



# PLETRONICS SM22K 32.768kHz 2016 CMOS Clock Oscillator



SM22K  
2.05 x 1.65 x 0.75 mm  
LCC Ceramic Package

## Features

- Quartz crystal controlled precision square wave oscillator
- CMOS Output
- Enable/Disable Function
- 1.62 ~ 3.63V Supply Voltage range
- 32.768 kHz

## Applications

RTC  
Smartphone  
IoT  
Wearable Device  
Watch  
Medical

## Electrical Characteristics

Parameter	Min	Typ	Max	Unit	Condition
Frequency	-	32.768	-	kHz	
Frequency Stability	±20*	-	±50	ppm	Includes supply voltage change (±10%), load change (±10%), aging for 1 year at 25°C ± 2°C, shock, vibration and temperatures. *See page 2
Operating Temperature Ranges	-20 -40	-	+70 +85	°C	
Supply Voltage <sup>1</sup> (V <sub>CC</sub> )	1.8	-	3.3	V	±10% of selected V <sub>CC</sub>
Input Current (I <sub>CC</sub> )	-	-	35	µA	No Load
Output Disabled Current (I <sub>st</sub> )	-	-	5	µA	
Output Waveform	CMOS				
Duty Cycle	45	-	55	%	At 50% V <sub>CC</sub> level, C <sub>LOAD</sub> = 15 pF
Output V <sub>HIGH</sub> (I <sub>OH</sub> = -1mA)	0.9V <sub>CC</sub>	-	-	V	
Output V <sub>LOW</sub> (I <sub>OL</sub> = 1mA)	-	-	0.1V <sub>CC</sub>	V	
Output T <sub>RISE</sub> and T <sub>FALL</sub>	-	-	50	ns	C <sub>LOAD</sub> = 15 pF 10% to 90% of V <sub>CC</sub> See Load Circuit
Startup Time	-	-	20	ms	Time for output to reach specified frequency
V <sub>DISABLE</sub> (V <sub>IL</sub> )	-	-	0.3V <sub>CC</sub>	V	Applied to Pad 1
V <sub>ENABLE</sub> (V <sub>IH</sub> )	0.7V <sub>CC</sub>	-			
Enable/Disable Pullup Resistance	-	61	-	kΩ	Pad 1 open or V <sub>IH</sub>
Output Disable Time	-	-	0.2	µs	
Output Enable Time	-	-	20	ms	
Aging 1st Year	-	-	±3	ppm	At 25°C
Storage Temperature Range	-55	-	+125	°C	

### Notes:

<sup>1</sup> Place an appropriate power supply bypass capacitor next to device for correct operation



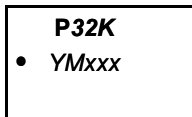
# PLETRONICS SM22K 32.768kHz 2016 CMOS Clock Oscillator

Part Number (Example: SM2245KE-32.768K)

Series Model	Frequency Stability		Operating Temperature Range	Frequency	Optional T&R Packaging code
SM22	45	K	E	- 32.768K	-XX
	45 = ± 50 ppm 44 = ± 25 ppm 20* = ± 20 ppm		C = -20 to +70°C E = -40 to +85°C	32.768 kHz	T250 = 250 per Reel T500 = 500 per Reel T3K = 3000 per Reel (Std)

\* Includes aging for -20 to +70°C, excludes aging for -40 to +85°C

## Device Marking



P = Pletronics  
32K = 32.768 kHz  
YM = Date Code, All other marking is internal code

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

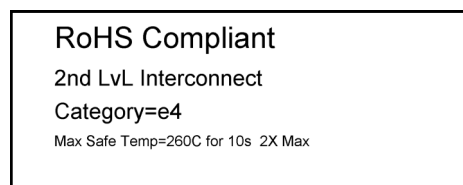
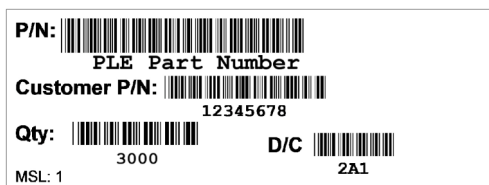
Codes for Date Code YM (Year Month)

Code	4	5	6	7	8	Code	A	B	C	D	E	F	G	H	J	K	L	M
Year	2024	2025	2026	2027	2028	Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

## Package Labeling

P/N Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Courier New  
Bar code is 39-Full ASCII

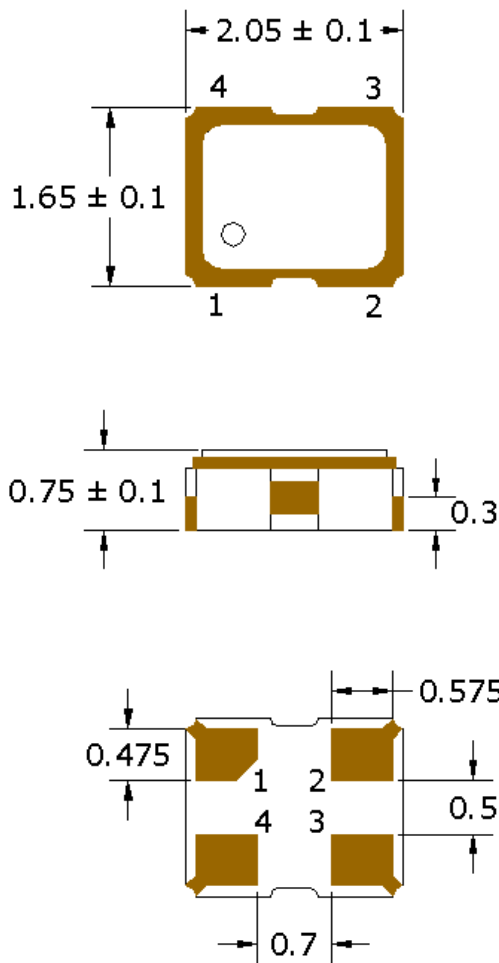
RoHS Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Arial



Pletronics Inc. certifies this device is in accordance with the RoHS and REACH directives.

Pletronics Inc. guarantees the device does not contain the following: Cadmium, Hexavalent Chromium, Lead, Mercury, PBBs, PBDE's  
Weight of the Device: 0.012 grams  
Moisture Sensitivity Level: 1 As defined in J-STD-020D  
Second Level Interconnect code: e4

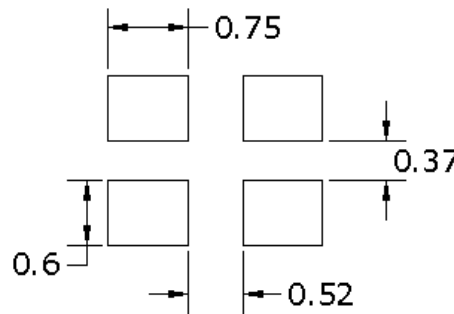
## Mechanical Dimensions



## Pad Connections

Pad	Function
1	Enable/Disable
2	Ground
3	Output
4	Vcc

ENABLE/DISABLE	
Pad 1	Output
V <sub>IH</sub> /Open	Active
V <sub>IL</sub> /Gnd	Disabled/Tristate



**Pad Layout**  
Disclaimer: Recommended layout shown. Adjust layout as needed for individual process requirements.

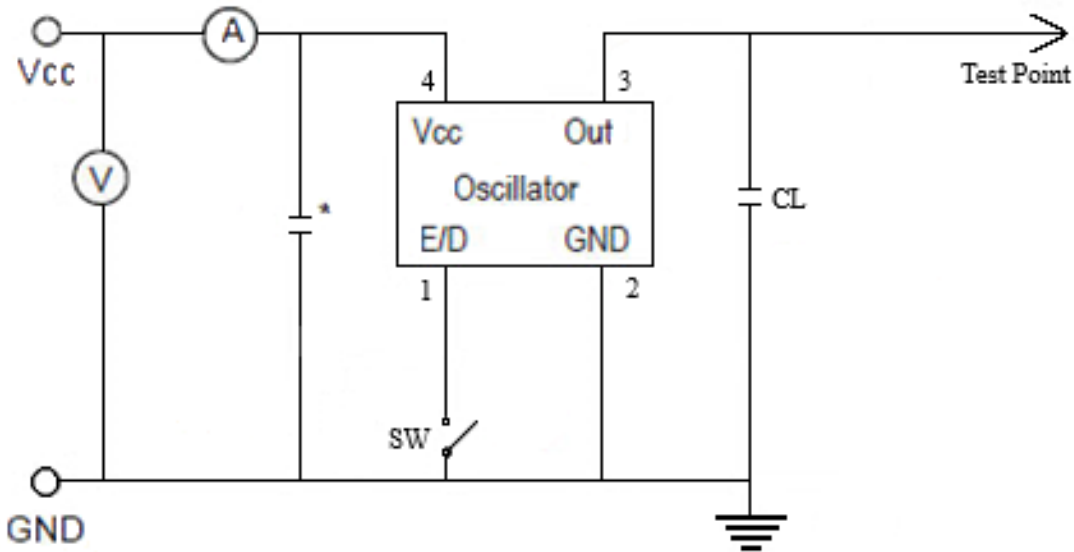
## Dimensions in mm

**Contacts (pads): Gold (0.3 to 1.0 μm) over Nickel (1.27 to 8.89 μm)**

For Optimum Jitter Performance, Pletronics recommends:

- A ground plane under the device
- Do not route large transient signals (both current and voltage) under the device
- Do not place near a large magnetic field such as a high frequency switching power supply
- Do not place near piezoelectric buzzers or mechanical fans

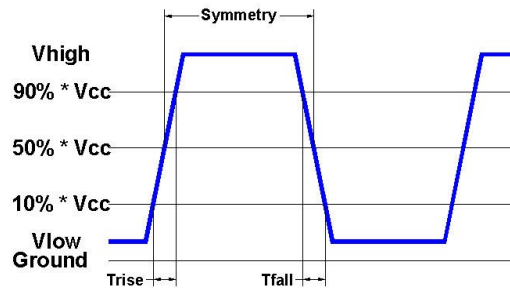
## Electrical Test / Load Circuit



Notes:

CL: 15pF Includes the input capacitance of oscilloscope

\* 0.01 $\mu$ F external by-pass filter is recommended



## Environmental / ESD Ratings

### Reliability: Environmental

Parameter	Condition
Mechanical Shock	MIL-STD-883, Method 2002, Condition B
Vibration	MIL-STD-883, Method 2007, Condition A
Solderability	IPC J-STD-002
Thermal Cycle	MIL-STD-883 Method 1010, Condition B

### ESD Rating

Model	Min. Voltage	Condition
Human Body Model	2000V	JESD22-A114
Machine Model	200V	JESD22-A115

### Absolute Maximum Ratings

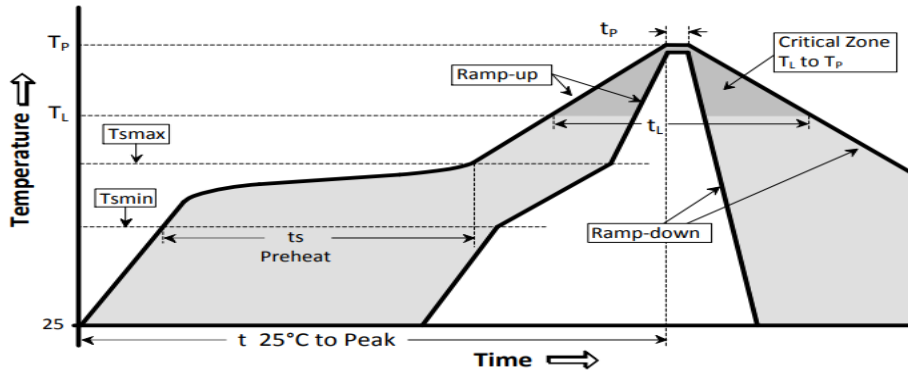
Parameter	Unit
V <sub>cc</sub> Supply Voltage	-0.5V to +5V
V <sub>i</sub> Input Voltage	-0.5V to +5.5V
V <sub>o</sub> Output Voltage	-0.5V to +5.5V

### Thermal Characteristics:

The maximum die or junction temperature is 150°C

## Reflow Cycle

Maximum Reflow Conditions in accordance with IPC/JEDEC J-STD-020C "Pb-free"

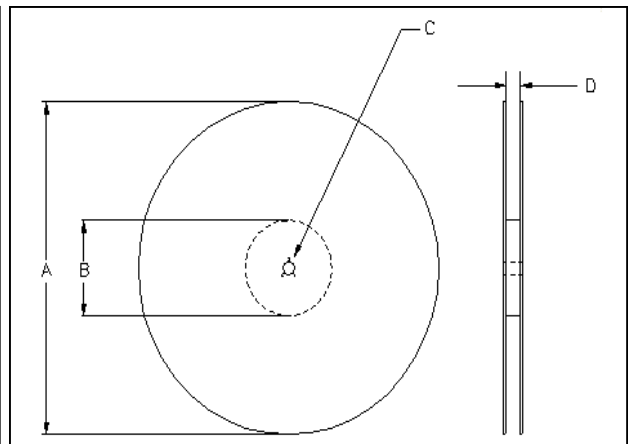
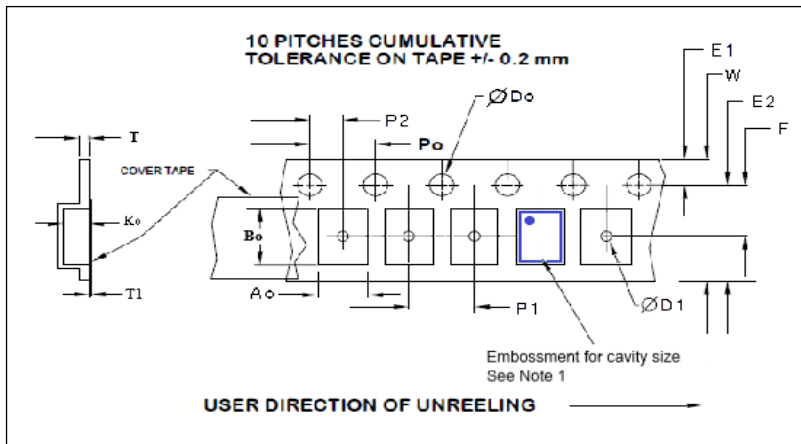


The part may be reflowed 2 times without degradation (typical for lead free processing).

Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	( $T_{S_{max}}$ to $T_p$ )	3°C / second max	°C / s
Ramp down Rate	$T_{cool}$	6°C / second max	°C / s
Time 25°C to Peak Temperature	$T_{to-peak}$	8 minutes max	min
<b>Preheat</b>			
Temperature min	$T_{S_{min}}$	150	°C
Temperature max	$T_{S_{max}}$	200	°C
Time $T_{S_{min}}$ to $T_{S_{max}}$	$t_s$	60 – 180	sec
<b>Soldering above liquidus</b>			
Temperature liquidus	$T_L$	217	°C
Time above liquidus	$t_L$	60 – 150	sec
<b>Peak temperature</b>			
Peak Temperature	$T_p$	260	°C
Time within 5°C of peak temperature	$t_p$	20 – 40	sec

## Tape and Reel

Tape and Reel available for quantities of 250 to 3000 per reel, cut tape for < 250. 8mm tape, 4mm pitch.



Tape Size	E2 typ	F	P1	W max	Ao	Bo	Ko
8mm	6.25	3.5 ±0.05	4.0 ±0.1	8.2	1.9±0.1	2.3±0.1	0.9±0.1

Reel Size	A		B		C	D
	Inches	mm	Inches	mm	mm	mm
7	7.0	180	2.42	60	13.0	Tape size +0.4
					+0.5 -0.2	+2.0 -0.0

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

Tape Size	Do	D1 min	E1	Po	P2	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	0.3	0.1



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