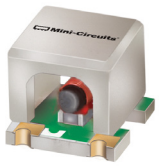
Surface Mount

Bias-Tee

TCBT-14R+

50Ω Wideband 10 MHz to 10 GHz



CASE STYLE: GU1414-2

The Big Deal

- Extremely Wideband 10 GHz
- Miniature SMT (0.15”x0.15”)

Product Overview

The TCBT-14R+ surface mount bias tee provides outstanding application versatility, covering an ultra-wide frequency range of 10 MHz to 10 GHz with excellent isolation performance over the band. Its miniature package and surface mount are space-efficient and practical for automated pick and place operation. Designed to handle 30 dBm of RF power and 200 mA input current, the TCBT-14R+ is ideal for many communications and testing applications including biasing of amplifiers and MMICs, laser diodes and active antennas.

Key Features

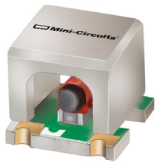
Feature	Advantages
Wideband	The TCBT-14R+ achieves wide 10 MHz – 10 GHz frequency range to serve a large host of applications.
Low Insertion Loss	0.6 dB typ. insertion loss enables highly efficient signal amplification with minimal impact on gain.
Excellent VSWR	Well-matched for 50Ω systems at 1.25:1 typ. VSWR.
Miniature Size	Its miniature footprint (0.15” x 0.15”) makes the TCBT-14R+ a high-performing space-saver in surface mount assemblies.
Aqueous Washable	The TCBT-14R+ features a unique open casing style which allows easy washing without trapping water.

Surface Mount

Bias-Tee

50Ω Wideband 10 MHz to 10 GHz

TCBT-14R+



CASE STYLE: GU1414-2

+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	1
RF&DC	2
DC	4
NOT USED	3

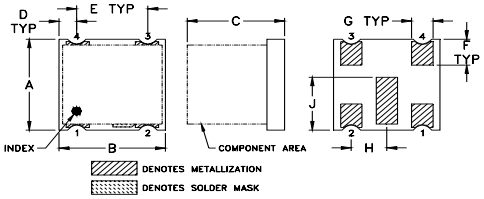
Features

- wideband, 10 to 10000 MHz
- low insertion loss, 0.6 dB typ.
- excellent VSWR, 1.25:1 typ.
- miniature surface mount 0.15"x0.15"
- aqueous washable
- protected by US Patent 8,644,029

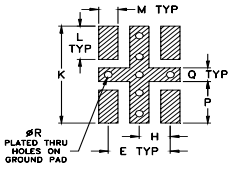
Applications

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

Outline Drawing



PCB Land Pattern



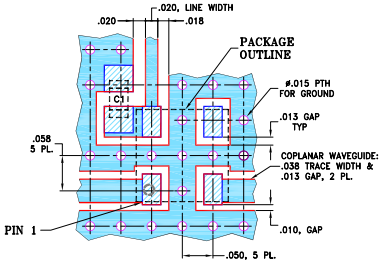
Suggested Layout,
Tolerance to be within ±.002

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H
0.150	0.150	0.140	0.025	0.100	0.043	0.030	0.050
3.81	3.81	3.56	0.64	2.54	1.09	0.76	1.27

J	K	L	M	P	Q	R	wt
0.087	0.193	0.066	0.031	0.083	0.027	0.013	grams
2.21	4.90	1.68	0.79	2.11	0.69	0.33	0.06

Demo Board MCL P/N: TB-268
Suggested PCB Layout (PL-146A)



CAPACITOR C1: .010 uF, 0603 SIZE

NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020±0.0015; 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.

Electrical Specifications at 25°C

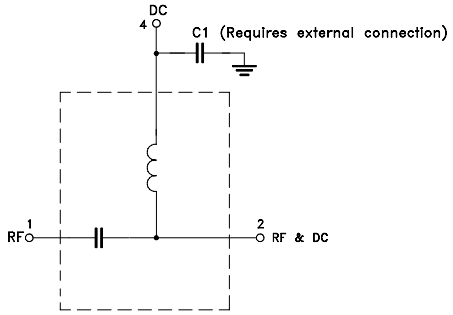
Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		10000	MHz
Insertion Loss	10 - 10000	0.05	0.6	1.6	dB
Isolation*	10 - 10000	15	33	—	dB
VSWR	10 - 10000	1.02	1.25	1.7	:1
DC Resistance, DC to RF and DC port	10 - 10000	—	1.0	—	ohms

* Isolation between DC to RF & DC 14 dB/min at 6-10 GHz

Typical Performance Data

Frequency (MHz)	INSERTION LOSS (dB)	VSWR (:1)		Isolation 0 mA	
		RF	RF&DC	RF-DC	RF&DC-DC
10.00	0.42	1.19	1.42	36.38	35.97
50.00	0.21	1.03	1.03	67.83	76.42
100.00	0.05	1.03	1.02	65.56	66.99
500.00	0.07	1.03	1.02	60.34	56.95
1000.00	0.09	1.02	1.02	51.24	48.05
2050.00	0.14	1.02	1.03	37.50	36.11
3100.00	0.19	1.08	1.08	31.08	29.64
4000.00	0.24	1.07	1.07	29.31	27.43
5050.00	0.33	1.04	1.03	26.34	24.91
6100.00	0.44	1.04	1.01	20.43	19.27
7000.00	0.66	1.09	1.07	16.60	15.87
8050.00	0.86	1.09	1.15	17.92	17.69
9100.00	0.92	1.23	1.22	19.03	18.34
9400.00	0.94	1.29	1.27	18.86	18.17
10000.00	0.98	1.45	1.41	17.61	17.20

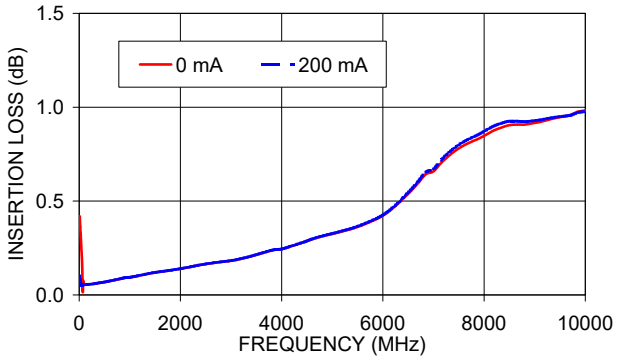
Functional Schematic



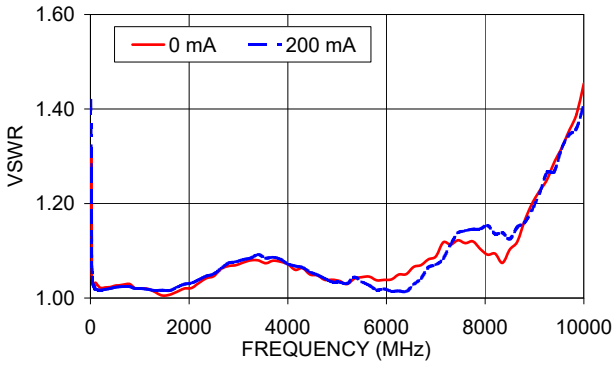
Notes

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

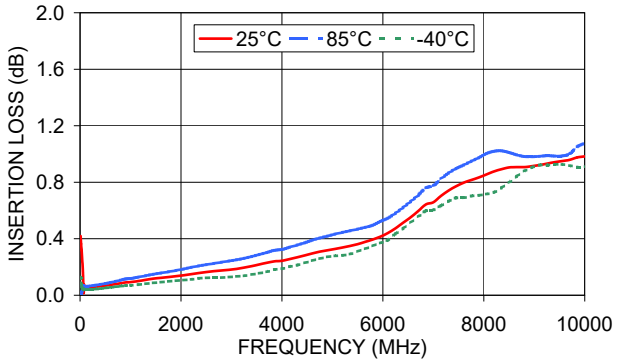
TCBT-14R+
INSERTION LOSS vs. CURRENT



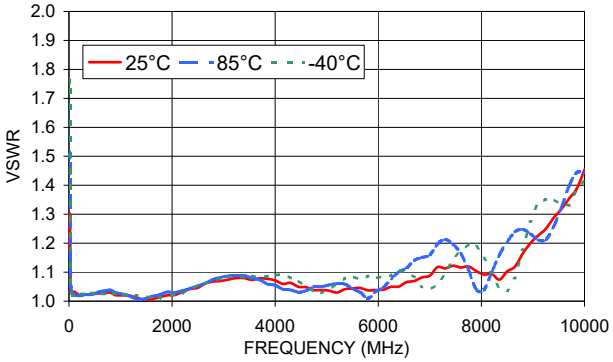
TCBT-14R+
VSWR vs. CURRENT



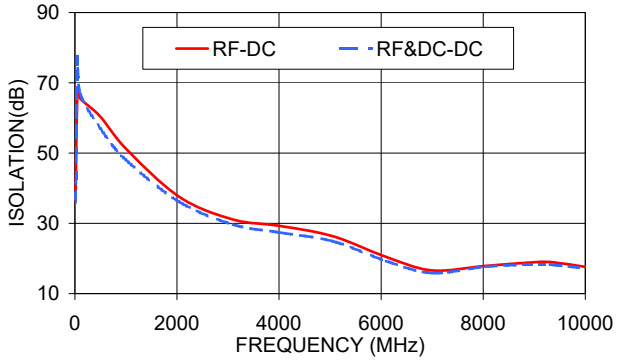
TCBT-14R+
INSERTION LOSS vs. TEMPERATURE



TCBT-14R+
VSWR vs. TEMPERATURE



TCBT-14R+
ISOLATION @ 25°C & 0mA



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Surface Mount

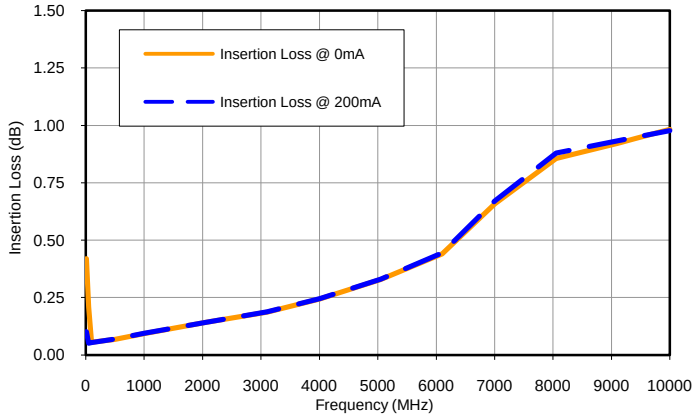
Bias-Tee TCBT-14R+

Typical Performance Data

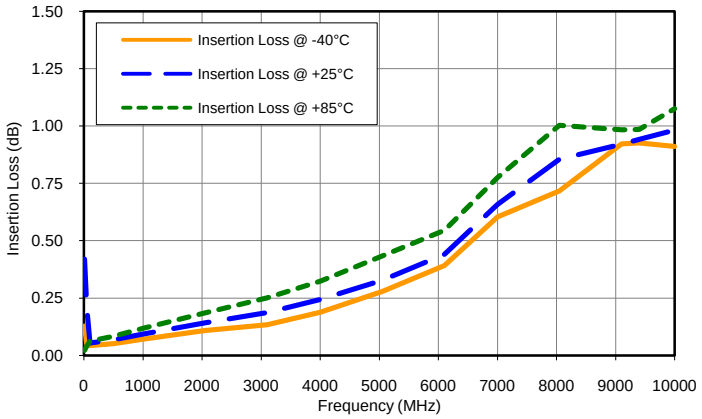
FREQUENCY	INSERTION LOSS (RF port to RF&DC port) (dB)					VSWR (:1)					ISOLATION (RF port to DC port) (RF&DC port to DC port) (dB)	
	+25°C		0mA			+25°C		0mA			+25°C & 0mA	
(MHz)	0mA	200mA	-40°C	+25°C	+85°C	0mA	200mA	-40°C	+25°C	+85°C	RF-DC	RF&DC-DC
10.0	0.42	0.10	0.13	0.42	0.02	1.19	1.18	1.75	1.19	1.51	36.38	35.97
50.0	0.21	0.05	0.05	0.21	0.04	1.03	1.03	1.03	1.03	1.03	67.83	76.42
100.0	0.05	0.05	0.04	0.05	0.06	1.03	1.03	1.02	1.03	1.02	65.56	66.99
500.0	0.07	0.07	0.05	0.07	0.08	1.03	1.03	1.03	1.03	1.03	60.34	56.95
1000.0	0.09	0.09	0.07	0.09	0.12	1.02	1.02	1.02	1.02	1.03	51.24	48.05
2050.0	0.14	0.14	0.11	0.14	0.19	1.02	1.02	1.02	1.02	1.03	37.50	36.11
3100.0	0.19	0.19	0.13	0.19	0.25	1.08	1.07	1.08	1.08	1.09	31.08	29.64
4000.0	0.24	0.24	0.19	0.24	0.32	1.07	1.07	1.09	1.07	1.05	29.31	27.43
5050.0	0.33	0.33	0.28	0.33	0.43	1.04	1.04	1.04	1.04	1.06	26.34	24.91
6100.0	0.44	0.44	0.39	0.44	0.55	1.04	1.04	1.09	1.04	1.05	20.43	19.27
7000.0	0.66	0.67	0.60	0.66	0.78	1.09	1.09	1.04	1.09	1.16	16.60	15.87
8050.0	0.86	0.88	0.72	0.86	1.00	1.09	1.09	1.15	1.09	1.04	17.92	17.69
9100.0	0.92	0.93	0.92	0.92	0.98	1.23	1.23	1.34	1.23	1.21	19.03	18.34
9400.0	0.94	0.95	0.93	0.94	0.99	1.29	1.29	1.35	1.29	1.26	18.86	18.17
10000.0	0.98	0.98	0.91	0.98	1.08	1.45	1.46	1.41	1.45	1.44	17.61	17.20

Typical Performance Curves

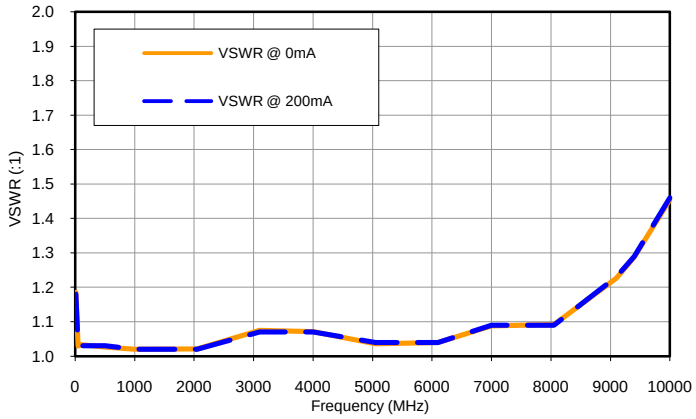
Insertion Loss @ +25°C



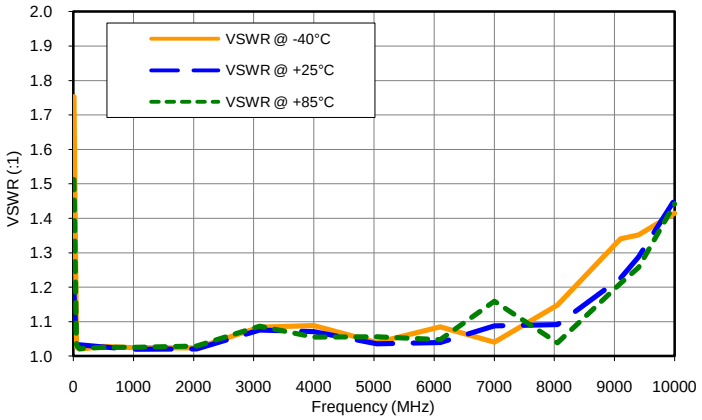
Insertion Loss @ 0mA



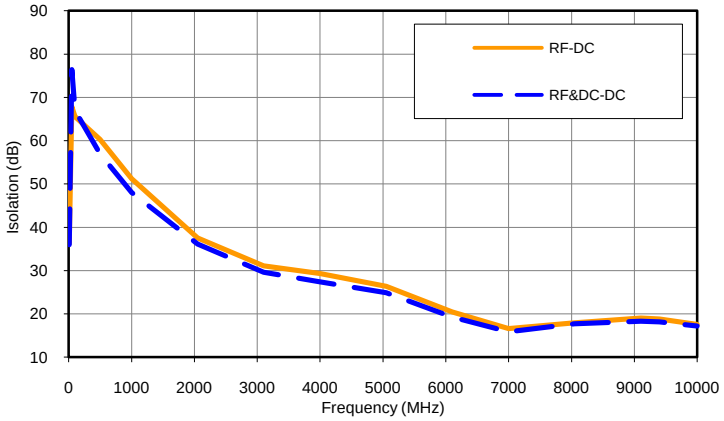
VSWR @ +25°C



VSWR @ 0mA



Isolation @ +25°C & 0mA

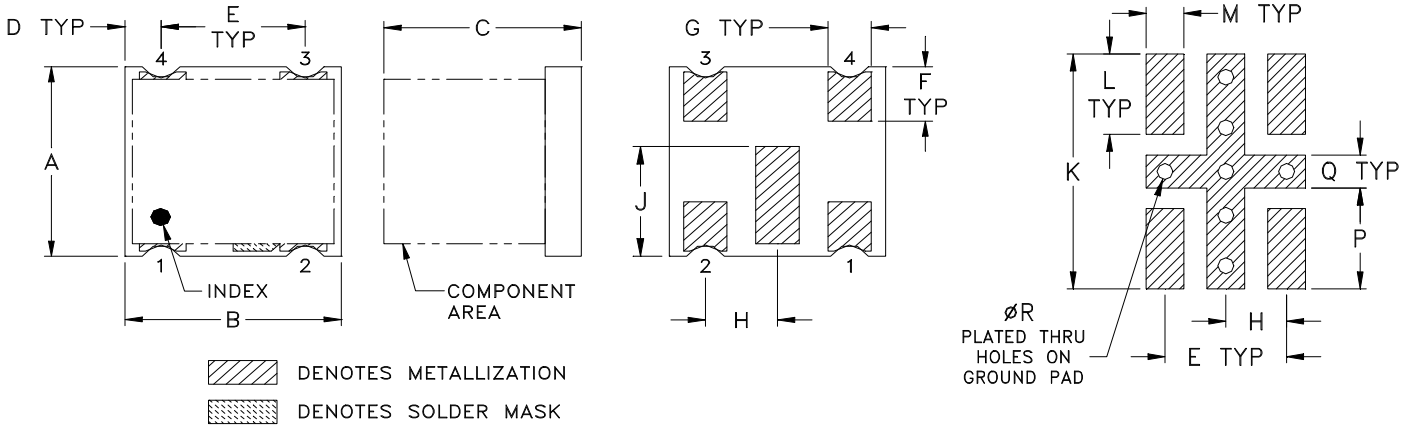


Case Style GU

Outline Dimensions

GU1414-2

PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	L
GU1414-2	.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)

CASE #	M	N	P	Q	R	WT.GRAMS
GU1414-2	.031 (.79)	- -	.083 (2.11)	.027 (.69)	.013 (.33)	.06

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

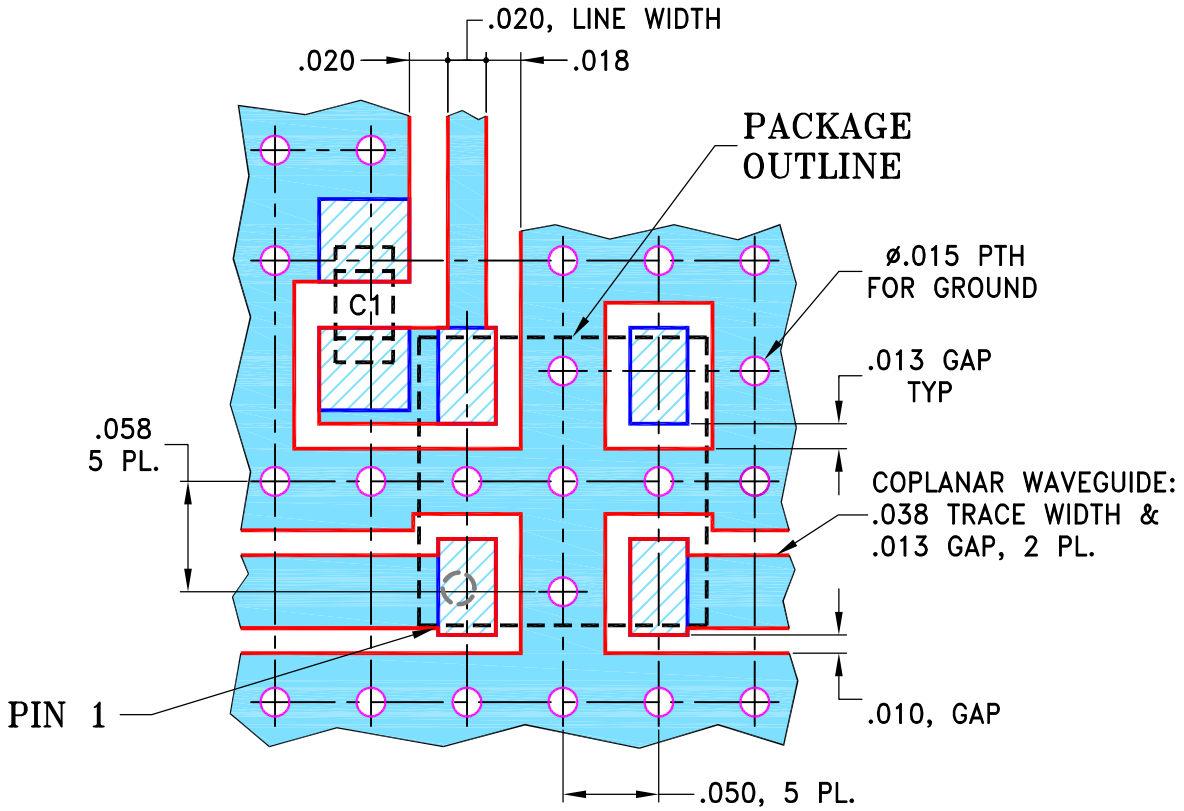
Notes:

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

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M167305	NEW RELEASE	04/18/18	ITG	IG

SUGGESTED MOUNTING CONFIGURATION FOR GU1414-2 CASE STYLE, "04BT03" PIN CONNECTION



CAPACITOR C1: .010 uF, 0603 SIZE

NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020±0.0015; 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	DRAWN	ITG	04/18/18
TOLERANCES ON:	CHECKED	GF	04/18/18
2 PL DECIMALS ±	APPROVED	IG	04/18/18
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

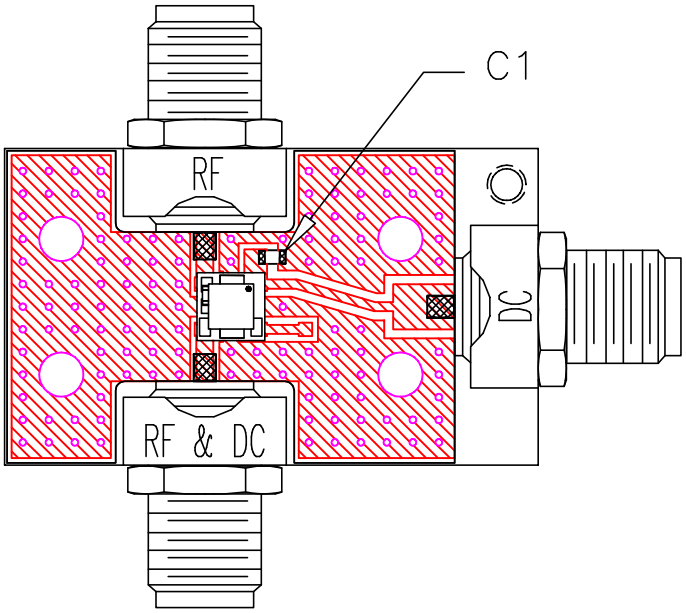
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 04BT03, GU1414-2, TCBT, TB-268

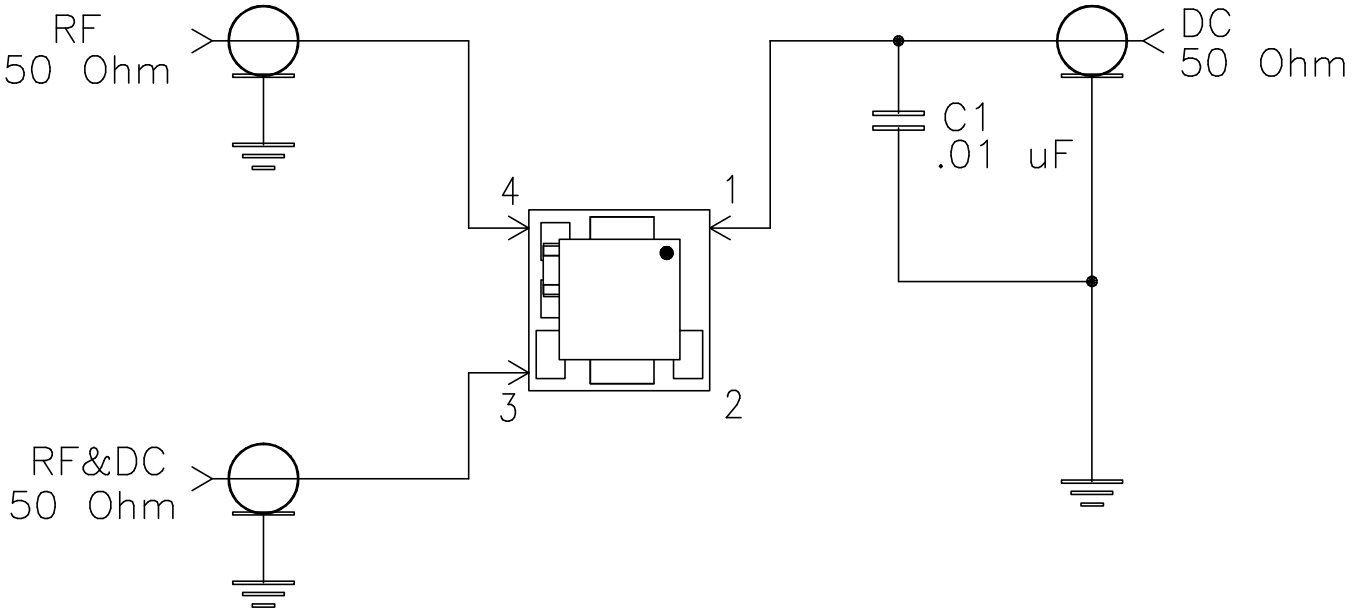
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-146A	OR

FILE:	SCALE:	SHEET:
98PL146A	10:1	1 OF 1

Evaluation Board and Circuit



TB-268



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 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