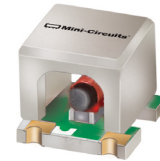


50Ω Wideband 10 MHz to 10 GHz



CASE STYLE: GU1414-2

## The Big Deal

- Extremely Wideband 10 GHz
- Miniature SMT (0.15" x 0.15")

## 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.

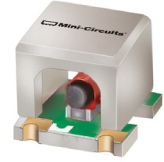
### Notes

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# 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

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

### Maximum Ratings

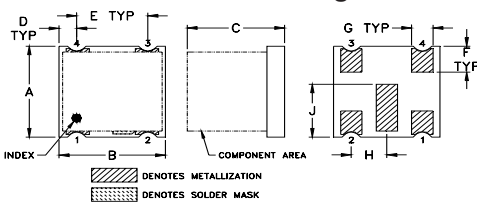
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	30dBm max.
Voltage at DC port	25V max.
Input Current	200mA

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

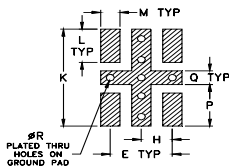
### Pad Terminations

RF	1
RF&DC	2
DC	4
NOT USED	3

### Outline Drawing



### PCB Land Pattern

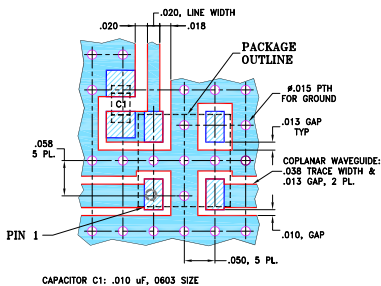


Suggested Layout,  
Tolerance to be within ±.002

### Outline Dimensions (inch)

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)



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.

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### 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

### Electrical Specifications at 25°C

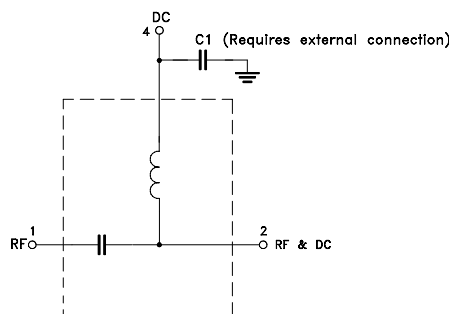
Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		10000	MHz
Insertion Loss	10 - 10000	0.05	0.6	1.6	dB
Isolation*	10 - 10000	15	33	—	dB
VSWR	10 - 10000	1.02	1.25	1.7	:1
DC Resistance, DC to RF and DC port	10 - 10000	—	1.0	—	ohms

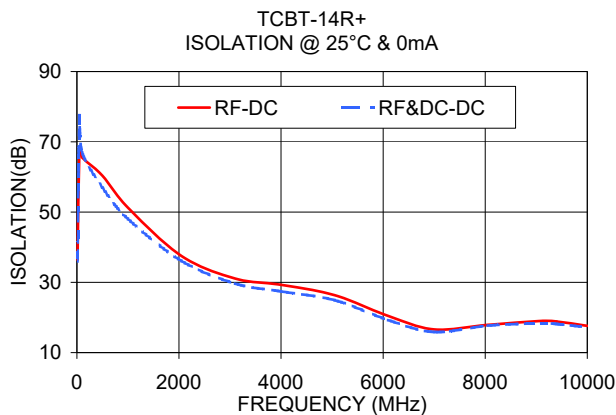
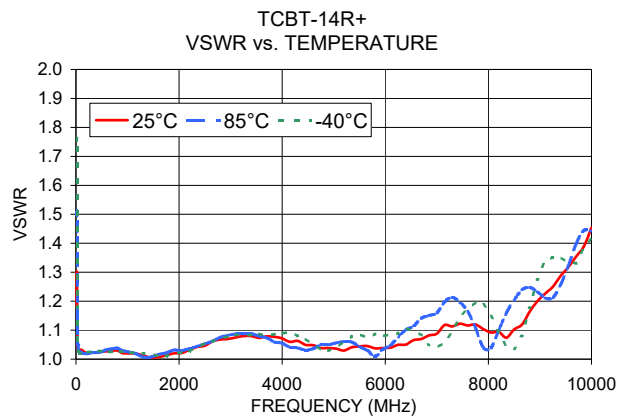
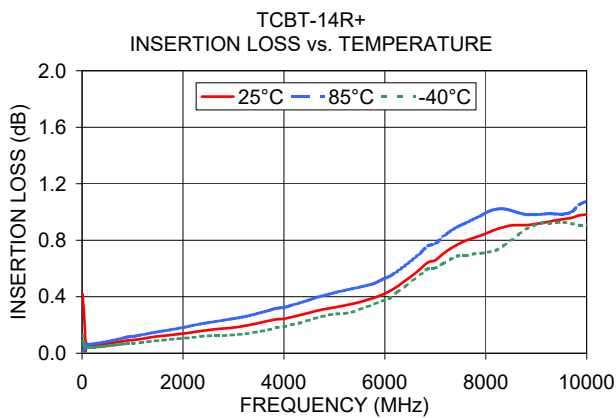
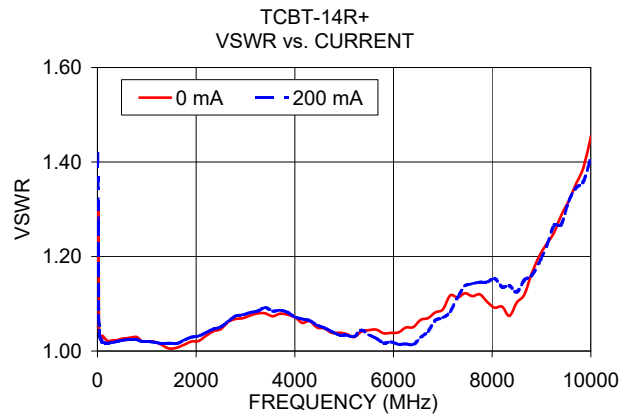
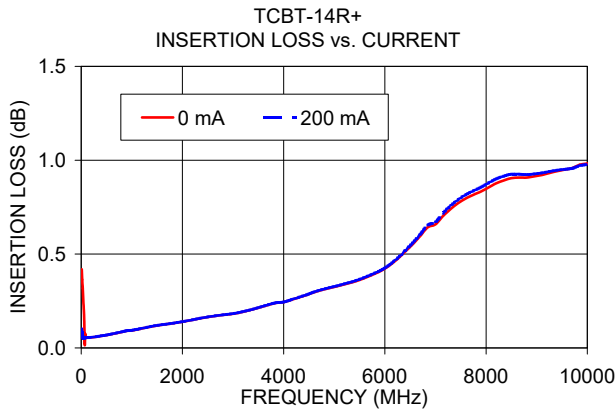
\* Isolation between DC to RF & DC 14 dB/min at 6-10 GHz

### 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





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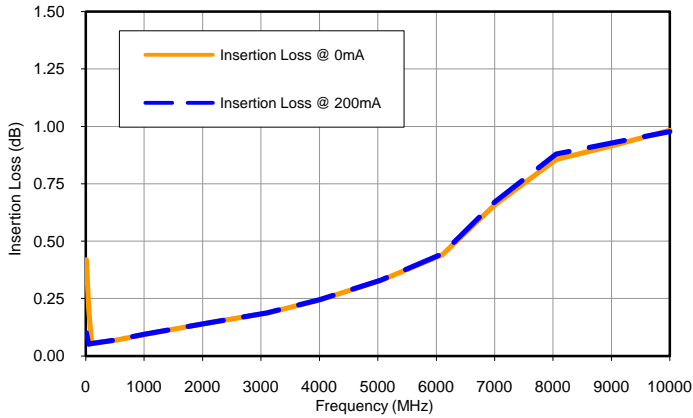


*Typical Performance Data*

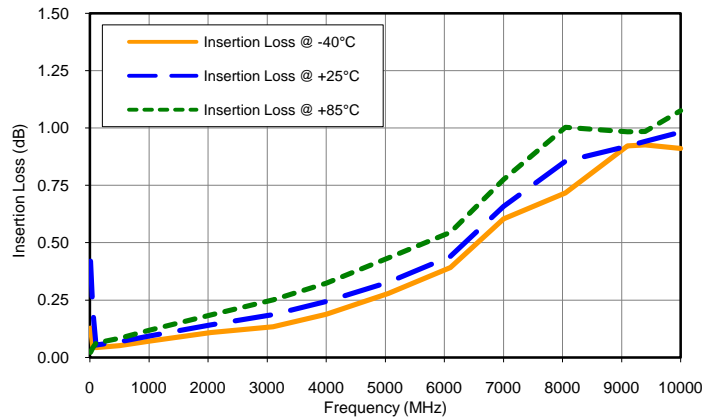
FREQUENCY (MHz)	INSERTION LOSS (RF port to RF&DC port) (dB)					VSWR (:1)					ISOLATION (RF port to DC port) (RF&DC port to DC port) (dB)	
	+25°C		0mA			+25°C		0mA			+25°C & 0mA	
	0mA	200mA	-40°C	+25°C	+85°C	0mA	200mA	-40°C	+25°C	+85°C	RF-DC	RF&DC-DC
10.0	0.42	0.10	0.13	0.42	0.02	1.19	1.18	1.75	1.19	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

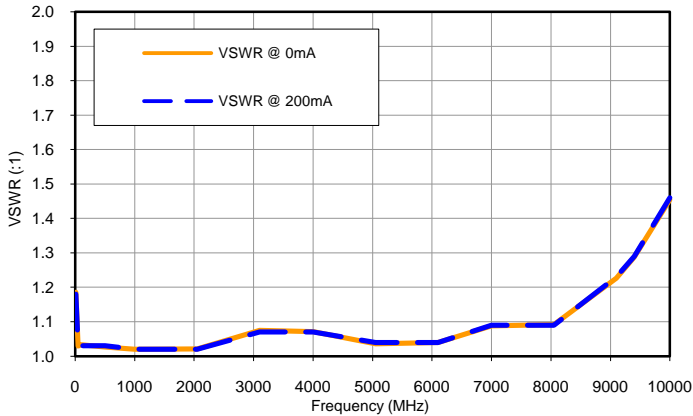
Insertion Loss @ +25°C



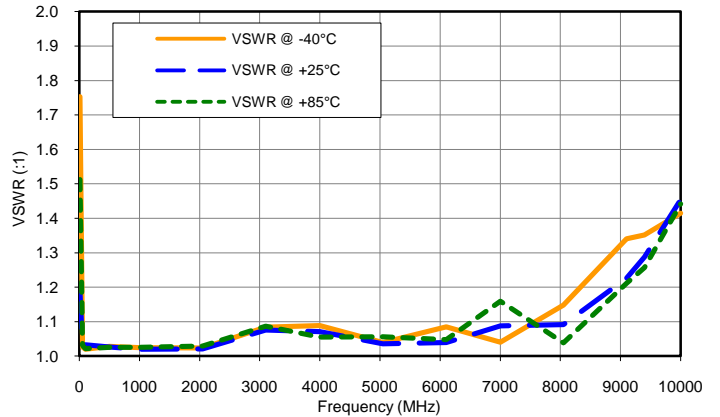
Insertion Loss @ 0mA



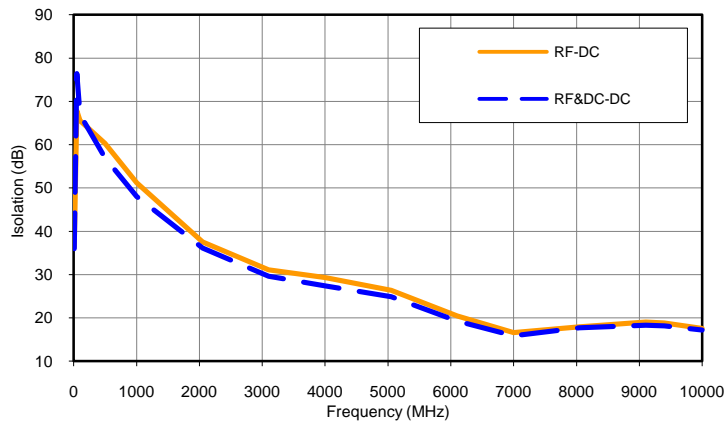
VSWR @ +25°C



VSWR @ 0mA

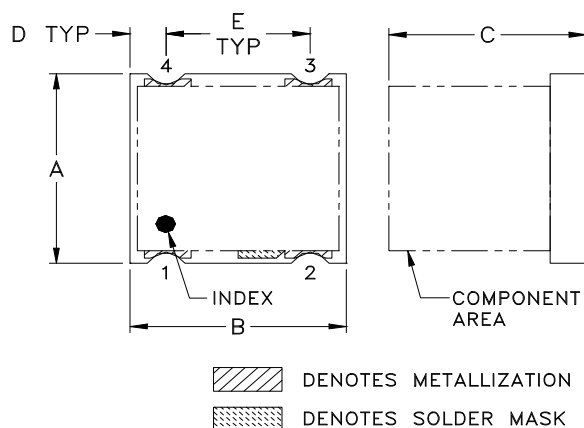


Isolation @ +25°C & 0mA

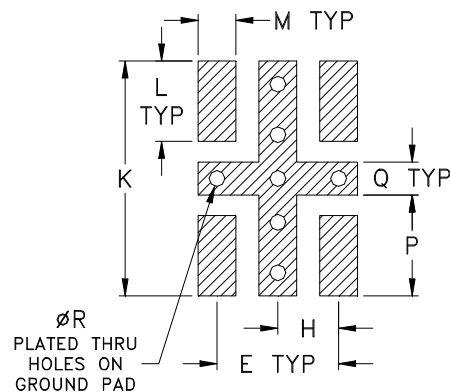


## Outline Dimensions

GU1414-2



## PCB Land Pattern



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

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)

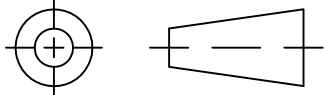
CASE #	M	N	P	Q	R	WT.GRAMS
GU1414-2	.031 (.79)	-	.083 (2.11)	.027 (.69)	.013 (.33)	.06

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

### Notes:

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

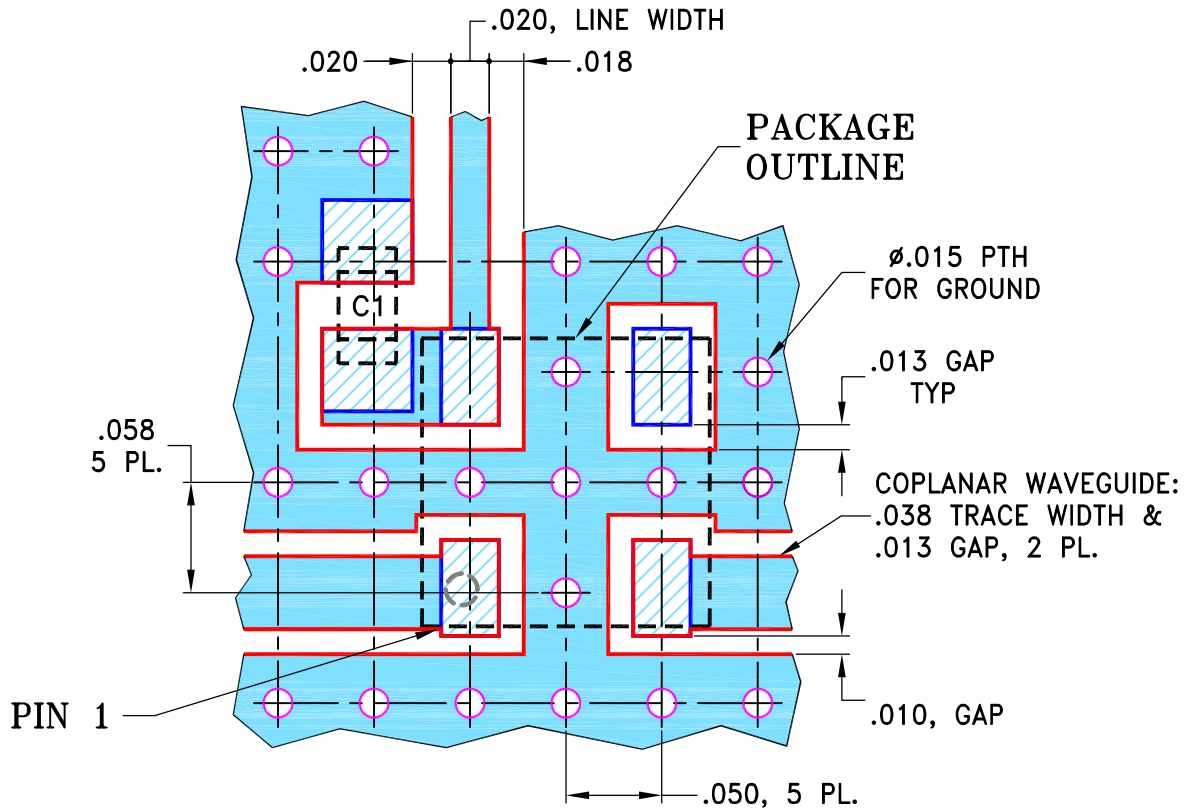
THIRD ANGLE PROJECTION



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  $\mu$ F, 0603 SIZE

NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS  $0.020 \pm 0.0015$ ; 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 $\pm$	APPROVED	IG	04/18/18
3 PL DECIMALS $\pm$ .005			
ANGLES $\pm$			
FRACTIONS $\pm$			

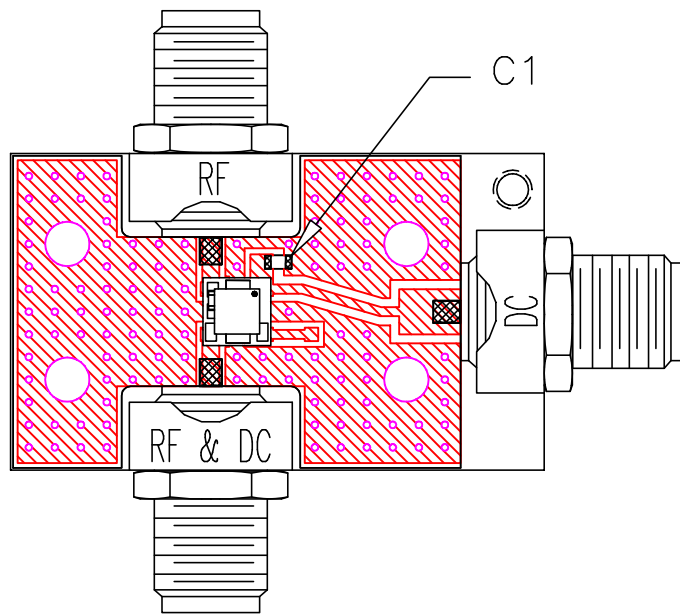
**Mini-Circuits<sup>®</sup>** 13 Neptune Avenue  
Brooklyn NY 11235

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

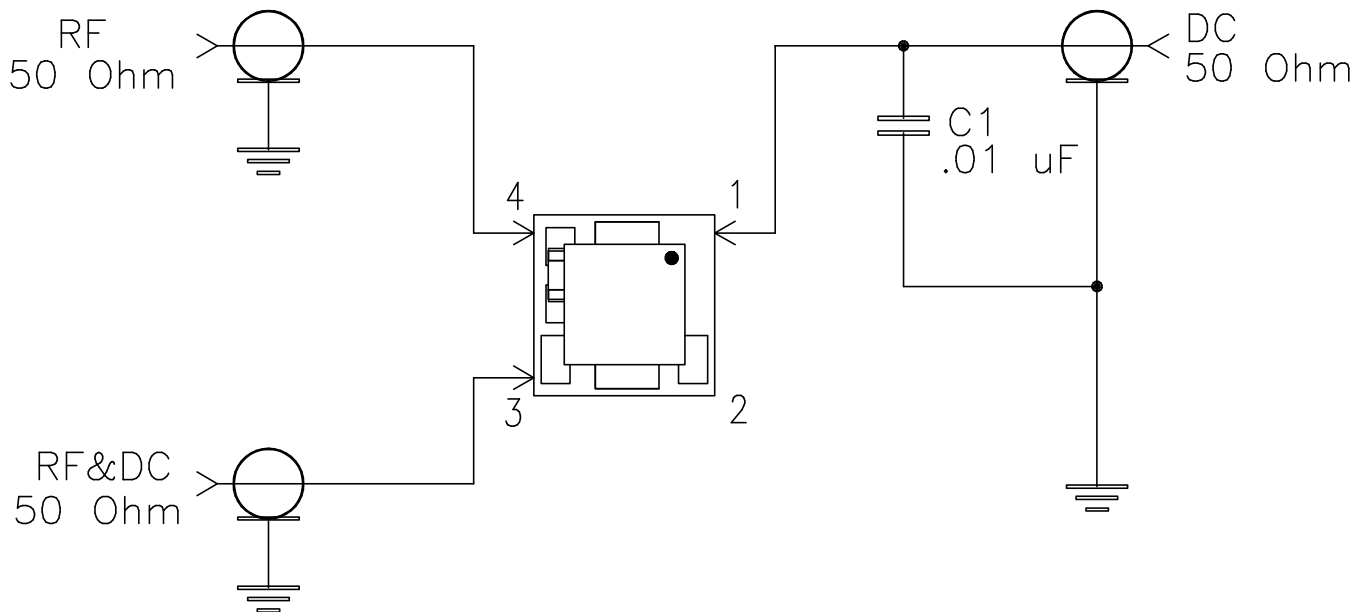
SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-146A	REV: OR
FILE: 98PL146A	SCALE: 10:1	SHEET: 1 OF 1	

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# Evaluation Board and Circuit




TB-268



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.

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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