



Mini-Circuits

SURFACE MOUNT

RF Transformer

TRS278-182-75+

75Ω 1:2.78 Ratio 45 to 1800 MHz

KEY FEATURES

- Wideband, 45 to 1800 MHz
- Balanced transmission line with secondary center tap
- Suitable for RoHS solder systems

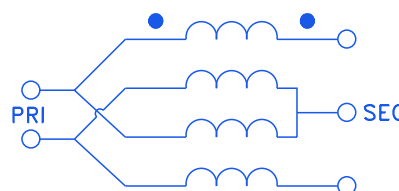


Generic photo used for illustration purposes only

APPLICATIONS

- CATV
- DOCSIS® 3.1
- DOCSIS® 4.0
- FDX

CONFIGURATION H



PRODUCT OVERVIEW

TRS278-182-75+ is a 75Ω surface-mount balanced to balanced transformer covering the 45 to 1800 MHz band, supporting bandwidth requirements for DOCSIS® 3.1/4.0 compliant systems and equipment. The transformer provides a 2.78:1 secondary/primary impedance ratio with 0.7 dB insertion loss, 0.4 dB amplitude unbalance, and $\pm 2^\circ$ phase unbalance typ. Featuring core and wire construction on a 5-pad printed laminate base with SN/AG/CU solder termination finish, the unit measures 0.146" x 0.235" x 0.145", accommodating dense circuit board layouts.

ELECTRICAL SPECIFICATIONS¹ AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio (secondary/primary)			2.78		
Frequency Range		45		1800	MHz
Insertion Loss	45 - 1800		0.7	1.3	dB
Amplitude Unbalance	45 - 1800		0.4	2.1	dB
Phase Unbalance	45 - 1800		2	10	Degree
Return Loss (Input)	45 - 1800	9	18		dB

1. Measured in Balanced-to-Balanced Setup.

ABSOLUTE MAXIMUM RATINGS²

Operating Temperature	-40°C to +65°C
Storage Temperature	-55°C to +100°C
Input Power	0.25 W
DC Current	30 mA

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

REV. OR
ECO-024695
TRS278-182-75+
MCL NY
250312





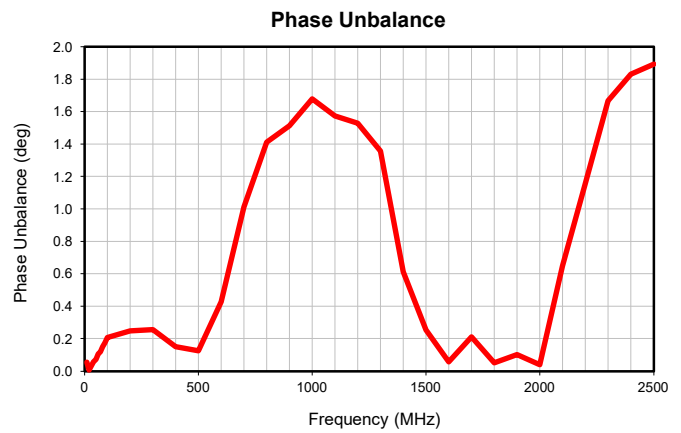
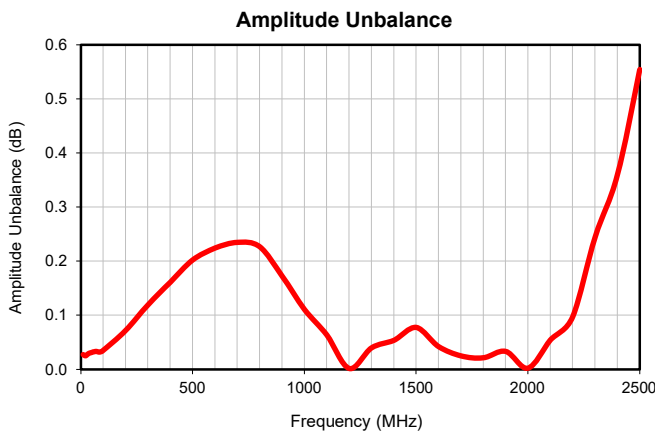
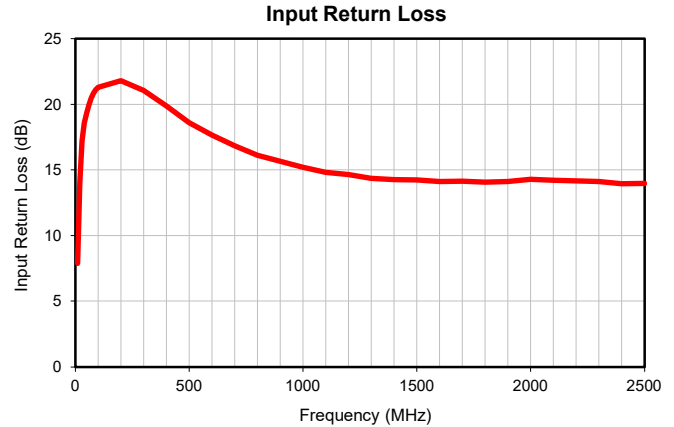
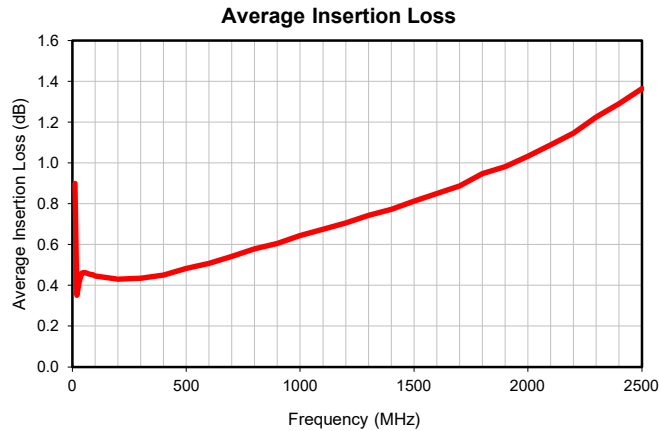
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75Ω 1:2.78 Ratio 45 to 1800 MHz

TYPICAL PERFORMANCE GRAPHS





CONFIGURATION H

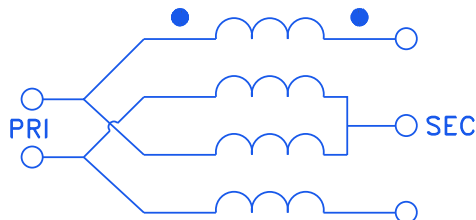
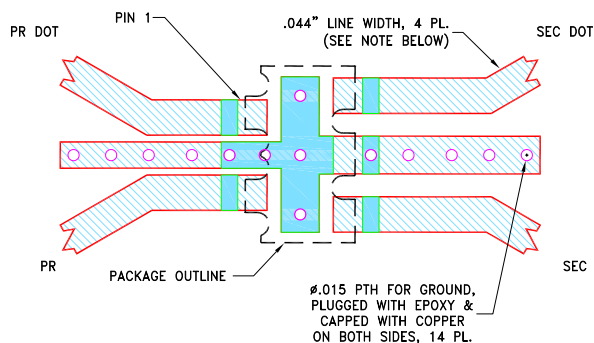


Figure 1. TRS278-182-75+ Configuration

PAD DESCRIPTION

Function	Pad Number
PRIMARY DOT	1
PRIMARY	2
SECONDARY DOT	5
SECONDARY	3
SECONDARY CT	4

SUGGESTED PCB LAYOUT (PL-809)



NOTES:

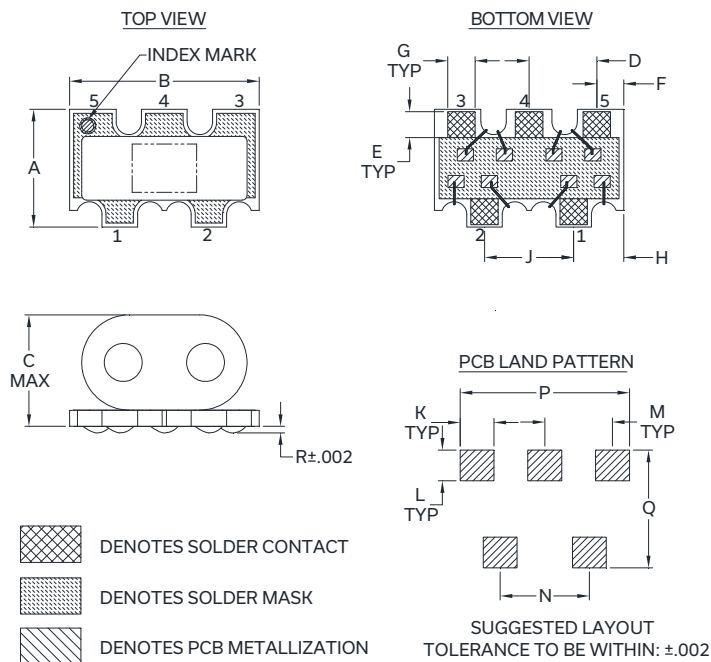
1. LINE WIDTH IS SHOWN FOR ROGERS RO4350B, DIELECTRIC THICKNESS: $.020 \pm .0015$;
COPPER: 1/2 Oz EACH SIDE. FOR OTHER MATERIALS LINE WIDTH MAY NEED TO BE MODIFIED.

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.

Figure 2. Suggested PCB Layout PL-809

CASE STYLE DRAWING



OUTLINE DIMENSIONS (Inch/mm)

A	B	C	D	E	F	G	H	J
.146	.235	.145	.084	.032	.034	.034	.062	.111
3.71	5.97	3.68	2.13	0.81	0.86	0.86	1.57	2.82
K	L	M	N	P	Q	R		wt
.042	.038	.084	.111	.210	.146	.009		grams
1.07	0.97	2.13	2.82	5.33	3.71	0.23		0.15

Tolerances: 3 Pl. $\pm .004$

PRODUCT MARKING*: N/A

*Marking may contain other features or characters for internal lot control.



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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD.

[CLICK HERE](#)

Performance Data & Graphs	Data Graphs S-Parameter (S4P Files) Data Set (.zip file) De-embedded to device pads
Case Style	AT3278 Lead Finish: SN/AG/CU Solder
RoHS Status	Compliant
Tape and Reel	F76
Suggested Layout for PCB Design	PL-809
Evaluation Board	TB-TRS27818275+ Gerber File
Environmental Rating	ENV02T1

NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
- 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/terms/viewterm.html



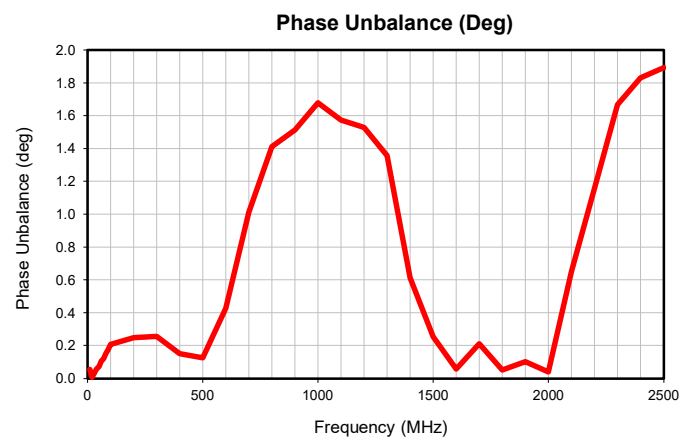
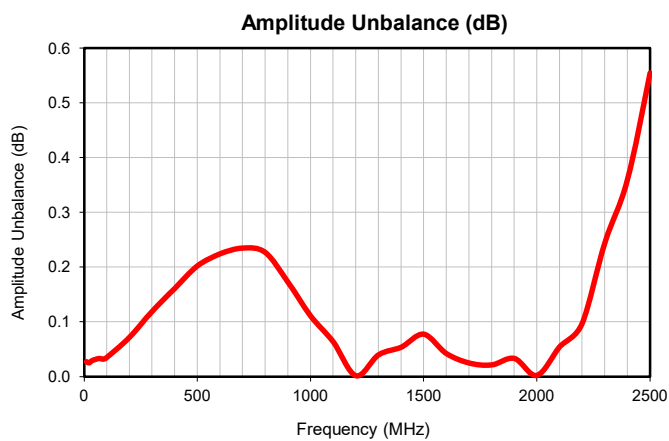
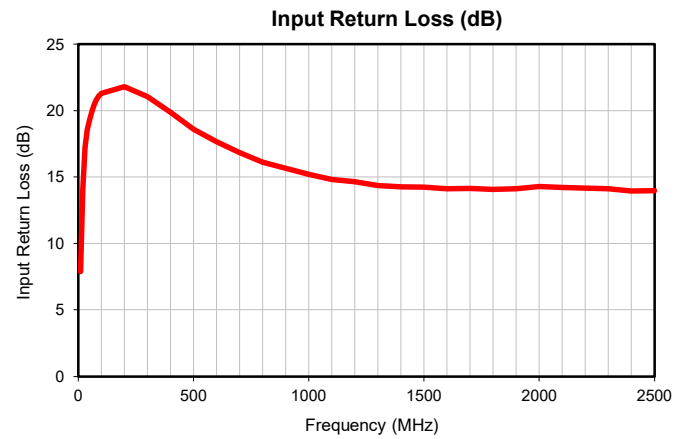
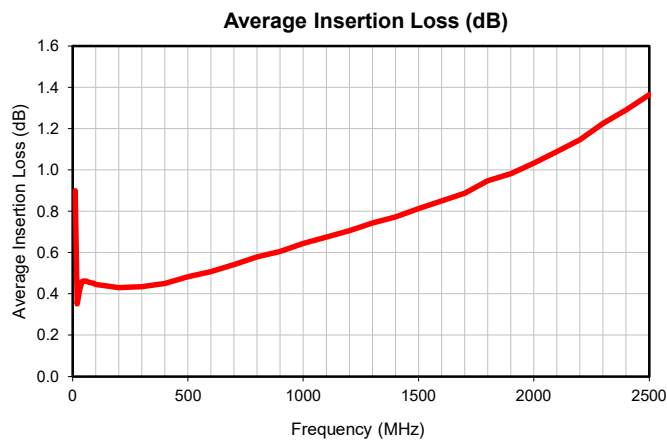
RF Transformer

TRS278-182-75+

Typical Performance Data

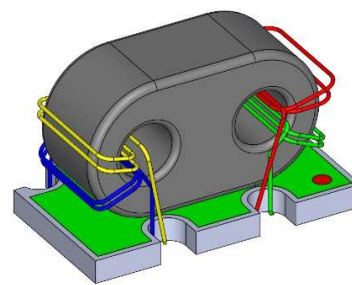
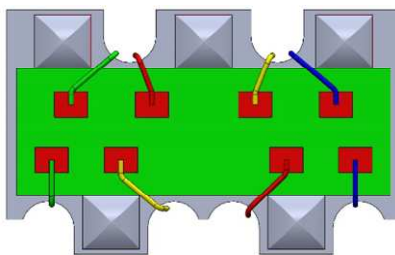
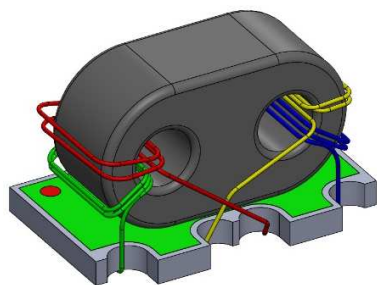
FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
10.00	0.90	7.89	0.03	0.05
20.00	0.35	14.06	0.02	0.01
30.00	0.42	17.22	0.03	0.03
40.00	0.46	18.56	0.03	0.06
50.00	0.46	19.37	0.03	0.07
60.00	0.46	19.97	0.03	0.11
70.00	0.46	20.46	0.03	0.12
80.00	0.45	20.84	0.03	0.15
90.00	0.45	21.10	0.03	0.17
100.00	0.44	21.28	0.03	0.21
200.00	0.43	21.81	0.07	0.25
300.00	0.43	21.05	0.12	0.26
400.00	0.45	19.88	0.16	0.15
500.00	0.48	18.60	0.20	0.12
600.00	0.51	17.65	0.22	0.43
700.00	0.54	16.84	0.23	1.01
800.00	0.58	16.10	0.23	1.41
900.00	0.61	15.66	0.17	1.51
1000.00	0.64	15.19	0.11	1.68
1100.00	0.67	14.82	0.06	1.57
1200.00	0.70	14.65	0.00	1.53
1300.00	0.74	14.36	0.04	1.36
1400.00	0.77	14.26	0.05	0.61
1500.00	0.81	14.24	0.08	0.25
1600.00	0.85	14.11	0.04	0.06
1700.00	0.89	14.14	0.03	0.21
1800.00	0.95	14.08	0.02	0.05
1900.00	0.98	14.11	0.03	0.10
2000.00	1.03	14.28	0.00	0.04
2100.00	1.09	14.21	0.05	0.65
2200.00	1.15	14.16	0.10	1.16
2300.00	1.23	14.10	0.25	1.67
2400.00	1.29	13.94	0.36	1.83
2500.00	1.36	13.97	0.55	1.89

Typical Performance Data



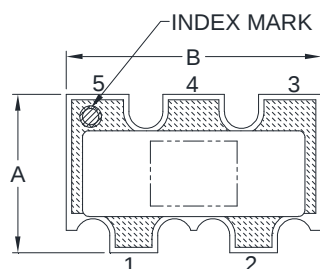
Case Style

AT3278

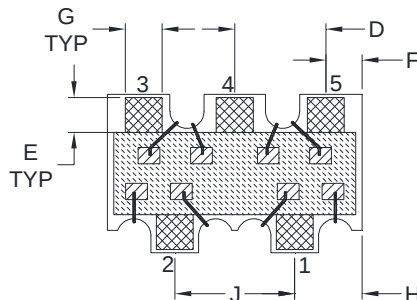


3D views for reference only

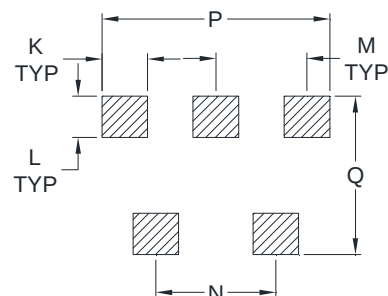
TOP VIEW



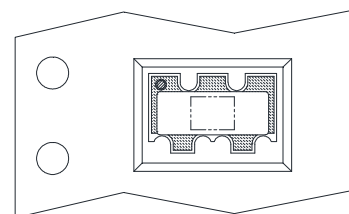
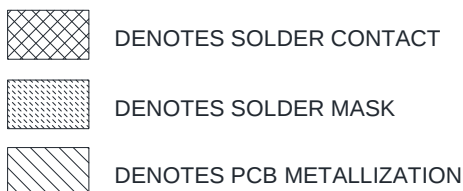
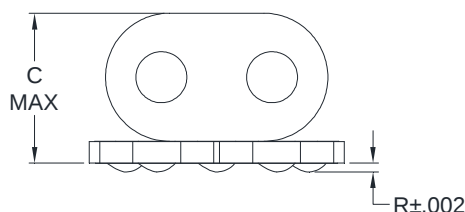
BOTTOM VIEW



PCB LAND PATTERN



**SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN: ± 0.002**



Refer to individual units for wiring information

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	WT. GRAMS
AT3278	.146 (3.71)	.235 (5.97)	.145 (3.68)	.084 (2.13)	.032 (0.81)	.034 (0.86)	.034 (0.86)	.062 (1.58)	.111 (2.81)	.042 (1.07)	.038 (0.97)	.084 (2.13)	.111 (2.82)	.210 (5.33)	.146 (3.71)	.009 (0.23)	.15
Dimensions are in inches (mm). Tolerances: 3 Pl. $\pm .004$										See tolerances in views							



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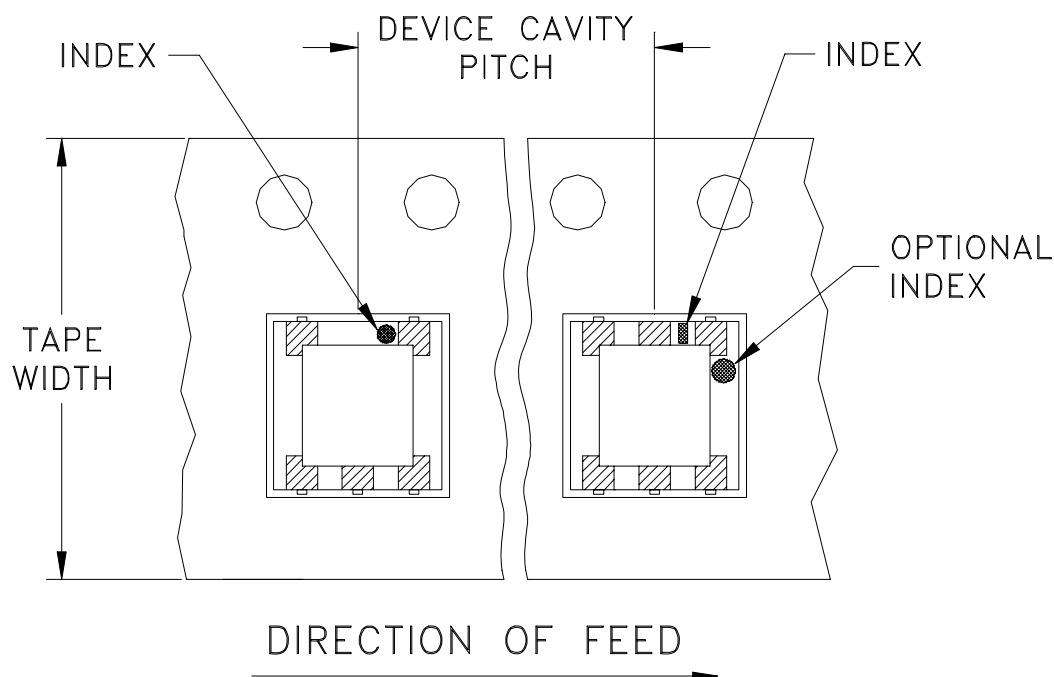
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS



Tape & Reel Packaging TR-F76

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
12	8	7	20
			50
			100
			200
			500
		13	1000
			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



INTERNET <http://www.minicircuits.com>

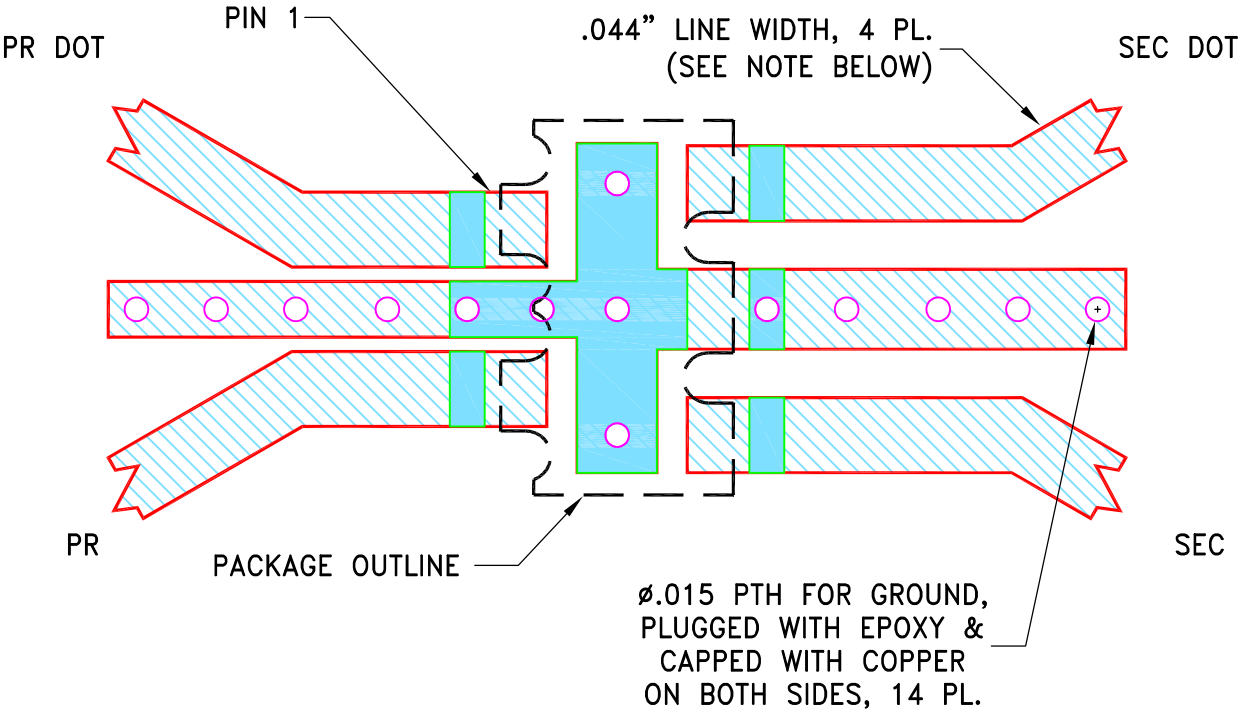
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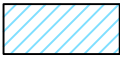
THIRD ANGLE PROJECTION		REVISIONS				
	REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
	OR	NPO-004886	NEW RELEASE	DEC 24	SKH	VR

SUGGESTED MOUNTING CONFIGURATION
FOR AT3278 CASE STYLE



- NOTES:
1. LINE WIDTH IS SHOWN FOR ROGERS R04350B, DIELECTRIC THICKNESS: $.020 \pm .0015$ ";
COPPER: 1/2 Oz EACH SIDE. FOR OTHER MATERIALS LINE 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).

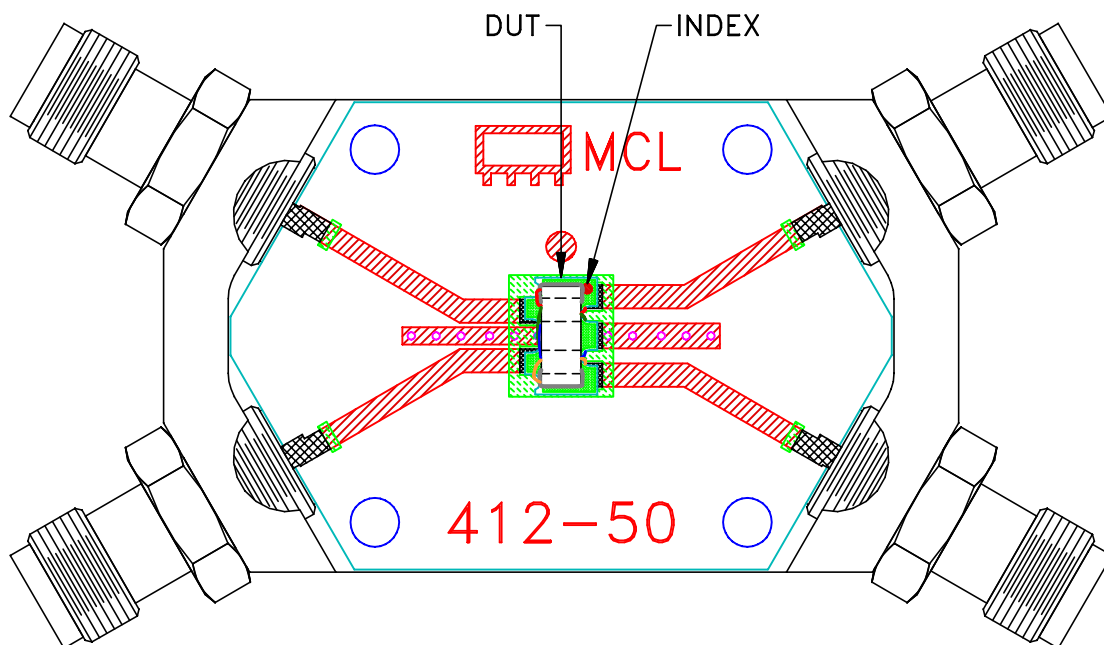
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE	Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235			
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .002 ANGLES ± FRACTIONS ±	DRAWN	SKH	17 DEC 24	PL, AT3278, TB-TRS17818275+			
	CHECKED	MD	17 DEC 24				
	APPROVED	PV	17 DEC 24				
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ASHEETA1.DWG REV:A DATE:01/12/95				FILE:	98-PL-809	SCALE: 8:1	SHEET: 1 OF 1

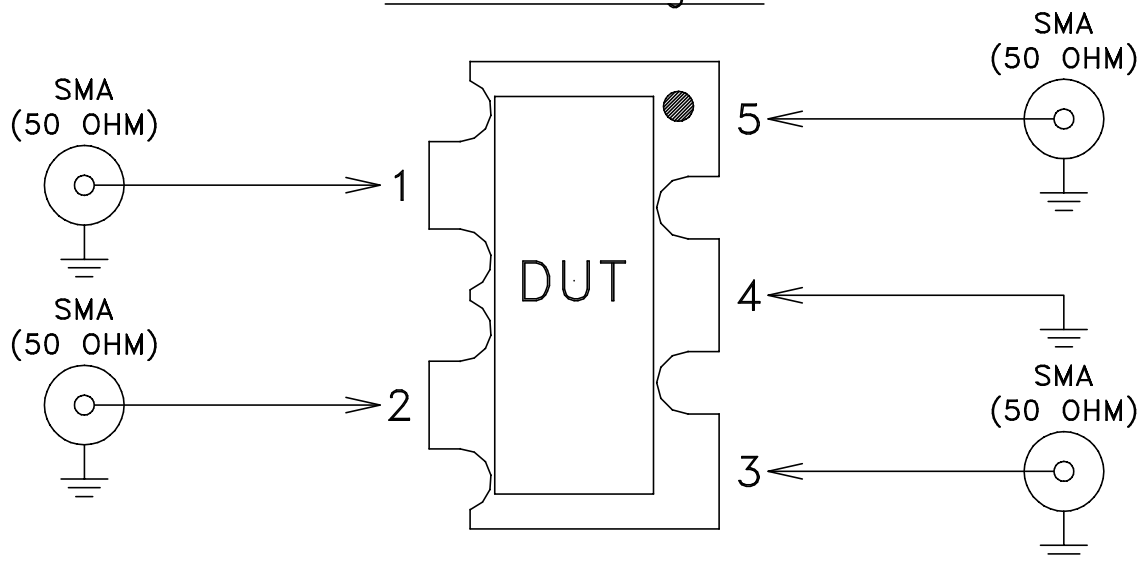
Evaluation Board and Circuit

TB-TRS27818275+

For Pin Connections refer to Data Sheet of the DUT



Schematic diagram



Notes:

1. PCB Material: ROGERS (R04350B) OR Equivalent, Dielectric Constant=3.48
Thickness=.020±.0015 inch
2. 50 Ohm SMA Female Connector.

 **Mini-Circuits®**



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