

BALANCED TO UNBALANCED

# RF Transformer

**TC1.33-282-5+****Mini-Circuits**

100Ω to 75Ω   Ratio 1.33:1   5 to 2800 MHz

**THE BIG DEAL**

- Wideband Balun, 5 to 2800 MHz
- Suitable for Tin/Lead and RoHS Solder Systems
- 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: AT224-1A

**+RoHS Compliant**

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

**APPLICATIONS**

- Balanced to Unbalanced Transformation
- Push-Pull Amplifiers
- Cable TV
- Mobile Radio

**PRODUCT OVERVIEW**

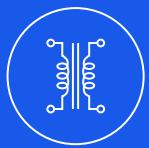
The TC1.33-282-5+ is a mini wideband tri-filar transformer, measuring approximately 4 mm on all sides. The plastic substrate, 5-pad design is aqueous washable and RoHS compliant, featuring a square core and all welded wire construction for repeatability and reliability in balanced-to-unbalanced 100/75Ω implementations.

**KEY FEATURES**

Feature	Advantages
Very Wide Bandwidth	5 to 2800 MHz bandwidth useful for CATV (forward & return), medical wireless and D2A/A2D, and communications applications.
Excellent Amplitude and Phase Unbalance	0.3 dB amplitude and 6° phase unbalance aid rejection of even harmonics (in push-pull amplifiers) and common mode signals (when used as a balun).
Good Return Loss	Efficient signal path across 100/75Ω transitions.
Low and Flat Insertion Loss	Flatness ±0.1 dB across 50-1000 MHz CATV bands preserves gain flatness after impedance transformation.

REV. A  
ECO-025279  
TC1.33-282-5+  
MCL NY  
251204

**Mini-Circuits**



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## ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio (Seconday/Primary)			1.33		
Frequency Range		5		2800	MHz
Insertion Loss <sup>1</sup>	5-2800			3	dB
	30-2000			2	
	50-1500			1	
Amplitude Unbalance	50-1500			0.3	dB
	30-2000			1.0	
Phase Unbalance	50-1500			6	Degree
	30-2000			6	

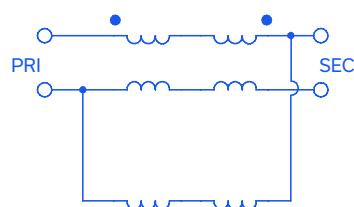
1. Insertion Loss is referenced to mid-band loss, 1.0 dB typ. Measured in 75Ω system.

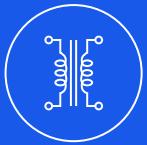
## ABSOLUTE MAXIMUM RATINGS

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

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

## CONFIGURATION K





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## RF Transformer

TC1.33-282-5+

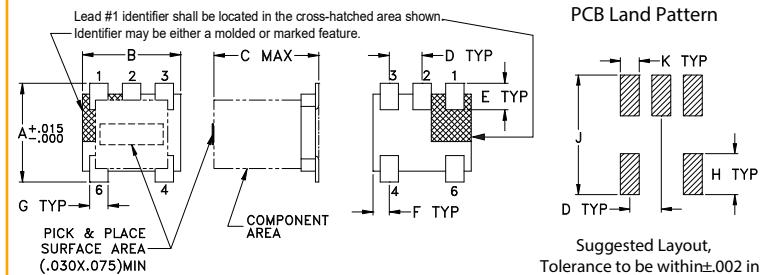
100Ω to 75Ω Ratio 1.33:1 5 to 2800 MHz

## PIN CONNECTIONS

PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
NOT USED	2

PRODUCT MARKING: N/A

## OUTLINE DRAWING

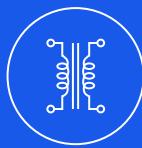


Pin 2 is not electrically connected. Solder attachment of Pin 2 is recommended for mechanical stability.

## OUTLINE DIMENSIONS (Inches mm)

A	B	C	D	E	F
.150	.150	.160	.050	.040	.025
3.81	3.81	4.06	1.27	1.02	0.64
G	H	J	K		wt
.028	.065	.190	.030		grams
0.71	1.65	4.83	0.76		0.15

## TAPE &amp; REEL INFORMATION: F17



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## TYPICAL PERFORMANCE DATA/CURVES AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return 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

- 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-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuit's 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-Circuit's website at [www.minicircuits.com/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)

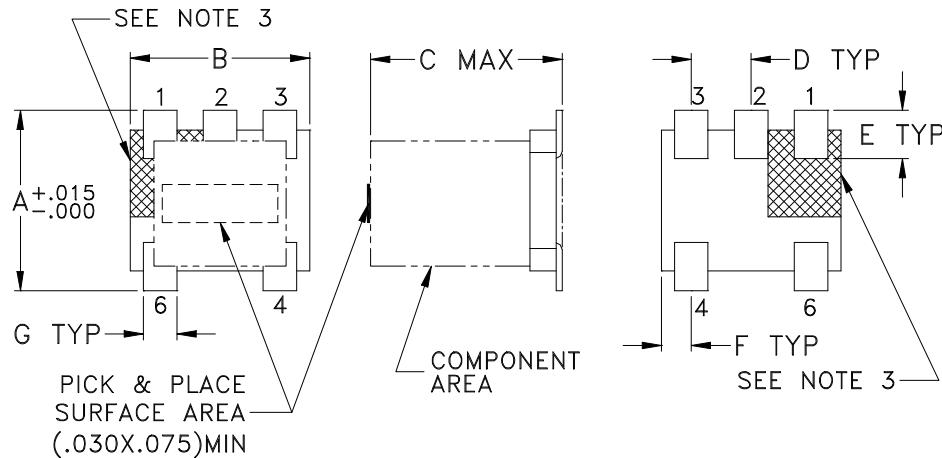
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# Case Style

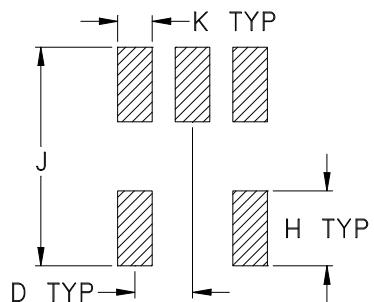
AT

## Outline Dimensions

AT224-1A



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAMS
AT224-1A	.150 (3.81)	.150 (3.81)	.160 (4.06)	.050 (1.27)	.040 (1.02)	.025 (0.64)	.028 (0.71)	.065 (1.65)	.190 (4.83)	.030 (0.76)	.15

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

### Notes:

1. Case material: Plastic.
2. Termination finish:  
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
3. Lead #1 identifier shall be located in the cross-hatched area shown.  
Identifier may be either a molded or marked feature.

 **Mini-Circuits®**  
ISO 9001 ISO 14001 CERTIFIED

ALL NEW  
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P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4681 For detailed performance specs & shopping online see Mini-Circuits web site

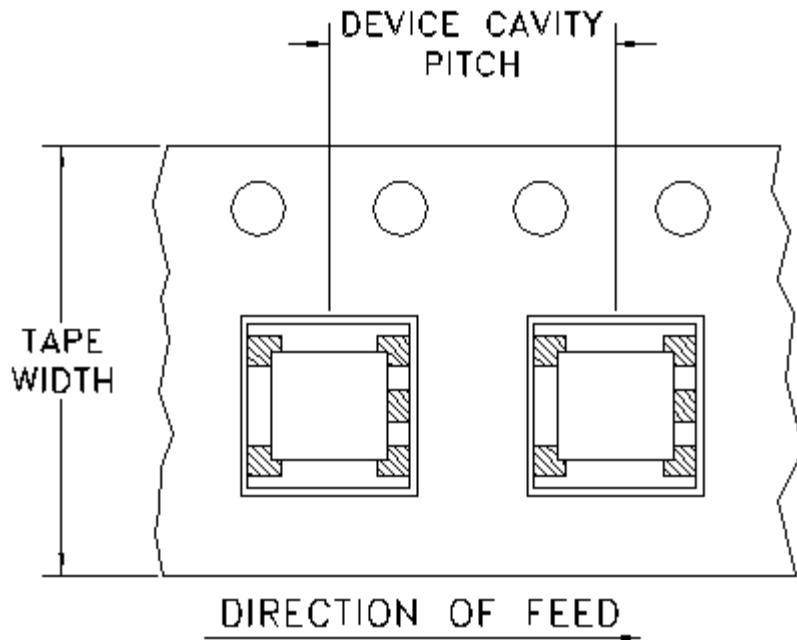
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RF/IF MICROWAVE COMPONENTS

# 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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



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RF/IF MICROWAVE COMPONENTS

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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 + propylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215