

# Surface Mount RF Transformer

50Ω 30 to 1000 MHz 10 Watt

## SYTX4-13HP+



Generic photo used for illustration purposes only

CASE STYLE: AH1647

**+RoHS Compliant**

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

**Available Tape and Reel at no extra cost**

Reel Size: 13" Devices/Reel: 200

### Maximum Ratings

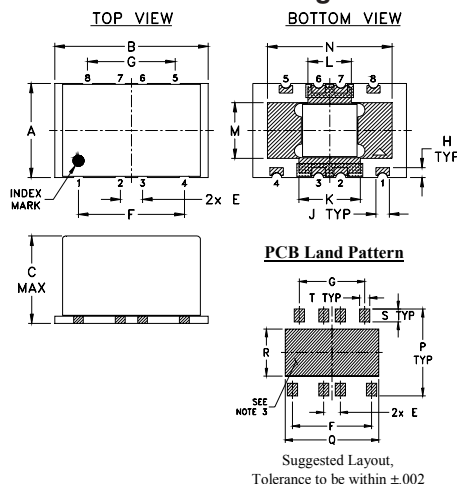
|                       |                |
|-----------------------|----------------|
| Operating Temperature | -40°C to 65°C  |
| Storage Temperature   | -55°C to 100°C |
| RF Power              | 10W            |
| DC Current            | 30mA           |

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

### Pin Connections

|                    |     |
|--------------------|-----|
| PRIMARY DOT        | 1   |
| PRIMARY            | 4   |
| SECONDARY DOT      | 8   |
| SECONDARY          | 5   |
| SECONDARY CT (GND) | 6,7 |
| GROUND             | 2,3 |

### Outline Drawing

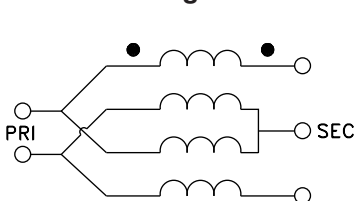


Refer to Application Note: [AN-00-017](#)

### Outline Dimensions (inch/mm)

| A     | B     | C     | E     | F     | G     | H    | J    | K     |
|-------|-------|-------|-------|-------|-------|------|------|-------|
| .433  | .690  | .415  | .100  | .476  | .394  | .045 | .060 | .276  |
| 11.00 | 17.53 | 10.54 | 2.54  | 12.09 | 10.01 | 1.14 | 1.52 | 7.01  |
| L     | M     | N     | P     | Q     | R     | S    | T    | wt    |
| .194  | .257  | .560  | .475  | .561  | .258  | .069 | .061 | grams |
| 4.93  | 6.53  | 14.22 | 12.07 | 14.25 | 6.55  | 1.75 | 1.55 | 2.80  |

### Config. H



### Notes

- 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.
- 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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### Features

- high power input, 10 Watt max.
- wide bandwidth, 30 to 1000 MHz
- good amplitude unbalance, 0.5 dB typ. at 1 dB bandwidth
- excellent phase unbalance 3 deg. typ. at 1 dB bandwidth
- balanced transmission line with secondary center tap

### Applications

- PCS
- cellular

### Electrical Specifications at 25°C

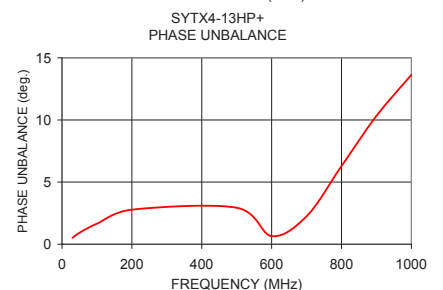
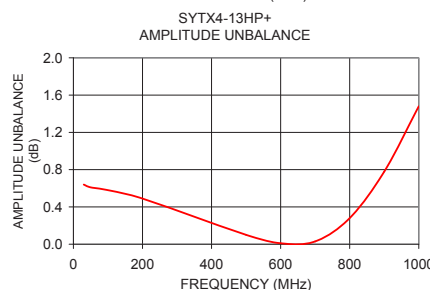
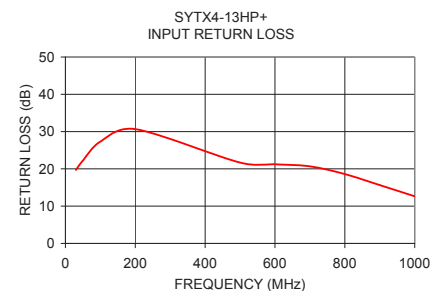
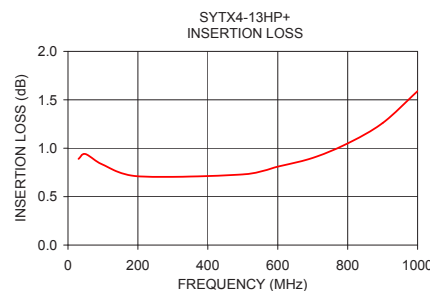
| Parameter                           | Frequency (MHz) | Min. | Typ. | Max. | Unit   |
|-------------------------------------|-----------------|------|------|------|--------|
| Impedance Ratio (secondary/primary) |                 |      | 4    |      | Ohm    |
| Frequency Range                     |                 | 30   | —    | 1000 | MHz    |
| Insertion Loss*                     | 100-500         | —    | 0.3  | 1.0  | dB     |
|                                     | 50-700          | —    | 0.7  | 1.5  |        |
|                                     | 30-1000         | —    | 1.0  | 2.5  |        |
| Amplitude Unbalance                 | 100-500         | —    | 0.5  | 1.5  | dB     |
|                                     | 50-700          | —    | 0.9  | 2.5  |        |
| Phase Unbalance                     | 100-500         | —    | 3    | 9    | Degree |
|                                     | 50-700          | —    | 5    | 12   |        |

\* Insertion Loss is referenced to mid-band loss 0.6 dB typ.

1. The user must provide adequate means of heat removal to limit the temperature of ground connections under the PCB to 65°C, in order to ensure proper performance. At 25°C ambient temperature this requires thermal resistance of the user's PC board heat sink to be 10°C/W.

### Typical Performance Data

| FREQUENCY (MHz) | INSERTION LOSS (dB) | INPUT R. LOSS (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE (Deg.) |
|-----------------|---------------------|--------------------|--------------------------|------------------------|
| 30.00           | 0.89                | 19.69              | 0.64                     | 0.51                   |
| 50.00           | 0.94                | 22.20              | 0.61                     | 0.92                   |
| 100.00          | 0.83                | 27.30              | 0.58                     | 1.65                   |
| 200.00          | 0.71                | 30.65              | 0.49                     | 2.78                   |
| 500.00          | 0.73                | 21.68              | 0.10                     | 2.93                   |
| 600.00          | 0.81                | 21.24              | 0.01                     | 0.65                   |
| 700.00          | 0.90                | 20.68              | 0.03                     | 2.25                   |
| 800.00          | 1.05                | 18.61              | 0.28                     | 6.29                   |
| 900.00          | 1.26                | 15.64              | 0.78                     | 10.33                  |
| 1000.00         | 1.59                | 12.63              | 1.48                     | 13.63                  |



# RF Transformer

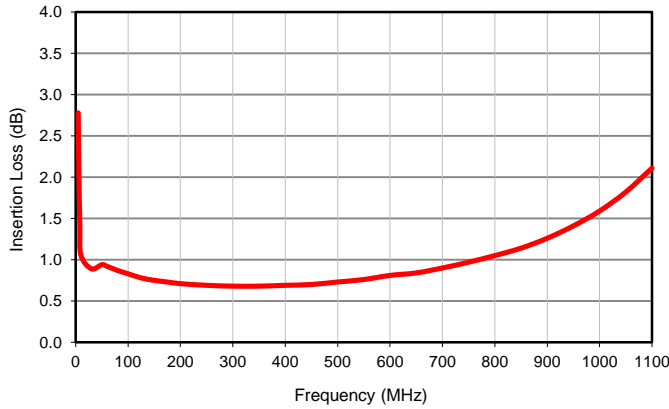
# SYTX4-13HP+

## Typical Performance Data

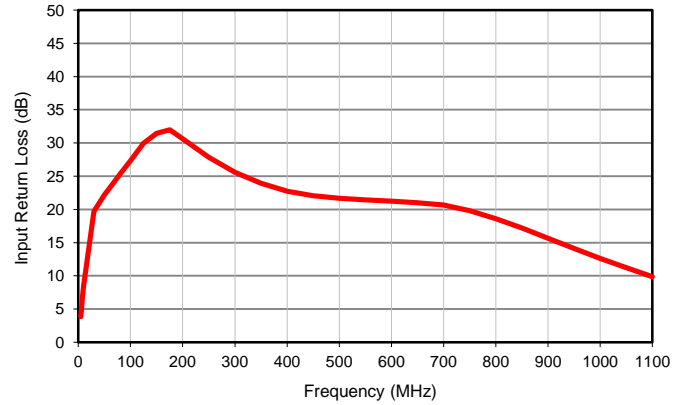
| FREQUENCY<br>(MHz) | AVERAGE<br>INSERTION LOSS<br>(dB) | INPUT<br>RETURN LOSS<br>(dB) | AMPLITUDE<br>UNBALANCE<br>(dB) | PHASE<br>UNBALANCE<br>(deg.) |
|--------------------|-----------------------------------|------------------------------|--------------------------------|------------------------------|
| 5                  | 2.78                              | 3.83                         | 0.60                           | 0.11                         |
| 6                  | 2.15                              | 4.85                         | 0.60                           | 0.10                         |
| 8                  | 1.43                              | 6.78                         | 0.61                           | 0.04                         |
| 10                 | 1.06                              | 8.59                         | 0.62                           | 0.01                         |
| 30                 | 0.89                              | 19.69                        | 0.64                           | 0.51                         |
| 50                 | 0.94                              | 22.20                        | 0.61                           | 0.92                         |
| 60                 | 0.92                              | 23.24                        | 0.60                           | 1.08                         |
| 80                 | 0.87                              | 25.34                        | 0.59                           | 1.36                         |
| 100                | 0.83                              | 27.30                        | 0.58                           | 1.65                         |
| 125                | 0.78                              | 29.94                        | 0.55                           | 1.94                         |
| 150                | 0.75                              | 31.47                        | 0.53                           | 2.32                         |
| 175                | 0.73                              | 31.99                        | 0.51                           | 2.54                         |
| 200                | 0.71                              | 30.65                        | 0.49                           | 2.78                         |
| 250                | 0.69                              | 27.85                        | 0.44                           | 3.25                         |
| 300                | 0.68                              | 25.59                        | 0.38                           | 3.55                         |
| 350                | 0.68                              | 23.92                        | 0.32                           | 3.74                         |
| 400                | 0.69                              | 22.75                        | 0.24                           | 3.64                         |
| 450                | 0.70                              | 22.04                        | 0.17                           | 3.37                         |
| 500                | 0.73                              | 21.68                        | 0.10                           | 2.93                         |
| 550                | 0.76                              | 21.44                        | 0.03                           | 2.15                         |
| 600                | 0.81                              | 21.24                        | 0.01                           | 0.65                         |
| 650                | 0.84                              | 21.01                        | 0.01                           | 0.53                         |
| 700                | 0.90                              | 20.68                        | 0.03                           | 2.25                         |
| 750                | 0.97                              | 19.79                        | 0.13                           | 4.16                         |
| 800                | 1.05                              | 18.61                        | 0.28                           | 6.29                         |
| 850                | 1.14                              | 17.20                        | 0.51                           | 8.39                         |
| 900                | 1.26                              | 15.64                        | 0.78                           | 10.33                        |
| 950                | 1.41                              | 14.11                        | 1.11                           | 12.13                        |
| 1000               | 1.59                              | 12.63                        | 1.48                           | 13.63                        |
| 1050               | 1.82                              | 11.22                        | 1.87                           | 14.89                        |
| 1100               | 2.11                              | 9.86                         | 2.28                           | 15.86                        |

## Typical Performance Data

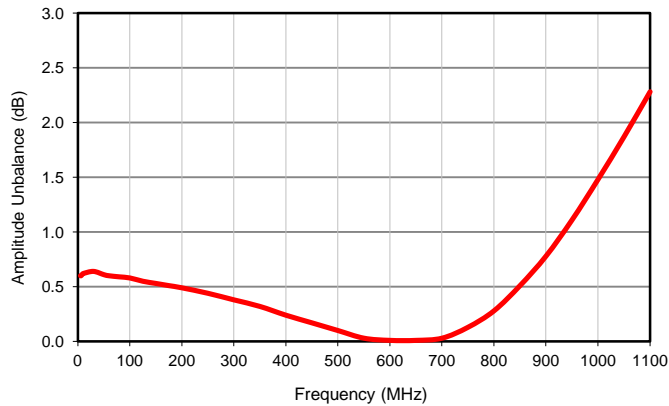
### Average Insertion Loss



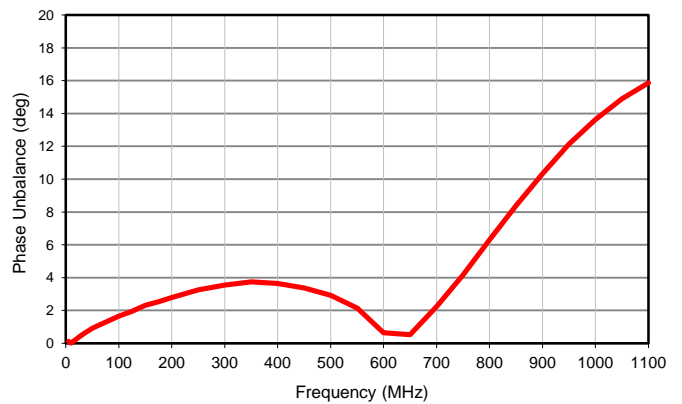
### Input Return Loss



### Amplitude Unbalance

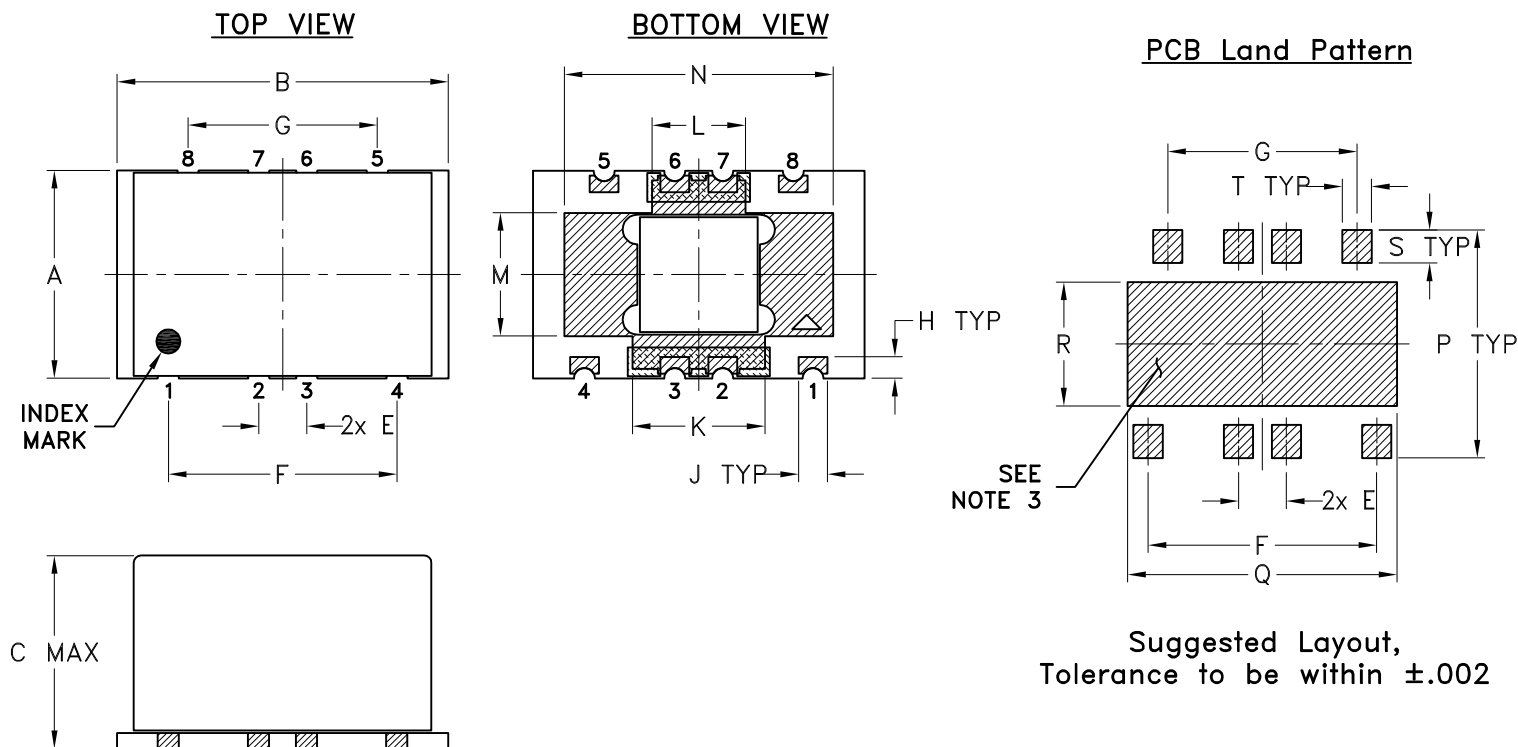


### Phase Unbalance



## Outline Dimensions

AH1647



Suggested Layout,  
Tolerance to be within  $\pm.002$

| CASE#      | A               | B               | C               | D              | E              | F               | G               | H              | J              | K              | L              | M              | N               |
|------------|-----------------|-----------------|-----------------|----------------|----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| AH164<br>7 | .433<br>(11.00) | .690<br>(17.53) | .415<br>(10.54) | -<br>-         | .100<br>(2.54) | .476<br>(12.09) | .394<br>(10.01) | .045<br>(1.14) | .060<br>(1.52) | .276<br>(7.01) | .194<br>(4.93) | .257<br>(6.53) | .560<br>(14.22) |
| CASE #     | P               | Q               | R               | S              | T              | WT, GRAM        |                 |                |                |                |                |                |                 |
| AH1647     | .475<br>(12.07) | .561<br>(14.25) | .258<br>(6.55)  | .069<br>(1.75) | .061<br>(1.55) | 2.80            |                 |                |                |                |                |                |                 |

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

### Notes:

- Case material: Nickel Silver alloy.
- Base material: Printed wiring laminate.
- Termination finish: Tin copper solder alloy up to 0.07% Nickel. All models, (+) suffix.

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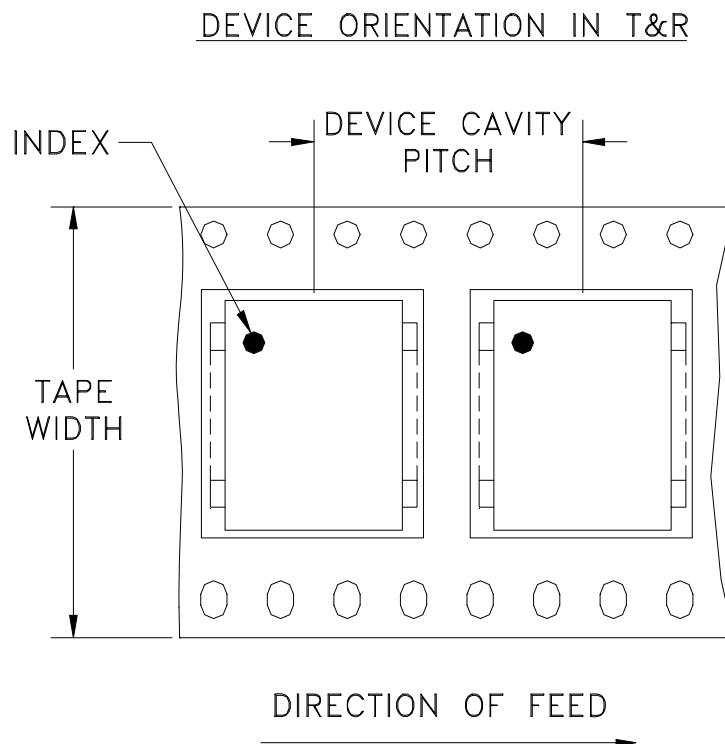
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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F109



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel |
|----------------|-------------------------|-------------------|------------------|
| 32             | 16                      | 13                | 200              |

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.

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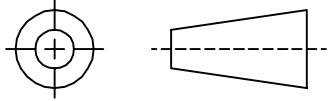
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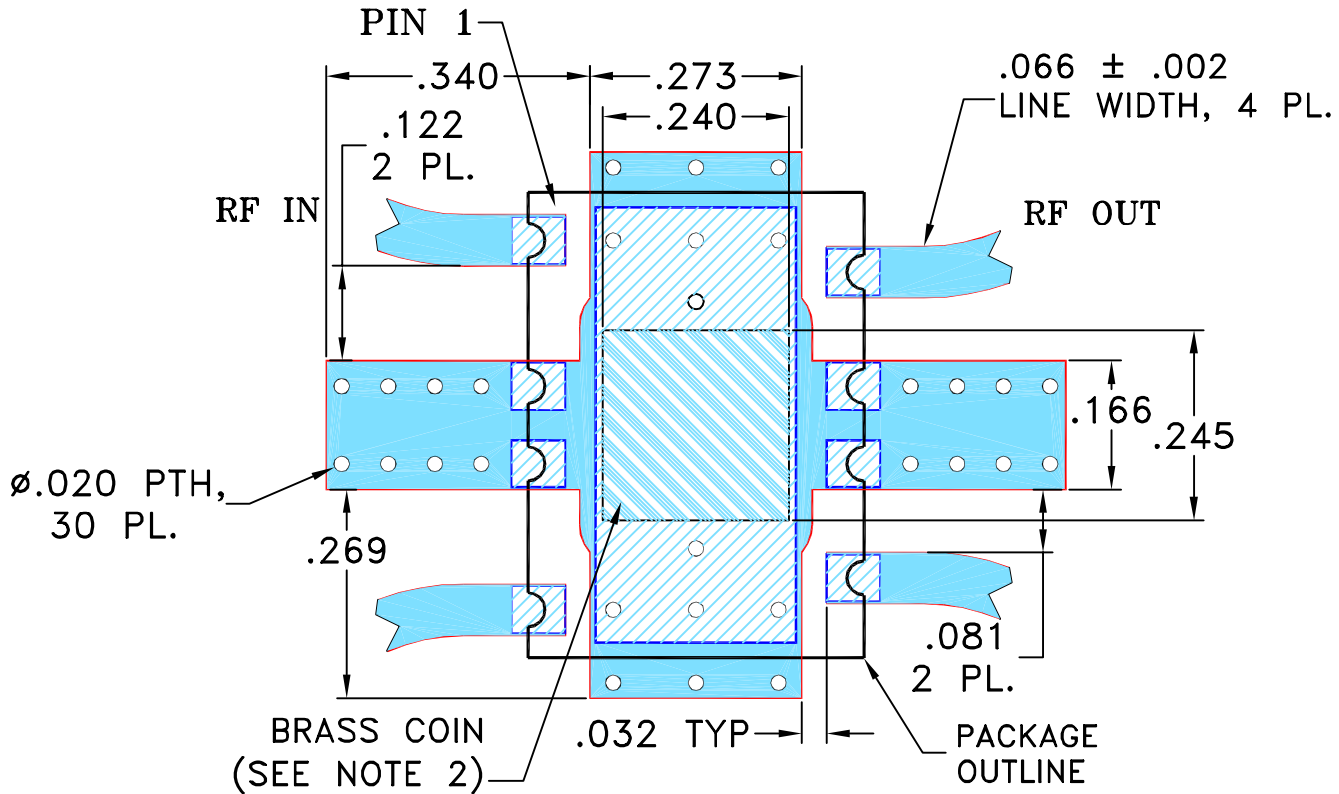
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION | DATE     | DR | AUTH |
|-----|---------|-------------|----------|----|------|
| OR  | M133287 | NEW RELEASE | 08/26/11 | GF | WP   |
|     |         |             |          |    |      |
|     |         |             |          |    |      |

SUGGESTED MOUNTING CONFIGURATION FOR  
AH1647 CASE STYLE, "08DC05" PIN CODE



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
 2. SUGGEST TO PROVIDE BRASS COIN FOR BETTER HEAT TRANSFER FROM THE UNIT. OTHERWISE PROVIDE ARRAY OF THERMAL VIAS ADEQUATE TO LIMIT TEMPERATURE OF GROUND CONNECTIONS UNDER THE UNIT TO 65°C.  
 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
- DENOTES BRASS COIN.

| UNLESS OTHERWISE SPECIFIED   | INITIALS |    | DATE     |
|--|----------|----|----------|
| DIMENSIONS ARE IN INCHES<br>TOLERANCES ON:<br>2 PL DECIMALS ±<br>3 PL DECIMALS ± .005<br>ANGLES ±<br>FRACTIONS ± | DRAWN    | GF | 08/22/11 |
|  | CHECKED  | IL | 08/25/11 |
|  | APPROVED | WP | 08/26/11 |

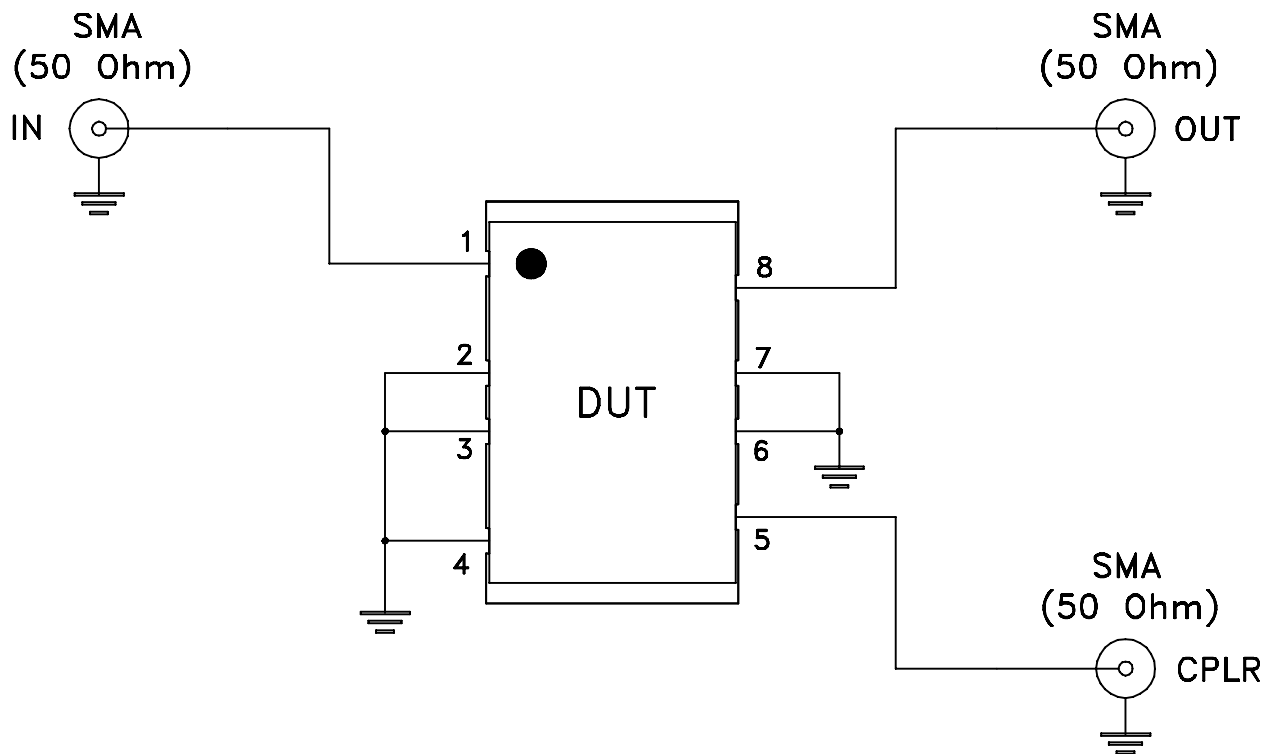
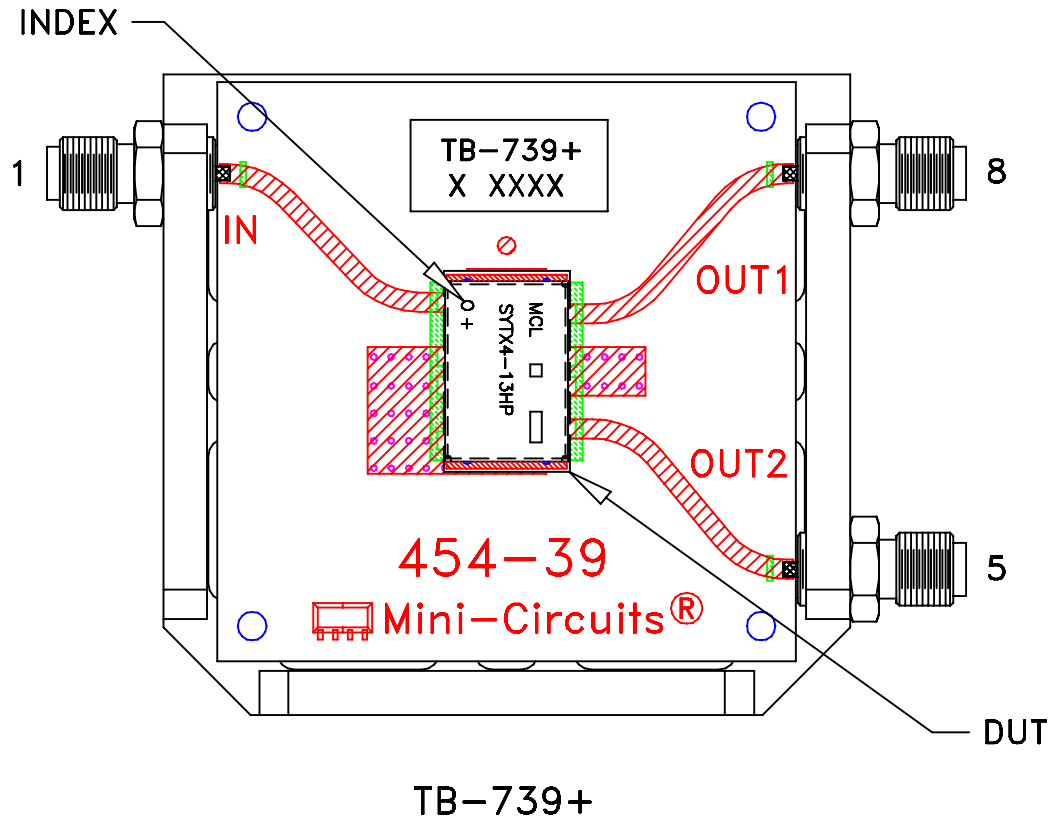
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PL, 08DC05, AH1647, TB-630+

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|------------------|---------------------|--------------------------|------------|
| SIZE<br>A        | CODE IDENT<br>15542 | DRAWING NO:<br>98-PL-351 | REV:<br>OR |
| FILE:<br>98PL351 | SCALE:<br>4:1       | SHEET:<br>1 OF 1         |            |


# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent.  
Dielectric Constant=3.5, Thickness=.030 inch.

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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                                     |
|---------------------------|---------------------------------------|--|
| Operating Temperature     | -40° to 65° C<br>Ambient Environment  | Individual Model Data Sheet                        |
| Storage Temperature       | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet                        |
| Stabilization Bake        | (non-operating)<br>125°C, 24 hours    | - - -  |
| Burn-in at Elevated Temp. | (DC on)<br>160 hours at 85° C         | MIL-STD-202, Method 108                            |
| Thermal Shock             | -55° to 100°C, 5 cycles               | MIL-STD-202, Method 107, Condition A, except 100°C |