

Crystal terms and application notes

**Overtone and Fundamental Modes:**

The main operating mode of the crystal is the Fundamental mode (or sometimes called first overtone). It has strongest energy as far as contribution to oscillation as well as lowest Equivalent Series Resistance (ESR). Because of handling problem (due to thin plate greater than 24 MHz), overtone modes are recommended. Special processes are made to create best suitable parameters for appropriate overtones, i.e. third-overtone, fifth overtone, seventh overtone, etc. ESR increases as overtone mode increases. However, 9th overtone mode is the highest recommended crystal in any application.

- Notes:
- The frequencies are not exactly three, five, seven, or nine times the fundamental frequency.
  - Fundamental higher frequencies options are available
  - However, it will affect cost.

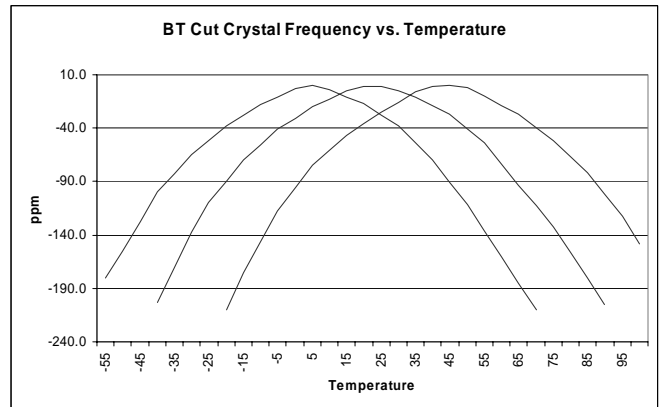


Fig. 14 Frequency temperature curves for the BT-cut crystal at different angle  $\phi$ .

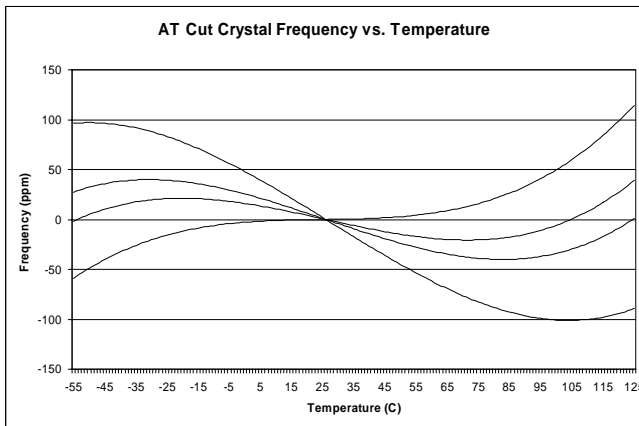


Fig. 13 Frequency-temperature curves for the AT-cut crystal at different angle  $\phi$ .

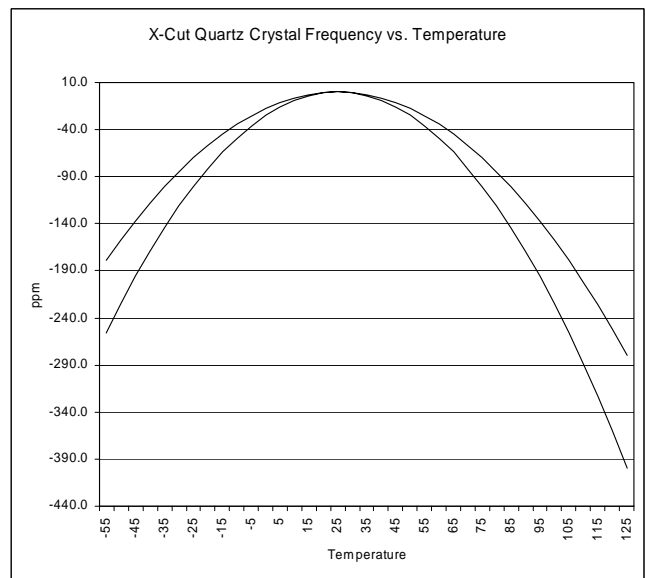


Fig. 15 Frequency temperature curves for the X-cut crystal at different angle  $\phi$ .