

Surface Mount RF Transformer

SBTX2-113-2W+

50Ω 2.6 to 11.0 GHz

The Big Deal

- Super wideband, 2.6 to 11.0 GHz
- Low insertion loss, 1.4 dB typ.
- Amplitude Unbalance, ± 0.9 dB typ.
- Low phase unbalance, $\pm 6^\circ$ typ.
- Common mode rejection, 22 dB typ.



CASE STYLE: AH2765

Product Overview

Mini-Circuits' SBTX2-113-2W+ is a surface-mount transmission line transformer (core and Semi-Rigid cable) covering a very wide frequency range from 2.6 to 11.0 GHz. The transformer provides low insertion loss with excellent phase and amplitude performance. Featuring core and cable construction on a 8-lead PCB unit measures 0.32 x 0.32 x 0.69 accommodating dense circuit board layouts.

Key Features

| Feature | Advantages |
|------------------------------------|--|
| Wideband, 2.6 to 11.0 GHz | Super wide frequency range covers bandwidth requirements for many broadband applications. |
| Low insertion loss, 1.4dB | Provides excellent signal transmission from input to output with consistent performance across its entire frequency range. |
| Good Phase and Amplitude Unbalance | Provides good CMRR and IP2. |
| Small size (0.32 x 0.32 x 0.69) | Provide good solderability and tight layouts. |

Surface Mount RF Transformer

SBTX2-113-2W+

50Ω 2.6 to 11.0 GHz 1:2 Ratio

Features

- wide bandwidth 2.6 to 11.0 GHz
- unbalanced to balanced transformer
- excellent amplitude and phase unbalance
- aqueous washable

Applications

- defense communication
- defense radar
- line of sight links
- PCS
- cellular
- wideband push-pull amplifiers
- ADC (Analog to Digital Converter)
- Balanced Receivers



Generic photo used for illustration purposes only

CASE STYLE: AH2765

+RoHS Compliant

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

Electrical Specifications at 25°C

| Parameter | Frequency (GHz) | Min. | Typ. | Max. | Unit |
|--|-----------------|------|------|------|--------|
| Impedance Ratio (secondary/primary) | | | 2 | | |
| Frequency Range | | 2.6 | | 11.0 | GHz |
| Insertion Loss (Average) (above theoretical 3 dB) | 2.6 - 6.0 | — | 1.4 | 1.9 | dB |
| | 6.0 - 10.0 | — | 1.5 | 2.2 | |
| | 10.0 - 11.0 | — | 1.7 | 2.5 | |
| Amplitude Unbalance (±) | 2.6 - 11.0 | — | 0.9 | 1.3 | dB |
| | 4.0 - 9.0 | — | 0.7 | 1.0 | |
| Phase Unbalance (±) | 4.0 - 9.0 | — | 4 | 8 | Degree |
| | 2.6 - 11.0 | — | 6 | 12 | |
| Common mode rejection | 4.0 - 9.0 | 18 | 24 | — | dB |
| | 2.6 - 11.0 | 15 | 22 | — | |

Maximum Ratings

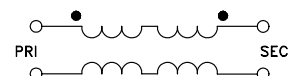
| Parameter | Ratings |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| RF Power | 2W |

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

Pin Connections

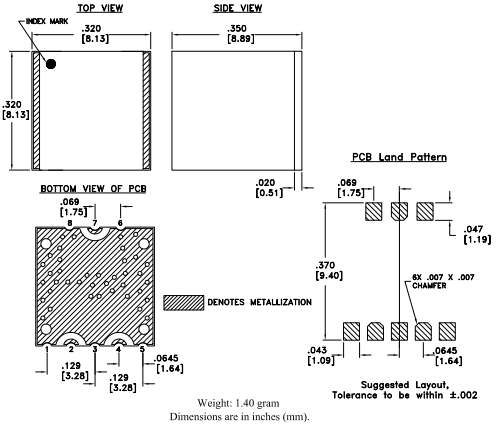
| Function | Pin Number |
|---------------|------------|
| PRIMARY DOT | 7 |
| PRIMARY (GND) | 6,8 |
| SECONDARY DOT | 4 |
| SECONDARY | 2 |
| GND | 1,3,5,6,8 |

Config. G

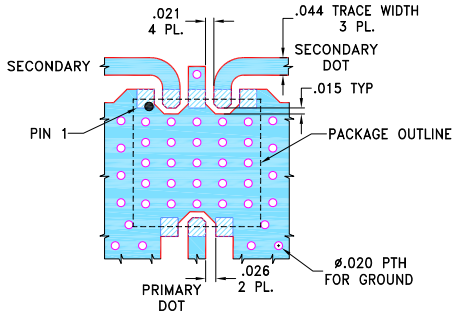


SBTX2-113-2W+

Outline Drawing



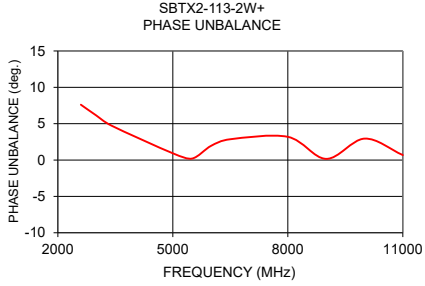
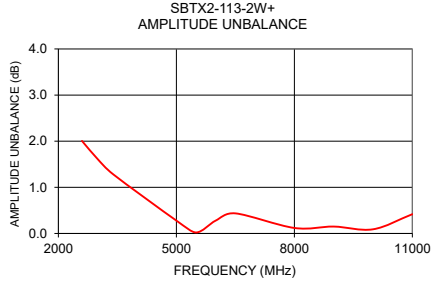
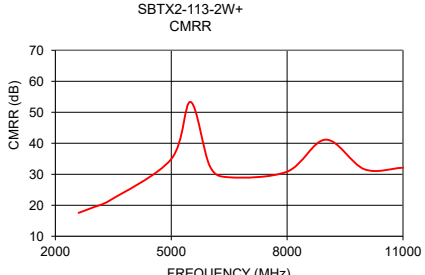
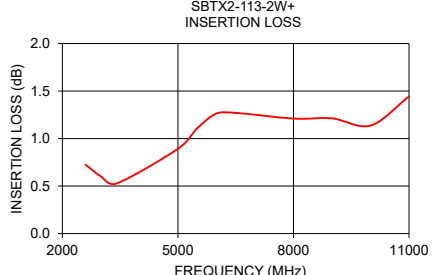
Demo Board MCL P/N: TB-1081+ Suggested PCB Layout (PL-629)



- NOTES:**
- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .010+.001. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS LINE WIDTH & GAP MAY NEED TO BE MODIFIED.
 - 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.

Typical Performance Data

| Frequency (MHz) | Avg. Insertion Loss (dB) | CMRR (dB) | Amplitude Unbalance (dB) | Phase Unbalance (Deg.) |
|-----------------|--------------------------|-----------|--------------------------|------------------------|
| 2600 | 0.73 | 17.53 | 2.01 | 7.61 |
| 3000 | 0.60 | 19.42 | 1.61 | 6.14 |
| 3400 | 0.53 | 21.49 | 1.28 | 4.73 |
| 5000 | 0.89 | 34.90 | 0.28 | 0.93 |
| 5500 | 1.11 | 53.33 | 0.02 | 0.20 |
| 6000 | 1.26 | 32.59 | 0.28 | 1.96 |
| 6500 | 1.27 | 29.02 | 0.44 | 2.86 |
| 8000 | 1.21 | 30.85 | 0.12 | 3.19 |
| 9000 | 1.21 | 41.17 | 0.15 | 0.16 |
| 10000 | 1.14 | 31.62 | 0.09 | 2.95 |
| 11000 | 1.44 | 32.11 | 0.42 | 0.69 |



Additional Notes

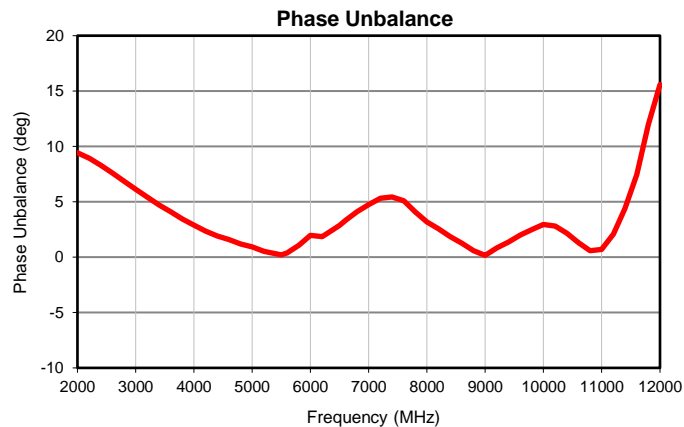
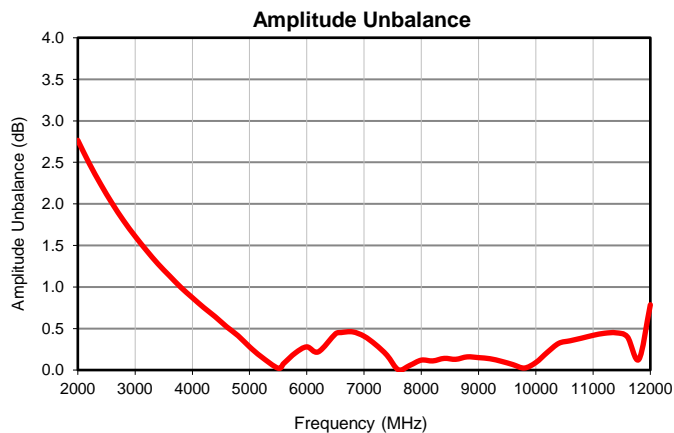
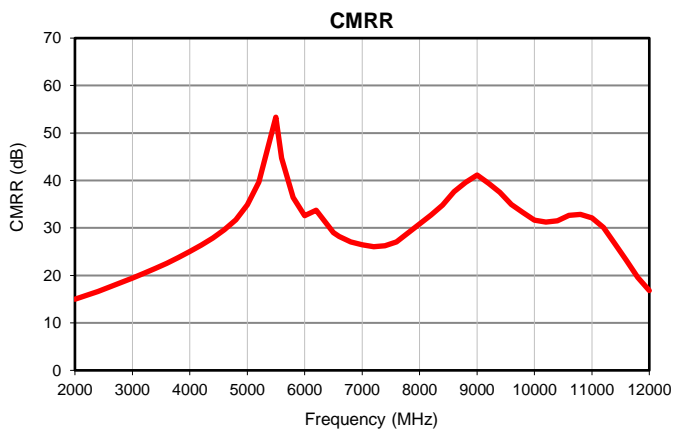
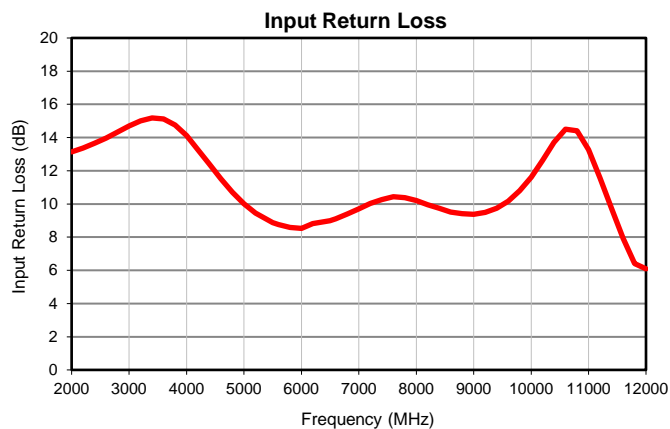
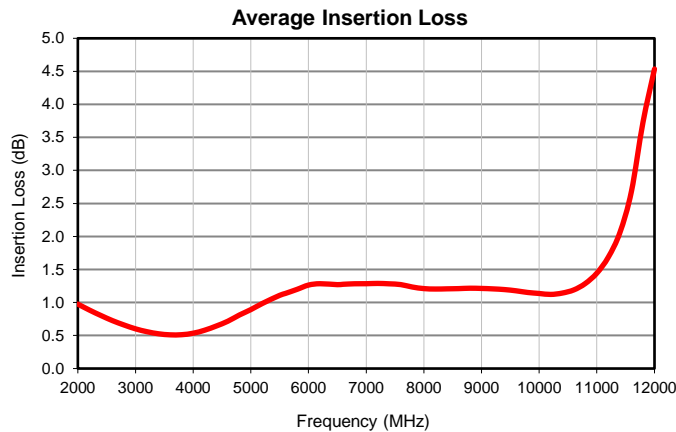
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Typical Performance Data

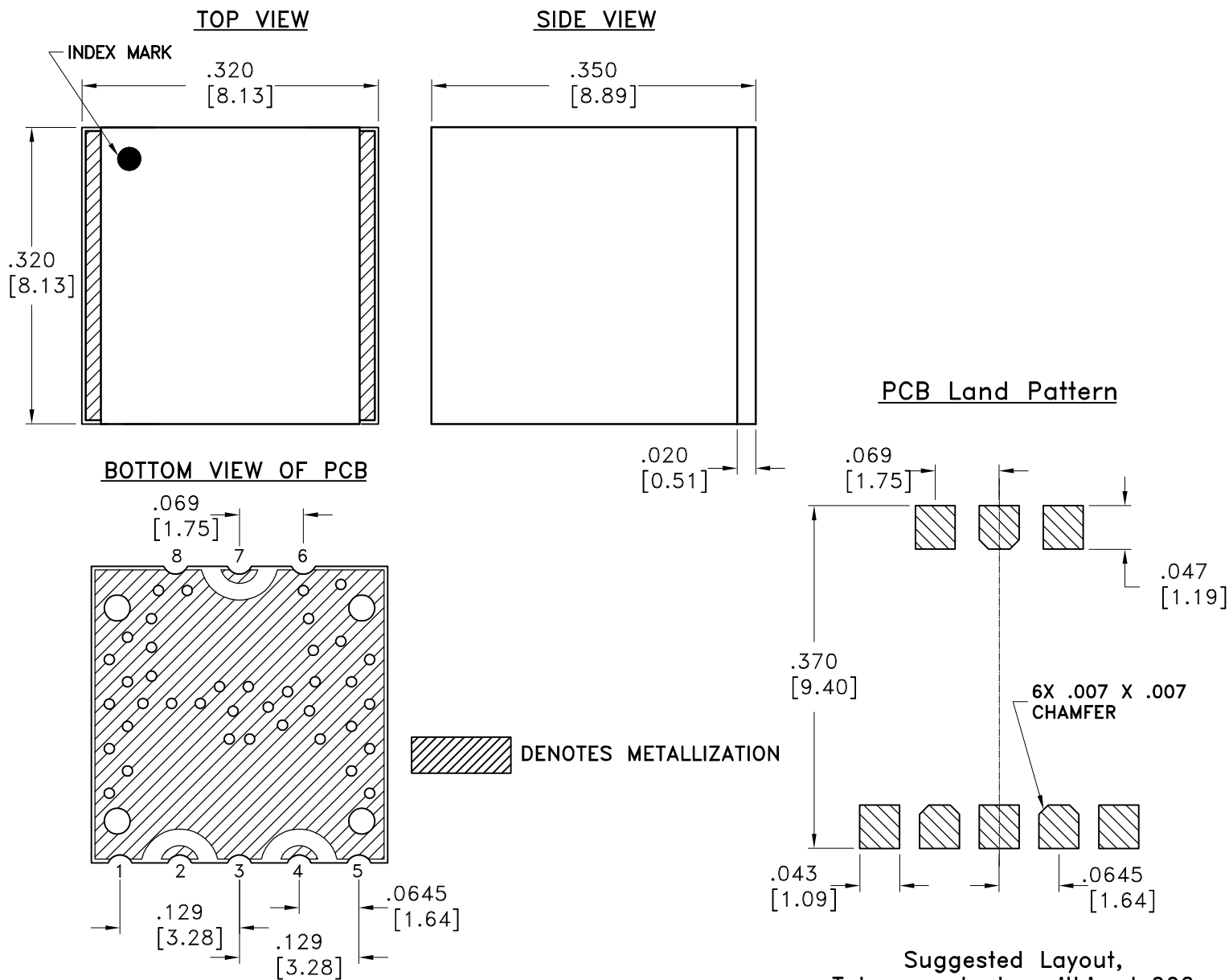
| FREQUENCY (MHz) | AVERAGE INSERTION LOSS (dB) | INPUT RETURN LOSS (dB) | CMRR (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE (deg.) |
|-----------------|-----------------------------|------------------------|-----------|--------------------------|------------------------|
| 2000 | 0.98 | 13.14 | 14.99 | 2.77 | 9.44 |
| 2200 | 0.89 | 13.37 | 15.80 | 2.49 | 8.93 |
| 2400 | 0.80 | 13.65 | 16.64 | 2.24 | 8.31 |
| 2600 | 0.73 | 13.97 | 17.53 | 2.01 | 7.61 |
| 2800 | 0.66 | 14.34 | 18.47 | 1.80 | 6.85 |
| 3000 | 0.60 | 14.69 | 19.42 | 1.61 | 6.14 |
| 3200 | 0.56 | 15.01 | 20.43 | 1.44 | 5.40 |
| 3400 | 0.53 | 15.18 | 21.49 | 1.28 | 4.73 |
| 3600 | 0.51 | 15.12 | 22.56 | 1.14 | 4.11 |
| 3800 | 0.51 | 14.76 | 23.78 | 1.00 | 3.45 |
| 4000 | 0.53 | 14.12 | 25.02 | 0.87 | 2.88 |
| 4200 | 0.58 | 13.27 | 26.39 | 0.75 | 2.36 |
| 4400 | 0.64 | 12.40 | 27.84 | 0.64 | 1.92 |
| 4600 | 0.72 | 11.51 | 29.60 | 0.52 | 1.61 |
| 4800 | 0.81 | 10.70 | 31.74 | 0.41 | 1.19 |
| 5000 | 0.89 | 10.01 | 34.90 | 0.28 | 0.93 |
| 5200 | 0.99 | 9.45 | 39.67 | 0.16 | 0.52 |
| 5500 | 1.11 | 8.87 | 53.33 | 0.02 | 0.20 |
| 5600 | 1.14 | 8.75 | 44.73 | 0.08 | 0.39 |
| 5800 | 1.20 | 8.59 | 36.42 | 0.21 | 1.07 |
| 6000 | 1.26 | 8.52 | 32.59 | 0.28 | 1.96 |
| 6200 | 1.28 | 8.81 | 33.72 | 0.22 | 1.87 |
| 6500 | 1.27 | 8.98 | 29.02 | 0.44 | 2.86 |
| 6600 | 1.28 | 9.11 | 28.18 | 0.45 | 3.33 |
| 6800 | 1.28 | 9.40 | 27.03 | 0.46 | 4.10 |
| 7000 | 1.28 | 9.71 | 26.46 | 0.41 | 4.73 |
| 7200 | 1.29 | 10.03 | 26.06 | 0.31 | 5.32 |
| 7400 | 1.28 | 10.27 | 26.25 | 0.18 | 5.45 |
| 7600 | 1.27 | 10.44 | 27.03 | 0.00 | 5.10 |
| 7800 | 1.23 | 10.37 | 28.93 | 0.06 | 4.08 |
| 8000 | 1.21 | 10.21 | 30.85 | 0.12 | 3.19 |
| 8200 | 1.20 | 9.96 | 32.71 | 0.11 | 2.55 |
| 8400 | 1.21 | 9.74 | 34.81 | 0.14 | 1.87 |
| 8600 | 1.21 | 9.51 | 37.62 | 0.13 | 1.24 |
| 8800 | 1.22 | 9.41 | 39.59 | 0.16 | 0.59 |
| 9000 | 1.21 | 9.38 | 41.17 | 0.15 | 0.16 |
| 9200 | 1.21 | 9.49 | 39.38 | 0.14 | 0.84 |
| 9400 | 1.20 | 9.74 | 37.48 | 0.10 | 1.37 |
| 9600 | 1.18 | 10.17 | 34.97 | 0.07 | 2.00 |
| 9800 | 1.15 | 10.80 | 33.24 | 0.02 | 2.49 |
| 10000 | 1.14 | 11.62 | 31.62 | 0.09 | 2.95 |
| 10200 | 1.12 | 12.62 | 31.27 | 0.21 | 2.80 |
| 10400 | 1.14 | 13.72 | 31.52 | 0.32 | 2.18 |
| 10600 | 1.19 | 14.50 | 32.67 | 0.35 | 1.30 |
| 10800 | 1.29 | 14.40 | 32.87 | 0.38 | 0.60 |
| 11000 | 1.44 | 13.27 | 32.11 | 0.42 | 0.69 |
| 11200 | 1.69 | 11.55 | 30.09 | 0.44 | 2.08 |
| 11400 | 2.06 | 9.72 | 26.70 | 0.45 | 4.40 |
| 11600 | 2.68 | 7.92 | 23.20 | 0.40 | 7.47 |
| 11800 | 3.73 | 6.41 | 19.57 | 0.13 | 11.97 |
| 12000 | 4.54 | 6.09 | 16.82 | 0.79 | 15.59 |

Typical Performance Data



Outline Dimensions

AH2765



Weight: 1.40 gram

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

Notes:

1. Case material: Nickel Silver alloy.
2. Base material: Printed wiring laminate.
3. Termination finish:
 - For RoHS Case Styles: 3-5 μ inch (.08-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.
 - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix



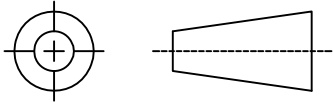
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

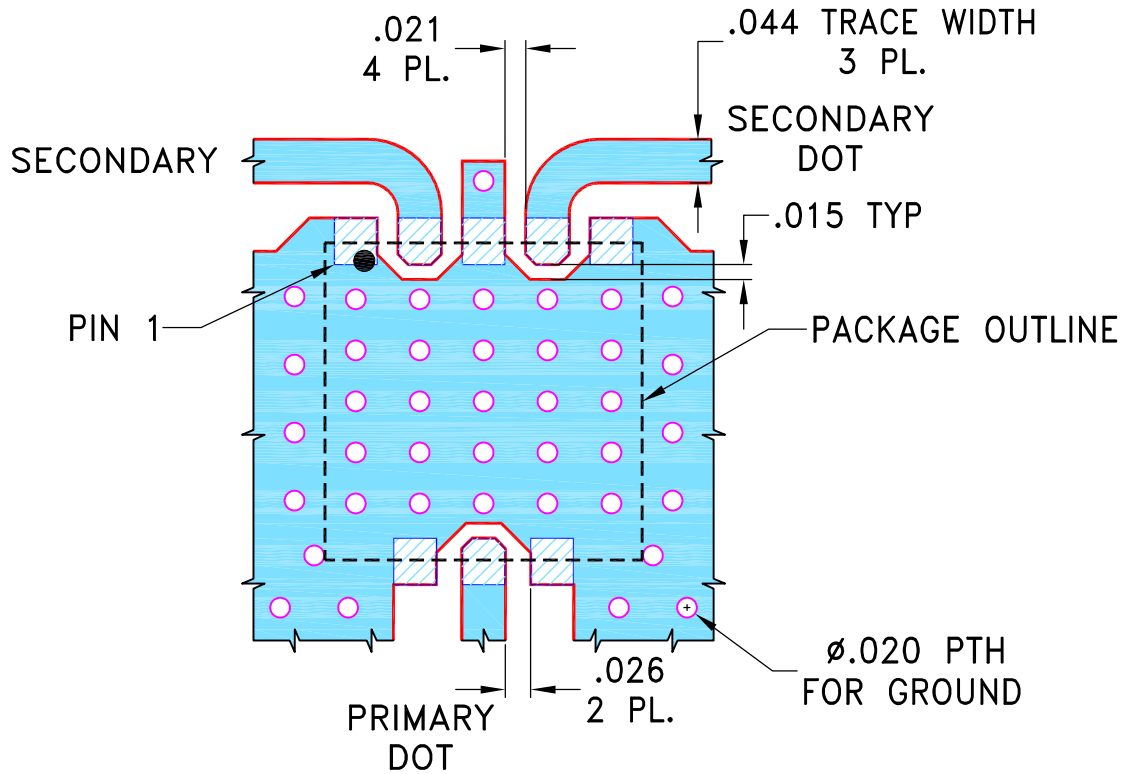
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
|-----|---------|-------------|----------|----|------|
| OR | M175300 | NEW RELEASE | 07/26/19 | GF | TN |
| | | | | | |
| | | | | | |

SUGGESTED MOUNTING CONFIGURATION
FOR AH2765 CASE STYLE, "08TG01" PIN CODE

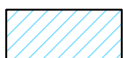


NOTES:

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- 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 | 07/18/19 |
| TOLERANCES ON: | CHECKED IL | 07/25/19 |
| 2 PL DECIMALS ± | APPROVED TN | 07/26/19 |
| 3 PL DECIMALS ± .005 | | |
| ANGLES ± | | |
| FRACTIONS ± | | |



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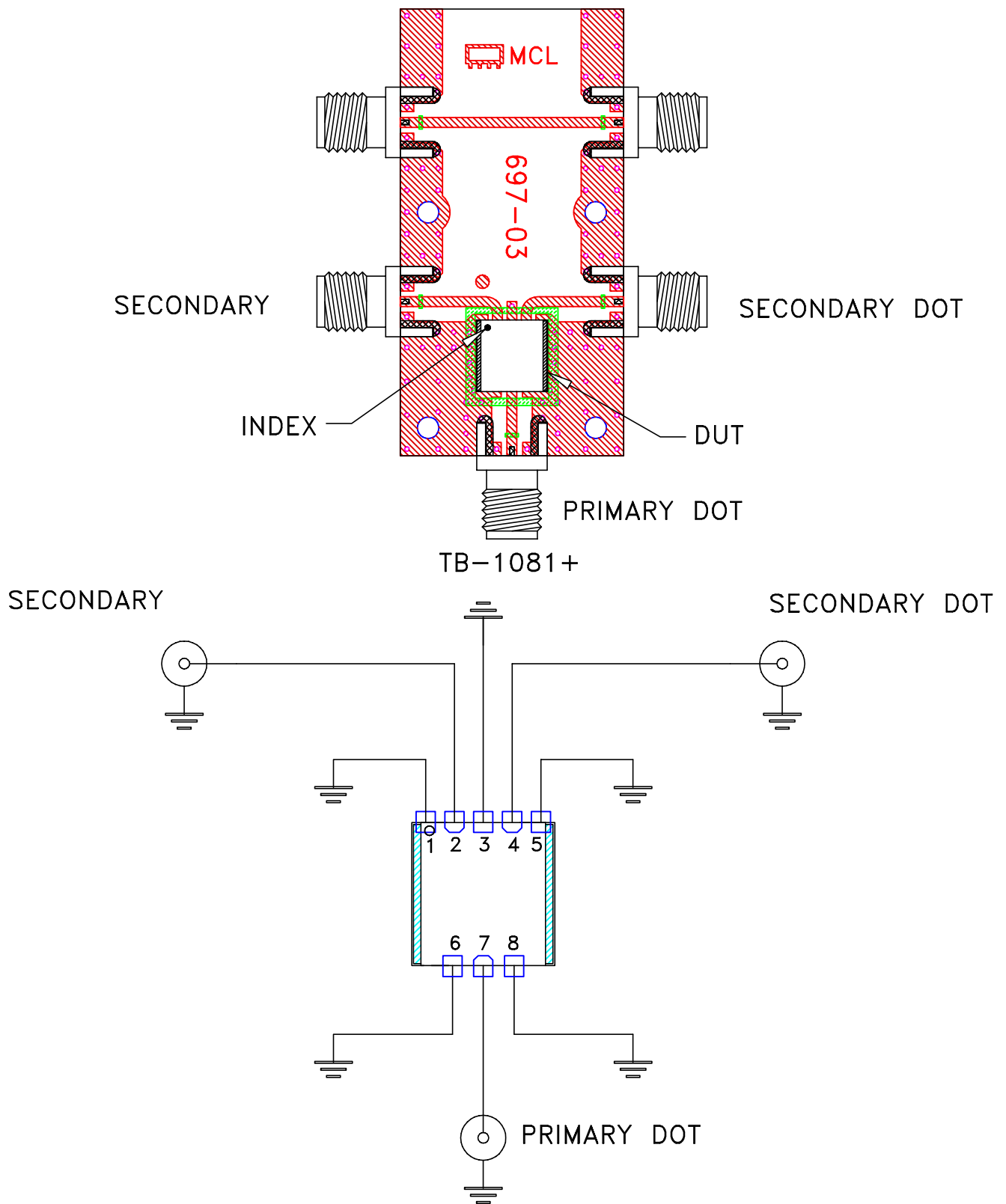
13 Neptune Avenue
Brooklyn NY 11235

PL, 08TG01, AH2765, TB-1081+

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| | | | |
|---------------|---------------------|--------------------------|------------|
| SIZE A | CODE IDENT 15542 | DRAWING NO: 98-PL-629 | REV: OR |
| FILE: 98PL629 | SCALE: 5:1 | SHEET: 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=.020 inch.

 **Mini-Circuits®**

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