

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 <ul style="list-style-type: none"> <li>• 1.0 dB, 10 to 20 GHz</li> <li>• 1.5 dB, 20 to 24 GHz</li> </ul>	Enables excellent signal power transmission from input to output.
Low unbalance <ul style="list-style-type: none"> <li>• 0.7 dB amplitude unbalance</li> <li>• 6° phase unbalance</li> </ul>	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.

# MMIC Balun RF Transformer

## MTY2-243+

50Ω 10 to 24 GHz

### 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

### Applications

- Radar
- SATCOM
- Instrumentation



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

### Electrical Specifications at 25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Unit
Impedance Ratio			2		
Frequency Range		10		24	GHz
Insertion Loss <sup>1</sup>	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 <sup>3</sup>	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

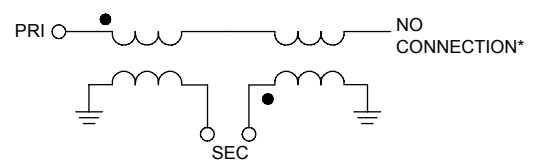
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-65°C to 150°C
Input RF Power	31 dBm

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



Characterization Test Circuit

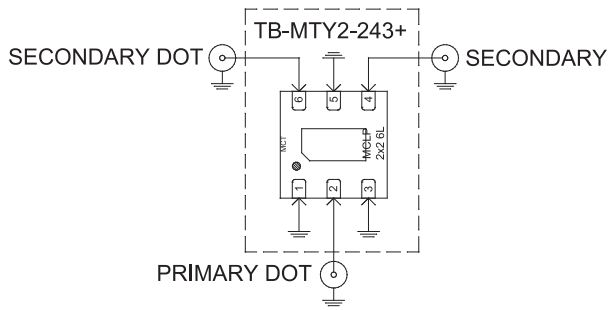


Fig 1. Application and Characterization Circuit

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



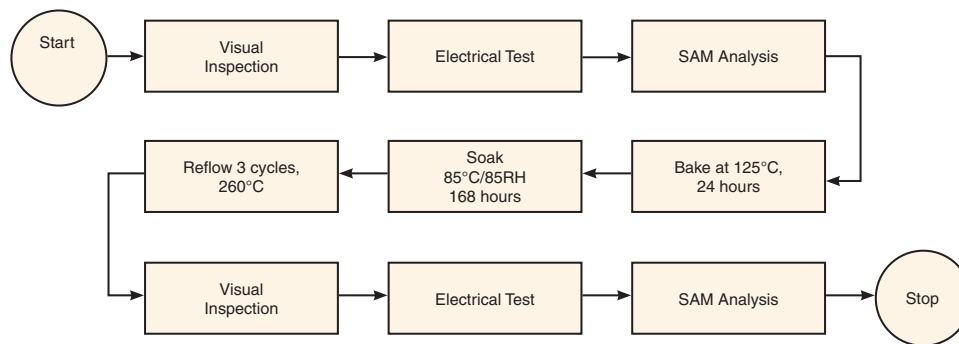
Marking may contain other features or characters for internal lot control

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

# MTY2-243+

## Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE <sup>(1)</sup> (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

<sup>(1)</sup> Relative to 180°



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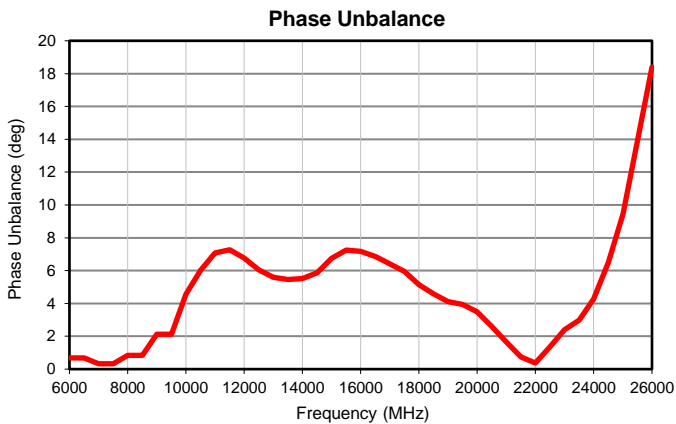
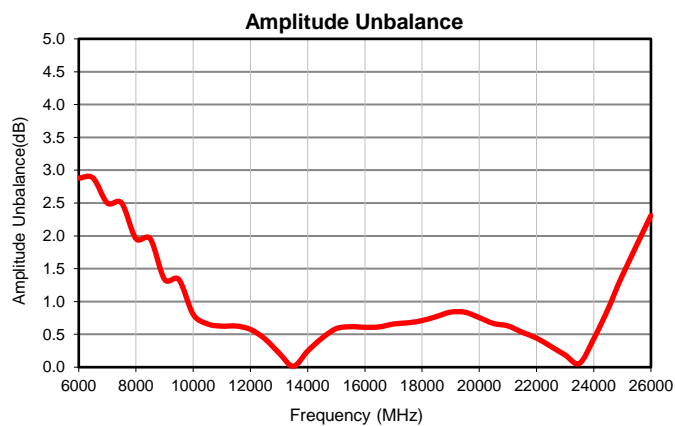
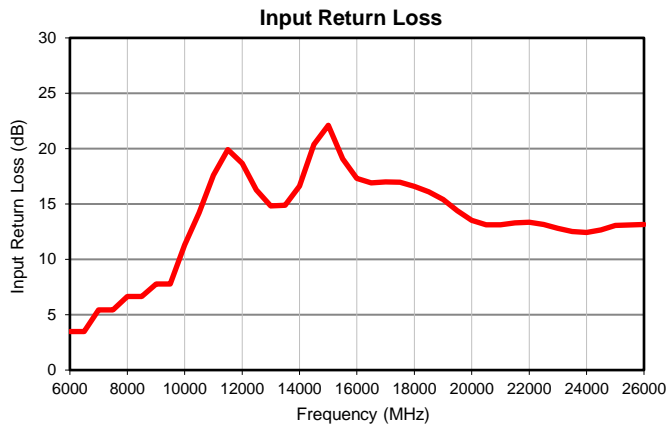


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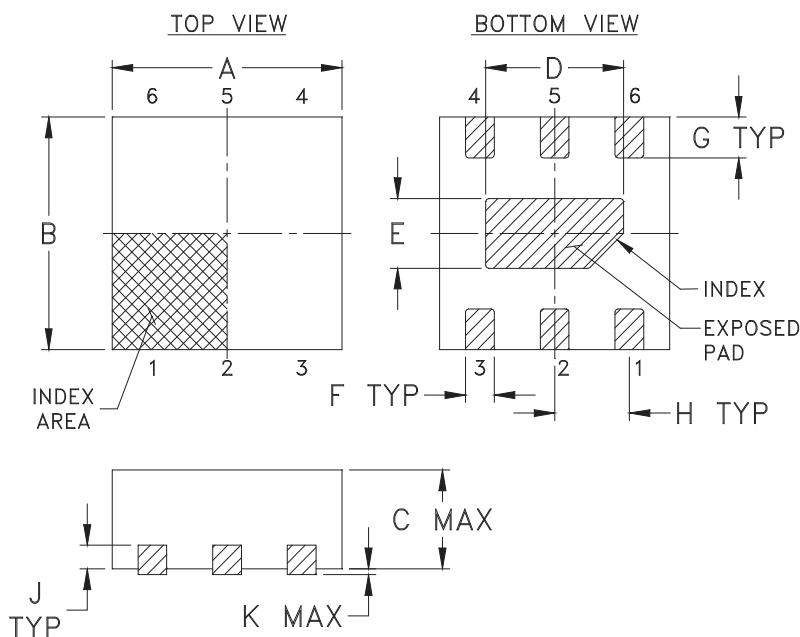
IF/RF MICROWAVE COMPONENTS

REV. OR  
MTY2-243+  
12/12/2019  
Page 1 of 1

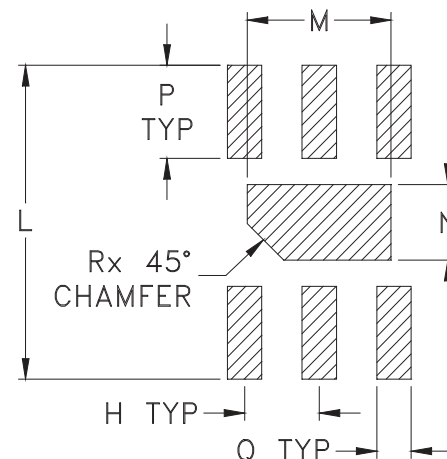
## Typical Performance Data



### Outline Dimensions



### PCB Land Pattern



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

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.  $\pm .01$ ; 3 Pl.  $\pm .005$

#### Notes:

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



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RF/IF MICROWAVE COMPONENTS

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

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INTERNET <http://www.minicircuits.com>

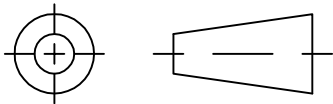
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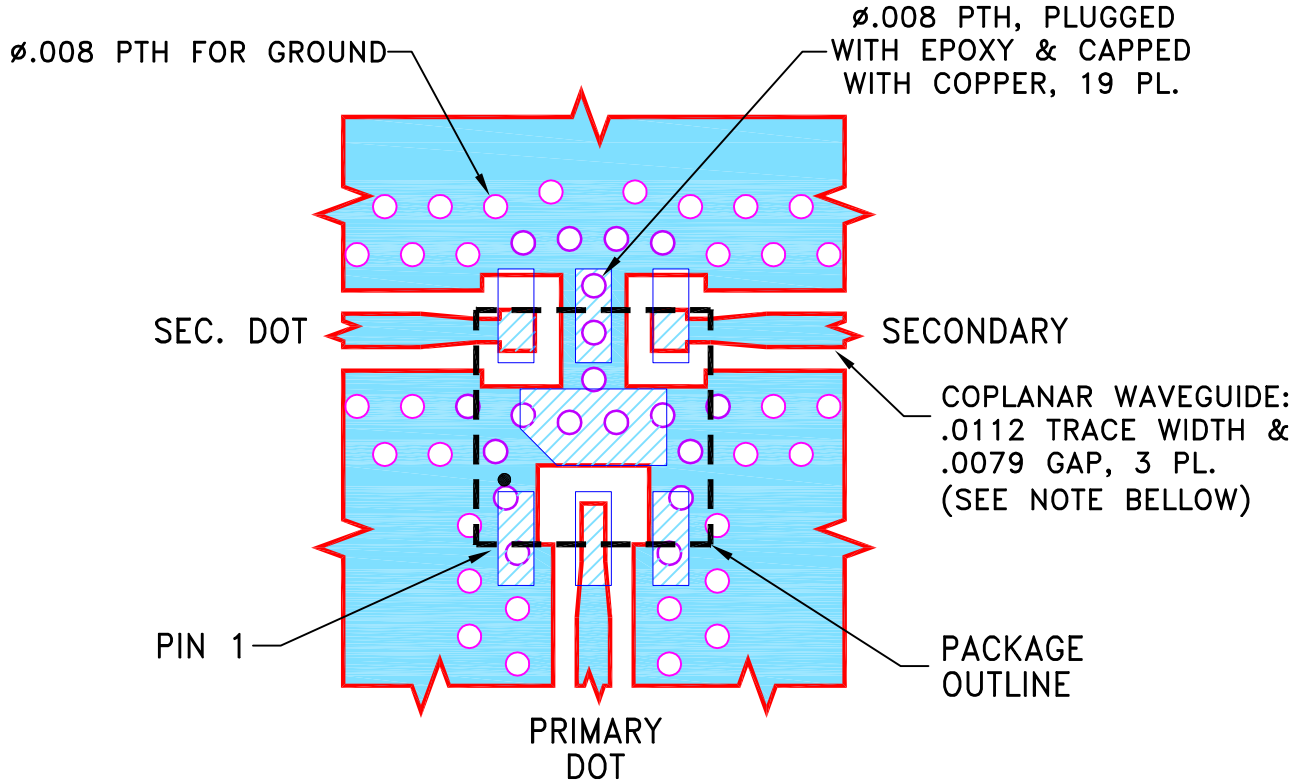
THIRD ANGLE PROJECTION



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  $.0066 \pm .0007$ ". 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
DRAWN	ITG	11/07/19
CHECKED	GF	11/07/19
APPROVED	GH	11/07/19

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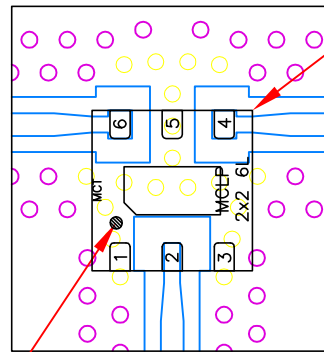
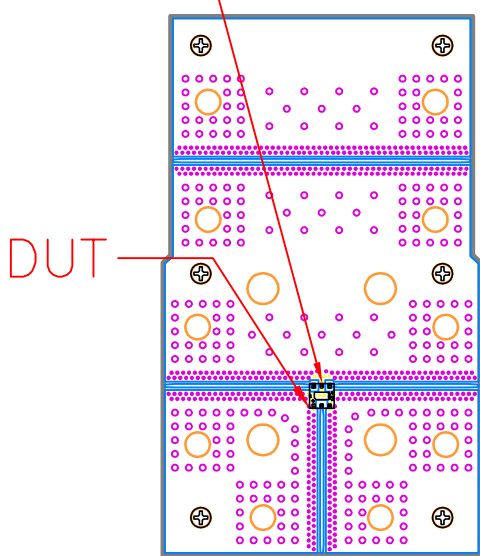
PL, MC1630-1, TB-MTY2-243+/243C+

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-656	REV: OR
FILE: 98PL656	SCALE: 15:1	SHEET: 1 OF 1	

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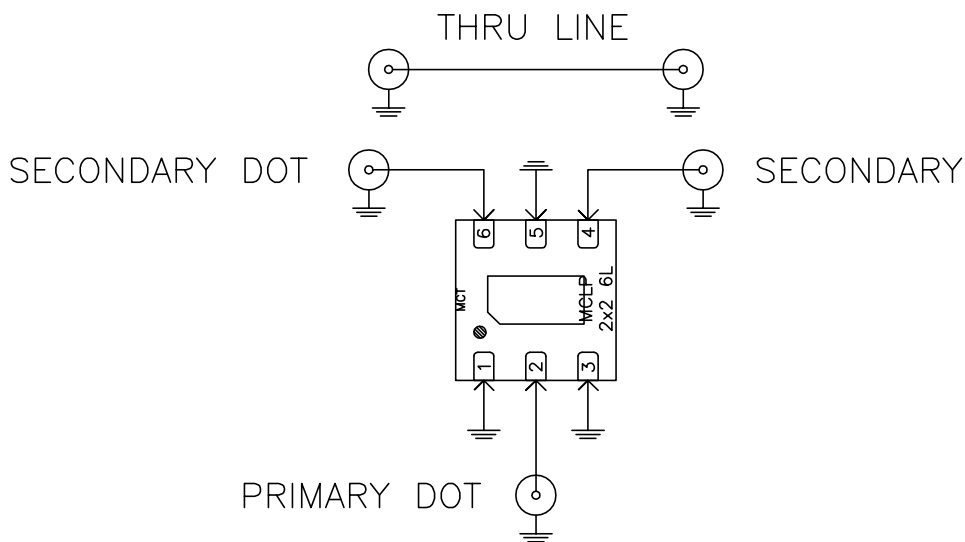
# Evaluation Board and Circuit

SEE DETAIL "A"



DUT

INDEX  
DETAIL "A"  
(SCALE 5:1)




SCHEMATIC DIAGRAM

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

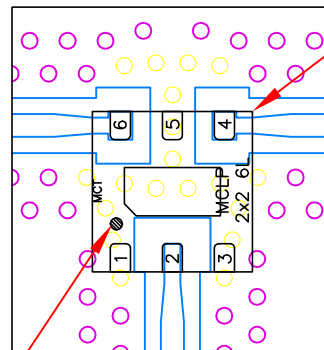
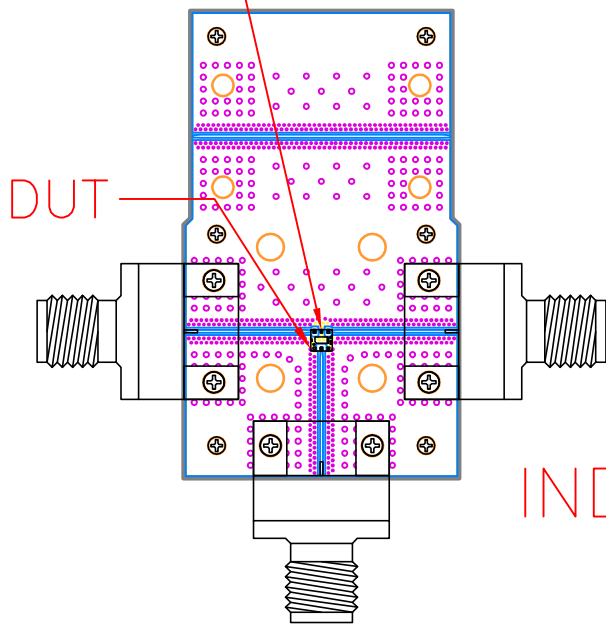
## Notes:

1. PCB Material: Roger R04350B or equivalent,  
Dielectric constant=3.5, Thickness=0.0066 inch

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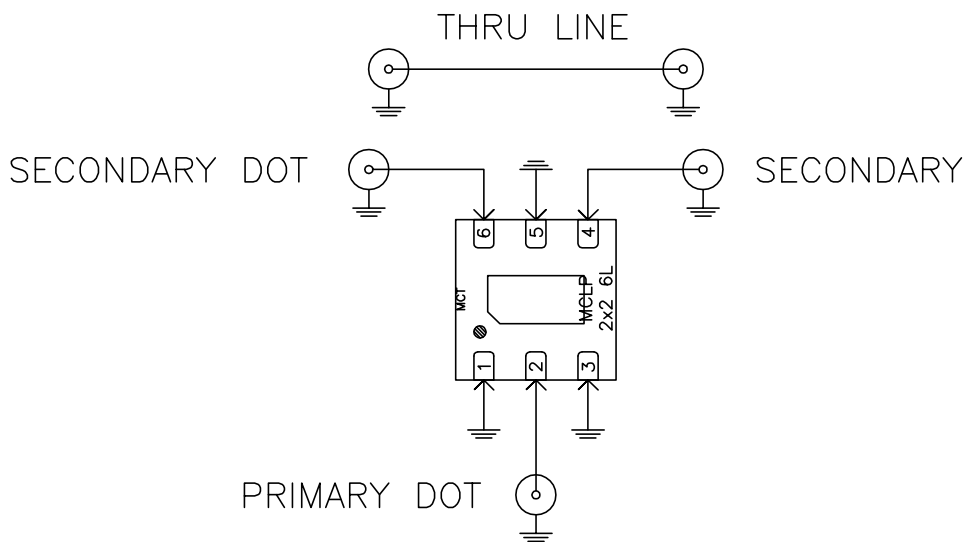
# Evaluation Board and Circuit

SEE DETAIL "A"



INDEX

DETAIL "A"  
(SCALE 5:1)




SCHMATIC DIAGRAM

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

## Notes:

- 2.4mm Female Connectors,
- PCB Material: Roger R04350B or equivalent,  
Dielectric constant=3.5, Thickness=0.0066 inch

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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 or -45° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether +	MIL-STD-202, Method 215



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<b>Specification</b>	<b>Test/Inspection Condition</b>	<b>Reference/Spec</b>
	monoethanolamine at 63°C to 70°C	