

## 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 :

$$f_T = \frac{F_0}{3} = \frac{36.864}{3} = 12.288MHz$$

$$L_1 = \frac{1}{(2 \times \pi \times f_T) \times (cp2 + C3)}$$

Where Cp2 = 6pF and C2 = 33pF

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

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 ) .

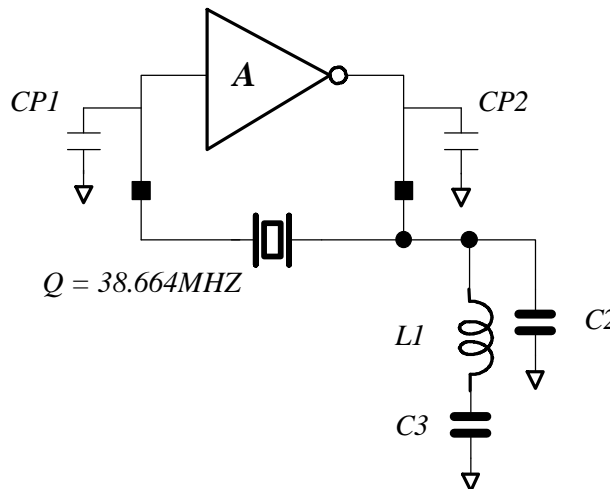


Figure 1. Typical application with a third overtone crystal

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