Balanced top hat®

RF Transformer

TRS2-1T-75+

75Ω 5 to 1200 MHz

The Big Deal

- Low insertion loss, 1.0 dB typ.
- Good return loss, 20 dB typ.
- Low amplitude unbalance, 0.3 dB
- Power handling up to 0.25W

CASE STYLE: TT1618

Product Overview

The TRS2-1T-75+ is a 75Ω surface mount balanced-to-balanced transformer with a 2:1 secondary/primary impedance ratio covering the 5 to 1200 MHz band, meeting bandwidth requirements for DOCSIS® 3.1 compliant systems and equipment, among other applications. This model handles RF input power up to 0.25W and provides low insertion loss, good return loss and low amplitude unbalance. Measuring only 0.28 x 0.25 x 0.12”, the unit features core and wire, all-welded construction with gold over nickel plate wraparound terminations suitable for tin/lead and RoHS solder systems. The unit also includes Mini-Circuits’ Top Hat™ feature for faster more accurate pick-and-place assembly.

Key Features

Feature	Advantages
Wideband, 5 to 1200 MHz	TRS2-1T-75+ supports a variety of applications including CATV and DOCSIS 3.1 systems and equipment.
Low insertion loss, 1.0 dB	Enables excellent signal power transmission from input to output.
Good return loss, 20 dB typ.	Excellent matching for 75Ω systems with minimal signal reflection.
Low amplitude unbalance, 0.3 dB	Low unbalance can improve a system’s electromagnetic compatibility by rejecting unwanted common-mode noise.
Small footprint, 0.28 x 0.25”	Accommodates tight space requirements for dense PCB layouts.
Top Hat® feature	Improves speed and accuracy of pick and place assembly and provides clear device marking for visual inspection

top hat®

Balanced RF Transformer

TRS2-1T-75+

75Ω 5 to 1200 MHz

Generic photo used for illustration purposes only

CASE STYLE: TT1618

+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
13”	500

Features

- suitable for tin/lead and RoHS solder systems
- wideband, 5 to 1200 MHz
- balanced transmission line
- good return loss, 20 dB typ. at 1 dB band
- excellent amplitude unbalance, 0.3 dB typ.
- aqueous washable

Applications

- balanced to unbalanced transformation
- push-pull amplifiers
- PCS/DCS
- cable TV
- cellular

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Impedance Ratio (secondary/primary)			2		
Frequency Range		5		1200	MHz
Insertion Loss*	5 - 600	—	0.6	1.0	dB
	600 - 1000	—	1.0	1.8	
	1000 - 1200	—	1.3	2.2	
Amplitude Unbalance	5 - 600	—	0.3	1.0	dB
	600 - 1000	—	0.6	1.7	
	1000 -1200	—	0.8	1.9	
Phase Unbalance	5 - 50	—	0.8	3	Degree
	50 - 1200	—	5	9	
Primary Return Loss (Input)	5 - 50	17	22	—	dB
	50 -1000	13	22	—	
	1000 - 1200	9	17	—	

* Insertion Loss is referenced to mid-band loss, 0.6 dB typ.

Maximum Ratings

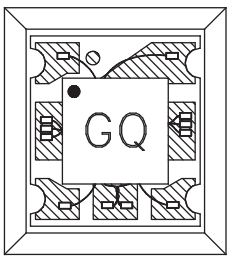
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.25W
DC Current	30mA

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

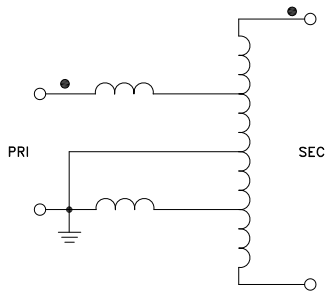
Pin Connections

Function	Pin Number
PRIMARY DOT	1
PRIMARY (GROUND)	4
SECONDARY DOT	3
SECONDARY	2

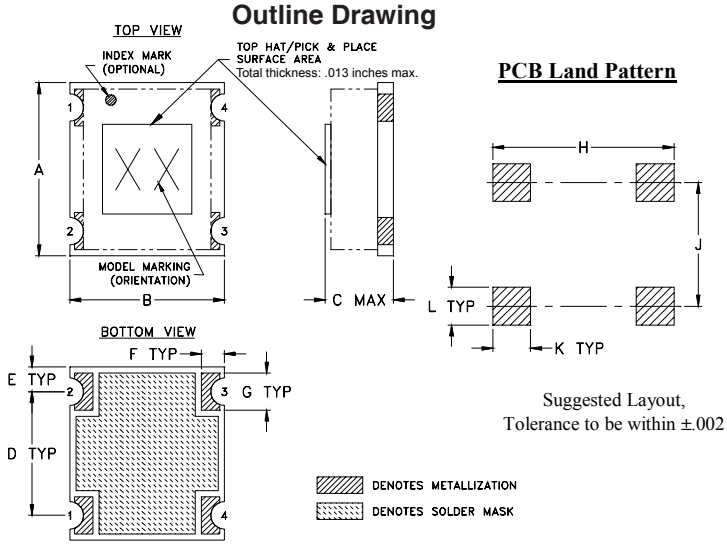
Product Marking



Config. P1



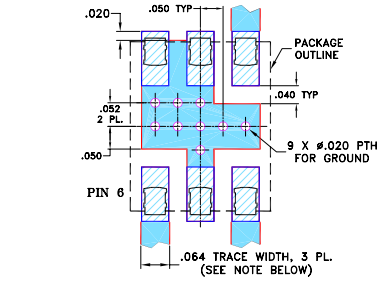
Outline Drawing



PCB Land Pattern

Suggested Layout,
Tolerance to be within ±.002

Demo Board MCL P/N: TB-619+
Suggested PCB Layout (PL-237)



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH 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

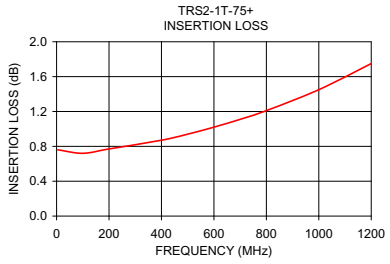
Outline Dimensions (inch / mm)

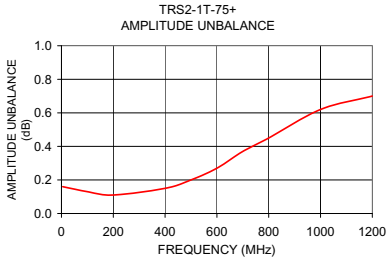
A	B	C	D	E	F
.280	.250	.12	.200	.040	.037
7.11	6.35	3.05	5.08	1.02	0.94

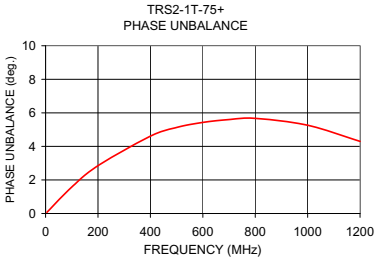
G	H	J	K	L	wt.
.060	.293	.200	.061	.061	grams
1.52	7.44	5.08	1.55	1.55	2.8

Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
5.00	0.76	20.46	0.16	0.07
100.00	0.72	23.43	0.13	1.58
200.00	0.77	24.55	0.11	2.85
400.00	0.87	27.39	0.15	4.61
500.00	0.94	29.37	0.20	5.13
600.00	1.02	30.97	0.27	5.43
700.00	1.11	29.50	0.37	5.60
800.00	1.21	26.22	0.45	5.67
1000.00	1.45	20.59	0.62	5.26
1200.00	1.75	16.81	0.70	4.30







RF Transformer TRS2-1T-75+

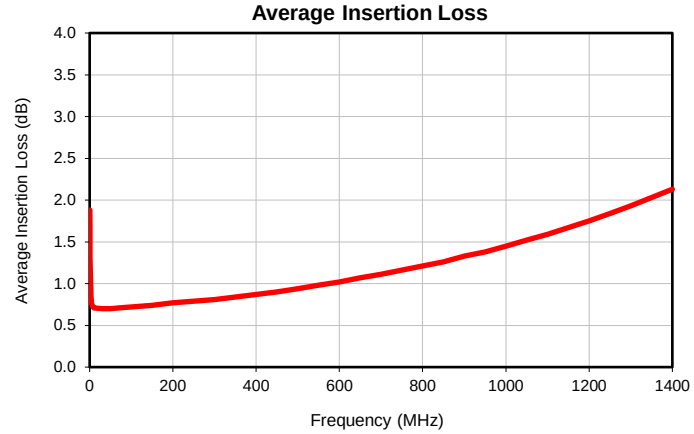
Typical Performance Data

FREQUENCY MHz	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
0.5	1.88	10.45	0.15	0.27
0.6	1.70	11.35	0.16	0.21
0.7	1.56	12.12	0.17	0.21
0.8	1.46	12.77	0.16	0.14
1.0	1.31	13.83	0.16	0.09
3.0	0.86	18.67	0.16	0.01
5.0	0.76	20.46	0.16	0.07
7.0	0.73	21.33	0.16	0.13
10	0.71	21.96	0.16	0.18
30	0.70	22.69	0.15	0.53
50	0.70	22.99	0.15	0.86
70	0.71	23.20	0.14	1.17
100	0.72	23.43	0.13	1.58
150	0.74	24.05	0.13	2.23
200	0.77	24.55	0.11	2.85
250	0.79	25.15	0.11	3.39
300	0.81	25.54	0.12	3.84
350	0.84	26.47	0.13	4.24
400	0.87	27.39	0.15	4.61
450	0.90	28.27	0.17	4.88
500	0.94	29.37	0.20	5.13
550	0.98	30.09	0.23	5.28
600	1.02	30.97	0.27	5.43
650	1.07	30.16	0.32	5.52
700	1.11	29.50	0.37	5.60
750	1.16	27.89	0.41	5.72
800	1.21	26.22	0.45	5.67
850	1.26	24.85	0.50	5.66
900	1.33	23.16	0.53	5.56
950	1.38	22.01	0.58	5.42
1000	1.45	20.59	0.62	5.26
1050	1.52	19.63	0.65	5.12
1100	1.59	18.54	0.68	4.86
1150	1.67	17.62	0.69	4.60
1200	1.75	16.81	0.70	4.30
1250	1.84	15.96	0.69	3.87
1300	1.93	15.37	0.68	3.36
1400	2.13	14.08	0.60	2.19

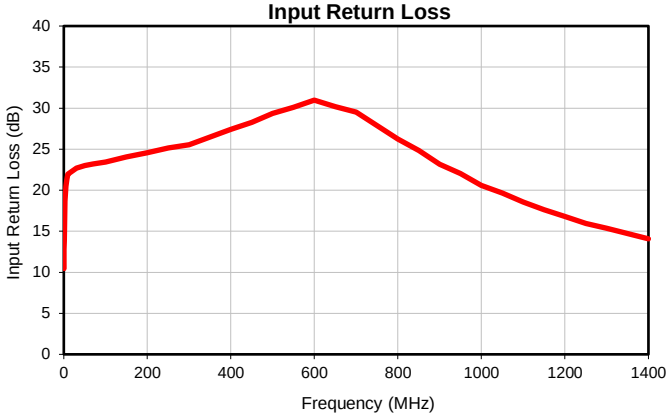
RF Transformer TRS2-1T-75+

Typical Performance Data

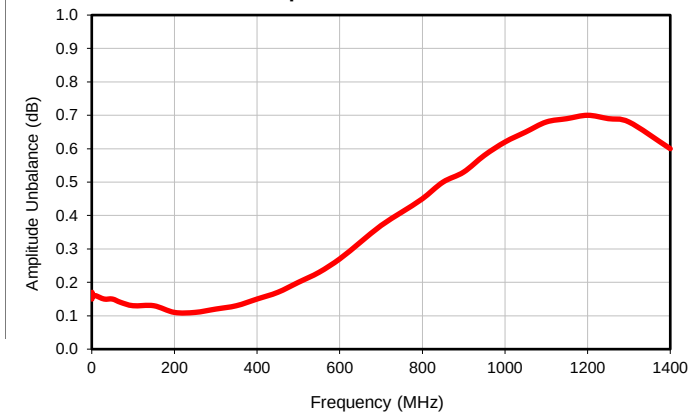
Average Insertion Loss



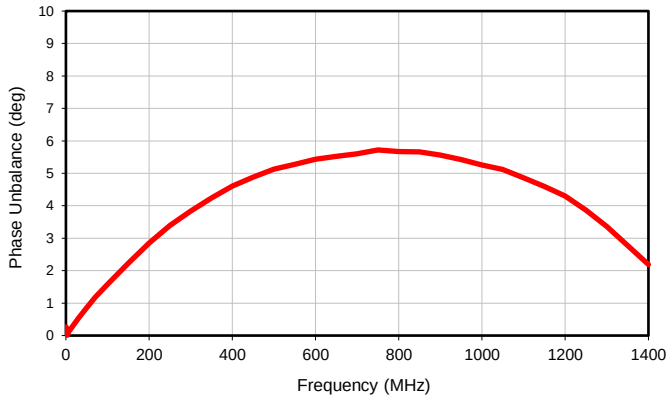
Input Return Loss



Amplitude Unbalance



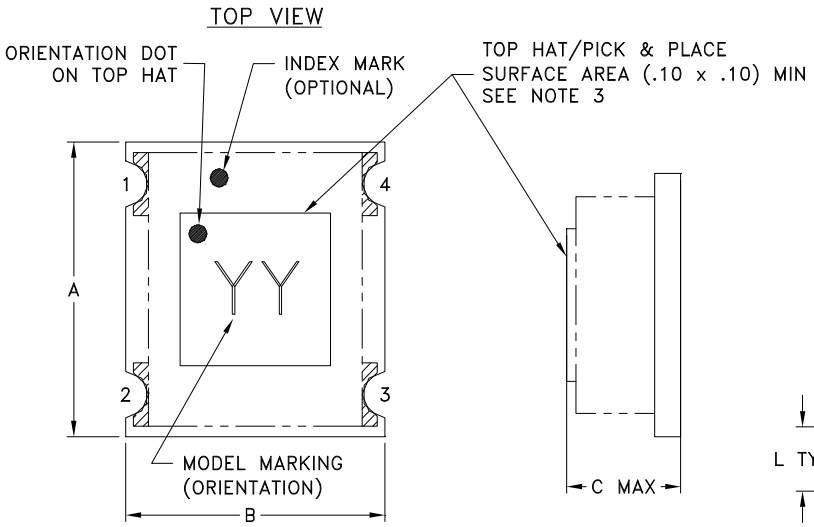
Phase Unbalance

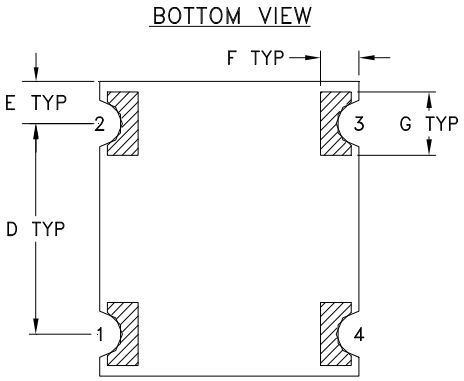


Case Style TT

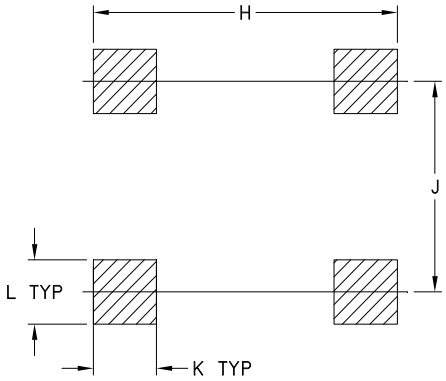
Outline Dimensions

TT1618

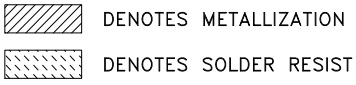




PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002



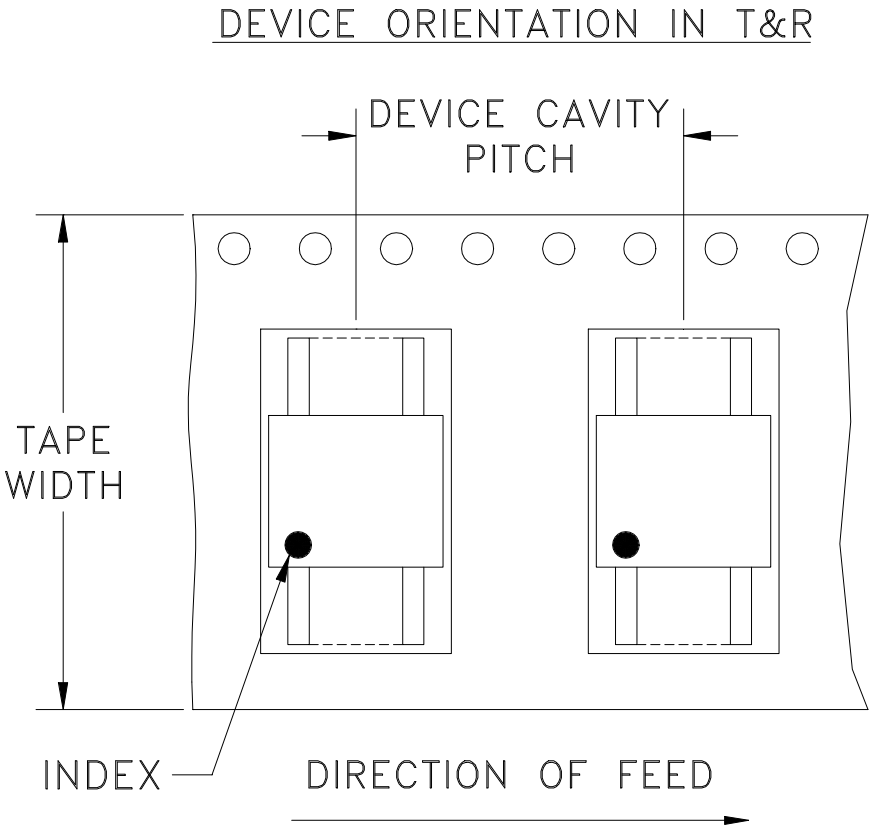
CASE #	A	B	C	D	E	F	G	H	J	K	L	WT GRAMS
TT1618	.280 (7.11)	.250 (6.35)	.12 (3.05)	.200 (5.08)	.040 (1.02)	.037 (.94)	.060 (1.52)	.293 (7.44)	.200 (5.08)	.061 (1.55)	.061 (1.55)	2.80

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

Notes:

1. Open style, Base material: Printed wiring laminate.
2. Termination finish: 3-5 µ inch (.08-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.
3. Top-Hat total thickness: .013 inches MAX.
4. Orientation Dot on Top Hat & PCB corresponds to Pin #1.

Tape & Reel Packaging TR-F1



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
24	12	13	900

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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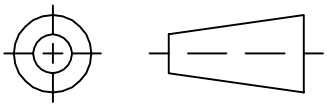
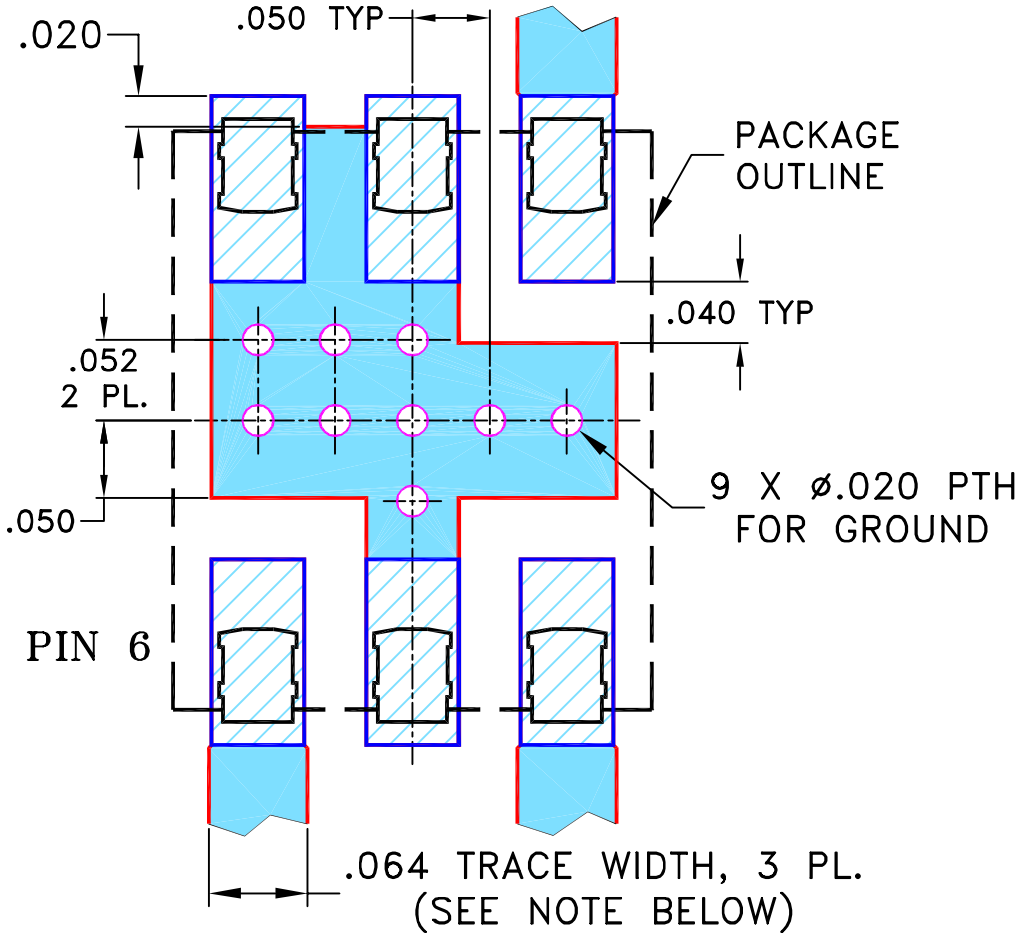
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M102713	NEW RELEASE	01/18/06	MMG	IL

SUGGESTED MOUNTING CONFIGURATION FOR QQQ569 CASE STYLE, "gn" PIN CONNECTION.



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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	MMG	01/16/06
TOLERANCES ON:	CHECKED	AV	01/16/06
2 PL DECIMALS ±	APPROVED	IL	01/18/06
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

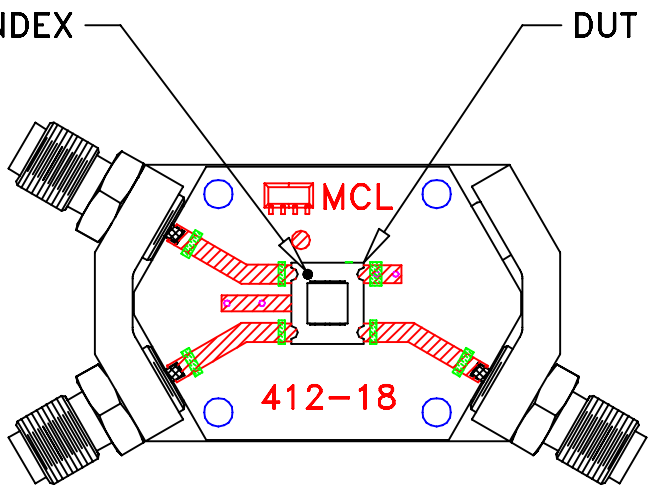
PL, gn, QQQ569, LRPS-J, TB-100

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-237	OR

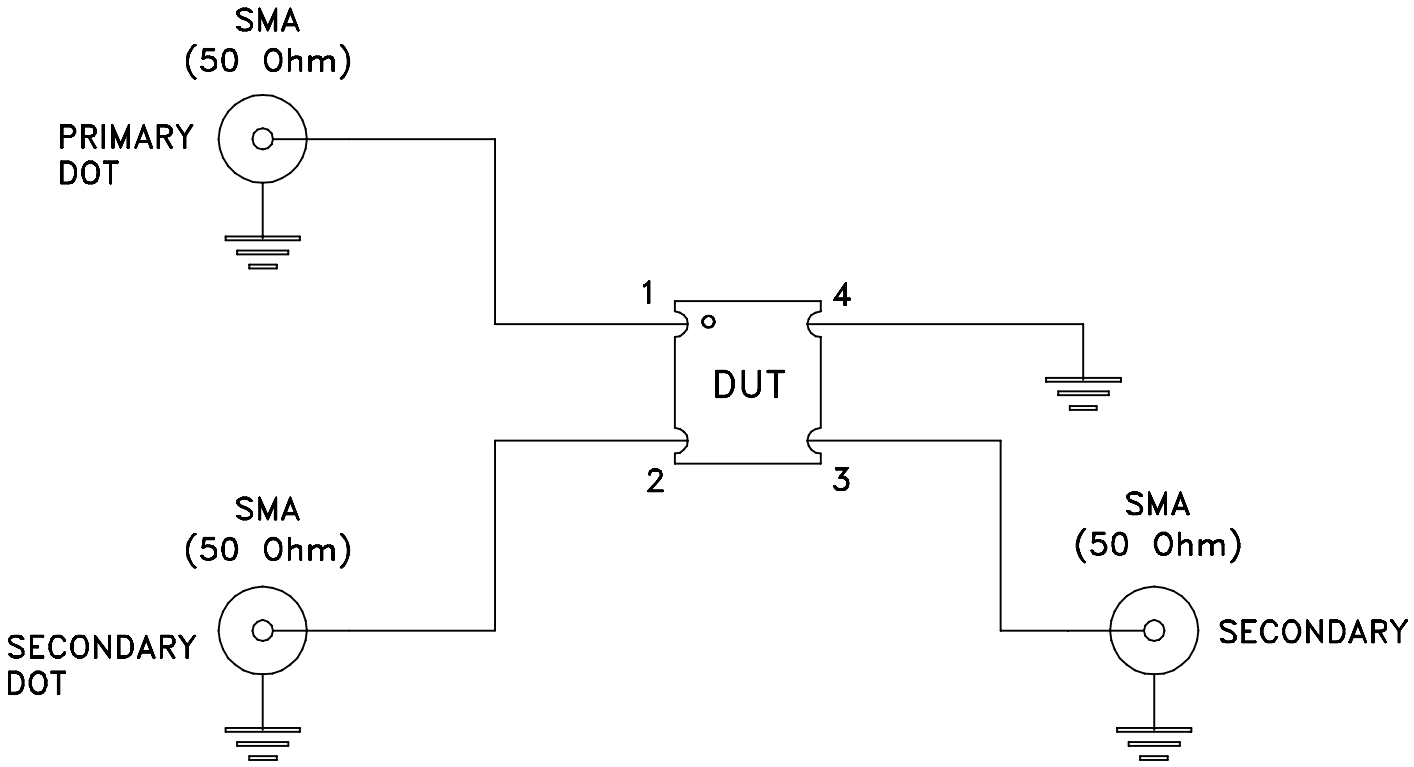
FILE:	SCALE:	SHEET:
98PL237	8:1	1 OF 1

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-619+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.030 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