

FEATURES

- Broadband Frequency Operation from 1300 to 4000 MHz
- 1:1.5 Impedance Transformation Ratio
- Low Insertion Loss, 0.55 dB Typ.
- Excellent Return Loss, 13.5 dB Typ.

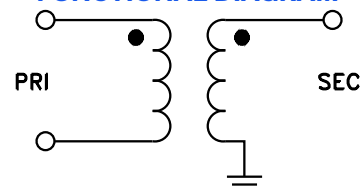


Generic photo used for illustration purposes only

APPLICATIONS

- 5G, Sub-6 GHz Infrastructure
- Wi-Fi and ISM Band Devices
- Test and Measurement Equipment

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' Model NCS1.5-402+ is a compact, high-performance solution designed for broadband operation from 1.3 to 4.0 GHz. Built using low temperature co-fired ceramic technology, this component provides electrical stability, repeatability and high-frequency operation in a miniature 0805 surface-mount package. This transformer is optimized for impedance transformation, delivering a 1:1.5 ratio to support efficient matching in RF signal chains. With low insertion loss and good return loss across the operating band, it enables improved signal integrity and system efficiency in demanding RF and microwave applications.

ELECTRICAL SPECIFICATIONS¹ AT +25 °C, Z₀ = 50 Ω

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio (Secondary/Primary)		1.5			
Frequency Range		1300		4000	MHz
Insertion Loss	1300–3300	–	0.55	1.5	dB
	3300–4000	–	0.9	1.5	
Return Loss	1300–3300	12	13.5	–	dB
	3300–4000	10.5	12.5	–	

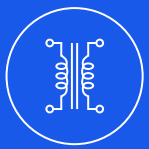
1. Tested in Evaluation Board P/N TB-NCS1.5-402C+.

ABSOLUTE MAXIMUM RATINGS²

Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power ³	2.5 W

2. Permanent damage may occur if any of these limits are exceeded.

3. At +25 °C, derate linearly to 0.8 W at +125 °C.



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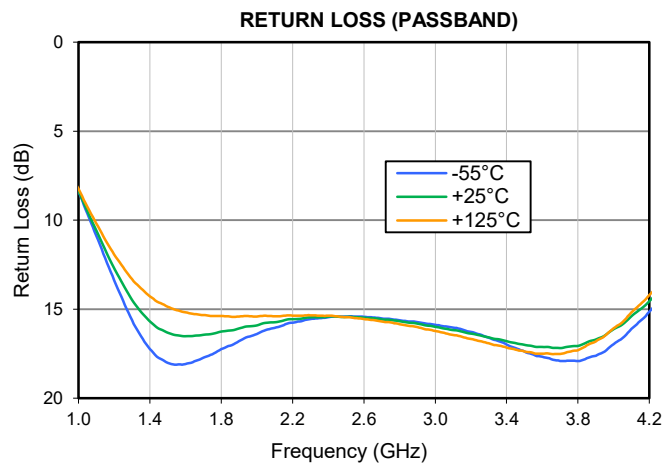
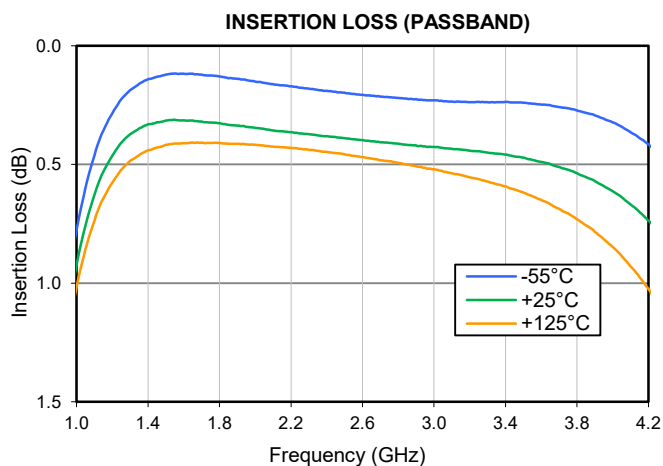
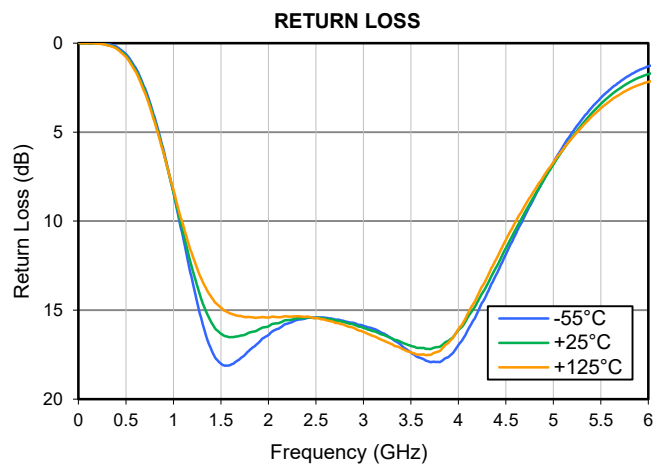
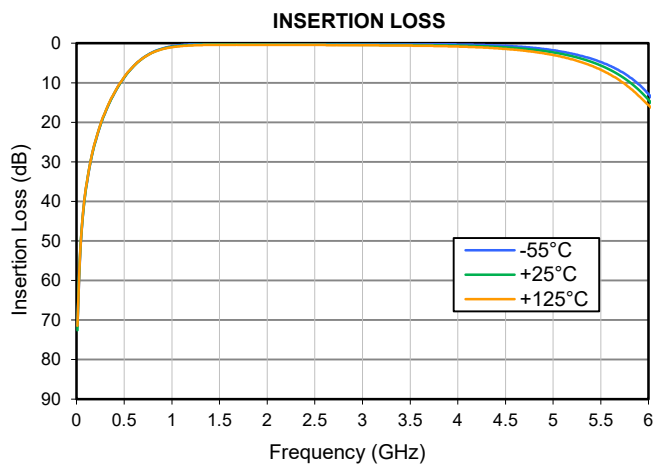
SURFACE MOUNT

RF Transformer

NCS1.5-402+

50Ω 1.3 to 4.0 GHz 1:1.5 Ratio

TYPICAL PERFORMANCE GRAPHS





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SURFACE MOUNT

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FUNCTIONAL DIAGRAM

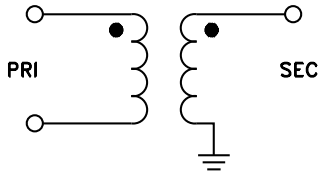
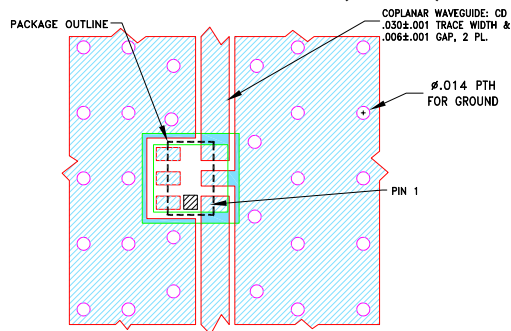


Figure 1. NCS1.5-402+ Functional Diagram

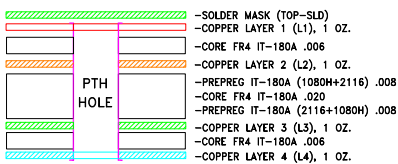
PAD DESCRIPTION

Function	Pad Number	Description
Input	1	Connects to 50Ω primary
GND	2	Connects to GND
Output	3	Connects to 75Ω secondary
No Connect	4, 5, 6	No connection, not used internally. See drawing PL-874 for connection to PCB

SUGGESTED PCB LAYOUT (PL-874)



STACK-UP DIAGRAM

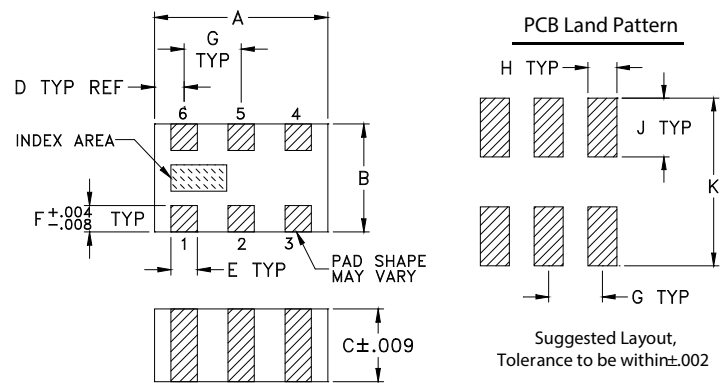


- TOTAL FINISHED THICKNESS 0.056±10%.
- PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
- TRACES REFERENCED TO GROUND ON COPPER LAYER 3.

- NOTES:
- TRACE WIDTH & GAP ARE SHOWN FOR FR4 IT-180A WITH DIELECTRIC THICKNESS 0.006±0.0006; COPPER 1 OZ. ON EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
 - Denotes PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).
 - Denotes COPPER LAND PATTERN FREE OF SOLDER MASK.

Figure 2. Suggested PCB Layout

CASE STYLE DRAWING



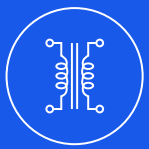
OUTLINE DIMENSIONS (Inches/mm)

A	B	C	D	E	F
.079	.049	.033	.014	.012	.012
2.0	1.24	0.84	0.36	0.30	0.30
G	H	J	K		wt
.026	.014	.039	.110		grams
0.66	0.36	1.00	2.80		.008

PRODUCT MARKING*: N/A

*Marking may contain other features or characters for internal lot control.

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SURFACE MOUNT

RF Transformer

NCS1.5-402+

50Ω 1.3 to 4.0 GHz 1:1.5 Ratio

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	GE0805C-9 Lead Finish: Tin over Nickel Plating
RoHS Status	Compliant
Tape and Reel	F114
Suggested Layout for PCB Design	PL-874
Evaluation Board	TB-NCS1.5-402C+ Gerber File
Environmental Rating	ENV166

NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
- 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

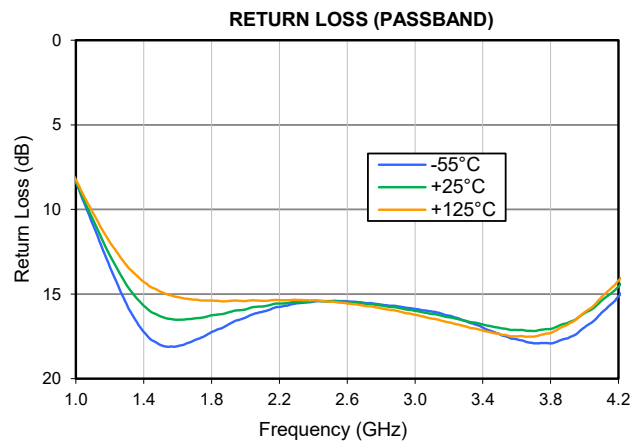
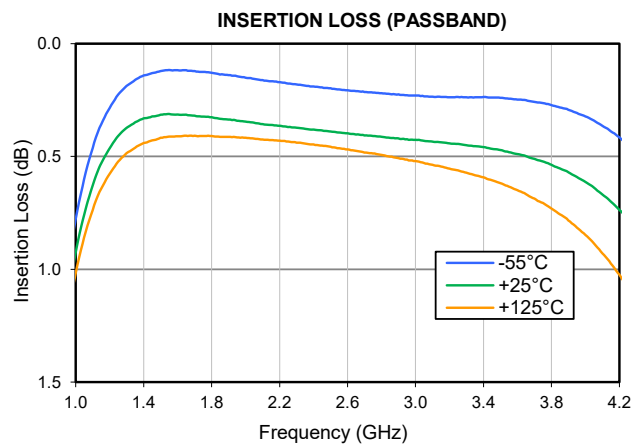
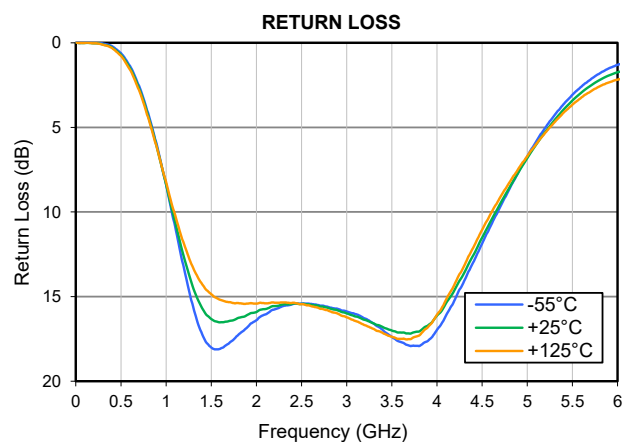
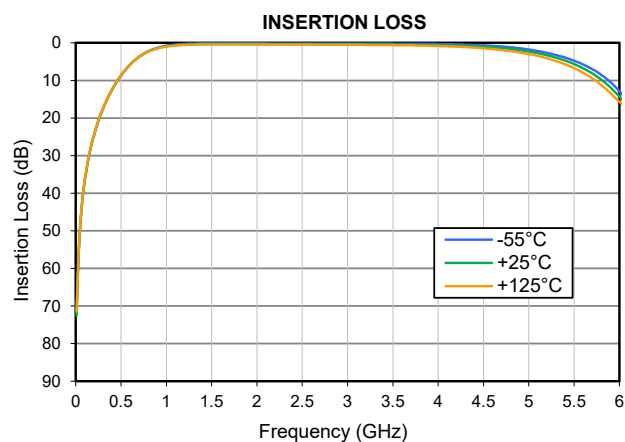


LTCC Transformer

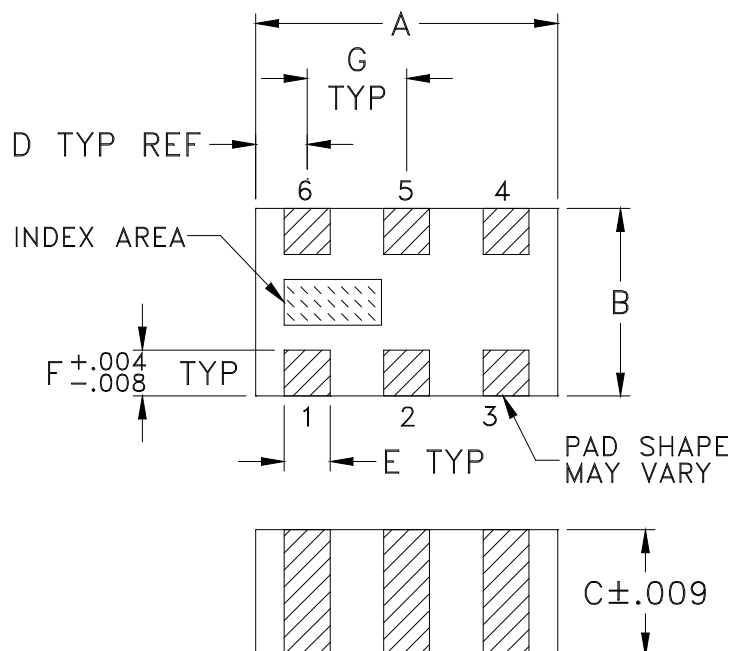
Typical Performance Data

NCS1.5-402+

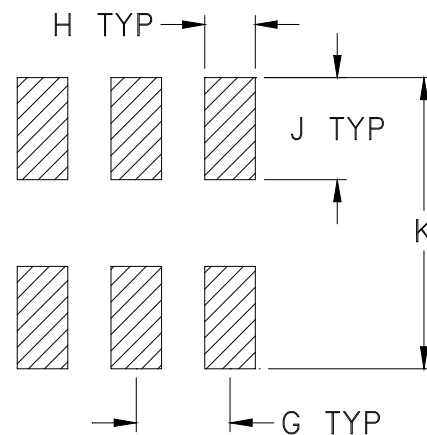
FREQUENCY (GHz)	INSERTION LOSS (dB)			RETURN LOSS (dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
1.00	0.78	0.93	1.02	8.39	8.36	8.24
1.20	0.28	0.46	0.58	13.38	12.70	11.92
1.40	0.14	0.33	0.44	17.24	15.69	14.28
1.60	0.12	0.31	0.41	18.08	16.52	15.18
1.80	0.13	0.33	0.41	17.25	16.26	15.38
2.00	0.15	0.35	0.42	16.40	15.91	15.42
2.20	0.17	0.36	0.43	15.75	15.56	15.36
2.40	0.19	0.38	0.45	15.44	15.42	15.36
2.60	0.21	0.40	0.47	15.43	15.48	15.55
2.80	0.22	0.41	0.49	15.62	15.68	15.84
3.00	0.23	0.43	0.52	15.88	15.99	16.22
3.20	0.24	0.44	0.55	16.28	16.37	16.68
3.40	0.24	0.46	0.59	16.98	16.80	17.15
3.60	0.25	0.49	0.65	17.68	17.12	17.50
3.80	0.27	0.54	0.73	17.92	17.06	17.31
4.00	0.32	0.61	0.85	16.96	16.12	16.07
4.20	0.42	0.74	1.03	15.15	14.56	14.21
4.40	0.57	0.93	1.28	12.99	12.58	12.12
4.60	0.81	1.22	1.66	10.76	10.50	10.06
4.80	1.20	1.67	2.21	8.67	8.58	8.28
5.00	1.79	2.33	2.99	6.72	6.82	6.70
5.20	2.67	3.30	4.10	5.01	5.26	5.32
5.40	3.94	4.72	5.69	3.64	3.96	4.15
5.60	5.78	6.78	7.97	2.59	2.94	3.23
5.80	8.53	9.81	11.23	1.81	2.20	2.58
6.00	12.87	14.31	15.67	1.30	1.74	2.18
6.20	18.33	18.27	17.70	1.08	1.56	2.03
6.40	15.21	14.57	13.93	1.12	1.61	2.11
6.60	10.63	10.56	10.45	1.34	1.87	2.38
6.80	7.74	7.88	8.01	1.76	2.34	2.90
7.00	5.80	6.00	6.25	2.31	3.01	3.65
7.20	4.41	4.65	4.95	3.01	3.87	4.66
7.40	3.40	3.68	4.00	3.84	4.90	5.95
7.60	2.68	2.99	3.33	4.74	6.02	7.44
7.80	2.17	2.53	2.92	5.67	7.13	8.85
8.00	1.83	2.27	2.72	6.48	7.92	9.57
8.20	1.65	2.17	2.70	7.01	8.16	9.27
8.40	1.63	2.24	2.85	6.93	7.73	8.32
8.60	1.77	2.45	3.12	6.31	6.91	7.23
8.80	2.04	2.78	3.52	5.44	5.99	6.22
9.00	2.50	3.30	4.12	4.51	5.08	5.33
9.20	3.43	4.37	5.20	3.60	4.26	4.71
9.40	3.41	3.96	4.65	3.87	4.50	4.88
9.60	3.26	4.09	4.92	3.34	3.97	4.51
9.80	3.71	4.52	5.34	2.87	3.56	4.24
10.00	4.15	4.94	5.73	2.53	3.25	4.03
10.20	4.54	5.32	6.09	2.27	3.02	3.85
10.40	4.88	5.64	6.40	2.08	2.83	3.68
10.60	5.14	5.90	6.65	1.93	2.71	3.55
10.80	5.33	6.09	6.81	1.82	2.60	3.44
11.00	5.46	6.21	6.90	1.76	2.55	3.37
11.20	5.53	6.27	6.90	1.74	2.54	3.37
11.40	5.55	6.26	6.84	1.76	2.57	3.43
11.60	5.51	6.20	6.76	1.81	2.65	3.52
11.80	5.43	6.12	6.72	1.92	2.80	3.68
12.00	5.28	6.01	6.72	2.09	3.00	3.88



Outline Dimensions



PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K	WT.GRAM
GE0805C-9	.079 (2.00)	.049 (1.25)	.037 (0.95)	.014 (0.35)	.012 (0.30)	.012 (0.30)	.026 (0.65)	.014 (0.35)	.039 (1.00)	.110 (2.80)	.008

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

Notes:

- Open style, ceramic base.
- Termination finish: For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
For RoHS-5 Case Styles: Tin-Lead plate over Nickel plate. All models, no (+) 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



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

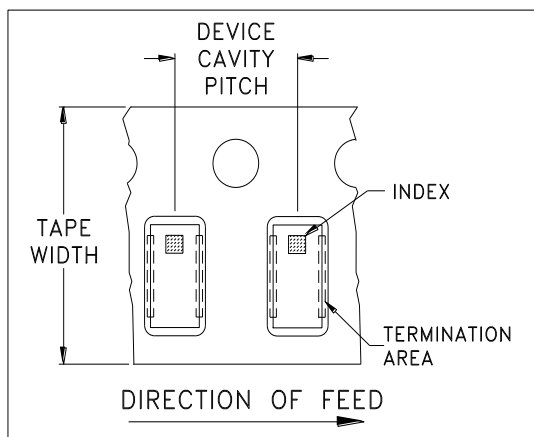


ILLUSTRATION 1

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

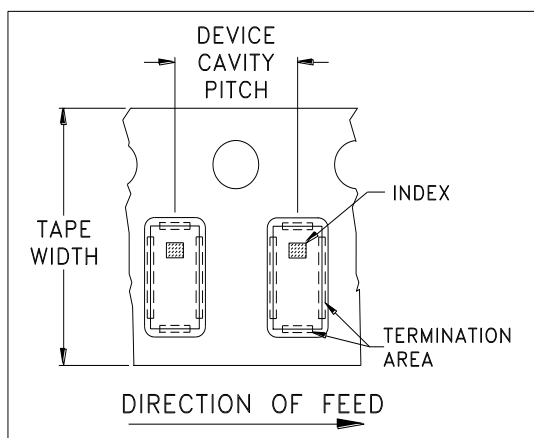


ILLUSTRATION 2

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	
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



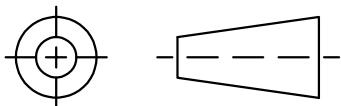
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THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-030132	NEW RELEASE	06.19.26	TP	JC

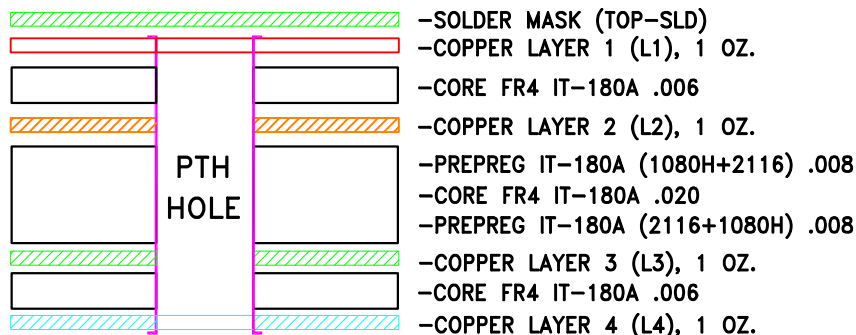
SUGGESTED MOUNTING CONFIGURATION
FOR GE0805C-9 CASE STYLE

PACKAGE OUTLINE

COPLANAR WAVEGUIDE: CD
.030±.001 TRACE WIDTH &
.006±.001 GAP, 2 PL.Ø.014 PTH
FOR GROUND

PIN 1

STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS $0.056 \pm 10\%$ ⓧ.
2. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
3. TRACES REFERENCED TO GROUND ON COPPER LAYER 3.

NOTES:

1. TRACE WIDTH & GAP ARE SHOWN FOR FR4 IT-180A WITH DIELECTRIC THICKNESS 0.006 ± 0.0006 ; COPPER 1 OZ. ON EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2.  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).
3.  DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN TP	06.19.26
TOLERANCES ON:	CHECKED IL	06.19.26
2 PL DECIMALS ±	APPROVED JC	06.19.26
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

 Mini-Circuits®

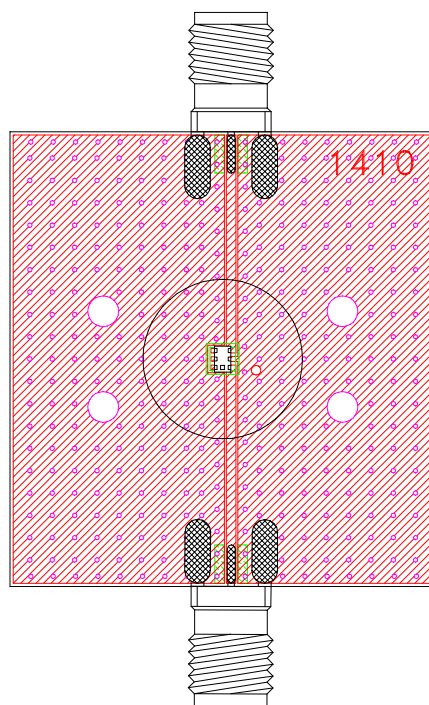
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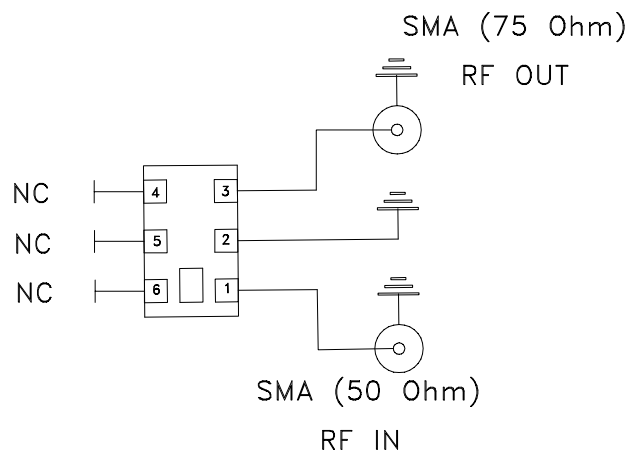
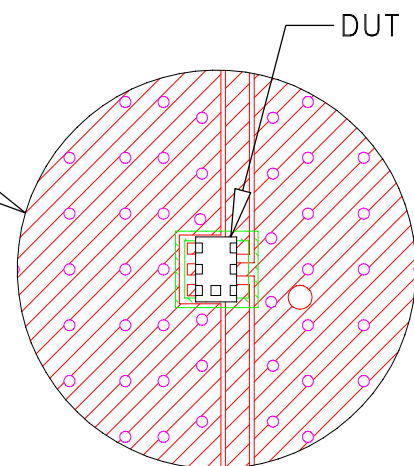
PL, GE0805C-9, TB-NCS1.5-402C+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-874	OR
FILE:	98PL874	SCALE: 10:1	SHEET: 1 OF 1

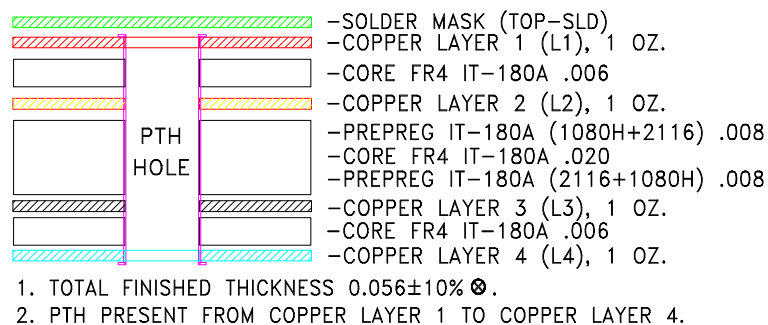
Evaluation Board and Circuit



TB-NCS1.5-402C+



Schematic Diagram



STACK-UP DIAGRAM

Notes:

1. 50 Ohm SMA Female connectors.





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, 1000 hours, 85 +/- 2°C	JESD22-A101
Solderability	10X Magnification	MIL-STD-883 Method 2003:> 95% coverage
Thermal Shock	-40°C to 125°C ± 5°C, dwell time 30 min, 100 cycles	JESD22-A104