



# PLETRONICS SM13T Series Miniature SMD Crystal



SM13T  
7.0 x 5.0 x 1.0 mm  
Ceramic Package

## Features

- Miniature low profile surface mount crystal.
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel Packaging.
- AT Cut Crystal
- 6 MHz to 100 MHz

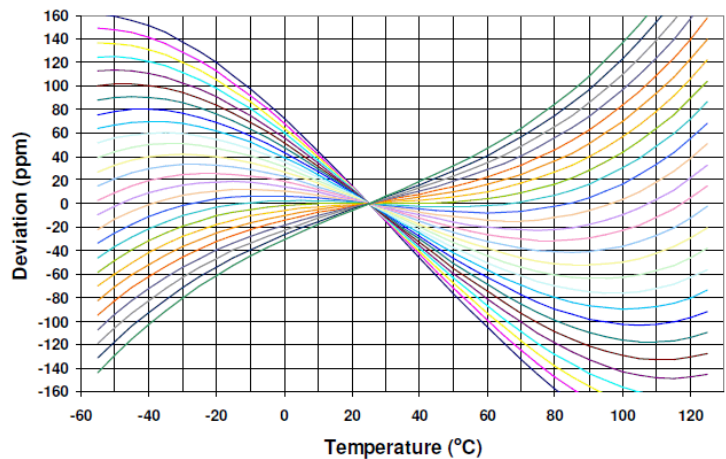
## Applications

Bluetooth  
WLAN  
IoT

## Electrical Characteristics

Parameter	Min	Typ	Max	Unit	Condition (Consult factory for other options)
Frequency Range	6.0	-	100.0	MHz	
Calibration Frequency Tolerance	±10	-	±50	ppm	at +25°C ± 3°C, see part number guide below for available options
Frequency Stability	±10	-	±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)	-	-	100 50 50 40 80	Ω	6 MHz ≤ Freq < 7.4 MHz 7.4 MHz ≤ Freq ≤ 9.8 MHz 9.8 MHz < Freq < 20 MHz 20 MHz ≤ Freq < 70 MHz 40 MHz ≤ Freq ≤ 100 MHz (3rd Overtone)
Drive Level	-	-	100	μW	Use 10μW for testing
Shunt Capacitance (C0)	-	-	7.0	pF	Pad to Pad Capacitance
Aging at 25°C ± 3°C	-	-	±5	ppm	for the first year
	-	-	±2	ppm	after the first year

## AT Cut Crystal Frequency versus Temperature Typical Performance:





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## Part Numbering

Series Model	Load Capacitance (CLoad) in pF	Frequency in MHz	Frequency Calibration Tolerance	Frequency Stability	AT Cut Crystal	Operating Temperature Range		Internal Code Or Blank
						Lowest	Highest	
<b>SM13T</b>	<b>-18</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>32</b> pF  <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>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>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>J</b>
	CODE	±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



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## Device Marking

**SM13Tx**  
**fff.fffM**  
**PLEymdz**

OR

**SM13T-zz**  
**fff.fffM**  
**PLEyywzz**

fff.fffM = Crystal Frequency in MHz  
 x = Capacitance Code (See below)  
 PLE = Pletronics  
 YYWW or YMD = Date code (Year-WeekWeek or Year-Month-Day; see chart below)  
 All other markings are internal factory codes

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

### Codes for Load Capacitance

Code	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y
pF	10	12	13	8	15	18	20	22	24	26	28	30	32	34	36	27	Series	33	50	19	16	17	14

## 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:   
 SM13T-18-14.31818M-20E1LK

Customer P/N:   
 12345678

Qty:  1000 D/C  504

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

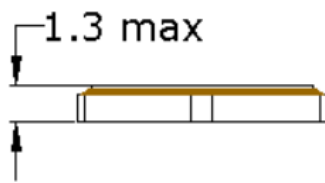
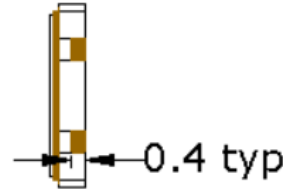
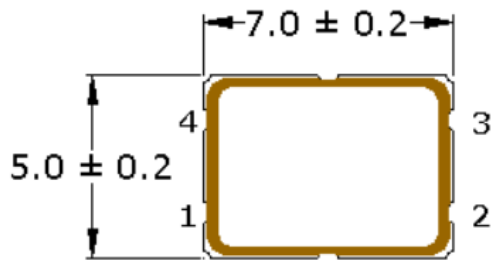
## Reliability

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



# PLETRONICS SM13T Series Miniature SMD Crystal

## Mechanical Dimensions

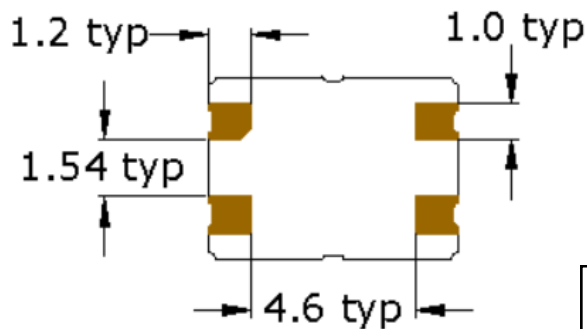


## Pin Connections

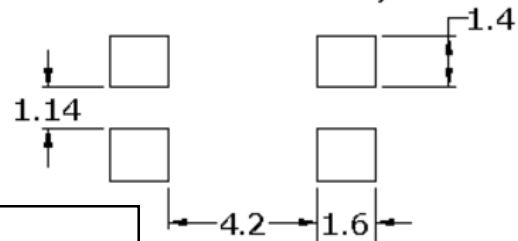
Pins 1 and 3 - Crystal

Pins 2 and 4 - Lid (connect to ground)

Side castellations are non-critical and may or may not be present.



## Solder Pad Layout



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

Dimensions in mm

**Contacts (pads): Gold (0.3 to 1µm) over Nickel (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.

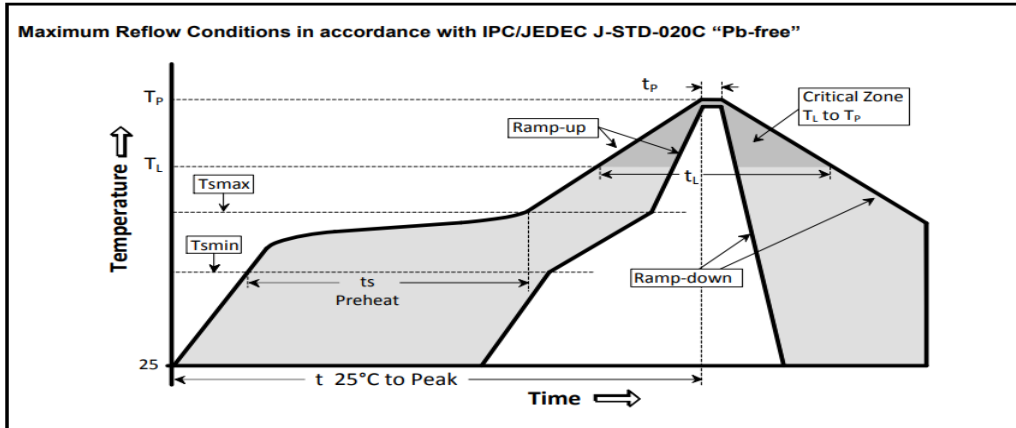
For Optimum Jitter Performance, Pletronics recommends:

- 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.



# PLETRONICS SM13T Series Miniature SMD Crystal

## Reflow Cycle

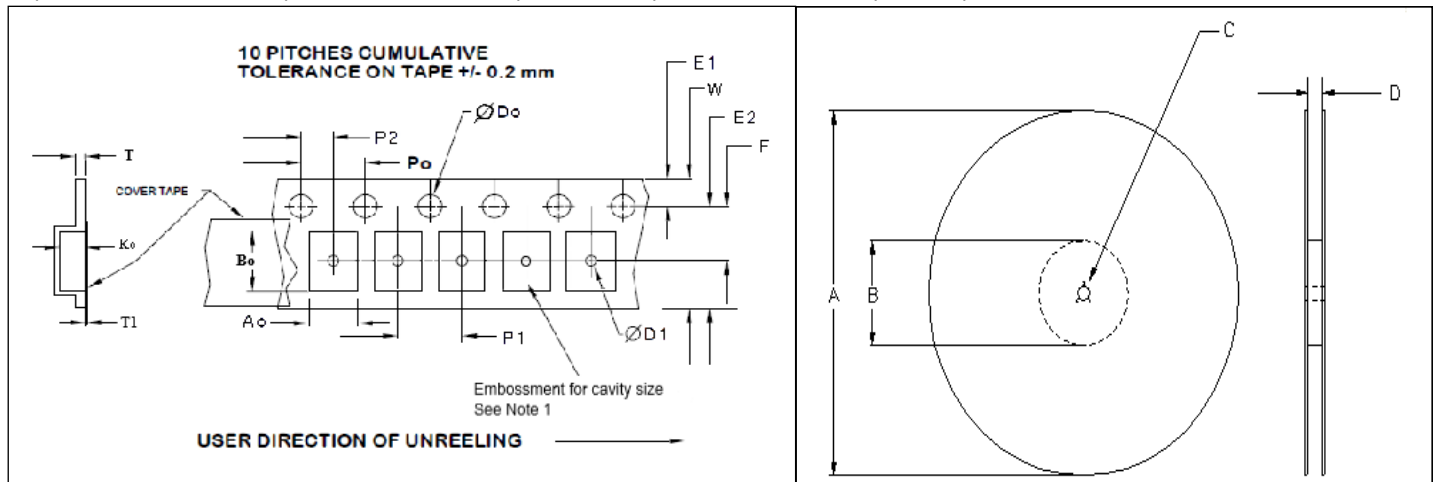


The part may be reflowed 2 times without degradation (typical for lead free processing).

Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	( $T_{S_{max}}$ 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 1000 per reel, cut tape for < 1000. 16mm tape, 8mm pitch.



Tape Size	E2 typ	F	P1	W max	Ao	Bo	Ko
16mm	14.25	7.5 ±0.05	8.0 ±0.1	16.3	5.5 ±0.1	7.4 ±0.1	1.65 ±0.1

Reel Size	A		B		C	D
	Inches	mm	Inches	mm		
7	7.0	177.8	2.50	63.5	13.0	Tape size +0.4
13	13.0	330.2	3.75	95.3	+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 typ	E1	Po	P2	T max	T1 max
16mm	1.5 +0.1 -0.0	1.5	1.75 ±0.1	4.0 ±0.1	2.0 ±0.1	0.3	0.1



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