



## SM10T Series Miniature SMD Crystal

November 2008



- Pletronics' SM10T Series is a miniature surface mount crystal.
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel packaging
- 16 MHz to 60 MHz
- 2.5 x 3.2 mm 4 pad
- AT Cut Fundamental Crystal
- Ideal for use in hand held consumer products

**Pletronics Inc. certifies this device is in accordance with the  
RoHS 6/9 (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: 0.06 grams

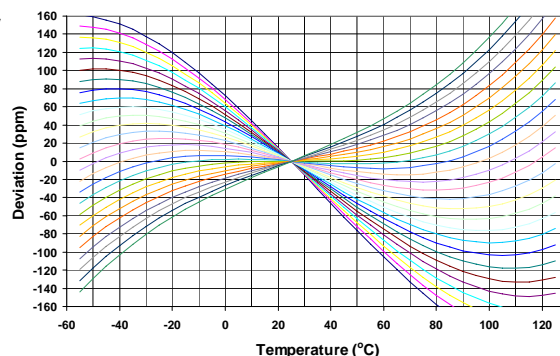
Moisture Sensitivity Level: 1 As defined in J-STD-020C

Second Level Interconnect code: e4

### Electrical Specification:

Item	Min	Max	Unit	Condition
Frequency Range	12	60	MHz	
Calibration Frequency Tolerance	10	50	ppm	at +25°C ± 3°C, see part number for options
Frequency Stability	3	150	ppm	see part number for available options
Equivalent Series Resistance (ESR)	-	100	Ohms	to 30 MHz
	-	50	Ohms	above 30 MHz
Drive Level	-	100	µW	use 10 µW for testing
Shunt Capacitance (C0)	-	5	pF	Pad to Pad capacitance
Aging at 25°C ± 3°C	-5	+5	ppm /Yr	for the first year
	-2	+2	ppm /Yr	after the first year
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:**

SM10T -18 -16.384M -20 E 1 L K -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
Fundamental mode AT cut crystal
<b>Frequency Stability</b> See chart below
<b>Calibration Frequency Tolerance</b> (Typ. 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 <b>30</b> = ± 30 ppm at 25°C ± 3°C (Standard)
<b>Frequency in MHZ</b>
<b>Load in pF</b> Parallel Resonance from <b>06</b> to <b>32</b> pF or <b>SR</b> = Series Resonance
<b>Model Number</b>

Operating Temperature Range	CODE	Available Frequency Stability versus Temperature in ppm									
		A	B	C	D	E	F	G	H	J	K
0 to +45°C	CB	± 3.0	± 5.0	± 8.0	± 10	± 15	± 20	± 30	± 50	± 100	± 150
0 to +50°C	CC	•	•	•	•	•	•	•	•	•	•
0 to +60°C	CE		•	•	•	•	•	•	•	•	•
0 to +70°C	CG		•	•	•	•	•	•	STD	•	•
-10 to +50°C	EC		•	•	•	•	•	•	•	•	•
-10 to +60°C	EE		•	•	•	•	•	•	•	•	•
-10 to +75°C	EH			•	•	•	•	•	•	•	•
-20 to +70°C	GG			•	•	•	•	•	•	•	•
-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):

SM10T	B	E	-18	-23.45M	-XX	
						Internal code or blank
						Frequency in MHz
						<b>Clload in pF</b> Parallel Resonance from 6 to 32 pF or <b>SR</b> = Series Resonance
						<b>Operating Temperature Range</b> Blank = 0 to +70°C (STD) <b>E</b> = -40 to +85°C
						<b>Calibration Tolerance / Frequency Stability</b> Blank = 30/50 (STD) <b>B</b> = 30/30
						Series Model





## 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

## Package Labeling

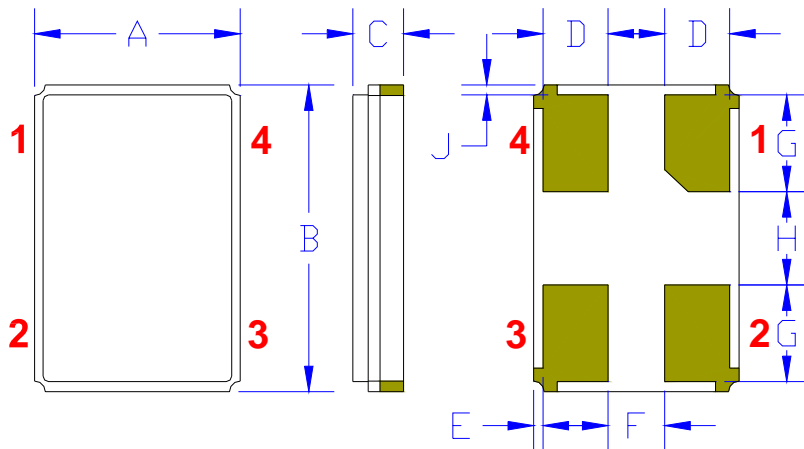
Label is 1" x 2.6" (25.4mm x 66.7mm)  
 Font is Courier New  
 Bar code is 39-Full ASCII

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

<b>P/N:</b>  SM10T-16-23.45M-10F1CG
<b>Customer P/N:</b>  12345678
<b>Qty:</b>  1000 <b>D/C</b>  0526

<b>RoHS Compliant</b> 2nd Lvl Interconnect Category=e4 Max Safe Temp=260C for 10s 2X Max
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## Mechanical:



	Inches	mm
A	0.098 ± 0.004	2.5 ± 0.15
B	0.126 ± 0.004	3.2 ± 0.15
C	0.028 max	0.7 max
D <sup>1</sup>	0.028 to 0.031	0.7 to 0.8
E <sup>1</sup>	0.004	0.1
F <sup>1</sup>	A - (2 * (D + E))	
G <sup>1</sup>	0.035	0.9
H <sup>1</sup>	0.047	1.2
J <sup>1</sup>	0.004	0.1

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

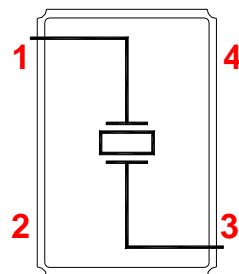
### Contacts :

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

**Not to Scale**

<sup>1</sup> Typical dimensions

## Connection (top view):



Pad 2 and Pad 4 are common and connected to the metal cover. They are not connected to the crystal.

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 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, pad 2 and/or pad 4 connected to ground.

## Marking

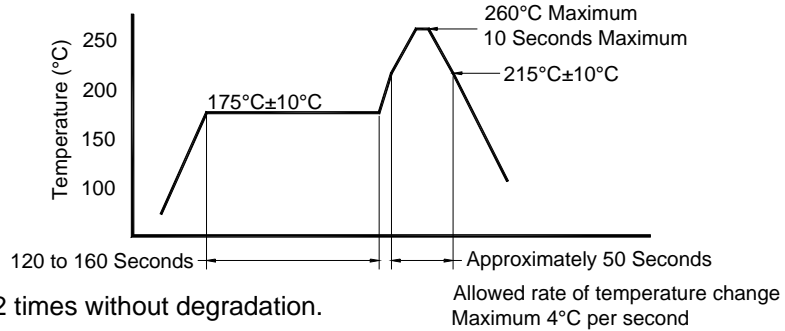
- Marking consists of the frequency (may be truncated due to package size) and date code
- Date code consists of Month Year (see codes below)
- Orientation of marking may be mixed on the tape
- Traceability of part is lost once removed from reel

### Codes for Date Code (Month Year)

Code	6	7	8	9	0	1	2
Year	2006	2007	2008	2009	2010	2011	2012

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

## Reflow Cycle (typical for lead free processing)

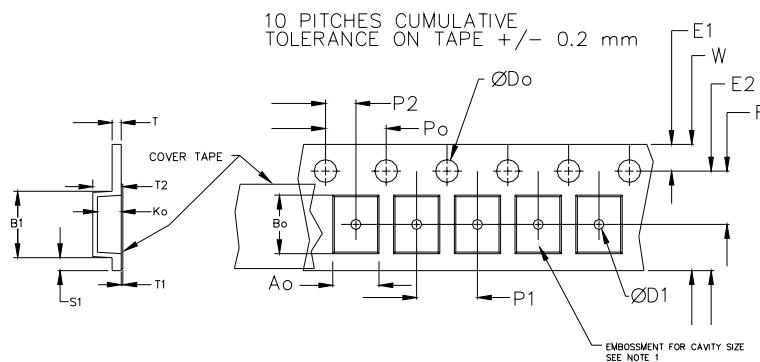
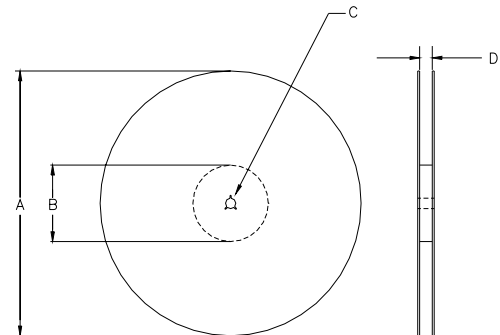


## Tape and Reel: available for quantities of 250 to 3000 per reel (<1000 will be cut tape)

Constant Dimensions Table 1								
Tape Size	D0	D1 Min	E1	P0	P2	S1 Min	T Max	T1 Max
8mm	1.5	1.0	1.75	4.0	2.0 ± 0.05	0.6	0.25	0.1
12mm		1.5			2.0 ± 0.1			
16mm		± 0.1			± 0.1			
24mm		1.5			± 0.1			

Variable Dimensions Table 2							
Tape Size	B1 Max	E2 Min	F	P1	T2 Max	W Max	Ao, Bo & Ko
8 mm	3.5	6.4	1.7 ± 0.1	4.0 ± 0.1	1.0	8.9	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	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	8.4	8.4	8.4	8.0
		+2.0 -0.0	+2.0 -0.0	+2.0 -0.0	

Reel dimensions may vary from the above

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### Contacting Pletronics Inc.

Pletronics Inc.  
19013 36<sup>th</sup> Ave. West  
Lynnwood, WA 98036-5761 USA

Tel: 425-776-1880  
Fax: 425-776-2760  
E-mail: [ple-sales@pletronics.com](mailto:ple-sales@pletronics.com)  
URL: [www.pletronics.com](http://www.pletronics.com)

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