



## TCF4 Series TCVCXO Oscillator

January 2009



- Pletronics' TCF4 Series is a temperature compensated voltage controlled crystal oscillator with a clipped sinewave output.
- The package is designed for high density surface mount designs.
- Tape and Reel packaging is available.
- 10 to 40 MHz
- 2.0 x 2.5 mm LCC Ceramic Package
- Optional Voltage Control Function

**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: 0.13 grams  
Moisture Sensitivity Level: 1 As defined in J-STD-020C  
Second Level Interconnect code: e4

### Absolute Maximum Ratings:

| Parameter                      | Unit                            |
|--------------------------------|---------------------------------|
| V <sub>CC</sub> Supply Voltage | -0.5V to +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 Number:

|  |     |     |   |   |     |     |         |     |  |
|--|-----|-----|---|---|-----|-----|---------|-----|--|
| TCF4   | 031 | 035 | G | H | 015 | 008 | -12.75M | -XX |  |
| Internal code or blank   |     |     |   |   |     |     |         |     |  |
| Nominal Frequency in MHZ   |     |     |   |   |     |     |         |     |  |
| <b>Pullability in ppm (Vcontrol)</b><br><b>000</b> = TCXO only<br><b>008</b> = ± 8 ppm minimum<br><b>015</b> = ± 15 ppm minimum  |     |     |   |   |     |     |         |     |  |
| <b>Stability in ppm</b><br><b>010</b> = ± 1 ppm<br><b>015</b> = ± 1.5 ppm<br><b>025</b> = ± 2.5 ppm  |     |     |   |   |     |     |         |     |  |
| <b>Highest Specified Operating Temperature</b><br><b>A</b> = +40°C <b>E</b> = +60°C <b>J</b> = +80°C<br><b>B</b> = +45°C <b>F</b> = +65°C <b>K</b> = +85°C<br><b>C</b> = +50°C <b>G</b> = +70°C<br><b>D</b> = +55°C <b>H</b> = +75°C                               |     |     |   |   |     |     |         |     |  |
| <b>Lowest Specified Operating Temperature</b><br><b>A</b> = +10°C <b>E</b> = -10°C <b>J</b> = -30°C<br><b>B</b> = +5°C <b>F</b> = -15°C <b>K</b> = -35°C<br><b>C</b> = +0°C <b>G</b> = -20°C <b>L</b> = -40°C<br><b>D</b> = -5°C <b>H</b> = -25°C <b>M</b> = -45°C |     |     |   |   |     |     |         |     |  |
| <b>Highest Supply Voltage *</b><br><b>035</b> = 3.5 volts for 3.3 volts nominal<br><b>031</b> = 3.1 volts for 3.0 volts nominal<br><b>026</b> = 2.6 volts for 2.5 volts nominal  |     |     |   |   |     |     |         |     |  |
| <b>Lowest Supply Voltage *</b><br><b>031</b> = 3.1 volts for 3.3 volts nominal<br><b>029</b> = 2.9 volts for 3.0 volts nominal<br><b>024</b> = 2.4 volts for 2.5 volts nominal   |     |     |   |   |     |     |         |     |  |
| <b>Series (Part Type, Logic &amp; Package)</b>   |     |     |   |   |     |     |         |     |  |

\* Supply Voltage: Select range between 2.7V and 5.0V with Highest / Lowest ≤ 1.10  
 For Example: the part number for 3.3V nominal would be TCE4032034.....

## Part Marking:

XXXXXX  
Pwwyzz

Where:

**XXXXXX** = process code for crystal  
**wwyzz** = Date code

## Electrical Specification for specified Vcc range of 2.3V through 3.7V with a variation of $\pm 5\%$ over the specified temperature range

| Item                                     | Min                                  | Typ              | Max                          | Unit             | Condition                                    |                    |
|--|--------------------------------------|------------------|------------------------------|------------------|--|--------------------|
| Frequency Range                          | 10                                   | -                | 40                           | MHZ              |  |                    |
| Frequency Accuracy Range <sup>1</sup>    | -2.5<br>-0.5                         | -                | +2.5<br>+0.5                 | ppm              | Vcontrol 1.50 volts if used <sup>2</sup>     |                    |
| Frequency setting                        | -2                                   | 0                | +2                           | ppm              | Vcontrol 1.50 volts at 25°C                  |                    |
| Frequency Stability vs. Supply           | -0.2                                 | 0                | +0.2                         | ppm              | Load: 10K ohm // 10 pF & Vcc $\pm 5\%$       |                    |
| Frequency Stability vs. Load             | -0.2                                 | 0                | +0.2                         | ppm              | Load: 10K ohm // 10 pF $\pm 5\%$             |                    |
| Output Waveform                          | Clipped Sinewave                     |                  |                              |                  |  |                    |
| Output Level                             | 0.8                                  | -                | 1.1                          | V p-p            | Load: 10K ohm $\pm 10\%$ // 10 pF $\pm 10\%$ |                    |
| Phase Noise                              | 100 Hz<br>1 KHz<br>10 KHz<br>100 KHz | -<br>-<br>-<br>- | -110<br>-130<br>-145<br>-145 | -<br>-<br>-<br>- | dBc/Hz                                       |                    |
| V Supply Range <sup>1</sup>              | V <sub>CC</sub>                      | 2.3              | -                            | 3.7              | Volts  |                    |
| Supply Current                           | I <sub>CC</sub>                      | -                | -                            | 2.0              | mA   |                    |
| Aging                                    |                                      | -1.0             | -                            | +1.0             | ppm  | Per year at 25°C   |
| Vcontrol Range                           |                                      | 0.5              | -                            | 2.50             | Volts  | 1.50 volts nominal |
| Frequency Pullability <sup>1</sup>       |                                      | -5               | $\pm 3$                      | +5               | ppm  |                    |
| Operating Temperature Range <sup>1</sup> |                                      | -30              |                              | +85              | °C   |                    |
| Storage Temperature Range                |                                      | -55              |                              | +95              | °C   |                    |

<sup>1</sup> Specified by part number

<sup>2</sup> For all supply voltages, load changes, aging for 1 year, shock, vibration and temperatures

## 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 |

### Package Labeling

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

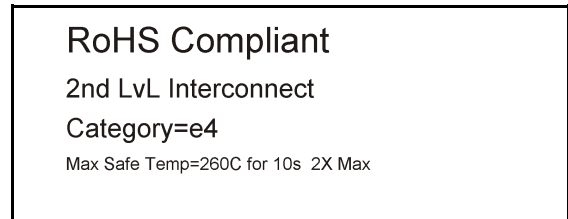
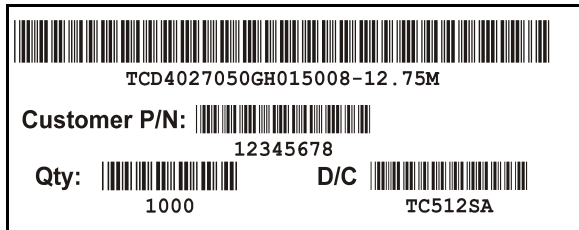
Font is Courier New

Bar code is 39-Full ASCII

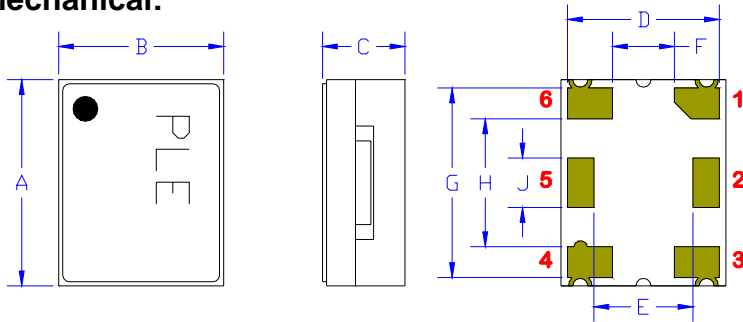
(the label will show the TCF4 actual part number)

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

Font is Arial



### Mechanical:



Not to Scale

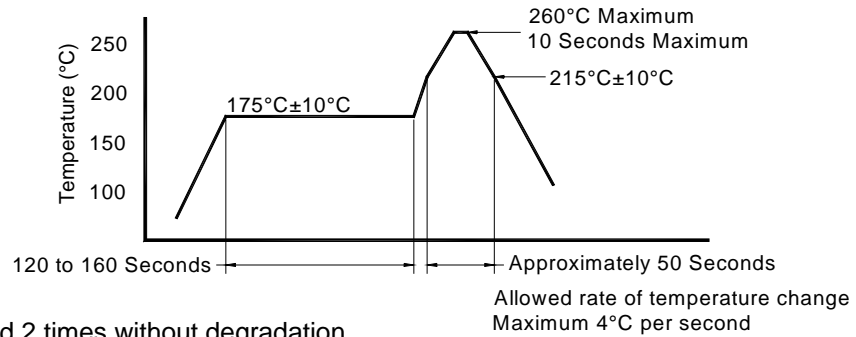
<sup>1</sup> Typical dimensions

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

|                | Inches       | mm         |
|----------------|--------------|------------|
| A              | 0.098 ±0.008 | 2.50 ±0.20 |
| B              | 0.079 ±0.008 | 2.00 ±0.20 |
| C              | 0.040 max    | 1.0 max    |
| D <sup>1</sup> | 0.072        | 1.84       |
| E <sup>1</sup> | 0.047        | 1.20       |
| F <sup>1</sup> | 0.030        | 0.75       |
| G <sup>1</sup> | 0.091        | 2.30       |
| H <sup>1</sup> | 0.061        | 1.55       |
| J <sup>1</sup> | 0.028        | 0.70       |

| Pad | Function                          | Note  |
|-----|-----------------------------------|---|
| 1   | Vcontrol Input                    | If this function is not specified, recommend connecting this pad to ground.           |
| 2   | none                              | No connection or Ground. Ground is recommended)                                       |
| 3   | Ground (GND)                      |   |
| 4   | Output                            |   |
| 5   | none                              | No connection or Ground. Ground is recommended)                                       |
| 6   | Supply Voltage (V <sub>CC</sub> ) | Recommend connecting appropriate power supply bypass capacitors as close as possible. |

## Reflow Cycle (typical for lead free processing)



The part may be reflowed 2 times without degradation.

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

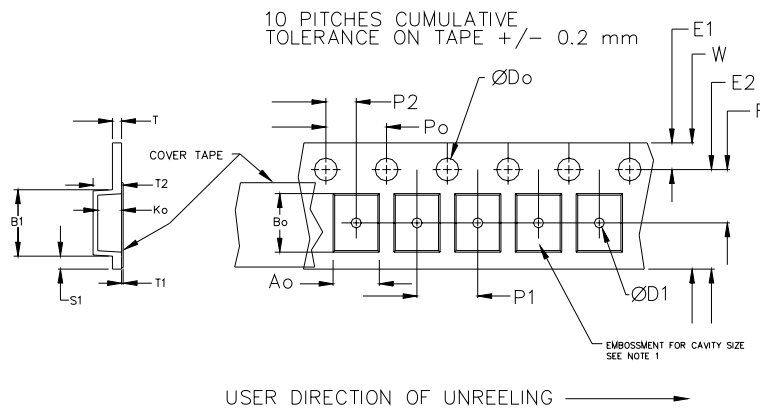
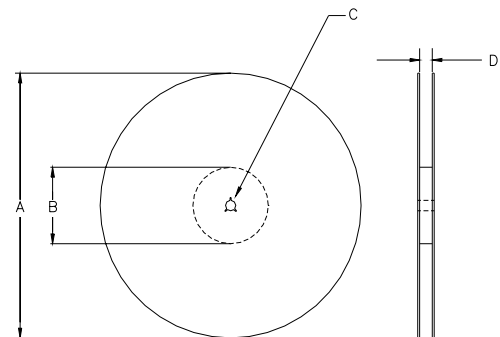
| Constant Dimensions Table 1 |     |              |      |     |            |        |       |        |
|-----------------------------|-----|--------------|------|-----|------------|--------|-------|--------|
| Tape Size                   | D0  | D1 Min       | E1   | P0  | P2         | S1 Min | T Max | T1 Max |
| 8mm                         | 1.5 | 1.0          | 1.75 | 4.0 | 2.0 ± 0.05 | 0.6    | 0.6   | 0.1    |
| 12mm                        |     | 1.5          |      |     | 2.0 ± 0.1  |        |       |        |
| 16mm                        |     | +0.1<br>-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         |            |
|                 | mm     | 63.5             | 101.6        | 95.3         |            |
| C               | mm     | 13.0 +0.5 / -0.2 |              |              |            |
| D               | mm     | 16.4             | 16.4         | 16.4         |            |
|                 |        | +2.0<br>-0.0     | +2.0<br>-0.0 | +2.0<br>-0.0 |            |

Reel dimensions may vary from the above

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