NON-CATALOG

*Surface Mount*

# Voltage Controlled Oscillator

# JTOS-150P+

## 5V Tuning for PLL ICs 72 to 91 MHz

CASE STYLE: BK377

### Features

- low phase noise
- 5V tuning voltage range
- linear tuning characteristics
- aqueous washable

### Applications

- PLL circuitry
- measurement instrumentation
- frequency synthesizers

***+RoHS Compliant***

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

### Electrical Specifications

| FREQUENCY (MHz) | | POWER OUTPUT (dBm) | TUNING VOLTAGE (V) | | PHASE NOISE (dBc/Hz) SSB at offset frequencies: Typ. | | | | PULLING pk-pk @ 12 dBr (MHz) | PUSHING (MHz/V) | TUNING SENSITIVITY (MHz/V) | HARMONICS (dBc) | | 3 dB MODULATION BANDWIDTH (MHz) | POWER SUPPLY | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 kHz | 10 kHz | 100 kHz | 1 MHz | | | | | | | Voltage (V) | Current (mA) |
| Min. | Max. | Typ. | Min. | Max. | | | | | Typ. | Typ. | Typ. | Typ. | Max. | Typ. | | Max. |
| 72 | 91 | +9.5 | 0.5 | 5.0 | -82 | -106 | -127 | -147 | 0.8 | 0.3 | 6-9 | -30 | -17 | 0.112 | 12 | 20 |

### Pin Connections

| | |
|---|---|
| RF OUT | 13 |
| VCC | 2 |
| V-TUNE | 5 |
| GROUND | 1,3,4,6,7,8,9,10,11,12,14 |

### Maximum Ratings

| | |
|---|---|
| Operating Temperature | -55°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| Absolute Max. Supply Voltage (Vcc) | 16V |
| Absolute Max. Tuning Voltage (Vtune) | 7V |
| All specifications | 50 ohm system |

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

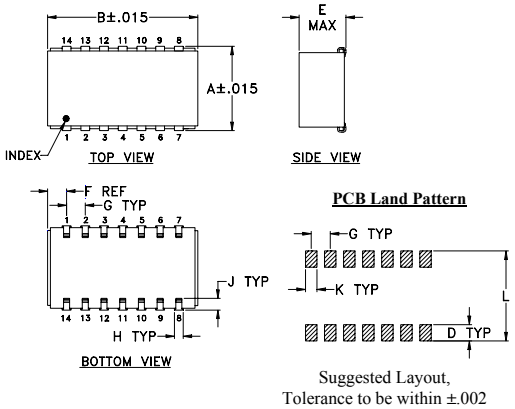
**Tape & Reel:** F107

7" Reels with 10, 20, 50, 100 devices

13" Reels with 200 devices

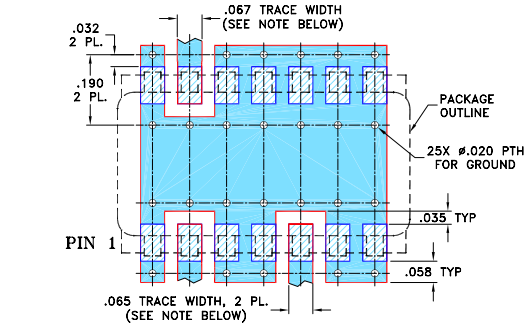
**Environmental Ratings:** ENV65

### Outline Drawing




Suggested Layout,
Tolerance to be within ±.002

*Demo Board MCL P/N: TB-04*
*Suggested PCB Layout (PL-005)*




NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; 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

### Outline Dimensions (inch / mm)

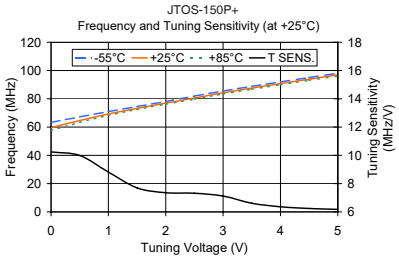
| A | B | C | D | E | F | G | H | J | K | L | wt |
|---|---|---|---|---|---|---|---|---|---|---|---|
| .505 | .800 | -- | .100 | .250 | .100 | .100 | .047 | .065 | .065 | .525 | grams |
| 12.83 | 20.32 | -- | 2.54 | 6.35 | 2.54 | 2.54 | 1.19 | 1.65 | 1.65 | 13.34 | 3.0 |

Notes

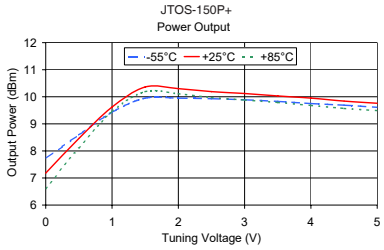
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's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

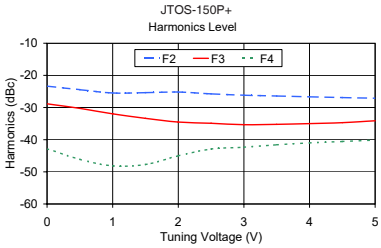
# Performance Data & Curves

# JTOS-150P+

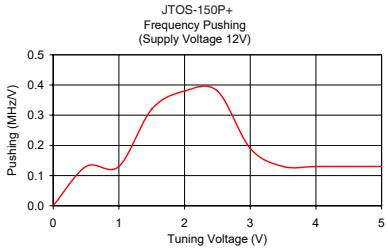



| V TUNE | TUNING SENS. (MHz/V) | FREQUENCY (MHz) | | | POWER OUTPUT (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | -55°C | +25°C | +85°C | -55°C | +25°C | +85°C |
| 0.00 | 10.24 | 63.31 | 59.60 | 57.51 | 7.72 | 7.18 | 6.61 |
| 0.50 | 9.99 | 67.21 | 64.66 | 63.26 | 8.59 | 8.46 | 8.11 |
| 1.00 | 8.82 | 70.96 | 69.22 | 68.25 | 9.43 | 9.62 | 9.45 |
| 1.50 | 7.70 | 74.52 | 73.21 | 72.43 | 9.95 | 10.36 | 10.19 |
| 2.00 | 7.36 | 78.14 | 76.93 | 76.19 | 9.95 | 10.30 | 10.11 |
| 2.50 | 7.32 | 81.92 | 80.54 | 79.77 | 9.93 | 10.19 | 9.97 |
| 3.00 | 7.12 | 85.50 | 84.18 | 83.40 | 9.89 | 10.12 | 9.88 |
| 3.50 | 6.61 | 88.81 | 87.54 | 86.76 | 9.83 | 10.03 | 9.79 |
| 4.00 | 6.36 | 91.97 | 90.75 | 89.97 | 9.75 | 9.95 | 9.68 |
| 4.50 | 6.24 | 95.04 | 93.89 | 93.10 | 9.69 | 9.84 | 9.57 |
| 5.00 | 6.18 | 98.10 | 96.99 | 96.21 | 9.61 | 9.76 | 9.49 |




| V TUNE | HARMONICS (dBc) | | | FREQ. PUSHING (MHz/V) |
|---|---|---|---|---|
| | F2 | F3 | F4 | |
| 0.00 | -23.33 | -28.83 | -42.83 | 0.00 |
| 0.50 | -24.44 | -30.27 | -46.11 | 0.13 |
| 1.00 | -25.46 | -31.96 | -48.13 | 0.13 |
| 1.50 | -25.37 | -33.37 | -47.70 | 0.32 |
| 2.00 | -25.17 | -34.51 | -45.01 | 0.38 |
| 2.50 | -25.73 | -34.90 | -42.90 | 0.38 |
| 3.00 | -26.16 | -35.33 | -42.33 | 0.19 |
| 3.50 | -26.40 | -35.24 | -41.57 | 0.13 |
| 4.00 | -26.66 | -34.99 | -40.99 | 0.13 |
| 4.50 | -26.88 | -34.71 | -40.55 | 0.13 |
| 5.00 | -27.11 | -34.11 | -40.11 | 0.13 |




Notes

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# Voltage Controlled Oscillator JTOS-150P+

## *Typical Performance Data*

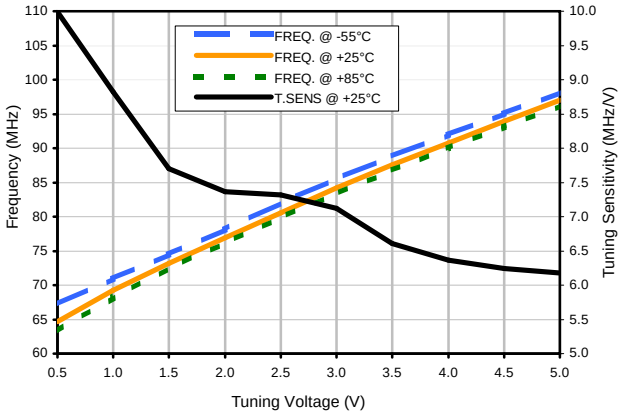
| V TUNE | TUNE SENS (MHz/V) | FREQUENCY (MHz) | | | POWER OUTPUT (dBm) | | | HARMONICS (dBc) | | | FREQ. PUSH (MHz/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -55ºC | +25ºC | +85ºC | -55ºC | +25ºC | +85ºC | F2 | F3 | F4 | |
| 0.5 | 9.99 | 67.2 | 64.7 | 63.3 | 8.59 | 8.46 | 8.11 | -24.4 | -30.3 | -46.1 | |
| 1.0 | 8.82 | 71.0 | 69.2 | 68.3 | 9.43 | 9.62 | 9.45 | -25.5 | -32.0 | -48.1 | 0.04 |
| 1.5 | 7.70 | 74.5 | 73.2 | 72.4 | 9.95 | 10.36 | 10.19 | -25.4 | -33.4 | -47.7 | |
| 2.0 | 7.36 | 78.1 | 76.9 | 76.2 | 9.95 | 10.30 | 10.11 | -25.2 | -34.5 | -45.0 | 0.37 |
| 2.5 | 7.32 | 81.9 | 80.5 | 79.8 | 9.93 | 10.19 | 9.97 | -25.7 | -34.9 | -42.9 | |
| 3.0 | 7.12 | 85.5 | 84.2 | 83.4 | 9.89 | 10.12 | 9.88 | -26.2 | -35.3 | -42.3 | 0.23 |
| 3.5 | 6.61 | 88.8 | 87.5 | 86.8 | 9.83 | 10.03 | 9.79 | -26.4 | -35.2 | -41.6 | |
| 4.0 | 6.36 | 92.0 | 90.8 | 90.0 | 9.75 | 9.95 | 9.68 | -26.7 | -35.0 | -41.0 | 0.17 |
| 4.5 | 6.24 | 95.0 | 93.9 | 93.1 | 9.69 | 9.84 | 9.57 | -26.9 | -34.7 | -40.6 | |
| 5.0 | 6.18 | 98.1 | 97.0 | 96.2 | 9.61 | 9.76 | 9.49 | -27.1 | -34.1 | -40.1 | 0.16 |

| FREQ OFFSET (KHz) | PHASE NOISE (dBc/Hz) |
|---|---|
| 1 | -82 |
| 10 | -106 |
| 100 | -127 |
| 1000 | -147 |

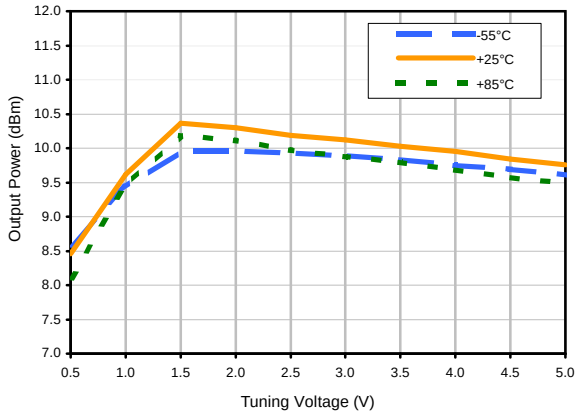
# Voltage Controlled Oscillator JTOS-150P+

## *Typical Performance Data*

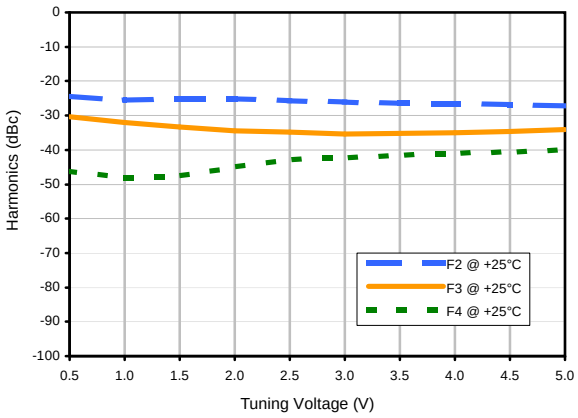
**Frequency and Tuning Sensitivity**



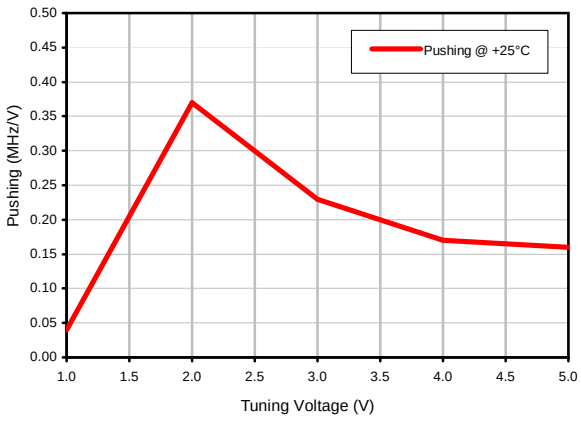

**Power Output**




**Harmonics Level**




**Frequency Pushing**

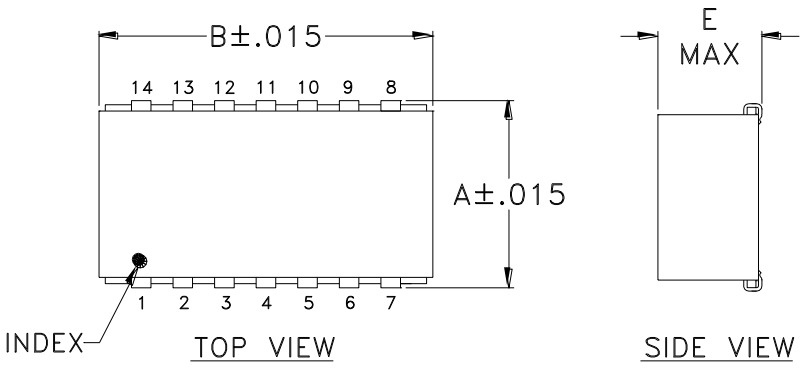


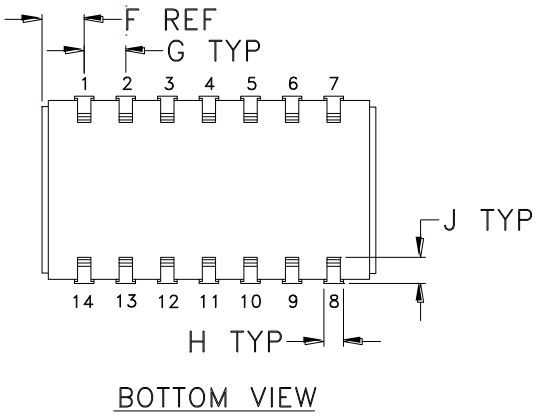

**Phase Noise**

# Case Style BK

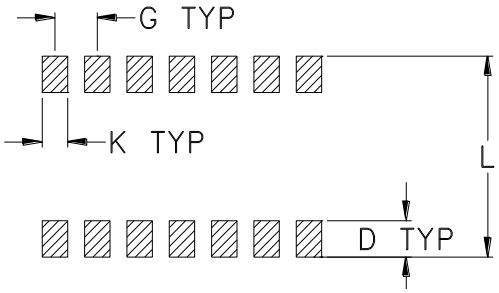
**BK377**

## Outline Dimensions




## PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002

| CASE # | A | B | C | D | E | F | G | H | J | K | L | WT. GRAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BK377 | .505 (12.83) | .800 (20.32) | -- -- | .100 (2.54) | .250 (6.35) | .100 (2.54) | .100 (2.54) | .047 (1.19) | .065 (1.65) | .065 (1.65) | .525 (13.34) | 2.0 MAX. |

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

**Notes:**

1. Case material: Copper Nickel alloy.
2. Base material: Printed wiring laminate.
3. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.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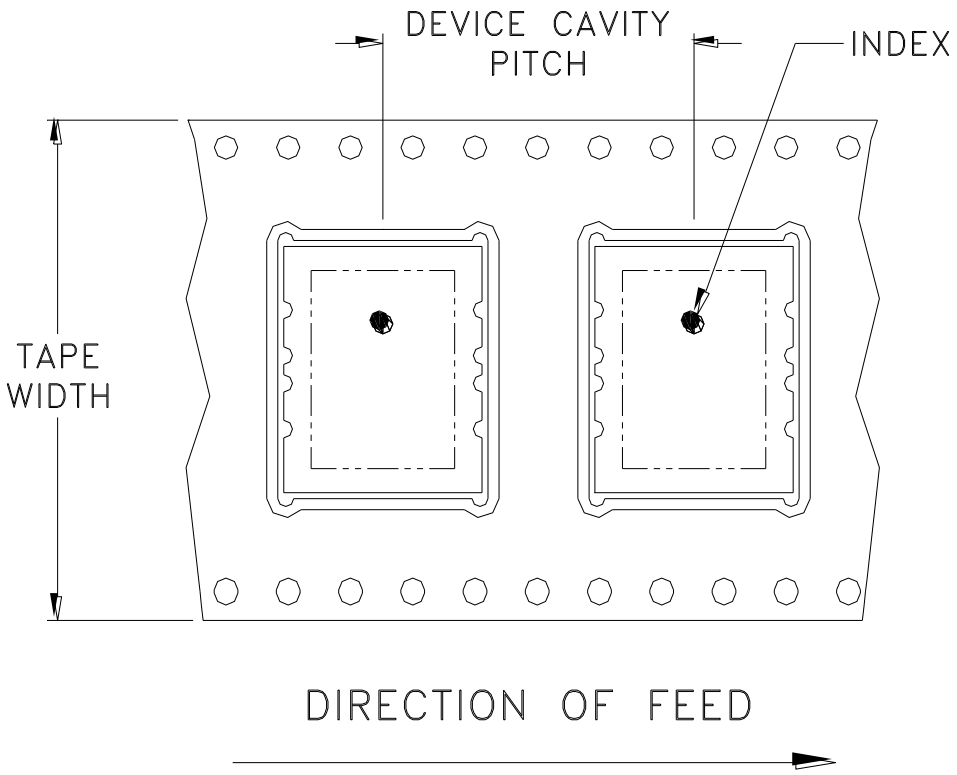
Mini-Circuits ISO 9001 & ISO 14001 Certified

# Tape & Reel Packaging TR-F107

## DEVICE ORIENTATION IN T&R




| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|---|---|---|---|---|
| 32 | 20 | 7 | Small quantity standards (see note) | 10 |
| | | | | 20 |
| | | | | 50 |
| | | | | 100 |
| | | 13 | Standard | 200 |

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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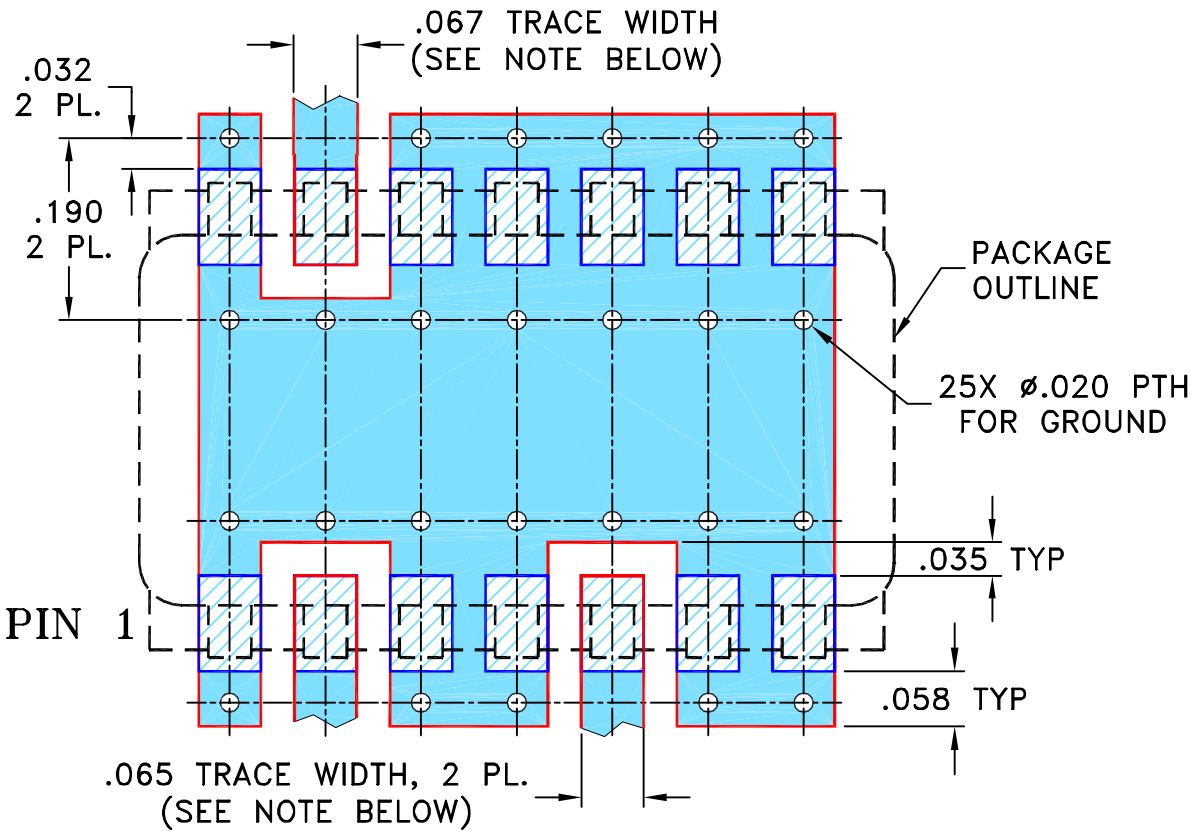
THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| B | M76077 | UPDATED DRAWING | 04/01 | GF | MM |
| C | M82575 | UPDATED DRAWING | 08/08/02 | IL | MM |
| D | M102713 | UPDATED DIMENSIONS & NOTES | 01/17/06 | MMG | IL |
| E | M115059 | CORRECTED NOTE 2 | 12/18/07 | MMG | IL |

## SUGGESTED MOUNTING CONFIGURATION FOR BK377 CASE STYLE, "jc" PIN CONNECTION




NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; 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

| UNLESS OTHERWISE SPECIFIED | | INITIALS | DATE |
|---|---|---|---|
| DIMENSIONS ARE IN INCHES | DRAWN | FB | 05/20/00 |
| TOLERANCES ON: | CHECKED | MM | 05/24/00 |
| 2 PL DECIMALS ± | APPROVED | DB | 05/24/00 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



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

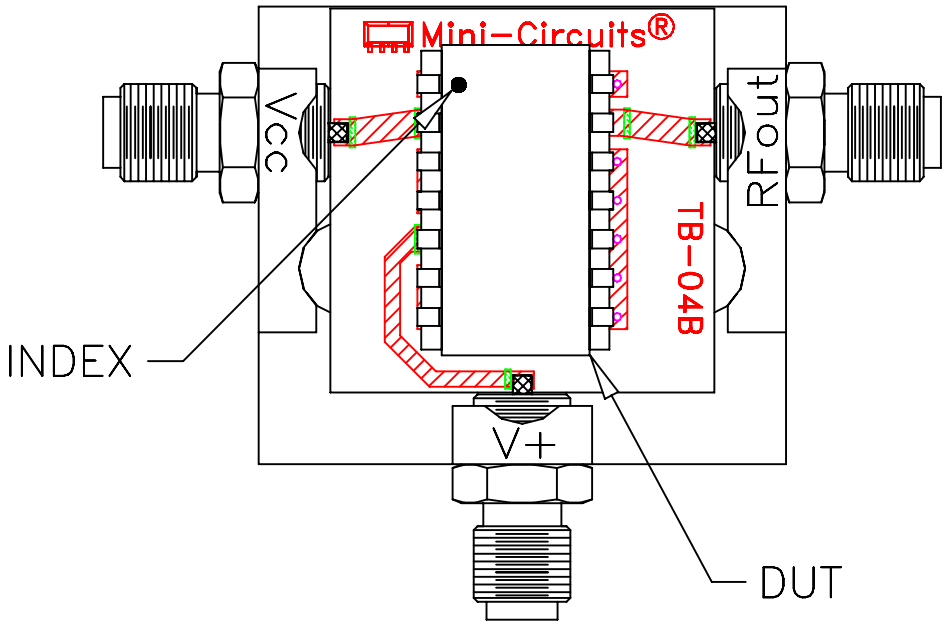
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

# PL, jc, BK377, JTOS, TB-04

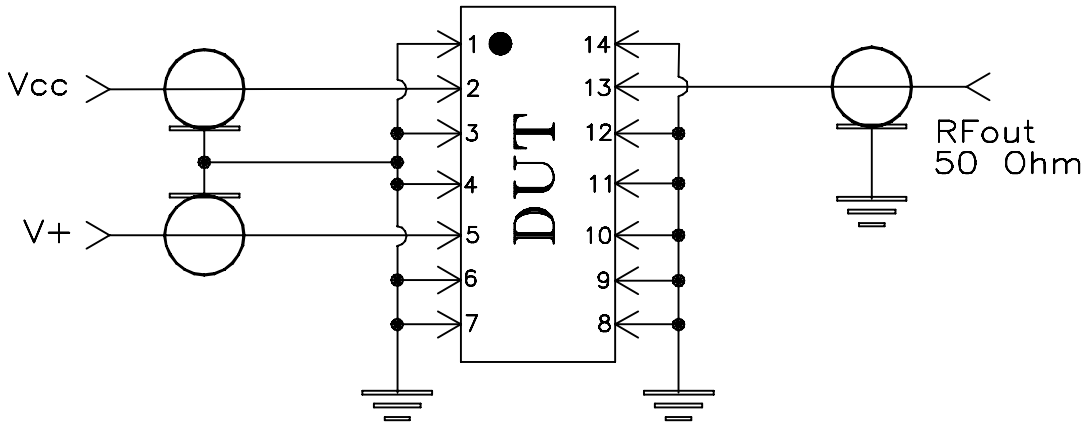
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-005 | E |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL005 | 5:1 | 1 OF 1 |

# Evaluation Board and Circuit




TB-04




Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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# Environmental Specifications ENV65

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 85°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Humidity | 90 to 95% RH, 240 hours, 50°C | MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Solder Reflow Heat | Sn-Pb Eutectic Process: 225°C peak<br>Pb-Free Process, 245°C peak | J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1 |
| Solderability | 10X Magnification | J-STD-002, Para 4.2.5, Test S, 95% Coverage |
| Vibration (High Frequency) | 20g peak, 20-2000 Hz, 4 times in each of three axes (total 12) | MIL-STD-883, Method 2007.3, Condition A |
| Mechanical Shock | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes | MIL-STD-202, Method 213, Condition A |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |