

## SM13T Series Miniature SMD Crystal

November 2018

- The Pletronics' SM13T Series is a miniature surface mount crystal.
- The package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel packaging
- 6 MHz to 70 MHz Fundamental
- 40 MHz to 100 MHz 3<sup>rd</sup> Overtone
- 5 x 7 mm 4 pad
- AT Cut Crystals
- Ideal for use in hand held consumer products.
- High endurance version available

**Pletronics Inc. certifies this device is in accordance with the  
RoHS 6/6 (2011/65/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: 0.16 grams

Moisture Sensitivity Level: 1 As defined in J-STD-020C

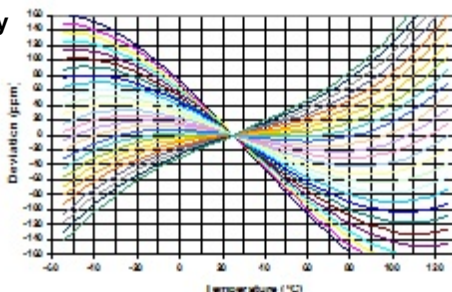
Second Level Interconnect code: e4



### Electrical Specification:

Item	Min	Max	Unit	Condition	
Frequency Range	6	70	MHz	Fundamental	
	40	100	MHz	3 <sup>rd</sup> overtone	
Calibration Frequency Tolerance	10	50	ppm	at +25°C $\pm$ 3°C, see part number for options	
Frequency Stability over OTR	10	150	ppm	see part number for available options	
Equivalent Series Resistance (ESR)	-	100	Ohms	6 MHz to 7.4 MHz	Fundamental
	-	60	Ohms	7.4 MHz to 9.8 MHz	
	-	50	Ohms	9.8 MHz to 20 MHz	
	-	40	Ohms	20 MHz to 70 MHz	
	-	80	Ohms	40 MHz to 100 MHz	3 <sup>rd</sup> Overtone
Drive Level	-	100	$\mu$ W	use 10 $\mu$ W for testing	
Shunt Capacitance (C0)	-	7	pF	Pad to Pad capacitance	
Aging	-5	+5	ppm /Yr	for the first year at +25°C $\pm$ 3°C	
	-2	+2	ppm /Yr	after the first year at +25°C $\pm$ 3°C	
Operating Temperature Range	-40	+125	°C	see part number for available options	
Storage Temperature Range	-55	+125	°C		

### AT Cut Crystal Frequency versus Temperature Typical Performance:



### Part Number:

SM13T	-18	-12.0M	-50	H	1	E	G	-XX	See chart below for available options
Internal code or blank									
<b>Highest Specified Operating Temperature</b> <b>A</b> = 40°C <b>G</b> = 70°C <b>N</b> = 100°C <b>B</b> = 45°C <b>H</b> = 75°C <b>P</b> = 105°C <b>C</b> = 50°C <b>J</b> = 80°C <b>R</b> = 110°C <b>D</b> = 55°C <b>K</b> = 85°C <b>S</b> = 115°C <b>E</b> = 60°C <b>L</b> = 90°C <b>T</b> = 120°C <b>F</b> = 65°C <b>M</b> = 95°C <b>U</b> = 125°C									
<b>Lowest Specified Operating Temperature</b> <b>A</b> = +10°C <b>F</b> = -15°C <b>L</b> = -40°C <b>B</b> = +5°C <b>G</b> = -20°C <b>M</b> = -45°C <b>C</b> = 0°C <b>H</b> = -25°C <b>N</b> = -50°C <b>D</b> = -5°C <b>J</b> = -30°C <b>P</b> = -55°C <b>E</b> = -10°C <b>K</b> = -35°C									
<b>Mode:</b> <b>1</b> = Fundamental <b>3</b> = 3rd Overtone									
<b>Frequency Stability</b> See chart below									
<b>Calibration Frequency Tolerance</b> (Typ. Values shown) <b>10</b> = $\pm 10$ ppm at 25°C $\pm 3^\circ\text{C}$ <b>20</b> = $\pm 20$ ppm at 25°C $\pm 3^\circ\text{C}$ <b>50</b> = $\pm 50$ ppm at 25°C $\pm 3^\circ\text{C}$ (Standard)									
<b>Frequency in MHz</b>									
<b>Load in pF</b> Load Resonance from <b>06</b> to <b>32</b> pF (18 pF Std) -or- <b>SR</b> = Series Resonance									
<b>Series Model</b> <b>SM13T</b> = Standard Version <b>SM13TS</b> = High Endurance Version									

Operating Temperature Range		Available Frequency Stability versus Temperature in ppm									
		A	B	C	D	E	F	G	H	J	K
CODE	± 3.0	± 5.0	± 8.0	± 10	± 15	± 20	± 30	± 50	± 100	± 150	
0 to +45°C	CB	●	●	●	●	●	●	●	●	●	
0 to +50°C	CC	●	●	●	●	●	●	●	●	●	
0 to +60°C	CE	●	●	●	●	●	●	●	●	●	
0 to +70°C	CG		●	●	●	●	●	●	●	●	
-10 to +50°C	EC		●	●	●	●	●	●	●	●	
-10 to +60°C	EE		●	●	●	●	●	●	●	●	
-10 to +75°C	EH			●	●	●	●	●	●	●	
-20 to +70°C	GG			●	●	●	●	●	STD	●	
-20 to +75°C	GH				●	●	●	●	●	●	
-30 to +75°C	JH				●	●	●	●	●	●	
-30 to +80°C	JJ				●	●	●	●	●	●	
-30 to +85°C	JK				●	●	●	●	●	●	
-35 to +80°C	KJ					●	●	●	●	●	
-40 to +85°C	LK					●	●	●	●	●	
-40 to +90°C	LL					●	●	●	●	●	
-40 to +105°C	LP					●	●	●	●	●	
-40 to +125°C	LU							●	●	●	

### Legacy Part Number (not for new designs):

SM13T	B	E	-18	-11.0592M	-XX
Internal code or blank					
Frequency in MHz					
Load in pF Parallel Resonance from 6 to 32 pF or <b>SR</b> = Series Resonance					
Operating Temperature Range Blank = 0 to + 70°C E = -40 to +85°C					
Calibration Tolerance / Frequency Stability Blank = 50/50 (Standard) A = 30/50 B = 30/30 C = 15/30 D = 10/20 (not all frequencies)					
Series Model <b>SM13T</b> = Standard Version <b>SM13TS</b> = High Endurance Version					

### Reliability: Environmental Compliance

Parameter	Condition for SM13T	SM13TS
Mechanical Shock	MIL-STD-883 Method 2002, Condition B	Condition D
Vibration	MIL-STD-883 Method 2007, Condition A	Condition B
Solderability	MIL-STD-883 Method 2003	same
Thermal Shock	MIL-STD-883 Method 1011, Condition A	same

### Package Labeling

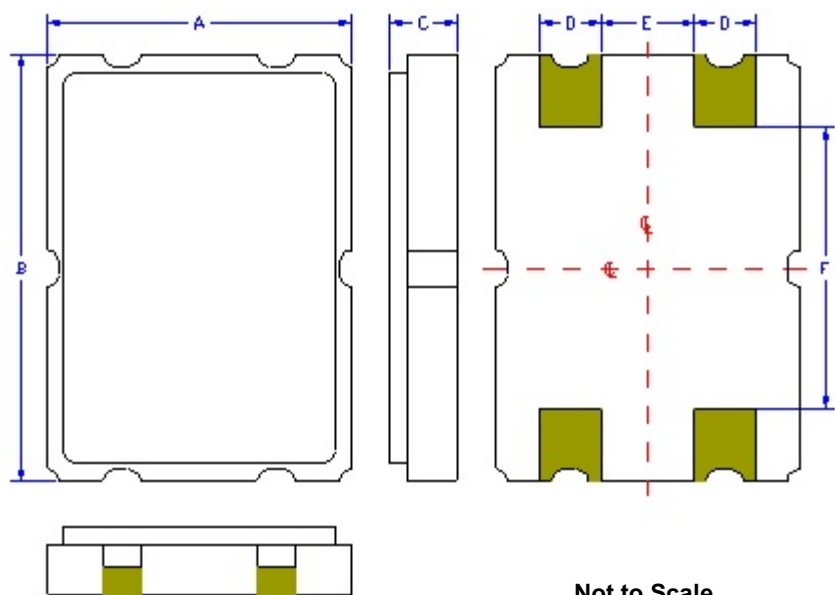
Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Courier New  
Bar code is 39-Full ASCII

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:	
D/C	
1000 504	

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

## Mechanical:



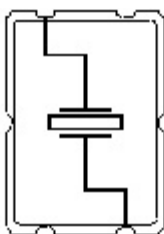
	Inches	mm
A	$0.197 \pm 0.008$	$5.0 \pm 0.2$
B	$0.276 \pm 0.008$	$7.0 \pm 0.2$
C	0.044 max	1.1 max
D <sup>1</sup>	0.039	1.0
E <sup>1</sup>	0.061	1.54
F <sup>1</sup>	0.181	4.6

<sup>1</sup> Typical dimensions

### Contacts :

Gold 11.8 μinches 0.3 μm minimum over Nickel 50 to 350 μinches 1.27 to 8.89 μm

## Connection (top view):



The pads shown not connected to the crystal are common and connected to the metal cover.

## Layout and application information

- 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.

### Part Marking:

**SM13Tx**      or      **SM13TSx**      or      **SM13T-zz**  
**FFF.FFF M**      **FFF.FFF M**      **FFF.FFF M**  
**PLEymdz**      **PLEymdz**      **PLEyywz**

### Legend:

PLE            = Pletronics  
 x              = Capacitance load code from below  
 FFF.FFM      = Frequency in MHz  
 YMD          = Date of Manufacture (year, month and day)  
 All other marking is internal factory codes

Specifications such as frequency tolerance 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.

- Orientation of marking may be mixed on the tape
- Traceability of part is lost once removed from reel

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

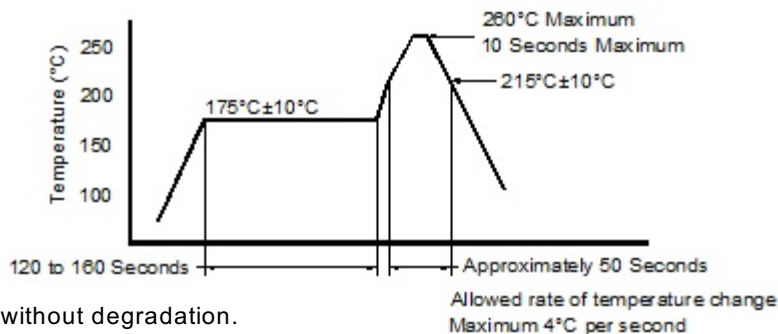
### Codes for Date Code YMD

Code	4	5	6	7	8	9	0
Year	2014	2015	2016	2017	2018	2019	2020

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					

### Reflow Cycle (typical for lead free processing)



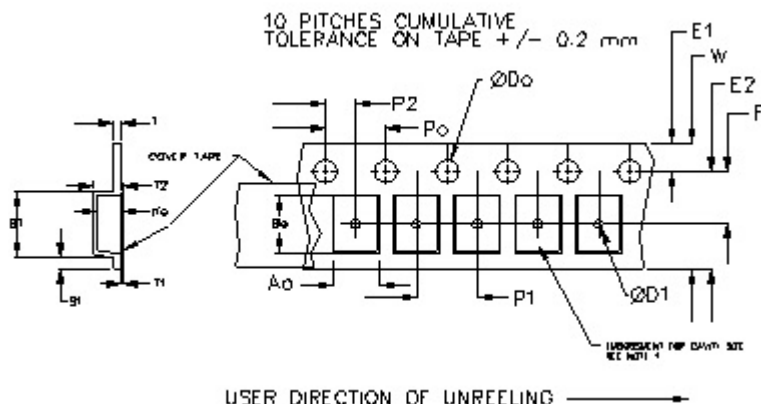
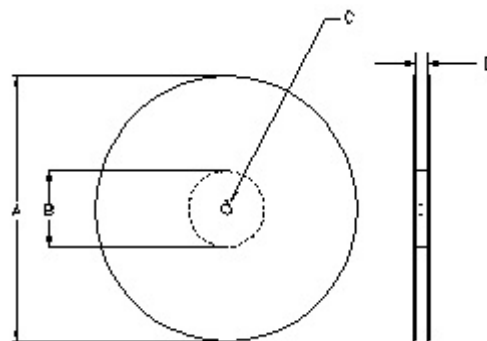
The part may be reflowed 2 times without degradation.

**Tape and Reel: available for quantities of 250 to 3000 per reel (<1000 will be cut tape)**

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	4.0	2.0 +0.05	0.6	0.25	0.1
12mm		1.5			2.0 +0.1			
16mm		1.5						
24mm		1.5						

Variable Dimensions Table 2							
Tape Size	B1 Max	E2 Min	F	P1	T2 Max	W Max	A0, B0 & K0
16 mm	8.1	14.25	7.5 ± 0.1	12.0 ± 0.1	1.8	16.3	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
C	mm	13.0 +0.5 / -0.2		
D	mm	16.4 +2.0 -0.0	16.4 +2.0 -0.0	16.4 +2.0 -0.0
		16.0		

Reel dimensions may vary from the above

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