

TH7122 and TH71221 Using an External Microprocessor Reference Oscillator (RO)

The TH7122x has programmable R and N dividers and does not provide any data synchronization or clock recovery signals. Therefore, the setting of the dividers is limited only by their range, the frequency considerations for the channel spacing and the maximum reference frequency. The EVB7122x evaluation boards are normally populated with a 7.1505 MHz crystal for the reference oscillator because this is a good compromise for tuning 315, 433.92, 868.3 and 915 MHz in both transmit and receive using integer values for the R and N counters. This allows it to have the unique feature that these frequencies can be set-up with jumpers on the board.

In the programmable mode using the internal reference oscillator, the reference frequency can be from 3 MHz to 12 MHz. Since the range for the R counter is 4 to 1023, the reference frequency must have the following limits:

$$4 \leq \frac{f_{RO}}{f_R} \leq 1023$$

Where f_R is the channel spacing or reference frequency and f_{RO} is the frequency of the crystal oscillator. Also, remember that the frequency of the VCO can be expressed as:

$$f_{VCO} = N \cdot f_R = N \cdot \frac{f_{RO}}{R}$$

If an external reference is supplied to the RO input (pin 10) the frequency range is from 1 MHz to 16 MHz. This falls nicely within the range of almost all microprocessor references, so it is possible to use the same crystal for both the microprocessor and the TH7122x. This can be a significant cost saving in many applications. It is important that the crystal tolerance be suitable for the frequency requirement of the transceiver application. If it is used in ASK mode, the tolerance is usually not critical, and a 50 ppm or 100 ppm crystal should be sufficient in most of the cases. However, for FSK operation, the center frequency usually must be within 10 kHz to 20 kHz of the center frequency, so the tolerance should be at least 20 ppm. Most standard microprocessor crystals are specified at 50 ppm.

A typical microprocessor clock oscillator based on a Pierce topology is shown in Fig. 1:

The output of the inverter swings from ground to VCC, and the input usually does also. It is possible to connect the RO pin of the TH7122x directly to the oscillator output, but the level is much higher than the transceiver requires and if they are some distance apart on the PCB the high level clock signal may radiate harmonics or couple the clock signal into nearby traces.

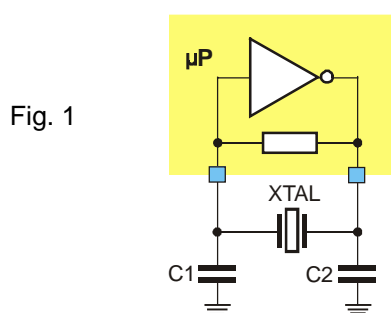


Fig. 1

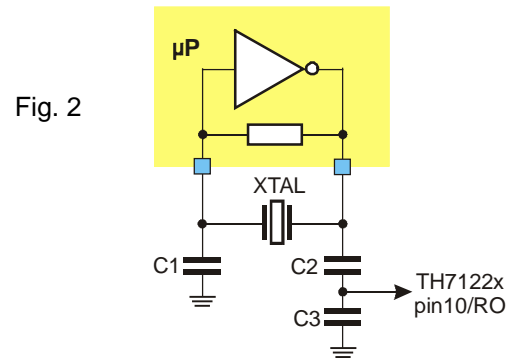
The typical levels required for the reference signal are:

Frequency f_{RO}	Amplitude V_{RO}
1 MHz to 4 MHz	150 mVpp
4 MHz to 8 MHz	150 mVpp
8 MHz to 12 MHz	250 mVpp
12 MHz to 16 MHz	600 mVpp

An easy and way to supply the reference signal to the TH7122x is with the circuit in Fig. 2:

The C2/C3 voltage divider provides AC coupling to pin 10 of the TH7122x and is selected to give the desired level. The series combination of C1, C2 and C3 determines the load on the crystal.

When using the TH7122x with an external reference, the ROMIN and ROMAX current settings in the B word should be set to 0. This turns off the reference oscillator amplitude regulation.



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