

## VPU7 High Frequency PECL VCXO

September 2007

**Lead Free** 

- Pletronics' VPU7 Series is a quartz crystal controlled precision square wave generator with a PECL output.
- The package is designed for high density surface mount designs.
- Low cost mass produced oscillator
- 10.9 MHz to 1,175MHz
- 5 x 7 mm LCC Ceramic Package
- Low Jitter
- RoHS 6/6 Compliant

**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: 0.28 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 +4.6V                  |
| 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 |
| I <sub>o</sub> Output Current  | -50mA                           |

### Thermal Characteristics

The maximum die or junction temperature is 155°C  
The thermal resistance junction to board is 30 to 50°C/Watt depending on the solder pads, ground plane and construction of the PCB.

**Part Number:**

|  |    |     |     |          |     |
|--|----|-----|-----|----------|-----|
| VPU7029036                               | EG | 000 | 050 | - 312.5M | -XX |
| <b>Packaging code or blank</b>           |    |     |     |          |     |
| T250 = 250 per Tape and Reel             |    |     |     |          |     |
| T500 = 500 per Tape and Reel             |    |     |     |          |     |
| T1K = 1000 per Tape and Reel             |    |     |     |          |     |
| <b>Frequency in MHZ</b>                  |    |     |     |          |     |
| <b>Pullability in ppm (Vcontrol) APR</b> |    |     |     |          |     |
| 050 = ± 50 ppm minimum is standard       |    |     |     |          |     |
| <b>Series Model</b>                      |    |     |     |          |     |
| <b>Temperature Range</b>                 |    |     |     |          |     |
| EG = -10 to +70°C                        |    |     |     |          |     |
| LK = -40 to +85°C                        |    |     |     |          |     |
| <b>Series Model</b>                      |    |     |     |          |     |

**Part Marking:**

**PLE VPU7**  
**FF.FFF M**  
• **YMDXX**

**Marking Legend:**

PLE = Pletronics  
FF.FFF M = Frequency in MHZ  
YMD = Date of Manufacture (year-month-day)  
All other marking is internal factory codes

**Codes for Date Code YMD**

|             |      |      |      |      |      |      |
|-------------|------|------|------|------|------|------|
| <b>Code</b> | 7    | 8    | 9    | 0    | 1    | 2    |
| <b>Year</b> | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |

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

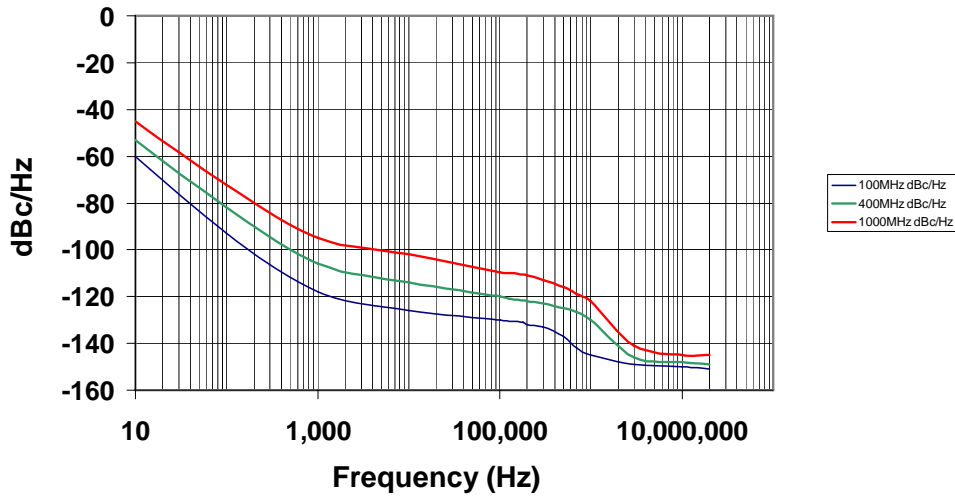
|             |    |    |    |    |    |    |    |    |    |    |    |    |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|
| <b>Code</b> | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | A  | B  | C  |
| <b>Day</b>  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12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

## Electrical Specification for 3.30V $\pm 10\%$ over the specified temperature range and the frequency range of 10.9 MHz to 766 MHz and 876 MHz to 1,175MHz

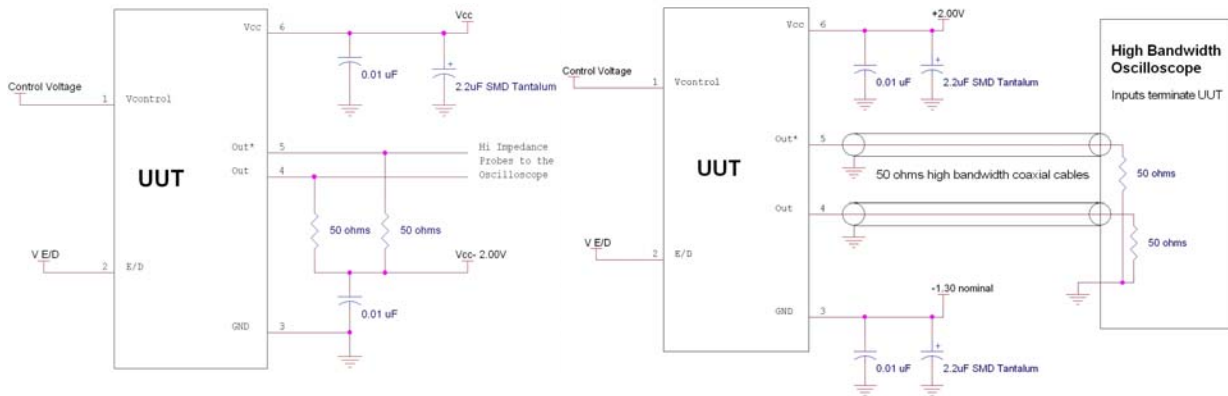
| Item                                 | Min                | Max   | Unit        | Condition   |                            |
|--------------------------------------|--------------------|-------|-------------|---|----------------------------|
| Pullability, Absolute Pull Range     | -50                | +50   | ppm         | APR includes the effect of temperature stability, aging, supply voltage and load. |                            |
| Output Waveform                      | PECL / ECL         |       |             |   |                            |
| Output High Level                    | 2.12               | 2.49  | volts       | Referenced to Ground, $V_{CC} = 3.3 V$  |                            |
|                                      | 0.82               | 1.19  | volts       | Referenced to termination voltage, $V_{CC} = 3.3 V$                               |                            |
|                                      | -1.18              | -0.81 | volts       | Referenced to $V_{CC}$ , $V_{CC} = 3.3 V$   |                            |
| Output Low Level                     | 1.83               | 1.99  | volts       | Referenced to Ground, $V_{CC} = 3.3 V$  |                            |
|                                      | 0.53               | 0.69  | volts       | Referenced to termination voltage, $V_{CC} = 3.3 V$                               |                            |
|                                      | -1.47              | -1.31 | volts       | Referenced to $V_{CC}$ , $V_{CC} = 3.3 V$   |                            |
| Output Symmetry                      | 47                 | 53    | %           | at 50% point of $V_{CC}$ (See load circuit)                                       |                            |
| Modulation Bandwidth                 | 10                 | -     | KHz         | $V_{control} = 1.65V \pm 1.50 V$ , -3dB   |                            |
| Vcontrol Resistance (Pad 1)          | 20                 | -     | Kohm        |   |                            |
| Voltage vs Frequency Linearity       | -10                | +10   | %           | $V_{control} = 1.65V \pm 1.50 V$  |                            |
| Jitter                               | -                  | 0.8   | pS RMS      | 12 KHz to 20 MHz from the output frequency  |                            |
|                                      | -                  | 3.2   | pS RMS      | 10 Hz to 20 MHz from the output frequency   |                            |
| Output $T_{RISE}$ and $T_{FALL}$     | 100                | 300   | pS          | $V_{th}$ is 20% and 80% of waveform   |                            |
| $V_{CC}$ Supply Current ( $I_{CC}$ ) | -                  | 110   | mA          |   |                            |
| Enable/Disable Internal Pull-up      | 50                 | -     | Kohm        | to $V_{CC}$   |                            |
| V disable                            | -                  | 0.8   | volts       | Referenced to pad 3   |                            |
| V enable                             | 2.00               | -     | volts       | Referenced to pad 3   |                            |
| Output leakage                       | $V_{OUT} = V_{CC}$ | -50   | +50         | $\mu A$   | Pad 1 low, device disabled |
|                                      | $V_{OUT} = 0V$     | -50   | +50         | $\mu A$   |                            |
| Enable time                          | -                  | 10    | nS          | Time for output to reach a logic state  |                            |
| Disable time                         | -                  | 10    | nS          | Time for output to reach a high Z state   |                            |
| Start up time                        | -                  | 5     | mS          | Time for output to reach specified frequency                                      |                            |
| Operating Temperature Range          | -10                | +70   | $^{\circ}C$ | Standard Temperature Range  |                            |
|                                      | -40                | +85   | $^{\circ}C$ | Extended Temperature Range  |                            |
| Storage Temperature Range            | -55                | +125  | $^{\circ}C$ |   |                            |

Specifications with Pad 2 E/D open circuit or connected to  $V_{CC}$

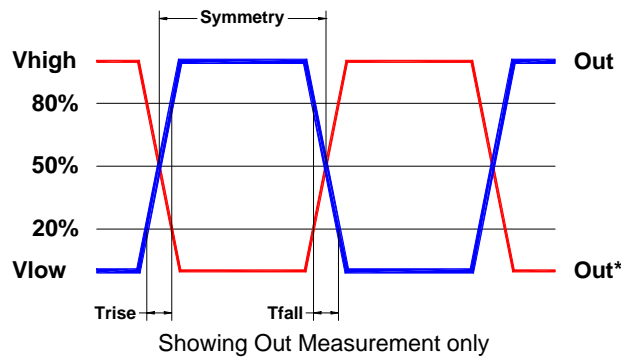
## Typical Phase-Noise Response



## Load Circuit



## 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     | 2000            | MIL-STD-883 Method 3115 |
| Charged Device Model | 1500            | JESD 22-C101            |

## Package Labeling

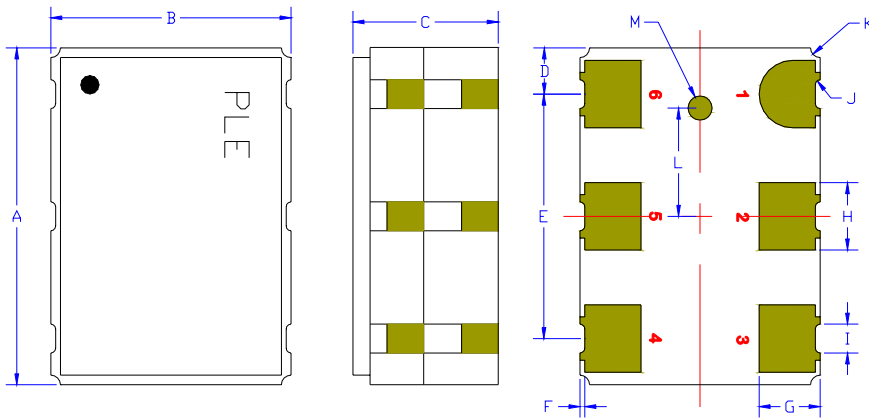
Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The part number will be in the PE99 line.

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

|               |   |   |
|---------------|---|---|
| P/N:          |  |      |
|               | PE9944DV-312.50M  |   |
| Customer P/N: |  |   |
|               | 12345678  |   |
| Qty:          |  | D/C  |
|               | 1000  | 7AA-BT  |

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

## Mechanical:



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.276 ±0.006 | 7.00 ±0.15 |
| B              | 0.197 ±0.006 | 5.00 ±0.15 |
| C              | 0.117 max    | 2.97 max   |
| D <sup>1</sup> | 0.038        | 0.96       |
| E <sup>1</sup> | 0.200        | 5.08       |
| F <sup>1</sup> | 0.004        | 0.10       |
| G <sup>1</sup> | 0.050        | 1.27       |
| H <sup>1</sup> | 0.055        | 1.40       |
| I <sup>1</sup> | 0.024        | 0.60       |
| J <sup>1</sup> | 0.004r       | 0.10r      |
| K <sup>1</sup> | 0.008r       | 0.20r      |
| L <sup>1</sup> | 0.089        | 2.25       |
| M <sup>1</sup> | 0.010r       | 0.25r      |

### Contacts:

Gold 11.8 μinches 0.3 μm minimum over  
Nickel 50 to 350 μinches 1.27 to 8.89 μm

<sup>1</sup> Typical dimensions

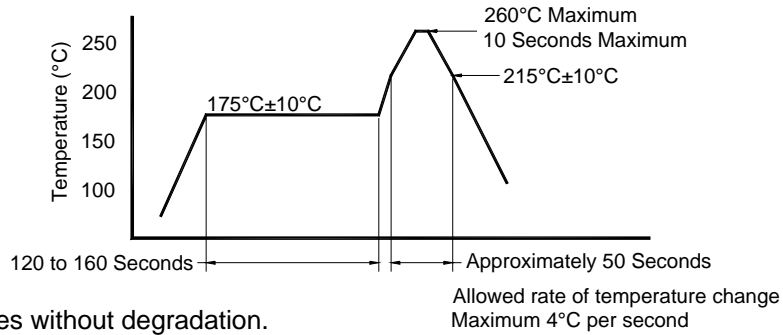
Not to Scale

Center metalized pad on the base is internally connected, may be open or connected to V<sub>cc</sub> or to Ground.

Do not permit solder to bridge the upper gold contacts on the side.

| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol                          | Modulates the output frequency   |
| 2   | Output Enable/Disable             | When this pad is not connected the oscillator shall operate.<br>When this pad is <0.80 volts, 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                            | Both outputs must be terminated and biased for proper operation. The ideal termination is 50 ohms connected to 2.0V below the Supply Voltage.<br>The outputs become a High Z when disabled and the voltage level is determined by the termination circuitry. |
| 5   | Output*                           |  |
| 6   | Supply Voltage (V <sub>cc</sub> ) | Recommend connecting appropriate power supply bypass capacitors as close as possible.  |

## Reflow Cycle (typical for lead free processing)



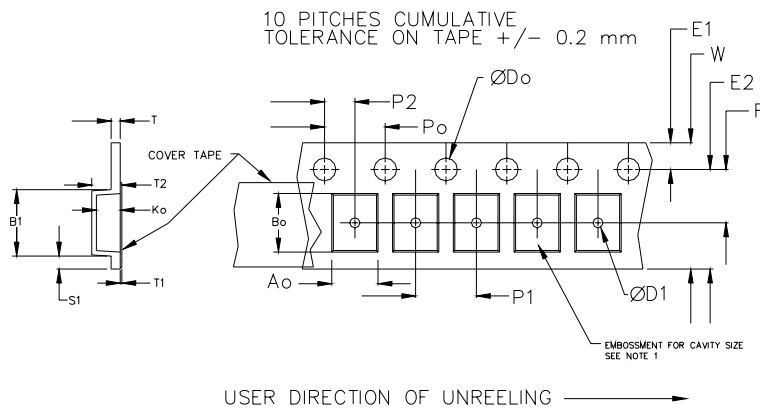
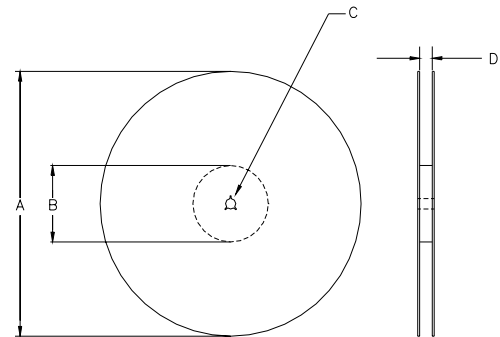
The part may be reflowed 2 times without degradation.

## Tape and Reel: available for quantities of 250 to 1000 per reel, cut tape for < 250

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

| 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           | Tape Width |
|                 | mm     | 177.8            | 254.0          | 330.2          |            |
| B               | inches | 2.50             | 4.00           | 3.75           | Tape Width |
|                 | mm     | 63.5             | 101.6          | 95.3           |            |
| C               | mm     | 13.0 +0.5 / -0.2 |                |                | Tape Width |
| D               | mm     | 16.4 +2.0 -0.0   | 16.4 +2.0 -0.0 | 16.4 +2.0 -0.0 |            |
|                 | mm     | ---              | ---            | 24.4 +2.0 -0.0 | 24.0       |
|                 | mm     | ---              | ---            | 32.4 +2.0 -0.0 | 32.0       |

Reel dimensions may vary from the above

## IMPORTANT NOTICE

Pletronics Incorporated (PLE) reserves the right to make corrections, improvements, modifications and other changes to this product at anytime. PLE reserves the right to discontinue any product or service without notice. Customers are responsible for obtaining the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to PLE's terms and conditions of sale supplied at the time of order acknowledgment.

PLE warrants performance of this product to the specifications applicable at the time of sale in accordance with PLE's limited warranty. Testing and other quality control techniques are used to the extent PLE deems necessary to support this warranty. Except where mandated by specific contractual documents, testing of all parameters of each product is not necessarily performed.

PLE assumes no liability for application assistance or customer product design. Customers are responsible for their products and applications using PLE components. To minimize the risks associated with the customer products and applications, customers should provide adequate design and operating safeguards.

PLE products are not designed, intended, authorized or warranted to be suitable for use in life support applications, devices or systems or other critical applications that may involve potential risks of death, personal injury or severe property or environmental damage. Inclusion of PLE products in such applications is understood to be fully at the risk of the customer. Use of PLE products in such applications requires the written approval of an appropriate PLE officer. Questions concerning potential risk applications should be directed to PLE.

PLE does not warrant or represent that any license, either express or implied, is granted under any PLE patent right, copyright, artwork or other intellectual property right relating to any combination, machine or process which PLE product or services are used. Information published by PLE regarding third-party products or services does not constitute a license from PLE to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from PLE under the patents or other intellectual property of PLE.

Reproduction of information in PLE data sheets or web site is permissible only if the reproduction is without alteration and is accompanied by associated warranties, conditions, limitations and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. PLE is not responsible or liable for such altered documents.

Resale of PLE products or services with statements different from or beyond the parameters stated by PLE for that product or service voids all express and implied warranties for the associated PLE product or service and is an unfair or deceptive business practice. PLE is not responsible for any such statements.

### Contacting Pletronics Inc.

Pletronics Inc.  
19013 36<sup>th</sup> Ave. West  
Lynnwood, WA 98036-5761 USA

Tel: 425-776-1880  
Fax: 425-776-2760  
E-mail: [ple-sales@pletronics.com](mailto:ple-sales@pletronics.com)  
URL: [www.pletronics.com](http://www.pletronics.com)

Copyright © 2005, 2006, Pletronics Inc.