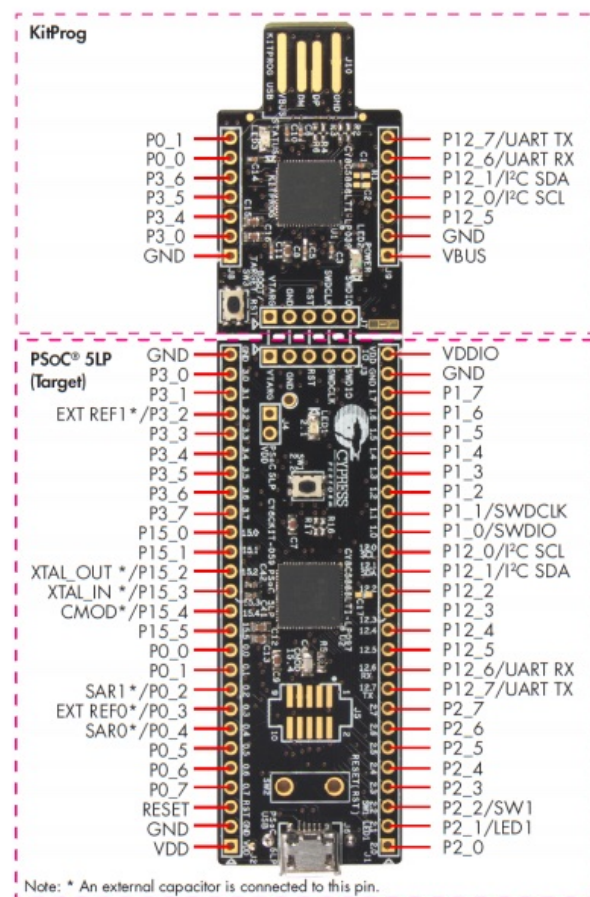# Laboratory 2

COMSYS 301 : Design : Hardware Software Systems

Objectives:

- To Use a Timer block to flash a LED at 1Hz
- To analyze a design

1. Abstract of the tasks

- Opening the workspace
- Making the correct project current
- Viewing and exploring the schematic
- Changing the schematic to modify the configuration
- Measuring the actual frequency on a scope

2. Tasks

In this lab, instructions will be minimal. Refer to lab1 if you don't remember how to achieve a task.
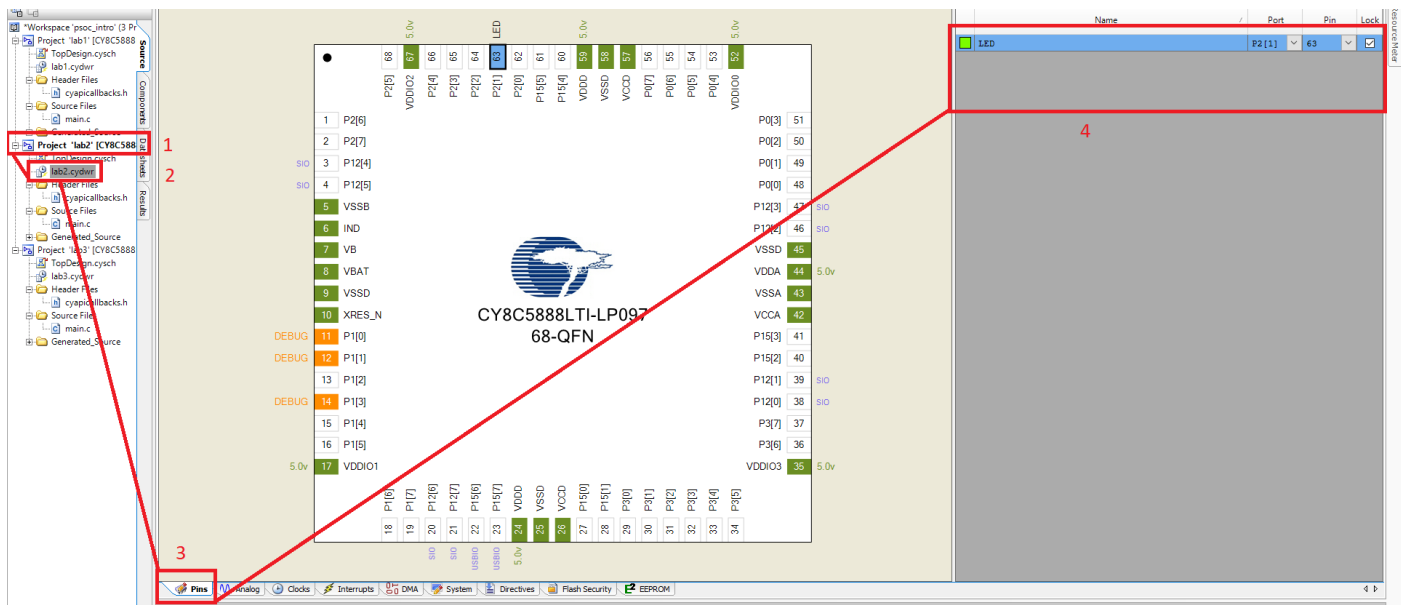
2.1. Opening the workspace

As in lab 1, begin by opening the psoc_intro.cywrk workspace.

2.2. Making the correct project current

Make the 'lab2' project active.

2.3. Viewing and exploring the schematic

Open lab2.cydwr, look at the Pins tab. How many in/out puts are there?

Open TopDesign.cysch, look at all the components. Look at their configuration parameters.

Read the datasheet of the Timer. Do this component need an initialisation in the .c files? Now focus on the in/output functionalities of the Timer bloc. How does the TC output reacts to the input of the Timer? You can draw a timing diagram to help you.

Read the datasheet of the T Flip-flop. Explain the intended operation. You can draw a timing diagram to help you.

Open the main.c, look at the code. Do you need to add something?

Open the resource monitor. Did you run out of any component? How much, in percentage, UDB (Universal Digital Block) did you use?

2.4. Changing the schematic to modify the configuration

How would you change the parameters of the Timer bloc so that it would flash at 1Hz?

Hint: look at the *Component Parameters* section of the datasheet, you only need to change 1 parameter.

2.5. Measuring the actual frequency on a scope

Now we would like to measure the frequency of the LED precisely. For that purpose, we need a scope. How would you connect the scope probe(s) to measure this frequency?

Hint: we don't need a phototransistor, look closely to the port of the led. You can refer to the first page of this document or to the lab2.cydwr file.

Is the frequency really 1Hz? Do you have an idea why? Note down the error in s.

Modify the source of the clock (default ILO) to PLL_OUT as shown below.
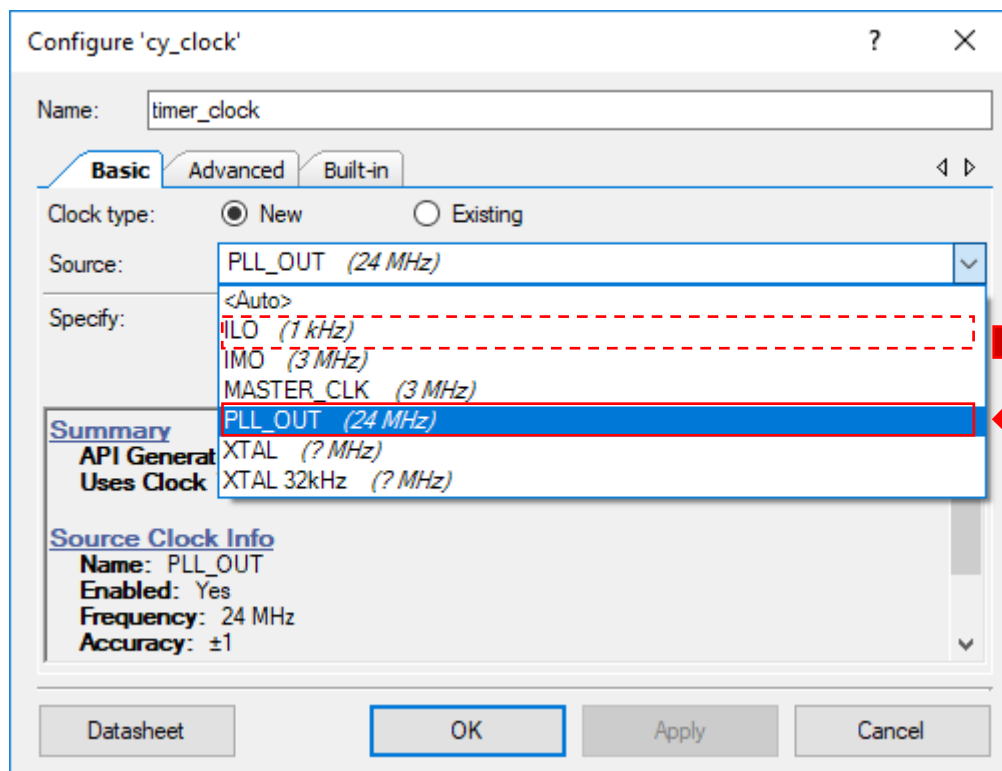
Keep the clock frequency to 1kHz, reprogram the PSoC, and make a new scope measurement. Note down the error in s.

Is the frequency closer to 1Hz than on the previous experiment? If yes, why?

3. Your notes

You are encouraged to take notes of the quick questions and remarks made in the lab because some of them may be in the quiz.

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