




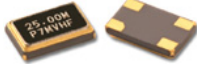



# Pletronics

## Crystal Selection Guide

### LOWEST COST SOLUTIONS

RoHS 6/6 Compliant

	Package	Series	Frequency Range	Package Size
THRU-HOLE		MP49	1.8 MHz–210 MHz ◆ <u>Lowest cost thru-hole package</u> ◆ 3rd and 5th overtones available	4.47 x 10.8 x 13.21h mm
		LP21 LP24 LP49	3.2 MHz–70 MHz ◆ Leaded version of the SM25, SM30, SM42 ◆ 3rd overtone available	LP21: 4.47 x 10.8 x 2.1h mm LP24: 4.47 x 10.8 x 2.5h mm LP49: 4.47 x 10.8 x 3.56h mm
		UM1 UM4 UM5	10 MHz–150 MHz ◆ 3rd and 5th overtones available ◆ Gull wing available	UM1: 3.2 x 9.0 x 8.1h mm UM4: 3.2 x 9.0 x 4.8h mm UM5: 3.2 x 9.0 x 6.0h mm
METAL SMD		SM25 SM30 SM42	3.0 MHz–70 MHz ◆ <u>Lowest cost metal surface mount package</u> ◆ Rugged reliable package ◆ Lowest frequencies not available in minimum height package	SM25: 5.0 max x 13.5 max x 2.9h mm SM30: 5.0 max x 13.5 max x 3.5h mm SM42: 5.0 max x 13.5 max x 4.6h mm
		SM45	3.0 MHz–70 MHz ◆ Carrier added under LP49 to make the part SMD. ◆ Adds electrical connections ◆ Mounts nicely for P&P operations	SM45: 4.8 max x 13 max x 5.0h mm
CERAMIC		SM13T	6 MHz–150 MHz ◆ <u>Lowest cost ceramic package</u> ◆ Fundamental and 3rd overtone	5.0 x 7.0 x 1.1h mm
		SM11T	12 MHz–300 MHz ◆ Fundamental and 3rd and 5th overtone	3.2 x 5.0 x .85h mm
<b>32.768 KHz CRYSTALS</b>				
WATCH CRYSTALS		SM20S	◆ <u>Lowest cost surface mount package</u> ◆ 4 pad plastic SMD ◆ 12.5 and 6 pF available	3.8 x 8.5 x 2.5h mm
		SM13S	◆ 2 pad plastic SMD	1.5 x 7.0 x 1.4h mm
		SM12S	◆ 2 pad ceramic SMD	1.82 x 4.95 x 0.95h mm
		SM8S	◆ 2 pad ceramic SMD	1.5 x 3.2 x 1.0h mm

Package	Frequency Range	Package Size
 SM8T	20 MHz–80 MHz	1.6 x 2.0 x 0.45h mm
 SM9T	16 MHz–80 MHz	2.0 x 2.5 x 0.55h mm
 SM10T *	13 MHz–60 MHz	2.5 x 3.2 x 0.7h mm
 SM11T *	12 MHz–300 MHz	3.2 x 5.0 x 0.85h mm
 SM12T *	10 MHz–250 MHz	3.5 x 6.0 x 1.2h mm
 SM12T2 *	10 MHz–50 MHz	3.5 x 6.0 x 1.1h mm
 SM13T *	6 MHz–150 MHz	5.0 x 7.0 x 1.1h mm

Tight Tolerance Solutions

\* These devices have been developed to be specified to very tight tolerances.

## KEY PARAMETERS NEEDED TO SPECIFY A CRYSTAL

### $C_{load}$ (capacitive load):

The  $C_{load}$  sets the frequency. The smaller the  $C_{load}$  the higher the crystal frequency. Pletronics recommends grounding the crystal whenever possible for the most stable results and the least RFI.

### ESR (equivalent series resistance):

If this value is too high, the crystal will not begin or sustain oscillation.

### Overtone:

Crystals will operate on the fundamental mode, 3<sup>rd</sup> overtone, 5<sup>th</sup> overtone, etc. For higher frequencies, overtone crystals are used because the crystal can be 3 times or 5 times thicker for the same resonant frequency, thus effecting cost. Thicker crystals are much easier to process. The end use circuit must have something added to force the crystal onto the overtone mode, for example an inductor. If this added circuitry is not present then a fundamental mode is required.

### Frequency vs Temperature Performance (tolerance @ 25°C):

The angle of the cut through the atomic planes of the quartz bar determine the frequency versus temperature performance. The tighter the allowed tolerance in ppm (parts per million), the more expensive the crystal becomes.

### Stability over Temperature Range:

Temperature stability is the allowable frequency drift in ppm (parts per million) over a specified temperature range. Note that this should not be specified as the operating temperature range of the crystal as they are two different specifications. It is important not to over specify the temperature stability as this does have a direct effect on the cost of the crystal.

♦ For information on determining  $C_{load}$  and maximum ESR, please visit the FAQ section on our website, [www.pletronics.com](http://www.pletronics.com). The complete part number builder is found in the crystal product section.