# VT-820

Temperature Compensated Crystal Oscillator
Previous Vectron Model VTM3


## Description

Vectron's VT-820 Temperature Compensated Crystal Oscillator (TCXO) is a quartz stabilized, clipped sine wave output, analog temperature compensated oscillator, operating off either 1.8, 2.8, 3.0 or 3.3 volt supply in a hermetically sealed 3.2x2.5mm ceramic package.

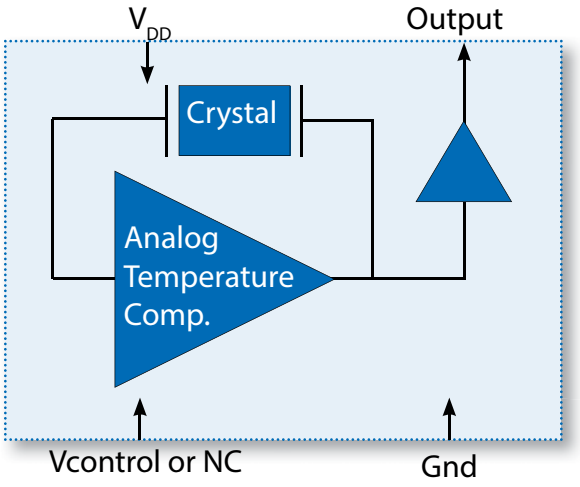
## Features

- **±0.5ppm Temperature Stability**
- Clipped Sine Wave Output
- Output Frequencies to 50 MHz
- Fundamental Crystal Design
- Optional VCXO Function available
- Hermetically Sealed Ceramic SMD package
- Product is compliant to RoHS directive and fully compatible with lead free assembly

## Applications

- GPS
- WiMAX, Wi-Fi,Wi-LAN
- Seismic Exploration
- Wireless Communications
- Base Stations
- Point to point radios
- Broadband Access
- Test Equipment
- Handsets

## Block Diagram



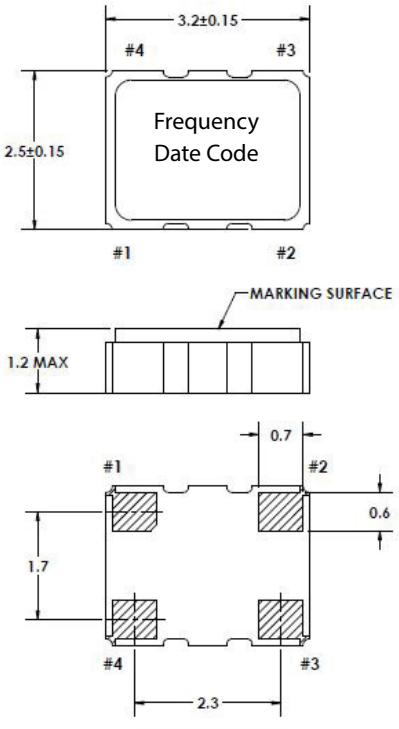
# Specifications

**Table 1. Electrical Performance**

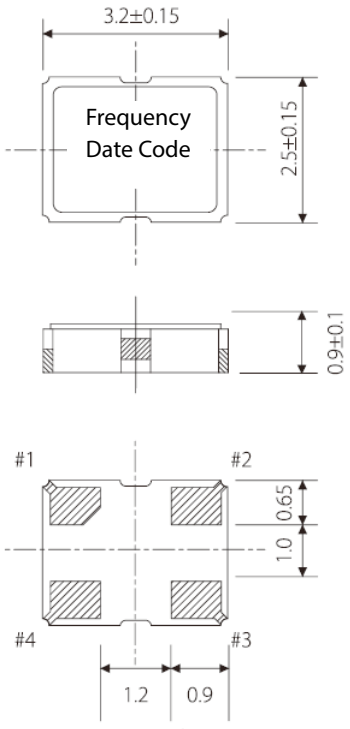
| Parameter | Symbol | Min. | Typ | Max | Units |
|---|---|---|---|---|---|
| Output Frequency | $f_O$ | 8 | | 45 | MHz |
| Supply Voltage,[1] (Ordering Option) | $V_{DD}$ | +1.8, 2.8, +3.0 or +3.3 | | | V |
| Supply Current, 8 to 19.999MHz<br>20.000 to 31.9999MHz<br>32.000 to 45.000MHz | $I_{DD}$ | | | 1.5<br>2.0<br>2.5 | mA |
| Operating Temperature, (Ordering Option) | $T_{OP}$ | -20/70, -30/80, -40/85 | | | °C |
| Stability Over $T_{OP}$, (Ordering Option) | | ±0.5, ±1.0, ±1.5, ±2.0, ±2.5 | | | ppm |
| Initial Accuracy[2], "No Adjust" Option | | | | ±1.0 | ppm |
| Power Supply Stability, ±5% change | | | | ±0.2 | ppm |
| Load Stability | | | | ±0.2 | ppm |
| Aging | | | | ±1.0 | ppm/yr |
| Pull Range, (Ordering Option) | TPR | ±5, ±10 | | | ppm |
| Control Voltage to reach Pull Range<br>1.8V option | | 0.5<br>0.3 | | 2.5<br>1.5 | V<br>V |
| Control Voltage Impedance | | 500 | | | Kohm |
| Output Level[3] | $V_O$ p/p | 0.8 | | | V |
| Output Load | | | | 10K II 10pF | |
| Phase Noise, 10.000MHz<br>10Hz<br>100Hz<br>1kHz<br>10kHz<br>100kHz | | | <br>-91<br>-116<br>-137<br>-149<br>-150 | | dBc/Hz |
| Start Up Time | | | | 2 | ms |

1. The VT-820 power supply pin should be filtered, eg, a 0.1 and 0.01uf capacitor.
2. Initial Accuracy is before IR reflow. Allow another 1ppm shift through 2 reflows and 24 hours.
3. The Output is DC coupled.

# Outline Drawing



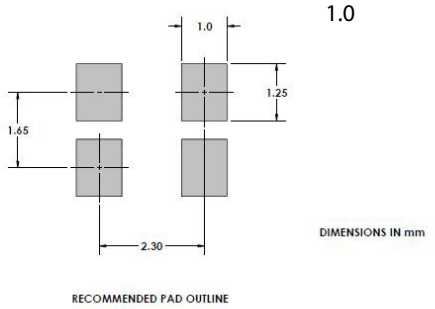

Dimensions in mm




Primary Package

# Pinout and 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-820 can be ordered with a VCXO function for applications were it will be used in a PLL, or the output frequency needs fine tune or calibration adjustments. This is a high impedance input, 500KMohm, 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 were the VT-820 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-820-xxx-xxx0. By using the "no adjust" option, the circuit is simplified as Vc 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.

# 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-820, proper precautions should be taken when handling and mounting, Vectron 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.

| Table 3. Maximum Ratings | | | |
|---|---|---|---|
| Parameter | Symbol | Rating | Unit |
| Storage Temperature | $T_{STORE}$ | -40/85 | ºC |
| Supply Voltage | $V_{DD}$ | 6 | V |
| Control Voltage | $V_C$ | 0/$V_{DD}$ | V |
| ESD, Human Body Model | | 1000 | V |
| ESD, Charged Device Model | | 1000 | V |

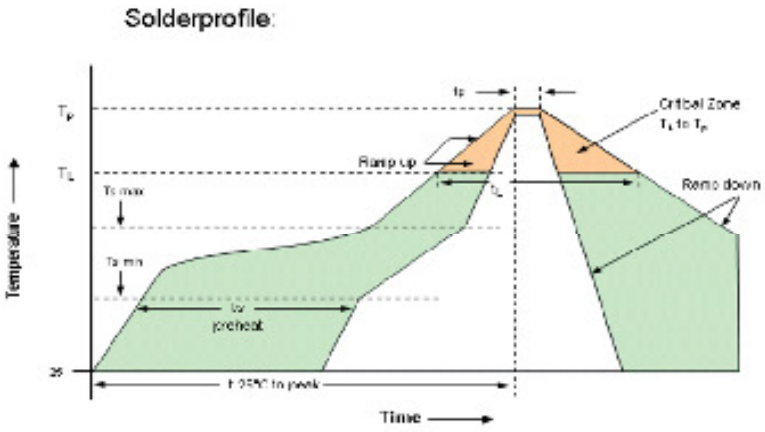
| Table 4. Environmental Compliance | |
|---|---|
| Parameter | Condition |
| Mechanical Shock | MIL-STD-883 Method 2002 |
| Mechanical Vibration | MIL-STD-883 Method 2007 |
| Temperature Cycle | MIL-STD-883 Method 1010 |
| Solderability | MIL-STD-883 Method 2003 |
| Fine and Gross Leak | MIL-STD-883 Method 1014 |
| Resistance to Solvents | MIL-STD-883 Method 2015 |
| Moisture Sensitivity Level | MSL1 |
| Contact Pads | Gold (0.3um min -1.0um max) over Nickel |
| Weight | 26 mg |

# IR Compliance

**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.

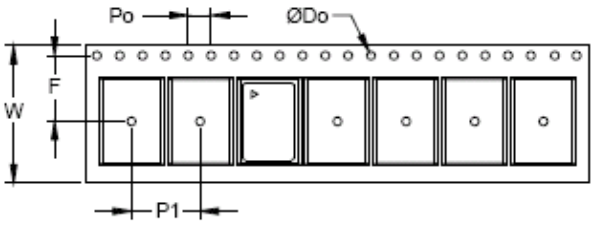
| Table 5. Reflow Profile | | |
|---|---|---|
| Parameter | Symbol | Value |
| PreHeat Time | ts | 200 sec Max |
| Ramp Up | $R_{UP}$ | 3°C/sec Max |
| Time above 217°C | tL | 150 sec Max |
| Time to Peak Temperature | tAMB-P | 480 sec Max |
| Time at 260°C | tP | 30 sec Max |
| Time at 240°C | tP2 | 60 sec Max |
| Ramp down | $R_{DN}$ | 6°C/sec Max |

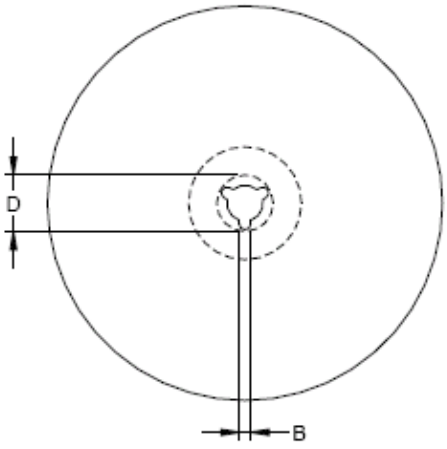


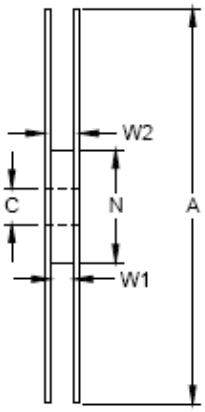

# Tape & Reel

**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 |
| 18 | 1.75 | 1.55 | 4 | 4 | 178 | 2.5 | 13 | 22 | 60 | 11.5 | 15 | 1000 |

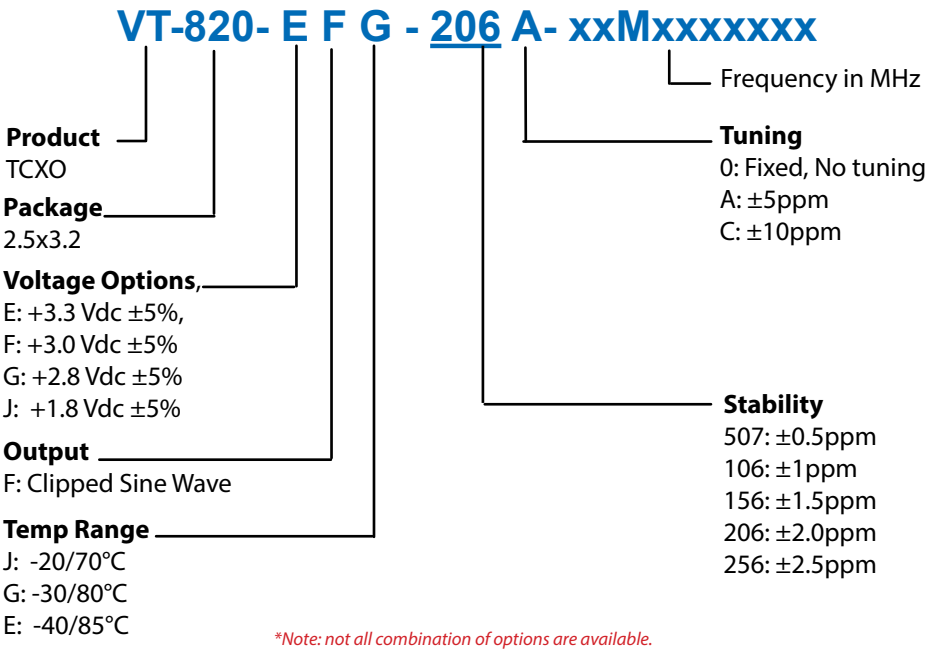


| Table 7. Standard Frequencies (MHz) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9.216 | 10.000 | 12.000 | 12.288 | 13.000 | 14.400 | 14.7456 | 15.360 | 16.000 | 16.368 |
| 16.369 | 16.384 | 16.386 | 19.200 | 20.000 | 21.500 | 22.5792 | 24.760 | 25.000 | 26.000 |
| 27.000 | 28.800 | 30.000 | 32.000 | 38.400 | 39.000 | 40.000 | 43.000 | 44.000 | 44.545 |
| 50.000 | | | | | | | | | |
| | | | | | | | | | |

## Ordering Information




*Note: not all combination of options are available.
Other specifications may be available upon request.

**Example: VT-820-EFG-206A-19M200000**

* Add **_SNPB** for tin lead solder dip

Example: VT-820_EFG-206A-19M2000000_SNPB

| Revision Date | Description |
|---|---|
| 10/21/2009 | Add J=1.8V option, Vc=0.3 1.6V for 1.5Voption in table 1 |
| 8/08/2013 | Removed 6pd package version (non-standard). Added two 4-pd package versions. |
| 10/29/2013 | Updated VI Asia Contact Information |
| 02/11/2014 | Updated new Vectron Logo and Hudson Address |
| 01/17/2017 | Updated IR Reflow Profile |
| 08/10/2018 | Update logo and contact information, optimize pad layout, add "SNPBDIP" ordering option |
| 04/05/2019 | Update logo and contact information, update package informtion, optimize pad layout, update frequency table, update ordering options, change "SNPBDIP" to "SNPB". |

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