

## Helping Customers Innovate, Improve & Grow



VCC1

### Description

Vectron's VCC1 Crystal Oscillator (XO) is a quartz stabilized square wave generator with a CMOS output. The VCC1 uses a fundamental or 3rd overtone crystal resulting in very low jitter performance, and a monolithic IC which improves reliability and reduces cost.

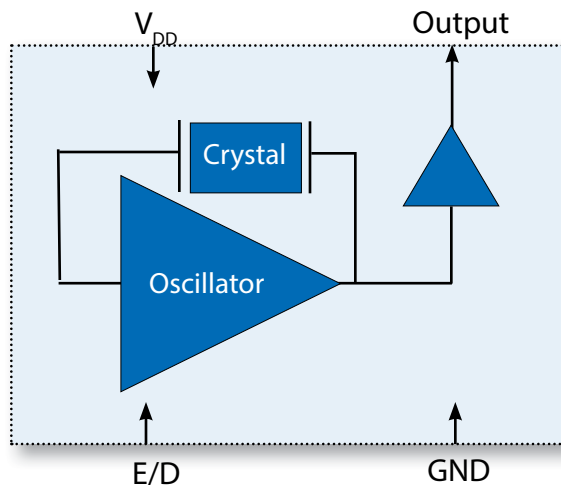
### Features

- Ultra Low Jitter, Fundamental or 3rd OT Crystal Design
- CMOS Output Crystal Oscillator
- Output Frequencies from 1.024 MHz to 190.000 MHz
- 5.0, 3.3, 2.5 or 1.8 V Operation
- Output Disable Feature
- Excellent 20ppm temperature stability
- -10/70°C, -40/85°C or -55/125°C operating temperature
- Small Industry Standard Package, 5x7mm
- Product is compliant to RoHS directive  and fully compatible with lead free assembly

### Applications

- SONET/SDH/DWDM
- Ethernet, GE, SynchE
- Storage Area Networking
- Fiber Channel
- Digital Video
- Broadband Access
- Base Stations, Picocells
- Driving A/D's, D/A's, FPGA's
- Test and Measurement
- COTS

### Block Diagram



**Table 1. Electrical Performance, 5V Option**

| Parameter                                                                                                                      | Symbol                                                                   | Minimum                             | Typical   | Maximum              | Units              |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------|-----------|----------------------|--------------------|
| Supply                                                                                                                         |                                                                          |                                     |           |                      |                    |
| Voltage <sup>1</sup>                                                                                                           | V <sub>DD</sub>                                                          | 4.5                                 | 5.0       | 5.5                  | V                  |
| Max Voltage                                                                                                                    |                                                                          | -0.7                                |           | 7                    | V                  |
| Current <sup>2</sup><br>≤20.000MHz<br>20.001 to 50.000MHz<br>50.001 to 85.000MHz<br>85.001 to 125.000MHz                       | I <sub>DD</sub>                                                          |                                     |           | 10<br>30<br>50<br>60 | mA                 |
| Current, Output Disabled                                                                                                       |                                                                          |                                     |           | 30                   | uA                 |
| Frequency                                                                                                                      |                                                                          |                                     |           |                      |                    |
| Nominal Frequency <sup>3</sup>                                                                                                 | f <sub>N</sub>                                                           | 1.544                               |           | 125.000              | MHz                |
| Stability <sup>4</sup> , (Ordering Option)                                                                                     |                                                                          | ±20, ±25, ±32, ±50, ±100            |           |                      | ppm                |
| Outputs                                                                                                                        |                                                                          |                                     |           |                      |                    |
| Output Logic Levels <sup>2</sup><br>Output Logic High<br>Output Logic Low<br>Output Logic High Drive<br>Output Logic Low Drive | V <sub>OH</sub><br>V <sub>OL</sub><br>I <sub>OH</sub><br>I <sub>OL</sub> | 0.9*V <sub>DD</sub><br><br>16<br>16 |           | 0.1*V <sub>DD</sub>  | V<br>V<br>mA<br>mA |
| Load                                                                                                                           | I <sub>OUT</sub>                                                         |                                     |           | 15                   | pF                 |
| Output Rise /Fall Time <sup>2</sup><br><20.000MHz<br>20.000 to 50.000MHz<br>50.001 to 125.000MHz                               | t <sub>R</sub> /t <sub>F</sub>                                           |                                     |           | 8<br>5<br>2          | ns                 |
| Output Leakage, Output Disabled                                                                                                | I <sub>z</sub>                                                           |                                     |           | ±10                  | uA                 |
| Duty Cycle <sup>2,5</sup>                                                                                                      |                                                                          | 45                                  | 50        | 55                   | %                  |
| Period Jitter <sup>6</sup><br>RMS<br>Peak-Peak                                                                                 | ϕJ                                                                       |                                     | 2.5<br>18 |                      | ps                 |
| RMS Jitter, 12k-20MHz                                                                                                          | ϕJ                                                                       |                                     | 0.5       | 1                    | ps                 |
| Enable/Disable                                                                                                                 |                                                                          |                                     |           |                      |                    |
| Output Enable/Disable <sup>7</sup><br>Output Enable<br>Output Disable                                                          | V <sub>IH</sub><br>V <sub>IL</sub>                                       | 4.0                                 |           | 0.8                  | V<br>V             |
| Disable time                                                                                                                   | t <sub>D</sub>                                                           |                                     |           | 100                  | ns                 |
| Enable Internal Pull-Up Resistor                                                                                               |                                                                          |                                     | 100       |                      | Kohm               |
| Start-Up Time                                                                                                                  | t <sub>SU</sub>                                                          |                                     |           | 10                   | ms                 |
| Operating Temp, (Ordering Option)                                                                                              | T <sub>OP</sub>                                                          | -10/70, -40/85, -55/125             |           |                      | °C                 |

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for example 0.1 and 0.01 uF

2] Parameters are tested with the test circuit shown in Figure 1.

3] See Standard Frequencies and Ordering Information tables for more specific information

4] Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and 10 years aging.

5] Duty Cycle is measured as On Time/Period, see Fig 2.

6] Broadband Period Jitter measured using a LeCroy Wavemaster 8600A, 90K samples, see Application Note for Typical Phase Noise and Jitter Performance

7] The Output is Enabled if the Enable/Disable is left open.

**Table 2. Electrical Performance, 3.3V Option**

| Parameter                                                                                                                      | Symbol                                                                   | Mininum                           | Typical   | Maximum             | Units              |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------|-----------|---------------------|--------------------|
| Supply                                                                                                                         |                                                                          |                                   |           |                     |                    |
| Voltage <sup>1</sup>                                                                                                           | V <sub>DD</sub>                                                          | 2.97                              | 3.3       | 3.63                | V                  |
| Maximum Voltage                                                                                                                |                                                                          | -0.5                              |           | 5                   | V                  |
| Current <sup>2</sup><br>≤20.000<br>20.001 to 50.000<br>50.001 to 85.000<br>85.001 to 190.000                                   | I <sub>DD</sub>                                                          |                                   |           | 7<br>20<br>30<br>50 | mA                 |
| Current, Output Disabled                                                                                                       |                                                                          |                                   |           | 30                  | uA                 |
| Frequency                                                                                                                      |                                                                          |                                   |           |                     |                    |
| Nominal Frequency <sup>3</sup>                                                                                                 | f <sub>N</sub>                                                           | 1.544                             |           | 190.000             | MHz                |
| Stability <sup>4</sup> , (Ordering Option)                                                                                     |                                                                          | ±20, ±25, ±32, ±50, ±100          |           |                     | ppm                |
| Outputs                                                                                                                        |                                                                          |                                   |           |                     |                    |
| Output Logic Levels <sup>2</sup><br>Output Logic High<br>Output Logic Low<br>Output Logic High Drive<br>Output Logic Low Drive | V <sub>OH</sub><br>V <sub>OL</sub><br>I <sub>OH</sub><br>I <sub>OL</sub> | 0.9*V <sub>DD</sub><br><br>8<br>8 |           | 0.1*V <sub>DD</sub> | V<br>V<br>mA<br>mA |
| Load                                                                                                                           | I <sub>OUT</sub>                                                         |                                   |           | 15                  | pF                 |
| Output Rise /Fall Time <sup>2</sup><br><20.000MHz<br>20.000 to 50.000MHz<br>50.001 to 90.000MHz<br>90.001 to 190.000MHz        | t <sub>R</sub> /t <sub>F</sub>                                           |                                   |           | 6<br>4<br>3<br>2    | ns                 |
| Output Leakage, Output Disabled <sup>2,5</sup>                                                                                 | I <sub>Z</sub>                                                           |                                   |           | ±10                 | uA                 |
| Duty Cycle <sup>2,5</sup>                                                                                                      |                                                                          | 45                                | 50        | 55                  | %                  |
| Period Jitter <sup>6</sup><br>RMS<br>Peak-Peak                                                                                 | ϕJ                                                                       |                                   | 2.5<br>18 |                     | ps                 |
| RMS Jitter, 12k-20M                                                                                                            | ϕJ                                                                       |                                   | 0.5       | 1                   | ps                 |
| Enable/Disable                                                                                                                 |                                                                          |                                   |           |                     |                    |
| Output Enable/Disable <sup>7</sup><br>Output Enable<br>Output Disable                                                          | V <sub>IH</sub><br>V <sub>IL</sub>                                       | 2.0                               |           | 0.5                 | V<br>V             |
| Disable time                                                                                                                   | t <sub>D</sub>                                                           |                                   |           | 100                 | ns                 |
| Enable Internal Pull-Up Resistor                                                                                               |                                                                          |                                   | 100       |                     | Kohm               |
| Start-Up Time                                                                                                                  | t <sub>SU</sub>                                                          |                                   |           | 10                  | ms                 |
| Operating Temp, (Ordering Option)                                                                                              | T <sub>OP</sub>                                                          | -10/70, -40/85, -55/125           |           |                     | °C                 |

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for example 0.1 and 0.01uF

2] Parameters are tested with the test circuit shown in Figure 1.

3] See Standard Frequencies and Ordering Information tables for more specific information

4] Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and 10 years aging.

5] Duty Cycle is measured as On Time/Period, see Fig 2.

6] Broadband Period Jitter measured using a LeCroy Wavemaster 8600A, 90K samples, see Application Note for Typical Phase Noise and Jitter Performance

7] The Output is Enabled if the Enable/Disable is left open.

**Table 3. Electrical Performance, 2.5V Option**

| Parameter                                                                                                                                                                                                       | Symbol                                                                               | Mininum                                     | Typical   | Maximum             | Units                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------|-----------|---------------------|--------------------------------|
| Supply                                                                                                                                                                                                          |                                                                                      |                                             |           |                     |                                |
| Voltage <sup>1</sup>                                                                                                                                                                                            | V <sub>DD</sub>                                                                      | 2.25                                        | 2.5       | 2.75                | V                              |
| Maximum Voltage                                                                                                                                                                                                 |                                                                                      | -0.5                                        |           | 5                   | V                              |
| Current <sup>2</sup><br>≤20.000MHz<br>20.001 to 50.000MHz<br>50.001 to 110.000MHz<br>110.001 to 190.000MHz                                                                                                      | I <sub>DD</sub>                                                                      |                                             |           | 7<br>15<br>20<br>30 | mA                             |
| Current, Output Disabled                                                                                                                                                                                        |                                                                                      |                                             |           | 30                  | uA                             |
| Frequency                                                                                                                                                                                                       |                                                                                      |                                             |           |                     |                                |
| Nominal Frequency <sup>3</sup>                                                                                                                                                                                  | f <sub>N</sub>                                                                       | 1.544                                       |           | 190.000             | MHz                            |
| Stability <sup>4</sup> , (Ordering Option)                                                                                                                                                                      |                                                                                      | ±20, ±25, ±32, ±50, ±100                    |           |                     | ppm                            |
| Outputs                                                                                                                                                                                                         |                                                                                      |                                             |           |                     |                                |
| Output Logic Levels <sup>2,3</sup><br>Output Logic High<br>Output Logic Low<br>Output Logic High Drive<br>Output Logic Low Drive<br>Output Logic High Drive <sup>5</sup><br>Output Logic Low Drive <sup>5</sup> | <br><br><br>V <sub>OH</sub><br>V <sub>OL</sub><br>I <sub>OH</sub><br>I <sub>OL</sub> | 0.9*V <sub>DD</sub><br><br>4<br>4<br>8<br>8 |           | 0.1*V <sub>DD</sub> | V<br>V<br>mA<br>mA<br>mA<br>mA |
| Load                                                                                                                                                                                                            | I <sub>OUT</sub>                                                                     |                                             |           | 15                  | pF                             |
| Output Rise /Fall Time <sup>2</sup><br><20.000MHz<br>20.000 to 50.000MHz<br>50.001 to 90.000MHz<br>90.001 to 190.000MHz                                                                                         | t <sub>R</sub> /t <sub>F</sub>                                                       |                                             |           | 10<br>6<br>3<br>2   | ns                             |
| Output Leakage, Output Disabled                                                                                                                                                                                 |                                                                                      |                                             |           | ±10                 | uA                             |
| Duty Cycle <sup>2,6</sup>                                                                                                                                                                                       |                                                                                      | 45                                          | 50        | 55                  | %                              |
| Period Jitter <sup>7</sup><br>RMS<br>Peak-Peak                                                                                                                                                                  | ϕJ                                                                                   |                                             | 2.5<br>18 |                     | ps                             |
| RMS Jitter, 12k-20MHz                                                                                                                                                                                           | ϕJ                                                                                   |                                             | 0.5       | 1                   | ps                             |
| Enable/Disable                                                                                                                                                                                                  |                                                                                      |                                             |           |                     |                                |
| Output Enable/Disable <sup>8</sup><br>Output Enable<br>Output Disable                                                                                                                                           | V <sub>IH</sub><br>V <sub>IL</sub>                                                   | 1.75                                        |           | 0.5                 | V<br>V                         |
| Disable time                                                                                                                                                                                                    | t <sub>D</sub>                                                                       |                                             |           | 100                 | ns                             |
| Enable Internal Pull-Up Resistor                                                                                                                                                                                |                                                                                      |                                             | 100       |                     | Kohm                           |
| Start-Up Time                                                                                                                                                                                                   | t <sub>SU</sub>                                                                      |                                             |           | 10                  | ms                             |
| Operating Temp, (Ordering Option)                                                                                                                                                                               | T <sub>OP</sub>                                                                      | -10/70, -40/85, -55/125                     |           |                     | °C                             |

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for example 0.1 and 0.01uF

2] Parameters are tested with the test circuit shown in Figure 1.

3] See Standard Frequencies and Ordering Information tables for more specific information

4] Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and 10 years aging.

5] Duty Cycle is measured as On Time/Period, see Fig 2.

6] Broadband Period Jitter measured using a LeCroy Wavemaster 8600A, 90K samples, see Application Note for Typical Phase Noise and Jitter Performance

7] The Output is Enabled if the Enable/Disable is left open.

**Table 4. Electrical Performance, 1.8V Option**

| Parameter                                                                                                                                                                                                       | Symbol                                                                                                         | Mininum                                         | Typical   | Maximum                   | Units              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------|---------------------------|--------------------|
| Supply                                                                                                                                                                                                          |                                                                                                                |                                                 |           |                           |                    |
| Voltage <sup>1</sup>                                                                                                                                                                                            | V <sub>DD</sub>                                                                                                | 1.71                                            | 1.8       | 1.89                      | V                  |
| Maximum Voltage                                                                                                                                                                                                 |                                                                                                                | -0.5                                            |           | 3.6                       | V                  |
| Current <sup>2</sup><br>≤20.000MHz<br>20.001 to 70.000MHz<br>70.001 to 96.000MHz<br>96.001 to 125.000MHz<br>125.001 to 172.000MHz                                                                               | I <sub>DD</sub>                                                                                                |                                                 |           | 5<br>15<br>20<br>25<br>30 | mA                 |
| Current, Output Disabled                                                                                                                                                                                        |                                                                                                                |                                                 |           | 30                        | uA                 |
| Frequency                                                                                                                                                                                                       |                                                                                                                |                                                 |           |                           |                    |
| Nominal Frequency <sup>3</sup>                                                                                                                                                                                  | f <sub>N</sub>                                                                                                 | 1.544                                           |           | 172.000                   | MHz                |
| Stability <sup>4</sup> , (Ordering Option)                                                                                                                                                                      |                                                                                                                | ±20, ±25, ±32, ±50, ±100                        |           |                           | ppm                |
| Outputs                                                                                                                                                                                                         |                                                                                                                |                                                 |           |                           |                    |
| Output Logic Levels <sup>2,3</sup><br>Output Logic High<br>Output Logic Low<br>Output Logic High Drive<br>Output Logic Low Drive<br>Output Logic High Drive <sup>5</sup><br>Output Logic Low Drive <sup>5</sup> | V <sub>OH</sub><br>V <sub>OL</sub><br>I <sub>OH</sub><br>I <sub>OL</sub><br>I <sub>OH</sub><br>I <sub>OL</sub> | 0.9*V <sub>DD</sub><br><br>2.8<br>2.8<br>8<br>8 |           | 0.1*V <sub>DD</sub>       | V<br>V<br>mA<br>mA |
| Load                                                                                                                                                                                                            | I <sub>OUT</sub>                                                                                               |                                                 |           | 15                        | pF                 |
| Output Rise /Fall Time <sup>2</sup><br><20.000MHz<br>20.000 to 50.000MHz<br>50.001 to 90.000MHz<br>90.000 to 172.000MHz                                                                                         | t <sub>R</sub> /t <sub>F</sub>                                                                                 |                                                 |           | 4<br>4<br>3<br>2          | ns                 |
| Output Leakage, Output Disabled                                                                                                                                                                                 | I <sub>Z</sub>                                                                                                 |                                                 |           | ±10                       | uA                 |
| Duty Cycle <sup>2,6</sup>                                                                                                                                                                                       |                                                                                                                | 45                                              | 50        | 55                        | %                  |
| Period Jitter <sup>7</sup><br>RMS<br>Peak-peak                                                                                                                                                                  | ϕJ                                                                                                             |                                                 | 2.5<br>18 |                           | ps                 |
| RMS Jitter, 12kHz-20MHz                                                                                                                                                                                         | ϕJ                                                                                                             |                                                 | 0.5       | 1                         | ps                 |
| Enable/Disable                                                                                                                                                                                                  |                                                                                                                |                                                 |           |                           |                    |
| Output Enable/Disable <sup>8</sup><br>Output Enable<br>Output Disable                                                                                                                                           | V <sub>IH</sub><br>V <sub>IL</sub>                                                                             | 1.26                                            |           | 0.5                       | V<br>V             |
| Disable time                                                                                                                                                                                                    | t <sub>D</sub>                                                                                                 |                                                 |           | 100                       | ns                 |
| Enable Internal Pull-Up Resistor                                                                                                                                                                                |                                                                                                                |                                                 | 1         |                           | Mohm               |
| Start-Up Time                                                                                                                                                                                                   | t <sub>SU</sub>                                                                                                |                                                 |           | 10                        | ms                 |
| Operating Temp, Ordering Option                                                                                                                                                                                 | T <sub>OP</sub>                                                                                                | -10/70, -40/85, -55/125                         |           |                           | °C                 |

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for example 0.1 and 0.01uF

2] Parameters are tested with the test circuit shown in Figure 1.

3] See Standard Frequencies and Ordering Information tables for more specific information

4] Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and 10 years aging.

5] Duty Cycle is measured as On Time/Period, see Fig 2.

6] Broadband Period Jitter measured using a LeCroy Wavemaster 8600A, 90K samples, see Application Note for Typical Phase Noise and Jitter Performance

7] The Output is Enabled if the Enable/Disable is left open.

## Test Diagram and Waveform

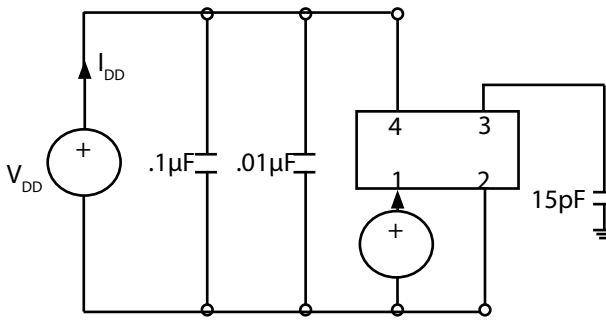


Fig 1: Test Circuit

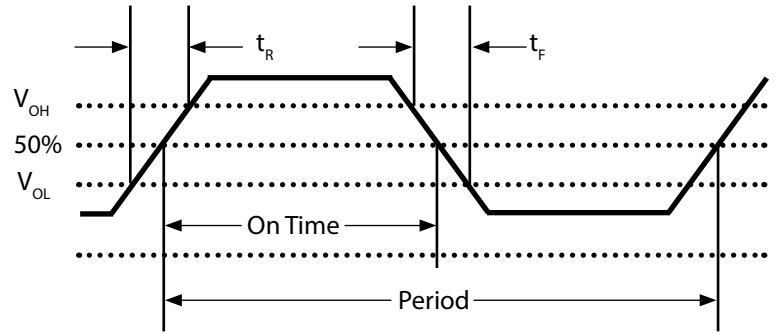
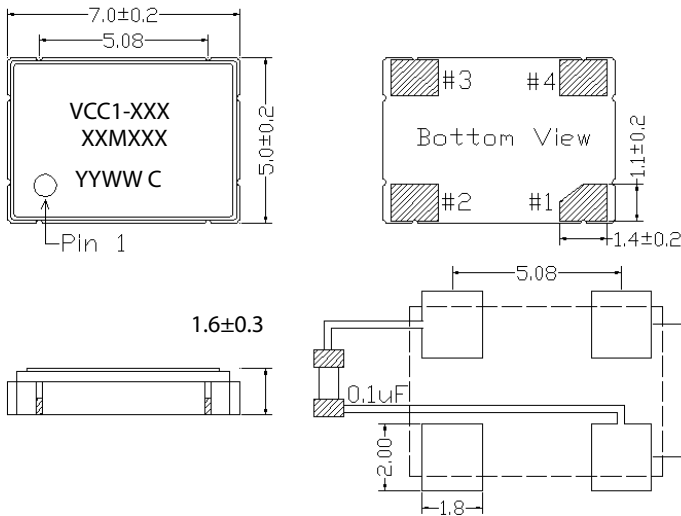


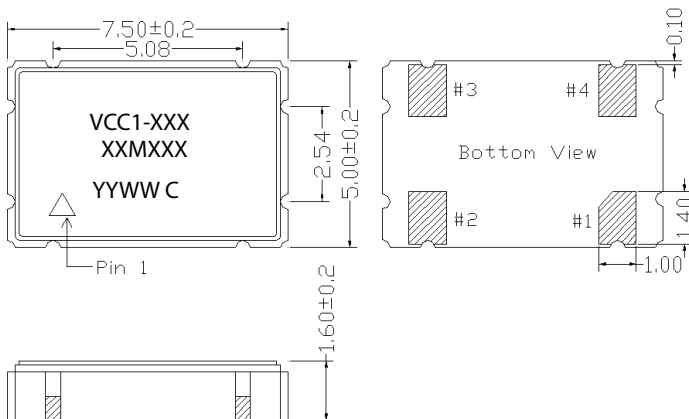
Fig 2: Waveform

## Outline Drawing & Pad Layout



Recommended Soldering Pad Layout

Dimensions in mm



Alternate Package Design

Table 5. Pin Out

| Pin | Symbol          | Function                   |
|-----|-----------------|----------------------------|
| 1   | E/D             | Enable Disable             |
| 2   | GND             | Case and Electrical Ground |
| 3   | Output          | Output                     |
| 4   | V <sub>DD</sub> | Power Supply Voltage       |

## Reliability

VI qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VCC1 family is capable of meeting the following qualification tests:

**Table 6. Environmental Compliance**

| Parameter                  | Conditions               |
|----------------------------|--------------------------|
| 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 |
| 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         |

Although ESD protection circuitry has been designed into the VCC1 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 7. ESD Ratings**

| Model                | Minimum | Conditions               |
|----------------------|---------|--------------------------|
| Human Body Model     | 1500V   | MIL-STD-883, Method 3015 |
| Charged Device Model | 1000V   | JESD22-C101              |

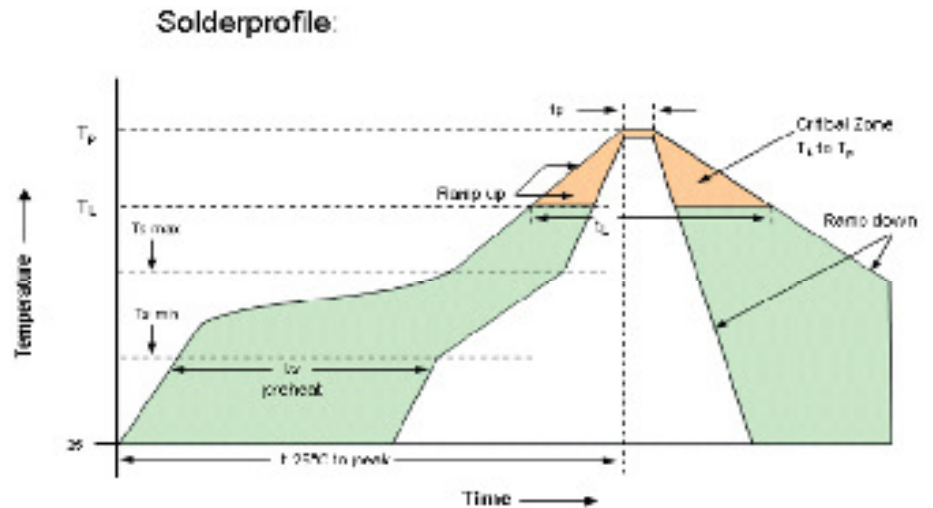
Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this datasheet. Exposure to absolute maximum ratings for extended periods may adversely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

**Table 8. Absolute Maximum Ratings**

| Parameter           | Symbol          | Ratings    | Unit     |
|---------------------|-----------------|------------|----------|
| Storage Temperature | TS              | -55 to 125 | °C       |
| Soldering Temp/Time | T <sub>LS</sub> | 260 / 30   | °C / sec |

## IR Reflow

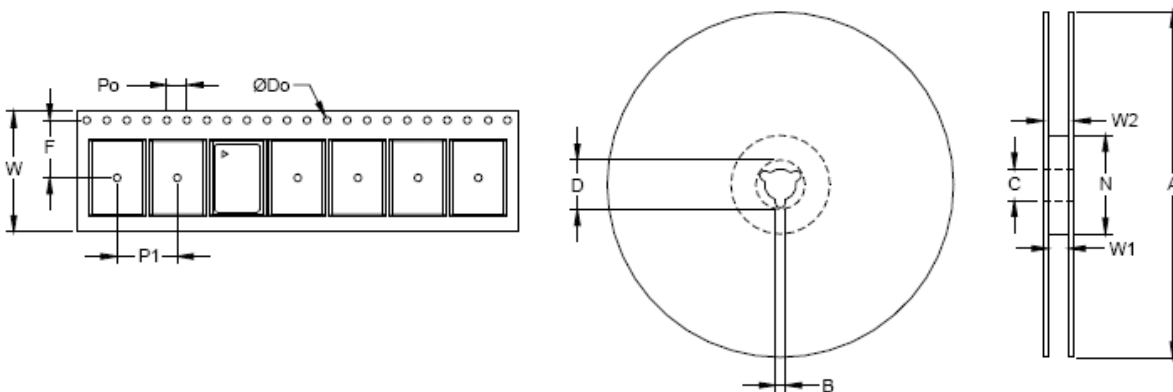
The VCC1 is qualified to meet the JEDEC standard for Pb-Free assembly. The temperatures and time intervals listed are based on the Pb-Free small body requirements. The VCC1 device is hermetically sealed so an aqueous wash is not an issue.



**Table 9. Reflow Profile**

| Parameter                        | Symbol      | Value                                     |
|----------------------------------|-------------|-------------------------------------------|
| PreHeat Time<br>Ts-min<br>Ts-max | $t_s$       | 60 sec Min, 260 sec Max<br>150°C<br>200°C |
| 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                   | $t_p$       | 30 sec Max                                |
| Ramp Down                        | $R_{DN}$    | 6 °C/sec Max                              |

## Tape and Reel



**Table 10. Tape and Reel Information**

| 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 |            |
| VCC1                 | 16  | 7.5 | 1.5 | 4   | 8   | 180                  | 2   | 13  | 21  | 60  | 17  | 21  | 1000       |

**Table 11. Standard Output Frequencies (MHz)**

|         |          |          |          |          |          |          |          |          |          |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 1.544   | 1.843    | 2.000    | 2.048    | 2.560    | 3.080    | 3.686    | 4.000    | 4.032    | 4.096    |
| 4.9152  | 5.000    | 6.000    | 6.176    | 7.3728   | 7.680    | 8.000    | 8.192    | 9.216    | 9.600    |
| 9.830   | 10.000   | 10.240   | 10.486   | 12.000   | 12.222   | 12.2725  | 12.288   | 12.352   | 12.500   |
| 12.544  | 12.624   | 12.729   | 12.800   | 12.81089 | 12.960   | 13.000   | 13.070   | 13.107   | 13.200   |
| 13.248  | 13.400   | 13.401   | 13.500   | 13.560   | 13.711   | 13.824   | 14.000   | 14.284   | 14.2848  |
| 14.285  | 14.318   | 14.31818 | 14.336   | 14.400   | 14.500   | 14.5152  | 14.720   | 14.736   | 14.745   |
| 14.746  | 15.000   | 15.211   | 15.360   | 15.555   | 15.625   | 15.748   | 15.74886 | 15.974   | 16.000   |
| 16.016  | 16.128   | 16.368   | 16.384   | 16.388   | 16.500   | 16.588   | 16.610   | 16.660   | 16.666   |
| 16.667  | 16.670   | 16.776   | 16.780   | 16.896   | 16.9344  | 17.000   | 17.0664  | 17.37476 | 17.408   |
| 17.600  | 17.664   | 17.734   | 17.73448 | 17.920   | 17.992   | 18.000   | 18.333   | 18.400   | 18.432   |
| 18.688  | 18.750   | 19.000   | 19.022   | 19.200   | 19.268   | 19.286   | 19.392   | 19.440   | 19.456   |
| 19.530  | 19.654   | 19.660   | 19.6608  | 19.752   | 19.774   | 19.872   | 19.968   | 20.000   | 20.00271 |
| 20.141  | 20.200   | 20.2752  | 20.480   | 20.516   | 20.712   | 20.736   | 20.769   | 20.7692  | 20.800   |
| 20.828  | 20.829   | 20.829   | 20.830   | 20.875   | 20.950   | 20.971   | 21.000   | 21.333   | 21.400   |
| 21.500  | 21.504   | 21.616   | 21.71055 | 21.711   | 22.000   | 22.118   | 22.174   | 22.184   | 22.217   |
| 22.500  | 22.579   | 22.5792  | 22.600   | 22.855   | 22.85568 | 23.000   | 23.040   | 23.732   | 24.000   |
| 24.431  | 24.444   | 24.540   | 24.545   | 24.5454  | 24.576   | 24.704   | 24.832   | 25.000   | 25.088   |
| 25.175  | 25.180   | 25.272   | 25.920   | 26.000   | 26.25641 | 26.664   | 26.6649  | 26.666   | 27.000   |
| 27.120  | 27.500   | 28.000   | 28.224   | 28.60489 | 28.636   | 28.63636 | 28.65645 | 28.672   | 28.800   |
| 29.000  | 29.265   | 29.491   | 29.49893 | 29.500   | 30.000   | 30.150   | 30.200   | 30.720   | 30.880   |
| 31.000  | 31.104   | 31.250   | 31.307   | 31.500   | 31.680   | 31.948   | 31.949   | 32.000   | 32.250   |
| 32.256  | 32.270   | 32.500   | 32.764   | 32.768   | 32.768   | 32.800   | 33.000   | 33.1776  | 33.300   |
| 33.333  | 33.792   | 33.810   | 33.860   | 33.8688  | 34.368   | 34.450   | 34.560   | 34.816   | 35.000   |
| 35.280  | 35.46895 | 35.500   | 35.600   | 35.840   | 35.984   | 36.000   | 36.500   | 36.666   | 36.860   |
| 36.864  | 36.923   | 37.000   | 37.056   | 37.140   | 37.376   | 37.500   | 37.643   | 38.000   | 38.3107  |
| 38.800  | 38.810   | 38.880   | 38.912   | 39.0625  | 39.497   | 39.9278  | 40.000   | 40.010   | 40.079   |
| 40.500  | 40.550   | 40.632   | 40.63232 | 40.920   | 40.960   | 41.472   | 41.500   | 41.657   | 41.660   |
| 41.670  | 41.750   | 41.895   | 41.931   | 42.000   | 42.400   | 42.500   | 42.620   | 43.000   | 43.560   |
| 44.000  | 44.137   | 44.236   | 44.250   | 44.267   | 44.330   | 44.434   | 44.539   | 44.732   | 44.736   |
| 44.928  | 45.000   | 45.135   | 45.158   | 45.818   | 46.080   | 46.232   | 46.2321  | 46.320   | 46.796   |
| 46.864  | 47.13333 | 47.16602 | 47.197   | 47.404   | 47.40437 | 48.000   | 48.33008 | 48.587   | 48.58736 |
| 48.600  | 48.81441 | 49.127   | 49.152   | 49.36221 | 49.408   | 49.512   | 49.58632 | 49.867   | 49.980   |
| 50.000  | 51.156   | 51.200   | 51.840   | 51.840   | 52.000   | 52.416   | 52.500   | 52.560   | 53.125   |
| 53.330  | 54.000   | 54.072   | 54.125   | 54.2174  | 54.500   | 55.000   | 55.289   | 55.500   | 56.000   |
| 56.064  | 56.446   | 56.448   | 56.666   | 57.272   | 57.344   | 57.600   | 57.800   | 58.000   | 58.250   |
| 58.320  | 58.982   | 58.982   | 59.000   | 60.000   | 60.480   | 61.000   | 61.250   | 61.440   | 62.000   |
| 62.208  | 62.500   | 62.800   | 63.000   | 63.8976  | 64.000   | 64.512   | 65.000   | 65.520   | 65.536   |
| 66.000  | 66.600   | 66.660   | 66.666   | 66.667   | 66.670   | 67.500   | 67.584   | 68.000   | 68.680   |
| 68.736  | 69.632   | 70.000   | 70.626   | 70.656   | 70.660   | 70.676   | 70.833   | 71.680   | 72.000   |
| 73.728  | 74.176   | 74.250   | 75.000   | 76.800   | 77.680   | 77.760   | 78.000   | 78.336   | 79.452   |
| 80.000  | 81.000   | 81.920   | 83.000   | 83.300   | 83.333   | 85.000   | 87.040   | 87.182   | 87.472   |
| 89.472  | 89.512   | 89.97804 | 90.000   | 91.008   | 92.000   | 95.000   | 96.000   | 97.776   | 98.304   |
| 100.000 | 102.400  | 103.680  | 104.000  | 106.250  | 110.000  | 112.500  | 114.000  | 115.200  | 116.640  |
| 120.000 | 125.000  | 125.010  | 127.000  | 128.000  | 133.000  | 135.000  | 144.600  | 150.000  | 155.520  |
| 156.250 | 157.000  | 166.000  | 167.000  | 189.000  | 190.000  |          |          |          |          |

## Ordering Information

### VCC1- B3B- xxMxxxxxxx

**Product**

5x7 Crystal Oscillator

Frequency in MHz

**Power Supply**

A: +5.0 Vdc, 15pF

B: +3.3 Vdc, 15pF

C: +3.0 Vdc, 15pF

E: +5.0 Vdc, 50pF

F: +3.3 Vdc, 50pF

G: +2.5 Vdc, 15pF

H: +1.8 Vdc, 15pF

**Stability**

A:  $\pm 100$ ppm over -10/70°C

B:  $\pm 50$ ppm over -10/70°C

C:  $\pm 100$ ppm over -40/85°C

D:  $\pm 50$ ppm over -40/85°C

E:  $\pm 25$ ppm over -10/70°C

F:  $\pm 25$ ppm over -40/85°C

K:  $\pm 32$ ppm over -10/70°C

O:  $\pm 32$ ppm over -40/85°C

P:  $\pm 100$ ppm over -55/125°C

R:  $\pm 50$ ppm over -55/125°C

**Electrical Options:****3: Tri-state 45/55% Duty Cycle**

*The following codes are not recommended for new designs*

0: No Tri-state, 40/60% Duty

1: Tri-state, 40/60% Duty

2: No tri-state, 45/55% Duty

5: Enable, 40/60% Duty

6: Enable, 45/55% Duty

**Example: VCC1-B3B-125M000000**

*\*Note: not all combination of options are available.*

*Other specifications may be available upon request.*

## 20ppm Stability Ordering Information

VCC1-105-frequency =  $\pm 20$ ppm over -10/70°C, +5.0Vdc, 45/55% Duty Cycle, 15pF load

VCC1-103-frequency =  $\pm 20$ ppm over -10/70°C, +3.3Vdc, 45/55% Duty Cycle, 15pF load

VCC1-118-frequency =  $\pm 20$ ppm over -10/70°C, +2.5Vdc, 45/55% Duty Cycle, 15pF load

VCC1-119-frequency =  $\pm 20$ ppm over -10/70°C, +1.8Vdc, 45/55% Duty Cycle, 15pF load

**\* Add SNPBDIP for tin lead solder dip**

**Example: VCC1-B3B-125M000000\_SNPBDIP**

## Revision History

| Revision Date   | Approved | Description                                                       |
|-----------------|----------|-------------------------------------------------------------------|
| August 10, 2018 | FB       | Update logo and contact information, add SNPBIDIP ordering option |
|                 |          |                                                                   |



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