MICROWAVE PRECISION

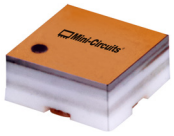
Fixed Attenuator

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

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ELECTRICAL SPECIFICATIONS[1] 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[2]

Parameter	Ratings
Operating Case Temperature[3]	-55°C to +125°C
Storage Temperature	-65°C to +150°C
RF Input Power[4]	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.

Fixed Attenuator

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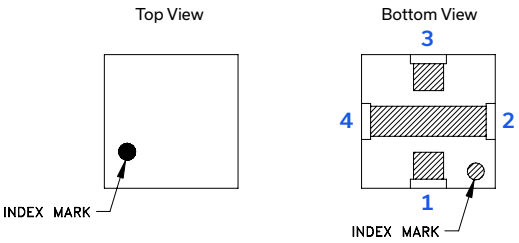


PAD DESCRIPTION

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

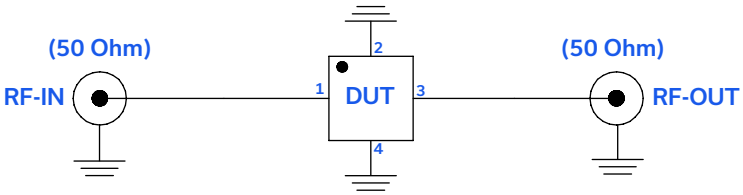
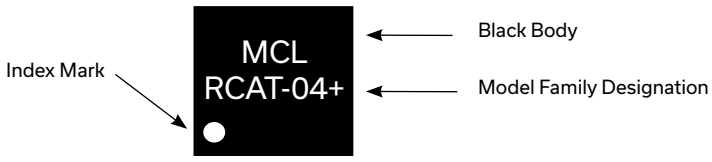


Fig 1. Block diagram of Test Circuit used for characterization. Characterization was performed by Modelithics, conditions test board details are available at: www.modelithics.com/mvp/minicircuits

PRODUCT MARKING



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

MICROWAVE PRECISION

Fixed Attenuator

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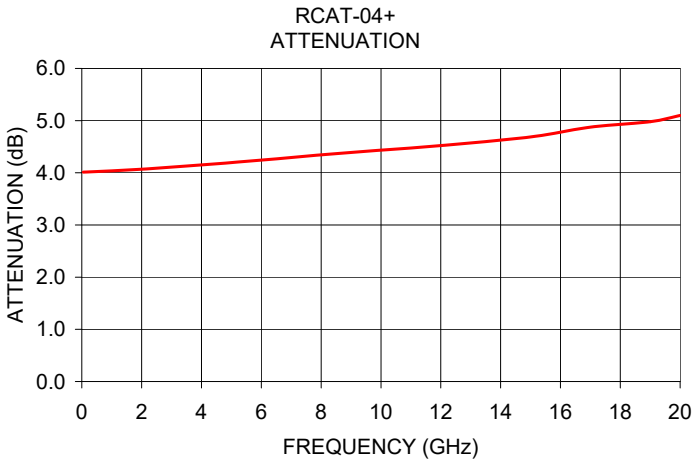
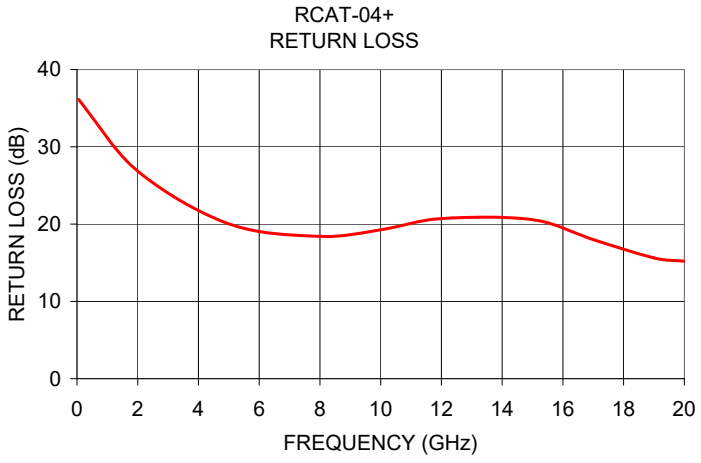
TYPICAL PERFORMANCE DATA AT +25°C

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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RCAT-04+

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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

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

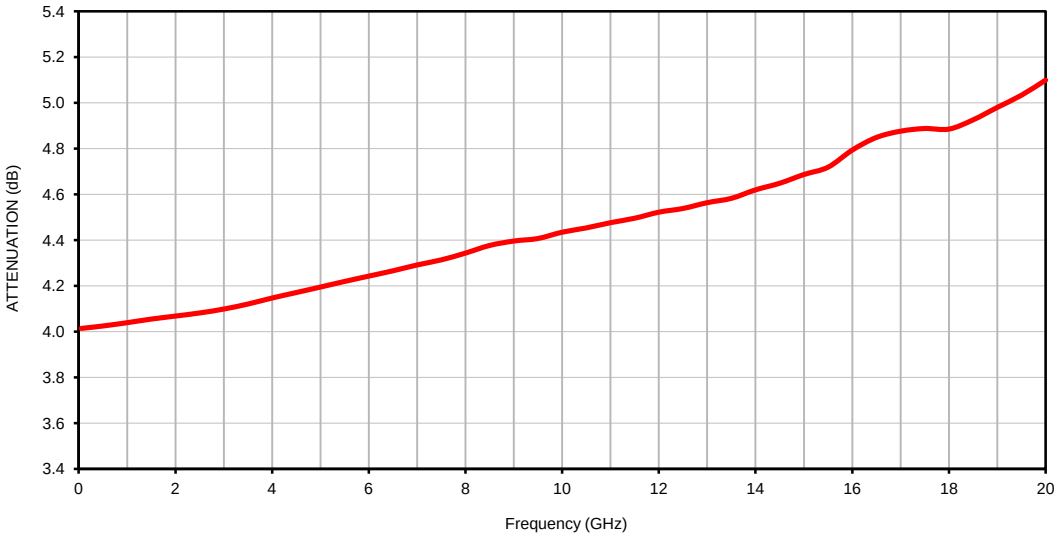
Fixed Attenuator RCAT-04+

Typical Performance Data

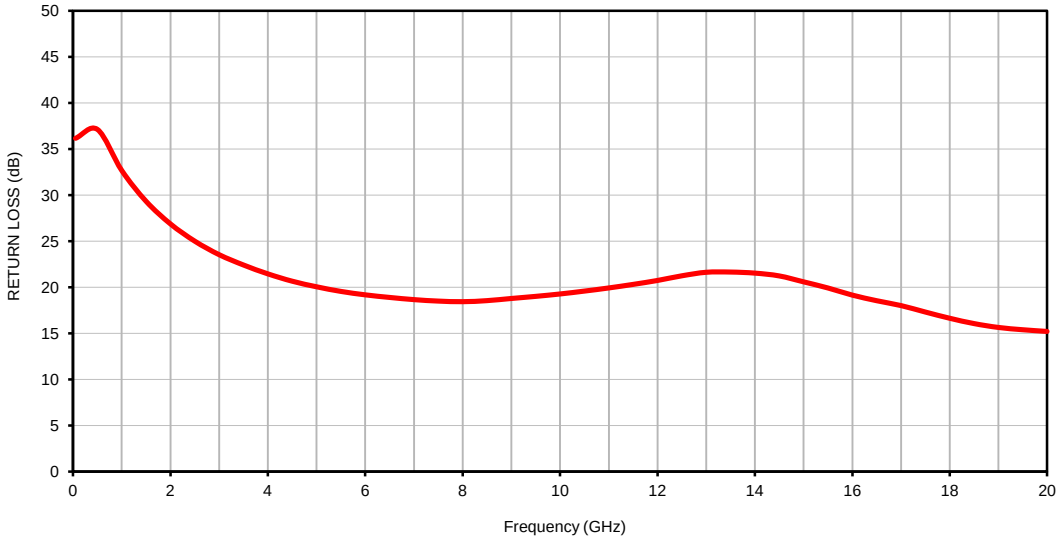
FREQUENCY (GHz)	ATTENUATION (dB)	RETURN LOSS (dB)
0.05	4.01	36.14
0.5	4.02	37.10
1.0	4.04	32.64
1.5	4.05	29.31
2.0	4.07	26.85
2.5	4.08	24.98
3.0	4.10	23.52
3.5	4.12	22.40
4.0	4.15	21.44
4.5	4.17	20.64
5.0	4.19	20.04
5.5	4.22	19.54
6.0	4.24	19.16
6.5	4.27	18.88
7.0	4.29	18.65
7.5	4.31	18.49
8.0	4.34	18.42
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

ATTENUATION



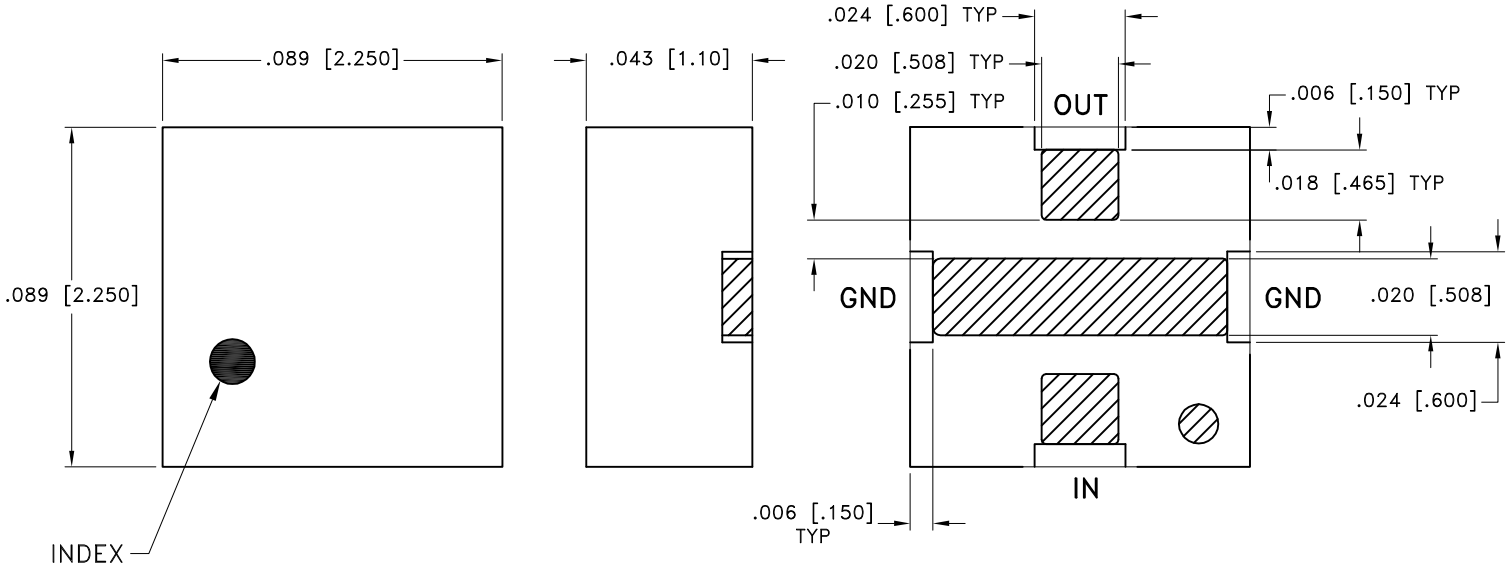
RETURN LOSS



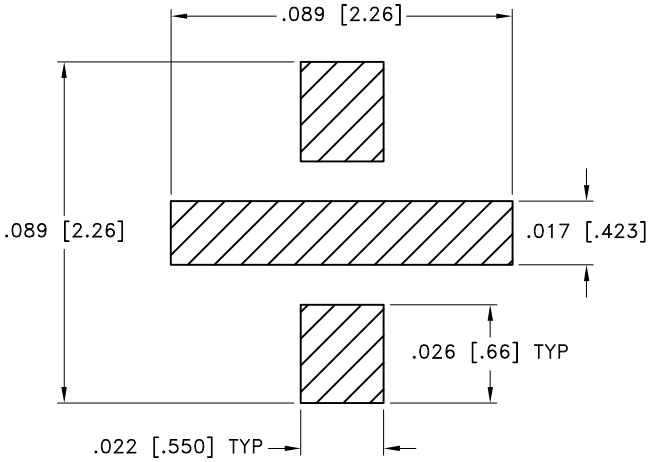
Case Style LZ

Outline Dimensions

LZ1737



PCB LAND PATTERN



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

NOTES:

1. DENOTES METALLIZATION

Weight: .015 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl. ±.005 Inch

Notes:

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

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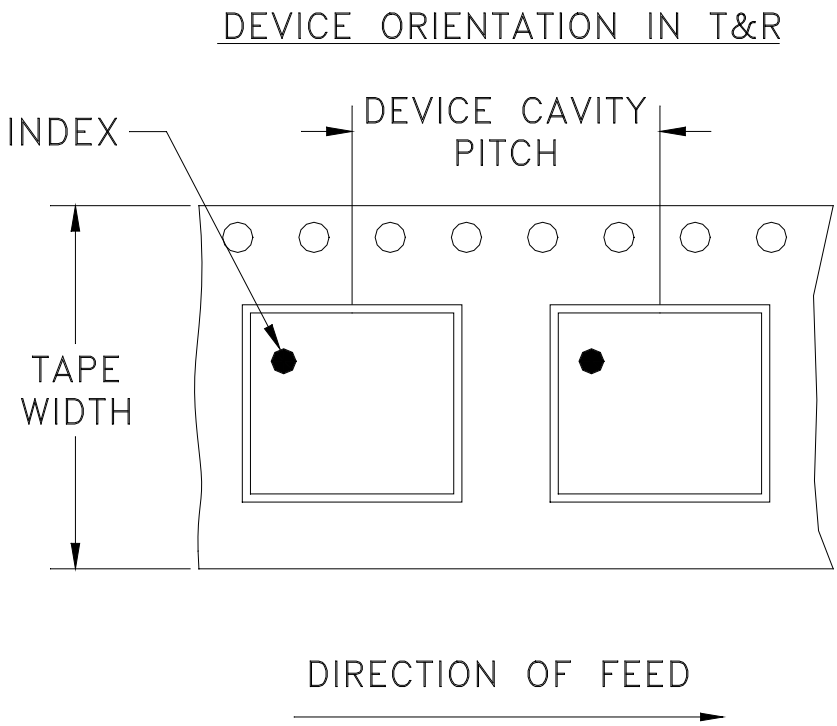
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com
RF/IF MICROWAVE COMPONENTS

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

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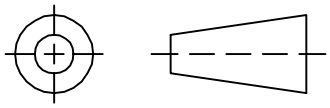
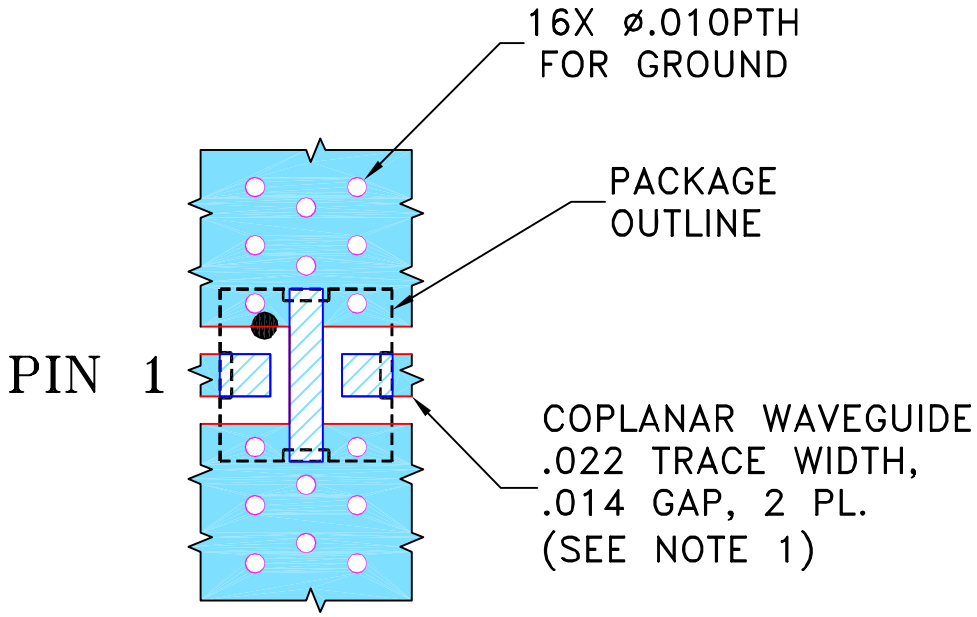
THIRD ANGLE PROJECTION



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" ± .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	DRAWN	AV	09/19/12
TOLERANCES ON:	CHECKED	IL	10/11/12
2 PL DECIMALS ±	APPROVED	BT	12/07/12
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

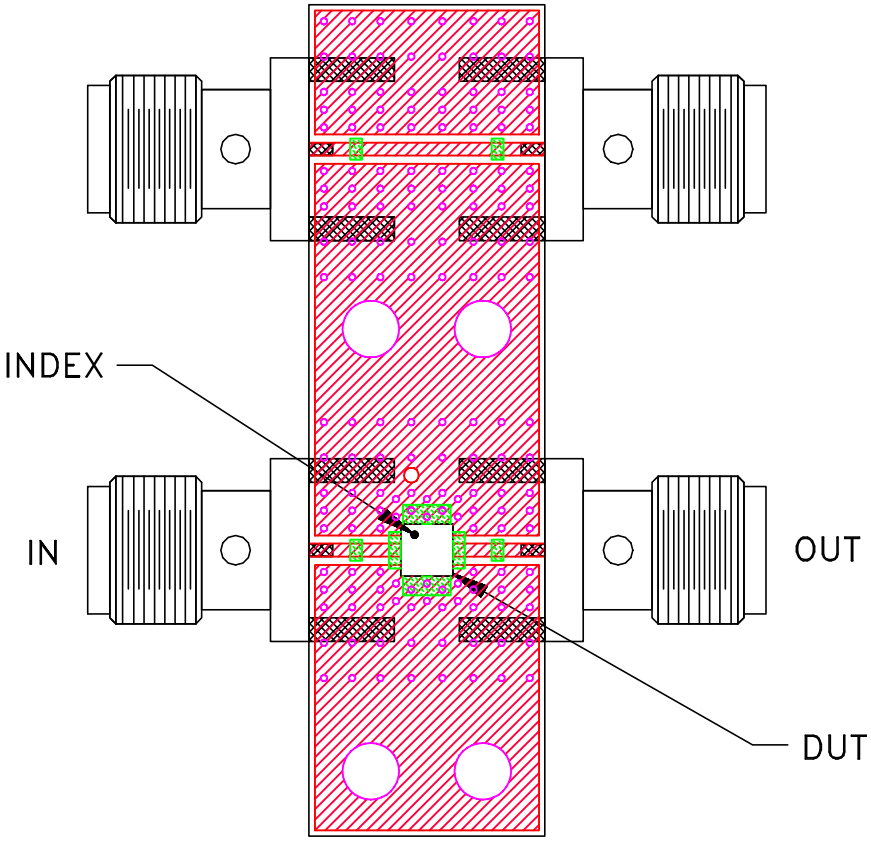
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

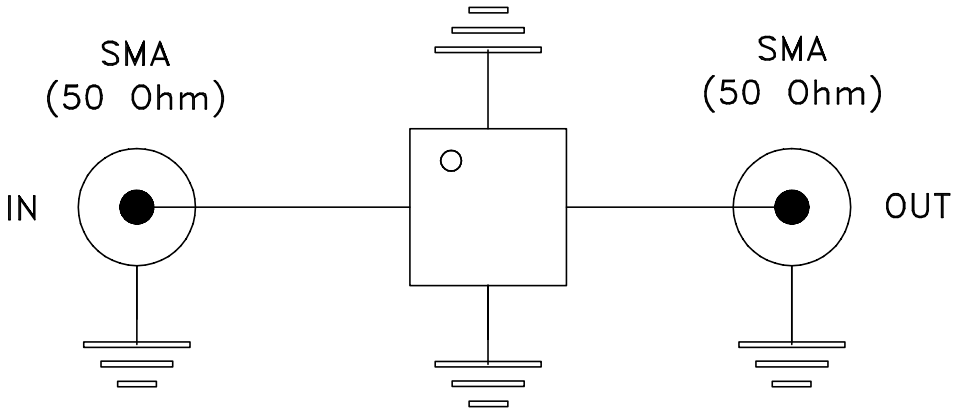
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-386	A

FILE:	SCALE:	SHEET:
98PL386	10:1	1 OF 1

Evaluation Board and Circuit



TB-668-04+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.010 inch.

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Environmental Specifications ENV71

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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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
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22 - Method A102

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