

## VHD6 Series 3.3V VCXO CMOS Oscillator

December 2008

**Lead Free**



- Pletronics' VHD6 Series is a voltage controlled crystal oscillator with a CMOS output.
- This model uses fundamental mode crystals with no multiplication circuits.
- Tape and Reel or tube packaging is available.
- 10 to 108 MHz
- 3.2 x 5 mm Ceramic LCC Package
- Voltage Control Function on pad 1
- Enable/ Disable Function on pad 2

**Pletronics Inc. certifies this device is in accordance with the  
RoHS 6/6 (2002/95/EC) and WEEE (2002/96/EC) directives.**

Pletronics Inc. guarantees the device does not contain the following:

Cadmium, Hexavalent Chromium, Lead, Mercury, PBB's, PBDE's

Weight of the Device: 0.09 grams

Moisture Sensitivity Level: 1 As defined in J-STD-020C

Second Level Interconnect code: e4

### Absolute Maximum Ratings:

| Parameter                      | Unit                            |
|--------------------------------|---------------------------------|
| V <sub>CC</sub> Supply Voltage | -0.5V to +5.5V                  |
| V <sub>i</sub> Input Voltage   | -0.5V to V <sub>CC</sub> + 0.5V |
| V <sub>o</sub> Output Voltage  | -0.5V to V <sub>CC</sub> + 0.5V |

### Thermal Characteristics

The maximum die or junction temperature is 155°C

The thermal resistance junction to board is 60 to 100°C/Watt depending on the solder pads, ground plane and construction of the PCB.

## Part Number:

|            |   |   |     |     |          |     |                                                                                                                                                                                                                        |
|------------|---|---|-----|-----|----------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VHD6031035 | E | G | 500 | 100 | -16.384M | -XX |                                                                                                                                                                                                                        |
|            |   |   |     |     |          |     | Internal code or blank                                                                                                                                                                                                 |
|            |   |   |     |     |          |     | Nominal Frequency in MHZ                                                                                                                                                                                               |
|            |   |   |     |     |          |     | Pullability in ppm (Vcontrol)<br>050 = $\pm 50$ ppm minimum<br>100 = $\pm 100$ ppm minimum                                                                                                                             |
|            |   |   |     |     |          |     | Stability in ppm<br>000 = APR      500 = $\pm 50$ ppm<br>250 = $\pm 25$ ppm                                                                                                                                            |
|            |   |   |     |     |          |     | Highest Specified Operating Temperature<br>A = +40°C   F = +65°C   L = +90°C<br>B = +45°C   G = +70°C   M = +95°C<br>C = +50°C   H = +75°C   N = +100°C<br>D = +55°C   J = +80°C   P = +105°C<br>E = +60°C   K = +85°C |
|            |   |   |     |     |          |     | Lowest Specified Operating Temperature<br>A = +10°C   E = -10°C   J = -30°C<br>B = +5°C   F = -15°C   K = -35°C<br>C = +0°C   G = -20°C   L = -40°C<br>D = -5°C   H = -25°C   M = -45°C                                |
|            |   |   |     |     |          |     | Series (Part Type, Logic & Package)                                                                                                                                                                                    |

## Part Marking:

PLE VHD6  
FF.FFFM  
• YMDXX

### Legend:

P or PLE = Pletronics  
FF.FFFM = Frequency in MHZ  
YMD = Date of Manufacture  
xx = Internal factory codes

Specifications such as frequency stability, supply voltage and operating temperature range, etc. are not identified from the marking. External packaging labels and packing list will correctly identify the ordered Pletronics part number.

### Codes for Date Code YMD

|      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|
| Code | 8    | 9    | 0    | 1    | 2    | 3    | 4    |
| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |

|       |     |     |     |     |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | A   | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |
| Month | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |

|      |    |    |    |    |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|----|----|----|----|
| Code | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  |
| Day  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 |
| Code | D  | E  | F  | G  | H  | J  | K  | L  | M  | N  | P  | R  |
| Day  | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Code | T  | U  | V  | W  | X  | Y  | Z  |    |    |    |    |    |
| Day  | 25 | 26 | 27 | 28 | 29 | 30 | 31 |    |    |    |    |    |

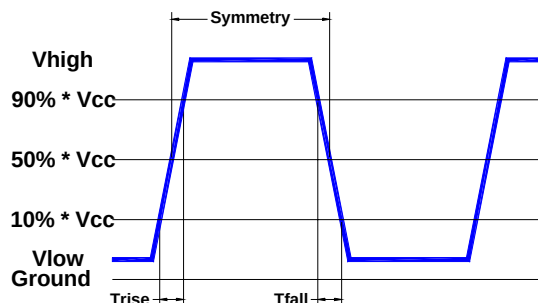
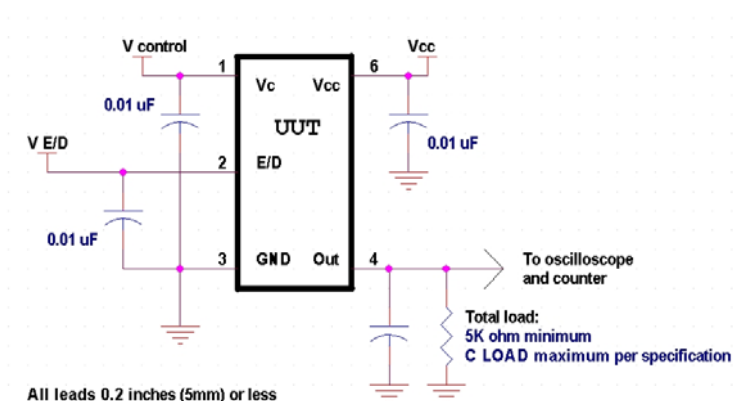
## Electrical Specification for 3.30V $\pm 5\%$ over the specified temperature range

| Item                                                | Min      | Typ | Max       | Unit        | Condition                                                                                           |
|-----------------------------------------------------|----------|-----|-----------|-------------|-----------------------------------------------------------------------------------------------------|
| Frequency Range                                     | 10       | -   | 108       | MHZ         |                                                                                                     |
| Frequency Accuracy <sup>1</sup>                     | $\pm 25$ | -   | -         | ppm         | Not specified if APR is specified                                                                   |
| Pullability <sup>1</sup>                            | $\pm 90$ | -   | $\pm 125$ | ppm         | For Vcontrol 1.65 V $\pm 1.5$ V.<br>Not specified if APR is specified<br>Defined by the part number |
| Pullability (APR) <sup>1</sup>                      | $\pm 50$ | -   | -         | ppm         | Absolute Pull Range, includes the effect of<br>temperature stability<br>Defined by the part number  |
| Output Waveform                                     | CMOS     |     |           |             |                                                                                                     |
| Output High Level                                   | 90       | -   | -         | %           | of $V_{CC}$ for $I_{OH} = +7$ mA                                                                    |
| Output Low Level                                    | -        | -   | 10        | %           | of $V_{CC}$ for $I_{OL} = -7$ mA                                                                    |
| Output $T_{RISE}$ and $T_{FALL}$                    | -        | 3.0 | 6.0       | nS          | 10% to 90% of $V_{CC}$ , $C_{LOAD} = 15$ pF                                                         |
| Output Symmetry                                     | 45       | 50  | 55        | %           | at 50% point of $V_{CC}$ (See load circuit)                                                         |
| Vcontrol Resistance Pin 1                           | 20       | 25  | -         | Kohm        |                                                                                                     |
| Modulation Bandwidth                                | 10       | 20  | -         | KHz         | Vcontrol = 1.65V $\pm 1.65$ V, -3dB                                                                 |
| Integrated Jitter                                   | -        | 0.4 | 0.6       | pS          | 12 KHz to 20 MHZ                                                                                    |
| E/D Internal Pull-up                                | 50       | -   | -         | Kohm        | to $V_{CC}$                                                                                         |
| V disable                                           | -        | -   | 15        | %           | of $V_{CC}$ applied to pin 1                                                                        |
| V enable                                            | 85       | -   | -         | %           | of $V_{CC}$ applied to pin 1                                                                        |
| Output leakage $V_{OUT} = V_{CC}$<br>$V_{OUT} = 0V$ | -10      | -   | +10       | $\mu A$     | Pin 1 low, device disabled                                                                          |
|                                                     | -10      | -   | +10       | $\mu A$     |                                                                                                     |
| Enable time                                         | -        | -   | 250       | nS          | Time for output to reach a logic state                                                              |
| Disable time                                        | -        | -   | 250       | nS          | Time for output to reach a high Z state                                                             |
| Start up time                                       | -        | 1.5 | 10        | mS          | Time for output to reach specified frequency                                                        |
| Supply Current                                      | -        | 5.0 | 8.0       | mA          | $C_{LOAD} = 15$ pF                                                                                  |
| Operating Temperature                               | -45      |     | +105      | $^{\circ}C$ | Defined by part number                                                                              |
| Storage Temperature Range                           | -55      |     | +125      | $^{\circ}C$ |                                                                                                     |

Specifications with Pad 2 E/D open circuit

<sup>1</sup>For all supply voltages, load changes, aging for 1 year, shock, vibration and temperatures.

## Load Circuit and Test Waveform



## Reliability: Environmental Compliance

| Parameter        | Condition                            |
|------------------|--------------------------------------|
| Mechanical Shock | MIL-STD-883 Method 2002, Condition B |
| Vibration        | MIL-STD-883 Method 2007, Condition A |
| Solderability    | MIL-STD-883 Method 2003              |
| Thermal Shock    | MIL-STD-883 Method 1011, Condition A |

## ESD Rating

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

## Package Labeling

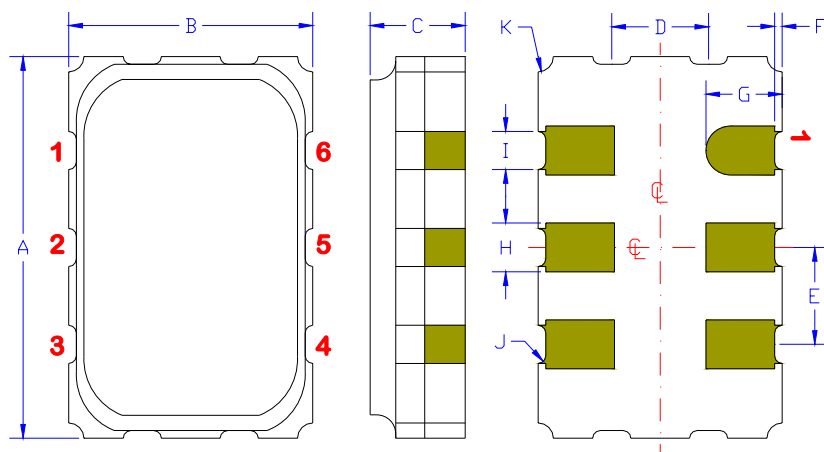
Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Courier New  
Bar code is 39-Full ASCII  
(example actual PN will appear)

|                            |          |
|----------------------------|----------|
| P/N:                       |          |
| VHA6029036EG500100-16.384M |          |
| Customer P/N:              |          |
| 12345678                   |          |
| Qty:                       | D/C:     |
| 1000                       | 0510M012 |

Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Arial

|                                   |
|-----------------------------------|
| RoHS Compliant                    |
| 2nd LVL Interconnect              |
| Category=e4                       |
| Max Safe Temp=260C for 10s 2X Max |

## Mechanical:



### Contacts:

Gold 11.8  $\mu$ inches 0.3  $\mu$ m minimum over  
Nickel 50 to 350  $\mu$ inches 1.27 to 8.89  $\mu$ m

<sup>1</sup> Typical dimensions

Not to Scale

|                | Inches            | mm              |
|----------------|-------------------|-----------------|
| A              | 0.197 $\pm$ 0.006 | 5.00 $\pm$ 0.15 |
| B              | 0.125 $\pm$ 0.006 | 3.20 $\pm$ 0.15 |
| C              | 0.053 max         | 1.35 max        |
| D <sup>1</sup> | 0.050             | 1.27            |
| E <sup>1</sup> | 0.050             | 1.27            |
| F <sup>1</sup> | 0.004             | 0.10            |
| G <sup>1</sup> | 0.039             | 1.00            |
| H <sup>1</sup> | 0.025             | 0.63            |
| I <sup>1</sup> | 0.020             | 0.50            |
| J <sup>1</sup> | 0.004R            | 0.10R           |
| K <sup>1</sup> | 0.008R            | 0.20R           |

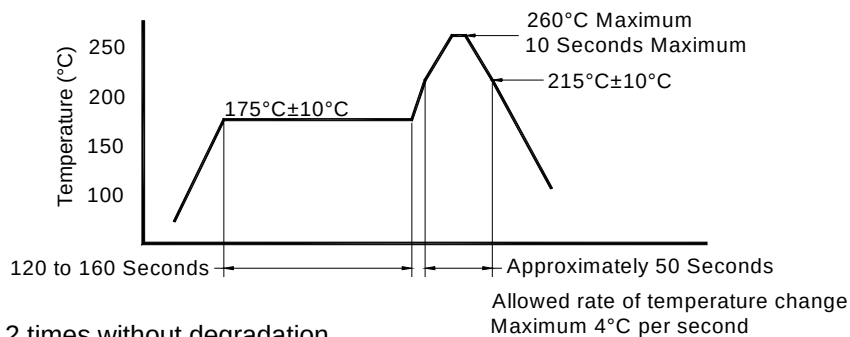
| Pad | Function                          | Note                                                                                                                                                                                                                                     |
|-----|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Vcontrol Input                    |                                                                                                                                                                                                                                          |
| 2   | Output Enable/ Disable            | When this pad is not connected, the oscillator shall operate<br>When this pad is logic low, the output will be inhibited (high impedance state)<br>Recommend connecting this pad to V <sub>cc</sub> if the oscillator is to be always on |
| 3   | Ground (GND)                      |                                                                                                                                                                                                                                          |
| 4   | Output                            |                                                                                                                                                                                                                                          |
| 5   | N.C.                              | No Internal connection, pad may be connected to ground or V <sub>cc</sub>                                                                                                                                                                |
| 6   | Supply Voltage (V <sub>cc</sub> ) | Recommend connecting appropriate power supply bypass capacitors as close as possible.                                                                                                                                                    |

## Layout and application information

For Optimum Jitter Performance, Pletronics recommends:

- a ground plane under the device
- no large transient signals (both current and voltage) should be routed under the device do not layout near a large magnetic field such as a high frequency switching power supply
- do not place near piezoelectric buzzers or mechanical fans.

## Reflow Cycle (typical for lead free processing)



The part may be reflowed 2 times without degradation.

## Tape and Reel: available for quantities of 250 to 1000 per reel

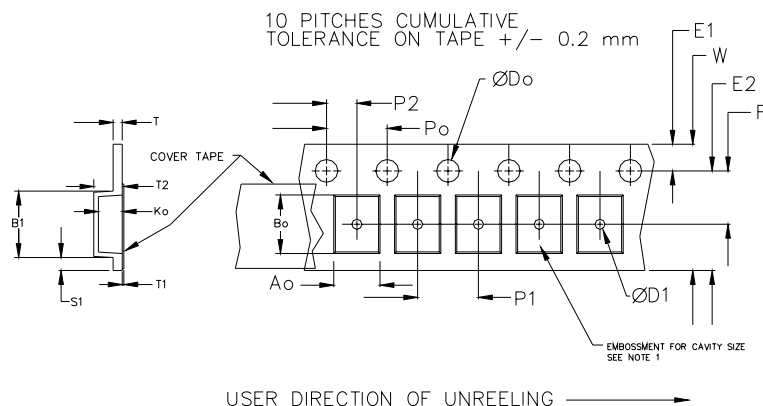
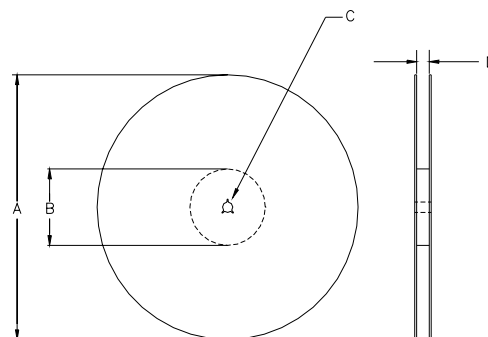
| Constant Dimensions Table 1 |                         |        |      |     |              |        |       |        |
|-----------------------------|-------------------------|--------|------|-----|--------------|--------|-------|--------|
| Tape Size                   | D0                      | D1 Min | E1   | P0  | P2           | S1 Min | T Max | T1 Max |
| 8mm                         | 1.5<br><br>+0.1<br>-0.0 | 1.0    | 1.75 | 4.0 | 2.0<br>+0.05 | 0.6    | 0.6   | 0.1    |
| 12mm                        |                         | 1.5    |      |     | 2.0<br>+0.1  |        |       |        |
| 16mm                        |                         | 1.5    |      |     |              |        |       |        |
| 24mm                        |                         | 1.5    |      |     |              |        |       |        |

| Variable Dimensions Table 2 |        |        |          |          |        |       |             |
|-----------------------------|--------|--------|----------|----------|--------|-------|-------------|
| Tape Size                   | B1 Max | E2 Min | F        | P1       | T2 Max | W Max | Ao, Bo & Ko |
| 16 mm                       | 12.1   | 14.25  | 7.5 ±0.1 | 8.0 ±0.1 | 8.0    | 16.3  | Note 1      |

Note 1: Embossed cavity to conform to EIA-481-B

Dimensions in mm

Not to scale



| REEL DIMENSIONS |        |                  |              |              |
|-----------------|--------|------------------|--------------|--------------|
| A               | inches | 7.0              | 10.0         | 13.0         |
|                 | mm     | 177.8            | 254.0        | 330.2        |
| B               | inches | 2.50             | 4.00         | 3.75         |
|                 | mm     | 63.5             | 101.6        | 95.3         |
| C               | mm     | 13.0 +0.5 / -0.2 |              |              |
| D               | mm     | 16.4             | 16.4         | 16.4         |
|                 |        | +2.0<br>-0.0     | +2.0<br>-0.0 | +2.0<br>-0.0 |

Reel dimensions may vary from the above

## IMPORTANT NOTICE

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