



## VPU7 Series 3.3V PECL VCXO Oscillators

November 2018



- Pletronics' VPU7 Series is a voltage - quartz crystal controlled precision square wave generator with a PECL output
- See VLU7 for LVDS output
- Tape and Reel or cut tape packaging
- 10.9 MHz to 1,175MHz
- Enable/Disable Function on pad 2
- Output frequency is synthesized
- Low Jitter

### **Pletronics Inc. certifies this device is in accordance with the RoHS (2011/65/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-020D.1  
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><br><b>T250</b> = 250 per Tape and Reel<br><b>T500</b> = 500 per Tape and Reel<br><b>T1K</b> = 1000 per Tape and Reel                  |
|            |    |     |     |         |     | <b>Frequency in MHZ</b>                                                                                                                                              |
|            |    |     |     |         |     | <b>Pullability in ppm (Vcontrol) APR</b><br><b>050</b> = $\pm 50$ ppm minimum is standard<br><b>075</b> = $\pm 75$ ppm minimum<br><b>100</b> = $\pm 100$ ppm minimum |
|            |    |     |     |         |     | <b>Stability in ppm (Stability in ppm * 10)</b><br><b>000</b> = APR <b>500</b> = $\pm 50$ ppm<br><b>250</b> = $\pm 25$ ppm      (typical values shown)               |
|            |    |     |     |         |     | <b>Temperature Range</b><br><b>EG</b> = -10 to +70°C<br><b>LK</b> = -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

| Code | 6    | 7    | 8    | 9    | 0    | Code  | A   | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |
|------|------|------|------|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Year | 2016 | 2017 | 2018 | 2019 | 2020 | 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  | D  | E  | F  | G  |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Day  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Code | H  | J  | K  | L  | M  | N  | P  | R  | T  | U  | V  | W  | X  | Y  | Z  |    |
| Day  | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 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<br>-75<br>-100    | +50<br>+75<br>+100 | ppm                | APR includes the effect of temperature stability, aging, supply voltage and load. Defined by part number. |                            |
| Output Waveform                      | PECL / ECL            |                    |                    |                                                                                                           |                            |
| Output High Level                    | 2.12                  | 2.49               | volts              | Referenced to Ground, $V_{CC} = 3.3\text{ V}$                                                             |                            |
|                                      | 0.82                  | 1.19               | volts              | Referenced to termination voltage, $V_{CC} = 3.3\text{ V}$                                                |                            |
|                                      | -1.18                 | -0.81              | volts              | Referenced to $V_{CC}$ , $V_{CC} = 3.3\text{ V}$                                                          |                            |
| Output Low Level                     | 1.83                  | 1.99               | volts              | Referenced to Ground, $V_{CC} = 3.3\text{ V}$                                                             |                            |
|                                      | 0.53                  | 0.69               | volts              | Referenced to termination voltage, $V_{CC} = 3.3\text{ V}$                                                |                            |
|                                      | -1.47                 | -1.31              | volts              | Referenced to $V_{CC}$ , $V_{CC} = 3.3\text{ V}$                                                          |                            |
| Output Peak to Peak Level            | 0.405                 | 1.076              | volts              |                                                                                                           |                            |
| Output Symmetry                      | 47                    | 53                 | %                  | at 50% point of $V_{CC}$ (See load circuit)                                                               |                            |
| Modulation Bandwidth                 | 10                    | -                  | KHz                | $V_{control} = 1.65\text{V} \pm 1.50\text{ V}$ , -3dB                                                     |                            |
| Vcontrol Resistance (Pad 1)          | 20                    | -                  | Kohm               |                                                                                                           |                            |
| Voltage vs Frequency Linearity       | -10                   | +10                | %                  | $V_{control} = 1.65\text{V} \pm 1.50\text{ V}$                                                            |                            |
| 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                | $\mu\text{A}$                                                                                             | Pad 1 low, device disabled |
|                                      | $V_{OUT} = 0\text{V}$ | -50                | +50                | $\mu\text{A}$                                                                                             |                            |
| 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                | $^{\circ}\text{C}$ | Standard Temperature Range                                                                                |                            |
|                                      | -40                   | +85                | $^{\circ}\text{C}$ | Extended Temperature Range                                                                                |                            |
| Storage Temperature Range            | -55                   | +125               | $^{\circ}\text{C}$ |                                                                                                           |                            |

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

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

|                                                                                                                              |                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>P/N:</b> <br>VPU7029036EG100050-100.0M |                                                                                                         |
| <b>Customer P/N:</b> <br>12345678         | <b>Qty:</b> <br>1000 |
| <b>D/C:</b> <br>4AN3LGC2-SF2              | <b>MSL:</b> 1                                                                                           |

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

## Mechanical:



### Contacts (pads):

Gold 11.8 to 39.4  $\mu$ inches (0.3 to 1.0  $\mu$ m)  
over

Nickel 50 to 350  $\mu$ inches (1.27 to 8.89  $\mu$ m)

Center metallized pad on the base is internally  
connected, may be open or connected to  $V_{cc}$  or  
to Ground.

<sup>1</sup> Typical dimensions

Not to Scale

|                | Inches            | mm              |
|----------------|-------------------|-----------------|
| A              | 0.276 $\pm$ 0.006 | 7.00 $\pm$ 0.15 |
| B              | 0.197 $\pm$ 0.006 | 5.00 $\pm$ 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           |

**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 $V_{cc}$ 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 ( $V_{cc}$ ) | 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<br>-0.0 | 1.5    | ± 0.1 | ± 0.1 | 2.0 ± 0.1  |        |       |        |
| 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   |                   |                   | Tape Width |
|---|--------|-------------------|-------------------|-------------------|------------|
| 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 +2.0<br>-0.0 | 16.4 +2.0<br>-0.0 | 16.4 +2.0<br>-0.0 | 16.0       |
|   | mm     | ---               | ---               | 24.4 +2.0<br>-0.0 | 24.0       |
|   | mm     | ---               | ---               | 32.4 +2.0<br>-0.0 | 32.0       |

Reel dimensions may vary from the above

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