SURFACE MOUNT

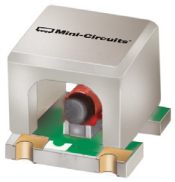
Bias Tee

TCBT-123+

50Ω Wideband 10 MHz to 12 GHz

THE BIG DEAL

- Wideband, 10 MHz to 12 GHz
- Low Insertion Loss, 0.5 dB Typ.
- Excellent VSWR, 1.25:1 Typ.
- Miniature Surface Mount 0.15x0.15"
- Aqueous Washable
- Protected by US Patent 8,644,029



Generic photo used for illustration purposes only

CASE STYLE: GU1414

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

APPLICATIONS

- Biasing Amplifiers
- Biasing of Laser Diodes
- Biasing of Active Antennas

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 (1 W) RF input power and DC input current up to 200 mA. The unit comes housed in a miniature, shielded package (0.15x0.15x0.14") 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 1 W	This model supports applications with a variety of power requirements.
Excellent DC-RF Isolation • 55 dB, 10 to 100 MHz • 33 dB, 100 to 6000 MHz • 22 dB, 6000 to 12000 MHz	Minimizes RF leakage and interference with other elements in the system.
Miniature Size, 0.15x0.15x0.14"	Small footprint makes the TCBT-123+ a space-saver in dense PCB-layouts.

REV. A
ECO-026344
TCBT-123+
MCL NY
251013

ELECTRICAL SPECIFICATIONS AT +25°C

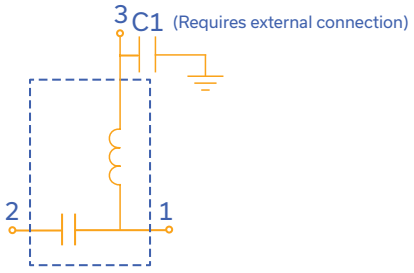
Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		12000	MHz
Insertion Loss	10-100		0.1	0.5	dB
	100-6000		0.3	0.8	
	6000-12000		0.8	1.6	
Isolation	10-100	30	55		dB
	100-6000	18	33		
	6000-12000	15	22		
VSWR	10-100		1.05	1.3	:1
	100-6000		1.2	1.5	
	6000-12000		1.3	1.7	

ABSOLUTE MAXIMUM RATINGS

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

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

FUNCTIONAL SCHEMATIC



SURFACE MOUNT

Bias Tee

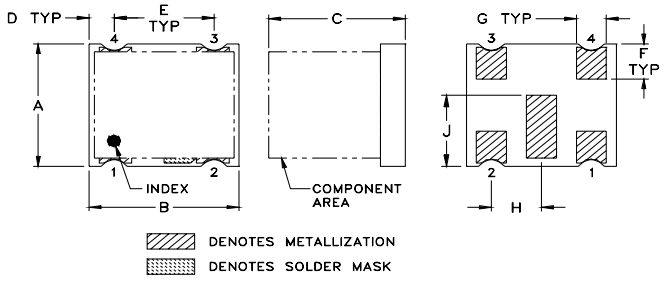
TCBT-123+

50Ω Wideband 10 MHz to 12 GHz

PAD CONNECTIONS

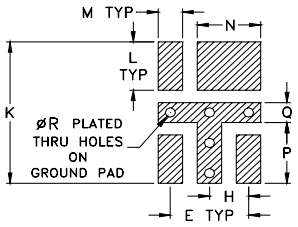
RF	2
RF & DC	1
DC	3
NOT USED	4

OUTLINE DRAWING



PRODUCT MARKING: N/A

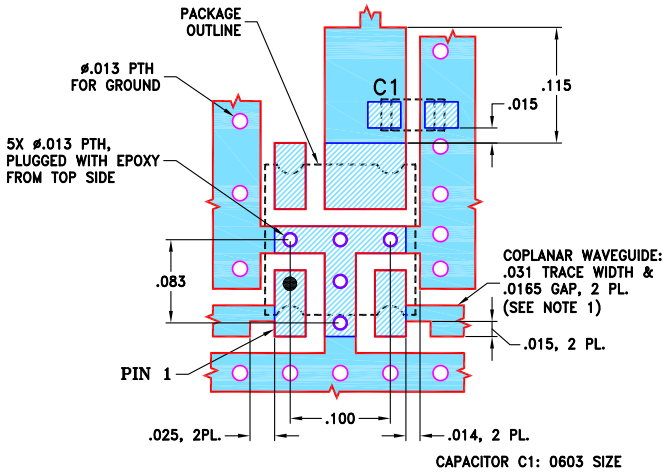
PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

DEMO BOARD MCL P/N: TB-TCBT-123+

SUGGESTED PCB LAYOUT (PL-481)



NOTES:
1. 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.
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

OUTLINE DIMENSIONS (Inches / mm)

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

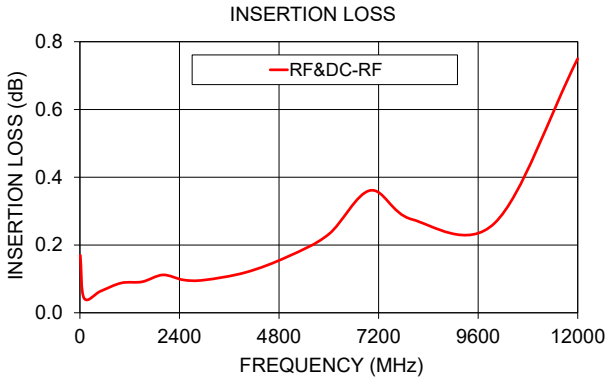
Bias Tee

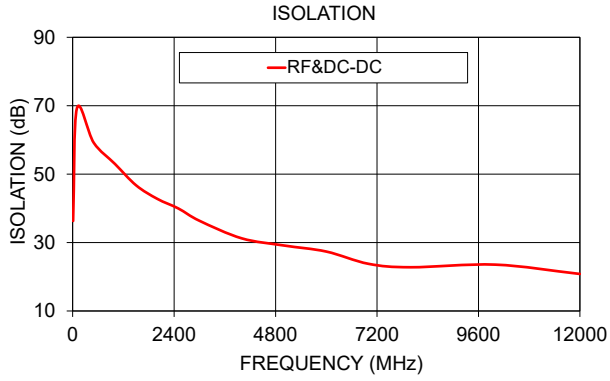
TCBT-123+

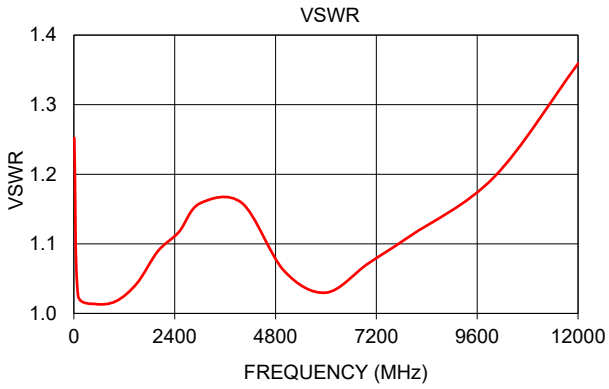
50Ω Wideband 10 MHz to 12 GHz

TYPICAL PERFORMANCE DATA

Frequency (MHz)	Insertion Loss (dB) RF & DC-RF with Current	VSWR (:1) RF & DC with Current	Isolation (dB) 0 mA 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







NOTES

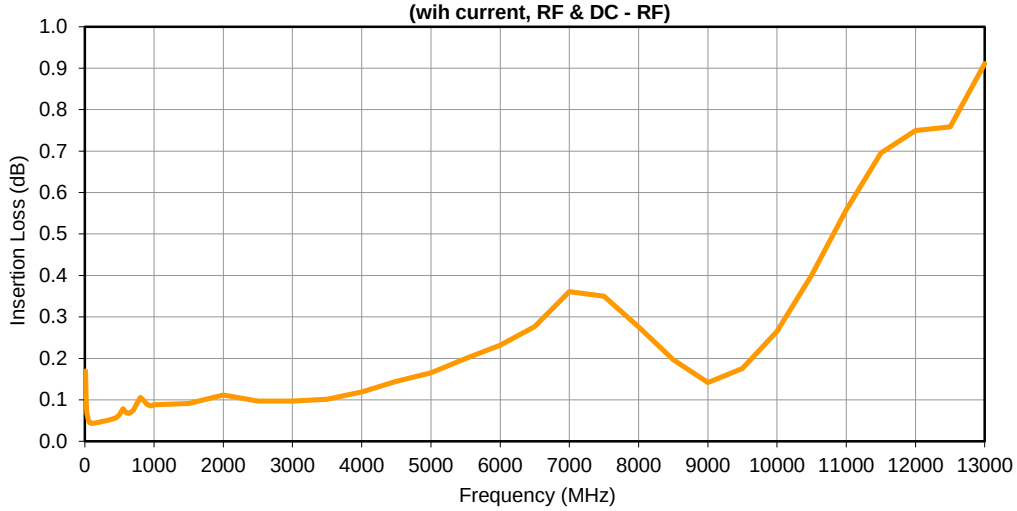
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
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Typical Performance Data

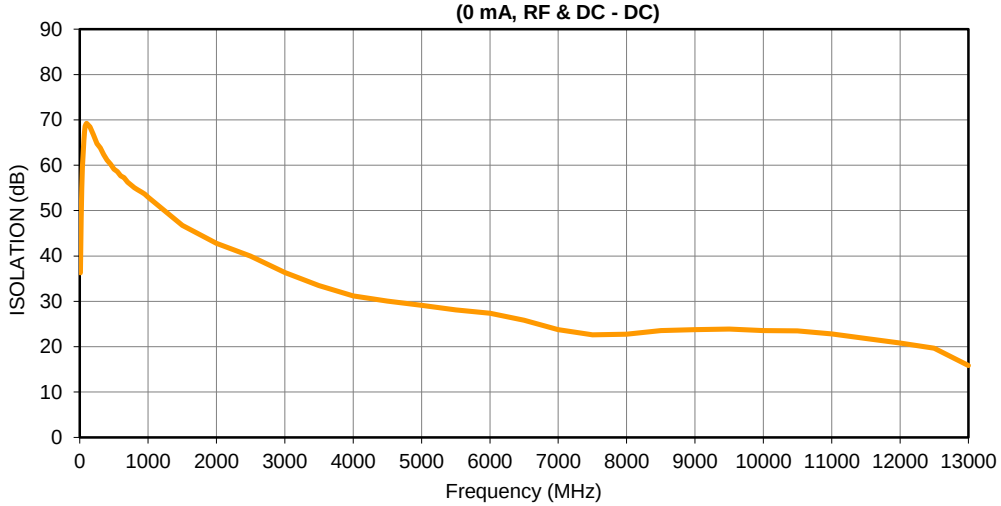
FREQ	INSERTION LOSS RF & DC-RF with current	ISOLATION RF & DC-DC 0 mA	VSWR RF & DC with current
(MHz)	(dB)	(dB)	(:1)
10	0.17	36.31	1.25
20	0.09	48.08	1.10
30	0.07	54.91	1.07
40	0.06	59.52	1.05
50	0.05	63.10	1.04
60	0.05	65.57	1.04
70	0.04	67.27	1.03
80	0.05	68.61	1.03
90	0.04	69.03	1.03
100	0.04	69.24	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

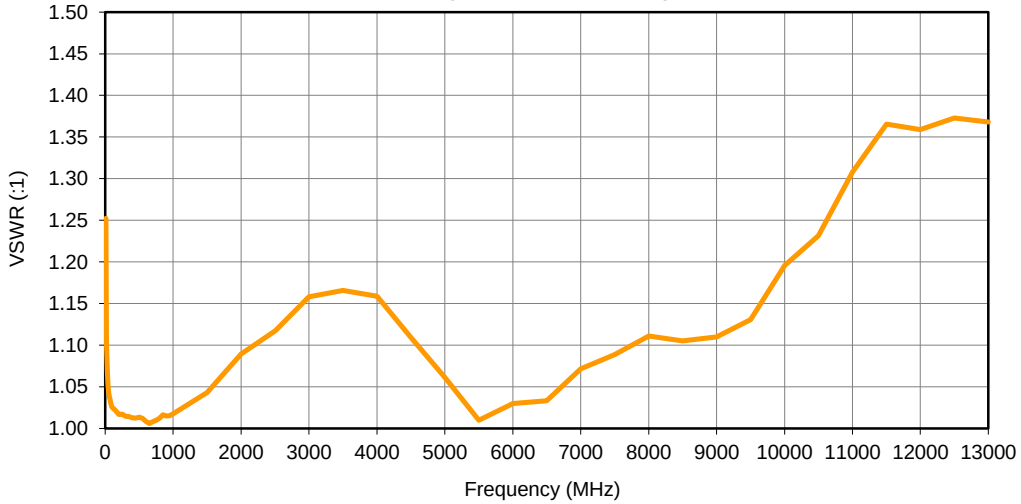
INSERTION LOSS
(wih current, RF & DC - RF)



ISOLATION
(0 mA, RF & DC - DC)



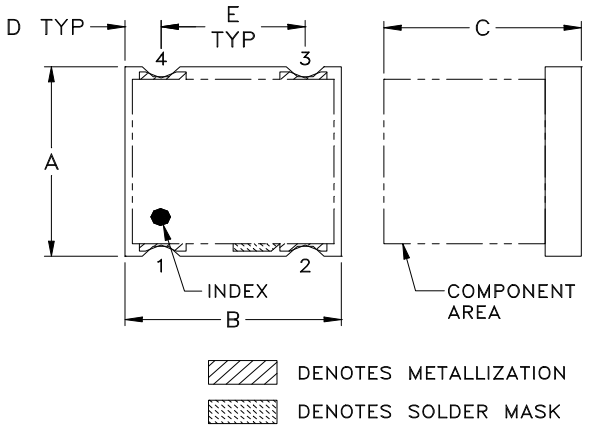
VSWR
(with current, RF & DC)



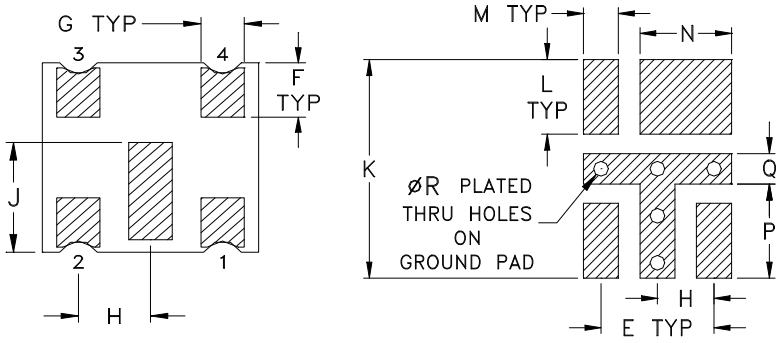
Case Style GU

Outline Dimensions

GU1414



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.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. ± .01; 3 Pl. ± .005

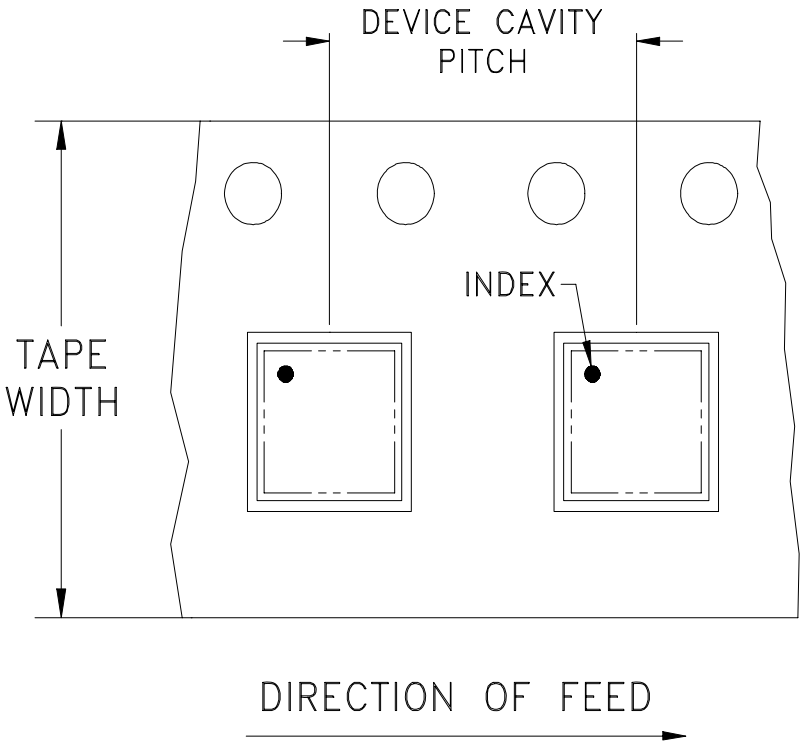
Notes:

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

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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

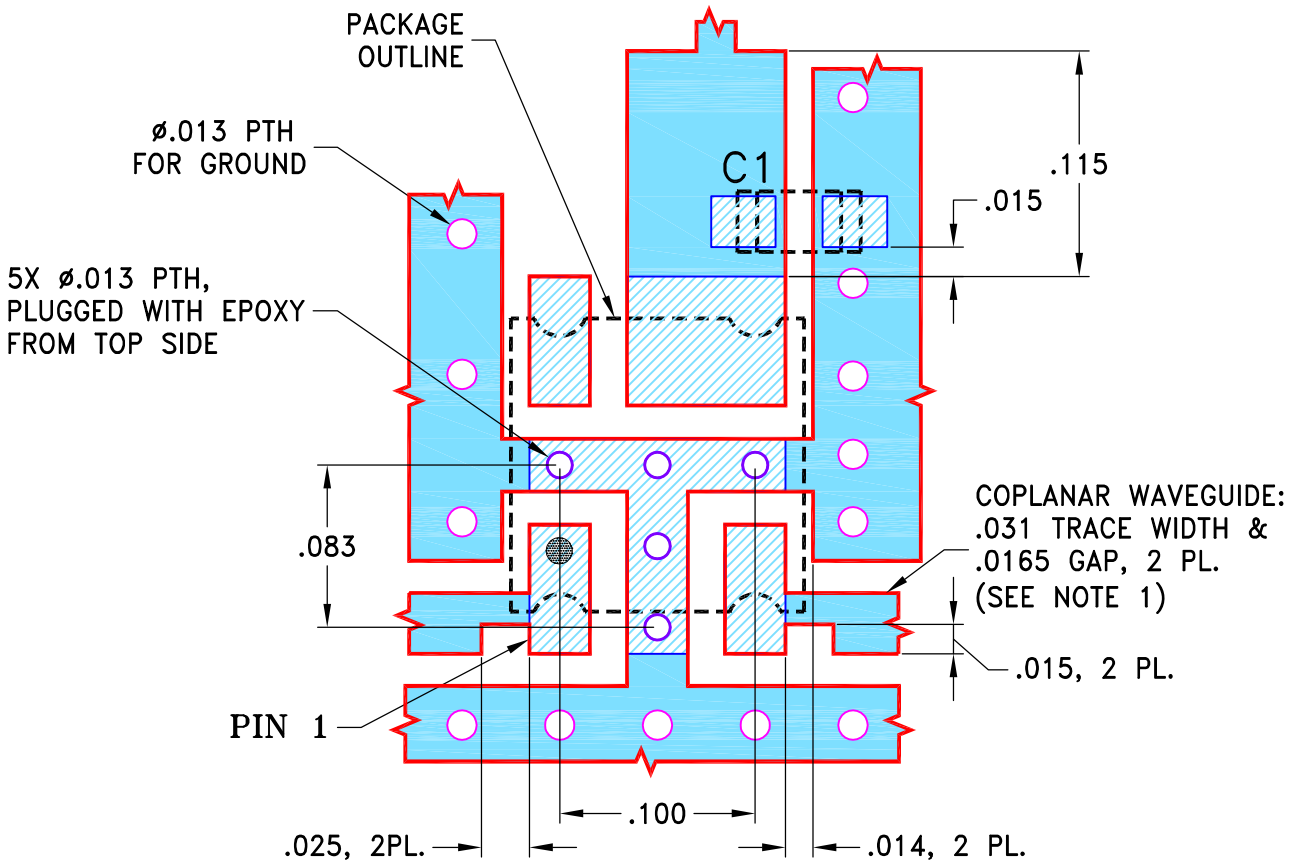
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THIRD ANGLE PROJECTION

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



CAPACITOR C1: 0603 SIZE

NOTES:

1. 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.
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	DRAWN	ITG	03/08/16
TOLERANCES ON:	CHECKED	GF	03/10/16
2 PL DECIMALS ±	APPROVED	DJ	03/10/16
3 PL DECIMALS ± .005			
ANGLES ± 1°			
FRACTIONS ±			

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

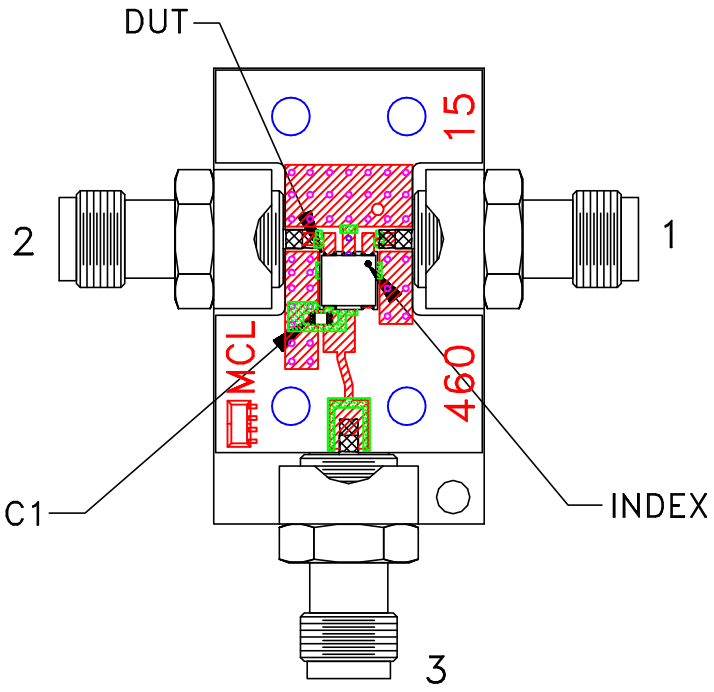
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 04BT02, GU1414, TB-879+

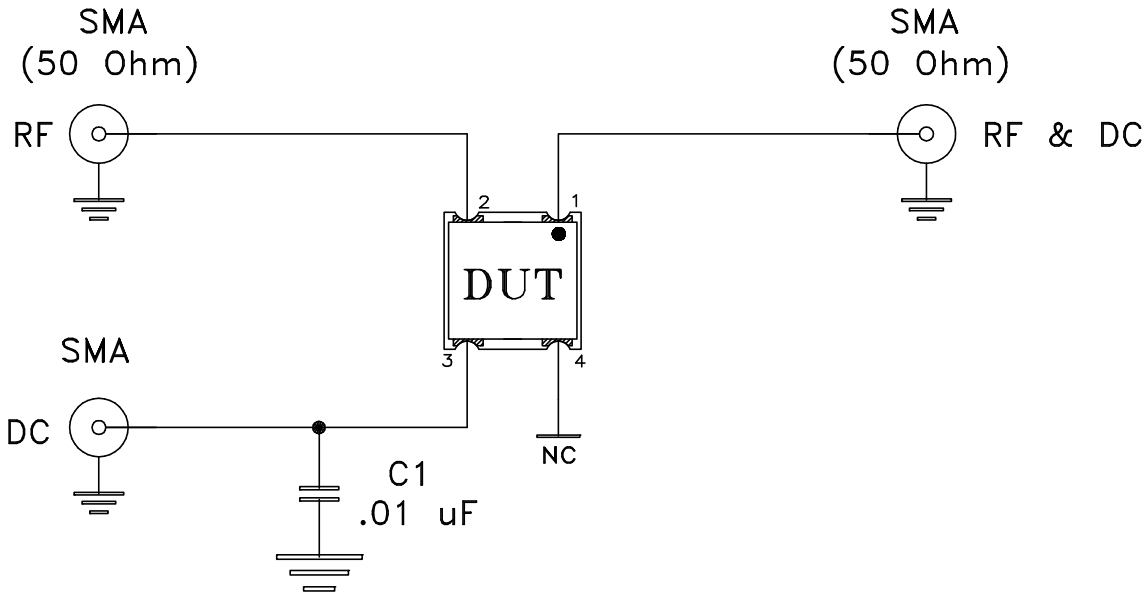
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-481	OR

FILE:	SCALE:	SHEET:
98PL481	10:1	1 OF 1

Evaluation Board and Circuit



TB-879+



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 ENV02T1

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

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