MMIC Balun

RF Transformer

MTY2-243+

50Ω 10 to 24 GHz

The Big Deal

- Wideband, 10 to 24 GHz
- Low insertion loss, 1.0 dB typ. to 20 GHz
- Low unbalance, 0.7 dB, 6°
- Power handling up to +31 dBm

CASE STYLE: MC1630-1

Product Overview

Mini-Circuits MTY2-243+ is a wideband MMIC balun transformer with an impedance ratio of 2:1 covering a wide range of applications from 10 to 24 GHz. Fabricated using HBT process technology, this model provides outstanding repeatability with low insertion loss, low amplitude unbalance, low phase unbalance, and RF input power handling up to +31 dBm (1.25W). The unit comes housed in a tiny 2x2x1mm QFN package with low inductance, excellent thermal efficiency, and high ESD rating.

Key Features

Feature	Advantages
Wideband, 10 to 24 GHz	MTY2-243+ supports a broad variety of applications including instrumentation, radar, SATCOM and more.
Low insertion loss • 1.0 dB, 10 to 20 GHz • 1.5 dB, 20 to 24 GHz	Enables excellent signal power transmission from input to output.
Low unbalance • 0.7 dB amplitude unbalance • 6° phase unbalance	Low unbalance can improve a system's electromagnetic compatibility by rejecting unwanted common-mode noise.
Tiny size, 2 x 2 x 1mm	Accommodates tight space requirements for dense PCB layouts.

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Features

- wideband, 10 to 24 GHz
- low phase unbalance, 6 deg. and amplitude unbalance, 0.7 dB typ.
- miniature size, (2 x 2 x 1 mm)
- low cost
- aqueous washable

Generic photo used for illustration purposes only

CASE STYLE: MC1630-1

+RoHS Compliant

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

Applications

- Radar
- SATCOM
- Instrumentation

Electrical Specifications at 25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Unit
Impedance Ratio			2		
Frequency Range		10		24	GHz
Insertion Loss[1]	10-12	—	1.0	1.7	dB
	12-15	—	1.0	1.5	
	15-20	—	1.0	1.7	
	20-24	—	1.5	2.2	
Amplitude Unbalance	10-12		0.7		dB
	12-15		0.3		
	15-20		0.7		
	20-24		0.4		
Phase Unbalance[3]	10-12		5.8		Degree
	12-15		6.4		
	15-20		5.5		
	20-24		2.9		

1. Above 3dB theoretical.
2. Relative to 180°

Maximum Ratings

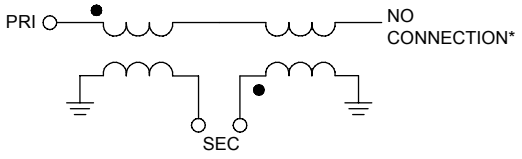
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-65°C to 150°C
Input RF Power	31 dBm

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

Pad Connections

Function	Pad Number
PRIMARY DOT (Unbalanced Port)	2
SECONDARY DOT (Balanced)	6
SECONDARY (Balanced)	4
GND	1,3 & paddle
NC (grounded on TB)	5

Configuration J



*Internal open circuit

Characterization Test Circuit

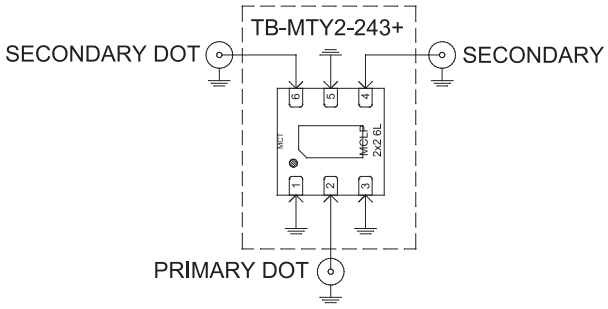
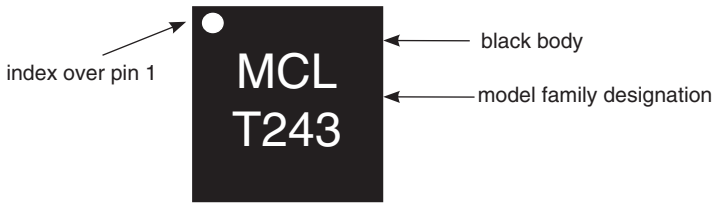


Fig 1. Application and Characterization Circuit

Note: This block diagram is used for characterization. (DUT is soldered on Mini-Circuits Characterization test board TB-MTY2-243+)
Insertion loss, Unbalance & Return loss measured using Keysight's N5242A PNA-X microwave network analyzer.

Conditions:
1. Insertion loss, Unbalance, and Return loss: Pin=-25dBm

Product Marking



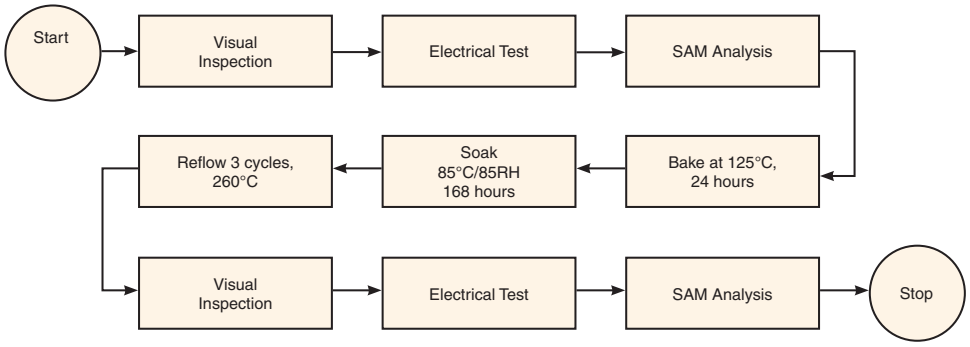
Marking may contain other features or characters for internal lot control

Additional Detailed Technical Information *additional information is available on our dash board. To access this information click here*	
Performance Data	Data Table
	Swept Graphs
	S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC1630-1 *Plastic package, exposed paddle lead finish: Matte-Tin*
Tape & Reel **Standard quantities available on reel**	F66 *7" reels with 20, 50, 100, 200, 500 or 1K devices*
Suggested Layout for PCB Design	PL-656
Evaluation Board	TB-MTY2-243+ & TB-MTY2-243C+
Environmental Ratings	ENV08T1

ESD Rating

Human Body Model (HBM): Class 1A (Pass 250 V) in accordance with ANSI/ESD STM 5.1 - 2001

MSL Test Flow Chart



Additional 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/MCLStore/terms.jsp

RF Transformer MTY2-243+

Typical Performance Data

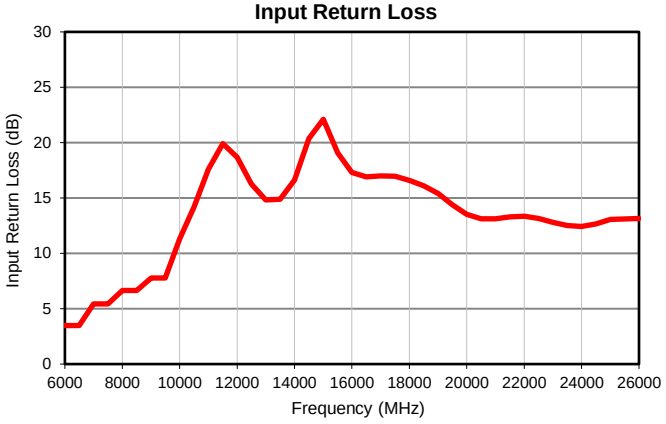
FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE[1] (deg.)
6000	5.43	3.48	2.88	0.68
6500	5.43	3.48	2.88	0.68
7000	3.64	5.43	2.50	0.33
7500	3.64	5.43	2.50	0.33
8000	2.82	6.64	1.96	0.83
8500	2.82	6.64	1.96	0.83
9000	2.08	7.78	1.34	2.12
9500	2.08	7.78	1.34	2.12
10000	1.31	11.29	0.80	4.57
10500	1.08	14.19	0.66	6.02
11000	0.98	17.59	0.62	7.07
11500	0.94	19.91	0.63	7.26
12000	0.93	18.68	0.58	6.76
12500	0.94	16.26	0.43	6.05
13000	0.96	14.84	0.22	5.60
13500	0.95	14.87	0.01	5.46
14000	0.90	16.63	0.25	5.51
14500	0.84	20.36	0.44	5.88
15000	0.81	22.11	0.59	6.74
15500	0.83	19.07	0.62	7.25
16000	0.87	17.32	0.61	7.18
16500	0.91	16.92	0.61	6.87
17000	0.95	16.99	0.66	6.42
17500	0.98	16.96	0.68	5.94
18000	1.00	16.60	0.71	5.15
18500	1.04	16.10	0.77	4.58
19000	1.10	15.42	0.84	4.12
19500	1.21	14.39	0.84	3.94
20000	1.32	13.53	0.75	3.49
20500	1.40	13.12	0.67	2.59
21000	1.44	13.13	0.63	1.66
21500	1.45	13.29	0.53	0.74
22000	1.47	13.35	0.44	0.38
22500	1.51	13.14	0.32	1.37
23000	1.57	12.81	0.19	2.39
23500	1.63	12.51	0.06	2.98
24000	1.71	12.43	0.43	4.28
24500	1.79	12.66	0.89	6.49
25000	1.91	13.08	1.40	9.46
26000	2.26	13.16	2.31	18.40

[1] Relative to 180°

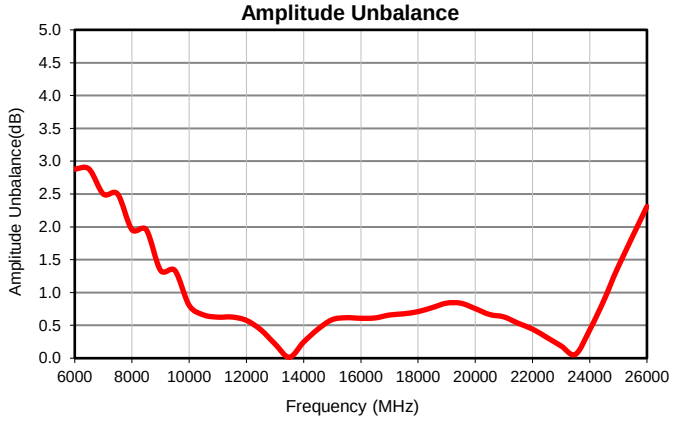
Typical Performance Data

Insertion Loss

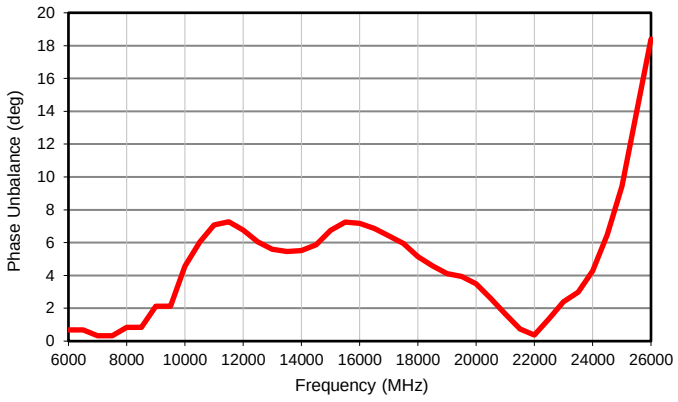
Input Return Loss



Amplitude Unbalance



Phase Unbalance

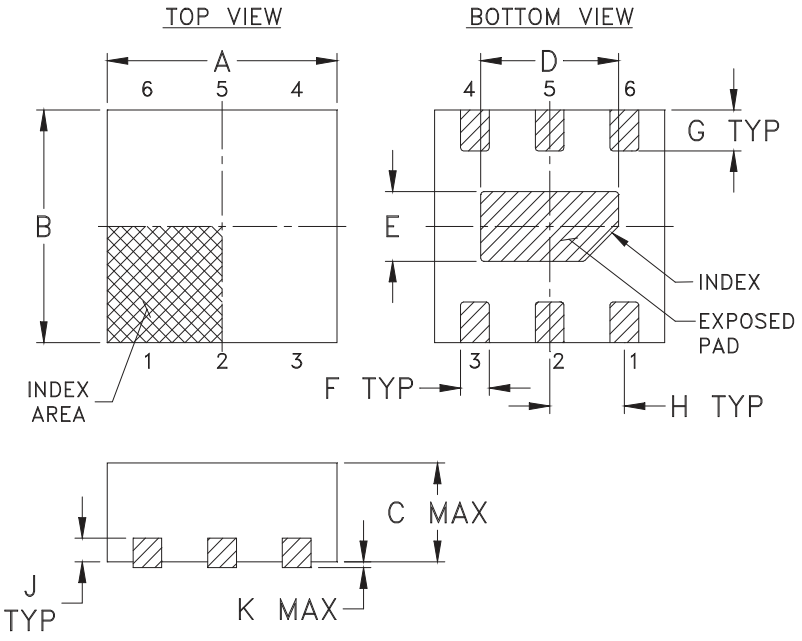


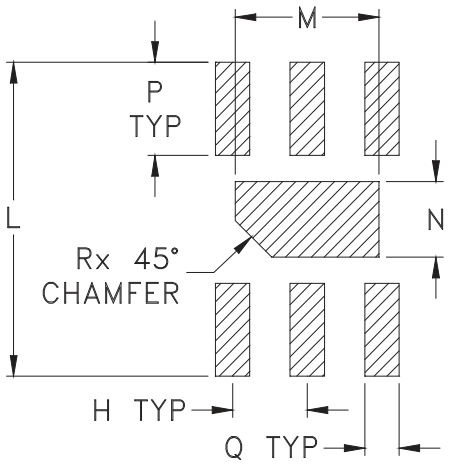
Case Style MC

MC1630-1

Outline Dimensions

PCB Land Pattern





Suggested Layout,
Tolerance to be within ±.002

CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
MC1630-1	.079 (2.00)	.079 (2.00)	.039 (1.00)	.047 (1.20)	.024 (.60)	.010 (.25)	.014 (.35)	.026 (.65)	.008 (.20)	.002 (.05)	.106 (2.70)	.049 (1.25)	.026 (.65)	.031 (.80)

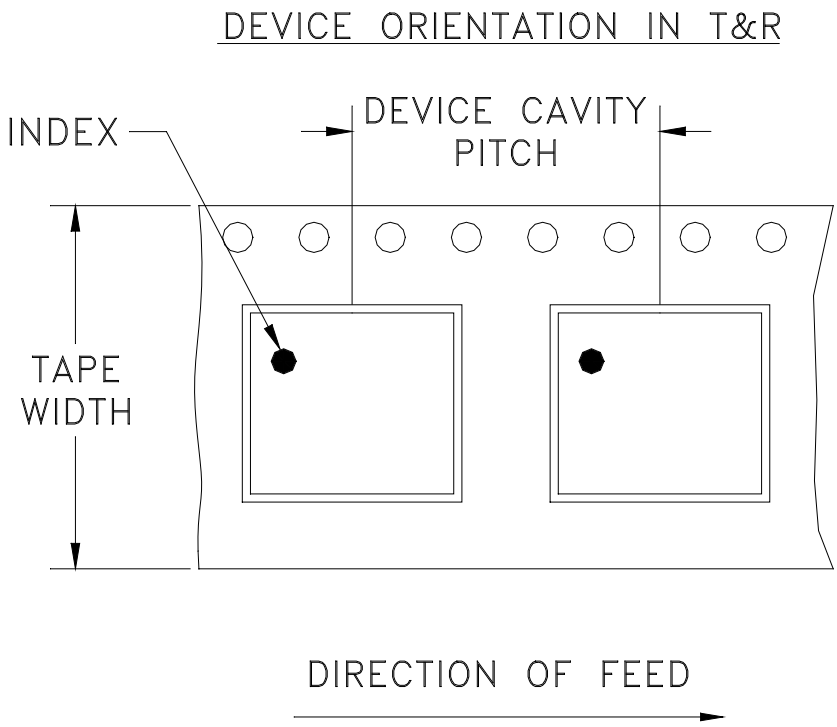
CASE #.	Q	R	WT, GRAM
MC1630-1	.012 (.30)	.012 (.30)	.006

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-Silver over Nickel plated or Matte-Tin plated (See Data sheet).
   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.

Tape & Reel Packaging TR-F66



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
8	4	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000, 2000, 3000

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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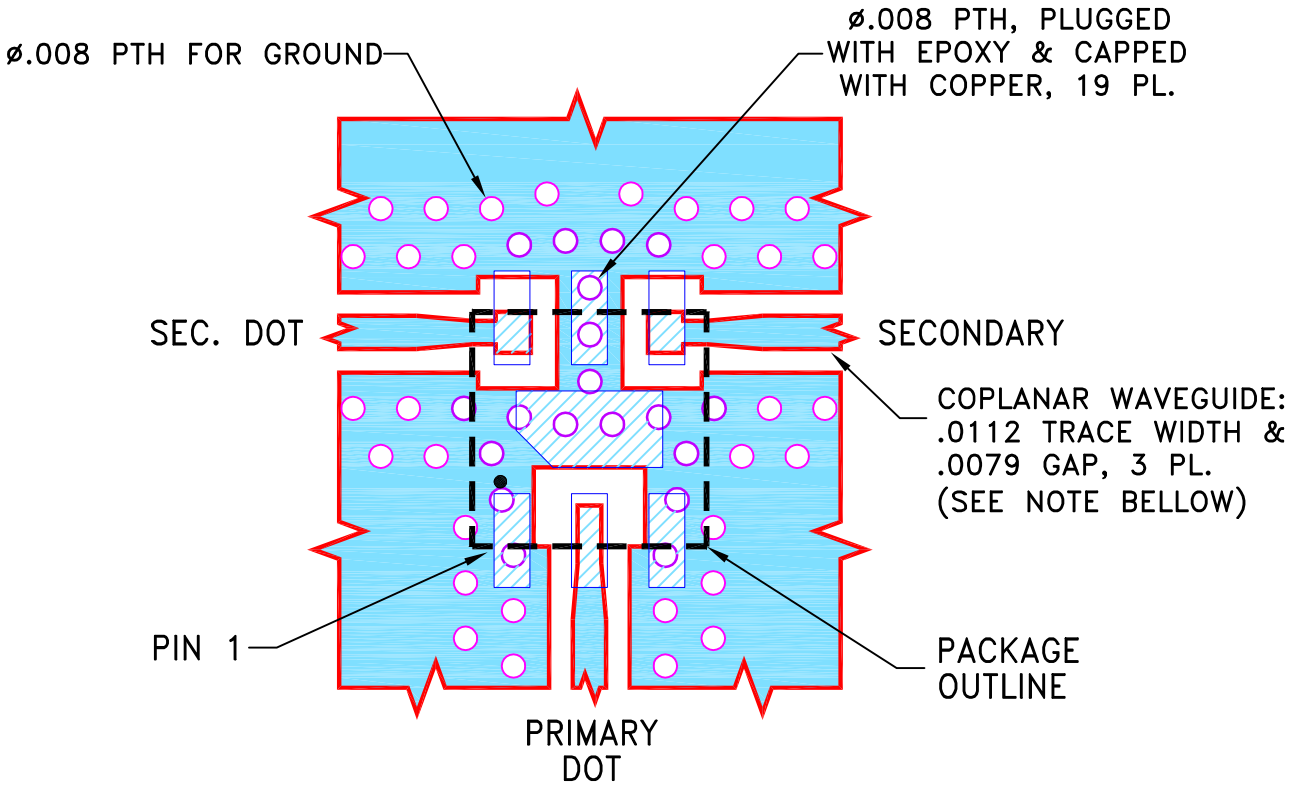
Mini-Circuits ISO 9001 & ISO 14001 Certified

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-000579	NEW RELEASE	11/07/19	ITG	GH

SUGGESTED MOUNTING CONFIGURATION FOR MC1630-1 CASE STYLE



NOTES:

1. TRACE WIDTH & GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .0066±.0007". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. UNIT FOOT PRINT IS OPTIMIZED FOR PERFORMANCE AND IS DIFFERENT FROM CASE STYLE MC1630-1 RECOMMENDATIONS.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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	DRAWN	ITG	11/07/19
TOLERANCES ON:	CHECKED	GF	11/07/19
2 PL DECIMALS ±	APPROVED	GH	11/07/19
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

ASHEETA1.DWG REV:A DATE:01/12/95

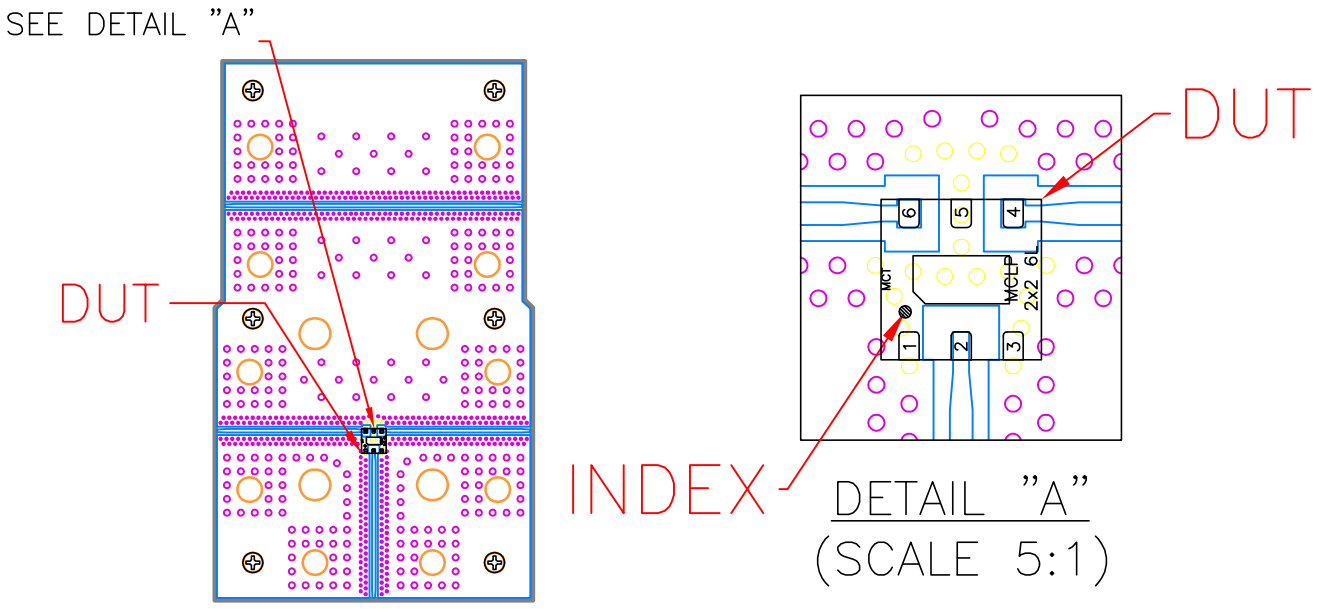
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, MC1630-1, TB-MTY2-243+/243C+

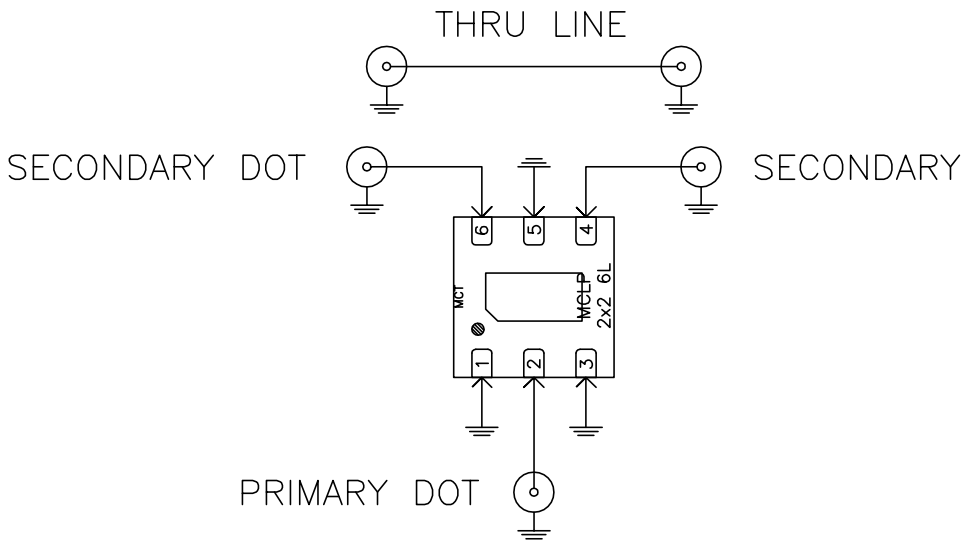
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-656	OR

FILE:	SCALE:	SHEET:
98PL656	15:1	1 OF 1

Evaluation Board and Circuit



DETAIL "A"
(SCALE 5:1)



SCHEMATIC DIAGRAM

Function	Pad
SECONDARY DOT	6
SECONDARY	4
PRIMARY DOT	2
GND	1,3,5

Notes:

1. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.0066 inch

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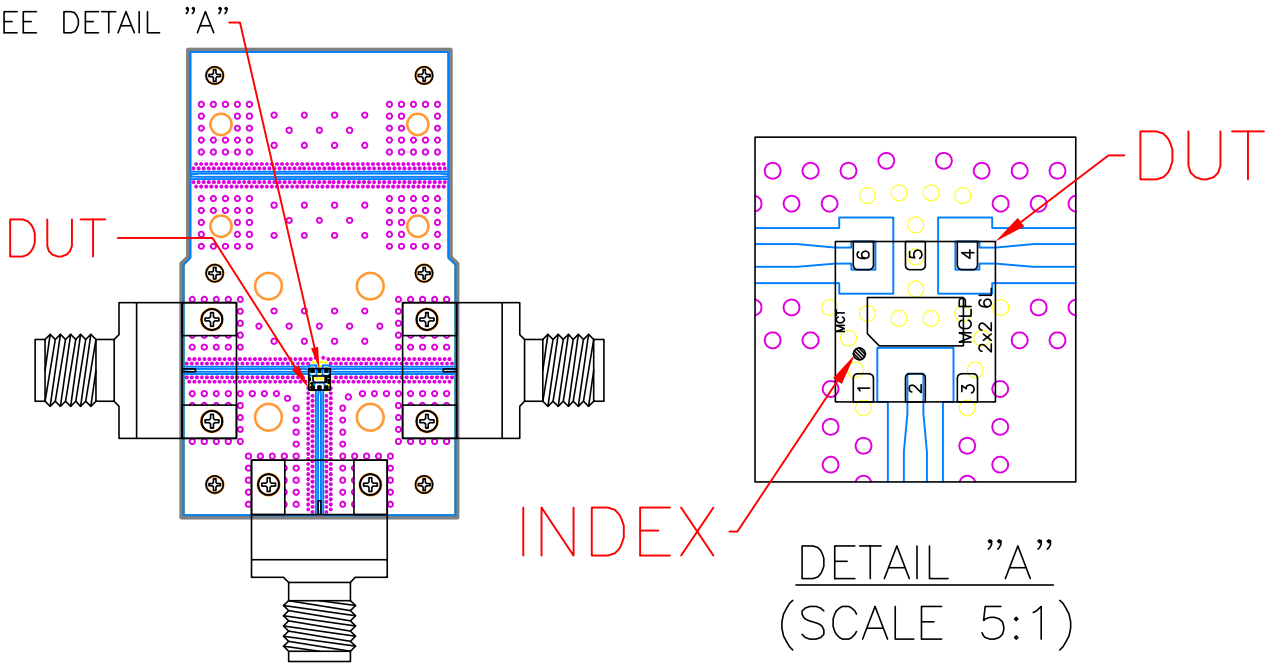
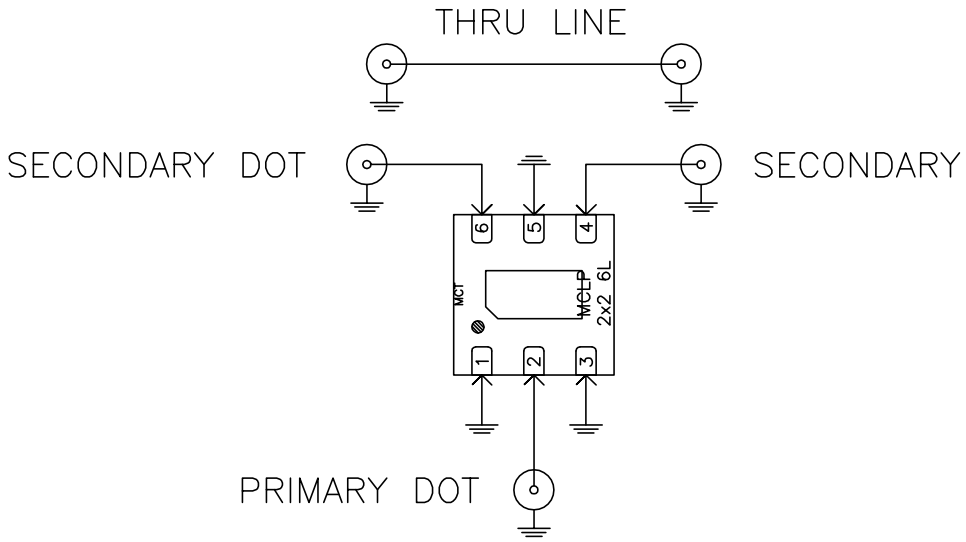
Evaluation Board and Circuit



DETAIL "A"
(SCALE 5:1)



SCHEMATIC DIAGRAM

Function	Pad
SECONDARY DOT	6
SECONDARY	4
PRIMARY DOT	2
GND	1,3,5

Notes:

1. 2.4mm Female Connectors,
1. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.0066 inch

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Mini-Circuits

Environmental Specifications **ENV08T1**

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 or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
HTOL	1000 hours at 125°C	MIL-STD-883, Method 1005, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak	J-STD-020

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
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