Microwave Precision

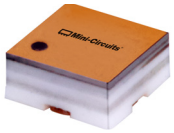
Fixed Attenuator

RCAT-SERIES

50Ω 2W DC to 20 GHz

The Big Deal

- Exceptional power handling of 2W
- Wide band width DC to 20 GHz
- Miniature size 2.25 mm x 2.25 mm x 1.1 mm Ceramic package
- Highly reliable and repeatable performance



CASE STYLE: LZ1737

Product Overview

RCAT attenuators are fixed value absorptive attenuators. The highly precision and repeatable monolithic attenuator chip is processed using the most advanced semiconductor processing techniques. The Cu filled through-die via's and Cu metallization on the backside provides a very low thermal resistance path to dissipate the attenuated power. The attenuator chip is packaged in an LTCC hermetic package utilizing fully automated and highly reliable manufacturing processes. 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

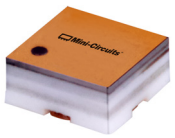
Feature	Advantages
Max power input 2W	Thermally optimized design can operate reliably at much higher input power as compared to similar devices
Band width DC to 20 GHz	Supports a broad band of applications with predictable and repeatable performance, excellent choice to buffer cascaded reflective components.
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.

Microwave Precision

Fixed Attenuator

RCAT-12+

50Ω 1.8W 12dB DC to 20 GHz



Generic photo used for illustration purposes only

CASE STYLE: LZ1737

MIL Screening Available
Please consult Applications Dept.

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

Product Features

- fixed value, absorptive device
- wide bandwidth, DC-20 GHz
- excellent attenuation accuracy & flatness
- miniature size 2.25 mm x 2.25 mm x 1.1 mm
- ceramic, hermetic, nitrogen filled
- aqueous washable

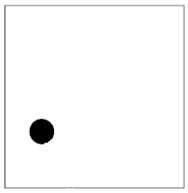
Typical Applications

- cellular
- PCS
- communications
- radar
- wideband military
- test and measurement equipment

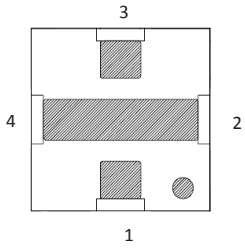
General Description

RCAT-12+ (RoHS compliant) is a wideband fixed attenuator with excellent attenuation accuracy and flatness. It can handle up to 1.8W. 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.

Top View



Bottom View



Pad Description

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

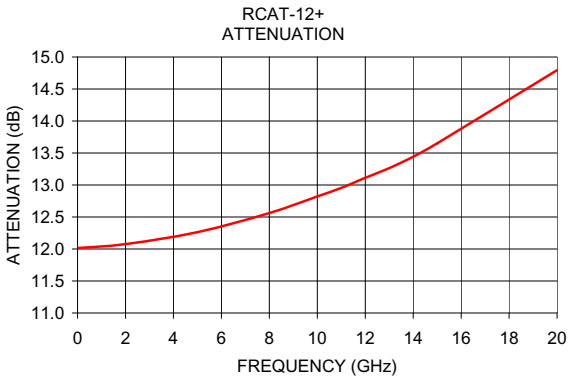
Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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

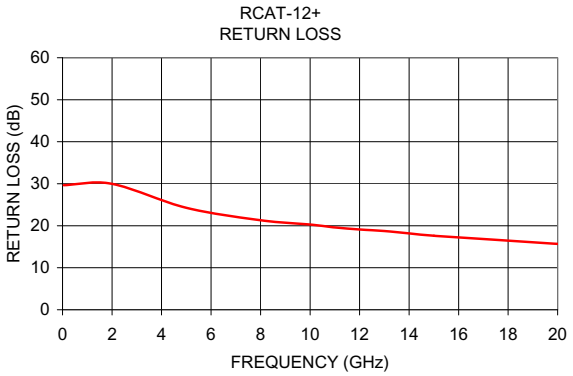
Electrical Specifications[1] at 25°C, 50Ω

Parameter	Condition (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		DC	—	20	GHz
Attenuation	1	11.5	12.0	12.5	dB
	10	12.2	12.8	13.4	
	20	13.8	14.8	15.8	
Return Loss	1	—	31.8	—	dB
	10	—	20.3	—	
	20	—	15.7	—	

Typical Performance Data at 25°C

Frequency (GHz)	Attenuation (dB)	Return Loss (dB)
0.05	12.02	29.66
2.00	12.08	29.98
5.00	12.26	24.28
8.00	12.56	21.32
10.00	12.82	20.27
11.00	12.95	19.60
12.00	13.11	19.10
13.00	13.26	18.75
14.00	13.44	18.19
15.00	13.65	17.63
20.00	14.79	15.68





Absolute Maximum Ratings[2]

Operating Case Temperature[3]	-55°C to 125°C
Storage Temperature	-65°C to 150°C
RF Input Power[4]	1.8W at 25°C

1. Tested using characterization test circuit as defined in Figure 1. See graphs and data above for performances at all other frequencies.
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: 1.8W. Derate linearly to 0.33W at 125°C.

Characterization Test Circuit

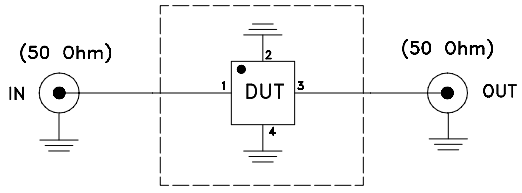
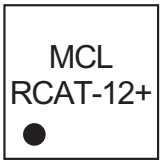


Fig 1. Block diagram of Test Circuit used for characterization. Characterization was performed by Modelithics®, conditions test board details are available at: www.modelithics.com/mvp/minicircuits

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

Product Marking



Additional Detailed Technical Information *additional information is available on our dash board. To access this information click here*	
Performance Data	Data Table
	Swept Graphs
Case Style	LZ1737 *Ceramic package, Terminal finish: Ni-Pd-Au*
Tape & Reel **Standard quantities available on reel**	F108 *7" reels with 20, 50, 100, 200, 500, 1K or 2K devices.*
Suggested Layout for PCB Design	*click here*
Evaluation Board	TB-668-12+
Environmental Ratings	ENV-71

ESD Rating

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

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

MSL Rating

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

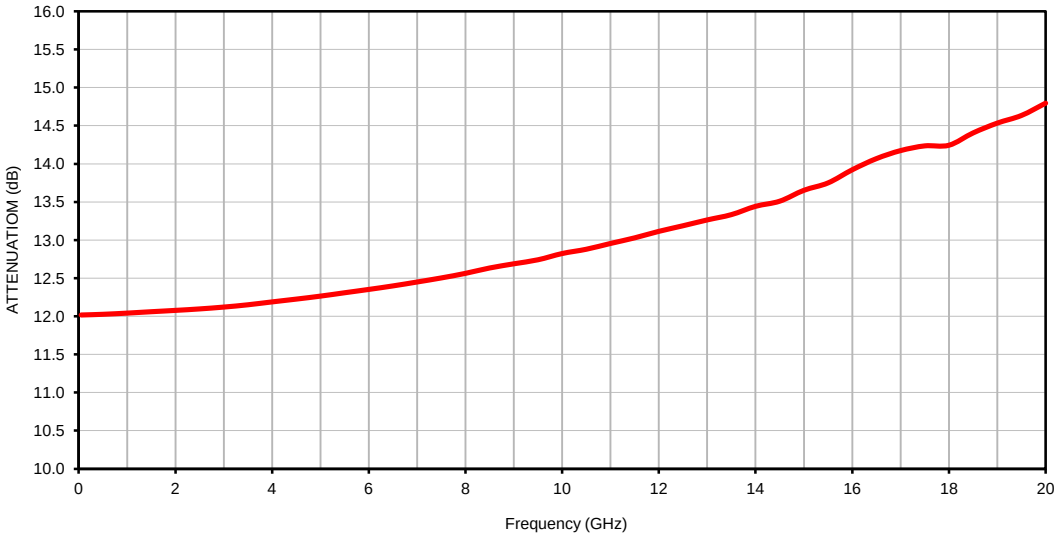
Fixed Attenuator RCAT-12+

Typical Performance Data

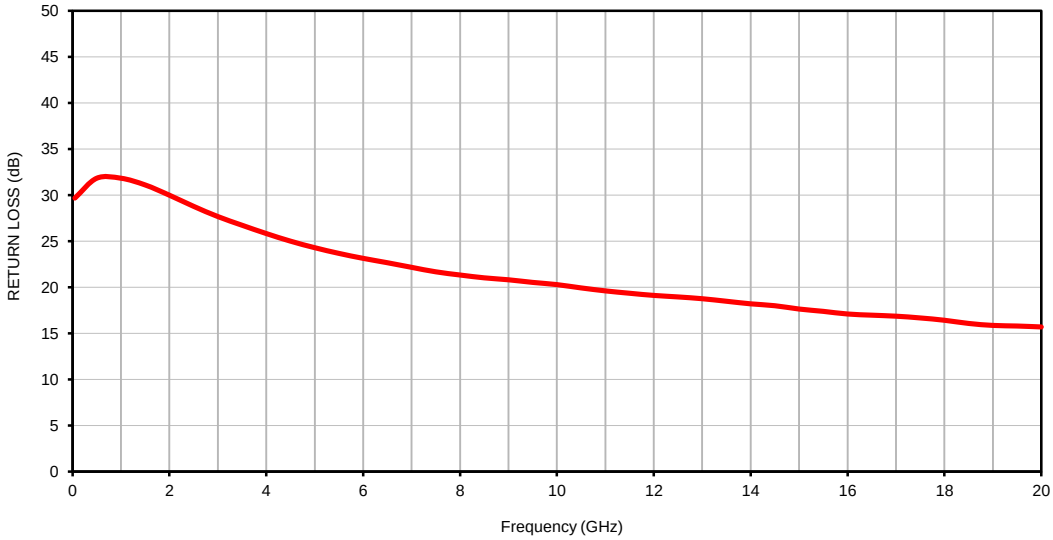
FREQUENCY (GHz)	ATTENUATION (dB)	RETURN LOSS (dB)
0.05	12.02	29.66
0.5	12.03	31.81
1.0	12.04	31.82
1.5	12.06	31.09
2.0	12.08	29.98
2.5	12.10	28.77
3.0	12.12	27.66
3.5	12.15	26.71
4.0	12.19	25.82
4.5	12.22	24.99
5.0	12.26	24.28
5.5	12.31	23.66
6.0	12.35	23.12
6.5	12.40	22.65
7.0	12.45	22.15
7.5	12.50	21.66
8.0	12.56	21.32
8.5	12.63	21.01
9.0	12.69	20.80
9.5	12.74	20.51
10.0	12.82	20.27
10.5	12.88	19.92
11.0	12.95	19.60
11.5	13.03	19.34
12.0	13.11	19.10
12.5	13.19	18.94
13.0	13.26	18.75
13.5	13.33	18.47
14.0	13.44	18.19
14.5	13.51	17.98
15.0	13.65	17.63
15.5	13.75	17.37
16.0	13.92	17.09
16.5	14.07	16.96
17.0	14.17	16.85
17.5	14.23	16.66
18.0	14.24	16.41
18.5	14.40	16.06
19.0	14.53	15.85
19.5	14.63	15.78
20.0	14.79	15.68

Typical Performance Curves

ATTENUATION



RETURN LOSS

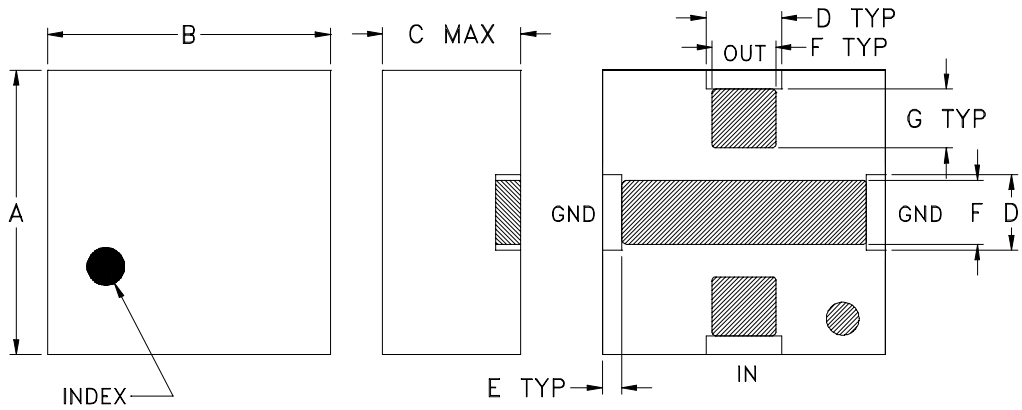


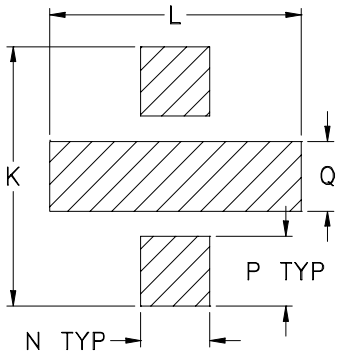
Case Style LZ

Outline Dimensions

LZ1737

PCB Land Pattern





Suggested Layout
Pattern to be within ± .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

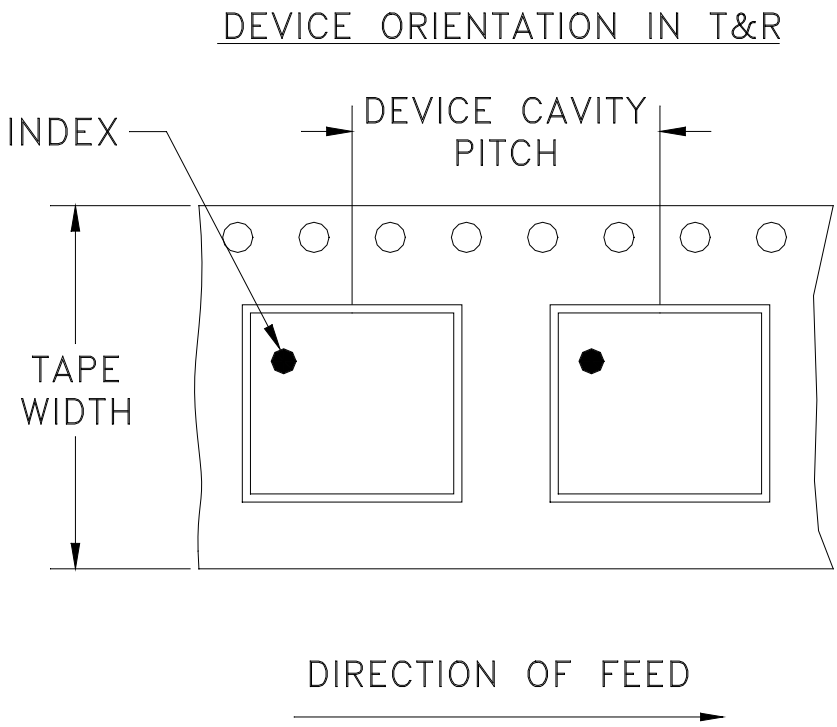
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

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

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

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

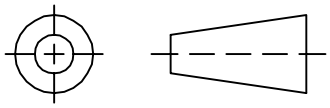
Note: Please consult individual model data sheet to determine device per reel availability.

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

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

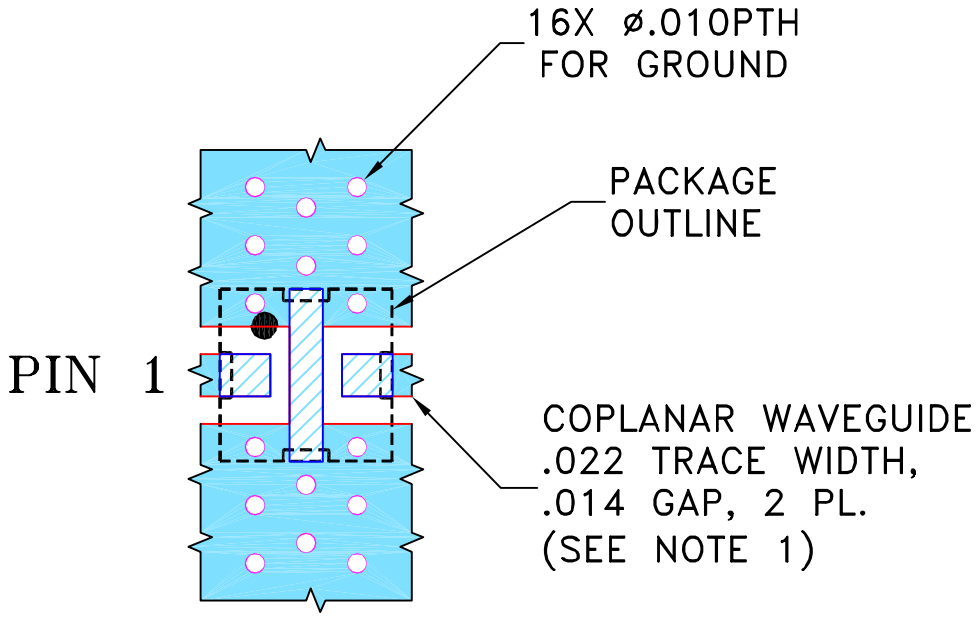
THIRD ANGLE PROJECTION



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 ±			

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

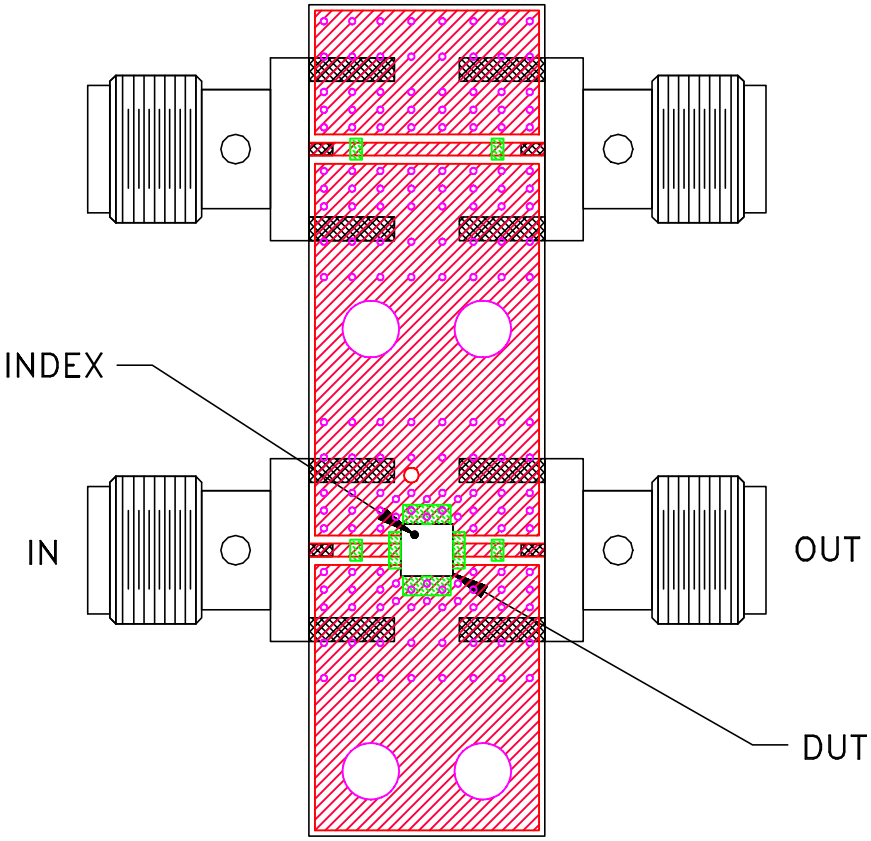
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

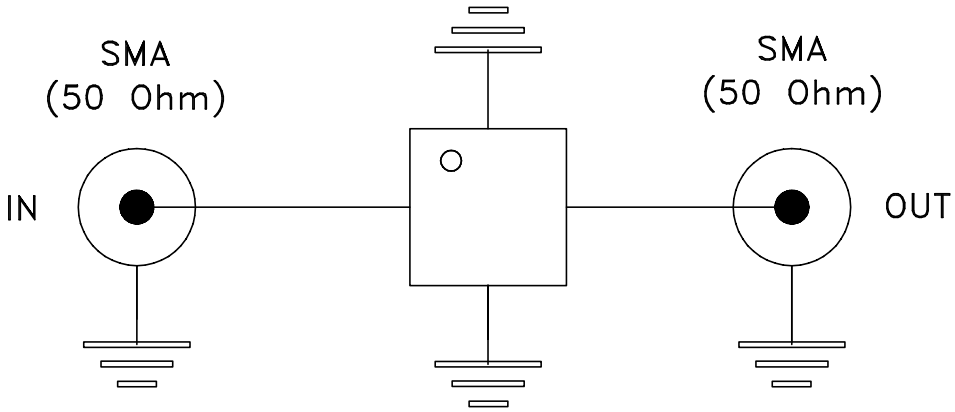
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-386	A

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

Evaluation Board and Circuit



TB-668-12+



Schematic Diagram

Notes:

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

Mini-Circuits®

Mini-Circuits

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

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