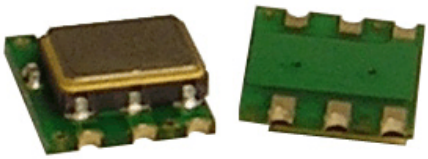
# LV76D / LV78D Series 2.5 V
## LVDS Clock Oscillators

February 2010



**Do Not Use for New Designs - use LV55 or LV77**

- Pletronics' LV76D / LV78D Series is a quartz crystal controlled precision square wave generator with an LVDS output.
- Solder pad compatible with many 9x14mm plastic J lead packages.
- Tape and Reel or cut tape packaging is available.
- 80 to 250 MHz
- 9.04mm x 8.23mm (S package)
- Enable/Disable LV76D on pad 1
  LV78D on pad 2
- Disable function includes low standby power mode
- 3rd Overtone Crystals used
- Low Jitter
- 5x7 mm LV77xxDW is used

**Pletronics Inc. certifies this device is in accordance with the RoHS 5/6 (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: 0.4 grams
Moisture Sensitivity Level: 1 As defined in J-STD-020C
Second Level Interconnect code: e4

### Absolute Maximum Ratings:

| Parameter | Unit |
|---|---|
| $V_{CC}$ Supply Voltage | -0.5V to +5.0V |
| Vi Input Voltage | -0.5V to $V_{CC}$ + 0.5V |
| Vo Output Voltage | -0.5V to $V_{CC}$ + 0.5V |

### Thermal Characteristics

The maximum die or junction temperature is 155°C
The thermal resistance junction to board is 60 to 100°C/Watt depending on the solder pads, ground plane and construction of the PCB.

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## LVDS Clock Oscillators

February 2010

**Part Number:**

| LV7x | 45 | D | E | W | -125.0M | -XX |
|---|---|---|---|---|---|---|

| | |
|---|---|
| **Packaging code or blank**<br>T250 = 250 per Tape and Reel<br>T500 = 500 per Tape and Reel<br>T1K = 1000 per Tape and Reel | |
| **Frequency in MHz** | |
| **Supply Voltage $V_{cc}$**<br>**W** = 2.5V ± 10% | |
| **Optional Enhanced OTR**<br>**Blank** = Temp. range -10 to +70°C<br>**E** = Temp. range -40 to +85°C | |
| **Series Model** | |
| **Frequency Stability**<br>**45** = ± 50 ppm<br>**44** = ± 25 ppm<br>**20** = ± 20 ppm | |
| **Series Model** LV76 or LV78 | |

**Part Marking:**

**PLE LV77**
***FF.FFF* M**
• ***YMDXX***

**Marking Legend:**
PLE = Pletronics — The marking is on the cover of the LV77 device
*FF.FFF* M = Frequency in MHz — The marking is that of the LV77 device
*YMD* = Date of Manufacture (year and week, or year-month-day)
All other marking is internal factory codes

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

**Codes for Date Code YMD**

| Code | 6 | 7 | 8 | 9 | 0 | 1 | 2 |
|---|---|---|---|---|---|---|---|
| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |

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

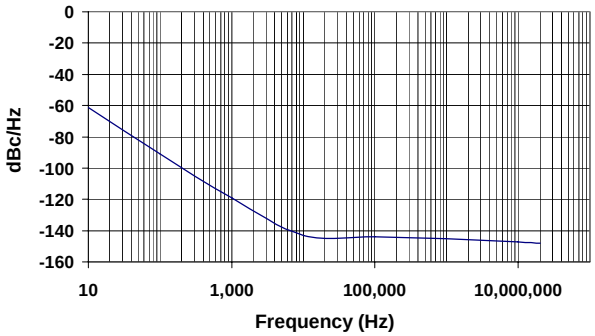
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Code | D | E | F | G | H | J | K | L | M | N | P | R |
| Day | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Code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

## Electrical Specification for 2.50V ±10% over the specified temperature range

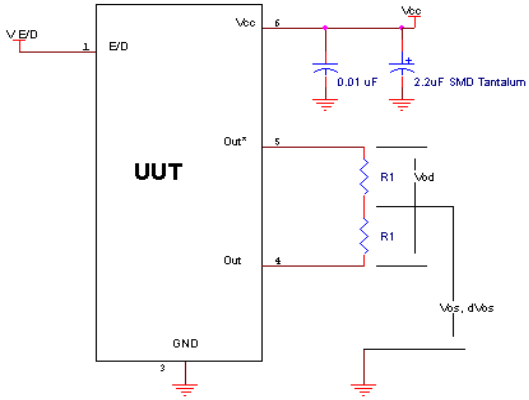
| Item | Min | Max | Unit | Condition |
|---|---|---|---|---|
| Frequency Range | 80 | 250 | MHz | |
| Frequency Accuracy "**45**" | -50 | +50 | ppm | For all supply voltages, load changes, aging for 1 year, shock, vibration and temperatures |
| "**44**" | -25 | +25 | | |
| "**20**" | -20 | +20 | | |
| Output Waveform | LVDS | | | |
| Output High Level | -- | 1.60 | Volts | See load circuit R1 = 50 ohms |
| Output Low Level | 0.90 | -- | Volts | See load circuit R1 = 50 ohms |
| Differential Output ($V_{OD}$) | 247 | 454 | mVolts | See load circuit R1 = 50 ohms |
| Output Offset Voltage ($V_{OS}$) | 1.125 | 1.375 | Volts | See load circuit R1 = 50 ohms |
| Differential Output Error ($dV_{OS}$) | -- | 50 | mVolts | See load circuit R1 = 50 ohms |
| Output Symmetry | 45 | 55 | % | Referenced to 50% of amplitude or crossing point |
| Output $T_{RISE}$ and $T_{FALL}$ | 300 | 700 | pS | Vth is 20% and 80% of waveform |
| Jitter | - | 0.15 | pS RMS | Measured from 12KHz to 20MHz from Fnominal |
| | - | 2.8 | | Measured from 10Hz to 1MHz from Fnominal |
| Vcc Supply Current | - | 63 | mA | Includes current of properly terminated device |
| Enable/Disable Internal Pull-up | 50 | - | Kohm | To Vcc (equivalent resistance) |
| V disable | - | 0.8 | Volts | Referenced to Ground |
| V enable | 2.0 | - | Volts | Referenced to Ground |
| Output leakage $V_{OUT} = V_{CC}$ | -10 | +10 | uA | Pad 1 low, device disabled |
| $V_{OUT}$ = 0V | -10 | +10 | uA | |
| Enable | - | 10 | nS | Time for output to reach a logic state |
| Disable time | - | 10 | nS | Time for output to reach a high Z state |
| Start up time | - | 5 | mS | Measured from the time Vcc = 3.0V |
| Operating Temperature Range | -10 | +70 | °C | Standard Temperature Range |
| | -40 | +85 | °C | Extended Temperature Range "**E**" Option |
| Storage Temperature Range | -55 | +125 | °C | |
| Standby Current $I_{CC}$ | - | 3 | uA | Pad 1 low, device disabled |

Specifications with E/D open circuit

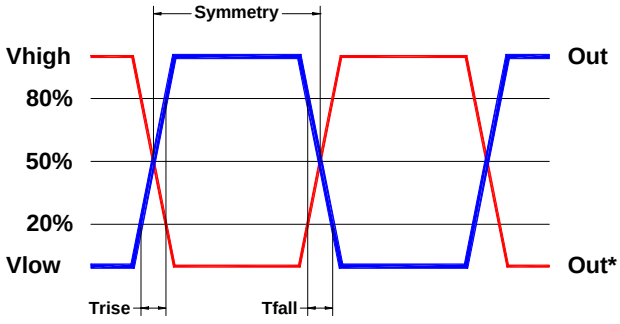
## Typical Phase-Noise Response




## Load Circuit




## Test Waveform




Showing Out Measurement only

## Reliability: Environmental Compliance

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

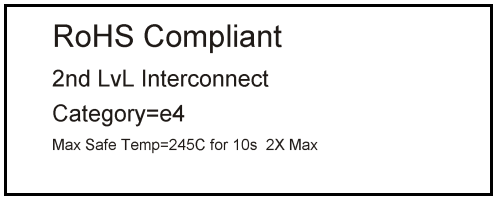
## ESD Rating

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

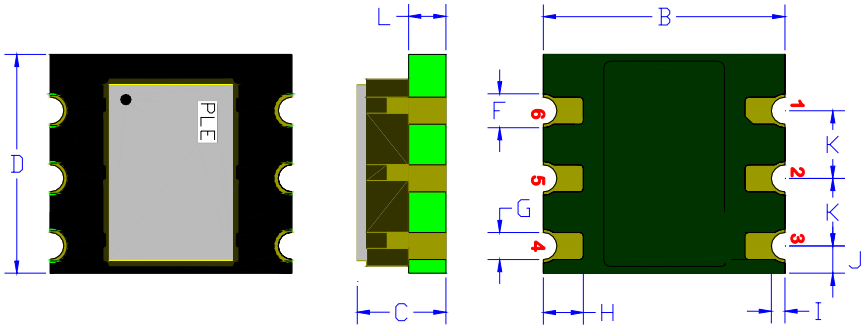
## Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Courier New
Bar code is 39-Full ASCII
(the label will show LV76 or LV78)


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



## Mechanical:




Label:
laser marked lettering

FR4 PCB Base:
Solder masked

All via holes tented on bottom
Copper Clad 670 µinch (17 µm)
Nickel plated 118 µinch (3 µm)
Gold plated 0.8 µinch (0.02 µm)
Typical thicknesses

Pin 3 Ground plane is typical
**Not to scale**

| | Inches | mm |
|---|---|---|
| B | 0.356 ±0.005 | 9.04 ±0.13 |
| C | 0.126 ±0.005 | 3.21 ±0.13 |
| D | 0.324 ±0.005 | 8.23 ±0.13 |
| F[1] | 0.050 | 1.27 |
| G[1] | 0.040 | 1.02 |
| H[1] | 0.059 | 1.50 |
| I[1] | 0.020 | 0.51 |
| J[1] | 0.040 | 1.02 |
| K[1] | 0.100 | 2.54 |
| L[1] | 0.062 | 1.57 |

| Pad | | Function | Note |
|---|---|---|---|
| 76 | 78 | | |
| 1 | 2 | No connect | There is no internal connection to this pad |
| 2 | 1 | Output Enable/Disable | When this pad is not connected the oscillator shall operate.<br>When this pad is <0.30 volts, the output will be inhibited (high impedance state.)<br>Recommend connecting this pad to $V_{CC}$ if the oscillator is to be always on. |
| 3 | | Ground (GND) | |
| 4 | | Output | The outputs must be terminated, 100 ohms between the outputs is the ideal termination. |
| 5 | | Output* | |
| 6 | | Supply Voltage ($V_{CC}$) | Recommend connecting appropriate power supply bypass capacitors as close as possible. |

## Layout and application information

Recommend connecting Pad 1 and Pad 2 together to permit the design to accept Enable/Disable on both input pads (see LV76D for E/D on pad 1)
For Optimum Jitter Performance, Pletronics recommends:

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

## Mechanical (obsolete version):

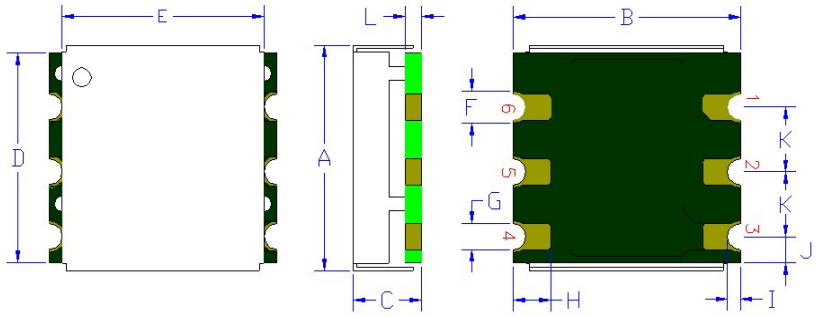
The cover is no longer being supplied over this part. This part is made with a hermetically sealed LV77xxDW series oscillator. This part is now exposed.

The cover has been deleted, the cover was causing problems with the newer high temperature RoHS lead free processes. The cover purpose was only cosmetic.

All parts with 2008 date codes will be made in the new fashion.

There is no change in electrical properties.

Pletronics does recommend that all designs should transition to the LV77xxDW ceramic part.



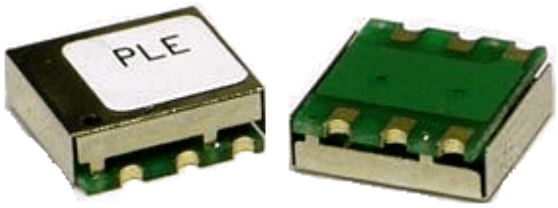

Cover:
Centered on the base
304 Stainless Steel
0.010 inch (0.25mm)
Electroless Nickel Plated
1 µinch (25 µm) typical

Label:
White Kapton with Black Letters
–or--
Blue Epoxy heat cure ink covering top with laser marked lettering

FR4 PCB Base:
Solder masked
Solder masked
All via holes tented on bottom
Copper Clad 670 µinch (17 µm)
Nickel plated 118 µinch (3 µm)
Gold plated 0.8 µinch (0.02 µm)
Typical thicknesses

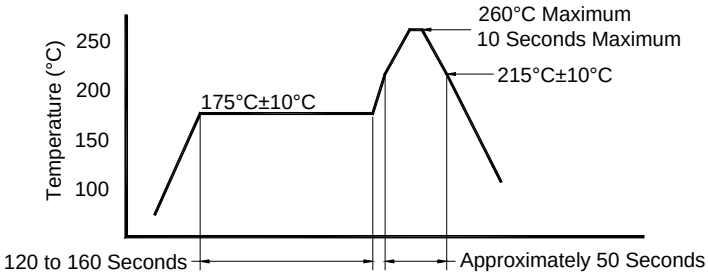
Pin 3 Ground plane is typical
**Not to scale**

| | Inches | mm |
|---|---|---|
| A | 0.351 ±0.003 | 8.91 ±0.07 |
| B | 0.356 ±0.005 | 9.04 ±0.13 |
| C | 0.103 ±0.005 | 2.62 ±0.13 |
| D[1] | 0.324 | 8.23 |
| E[1] | 0.316 | 8.03 |
| F[1] | 0.050 | 1.27 |
| G[1] | 0.040 | 1.02 |
| H[1] | 0.059 | 1.50 |
| I[1] | 0.020 | 0.51 |
| J[1] | 0.040 | 1.02 |
| K[1] | 0.100 | 2.54 |
| L[1] | 0.026 typical | 0.66 |




- The package is not hermetically sealed.
- The sides are intentionally left open to permit cleaning material to freely flow in the package, thus minimizing the accumulation of contaminants during cleaning processes.
- The internal part of the package must be thoroughly dry before operating.

## Reflow Cycle (typical for lead free processing)




The part may be reflowed 2 times without degradation.

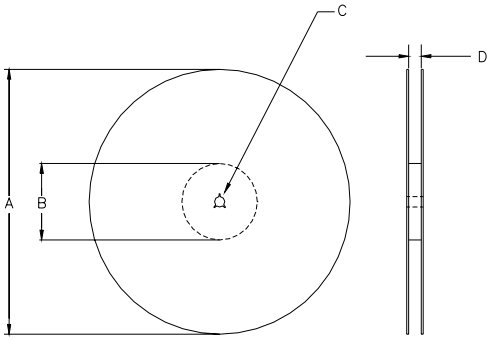
Allowed rate of temperature change
Maximum 4°C per second

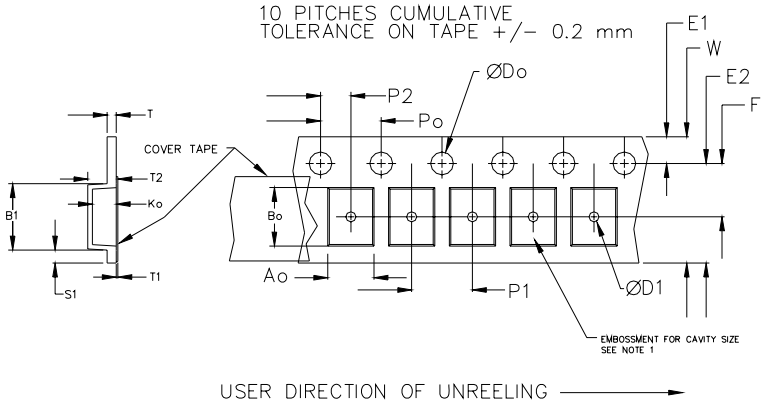
## Tape and Reel: available for quantities of 250 to 1000 per reel, cut tape for < 250

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

| Variable Dimensions Table 2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tape Size | B1 Max | E2 Min | F | P1 | T2 Max | W Max | Ao, Bo & Ko |
| 24 mm | 9.88 | 22.25 | 11.5 ±0.1 | 16.0 ±0.1 | 3.22 | 24.3 | Note 1 |

Note 1: Embossed cavity to conform to EIA-481-B  Dimensions in mm  Not to scale




| | | REEL DIMENSIONS | | | |
|---|---|---|---|---|---|
| A | inches | 7.0 | 10.0 | 13.0 | |
| | mm | 177.8 | 254.0 | 330.2 | |
| B | inches | 2.50 | 4.00 | 3.75 | |
| | mm | 63.5 | 101.6 | 95.3 | Tape Width |
| C | mm | 13.0 +0.5 / -0.2 | | | |
| D | mm | --- | --- | 24.4 +2.0 -0.0 | 24.0 |

Reel dimensions may vary from the above

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