SURFACE MOUNT

Bias Tee

TCBT-203+

50Ω Wideband 10 MHz to 20 GHz

THE BIG DEAL

- Ultra-wideband, 10 MHz to 20 GHz
- Very low insertion loss, 0.8 dB
- Excellent VSWR, 1.3:1
- Small footprint, 0.175 x 0.150 x 0.110”

Generic photo used for illustration purposes only

CASE STYLE: GU1414-4

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

APPLICATIONS

- Biasing amplifiers
- Biasing of laser diodes
- Biasing of active antennas

PRODUCT OVERVIEW

Mini-Circuits’ TCBT-203+ is an ultra-wideband surface mount bias tee, covering applications from 10 MHz to 20 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 250 mA. The unit comes housed in a miniature, surface mount package (0.175 x 0.150 x 0.110”).

KEY FEATURES

Feature	Advantages
Ultra-wideband, 10 MHz to 20 GHz	Supports a wide range of applications with a single device, including biasing broadband amplifiers, laser diodes, active antennas and more.
Low insertion loss, 0.8 dB	Preserves signal strength from input to output, and minimizes overall system loss
Excellent VSWR, 1.3:1	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 • 50 dB, 10 to 100 MHz • 33 dB, 100 to 12000 MHz • 23 dB, 12000 to 20000 MHz	Minimizes RF leakage and interference with other elements in the system.
Miniature size, 0.175 x 0.150 x 0.110”	Small footprint makes the TCBT-203+ a space-saver in dense PCB-layouts.

REV. A
ECO-010393
TCBT-203+
DF/CP/AM
211029

ELECTRICAL SPECIFICATIONS AT 25°C

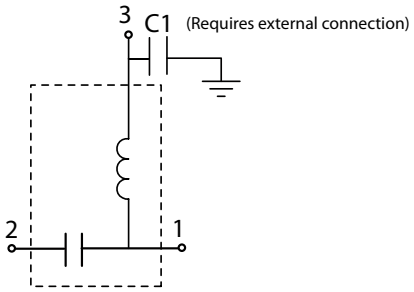
Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		20000	MHz
Insertion Loss	10-100	-	0.2	-	dB
	100-14000	-	0.4	1.1	
	14000-18000	-	0.8	1.3	
	18000-20000	-	0.9	1.6	
Isolation	10-100	24	50	-	dB
	100-14000	22	33	-	
	14000-18000	19	23	-	
VSWR	10-100	-	1.2	2.1	:1
	100-14000	-	1.22	1.7	
	14000-18000	-	1.35	1.8	
	18000-20000	-	1.4	2.0	

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	30 V max.
Input Current	250 mA

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

FUNCTIONAL SCHEMATIC

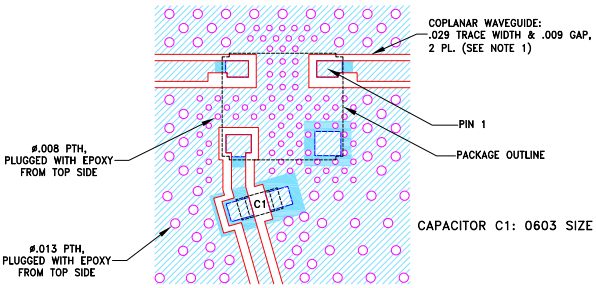


PAD CONNECTIONS

RF	2
RF & DC	1
DC	3
NOT USED	4

PRODUCT MARKING: N/A

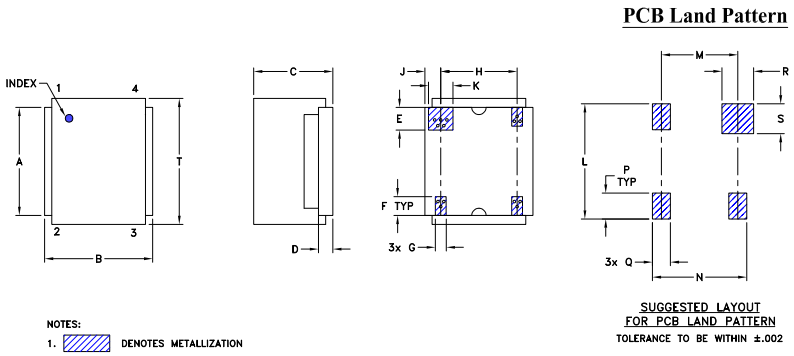
DEMO BOARD MCL P/N: TB-TCBT-203+
SUGGESTED PCB LAYOUT (PL-715)



NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020±.0015; COPPER: ½ 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 DRAWING



NOTES:
1. DENOTES METALLIZATION

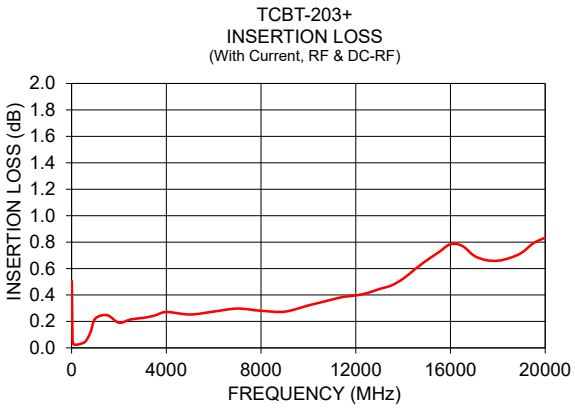
OUTLINE DIMENSIONS (Inches / mm)

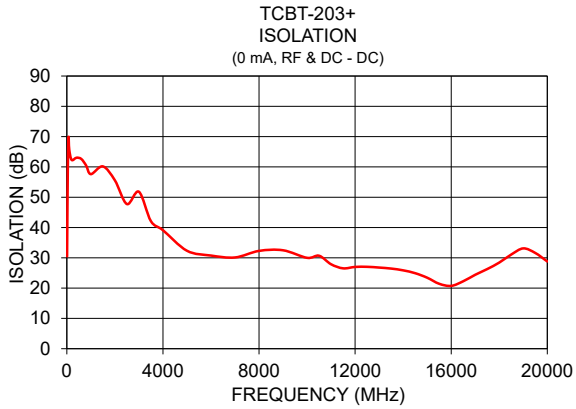
A	B	C	D	E	F	G	H	J	K
0.150	0.150	0.110	0.020	0.031	0.026	0.015	0.106	0.022	0.034
3.81	3.81	2.79	0.51	0.79	0.66	0.38	2.69	0.56	0.86

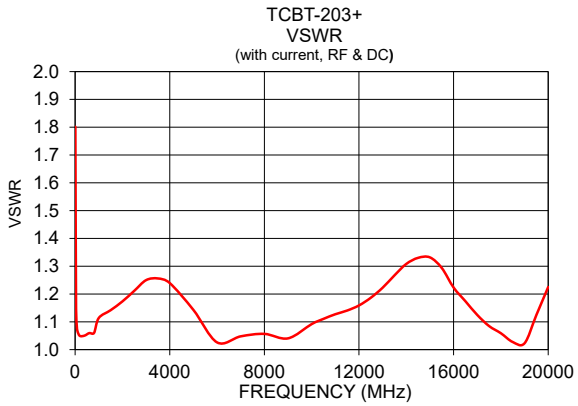
L	M	N	P	Q	R	S	T		wt
0.160	0.106	0.131	0.036	0.025	0.044	0.042	0.175		grams
4.06	2.69	3.33	0.91	0.64	1.12	1.05	4.45		0.054

TYPICAL PERFORMANCE DATA

Frequency (MHz)	Insertion Loss (dB) RF & DC - RF with Current	Isolation (dB) RF & DC - DC	VSWR (:1) RF & DC with Current
10	0.51	30.49	1.80
2000	0.19	55.58	1.17
3000	0.23	51.81	1.25
4000	0.27	39.12	1.24
5000	0.25	32.33	1.14
6000	0.27	30.75	1.03
7000	0.30	30.11	1.05
8000	0.28	32.28	1.06
9000	0.27	32.49	1.04
10000	0.32	29.99	1.09
11000	0.37	27.87	1.13
12000	0.40	26.99	1.16
13000	0.45	26.78	1.22
14000	0.52	25.86	1.31
15000	0.66	23.43	1.33
16000	0.78	20.74	1.22
17000	0.70	24.40	1.12
18000	0.66	28.43	1.06
19000	0.72	33.11	1.02
20000	0.83	28.79	1.23







NOTES

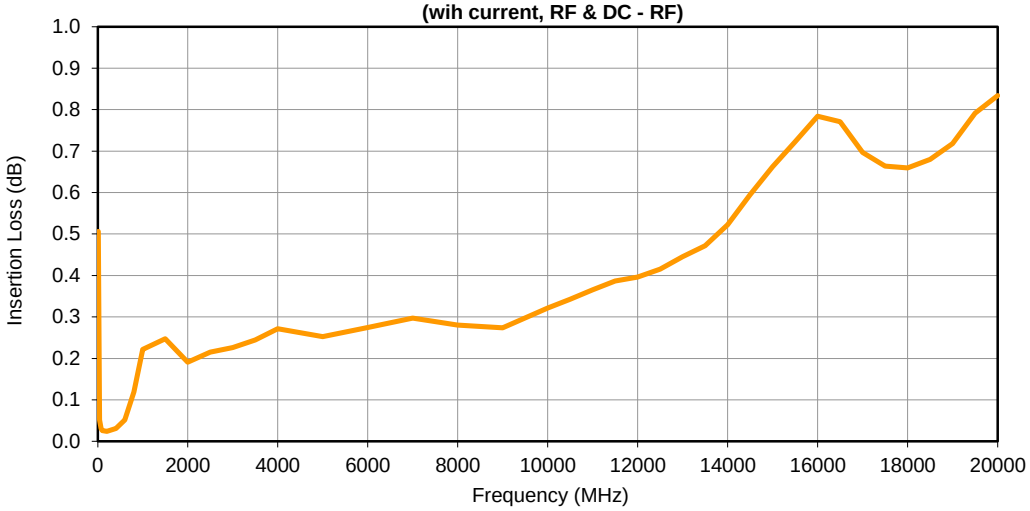
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's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

Typical Performance Data

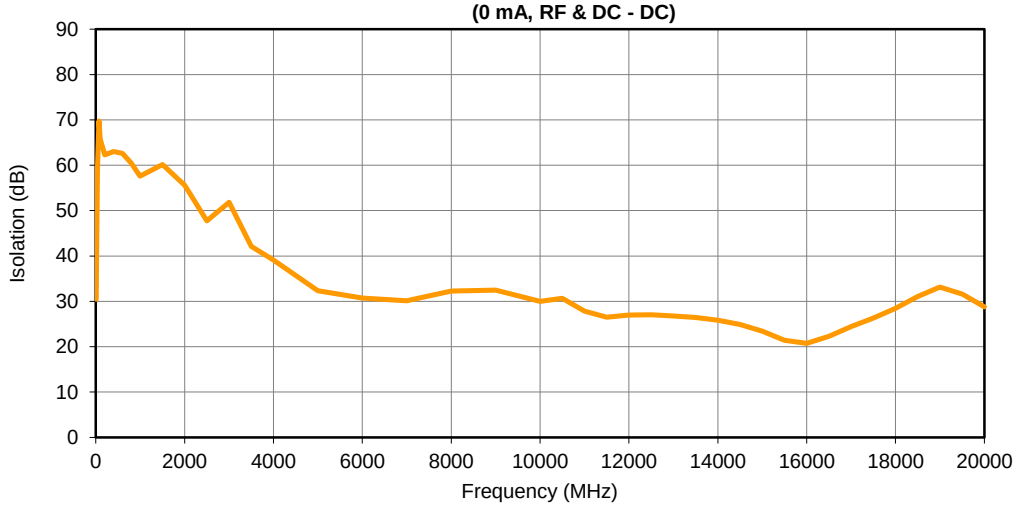
FREQ (MHz)	INSERTION LOSS RF & DC-RF with current (dB)	ISOLATION RF & DC-DC 0 mA (dB)	VSWR RF & DC with current (:1)
10	0.51	30.49	1.80
40	0.05	59.08	1.15
70	0.03	69.75	1.09
100	0.03	65.77	1.07
200	0.02	62.30	1.05
400	0.03	63.03	1.05
600	0.05	62.64	1.06
800	0.12	60.51	1.06
1000	0.22	57.62	1.11
1500	0.25	60.17	1.14
2000	0.19	55.58	1.17
2500	0.22	47.74	1.21
3000	0.23	51.81	1.25
3500	0.24	42.10	1.26
4000	0.27	39.12	1.24
5000	0.25	32.33	1.14
6000	0.27	30.75	1.03
7000	0.30	30.11	1.05
8000	0.28	32.28	1.06
9000	0.27	32.49	1.04
10000	0.32	29.99	1.09
10500	0.34	30.68	1.11
11000	0.37	27.87	1.13
11500	0.39	26.53	1.14
12000	0.40	26.99	1.16
12500	0.42	27.03	1.19
13000	0.45	26.78	1.22
13500	0.47	26.45	1.27
14000	0.52	25.86	1.31
14500	0.59	24.92	1.33
15000	0.66	23.43	1.33
15500	0.72	21.43	1.29
16000	0.78	20.74	1.22
16500	0.77	22.26	1.17
17000	0.70	24.40	1.12
17500	0.66	26.29	1.08
18000	0.66	28.43	1.06
18500	0.68	31.09	1.03
19000	0.72	33.11	1.02
19500	0.79	31.60	1.12
20000	0.83	28.79	1.23

Typical Performance Curves

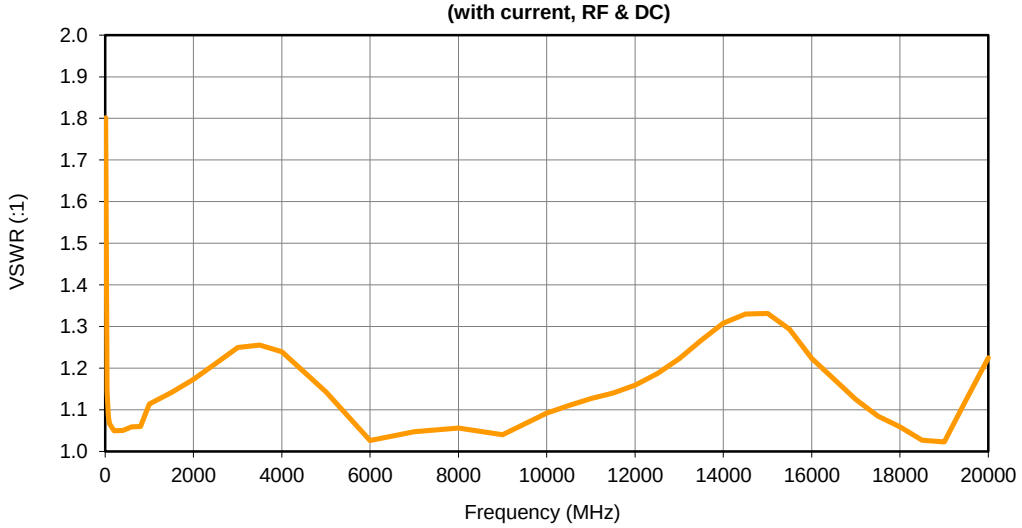
INSERTION LOSS
(wih current, RF & DC - RF)



ISOLATION
(0 mA, RF & DC - DC)



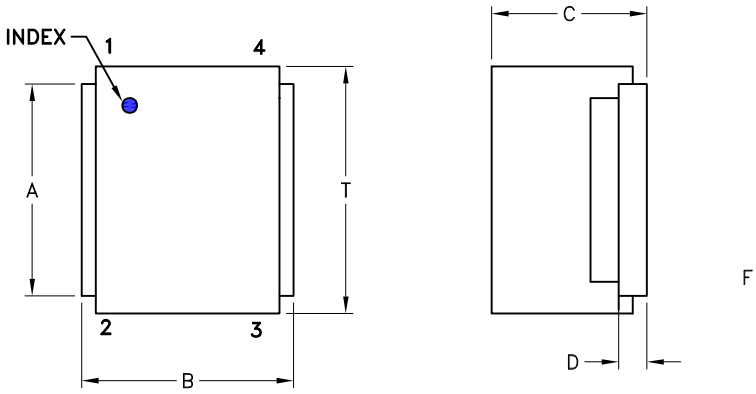
VSWR
(with current, RF & DC)



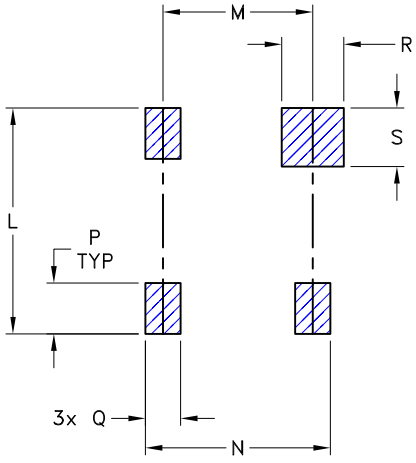
Case Style GU

Outline Dimensions

GU1414-4



PCB Land Pattern



SUGGESTED LAYOUT
FOR PCB LAND PATTERN
TOLERANCE TO BE WITHIN ±.002

NOTES:
1. DENOTES METALLIZATION

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P
GU1414-4	.150 (3.81)	.150 (3.81)	.110 (2.79)	.020 (.51)	.031 (.80)	.026 (.66)	.015 (.38)	.106 (2.69)	.022 (.56)	.034 (.86)	.160 (4.06)	.106 (2.69)	.131 (3.33)	.036 (.91)

CASE #	Q	R	S	T	WT, GRAM
GU1414-4	.025 (.63)	.044 (1.12)	.042 (1.05)	.175 (4.44)	.054

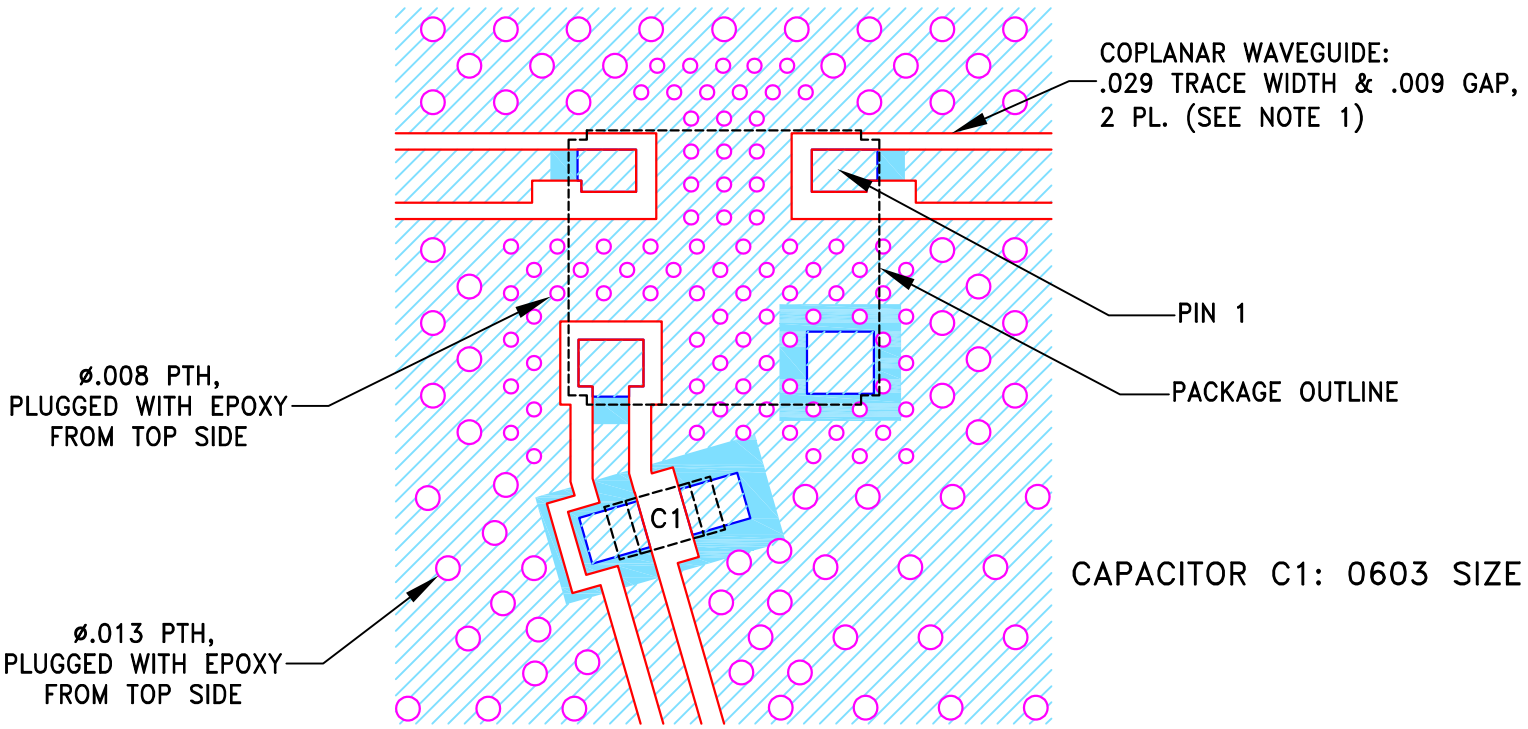
Dimensions are in inches (mm). Tolerances: 2 Pl.±.01; 3 Pl. ±.005

Notes:
1. Case material: Plastic
2. Termination finish: Gold Plating.

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-009086	NEW RELEASE	08/06/21	NP	DF

SUGGESTED MOUNTING CONFIGURATION FOR GU1414-4 CASE STYLE



NOTES:

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   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	NP	08/06/21
TOLERANCES ON:	CHECKED	GF	08/06/21
2 PL DECIMALS ±	APPROVED	DF	08/06/21
3 PL DECIMALS ±			
ANGLES ±			
FRACTIONS ±			

Mini-Circuits®

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

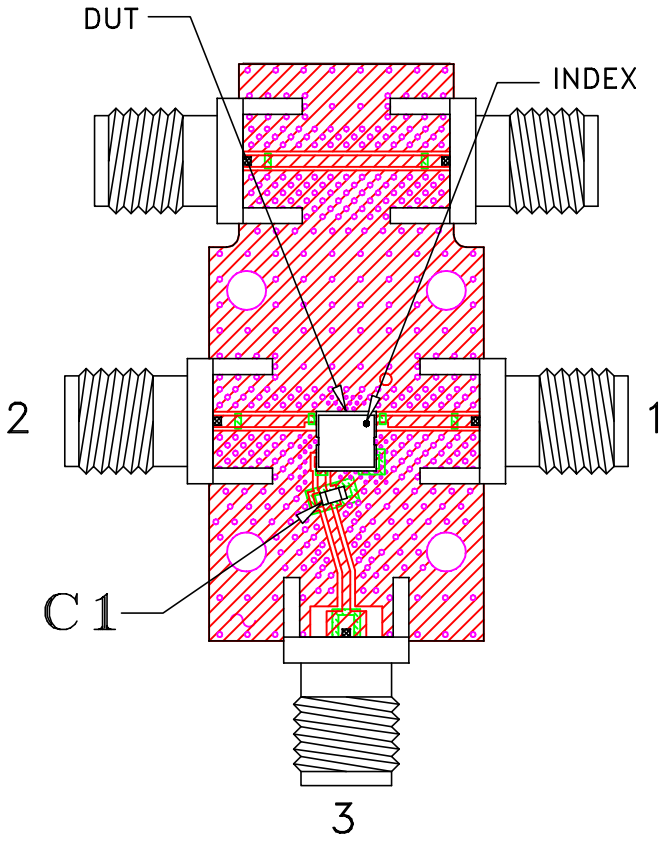
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, GU1414-4, TB-TCBT-203+

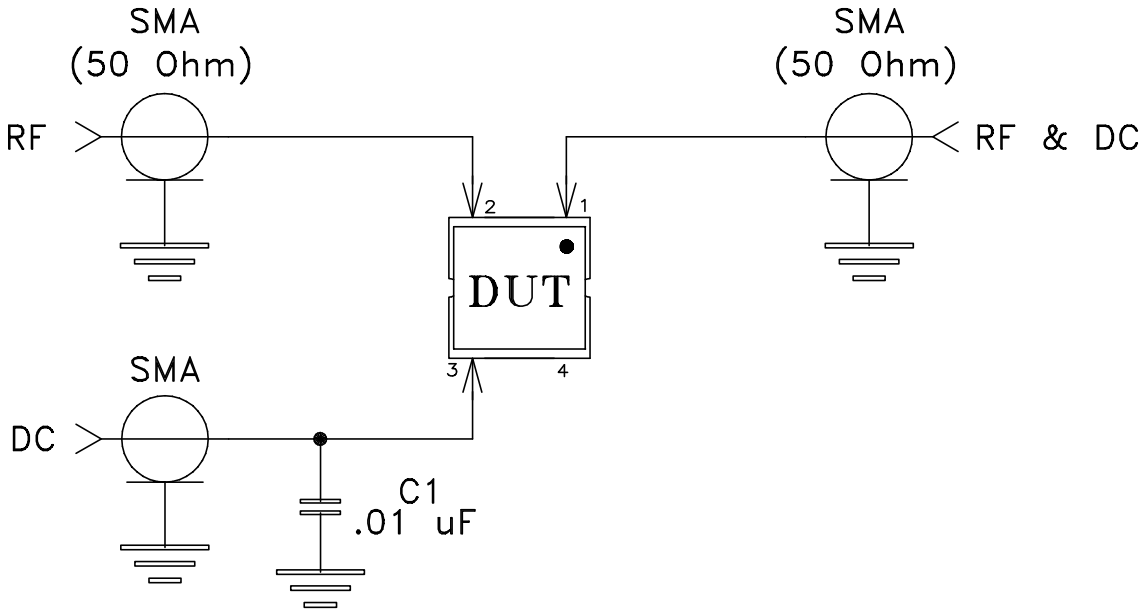
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-715	OR

FILE:	SCALE:	SHEET:
98PL715	9:1	1 OF 1

Evaluation Board and Circuit



TB-TCBT-203+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350B or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.

Mini-Circuits®

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