

# PE91/PE97 Series 3.3 V PECL Clock Oscillators

April 2010



- Pletronics PE91/PE97 Series is a quartz crystal controlled precision square wave generator with an PECL output.
- Solder pad compatible legacy PECL oscillator solutions.
- FR4 base using the PE93 or PE99 5x7 mm ceramic packaged SMD device.
- Tape and Reel packaging is available.
- 10.9 to 1,175 MHz
- 9.7 mm x 14.0 mm 'B' package
- Enable/Disable Function:
  - **PE91** on pad 2
  - **PE97** on pad 1
- Low Jitter

***This series, PE91 and PE97, is not recommended for new designs. Use PE93 or PE99 series for new designs .***

**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: 0.66 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 40 to 80°C/Watt depending on the solder pads, ground plane and construction of the PCB.

### Part Number:

PE9x	45	D	E	V	-125.0M	-XX	
							<b>Packaging code or blank</b> T250 = 250 per Tape and Reel T500 = 500 per Tape and Reel T1K = 1000 per Tape and Reel
							<b>Frequency in MHZ</b>
							<b>Supply Voltage V<sub>CC</sub></b> <b>V = 3.3V ± 10%</b>
							<b>Temperature Range</b> <b>blank = -10 to +70°C</b> <b>C = -20 to +70°C</b> <b>E = -40 to +85°C</b>
							<b>Series Model</b>
							<b>Frequency Stability</b> <b>45 = ± 50 ppm</b> <b>44 = ± 25 ppm</b> <b>20 = ± 20 ppm</b>
							<b>Series Model (x is 1 or 7)</b>

### Part Marking:

**PLE PE9x**  
**FF.FFF M**  
 • **YMDXX**

### Marking Legend:

PLE = Pletronics      X = 1 or 7  
 FF.FFF M = Frequency in MHZ  
 YMD = Date of Manufacture (year-month-day)  
 All other marking is internal factory codes

### Codes for Date Code YMD

Code	0	1	2	3	4	Code	A	B	C	D	E	F	G	H	J	K	L	M
Year	2010	2011	2012	2013	2014	Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Code	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

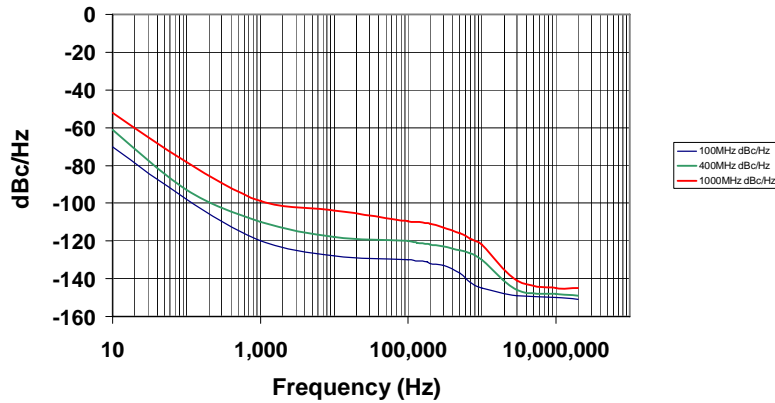
Code	H	J	K	L	M	N	P	R	T	U	V	W	X	Y	Z
Day	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

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

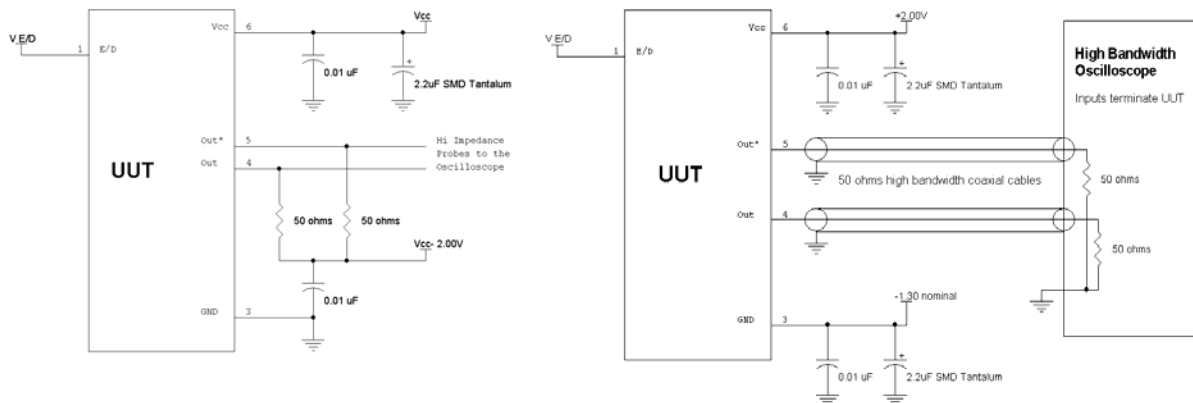
Item	Min	Max	Unit	Condition	
Frequency Accuracy	"45"	-50	+50	ppm	For all supply voltages, load changes, aging for 1 year, shock, vibration and temperatures
	"44"	-25	+25		
	"20"	-20	+20		
Output Waveform	PECL / ECL				
Output High Level	2.12	2.49	volts	Referenced to Ground, $V_{CC} = 3.3 V$	
	0.82	1.19	volts	Referenced to termination voltage, $V_{CC} = 3.3 V$	
	-1.18	-0.81	volts	Referenced to $V_{CC}$ , $V_{CC} = 3.3 V$	
Output Low Level	1.83	1.99	volts	Referenced to Ground, $V_{CC} = 3.3 V$	
	0.53	0.69	volts	Referenced to termination voltage, $V_{CC} = 3.3 V$	
	-1.47	-1.31	volts	Referenced to $V_{CC}$ , $V_{CC} = 3.3 V$	
Output Symmetry	47	53	%	at 50% point of $V_{CC}$ (See load circuit)	
Jitter	-	0.6	pS RMS	12 KHz to 20 MHz from the output frequency	
	-	2.8	pS RMS	10 Hz to 20 MHz from the output frequency	
Output $T_{RISE}$ and $T_{FALL}$	100	300	pS	$V_{th}$ is 20% and 80% of waveform	
$V_{CC}$ Supply Current ( $I_{CC}$ )	-	90	mA		
Enable/Disable Internal Pull-up	50	-	Kohm	to $V_{CC}$	
V disable	-	0.8	volts	Referenced to pad 3	
V enable	2.00	-	volts	Referenced to pad 3	
Output leakage	$V_{OUT} = V_{CC}$	-50	+50	uA	Pad 1 low, device disabled
	$V_{OUT} = 0V$	-50	+50		
Enable time	-	10	nS	Time for output to reach a logic state	
Disable time	-	10	nS	Time for output to reach a high Z state	
Start up time	-	5	mS	Time for output to reach specified frequency	
Operating Temperature Range	-10	+70	°C	Standard Temperature Range	
	-20	+70	°C	Extended Temperature Range "C" Option	
	-40	+85	°C	Extended Temperature Range "E" Option	
Storage Temperature Range	-55	+125	°C		

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

## Typical Phase-Noise Response

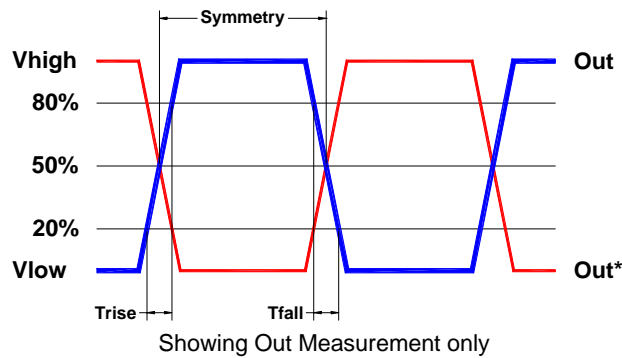


## Load Circuit



E/D shown on pad 1 for PE97, will be on pad 2 for PE91

## Test Waveform



## Reliability: Environmental Compliance

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

## ESD Rating

Model	Minimum Voltage	Conditions
Human Body Model	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 part number will show as PE91xx or PE97xx)

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

Font is Arial

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

RoHS Compliant
2nd Lvl Interconnect
Category=e4
Max Safe Temp=245C for 10s 2X Max

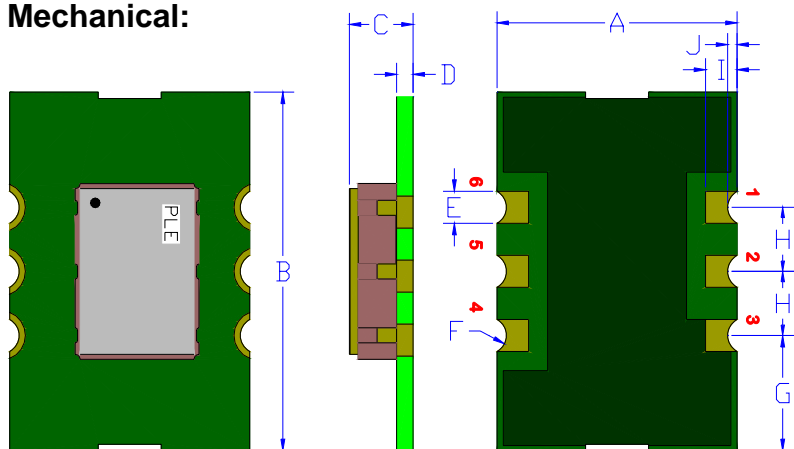
## Layout and application information

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
- do not place near piezoelectric buzzers or mechanical fans.

As much ground plane and thermal paths that can be realized under and to the side of the part is desired.

## Mechanical:



FR4 PCB Base:  
Solder masked  
All via holes tented on bottom  
Copper Clad ½ oz. Typical  
Gold plated 0.02 µinch (0.5 µm)

Pin 3 Ground plane is typical

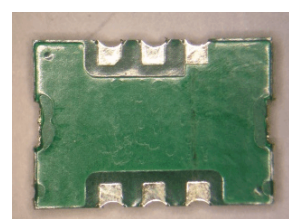
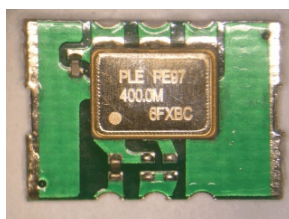
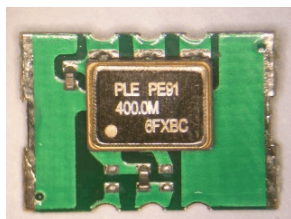
**Not to scale**

	Inches	mm
A	0.380 ±0.010	9.65 ±0.25
B	0.550 ±0.010	13.97 ±0.25
C	0.098 ±0.010	2.49 ±0.25
D <sup>1</sup>	0.026 typ.	0.66
E <sup>1</sup>	0.050	1.27
F <sup>1</sup>	0.028 R	0.72 R
G <sup>1</sup>	0.180	4.57
H <sup>1</sup>	0.100	2.54
I <sup>1</sup>	0.050	1.27
J <sup>1</sup>	0.015	0.38

<sup>1</sup> Typical Dimensions

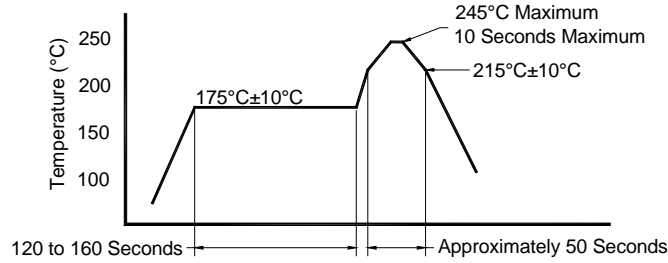
## Label:

Laser engraved on the 5x7 mm oscillator that is mounted on the FR4 base



PE91 Pad	PE97 Pad	Function	Note
2	1	Output Enable/Disable	When this pad is not connected the oscillator shall operate. This is not a recommended condition!!!! When this pad is <0.80 volts, the output will be inhibited (High impedance state) Recommend connecting this pad to V <sub>CC</sub> if the oscillator is to be always on.
1	2	No function	Recommend connecting this pad to ground. The is internal connection.
3		Ground (GND)	
4		Output	Both outputs must be terminated and biased for proper operation. The ideal termination is 50 ohms connected to 2.0V below the Supply Voltage. The outputs become a High Z when disabled and the voltage level is determined by the termination circuitry.
5		Output*	
6		Supply Voltage (V <sub>CC</sub> )	Recommend connecting appropriate power supply bypass capacitors as close as possible.

## Reflow Cycle (typical for lead free processing)



The part may be reflowed 3 times without degradation.

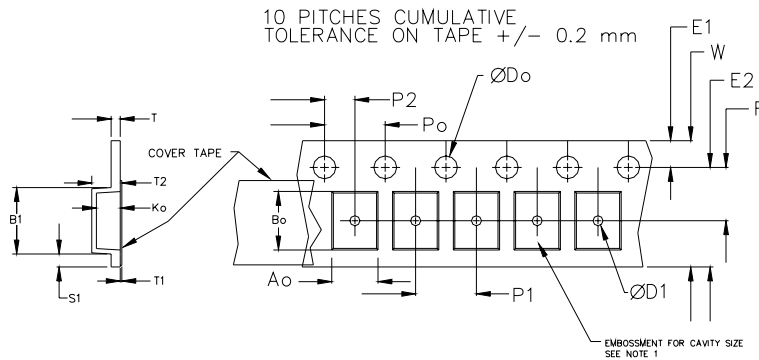
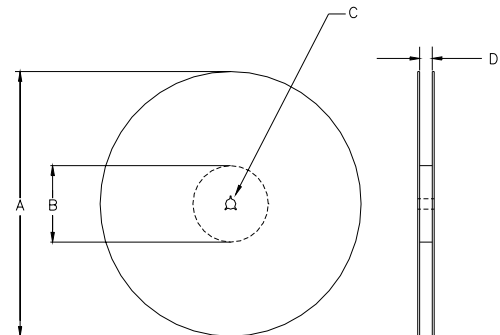
Allowed rate of temperature change  
Maximum 4°C per second

## Tape and Reel: available for quantities of 250 to 1000 per reel

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			1.5			
24mm		1.5			1.5			

Variable Dimensions Table 2							
Tape Size	B1 Max	E2 Min	F	P1	T2 Max	W Max	Ao, Bo & Ko
24 mm	12.1	14.25	7.5 ± 0.1	16.0 ± 0.1	8.0	16.3	Note 1

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



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	---	---	24.4 +2.0 -0.0	

Reel dimensions may vary from the above