



Mini-Circuits

MICROWAVE PRECISION

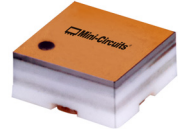
# Fixed Attenuator

RCAT-04+

50Ω 2 W 4 dB DC to 20 GHz

## THE BIG DEAL

- Wide Bandwidth, DC to 20 GHz
- Excellent Power Handling, 2 W
- Excellent Attenuation Accuracy & Flatness
- Miniature Size, 2.25 x 2.25 x 1.1 mm
- Ceramic, Hermetic, Nitrogen Filled
- Aqueous Washable



Generic photo used for illustration purposes only

CASE STYLE: LZ1737

## +RoHS Compliant

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

## APPLICATIONS

- Cellular
- PCS
- Communications
- Radar
- Wideband Military
- Test and Measurement Equipment

## PRODUCT OVERVIEW

RCAT-04+ (RoHS compliant) is a wideband fixed attenuator with excellent attenuation accuracy and flatness. It can handle up to 2 W. The integrated circuits comprising of thin film resistors is bonded in an optimized multi layer integrated LTCC substrate, and then hermetically sealed under a controlled nitrogen atmosphere with gold-plated covers and eutectic AuSn solder. These attenuators are capable of meeting MIL requirements for gross leak, fine leak, thermal shock, vibration, acceleration, mechanical shock, and HTOL. The testing can be done if requested.

## KEY FEATURES

Feature	Advantages
Max Power Input 2 W	Thermally optimized design can operate reliably at much higher input power as compared to similar devices
Wide Bandwidth, DC to 20 GHz	Supports a broad band of applications with predictable and repeatable performance, excellent choice to buffer cascaded reflective components.
Ceramic Hermetic Package	Highly reliable hermetic package provides predictable and repeatable performance in military applications including ground, air, and ship requirements
Very Small Size	Miniature 2.25 mm x 2.25 mm and very low profile of 1.1 mm.

REV. C  
ECO-024243  
RCAT-04+  
MCL NY  
250116



ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25°C, 50Ω

Parameter	Condition (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		DC		20	GHz
Attenuation	1	3.5	4.04	4.5	dB
	10	3.9	4.43	4.9	
	20	4.3	5.10	5.9	
Return Loss	1		30		dB
	10		19		
	20		15		

1. Tested using characterization test circuit as defined in Figure 1. See data and graphs for performance at all other frequencies.

ABSOLUTE MAXIMUM RATINGS<sup>2</sup>

Parameter	Ratings
Operating Case Temperature <sup>3</sup>	-55°C to +125°C
Storage Temperature	-65°C to +150°C
RF Input Power <sup>4</sup>	2 W at +25°C

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

3. Case is defined as ground lead.

4. RF Power at +25°C case temperature: 2 W. Derate linearly to 0.33 W at +125°C.



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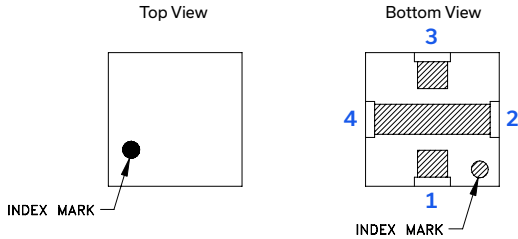
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## PAD DESCRIPTION

Function	Pad Number	Description
RF-IN / RF-OUT	1	RF input / output pad
RF-OUT / RF-IN	3	RF input / output pad
GND	2,4	Connected to circuit ground



## CHARACTERIZATION TEST CIRCUIT

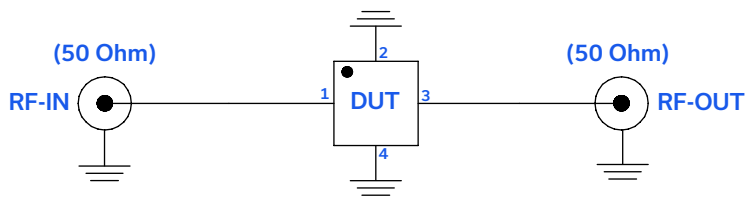
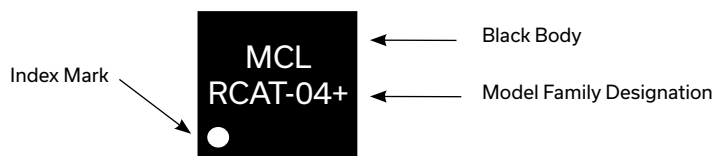


Fig 1. Block diagram of Test Circuit used for characterization. Characterization was performed by Modelithics, conditions test board details are available at: [www.modelithics.com/mvp/minicircuits](http://www.modelithics.com/mvp/minicircuits)

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control.





MICROWAVE PRECISION

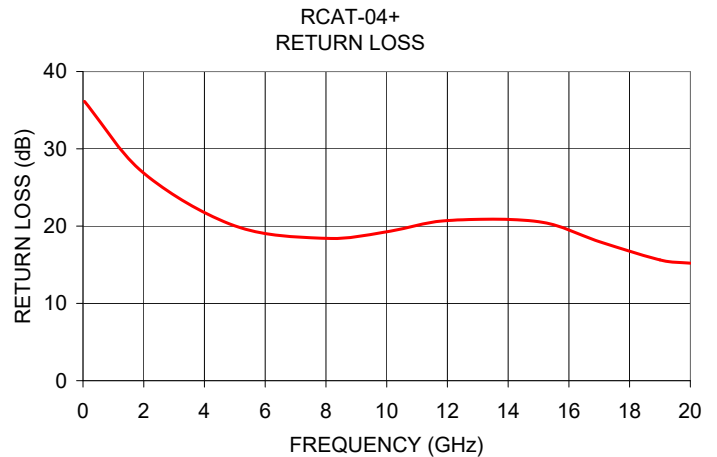
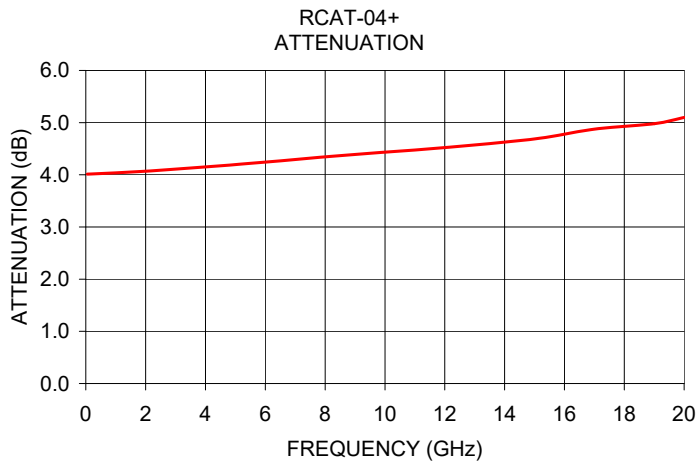
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TYPICAL PERFORMANCE DATA AT +25°C

Frequency (GHz)	Attenuation (dB)	VSWR (:1)
0.05	4.01	36.14
2.00	4.07	26.85
5.00	4.19	20.04
8.00	4.34	18.42
10.00	4.43	19.26
12.00	4.52	20.72
15.00	4.69	20.57
17.00	4.88	18.00
19.00	4.98	15.63
20.00	5.10	15.20





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# Fixed Attenuator

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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. [CLICK HERE](#)

Performance Data and Graphs	Data Table
	Swept Graphs
Case Style	LZ1737 Ceramic package, Terminal finish: Ni-Pd-Au
Tape & Reel	F66
Suggested Layout for PCB Design	PL-386
Evaluation Board	TB-668-04+
Environmental Ratings	ENV71

## ESD RATING

Human Body Model (HBM): Class 1A (Pass 250 V) (JESD22-A114)

Machine Model (MM): Class B (Pass 200 V) (JESD22-A115)

## MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

## NOTES

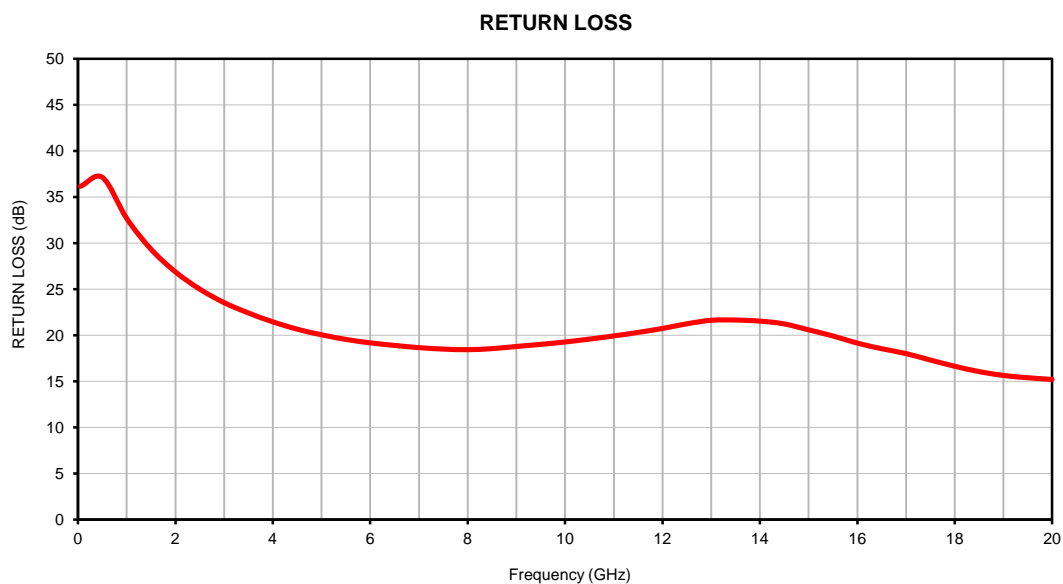
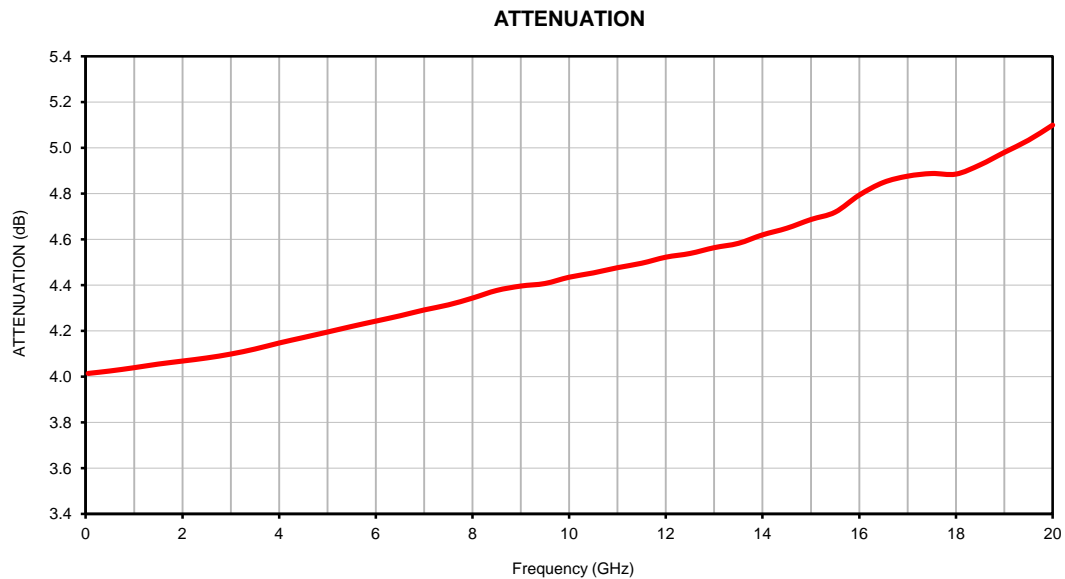
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*Typical Performance Data*

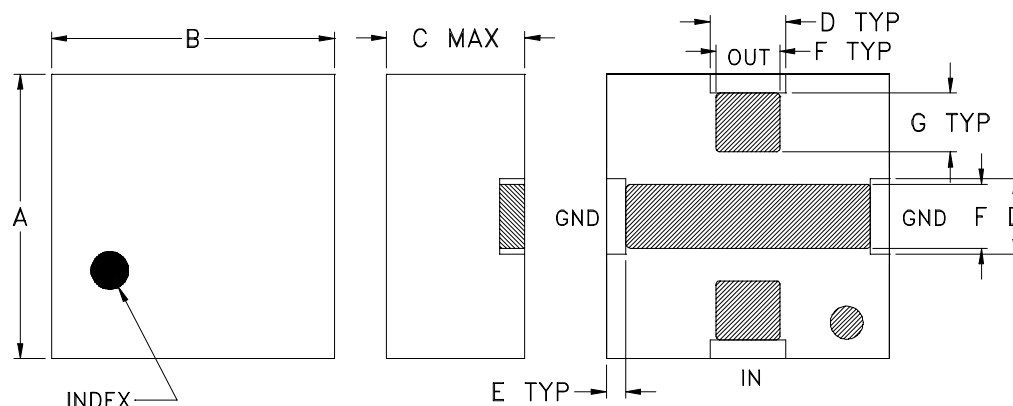
FREQUENCY (GHz)	ATTENUATION (dB)	RETURN LOSS (dB)
0.05	4.01	36.14
0.5	4.02	37.10
1.0	4.04	32.64
1.5	4.05	29.31
2.0	4.07	26.85
2.5	4.08	24.98
3.0	4.10	23.52
3.5	4.12	22.40
4.0	4.15	21.44
4.5	4.17	20.64
5.0	4.19	20.04
5.5	4.22	19.54
6.0	4.24	19.16
6.5	4.27	18.88
7.0	4.29	18.65
7.5	4.31	18.49
8.0	4.34	18.42
8.5	4.38	18.54
9.0	4.40	18.77
9.5	4.41	19.00
10.0	4.43	19.26
10.5	4.45	19.57
11.0	4.48	19.91
11.5	4.50	20.30
12.0	4.52	20.72
12.5	4.54	21.23
13.0	4.56	21.61
13.5	4.58	21.64
14.0	4.62	21.52
14.5	4.65	21.22
15.0	4.69	20.57
15.5	4.72	19.91
16.0	4.79	19.14
16.5	4.85	18.53
17.0	4.88	18.00
17.5	4.89	17.30
18.0	4.88	16.63
18.5	4.93	16.05
19.0	4.98	15.63
19.5	5.03	15.38
20.0	5.10	15.20

## Typical Performance Curves

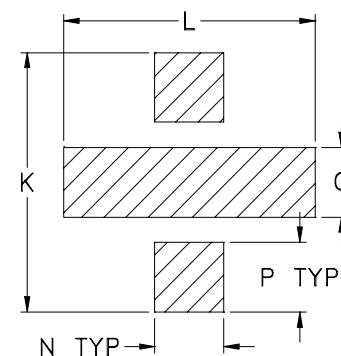


## Outline Dimensions

LZ1737



## PCB Land Pattern



Suggested Layout  
Pattern to be within  $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M
LZ1737	.089 (2.250)	.089 (2.250)	.043 (1.10)	.024 (.600)	.006 (.150)	.020 (.508)	.018 (.465)	- -	.010 (.255)	.089 (2.26)	.089 (2.26)	- -

CASE #	N	P	Q	R	WT. GRAM
LZ1737	.022 (.550)	.026 (.66)	.017 (.432)	- -	.015

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

### Notes:

1. Case material: Ceramic.
2. Base material: 36 mil thk laminate.
3. Termination finish: Electroless Nickel-Palladium-Gold Plate.



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

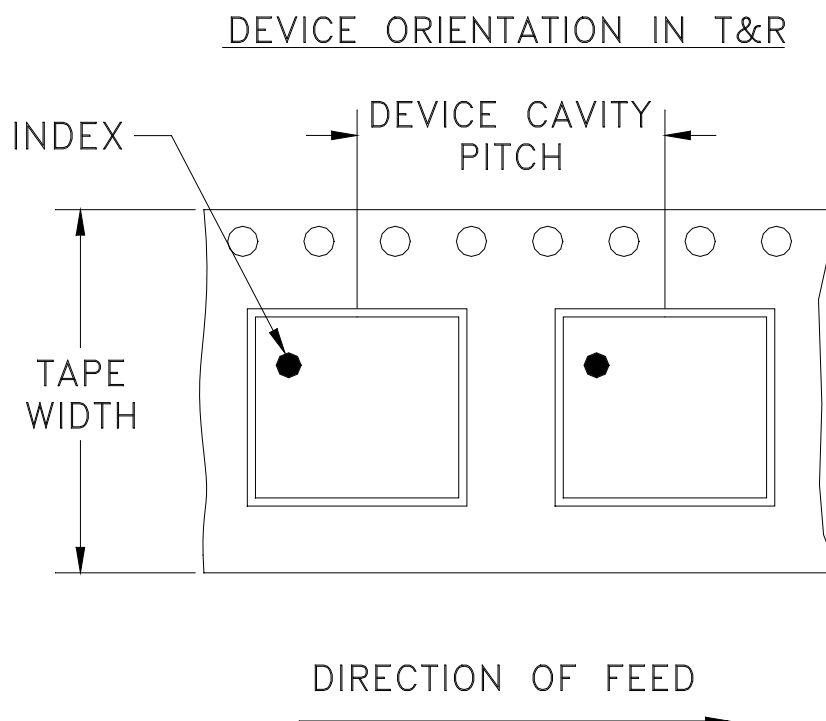
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# Tape & Reel Packaging TR-F66



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)

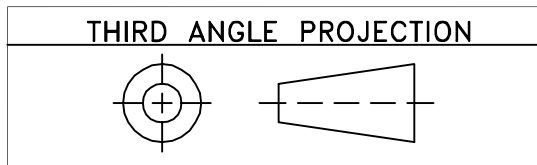


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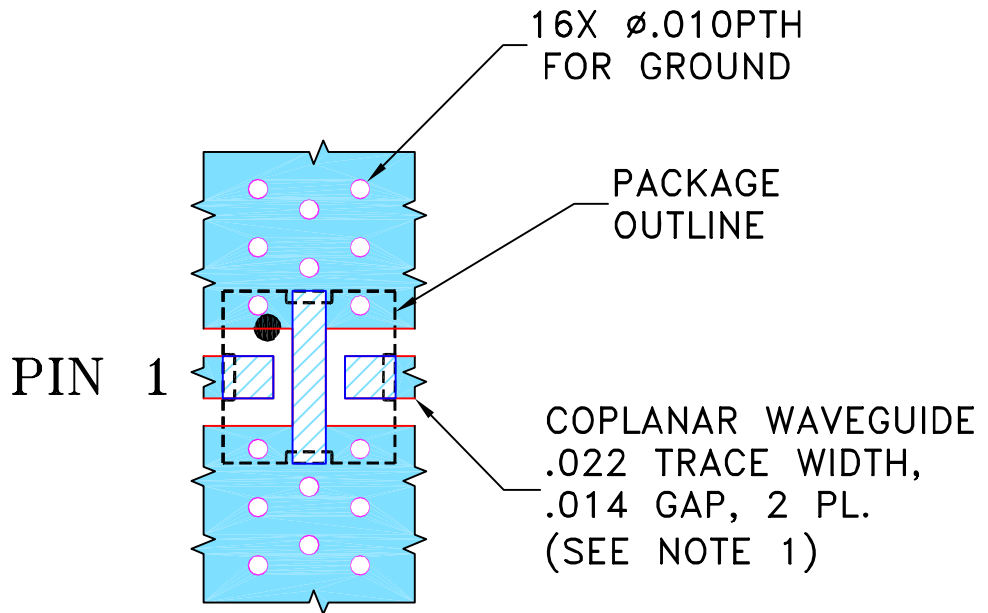
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REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M138802	NEW RELEASE	12/07/12	AV	BT
A	M142XXX	REDESIGNED PL-DRAWING	07/17/13	IL	RD

SUGGESTED MOUNTING CONFIGURATION FOR  
LZ1737 CASE STYLE, "04AF03" PIN CODE



NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"  $\pm$  .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
3. IN ORDER TO ACHIEVE PERFORMANCE AT HIGHER FREQUENCIES, THICKNESS OF SOLDER MASK SHALL BE MINIMAL.



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 $\pm$ 3 PL DECIMALS $\pm$ .005 ANGLES $\pm$ FRACTIONS $\pm$	DRAWN	AV	09/19/12
	CHECKED	IL	10/11/12
	APPROVED	BT	12/07/12



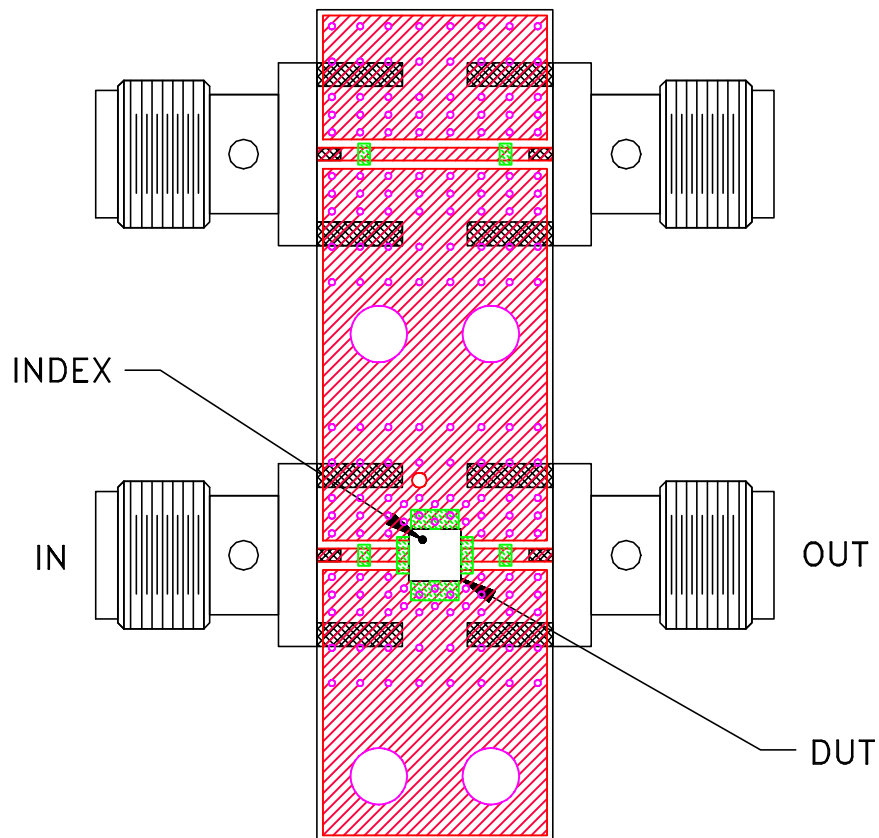
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PL, 04AF03, LZ1737, TB-668-XX+

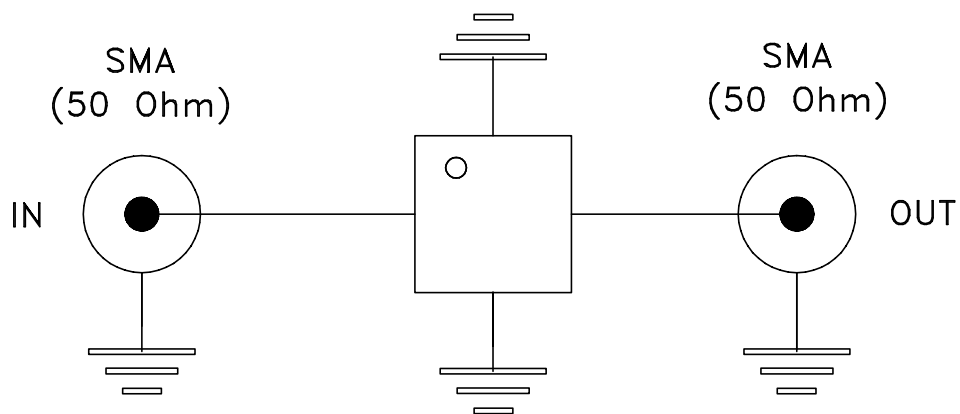
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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-386	A
FILE:	98PL386	SCALE: 10:1	SHEET: 1 OF 1

# Evaluation Board and Circuit




TB-668-04+



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.010 inch.

 **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	-55° to 125° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Thermal Shock (device level)	-55° to 125°C, 100 cycles	MIL-STD-202, Method 107
Thermal Shock (board level)	-55° to 150°C, 1000 cycles	MIL-STD-202, Method 107
HTOL	1000 hours, 25°C, @ rated power	MIL-STD-202, Method 108, cond D.
Constant Acceleration	Y1 plane only, 30 Kg	MIL-STD-883, Method 2001, Cond. E
Vibration	10-2000MHz sine, 20g, 3 axis	MIL-STD-202, Method 204, Cond. 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
PIND	20G's @130 Hz	MIL-STD-750, Method 2052.2
Resistance to Soldering Heat	3X Reflow, Peak Temperature 260°C	JESD22-B102
Moisture Sensitivity Level	Hermetic device, MSL-1 by construction	JESD22-A113, MSL1/260
Hermeticity	Fine Leak, Gross Leak	MIL-STD-202, Method 112, Cond. C&D



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Specification	Test/Inspection Condition	Reference/Spec
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22 - Method A102