top hat®

Surface Mount
Bias-Tee

TCBT-6G+

50Ω Wideband 50 to 6000 MHz

Generic photo used for illustration purposes only

CASE STYLE: GU1604

+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”	20, 50, 100, 200, 500, 1000
13”	2000

Features

- wideband, 50 to 6000 MHz
- low insertion loss, 0.7 dB typ.
- miniature surface mount 0.15"x0.15"
- protected by US Patent, 7,012,486
- aqueous washable

Applications

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

Electrical Specifications

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		50		6000	MHz
Insertion Loss	50-500	—	0.2	0.8	dB
	500-3000	—	0.7	1.8	
	3000-6000	—	1.1	2.5	
Isolation (RF port to DC port) (RF & DC port to DC port)	50-500	38	52	—	dB
	500-3000	18	28	—	
	3000-6000	14	19	—	
VSWR	50-500	—	1.05	1.5	:1
	500-3000	—	1.1	1.3	
	3000-6000	—	1.2	2.2	

External C1(0.01μF) is required. See functional schematic and PCB layout.

Maximum Ratings

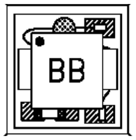
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	30 dBm max.
Voltage at DC port	25 V max.
DC Current	200mA

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

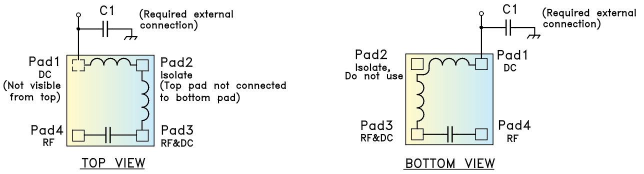
Pad Terminations

Function	Pad Number
RF	4
RF&DC	3
DC	1
ISOLATE (see PCB Layout)	2

Product Marking

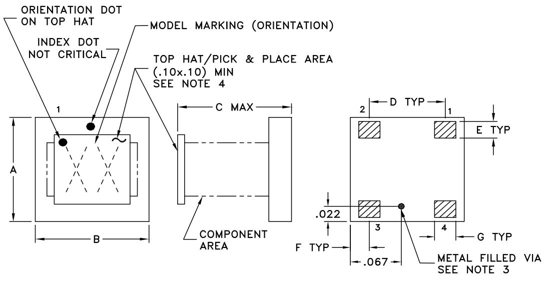


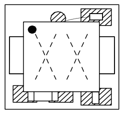
Functional Schematic



REV. H
ECO-022092
ED-11250/1
TCBT-6G+
MCL NY
240618

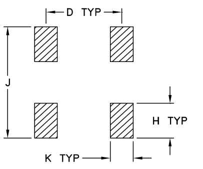
Outline Drawing





TOP VIEW OF "TCBT" SERIES MODELS

PCB Land Pattern

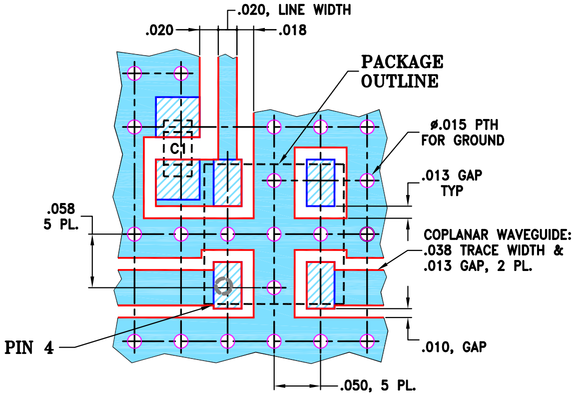


SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

Notes:

3. Must be isolated from external conductors on mounting surface . Suggested solder mask area is .025 x .025. At Mini-Circuits option via may be removed.
4. Top-Hat total thickness: .013 inches MAX.

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



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.

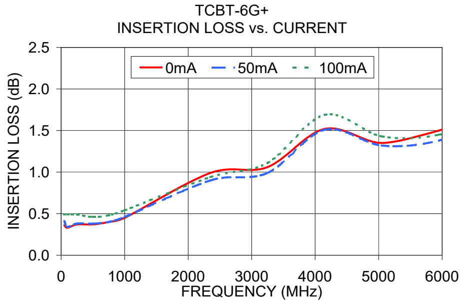
Outline Dimensions (inch / mm)

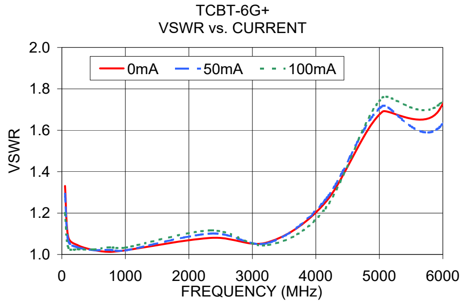
A	B	C	D	E	F
.150	.150	.150	.100	.030	.025
3.81	3.81	3.81	2.54	0.76	0.64

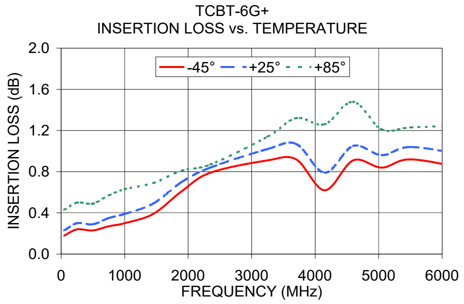
G	H	J	K	wt
.028	.050	.160	.030	grams
0.71	1.27	4.06	0.76	0.10

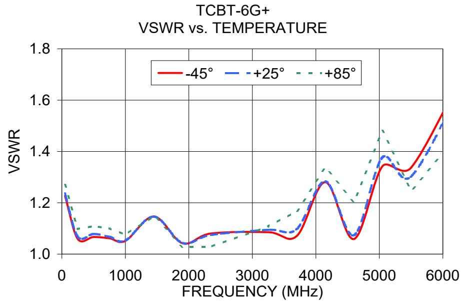
Typical Performance Data

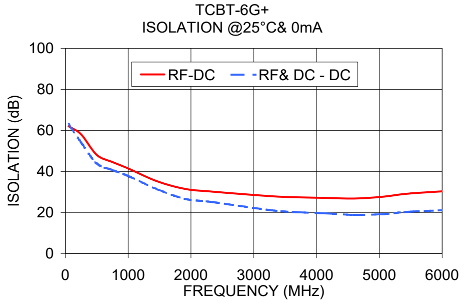
FREQUENCY (MHz)	INSERTION LOSS (dB) with temperature			VSWR (:1) with temperature			ISOLATION (dB) 0mA	
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	RF - DC	RF & DC -DC
50.00	0.18	0.23	0.43	1.23	1.24	1.27	62.01	63.14
250.00	0.24	0.30	0.50	1.06	1.07	1.10	58.05	54.10
500.00	0.23	0.29	0.49	1.07	1.08	1.11	48.04	43.88
750.00	0.27	0.35	0.57	1.06	1.07	1.10	44.58	40.67
1000.00	0.30	0.39	0.63	1.05	1.05	1.08	41.47	37.79
1450.00	0.39	0.49	0.69	1.15	1.15	1.15	35.33	31.47
1900.00	0.61	0.70	0.81	1.04	1.04	1.03	31.51	26.67
2350.00	0.79	0.84	0.87	1.08	1.07	1.03	30.13	25.03
3250.00	0.91	1.02	1.14	1.09	1.09	1.11	27.98	21.20
3700.00	0.92	1.07	1.32	1.07	1.10	1.17	27.37	20.10
4150.00	0.62	0.79	1.26	1.28	1.28	1.34	27.10	19.55
4600.00	0.91	1.05	1.48	1.06	1.07	1.20	26.78	18.79
5050.00	0.84	0.96	1.21	1.34	1.38	1.48	27.64	19.18
5500.00	0.92	1.04	1.23	1.34	1.30	1.25	29.30	20.39
6400.00	0.83	0.96	1.25	1.74	1.70	1.51	31.01	21.50











Additional 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

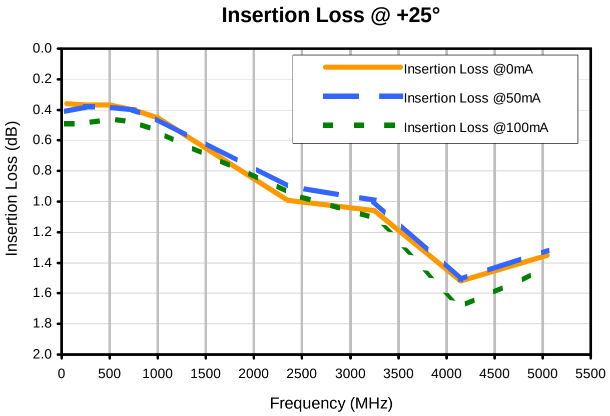
Bias Tee , Surface Mount TCBT-6G+

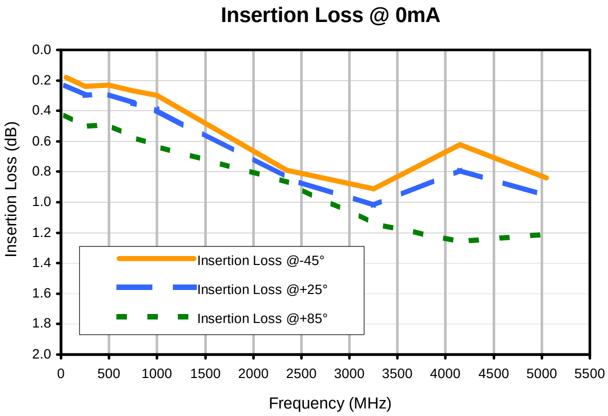
Typical Performance Data

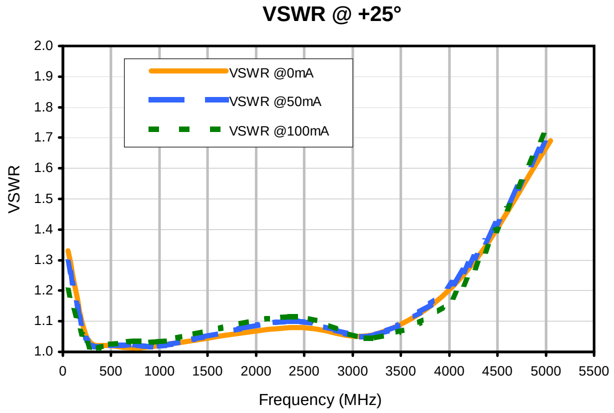
FREQ. (MHz)	INSERTION LOSS (RF Port to RF&DC Port) (dB)						VSWR (:1)					
	+25°			0mA			+25°			0mA		
	0mA	50mA	100mA	-45°	+25°	+85°	0mA	50mA	100mA	-45°	+25°	+85°
50	0.36	0.41	0.49	0.18	0.23	0.43	1.33	1.29	1.20	1.23	1.24	1.27
250	0.37	0.38	0.49	0.24	0.30	0.50	1.04	1.03	1.03	1.06	1.07	1.10
500	0.37	0.38	0.46	0.23	0.29	0.49	1.02	1.02	1.02	1.07	1.08	1.11
750	0.40	0.40	0.48	0.27	0.35	0.57	1.01	1.02	1.03	1.06	1.07	1.10
1000	0.45	0.46	0.54	0.30	0.39	0.63	1.02	1.02	1.03	1.05	1.05	1.08
2350	0.99	0.90	0.94	0.79	0.84	0.87	1.08	1.10	1.12	1.08	1.07	1.03
3250	1.06	0.99	1.11	0.91	1.02	1.14	1.06	1.06	1.05	1.09	1.09	1.11
4150	1.52	1.51	1.69	0.62	0.79	1.26	1.25	1.26	1.22	1.28	1.28	1.34
5050	1.35	1.32	1.43	0.84	0.96	1.21	1.69	1.72	1.76	1.34	1.38	1.48

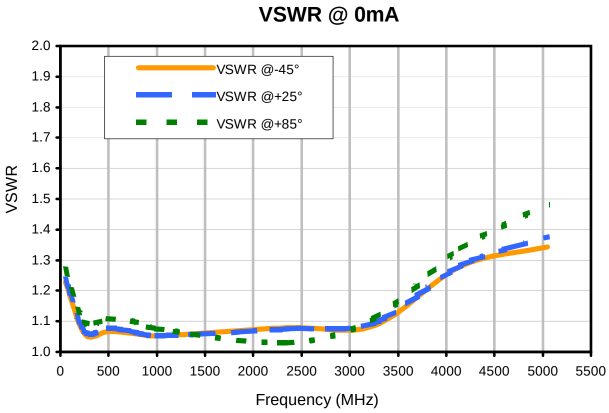
Bias Tee , Surface Mount **TCBT-6G+**

Typical Performance Curves





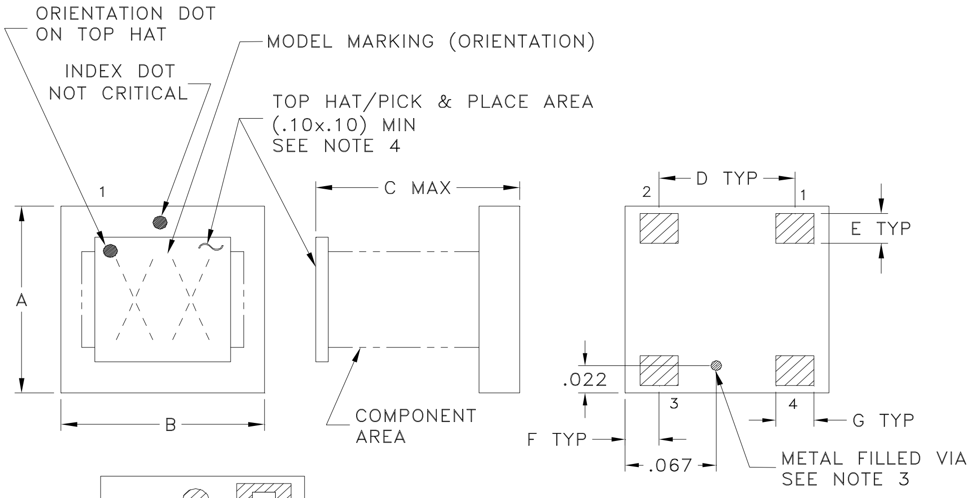




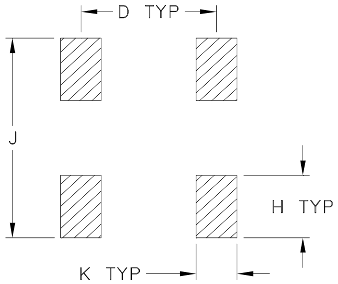
Case Style GU

Outline Dimensions

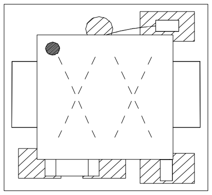
GU1604



PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002



TOP VIEW OF "TCBT" SERIES MODELS

CASE #	A	B	C	D	E	F	G	H	J	K	WT.GRAMS
GU1604	.150 (3.81)	.150 (3.81)	.150 (3.81)	.100 (2.54)	.030 (.76)	.025 (.64)	.028 (.71)	.050 (1.27)	.160 (4.06)	.030 (.76)	.10

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

Notes:

1. Open style, Ceramic Base.
2. Termination finish: Silver Palladium or Gold Over Nickel based on stock availability.
3. Must be isolated from external conductors on mounting surface. Suggested solder mask area is .025 x .025. At Mini-Circuits option via may be removed.
4. Top-Hat total thickness: .013 inches MAX.
5. Orientation Dot on Top Hat corresponds to Pin #1.

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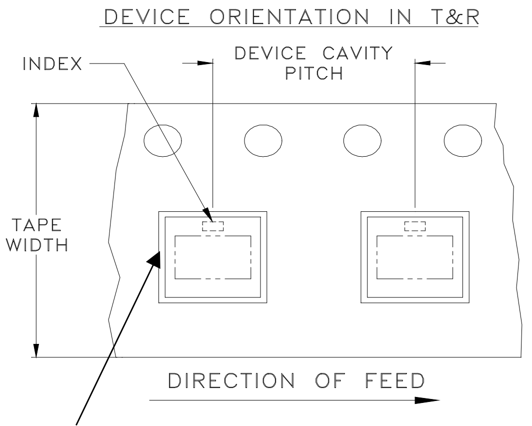
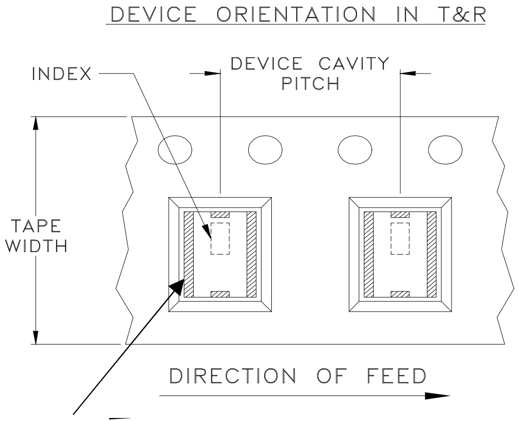
RF/IF MICROWAVE COMPONENTS
GU1604 Rev.:W (02 JUL 24) ECO-021945 File: GU1604.DOC
Sheet 1 of 1

Tape & Reel Packaging TR-F77



Note: The shape of the pocket may differ



Note: The location and shape of the metallization may differ

Applicable Case Styles
GU1604, GU1804, GU2644, TT1618-2

Applicable Case Styles
MZ4532C, NM1812C, NM1812C-1, NM1812C-2, NM1812C-3, NM1812C-5, NM1812C-6, NM3237

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
				1000
		13	Standard	2000

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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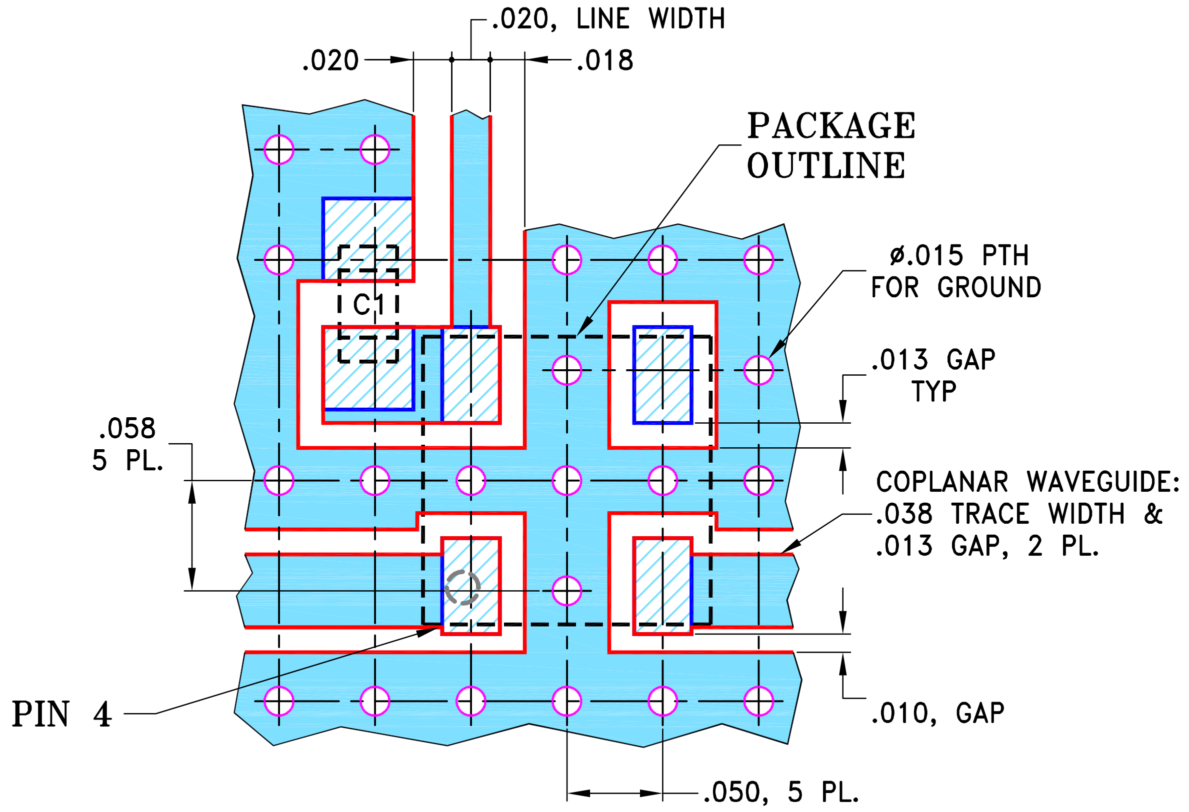
THIRD ANGLE PROJECTION

REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
B	M102713	ADDED "...WITH SMOBC"	01/12/06	GF	IL
C	M103775	.010 uF WAS .010 mF	03/01/06	MMG	DJ
D	M154947	CHANGED PIN1 & PIN CONNECTION	02/03/16	ITG	DJ
E	M167305	CHANGED CASE STYLE & PIN CONNECT.	04/18/18	ITG	IG

SUGGESTED MOUNTING CONFIGURATION FOR GU1604 CASE STYLE, "04BT01" 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	AV	10/13/03
TOLERANCES ON:	CHECKED	IL	10/23/03
2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	APPROVED	DJ	10/23/03

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

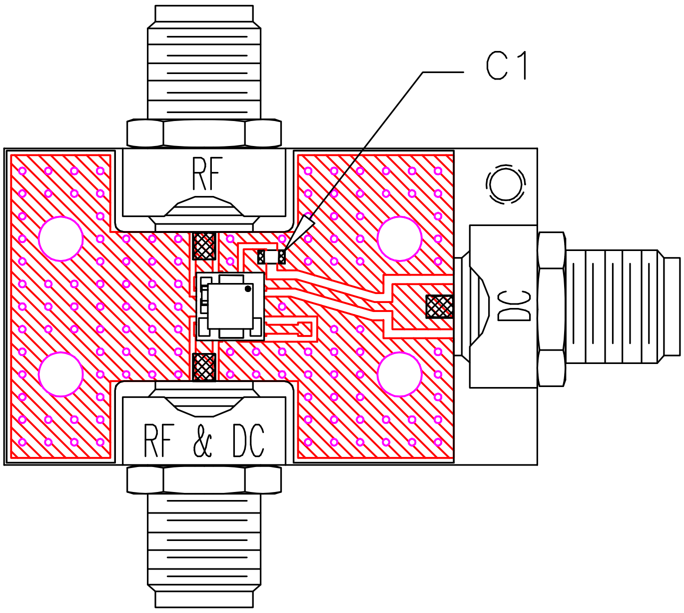
Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

PL, 04BT01, GU1604, TCBT, TB-268

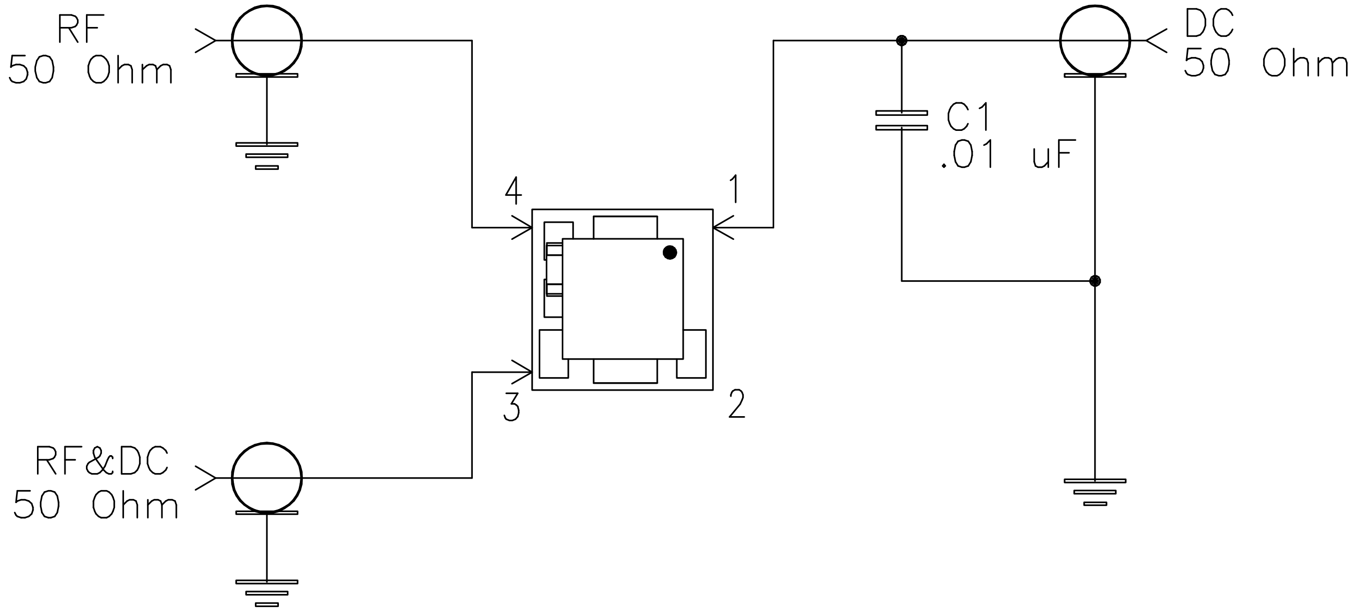
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-146	E

FILE: 98PL146
SCALE: 10:1
SHEET: 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®

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