

CERAMIC BALUN

RF Transformer

TCW2-7200+

50Ω 5500 to 7200 MHz 1:2 Ratio

THE BIG DEAL

- Tiny size, 0603
- Low cost
- DC feeding capability
- Rugged LTCC construction



Generic photo used for illustration purposes only

CASE STYLE: JC0603C

+RoHS Compliant

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

APPLICATIONS

- WIFI 6
- Wireless Communication

PRODUCT OVERVIEW

Mini-Circuits' TCW2-7200+ is a tiny ceramic RF balun transformer with an impedance ratio of 1:2, covering a variety of wireless communications applications from 5500 to 7200 MHz. This model provides low insertion loss, low phase unbalance (relative to 180°), low amplitude unbalance, and RF input power handling up to 2W. It provides DC isolation from input to output allowing it to be used for DC biasing of external circuits at the output. Fabricated using LTCC technology, the unit comes housed in a tiny, rugged ceramic package (0.06 x 0.03 x 0.02") suitable for harsh operating environments.

KEY FEATURES

| Feature | Advantages |
|----------------------------------|--|
| 2W power handling | Supports a wide range of power requirements |
| DC Isolated from input to output | Can be used to DC bias external circuits at the output.... |
| Tiny size, 0603 | Accommodates tight space requirements for dense PCB layouts |
| LTCC construction | LTCC process enables tiny size and low cost, suitable for high-volume production. Rugged ceramic package provides excellent reliability in harsh operating environments. |

REV. OR
ECO-009931
TCW2-7200+
AVB/CP/AM
221005





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RF Transformer

TCW2-7200+

50Ω 5500 to 7200 MHz 1:2 Ratio

ELECTRICAL SPECIFICATIONS AT 25°C

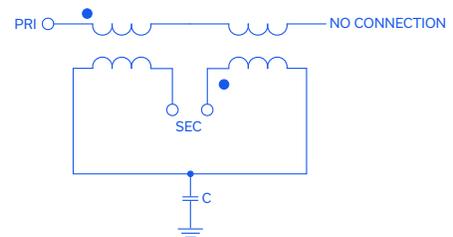
| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Units |
|-----------------------------|-----------------|--------|------|------|--------|
| Impedance Ratio | | 50:100 | | | |
| Frequency Range | | 5500 | | 7200 | MHz |
| Insertion Loss | 5500-7200 | | 1.3 | 1.5 | dB |
| Amplitude Unbalance | 5500-7200 | | 0.8 | 1.2 | dB |
| Phase Unbalance | 5500-7200 | | 8 | 12 | Degree |
| Return Loss Unbalanced Port | 5500-7200 | 9.5 | | | dB |

MAXIMUM RATINGS

| Parameter | Ratings |
|-----------------------|----------------|
| Operating Temperature | -55°C to 125°C |
| Storage Temperature | -55°C to 125°C |
| RF Power Input | 2W* |

*Room temperature; Linear derate to 0.5W at 125°C. Permanent damage may occur if any of these limits are exceeded.

CONFIGURATION R





CERAMIC BALUN

RF Transformer

TCW2-7200+



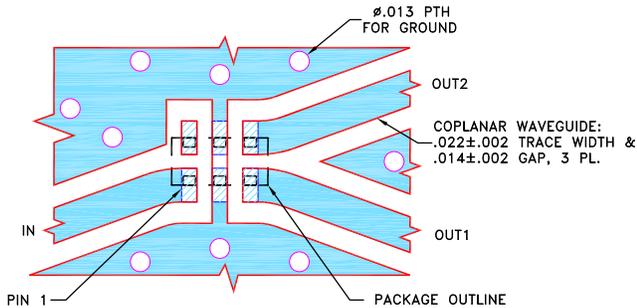
50Ω 5500 to 7200 MHz 1:2 Ratio

PAD CONNECTIONS

| | |
|-----------------|-----|
| UNBALANCED PORT | 1 |
| BALANCED PORT | 3,4 |
| GROUND | 5 |
| NOT CONNECT | 6 |
| GND or DC feed | 2 |

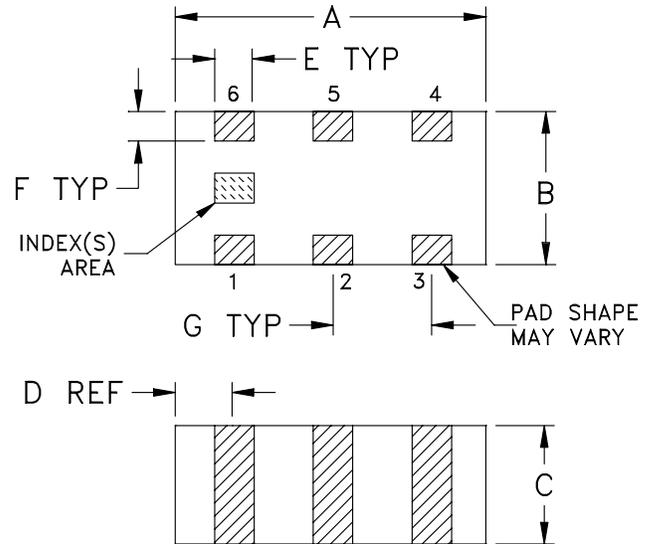
PRODUCT MARKING: Y

DEMO BOARD MCL P/N: TB-TCW2-7200+ SUGGESTED PCB LAYOUT (PL-513)



- TRACE WIDTH AND GAP PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS $.010 \pm .001$ ". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND 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.

OUTLINE DRAWING

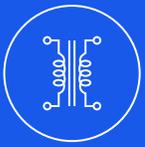


OUTLINE DIMENSIONS (Inches/mm)

| A | B | C | D | E | F | G | wt |
|------|------|------|------|------|------|------|-------|
| .063 | .031 | .024 | .012 | .008 | .006 | .020 | grams |
| 1.60 | 0.79 | 0.61 | 0.30 | 0.20 | 0.15 | 0.51 | 0.005 |

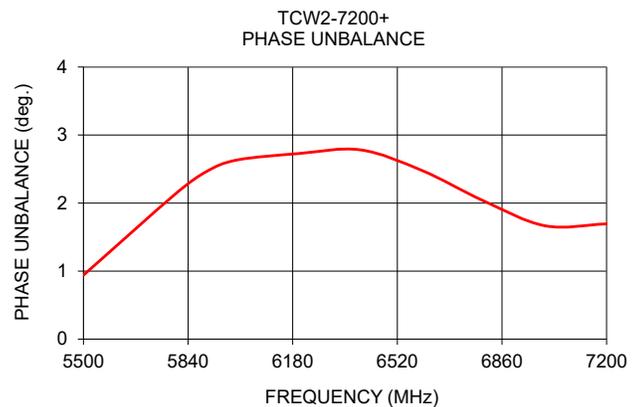
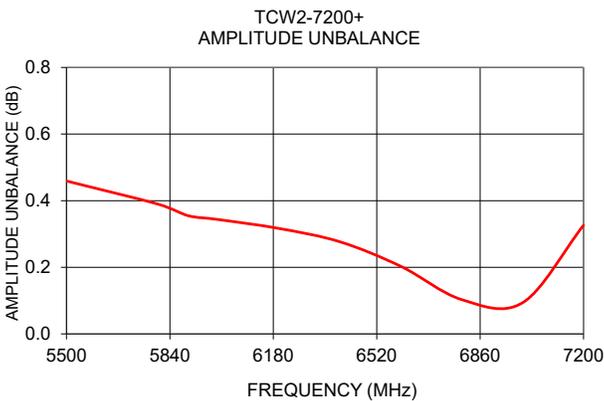
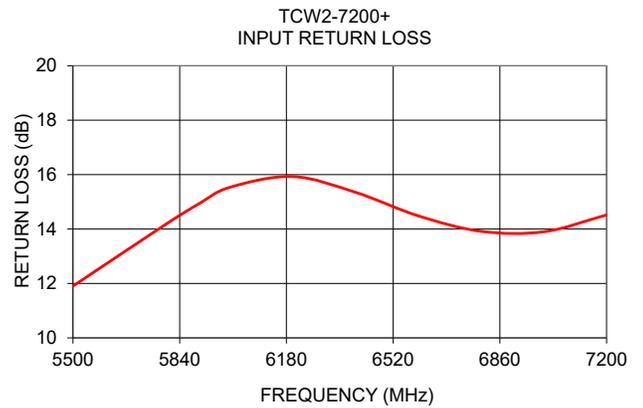
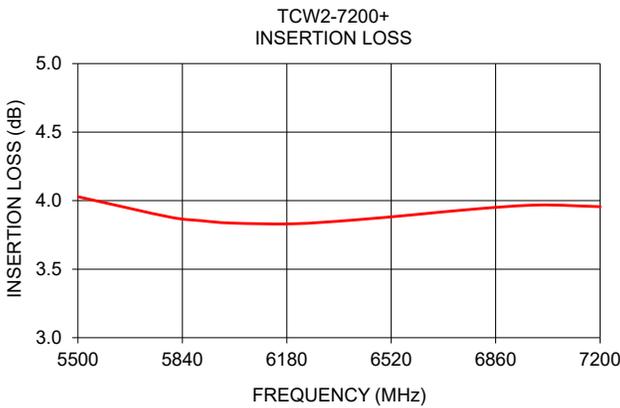
TAPE & REEL INFORMATION: F114





TYPICAL PERFORMANCE DATA

| Frequency (MHz) | Insertion Loss (dB) | Return Loss (dB) | Amplitude Unbalance (dB) | Phase Unbalance (deg) |
|-----------------|---------------------|------------------|--------------------------|-----------------------|
| 5500 | 4.03 | 11.90 | 0.46 | 0.94 |
| 5800 | 3.88 | 14.21 | 0.39 | 2.14 |
| 5900 | 3.85 | 14.92 | 0.35 | 2.46 |
| 6000 | 3.84 | 15.53 | 0.34 | 2.63 |
| 6200 | 3.83 | 15.93 | 0.32 | 2.73 |
| 6400 | 3.86 | 15.35 | 0.28 | 2.78 |
| 6600 | 3.90 | 14.48 | 0.20 | 2.48 |
| 6800 | 3.94 | 13.92 | 0.10 | 2.03 |
| 7000 | 3.97 | 13.90 | 0.09 | 1.67 |
| 7200 | 3.96 | 14.52 | 0.33 | 1.69 |



- 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.
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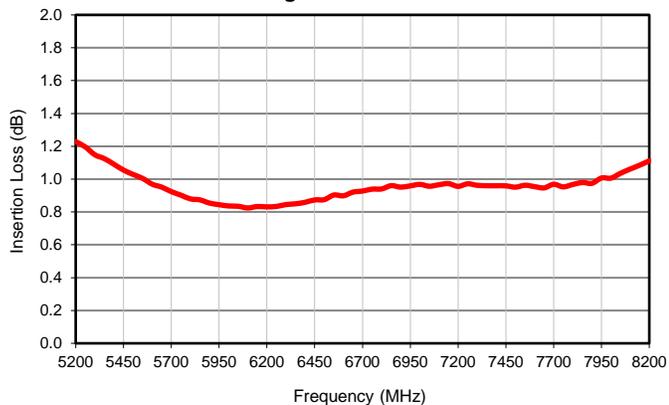
Typical Performance Data

| FREQUENCY (MHz) | AVERAGE INSERTION LOSS (dB) | INPUT RETURN LOSS (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE ⁽¹⁾ (deg.) |
|-----------------|-----------------------------|------------------------|--------------------------|---------------------------------------|
| 5200 | 1.23 | 10.54 | 0.73 | 3.28 |
| 5250 | 1.20 | 10.65 | 0.65 | 2.09 |
| 5300 | 1.15 | 10.82 | 0.60 | 1.20 |
| 5350 | 1.12 | 11.04 | 0.56 | 0.48 |
| 5400 | 1.09 | 11.26 | 0.51 | 0.17 |
| 5450 | 1.06 | 11.55 | 0.48 | 0.57 |
| 5500 | 1.03 | 11.90 | 0.46 | 0.94 |
| 5550 | 1.00 | 12.18 | 0.45 | 1.31 |
| 5600 | 0.97 | 12.59 | 0.42 | 1.63 |
| 5650 | 0.95 | 12.98 | 0.42 | 1.68 |
| 5700 | 0.92 | 13.36 | 0.42 | 2.04 |
| 5750 | 0.90 | 13.77 | 0.38 | 2.14 |
| 5800 | 0.88 | 14.21 | 0.39 | 2.14 |
| 5850 | 0.87 | 14.55 | 0.38 | 2.44 |
| 5900 | 0.85 | 14.92 | 0.35 | 2.46 |
| 5950 | 0.84 | 15.27 | 0.36 | 2.47 |
| 6000 | 0.84 | 15.53 | 0.34 | 2.63 |
| 6050 | 0.83 | 15.71 | 0.33 | 2.70 |
| 6100 | 0.82 | 15.88 | 0.33 | 2.64 |
| 6150 | 0.83 | 15.93 | 0.32 | 2.76 |
| 6200 | 0.83 | 15.93 | 0.32 | 2.73 |
| 6250 | 0.83 | 15.86 | 0.30 | 2.82 |
| 6300 | 0.85 | 15.75 | 0.29 | 2.78 |
| 6350 | 0.85 | 15.51 | 0.29 | 2.76 |
| 6400 | 0.86 | 15.35 | 0.28 | 2.78 |
| 6450 | 0.87 | 15.14 | 0.25 | 2.64 |
| 6500 | 0.87 | 14.90 | 0.25 | 2.60 |
| 6550 | 0.90 | 14.68 | 0.24 | 2.61 |
| 6600 | 0.90 | 14.48 | 0.20 | 2.48 |
| 6650 | 0.92 | 14.31 | 0.20 | 2.29 |
| 6700 | 0.93 | 14.10 | 0.16 | 2.33 |
| 6750 | 0.94 | 14.03 | 0.12 | 2.12 |
| 6800 | 0.94 | 13.92 | 0.10 | 2.03 |
| 6850 | 0.96 | 13.87 | 0.06 | 1.92 |
| 6900 | 0.95 | 13.83 | 0.00 | 1.82 |
| 6950 | 0.96 | 13.88 | 0.04 | 1.69 |
| 7000 | 0.97 | 13.90 | 0.09 | 1.67 |
| 7050 | 0.96 | 14.03 | 0.14 | 1.66 |
| 7100 | 0.97 | 14.15 | 0.21 | 1.65 |
| 7150 | 0.97 | 14.31 | 0.26 | 1.63 |
| 7200 | 0.96 | 14.52 | 0.33 | 1.69 |
| 7250 | 0.97 | 14.80 | 0.38 | 1.68 |
| 7300 | 0.96 | 15.11 | 0.44 | 1.67 |
| 7350 | 0.96 | 15.48 | 0.49 | 1.69 |
| 7400 | 0.96 | 15.94 | 0.54 | 1.68 |
| 7450 | 0.96 | 16.42 | 0.62 | 1.79 |
| 7500 | 0.95 | 16.98 | 0.65 | 1.62 |
| 7550 | 0.96 | 17.72 | 0.72 | 1.66 |
| 7600 | 0.95 | 18.49 | 0.79 | 1.57 |
| 7650 | 0.95 | 19.49 | 0.86 | 1.41 |
| 7700 | 0.97 | 20.66 | 0.92 | 1.31 |
| 7750 | 0.95 | 22.01 | 1.02 | 1.28 |
| 7800 | 0.97 | 23.77 | 1.11 | 0.96 |
| 7850 | 0.98 | 25.85 | 1.17 | 0.87 |
| 7900 | 0.97 | 28.83 | 1.28 | 0.87 |
| 7950 | 1.01 | 32.11 | 1.37 | 0.55 |
| 8000 | 1.01 | 32.43 | 1.47 | 0.50 |
| 8050 | 1.04 | 30.31 | 1.58 | 0.47 |
| 8100 | 1.06 | 26.57 | 1.71 | 0.26 |
| 8150 | 1.08 | 24.05 | 1.81 | 0.20 |
| 8200 | 1.11 | 21.85 | 1.95 | 0.33 |

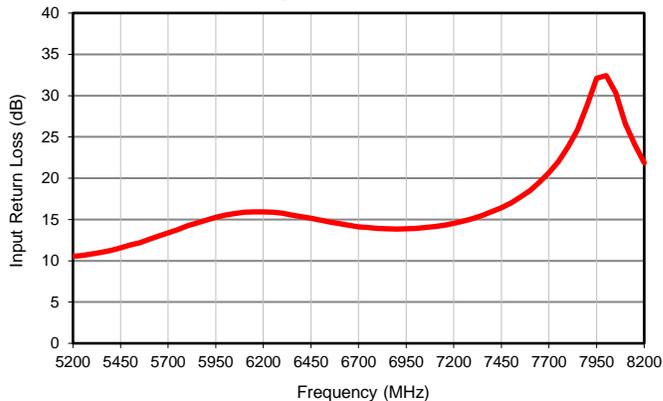
⁽¹⁾ Relative to 180°

Typical Performance Data

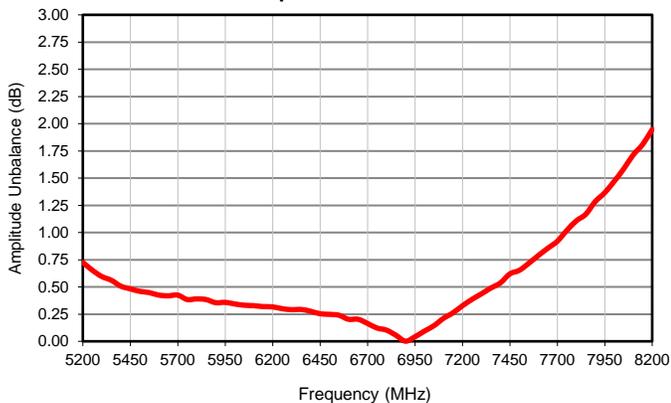
Average Insertion Loss



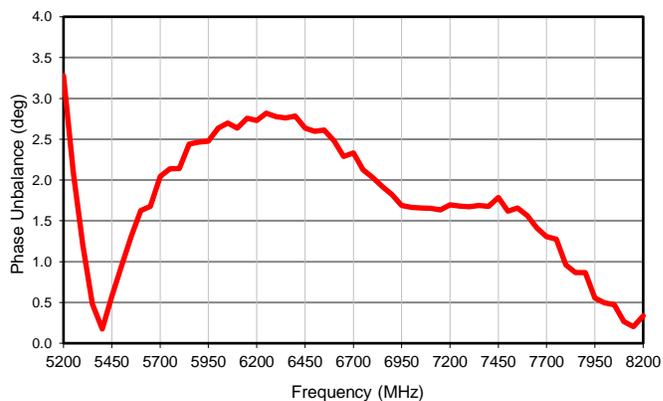
Input Return Loss



Amplitude Unbalance



Phase Unbalance

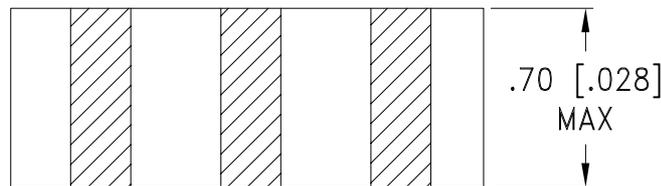
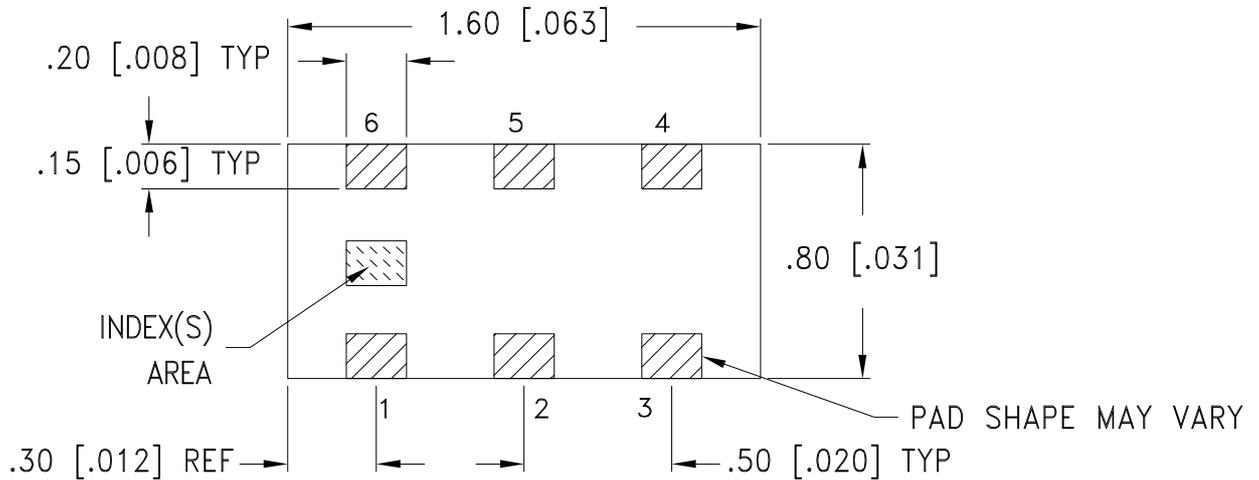


Case Style

JC

Outline Dimensions

JC0603C



Weight: .005 grams

Dimensions are in mm [inch]. Tolerances: ± 0.13 mm

Notes:

1. Open style, ceramic base.
2. Termination finish:

For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.

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RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F114

DEVICE ORIENTATION IN T&R

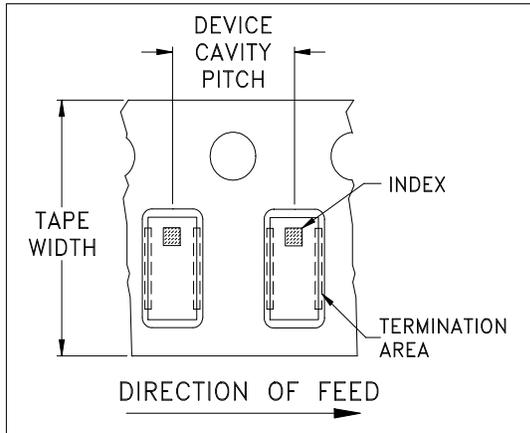


ILLUSTRATION 1

| Applicable Case Styles | |
|------------------------|-----------|
| GE0805C | JC0603C |
| GE0805C-1 | JC0603C-4 |
| GE0805C-1AP | JC0603C-6 |
| GE0805C-7 | |
| GE0805C-9 | |
| GE0805C-10 | |
| GE0805C-11 | |
| GE0805C-12 | |

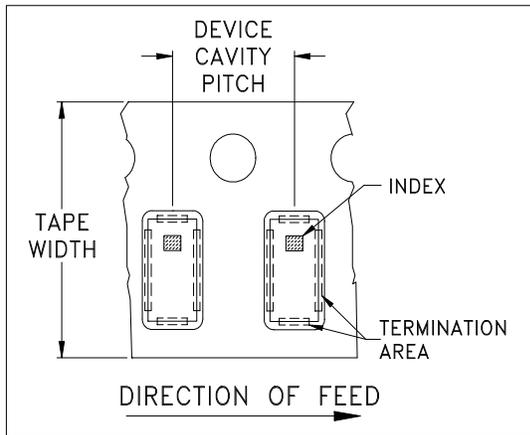


ILLUSTRATION 2

| Applicable Case Styles | |
|------------------------|-----------|
| GE0805C-2 | JC0603C-1 |
| GE0805C-3 | JC0603C-2 |
| GE0805C-4 | JC0603C-3 |
| GE0805C-5 | JC0603C-5 |
| GE0805C-6 | JC0603C-7 |
| GE0805C-8 | JV1210C-1 |
| GE0805C-15 | |

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

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



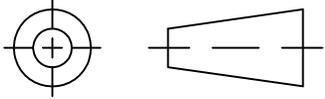
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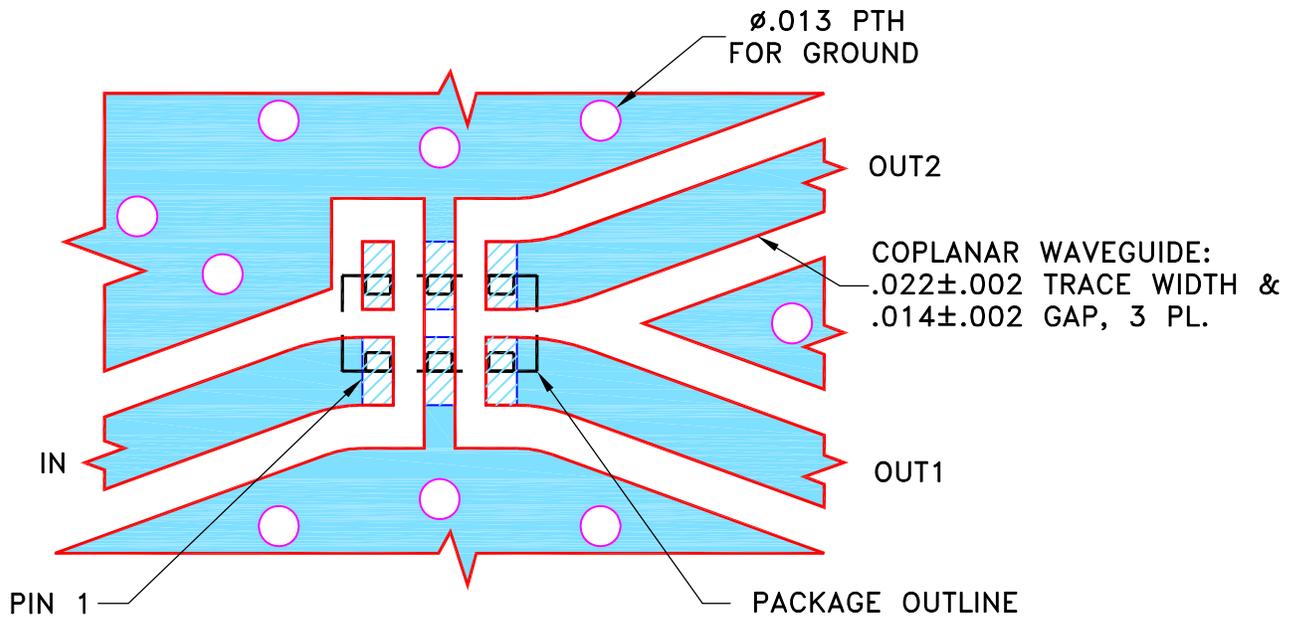
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
|-----|---------|-------------|----------|-----|------|
| OR | M162337 | NEW RELEASE | 06/15/17 | ITG | AVB |
| | | | | | |
| | | | | | |

**SUGGESTED MOUNTING CONFIGURATION
FOR JC0603C CASE STYLE, "06TR01" PIN CODE**



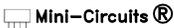
- TRACE WIDTH AND GAP PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS $.010 \pm .001$ ". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

| UNLESS OTHERWISE SPECIFIED | INITIALS | | DATE |
|--|----------|-----|----------|
| DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ± | DRAWN | ITG | 06/14/17 |
| | CHECKED | GF | 06/15/17 |
| | APPROVED | AVB | 06/15/17 |
| | | | |

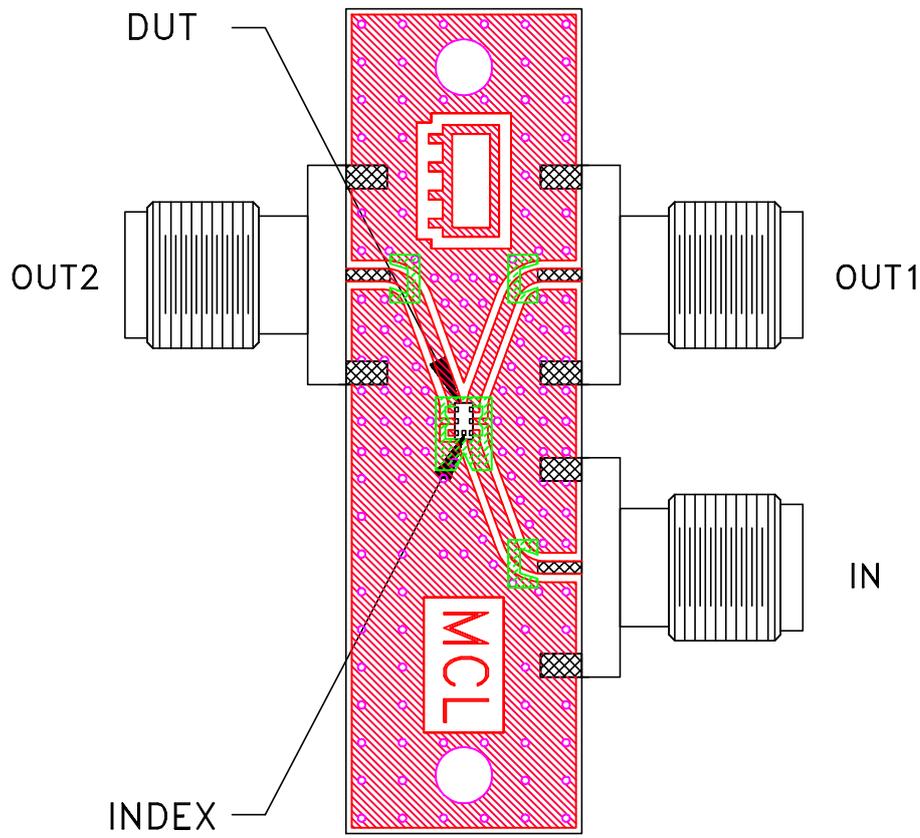
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PL, 06TR01, JC0603C, TB-828+

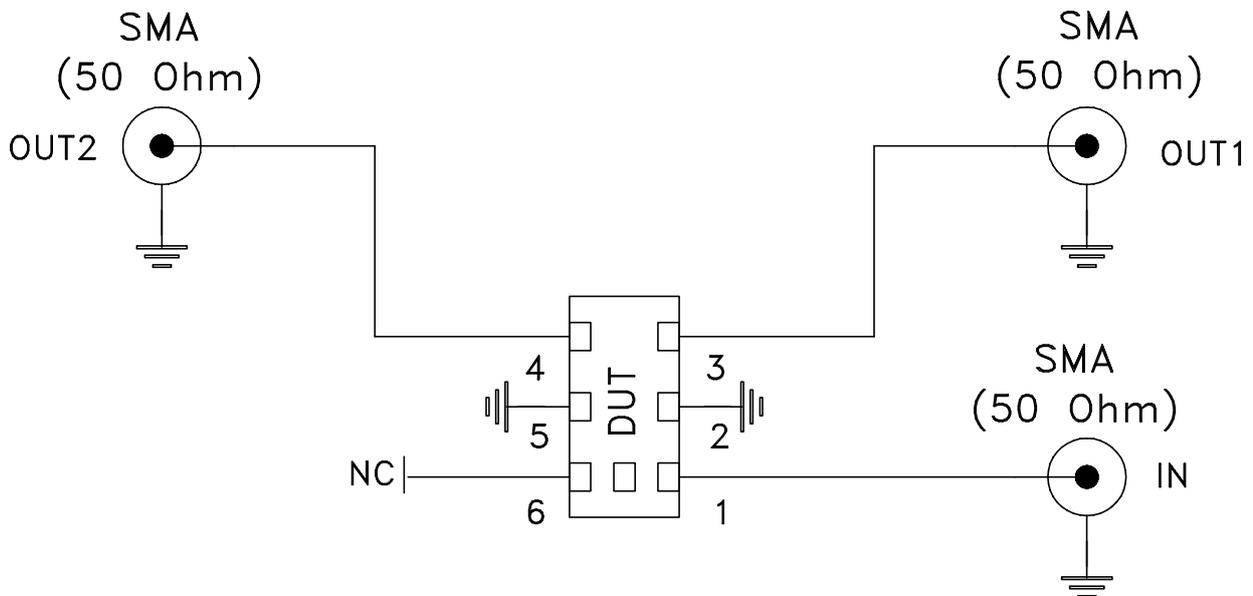
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| SIZE | CODE IDENT | DRAWING NO: | REV: |
|-------|------------|-------------|---------------|
| A | 15542 | 98-PL-513 | OR |
| FILE: | 98PL513 | SCALE: 16:1 | SHEET: 1 OF 1 |

Evaluation Board and Circuit



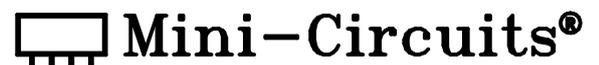
TB-828+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.010 inch.





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 | -55° to 125° C Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 125° 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 |
| Solder Reflow Heat | Sn-Pb Eutectic Process: 225°C peak Pb-Free Process: 250°C peak | J-STD-020C, 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 |