

# Voltage Controlled Oscillator

# SOS-1225-119+

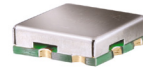
5V Tuning for PLL ICs 1185 to 1225 MHz

## Features

- linear tuning characteristics
- low pushing & pulling
- low phase noise
- small size 0.3" x 0.3"
- aqueous washable

## Applications

- wireless communications
- handset radio



CASE STYLE: FZ990

### +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 <sub>r</sub> (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. |                                         |                 | Max.               | Typ. | Typ. | V <sub>cc</sub> (volts) | Current (mA) |
|               |             |      |                    |                                                  |      |      |      |        |                   |                       |               |                                 |                             |                 |      |                                         |                 |                    |      |      |                         |              |
| SOS-1225-119+ | 1185        | 1225 | -0.2               | -79                                              | -105 | -125 | -145 | 0.5    | 3                 | 42                    | 22            | 75                              | -90                         | -17             | -10  | 2                                       | 0.7             | 3                  | 14   |      |                         |              |

## Pin Connections

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

## Maximum Ratings

|                                      |                |
|--------------------------------------|----------------|
| Operating Temperature                | -55°C to 85°C  |
| Storage Temperature                  | -55°C to 100°C |
| Absolute Max. Supply Voltage (Vcc)   | 5V             |
| Absolute Max. Tuning Voltage (Vtune) | 5V             |
| All specifications                   | 50 ohm system  |

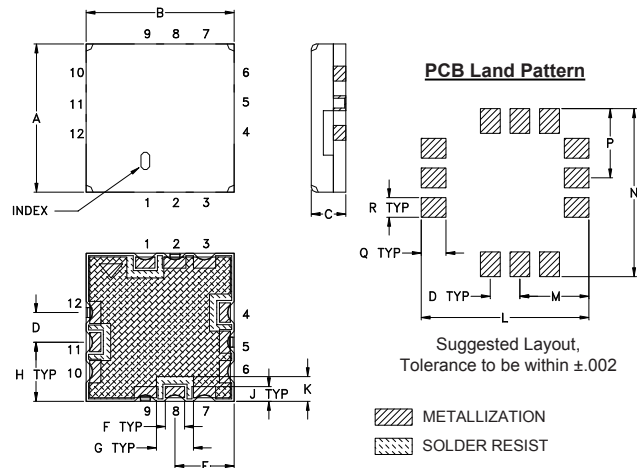
Permanent damage may occur if any of these limits are exceeded.

## Tape & Reel: F78

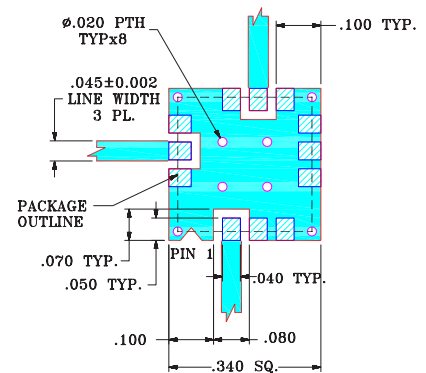
7" Reels with 10, 20, 50, 100 devices  
13" Reels with 200, 500, 1000 devices

## Environmental Ratings: ENV65

## Outline Drawing



## Demo Board MCL P/N: TB-271 Suggested PCB Layout (PL-143)



### NOTE:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.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    | M    | N    | P    | Q    | R    | wt.   |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| .300 | .300 | .100 | .060 | .120 | .039 | .075 | .120 | .030 | .050 | .340 | .140 | .340 | .140 | .050 | .040 | grams |
| 7.62 | 7.62 | 2.54 | 1.52 | 3.05 | 0.99 | 1.91 | 3.05 | 0.76 | 1.27 | 8.64 | 3.56 | 8.64 | 3.56 | 1.27 | 1.02 | .25   |

### Notes

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- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
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REV. B  
M169213  
EDR-8910/3F1  
SOS-1225-119+  
RAV  
180814  
Page 1 of 2

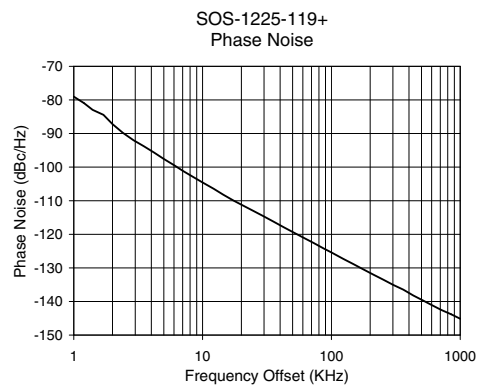
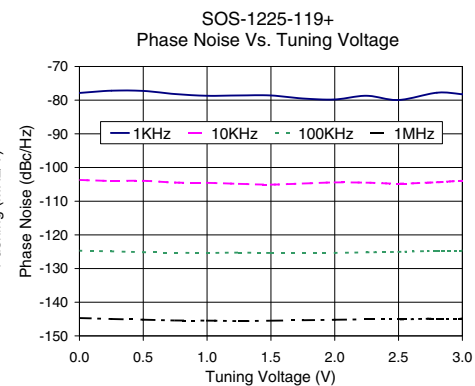
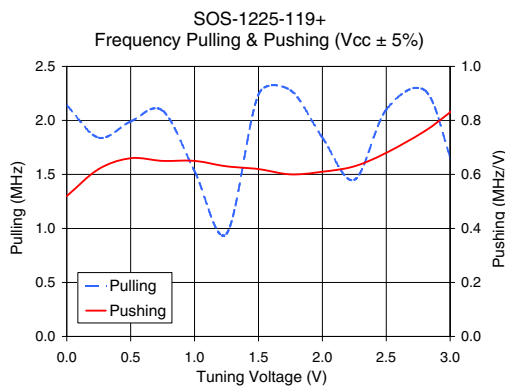
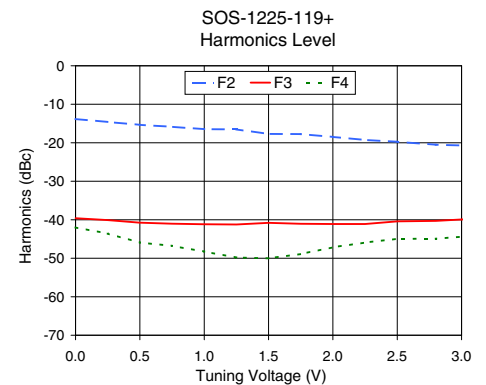
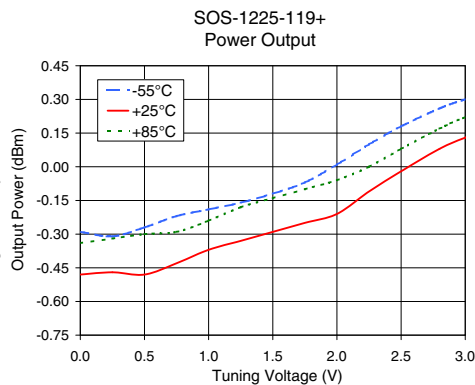
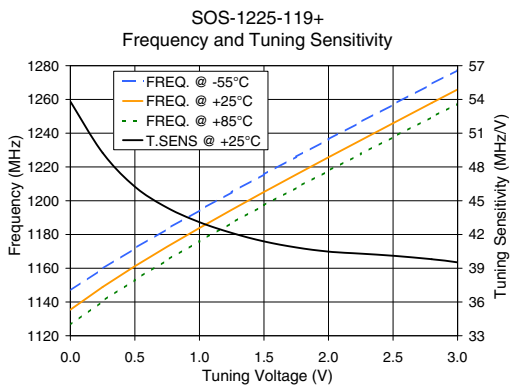
# NON-CATALOG

## Performance Data & Curves\*

## SOS-1225-119+

| V<br>TUNE | TUNE<br>SENS<br>(MHz/V) | FREQUENCY<br>(MHz) |        |        | POWER OUTPUT<br>(dBm) |       |       | Icc<br>(mA) | HARMONICS (dBc) |       |       | FREQ.<br>PUSH<br>(MHz/V) | FREQ.<br>PULL<br>(MHz) | PHASE NOISE (dBc/Hz)<br>at offsets |        |        |        | FREQ<br>OFFSET<br>(KHz) | PHASE<br>NOISE at<br>1205 MHz<br>(dBc/Hz) |
|-----------|-------------------------|--------------------|--------|--------|-----------------------|-------|-------|-------------|-----------------|-------|-------|--------------------------|------------------------|------------------------------------|--------|--------|--------|-------------------------|-------------------------------------------|
|           |                         | -55°C              | +25°C  | +85°C  | -55°C                 | +25°C | +85°C |             | F2              | F3    | F4    |                          |                        | 1kHz                               | 10kHz  | 100kHz | 1MHz   |                         |                                           |
| 0.00      | 53.81                   | 1146.8             | 1135.4 | 1126.4 | -0.29                 | -0.48 | -0.34 | 8.42        | -13.8           | -39.6 | -42.0 | 0.52                     | 2.14                   | -77.9                              | -103.7 | -124.7 | -144.7 | 1.0                     | -79.03                                    |
| 0.25      | 49.26                   | 1159.8             | 1148.9 | 1140.5 | -0.31                 | -0.47 | -0.32 | 8.38        | -14.6           | -40.1 | -43.6 | 0.62                     | 1.84                   | -77.2                              | -104.0 | -124.9 | -145.0 | 3.5                     | -93.79                                    |
| 0.50      | 46.25                   | 1171.8             | 1161.2 | 1153.1 | -0.27                 | -0.48 | -0.30 | 8.36        | -15.4           | -40.8 | -45.9 | 0.66                     | 1.99                   | -77.3                              | -104.0 | -125.2 | -145.2 | 5.0                     | -97.57                                    |
| 0.75      | 44.37                   | 1183.2             | 1172.8 | 1164.9 | -0.22                 | -0.43 | -0.29 | 8.34        | -15.9           | -41.0 | -46.8 | 0.65                     | 2.09                   | -78.2                              | -104.5 | -125.3 | -145.4 | 10.0                    | -104.57                                   |
| 1.00      | 43.09                   | 1194.3             | 1183.9 | 1176.0 | -0.19                 | -0.37 | -0.24 | 8.32        | -16.5           | -41.2 | -48.3 | 0.65                     | 1.53                   | -78.7                              | -104.6 | -125.4 | -145.5 | 35.5                    | -116.22                                   |
| 1.25      | 42.13                   | 1205.0             | 1194.6 | 1186.8 | -0.16                 | -0.33 | -0.18 | 8.30        | -16.5           | -41.2 | -49.8 | 0.63                     | 0.95                   | -78.6                              | -104.8 | -125.3 | -145.6 | 50.7                    | -119.43                                   |
| 1.50      | 41.39                   | 1215.6             | 1205.2 | 1197.3 | -0.12                 | -0.29 | -0.14 | 8.27        | -17.7           | -40.8 | -50.0 | 0.62                     | 2.24                   | -78.6                              | -105.1 | -125.4 | -145.5 | 100.0                   | -125.40                                   |
| 1.75      | 40.85                   | 1226.0             | 1215.5 | 1207.6 | -0.07                 | -0.25 | -0.10 | 8.25        | -17.7           | -41.0 | -48.9 | 0.60                     | 2.28                   | -79.5                              | -104.8 | -125.4 | -145.3 | 148.1                   | -128.86                                   |
| 2.00      | 40.48                   | 1236.4             | 1225.7 | 1217.8 | 0.01                  | -0.21 | -0.06 | 8.22        | -18.5           | -41.1 | -47.1 | 0.61                     | 1.84                   | -79.8                              | -104.4 | -125.4 | -145.2 | 253.0                   | -133.52                                   |
| 2.25      | 40.29                   | 1246.7             | 1235.8 | 1227.7 | 0.10                  | -0.11 | 0.00  | 8.18        | -19.3           | -41.1 | -45.9 | 0.63                     | 1.45                   | -78.7                              | -104.5 | -125.2 | -145.1 | 361.5                   | -136.48                                   |
| 2.50      | 40.10                   | 1257.0             | 1245.9 | 1237.7 | 0.18                  | -0.02 | 0.08  | 8.15        | -19.7           | -40.4 | -45.0 | 0.68                     | 2.10                   | -79.9                              | -104.8 | -125.1 | -145.1 | 507.5                   | -139.59                                   |
| 2.80      | 39.80                   | 1269.2             | 1257.9 | 1249.5 | 0.26                  | 0.08  | 0.17  | 8.09        | -20.5           | -40.3 | -44.9 | 0.76                     | 2.28                   | -77.8                              | -104.4 | -124.8 | -144.9 | 851.6                   | -143.81                                   |
| 3.00      | 39.52                   | 1277.4             | 1265.9 | 1257.4 | 0.30                  | 0.13  | 0.22  | 8.07        | -20.7           | -39.9 | -44.4 | 0.83                     | 1.66                   | -78.3                              | -104.0 | -124.7 | -144.9 | 1000.0                  | -145.13                                   |

\*at 25°C unless mentioned otherwise



### Notes

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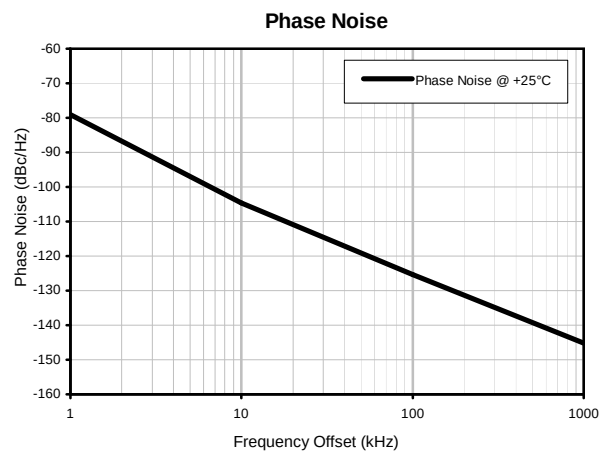
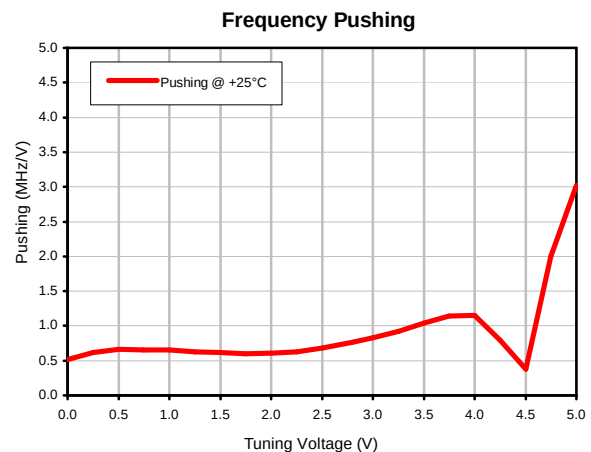
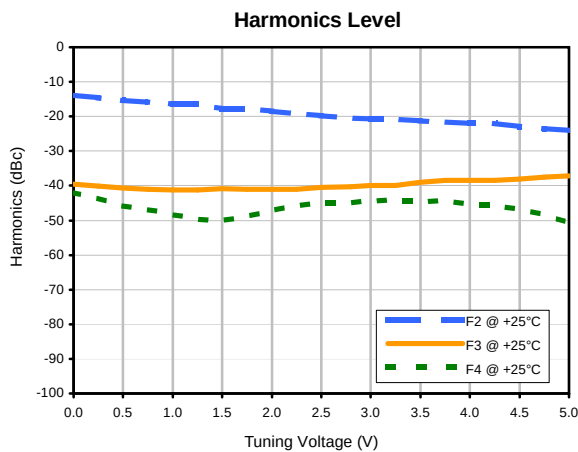
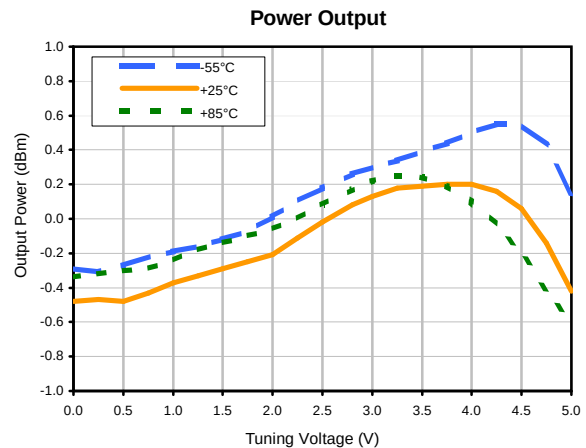
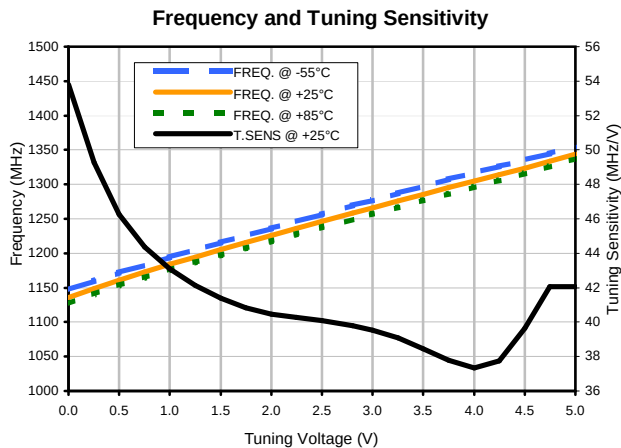
## Typical Performance Data

| V<br>TUNE | TUNE<br>SENS<br>(MHz/V) | FREQUENCY<br>(MHz) |        |        | POWER OUTPUT<br>(dBm) |       |       | HARMONICS (dBc) |       |       | FREQ.<br>PUSH<br>(MHz/V) | FREQ<br>OFFSET<br>(KHz) | PHASE<br>NOISE<br>(dBc/Hz) |
|-----------|-------------------------|--------------------|--------|--------|-----------------------|-------|-------|-----------------|-------|-------|--------------------------|-------------------------|----------------------------|
|           |                         | -55°C              | +25°C  | +85°C  | -55°C                 | +25°C | +85°C | F2              | F3    | F4    |                          |                         |                            |
| 0.00      | 53.81                   | 1146.8             | 1135.4 | 1126.4 | -0.29                 | -0.48 | -0.34 | -13.8           | -39.6 | -42.0 | 0.52                     | 1                       | -79                        |
| 0.25      | 49.26                   | 1159.8             | 1148.9 | 1140.5 | -0.31                 | -0.47 | -0.32 | -14.6           | -40.1 | -43.6 | 0.62                     | 10                      | -105                       |
| 0.50      | 46.25                   | 1171.8             | 1161.2 | 1153.1 | -0.27                 | -0.48 | -0.30 | -15.4           | -40.8 | -45.9 | 0.66                     | 100                     | -125                       |
| 0.75      | 44.37                   | 1183.2             | 1172.8 | 1164.9 | -0.22                 | -0.43 | -0.29 | -15.9           | -41.0 | -46.8 | 0.65                     | 1000                    | -145                       |
| 1.00      | 43.09                   | 1194.3             | 1183.9 | 1176.0 | -0.19                 | -0.37 | -0.24 | -16.5           | -41.2 | -48.3 | 0.65                     |                         |                            |
| 1.25      | 42.13                   | 1205.0             | 1194.6 | 1186.8 | -0.16                 | -0.33 | -0.18 | -16.5           | -41.2 | -49.8 | 0.63                     |                         |                            |
| 1.50      | 41.39                   | 1215.6             | 1205.2 | 1197.3 | -0.12                 | -0.29 | -0.14 | -17.7           | -40.8 | -50.0 | 0.62                     |                         |                            |
| 1.75      | 40.85                   | 1226.0             | 1215.5 | 1207.6 | -0.07                 | -0.25 | -0.10 | -17.7           | -41.0 | -48.9 | 0.60                     |                         |                            |
| 2.00      | 40.48                   | 1236.4             | 1225.7 | 1217.8 | 0.01                  | -0.21 | -0.06 | -18.5           | -41.1 | -47.1 | 0.61                     |                         |                            |
| 2.25      | 40.29                   | 1246.7             | 1235.8 | 1227.7 | 0.10                  | -0.11 | 0.00  | -19.3           | -41.1 | -45.9 | 0.63                     |                         |                            |
| 2.50      | 40.10                   | 1257.0             | 1245.9 | 1237.7 | 0.18                  | -0.02 | 0.08  | -19.7           | -40.4 | -45.0 | 0.68                     |                         |                            |
| 2.80      | 39.80                   | 1269.2             | 1257.9 | 1249.5 | 0.26                  | 0.08  | 0.17  | -20.5           | -40.3 | -44.9 | 0.76                     |                         |                            |
| 3.00      | 39.52                   | 1277.4             | 1265.9 | 1257.4 | 0.30                  | 0.13  | 0.22  | -20.7           | -39.9 | -44.4 | 0.83                     |                         |                            |
| 3.25      | 39.07                   | 1287.4             | 1275.8 | 1267.2 | 0.34                  | 0.18  | 0.25  | -20.7           | -39.9 | -44.2 | 0.92                     |                         |                            |
| 3.50      | 38.45                   | 1297.4             | 1285.6 | 1276.9 | 0.39                  | 0.19  | 0.24  | -21.2           | -38.9 | -44.6 | 1.04                     |                         |                            |
| 3.75      | 37.79                   | 1307.3             | 1295.2 | 1286.5 | 0.44                  | 0.20  | 0.19  | -21.6           | -38.5 | -44.3 | 1.14                     |                         |                            |
| 4.00      | 37.35                   | 1317.0             | 1304.6 | 1296.2 | 0.50                  | 0.20  | 0.10  | -22.0           | -38.4 | -45.3 | 1.15                     |                         |                            |
| 4.25      | 37.75                   | 1326.5             | 1314.0 | 1306.0 | 0.55                  | 0.16  | -0.03 | -22.0           | -38.5 | -45.6 | 0.79                     |                         |                            |
| 4.50      | 39.63                   | 1335.8             | 1323.4 | 1316.0 | 0.55                  | 0.06  | -0.21 | -22.9           | -38.0 | -46.7 | 0.38                     |                         |                            |
| 4.75      | 42.07                   | 1344.8             | 1333.3 | 1326.4 | 0.43                  | -0.14 | -0.41 | -23.4           | -37.6 | -48.4 | 2.00                     |                         |                            |
| 5.00      | 42.07                   | 1354.3             | 1343.8 | 1337.0 | 0.14                  | -0.42 | -0.62 | -24.0           | -37.2 | -50.7 | 3.02                     |                         |                            |

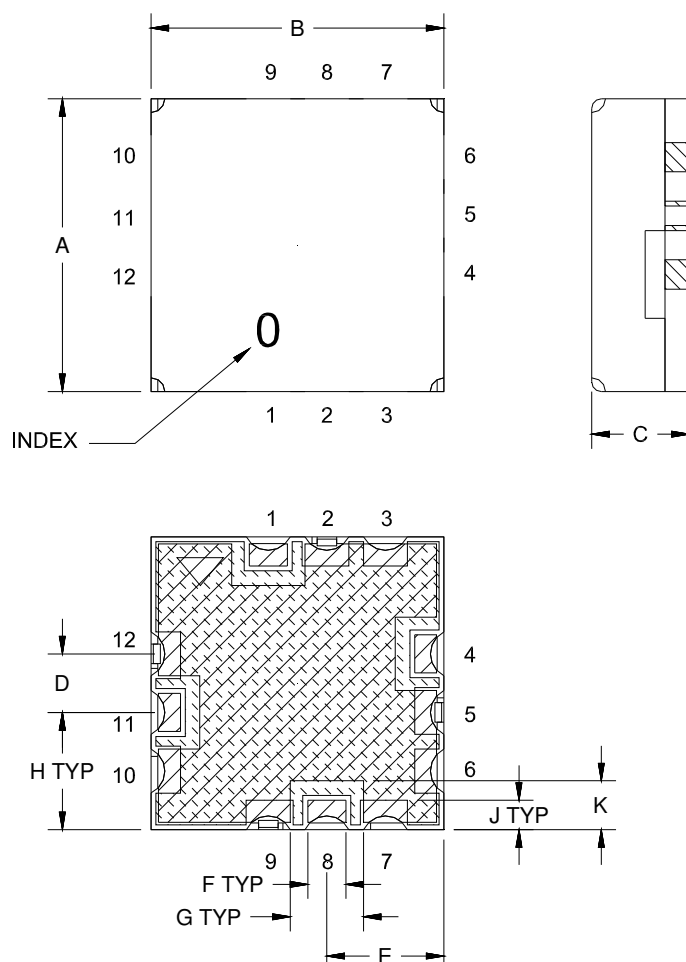
# Voltage Controlled Oscillator

SOS-1225-119+

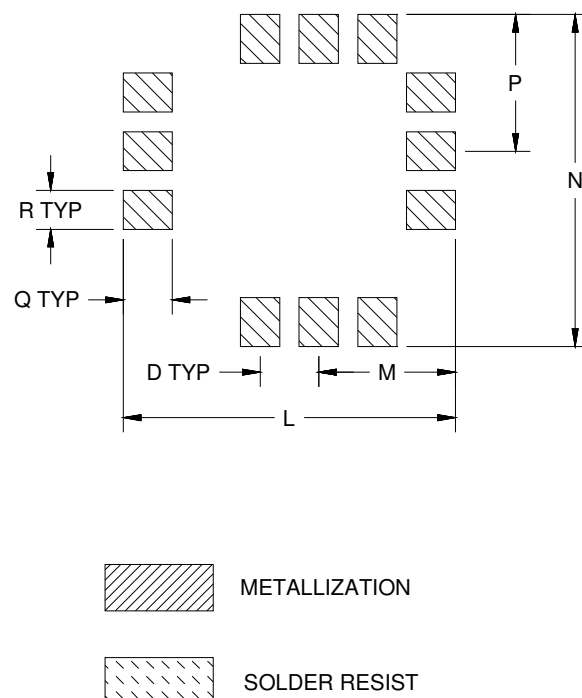
## Typical Performance Data



### Outline Dimensions



### PCB Land Pattern



| CASE # | A              | B              | C              | D              | E              | F              | G              | H              | J              | K              |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| FZ990  | .300<br>(7.62) | .300<br>(7.62) | .100<br>(2.54) | .060<br>(1.52) | .120<br>(3.05) | .039<br>(0.99) | .075<br>(1.91) | .120<br>(3.05) | .030<br>(0.76) | .050<br>(1.27) |

| CASE # | L              | M              | N              | P              | Q              | R              | WT. GRAM |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------|
| FZ990  | .340<br>(8.64) | .140<br>(3.56) | .340<br>(8.64) | .140<br>(3.56) | .050<br>(1.27) | .040<br>(1.02) | .25      |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3Pl.  $\pm .015$

### Notes:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- Termination finish:  
For RoHS Case Styles: 3-5  $\mu$  inch (.08-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate.



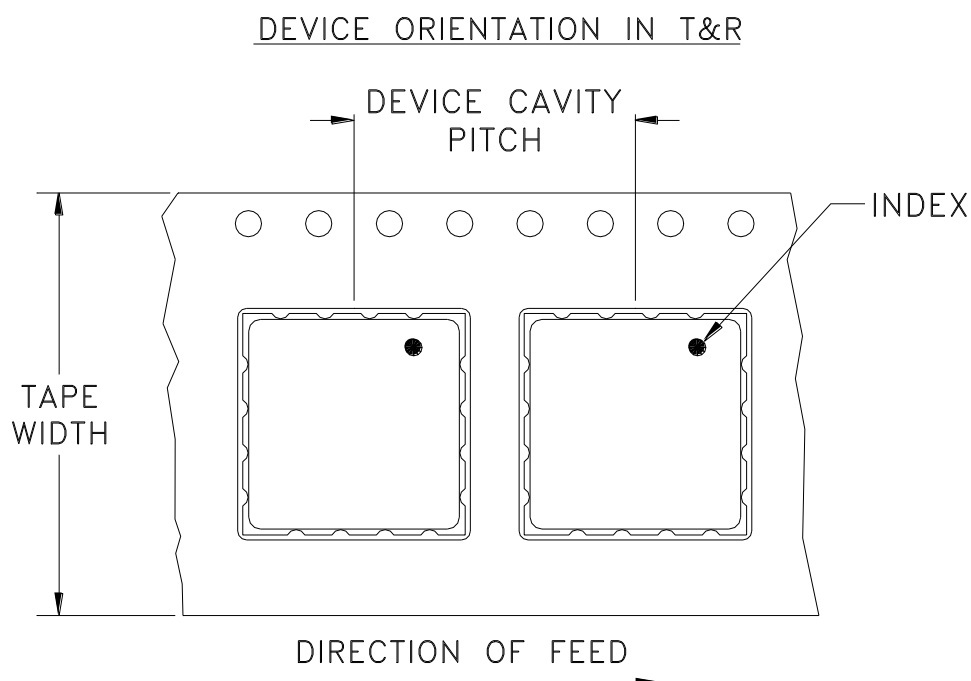
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Mini-Circuits ISO 9001 & ISO 14001 Certified

# Tape & Reel Packaging TR-F78



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel<br>see note |
|-------------------|----------------------------|----------------------|------------------------------|
| 16                | 12                         | 7                    | 10                           |
|                   |                            |                      | 20                           |
|                   |                            |                      | 50                           |
|                   |                            |                      | 100                          |
|                   |                            |                      | 200                          |
|                   |                            | 13                   | 500, 1000                    |

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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



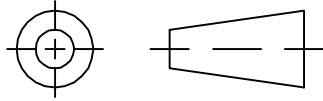
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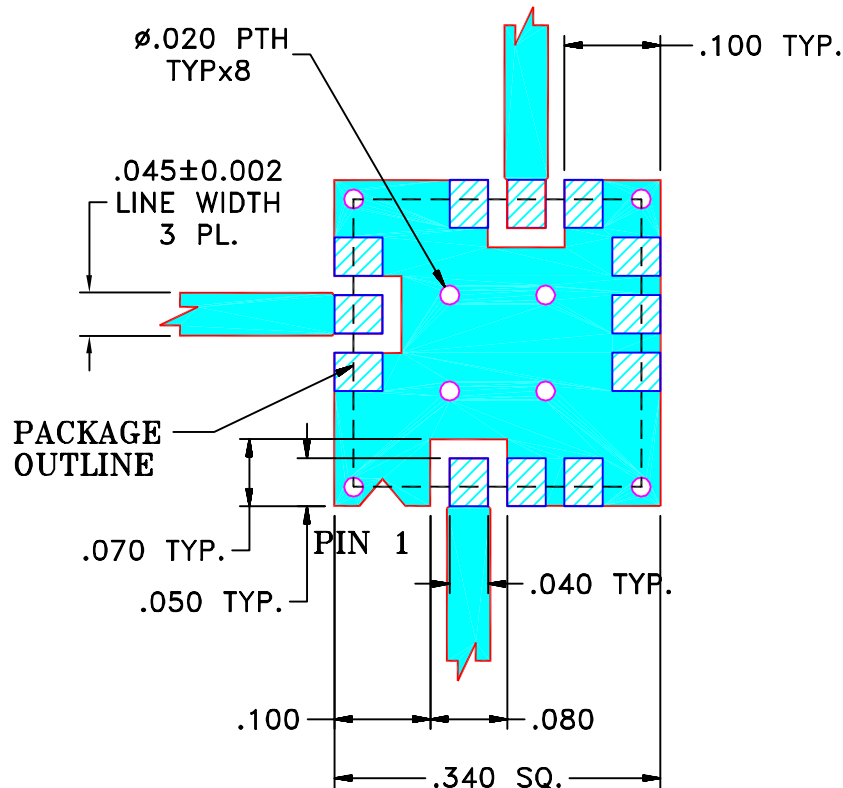
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION              | DATE     | DR | AUTH |
|-----|---------|--------------------------|----------|----|------|
| OR  | M89039  | NEW RELEASE (FROM RAVON) | 01/04    | DK | HH   |
| OR  | R54816  | NEW RELEASE (FROM RAVON) | 01/04    | DK | HH   |
| A   | M102713 | ADDED "...WITH SMOBC"    | 01/12/06 | GF | IL   |

**SUGGESTED MOUNTING CONFIGURATION  
FOR FZ802/FZ990 CASE STYLE, pl PIN CONNECTION.**

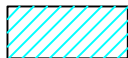


## NOTE:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS  $.025" \pm .002"$ ; 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

DK (RAV)

19/01/04

TOLERANCES ON:

CHECKED

RZ (RAV)

19/01/04

2 PL DECIMALS  $\pm$ 

APPROVED

HH (RAV)

19/01/04

3 PL DECIMALS  $\pm$  .005ANGLES  $\pm$ FRACTIONS  $\pm$ 

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Brooklyn NY 11235

PL, pl, FZ802/FZ990, SOS, TB-271

SIZE

CODE IDENT

DRAWING NO:

REV:

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15542

98-PL-143

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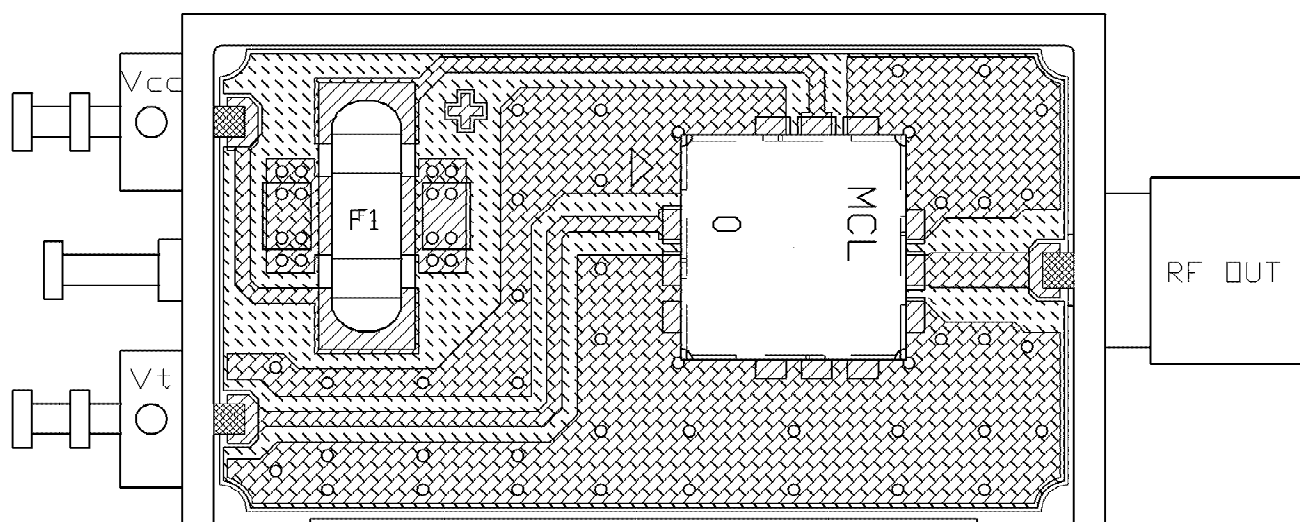
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1 OF 1

# Evaluation Board and Circuit

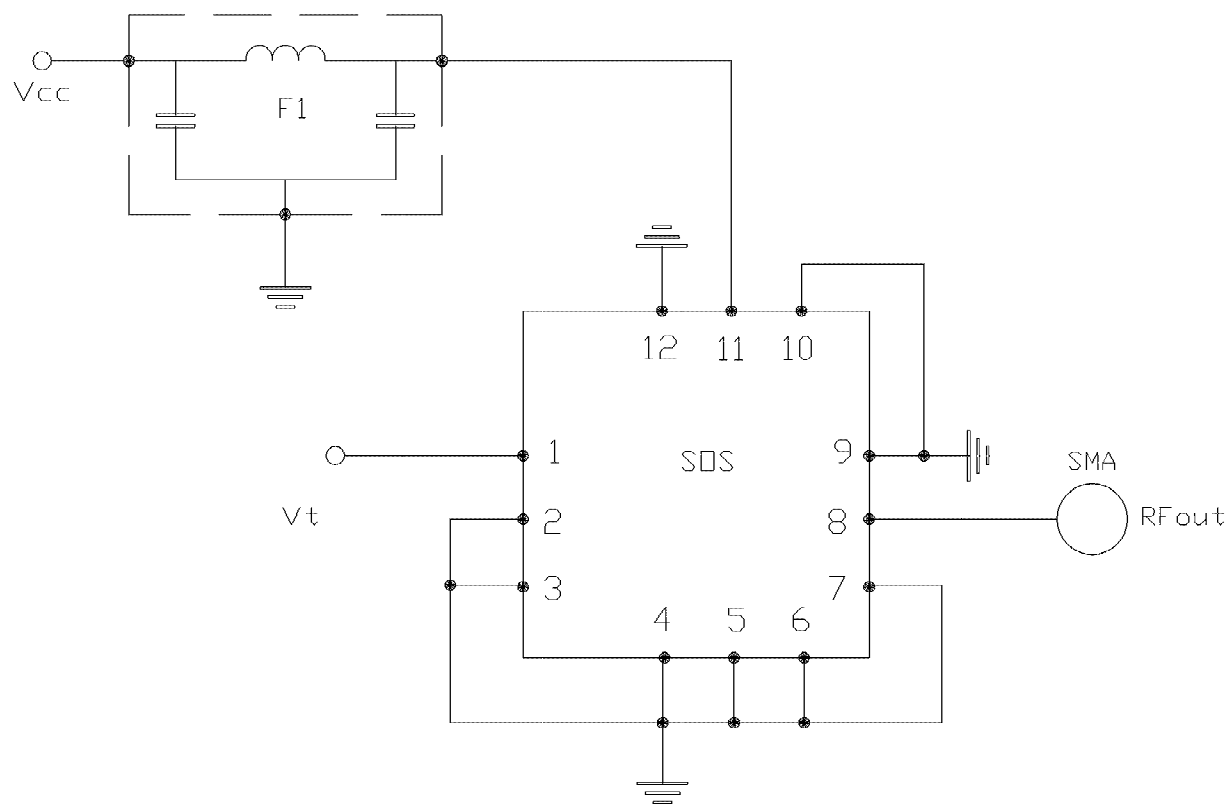


TB-271

## NOTES:

1. SMA FEMALE CONNECTORS.
2. PCB MATERIAL: RO4350B OR EQUIVALENT, DIALECTRIC CONSTANT=3.48, DIALECTRIC THICKNESS=.020 INCH.





Schematic Diagram



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                                                                              |