How to use a Third Overtone Crystal with a 80C51 Family Microcontroller

Description

For cost reason using an overtone crystal is 5 to 6 times cheaper than a fundamental one. Using this type of crystal is slightly different comparing to a fundamental one . The frequency of an overtone crystal is adjusted on the fundamental one and this one must be trapped by a LC pass–band filter. The typical schematic is shown below.

CP1 and CP2 are the parasitic capacitors due to the packaging and the PCB lay–out. L1 and C1 is the passe–band filter used to trap the fundamental frequency. C2 is a small capacitor to increase a little bit the open–loop gain given by:

$$A \times B = A \times \frac{CP2 + C2}{CP1}$$

where A is the gain a the operating frequency and B is the gain of the feed–back . The frequency of the filter is given below:

$$f_T = \frac{F_Q}{3} = \frac{36.864}{3} = 12.288\ MHz$$

$$L_1 = \frac{1}{(2 \times \pi \times f_T)^2 \times C3}$$

Where C3 = 33 pF

$$L_1 = \frac{1}{(2 \times \pi \times 12.288 \times 10^6) \times (39 \times 10^{-12})} = 4.3\mu H$$

The standard one is 4.7µH and not critical because the bandwidth is large enough . C2 is chosen to be equal to 10pf (a larger value break–down the amplifier and the open loop gain) .

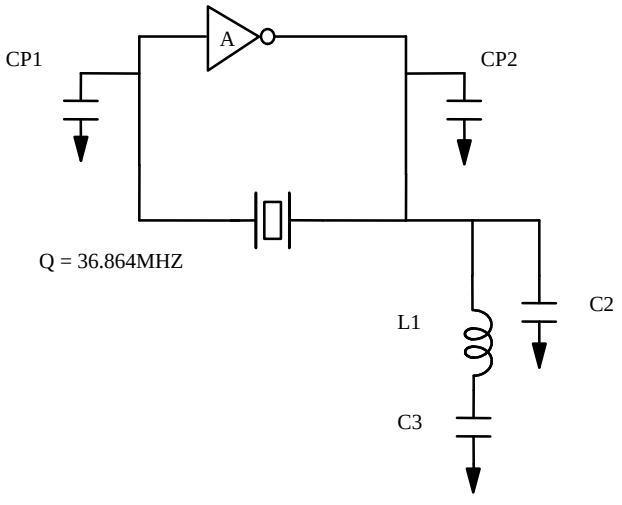

Figure 1. Typical application with a third overtone crystal