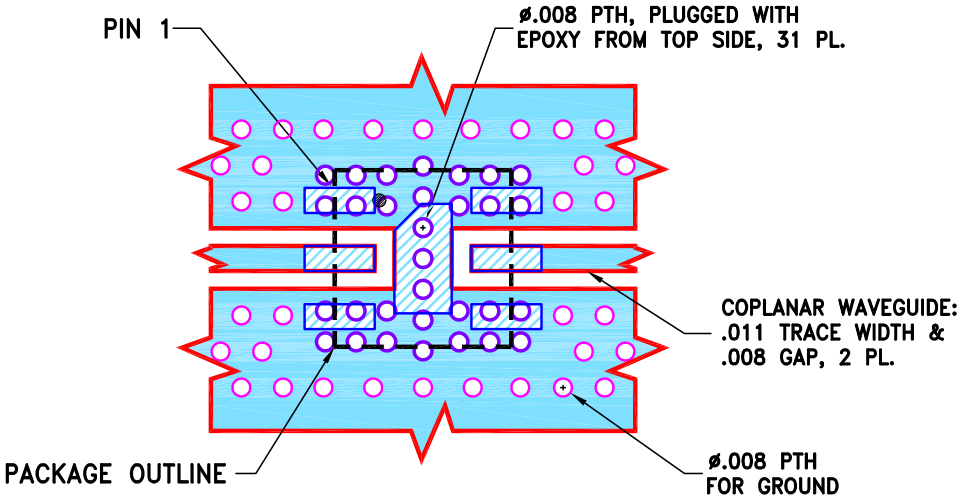



Fig 1. Block diagram of Test Circuit used for characterization, Test board TB-YAT-3A+
Conditions: Attenuation, VSWR: $P_{IN}$=-10 dBm

## SUGGESTED PCB LAYOUT (PL-586)

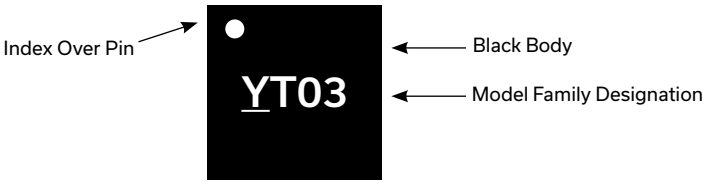



NOTES:
1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .0066±.0007. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

## PRODUCT MARKING




Marking may contain other features or characters for internal lot control.

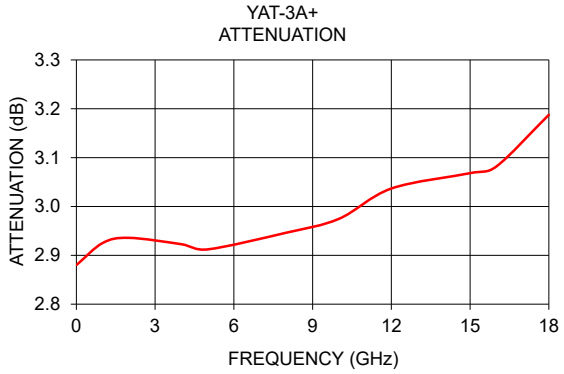
# Fixed Attenuator

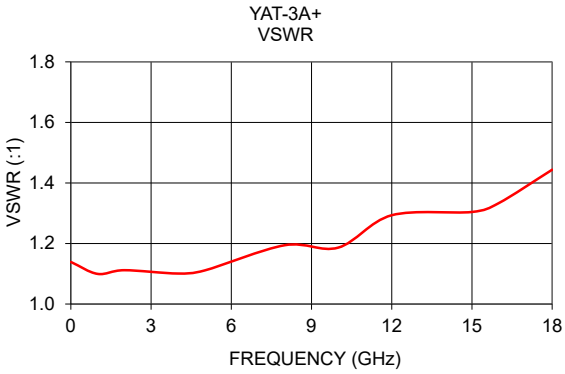
## YAT-3A+

50Ω 2 W 3 dB DC to 18 GHz

### TYPICAL PERFORMANCE DATA AT +25°C

| Frequency (GHz) | Attenuation (dB) | VSWR (:1) |
|---|---|---|
| 0.010 | 2.88 | 1.14 |
| 1.0 | 2.93 | 1.10 |
| 2.0 | 2.94 | 1.11 |
| 4.0 | 2.92 | 1.10 |
| 5.0 | 2.91 | 1.11 |
| 8.0 | 2.95 | 1.19 |
| 10.0 | 2.97 | 1.19 |
| 12.0 | 3.04 | 1.29 |
| 15.0 | 3.07 | 1.30 |
| 16.0 | 3.08 | 1.33 |
| 18.0 | 3.19 | 1.44 |



# Fixed Attenuator

## YAT-3A+

50Ω 2 W 3 dB DC to 18 GHz

**ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.** CLICK HERE

| | |
|---|---|
| **Performance Data** | Data Table<br>Swept Graphs |
| **Case Style** | MC1630 Plastic package, Terminal finish: Matte Tin Plate |
| **Tape & Reel**<br>**Standard Quantities Available on Reel** | F108<br>7" Reels with 20, 50, 100, 200, 500, 1K, 2K, or 3K devices |
| **Suggested Layout for PCB Design** | PL-586 |
| **Evaluation Board** | TB-YAT-3A+ |
| **Environmental Ratings** | ENV08T1 |

## ESD RATING*

| | Class | Voltage Range | Reference Standard |
|---|---|---|---|
| HBM | Class 2 | >2000 V | ANSI/ESD STM 5.1-2001 |
| CDM | Class C3 | >1000 V | ANSI/ESDA/JEDEC JS-002-2022 |

* Tested in industry standard 2x2 mm, 6-lead MCLP package

## MSL RATING

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

NOTES

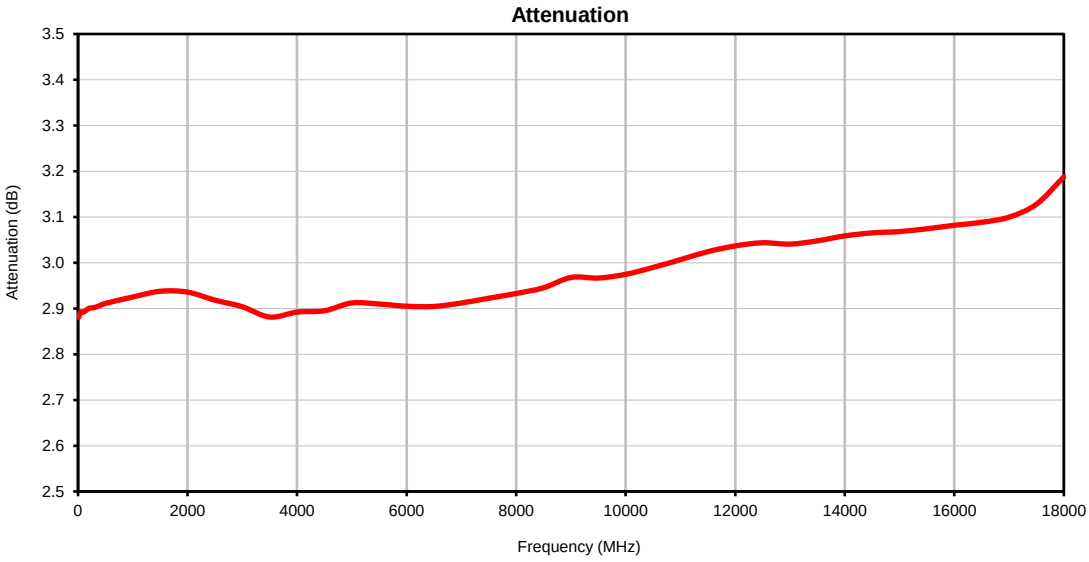
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B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
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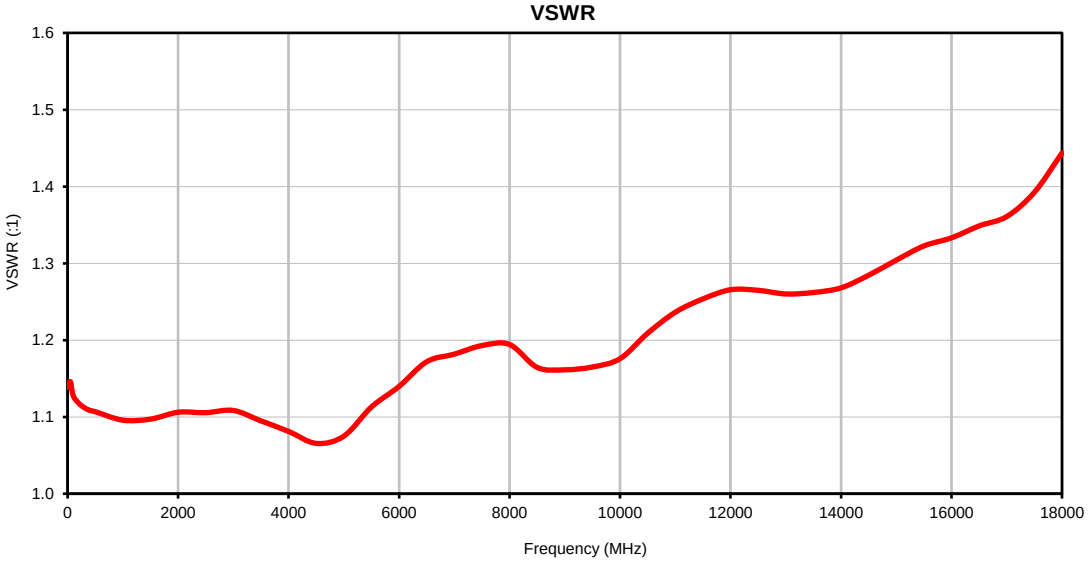
# Fixed Attenuator YAT-3A+

*Typical Performance Data*

| FREQUENCY (MHz) | ATTENUATION (dB) | VSWR (:1) |
|---|---|---|
| 10 | 2.88 | 1.14 |
| 50 | 2.89 | 1.15 |
| 100 | 2.89 | 1.13 |
| 200 | 2.90 | 1.12 |
| 300 | 2.90 | 1.11 |
| 400 | 2.91 | 1.11 |
| 500 | 2.91 | 1.11 |
| 1000 | 2.93 | 1.10 |
| 1500 | 2.94 | 1.10 |
| 2000 | 2.94 | 1.11 |
| 2500 | 2.92 | 1.11 |
| 3000 | 2.90 | 1.11 |
| 3500 | 2.88 | 1.09 |
| 4000 | 2.89 | 1.08 |
| 4500 | 2.90 | 1.07 |
| 5000 | 2.91 | 1.07 |
| 5500 | 2.91 | 1.11 |
| 6000 | 2.90 | 1.14 |
| 6500 | 2.90 | 1.17 |
| 7000 | 2.91 | 1.18 |
| 7500 | 2.92 | 1.19 |
| 8000 | 2.93 | 1.19 |
| 8500 | 2.95 | 1.16 |
| 9000 | 2.97 | 1.16 |
| 9500 | 2.97 | 1.16 |
| 10000 | 2.97 | 1.18 |
| 10500 | 2.99 | 1.21 |
| 11000 | 3.01 | 1.24 |
| 11500 | 3.02 | 1.25 |
| 12000 | 3.04 | 1.27 |
| 12500 | 3.04 | 1.26 |
| 13000 | 3.04 | 1.26 |
| 13500 | 3.05 | 1.26 |
| 14000 | 3.06 | 1.27 |
| 14500 | 3.07 | 1.28 |
| 15000 | 3.07 | 1.30 |
| 15500 | 3.07 | 1.32 |
| 16000 | 3.08 | 1.33 |
| 16500 | 3.09 | 1.35 |
| 17000 | 3.10 | 1.36 |
| 17500 | 3.13 | 1.39 |
| 18000 | 3.19 | 1.44 |

## *Typical Performance Curves*

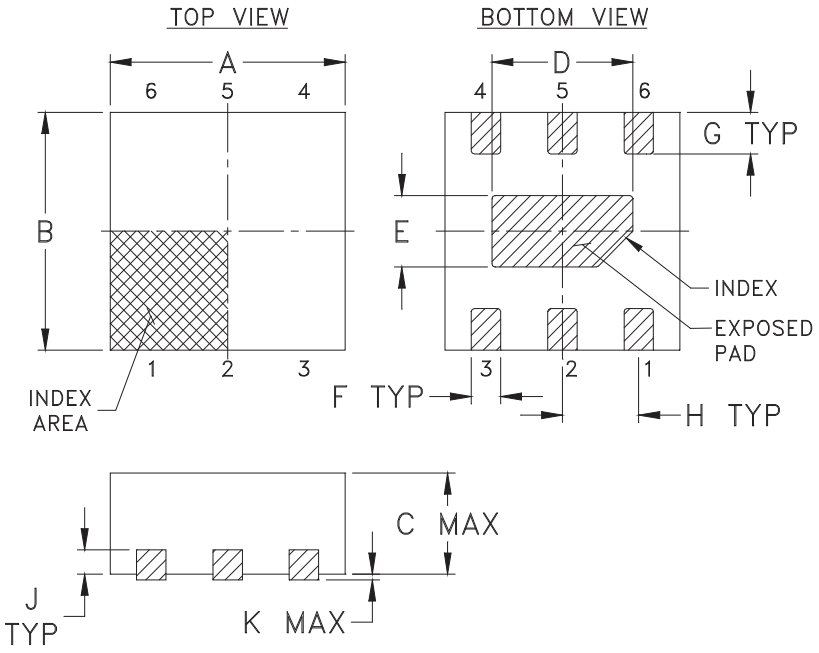


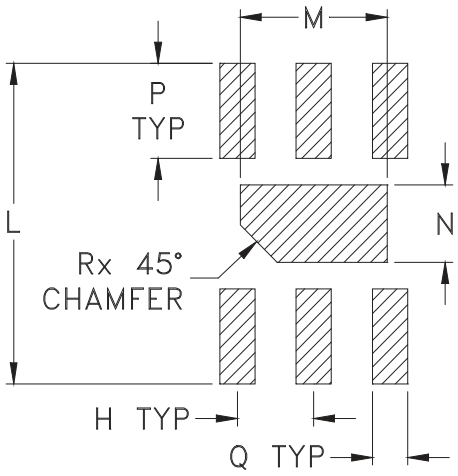
# Case Style MC

**MC1630**

## Outline Dimensions




### PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002

| CASE #. | A | B | C | D | E | F | G | H | J | K | L | M | N | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MC1630 | .079 (2.00) | .079 (2.00) | .031 (.80) | .047 (1.20) | .024 (.60) | .010 (.25) | .014 (.35) | .026 (.65) | .008 (.20) | .002 (.05) | .106 (2.70) | .049 (1.25) | .026 (.65) | .031 (.80) |

| CASE #. | Q | R | WT, GRAM |
|---|---|---|---|
| MC1630 | .012 (.30) | .012 (.30) | .006 |

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

**Notes:**

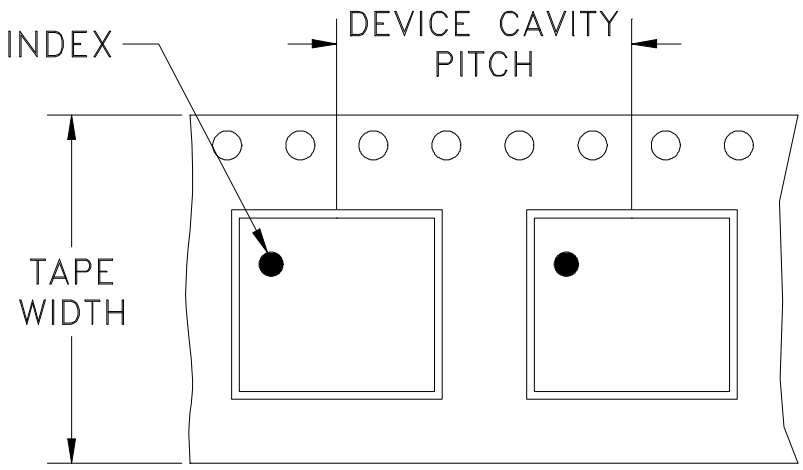
1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Matte Tin plate. All models, (+) suffix.
3. Lead #1 identifier shall be located in the cross-hatched area shown.
   Identifier may be either a molded or marked feature.



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# Tape & Reel Packaging TR-F108

DEVICE ORIENTATION IN T&R




DIRECTION OF FEED

| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|---|---|---|---|---|
| 12 | 4 | 7 | Small quantity standards | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | | | 1000 |
| | | 7 | Standard | 2000 |
| | | | | 3000 |

Note: Please Consult individual data sheet to determine device per reel availability

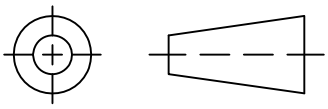
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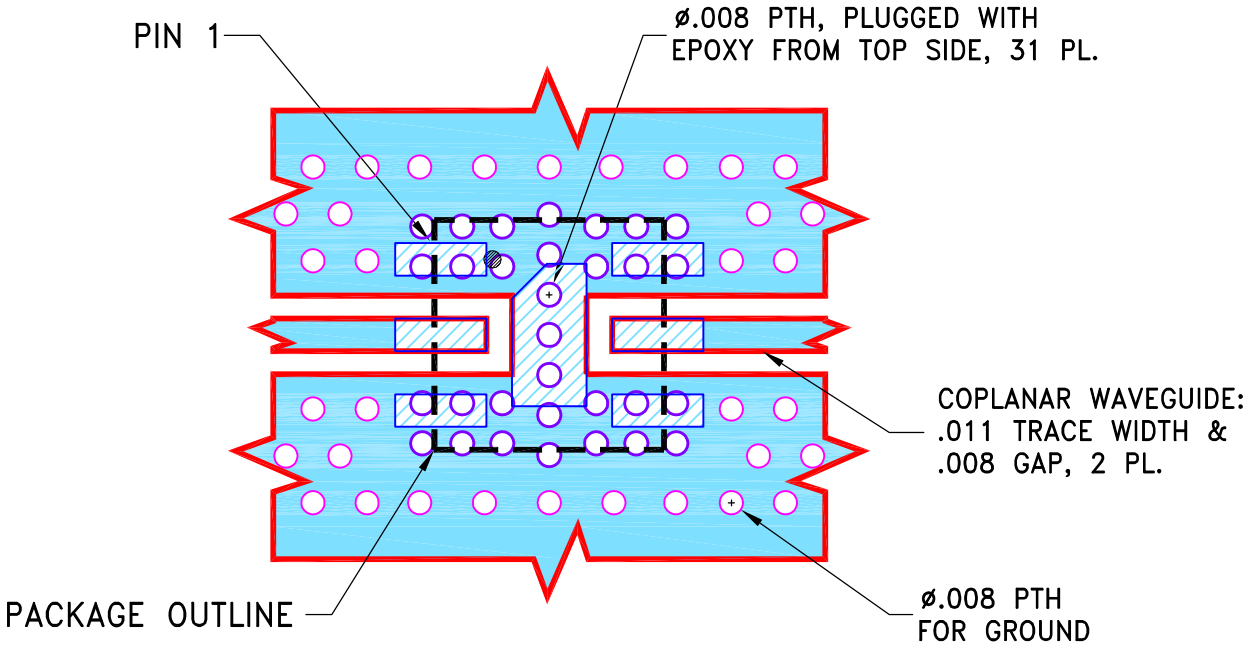
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
|---|---|---|---|---|---|
| 0R | M167874 | NEW RELEASE | 05/17/18 | ITG | RS |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION
# FOR MC1630-1 CASE STYLE, "06AF04" PIN CODE




NOTES:

1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .0066±.0007. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP 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 | ITG | 05/11/18 |
| TOLERANCES ON: | CHECKED | GF | 05/17/18 |
| 2 PL DECIMALS ± | APPROVED | RS | 05/17/18 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |

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

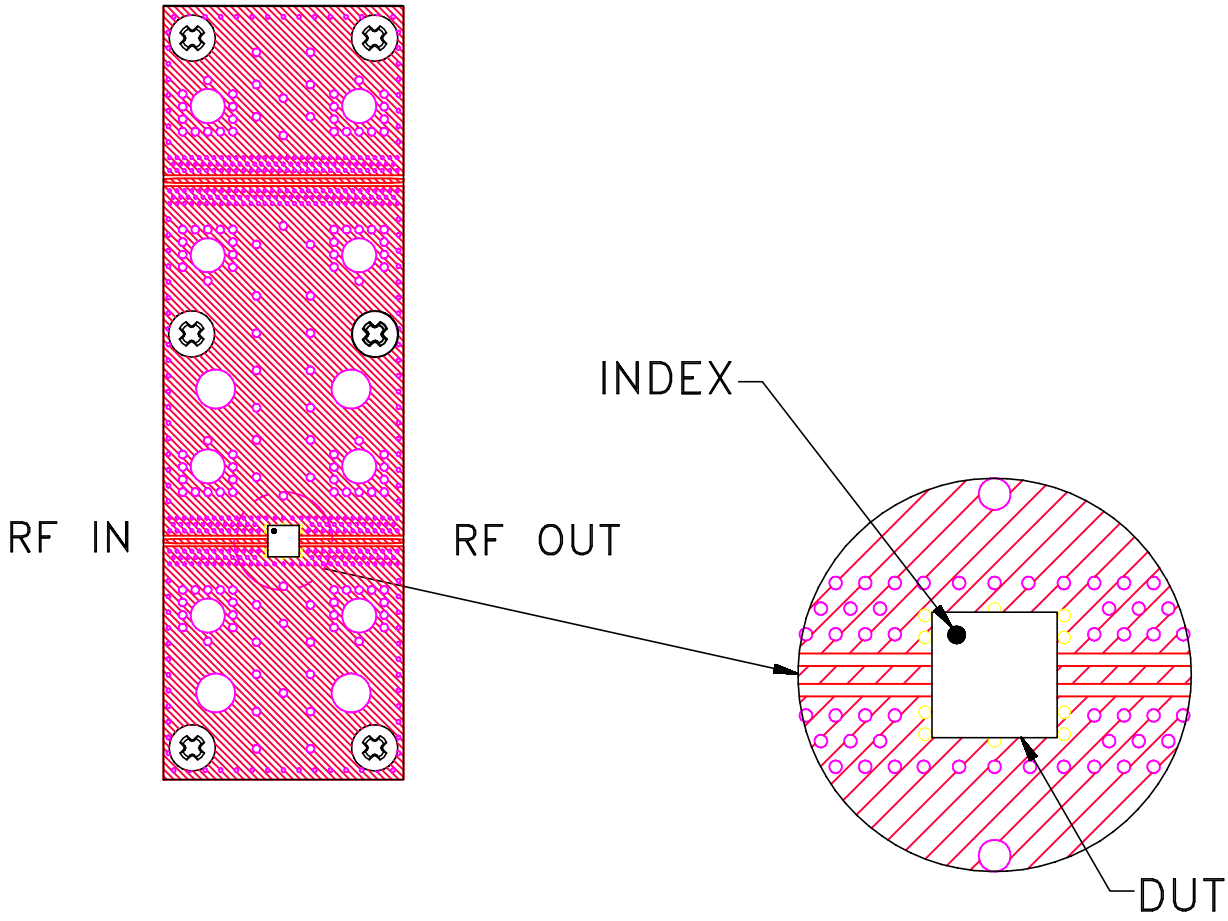
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

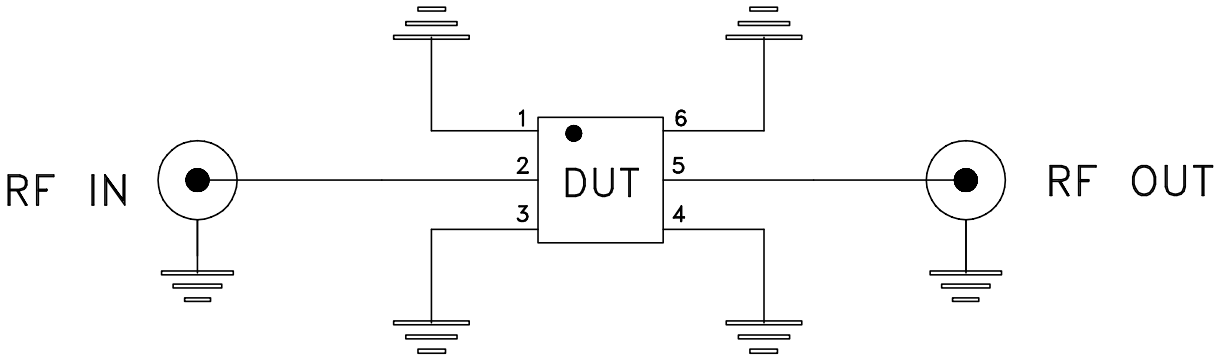
PL, 06AF04, MC1630-1, TB-934-NC+

| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-586 | 0R |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL586 | 15:1 | 1 OF 1 |

# Evaluation Board and Circuit




Schematic Diagram

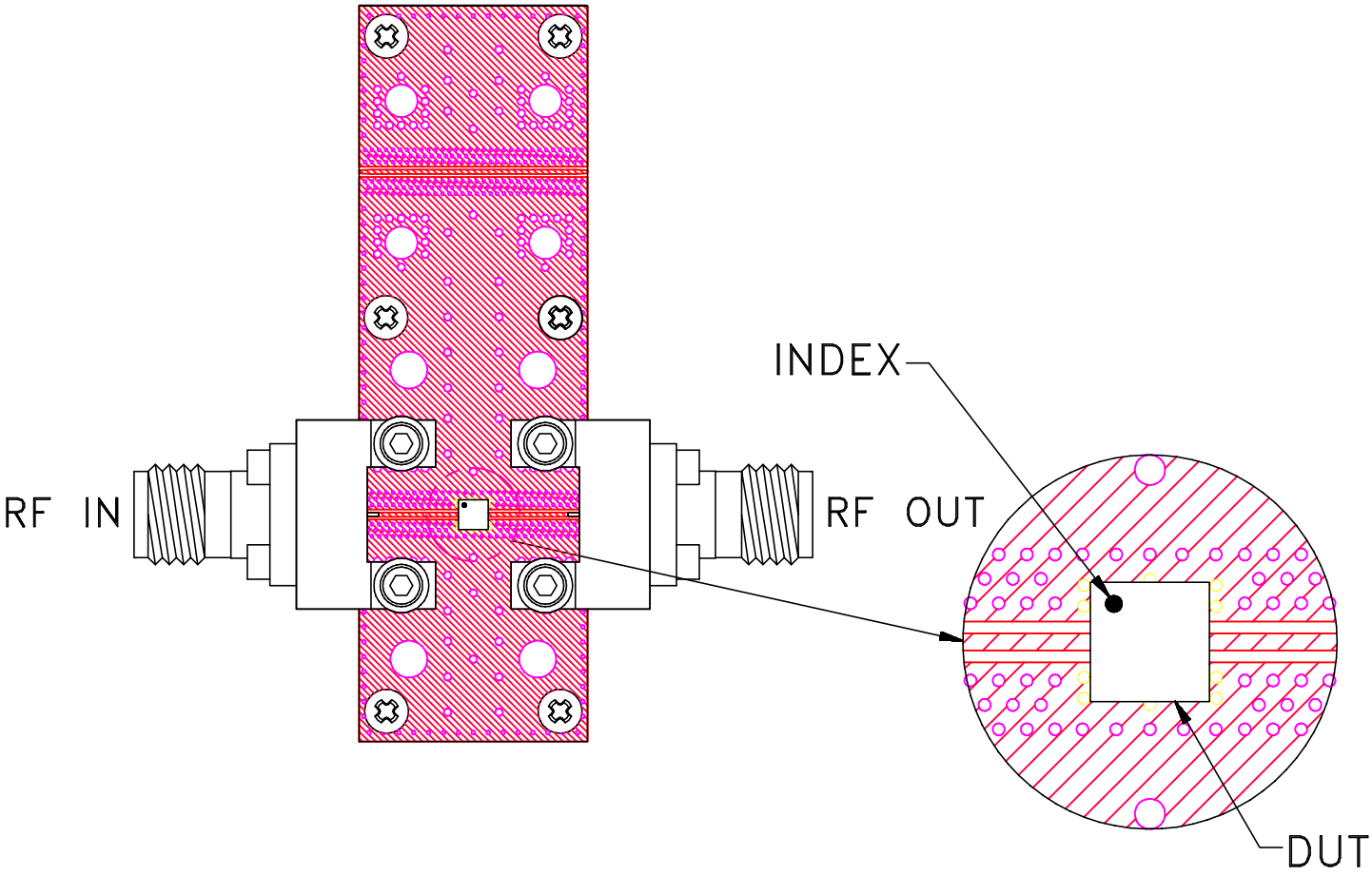
Note:

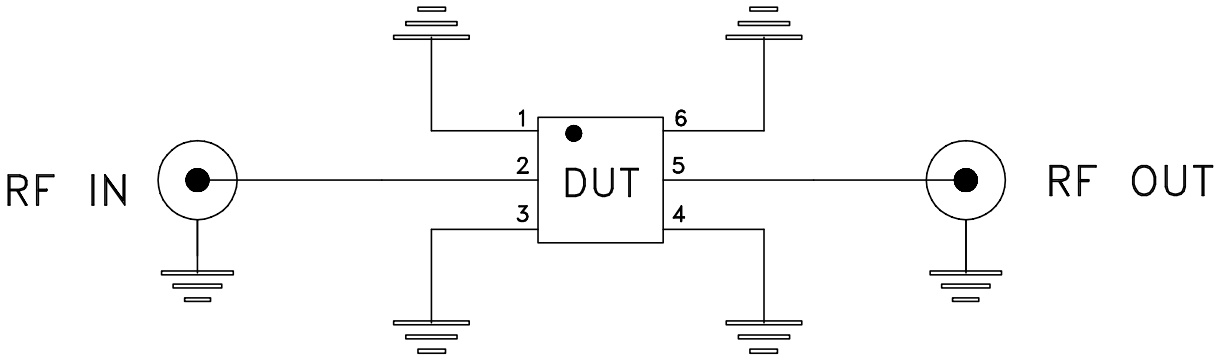
1. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.0066 inch.

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# Evaluation Board and Circuit




Schematic Diagram

Notes:

1. 50 Ohm 2.40mm Female end launch connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.0066 inch.

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**Environmental Specifications** **ENV08T1**

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 or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C or -65° to 150°<br>Ambient Environment | Individual Model Data Sheet |
| HTOL | 1000 hours at 125°C | MIL-STD-883, Method 1005, Condition B |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Mechanical Shock | 1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only | MIL-STD-883, Method 2002, Condition B, except Y1 direction only |
| Vibration (Variable Frequency) | 50g peak | MIL-STD-883, Method 2007, Condition B |
| Autoclave | 15 psig, 100% RH, 121°C, 96 hours | JESD22-A102, Condition C |
| HAST | 130°C, 85% RH, 96 hours | JESD22-A110 |
| Solderability | 10X Magnification | J-STD-002, Para 4.2.5, Test S, 95% Coverage |
| Solder Reflow Heat | Sn-Pb Eutetic Process: 240°C peak<br>Pb-Free Process: 260°C peak | J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1 |
| 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-020 |


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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 |
|---|---|---|
| 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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