

SURFACE MOUNT

RF Transformer

Mini-Circuits

4.5 to 3000 MHz 50Ω

FEATURES

- Suitable for tin/lead and RoHS solder systems
- Wideband, 4.5 to 3000 MHz
- Balanced transmission line
- Good return loss
- Excellent amplitude unbalance, 0.5 dB typ. and phase unbalance, 2 deg typ. in 1 dB bandwidth
- Plastic base with leads
- Aqueous washable



TC1-1-13MG2+

Generic photo used for illustration purposes only CASE STYLE: AT224-3

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

- **APPLICATIONS**
- Balanced to unbalanced transformation
- Push-pull amplifiers
- PCS/DCS
- MMDS

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Тур.	Max.	Unit
Impedance Ratio			1		
Frequency Range		4.5		3000	MHz
	2000-3000		3		
Insertion Loss*	1000-2000		2		dB
	4.5-1000		1		
Phase Unbalance	4.5-1000		2		Dan
Phase Unbalance	1000-2000		3		Deg.
	4.5-1000		0.5		dB
Amplitude Unbalance	1000-2000		0.5	0.5	

*Insertion Loss is referenced to mid-band loss, 0.5 dB tvp.

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.



REV. B ECO-021646 TC1-1-13MG2+ MCL NY 240424

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TC1-1-13MG2+

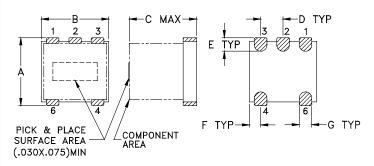
Mini-Circuits

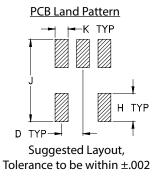
50Ω 4.5 to 3000 MHz

PIN CONNECTIONS

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

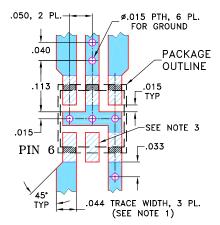
OUTLINE DRAWING





PRODUCT MARKING: N/A

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



- 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.
- 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 DIMENSIONS (Inch)

A	B	C	D	E	F
.150	.150	.150	.050	.030	.025
3.81	3.81	3.81	1.27	0.76	0.64
G	H	J	K		wt
.028	.065	.190	.030		grams
0.71	1.65	4.83	0.76		0.10

TAPE & REEL INFORMATION: F17

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SURFACE MOUNT

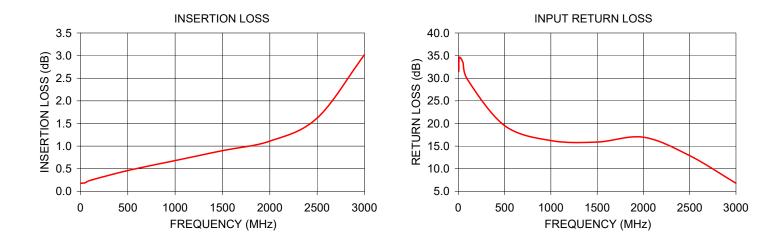
RF Transformer

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50Ω 4.5 to 3000 MHz

TYPICAL PERFORMANCE DATA

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
4.50	0.18	31.52	0.69	3.81
10.00	0.18	34.60	0.56	1.78
50.00	0.19	33.50	0.56	0.11
100.00	0.24	29.68	0.55	0.19
500.00	0.46	19.52	0.45	0.81
1000.00	0.68	16.22	0.14	1.59
1500.00	0.90	15.89	0.29	0.89
2000.00	1.11	16.97	0.71	1.28
2500.00	1.62	12.88	0.78	5.79
3000.00	3.02	6.79	0.49	12.32



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

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Typical Performance Data

FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg)
4.5	0.18	31.52	0.69	176.19
10.0 50.0	0.18 0.19	34.60 33.50	0.56 0.56	178.22 180.11
100.0	0.19	29.68	0.55	179.81
500.0	0.46	19.52	0.45	179.19
1000.0	0.68	16.22	0.14	178.41
1500.0	0.90	15.89	0.29	179.11
2000.0	1.11	16.97	0.71	181.28
2500.0	1.62	12.88	0.78	185.79
3000.0	3.02	6.79	0.49	167.68

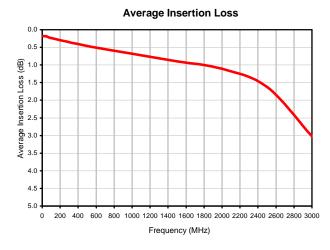


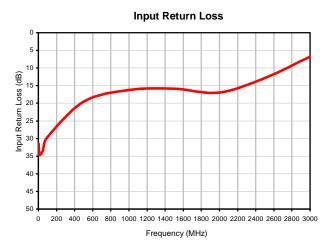
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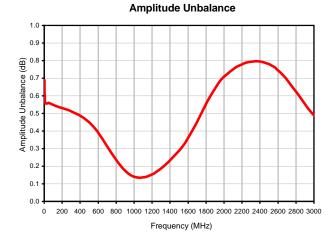
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RF Transformer

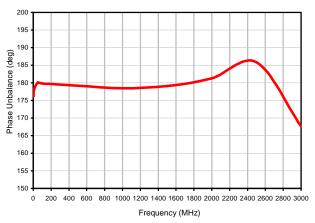
Typical Performance Curves







Phase Unbalance





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Case Style

Outline Dimensions

3

-777

В 2

777

1

77

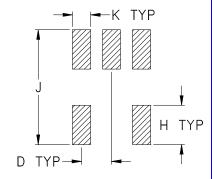
6

PICK & PLACE

SURFACE AREA

(.030X.075)MIN

PCB Land Pattern



Suggested Layout, Tolerance to be within ±.002

CASE #	А	В	С	D	Е	F	G	Н	J	K	L	WT. GRAMS
AT224-3	.150	.150	.150	.050	.030	.025	.028	.065	.190	.030		.10
A122 4 -J	(3.81)	(3.81)	(3.81)	(1.27)	(0.76)	(0.64)	(0.71)	(1.65)	(4.83)	(0.76)		.10

D TYP

1

6

-G TYP

2

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

COMPONENT

AREA

-С МАХ--

E TYP

F TYP

Notes:

- 1. Open style, ceramic base.
- 2. Termination finish: 3.15-5.12 µ inch (.08-.130 microns) Gold over 78-236 µ inch (1.98-6.0 microns) Nickel plate.





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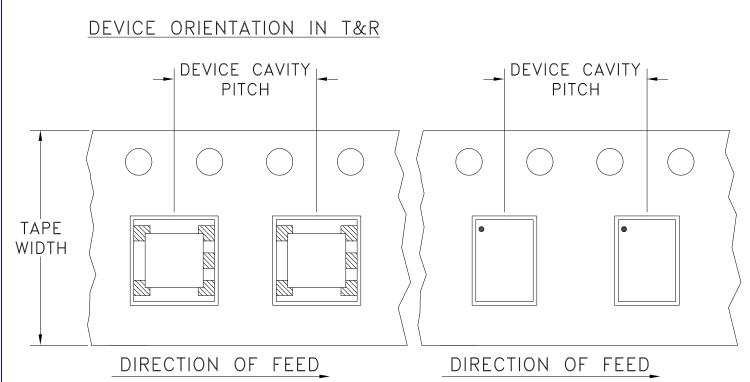


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RF/IF MICROWAVE COMPONENTS

AT224-3

Tape & Reel Packaging TR-F17



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices	s per Reel
			Small	20
			quantity	50
		7	standards	100
12	8		(see note)	200
				500
		13	Standard	1000
		13	Standard	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



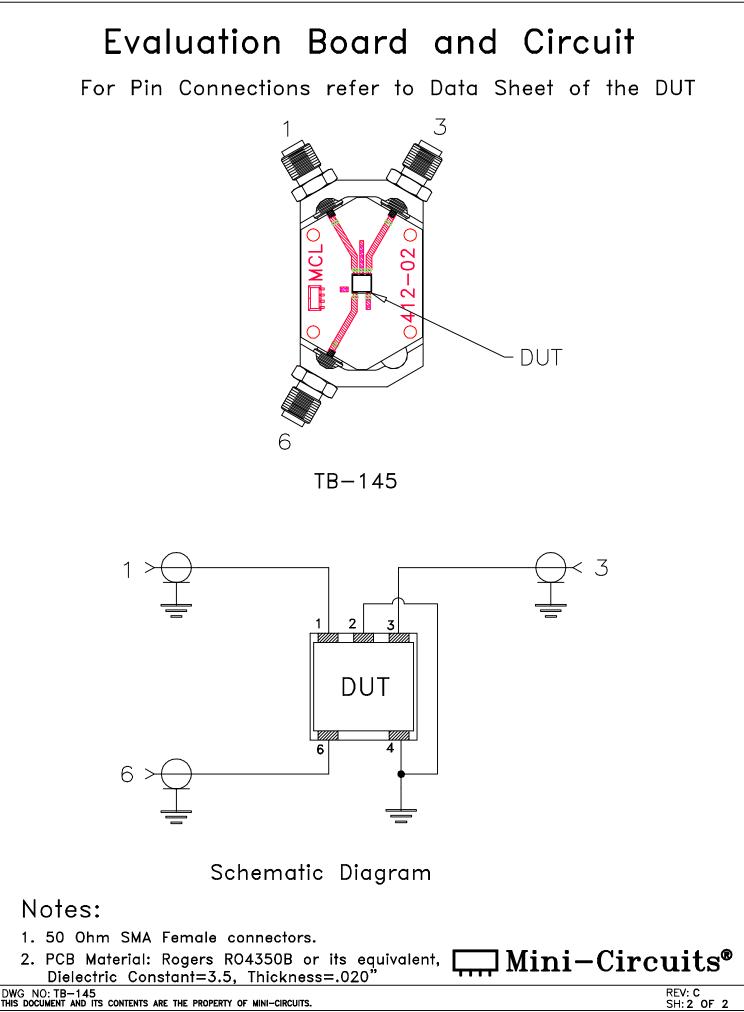


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RF/IF MICROWAVE COMPONENTS

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THIRD ANGLE PROJECTI	ON			REVISIONS			
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FOR AT224/DB						2	
<u>(FOR S</u>	INGLE ENDE	<u>U TO E</u>	BALANCE	D APPLICATIO	<u>(nc</u>		
.050, 2 PL. FOR GROUND .040 .040 PACKAGE OUTLINE .113 .015 TYP .015 PIN 6 .033							
NOTES: 1. TRACE WID	45° TYP044 TRACE WIDTH, 3 PL. (SEE NOTE 1)						
NOTES: 1. 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. 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							
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ASHEETA1.DWG	REV:A DATE:01/12/95		8PL244	SCALE: 8:1		OF	1



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

ENV02T1 Rev: B 02/25/11 M130240 File: ENV02T1.pdf

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