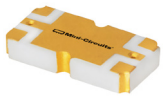
# High Power
# Bi-Directional Coupler

## MBD-20-63HP+

50Ω 20dB Coupling DC Pass 5000 to 6000 MHz



*Generic photo used for illustration purposes only*

CASE STYLE: JM1360

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

### Maximum Ratings

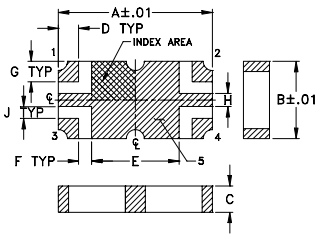
| | |
|---|---|
| *Operating Temperature,Case | -55°C to 100°C |
| Storage Temperature | -55°C to 100°C |
| DC Current | 1A |

* Case temperature is defined as temperature on ground leads. Permanent damage may occur if any of these limits are exceeded.

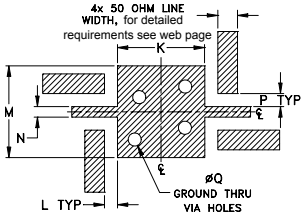
### Pin Connections

| | |
|---|---|
| INPUT | 1 |
| OUTPUT | 2 |
| COUPLED (forward) | 3 |
| COUPLED (reverse) | 4 |
| GROUND | 5 |

### Outline Drawing




**PCB Land Pattern**



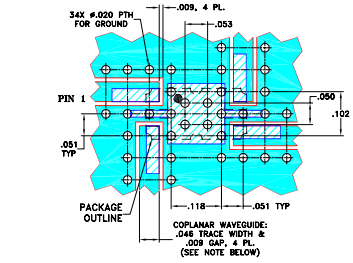

Suggested Layout,
Tolerance to be within ± .002

### Outline Dimensions (inch / mm)

| A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|
| .236 | .118 | .040 | .031 | .134 | .020 | .031 | .020 |
| 5.99 | 3.00 | 1.02 | 0.79 | 3.40 | 0.51 | 0.79 | 0.51 |

| J | K | L | M | N | P | Q | wt |
|---|---|---|---|---|---|---|---|
| .018 | .134 | .020 | .140 | .016 | .020 | .020 | grams |
| 0.46 | 3.40 | 0.51 | 3.56 | 0.41 | 0.51 | 0.51 | 0.04 |

### *Demo Board MCL P/N: TB-482+*
### *Suggested PCB Layout (PL-291)*




NOTES: 1. TRACE WIDTH IS SHOWN FOR OAK-602 WITH DIELECTRIC THICKNESS .022" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 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

### Features

- high power handling, 20 watts typ.
- low mainline loss, 0.18 dB typ.
- excellent VSWR, 1.10:1 typ.
- excellent directivity, 20 dB typ.
- wideband frequency, 4000 to 7000 MHz

### Applications

- instrumentation
- ISM, WiMAX
- defense communications
- federal communications
- fixed satellite

### Bi-Directional Coupler Electrical Specifications at 25°C

| FREQ. (MHz) | COUPLING (dB) | | MAINLINE LOSS[1] (dB) | | DIRECTIVITY (dB) | | VSWR (:1) | POWER[2] INPUT (W) |
|---|---|---|---|---|---|---|---|---|
| $f_L$-$f_U$ | Nom. | Flatness | Typ. | Max. | Typ. | Min. | Typ. | Max. |
| 5000-6000 | 20±0.5 | ±0.4 | 0.18 | 0.25 | 20 | 14 | 1.10 | 20 |

1. Mainline loss includes theoretical power loss at coupled port and does not include test fixture thru loss.

2. The user must provide adequate means of heat removal to limit the temperature of ground connection 5 to 100°C, in order to ensure proper performance. At 25°C ambient temperature this requires thermal resistance of the user's PC board heat sink to be 70°C/W or less when the unit is driven at maximum specified RF input power, 20W. At higher ambient temperature, with the same heat sink, input power in watts must not exceed 20W x (100°C -Tambient) ÷ 75°C.

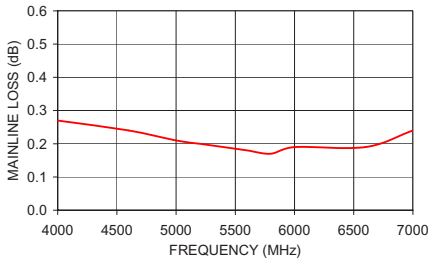
**All measurements done with Agilent 4-port PNA Analyzer (Model N5230A), with calibration done using E-CAL (Model N4433A) with port extension.**

### Typical Performance Data

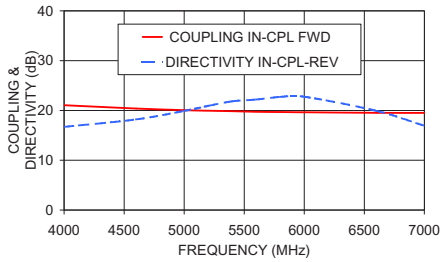
| Frequency (MHz) | Mainline Loss* (dB) | Coupling (dB) | | Directivity (dB) | | Return Loss (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | In-Out | In-Cpl Fwd | Out-Cpl Rev | Out-Cpl Fwd | In-Cpl Rev | In | Out | Cpl Fwd | Cpl Rev |
| 4000.00 | 0.27 | 21.06 | 21.10 | 20.20 | 16.70 | 16.30 | 16.28 | 28.35 | 29.32 |
| 4600.00 | 0.24 | 20.39 | 20.45 | 24.73 | 18.19 | 18.30 | 18.14 | 34.08 | 35.71 |
| 5000.00 | 0.21 | 20.06 | 20.10 | 27.03 | 19.91 | 20.98 | 20.96 | 38.78 | 50.81 |
| 5200.00 | 0.20 | 19.94 | 19.94 | 27.05 | 20.91 | 23.32 | 23.28 | 37.66 | 39.28 |
| 5400.00 | 0.19 | 19.85 | 19.84 | 26.30 | 21.84 | 26.43 | 26.07 | 36.34 | 34.07 |
| 5600.00 | 0.18 | 19.73 | 19.72 | 23.89 | 22.19 | 31.76 | 31.82 | 37.16 | 33.74 |
| 5800.00 | 0.17 | 19.68 | 19.65 | 21.76 | 22.72 | 39.73 | 40.80 | 37.76 | 33.32 |
| 6000.00 | 0.19 | 19.63 | 19.61 | 20.27 | 22.76 | 33.56 | 39.28 | 52.55 | 33.03 |
| 6600.00 | 0.19 | 19.52 | 19.41 | 16.62 | 19.93 | 22.87 | 22.61 | 28.93 | 26.69 |
| 7000.00 | 0.24 | 19.51 | 19.41 | 14.18 | 16.94 | 20.19 | 20.12 | 20.85 | 20.72 |

*Data shown includes test fixture thru loss.

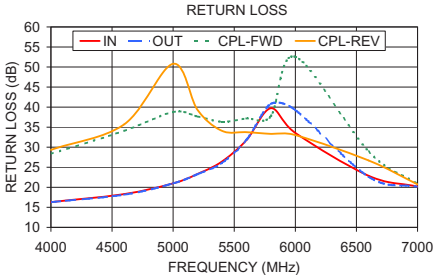
MBD-20-63HP+
MAINLINE LOSS



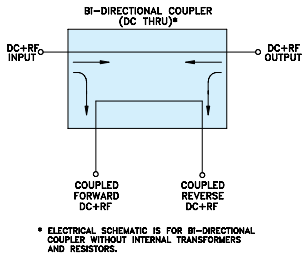

MBD-20-63HP+
COUPLING & DIRECTIVITY




MBD-20-63HP+
RETURN LOSS




### Electrical Schematic




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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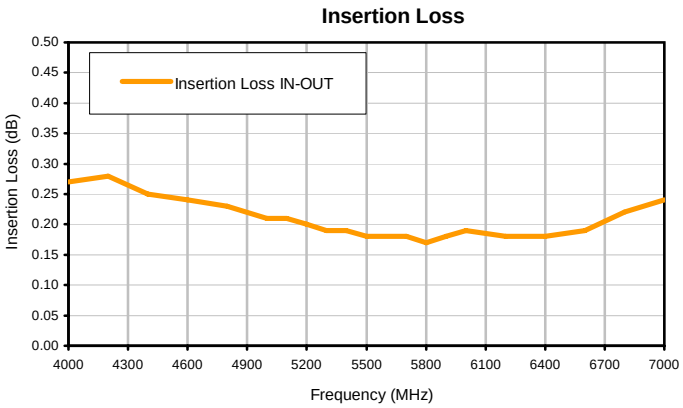
# Bi-Directional Coupler MBD-20-63HP+

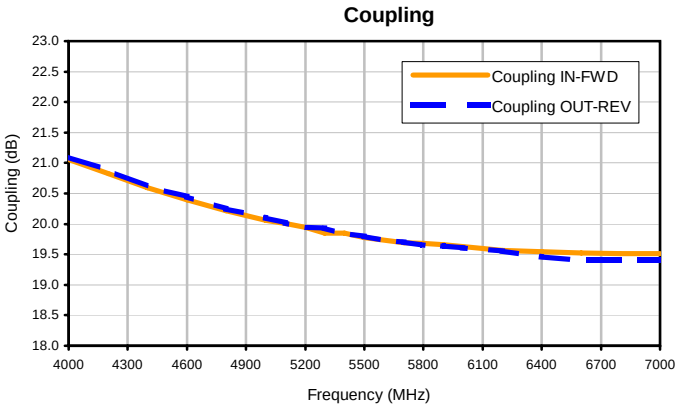
*Typical Performance Data*

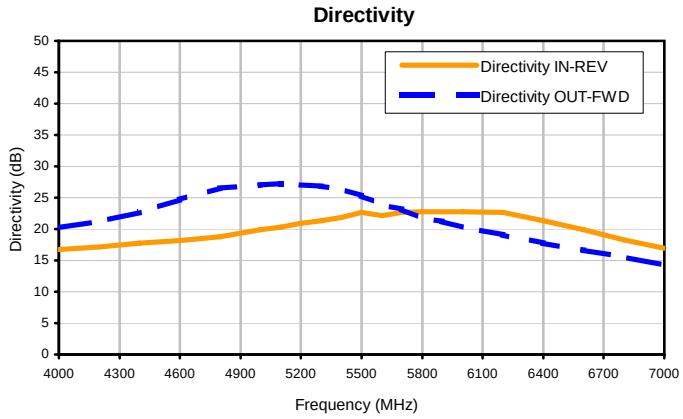
| FREQ. (MHz) | INSERTION LOSS (dB) | COUPLING (dB) | | DIRECTIVITY (dB) | | RETURN LOSS (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | IN-OUT | IN-FWD | OUT-REV | IN-REV | OUT-FWD | IN | OUT | FWD | REV |
| 4000.0 | 0.27 | 21.06 | 21.10 | 16.70 | 20.20 | 16.30 | 16.28 | 28.35 | 29.32 |
| 4200.0 | 0.28 | 20.83 | 20.88 | 17.17 | 21.25 | 16.69 | 16.77 | 29.09 | 30.35 |
| 4400.0 | 0.25 | 20.59 | 20.62 | 17.76 | 22.66 | 17.38 | 17.27 | 30.50 | 32.74 |
| 4600.0 | 0.24 | 20.39 | 20.45 | 18.19 | 24.73 | 18.30 | 18.14 | 34.08 | 35.71 |
| 4800.0 | 0.23 | 20.22 | 20.25 | 18.76 | 26.51 | 19.47 | 19.36 | 37.87 | 43.69 |
| 5000.0 | 0.21 | 20.06 | 20.10 | 19.91 | 27.03 | 20.98 | 20.96 | 38.78 | 50.81 |
| 5100.0 | 0.21 | 20.01 | 20.02 | 20.27 | 27.28 | 21.97 | 22.06 | 38.14 | 44.17 |
| 5200.0 | 0.20 | 19.94 | 19.94 | 20.91 | 27.05 | 23.32 | 23.28 | 37.66 | 39.28 |
| 5300.0 | 0.19 | 19.85 | 19.93 | 21.30 | 26.88 | 24.63 | 24.59 | 37.16 | 37.66 |
| 5400.0 | 0.19 | 19.85 | 19.84 | 21.84 | 26.30 | 26.43 | 26.07 | 36.34 | 34.07 |
| 5500.0 | 0.18 | 19.78 | 19.80 | 22.68 | 25.29 | 28.97 | 28.13 | 36.73 | 33.61 |
| 5600.0 | 0.18 | 19.73 | 19.72 | 22.19 | 23.89 | 31.76 | 31.82 | 37.16 | 33.74 |
| 5700.0 | 0.18 | 19.69 | 19.70 | 22.69 | 23.14 | 36.11 | 34.76 | 36.37 | 33.03 |
| 5800.0 | 0.17 | 19.68 | 19.65 | 22.72 | 21.76 | 39.73 | 40.80 | 37.76 | 33.32 |
| 5900.0 | 0.18 | 19.66 | 19.64 | 22.75 | 21.20 | 37.01 | 45.03 | 44.03 | 33.71 |
| 6000.0 | 0.19 | 19.63 | 19.61 | 22.76 | 20.27 | 33.56 | 39.28 | 52.55 | 33.03 |
| 6200.0 | 0.18 | 19.57 | 19.55 | 22.62 | 19.07 | 27.15 | 29.21 | 45.38 | 33.21 |
| 6400.0 | 0.18 | 19.54 | 19.46 | 21.30 | 17.77 | 24.23 | 25.03 | 34.14 | 30.43 |
| 6600.0 | 0.19 | 19.52 | 19.41 | 19.93 | 16.62 | 22.87 | 22.61 | 28.93 | 26.69 |
| 6800.0 | 0.22 | 19.51 | 19.41 | 18.28 | 15.63 | 21.39 | 21.23 | 24.27 | 23.88 |
| 7000.0 | 0.24 | 19.51 | 19.41 | 16.94 | 14.18 | 20.19 | 20.12 | 20.85 | 20.72 |

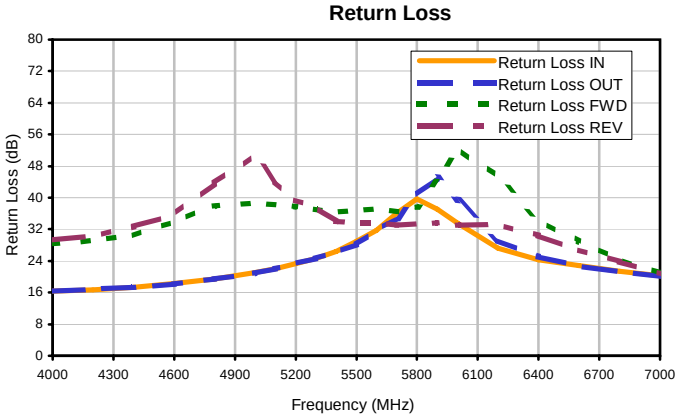
# Bi-Directional Coupler MBD-20-63HP+

## *Typical Performance Curves*



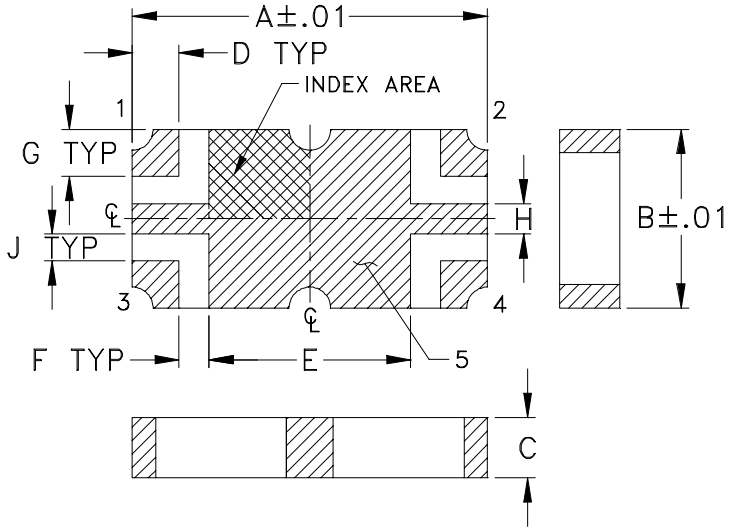



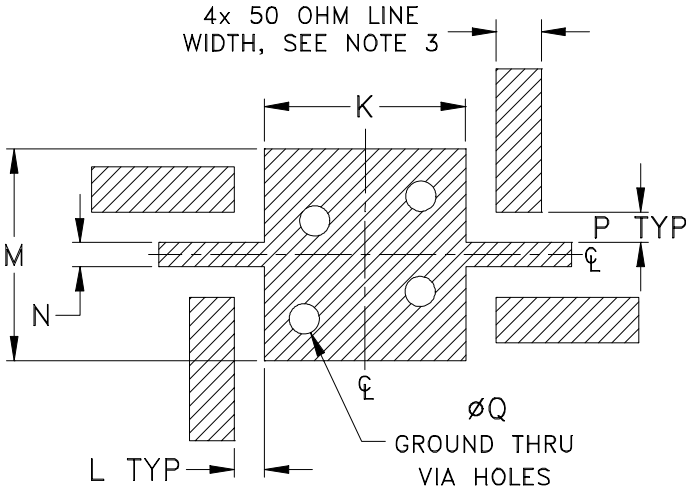
# Case Style JM

**JM1360**

## Outline Dimensions

**PCB Land Pattern**




Suggested Layout,
Tolerance to be within ±.002

| CASE # | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | WT. GRAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JM1360 | .236 (5.99) | .118 (3.00) | .040 (1.02) | .031 (0.79) | .134 (3.40) | .020 (0.51) | .031 (0.79) | .020 (0.51) | .018 (0.46) | .134 (3.40) | .020 (0.51) | .140 (3.56) | .016 (0.41) | .020 (0.51) | .020 (0.51) | .04 |

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

**Notes:**

1. Open style, ceramic base.
2. Termination finish: 2-4 µ inch (.05-.10 microns) Gold over 110-140 µ inch (2.79-3.56 microns) Nickel plate.
3. 50 Ohm line width (micro strip feed line) depends on the material and the thickness of PCB.
   e.g. If the PCB is made from FR4 having dielectric constant 4.4 and its thickness is .016 (.4mm) The 50 Ohm line width results into .03 (.76mm).
4. Top and bottom view are same.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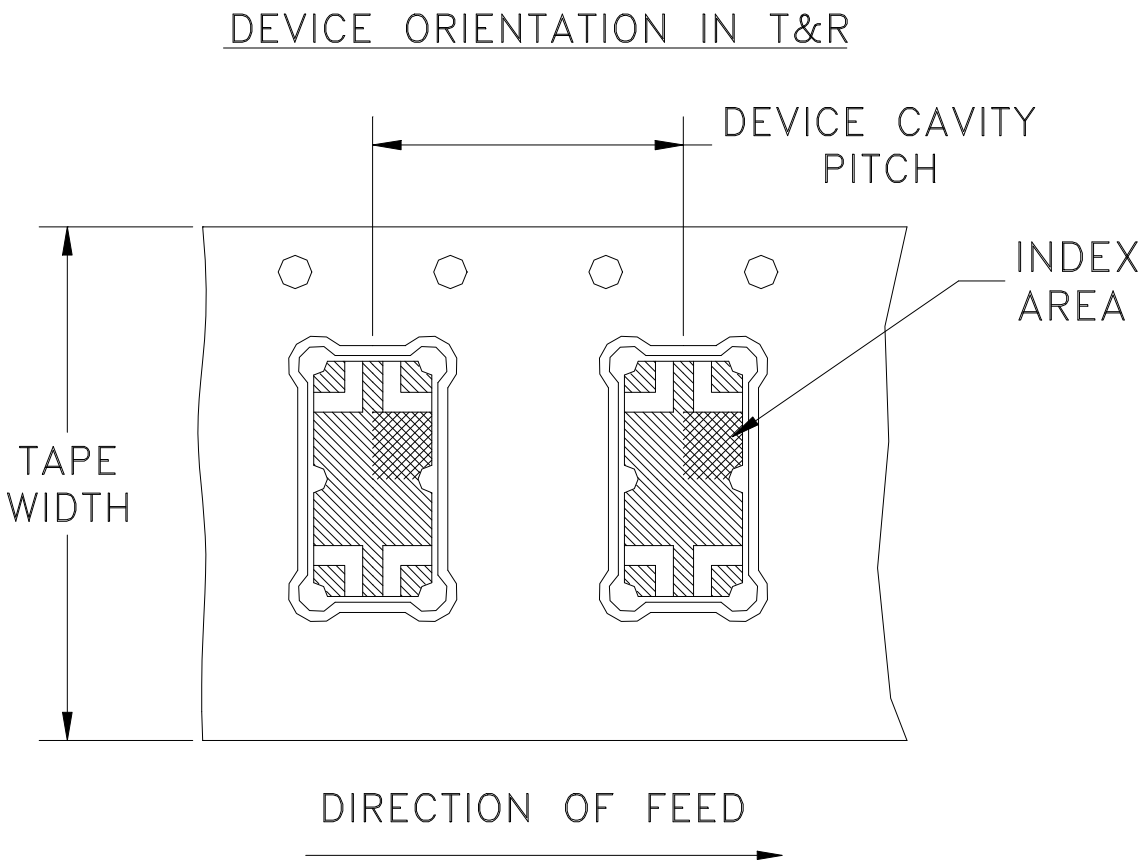
# Tape & Reel Packaging TR-F92




| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel |
|---|---|---|---|
| 16 | 8 | 7 | 1000 |

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.

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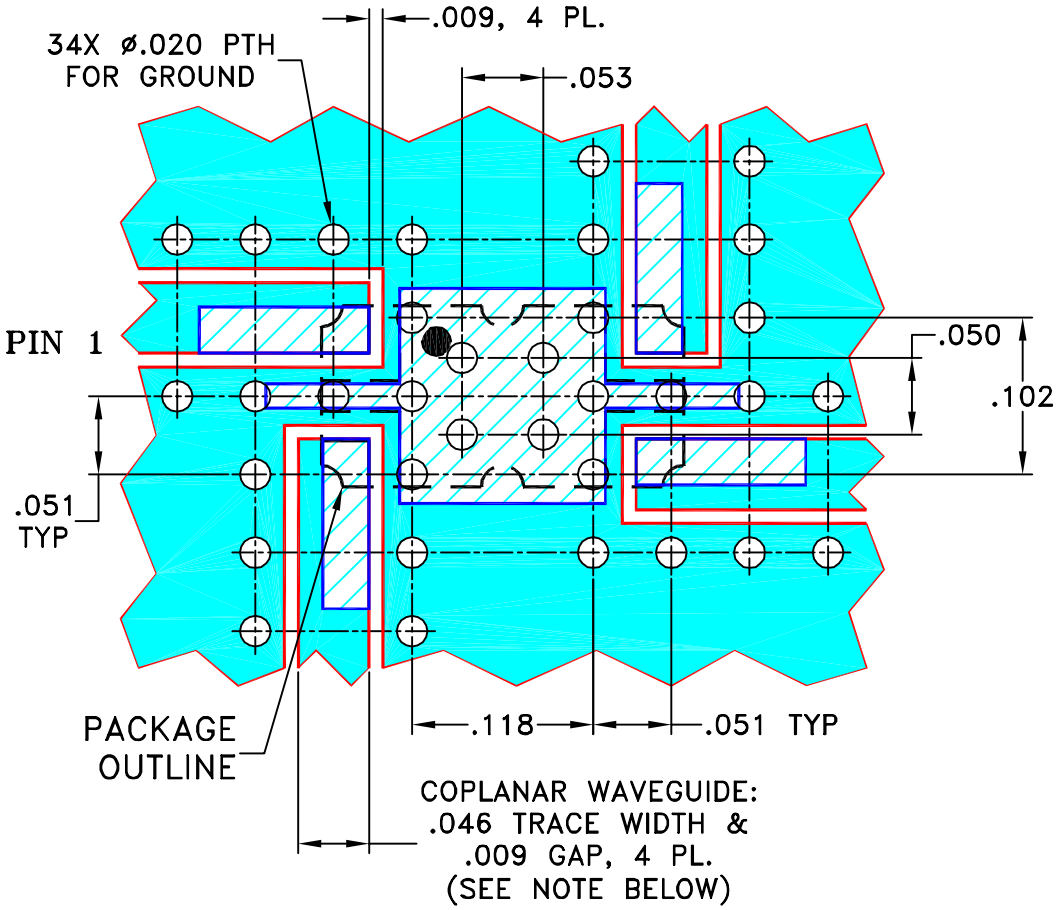
THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M119428 | NEW RELEASE | 09/19/08 | AV | HL |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION FOR JM1360 CASE STYLE, "04DC01" PIN CODE




NOTES:
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2. 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 |
|---|---|---|---|
| DIMENSIONS ARE IN INCHES | DRAWN | AV | 09/12/08 |
| TOLERANCES ON: | CHECKED | MMG | 09/19/08 |
| 2 PL DECIMALS ± | APPROVED | HL | 09/19/08 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |

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

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PL, 04DC01, JM1360, MBD-20, TB-482+

| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-291 | OR |
| FILE: 98PL291 | SCALE: 8:1 | SHEET: 1 OF 1 | |

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# Environmental Specifications ENV28

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 100°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Barometric Pressure | 100,000 Feet | MIL-STD-202, Method 105, Condition D |
| Humidity | 90% RH, 65°C<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103 |
| Thermal Shock | -65° to 125°C, 5 cycles | MIL-STD-202, Method 107, Condition B |
| Vibration (High Frequency) | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36) | MIL-STD-202, Method 204, Condition D |
| Mechanical Shock | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18) | MIL-STD-202, Method 213, Condition I |


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