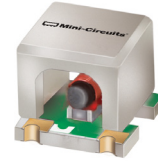


50Ω Wideband 10 MHz to 12 GHz



CASE STYLE: GU1414

## The Big Deal

- Extremely Wideband, 10 MHz to 12 GHz
- Very low insertion loss, 0.5 dB
- Excellent VSWR, 1.25:1
- Tiny size, 0.15 x 0.15 x 0.14”

## Product Overview

Mini-Circuits’ TCBT-123+ is an ultra-wideband surface-mount bias tee covering applications from 10 MHz to 12 GHz with low insertion loss, excellent VSWR, and high DC-RF isolation over its entire frequency range. This model is capable of handling up to +30 dBm (1W) RF input power and DC input current up to 200mA. The unit comes housed in a miniature, shielded package (0.15 x 0.15 x 0.14”) with wraparound terminations for excellent solderability.

## Key Features

Feature	Advantages
Ultra-wideband, 10 MHz to 12 GHz	Supports a wide range of applications with a single device, including biasing broadband amplifiers, laser diodes, active antennas and more.
Low insertion loss, 0.5 dB	Preserves signal strength from input to output and minimizes overall system loss
Excellent VSWR, 1.25:1	Provides excellent matching for 50Ω systems with minimal signal reflection.
RF power handling up to 1W	This model supports applications with a variety of power requirements.
Excellent DC-RF isolation <ul style="list-style-type: none"> <li>• 55 dB, 10 to 100 MHz</li> <li>• 33 dB, 100 to 6000 MHz</li> <li>• 22 dB, 6000 to 12000 MHz</li> </ul>	Minimizes RF leakage and interference with other elements in the system.
Miniature size, 0.15 x 0.15 x 0.14”	Small footprint makes the TCBT-123+ a space-saver in dense PCB-layouts.

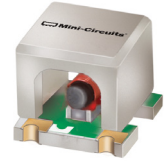
### Notes

- 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)

# Surface Mount Bias-Tee

50Ω Wideband 10 MHz to 12 GHz

## TCBT-123+



CASE STYLE: GU1414

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

Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7"	10, 20, 50, 100, 200, 500
13"	1000

### Maximum Ratings

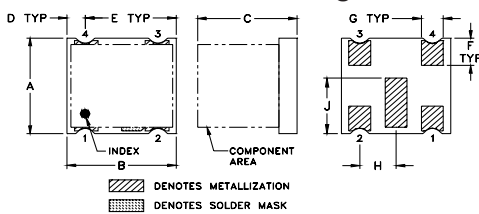
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	30dBm max.
Voltage at DC port	25V max.
Input Current	200mA

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

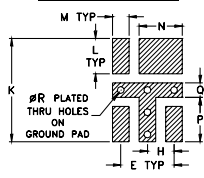
### Pad Terminations

RF	2
RF&DC	1
DC	3
NOT USED	4

### Outline Drawing



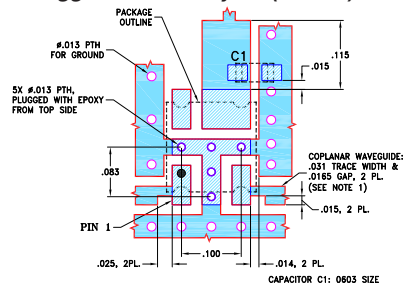
### PCB Land Pattern



### Outline Dimensions (inch)

A	B	C	D	E	F	G	H	J
.150	.150	.14	.025	.100	.043	.030	.050	.087
3.81	3.81	3.56	0.64	2.54	1.09	0.76	1.27	2.21
K	L	M	N	P	Q	R	wt	
.193	.066	0.031	.081	.083	.027	0.013	grams	
4.90	1.68	0.79	2.06	2.11	0.69	0.33	0.06	

### Demo Board MCL P/N: TB-879+ Suggested PCB Layout (PL-481)



- NOTES:
- COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020"±.0015". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
  - FOOTPRINT OF C1 IS SHOWN FOR REFERENCE.
  - 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

### Notes

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### Features

- wideband, 10 to 12000 MHz
- low insertion loss, 0.5 dB typ.
- excellent VSWR, 1.25:1 typ.
- miniature surface mount 0.15"x0.15"
- aqueous washable
- protected by US Patent 8,644,029

### Applications

- biasing amplifiers
- biasing of laser diodes
- biasing of active antennas

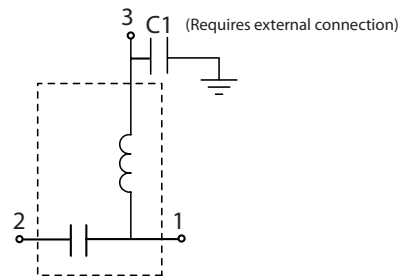
### Electrical Specifications at 25°C

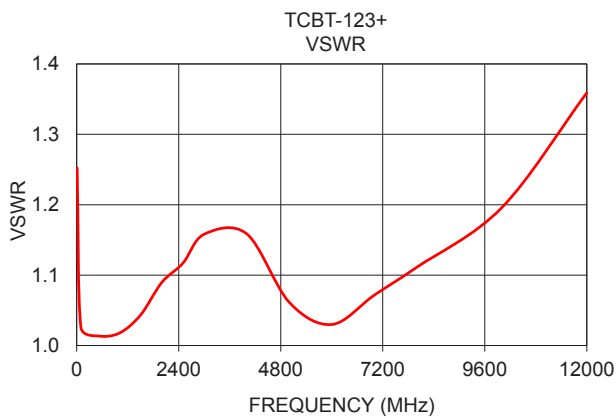
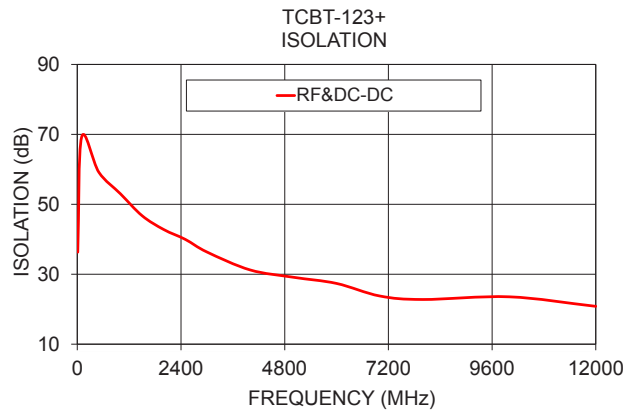
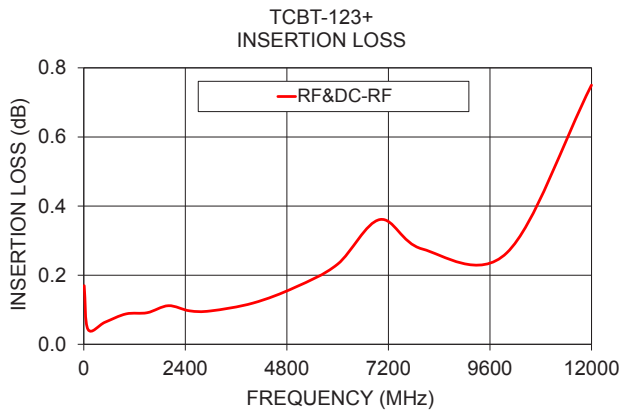
Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		12000	MHz
Insertion Loss	10-100	—	0.1	0.5	dB
	100-6000	—	0.3	0.8	
	6000-12000	—	0.8	1.6	
Isolation	10-100	30	55	—	dB
	100-6000	18	33	—	
	6000-12000	15	22	—	
VSWR	10-100		1.05	1.3	:1
	100-6000		1.2	1.5	
	6000-12000		1.3	1.7	

### Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB) with current	VSWR (:1) with current	ISOLATION (dB) 0mA
	RF & DC-RF	RF-DC	RF & DC - DC
10	0.17	1.25	36.31
100	0.04	1.03	69.24
500	0.06	1.01	59.14
1000	0.09	1.02	52.98
1500	0.09	1.04	46.74
2000	0.11	1.09	42.79
2500	0.10	1.12	39.96
3000	0.10	1.16	36.36
4000	0.12	1.16	31.23
5000	0.17	1.06	29.13
6000	0.23	1.03	27.37
7000	0.36	1.07	23.78
8000	0.28	1.11	22.78
10000	0.26	1.20	23.54
12000	0.75	1.36	20.82

### Functional Schematic





**Notes**

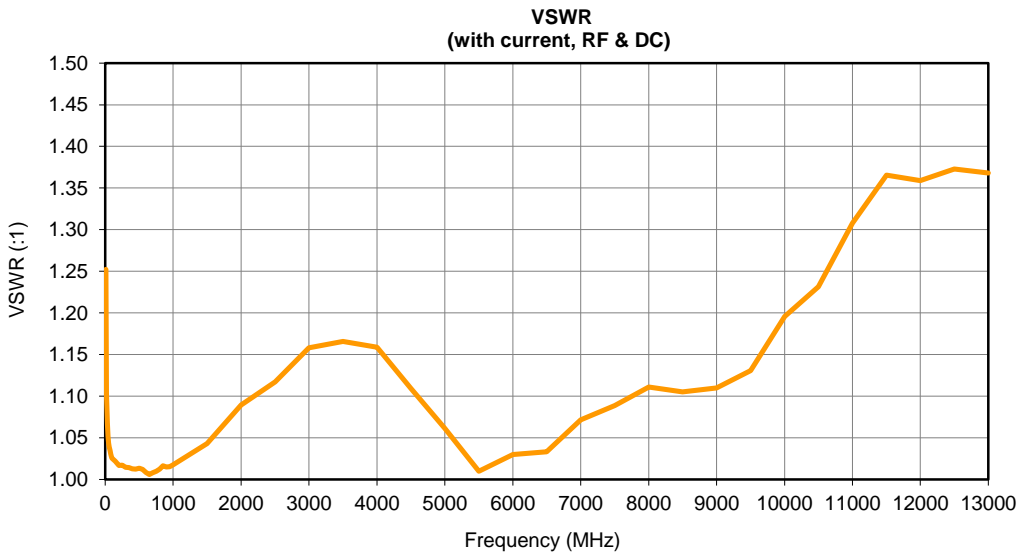
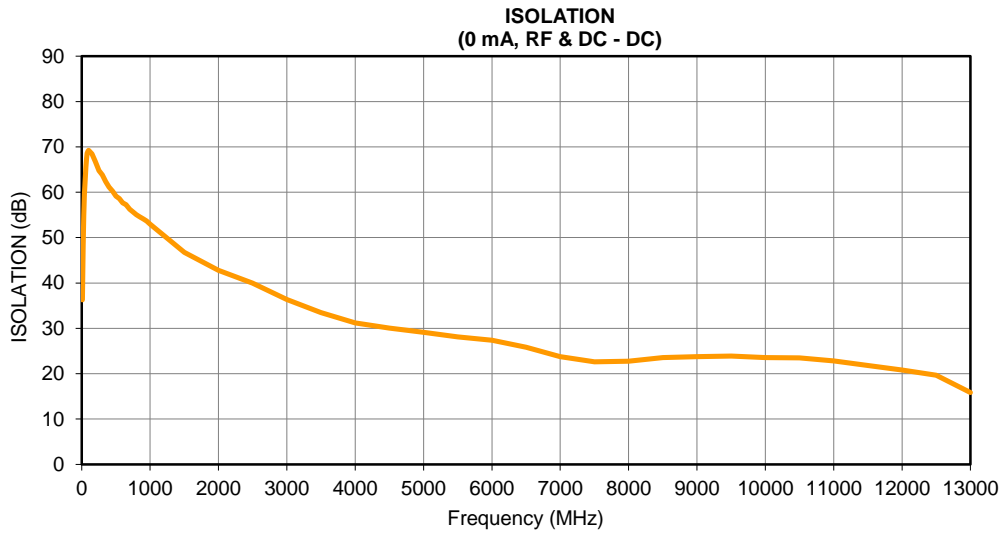
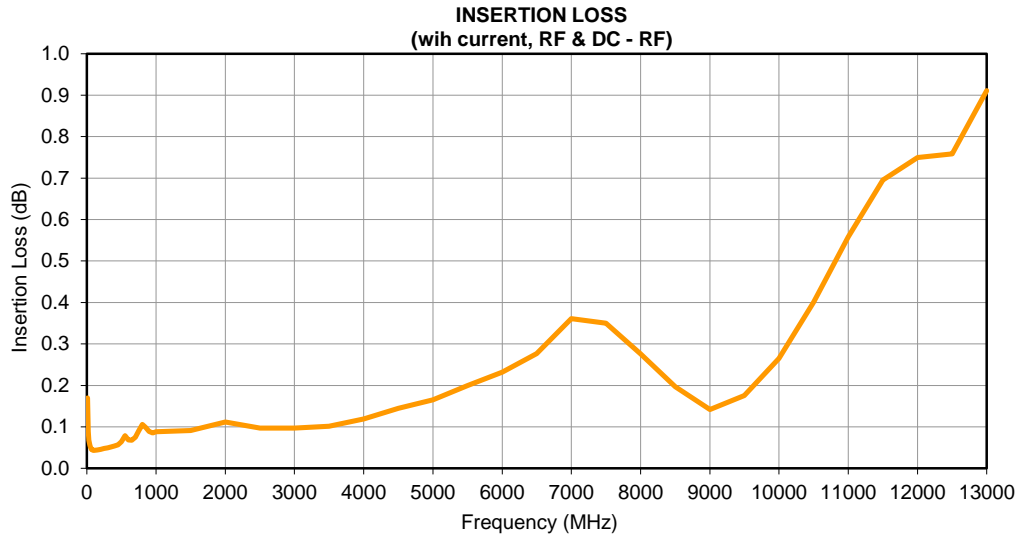
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## Typical Performance Data

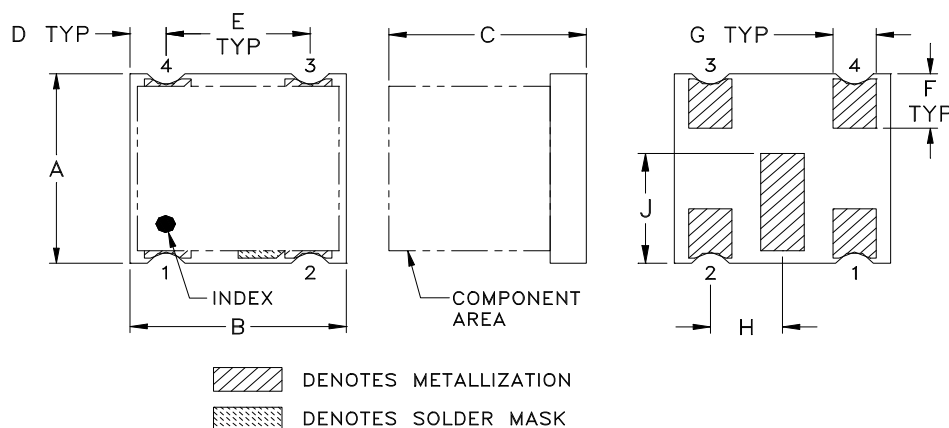
FREQ	INSERTION LOSS RF & DC-RF with current	ISOLATION RF & DC-DC 0 mA	VSWR RF & DC with current
(MHz)	(dB)	(dB)	(:1)
10	0.17	36.31	1.25
20	0.09	48.08	1.10
30	0.07	54.91	1.07
40	0.06	59.52	1.05
50	0.05	63.10	1.04
60	0.05	65.57	1.04
70	0.04	67.27	1.03
80	0.05	68.61	1.03
90	0.04	69.03	1.03
100	0.04	69.24	1.03
150	0.04	68.46	1.02
200	0.05	66.77	1.02
250	0.05	64.79	1.02
300	0.05	63.82	1.01
350	0.05	62.36	1.01
400	0.05	61.18	1.01
450	0.06	60.23	1.01
500	0.06	59.14	1.01
550	0.08	58.59	1.01
600	0.07	57.69	1.01
650	0.07	57.25	1.01
700	0.08	56.29	1.01
750	0.09	55.66	1.01
800	0.11	55.02	1.01
850	0.10	54.61	1.02
900	0.09	54.09	1.01
950	0.09	53.65	1.02
1000	0.09	52.98	1.02
1500	0.09	46.74	1.04
2000	0.11	42.79	1.09
2500	0.10	39.96	1.12
3000	0.10	36.36	1.16
3500	0.10	33.45	1.17
4000	0.12	31.23	1.16
4500	0.14	30.08	1.11
5000	0.17	29.13	1.06
5500	0.20	28.12	1.01
6000	0.23	27.37	1.03
6500	0.28	25.81	1.03
7000	0.36	23.78	1.07
7500	0.35	22.65	1.09
8000	0.28	22.78	1.11
8500	0.20	23.56	1.11
9000	0.14	23.77	1.11
9500	0.18	23.86	1.13
10000	0.26	23.54	1.20
10500	0.40	23.50	1.23
11000	0.56	22.82	1.31
11500	0.70	21.81	1.37
12000	0.75	20.82	1.36
12500	0.76	19.68	1.37
13000	0.91	15.85	1.37

Typical Performance Curves

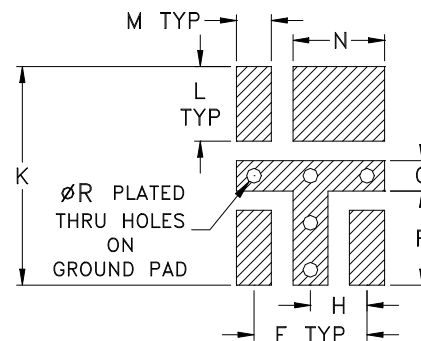


## Outline Dimensions

GU1414



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N
GU1414	.150 (3.81)	.150 (3.81)	.14 (3.56)	.025 (.64)	.100 (2.54)	.043 (1.09)	.030 (.76)	.050 (1.27)	.087 (2.21)	.193 (4.90)	.066 (1.68)	.031 (.79)	.081 (2.06)

CASE #	P	Q	R	WT. GRAMS
GU1414	.083 (2.11)	.027 (.69)	.013 (.33)	.06

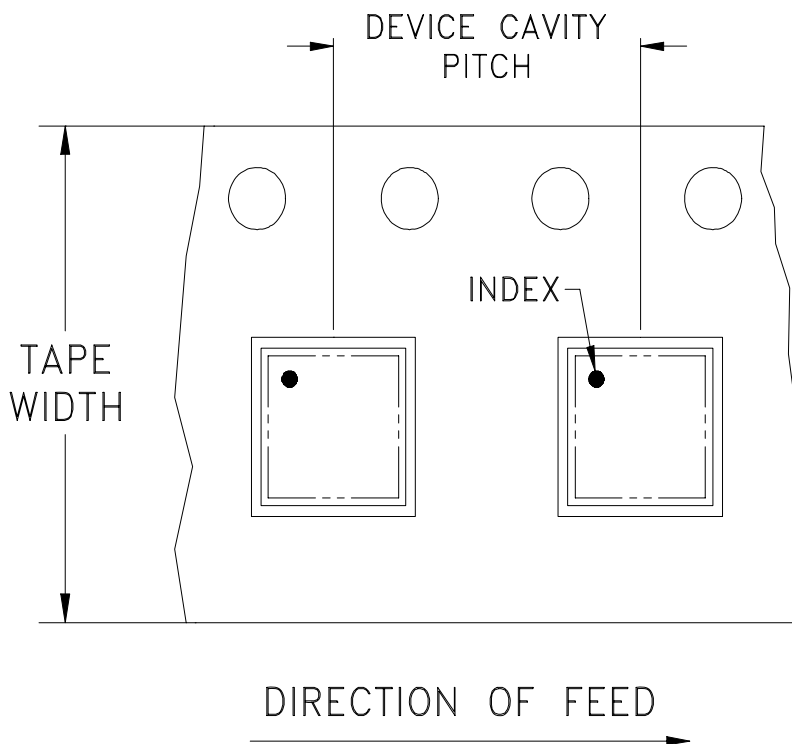
Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .01$ ; 3 Pl.  $\pm .005$

### Notes:

1. Case material: Plastic.
2. Termination finish: 3-5µinch Gold over 120-240 µinch Nickel Plate. All models (+) suffix.

# Tape & Reel Packaging TR-F102

## DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
12	8	7	Small quantity standards (see note)	20
				50
				100
				200
		500		
		13	Standard	1000

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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



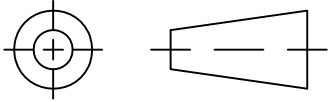
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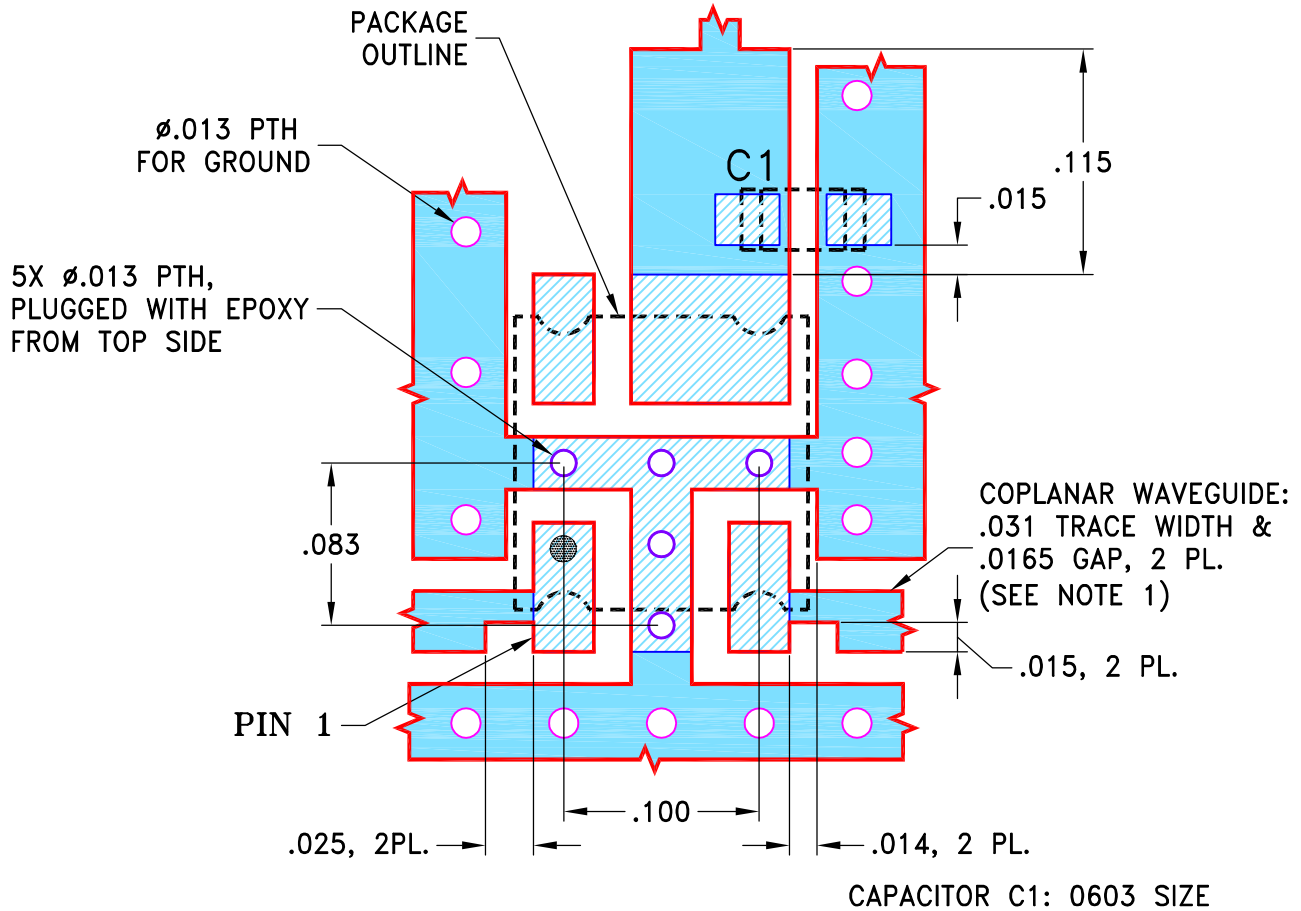
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M155422	NEW RELEASE	03/10/16	ITG	DJ

SUGGESTED MOUNTING CONFIGURATION FOR GU1414 CASE STYLE, "04BT02" PIN CONNECTION



**NOTES:**

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS  $.020 \pm .0015$ "; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. FOOTPRINT OF C1 IS SHOWN FOR REFERENCE.
3. 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 ± 1° FRACTIONS ±	DRAWN	ITG	03/08/16
	CHECKED	GF	03/10/16
	APPROVED	DJ	03/10/16



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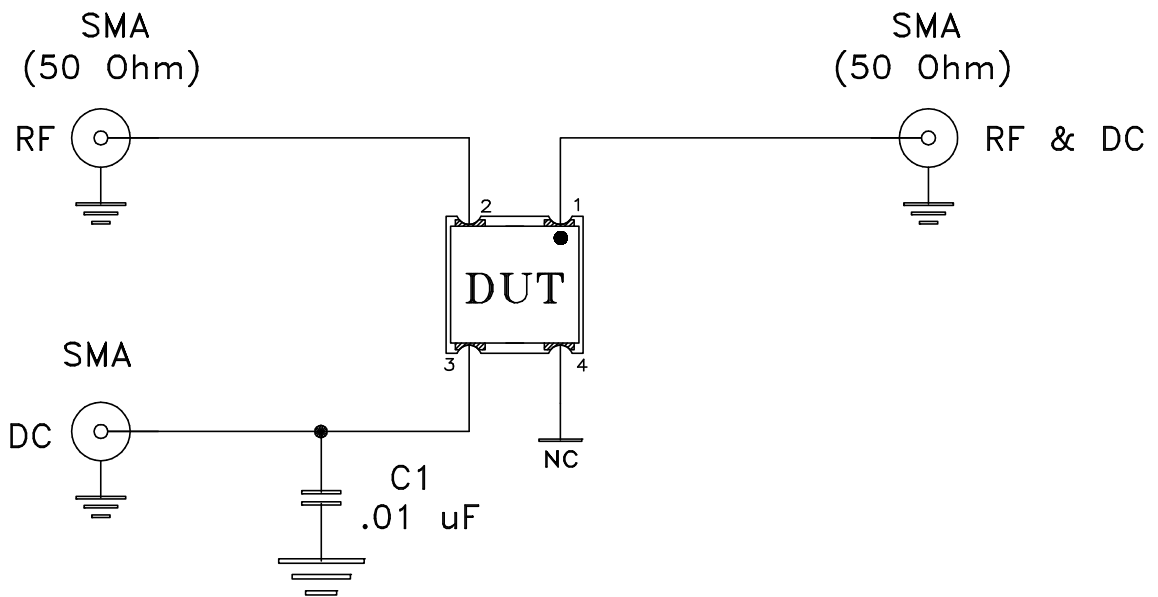
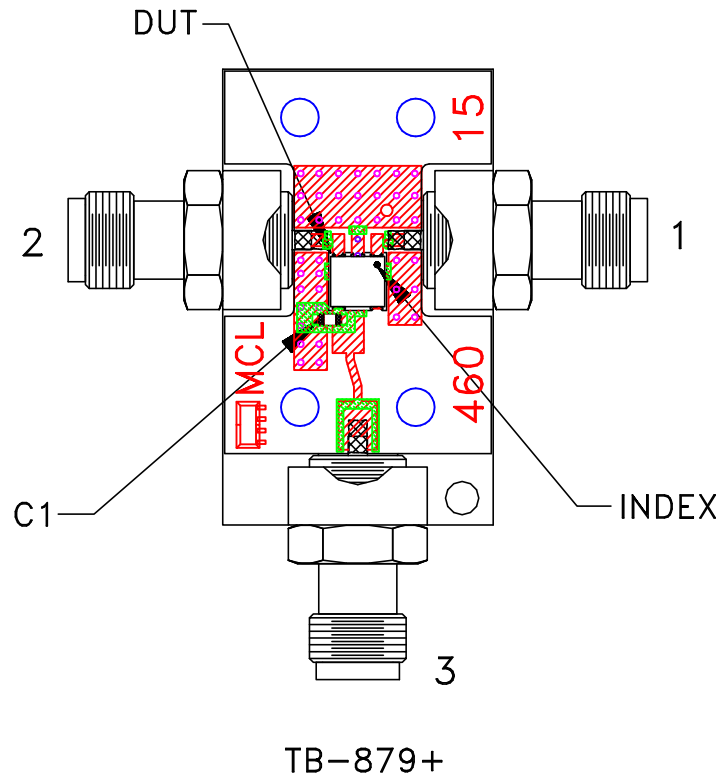
PL, 04BT02, GU1414, TB-879+

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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-481	OR
FILE:	98PL481	SCALE:	SHEET:
		10:1	1 OF 1



# Evaluation Board and Circuit



Schematic Diagram

**Notes:**

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 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, 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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215