



Mini-Circuits

MICROWAVE PRECISION

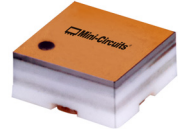
Fixed Attenuator

RCAT-00+

50Ω 2 W 0 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-00+ (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. B
ECO-024243
RCAT-00+
MCL NY
250116



ELECTRICAL SPECIFICATIONS¹ AT +25°C, 50Ω

| Parameter | Condition (GHz) | Min. | Typ. | Max. | Unit |
|-----------------|-----------------|------|------|------|------|
| Frequency Range | | DC | | 20 | GHz |
| Attenuation | 1 | 0 | 0.03 | 0.5 | dB |
| | 10 | 0 | 0.20 | 0.7 | |
| | 20 | 0 | 0.49 | 1.3 | |
| Return Loss | 1 | | 30 | | dB |
| | 10 | | 19 | | |
| | 20 | | 12 | | |

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

ABSOLUTE MAXIMUM RATINGS²

| 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.



Mini-Circuits

MICROWAVE PRECISION

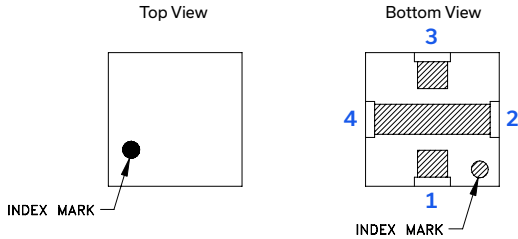
Fixed Attenuator

RCAT-00+

50Ω 2 W 0 dB DC to 20 GHz

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

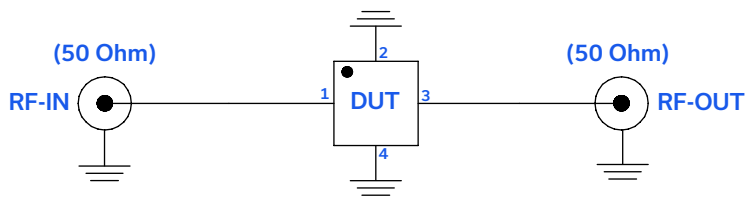
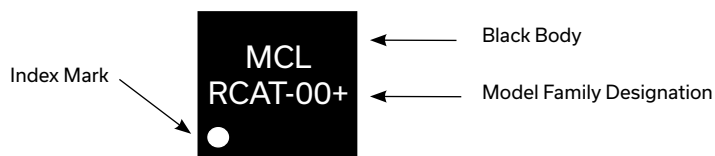


Fig 1. Block diagram of Test Circuit used for characterization. Characterization was performed by Modelithics, conditions test board details are available at: www.modelithics.com/mvp/minicircuits

PRODUCT MARKING



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





MICROWAVE PRECISION

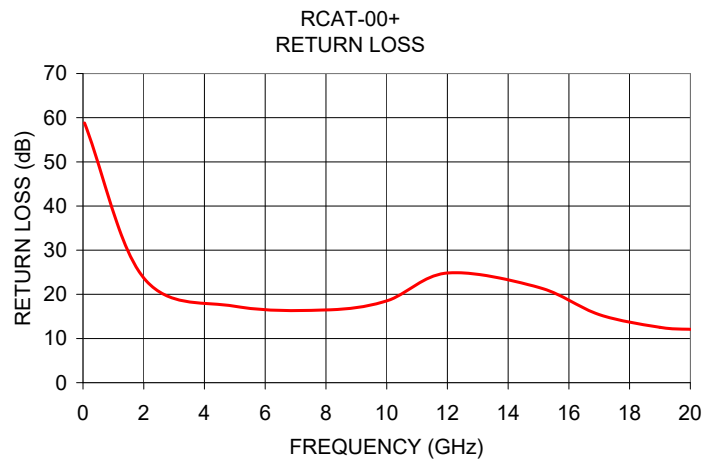
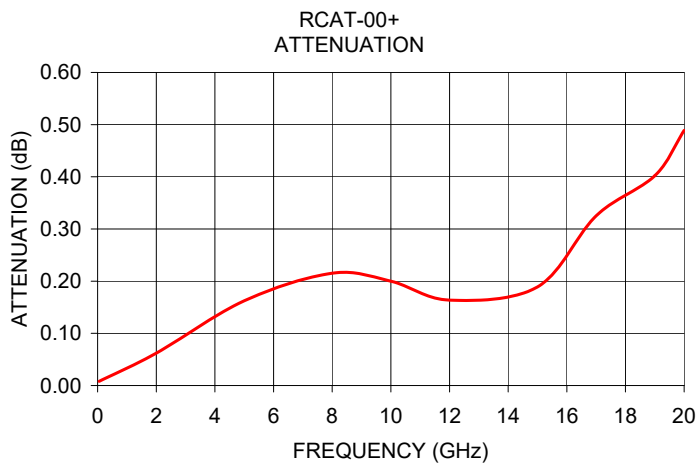
Fixed Attenuator

RCAT-00+

50Ω 2 W 0 dB DC to 20 GHz

TYPICAL PERFORMANCE DATA AT +25°C

| Frequency (GHz) | Attenuation (dB) | VSWR (:1) |
|-----------------|------------------|-----------|
| 0.05 | 0.01 | 58.82 |
| 2.00 | 0.06 | 23.71 |
| 5.00 | 0.16 | 17.31 |
| 8.00 | 0.22 | 16.47 |
| 10.00 | 0.20 | 18.54 |
| 12.00 | 0.16 | 24.84 |
| 15.00 | 0.19 | 21.57 |
| 17.00 | 0.33 | 15.43 |
| 19.00 | 0.40 | 12.53 |
| 20.00 | 0.49 | 12.09 |





Mini-Circuits

MICROWAVE PRECISION

Fixed Attenuator

RCAT-00+

50Ω 2 W 0 dB DC to 20 GHz

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-668-00+ |
| 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

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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



Fixed Attenuator

RCAT-00+

Typical Performance Data

| FREQUENCY (GHz) | ATTENUATION (dB) | RETURN LOSS (dB) |
|--------------------|---------------------|---------------------|
| 0.05 | 0.01 | 58.82 |
| 0.5 | 0.02 | 35.68 |
| 1.0 | 0.03 | 29.61 |
| 1.5 | 0.05 | 26.15 |
| 2.0 | 0.06 | 23.71 |
| 2.5 | 0.07 | 21.92 |
| 3.0 | 0.09 | 20.49 |
| 3.5 | 0.11 | 19.44 |
| 4.0 | 0.13 | 18.55 |
| 4.5 | 0.15 | 17.84 |
| 5.0 | 0.16 | 17.31 |
| 5.5 | 0.18 | 16.89 |
| 6.0 | 0.19 | 16.60 |
| 6.5 | 0.20 | 16.40 |
| 7.0 | 0.20 | 16.32 |
| 7.5 | 0.21 | 16.35 |
| 8.0 | 0.22 | 16.47 |
| 8.5 | 0.21 | 16.76 |
| 9.0 | 0.22 | 17.26 |
| 9.5 | 0.20 | 17.87 |
| 10.0 | 0.20 | 18.54 |
| 10.5 | 0.18 | 19.57 |
| 11.0 | 0.17 | 20.86 |
| 11.5 | 0.17 | 22.54 |
| 12.0 | 0.16 | 24.84 |
| 12.5 | 0.15 | 28.32 |
| 13.0 | 0.15 | 32.29 |
| 13.5 | 0.14 | 32.50 |
| 14.0 | 0.16 | 27.90 |
| 14.5 | 0.18 | 24.44 |
| 15.0 | 0.19 | 21.57 |
| 15.5 | 0.21 | 19.48 |
| 16.0 | 0.27 | 17.77 |
| 16.5 | 0.30 | 16.44 |
| 17.0 | 0.33 | 15.43 |
| 17.5 | 0.34 | 14.35 |
| 18.0 | 0.33 | 13.54 |
| 18.5 | 0.36 | 12.96 |
| 19.0 | 0.40 | 12.53 |
| 19.5 | 0.45 | 12.26 |
| 20.0 | 0.49 | 12.09 |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

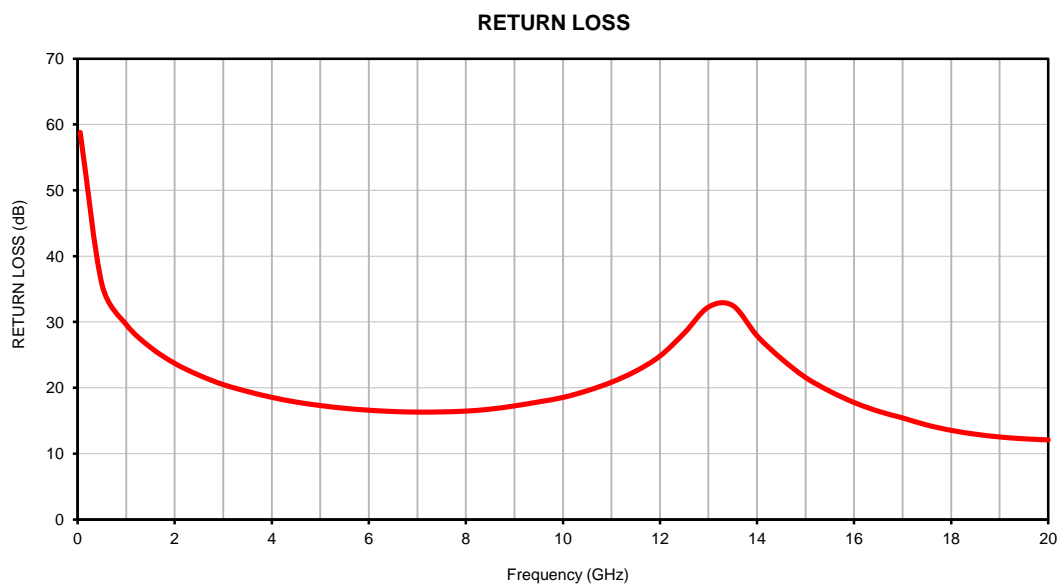
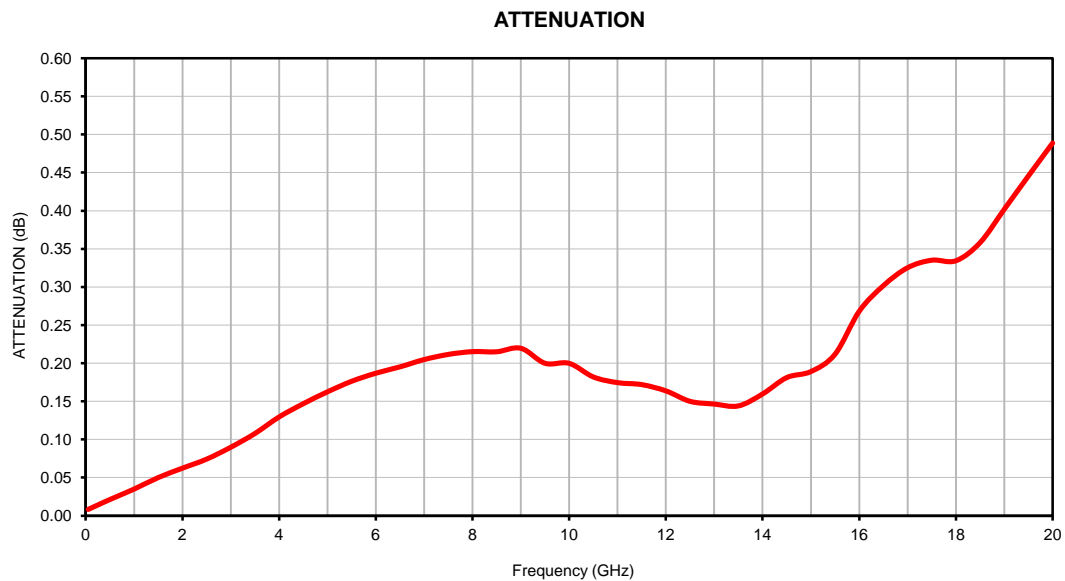


IF/RF MICROWAVE COMPONENTS



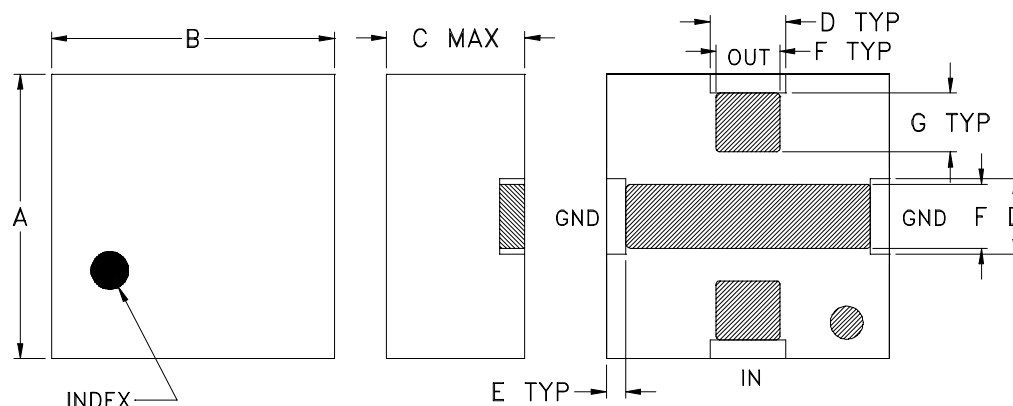
REV. OR
RCAT-00+
4/24/2013
Page 1 of 1

Typical Performance Curves

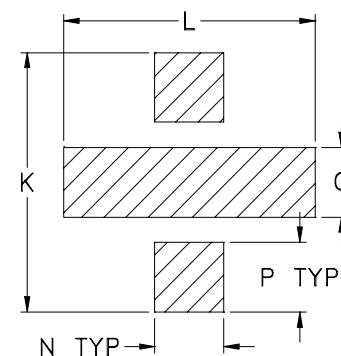


Outline Dimensions

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.



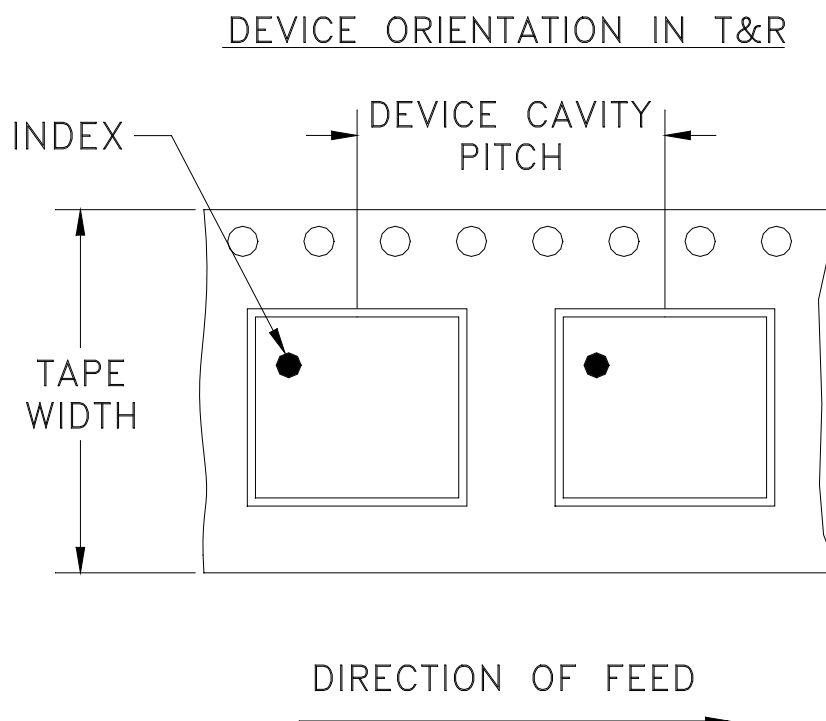
INTERNET <http://www.minicircuits.com>

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

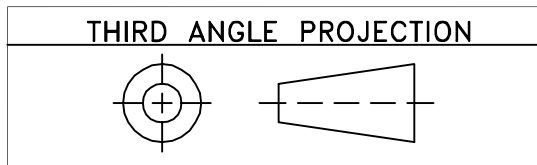


INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

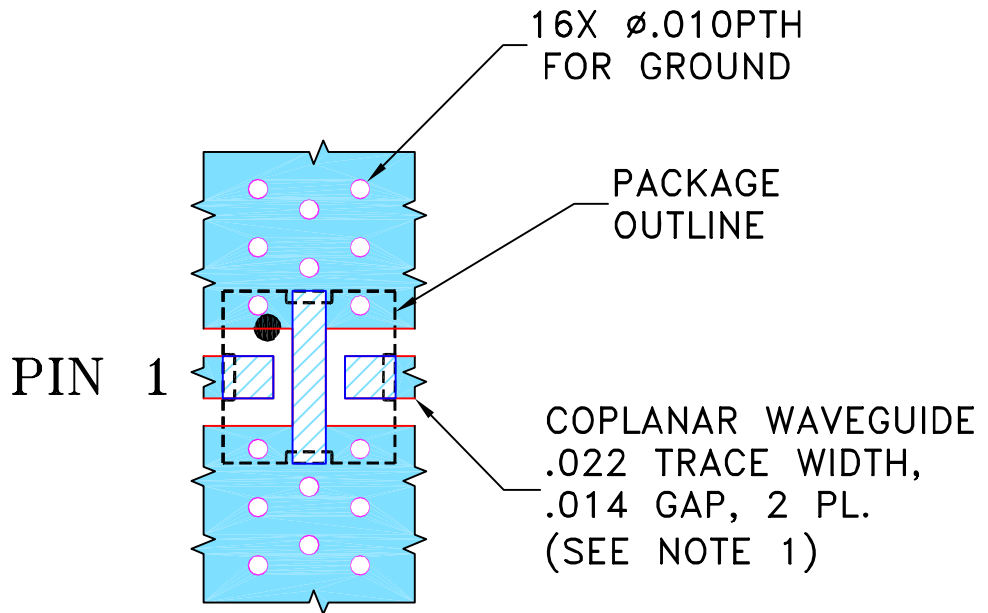
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified



| 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 |
| | | | |



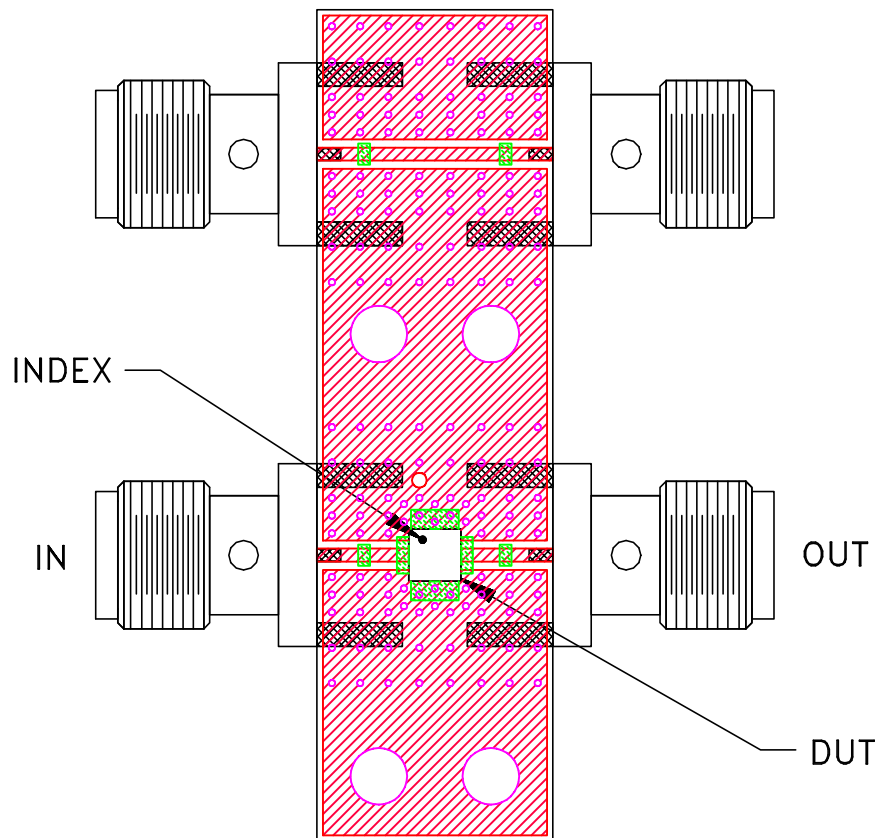
Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

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

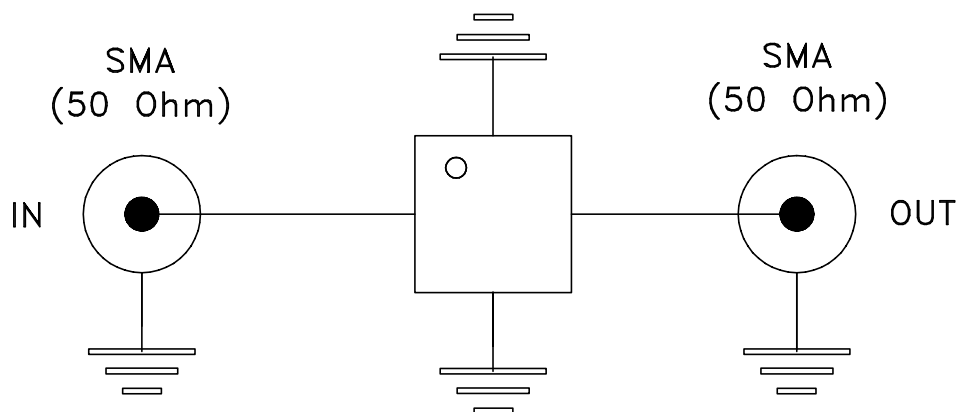
| | |
|---|---------------|
| Mini-Circuits® THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS. | |
| ASHEETA1.DWG REV:A | DATE:01/12/95 |

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

Evaluation Board and Circuit




TB-668-00+



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 |



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 |