

NON-CATALOG

Surface Mount

Voltage Controlled Oscillator

JTOS-1650+

Linear Tuning 1200 to 1650 MHz

Features

- wide frequency range, 1200 to 1650 MHz
- linear tuning characteristics
- low phase noise, -144 dBc/Hz at 1 MHz offset
- aqueous washable

Applications

- GPS
- instrumentation
- communication systems



CASE STYLE: BK377

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

Electrical Specifications

| MODEL NO. | FREQ. (MHz) | | POWER OUTPUT (dBm) | PHASE NOISE dBc/Hz SSB at offset frequencies, kHz | | | | TUNING | | | | | NON HARMONIC SPURIOUS (dBc) | HARMONICS (dBc) | | PULLING pk-pk @ 12 dB (MHz) | PUSHING (MHz/V) | DC OPERATING POWER | |
|------------|-------------|------|--------------------|---|-----|------|------|--------|-------------------|----------------------|---------------|---------------------------------|-----------------------------|-----------------|------|-----------------------------|-----------------|--------------------|------|
| | Min. | Max. | | Typ. | 1 | 10 | 100 | 1000 | VOLTAGE RANGE (V) | SENSI-TIVITY (MHz/V) | PORT CAP (pF) | 3 dB MODULATION BANDWIDTH (MHz) | | Typ. | Typ. | | | Typ. | Typ. |
| JTOS-1650+ | 1200 | 1650 | +9 | -72 | -99 | -124 | -144 | 1 | 13 | 55 - 70 | 37 | 1 | -90 | -30 | -17 | 15 | 1.5 | 12 | 33 |

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) | 14V |
| Absolute Max. Tuning Voltage (Vtune) | 15V |
| All specifications | 50 ohm system |

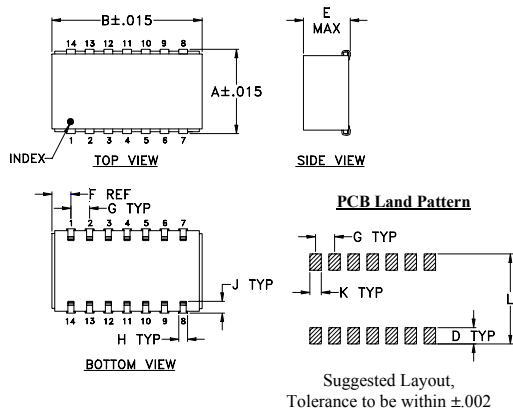
Permanent damage may occur if any of these limits are exceeded.

Tape & Reel: F107

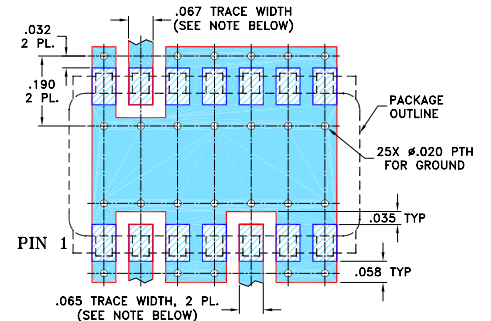
7" Reels with 10, 20, 50, 100 devices
13" Reels with 200 devices

Environmental Ratings: ENV65

Outline Drawing



Demo Board MCL PIN: TB-04
Suggested PCB Layout (PL-005)



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

- 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.
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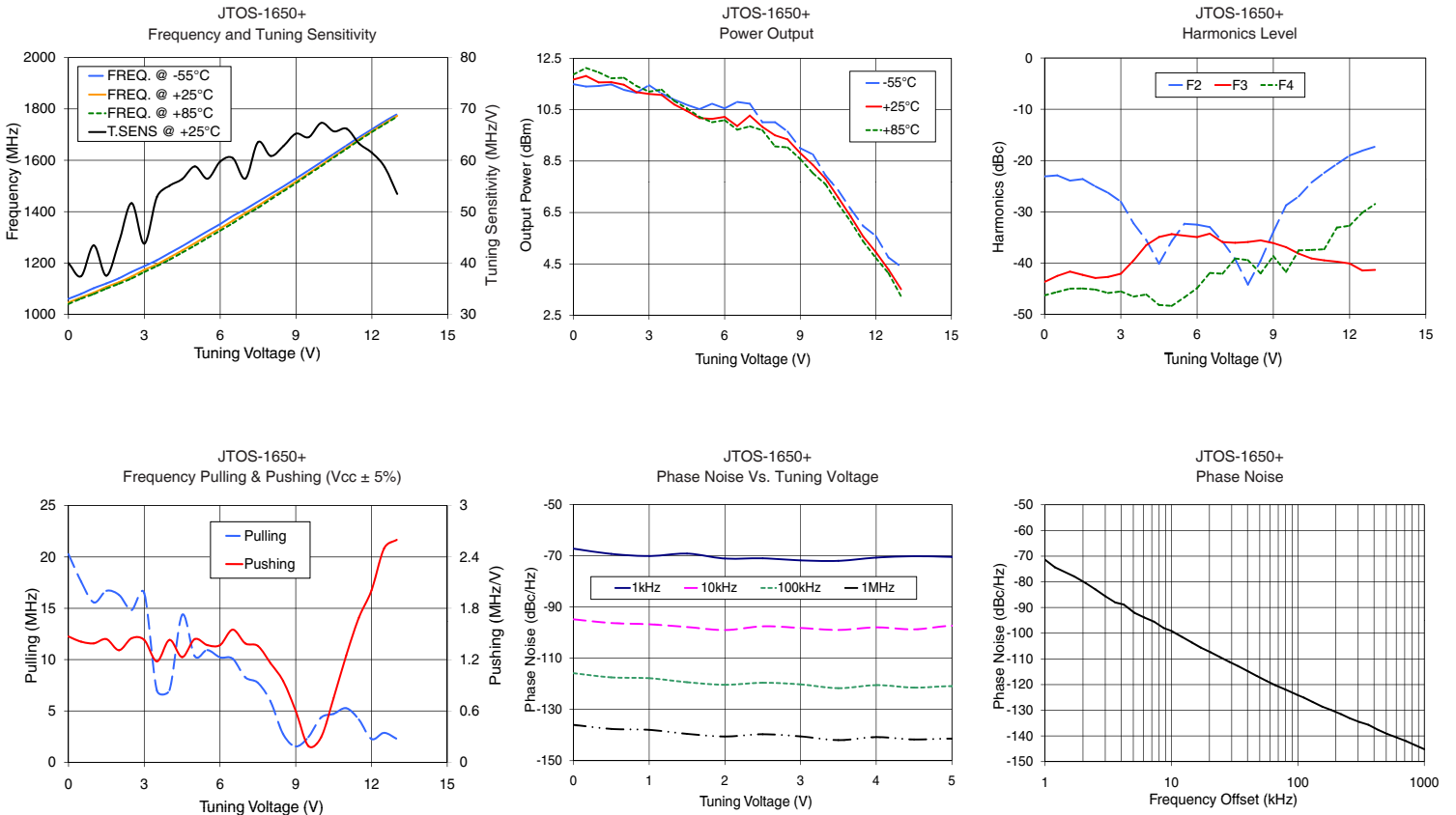
NON-CATALOG

Performance Data & Curves*

JTOS-1650+

| V TUNE | TUNE SENS (MHz/V) | FREQUENCY (MHz) | | | POWER OUTPUT (dBm) | | | Icc (mA) | HARMONICS (dBc) | | | FREQ. PUSH (MHz/V) | FREQ. PULL (MHz) | PHASE NOISE (dBc/Hz) at offsets | | | | FREQ OFFSET (kHz) | PHASE NOISE at 1425 MHz (dBc/Hz) |
|--------|-------------------|-----------------|--------|--------|--------------------|-------|-------|----------|-----------------|-------|-------|--------------------|------------------|---------------------------------|--------|--------|--------|-------------------|----------------------------------|
| | | -55°C | +25°C | +85°C | -55°C | +25°C | +85°C | | F2 | F3 | F4 | | | 1kHz | 10kHz | 100kHz | 1MHz | | |
| 0.00 | 39.99 | 1060.8 | 1046.3 | 1040.8 | 11.49 | 11.67 | 11.87 | 24.84 | -23.1 | -43.7 | -46.3 | 1.47 | 20.26 | -67.23 | -94.8 | -115.8 | -136.0 | 1.0 | -71.37 |
| 0.50 | 37.44 | 1080.2 | 1066.3 | 1061.2 | 11.40 | 11.81 | 12.12 | 25.07 | -22.9 | -42.5 | -45.7 | 1.41 | 17.60 | -69.27 | -96.3 | -117.5 | -137.6 | 2.5 | -82.91 |
| 1.00 | 43.45 | 1102.0 | 1085.0 | 1079.4 | 11.42 | 11.56 | 11.95 | 25.23 | -23.9 | -41.7 | -45.0 | 1.39 | 15.57 | -70.12 | -96.8 | -117.8 | -138.0 | 4.2 | -88.83 |
| 1.50 | 37.55 | 1120.5 | 1106.7 | 1100.5 | 11.48 | 11.57 | 11.72 | 25.49 | -23.6 | -42.3 | -45.0 | 1.44 | 16.70 | -69.16 | -97.8 | -119.4 | -139.5 | 7.3 | -95.54 |
| 2.00 | 44.13 | 1140.7 | 1125.5 | 1119.6 | 11.27 | 11.47 | 11.74 | 25.62 | -25.1 | -42.9 | -45.2 | 1.31 | 16.30 | -71.08 | -99.0 | -120.4 | -140.6 | 10.0 | -99.12 |
| 3.00 | 43.77 | 1187.9 | 1173.4 | 1165.2 | 11.45 | 11.11 | 11.20 | 25.93 | -28.0 | -42.1 | -45.5 | 1.43 | 16.48 | -71.80 | -98.2 | -120.2 | -140.5 | 12.2 | -101.51 |
| 4.00 | 55.04 | 1238.5 | 1221.7 | 1213.2 | 10.89 | 10.70 | 10.84 | 26.06 | -35.5 | -36.5 | -46.1 | 1.43 | 7.03 | -70.72 | -98.0 | -120.5 | -140.8 | 24.0 | -109.22 |
| 5.00 | 58.80 | 1295.0 | 1277.4 | 1268.2 | 10.52 | 10.17 | 10.22 | 26.33 | -35.7 | -34.4 | -48.4 | 1.44 | 10.33 | -70.46 | -97.3 | -120.9 | -141.4 | 40.2 | -114.77 |
| 6.00 | 59.75 | 1352.0 | 1335.0 | 1326.2 | 10.55 | 10.22 | 10.09 | 26.70 | -32.5 | -34.9 | -44.9 | 1.37 | 10.22 | -70.84 | -98.4 | -122.6 | -143.3 | 66.3 | -120.26 |
| 7.00 | 56.45 | 1409.8 | 1395.1 | 1386.8 | 10.73 | 10.27 | 9.85 | 27.07 | -35.8 | -35.9 | -42.1 | 1.39 | 8.28 | -71.54 | -99.3 | -124.1 | -145.1 | 100.0 | -124.12 |
| 8.00 | 60.85 | 1468.9 | 1455.1 | 1448.0 | 10.01 | 9.50 | 9.07 | 26.78 | -44.2 | -35.9 | -39.4 | 1.16 | 5.93 | -72.15 | -100.0 | -125.5 | -146.5 | 111.3 | -125.07 |
| 9.00 | 65.18 | 1529.6 | 1516.9 | 1511.3 | 9.00 | 8.81 | 8.58 | 26.33 | -33.9 | -36.1 | -38.6 | 0.60 | 1.55 | -73.87 | -102.0 | -126.8 | -147.5 | 156.2 | -128.61 |
| 10.00 | 67.28 | 1593.0 | 1581.7 | 1577.5 | 7.95 | 7.82 | 7.60 | 25.95 | -27.0 | -38.2 | -37.5 | 0.29 | 4.35 | -74.46 | -101.9 | -125.2 | -145.8 | 183.5 | -129.90 |
| 11.00 | 66.14 | 1657.8 | 1648.2 | 1644.7 | 6.64 | 6.35 | 6.15 | 25.69 | -22.4 | -39.5 | -37.3 | 1.25 | 5.27 | -72.38 | -99.1 | -121.7 | -142.4 | 219.3 | -131.52 |
| 12.00 | 61.46 | 1720.5 | 1712.9 | 1709.9 | 5.59 | 4.96 | 4.73 | 25.62 | -19.0 | -40.1 | -32.7 | 2.01 | 2.27 | -70.85 | -97.1 | -119.5 | -140.2 | 307.9 | -134.60 |
| 12.50 | 58.72 | 1751.4 | 1743.6 | 1740.3 | 4.75 | 4.28 | 4.14 | 25.54 | -18.1 | -41.5 | -30.2 | 2.50 | 2.87 | -69.01 | -95.5 | -118.0 | -138.7 | 361.5 | -135.69 |
| 13.00 | 53.46 | 1779.6 | 1773.0 | 1770.2 | 4.39 | 3.52 | 3.24 | 25.60 | -17.3 | -41.3 | -28.5 | 2.60 | 2.29 | -68.92 | -95.8 | -118.0 | -138.7 | 507.5 | -139.19 |
| 13.50 | 52.04 | 1806.6 | 1799.7 | 1796.9 | 4.15 | 3.37 | 3.12 | 25.65 | -16.5 | -41.0 | -31.2 | 2.94 | 3.38 | -68.60 | -94.8 | -117.2 | -137.9 | 606.7 | -140.64 |
| 14.00 | 48.80 | 1832.8 | 1825.7 | 1822.9 | 3.59 | 2.80 | 2.56 | 25.65 | -16.8 | -41.2 | -30.3 | 3.10 | 3.95 | -68.31 | -94.9 | -116.9 | -137.3 | 851.6 | -143.64 |
| 15.00 | 45.29 | 1879.8 | 1872.8 | 1869.7 | 3.00 | 1.97 | 1.72 | 25.67 | -15.3 | -37.9 | -31.7 | 3.42 | 2.27 | -67.83 | -94.1 | -116.3 | -136.9 | 1000.0 | -145.17 |

*at 25°C unless mentioned otherwise.



Notes

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Voltage Controlled Oscillator

JTOS-1650+

Typical Performance Data

| V TUNE | TUNE SENS (MHz/V) | FREQUENCY (MHz) | | | POWER OUTPUT (dBm) | | | HARMONICS (dBc) | | | FREQ. PUSH (MHz/V) | FREQ OFFSET (KHz) | PHASE NOISE (dBc/Hz) |
|-----------|-------------------------|--------------------|--------|--------|-----------------------|-------|-------|--------------------|-------|-------|--------------------------|-------------------------|----------------------------|
| | | -55°C | +25°C | +85°C | -55°C | +25°C | +85°C | F2 | F3 | F4 | | | |
| 1.0 | 101.10 | 1106.7 | 1085.6 | 1067.2 | 7.77 | 7.62 | 7.59 | -23.9 | -32.0 | -42.4 | 0.16 | 1 | -70 |
| 2.0 | 85.99 | 1190.5 | 1170.3 | 1151.7 | 7.98 | 7.96 | 7.71 | -32.3 | -34.0 | -36.3 | 0.48 | 10 | -95 |
| 3.0 | 77.73 | 1267.7 | 1246.6 | 1228.2 | 8.37 | 8.07 | 7.89 | -20.2 | -27.5 | -30.8 | 0.90 | 100 | -115 |
| 4.0 | 67.82 | 1336.4 | 1315.1 | 1297.1 | 9.21 | 8.38 | 8.46 | -22.9 | -25.2 | -26.1 | 0.98 | 1000 | -135 |
| 5.0 | 61.47 | 1394.4 | 1375.4 | 1359.0 | 9.74 | 9.09 | 8.73 | -33.8 | -24.8 | -26.5 | 1.22 | | |
| 6.0 | 58.97 | 1452.6 | 1434.1 | 1417.7 | 10.03 | 9.44 | 9.03 | -25.1 | -26.3 | -28.1 | 1.51 | | |
| 7.0 | 57.55 | 1508.1 | 1490.4 | 1475.0 | 10.28 | 9.63 | 9.37 | -19.8 | -26.9 | -29.6 | 1.51 | | |
| 8.0 | 56.98 | 1561.3 | 1546.5 | 1531.6 | 10.72 | 10.04 | 9.46 | -18.6 | -28.9 | -31.9 | 1.36 | | |
| 9.0 | 55.89 | 1615.3 | 1601.1 | 1587.1 | 10.44 | 10.29 | 9.64 | -18.3 | -29.5 | -32.3 | 1.08 | | |
| 10.0 | 54.81 | 1665.7 | 1652.9 | 1641.1 | 10.22 | 10.30 | 9.39 | -19.0 | -38.6 | -30.3 | 0.54 | | |
| 11.0 | 55.14 | 1719.1 | 1707.0 | 1695.6 | 9.52 | 10.09 | 8.95 | -20.6 | -39.9 | -29.4 | 0.13 | | |
| 12.0 | 54.98 | 1772.5 | 1758.8 | 1747.1 | 8.35 | 9.52 | 8.13 | -20.7 | -29.9 | -28.1 | 0.86 | | |
| 13.0 | 56.31 | 1822.8 | 1809.2 | 1797.6 | 7.08 | 8.48 | 7.27 | -17.7 | -26.5 | -30.5 | 1.09 | | |

REV. X1
JTOS-1650+
070131
Page 1 of 1



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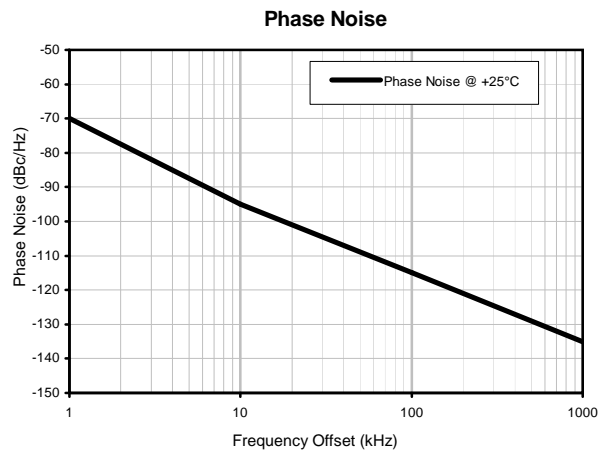
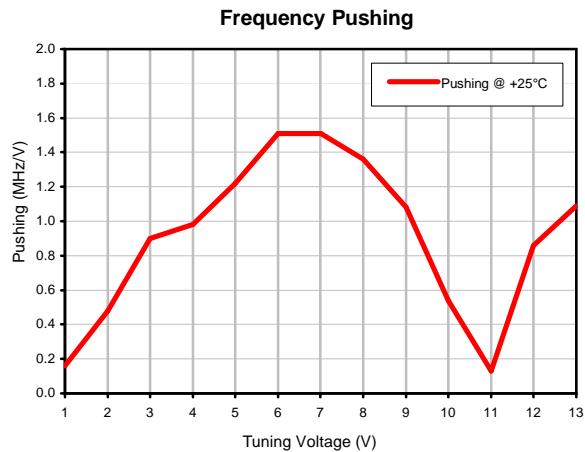
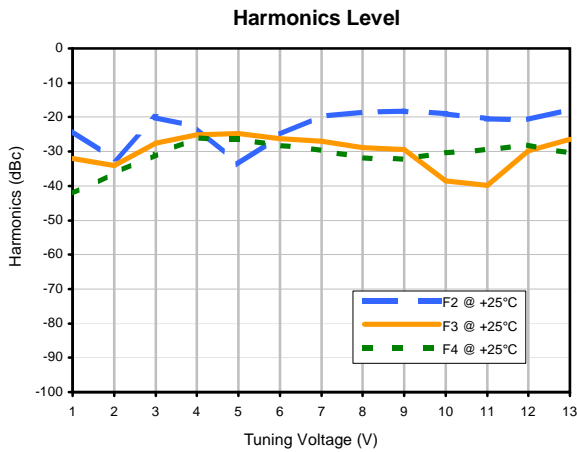
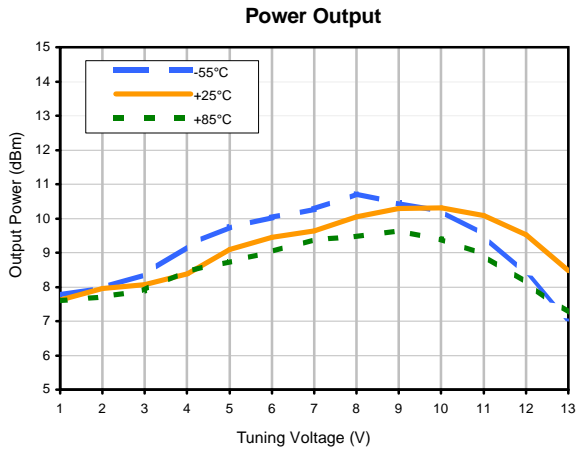
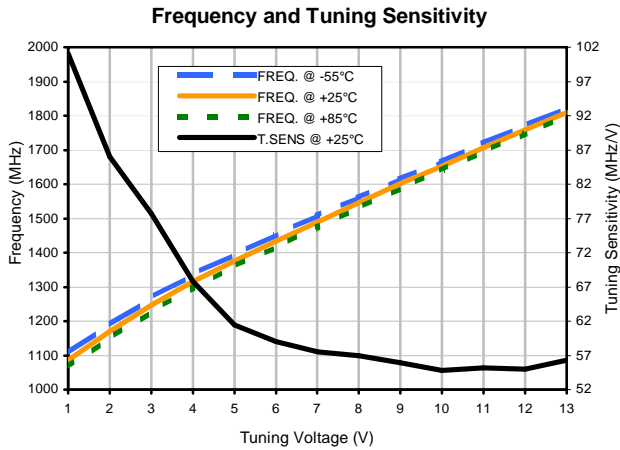
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



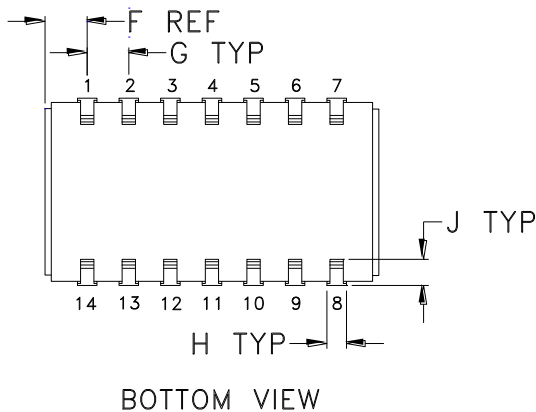
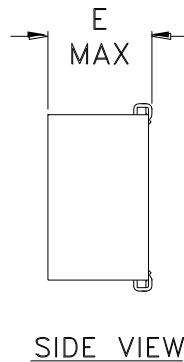
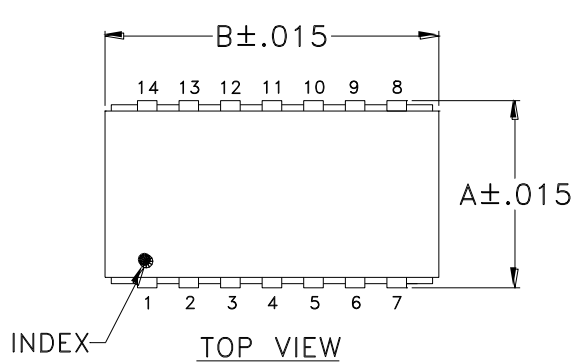
Voltage Controlled Oscillator

JTOS-1650+

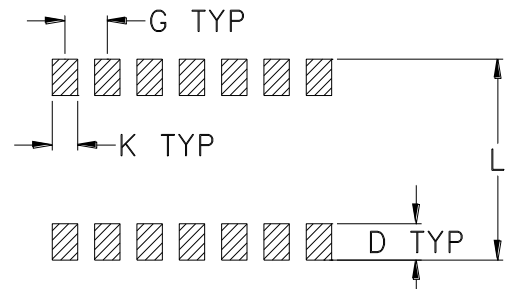
Typical Performance Data



Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

| 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. $\pm .01$; 3Pl. $\pm .005$

Notes:

- Case material: Copper Nickel alloy.
- Base material: Printed wiring laminate.
- 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.



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

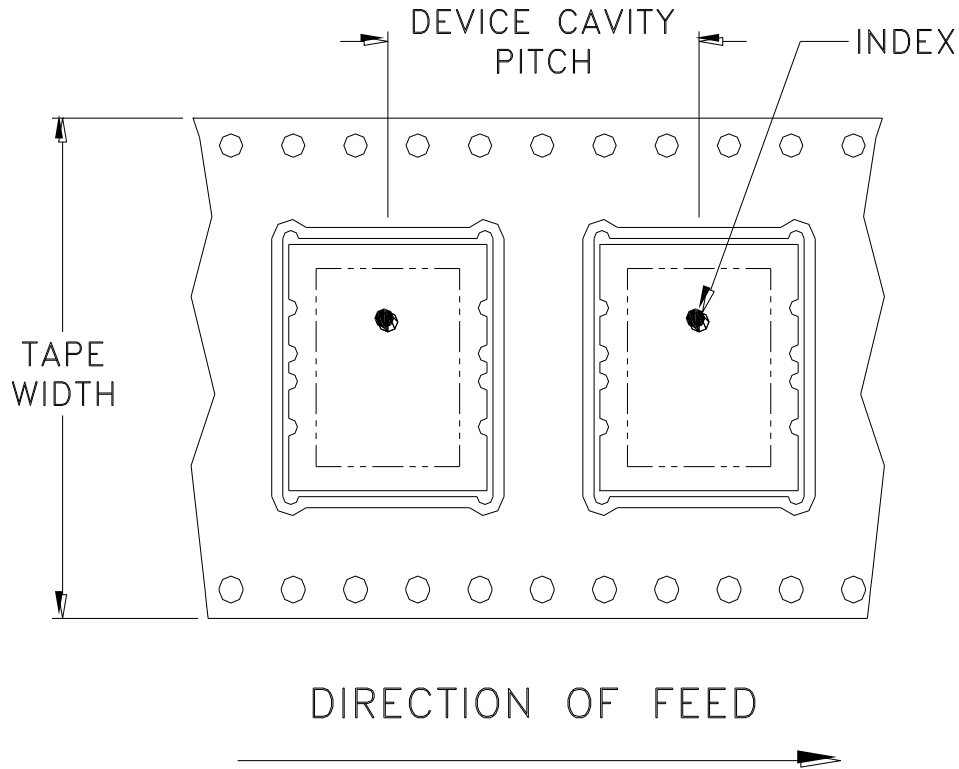
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Tape & Reel Packaging TR-F107

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 |
| | | 13 | Standard | 100 |
| | | | 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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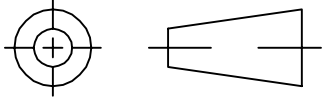
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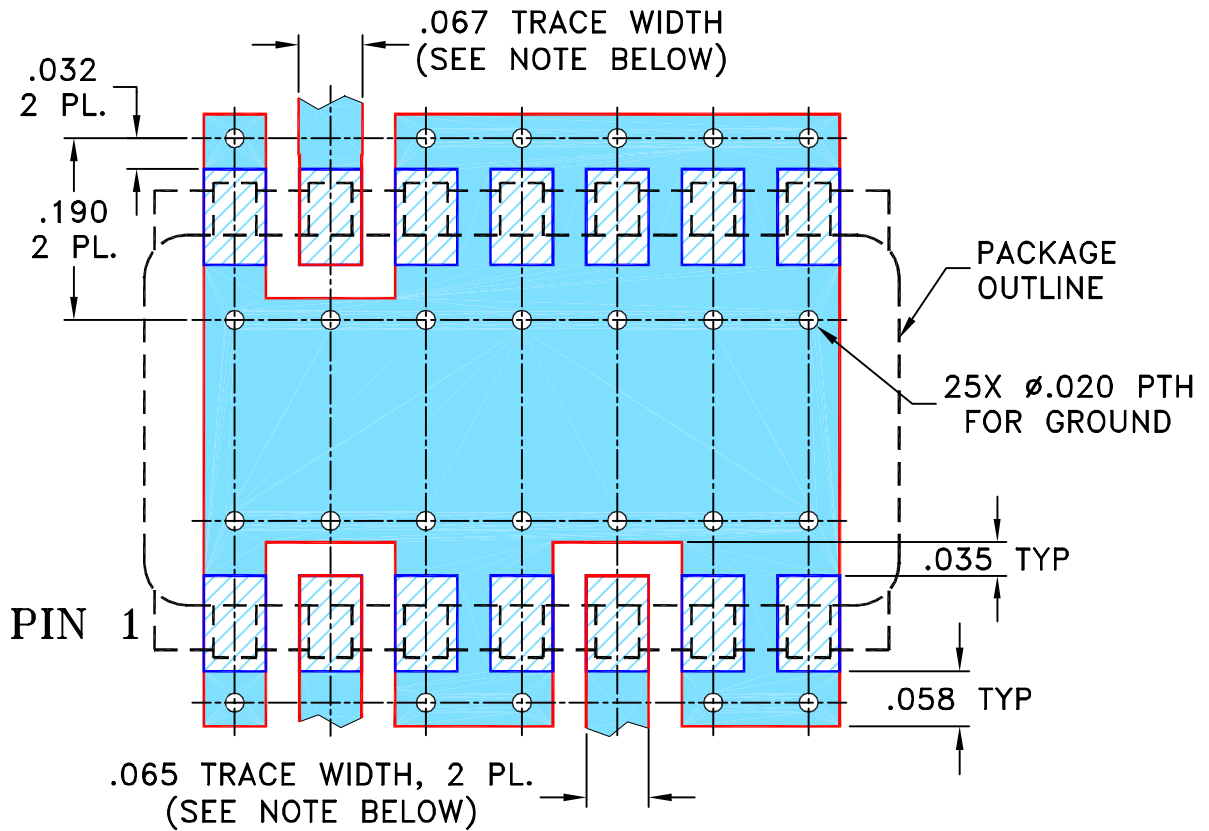
THIRD ANGLE PROJECTION




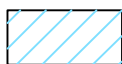
REVISIONS

| 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



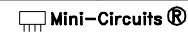
- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

-  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 ± | | |

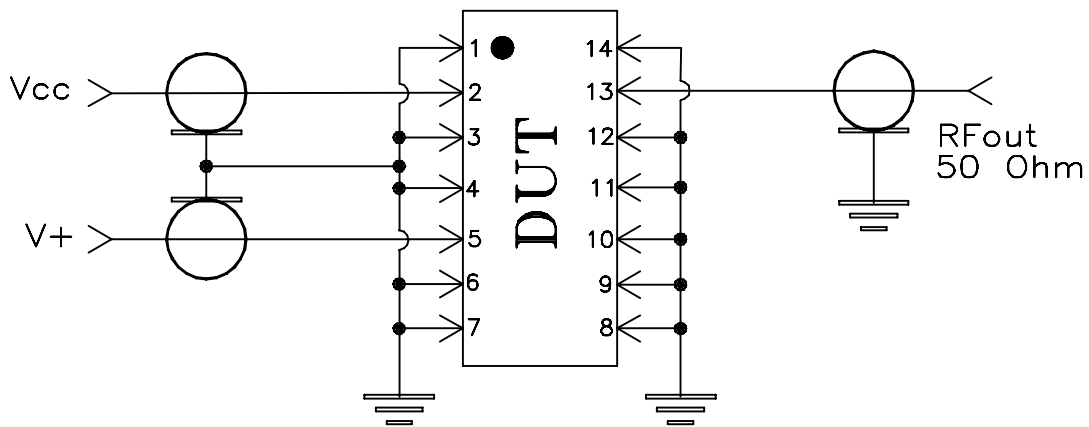
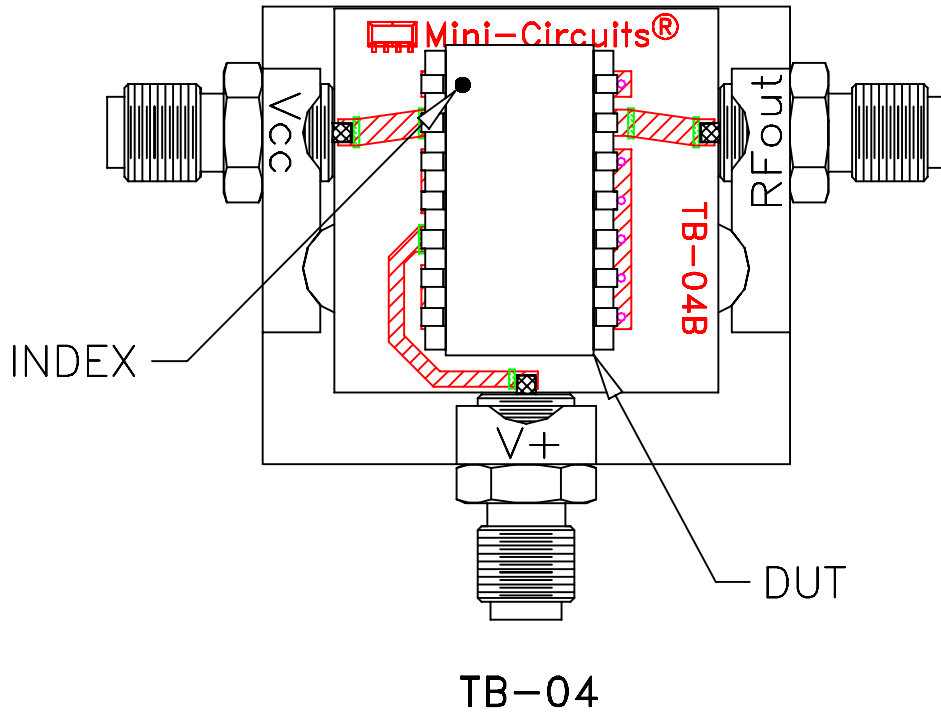
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PL, jc, BK377, JTOS, TB-04

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| SIZE | CODE IDENT | DRAWING NO: | REV: |
|-------|------------|-------------|---------------|
| A | 15542 | 98-PL-005 | E |
| FILE: | 98PL005 | SCALE: 5:1 | SHEET: 1 OF 1 |

Evaluation Board and Circuit



Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.030 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 85°C Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C 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 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; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |