



## SM12T Series Miniature SMD Crystal

February 2015

- Pletronics' SM12T Series is a miniature surface mount crystal.
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel packaging
- 10 MHz to 80 MHz Fundamental Mode
- 40 MHz to 150 MHz 3<sup>rd</sup> Overtone
- 3.5 x 6 mm 4 pad
- AT Cut Crystal
- 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.**

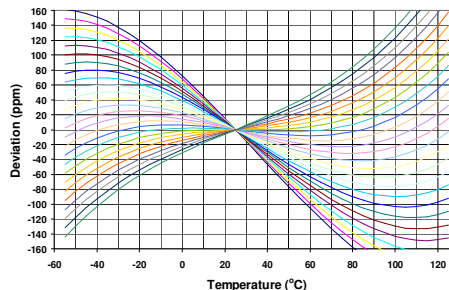
Pletronics Inc. guarantees the device does not contain the following:  
Cadmium, Hexavalent Chromium, Lead, Mercury, PBB's, PBDE's  
Weight of the Device: 0.06 grams  
Moisture Sensitivity Level: 1 As defined in J-STD-020C  
Second Level Interconnect code: e4



### Electrical Specification:

| Item                               | Min | Max  | Unit    | Condition                                   |                          |
|------------------------------------|-----|------|---------|---|--------------------------|
| Frequency Range                    | 10  | 80   | MHz     | Fundamental Mode                            |                          |
|                                    | 40  | 150  | MHz     | 3 <sup>rd</sup> Overtone                    |                          |
| Calibration Frequency Tolerance    | 10  | 50   | ppm     | at +25°C ± 3°C, see part number for options |                          |
| Frequency Stability over OTR       | 3   | 150  | ppm     | see part number for available options       |                          |
| Equivalent Series Resistance (ESR) | -   | 60   | Ohms    | 10 MHz to 16 MHz                            | Fundamental              |
|                                    | -   | 50   | Ohms    | 16 MHz to 50 MHz                            |                          |
|                                    | -   | 100  | Ohms    | 40 MHz to 150 MHz                           | 3 <sup>rd</sup> Overtone |
| Drive Level                        | -   | 100  | µW      | use 10 µW for testing                       |                          |
| Shunt Capacitance (C0)             | -   | 5    | pF      | Pad to Pad capacitance                      |                          |
| Aging                              | -3  | +3   | 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:**

SM12T -18 -14.31818M- 20 E 1 L K -XX

See chart below for available options

|  |  |
|--|--|
| <div style="font-size: 48px; margin: 0;"> <span style="display: inline-block; width: 100%; height: 100%; vertical-align: middle;"> <span style="font-size: 24px;">SM12T</span> <span style="font-size: 24px;">-18</span> <span style="font-size: 24px;">-14.31818M-</span> <span style="font-size: 24px;">20</span> <span style="font-size: 24px;">E</span> <span style="font-size: 24px;">1</span> <span style="font-size: 24px;">L</span> <span style="font-size: 24px;">K</span> <span style="font-size: 24px;">-XX</span> </span> </div> | 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>Mode:</b> <b>1</b> = Fundamental <b>3</b> = 3 <sup>rd</sup> Overtone  |
|  | <b>Frequency Stability</b> See chart below   |
|  | <b>Calibration Frequency Tolerance</b><br><b>10</b> = ± 10 ppm at 25°C ± 3°C<br><b>15</b> = ± 15 ppm at 25°C ± 3°C<br><b>20</b> = ± 20 ppm at 25°C ± 3°C<br><b>50</b> = ± 50 ppm at 25°C ± 3°C (Standard)  |
|  | <b>Frequency in MHz</b>  |
|  | <b>Load in pF</b><br>Parallel Resonance from <b>06</b> to <b>32</b> pF or<br><b>SR</b> = Series Resonance  |
| <b>Series Model</b>  |  |

|                             |      | Available Frequency Stability versus Temperature in ppm |       |       |      |      |      |      |      |       |       |
|-----------------------------|------|---|-------|-------|------|------|------|------|------|-------|-------|
| Operating Temperature Range | CODE | 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):





|  |   |   |     |           |     |  |
|--|---|---|-----|-----------|-----|--|
| SM12T  | B | E | -18 | -11.0592M | -XX |  |
| <b>Internal code or blank</b>  |   |   |     |           |     |  |
| <b>Frequency in MHz</b>  |   |   |     |           |     |  |
| <b>Load in pF</b><br>Parallel Resonance from <b>6</b> to <b>32</b> pF or<br><b>SR</b> = Series Resonance   |   |   |     |           |     |  |
| <b>Operating Temperature Range</b><br>Blank = 0 to + 70°C<br><b>E</b> = -40 to +85°C   |   |   |     |           |     |  |
| <b>Calibration Tolerance / Frequency Stability</b><br>Blank = 50/50 (Standard)<br><b>A</b> = 30/50<br><b>B</b> = 30/30<br><b>C</b> = 15/30<br><b>D</b> = 10/20 (not all frequencies) |   |   |     |           |     |  |
| <b>Model Number</b>  |   |   |     |           |     |  |

## 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

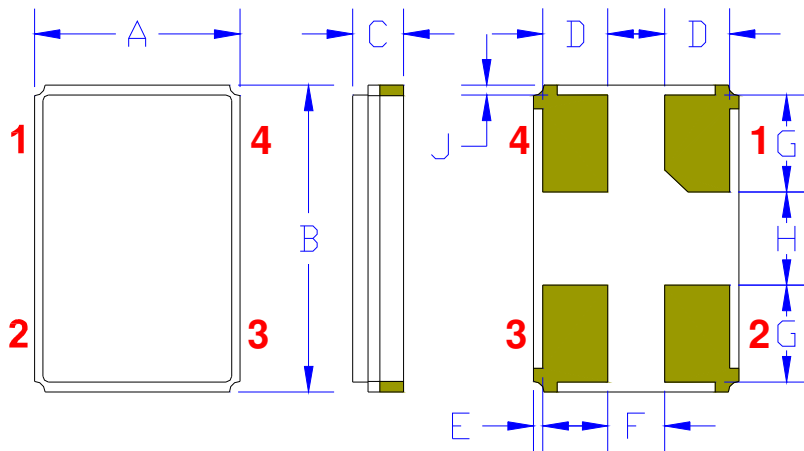
Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Courier New  
Bar code is 39-Full ASCII

|               |  |
|---------------|--|
| P/N:          |           |
|               | SM12T-SR-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:



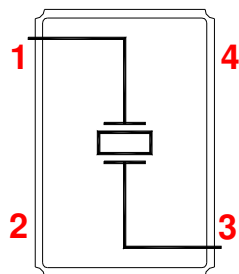
|                | Inches        | mm        |
|----------------|---------------|-----------|
| A              | 0.138 ± 0.008 | 3.5 ± 0.2 |
| B              | 0.236 ± 0.008 | 6.0 ± 0.2 |
| C              | 0.047 max     | 1.2 max   |
| D <sup>1</sup> | 0.035         | 0.9       |
| E <sup>1</sup> | 0.004         | 0.1       |
| F <sup>1</sup> | 0.059         | 1.5       |
| G <sup>1</sup> | 0.055         | 1.4       |
| H <sup>1</sup> | 0.118         | 3.0       |
| J <sup>1</sup> | 0.004         | 0.1       |

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.



## 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.

## Part Marking:

**fff.fff M**  
**PymdC**

Where *fff.fff* = frequency in MHz  
*Pymd* = Pletronics and Date code  
*C* = Capacitance load code (see table below)

- 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 |

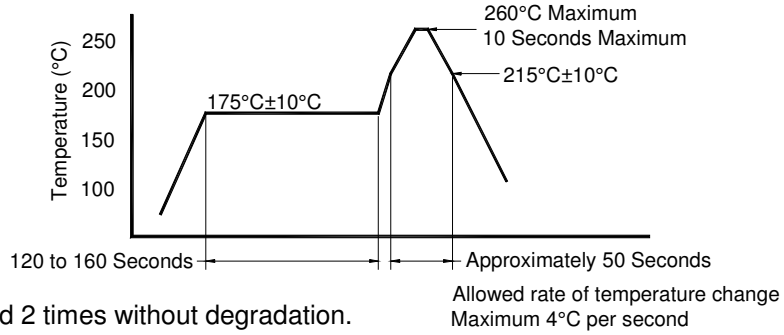
## Codes for Date Code YMD

| Code | 2    | 3    | 4    | 5    | 6    | 7    | 8    |
|------|------|------|------|------|------|------|------|
| Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |

| 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)



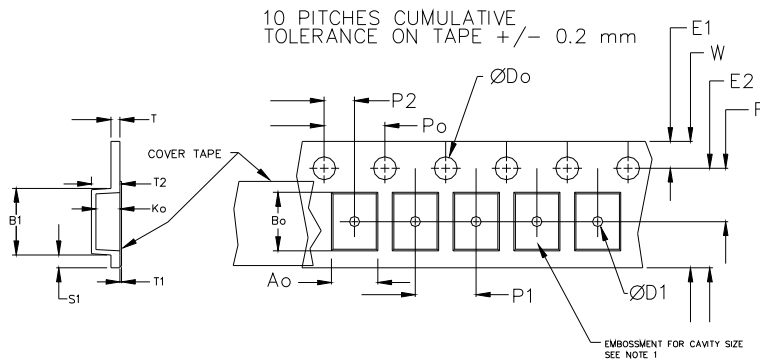
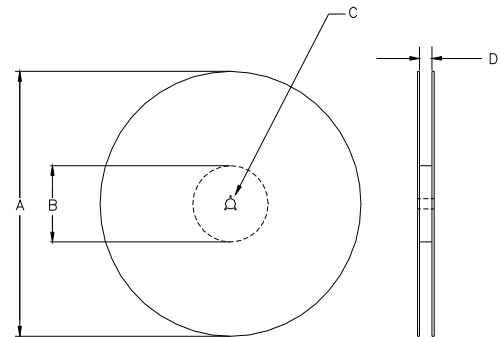
The part may be reflowed 2 times without degradation.

## 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 | 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<br>-0.0 |      |     | ± 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 |
| 16 mm                       | 12.1   | 14.25  | 7.5 ± 0.1 | 8.0 ± 0.1 | 8.0    | 16.3  | 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           | Tape Width |
|                 | mm     | 63.5             | 101.6          | 95.3           |            |
| C               | mm     | 13.0 +0.5 / -0.2 |                |                | Tape Width |
| D               | mm     | 16.4 +2.0 -0.0   | 16.4 +2.0 -0.0 | 16.4 +2.0 -0.0 |            |

Reel dimensions may vary from the above

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