•The L_1Cc and C_2 components form a *parallel resonant circuit* at a frequency about half-way between the fundamental and third-overtone frequency. This condition makes the circuit capacitive at the third-overtone frequency, which favors the oscillation at the desired overtone mode. See figure 11.

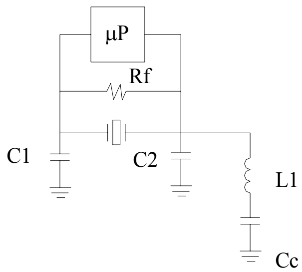

Figure 11

•In a standard overtone mode, C_2 value varies from 10pF to 30pF. Cc value should be chosen at least *10 times the value of* C_2, so its equivalent Cequiv. will be approximately the value of C_2.

•Typical values of L_1 for different crystal frequencies:

25 MHz4.7uH, 6.8uH, 8.2uH, l0uH
32 MHz2.7uH, 3.9uH, 4.7uH, 5.6uH
40 MHz1.5uH, 1.8uH, 2.2uH, 2.7uH, 3.3uH

Figure 12 shows a typical circuit configuration for a 40.3200MHz, third-overtone mode operation.

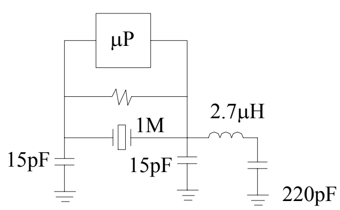

Figure 12

Overtone and Fundamental Modes:
The main operating mode of the crystal is the Fundamental Mode. 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 30 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.

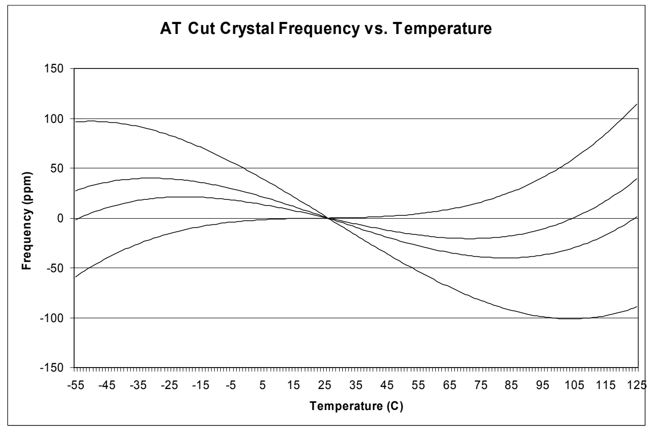

Fig. 13 Frequency-temperature curves for the AT-cut crystal at different angle ϕ.

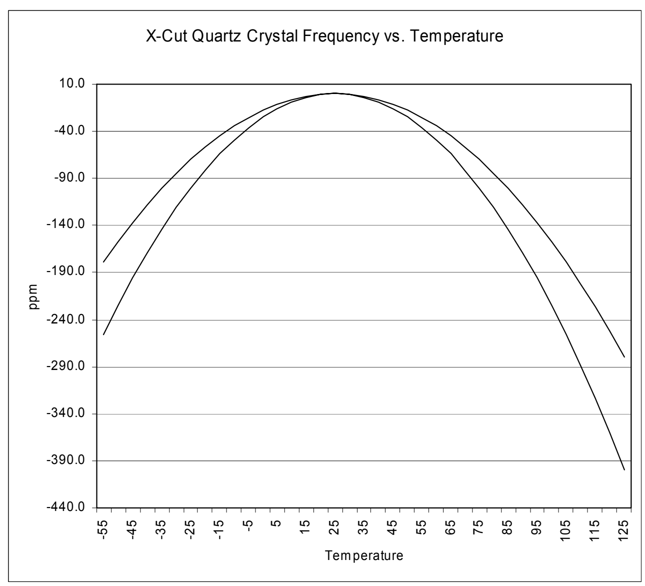

Fig. 15 Frequency temperature curves for the X-cut crystal at different angle ϕ.