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### Description

Vectron's VT-490 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, clipped sine wave output, analog temperature compensated oscillator, operating off either 3.0 or 5.0 volt supply built on a 9.9x11.8 FR4 board with a cover.

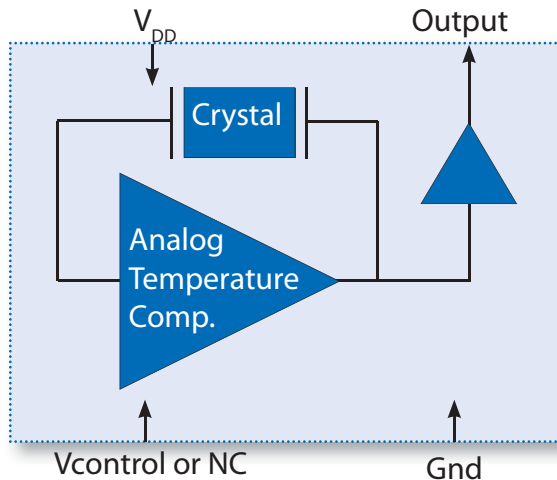
### Features

- Clipped Sine Wave Output
- Output Frequencies to 40 MHz
- Fundamental Crystal Design
- Optional VCXO Function available
- Gold over nickel contact pads
- SMD package
- Product is compliant to RoHS directive  and fully compatible with lead free assembly

### Applications

- Wireless Communications
- Base Stations
- Point to point radios
- Broadband Access
- Test Equipment

### Block Diagram



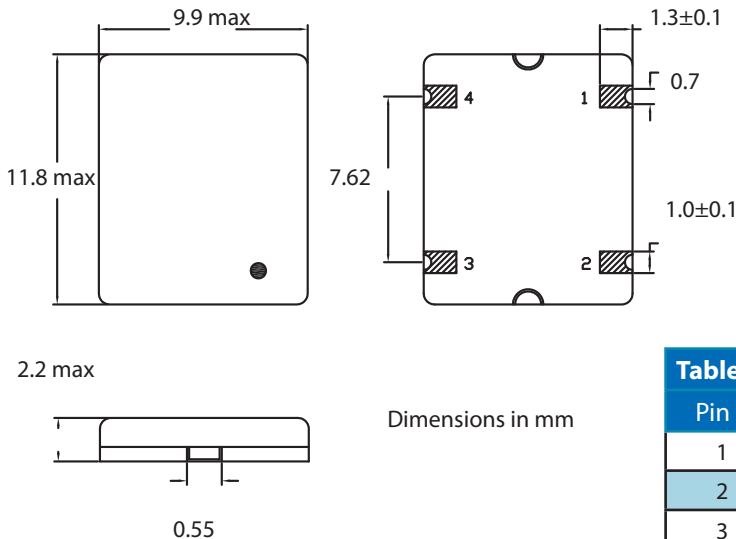
# Performance Specifications

**Table 1. Electrical Performance**

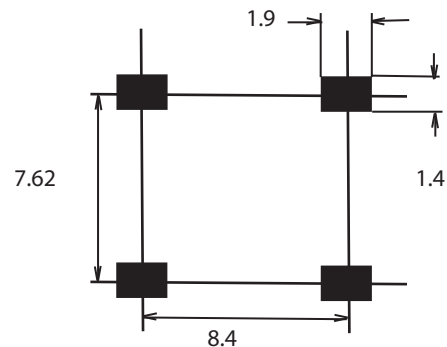
| Parameter  | Symbol    | Min.                   | Typ                                  | Max                  | Units  |
|--|-----------|------------------------|--------------------------------------|----------------------|--------|
| Output Frequency   | $f_o$     | 10                     |                                      | 40                   | MHz    |
| Supply Voltage <sup>1</sup>  | $V_{DD}$  | +3.0 or +5.0           |                                      |                      | V      |
| Supply Current, 8-16.800MHz<br>16.801-25.9999MHz<br>26.000-40.000MHz                                       | $I_{DD}$  |                        |                                      | 2.0<br>3.0<br>4.0    | mA     |
| Operating Temperature, (Ordering Option)   | $T_{OP}$  | -20/70, -30/80, -40/85 |                                      |                      | °C     |
| Stability Over $T_{OP}$ (Ordering Option)  |           | ±1.5, ±2.0, ±2.5, ±5.0 |                                      |                      | ppm    |
| Initial Accuracy, "No Adjust" Option   |           |                        |                                      | ±1.0                 | ppm    |
| Power Supply Stability, 10-16.800MHz<br>16.801-25.9999MHz<br>26.000-40.000MHz                              |           |                        |                                      | ±0.3<br>±0.5<br>±1.0 | ppm    |
| Load Stability   |           |                        |                                      | ±0.5                 | ppm    |
| Aging  |           |                        |                                      | ±1                   | ppm/yr |
| Pull Range, <sup>3</sup><br>Mechanical Trim Only<br>Electrical and Mechanical Trim<br>Electrical Trim only | TPR       | ±8<br>±5<br>±8         |                                      |                      | ppm    |
| Control Voltage to reach Pull Range, 5V<br>3.0V option   |           | 0.5<br>0.5             |                                      | 4.5<br>2.5           | V      |
| Control Voltage Impedance  |           | 100                    |                                      |                      | Kohm   |
| Output Level <sup>2</sup> , 5V option<br>3.0V option   | $V_o$ p/p | 1.0<br>0.7             |                                      |                      | V      |
| Output Load  |           |                        |                                      | 10K II 10pF          |        |
| Phase Noise, 10.000MHz<br>10Hz<br>100Hz<br>1kHz<br>10kHz<br>100kHz   |           |                        | -100<br>-123<br>-133<br>-143<br>-151 |                      | dBc/Hz |
| Start Up Time  |           |                        |                                      | 10                   | ms     |

1. The OSC power supply pin should be filtered, eg, a 0.1 and 0.01uf capacitor
2. The Output is AC coupled
3. A special trim tool, KMTZ04, should be used to adjust the frequency

## Outline Drawing



## Recommended Pad Layout



**Table 2. Pinout**

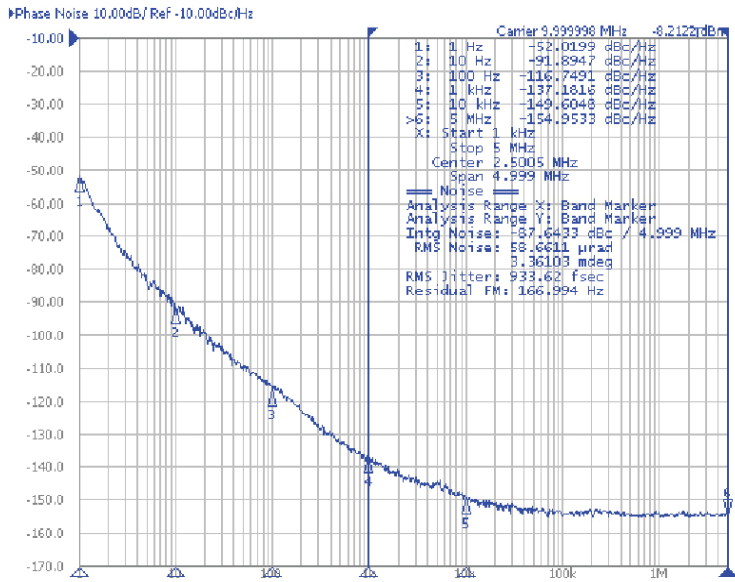
| Pin # | Symbol   | Function                       |
|-------|----------|--------------------------------|
| 1     | $V_c$    | TCXO Control Voltage or Ground |
| 2     | GND      | Electrical and Lid Ground      |
| 3     | $f_o$    | Output Frequency               |
| 4     | $V_{DD}$ | Supply Voltage                 |

## VCXO Function

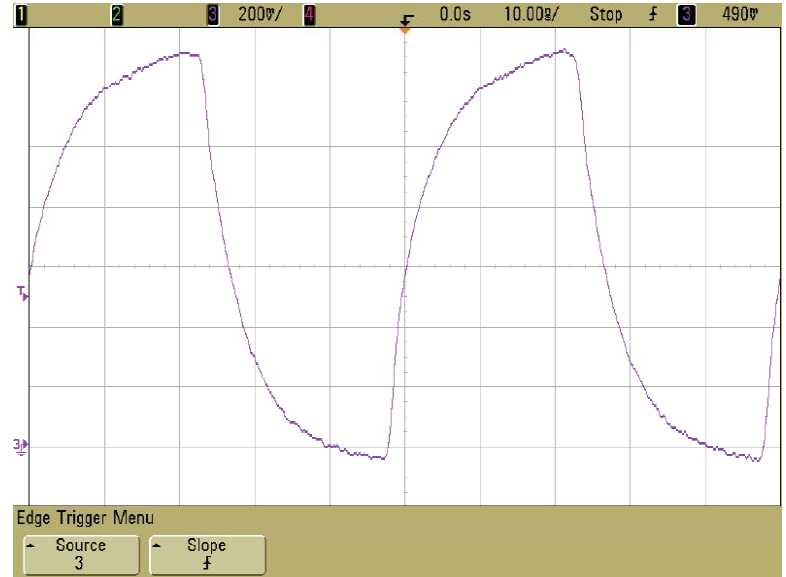
**VCXO Feature:** The VT-490 can be ordered with a VCXO function for applications where it will be used in a PLL, or the output frequency needs fine tune or calibration adjustments. This is a high impedance input, 1Mohm, and can be driven with an op-amp or terminated with adjustable resistors etc. **Pin 1 should not be left floating on the VCXO optional device.**

**“No Adjust” Option:** In applications where the VT-490 will not be used in a PLL, or the output frequency does not need fine tune adjustments, the best device to use would be a VT-490-xxx-xxx0. By using the “no adjust” option, the circuit is simplified as  $V_c$  does not need to be adjusted or set to a predetermined voltage and pin 1 should be grounded (pin 1 can be left open but should not be set to a voltage such as an RF signal or power supply voltage).

## Phase Noise



## Output Waveform



## Maximum Ratings

### Absolute Maximum Ratings and Handling Precautions

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied or any other excess of conditions represented in the operational sections of this data sheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability.

Although ESD protection circuitry has been designed into the VT-490, proper precautions should be taken when handling and mounting, VI employs a Human Body Model and Charged Device Model for ESD susceptibility testing and design evaluation.

ESD thresholds are dependent on the circuit parameters used to define the model. Although no industry standard has been adopted for the CDM a standard resistance of 1.5kOhms and capacitance of 100pF is widely used and therefor can be used for comparison purposes.

| Parameter                 | Symbol      | Rating      | Unit        |
|---------------------------|-------------|-------------|-------------|
| Storage Temperature       | $T_{STORE}$ | -55/125     | $^{\circ}C$ |
| Supply Voltage            | $V_{DD}$    | 6           | V           |
| Control Voltage           | $V_C$       | 0/ $V_{DD}$ | V           |
| ESD, Human Body Model     |             | 1500        | V           |
| ESD, Charged Device Model |             | 1000        | V           |

| Table 4. Environmental Compliance |                         |
|-----------------------------------|-------------------------|
| Parameter                         | Condition               |
| Mechanical Shock                  | MIL-STD-883 Method 2002 |
| Mechanical Vibration              | MIL-STD-883 Method 2007 |
| Temperature Cycle                 | MIL-STD-883 Method 1010 |
| Solderability                     | MIL-STD-883 Method 2003 |
| Fine and Gross Leak               | MIL-STD-883 Method 1014 |
| Resistance to Solvents            | MIL-STD-883 Method 2015 |
| Moisture Sensitivity Level        | MSL1                    |
| Contact Pads                      | Gold over Nickel        |

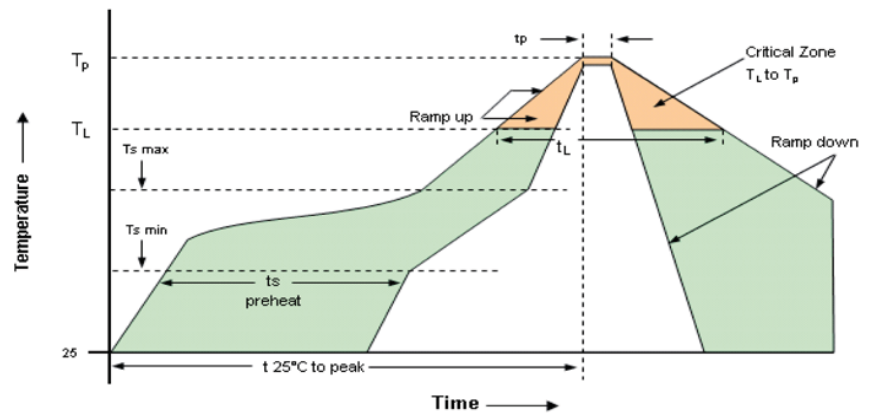
## IR Reflow

### Suggested IR Profile

Devices are built using lead free epoxy and can be subjected to standard lead free IR reflow conditions shown in Table 5. Contact pads are gold over nickel and lower maximum temperatures can also be used, such as 220C.

| Table 5. Reflow Profile  |                     |             |
|--------------------------|---------------------|-------------|
| Parameter                | Symbol              | Value       |
| PreHeat Time             | $t_s$               | 200 sec Max |
| Ts-min                   |                     | 150°C       |
| Ts-max                   |                     | 200°C       |
| Ramp Up                  | $R_{UP}$            | 3°C/sec Max |
| Time above 217C          | $t_L$               | 150 sec Max |
| Time to Peak Temperature | $t_{25C\ to\ peak}$ | 480 sec Max |
| Time at 260C             | $t_p$               | 10 sec Max  |
| Time at 240C             | $t_{p2}$            | 60 sec Max  |
| Ramp down                | $R_{DN}$            | 6°C/sec Max |

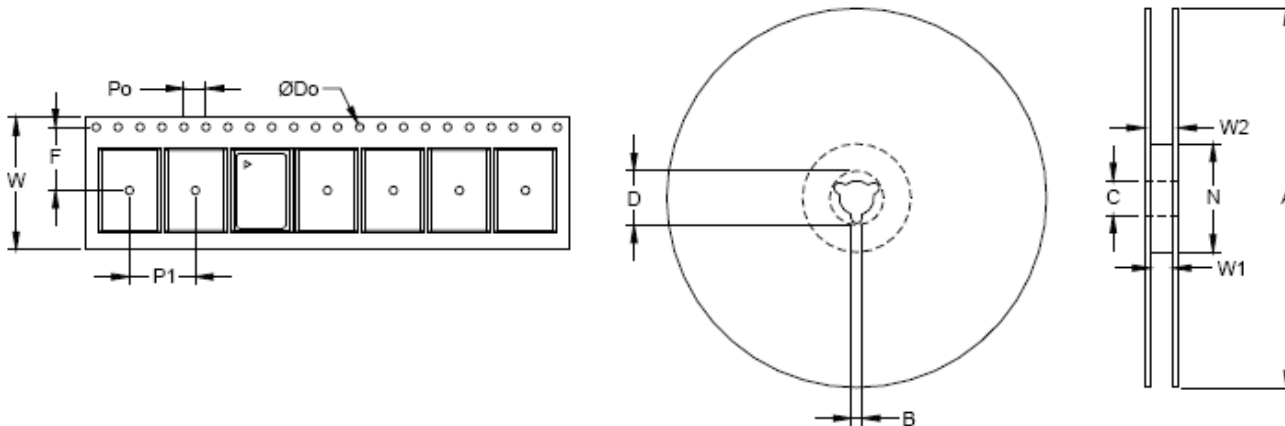
### Solderprofile:



## Tape and Reel Information

Table 6. Tape and Reel Information

| Tape Dimensions (mm) |     |     |    |    | Reel Dimensions (mm) |     |    |      |    |      |      |        |
|----------------------|-----|-----|----|----|----------------------|-----|----|------|----|------|------|--------|
| W                    | F   | Do  | Po | P1 | A                    | B   | C  | D    | N  | W1   | W2   | #/Reel |
| 16                   | 7.5 | 1.5 | 4  | 8  | 180                  | 1.5 | 13 | 20.2 | 60 | 16.4 | 20.4 | 1000   |

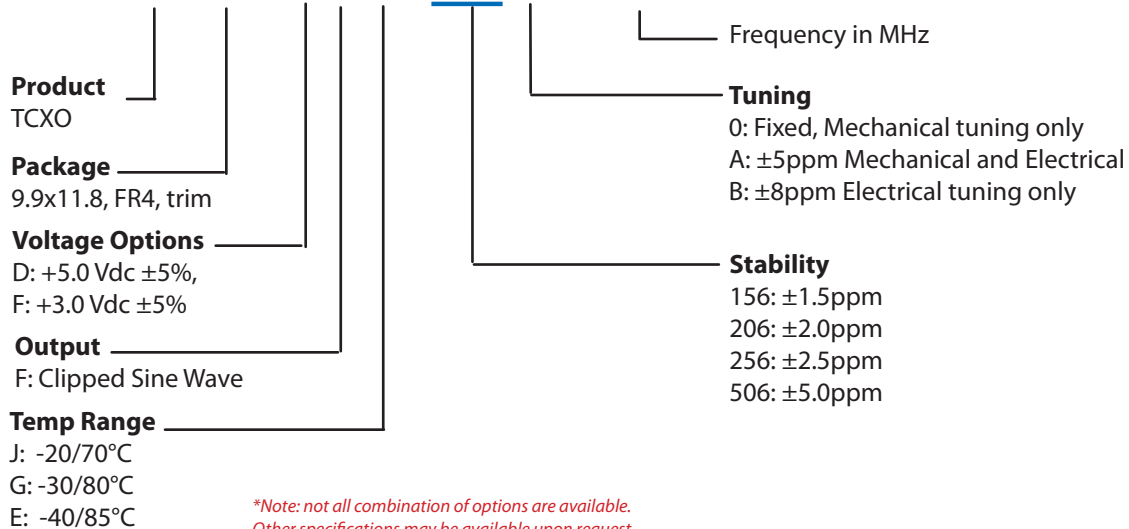


**Table 7. Standard Frequencies (MHz)**

|         |         |           |          |           |         |        |          |         |         |
|---------|---------|-----------|----------|-----------|---------|--------|----------|---------|---------|
| 10.000  | 10.245  | 12.504    | 12.800   | 13.000    | 13.568  | 14.000 | 14.31818 | 14.4844 | 14.7456 |
| 15.000  | 16.000  | 16.325291 | 16.36625 | 16.367667 | 16.3683 | 16.396 | 16.800   | 17.500  | 18.414  |
| 19.200  | 19.440  | 19.6608   | 19.680   | 19.800    | 20.000  | 20.910 | 21.250   | 23.104  | 24.000  |
| 24.5454 | 24.5535 | 24.576    | 25.000   | 25.600    | 26.000  | 27.000 | 27.456   | 28.800  | 32.768  |
| 40.000  |         |           |          |           |         |        |          |         |         |

## Ordering Information

### VT- 490- F F J - 206 A- xxMxxxxxxx



**Example: VT-490-FFJ-206A-19M2000000**

## For Additional Information, Please Contact

### USA:

Vectron International  
267 Lowell Road  
Hudson, NH 03051  
Tel: 1.888.328.7661  
Fax: 1.888.329.8328

### Europe:

Vectron International  
Landstrasse, D-74924  
Neckarbischofsheim, Germany  
Tel: +49 (0) 3328.4784.17  
Fax: +49 (0) 3328.4784.30

### Asia:

Vectron International  
1F-2F, No 8 Workshop, No 308 Fenju Road  
WaiGaoQiao Free Trade Zone  
Pudong, Shanghai, China 200131  
Tel: 86.21.5048.0777  
Fax: 86.21.5048.1881

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