FPGA Design – Spring 2022
Homework 2

Date : 2022/03/21

Outline

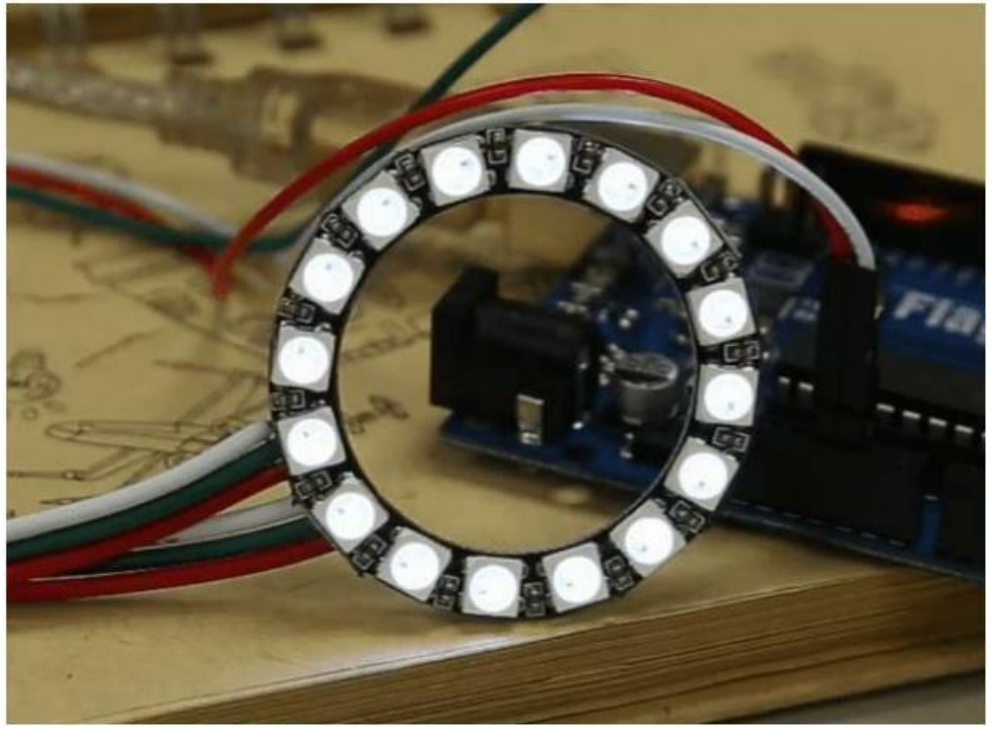
- Problem1 – Breathing Light
- Problem2 – Rainbow Breathing Light

Problem1 – Breathing Light (70%)

- 實作一個電路，可根據不同的switch輸入改變RGB 呼吸燈的輸出

Breathing Light

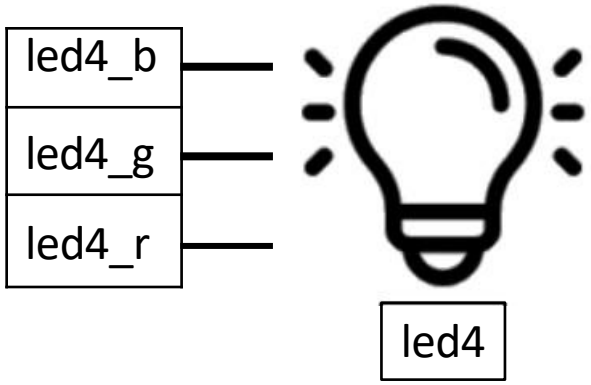
- 亮度漸變(暗→亮→暗~)

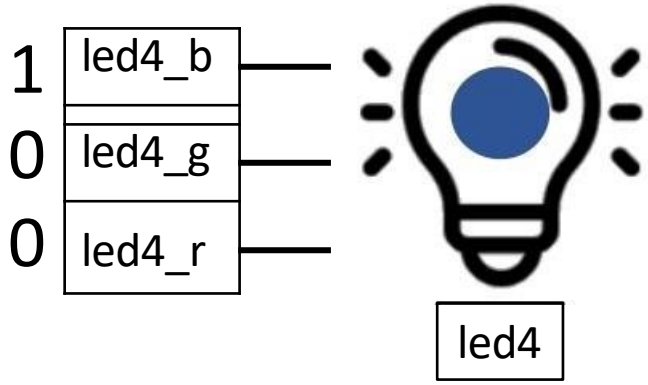


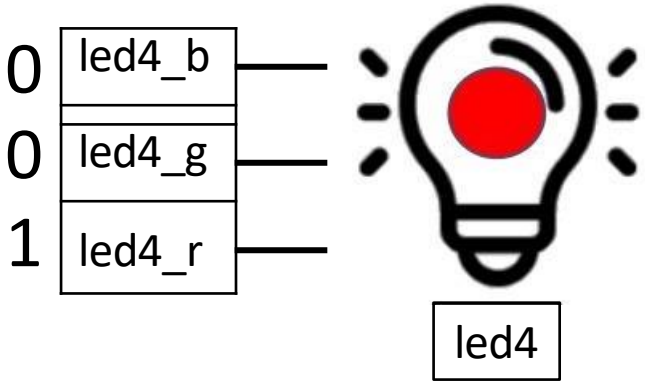
Reference : https://www.youtube.com/watch?v=Z6tbQ0HNmag&ab_channel=FlagTechnology

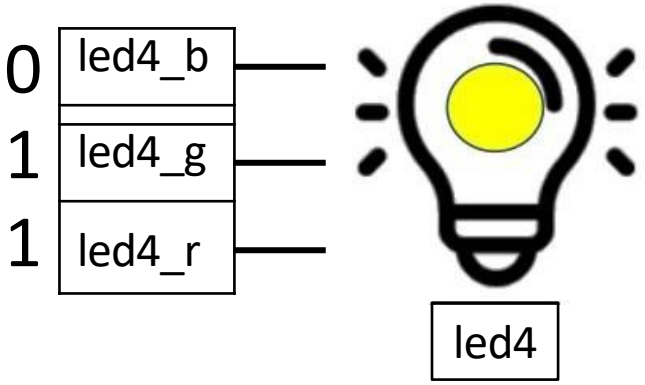
RGB LED Control

- 1個RGB LED由3個bit控制









Spec

Switch	RGB LED 4	RGB LED 5	Hex Triplet (RGB)
00	Purple Light	Purple Breathing Light	#7F1FFF
01	Cyan Light	Cyan Breathing Light	#00FFFF
10	Yellow Light	Yellow Breathing Light	#FFFF00
11	Crimson Light	Crimson Breathing Light	#FF00FF

*Button[0]作為電路的Reset訊號

Problem2 – Rainbow Breathing Light (20%)

- 實作一個電路，使RGB 呼吸燈的輸出為彩虹六色的Sequence

Spec

- 暗→亮→暗→亮→暗→亮→暗→亮→暗→亮→暗→亮→暗→亮→ 暗~

Color	紅	橙	黃	綠	藍	紫
Hex Triplet	#FF0000	#FF6100	#FFFF00	#00FF00	#0000FF	#7F1FFF

Hint & Description

- 一次呼吸(暗→亮→暗)至少需切割32個phases
    - hint : frequency divider or counter
- 呼吸燈的變化時長至少要肉眼可見
- 在Problem1中，切換switch後可不必馬上換顏色發光，可切換後再加上reset訊號重置發光
- Problem1、2皆須使用Block Design的方式實作

繳交說明

- 繳交期限 : 4/4 (一) 19:00 逾時拒收以0分計算
- 請壓縮成 .rar 或是 .zip
- 說明文件(10%)內容至少要有組員學號、電路設計說明、Block Design 截圖
  - 使用Word、PPT撰寫請轉成pdf檔，違者斟酌扣分
  - 使用Markdown撰寫可直接上傳
- 不用上傳整個Vivado Project，只需提供source file、xdc、bitstream即可

檔案格式

- FPGA_HW2_GroupX
  - Problem1
    - src (include top & IPs)
      - IP_repo (放置package好的IP資料夾)
    - xdc (include top & IPs)
    - bit
  - Problem2
    - src (include top & IPs)
      - IP_repo (放置package好的IP資料夾)
    - xdc (include top & IPs)
    - bit
  - document