



## CERAMIC BALUN

# RF Transformer

# TCW2-133+

50Ω 7 to 13 GHz Ratio 1:2

### THE BIG DEAL

- Insertion loss (above 3dB): 1.0 dB typ.
- Amplitude unbalance: 1.7 dB typ.
- Phase unbalance: 13 degrees typ.
- RF input power: 2W max at 25 °C
- 0603 Surface Mount Footprint



Generic photo used for illustration purposes only

CASE STYLE: JC0603C

### APPLICATIONS

- Satellite Communication
- Clock Distribution
- Radar
- High Speed ADC/DAC interface

### +RoHS Compliant

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

### PRODUCT OVERVIEW

Mini-Circuits' TCW2-133+ is a tiny ceramic RF balun transformer with an impedance ratio of 1:2, covering a variety of wireless communications applications from 7 to 13 GHz. 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. 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
Extremely wide operating temperature. -55 to +125 °C	Able to be used in demanding commercial, industrial and military applications.
2W power handling	Supports a wide range of power requirements
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. A  
ECO-016193  
TCW2-133+  
SL/CP/AM  
221220





### ELECTRICAL SPECIFICATIONS AT 25°C<sup>1</sup>

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio		50:100			
Frequency Range		7000		13000	MHz
Average Insertion loss (above 3dB)	7000-13000	—	1.0	1.5	dB
Amplitude Unbalance	7000-13000	—	1.7	—	dB
Phase Unbalance	7000-13000	—	13	—	Degree
Return Loss Unbalanced Port	7000-13000	—	10	—	dB

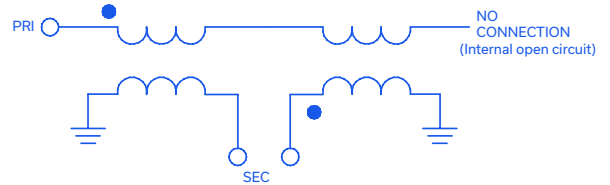
1. Tested on TB-TCW2-133+; Evaluation Board losses have been de-embedded.

### MAXIMUM RATINGS

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

\*Specified at 25 °C (Room temperature); Derates linearly to 0.5 W at 125 °C. Permanent damage may occur if any of these limits are exceeded.

### CONFIGURATION J





# CERAMIC BALUN

# RF Transformer

# TCW2-133+

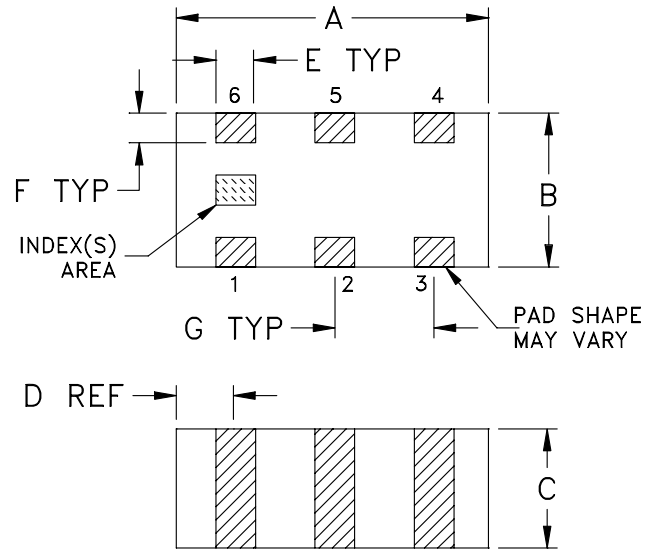


50Ω 7 to 13 GHz Ratio 1:2

### PAD CONNECTIONS

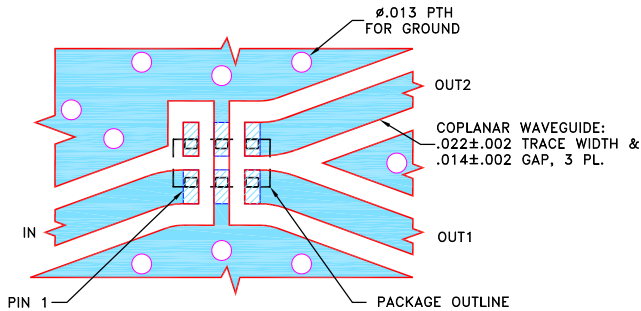
UNBALANCED PORT (PRI)	1
BALANCED PORT (SEC)	3,4
GROUND	2,5
NOT CONNECT	6

### OUTLINE DRAWING



PRODUCT MARKING: TX

### DEMO BOARD MCL P/N: TB-TCW2-133+ SUGGESTED PCB LAYOUT (PL-513)



### 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

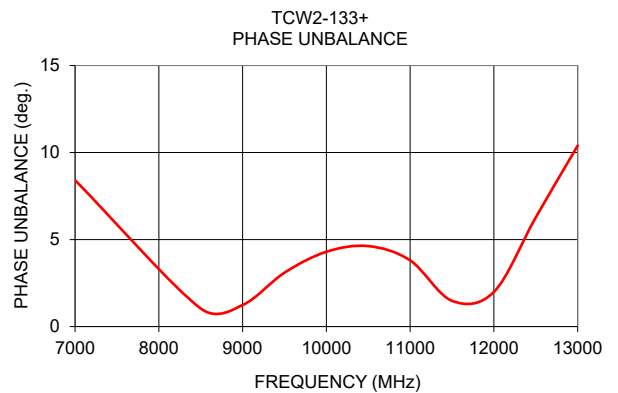
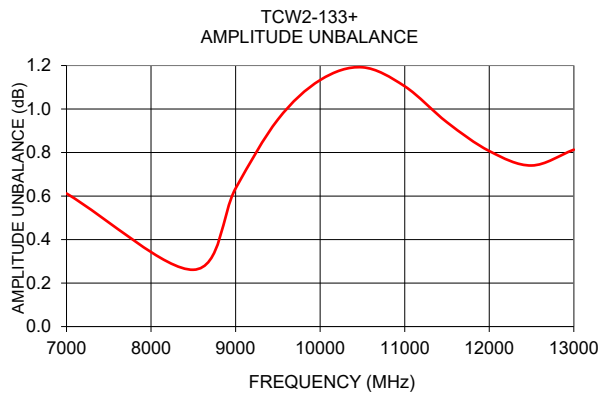
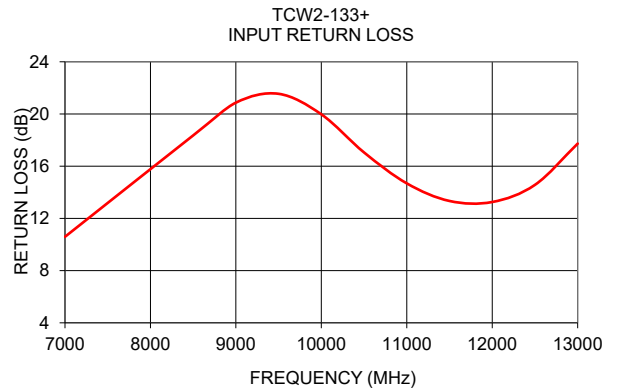
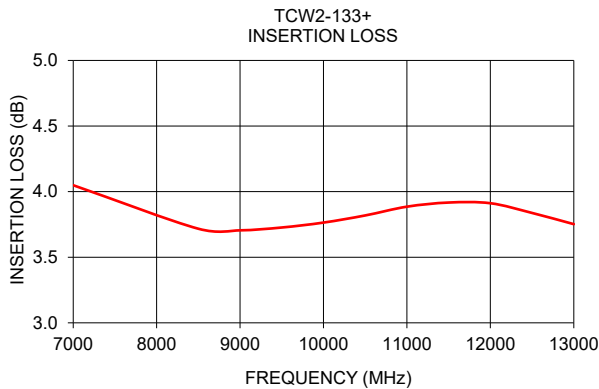
- TRACE WIDTH AND GAP PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .010"±.001". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
  - BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).  
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.





### TYPICAL PERFORMANCE DATA

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Amplitude Unbalance (dB)	Phase Unbalance (deg)
7000	4.05	10.59	0.61	8.41
8500	3.72	18.36	0.26	1.04
9000	3.70	20.87	0.64	1.24
9500	3.73	21.55	0.95	3.10
10000	3.76	19.97	1.13	4.30
10500	3.82	17.05	1.19	4.63
11000	3.89	14.68	1.10	3.80
11500	3.92	13.34	0.94	1.48
12000	3.91	13.26	0.81	1.99
12500	3.84	14.57	0.74	6.28
13000	3.75	17.73	0.81	10.39



- 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](http://www.minicircuits.com/terms/viewterm.html)