



# OeD4205-19.20M TCVCXO Oscillator

November 2010

- Pletronics' OeD4 is from the OeXO™ Series of temperature compensated voltage controlled crystal oscillator with a CMOS output.
- Cut Tape -or- Tape and Reel packaging
- 3.2 x 5 mm LCC Ceramic Package
- Supply Voltage: 3.3V

**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: 0.10 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 +6.5V                  |
| 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 |

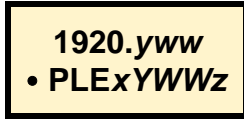
## Thermal Characteristics

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

## ESD Rating

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

### Part Marking:



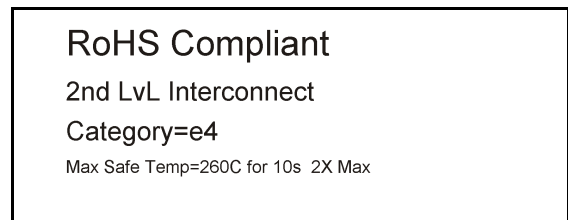
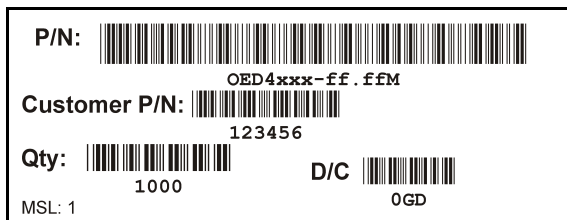
|      |   |  |
|------|---|--|
| 1920 | = | 19.20MHz, the crystal frequency          |
| yww  | = | Year and Week of the crystal manufacture |
| PLE  | = | Pletronics                               |
| X    | = | Model number, normally a "B"             |
| YWW  | = | Year and Week of assembly of the TCXO    |
| Z    | = | internal factory code                    |

The actual part number is OED4205-19.20M where the model number "205" is the specification number the part is made to. This is not included in the part marking. This is included on the label on the Tape and Reel.

### Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The bar code will show the actual Part Number  
**(OED4205-19.20M)**

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



### Reliability: Environmental Compliance

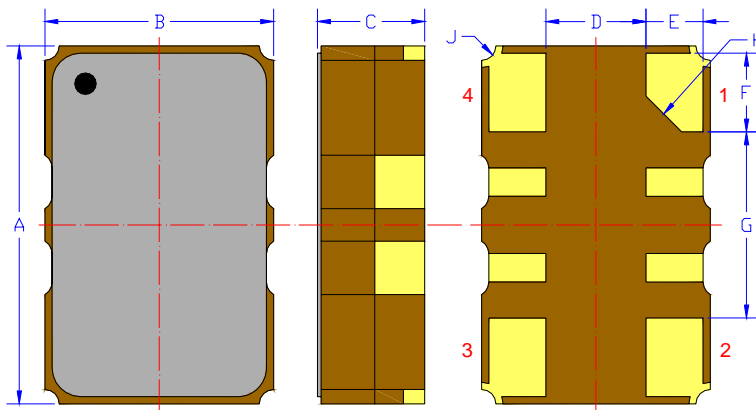
| Parameter        | Condition                            |
|------------------|--------------------------------------|
| Mechanical Shock | MIL-STD-883 Method 2002, Condition B |
| Vibration        | MIL-STD-883 Method 2007, Condition A |
| Solderability    | MIL-STD-883 Method 2003              |
|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

## Electrical Specification for specified Vcc= 3.3V ±5% over the specified temperature range.

| Item   | Min                        | TYP  | Max                        | Unit       | Condition  |
|--|----------------------------|--|----------------------------|------------|--|
| Frequency Stability over temperature                                 | -50                        | -  | 50                         | ppb        | Over 0°C to 70°C<br>at fixed supply voltage + load (reference to midpoint min/max frequency)   |
| Holdover   | -50<br>-40                 | 0<br>0                                     | 50<br>40                   | ppb<br>ppb | Over 0°C to 70°C for 24 hours<br>Over ±5°C change for 24 hours   |
| Frequency Calibration  | -2.0                       | -  | 2.0                        | ppm        | Frequency offset at 25°C, 60 minutes after reflow.   |
| Supply voltage stability   | -10                        | 0  | 10                         | ppb        | ± 2% variation in supply voltage   |
| Load sensitivity   | -5                         | -  | 5                          | ppb        | 10K ohm ±5%    10 pF ±10%  |
| Warm Up  | -                          | 0.4  | 3.0                        | S          | Time to reach specified frequency  |
| Aging rate following reflow  | -<br>-<br>-                | ±10<br>±3<br>±1                            | -<br>-<br>-                | ppb/day    | 1 day after reflow<br>7 days after reflow<br>30 days after reflow  |
| Long term stability (Aging)  | -1000<br>-1500<br>-4600    | -<br>-<br>-                                | 1000<br>1500<br>4600       | ppb        | after 1 year<br>after 5 years<br>after 15 years  |
| Output Waveform  | CMOS                       |  |                            |            |  |
| Output V <sub>HIGH</sub>   | 90                         | -  | -                          | %Vs        | Load: 10K ohm ±5%    10 pF ±10%<br>V <sub>th</sub> : T <sub>R</sub> and T <sub>F</sub> 10% and 90% of amplitude<br>V <sub>th</sub> : D.C. 50% of amplitude |
| Output V <sub>LOW</sub>  | -                          | -  | 10                         | %Vs        |  |
| T <sub>RISE</sub> and T <sub>FALL</sub>                              | -                          | -  | 6.5                        | nS         |  |
| Duty Cycle   | 40                         | 50   | 60                         | %          |  |
| Phase Noise<br>1 Hz<br>10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz | -<br>-<br>-<br>-<br>-<br>- | -71<br>-93<br>-117<br>-138<br>-152<br>-155 | -<br>-<br>-<br>-<br>-<br>- | dBc/Hz     | 25°C   |
| Jitter   | -                          | -  | 0.6                        | pS         | Frequency offset from carrier 12kHz to 20MHz   |
| V Supply Range <sup>1</sup> V <sub>CC</sub>                          | 3.13                       | 3.30                                       | 3.47                       | Volts      |  |
| Supply Current I <sub>CC</sub>                                       | -                          | -  | 3.0                        | mA         |  |
| Vcontrol Range   | 0.5                        | -  | 2.50                       | Volts      | 1.50 volts nominal   |
| Frequency Pullability  | 5                          | -  | 10                         | ±ppm       | Slope positive   |
| Linearity  | -                          | 0.05                                       | 2.0                        | %          | In accordance with MIL-PRF-55310   |
| Operating Temperature  | 0                          | -  | +70                        | °C         | Widest range allowed   |
| Storage Temperature  | -55                        | -  | +95                        | °C         |  |

Note: <sup>1</sup> For correct operation a 10nF supply de-coupling capacitor should be placed next to the device.

### Mechanical:



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.197 ±0.008 | 5.00 ±0.20 |
| B              | 0.126 ±0.008 | 3.20 ±0.20 |
| C              | 0.059 max    | 1.50 max   |
| D <sup>1</sup> | 0.055        | 1.40       |
| E <sup>1</sup> | 0.031        | 0.80       |
| F <sup>1</sup> | 0.043        | 1.10       |
| G <sup>1</sup> | 0.102        | 2.60       |
| H <sup>1</sup> | 0.013C       | 0.50C      |
| J <sup>1</sup> | 0.008        | 0.20R      |

Not to Scale

<sup>1</sup> Typical dimensions

#### Contacts:

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm)  
over  
Nickel 50 to 350 μinches (1.27 to 8.89 μm)

| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.  |
| 2   | Ground (GND)                      |  |
| 3   | Output                            | CMOS   |
| 4   | Supply Voltage (V <sub>CC</sub> ) | Connect an appropriate power supply bypass capacitors as close as possible.  |
| -   | N. C.                             | All other pads on the bottom shall not be connected. These are internally connected and were for the TCXO compensation process |

### Layout and application information

All connection points in the designated region have solder mask cover to avoid any electrical connections

For Optimum Stability and 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.
- minimize air flow across the device



### Reflow Cycle (typical for lead free processing)



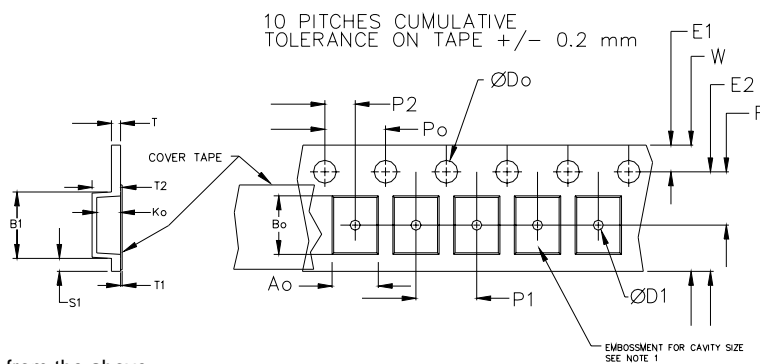
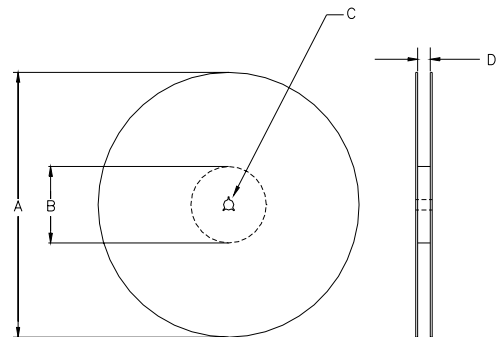
The part may be reflowed 2 times without degradation.

### 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



from the above

USER DIRECTION OF UNREELING →

| 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 |            |

Reel dimensions may vary

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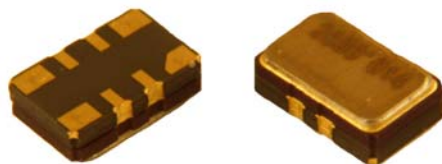
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**Contacting Pletronics Inc.**

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URL: [www.pletronics.com](http://www.pletronics.com)

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## OeD4206-20.00M TCVCXO Oscillator

November 2010

- Pletronics' OeD4 is from the OeXO™ Series of temperature compensated voltage controlled crystal oscillator with a CMOS output.
- Cut Tape -or- Tape and Reel packaging
- 3.2 x 5 mm LCC Ceramic Package
- Supply Voltage: 3.3V

**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: 0.10 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 +6.5V                  |
| 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

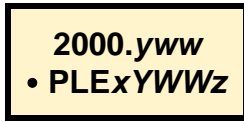
The maximum die or junction temperature is 155°C

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

### ESD Rating

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

### Part Marking:



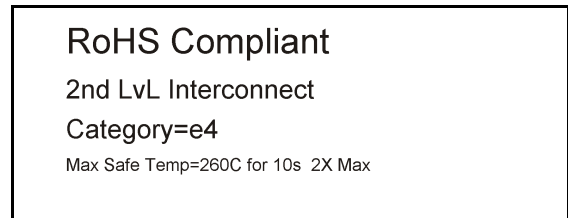
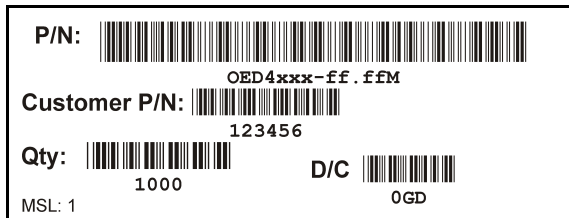
|      |   |  |
|------|---|--|
| 2000 | = | 20.00MHz, the crystal frequency          |
| yww  | = | Year and Week of the crystal manufacture |
| PLE  | = | Pletronics                               |
| X    | = | Model number, normally a "B"             |
| YWW  | = | Year and Week of assembly of the TCXO    |
| Z    | = | internal factory code                    |

The actual part number is OED4206-20.00M where the model number "206" is the specification number the part is made to. This is not included in the part marking. This is included on the label on the Tape and Reel.

### Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The bar code will show the actual Part Number  
**(OED4206-20.00M)**

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



### 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 |

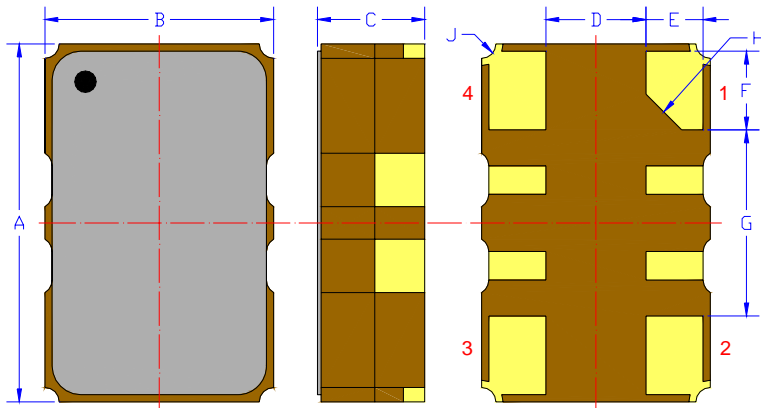


## Electrical Specification for specified Vcc= 3.3V ±5% over the specified temperature range.

| Item   | Min                        | TYP  | Max                        | Unit    | Condition  |
|--|----------------------------|--|----------------------------|---------|--|
| Frequency Stability over temperature                                 | -50                        | -  | 50                         | ppb     | Over 0°C to 70°C<br>at fixed supply voltage + load (reference to midpoint min/max frequency)   |
| Holdover   | -50<br>-40                 | 0<br>0                                     | 50<br>40                   | ppb     | Over 0°C to 70°C for 24 hours<br>Over ±5°C change for 24 hours   |
| Frequency Calibration  | -2.0                       | -  | 2.0                        | ppm     | Frequency offset at 25°C,<br>60 minutes after reflow.  |
| Supply voltage stability   | -10                        | 0  | 10                         | ppb     | ± 2% variation in supply voltage   |
| Load sensitivity   | -5                         | -  | 5                          | ppb     | 10K ohm ±5%    10 pF ±10%  |
| Warm Up  | -                          | 0.4  | 3.0                        | S       | Time to reach specified frequency  |
| Aging rate following reflow  | -<br>-<br>-                | ±10<br>±3<br>±1                            | -<br>-<br>-                | ppb/day | 1 day after reflow<br>7 days after reflow<br>30 days after reflow  |
| Long term stability (Aging)  | -1000<br>-1500<br>-4600    | -<br>-<br>-                                | 1000<br>1500<br>4600       | ppb     | after 1 year<br>after 5 years<br>after 15 years  |
| Output Waveform  | CMOS                       |  |                            |         |  |
| Output V <sub>HIGH</sub>   | 90                         | -  | -                          | %Vs     | Load: 10K ohm ±5%    10 pF ±10%<br>V <sub>th</sub> : T <sub>R</sub> and T <sub>F</sub> 10% and 90% of amplitude<br>V <sub>th</sub> : D.C. 50% of amplitude |
| Output V <sub>LOW</sub>  | -                          | -  | 10                         | %Vs     |  |
| T <sub>RISE</sub> and T <sub>FALL</sub>                              | -                          | -  | 6.5                        | nS      |  |
| Duty Cycle   | 40                         | 50   | 60                         | %       |  |
| Phase Noise<br>1 Hz<br>10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz | -<br>-<br>-<br>-<br>-<br>- | -71<br>-93<br>-117<br>-138<br>-152<br>-155 | -<br>-<br>-<br>-<br>-<br>- | dBc/Hz  | at 25°C  |
| Jitter   | -                          | -  | 0.6                        | pS      | Frequency offset from carrier 12kHz to 20MHz   |
| V Supply Range <sup>1</sup> V <sub>CC</sub>                          | 3.13                       | 3.30                                       | 3.47                       | Volts   |  |
| Supply Current I <sub>CC</sub>                                       | -                          | -  | 3.0                        | mA      |  |
| Vcontrol Range   | 0.5                        | -  | 2.50                       | Volts   | 1.50 volts nominal   |
| Frequency Pullability  | 5                          | -  | 10                         | ±ppm    | Slope positive   |
| Linearity  | -                          | 0.05                                       | 2.0                        | %       | In accordance with MIL-PRF-55310   |
| Operating Temperature  | 0                          | -  | +70                        | °C      | Widest range allowed   |
| Storage Temperature  | -55                        | -  | +95                        | °C      |  |

Note: <sup>1</sup> For correct operation a 10nF supply de-coupling capacitor should be placed next to the device.

### Mechanical:



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.197 ±0.008 | 5.00 ±0.20 |
| B              | 0.126 ±0.008 | 3.20 ±0.20 |
| C              | 0.059 max    | 1.50 max   |
| D <sup>1</sup> | 0.055        | 1.40       |
| E <sup>1</sup> | 0.031        | 0.80       |
| F <sup>1</sup> | 0.043        | 1.10       |
| G <sup>1</sup> | 0.102        | 2.60       |
| H <sup>1</sup> | 0.013C       | 0.50C      |
| J <sup>1</sup> | 0.008        | 0.20R      |

Not to Scale

<sup>1</sup> Typical dimensions

#### Contacts:

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm)  
over  
Nickel 50 to 350 μinches (1.27 to 8.89 μm)

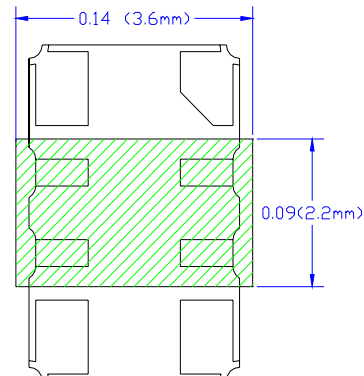
| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.  |
| 2   | Ground (GND)                      |  |
| 3   | Output                            | CMOS   |
| 4   | Supply Voltage (V <sub>CC</sub> ) | Connect an appropriate power supply bypass capacitors as close as possible.  |
| -   | N. C.                             | All other pads on the bottom shall not be connected. These are internally connected and were for the TCXO compensation process |

### Layout and application information

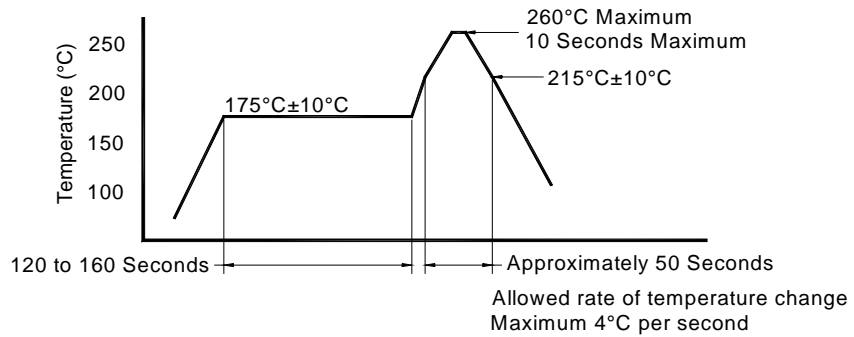
All connection points in the designated region have solder mask cover to avoid any electrical connections

For Optimum Stability and 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.
- minimize air flow across the device



### Reflow Cycle (typical for lead free processing)



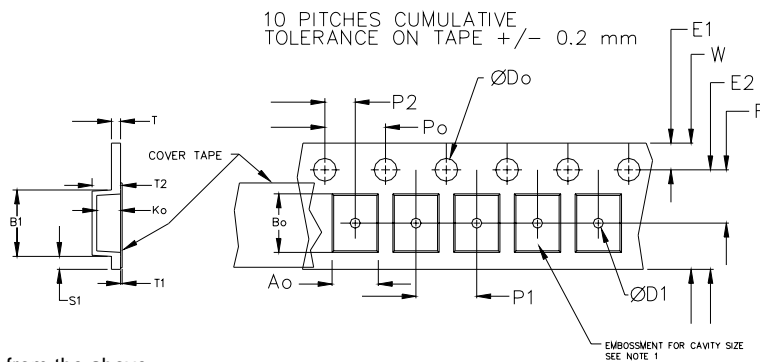
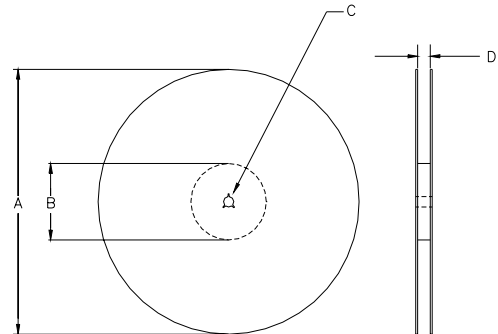
The part may be reflowed 2 times without degradation.

### 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



from the above

USER DIRECTION OF UNREELING →

| 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 |            |

Reel dimensions may vary

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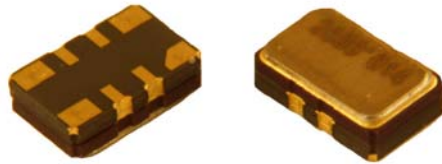
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### Contacting Pletronics Inc.

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

Tel: 425-776-1880  
Fax: 425-776-2760  
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URL: [www.pletronics.com](http://www.pletronics.com)

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# OeD4207-26.00M TCVCXO Oscillator

November 2010

- Pletronics' OeD4 is from the OeXO™ Series of temperature compensated voltage controlled crystal oscillator with a CMOS output.
- Cut Tape -or- Tape and Reel packaging
- 3.2 x 5 mm LCC Ceramic Package
- Supply Voltage: 3.3V

**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: 0.10 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 +6.5V                  |
| 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 |

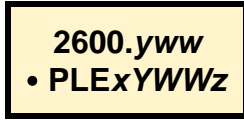
## Thermal Characteristics

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

## ESD Rating

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

### Part Marking:



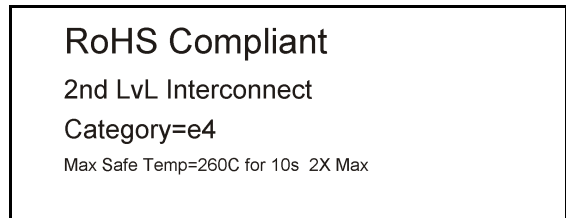
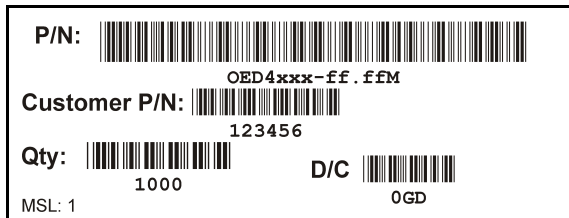
|      |   |  |
|------|---|--|
| 2600 | = | 26.00MHz, the crystal frequency          |
| yww  | = | Year and Week of the crystal manufacture |
| PLE  | = | Pletronics                               |
| X    | = | Model number, normally a "B"             |
| YWW  | = | Year and Week of assembly of the TCXO    |
| Z    | = | internal factory code                    |

The actual part number is OED4207-26.00M where the model number "207" is the specification number the part is made to. This is not included in the part marking. This is included on the label on the Tape and Reel.

### Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The bar code will show the actual Part Number  
**(OED4207-26.00M)**

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



### Reliability: Environmental Compliance

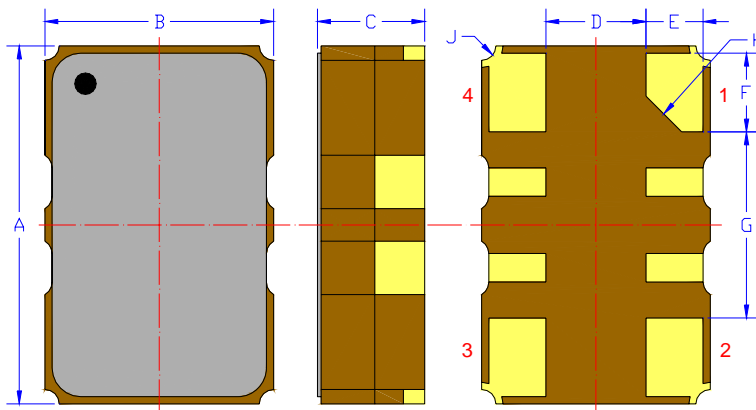
| Parameter        | Condition                            |
|------------------|--------------------------------------|
| Mechanical Shock | MIL-STD-883 Method 2002, Condition B |
| Vibration        | MIL-STD-883 Method 2007, Condition A |
| Solderability    | MIL-STD-883 Method 2003              |
|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

## Electrical Specification for specified Vcc= 3.3V ±5% over the specified temperature range.

| Item   | Min                        | TYP  | Max                        | Unit       | Condition  |
|--|----------------------------|--|----------------------------|------------|--|
| Frequency Stability over temperature                                 | -50                        | -  | 50                         | ppb        | Over 0°C to 70°C<br>at fixed supply voltage + load (reference to midpoint min/max frequency)   |
| Holdover   | -50<br>-40                 | 0<br>0                                     | 50<br>40                   | ppb<br>ppb | Over 0°C to 70°C for 24 hours<br>Over ±5°C change for 24 hours   |
| Frequency Calibration  | -2.0                       | -  | 2.0                        | ppm        | Frequency offset at 25°C, 60 minutes after reflow.   |
| Supply voltage stability   | -10                        | 0  | 10                         | ppb        | ± 2% variation in supply voltage   |
| Load sensitivity   | -5                         | -  | 5                          | ppb        | 10K ohm ±5%    10 pF ±10%  |
| Warm Up  | -                          | 0.4  | 3.0                        | S          | Time to reach specified frequency  |
| Aging rate following reflow  | -<br>-<br>-                | ±10<br>±3<br>±1                            | -<br>-<br>-                | ppb/day    | 1 day after reflow<br>7 days after reflow<br>30 days after reflow  |
| Long term stability (Aging)  | -1000<br>-1500<br>-4600    | -<br>-<br>-                                | 1000<br>1500<br>4600       | ppb        | after 1 year<br>after 5 years<br>after 15 years  |
| Output Waveform  | CMOS                       |  |                            |            |  |
| Output V <sub>HIGH</sub>   | 90                         | -  | -                          | %Vs        | Load: 10K ohm ±5%    10 pF ±10%<br>V <sub>th</sub> : T <sub>R</sub> and T <sub>F</sub> 10% and 90% of amplitude<br>V <sub>th</sub> : D.C. 50% of amplitude |
| Output V <sub>LOW</sub>  | -                          | -  | 10                         | %Vs        |  |
| T <sub>RISE</sub> and T <sub>FALL</sub>                              | -                          | -  | 6.5                        | nS         |  |
| Duty Cycle   | 40                         | 50   | 60                         | %          |  |
| Phase Noise<br>1 Hz<br>10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz | -<br>-<br>-<br>-<br>-<br>- | -71<br>-93<br>-117<br>-138<br>-152<br>-155 | -<br>-<br>-<br>-<br>-<br>- | dBc/Hz     | at 25°C  |
| Jitter   | -                          | -  | 0.6                        | pS         | Frequency offset from carrier 12kHz to 20MHz   |
| V Supply Range <sup>1</sup> V <sub>CC</sub>                          | 3.13                       | 3.30                                       | 3.47                       | Volts      |  |
| Supply Current I <sub>CC</sub>                                       | -                          | -  | 3.0                        | mA         |  |
| Vcontrol Range   | 0.5                        | -  | 2.50                       | Volts      | 1.50 volts nominal   |
| Frequency Pullability  | 5                          | -  | 10                         | ±ppm       | Slope positive   |
| Linearity  | -                          | 0.05                                       | 2.0                        | %          | In accordance with MIL-PRF-55310   |
| Operating Temperature  | 0                          | -  | +70                        | °C         | Widest range allowed   |
| Storage Temperature  | -55                        | -  | +95                        | °C         |  |

Note: <sup>1</sup> For correct operation a 10nF supply de-coupling capacitor should be placed next to the device.

### Mechanical:



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.197 ±0.008 | 5.00 ±0.20 |
| B              | 0.126 ±0.008 | 3.20 ±0.20 |
| C              | 0.059 max    | 1.50 max   |
| D <sup>1</sup> | 0.055        | 1.40       |
| E <sup>1</sup> | 0.031        | 0.80       |
| F <sup>1</sup> | 0.043        | 1.10       |
| G <sup>1</sup> | 0.102        | 2.60       |
| H <sup>1</sup> | 0.013C       | 0.50C      |
| J <sup>1</sup> | 0.008        | 0.20R      |

Not to Scale

<sup>1</sup> Typical dimensions

#### Contacts:

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm)  
over  
Nickel 50 to 350 μinches (1.27 to 8.89 μm)

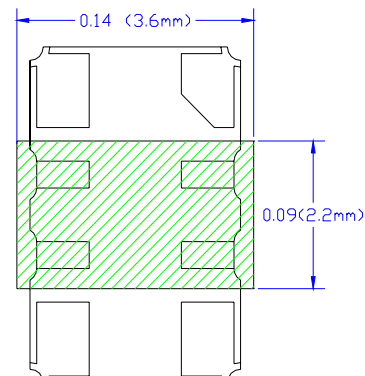
| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.  |
| 2   | Ground (GND)                      |  |
| 3   | Output                            | CMOS   |
| 4   | Supply Voltage (V <sub>CC</sub> ) | Connect an appropriate power supply bypass capacitors as close as possible.  |
| -   | N. C.                             | All other pads on the bottom shall not be connected. These are internally connected and were for the TCXO compensation process |

### Layout and application information

All connection points in the designated region have solder mask cover to avoid any electrical connections

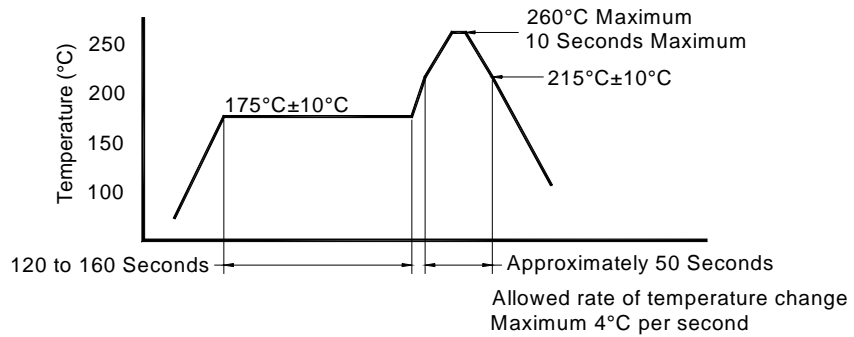
For Optimum Stability and Jitter Performance, Pletronics recommends:

- 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.
- minimize air flow across the device





### Reflow Cycle (typical for lead free processing)



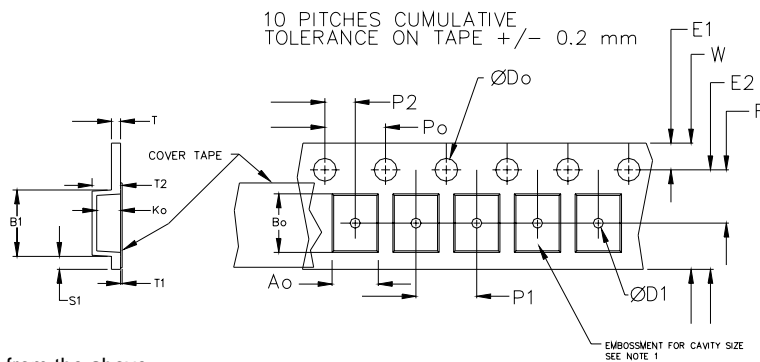
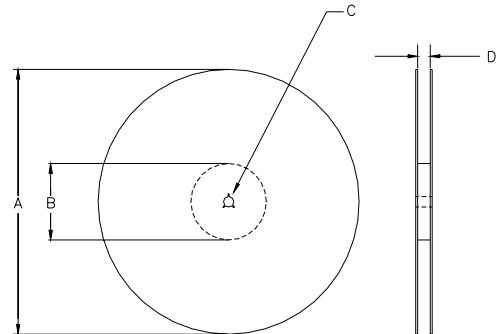
The part may be reflowed 2 times without degradation.

### 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 |            |

Reel dimensions may vary

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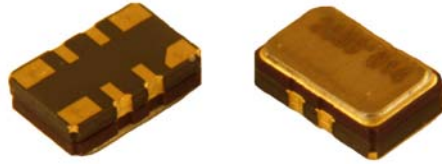
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**Contacting Pletronics Inc.**

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URL: [www.pletronics.com](http://www.pletronics.com)

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# OeD4212-10.00M TCVCXO Oscillator

November 2010

- Pletronics' OeD4 is from the OeXO™ Series of temperature compensated voltage controlled crystal oscillator with a CMOS output.
- Cut Tape -or- Tape and Reel packaging
- 3.2 x 5 mm LCC Ceramic Package
- Supply Voltage: 3.3V

**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: 0.10 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 +6.5V                  |
| 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 |

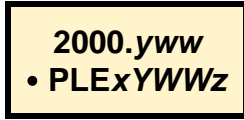
## Thermal Characteristics

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

## ESD Rating

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

### Part Marking:



|      |   |  |
|------|---|--|
| 2000 | = | 20.00MHz, the crystal frequency          |
| yww  | = | Year and Week of the crystal manufacture |
| PLE  | = | Pletronics                               |
| X    | = | Model number, normally a "B"             |
| YWW  | = | Year and Week of assembly of the TCXO    |
| Z    | = | internal factory code                    |

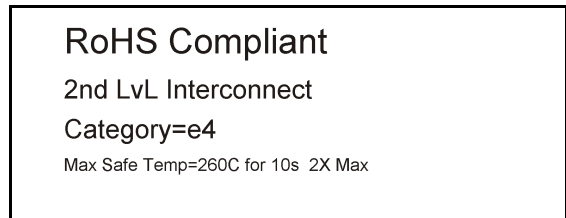
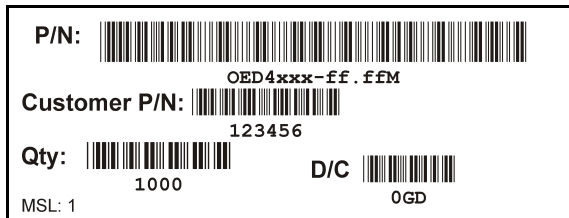
The actual part number is OED4212-10.00M where the model number "212" is the specification number the part is made to. This is not included in the part marking. This is included on the label on the Tape and Reel.

Note that the crystal frequency is 2 times the specified frequency of 10.00MHz. The TCVCXO IC used divides the crystal frequency by 2 resulting in a 10.00MHz output

### Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The bar code will show the actual Part Number  
**(OED4212-10.00M)**

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



### Reliability: Environmental Compliance

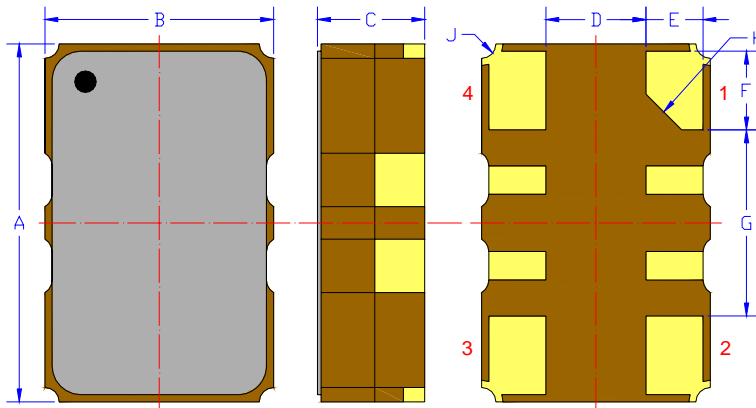
| Parameter        | Condition                            |
|------------------|--------------------------------------|
| Mechanical Shock | MIL-STD-883 Method 2002, Condition B |
| Vibration        | MIL-STD-883 Method 2007, Condition A |
| Solderability    | MIL-STD-883 Method 2003              |
|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

## Electrical Specification for specified Vcc= 3.3V ±5% over the specified temperature range.

| Item  | Min   | TYP                        | Max  | Unit                       | Condition  |         |
|---|---|----------------------------|--|----------------------------|--|---------|
| Frequency Stability over temperature        | -250  | -                          | 250  | ppb                        | Over -40°C to 85°C<br>at fixed supply voltage + load (reference to midpoint min/max frequency)                                   |         |
| Holdover                                    | -250<br>-125  | 0<br>0                     | 250<br>125                                 | ppb<br>ppb                 | Over -40°C to 85°C for 24 hours<br>Over ±5°C change for 24 hours   |         |
| Frequency Calibration                       | -2.0  | -                          | 2.0  | ppm                        | Frequency offset at 25°C,<br>60 minutes after reflow.  |         |
| Supply voltage stability                    | -10   | 0                          | 10   | ppb                        | ± 2% variation in supply voltage   |         |
| Load sensitivity                            | -5  | -                          | 5  | ppb                        | 10K ohm ±5%    10 pF ±10%  |         |
| Warm Up                                     | -   | 0.4                        | 3.0  | S                          | Time to reach specified frequency  |         |
| Aging rate following reflow                 | -<br>-<br>-   | ±10<br>±3<br>±1            | -<br>-<br>-                                | ppb/day                    | 1 day after reflow<br>7 days after reflow<br>30 days after reflow  |         |
| Long term stability (Aging)                 | -1000<br>-1500<br>-4600                               | -<br>-<br>-                | 1000<br>1500<br>4600                       | ppb                        | after 1 year<br>after 5 years<br>after 15 years  |         |
| Output Waveform                             | CMOS  |                            |  |                            |  |         |
| Output V <sub>HIGH</sub>                    | 90  | -                          | -  | %Vs                        | Load: 10K ohm ±5%    10 pF ±10%<br>Vth: T <sub>R</sub> and T <sub>F</sub> 10% and 90% of amplitude<br>Vth: D.C. 50% of amplitude |         |
| Output V <sub>LOW</sub>                     | -   | -                          | 10   | %Vs                        |  |         |
| T <sub>RISE</sub> and T <sub>FALL</sub>     | -   | -                          | 6.5  | nS                         |  |         |
| Duty Cycle                                  | 40  | 50                         | 60   | %                          |  |         |
| Phase Noise                                 | 1 Hz<br>10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz | -<br>-<br>-<br>-<br>-<br>- | -71<br>-93<br>-117<br>-138<br>-152<br>-155 | -<br>-<br>-<br>-<br>-<br>- | dBc/Hz   | at 25°C |
| Jitter                                      | -   | -                          | 0.6  | pS                         | Frequency offset from carrier 12kHz to 20MHz   |         |
| V Supply Range <sup>1</sup> V <sub>CC</sub> | 3.13  | 3.30                       | 3.47                                       | Volts                      |  |         |
| Supply Current I <sub>CC</sub>              | -   | -                          | 3.0  | mA                         |  |         |
| Vcontrol Range                              | 0.5   | -                          | 2.50                                       | Volts                      | 1.50 volts nominal   |         |
| Frequency Pullability                       | 5   | -                          | 10   | ±ppm                       | Slope positive   |         |
| Linearity                                   | -   | 0.05                       | 2.0  | %                          | In accordance with MIL-PRF-55310   |         |
| Operating Temperature                       | -40   | -                          | +85  | °C                         | Widest range allowed   |         |
| Storage Temperature                         | -55   | -                          | +95  | °C                         |  |         |

Note: <sup>1</sup> For correct operation a 10nF supply de-coupling capacitor should be placed next to the device.

### Mechanical:



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.197 ±0.008 | 5.00 ±0.20 |
| B              | 0.126 ±0.008 | 3.20 ±0.20 |
| C              | 0.059 max    | 1.50 max   |
| D <sup>1</sup> | 0.055        | 1.40       |
| E <sup>1</sup> | 0.031        | 0.80       |
| F <sup>1</sup> | 0.043        | 1.10       |
| G <sup>1</sup> | 0.102        | 2.60       |
| H <sup>1</sup> | 0.013C       | 0.50C      |
| J <sup>1</sup> | 0.008        | 0.20R      |

Not to Scale

<sup>1</sup> Typical dimensions

#### Contacts:

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm)  
over  
Nickel 50 to 350 μinches (1.27 to 8.89 μm)

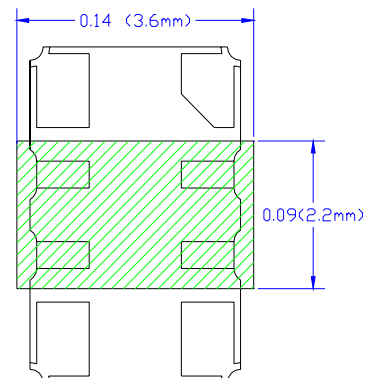
| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.  |
| 2   | Ground (GND)                      |  |
| 3   | Output                            | CMOS   |
| 4   | Supply Voltage (V <sub>CC</sub> ) | Connect an appropriate power supply bypass capacitors as close as possible.  |
| -   | N. C.                             | All other pads on the bottom shall not be connected. These are internally connected and were for the TCXO compensation process |

### Layout and application information

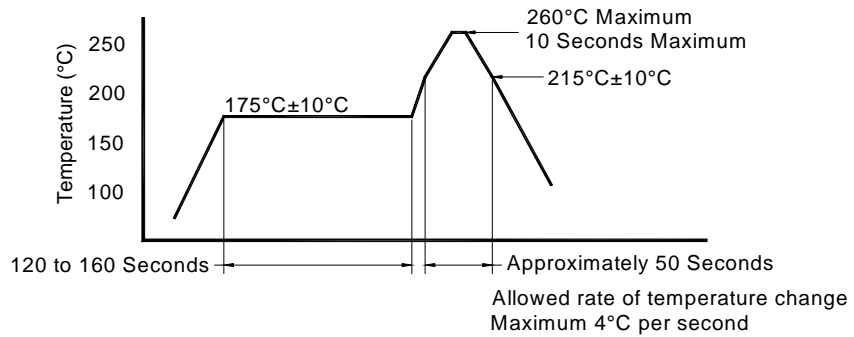
All connection points in the designated region have solder mask cover to avoid any electrical connections

For Optimum Stability and 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.
- minimize air flow across the device



### Reflow Cycle (typical for lead free processing)



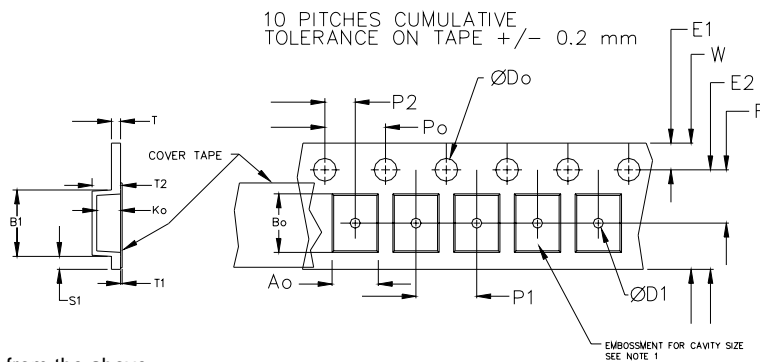
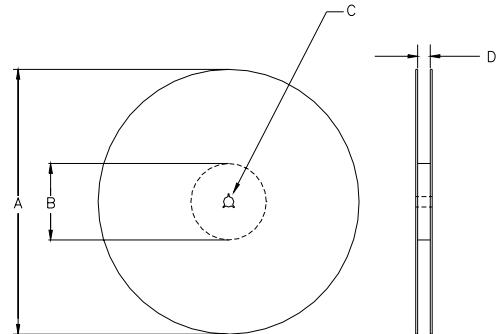
The part may be reflowed 2 times without degradation.

### 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



from the above

USER DIRECTION OF UNREELING →

| 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 |            |

Reel dimensions may vary

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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.

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**Contacting Pletronics Inc.**

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19013 36<sup>th</sup> Ave. West  
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URL: [www.pletronics.com](http://www.pletronics.com)

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# OeD4213-19.20M TCVCXO Oscillator

November 2010

- Pletronics' OeD4 is from the OeXO™ Series of temperature compensated voltage controlled crystal oscillator with a CMOS output.
- Cut Tape -or- Tape and Reel packaging
- 3.2 x 5 mm LCC Ceramic Package
- Supply Voltage: 3.3V

**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: 0.10 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 +6.5V                  |
| 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 |

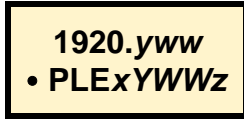
## Thermal Characteristics

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

## ESD Rating

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

### Part Marking:



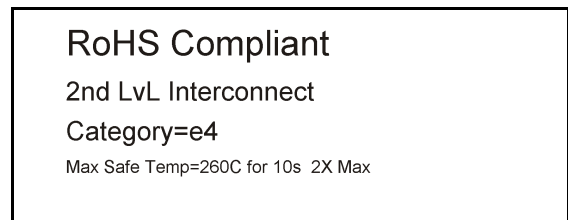
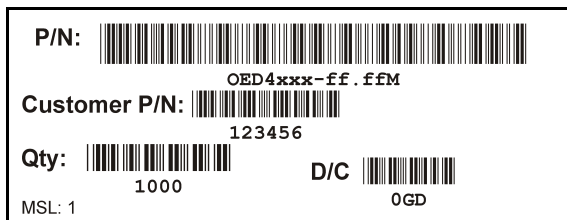
|      |   |  |
|------|---|--|
| 1920 | = | 19.20MHz, the crystal frequency          |
| yww  | = | Year and Week of the crystal manufacture |
| PLE  | = | Pletronics                               |
| X    | = | Model number, normally a "B"             |
| YWW  | = | Year and Week of assembly of the TCXO    |
| Z    | = | internal factory code                    |

The actual part number is OED4213-19.20M where the model number "213" is the specification number the part is made to. This is not included in the part marking. This is included on the label on the Tape and Reel.

### Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The bar code will show the actual Part Number  
**(OED4213-19.20M)**

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



### Reliability: Environmental Compliance

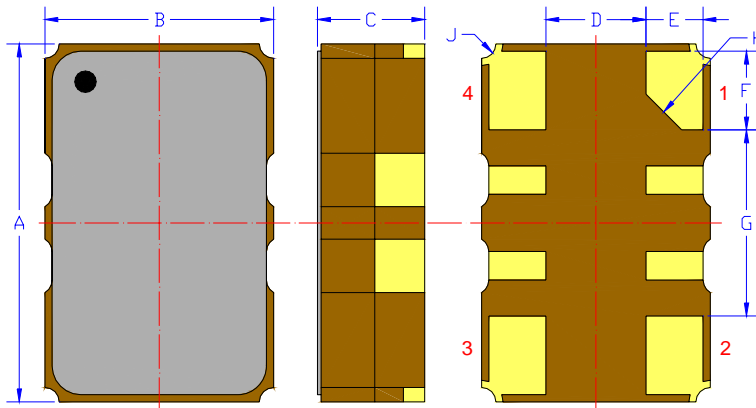
| Parameter        | Condition                            |
|------------------|--------------------------------------|
| Mechanical Shock | MIL-STD-883 Method 2002, Condition B |
| Vibration        | MIL-STD-883 Method 2007, Condition A |
| Solderability    | MIL-STD-883 Method 2003              |
|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

## Electrical Specification for specified Vcc= 3.3V ±5% over the specified temperature range.

| Item  | Min                     | TYP             | Max                  | Unit       | Condition  |
|---|-------------------------|-----------------|----------------------|------------|--|
| Frequency Stability over temperature        | -250                    | -               | 250                  | ppb        | Over -40°C to 85°C<br>at fixed supply voltage + load (reference to midpoint min/max frequency)   |
| Holdover                                    | -250<br>-125            | 0<br>0          | 250<br>125           | ppb<br>ppb | Over -40°C to 85°C for 24 hours<br>Over ±5°C change for 24 hours   |
| Frequency Calibration                       | -2.0                    | -               | 2.0                  | ppm        | Frequency offset at 25°C, 60 minutes after reflow.   |
| Supply voltage stability                    | -10                     | 0               | 10                   | ppb        | ± 2% variation in supply voltage   |
| Load sensitivity                            | -5                      | -               | 5                    | ppb        | 10K ohm ±5%    10 pF ±10%  |
| Warm Up                                     | -                       | 0.4             | 3.0                  | S          | Time to reach specified frequency  |
| Aging rate following reflow                 | -<br>-<br>-             | ±10<br>±3<br>±1 | -<br>-<br>-          | ppb/day    | 1 day after reflow<br>7 days after reflow<br>30 days after reflow  |
| Long term stability (Aging)                 | -1000<br>-1500<br>-4600 | -<br>-<br>-     | 1000<br>1500<br>4600 | ppb        | after 1 year<br>after 5 years<br>after 15 years  |
| Output Waveform                             | CMOS                    |                 |                      |            |  |
| Output V <sub>HIGH</sub>                    | 90                      | -               | -                    | %Vs        | Load: 10K ohm ±5%    10 pF ±10%<br>V <sub>th</sub> : T <sub>R</sub> and T <sub>F</sub> 10% and 90% of amplitude<br>V <sub>th</sub> : D.C. 50% of amplitude |
| Output V <sub>LOW</sub>                     | -                       | -               | 10                   | %Vs        |  |
| T <sub>RISE</sub> and T <sub>FALL</sub>     | -                       | -               | 6.5                  | nS         |  |
| Duty Cycle                                  | 40                      | 50              | 60                   | %          |  |
| Phase Noise                                 |                         |                 |                      |            | at 25°C  |
|   | 1 Hz                    | -               | -71                  | -          | dBc/Hz   |
|   | 10 Hz                   | -               | -93                  | -          |  |
|   | 100 Hz                  | -               | -117                 | -          |  |
|   | 1 KHz                   | -               | -138                 | -          |  |
|   | 10 KHz                  | -               | -152                 | -          |  |
|   | 100 KHz                 | -               | -155                 | -          |  |
| Jitter                                      | -                       | -               | 0.6                  | pS         | Frequency offset from carrier 12kHz to 20MHz   |
| V Supply Range <sup>1</sup> V <sub>CC</sub> | 3.13                    | 3.30            | 3.47                 | Volts      |  |
| Supply Current I <sub>CC</sub>              | -                       | -               | 3.0                  | mA         |  |
| Vcontrol Range                              | 0.5                     | -               | 2.50                 | Volts      | 1.50 volts nominal   |
| Frequency Pullability                       | 5                       | -               | 10                   | ±ppm       | Slope positive   |
| Linearity                                   | -                       | 0.05            | 2.0                  | %          | In accordance with MIL-PRF-55310   |
| Operating Temperature                       | -40                     | -               | +85                  | °C         | Widest range allowed   |
| Storage Temperature                         | -55                     | -               | +95                  | °C         |  |

Note: <sup>1</sup> For correct operation a 10nF supply de-coupling capacitor should be placed next to the device.

### Mechanical:



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.197 ±0.008 | 5.00 ±0.20 |
| B              | 0.126 ±0.008 | 3.20 ±0.20 |
| C              | 0.059 max    | 1.50 max   |
| D <sup>1</sup> | 0.055        | 1.40       |
| E <sup>1</sup> | 0.031        | 0.80       |
| F <sup>1</sup> | 0.043        | 1.10       |
| G <sup>1</sup> | 0.102        | 2.60       |
| H <sup>1</sup> | 0.013C       | 0.50C      |
| J <sup>1</sup> | 0.008        | 0.20R      |

Not to Scale

<sup>1</sup> Typical dimensions

#### Contacts:

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm)  
over  
Nickel 50 to 350 μinches (1.27 to 8.89 μm)

| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.  |
| 2   | Ground (GND)                      |  |
| 3   | Output                            | CMOS   |
| 4   | Supply Voltage (V <sub>CC</sub> ) | Connect an appropriate power supply bypass capacitors as close as possible.  |
| -   | N. C.                             | All other pads on the bottom shall not be connected. These are internally connected and were for the TCXO compensation process |

### Layout and application information

All connection points in the designated region have solder mask cover to avoid any electrical connections

For Optimum Stability and 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.
- minimize air flow across the device



### Reflow Cycle (typical for lead free processing)



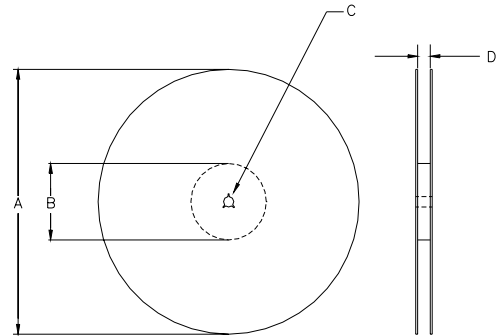
The part may be reflowed 2 times without degradation.

### 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



from the above

USER DIRECTION OF UNREELING →

| 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           |            |
|                 | mm     | 63.5             | 101.6          | 95.3           |            |
| C               | mm     | 13.0 +0.5 / -0.2 |                |                |            |
| D               | mm     | 16.4 +2.0 -0.0   | 16.4 +2.0 -0.0 | 16.4 +2.0 -0.0 |            |
|                 |        | 16.0             |                |                |            |

Reel dimensions may vary

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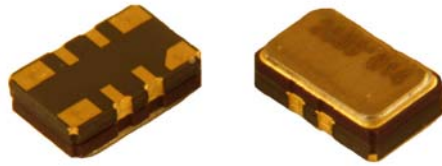
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# OeD4214-20.00M TCVCXO Oscillator

November 2010

- Pletronics' OeD4 is from the OeXO™ Series of temperature compensated voltage controlled crystal oscillator with a CMOS output.
- Cut Tape -or- Tape and Reel packaging
- 3.2 x 5 mm LCC Ceramic Package
- Supply Voltage: 3.3V

**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: 0.10 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 +6.5V                  |
| 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 |

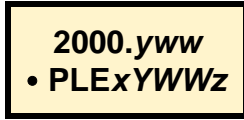
## Thermal Characteristics

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

## ESD Rating

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

### Part Marking:



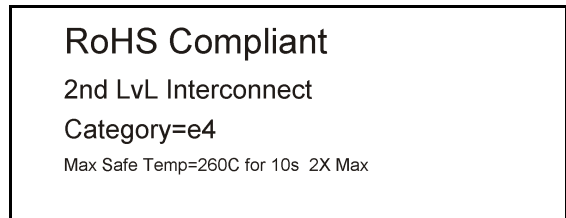
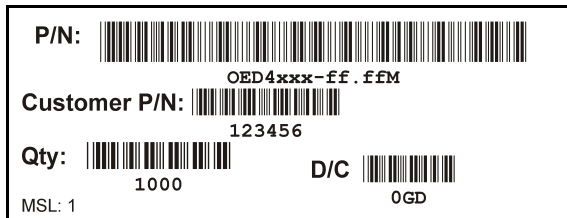
|      |   |  |
|------|---|--|
| 2000 | = | 20.00MHz, the crystal frequency          |
| yww  | = | Year and Week of the crystal manufacture |
| PLE  | = | Pletronics                               |
| X    | = | Model number, normally a "B"             |
| YWW  | = | Year and Week of assembly of the TCXO    |
| Z    | = | internal factory code                    |

The actual part number is OED4214-20.00M where the model number "214" is the specification number the part is made to. This is not included in the part marking. This is included on the label on the Tape and Reel.

### Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The bar code will show the actual Part Number  
**(OED4214-20.00M)**

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



### 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 |

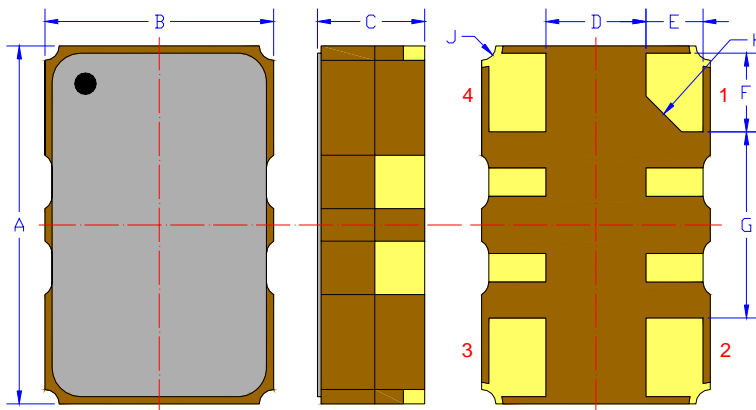


## Electrical Specification for specified $V_{CC} = 3.3V \pm 5\%$ over the specified temperature range.

| Item   | Min                        | TYP  | Max                        | Unit      | Condition  |
|--|----------------------------|--|----------------------------|-----------|--|
| Frequency Stability over temperature                                 | -250                       | -  | 250                        | ppb       | Over -40°C to 85°C<br>at fixed supply voltage + load (reference to midpoint min/max frequency)                             |
| Holdover   | -250<br>-125               | 0<br>0                                     | 250<br>125                 | ppb       | Over -40°C to 85°C for 24 hours<br>Over $\pm 5^\circ\text{C}$ change for 24 hours  |
| Frequency Calibration  | -2.0                       | -  | 2.0                        | ppm       | Frequency offset at 25°C, 60 minutes after reflow.   |
| Supply voltage stability   | -10                        | 0  | 10                         | ppb       | $\pm 2\%$ variation in supply voltage  |
| Load sensitivity   | -5                         | -  | 5                          | ppb       | 10K ohm $\pm 5\%$    10 pF $\pm 10\%$  |
| Warm Up  | -                          | 0.4  | 3.0                        | S         | Time to reach specified frequency  |
| Aging rate following reflow  | -<br>-<br>-                | $\pm 10$<br>$\pm 3$<br>$\pm 1$             | -<br>-<br>-                | ppb/day   | 1 day after reflow<br>7 days after reflow<br>30 days after reflow  |
| Long term stability (Aging)  | -1000<br>-1500<br>-4600    | -<br>-<br>-                                | 1000<br>1500<br>4600       | ppb       | after 1 year<br>after 5 years<br>after 15 years  |
| Output Waveform  | CMOS                       |  |                            |           |  |
| Output $V_{HIGH}$  | 90                         | -  | -                          | %Vs       | Load: 10K ohm $\pm 5\%$    10 pF $\pm 10\%$<br>Vth: $T_R$ and $T_F$ 10% and 90% of amplitude<br>Vth: D.C. 50% of amplitude |
| Output $V_{LOW}$   | -                          | -  | 10                         | %Vs       |  |
| $T_{RISE}$ and $T_{FALL}$  | -                          | -  | 6.5                        | nS        |  |
| Duty Cycle   | 40                         | 50   | 60                         | %         |  |
| Phase Noise<br>1 Hz<br>10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz | -<br>-<br>-<br>-<br>-<br>- | -71<br>-93<br>-117<br>-138<br>-152<br>-155 | -<br>-<br>-<br>-<br>-<br>- | dBc/Hz    | at 25°C  |
| Jitter   | -                          | -  | 0.6                        | pS        | Frequency offset from carrier 12kHz to 20MHz   |
| V Supply Range <sup>1</sup> $V_{CC}$                                 | 3.13                       | 3.30                                       | 3.47                       | Volts     |  |
| Supply Current $I_{CC}$  | -                          | -  | 3.0                        | mA        |  |
| Vcontrol Range   | 0.5                        | -  | 2.50                       | Volts     | 1.50 volts nominal   |
| Frequency Pullability  | 5                          | -  | 10                         | $\pm$ ppm | Slope positive   |
| Linearity  | -                          | 0.05                                       | 2.0                        | %         | In accordance with MIL-PRF-55310   |
| Operating Temperature  | -40                        | -  | +85                        | °C        | Widest range allowed   |
| Storage Temperature  | -55                        | -  | +95                        | °C        |  |

Note: <sup>1</sup> For correct operation a 10nF supply de-coupling capacitor should be placed next to the device.

### Mechanical:



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.197 ±0.008 | 5.00 ±0.20 |
| B              | 0.126 ±0.008 | 3.20 ±0.20 |
| C              | 0.059 max    | 1.50 max   |
| D <sup>1</sup> | 0.055        | 1.40       |
| E <sup>1</sup> | 0.031        | 0.80       |
| F <sup>1</sup> | 0.043        | 1.10       |
| G <sup>1</sup> | 0.102        | 2.60       |
| H <sup>1</sup> | 0.013C       | 0.50C      |
| J <sup>1</sup> | 0.008        | 0.20R      |

Not to Scale

<sup>1</sup> Typical dimensions

#### Contacts:

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm)  
over  
Nickel 50 to 350 μinches (1.27 to 8.89 μm)

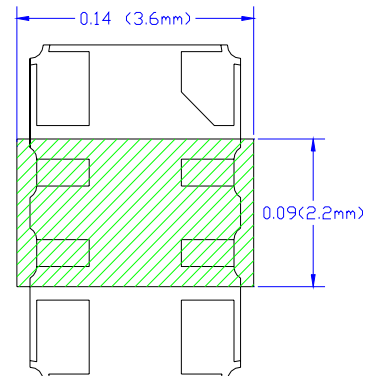
| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.  |
| 2   | Ground (GND)                      |  |
| 3   | Output                            | CMOS   |
| 4   | Supply Voltage (V <sub>CC</sub> ) | Connect an appropriate power supply bypass capacitors as close as possible.  |
| -   | N. C.                             | All other pads on the bottom shall not be connected. These are internally connected and were for the TCXO compensation process |

### Layout and application information

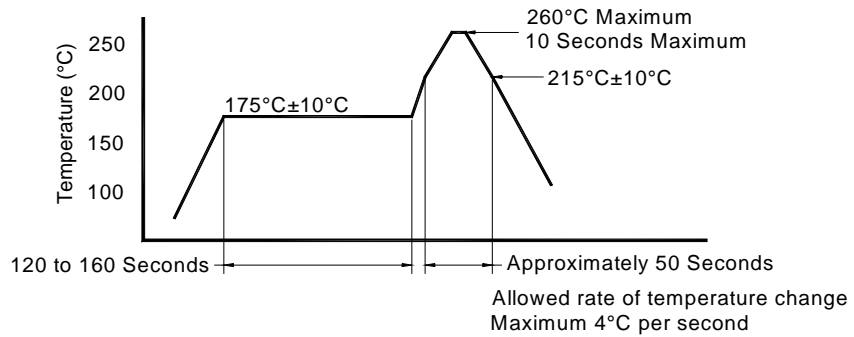
All connection points in the designated region have solder mask cover to avoid any electrical connections

For Optimum Stability and 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.
- minimize air flow across the device



### Reflow Cycle (typical for lead free processing)



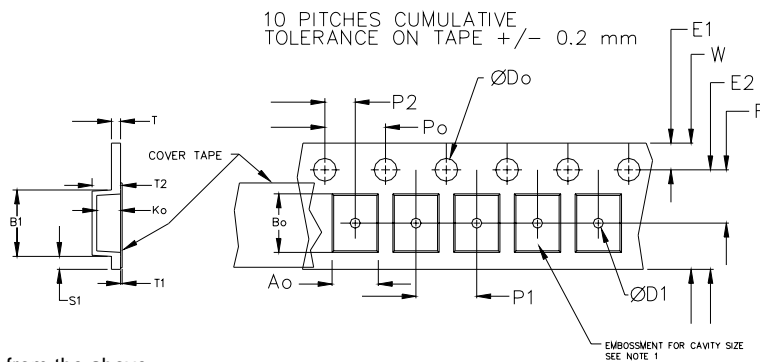
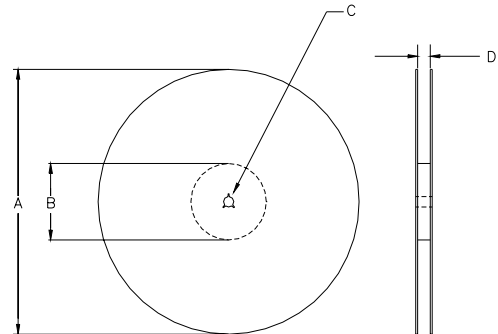
The part may be reflowed 2 times without degradation.

### 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



from the above

USER DIRECTION OF UNREELING →

| 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 |            |

Reel dimensions may vary

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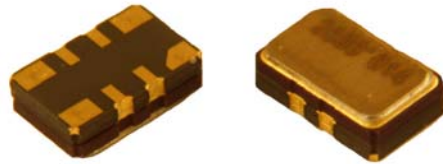
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19013 36<sup>th</sup> Ave. West  
Lynnwood, WA 98036-5761 USA

Tel: 425-776-1880  
Fax: 425-776-2760  
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URL: [www.pletronics.com](http://www.pletronics.com)

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# OeD4215-26.00M TCVCXO Oscillator

November 2010

- Pletronics' OeD4 is from the OeXO™ Series of temperature compensated voltage controlled crystal oscillator with a CMOS output.
- Cut Tape -or- Tape and Reel packaging
- 3.2 x 5 mm LCC Ceramic Package
- Supply Voltage: 3.3V

**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: 0.10 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 +6.5V                  |
| 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 |

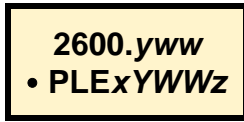
## Thermal Characteristics

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

## ESD Rating

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

### Part Marking:



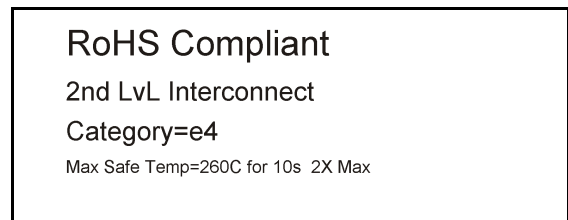
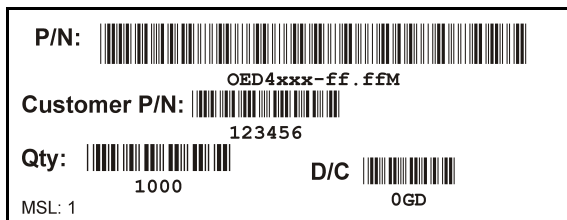
|      |   |  |
|------|---|--|
| 1920 | = | 26.00MHz, the crystal frequency          |
| yww  | = | Year and Week of the crystal manufacture |
| PLE  | = | Pletronics                               |
| X    | = | Model number, normally a "B"             |
| YWW  | = | Year and Week of assembly of the TCXO    |
| Z    | = | internal factory code                    |

The actual part number is OED4215-26.00M where the model number "215" is the specification number the part is made to. This is not included in the part marking. This is included on the label on the Tape and Reel.

### Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII  
 The bar code will show the actual Part Number  
**(OED4215-26.00M)**

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



### Reliability: Environmental Compliance

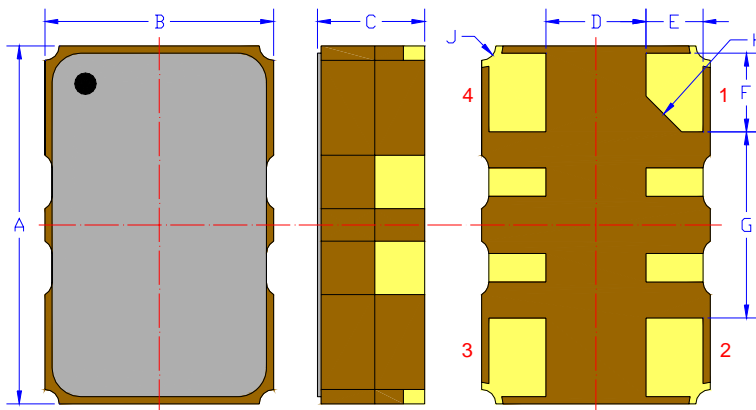
| Parameter        | Condition                            |
|------------------|--------------------------------------|
| Mechanical Shock | MIL-STD-883 Method 2002, Condition B |
| Vibration        | MIL-STD-883 Method 2007, Condition A |
| Solderability    | MIL-STD-883 Method 2003              |
|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

## Electrical Specification for specified Vcc= 3.3V ±5% over the specified temperature range.

| Item   | Min                        | TYP  | Max                        | Unit       | Condition  |
|--|----------------------------|--|----------------------------|------------|--|
| Frequency Stability over temperature                                 | -250                       | -  | 250                        | ppb        | Over -40°C to 85°C<br>at fixed supply voltage + load (reference to midpoint min/max frequency)   |
| Holdover   | -250<br>-125               | 0<br>0                                     | 250<br>125                 | ppb<br>ppb | Over -40°C to 85°C for 24 hours<br>Over ±5°C change for 24 hours   |
| Frequency Calibration  | -2.0                       | -  | 2.0                        | ppm        | Frequency offset at 25°C, 60 minutes after reflow.   |
| Supply voltage stability   | -10                        | 0  | 10                         | ppb        | ± 2% variation in supply voltage   |
| Load sensitivity   | -5                         | -  | 5                          | ppb        | 10K ohm ±5%    10 pF ±10%  |
| Warm Up  | -                          | 0.4  | 3.0                        | S          | Time to reach specified frequency  |
| Aging rate following reflow  | -<br>-<br>-                | ±10<br>±3<br>±1                            | -<br>-<br>-                | ppb/day    | 1 day after reflow<br>7 days after reflow<br>30 days after reflow  |
| Long term stability (Aging)  | -1000<br>-1500<br>-4600    | -<br>-<br>-                                | 1000<br>1500<br>4600       | ppb        | after 1 year<br>after 5 years<br>after 15 years  |
| Output Waveform  | CMOS                       |  |                            |            |  |
| Output V <sub>HIGH</sub>   | 90                         | -  | -                          | %Vs        | Load: 10K ohm ±5%    10 pF ±10%<br>V <sub>th</sub> : T <sub>R</sub> and T <sub>F</sub> 10% and 90% of amplitude<br>V <sub>th</sub> : D.C. 50% of amplitude |
| Output V <sub>LOW</sub>  | -                          | -  | 10                         | %Vs        |  |
| T <sub>RISE</sub> and T <sub>FALL</sub>                              | -                          | -  | 6.5                        | nS         |  |
| Duty Cycle   | 40                         | 50   | 60                         | %          |  |
| Phase Noise<br>1 Hz<br>10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz | -<br>-<br>-<br>-<br>-<br>- | -71<br>-93<br>-117<br>-138<br>-152<br>-155 | -<br>-<br>-<br>-<br>-<br>- | dBc/Hz     | at 25°C  |
| Jitter   | -                          | -  | 0.6                        | pS         | Frequency offset from carrier 12kHz to 20MHz   |
| V Supply Range <sup>1</sup> V <sub>CC</sub>                          | 3.13                       | 3.30                                       | 3.47                       | Volts      |  |
| Supply Current I <sub>CC</sub>                                       | -                          | -  | 3.0                        | mA         |  |
| Vcontrol Range   | 0.5                        | -  | 2.50                       | Volts      | 1.50 volts nominal   |
| Frequency Pullability  | 5                          | -  | 10                         | ±ppm       | Slope positive   |
| Linearity  | -                          | 0.05                                       | 2.0                        | %          | In accordance with MIL-PRF-55310   |
| Operating Temperature  | -40                        | -  | +85                        | °C         | Widest range allowed   |
| Storage Temperature  | -55                        | -  | +95                        | °C         |  |

Note: <sup>1</sup> For correct operation a 10nF supply de-coupling capacitor should be placed next to the device.

**Mechanical:**



|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.197 ±0.008 | 5.00 ±0.20 |
| B              | 0.126 ±0.008 | 3.20 ±0.20 |
| C              | 0.059 max    | 1.50 max   |
| D <sup>1</sup> | 0.055        | 1.40       |
| E <sup>1</sup> | 0.031        | 0.80       |
| F <sup>1</sup> | 0.043        | 1.10       |
| G <sup>1</sup> | 0.102        | 2.60       |
| H <sup>1</sup> | 0.013C       | 0.50C      |
| J <sup>1</sup> | 0.008        | 0.20R      |

Not to Scale

<sup>1</sup> Typical dimensions

**Contacts:**

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm)  
over  
Nickel 50 to 350 μinches (1.27 to 8.89 μm)

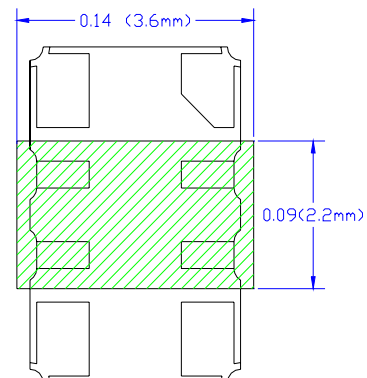
| Pad | Function                          | Note   |
|-----|-----------------------------------|--|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.  |
| 2   | Ground (GND)                      |  |
| 3   | Output                            | CMOS   |
| 4   | Supply Voltage (V <sub>CC</sub> ) | Connect an appropriate power supply bypass capacitors as close as possible.  |
| -   | N. C.                             | All other pads on the bottom shall not be connected. These are internally connected and were for the TCXO compensation process |

**Layout and application information**

All connection points in the designated region have solder mask cover to avoid any electrical connections

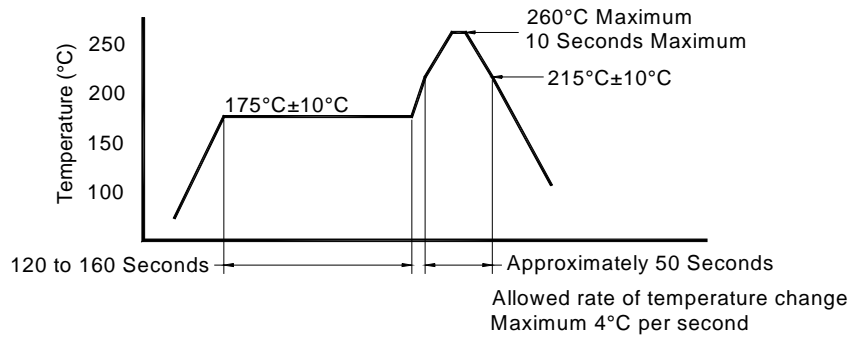
For Optimum Stability and Jitter Performance, Pletronics recommends:

- 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.
- minimize air flow across the device





### Reflow Cycle (typical for lead free processing)



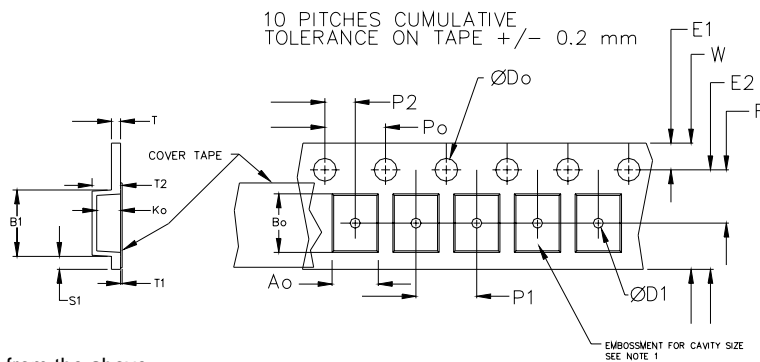
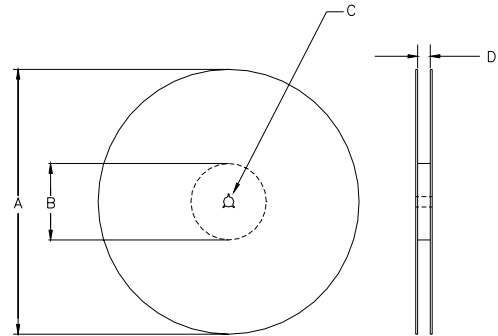
The part may be reflowed 2 times without degradation.

### 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



from the above

USER DIRECTION OF UNREELING →

| 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 |            |

Reel dimensions may vary

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