



# SURFACE MOUNT <sup>top hat</sup> RF Transformer

## TC1-1T-75X+

75Ω 5 to 120 MHz

### THE BIG DEAL

- Supports DOCSIS® 3.1 upstream bandwidth
- Low insertion loss, 0.2 dB
- Good return loss, 28 dB
- Low amplitude / phase unbalance, 0.2 dB / 2°
- Small size, 0.15 x 0.15 x 0.16"



Generic photo used for illustration purposes only

CASE STYLE: AT1521

### APPLICATIONS

- Impedance matching
- Unbalance to balance transformation
- Cable/CATV and broadband fiber networks

#### +RoHS Compliant

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

### PRODUCT OVERVIEW

TC1-1T-75X+ is a 75Ω surface-mount, DC-isolated transformer with a secondary center tap, covering the 5 to 120 MHz band, supporting upstream bandwidth requirements for DOCSIS® 3.1 systems and equipment. This model provides a 1:1 secondary/primary impedance ratio and is capable of handling up to 0.25W RF input power. It provides 0.2 dB insertion loss, 28 dB return loss, 0.2 dB amplitude unbalance and 2° phase unbalance. Featuring core and wire construction mounted on a 5-lead plastic base with tin over nickel termination finish, the unit measures 0.15 x 0.15 x 0.16" to accommodate dense circuit board layouts. It also incorporates Mini-Circuits' Top Hat® feature for faster, more accurate pick-and-place assembly.

### KEY FEATURES

Feature	Advantages
Supports DOCSIS® 3.1 upstream bandwidth requirements	This model is optimized for use over the upstream bandwidth for CATV and broadband fiber networks including DOCSIS® 3.1 systems.
Low insertion loss, 0.2 dB	Provides excellent transmission of signal power from input to output.
Good return loss, 28 dB	Provides excellent matching for 75Ω systems.
Low unbalance: <ul style="list-style-type: none"> <li>• 0.2dB amplitude unbalance</li> <li>• 2° phase unbalance</li> </ul>	Low unbalance improves a system's electromagnetic compatibility by rejecting unwanted common-mode noise.
DC isolation	Provides DC isolation between circuits and efficient AC transmission, eliminating the need for external DC biasing components.
Secondary center tap	Allows DC feed up to 30 mA and DC bias without adding bias tees into the signal chain.
Small footprint (0.15 x 0.15 x 0.16")	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.



SURFACE MOUNT

top hat



# RF Transformer

## TC1-1T-75X+

Mini-Circuits

75Ω 5 to 120 MHz

### ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Impedance Ratio			1		Ohm
Frequency Range		5	—	120	MHz
Insertion Loss*	5 - 75	—	0.1	0.4	dB
	75 - 120	—	0.3	0.6	
Amplitude Unbalance	5 - 75	—	0.1	0.2	dB
	75 - 120	—	0.2	0.3	
Phase Unbalance	5 - 75	—	1	4	Degree
	75 - 120	—	3	6	
Return Loss	5 - 20	25	30	—	dB
	20-75	23	28	—	
	75-120	20	25	—	

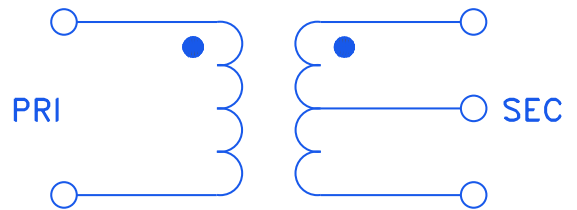
\*Insertion Loss is referenced to mid-band loss, 0.25 dB typ.

### 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.

### CONFIGURATION A





top hat  
SURFACE MOUNT  
RF Transformer

TC1-1T-75X+

Mini-Circuits

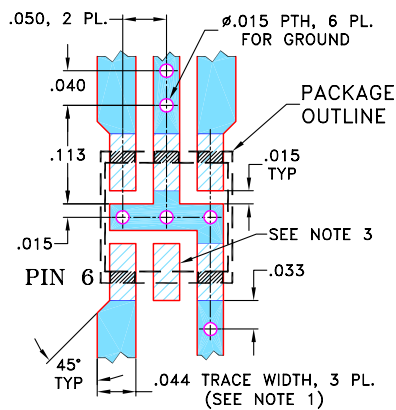
75Ω 5 to 120 MHz

PIN CONNECTIONS

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

PRODUCT MARKING: JD

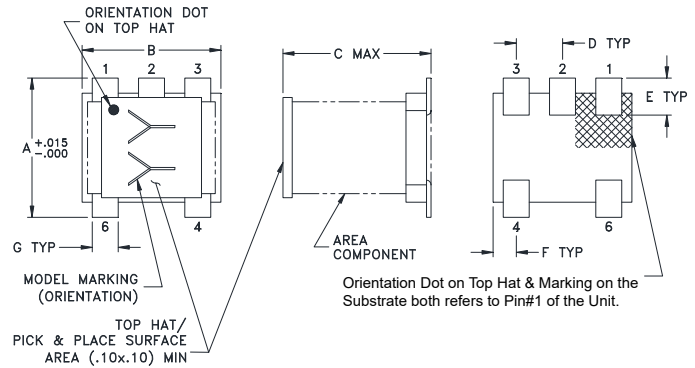
DEMO BOARD MCL P/N: TB-145  
SUGGESTED PCB LAYOUT: PL-244



1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
3. THIS PAD IS NOT REQUIRED FOR AT224 CASE STYLE.

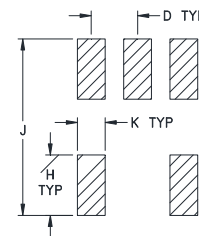
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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

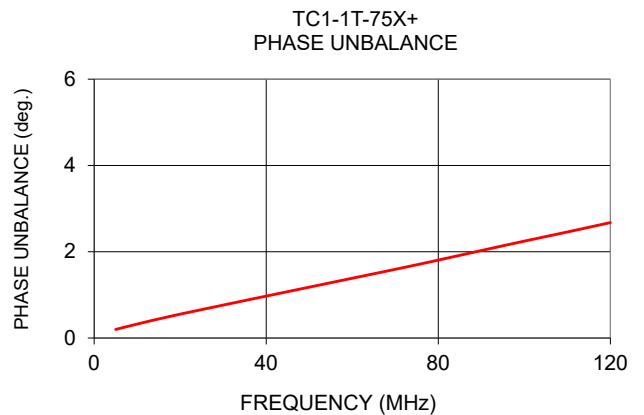
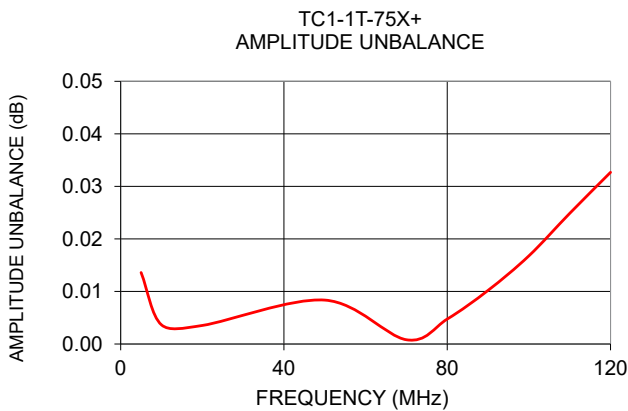
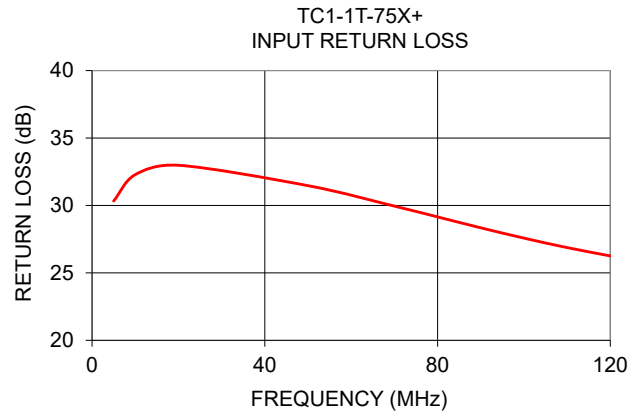
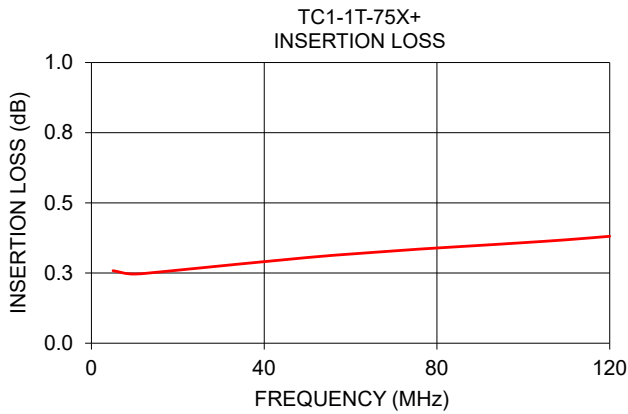
Weight: 0.15 grams

TAPE & REEL INFORMATION: F17



### TYPICAL PERFORMANCE DATA AT +25°C

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
5.00	0.26	30.33	0.01	0.20
10.00	0.25	32.29	0.00	0.32
20.00	0.26	32.98	0.00	0.55
50.00	0.31	31.47	0.01	1.18
70.00	0.33	29.95	0.00	1.59
80.00	0.34	29.15	0.00	1.81
90.00	0.35	28.34	0.01	2.03
100.00	0.36	27.58	0.02	2.25
110.00	0.37	26.88	0.02	2.46
120.00	0.38	26.26	0.03	2.68



- 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](http://www.minicircuits.com/terms/viewterm.html)

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