PLETRONICS
www.pletronics.com 425-776-1880

SM10T Series
Miniature SMD Crystal

February 2009

Lead Free

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

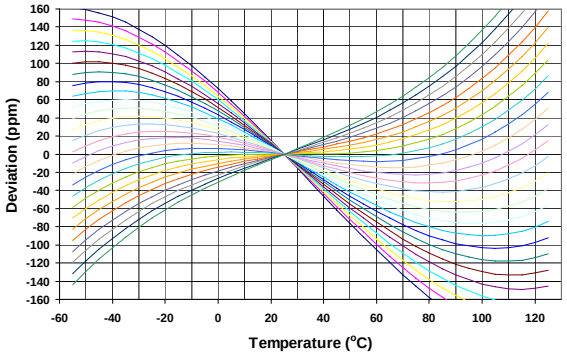
Pletronics Inc. certifies this device is in accordance with the RoHS 6/6 (2002/95/EC) and WEEE (2002/96/EC) directives.

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)	-	120	Ohms	to 16 MHz
	-	100	Ohms	16 MHz 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:



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Part Number:

SM10T	-18	-16.384M	-20	E	1	L	K	-XX

See chart below for available options

Internal code or blank

Highest Specified Operating Temperature

A = 40°C	**G** = 70°C	**N** = 100°C
B = 45°C	**H** = 75°C	**P** = 105°C
C = 50°C	**J** = 80°C	**R** = 110°C
D = 55°C	**K** = 85°C	**S** = 115°C
E = 60°C	**L** = 90°C	**T** = 120°C
F = 65°C	**M** = 95°C	**U** = 125°C

Lowest Specified Operating Temperature

A = +10°C	**F** = -15°C	**L** = -40°C
B = +5°C	**G** = -20°C	**M** = -45°C
C = 0°C	**H** = -25°C	**N** = -50°C
D = -5°C	**J** = -30°C	**P** = -55°C
E = -10°C	**K** = -35°C	

Fundamental mode AT cut crystal

Frequency Stability See chart below

Calibration Frequency Tolerance (Typ. Values shown)
10 = ± 10 ppm at 25°C ± 3°C
15 = ± 15 ppm at 25°C ± 3°C
20 = ± 20 ppm at 25°C ± 3°C
30 = ± 30 ppm at 25°C ± 3°C (Standard)

Frequency in MHZ

Cload in pF
Parallel Resonance from **06** to **32** pF or
SR = Series Resonance

Model Number

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**		●	●	●	●	●	●	**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
Cload in pF Parallel Resonance from 6 to 32 pF or **SR** = Series Resonance
Operating Temperature Range Blank = 0 to + 70°C (STD **E** = -40 to +85°C
Calibration Tolerance / Frequency Stability Blank = 30/50 (STD) **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

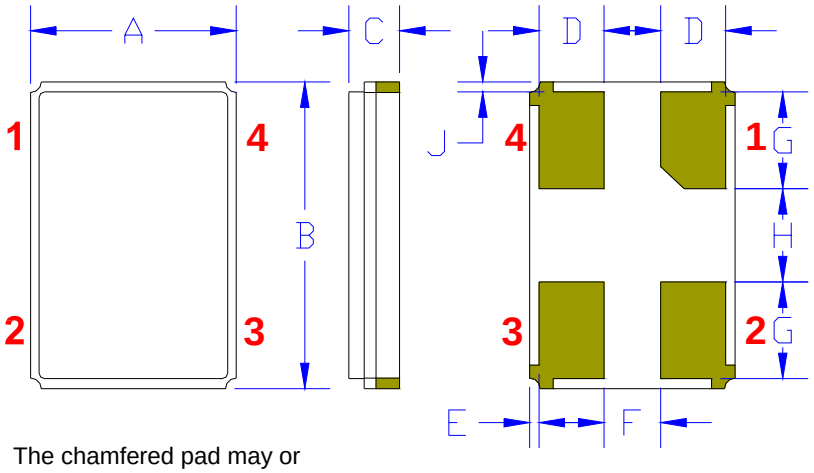
Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Courier New
Bar code is 39-Full ASCII

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

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

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

Mechanical:



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

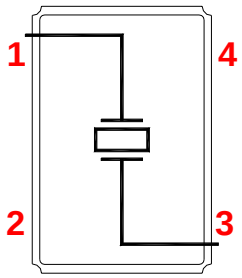
Contacts :
Gold 11.8 µinches 0.3 µm minimum over
Nickel 50 to 350 µinches 1.27 to 8.89 µm

Not to Scale

[1] Typical dimensions

	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[1]	0.028 to 0.031	0.7 to 0.8
E[1]	0.004	0.1
F[1]	A - (2 * (D + E))	
G[1]	0.035	0.9
H[1]	0.047	1.2
J[1]	0.004	0.1

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.

Lead Free

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

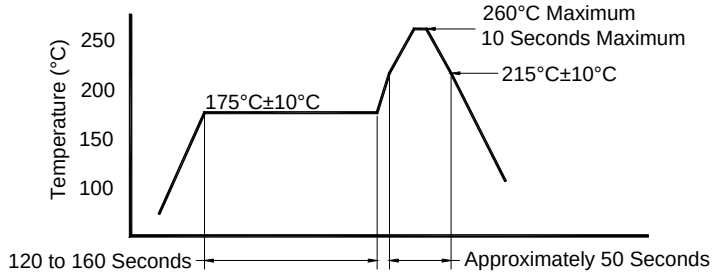
- Marking consists of the frequency (may be truncated due to package size) and date code
- Date code consists of Month Year (see codes below)
- Orientation of marking may be mixed on the tape
- Traceability of part is lost once removed from reel

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)



The part may be reflowed 2 times without degradation.

Allowed rate of temperature change
Maximum 4°C per second

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

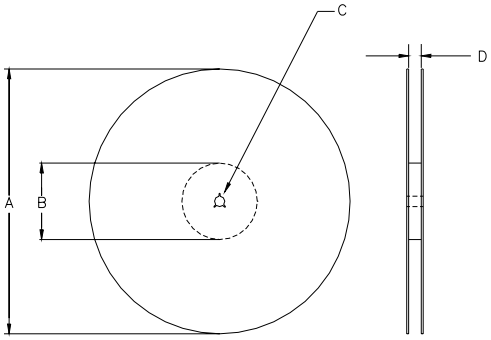
Constant Dimensions Table 1

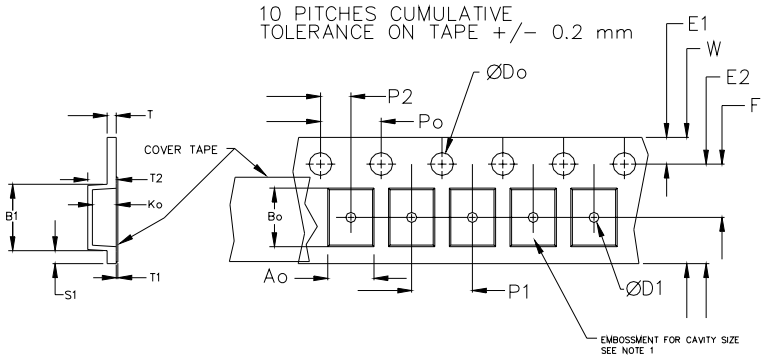
Tape Size	D0	D1 Min	E1	P0	P2	S1 Min	T Max	T1 Max
8mm	1.5 +0.1 -0.0	1.0	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	0.6	0.25	0.1
12mm		1.5						
16mm		1.5			2.0 ±0.1			
24mm		1.5						

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





USER DIRECTION OF UNREELING

		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	Tape Width
C	mm	13.0 +0.5 / -0.2			
D	mm	8.4 +2.0 -0.0	8.4 +2.0 -0.0	8.4 +2.0 -0.0	8.0

Reel dimensions may vary from the above

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