

## SM10T Series Miniature SMD Crystal

March 2015



- 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 67.5 MHz
- 2.5 x 3.2 mm 4 pad
- AT Cut Fundamental and 3<sup>rd</sup> Overtone Crystals
- Ideal for use in hand held consumer products

**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: 0.03 grams

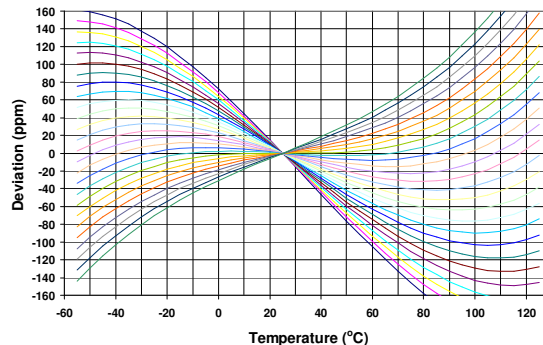
Moisture Sensitivity Level: 1 As defined in J-STD-020D.1

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 $\pm$ 3°C, see part number for options |
| Frequency Stability                | 3   | 150  | ppm     | see part number for available options           |
| Equivalent Series Resistance (ESR) | -   | 120  | Ohms    | 12 MHz to 14.318 MHz                            |
|                                    | -   | 100  | Ohms    | 14.318 MHz to 16 MHz                            |
|                                    | -   | 80   | Ohms    | 16 MHz to 20 MHz                                |
|                                    | -   | 70   | Ohms    | 20 MHz to 30 MHz                                |
|                                    | -   | 50   | Ohms    | 30 MHz to 50 MHz                                |
|                                    | -   | 80   | Ohms    | above 50 MHz                                    |
| Drive Level                        | -   | 100  | $\mu$ W | use 10 $\mu$ W for testing                      |
| Shunt Capacitance (C0)             | -   | 5    | pF      | Pad to Pad capacitance                          |
| Aging at 25°C $\pm$ 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:



Product information is current as of publication date. The product conforms to specifications per the terms of the Pletronics standard warranty. Production processing does not necessarily include testing of all parameters.

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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                                                                                                                                                                                                                                                                                                                                                 |
|  | <b>Highest Specified Operating Temperature</b><br><b>A</b> = 40°C <b>G</b> = 70°C <b>N</b> = 100°C<br><b>B</b> = 45°C <b>H</b> = 75°C <b>P</b> = 105°C<br><b>C</b> = 50°C <b>J</b> = 80°C <b>R</b> = 110°C<br><b>D</b> = 55°C <b>K</b> = 85°C <b>S</b> = 115°C<br><b>E</b> = 60°C <b>L</b> = 90°C <b>T</b> = 120°C<br><b>F</b> = 65°C <b>M</b> = 95°C <b>U</b> = 125°C |
|  | <b>Lowest Specified Operating Temperature</b><br><b>A</b> = +10°C <b>F</b> = -15°C <b>L</b> = -40°C<br><b>B</b> = +5°C <b>G</b> = -20°C <b>M</b> = -45°C<br><b>C</b> = 0°C <b>H</b> = -25°C <b>N</b> = -50°C<br><b>D</b> = -5°C <b>J</b> = -30°C <b>P</b> = -55°C<br><b>E</b> = -10°C <b>K</b> = -35°C                                                                 |
|  | <b>Fundamental mode AT cut crystal</b><br><b>1</b> = Fundamental AT cut crystal<br><b>3</b> = 3 <sup>rd</sup> Overtone AT cut crystal                                                                                                                                                                                                                                  |
|  | Frequency Stability    See chart below                                                                                                                                                                                                                                                                                                                                 |
|  | <b>Calibration Frequency Tolerance (Typ. Values shown)</b><br><b>10</b> = ± 10 ppm at 25°C ± 3°C<br><b>20</b> = ± 20 ppm at 25°C ± 3°C<br><b>30</b> = ± 30 ppm at 25°C ± 3°C (Standard)<br><b>50</b> = ± 50 ppm at 25°C ± 3°C                                                                                                                                          |
|  | Frequency in MHZ                                                                                                                                                                                                                                                                                                                                                       |
|  | <b>Load in pF</b><br><b>Parallel Resonance</b> from <b>06</b> to <b>32</b> pF or<br><b>SR</b> = Series Resonance                                                                                                                                                                                                                                                       |
|  | Model Number                                                                                                                                                                                                                                                                                                                                                           |

| Operating Temperature Range | CODE | Available Frequency Stability versus Temperature in ppm |       |       |      |      |      |      |      |       |       |
|-----------------------------|------|---------------------------------------------------------|-------|-------|------|------|------|------|------|-------|-------|
|                             |      | A                                                       | B     | C     | D    | E    | F    | G    | H    | J     | K     |
|                             |      | ± 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                                                                |
|       |   |   |     |         |     | Load in pF<br>Parallel Resonance from 6 to 32 pF or<br>SR = Series Resonance    |
|       |   |   |     |         |     | Operating Temperature Range<br>Blank = 0 to + 70°C (STD)<br>E = -40 to +85°C    |
|       |   |   |     |         |     | Calibration Tolerance / Frequency Stability<br>Blank = 30/50 (STD)<br>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

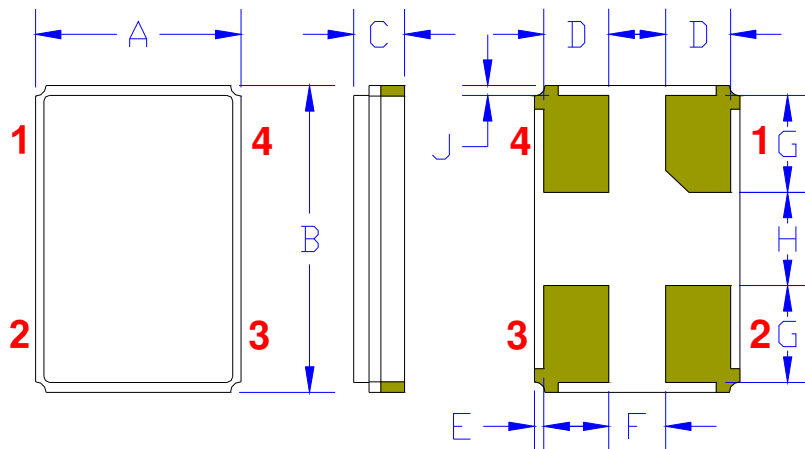
Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Courier New  
Bar code is 39-Full ASCII

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

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

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

### 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

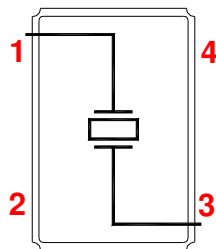
#### Contacts :

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. Connected to ground is recommended

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.

### Marking:

- P = Pletronics
- ff.ffM or ff.f = Frequency
- ymd or ym = Year Month Day or Year Month, see code below
- z = Internal information
- Orientation of marking may be mixed on the tape
- Traceability of part is lost once removed from reel

**Pff.ffM  
ymdz**

OR

**ff.ffM  
Pymdz**

OR

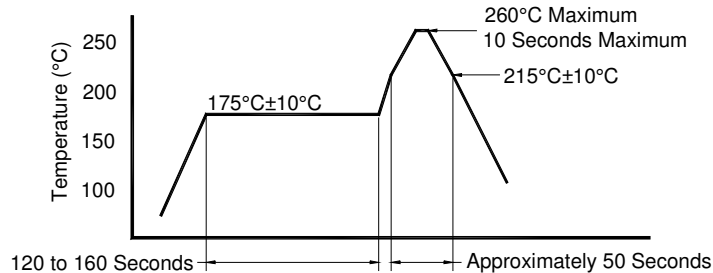
**ff.fym**

### Codes for Date Code YMD

| Code | 3    | 4    | 5    | 6    | 7    | Code  | A   | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |
|------|------|------|------|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Year | 2013 | 2014 | 2015 | 2016 | 2017 | 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  |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Day  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Code | H  | J  | K  | L  | M  | N  | P  | R  | T  | U  | V  | W  | X  | Y  | Z  |    |
| Day  | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |    |

### 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)

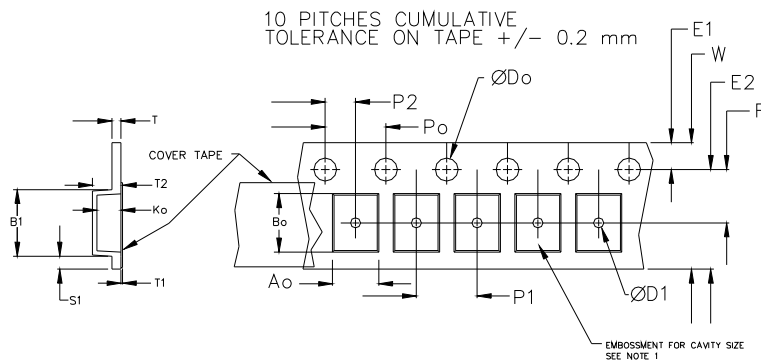
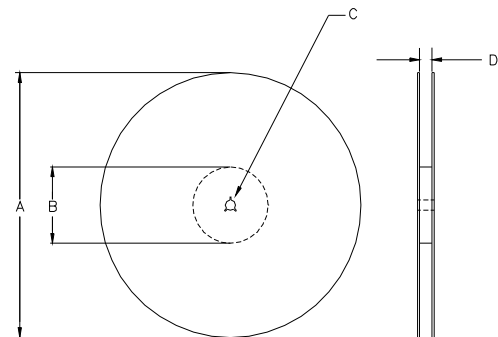
| Constant Dimensions Table 1 |                     |        |              |             |              |        |       |        |
|-----------------------------|---------------------|--------|--------------|-------------|--------------|--------|-------|--------|
| Tape Size                   | D0                  | D1 Min | E1           | P0          | P2           | S1 Min | T Max | T1 Max |
| 8mm                         | 1.5<br>+0.1<br>-0.0 | 1.0    | 1.75<br>±0.1 | 4.0<br>±0.1 | 2.0<br>+0.05 | 0.6    | 0.25  | 0.1    |
| 12mm                        |                     | 1.5    |              |             | 2.0<br>±0.1  |        |       |        |
| 16mm                        |                     | 1.5    |              |             |              |        |       |        |
| 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  | Tape Width |
|   | 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     | 8.4              | 8.4   | 8.4   | 8.0        |
|   |        | +2.0             | +2.0  | +2.0  |            |
|   |        | -0.0             | -0.0  | -0.0  |            |

Reel dimensions may vary from the above

## IMPORTANT NOTICE

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