



CERAMIC BALUN

RF Transformer

TCW4-262+

Mini-Circuits

50Ω 2300 to 2600 MHz 1:4 Ratio

THE BIG DEAL

- Miniature size 0603 (0.063" [1.6mm] x 0.031" [0.8mm] x 0.024" [0.6mm])
- Low cost
- Aqueous washable



Generic photo used for illustration purposes only

CASE STYLE: JC0603C

APPLICATIONS

- ISM Band
- WLAN
- Bluetooth
- Zigbee

+RoHS Compliant

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

PRODUCT OVERVIEW

Mini-Circuits' TCW4-262+ is a tiny ceramic RF balun transformer with an impedance ratio of 1:4, covering a variety of wireless communications applications from 2300 to 2600 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. A
ECO-010443
TCW4-262+
AVB/CP/AM
211104





ELECTRICAL SPECIFICATIONS AT 25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Units
Impedance Ratio (Secondary/ Primary)			4		
Frequency Range		2300		2600	MHz
Insertion Loss Loss ¹	2300-2600	—	1.3	1.7	dB
Amplitude Unbalance	2300-2600	—	0.6	1	dB
Phase Unbalance ²	2300-2600	—	—	13	Degree
Unbalance Return Loss	2300-2600	9.5	12.5	—	dB

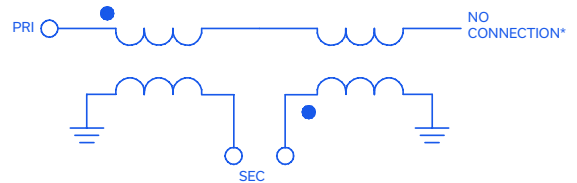
1. Tested on Evaluation Board TB-TCW4-262+
2. Relative to 180°

MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-55°C to 125°C
Storage Temperature ³	-55°C to 125°C
RF Power ⁴	2W

3. Refer to product storage temperature after installation. Suggestion for T&R unused product storage condition: +5~+35°C, Humidity 45~75%RH, 12 Month max.
 4. Derate linearly to 0.5W at 125°C.
- Permanent damage may occur if any of these limits are exceeded.

CONFIGURATION J



*Internal open circuit

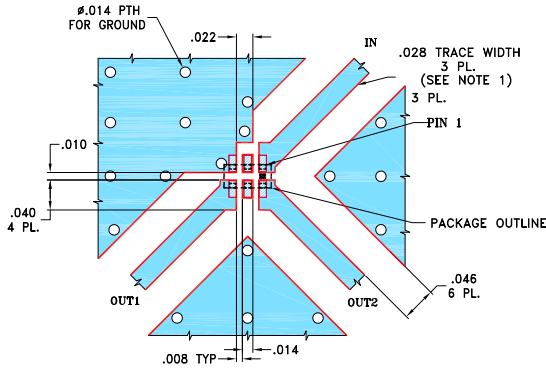


PAD CONNECTIONS

PRIMARY DOT	1
GND or DC feed	3
SECONDARY DOT (Balanced)	4
SECONDARY (Balanced)	6
NO CONNECTION	2,5

PRODUCT MARKING: N/A

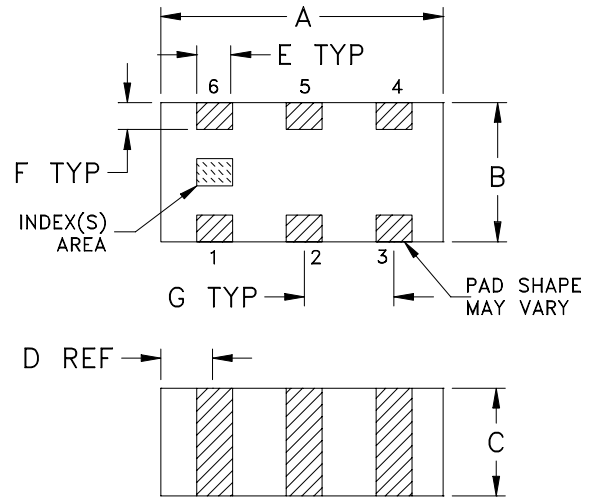
DEMO BOARD MCL P/N: TB-TCW4-262+ SUGGESTED PCB LAYOUT (PL-559)



NOTES:

- TRACE WIDTH IS SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS .016±.0015. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & 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

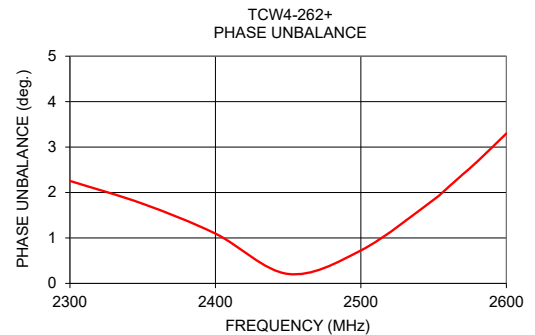
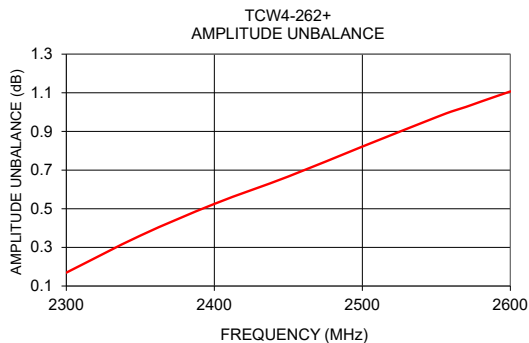
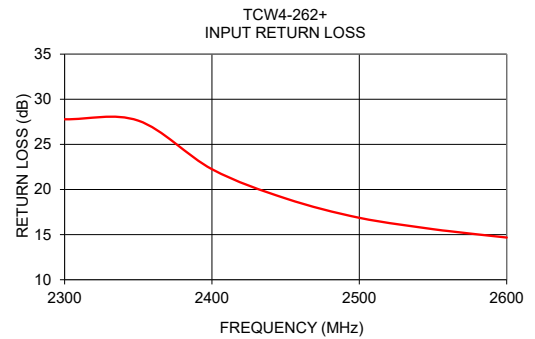
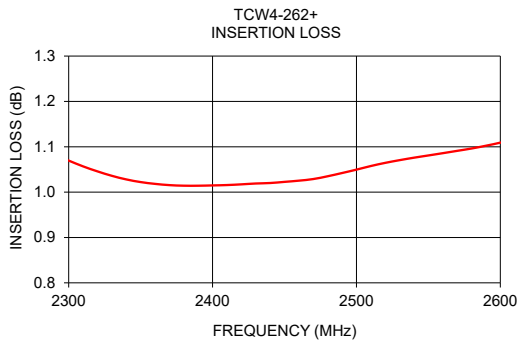
TAPE & REEL INFORMATION: F114



TYPICAL PERFORMANCE DATA⁵

Frequency (MHz)	Insertion Loss (dB)	Input Return Loss (dB)	Amplitude Unbalance (dB)	Phase Unbalance (deg)
2300	1.07	27.78	0.17	2.26
2350	1.02	27.63	0.36	1.75
2400	1.01	22.25	0.52	1.10
2450	1.02	19.01	0.67	0.21
2500	1.05	16.86	0.82	0.72
2550	1.08	15.60	0.97	1.84
2560	1.09	15.40	1.00	2.12
2570	1.09	15.21	1.03	2.40
2580	1.10	15.03	1.05	2.68
2600	1.11	14.68	1.11	3.30

5. Measured with Agilent N5242A 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.
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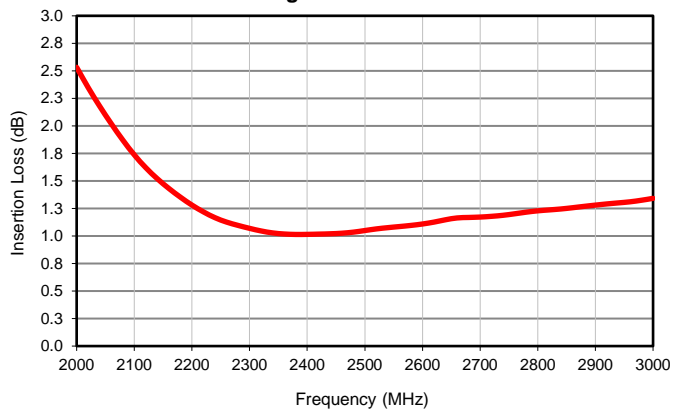
Typical Performance Data

FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE ⁽¹⁾ (deg.)
2000	2.53	7.19	1.25	2.90
2020	2.35	7.78	1.13	2.96
2040	2.18	8.40	1.01	3.00
2060	2.02	9.09	0.91	3.04
2080	1.87	9.84	0.80	3.07
2100	1.74	10.69	0.70	3.08
2120	1.62	11.62	0.59	3.08
2140	1.52	12.63	0.49	3.06
2160	1.43	13.74	0.40	3.02
2180	1.35	14.96	0.30	2.97
2200	1.28	16.36	0.21	2.92
2220	1.22	18.00	0.13	2.84
2240	1.17	19.93	0.05	2.74
2260	1.13	22.20	0.02	2.61
2280	1.10	24.87	0.09	2.45
2300	1.07	27.78	0.17	2.26
2320	1.05	29.76	0.24	2.06
2340	1.03	28.82	0.32	1.87
2360	1.02	26.33	0.40	1.64
2380	1.01	24.06	0.46	1.39
2400	1.01	22.25	0.52	1.10
2420	1.02	20.79	0.58	0.75
2440	1.02	19.55	0.64	0.39
2460	1.03	18.49	0.70	0.02
2480	1.03	17.60	0.76	0.34
2500	1.05	16.86	0.82	0.72
2520	1.06	16.28	0.89	1.14
2540	1.08	15.81	0.95	1.59
2560	1.09	15.40	1.00	2.12
2580	1.10	15.03	1.05	2.68
2600	1.11	14.68	1.11	3.30
2620	1.13	14.37	1.17	3.94
2640	1.15	14.14	1.23	4.58
2660	1.16	13.98	1.31	5.16
2680	1.17	13.82	1.38	5.71
2700	1.17	13.68	1.44	6.31
2720	1.18	13.55	1.51	6.99
2740	1.19	13.43	1.58	7.75
2760	1.20	13.37	1.65	8.54
2780	1.22	13.35	1.73	9.33
2800	1.23	13.35	1.81	10.10
2820	1.24	13.36	1.90	10.85
2840	1.25	13.36	1.98	11.58
2860	1.26	13.36	2.07	12.31
2880	1.27	13.39	2.17	13.08
2900	1.28	13.47	2.27	13.84
2920	1.29	13.59	2.37	14.60
2940	1.30	13.73	2.47	15.38
2960	1.31	13.84	2.58	16.17
2980	1.32	13.92	2.69	16.95
3000	1.34	13.99	2.81	17.67

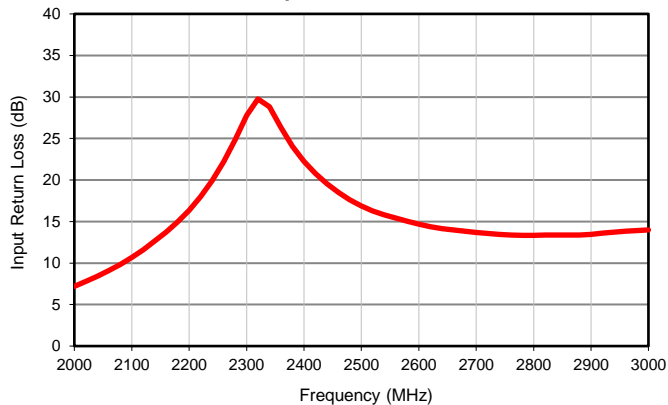
⁽¹⁾ Relative to 180°

Typical Performance Data

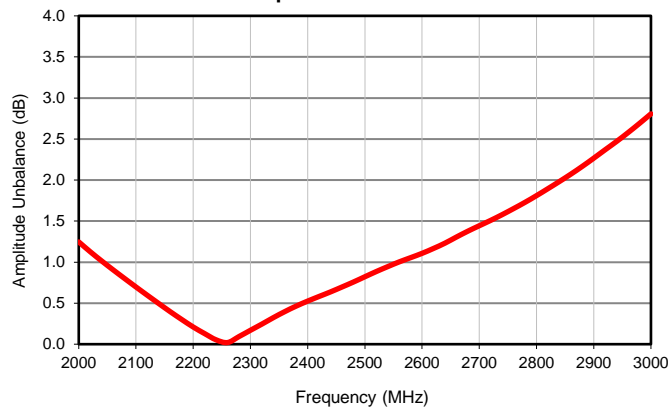
Average Insertion Loss



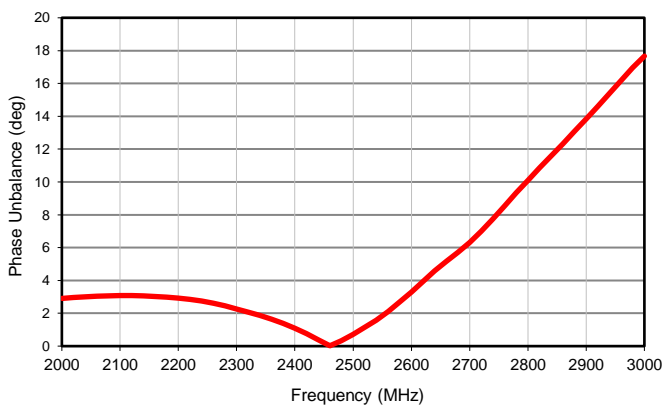
Input Return Loss



Amplitude Unbalance

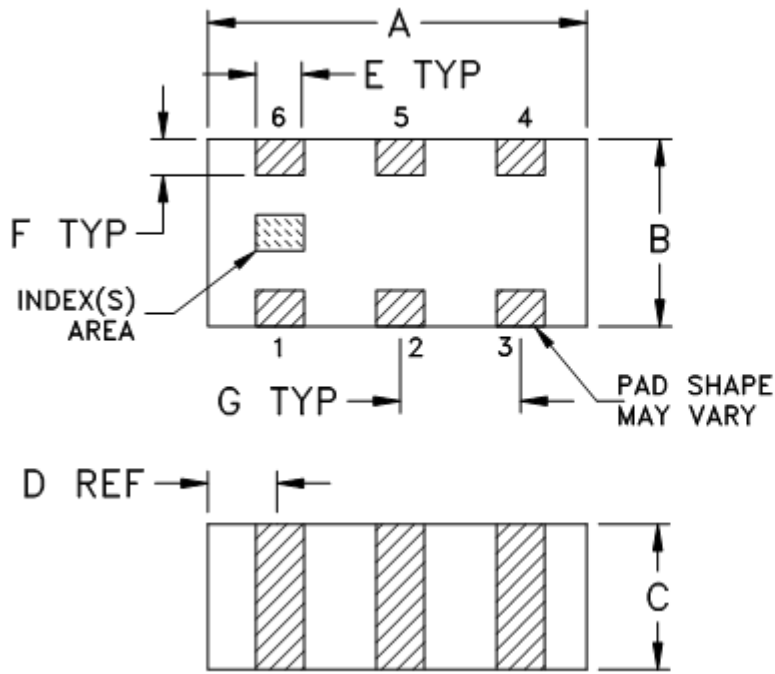


Phase Unbalance

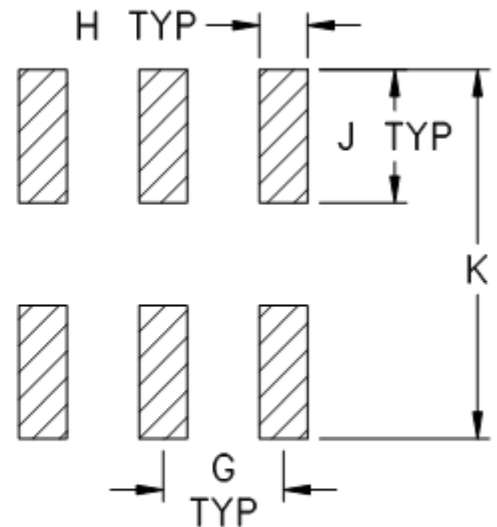


Outline Dimensions

JC0603C



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAM
JC0603C	.063 (1.60)	.031 (0.80)	.024 (0.60)	.012 (0.30)	.008 (0.20)	.006 (0.15)	.020 (0.50)	.010 (0.25)	.022 (0.55)	0.053 (1.35)	.005

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .01$; 3 Pl. $\pm .005$

Notes:

1. Open style, ceramic base.
2. Termination finish:
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F114

DEVICE ORIENTATION IN T&R

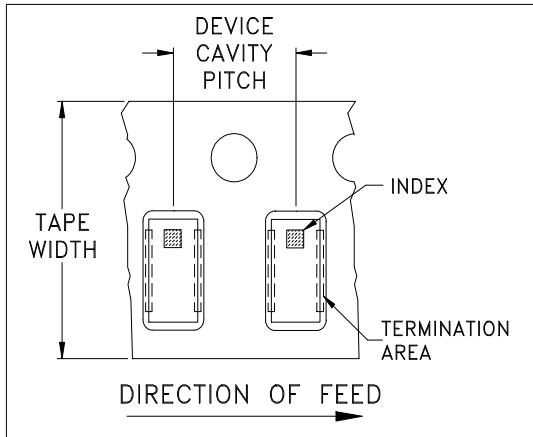


ILLUSTRATION 1

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

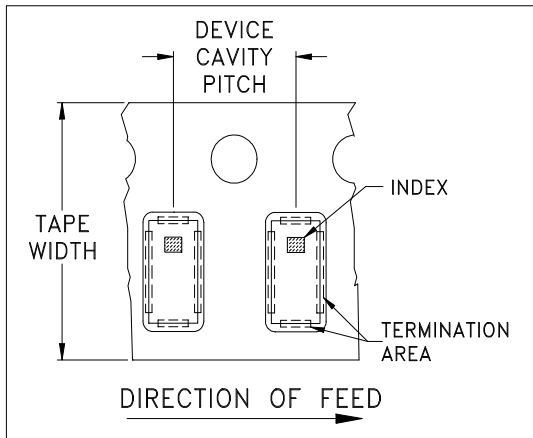


ILLUSTRATION 2

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



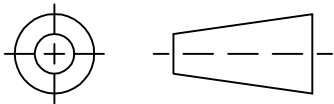
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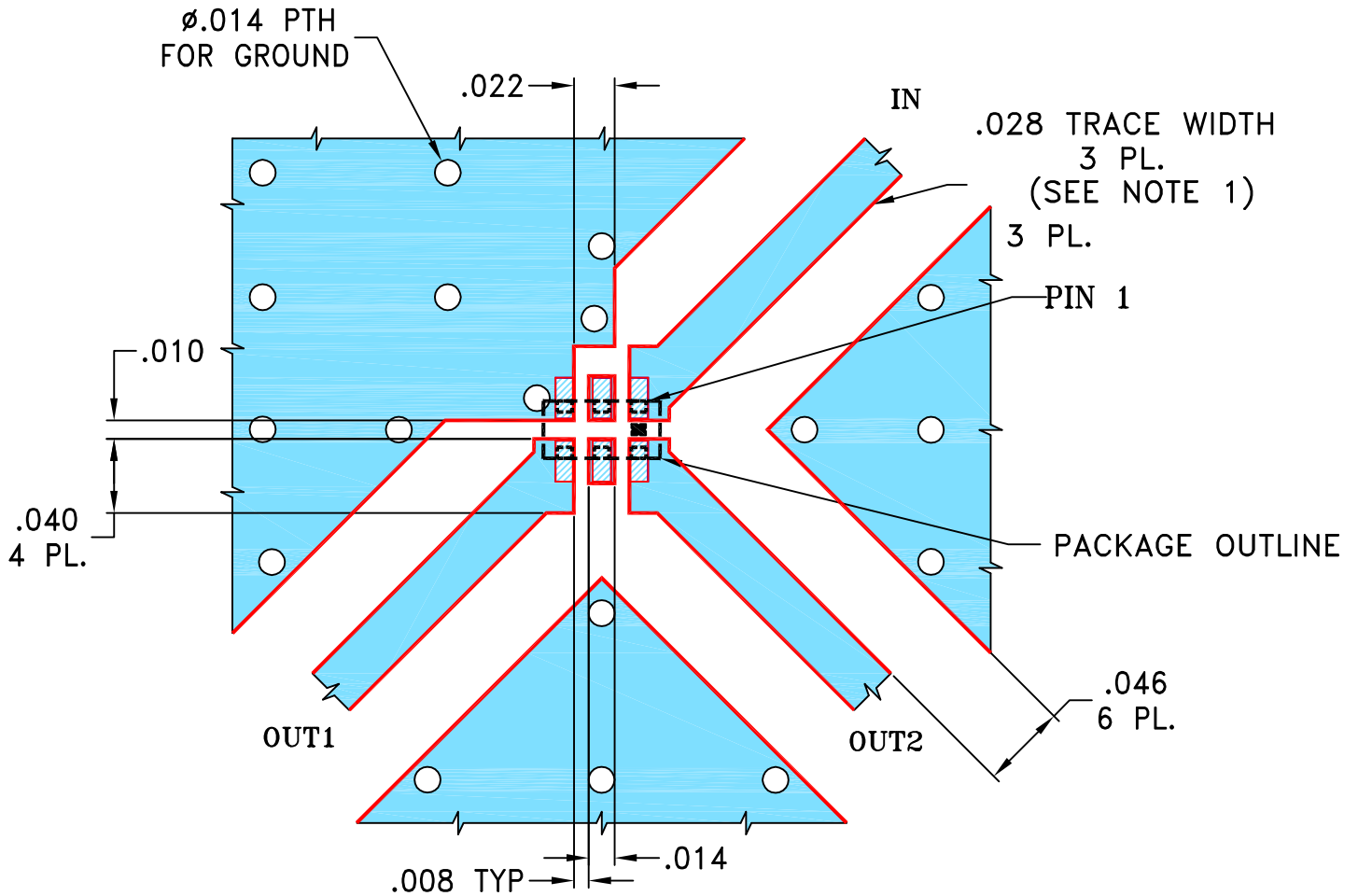
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168200	NEW RELEASE	05/31/18	NP	SL

**SUGGESTED MOUNTING CONFIGURATION
FOR JC0603C CASE STYLE, "06TJ06" PIN CODE**



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS $.016 \pm .0015$. 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.

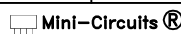
UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DRAWN	NP	05/30/18
CHECKED	GF	05/30/18
APPROVED	SL	05/31/18

DIMENSIONS ARE IN INCHES
TOLERANCES ON:
2 PL DECIMALS ±
3 PL DECIMALS ± .005
ANGLES ±
FRACTIONS ±

 **Mini-Circuits®** 13 Neptune Avenue
Brooklyn NY 11235

PL, 06TJ06, JC0603C, TB-1013+

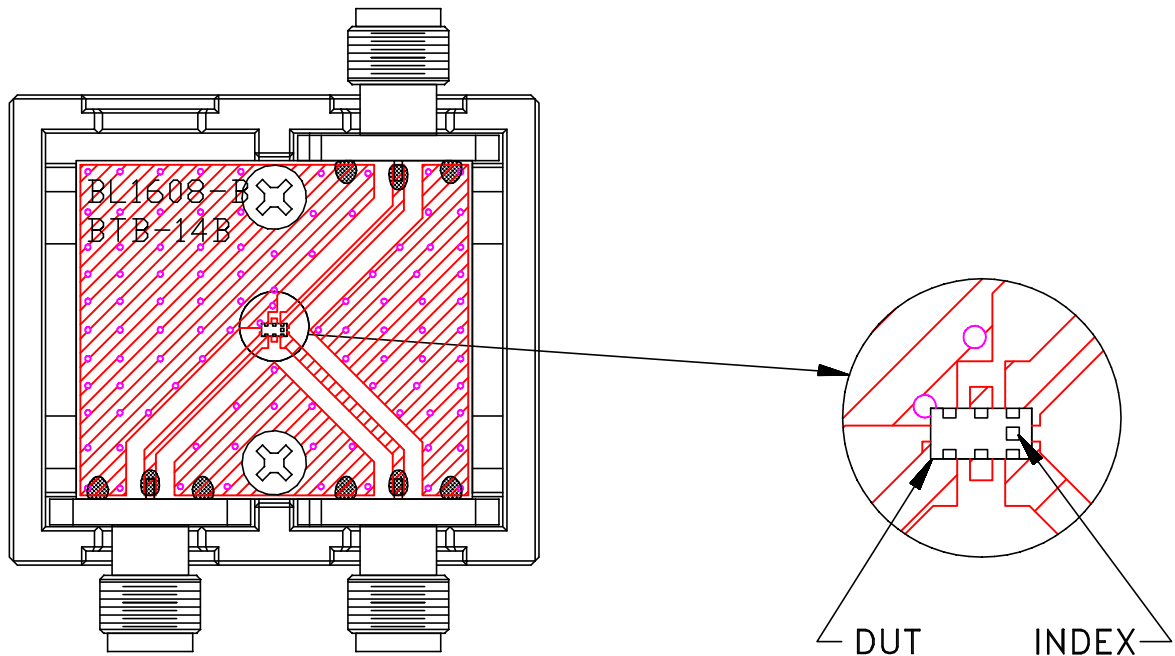
SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-559	REV: OR
FILE: 98PL559	SCALE: 10:1	SHEET: 1 OF 1	

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

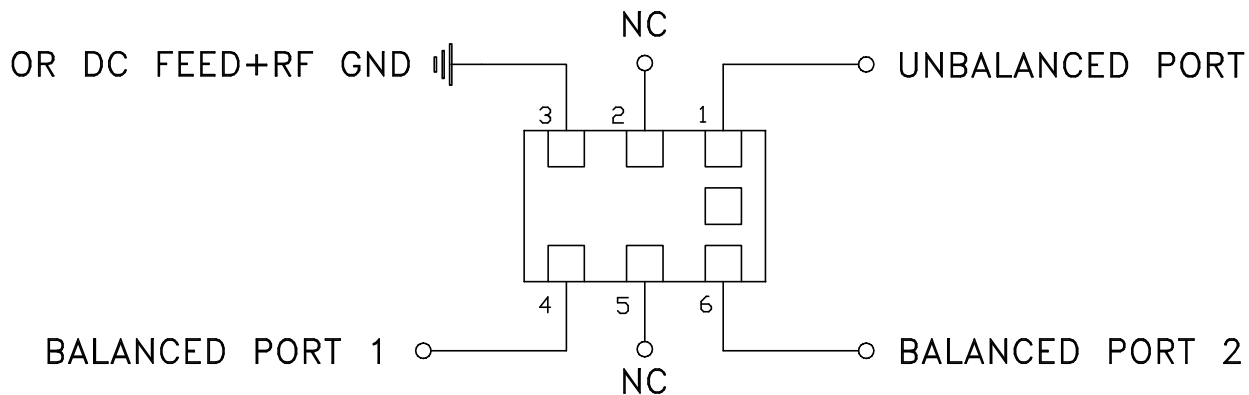
Evaluation Board and Circuit

UNBALANCED PORT



BALANCED PORT 1 BALANCED PORT 2

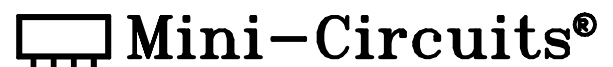
TB-1013+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent,
Dielectric Constant=4.5, Thickness=.016 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