BALANCED TO UNBALANCED top hat

RF Transformer

TC1.33-282X+

100 to 75Ω 5 to 2800 MHz

FEATURES

- Suitable for tin/lead and RoHS solder systems
- Wideband, 5 to 2800 MHz
- Balanced transmission line
- Good return loss, 20 dB typ. at 1 dB band
- Excellent amplitude unbalance, 0.3 dB typ.
- Aqueous washable

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

- Impedance matching
- Balanced amplifier

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Impedance Ratio (secondary/primary)			1.33		Ohm
Frequency Range		5		2800	MHz
Insertion Loss*	5 - 2800		3.0		dB
	30 - 2000		2.0		
	50 - 1500		1.0		
Amplitude Unbalance	50 - 1500		0.3		dB
	30 - 2000		1.0		
Phase Unbalance	50 - 1500		6.0		Degree
	30 - 2000		6.0		

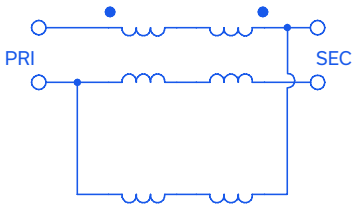
* Insertion Loss is referenced to mid-band loss, 1.0 dB typ. Measured in 75Ω system.

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.

CONFIG. K



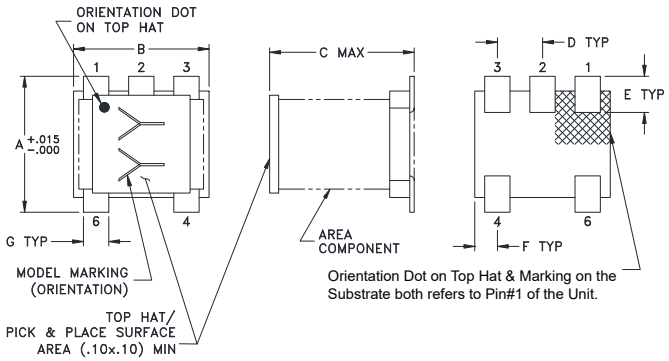
REV. A
ECO-021661
TC1.33-282X+
MCL NY
240501

PIN CONNECTIONS

Function	Pin Number
PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
NOT USED	2

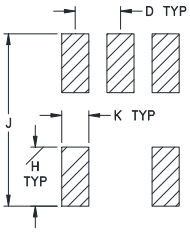
PRODUCT MARKING: CM

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

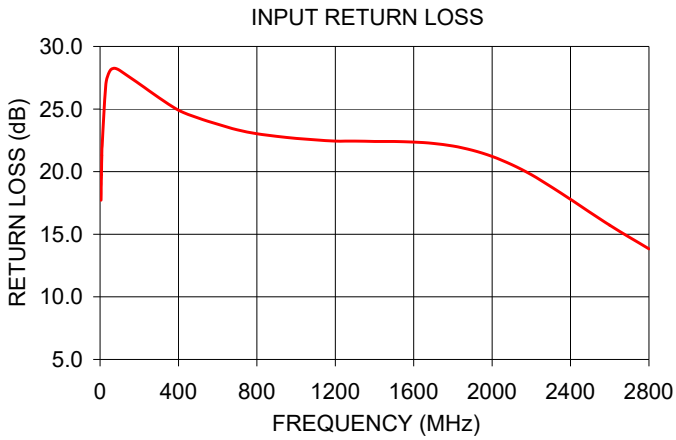
RF Transformer

TC1.33-282X+

100 to 75Ω 5 to 2800 MHz

TYPICAL PERFORMANCE DATA

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
5.00	1.48	17.72	0.38	3.28
10.00	1.20	21.95	0.21	2.17
30.00	1.08	27.05	0.11	0.55
50.00	1.08	28.04	0.09	0.06
100.00	1.09	28.09	0.08	1.09
500.00	0.99	24.29	0.21	5.00
1000.00	0.97	22.66	0.07	6.34
1500.00	1.20	22.41	0.71	5.18
2000.00	1.64	21.22	1.49	1.64
2400.00	2.13	17.79	2.00	3.40
2800.00	2.76	13.83	2.31	10.70



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 TC1.33-282X+

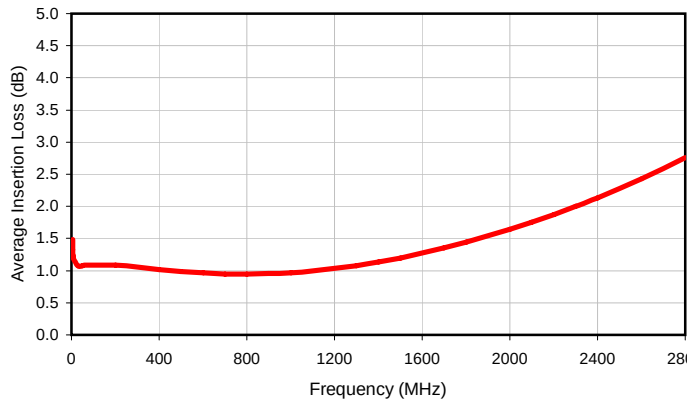
Typical Performance Data

FREQUENCY MHz	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
5.0	1.48	17.72	0.38	3.28
7.0	1.32	19.74	0.30	2.77
9.0	1.23	21.31	0.23	2.35
10.0	1.20	21.95	0.21	2.17
30.0	1.08	27.05	0.11	0.55
50.0	1.08	28.04	0.09	0.06
70.0	1.09	28.26	0.08	0.51
90.0	1.09	28.18	0.08	0.92
100.0	1.09	28.09	0.08	1.09
200.0	1.09	27.01	0.12	2.56
300.0	1.06	25.91	0.17	3.66
400.0	1.02	24.91	0.21	4.42
500.0	0.99	24.29	0.21	5.00
600.0	0.97	23.79	0.19	5.45
700.0	0.95	23.34	0.15	5.84
800.0	0.95	23.03	0.10	6.12
900.0	0.96	22.82	0.02	6.27
1000.0	0.97	22.66	0.07	6.34
1100.0	1.00	22.54	0.18	6.30
1200.0	1.04	22.44	0.30	6.17
1300.0	1.08	22.44	0.43	5.91
1400.0	1.14	22.41	0.57	5.57
1500.0	1.20	22.41	0.71	5.18
1600.0	1.27	22.36	0.86	4.62
1700.0	1.35	22.25	1.02	4.06
1800.0	1.44	22.05	1.18	3.35
1900.0	1.54	21.71	1.34	2.55
2000.0	1.64	21.22	1.49	1.64
2100.0	1.75	20.56	1.63	0.61
2200.0	1.87	19.76	1.76	0.56
2300.0	2.00	18.80	1.89	1.90
2400.0	2.13	17.79	2.00	3.40
2600.0	2.43	15.72	2.20	6.79
2800.0	2.76	13.83	2.31	10.70

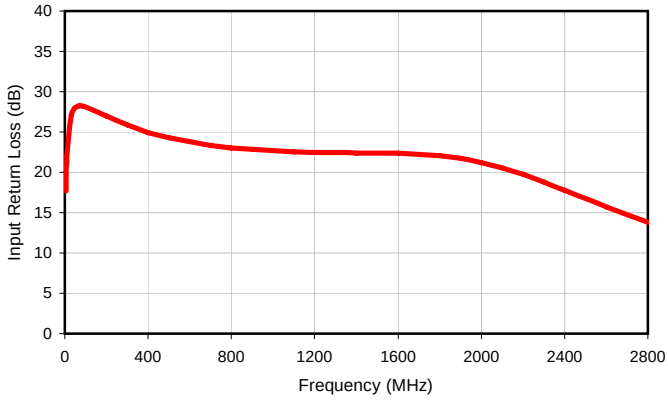
RF Transformer TC1.33-282X+

Typical Performance Data

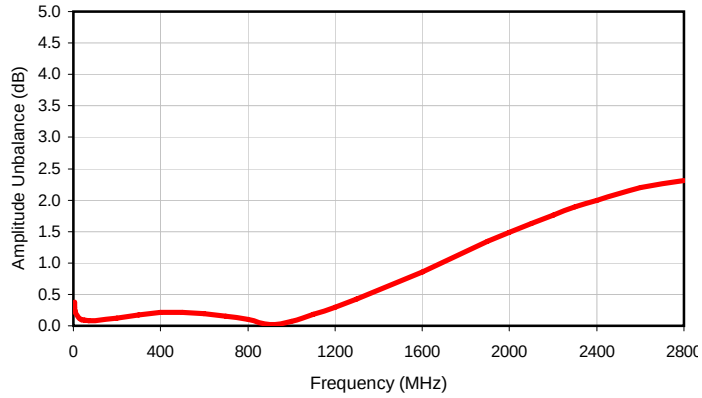
Average Insertion Loss



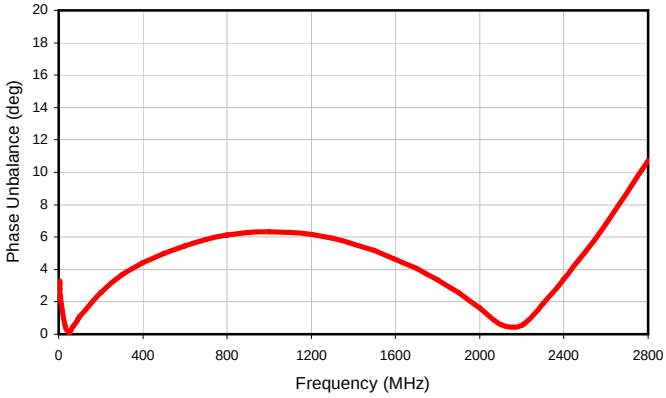
Input Return Loss



Amplitude Unbalance



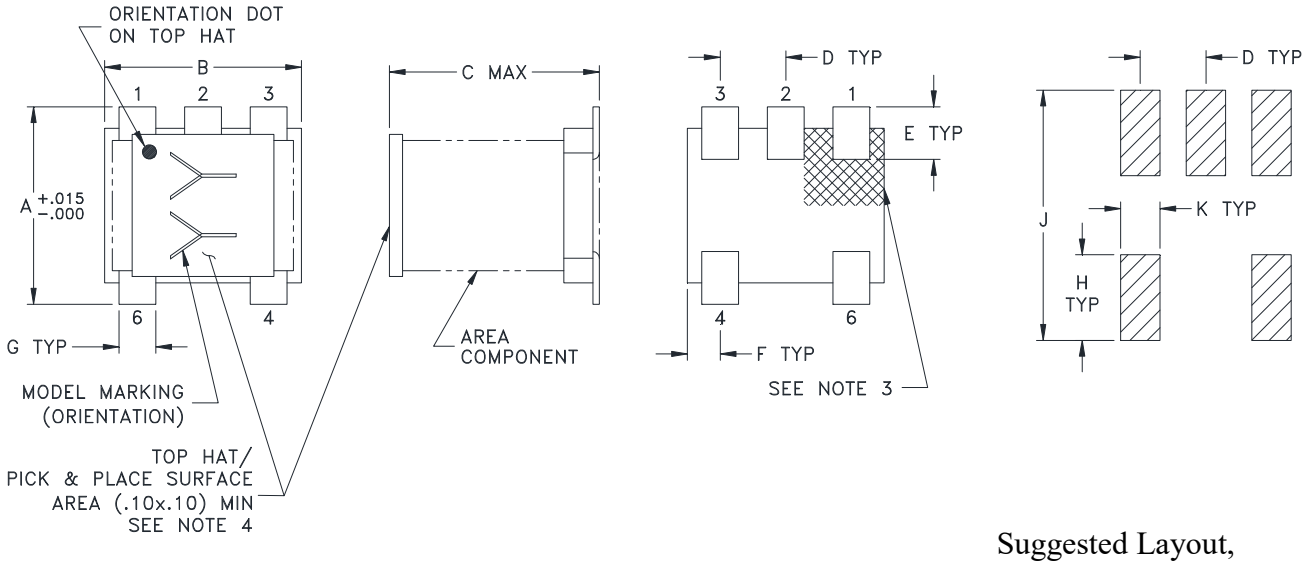
Phase Unbalance



Case Style AT

Outline Dimensions

AT1521



PCB Land Pattern

Suggested Layout,
Tolerance to be within ±.002

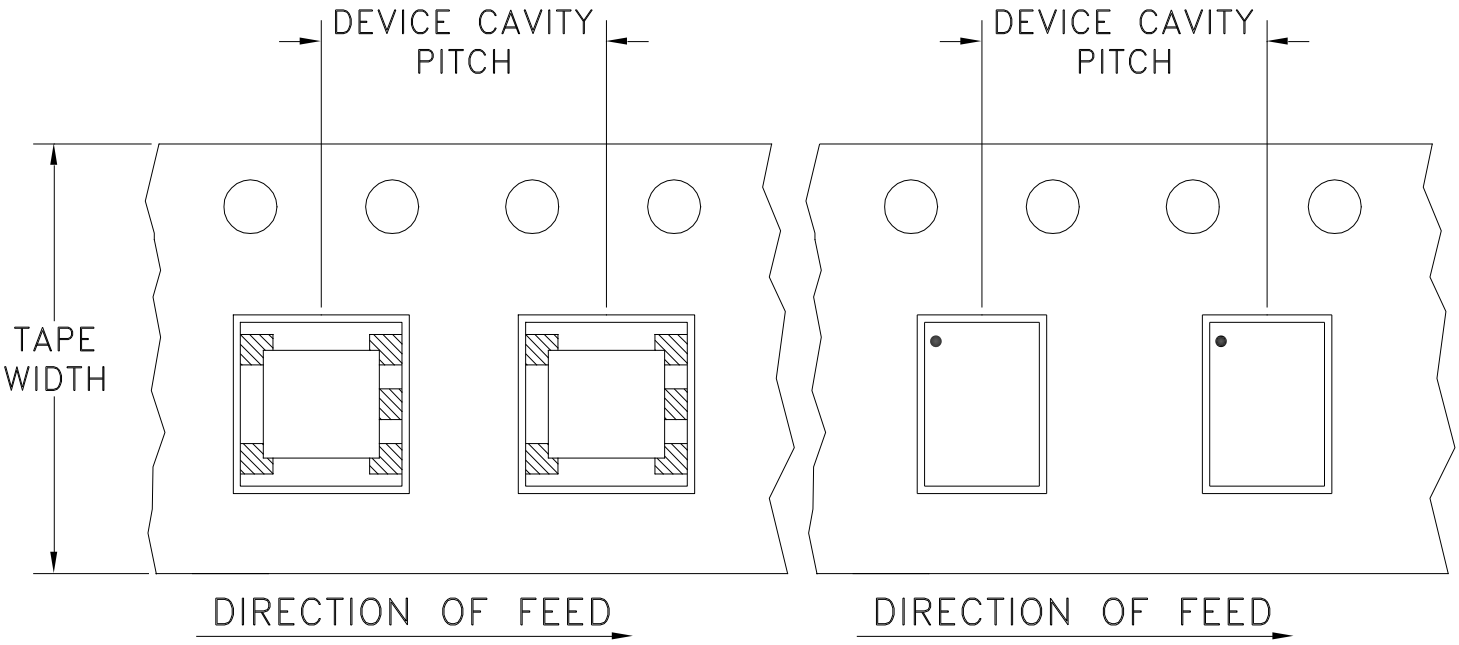
CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAMS
AT1521	.150 (3.81)	.150 (3.81)	.160 (4.06)	.050 (1.27)	.040 (1.02)	.025 (.64)	.028 (.71)	.065 (1.65)	.190 (4.83)	.030 (.76)	.15

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