

## The Big Deal

- DC isolated
- Low unbalance, 0.6 dB, 3°
- Power handling up to 0.25W
- Small size, 0.15 x 0.15 x 0.16"



CASE STYLE: AT1521

## Product Overview

TC4-6T-75X+ is a 75Ω surface-mount DC isolated transformer with a secondary center tap that covers the 0.6 to 600 MHz band. This model provides a 4:1 secondary/primary impedance ratio, 1.0 dB insertion loss (typ.), 0.25W RF input power handling, 0.6 dB amplitude unbalance and 3° 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", accommodating dense circuit board layouts. It also incorporates Mini-Circuits' Top Hat® feature for faster, more accurate pick-and-place assembly.

## Key Features

Feature	Advantages
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.
Low unbalance <ul style="list-style-type: none"> <li>• 0.6 dB amplitude unbalance</li> <li>• 3° phase unbalance</li> </ul>	Low unbalance can improve a system's electromagnetic compatibility by rejecting unwanted common-mode noise.
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 <sup>top hat</sup> RF Transformer

75Ω 0.6 to 600 MHz

## TC4-6T-75X+

### Features

- DOCSIS 3.1 suitable
- plastic base with leads
- aqueous washable

### Applications

- impedance matching
- unbalance to balance transformation
- cable/CATV and broadband fiber networks



Generic photo used for illustration purposes only

CASE STYLE: AT1521

**+RoHS Compliant**

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

Available Tape and Reel at no extra cost	
Reel Size	Devices/Reel
7"	20, 50, 100, 200, 500
13"	1000, 2000

### Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
<b>Impedance Ratio</b> (secondary/primary)			4		
<b>Frequency Range</b>		0.6	—	600	MHz
<b>Insertion Loss*</b>	0.6-600	—	—	1.8	dB
	1- 300	—	—	1.0	
<b>Amplitude Unbalance</b>	0.6-600	—	0.6	1.2	dB
	1- 300	—	0.1	0.5	
<b>Phase Unbalance</b>	0.6-600	—	3	8	Degree
	1- 300	—	0.2	2	
<b>Return Loss</b>	0.6-600	8	13	—	dB
	1- 300	12	20	—	

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

### Maximum Ratings

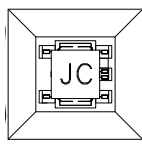
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	0.25W
DC Current	30mA

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

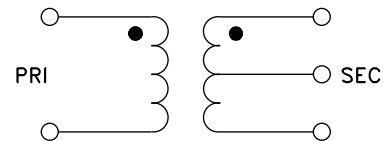
### Pin Connections

Function	Pin Number
PRIMARY DOT	6
PRIMARY	4
SECONDARY DOT	1
SECONDARY	3
SECONDARY CT	2

### Product Marking

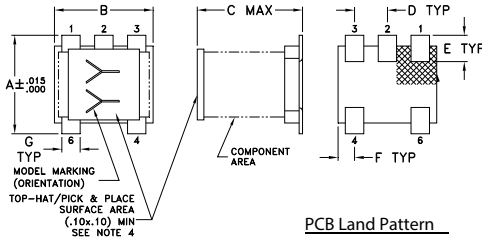


### Config. A



# TC4-6T-75X+

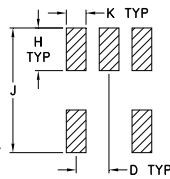
## Outline Drawing



## Outline Dimensions (inch/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	

## PCB Land Pattern



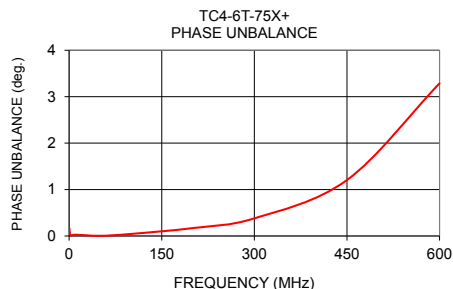
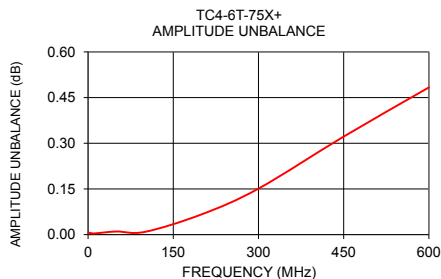
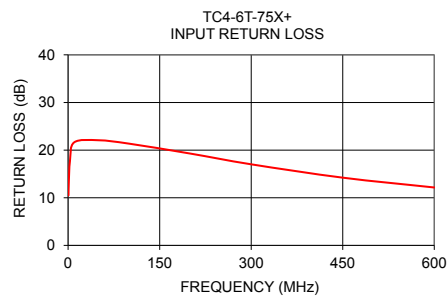
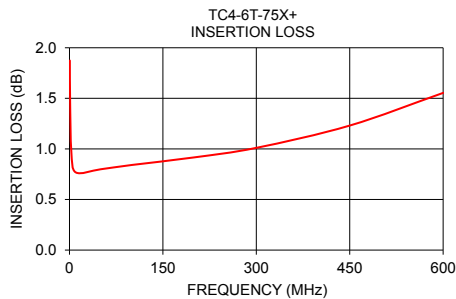
### Note:

1. Case Material Plastic
2. Termination Finish: Tin plate over Nickel plate.
3. Lead #1 identifier shall be located in the cross-hatched area shown, on bottom view. Identifier may be either a molded or marked feature.
4. Top-Hat total thickness: .013 inches max.

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

## Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
0.60	1.87	10.51	0.00	0.16
1.00	1.49	12.84	0.00	0.07
3.00	0.97	17.73	0.01	0.01
10.00	0.77	21.64	0.00	0.03
50.00	0.80	22.07	0.01	0.00
100.00	0.84	21.36	0.01	0.04
200.00	0.92	19.28	0.07	0.17
300.00	1.01	17.02	0.15	0.38
450.00	1.23	14.22	0.32	1.21
600.00	1.55	12.16	0.48	3.29



# RF Transformer

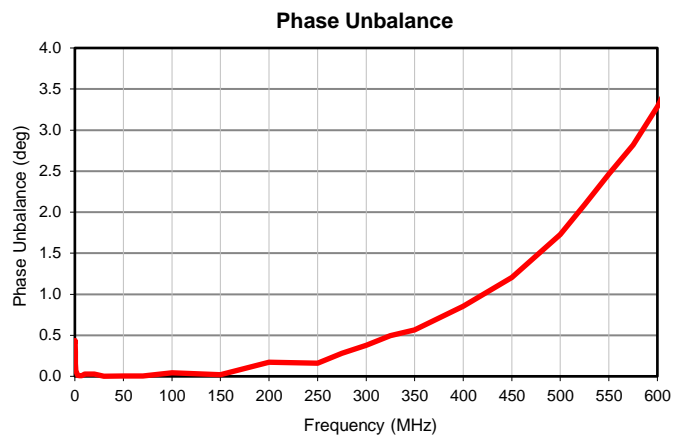
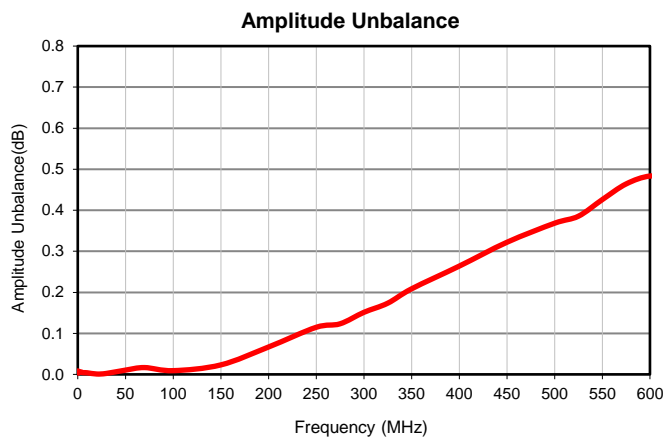
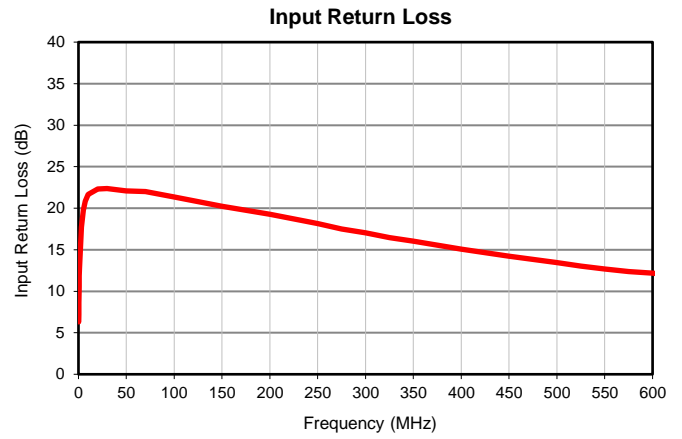
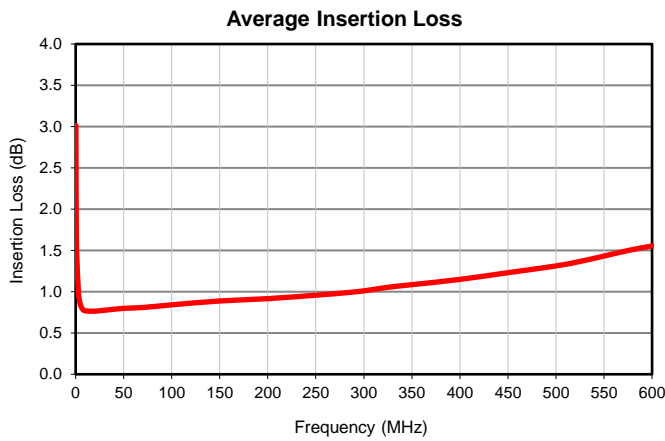
# TC4-6T-75X+

## Typical Performance Data

FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
0.30	2.70	7.19	0.01	0.44
0.40	2.29	8.60	0.01	0.30
0.60	1.87	10.51	0.00	0.16
0.80	1.64	11.83	0.01	0.09
1.0	1.49	12.84	0.00	0.07
3.0	0.97	17.73	0.01	0.01
5.0	0.84	19.78	0.00	0.01
7.0	0.79	20.86	0.00	0.01
10.0	0.77	21.64	0.00	0.03
20.0	0.76	22.33	0.00	0.03
30.0	0.78	22.37	0.00	0.00
50.0	0.80	22.07	0.01	0.00
70.0	0.81	21.99	0.02	0.00
100.0	0.84	21.36	0.01	0.04
150.0	0.89	20.22	0.02	0.02
200.0	0.92	19.28	0.07	0.17
250.0	0.96	18.13	0.11	0.16
275.0	0.98	17.51	0.12	0.28
300.0	1.01	17.02	0.15	0.38
325.0	1.05	16.47	0.17	0.49
350.0	1.09	16.04	0.21	0.56
400.0	1.15	15.08	0.26	0.85
450.0	1.23	14.22	0.32	1.21
500.0	1.31	13.46	0.37	1.73
525.0	1.37	13.03	0.39	2.09
550.0	1.43	12.69	0.43	2.46
575.0	1.50	12.37	0.46	2.82
600.0	1.55	12.16	0.48	3.29
625.0	1.60	11.83	0.48	3.87
650.0	1.67	11.59	0.51	4.49
675.0	1.74	11.29	0.52	5.23
700.0	1.81	11.14	0.56	5.95
725.0	1.88	10.93	0.56	6.82
750.0	1.93	10.88	0.54	7.82
775.0	2.00	10.72	0.51	9.03
800.0	2.08	10.61	0.51	10.36



## Typical Performance Data



## Outline Dimensions

AT1521



## PCB Land Pattern

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

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.  $\pm .01$ ; 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. 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.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 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)



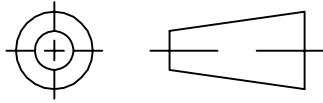
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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RF/IF MICROWAVE COMPONENTS

THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M106563	NEW RELEASE	08/23/06	AV	IG

SUGGESTED MOUNTING CONFIGURATION  
FOR AT224/DB714 CASE STYLE, "gs/ha/hd" PIN CONNECTIONS  
(FOR SINGLE ENDED TO BALANCED APPLICATION)



- NOTES:**
- TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  - BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
  - 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

UNLESS OTHERWISE SPECIFIED

INITIALS      DATE

DIMENSIONS ARE IN INCHES  
 TOLERANCES ON:  
 2 PL DECIMALS ±  
 3 PL DECIMALS ± .005  
 ANGLES ±  
 FRACTIONS ±

DRAWN	AV	07/28/06
CHECKED	IL	08/23/06
APPROVED	IG	08/23/06



**Mini-Circuits®**

13 Neptune Avenue  
 Brooklyn NY 11235

PL, gs/ha/hd, AT224/DB714, TC/TCM, TB-145

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-244	REV: OR
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FILE: 98PL244	SCALE: 8:1	SHEET: 1 OF 1
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ASHEETA1.DWG REV:A DATE:01/12/95

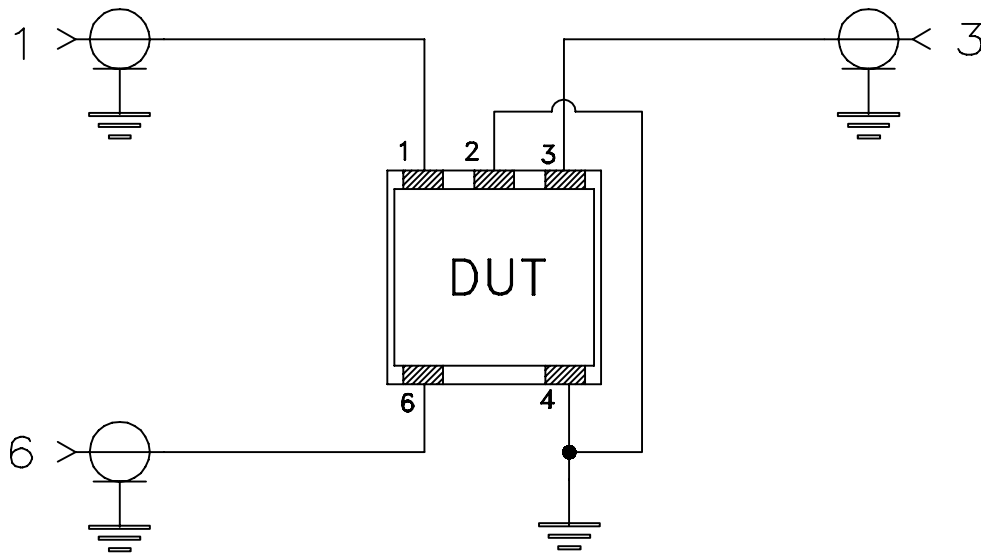


# Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-145



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers RO4350B or its equivalent, Dielectric Constant=3.5, Thickness=.020"

 **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