

## VCC4 series

### 1.8, 2.5, 3.3, 5.0 volt CMOS Oscillator



The VCC4 Crystal Oscillator

#### Features

- CMOS output
- Output frequencies to 125 MHz
- Low jitter, Fundamental or 3<sup>rd</sup> OT Crystal
- Tristate 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

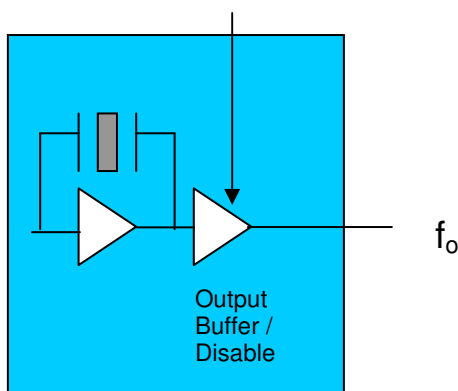
#### Applications

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

#### Description

Vectron's VCC4 Crystal Oscillator (XO) is quartz stabilized square wave generator with a CMOS output, operating off a 1.8, 2.5, 3.3 or 5.0 volt supply.

The VCC4 uses fundamental or 3<sup>rd</sup> overtone crystals for output frequencies > 50MHz resulting in low jitter performance. VCC4 is hermetically sealed and also uses a monolithic IC, which improves reliability and reduces cost.



## Performance Characteristics

Table 1. Electrical Performance, 5V option

| Parameter                                     | Symbol    | Min                       | Typical | Maximum            | Units |
|-----------------------------------------------|-----------|---------------------------|---------|--------------------|-------|
| Frequency                                     | $f_O$     | 1.544                     |         | 75.000             | MHz   |
| Operating Supply Voltage <sup>1</sup>         | $V_{DD}$  | 4.5                       |         | 5.5                | V     |
| Absolute Maximum Supply Voltage               |           | -0.7                      |         | 7.0                | V     |
| Supply Current, Output Enabled                | $I_{DD}$  |                           |         |                    | mA    |
| < 1.50 MHz                                    |           |                           |         | 7                  |       |
| 1.500 to 20 MHz                               |           |                           |         | 10                 |       |
| 20.01 to 50 MHz                               |           |                           |         | 30                 |       |
| 50.01 to 75 MHz                               |           |                           |         | 40                 |       |
| Supply Current, Out disabled                  | $I_{DD}$  |                           |         | 30                 | 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                       | $I_{OH}$  | 16                        |         |                    | mA    |
| Output Logic Low Drive                        | $I_{OL}$  | 16                        |         |                    | mA    |
| Output Rise/Fall Time <sup>2</sup>            | $t_R/t_F$ |                           |         |                    | ns    |
| < 20.00 MHz                                   |           |                           |         | 8                  |       |
| 20.01 to 50.00 MHz                            |           |                           |         | 5                  |       |
| 50.01 to 75.00 MHz                            |           |                           |         | 2                  |       |
| Duty Cycle <sup>3</sup> (ordering option)     | SYM       | 45/55                     |         |                    | %     |
| Operating temperature (ordering option)       |           | -10/70 or -40/85          |         |                    | °C    |
| Stability <sup>4</sup> (ordering option)      |           | $\pm 25, \pm 50, \pm 100$ |         |                    | ppm   |
| RMS Jitter, 12kHz to 20 MHz                   |           |                           | 0.5     | 1                  | ps    |
| Period Jitter                                 |           |                           |         |                    | ps    |
| RMS                                           |           |                           | 3.0     |                    |       |
| Peak to Peak                                  |           |                           | 21      |                    |       |
| Output Enable/Disable <sup>5</sup>            |           |                           |         |                    | V     |
| Output Enabled                                |           | 4.0                       |         |                    |       |
| Output Disabled                               |           |                           |         | 0.8                |       |
| Internal Enable Pull-Up resistor <sup>5</sup> |           |                           | 100     |                    | Kohm  |
| Start-up time                                 |           |                           |         | 8                  | ms    |

1. Recommend a 0.01uF and a 0.1uF capacitor between power supply and ground (close to supply).
2. Parameter is defined in Figure 1 and tested as shown in Figure 2.
3. Symmetry is defined as On Time/Period (Figure 1).
4. Includes calibration tolerance, operating temperature, supply voltage variations, and shock and vibration (not under operation). Aging is included for  $\pm 50$  and  $\pm 100$ ppm options.
5. Output will be enabled if enable/disable is left open.

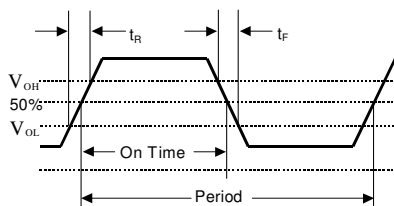


Figure 1: Output Waveform

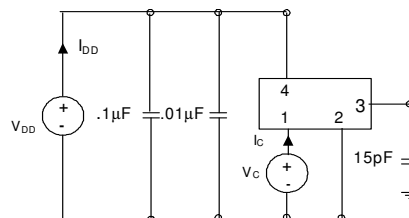


Figure 2: Typical Output Test Conditions (25±5°C)

## VCC4 Data sheet

| Table 2. Electrical Performance, 3.3V option  |           |                           |         |                    |       |
|-----------------------------------------------|-----------|---------------------------|---------|--------------------|-------|
| Parameter                                     | Symbol    | Min                       | Typical | Maximum            | Units |
| Frequency                                     | $f_O$     | 1.544                     |         | 125.000            | 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    |
| < 1.500 MHz                                   |           |                           |         | 5                  |       |
| 1.5 to 20 MHz                                 |           |                           |         | 7                  |       |
| 20.01 to 50 MHz                               |           |                           |         | 20                 |       |
| 50.01 to 75 MHz                               |           |                           |         | 30                 |       |
| 75.01 to 100 MHz                              |           |                           |         | 40                 |       |
| 100.01 to 125 MHz                             |           |                           |         | 46                 |       |
| Supply Current, Output disabled               | $I_{DD}$  |                           |         | 30                 | uA    |
| Output Logic Levels                           |           |                           |         |                    |       |
| Output Logic High <sup>2</sup>                | $V_{OH}$  | $0.9 \cdot V_{DD}$        |         |                    | V     |
| Output Logic Low <sup>2</sup>                 | $V_{OL}$  |                           |         | $0.1 \cdot V_{DD}$ | V     |
| Output Logic High Drive                       | $I_{OH}$  | 8                         |         |                    | mA    |
| Output Logic Low Drive                        | $I_{OL}$  | 8                         |         |                    | mA    |
| Output Rise/Fall Time <sup>2</sup>            | $t_R/t_F$ |                           |         |                    | ns    |
| < 20.00 MHz                                   |           |                           |         | 10                 |       |
| 20.01 to 50.00 MHz                            |           |                           |         | 6                  |       |
| 50.01 to 125.00 MHz                           |           |                           |         | 3                  |       |
| Duty Cycle <sup>3</sup> (ordering option)     | SYM       | 45/55                     |         |                    | %     |
| Operating temperature (ordering option)       |           | -10/70 or -40/85          |         |                    | °C    |
| Stability <sup>4</sup> (ordering option)      |           | $\pm 25, \pm 50, \pm 100$ |         |                    | ppm   |
| RMS Jitter, 12kHz to 20 MHz                   |           |                           | 0.5     | 1                  | ps    |
| Period Jitter                                 |           |                           |         |                    | ps    |
| RMS                                           |           |                           | 3.0     |                    |       |
| Peak to Peak                                  |           |                           | 21      |                    |       |
| Output Enable/Disable <sup>5</sup>            |           |                           |         |                    | V     |
| Output Enabled                                |           | 2.0                       |         |                    |       |
| Output Disabled                               |           |                           |         | 0.5                |       |
| Internal Enable Pull-Up resistor <sup>5</sup> |           |                           | 100     |                    | Kohm  |
| Start-up time                                 |           |                           |         | 8                  | ms    |

1. Recommend a 0.01uF and a 0.1uF capacitor between power supply and ground (close to supply).
2. Parameter is defined in Figure 3 and tested as shown in Figure 4. For  $f_O > 90\text{MHz}$ , rise and fall time is measured 20 to 80%.
3. Symmetry is defined as On Time/Period (Figure 3).
4. Includes calibration tolerance, operating temperature, supply voltage variations, and shock and vibration (not under operation).  $\pm 50$  and  $\pm 100\text{ppm}$  options include aging.
5. Output will be enabled if enable/disable is left open.

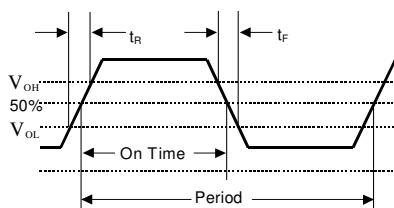


Figure 3: Output Waveform

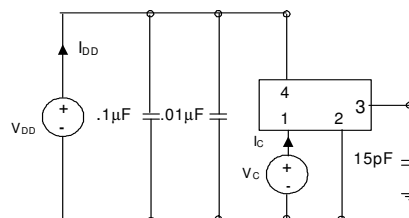


Figure 4: Typical Output Test Conditions (25±5°C)

## VCC4 Data sheet

| Table 3. Electrical Performance, 2.5V option  |           |                           |         |                    |       |
|-----------------------------------------------|-----------|---------------------------|---------|--------------------|-------|
| Parameter                                     | Symbol    | Min                       | Typical | Maximum            | Units |
| Frequency                                     | $f_O$     | 1.544                     |         | 125.000            | 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                | $I_{DD}$  |                           |         |                    | mA    |
| < 1.5 MHz                                     |           |                           |         | 5                  |       |
| 1.500 to 20 MHz                               |           |                           |         | 7                  |       |
| 20.01 to 50 MHz                               |           |                           |         | 15                 |       |
| 50.01 to 75 MHz                               |           |                           |         | 20                 |       |
| 75.01 to 100 MHz                              |           |                           |         | 26                 |       |
| 100.01 to 125 MHz                             |           |                           |         | 36                 |       |
| Supply Current, Out disabled                  | $I_{DD}$  |                           |         | 30                 | 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                       | $I_{OH}$  | 4                         |         |                    | mA    |
| Output Logic Low Drive                        | $I_{OL}$  | 4                         |         |                    | mA    |
| Output Logic High Drive <sup>3</sup>          | $I_{OH}$  | 8                         |         |                    | mA    |
| Output Logic Low Drive <sup>3</sup>           | $I_{OL}$  | 8                         |         |                    | mA    |
| Output Rise/Fall Time <sup>2</sup>            | $t_R/t_F$ |                           |         |                    | ns    |
| < 20.000 MHz                                  |           |                           |         | 10                 |       |
| 20.01 to 50.00 MHz                            |           |                           |         | 6                  |       |
| 50.01 to 125.00 MHz                           |           |                           |         | 3                  |       |
| Duty Cycle <sup>4</sup> (ordering option)     | SYM       | 45/55                     |         |                    | %     |
| Operating temperature (ordering option)       |           | -10/70 or -40/85          |         |                    | °C    |
| Stability <sup>5</sup> (ordering option)      |           | $\pm 25, \pm 50, \pm 100$ |         |                    | ppm   |
| RMS Jitter, 12kHz to 20 MHz                   |           |                           | 0.5     | 1                  | ps    |
| Period Jitter                                 |           |                           |         |                    | ps    |
| RMS                                           |           |                           | 3.0     |                    |       |
| Peak to Peak                                  |           |                           | 21      |                    |       |
| Output Enable/Disable <sup>6</sup>            |           |                           |         |                    | V     |
| Output Enabled                                |           | 1.75                      |         |                    |       |
| Output Disabled                               |           |                           |         | 0.5                |       |
| Internal Enable Pull-Up resistor <sup>6</sup> |           |                           | 100     |                    | Kohm  |
| Start-up time                                 |           |                           |         | 8                  | ms    |

1. Recommend a 0.01uF and a 0.1uF capacitor between power supply and ground (close to supply).
2. Parameter is defined in Figure 5 and tested as shown in Figure 6.
3. Overtone designs, output frequencies > 35MHz.
4. Symmetry is defined as On Time/Period (Figure 5).
5. Includes calibration tolerance, operating temperature, supply voltage variations, and shock and vibration (not under operation).  $\pm 50$  and  $\pm 100$ ppm options include aging.
6. Output will be enabled if enable/disable is left open.

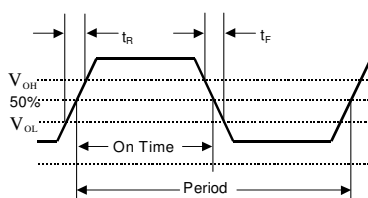


Figure 5: Output Waveform

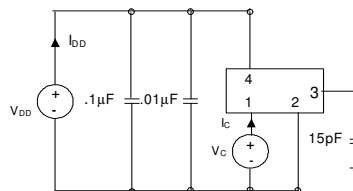


Figure 6: Typical Output Test Conditions (25±5°C)

## VCC4 Data sheet

| Table 4. Electrical Performance, 1.8V option                                                   |           |                    |                           |                    |       |
|------------------------------------------------------------------------------------------------|-----------|--------------------|---------------------------|--------------------|-------|
| Parameter                                                                                      | Symbol    | Min                | Typical                   | Maximum            | Units |
| Frequency                                                                                      | $f_O$     | 1.544              |                           | 75.000             | MHz   |
| Operating Supply Voltage <sup>1</sup>                                                          | $V_{DD}$  | 1.71               | 1.8                       | 1.89               | V     |
| Absolute Maximum Voltage                                                                       |           | -0.5               |                           | 3.6                | V     |
| Supply Current, Output Enabled<br>< 20 MHz<br>20.01 to 70 MHz                                  | $I_{DD}$  |                    |                           | 5<br>15            | mA    |
| Supply Current, Out disabled                                                                   | $I_{DD}$  |                    |                           | 30                 | 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                                                                        | $I_{OH}$  | 2.8                |                           |                    | mA    |
| Output Logic Low Drive                                                                         | $I_{OL}$  | 2.8                |                           |                    | mA    |
| Output Logic High Drive <sup>3</sup>                                                           | $I_{OH}$  | 8                  |                           |                    | mA    |
| Output Logic Low Drive <sup>3</sup>                                                            | $I_{OL}$  | 8                  |                           |                    | mA    |
| Output Rise/Fall Time <sup>2</sup><br>< 20.000 MHz<br>20.01 to 50.00 MHz<br>50.01 to 70.00 MHz | $t_R/t_F$ |                    |                           | 10<br>6<br>3       | ns    |
| Duty Cycle <sup>4</sup> (ordering option)                                                      | SYM       |                    | 45/55                     |                    | %     |
| Operating temperature (ordering option)                                                        |           |                    | -10/70 or -40/85          |                    | °C    |
| Stability <sup>5</sup> (ordering option)                                                       |           |                    | $\pm 25, \pm 50, \pm 100$ |                    | ppm   |
| RMS Jitter, 12kHz to 20 MHz                                                                    |           |                    | 0.5                       | 1                  | ps    |
| Period Jitter<br>RMS<br>Peak to Peak                                                           |           |                    | 3.0<br>21                 |                    | ps    |
| Output Enable/Disable <sup>6</sup><br>Output Enabled<br>Output Disabled                        |           | 1.26               |                           | 0.5                | V     |
| Internal Enable Pull-Up resistor <sup>6</sup>                                                  |           |                    | 1                         |                    | Mohm  |
| Start-up time                                                                                  |           |                    |                           | 8                  | ms    |

1. Recommend a 0.01uF and a 0.1uF capacitor between power supply and ground (close to supply).
2. Parameter is defined in Figure 7 and tested as shown in Figure 8.
3. Overtone designs, output frequencies > 50MHz.
4. Symmetry is defined as On Time/Period (Figure 7).
5. Includes calibration tolerance, operating temperature, supply voltage variations, and shock and vibration (not under operation).  $\pm 50$  and  $\pm 100$  ppm options include aging.
6. Output will be enabled if enable/disable is left open.

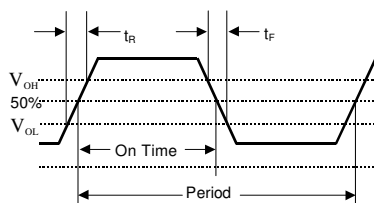


Figure 7: Output Waveform

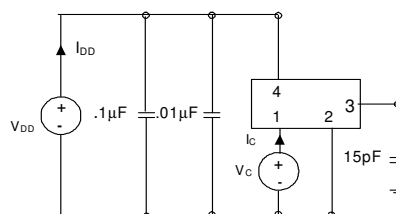


Figure 8: Typical Output Test Conditions (25±5 °C)

## Enable/Disable Functional Description

Under normal operation the Enable/Disable is left open, or set to a logic high state, and the VCC4 is oscillating. 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.

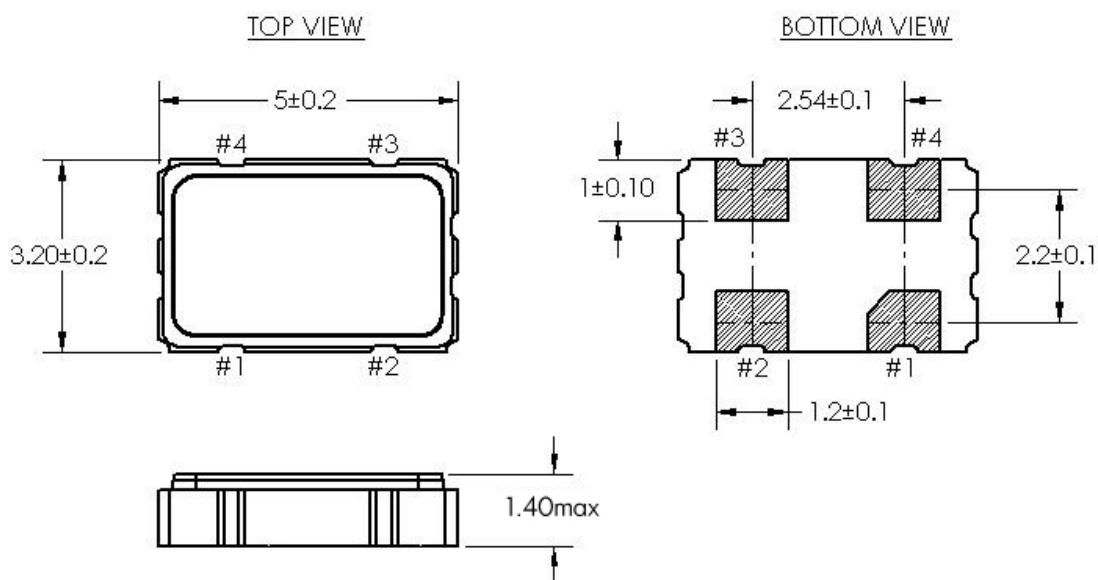
## TriState Functional Description

Under normal operation the Tristate 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.

## Outline Diagrams, Pad Layout and Pin Out

**Table 5. Pin out**

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

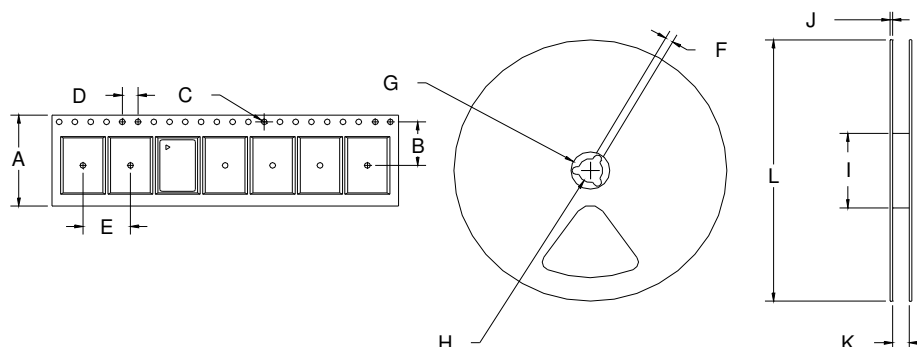


All dimensions in mm.  
Contact Pads are gold over nickel

**Figure 9: Package drawing**

## Tape and Reel

| Table 6: Tape and Reel Dimensions (mm) |    |     |     |   |   |                 |    |    |    |   |    |     |            |
|----------------------------------------|----|-----|-----|---|---|-----------------|----|----|----|---|----|-----|------------|
| Tape Dimensions                        |    |     |     |   |   | Reel Dimensions |    |    |    |   |    |     | # Per Reel |
| Product                                | A  | B   | C   | D | E | F               | G  | H  | I  | J | K  | L   |            |
| VCC4                                   | 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 7. Absolute Maximum Ratings |                      |         |      |
|-----------------------------------|----------------------|---------|------|
| Parameter                         | Symbol               | Ratings | Unit |
| Storage Temperature               | T <sub>storage</sub> | -55/125 | °C   |

## Reliability

The VCC4 qualification tests include:

| Table 8. 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 |

## Handling Precautions

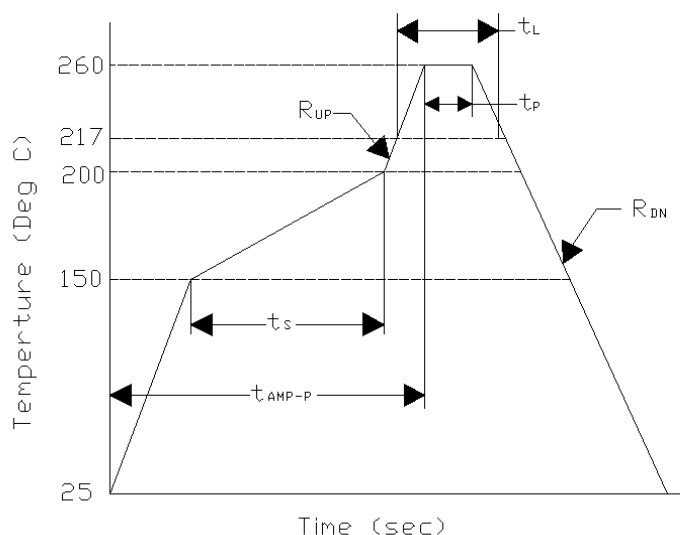
Although ESD protection circuitry has been designed into the the VCC4, proper precautions should be taken when handling and mounting. VI employs a Human Body Model and a Charged-Device Model (CDM) for ESD susceptibility testing and design protection evaluation. ESD thresholds are dependent on the circuit 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 9. 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 9 shows max temperatures and lower temperatures can also be used e.g. peak temperature of 220C.

| Table 10. Reflow Profile (IPC/JEDEC J-STD-020B) |             |                          |
|-------------------------------------------------|-------------|--------------------------|
| 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)                            | $t_P$       | 30 sec Max               |
| Time At 240 °C (max)                            | $t_{p2}$    | 60 sec Max               |
| Ramp Down                                       | $R_{DN}$    | 6 °C /sec Max            |



## VCC4 Data Sheet

**Table 11. Standard Frequency List**

|        |           |         |         |           |        |         |        |
|--------|-----------|---------|---------|-----------|--------|---------|--------|
| 9.8304 | 10.000    | 11.0596 | 11.0590 | 11.2896   | 12.000 | 12.272  | 12.288 |
| 12.353 | 13.000    | 13.500  | 13.560  | 14.318    | 14.745 | 16.000  | 16.376 |
| 16.384 | 16.777216 | 16.800  | 17.734  | 17.734475 | 18.432 | 19.440  | 19.660 |
| 19.800 | 20.000    | 20.480  | 22.000  | 22.5792   | 24.000 | 24.5453 | 24.576 |
| 25.000 | 26.000    | 27.000  | 27.120  | 28.636    | 28.375 | 30.000  | 32.000 |
| 32.768 | 33.000    | 33.333  | 34.368  | 36.000    | 37.056 | 37.500  | 40.000 |
| 44.000 | 44.736    | 48.000  | 49.090  | 50.000    | 54.000 | 60.000  | 66.000 |
| 75.000 | 100.00    | 106.250 | 125.000 |           |        |         |        |

### Ordering Information

**VCC4 -**

**B**

**3**

**B -**

**50M000**

Product Family  
Crystal Oscillator

Voltage Options

**A:** +5.0 Vdc  $\pm$  10%, 15pF  
**B:** +3.3 Vdc  $\pm$  10%, 15pF  
**C:** +3.0 Vdc  $\pm$  10%, 15pF  
**E:** +5.0 Vdc  $\pm$  10%, 50pF  
**F:** +3.3 Vdc  $\pm$  10%, 50pF  
**G:** +2.5 Vdc  $\pm$  10%, 15pF  
**H:** +1.8 Vdc  $\pm$  10%, 15pF

Electrical Options

**3: Tristate, 45/55 % Duty Cycle**

Following Codes are not recommended for new designs.  
**0:** No Tristate, 40/60% Duty Cycle  
**1:** Tristate, 40/60% Duty Cycle  
**2:** No Tristate, 45/55% Duty Cycle  
**5:** Enable, 40/60% Duty Cycle  
**6:** Enable, 45/55% Duty Cycle

Output Frequency  
In MHZ

Stability Options

**A:**  $\pm$ 100ppm, -10  $^{\circ}$ C to 70  $^{\circ}$ C  
**C:**  $\pm$ 100ppm, -40  $^{\circ}$ C to 85  $^{\circ}$ C  
**B:**  $\pm$ 50ppm, -10  $^{\circ}$ C to 70  $^{\circ}$ C  
**D:**  $\pm$ 50ppm, -40  $^{\circ}$ C to 85  $^{\circ}$ C  
**E:**  $\pm$ 25ppm, -10  $^{\circ}$ C to 70  $^{\circ}$ C  
**F:**  $\pm$ 25ppm, -40  $^{\circ}$ C to 85  $^{\circ}$ C

**Note: Not all combinations are available.**

*Tristate with a 45/55% is the most common Electrical code and is recommended for most applications.*

### For Additional Information, Please Contact:



**www.vectron.com**

Rev: Oct 16, 2014 VN

**USA: Vectron International**  
 267 Lowell Road, Hudson, NH 03051  
 Tel: 1-88-VECTRON-1 Fax: 1-888-FAX-VECTRON

**EUROPE: Vectron International**  
 Landstrasse, D-74924, Neckarbischofsheim, Germany  
 Tel: 49 (0) 7268 8010 Fax: 49 (0) 7268 801281

**ASIA: Vectron International**  
 68 Yin Cheng Road @, 22<sup>nd</sup> Floor, One LuJiaZui  
 Pudong, Shanghai 200120, China  
 Tel: 8621 61946886 Fax: 8621 61946699

Vectron International 267 Lowell Rd, Suite 102, Hudson NH 03051 Tel: 1-88-VECTRON-1 e-mail vectron@vectron.com

## VCC4 Data Sheet

### Revision History

| Revision Date | Approved | Description                                                                                 |
|---------------|----------|---------------------------------------------------------------------------------------------|
| Oct 16, 2014  | VN       | Modified package drawing to reflect 1.40mm maximum height.<br>Added Revision History Table. |
|               |          |                                                                                             |
|               |          |                                                                                             |