CERAMIC BALUN

# RF Transformer

# NCS1-222-75+

75Ω 950 to 2200 MHz 1:1 Ratio

## FEATURES

- Wideband, 950 to 2000 MHz
- Low phase unbalance, 5 deg. and amplitude unbalance, 0.9 dB typ.
- Miniature size, 0.079"x0.049"x0.033"
- LTCC construction
- Low cost
- Aqueous washable

*Generic photo used for illustration purposes only*

CASE STYLE: GE0805C-1

***+RoHS Compliant***

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

## APPLICATIONS

- WCDMA
- PCS
- GPS

## ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Impedance Ratio | | | 1 | | |
| Frequency Range | | 950 | | 2200 | MHz |
| Insertion Loss[1] | 950 - 2200 | — | 1.0 | 1.5 | dB |
| Amplitude Unbalance | 950 - 2200 | — | 0.9 | 1.4 | dB |
| Phase Unbalance[2] | 950 - 2200 | — | 5 | 8 | Degree |

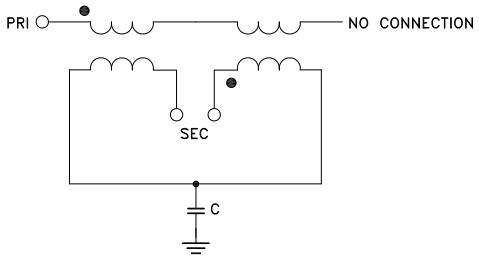
1. Insertion Loss is referenced to mid-band loss, 0.7 dB. Reference Demo Board TB-626+
2. Relative to 180°

## MAXIMUM RATINGS

| Parameter | Ratings |
|---|---|
| Operating Temperature | -40°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| RF Power | 3W at 25°C |

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

## CONFIGURATION R



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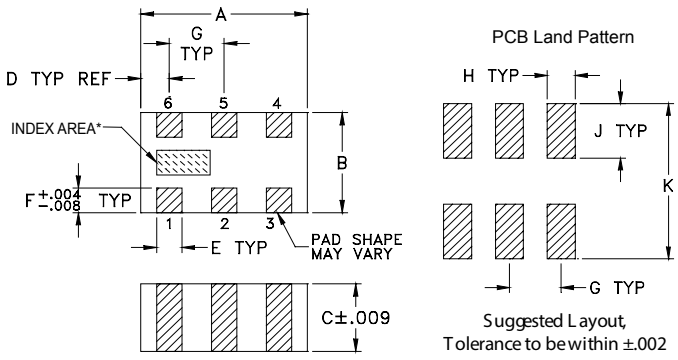
# RF Transformer

# NCS1-222-75+

## PAD CONNECTIONS

| | |
|---|---|
| PRIMARY DOT (Unbalanced Port) | 2 |
| PRIMARY (GND) | 1,3 |
| SECONDARY DOT (Balanced) | 4 |
| SECONDARY (Balanced) | 6 |
| NO CONNECTION | 5 |

## OUTLINE DRAWING

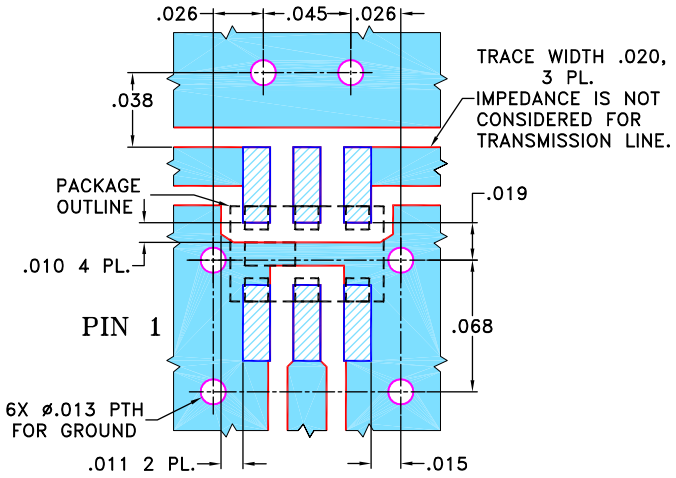



*Shape of index marking may vary

## PRODUCT MARKING: N/A

## DEMO BOARD MCL P/N: TB-626+

## SUGGESTED PCB LAYOUT (PL-348)




NOTES:

1. TRACE WIDTH IS SHOWN FOR REFERENCE ONLY.
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 DIMENSIONS (Inches / mm)

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| .079 | .049 | .033 | .014 | .012 | .012 |
| 2.01 | 1.24 | 0.84 | 0.36 | 0.30 | 0.30 |

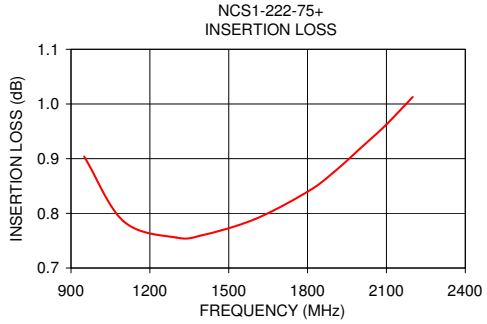
| G | H | J | K | | wt |
|---|---|---|---|---|---|
| .026 | .014 | .039 | .110 | | grams |
| 0.66 | 0.36 | 1.00 | 2.80 | | .008 |

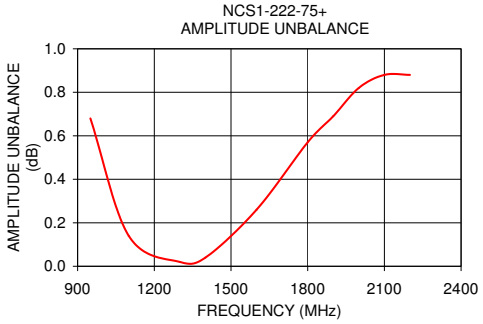
## TAPE & REEL INFORMATION: F74

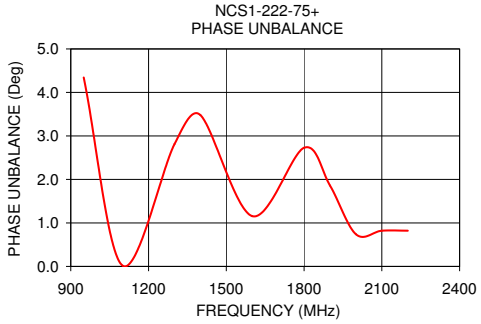
## TYPICAL PERFORMANCE DATA[3]

| Frequency (MHz) | Insertion Loss (dB) | Input Return Loss (dB) | Amplitude Unbalance (dB) | Phase Unbalance (deg) |
|---|---|---|---|---|
| 950 | 0.90 | 13.69 | 0.68 | 4.34 |
| 1100 | 0.79 | 16.77 | 0.14 | 0.02 |
| 1300 | 0.76 | 19.79 | 0.02 | 2.81 |
| 1400 | 0.76 | 20.85 | 0.04 | 3.48 |
| 1600 | 0.79 | 22.77 | 0.26 | 1.16 |
| 1800 | 0.84 | 23.40 | 0.57 | 2.73 |
| 1900 | 0.88 | 23.04 | 0.69 | 1.86 |
| 2000 | 0.92 | 22.48 | 0.82 | 0.74 |
| 2100 | 0.96 | 21.90 | 0.88 | 0.82 |
| 2200 | 1.01 | 21.77 | 0.88 | 2.44 |

3. Measured with Agilent E5071B network analyzer using impedance conversion and port extension.




**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

# RF Transformer NCS1-222-75+

## *Typical Performance Data*

| FREQUENCY MHz | AVERAGE INSERTION LOSS* (dB) | INPUT RETURN LOSS (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE** (deg.) |
|---|---|---|---|---|
| 950.0 | 0.90 | 13.69 | 0.68 | 4.34 |
| 975.0 | 0.87 | 14.21 | 0.56 | 3.41 |
| 1000.0 | 0.85 | 14.77 | 0.44 | 2.56 |
| 1025.0 | 0.83 | 15.28 | 0.35 | 1.79 |
| 1050.0 | 0.81 | 15.75 | 0.26 | 1.16 |
| 1075.0 | 0.80 | 16.27 | 0.19 | 0.58 |
| 1100.0 | 0.79 | 16.77 | 0.14 | 0.02 |
| 1125.0 | 0.78 | 17.22 | 0.08 | 0.51 |
| 1150.0 | 0.77 | 17.63 | 0.05 | 0.94 |
| 1175.0 | 0.76 | 18.04 | 0.01 | 1.34 |
| 1200.0 | 0.76 | 18.42 | 0.00 | 1.66 |
| 1225.0 | 0.76 | 18.83 | 0.01 | 2.09 |
| 1250.0 | 0.76 | 19.17 | 0.03 | 2.33 |
| 1275.0 | 0.76 | 19.42 | 0.03 | 2.60 |
| 1300.0 | 0.76 | 19.79 | 0.02 | 2.81 |
| 1325.0 | 0.76 | 20.14 | 0.01 | 3.05 |
| 1350.0 | 0.76 | 20.45 | 0.00 | 3.26 |
| 1375.0 | 0.76 | 20.61 | 0.01 | 3.36 |
| 1400.0 | 0.76 | 20.85 | 0.04 | 3.48 |
| 1425.0 | 0.76 | 21.24 | 0.06 | 3.57 |
| 1450.0 | 0.77 | 21.51 | 0.09 | 3.72 |
| 1475.0 | 0.77 | 21.73 | 0.10 | 3.76 |
| 1500.0 | 0.77 | 21.84 | 0.14 | 3.74 |
| 1525.0 | 0.78 | 22.15 | 0.17 | 3.79 |
| 1550.0 | 0.78 | 22.48 | 0.21 | 3.80 |
| 1575.0 | 0.79 | 22.66 | 0.24 | 3.80 |
| 1600.0 | 0.79 | 22.77 | 0.26 | 3.73 |
| 1625.0 | 0.80 | 22.87 | 0.32 | 3.60 |
| 1650.0 | 0.80 | 23.14 | 0.35 | 3.63 |
| 1675.0 | 0.81 | 23.22 | 0.39 | 3.51 |
| 1700.0 | 0.81 | 23.41 | 0.41 | 3.42 |
| 1725.0 | 0.82 | 23.38 | 0.45 | 3.15 |
| 1750.0 | 0.83 | 23.45 | 0.51 | 3.02 |
| 1775.0 | 0.83 | 23.41 | 0.54 | 2.98 |
| 1800.0 | 0.84 | 23.40 | 0.57 | 2.73 |
| 1825.0 | 0.85 | 23.47 | 0.60 | 2.54 |
| 1850.0 | 0.86 | 23.28 | 0.64 | 2.25 |
| 1875.0 | 0.87 | 23.17 | 0.68 | 2.07 |
| 1900.0 | 0.88 | 23.04 | 0.69 | 1.86 |
| 1925.0 | 0.89 | 23.01 | 0.73 | 1.51 |
| 1950.0 | 0.89 | 22.92 | 0.76 | 1.25 |
| 1975.0 | 0.91 | 22.67 | 0.79 | 0.90 |
| 2000.0 | 0.92 | 22.48 | 0.82 | 0.74 |
| 2025.0 | 0.93 | 22.28 | 0.82 | 0.37 |
| 2050.0 | 0.94 | 22.29 | 0.84 | 0.05 |
| 2075.0 | 0.95 | 22.09 | 0.86 | 0.37 |
| 2100.0 | 0.96 | 21.90 | 0.88 | 0.82 |
| 2125.0 | 0.98 | 21.84 | 0.88 | 1.05 |
| 2150.0 | 0.99 | 21.83 | 0.87 | 1.56 |
| 2175.0 | 1.00 | 21.94 | 0.89 | 2.02 |
| 2200.0 | 1.01 | 21.77 | 0.88 | 2.44 |

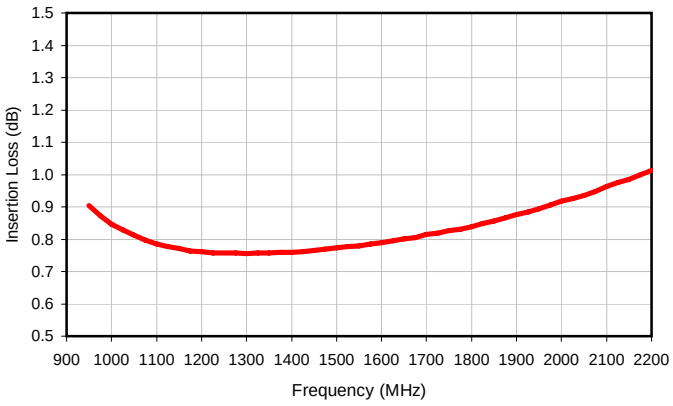
* Insertion Loss is referenced to mid-band loss , 0.7 dB.

**Phase Unbalance is relative to 180˚

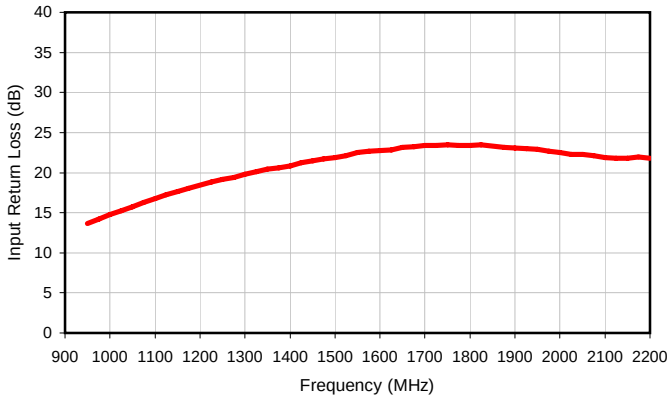
# RF Transformer NCS1-222-75+

## *Typical Performance Data*

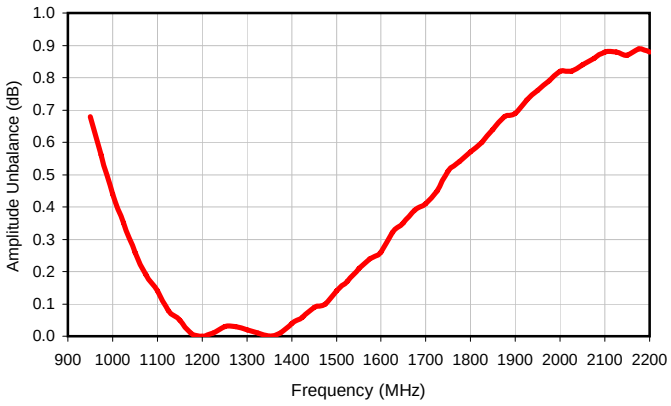
**Average Insertion Loss**



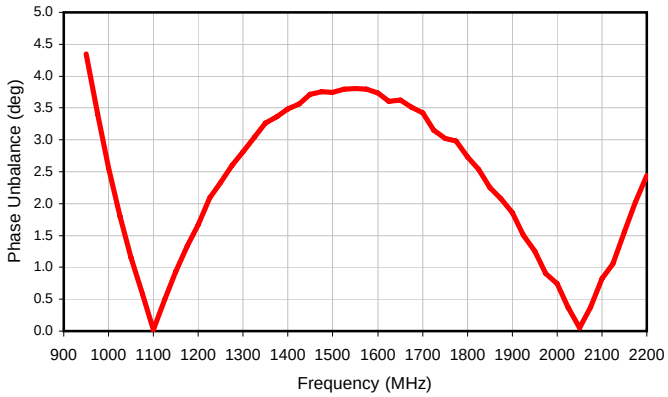

**Input Return Loss**




**Amplitude Unbalance**

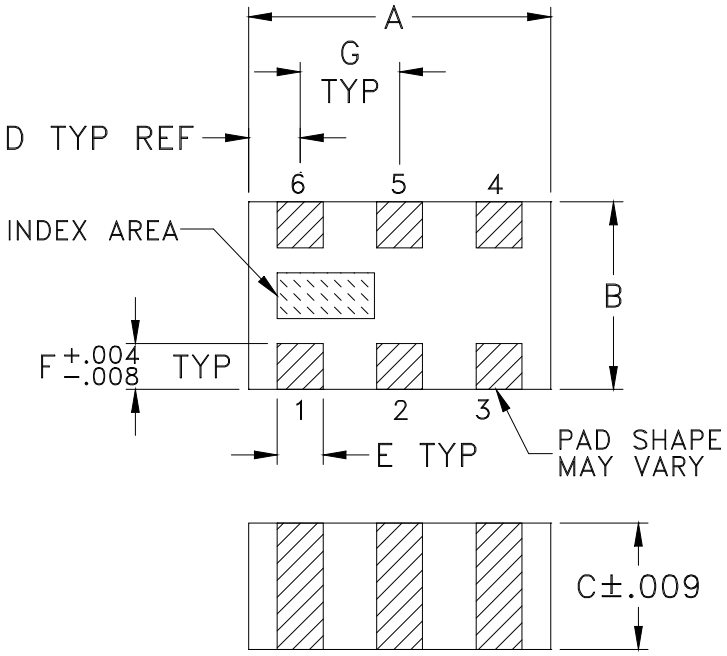



**Phase Unbalance**

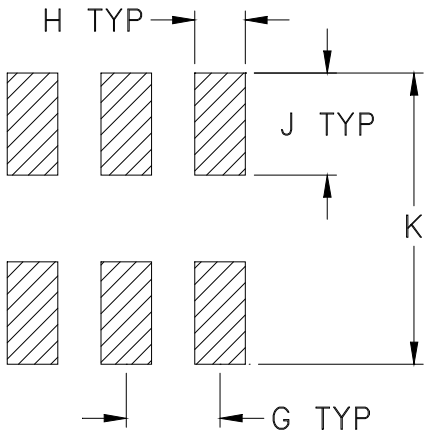


**GE0805C-1**

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GE0805C-1 | .079 (2.00) | .049 (1.25) | .033 (0.84) | .014 (0.35) | .012 (0.30) | .012 (0.30) | .026 (0.65) | .014 (0.35) | .039 (1.00) | .110 (2.80) | .008 |

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

**Notes:**

1. Open style, ceramic base.
2. Termination finish: For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Style: Tin-lead plate. All models, no (+) suffix.

# Tape & Reel Packaging TR-F74

## DEVICE ORIENTATION IN T&R

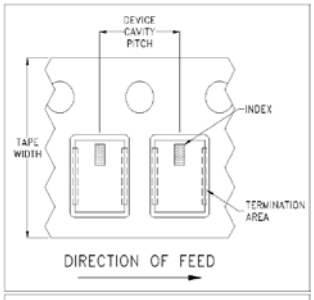



**ILLUSTRATION 1**

| Applicable Case Styles |
|---|
| GE0805C-1 |
| GE0805C-1AP |
| JV1210C-1 |
| GU2939 |

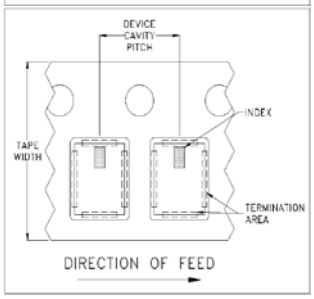



**ILLUSTRATION 2**

| Applicable Case Styles |
|---|
| JV1210C |
| JV1210C-2 |
| JV1210C-3 |
| JV1210C-4 |
| JV1210C-5 |
| JV1210C-6 |
| JV1210C-11 |

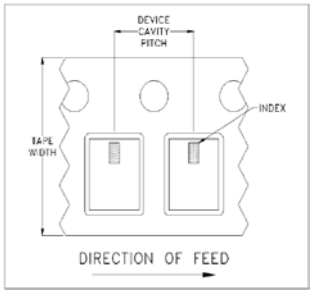



**ILLUSTRATION 3**

| Applicable Case Styles |
|---|
| JC0603C-8 |
| JV1210C-7 |
| JV1210C-8 |
| JV1210C-9 |
| JV1210C-10 |
| JV1210C-13 |
| GE0805C-13 |

| Tape Width, mm | Device Cavity Pitch, mm | Real Size, inches | Devices per Reel | |
|---|---|---|---|---|
| 8 | 4 | 7 | Small quantity standards **(see note)** | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | | | 1000 |
| | | | Standard | 2000 |
| | | | | 4000 |

Note: Small reel availability varies by model. Refer to pricing and availability on individual model dashboard.

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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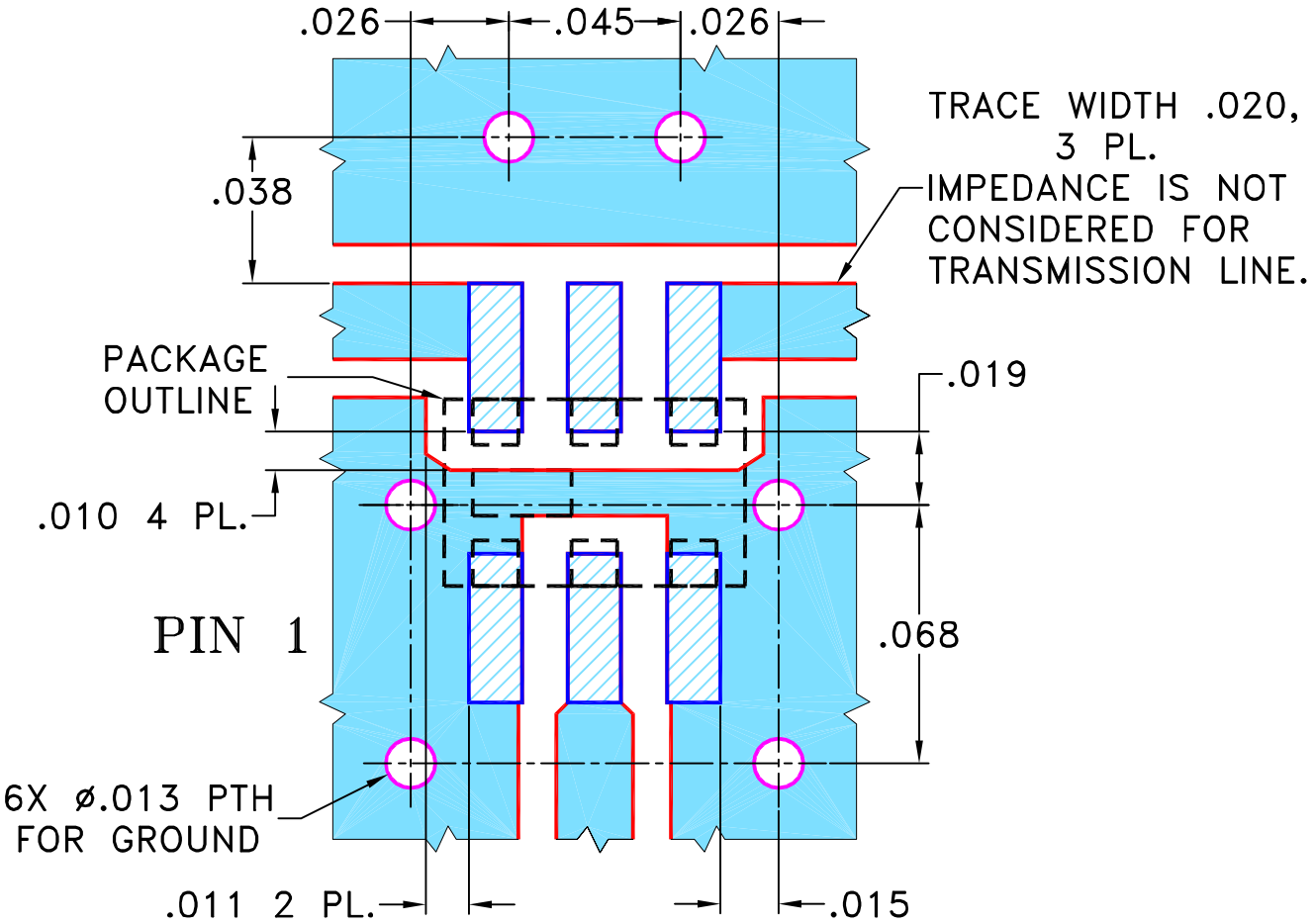
THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M132367 | NEW RELEASE | 07/20/11 | GF | ABD |
| A | M151441 | UPDATED TRACE WIDTH INFO | 06/05/15 | GF | WP |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION FOR GE0805C-1 CASE STYLE, "06TJ01" PIN CODE




## NOTES:

1. TRACE WIDTH IS SHOWN FOR REFERENCE ONLY.
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 | 06/20/11 |
| TOLERANCES ON: | CHECKED | IL | 07/20/11 |
| 2 PL DECIMALS ± | APPROVED | ABD | 07/20/11 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



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

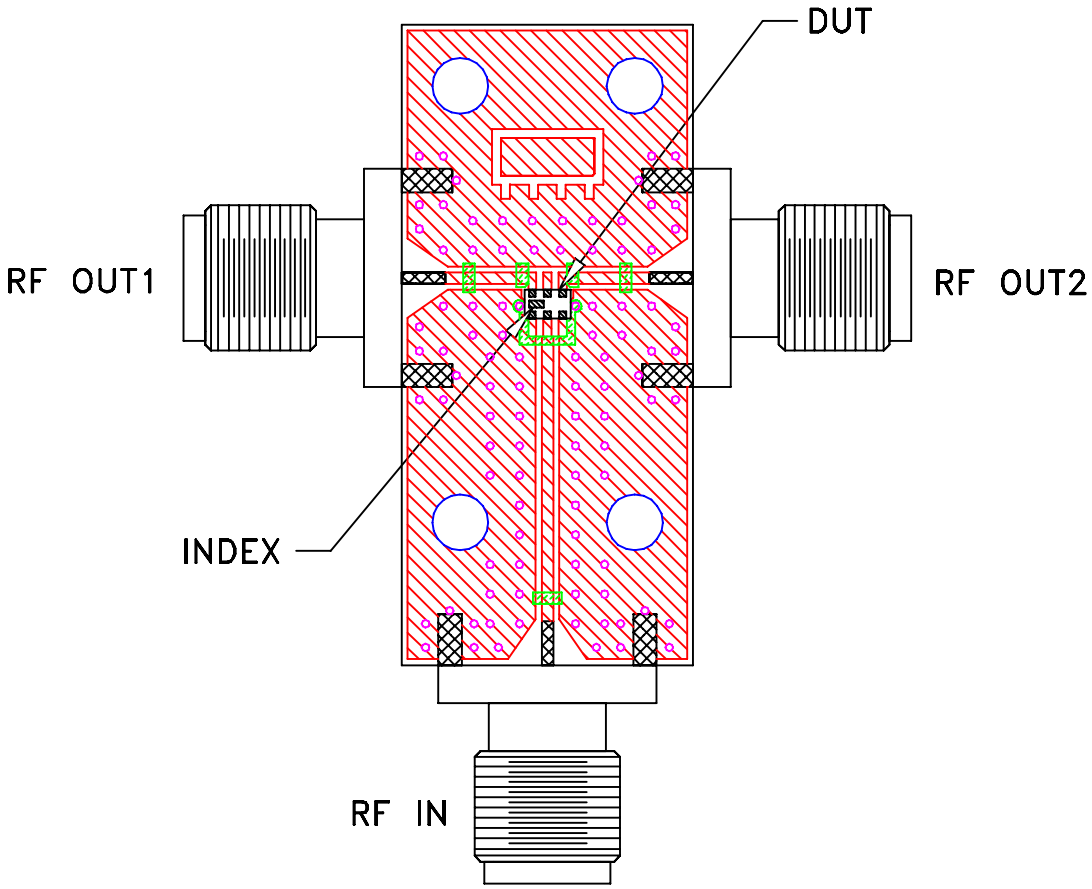
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 06TJ01, GE0805C-1, TB-626+

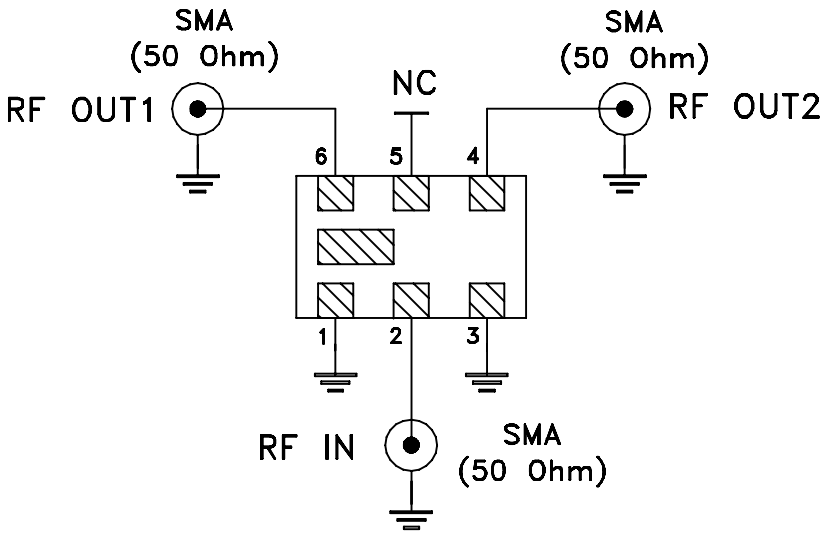
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-348 | A |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL348 | 20:1 | 1 OF 1 |

# Evaluation Board and Circuit




TB-626+




Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.010 inch.

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# Environmental Specifications ENV06T2

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, Para 4.2.5, Test S, 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 |