CERAMIC BALUN

RF Transformer

TCW2-4300+

50Ω 2150 to 4300 MHz Ratio 1:2

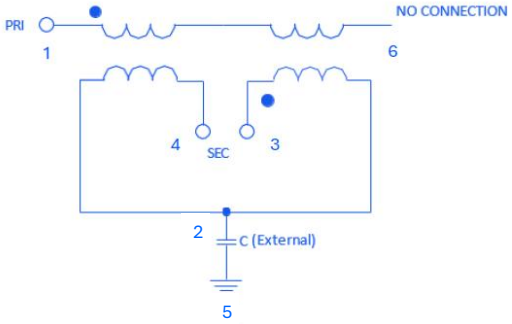
THE BIG DEAL

- Tiny Size, 0603
- Low Cost
- DC Feeding Capability for Secondary
- Rugged LTCC Construction



Generic photo used for illustration purposes only

CONFIGURATION R



APPLICATIONS

- Wireless Infrastructure 5G, Sub-6 GHz Bands
- Small Cells, Repeaters and Base Station Modules
- Satellite and Aerospace

PRODUCT OVERVIEW

Mini-Circuits' TCW-4300+ is a high-performance ceramic RF balun transformer with a 1:2 impedance ratio, optimized for 2.15 to 4.3 GHz – a critical range for wireless infrastructure, SATCOM uplinks and 5G sub-6 GHz systems. Engineered for precision, it delivers low insertion loss, excellent phase balance and minimal amplitude variation, ensuring superior signal integrity in demanding RF chains. With 4 W RF power handling and DC isolation between the input and output, it supports biasing flexibility for active components. Built on LTCC technology and housed in a rugged 0603 ceramic package, TCW2-4300+ combines compact size with exceptional reliability for harsh environments. .

KEY FEATURES

Feature	Advantages
4 W 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 combines compact size with exceptional reliability for harsh environments.

REV. A
ECO-030282
TCW2-4300+
MCL NY
260630

ELECTRICAL SPECIFICATIONS[1] AT +25 °C, Z_0 = 50Ω

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio (Secondary/Primary)			2		
Frequency Range		2150		4300	MHz
Average Insertion Loss[2]	2150–4300	–	0.8	1.2	dB
Return Loss (Unbalanced Port)	2150–4300	10	15	–	dB
Return Loss (Balanced Port)[2]	2150–4300	10	15	–	dB
CMRR	2150–4300	20	22	–	dB
Amplitude Unbalance	2150–4300	–	–	1.3	dB
Phase Unbalance[3]	2150–4300	–	–	11	Degrees

1. Tested in Evaluation Board P/N TB-TCW2-4300C+.
2. Based on mixed-mode parameters.
3. Relative to 180°.

ABSOLUTE MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
RF Power Input[5]	4 W

4. Permanent damage may occur if any of these limits are exceeded.
5. At +25 °C, derate linearly to 1.4 W at +125 °C.

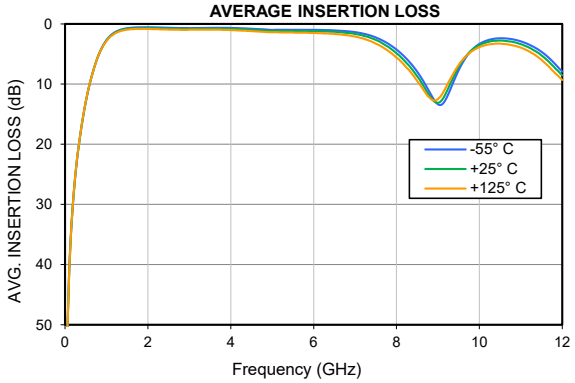
RF Transformer

TCW2-4300+

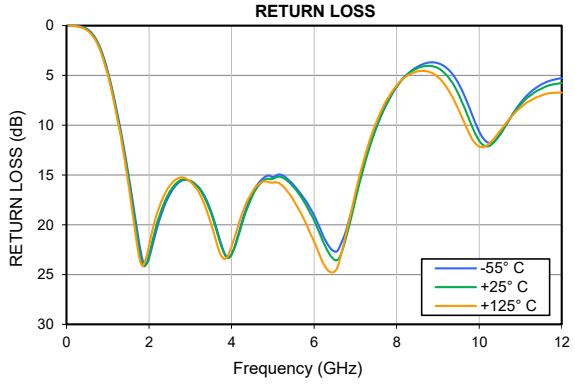
50Ω 2150 to 4300 MHz Ratio 1:2

TYPICAL PERFORMANCE GRAPHS

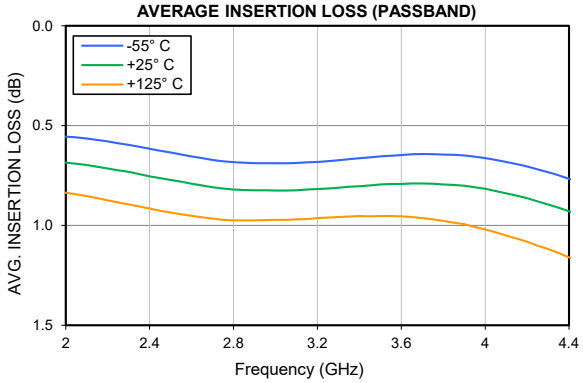
AVERAGE INSERTION LOSS



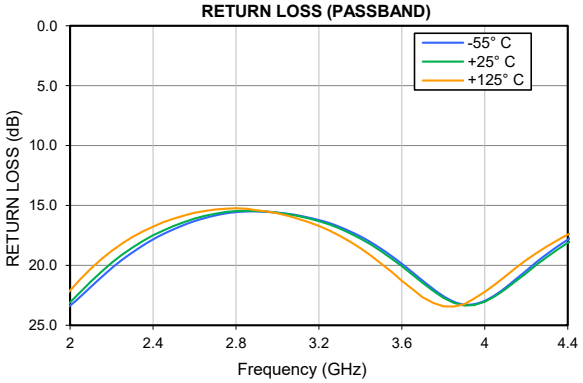
RETURN LOSS



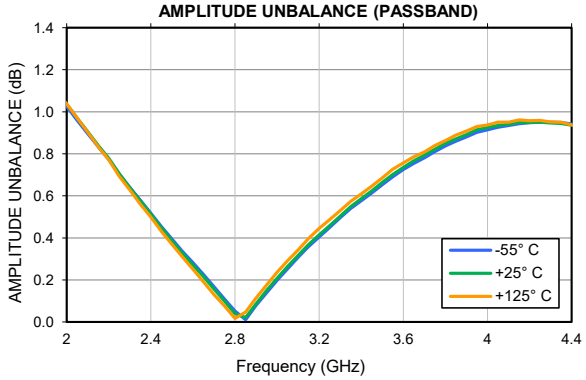
AVERAGE INSERTION LOSS (PASSBAND)



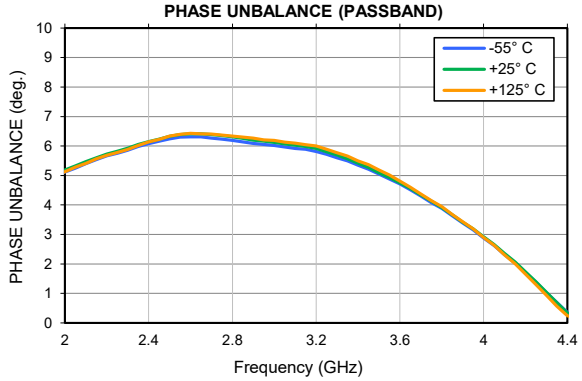
RETURN LOSS (PASSBAND)



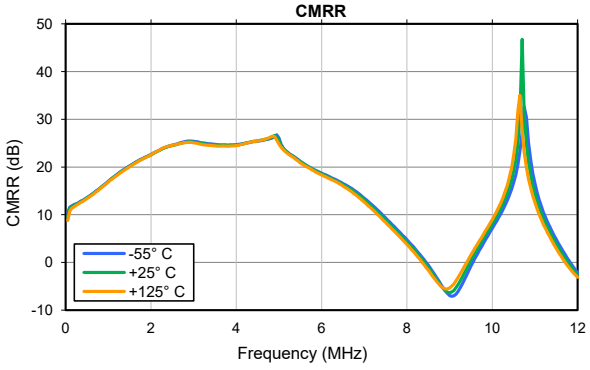
AMPLITUDE UNBALANCE (PASSBAND)



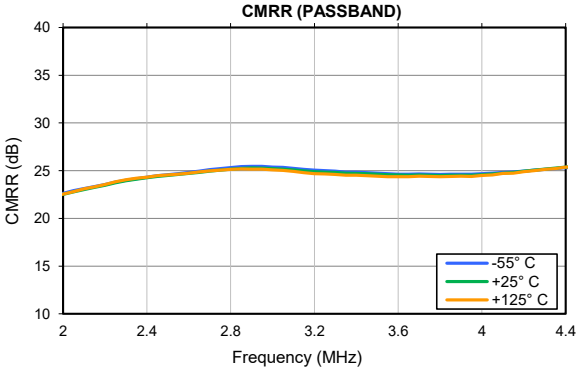
PHASE UNBALANCE (PASSBAND)



CMRR



CMRR (PASSBAND)



RF Transformer

TCW2-4300+

50Ω 2150 to 4300 MHz Ratio 1:2

CONFIGURATION R

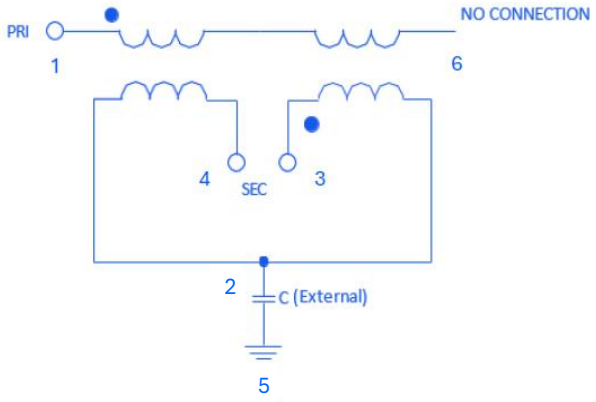
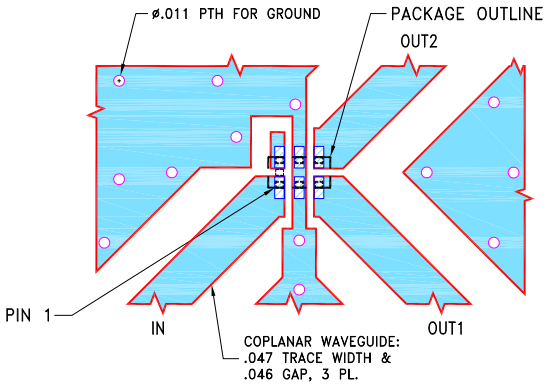


Figure 1. TCW2-4300+ Configuration

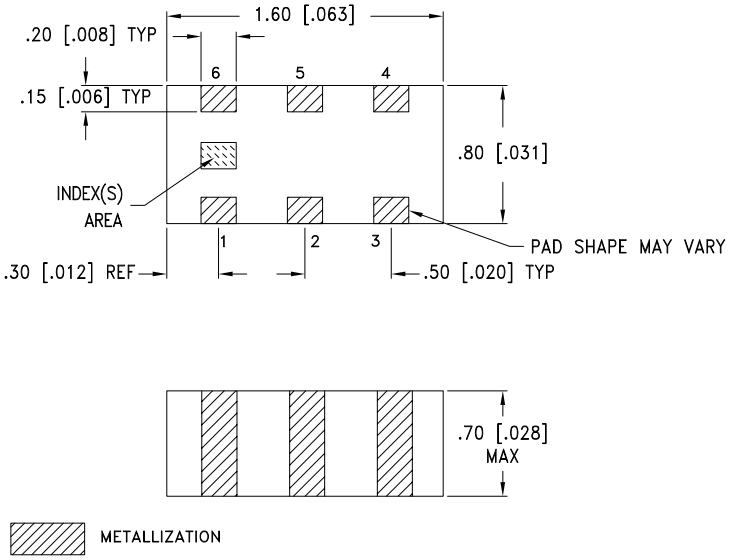
PAD DESCRIPTION

PRIMARY DOT (Unbalanced Port)	1
GND or DC FEED + RF	2
SECONDARY DOT (Balanced)	3
SECONDARY (Balanced)	4
GND	5
NO CONNECTION	6

DEMO BOARD MCL P/N: TB-TCW2-4300C+
SUGGESTED PCB LAYOUT (PL-574)



OUTLINE DRAWING



Weight: .005 grams
Dimensions are in mm [inch]. Tolerances: ±0.13 mm

PRODUCT MARKING: N/A

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.

CERAMIC BALUN

RF Transformer

TCW2-4300+

50Ω 2150 to 4300 MHz Ratio 1:2

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD. CLICK HERE

Performance Data & Graphs	Data Graphs S-Parameter (SXP Files) Data Set (.zip file) De-embedded to device pads
Case Style	JC0603C Lead Finish: Tin over Nickel Plating
RoHS Status	Compliant
Tape and Reel	TR-F114
Suggested Layout for PCB Design	PL-574
Evaluation Board	TB-TCW2-4300C+ Gerber File
Environmental Rating	ENV06T10

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-Circuits' 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

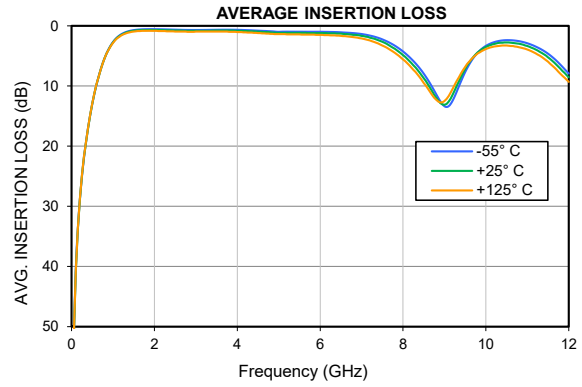
RF Transformer TCW2-4300+

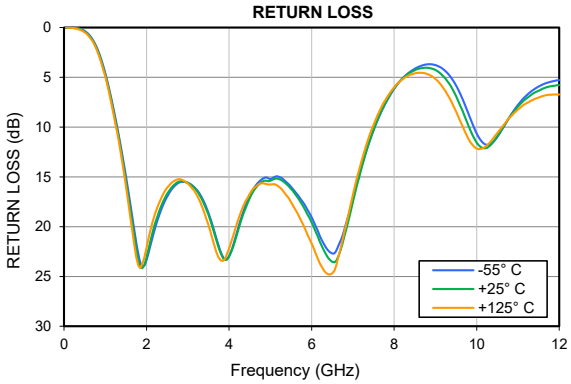
Typical Performance Data

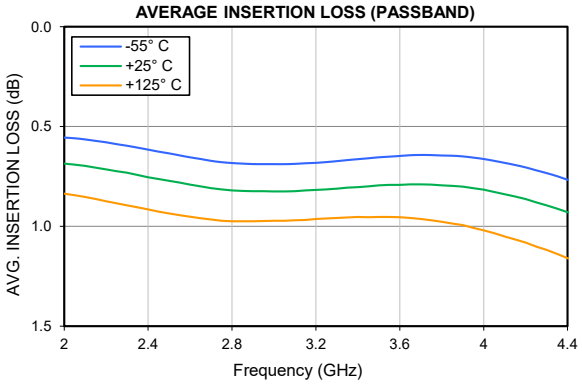
FREQUENCY (GHz)	AVERAGE INSERTION LOSS (dB)	RETURN LOSS (UNBALANCED PORT) (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE[1] (deg.)	CMRR
1.500	0.83	15.35	1.67	2.35	20.16
1.550	0.78	16.69	1.60	2.72	20.43
1.600	0.75	18.07	1.53	3.05	20.72
1.650	0.73	19.50	1.47	3.37	20.98
1.700	0.71	20.92	1.40	3.68	21.25
1.750	0.69	22.27	1.34	4.00	21.47
1.800	0.69	23.37	1.28	4.27	21.68
1.850	0.68	24.10	1.21	4.54	21.92
1.900	0.68	24.18	1.15	4.79	22.14
1.950	0.68	23.80	1.09	5.02	22.32
2.000	0.69	23.07	1.04	5.19	22.51
2.050	0.69	22.22	0.97	5.32	22.79
2.100	0.70	21.34	0.90	5.47	23.02
2.150	0.71	20.54	0.84	5.60	23.25
2.200	0.71	19.79	0.78	5.72	23.46
2.250	0.72	19.11	0.71	5.82	23.73
2.300	0.73	18.52	0.64	5.93	23.95
2.350	0.74	17.98	0.58	6.05	24.10
2.400	0.75	17.50	0.51	6.15	24.25
2.450	0.76	17.08	0.45	6.23	24.40
2.500	0.77	16.71	0.39	6.33	24.50
2.550	0.78	16.39	0.33	6.39	24.59
2.600	0.79	16.10	0.27	6.42	24.70
2.650	0.80	15.87	0.22	6.41	24.82
2.700	0.81	15.69	0.16	6.39	24.96
2.750	0.82	15.55	0.10	6.35	25.07
2.800	0.82	15.46	0.04	6.31	25.16
2.850	0.82	15.43	0.02	6.26	25.24
2.900	0.82	15.45	0.09	6.20	25.29
2.950	0.82	15.51	0.15	6.16	25.27
3.000	0.82	15.60	0.21	6.13	25.22
3.050	0.82	15.72	0.26	6.07	25.16
3.100	0.82	15.88	0.32	6.03	25.09
3.150	0.82	16.08	0.37	5.99	24.97
3.200	0.82	16.31	0.41	5.92	24.90
3.250	0.81	16.58	0.46	5.81	24.85
3.300	0.81	16.92	0.50	5.69	24.80
3.350	0.81	17.32	0.55	5.57	24.74
3.400	0.80	17.76	0.59	5.42	24.72
3.450	0.80	18.25	0.62	5.27	24.68
3.500	0.80	18.81	0.66	5.09	24.64
3.550	0.79	19.42	0.70	4.93	24.59
3.600	0.79	20.07	0.74	4.75	24.54
3.650	0.79	20.76	0.77	4.56	24.53
3.700	0.79	21.45	0.79	4.34	24.54
3.750	0.79	22.11	0.82	4.13	24.52
3.800	0.79	22.70	0.85	3.91	24.50
3.850	0.80	23.13	0.87	3.67	24.51
3.900	0.80	23.35	0.89	3.42	24.54
3.950	0.81	23.31	0.91	3.19	24.52
4.000	0.82	23.03	0.93	2.92	24.58
4.050	0.83	22.57	0.94	2.66	24.65
4.100	0.84	21.98	0.94	2.36	24.75
4.150	0.85	21.31	0.95	2.06	24.82
4.200	0.86	20.65	0.95	1.73	24.94
4.250	0.88	19.94	0.95	1.39	25.04
4.300	0.89	19.29	0.95	1.04	25.16
4.350	0.91	18.69	0.94	0.69	25.26
4.400	0.93	18.12	0.94	0.34	25.36
4.450	0.95	17.62	0.93	0.03	25.43
4.500	0.96	17.15	0.92	0.41	25.50

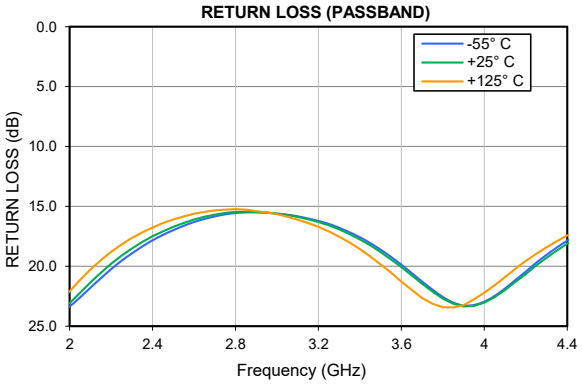
[1] Relative to 180°

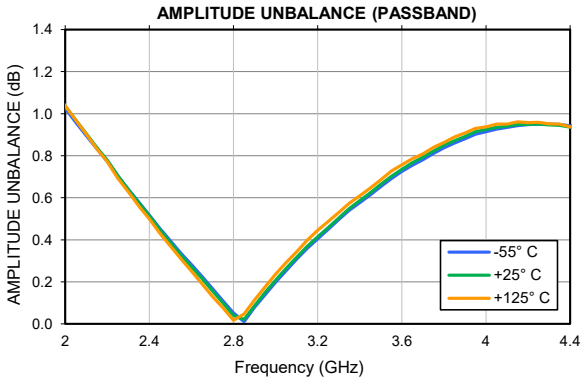
Typical Performance Curves

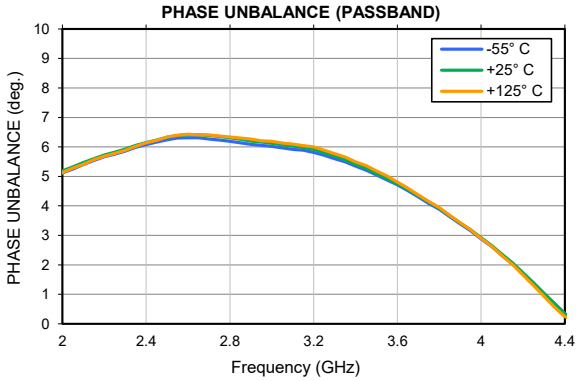


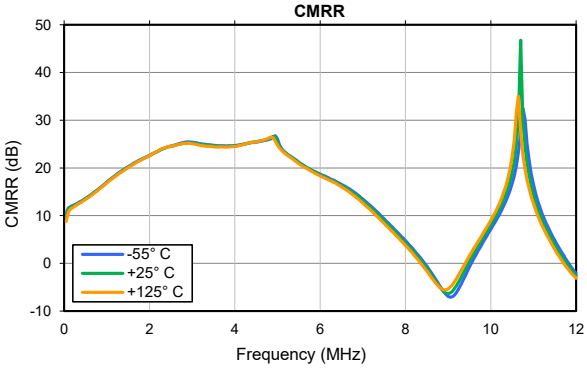


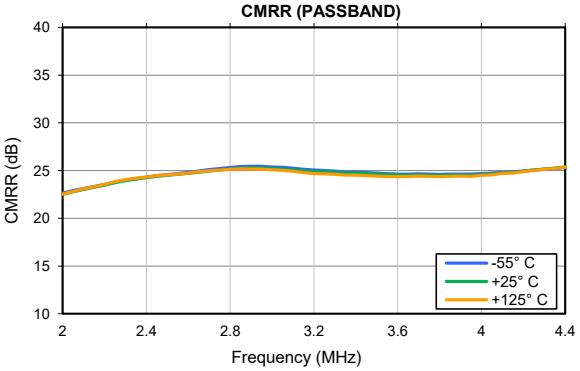






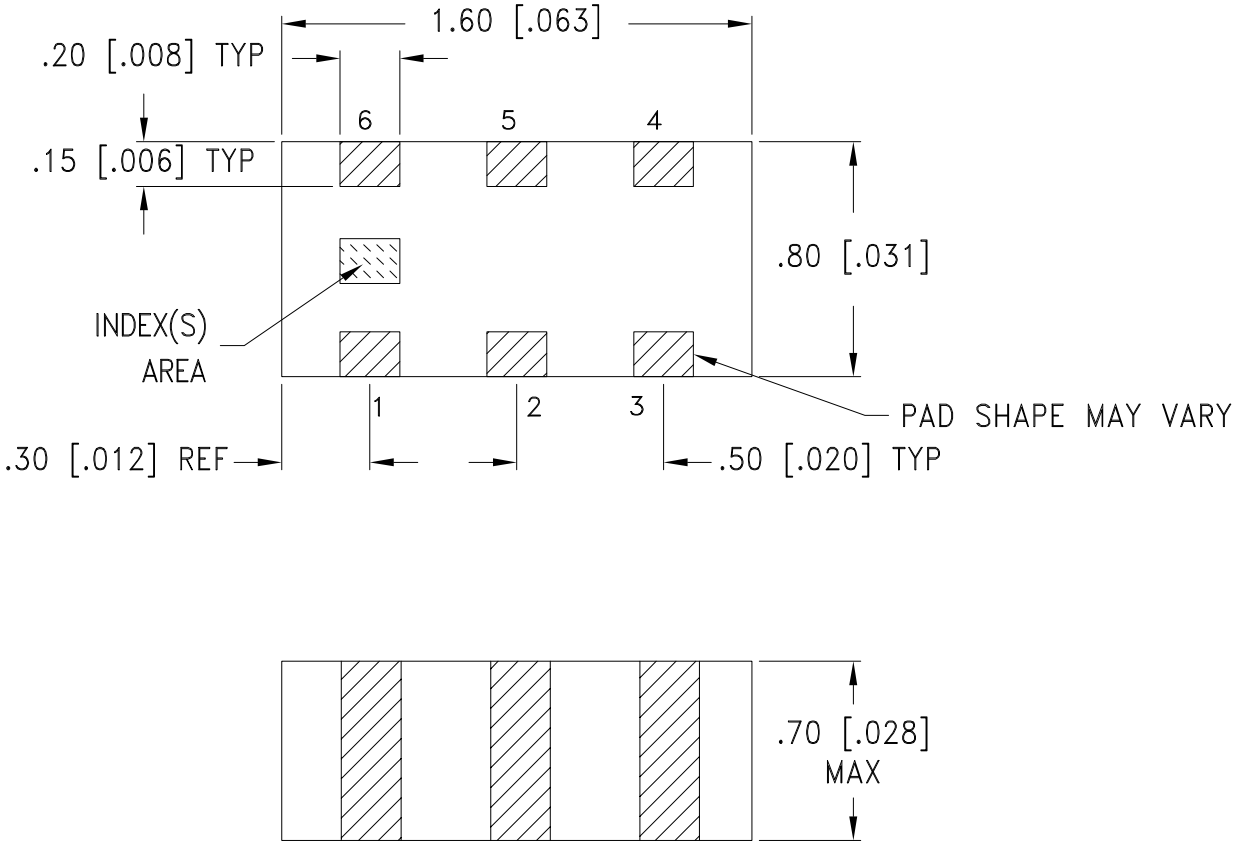






Case Style JC

Outline Dimensions JC0603C



METALLIZATION

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

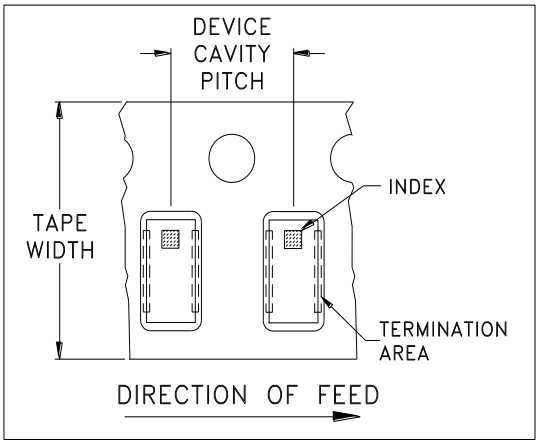


ILLUSTRATION 1

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

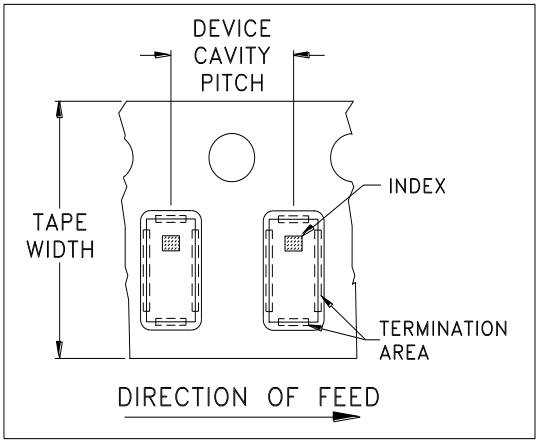


ILLUSTRATION 2

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	
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.

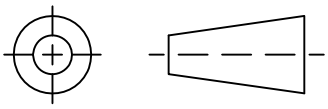
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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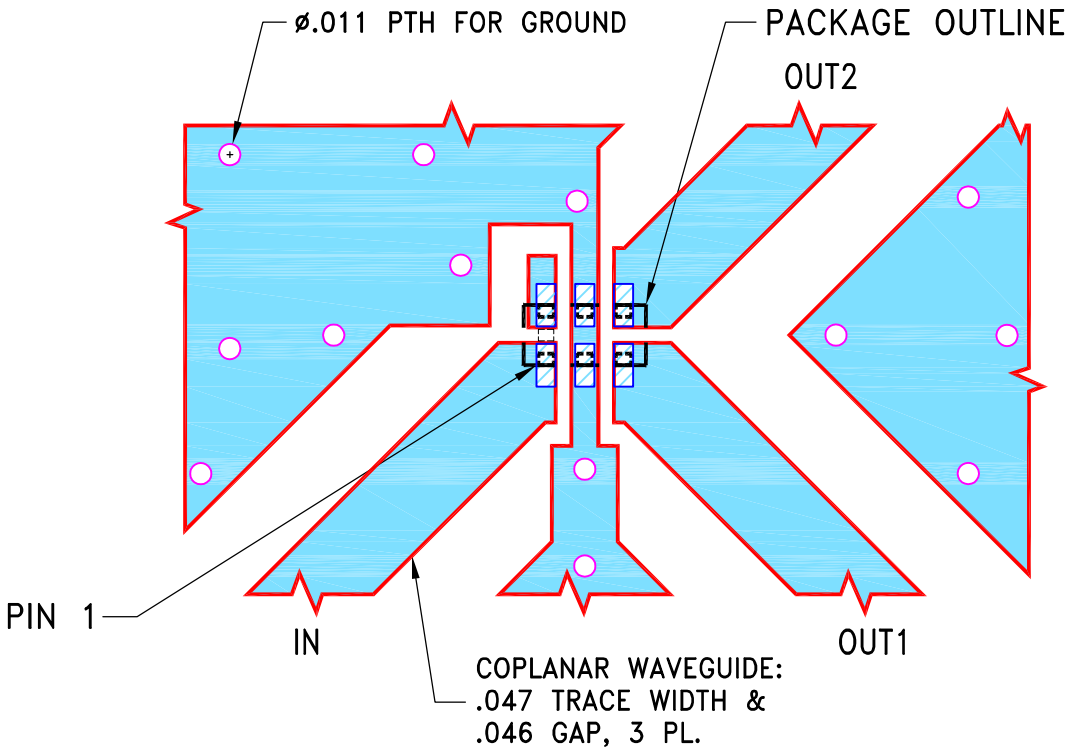
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THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M166452	NEW RELEASE	02/22/18	ITG	BK

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



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.

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	ITG	02/20/18
TOLERANCES ON:	CHECKED	GF	02/21/18
2 PL DECIMALS ±	APPROVED	BK	02/22/18
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

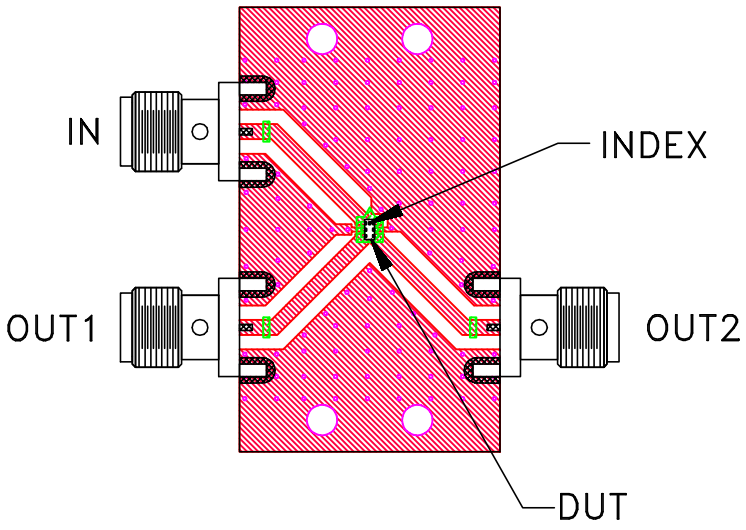
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 06TR01, JC0603C, TB-912+

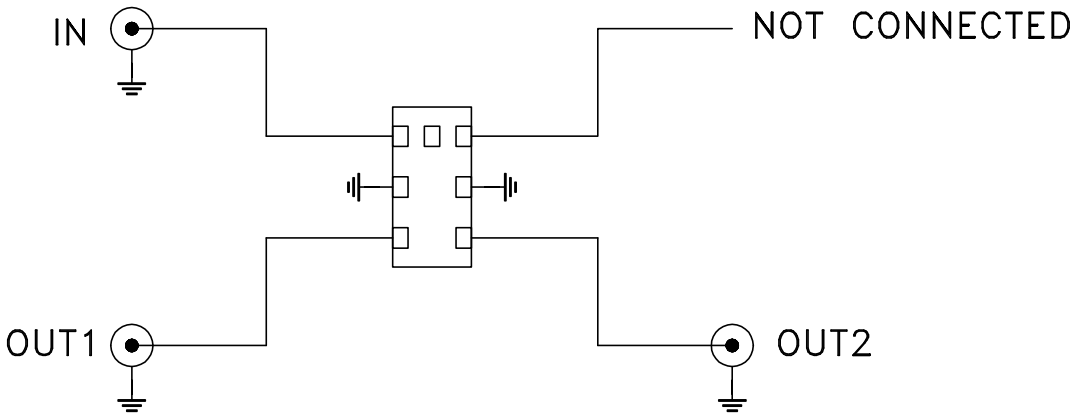
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-574	OR

FILE:	SCALE:	SHEET:
98PL574	10:1	1 OF 1

Evaluation Board and Circuit



TB-912+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5,
   Thickness=.020 inch.

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Mini-Circuits

Environmental Specifications ENV06T10

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 245° - 250°C peak	J-STD-020C, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Test B,B1, 95% Coverage
Thermal Shock	-55° to +125°C, 15 min dwell,250 cycles	MIL-STD-202, Method 107
Bend Test	1mm, deflection for 5 seconds Span of bending: 2.75"	--
High Temp Storage	125°C to 1000 Hrs	---

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