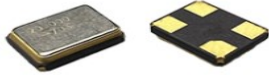




# PLETRONICS SM10T Series Miniature SMD Crystal



SM10T  
3.2 x 2.5 x 0.7 mm  
Ceramic Package

## Features

- Pletronics' SM10T Series is a miniature low profile surface mount crystal.
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel Packaging.
- AT Cut Crystal
- 8 MHz to 150 MHz

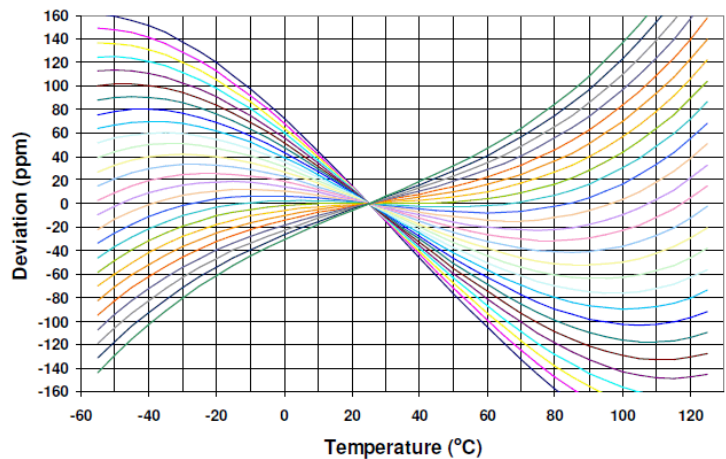
## Applications

Bluetooth  
WLAN  
IoT

## Electrical Characteristics

Parameter	Min	Typ	Max	Unit	Condition (Consult factory for other options)
Frequency Range	8.0	-	150.0	MHz	
Calibration Frequency Tolerance	±10	-	±50	ppm	at +25°C ± 3°C, see part number guide below for available options
Frequency Stability	±5	-	±100	ppm	see part number guide below for available options
Operating Temperature Range	-40	-	+125	°C	see part number guide below for available options
Storage Temperature Range	-55	-	+125	°C	
Equivalent Series Resistance (ESR)	-	-	500 150 100 80 60 50 100 80	Ω	8 MHz ≤ Freq < 10 MHz 10 MHz ≤ Freq < 12 MHz 12 MHz ≤ Freq < 13 MHz 13 MHz ≤ Freq < 16 MHz 16 MHz ≤ Freq < 22 MHz 22 MHz ≤ Freq ≤ 54MHz 60 MHz ≤ Freq < 125 MHz (3rd Overtone) 125 MHz ≤ Freq < 150 MHz (3rd Overtone)
Drive Level	-	-	100	μW	Use 10μW for testing
Shunt Capacitance (C0)	-	-	5.0	pF	Pad to Pad Capacitance
Aging at 25°C ± 3°C	-	-	±5	ppm	for the first year at +25°C ± 3°C
	-	-	±2	ppm	after the first year at +25°C ± 3°C

## AT Cut Crystal Frequency versus Temperature Typical Performance:





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## Electrical Characteristics

Series Model	Load Capacitance (C <sub>Load</sub> ) in pF	Frequency in MHz	Frequency Calibration Tolerance	Frequency Stability	AT Cut Crystal	Operating Temperature Range		Internal Code Or Blank
						Lowest	Highest	
<b>SM10T</b>	<b>-8</b>	<b>-25.0M</b>	<b>-20</b>	<b>H</b>	<b>1</b>	<b>G</b>	<b>G</b>	<b>-xx</b>
	Parallel Resonance from <b>06</b> to <b>18</b> pF (8pF is standard) <b>SR</b> = Series Resonance		(Typical Values Shown) <b>10</b> = ±10 ppm at 25°C ± 3°C <b>15</b> = ±15 ppm at 25°C ± 3°C <b>20</b> = ±20 ppm at 25°C ± 3°C (Standard) <b>25</b> = ±25 ppm at 25°C ± 3°C <b>50</b> = ±50 ppm at 25°C ± 3°C	See Table Below	1 = Fundamental 3 = 3rd OT	<b>C</b> = 0°C <b>D</b> = -5°C <b>E</b> = -10°C <b>G</b> = -20°C <b>J</b> = -30°C <b>K</b> = -35°C <b>L</b> = -40°C	<b>C</b> = +50°C <b>E</b> = +60°C <b>G</b> = +70°C <b>H</b> = +75°C <b>J</b> = +80°C <b>K</b> = +85°C <b>P</b> = +105°C <b>U</b> = +125°C	

## Available Frequency Stability versus Temperature in ppm

Operating Temperature Range		<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>J</b>
	CODE	±5	±8	±10	±15	±20	±30	±50	±100
0 to +50°C	<b>CC</b>	•	•	•	•	•	•	•	•
0 to +60°C	<b>CE</b>	•	•	•	•	•	•	•	•
0 to +70°C	<b>CG</b>		•	•	•	•	•	STD	•
-10 to +50°C	<b>EC</b>	•	•	•	•	•	•	•	•
-10 to +60°C	<b>EE</b>	•	•	•	•	•	•	•	•
-10 to +70°C	<b>EH</b>		•	•	•	•	•	•	•
-20 to +70°C	<b>GG</b>		•	•	•	•	•	•	•
-20 to +75°C	<b>GH</b>		•	•	•	•	•	•	•
-30 to +75°C	<b>JH</b>			•	•	•	•	•	•
-30 to +85°C	<b>JK</b>			•	•	•	•	•	•
-35 to +80°C	<b>KJ</b>				△	•	•	•	•
-40 to +85°C	<b>LK</b>				△	•	•	•	•
-40 to +105°C	<b>LP</b>					•	•	•	•
-40 to +125°C	<b>LU</b>						△	•	•

• = Available      △ = Check with Pletronics



# PLETRONICS SM10T Series Miniature SMD Crystal

## Device Marking



OR



*FF* = Crystal Frequency in MHz  
*x* = Internal factory codes  
*P* = Pletronics  
*YMD or YM* = Date code (Year-Month-Day or Year-Month see chart below)

Specifications such as part number, 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 YMD (Year Month Day)

Code	2	3	4	5	6	Code	A	B	C	D	E	F	G	H	J	K	L	M
Year	2022	2023	2024	2025	2026	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	H	J	K	L	M	N	P	R	T	U	V	W	X	Y	Z
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

## 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

**P/N:** SM10T-12-38.4M-10F1LK  
**Customer P/N:** 12345678  
**Qty:** 1000 **D/C** 6A-HK  
 MSL: 1

**RoHS Compliant**  
 2nd Lvl Interconnect  
 Category=e4  
 Max Safe Temp=260C for 10s 2X Max

**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, PBB's, PBDE's  
 Weight of the Device: 0.018 grams  
 Moisture Sensitivity Level: 1 As defined in J-STD-020D  
 Second Level Interconnect code: e4

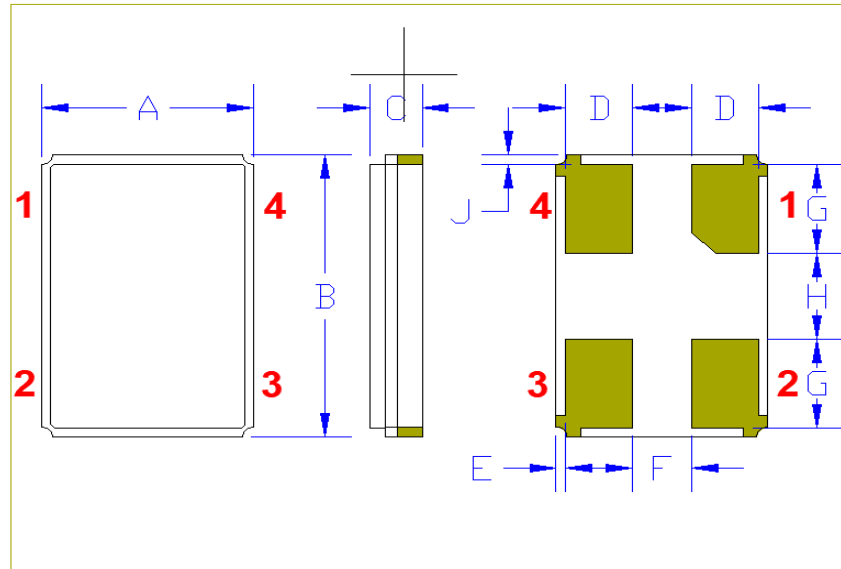
## Reliability

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

## Mechanical Dimensions

	Inches	mm
A	0.098 ± 0.008	2.5 ± 0.2
B	0.126 ± 0.008	3.2 ± 0.2
C	0.028 max	0.7 max
D	0.031	0.8
E <sup>1</sup>	0.004	0.1
F <sup>1</sup>	0.028	0.7
G <sup>1</sup>	0.035	0.9
H <sup>1</sup>	0.047	1.2
J <sup>1</sup>	0.004	0.1

<sup>1</sup> Typical dimensions



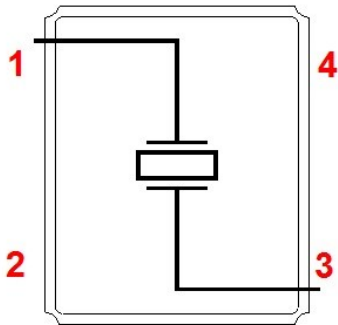
(Not to Scale)

**Contacts (pads):** Gold 11.8 to 39.4 μinches (0.3 to 1 μm) over Nickel 50 to 350 μinches (1.27 to 8.89 μm)

**The chamfered pad may or may not be present and may be on any pad.**

The crystal is symmetrical, there is no Pad 1 preference. The part can be rotated 180° when being assembled on the PCB and will still perform correctly.

## Layout

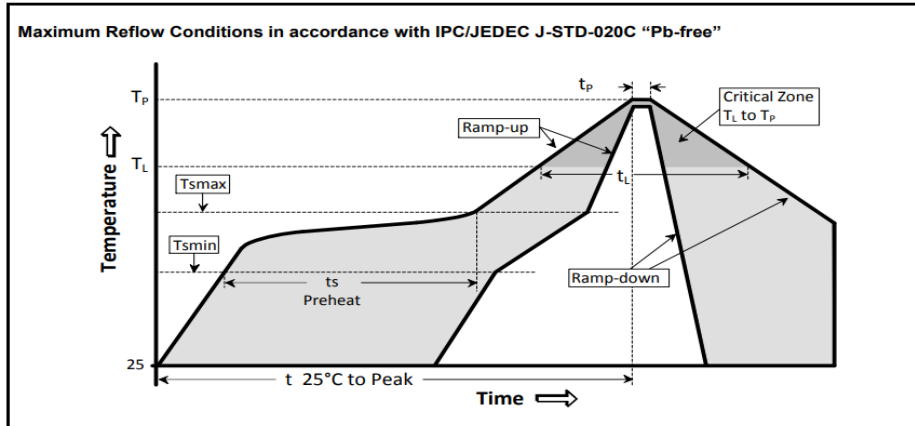


Pad	Note
2 + 4	Connected to the metal cover

For Optimum Jitter Performance, Pletronics recommends:

- Trace lengths to the crystal should be kept as short as possible.
- The crystal connections are sensitive to noise.
- The package should be grounded for optimum performance, pad 2 or 4 connected to ground.
- These very small crystals have high ESR, the oscillator start-up and operation should take this into consideration.
- These small crystals should have their maximum drive level limited to 100 μW.

## Reflow Cycle

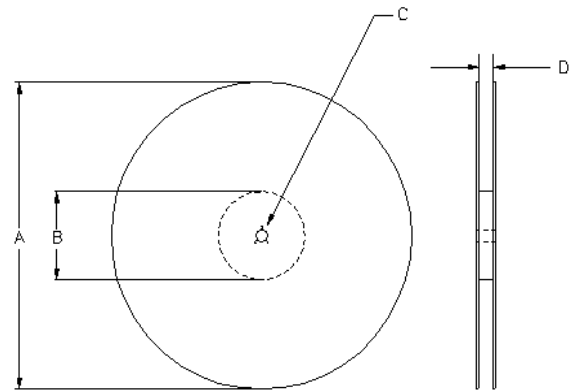
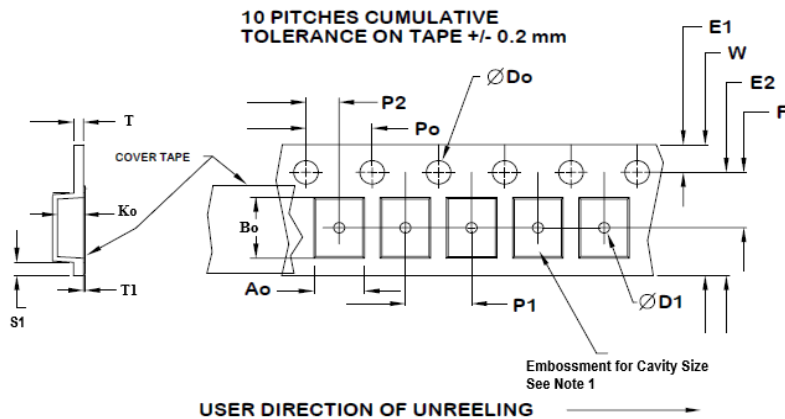


The part may be reflowed 2 times without degradation (typical for lead free processing).

Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	$(T_{Smax} \text{ to } T_p)$	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	$T_{Smin}$	150	°C
Temperature max	$T_{Smax}$	200	°C
Time $T_{Smin}$ to $T_{Smax}$	$t_s$	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 < 1000. 8mm tape, 4mm pitch.



Tape Size	E2 typ	F	P1	W max	A <sub>o</sub>	B <sub>o</sub>	K <sub>o</sub>
8mm	6.25	3.5 ±0.05	4.0 ±0.1	8.2	2.7±0.1	3.4±0.1	1.4±0.1

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

Tape Size	D <sub>o</sub>	D1 min	E1	P <sub>o</sub>	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	0.3	0.1

Reel Size	A		B		C	D
	Inches	mm	Inches	mm		
7	7.0	177.8	2.50	63.5	13.0 +0.5 -0.2	Tape size +0.4 +2.0 -0.0
10	10.0	254.0	4.00	101.6		
13	13.0	330.2	3.75	95.3		



# PLETRONICS SM10T Series Miniature SMD Crystal

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### Contacting Pletronics Inc.

Pletronics, Inc.  
19013 36th Ave. West  
Lynnwood, WA 98036-5761  
U.S.A.

Tel: 425.776.1880  
Fax: 425.776.2760  
email: [ple-sales@pletronics.com](mailto:ple-sales@pletronics.com)

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