


## VCS3 series 1.8, 2.5, 3.3 volt CMOS Oscillator



**VCS3 Crystal Oscillator**

### Features

- Quick delivery
- CMOS output
- 3.2mm x 2.5mm x 1.2 mm
- Output frequencies to 200.00 MHz
- Tri-state output for board test and debug
- -10/70 or -40/85°C operating temperature
- Gold over nickel contact pads
- Hermetically sealed ceramic SMD package
- Product is compliant to RoHS directive  and fully compatible with lead free assembly

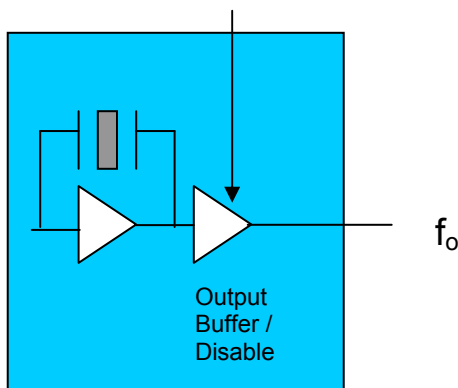
### Applications

- SONET/SDH/DWDM
- Ethernet, Gigabit Ethernet
- Storage Area Network
- Digital Video
- Broadband Access
- Microprocessors/DSP/FPGA

### Description

Vectron's VCS3 Crystal Oscillator (XO) is quartz stabilized square wave generator with a CMOS output, operating from a 1.8, 2.5 or 3.3 volt supply.

The VCS3 utilized a high performance, low frequency quartz resonator followed by a custom ASIC to synthesize the output frequency.



| Table 1. Electrical Performance, 3.3V option                 |           |                           |         |                    |       |
|--|-----------|---------------------------|---------|--------------------|-------|
| Parameter  | Symbol    | Min                       | Typical | Maximum            | Units |
| Frequency  | $f_O$     | 1.0                       |         | 200.000            | MHz   |
| Operating Supply Voltage <sup>1</sup>                        | $V_{DD}$  | 2.97                      | 3.3     | 3.63               | V     |
| Absolute Maximum Operating Voltage                           |           | -0.5                      |         | 5.0                | V     |
| Supply Current, Output Enabled                               | $I_{DD}$  |                           |         |                    | mA    |
| <30 MHz  |           |                           |         | 10                 |       |
| 30.01 to 75 MHz  |           |                           |         | 15                 |       |
| 75.01 to 133 MHz   |           |                           |         | 20                 |       |
| 133.01 to 200 MHz  |           |                           |         | 25                 |       |
| Supply Current, Output disabled                              | $I_{DD}$  |                           |         | 15                 | uA    |
| Output Logic Levels  |           |                           |         |                    |       |
| Output Logic High <sup>2</sup>                               | $V_{OH}$  | $0.9 \cdot V_{DD}$        |         | $0.1 \cdot V_{DD}$ | V     |
| Output Logic Low <sup>2</sup>                                | $V_{OL}$  |                           |         |                    | V     |
| Output Logic High Drive                                      | $I_{OH}$  | 8                         |         |                    | mA    |
| Output Logic Low Drive                                       | $I_{OL}$  | 8                         |         |                    | mA    |
| Output Rise/Fall Time <sup>2</sup> , $f_o \leq 10\text{MHz}$ | $t_{R/F}$ |                           |         | 3                  | ns    |
| $f_o > 10\text{MHz}$   |           |                           |         | 2                  | ns    |
| Duty Cycle <sup>3</sup>                                      | SYM       | 45                        |         | 55                 | %     |
| Operating Temperature (ordering option)                      |           | -10/70 or -40/85          |         |                    | °C    |
| Storage Temperature  |           | -55                       |         | 125                | °C    |
| Stability <sup>4</sup> (ordering option)                     |           | $\pm 25, \pm 50, \pm 100$ |         |                    | ppm   |
| Output Enable/Disable <sup>5</sup>                           |           |                           |         |                    | V     |
| Output Enabled   |           | $0.7 \cdot V_{DD}$        |         |                    |       |
| Output Disabled  |           |                           |         | $0.3 \cdot V_{DD}$ |       |
| Start-up time  |           |                           |         | 2                  | ms    |

1. A 0.01uF and a 0.1uF capacitor should be located as close to the supply as possible (to ground).
2. Figure 1 defines these parameters. Figure 2 illustrates the operating conditions under which these parameters are tested and specified.
3. Symmetry is measured defined as On Time/Period.
4. Includes calibration tolerance, operating temperature, supply voltage variations, aging and shock and vibration (not under operation).
5. Output will be enabled if enable/disable is left open.

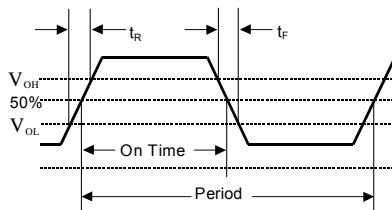


Figure 1. Output Waveform

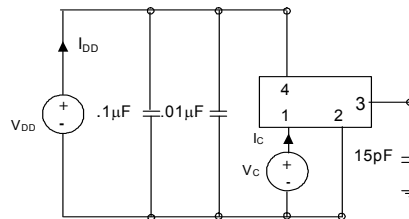


Figure 2. Typical Output Test Conditions (25±5°C)

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| Table 2. Electrical Performance, 2.5V option  |  |                              |         |                     |                    |
|---|--|------------------------------|---------|---------------------|--------------------|
| Parameter   | Symbol                                       | Min                          | Typical | Maximum             | Units              |
| Frequency   | $f_O$  | 1.0                          |         | 166.000             | MHz                |
| Operating Supply Voltage <sup>1</sup>   | $V_{DD}$                                     | 2.25                         | 2.5     | 2.75                | V                  |
| Absolute Maximum Voltage  |  | -0.5                         |         | 5.0                 | V                  |
| Supply Current, Output Enabled<br>< 30 MHz<br>30.01 to 75 MHz<br>75.01 to 166 MHz   | $I_{DD}$                                     |                              |         | 8.0<br>10.0<br>15.0 | mA                 |
| Supply Current, Out disabled  | $I_{DD}$                                     |                              |         | 15                  | uA                 |
| Output Logic Levels<br>Output Logic High <sup>2</sup><br>Output Logic Low <sup>2</sup><br>Output Logic High Drive<br>Output Logic Low Drive | $V_{OH}$<br>$V_{OL}$<br>$I_{OH}$<br>$I_{OL}$ | $0.9 \cdot V_{DD}$<br>8<br>8 |         | $0.1 \cdot V_{DD}$  | V<br>V<br>mA<br>mA |
| Output Rise/Fall Time <sup>2</sup> , $f_o \leq 10\text{MHz}$<br>$f_o > 10\text{MHz}$  | $t_R/t_F$                                    |                              |         | 4<br>3              | ns<br>ns           |
| Duty Cycle <sup>3</sup>   | SYM  | 45                           |         | 55                  | %                  |
| Operating Temperature (ordering option)   |  | -10/70 or -40/85             |         |                     | °C                 |
| Storage Temperature   |  | -55                          |         | 125                 | °C                 |
| Stability <sup>4</sup> (ordering option)  |  | $\pm 25, \pm 50, \pm 100$    |         |                     | ppm                |
| Output Enable/Disable <sup>5</sup><br>Output Enabled<br>Output Disabled   |  | $0.7 \cdot V_{DD}$           |         | $0.3 \cdot V_{DD}$  | V                  |
| Start-up time   |  |                              |         | 2                   | Ms                 |

1. A 0.01uF and a 0.1uF capacitor should be located as close to the supply as possible (to ground).
2. Figure 3 defines these parameters. Figure 4 illustrates the operating conditions under which these parameters are tested and specified.
3. Symmetry is measured defined as On Time/Period.
4. Includes calibration tolerance, operating temperature, supply voltage variations, aging and shock and vibration (not under operation).
5. Output will be enabled if enable/disable is left open.

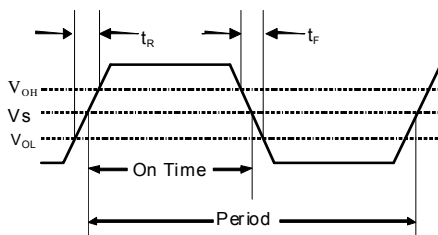


Figure 3. Output Waveform

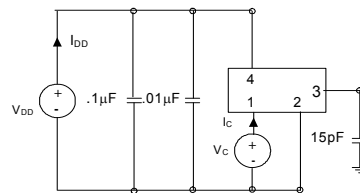


Figure 4. Typical Output Test Conditions (25±5°C)

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| Table 3. Electrical Performance, 1.8V option  |  |                              |         |                    |                    |
|---|--|------------------------------|---------|--------------------|--------------------|
| Parameter   | Symbol                                       | Min                          | Typical | Maximum            | Units              |
| Frequency   | $f_O$  | 0.8                          |         | 133.00             | MHz                |
| Operating Supply Voltage <sup>1</sup>   | $V_{DD}$                                     | 1.62                         | 1.8     | 1.98               | V                  |
| Absolute Maximum Voltage  |  | -0.5                         |         | 3.6                | V                  |
| Supply Current, Output Enabled<br>< 30 MHz<br>30.01 to 75 MHz<br>75.01 to 133 MHz   | $I_{DD}$                                     |                              |         | 6<br>8<br>12       | mA                 |
| Supply Current, Out disabled  | $I_{DD}$                                     |                              |         | 15                 | uA                 |
| Output Logic Levels<br>Output Logic High <sup>2</sup><br>Output Logic Low <sup>2</sup><br>Output Logic High Drive<br>Output Logic Low Drive | $V_{OH}$<br>$V_{OL}$<br>$I_{OH}$<br>$I_{OL}$ | $0.9 \cdot V_{DD}$<br>8<br>8 |         | $0.1 \cdot V_{DD}$ | V<br>V<br>mA<br>mA |
| Output Rise/Fall Time <sup>2</sup> , $f_o \leq 10\text{MHz}$<br>$f_o > 10\text{MHz}$  | $t_R/t_F$                                    |                              |         | 5<br>4             | ns<br>ns           |
| Duty Cycle <sup>3</sup>   | SYM  | 45                           |         | 55                 | %                  |
| Operating temperature (ordering option)   |  | -10/70 or -40/85             |         |                    | °C                 |
| Storage Temperature   |  | -55                          |         | 125                | °C                 |
| Stability <sup>4</sup> (ordering option)  |  | $\pm 25, \pm 50, \pm 100$    |         |                    | ppm                |
| Output Enable/Disable <sup>5</sup><br>Output Enabled<br>Output Disabled   |  | $0.7 \cdot V_{DD}$           |         | $0.3 \cdot V_{DD}$ | V                  |
| Start-up time   |  |                              |         | 2                  | ms                 |

1. A 0.01uF and a 0.1uF capacitor should be located as close to the supply as possible (to ground) is recommended.
2. Figure 5 defines these parameters. Figure 6 illustrates the operating conditions under which parameters are tested/specified.
3. Symmetry is measured defined as On Time/Period.
4. Includes calibration tolerance, operating temperature, supply voltage variations, aging and shock and vibration (not under operation).
5. Output will be enabled if enable/disable is left open.

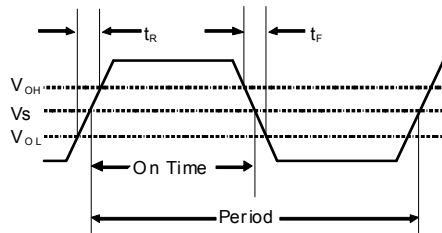


Figure 5. Output Waveform

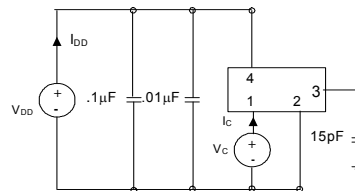


Figure 6. Typical Output Test Conditions (25±5°C)

### Enable/Disable Functional Description

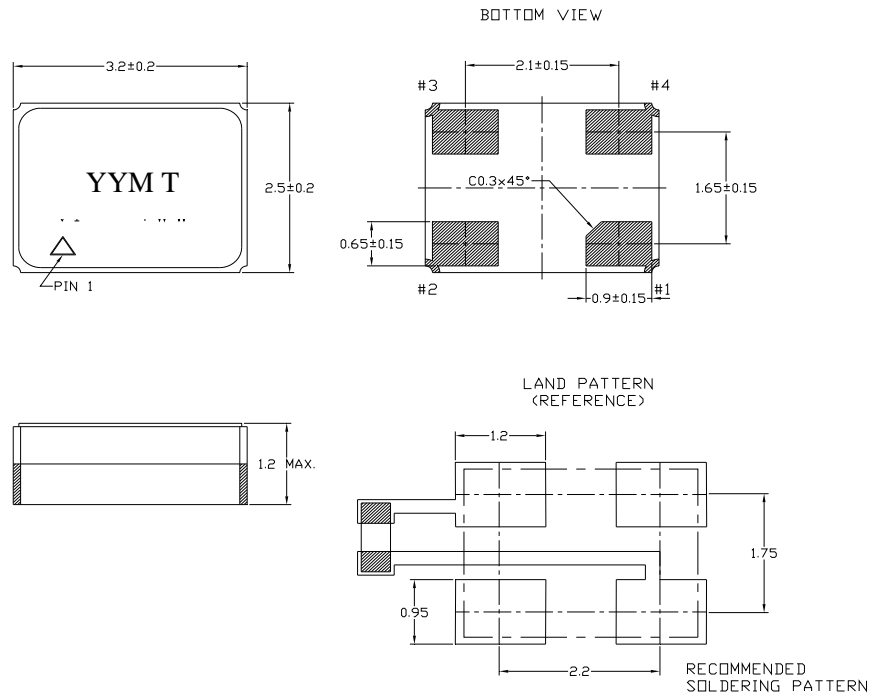
Under normal operation the Enable/Disable is left open or set to a logic high state. When the E/D is set to a logic low, the oscillator stops and the output is in a high impedance state. This helps reduce power consumption as well as facilitating board testing and troubleshooting.

### Tri-state Functional Description

Under normal operation the tri-state is left open or set to a logic high state. When the tri-state is set to a logic low, the oscillator remains active but the output buffer is in a high impedance state. This helps facilitate board testing and troubleshooting.

**Table 4. Outline Diagrams, Pad Layout and Pin Out**

| Pin # | Symbol   | Function                   |
|-------|----------|----------------------------|
| 1     | E/D      | Tri-state, Enable/Disable  |
| 2     | GND      | Electrical and Case Ground |
| 3     | $f_o$    | Output Frequency           |
| 4     | $V_{DD}$ | Supply Voltage             |



Contact Pads are gold over nickel

**Figure 7, Package drawing**

# VCS3 Data Sheet

## Reliability

The VCS3 qualification tests have included:

**Table 5. Environmental Compliance**

| Parameter              | Conditions              |
|------------------------|-------------------------|
| Mechanical Shock       | MIL-STD-883 Method 2022 |
| Mechanical Vibration   | MIL-STD-883 Method 2007 |
| Temperature Cycle      | MIL-STD-883 Method 1010 |
| Solderability          | MIL-STD-883 Method 2003 |
| Gross and Fine Leak    | MIL-STD-883 Method 1014 |
| Resistance to Solvents | MIL-STD-883 Method 2015 |
| MSL                    | 1                       |

## Handling Precautions

Although ESD protection circuitry has been designed into the the VCS3, proper precautions should be taken when handling and mounting. VI employs a Human Body Model and a Charged-Device Model (CDM) for ESD susceptibility testing and design protection evaluation. ESD thresholds are dependent on the circuit parameters used to define the model. Although no industry wide standard has been adopted for the CDM, a standard HBM of resistance = 1.5kohms and capacitance = 100pF is widely used and therefore can be used for comparison purposes.

**Table 6. ESD Ratings**

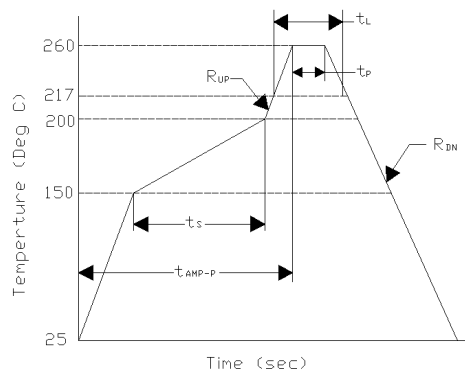
| Model                | Minimum | Conditions              |
|----------------------|---------|-------------------------|
| Human Body Model     | 1000    | MIL-STD-883 Method 3115 |
| Charged Device Model | 1500    | JESD 22-C101            |

## Suggested IR profile

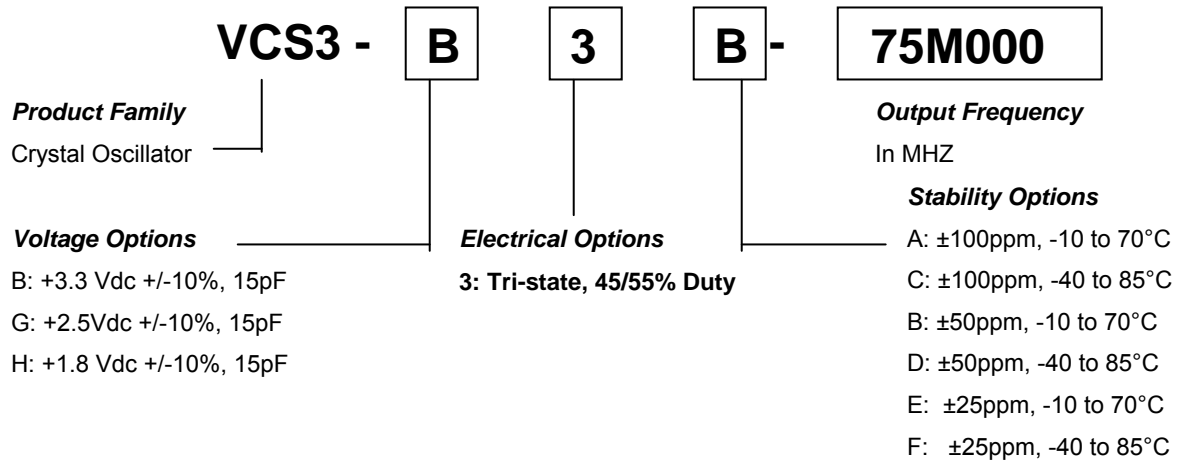
Devices are built using lead free epoxy and can also be subjected to standard lead free IR reflow conditions, Table 7 shows max temperatures and lower temperatures can also be used e.g. peak temperature of 220C.

**Table 7. Reflow Profile (IPC/JEDEC J-STD-020)**

| Parameter                | Symbol      | Value                    |
|--------------------------|-------------|--------------------------|
| Preheat Time             | $t_s$       | 150 sec Min, 200 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 (max)     | $t_p$       | 20 sec Min, 40 sec Max   |
| Time At 240 °C (max)     | $t_{p2}$    | 60 sec Max               |
| Ramp Down                | $R_{DN}$    | 6 °C/sec Max             |



**Ordering Information**



Note: Not all combinations are available.

**For Additional Information, Please Contact:**



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