



CERAMIC BALUN

# RF Transformer

## NCS1-112+

Mini-Circuits

50Ω 700 to 1100 MHz 1:1 Ratio

### FEATURES

- Wideband, 700 to 1100 MHz
- Low phase unbalance, 2 deg. and amplitude unbalance, 0.3 dB typ.
- Miniature size, 0.079"x0.049"x0.028"
- LTCC construction
- Low cost
- Aqueous washable

### APPLICATIONS

- WCDMA
- PCS
- GPS



Generic photo used for illustration purposes only

CASE STYLE: GE0805C-1AP

#### +RoHS Compliant

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

### PRODUCT OVERVIEW

Mini-Circuits new RF Transformer, NCS1-112+ converts single ended, unbalanced RF signals, that propagate through systems, to balanced signals that are required for many semiconductor devices. The NCS series offers a low cost small size alternative for matching, A/D converters, System on Chips, and up/down converters. The outstanding phase and amplitude unbalance make this component a versatile building block for use in a variety of systems and sub-system designs. package with low inductance, excellent thermal efficiency, and high ESD rating.

### KEY FEATURES

Feature	Advantages
Small Size	Offered in the EIA-0805 package size, the NCS1-112+ offers an industry leading combination of size and performance. The small footprint (2.0 mm x 1.25 mm) allows for reduced parasitics in systems with improved performance and simplified layout.
Low Phase and Amplitude Unbalance	Supporting 8 deg. and 0.8 dB unbalance make this RF Transformer applicable for use in higher level integrated components such as A/D converters and system on a chip.





### ELECTRICAL SPECIFICATIONS AT 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio		1			
Frequency Range		700		1100	MHz
Insertion Loss <sup>1</sup>	700 - 730	—	1.1	—	dB
	730 - 950	—	0.75	1.2	
	950 - 1000	—	0.8	1.2	
	1000 - 1100	—	1.1	—	
Amplitude Unbalance	700 - 730	—	0.85	—	dB
	730 - 950	—	0.75	0.95	
	950 - 1000	—	0.65	0.95	
	1000 - 1100	—	0.87	—	
Phase Unbalance <sup>2</sup>	700 - 730	—	0.85	—	Degree
	730 - 950	—	4.5	9	
	950 - 1000	—	8	12	
	1000 - 1100	—	13	—	

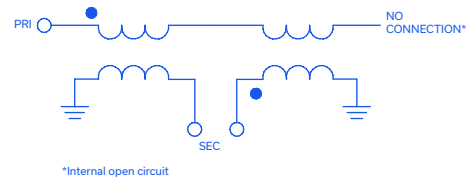
1. Insertion Loss is referenced to mid-band loss, 0.7 dB. Reference Demo Board TB-419+  
 2. Relative to 180°

### MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	3W

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

### CONFIGURATION J





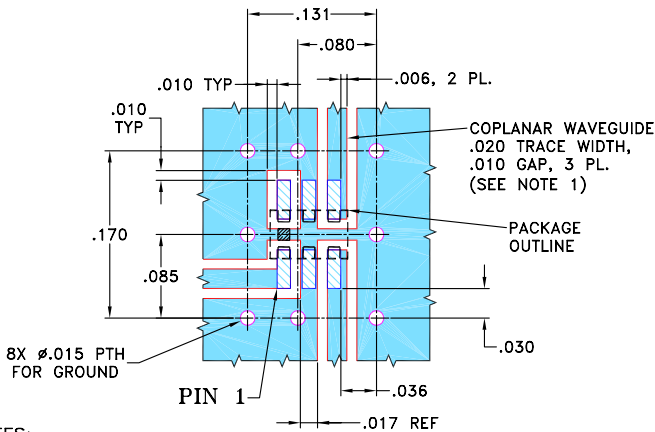
### PAD CONNECTIONS

PRIMARY DOT (Unbalanced Port)	1
PRIMARY (GND)	2
SECONDARY DOT (Balanced)	4
SECONDARY (Balanced)	3
NO CONNECTION	6
NOT USED (GND Externally)	5

Pads 2,3,4 are DC-connected internally

PRODUCT MARKING: N/A

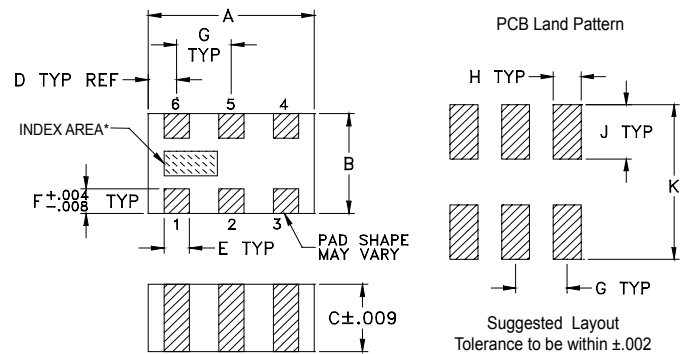
### DEMO BOARD MCL P/N: TB-419+ SUGGESTED PCB LAYOUT (PL-264)



**NOTES:**

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS  $.010'' \pm .001''$ . COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND 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 DRAWING



\*Shape of index marking may vary

### OUTLINE DIMENSIONS (Inches/mm)

A	B	C	D	E	F
.079	.049	.028	.014	.012	.012
2.00	1.25	0.70	0.35	0.30	0.30
G	H	J	K		wt
.026	.014	.039	.110		grams
0.65	0.35	1.00	2.80		.008

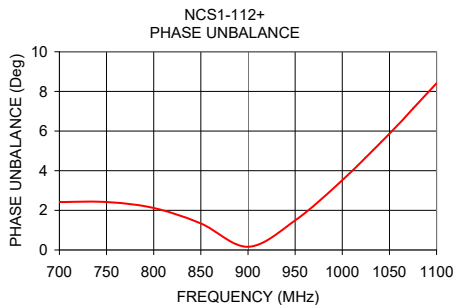
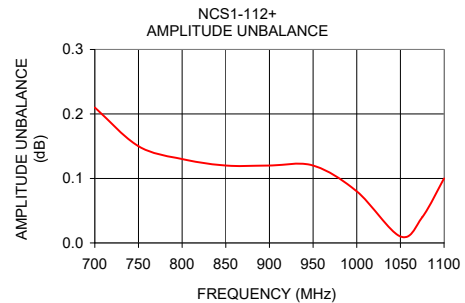
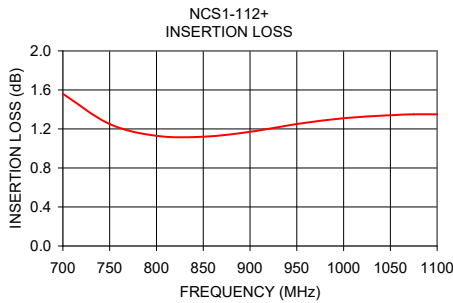
### TAPE & REEL INFORMATION: F74



### TYPICAL PERFORMANCE DATA<sup>3</sup>

Frequency (MHz)	Insertion Loss (dB)	Input Return Loss (dB)	Amplitude Unbalance (dB)	Phase Unbalance (deg)
700	1.56	10.10	0.21	2.42
750	1.25	13.51	0.15	2.42
800	1.13	16.24	0.13	2.12
850	1.12	16.12	0.12	1.34
900	1.17	14.60	0.12	0.16
950	1.25	13.37	0.12	1.49
1000	1.31	12.75	0.08	3.52
1050	1.34	12.64	0.01	5.87
1075	1.35	12.79	0.04	7.13
1100	1.35	13.09	0.10	8.41

3. Measured with Agilent E5071B 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.
- 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

## Typical Performance Data

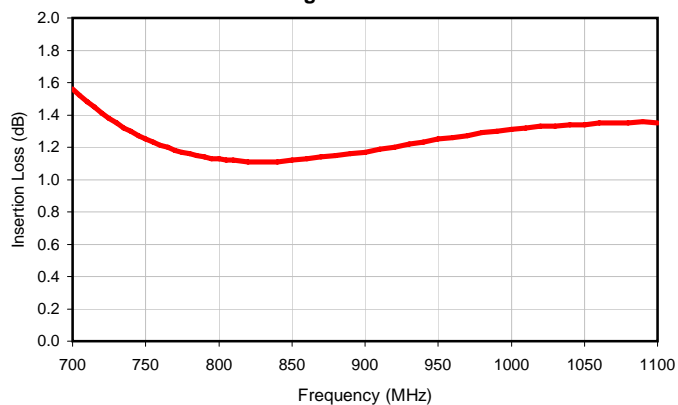
FREQUENCY MHz	AVERAGE INSERTION LOSS* (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE** (deg.)
700.0	1.56	10.10	0.21	2.42
705.0	1.52	10.42	0.20	2.44
710.0	1.48	10.75	0.20	2.45
715.0	1.45	11.08	0.19	2.46
720.0	1.41	11.42	0.19	2.47
725.0	1.38	11.76	0.18	2.47
730.0	1.35	12.11	0.17	2.46
735.0	1.32	12.46	0.17	2.46
740.0	1.30	12.81	0.16	2.45
745.0	1.27	13.17	0.16	2.44
750.0	1.25	13.51	0.15	2.42
755.0	1.23	13.85	0.15	2.41
760.0	1.21	14.19	0.15	2.39
765.0	1.20	14.52	0.14	2.38
770.0	1.18	14.83	0.14	2.35
775.0	1.17	15.13	0.14	2.32
780.0	1.16	15.41	0.13	2.29
785.0	1.15	15.66	0.13	2.26
790.0	1.14	15.89	0.13	2.22
795.0	1.13	16.08	0.13	2.17
800.0	1.13	16.24	0.13	2.12
805.0	1.12	16.36	0.13	2.05
810.0	1.12	16.45	0.13	2.00
820.0	1.11	16.52	0.12	1.85
830.0	1.11	16.48	0.12	1.71
840.0	1.11	16.34	0.12	1.53
850.0	1.12	16.12	0.12	1.34
860.0	1.13	15.85	0.12	1.14
870.0	1.14	15.54	0.12	0.92
880.0	1.15	15.22	0.12	0.69
890.0	1.16	14.91	0.12	0.43
900.0	1.17	14.60	0.12	0.16
910.0	1.19	14.30	0.13	0.14
920.0	1.20	14.03	0.13	0.45
930.0	1.22	13.78	0.12	0.78
940.0	1.23	13.56	0.12	1.13
950.0	1.25	13.37	0.12	1.49
960.0	1.26	13.20	0.11	1.87
970.0	1.27	13.05	0.10	2.27
980.0	1.29	12.92	0.10	2.67
990.0	1.30	12.83	0.09	3.09
1000.0	1.31	12.75	0.08	3.52
1010.0	1.32	12.69	0.07	3.96
1020.0	1.33	12.64	0.06	4.42
1030.0	1.33	12.61	0.05	4.90
1040.0	1.34	12.61	0.03	5.38
1050.0	1.34	12.64	0.01	5.87
1060.0	1.35	12.69	0.01	6.37
1070.0	1.35	12.75	0.03	6.88
1080.0	1.35	12.84	0.05	7.39
1090.0	1.36	12.95	0.08	7.90
1100.0	1.35	13.09	0.10	8.41

\* Insertion Loss is referenced to mid-band loss , 0.7 dB.

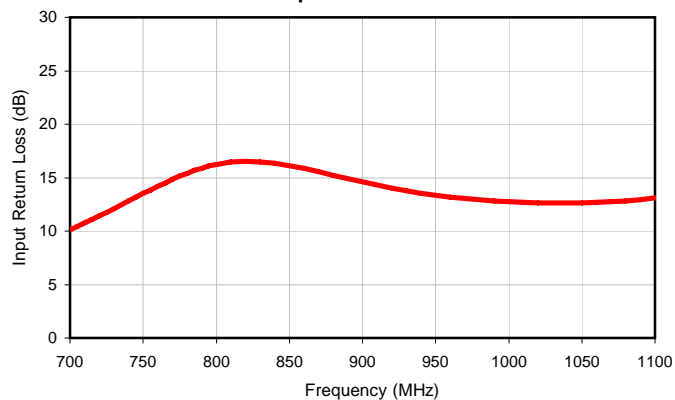
\*\*Phase Unbalance is relative to 180°

## Typical Performance Data

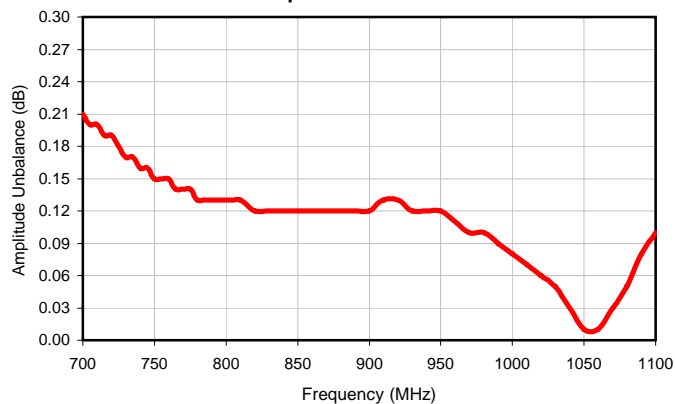
### Average Insertion Loss



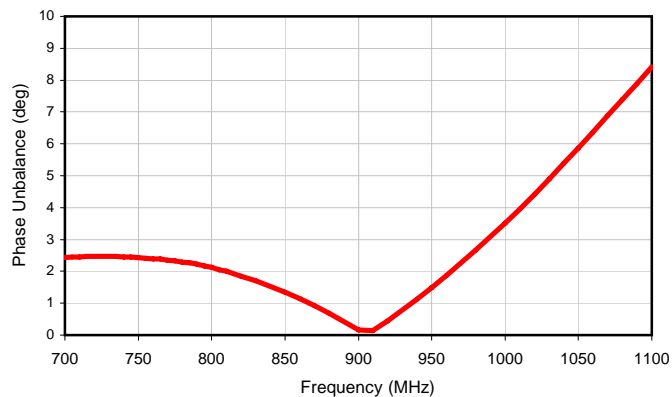
### Input Return Loss



### Amplitude Unbalance

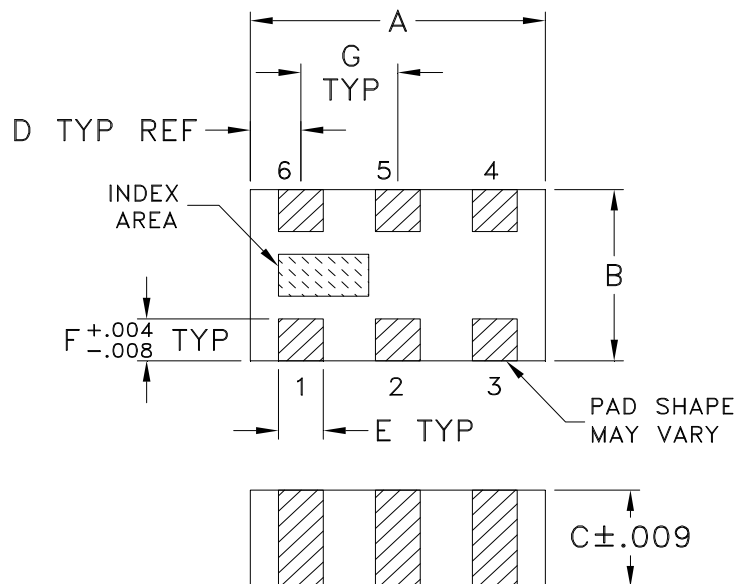


### Phase Unbalance

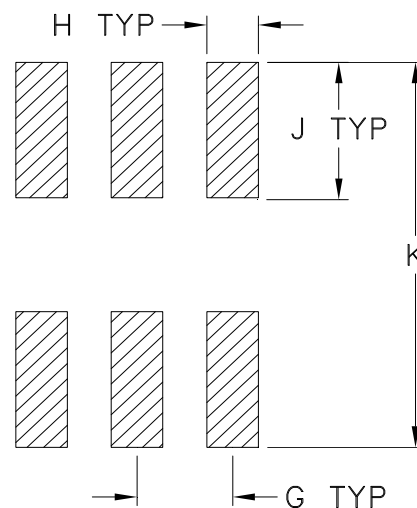


GE0805C-1AP

## 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-1AP	.079 (2.00)	.049 (1.25)	.028 (0.70)	.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:

1. Open style, ceramic base.
2. Termination finish: For RoHS Case Styles: Silver platinum 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

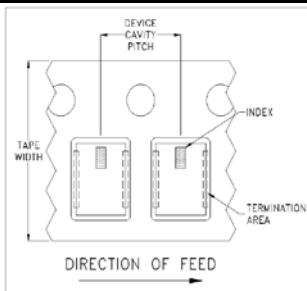


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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F74

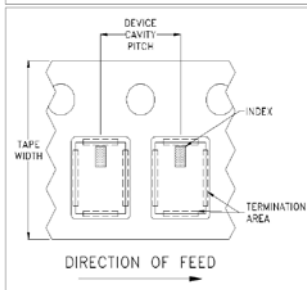
## DEVICE ORIENTATION IN T&R



**ILLUSTRATION 1**

### Applicable Case Styles

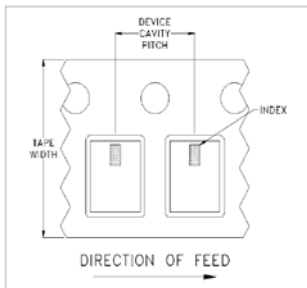
GE0805C-1  
 GE0805C-1AP  
 JV1210C-1  
 GU2939



**ILLUSTRATION 2**

### Applicable Case Styles

JV1210C  
 JV1210C-2  
 JV1210C-3  
 JV1210C-4  
 JV1210C-5  
 JV1210C-6  
 JV1210C-11



**ILLUSTRATION 3**

### Applicable Case Styles

JC0603C-8  
 JV1210C-7  
 JV1210C-8  
 JV1210C-9  
 JV1210C-10  
 JV1210C-13  
 GE0805C-13

Tape Width, mm	Device Cavity Pitch, mm	Real Size, inches	Devices per Reel	
8	4	7	Small quantity standards (see note)	20
				50
				100
				200
				500
			Standard	1000
				2000
			4000	

Note: Small reel availability varies by model. Refer to pricing and availability on individual model dashboard.

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.

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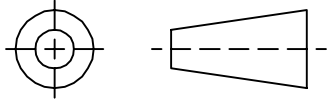
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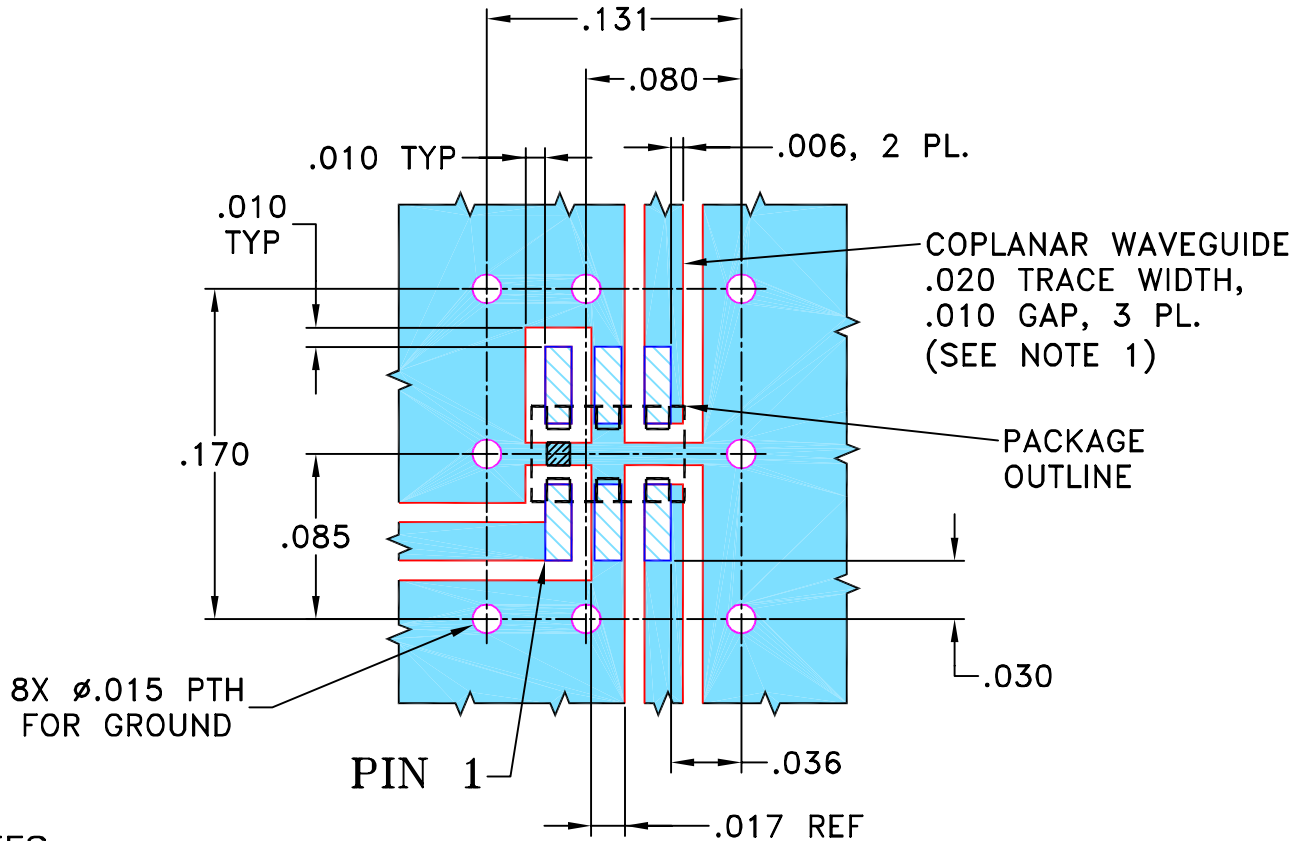


THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M109549	NEW RELEASE	01/31/07	PW	DJ

SUGGESTED MOUNTING CONFIGURATION  
FOR GE0805C-1 CASE STYLE, "ry" PIN CONNECTION.



**NOTES:**

1. COPLANAR WAVEGUIDE 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.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

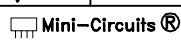
 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED	INITIALS		DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	PW	01/30/07
	CHECKED	IL	01/31/07
	APPROVED	DJ	01/31/07

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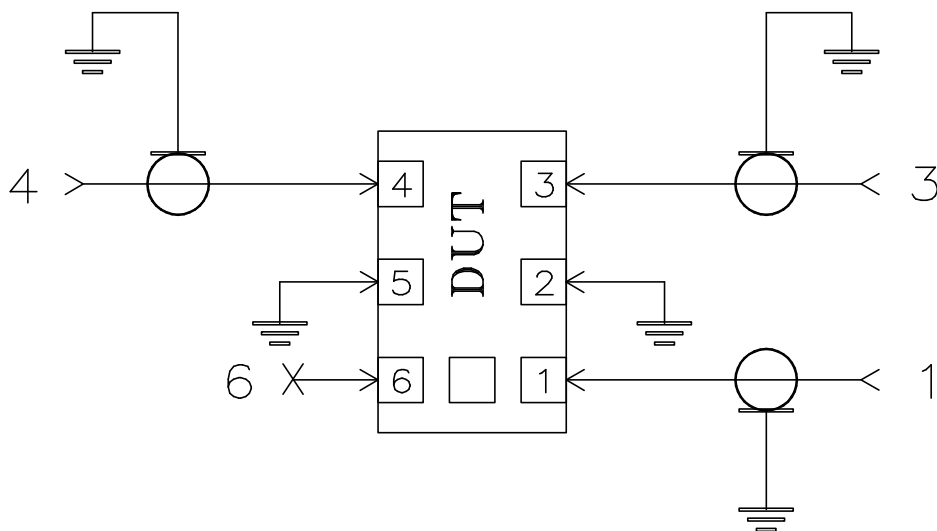
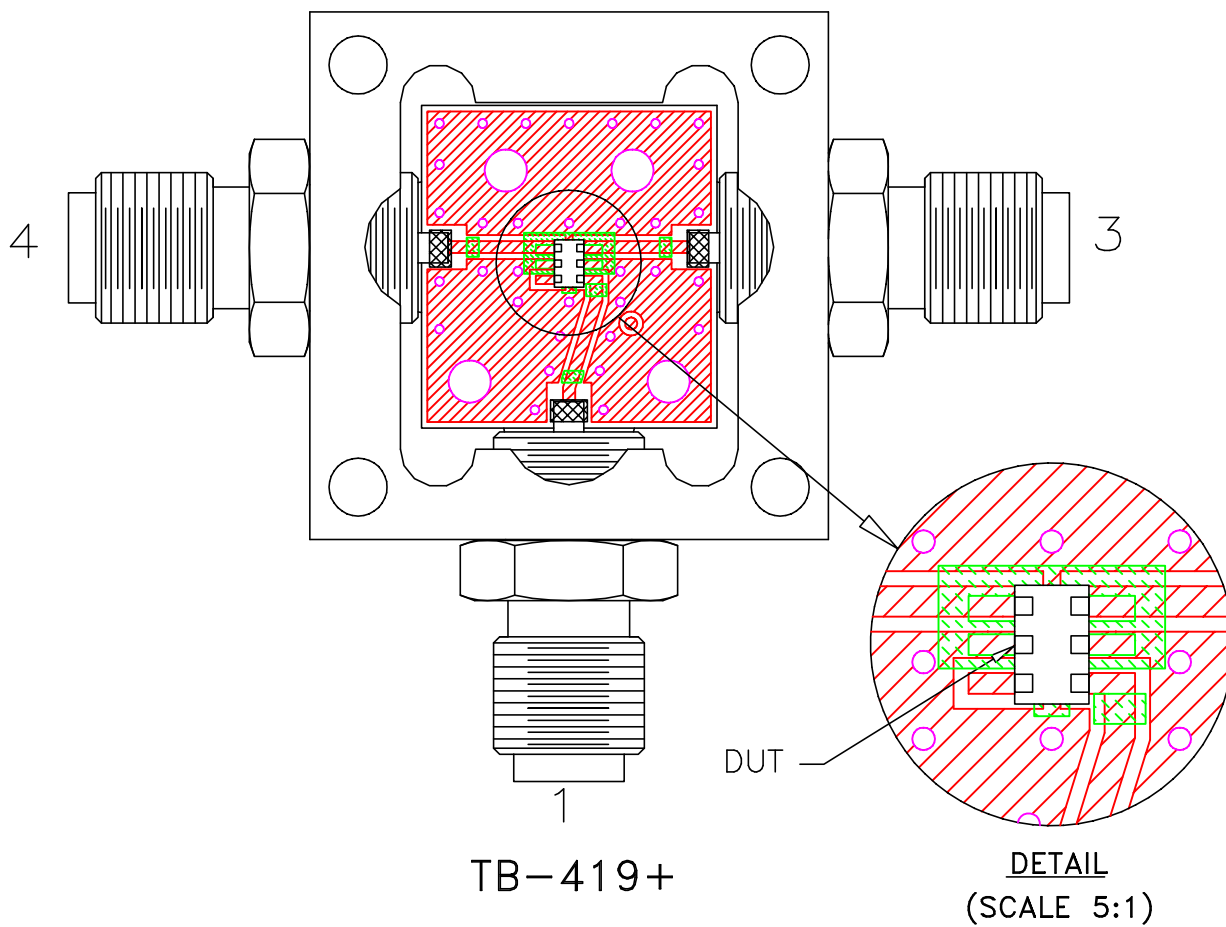
PL, ry, GE0805C-1, NCS, TB-419+

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-264	REV: OR
FILE: 98PL264	SCALE: 10:1	SHEET: 1 OF 1	

# Evaluation Board and Circuit


For Pin Connections refer to Data Sheet of the DUT



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.010 inch.

 **Mini-Circuits®**



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	-40° to 85° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° 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
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, 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
Shelf Life	Shelf life is 12 months when kept in sealed bags. Unused parts are to be resealed to preseve shelf life for proper solderability.	