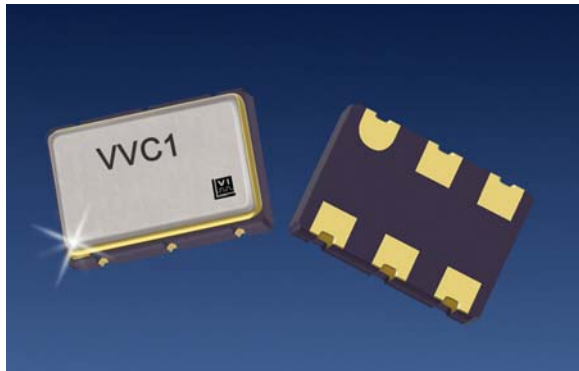


# VVC1 VVC2

## Voltage Controlled Crystal Oscillator



The VVC1 Voltage Controlled Crystal Oscillator

### Features

- VCXO with a CMOS output
- Small 5.0 X 7.0 X 1.9 mm package
- Output frequencies to 66 MHz
- 5.0 or 3.3 V operation
- Low Jitter < 6 pS rms,  $f_o > 12\text{MHz}$
- Tri-State Output for test and board debug
- 0/70 or -40/85 °C operating temperature
- Hermetically sealed ceramic SMD package
- Lead free construction

- Product is compliant to RoHS directive  and fully compatible with lead free assembly

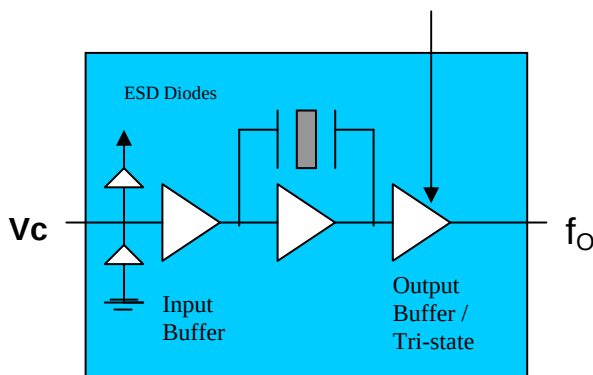
### Applications

- SONET/SDH/DWDM
- Ethernet, Gigabit Ethernet
- xDSL/PCMCIA cards
- Digital Video
- Broadband Access

### Description

Vectron's VVC1/VVC2 Voltage Controlled Crystal Oscillator (VCXO) is a quartz stabilized square wave generator with a CMOS output and is tested at CMOS and TTL (5.0 volt operation) logic levels.

The VVC1/VVC2 uses fundamental crystals resulting in low jitter performance and a monolithic IC which improves reliability and reduces cost.



# VVC1, VVC2 Voltage Controlled Crystal Oscillator

## Performance Characteristics

| Table 1. Electrical Performance                                                                                                                                                               |                      |                                                                       |                   |                                |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------|-------------------|--------------------------------|----------|
| Parameter                                                                                                                                                                                     | Symbol               | Min                                                                   | Typical           | Maximum                        | Units    |
| Frequency                                                                                                                                                                                     | $f_o$                | 1.544                                                                 |                   | 65.536                         | MHz      |
| Supply Voltage <sup>1</sup><br>(+5.0 V $\pm$ 5%)<br>(+3.3 V $\pm$ 5%)<br>(+2.7 V $\pm$ 5%) <sup>4</sup>                                                                                       | $V_{DD}$             | 4.750<br>3.135<br>2.7                                                 | 5.0<br>3.3<br>2.7 | 5.250<br>3.465<br>2.835        | V        |
| Supply Current +5.0 V, 1.544-30.000MHz<br>+5V, 30.001-50.000<br>+5V, 50.001-77.760<br>+2.7 or +3.3 V, 1.544-30.000MHz<br>+2.7 or +3.3 V, 30.001-50.000MHz<br>+2.7 or +3.3 V, 50.001-77.760MHz | $I_{DD}$             |                                                                       |                   | 10<br>12<br>18<br>5<br>9<br>14 | mA       |
| Output Logic Levels<br>Output Logic High <sup>2</sup><br>Output Logic Low <sup>2</sup>                                                                                                        | $V_{OH}$<br>$V_{OL}$ | 0.9* $V_{DD}$                                                         |                   | 0.1 $V_{DD}$                   | V<br>V   |
| Transition Times<br>Rise Time <sup>2</sup><br>Fall Time <sup>2</sup>                                                                                                                          | $t_R$<br>$t_F$       |                                                                       |                   | 5<br>5                         | ns<br>ns |
| Symmetry or Duty Cycle <sup>3</sup>                                                                                                                                                           | SYM                  | 45                                                                    | 50                | 55                             | %        |
| Operating temperature ( <i>ordering option</i> )                                                                                                                                              |                      | 0/70 or -40/85                                                        |                   |                                | °C       |
| Total Pull Range ( <i>ordering option</i> )<br>Or<br>Absolute Pull Range                                                                                                                      |                      | $\pm 50$ , $\pm 100$ or $\pm 150$<br>$\pm 50$ , $\pm 80$ or $\pm 100$ |                   |                                | ppm      |
| Test Conditions for APR (+5V option)                                                                                                                                                          | $V_C$                | 0.5                                                                   |                   | 4.5                            | V        |
| Test Conditions for APR (+3.3V option)                                                                                                                                                        | $V_C$                | 0.3                                                                   |                   | 3.0                            | V        |
| Gain Transfer                                                                                                                                                                                 |                      | Positive                                                              |                   |                                | ppm/V    |
| Control Voltage Impedance                                                                                                                                                                     |                      |                                                                       | 90                |                                | Kohm     |
| Control Voltage Bandwidth (-3dB)                                                                                                                                                              | BW                   | 10                                                                    |                   |                                | kHz      |
| Package Size                                                                                                                                                                                  |                      | 5.0 x 7.0 x 1.9                                                       |                   |                                | mm       |

1. A 0.01 $\mu$ F and a 0.1 $\mu$ F capacitor should be located as close to the supply as possible (to ground) is recommended.
2. Figure 1 defines these parameters. Figure 2 illustrates the equivalent five gate TTL load and operating conditions under which these parameters are tested and specified.
3. Symmetry is defined as (ON TIME/PERIOD with  $V_s = 1.4$  V for TTL and  $V_s = 2.5$  V for CMOS, 5 volt operation, and  $V_s = 1.65$  V for 3.3 Volt operation.
4. Only available as 50 ppm APR.

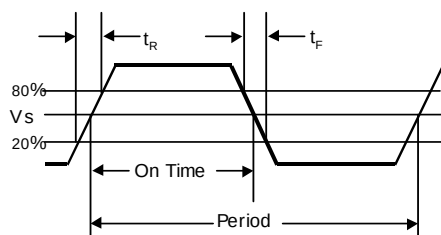


Figure 1. Output Waveform

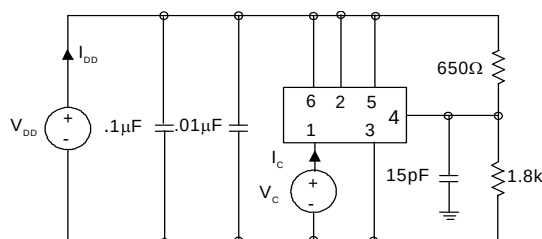
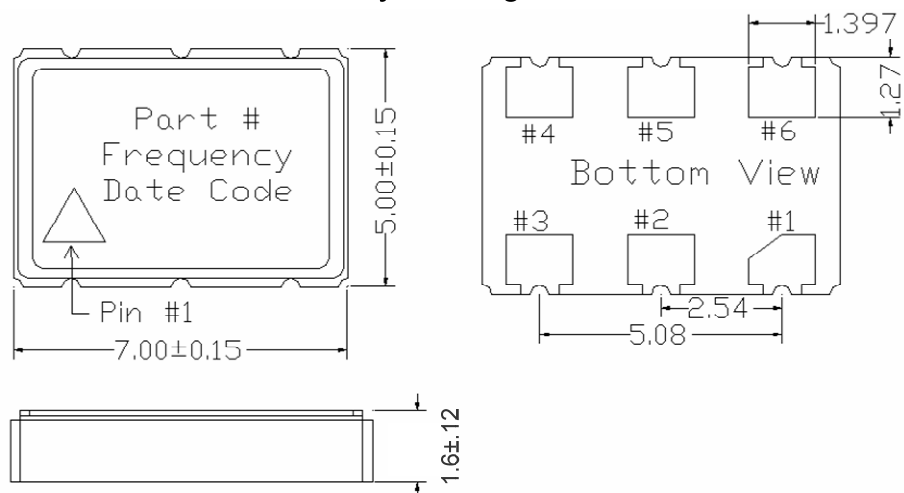


Figure 2. Typical Output Test Conditions (25±5°C)

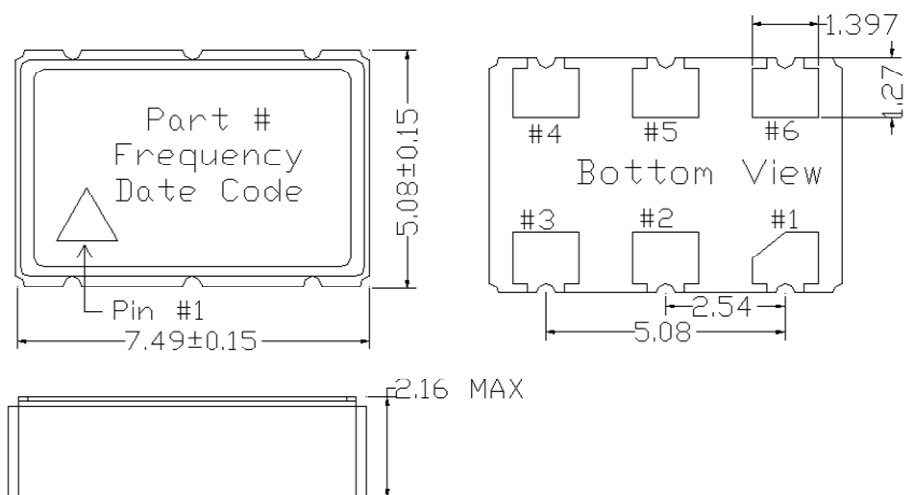
## VVC1, VVC2 Voltage Controlled Crystal Oscillator

### Outline Diagram, Pad Layout and Pin Out

#### Primary Package



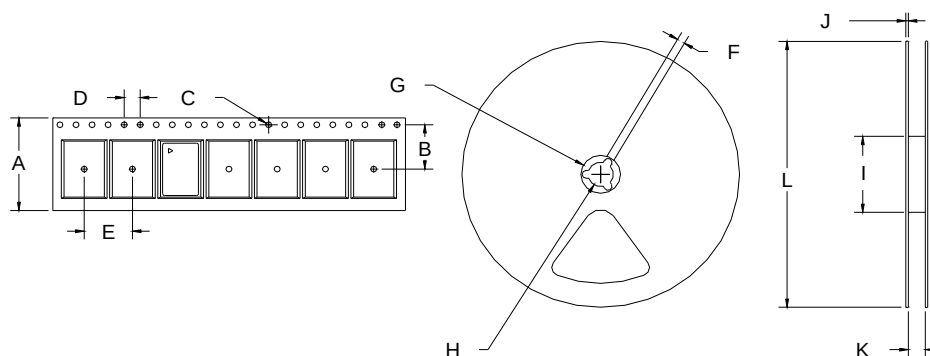
#### Alternate Package



| Pin # | Symbol          | Function                                                                         |
|-------|-----------------|----------------------------------------------------------------------------------|
| 1     | $V_C$           | Control Voltage                                                                  |
| 2     | NC or Tri-state | No Connect or Tri-state                                                          |
| 3     | GND             | Ground                                                                           |
| 4     | $f_o$           | Output Frequency                                                                 |
| 5     | Tri-state or NC | Logic low disables output<br>Logic high or no connection enables output waveform |
| 6     | $V_{DD}$        | Supply Voltage                                                                   |

## VVC1, VVC2 Voltage Controlled Crystal Oscillator

### Tape and Reel



**Table 2. Tape and Reel Dimensions (mm)**

| Tape Dimensions |    |     |     |   |   | Reel Dimensions |    |    |    |   |    |     | # Per Reel |
|-----------------|----|-----|-----|---|---|-----------------|----|----|----|---|----|-----|------------|
| Product         | A  | B   | C   | D | E | F               | G  | H  | I  | J | K  | L   |            |
| VVC1/2          | 16 | 7.5 | 1.5 | 4 | 8 | 2               | 21 | 13 | 60 | 2 | 17 | 180 | 1000       |

### Absolute Maximum Ratings

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 data sheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability.

**Table 3. Absolute Maximum Ratings**

| Parameter             | Symbol   | Ratings         | Unit |
|-----------------------|----------|-----------------|------|
| Power Supply          | $V_{DD}$ | 6               | Vdc  |
| Storage Temperature   | Tstorage | -55/125         | °C   |
| Voltage Control Range | $V_C$    | Gnd to $V_{DD}$ | V    |

## VVC1, VVC2 Voltage Controlled Crystal Oscillator

### Reliability

The VVC1/VVC2 is capable of meeting the following qualification tests.

**Table 4. 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 2016 |
| Moisture Sensitivity Level | 1                       |

### Handling Precautions

Although ESD protection circuitry has been designed into the the VVC1/VVC2, 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 5. ESD Ratings**

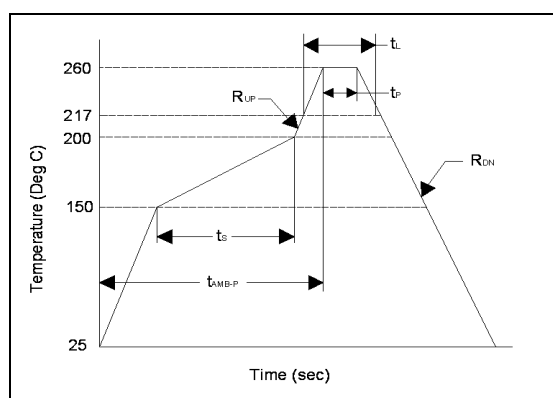
| Model                | Minimum | Conditions              |
|----------------------|---------|-------------------------|
| Human Body Model     | 1500    | MIL-STD-883 Method 3115 |
| Charged Device Model | 1000    | JESD 22-C101            |

### Suggested IR profile

Devices are built using lead free epoxy and can also be subjected to standard lead free IR reflow conditions.

**Table 6. Reflow Profile (IPC/JEDEC J-STD-020)**

| Parameter                | Symbol      | Value                   |
|--------------------------|-------------|-------------------------|
| PreHeat Time             | $t_s$       | 60 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)      | $tp2$       | 60 sec MAX              |
| Ramp Down                | $R_{DN}$    | 6 °C/sec Max            |



## VVC1, VVC2 Voltage Controlled Crystal Oscillator

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

|        |        |        |        |        |
|--------|--------|--------|--------|--------|
| 1.544  | 2.048  | 4.096  | 8.192  | 10.000 |
| 12.000 | 12.288 | 12.352 | 13.000 | 14.318 |
| 15.440 | 16.000 | 16.384 | 18.432 | 19.440 |
| 20.000 | 20.480 | 24.576 | 24.704 | 27.000 |
| 30.000 | 32.000 | 32.768 | 34.368 | 35.328 |
| 38.880 | 40.000 | 40.960 | 44.736 | 51.840 |
| 52.000 | 62.208 | 65.536 |        |        |

Other frequencies may be available upon request. Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

## Ordering Information

# VVC1-BGE - xxMxxx

**Product Family**  
VV = VCXO

**Package**  
5x7x1.9

**Tristate**  
1= Pin 5  
2= Pin 2

**Power Supply, Linearity**  
A= 5.0V, 20% Linearity  
B= 3.3V, 20% Linearity  
C= 5.0V, 10% Linearity  
D= 2.7V, 20% Linearity\*  
F= 3.3V, 10% Linearity

**Frequency**  
ex.: 44M736 = 44.736MHz

**Temperature Range, Stability (for TPR)**  
B= 0/70°C, ±50 ppm  
D= -40/85°C, ±50 ppm  
E= 0/70°C, ±25 ppm  
F= -40/85°C, ±25 ppm

**Absolute Pull Range**  
G= ±50 ppm APR  
N= ±80 ppm APR  
H= ±100 ppm APR

**or Total Pull Range**  
1= ±50 ppm  
2= ±100 ppm  
3= ±150 ppm

**NOTE:** Not all combinations of options are available. Higher frequencies have less pull capability, especially at +3.3 volts supply, and higher pull can result in 20% linearity instead of 10%. Consult factory or your local sales representative with application requirements.

\* Only 50 ppm APR is available with this power supply

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