CERAMIC BALUN

# RF Transformer

# TCW1-422+

50Ω 3100 to 4200 MHz 1:1 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

- 5G application
- Wireless Communication

## PRODUCT OVERVIEW

Mini-Circuits' TCW1-422+ is a tiny ceramic RF balun transformer with an impedance ratio of 1:1, covering a variety of wireless communications applications from 3100 to 4200 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-010936
TCW1-422+
SL/CP/AM
221003

# RF Transformer

# TCW1-422+

50Ω 3100 to 4200 MHz 1:1 Ratio

## ELECTRICAL SPECIFICATIONS AT 25°C

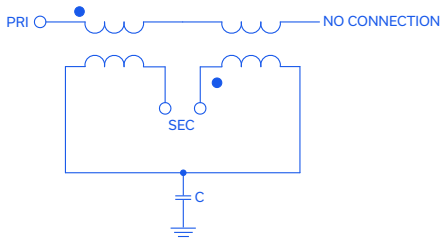
| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Impedance Ratio | | | 50:50 | | |
| Frequency Range | | 3100 | | 4200 | MHz |
| Insertion Loss | 3100-4200 | | 1.1 | 1.5 | dB |
| Amplitude Unbalance | 3100-4200 | | 1 | 1.5 | dB |
| Phase Unbalance | 3100-4200 | | 7 | 13 | Degree |
| Return Loss Unbalanced Port | 3100-4200 | 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

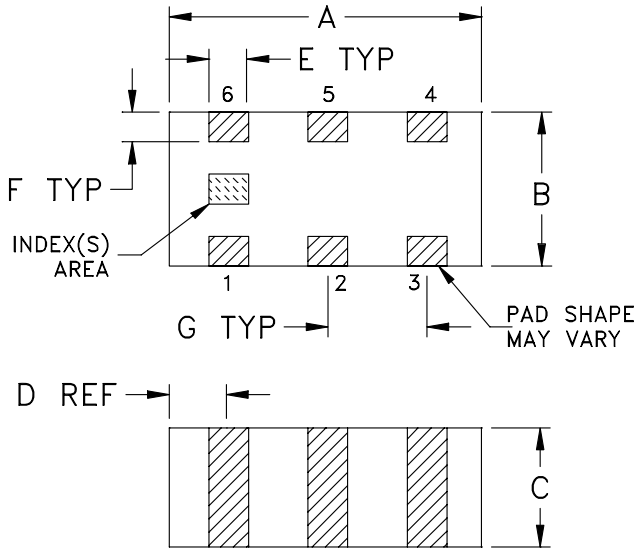
# TCW1-422+

50Ω 3100 to 4200 MHz 1:1 Ratio

## PAD CONNECTIONS

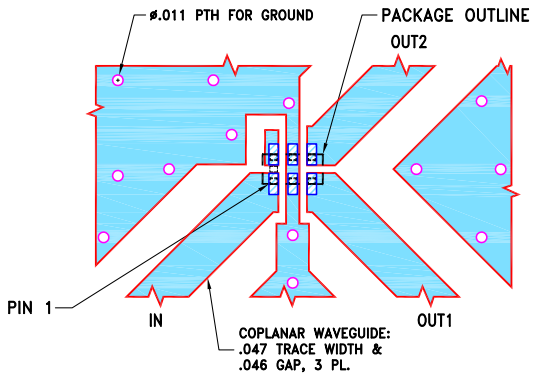
| | |
|---|---|
| UNBALANCED PORT | 1 |
| BALANCED PORT | 3,4 |
| GROUND | 5 |
| NOT CONNECT | 6 |
| GND or DC feed | 2 |

## OUTLINE DRAWING




## DEMO BOARD MCL P/N: TB-TCW1-422+

## SUGGESTED PCB LAYOUT (PL-574)




NOTES:
1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020±.0015. 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.

## 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

CERAMIC BALUN

# RF Transformer

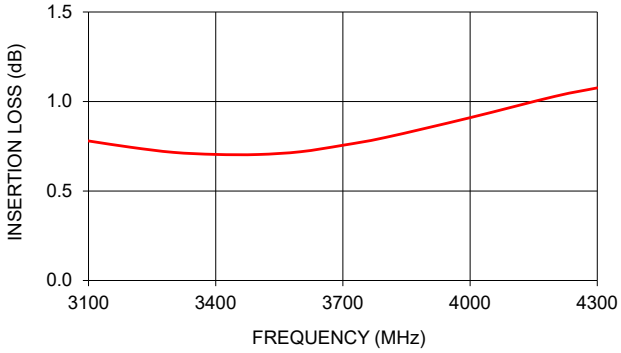
# TCW1-422+

50Ω 3100 to 4200 MHz 1:1 Ratio

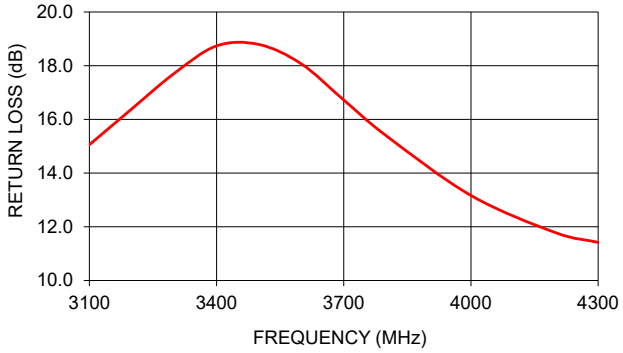
## TYPICAL PERFORMANCE DATA

| Frequency (MHz) | Insertion Loss (dB) | Return Loss (dB) | Amplitude Unbalance (dB) | Phase Unbalance (deg) |
|---|---|---|---|---|
| 3100 | 0.78 | 15.06 | 0.40 | 5.45 |
| 3200 | 0.74 | 16.39 | 0.43 | 4.72 |
| 3300 | 0.72 | 17.71 | 0.43 | 3.94 |
| 3400 | 0.70 | 18.74 | 0.40 | 3.18 |
| 3500 | 0.70 | 18.79 | 0.36 | 2.33 |
| 3600 | 0.72 | 18.07 | 0.29 | 1.48 |
| 3700 | 0.76 | 16.72 | 0.20 | 0.59 |
| 3800 | 0.80 | 15.39 | 0.07 | 0.32 |
| 4000 | 0.91 | 13.17 | 0.22 | 2.24 |
| 4200 | 1.03 | 11.78 | 0.60 | 4.25 |

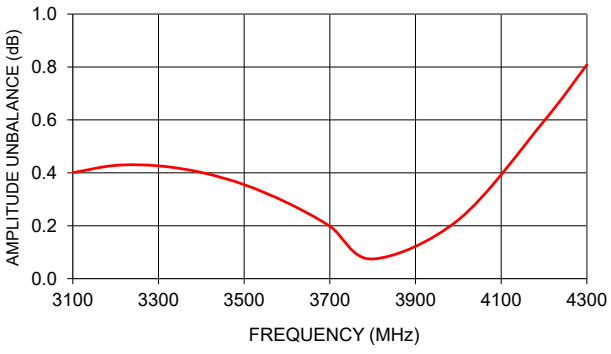
TCW1-422+
INSERTION LOSS



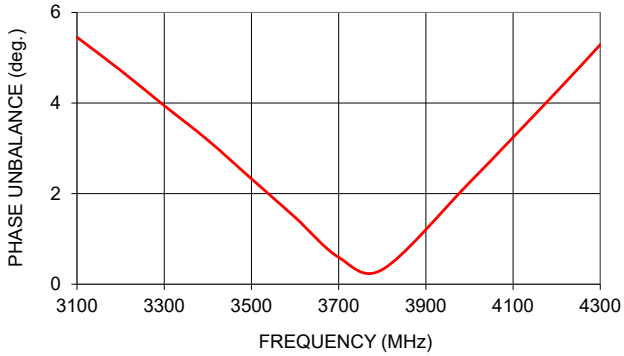

TCW1-422+
INPUT RETURN LOSS




TCW1-422+
AMPLITUDE UNBALANCE




TCW1-422+
PHASE UNBALANCE




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/terms/viewterm.html