# VV-800

Voltage Controlled Crystal Oscillator
Previous Vectron Model VVC4


## Description

Vectron's VV-800 Voltage Controlled Crystal Oscillator (VCXO) is a quartz stabilized square wave generator with a CMOS output. The VV-800 uses fundamental crystals resulting in low jitter performance and a monolithic IC which improves reliability and reduces cost.

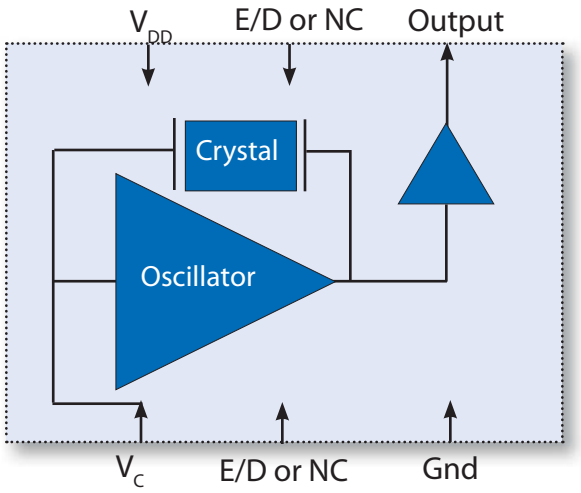
## Features

- CMOS output VCXO
- Output Frequencies from 1.544 MHz to 77.760 MHz
- 5.0 or 3.3 V Operation
- Fundamental Crystal Design with Low Jitter Performance
- Output Disable Feature
- Excellent 20ppm Temperature Stability
- -10/70°C or -40/85°C Operating Temperature
- Small Industry Standard Package, 3.2x5x1.2mm
- Hermetically Sealed
- Product is free of lead and compliant to EC RoHS Directive

## Applications

- SONET/SDH/DWDM
- Ethernet, SynchE
- xDSL, PCMIA
- Digital Video
- Broadband Access
- Base Stations, Picocells

## Block Diagram



# Performance Specifications

**Table 1. Electrical Performance**

| Parameter | Symbol | Min | Typical | Maximum | Units |
|---|---|---|---|---|---|
| **Supply** | | | | | |
| Voltage[1], 5V option<br>3.3V option | $V_{DD}$ | 4.750<br>3.135 | 5.0<br>3.3 | 5.250<br>3.465 | V |
| Current[2], 5V option<br>3.3V option | $I_{DD}$ | | | 55<br>40 | mA |
| **Frequency** | | | | | |
| Nominal Frequency[3] | $f_N$ | 1.544 | | 77.760 | MHz |
| Pull Range[2,6], *ordering option* | APR | | ±50, ±80, ±100 | | ppm |
| Linearity[2] | Lin | | 5 | | % |
| Gain Transfer[2], 61.440MHz<br>30.720MHz | $K_V$ | | +80<br>+120 | | ppm/V |
| Temperature Stability | $f_{STAB}$ | | ±20 | | ppm |
| **Outputs** | | | | | |
| Output Logic Levels[2]<br>Output Logic High<br>Output Logic Low | <br>$V_{OH}$<br>$V_{OL}$ | <br>0.9*$V_{DD}$ | | <br><br>0.1*$V_{DD}$ | V |
| Load | $I_{OUT}$ | | | 15 | pF |
| Rise Time[2,4] | $t_R$ | | | 5 | ns |
| Fall Time[2,4] | $t_F$ | | | 5 | ns |
| Symmetry[2] | SYM | 45 | 50 | 55 | % |
| Period Jitter[5,7], RMS (61.44 MHz) | ϕJ | | 3.0 | | ps |
| Period Jitter[5,7], Peak - Peak (61.44MHz) | ϕJ | | 23 | | ps |
| Phase Noise[8]<br>10Hz<br>100Hz<br>1kHz<br>10kHz<br>100kHz<br>1MHz<br>10MHz | | | <br>-63<br>-97<br>-129<br>-144<br>-157<br>-159<br>-164 | | dBc/Hz |
| **Control Voltage** | | | | | |
| Control Voltage Range for Pull Range | $V_C$ | 0.5<br>0.3 | | 4.5<br>3.0 | V |
| Control Voltage Input Impedance<br>"E" Ordering Option, +3.3V only | $Z_{IN}$ | <br>2 | 100 | | KΩ<br>MΩ |
| Control Voltage Modulation BW | BW | 10 | | | kHz |
| Output Enable/Disable[9]<br>Output Enabled<br>Output Disabled | <br>$V_{IH}$<br>$V_{IL}$ | <br>0.9*$V_{DD}$ | | <br><br>0.1*$V_{DD}$ | V |
| Start-Up Time | $T_{SU}$ | | | 10 | ms |
| Operating Temp, Ordering Option | $T_{OP}$ | | 0/70 or -40/85 | | °C |
| Package Size | | | 5.0 x 3.2 x 1.2 | | mm |

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for examples 0.1 and 0.01uF
2] Parameters are tested with production test circuit in Figure 1.
3] See Standard Frequencies and Ordering Information tables for more specific information
4] Measured from 20% to 80% of a full output swing (Fig 2).
5] Not tested in production, guaranteed by design, verified at qualification.
6] Tested with Vc = 0.3V to 3.0V unless otherwise stated in part description
7] Broadband Period Jitter measured using Wavecrest SIA3300C, 90K samples.
8] Phase Noise is measured with an Agilent E5052A.
9] The Output is Enabled if the Enable/Disable is left open.

## Test Circuit

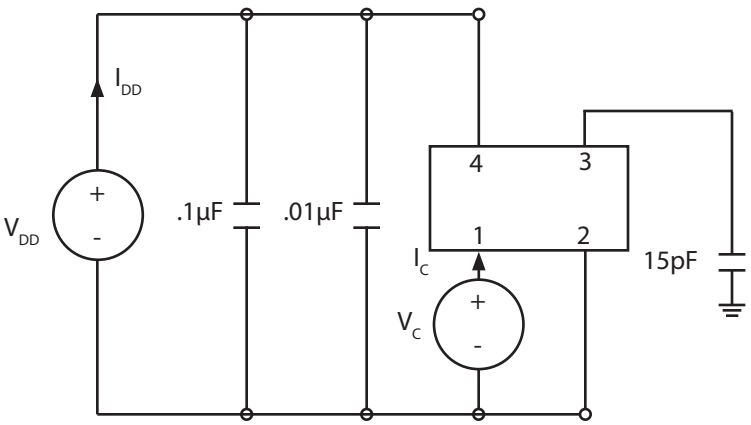



**Fig 1: Test Circuit**

## Waveform

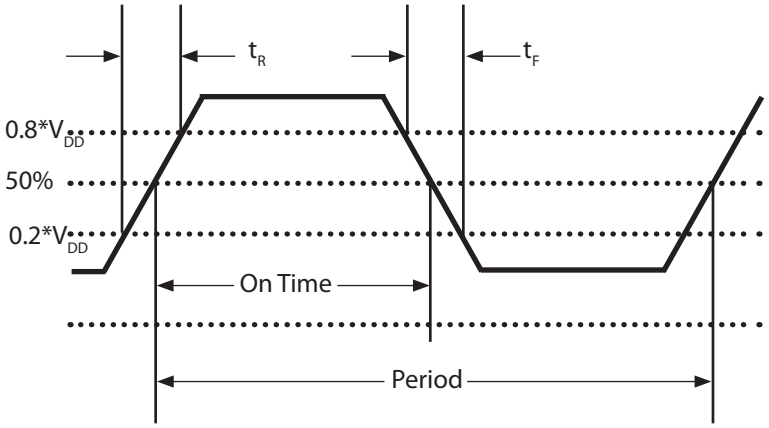


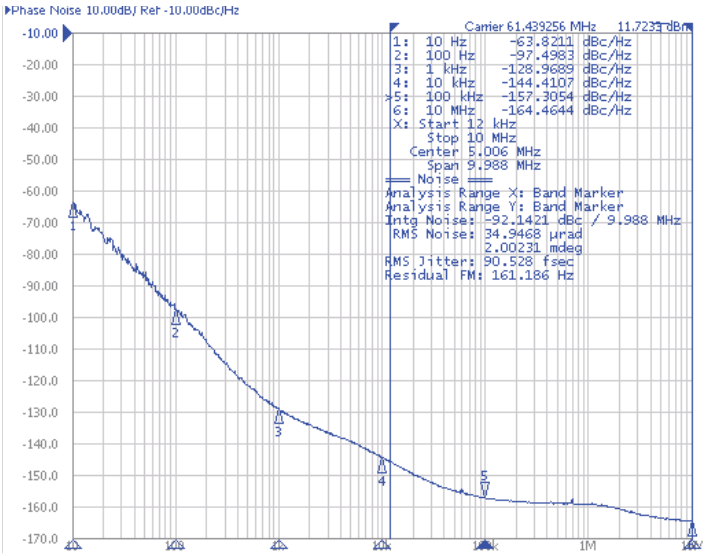

**Fig 2: Waveform**

**Table 2. Absolute Maximum Ratings**

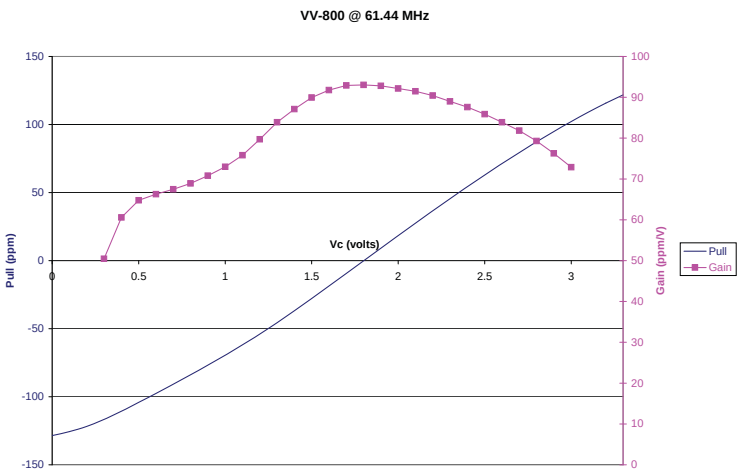
| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Power Supply | $V_{DD}$ | 0 to 6 | V |
| Voltage Control Range | $V_C$ | 0 to $V_{CC}$ | V |
| Storage Temperature | TS | -55 to 125 | °C |
| Soldering Temp/Time | $T_{LS}$ | 260 / 20 | °C / sec |

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this datasheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability. Permanent damage is also possible if OD or Vc is applied before Vcc.

## Typical Phase Noise




## Typical Gain



# Reliability

VI qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VV-800 family is capable of meeting the following qualification tests:

**Table 3. Environmental Compliance**

| Parameter | Conditions |
|---|---|
| Mechanical Shock | MIL-STD-883, Method 2002 |
| Mechanical Vibration | MIL-STD-883, Method 2007 |
| Solderability | MIL-STD-883, Method 2003 |
| Gross and Fine Leak | MIL-STD-883, Method 1014 |
| Resistance to Solvents | MIL-STD-883, Method 2015 |
| Moisture Sensitivity Level | MSL 1 |
| Contact Pads | Gold over Nickel |

# Handling Precautions

Although ESD protection circuitry has been designed into the VV-800 proper precautions should be taken when handling and mounting. VI employs a human body model (HBM) and a charged device model (CDM) for ESD susceptibility testing and design protection evaluation.

**Table 4. ESD Ratings**

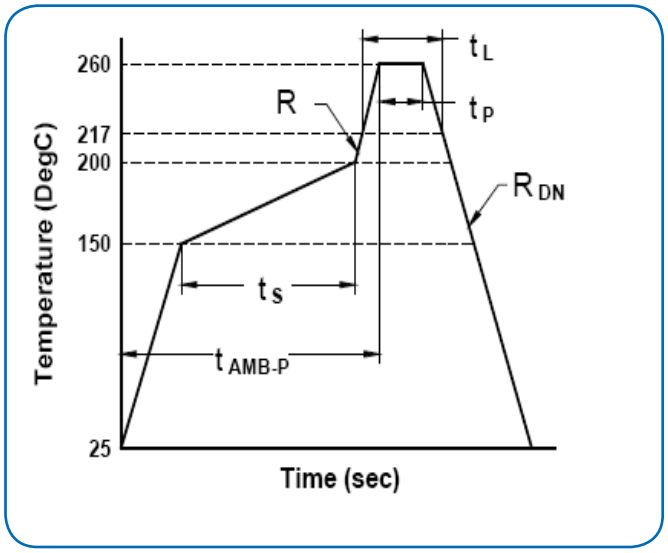
| Model | Minimum | Conditions |
|---|---|---|
| Human Body Model | 500V | MIL-STD-883, Method 3015 |
| Charged Device Model | 500V | JESD22-C101 |

**Table 5. Reflow Profile**

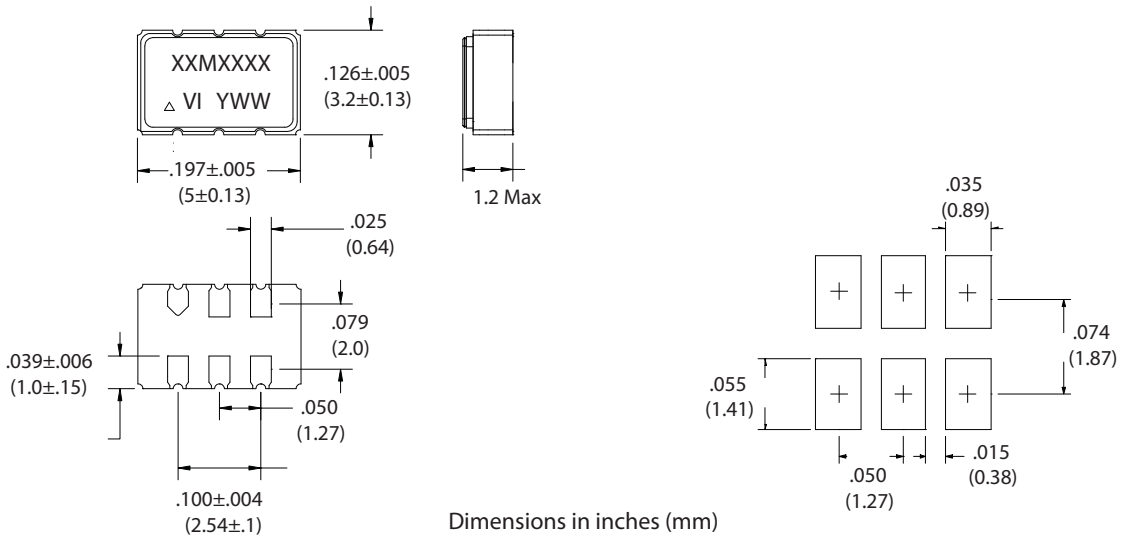
| Parameter | Symbol | Value |
|---|---|---|
| PreHeat Time | $t_S$ | 60 sec Min, 180 sec Max |
| Ramp Up | $R_{UP}$ | 3 °C/sec Max |
| Time Above 217 °C | $t_L$ | 60 sec Min, 150 sec Max |
| Time To Peak Temperature | $T_{AMB-P}$ | 480 sec Max |
| Time at 260 °C | $t_P$ | 20 sec Min, 40 sec Max |
| Ramp Down | $R_{DN}$ | 6 °C/sec Max |

The device is qualified to meet the JEDEC standard for Pb-Free assembly. The temperatures and time intervals listed are based on the Pb-Free small body requirements. The VV-800 device is hermetically sealed so an aqueous wash is not an issue.

Termination Plating:
Electroless Gold Plate over Nickel Plate



# Outline Drawing & Pad Layout

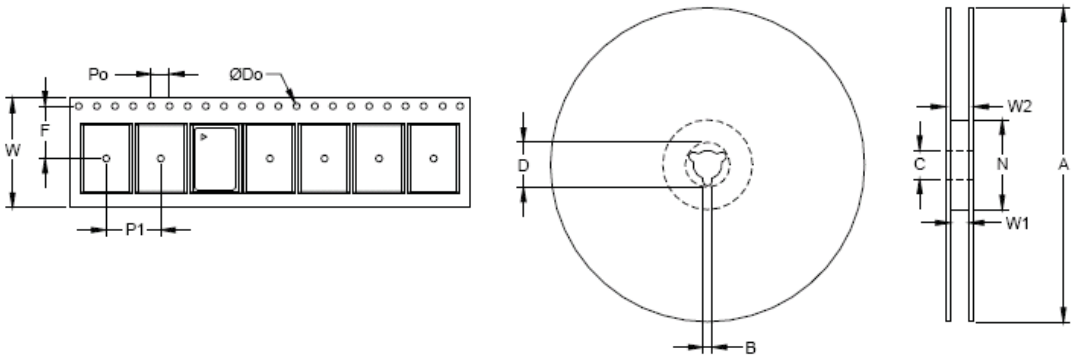



Dimensions in inches (mm)

**Table 6. Pin Out**

| Pin | Symbol | Function |
|---|---|---|
| 1 | $V_C$ | VCXO Control Voltage |
| 2 | E/D | Enable Disable or NC |
| 3 | GND | Case and Electrical Ground |
| 4 | Output | Output |
| 5 | E/D | Enable Disable or NC |
| 6 | $V_{DD}$ | Power Supply Voltage |

# Tape & Reel (EIA-481-2-A)




| Table 7. Tape and Reel Informattion | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tape Dimensions (mm) | | | | | | Reel Dimensions (mm) | | | | | | | |
| Dimension | W | F | Do | Po | P1 | A | B | C | D | N | W1 | W2 | # Per Reel |
| Tolerance | Typ | Typ | Typ | Typ | Typ | Typ | Min | Typ | Min | Min | Typ | Max | |
| VV-800 | 12 | 5.5 | 1.5 | 4 | 8 | 178 | 1.78 | 13 | 20.6 | 55 | 12.4 | 22.4 | 500 |

| Table 8. Standard Output Frequencies (MHz) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3.600000 | 4.096000 | 8.192000 | 10.000000 | 12.960000 | 13.500000 | 14.318180 | 15.360000 |
| 16.000000 | 16.384000 | 19.200000 | 19.440000 | 20.000000 | 25.000000 | 26.000000 | 27.000000 |
| 28.37500 | 30.720000 | 32.768000 | 34.560000 | 38.400000 | 38.785000 | 39.321600 | 40.000000 |
| 44.736000 | 45.000000 | 50.000000 | 51.840000 | 62.208000 | 65.468000 | 70.000000 | 74.175800 |
| 74.528000 | 77.760000 | | | | | | |

## Ordering Information

**VV-800- D A W - K A A N- 39M3216000**

**Product**
VCXO, 3.2x5 Package

**Voltage Options**
D: +5 Vdc
E: +3.3 Vdc

**Output**
A: CMOS

**Temp Range**
W: -10/70°C
E: -40/85°C

Frequency in MHz

**Custom Options**
N: Standard Option
E: Control Voltage > 2Mohm

**Enable/Disable Pin**
A: Pin 2
B: Pin 5

**Enable/Disable**
A: Enable High

**Absolute Pull Range**
K: ±50ppm
P: ±80ppm
S: ±100ppm

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

**Example: VV-800-EAE-KAAN-51M8400000**

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