BALANCED TO UNBALANCED top hat®

RF Transformer

TC1-1T-152X+

50 Ω 5 to 1500 MHz Ratio 1:1

THE BIG DEAL

- Super wideband, 5 to 1500 MHz
- Low insertion loss, 1.5 dB typ., 5 to 1500 MHz
- Amplitude unbalance, ±0.2 dB typ.
- Good input return loss, 14 dB typ., 5 to 1500 MHz
- Low phase unbalance, ±1.5° typ.
- Common mode rejection, 30 dB typ. 1000 MHz

Generic photo used for illustration purposes only

CASE STYLE: AT1521

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

APPLICATIONS

- VHF/UHF transmitters
- Cellular
- GPS
- Communication

PRODUCT OVERVIEW

Mini-Circuits' TC1-1T-152X+ is a surface-mount transmission line transformer (with bias center tap) covering a very wide frequency range from 5 to 1500 MHz. The transformer provides low insertion loss with excellent phase and amplitude performance. Featuring core and wire construction on a 5-lead unit measures 0.15 x 0.15 x 0.16 inch.

KEY FEATURES

Feature	Advantages
Wideband, 5 to 1500 MHz	Super wide frequency range covers bandwidth requirements for many broadband applications.
Low insertion loss, 1.5 dB typ.	This unit provides excellent signal transmission from input to output with consistent performance across its entire frequency range.
Good Phase and Amplitude Unbalance	Provides good CMRR.
DC current 200 mA	Supply DC current from center tap.

REV. B
ECO-021678
TC1-1T-152X+
MCL NY
240503

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio			1		
Frequency Range		5	—	1500	MHz
Insertion Loss*	5-870	—	1.0	1.6	dB
	870-1000	—	1.2	1.7	
	1000-1500	—	1.8	2.5	
Amplitude Unbalance	5-870	—	0.1	0.7	dB
	870-1000	—	0.3	0.9	
	1000-1500	—	0.5	1.8	
Phase Unbalance	5-870	—	1.0	6	Degree
	870-1000	—	2.0	8	
	1000-1500	—	3.0	10	
Common mode rejection	5-1000	22	33	—	dB
	1000-1500	20	28	—	
Input Return Loss	5-870	—	15	—	dB
	870-1000	—	12	—	

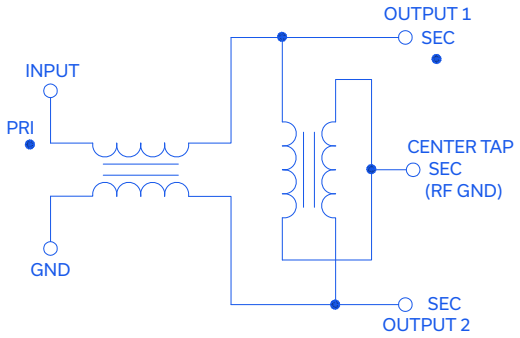
* Insertion Loss is referenced to mid-band loss, 0.7 dB typ.

MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.5W
DC Current	200mA

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

CONFIGURATION M1



BALANCED TO UNBALANCED top hat®

RF Transformer

TC1-1T-152X+

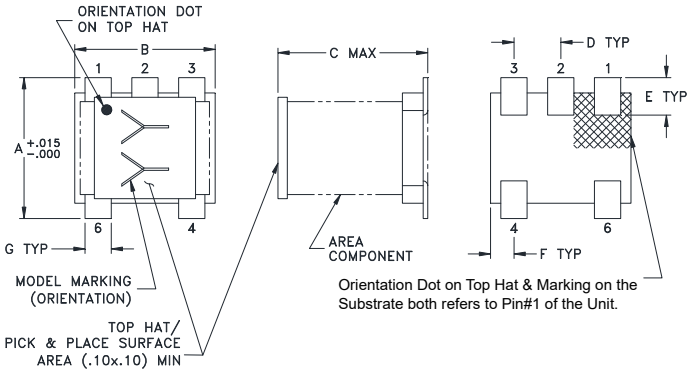
50 Ω 5 to 1500 MHz Ratio 1:1

PIN CONNECTIONS

PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
SECONDARY CT	2

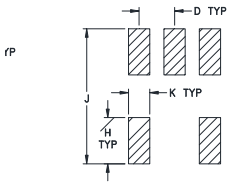
PRODUCT MARKING: WH

OUTLINE DRAWING



Top-hat total thickness: .013 inches MAX.

PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

OUTLINE DIMENSIONS (Inch / mm)

A	B	C	D	E	F	G	H	J	K
.150	.150	.160	.050	.040	.025	.028	.065	.190	.030
3.81	3.81	4.06	1.27	1.02	0.64	0.71	1.65	4.83	0.76

Weight: 0.15 grams

TAPE & REEL INFORMATION: F17

BALANCED TO UNBALANCED top hat

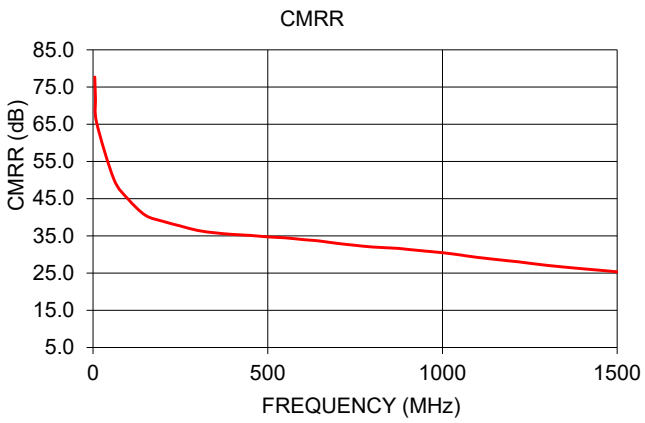
RF Transformer

TC1-1T-152X+

50 Ω 5 to 1500 MHz Ratio 1:1

TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Amplitude Unbalance (dB)	Phase Unbalance (deg)	CMRR (dB)
5	0.79	21.59	0.00	0.00	77.68
10	0.71	24.37	0.00	0.06	65.55
100	0.73	24.80	0.02	0.64	44.93
200	0.77	21.92	0.05	1.25	38.91
400	0.87	17.73	0.11	1.80	35.39
600	0.98	15.25	0.04	2.27	34.01
800	1.14	13.56	0.05	2.86	32.01
1000	1.32	12.43	0.24	3.05	30.47
1200	1.54	11.48	0.47	3.23	28.19
1400	1.79	10.65	0.70	3.24	26.17
1500	1.92	10.27	0.81	3.16	25.34



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/terms/viewterm.html

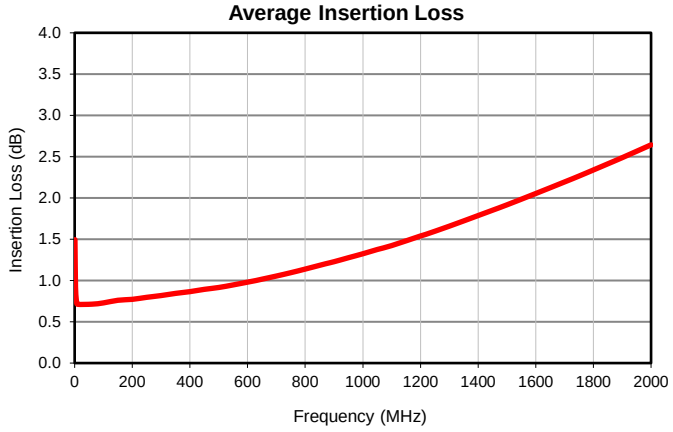
RF Transformer TC1-1T-152X+

Typical Performance Data

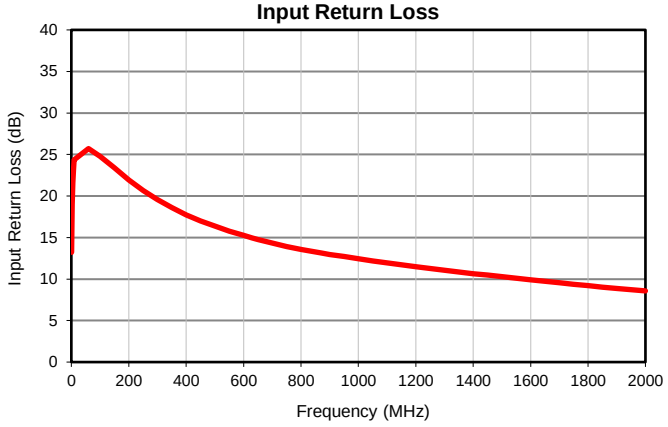
FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
1	1.49	13.23	0.02	0.01
3	0.92	19.01	0.00	0.00
5	0.79	21.59	0.00	0.00
7	0.74	23.07	0.00	0.01
10	0.71	24.37	0.00	0.06
60	0.71	25.71	0.00	0.36
100	0.73	24.80	0.02	0.64
150	0.76	23.39	0.05	1.02
200	0.77	21.92	0.05	1.25
250	0.80	20.66	0.08	1.41
300	0.82	19.56	0.10	1.60
350	0.84	18.59	0.11	1.72
400	0.87	17.73	0.11	1.80
450	0.89	17.01	0.11	1.88
500	0.92	16.37	0.09	2.01
550	0.95	15.77	0.06	2.12
600	0.98	15.25	0.04	2.27
630	1.00	14.95	0.02	2.34
650	1.02	14.75	0.02	2.39
700	1.05	14.32	0.01	2.57
750	1.10	13.93	0.02	2.72
800	1.14	13.56	0.05	2.86
870	1.20	13.13	0.11	2.91
900	1.23	12.95	0.13	2.97
950	1.28	12.70	0.18	3.03
1000	1.32	12.43	0.24	3.05
1050	1.38	12.18	0.29	3.12
1100	1.42	11.94	0.36	3.19
1200	1.54	11.48	0.47	3.23
1218	1.56	11.40	0.49	3.22
1300	1.66	11.07	0.59	3.26
1400	1.79	10.65	0.70	3.24
1450	1.85	10.46	0.75	3.22
1500	1.92	10.27	0.81	3.16
1600	2.05	9.90	0.92	3.07
1700	2.19	9.55	1.04	2.95
1750	2.27	9.37	1.11	2.89
1800	2.34	9.20	1.17	2.80
1850	2.41	9.03	1.23	2.74
1900	2.49	8.87	1.29	2.60
2000	2.64	8.57	1.40	2.40

Typical Performance Data

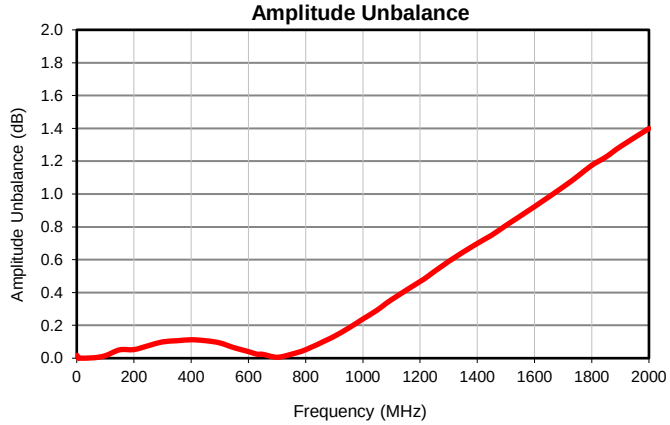
Average Insertion Loss



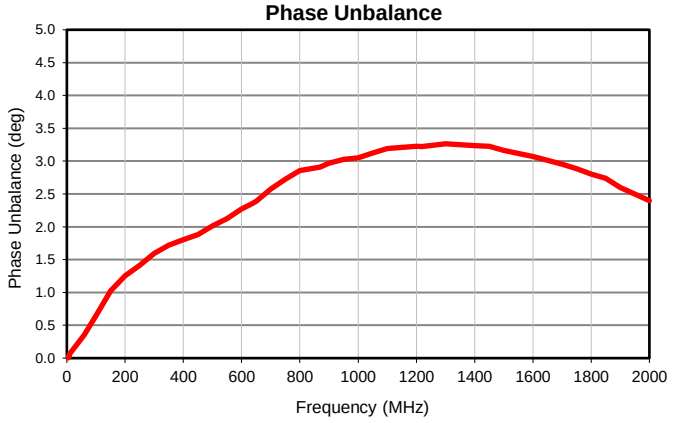
Input Return Loss



Amplitude Unbalance



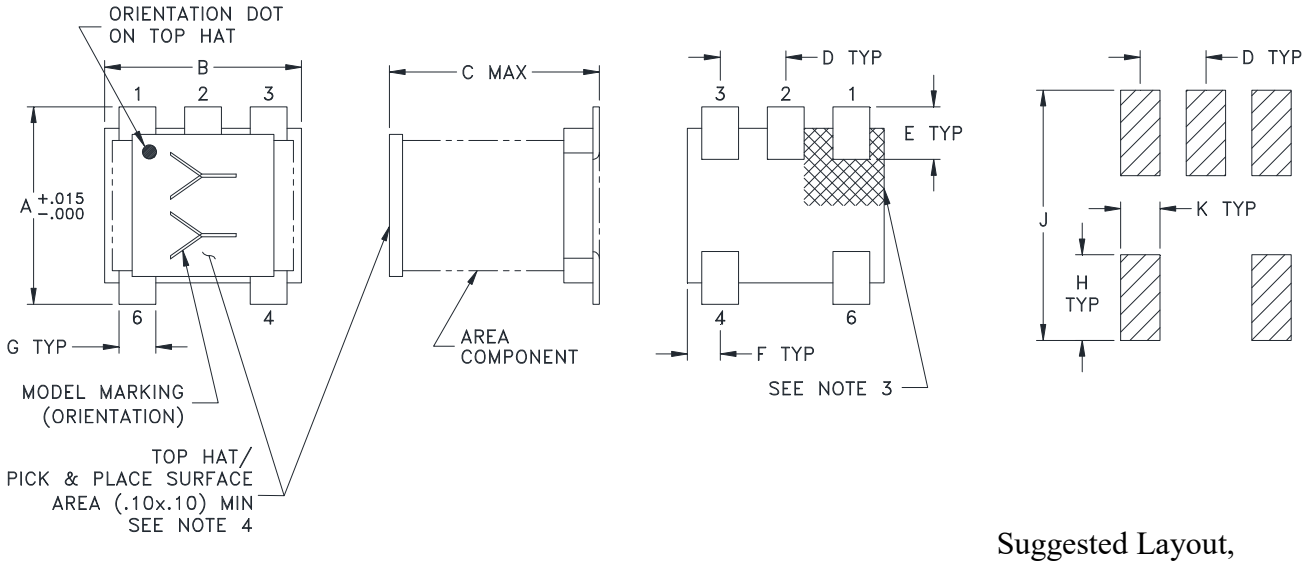
Phase Unbalance



Case Style AT

Outline Dimensions

AT1521



PCB Land Pattern

Suggested Layout,
Tolerance to be within ±.002

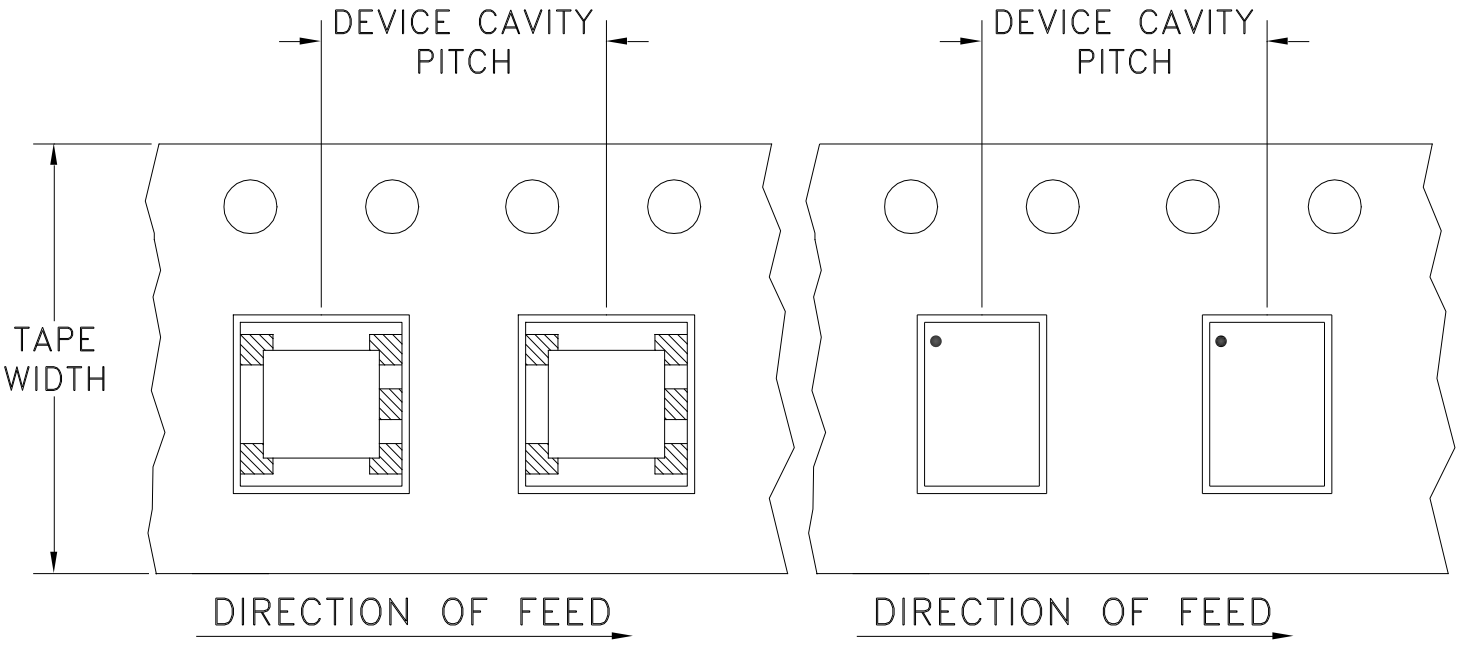
CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAMS
AT1521	.150 (3.81)	.150 (3.81)	.160 (4.06)	.050 (1.27)	.040 (1.02)	.025 (.64)	.028 (.71)	.065 (1.65)	.190 (4.83)	.030 (.76)	.15

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

Notes:
1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
3. Orientation Dot on Top Hat & Marking on the Substrate both refers to Pin #1 of the Unit.
4. Top-Hat total thickness: .013 inches MAX.

Tape & Reel Packaging TR-F17

DEVICE ORIENTATION IN T&R



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
		13	Standard	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

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