

LAB06_312651057

吳鴻明

實驗目的

製作一個single processor使用single port ROM 當作 instruction memory，將IM裡面的指令讀出，並且透過decoder解碼，並做出相對應的運算。

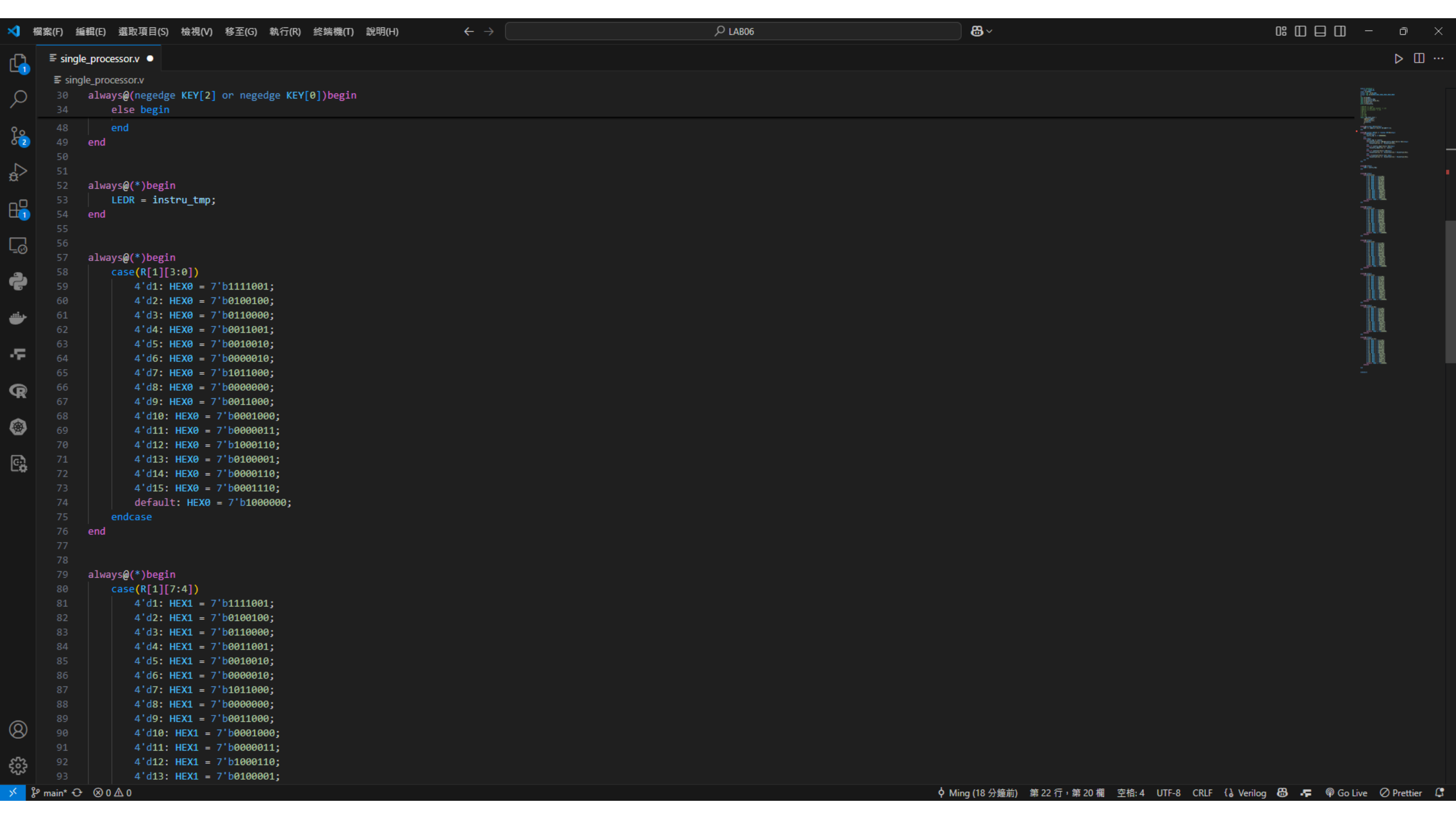
實驗程式碼

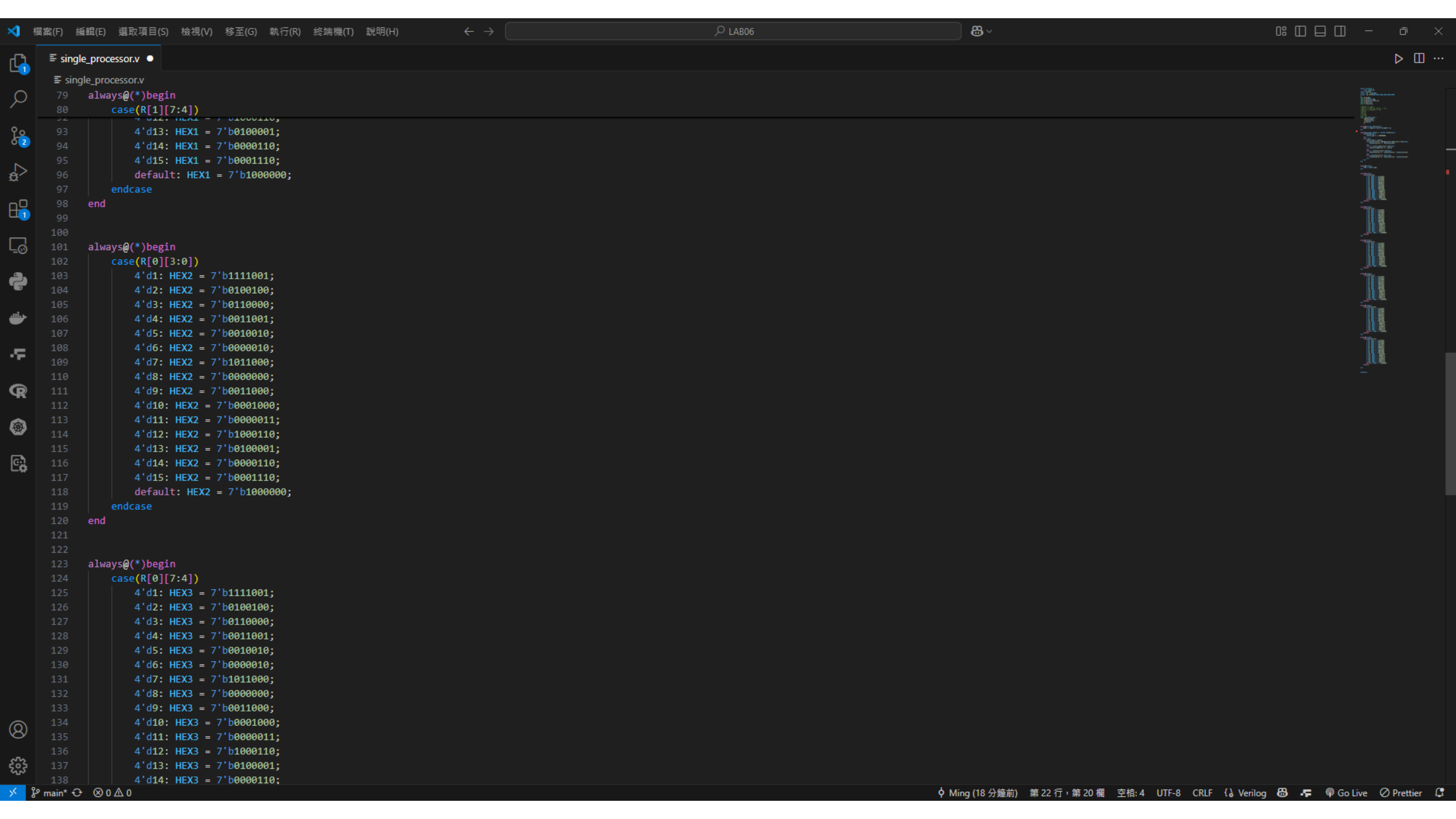
single_processor.v

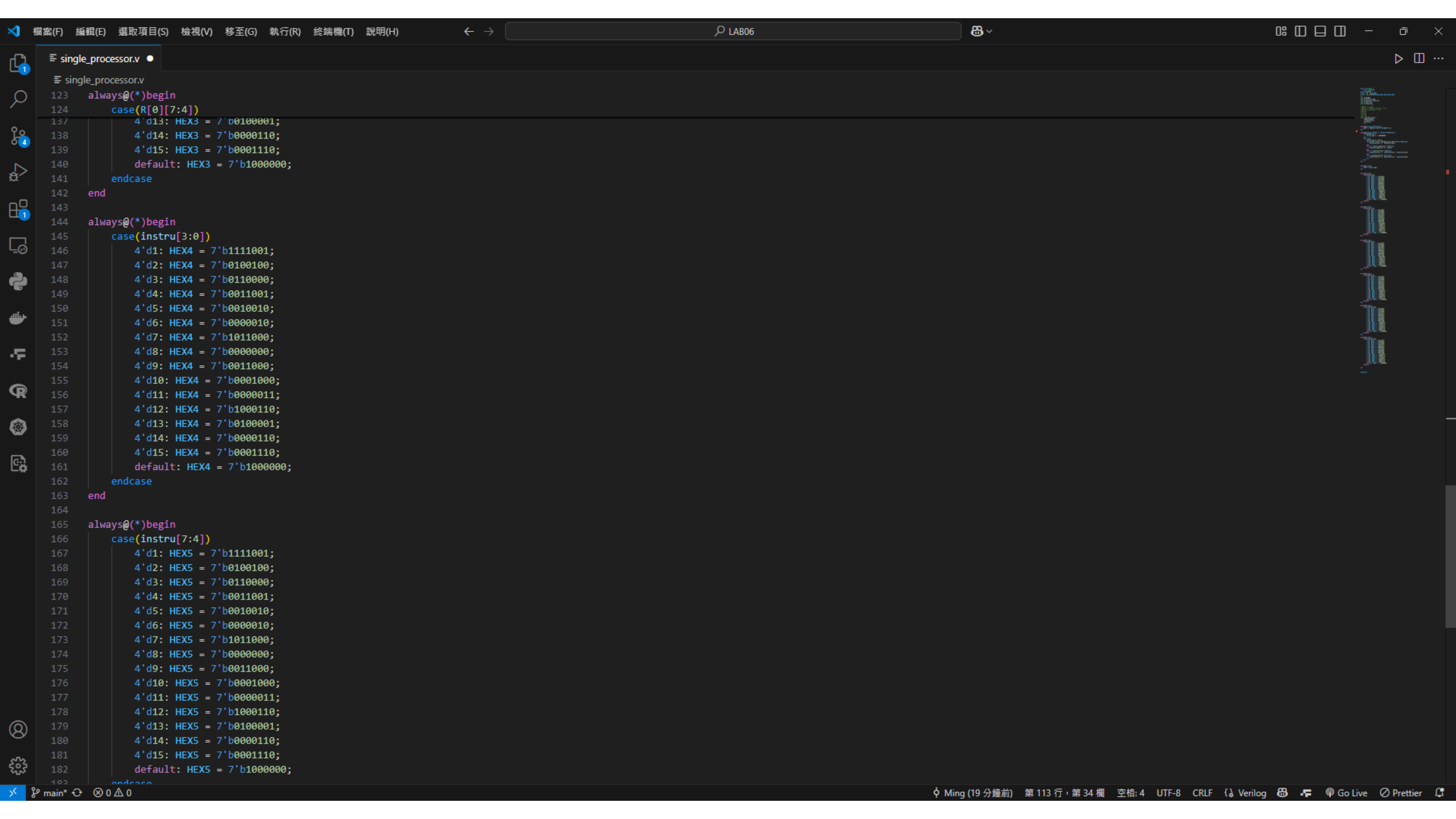
single_processor.v

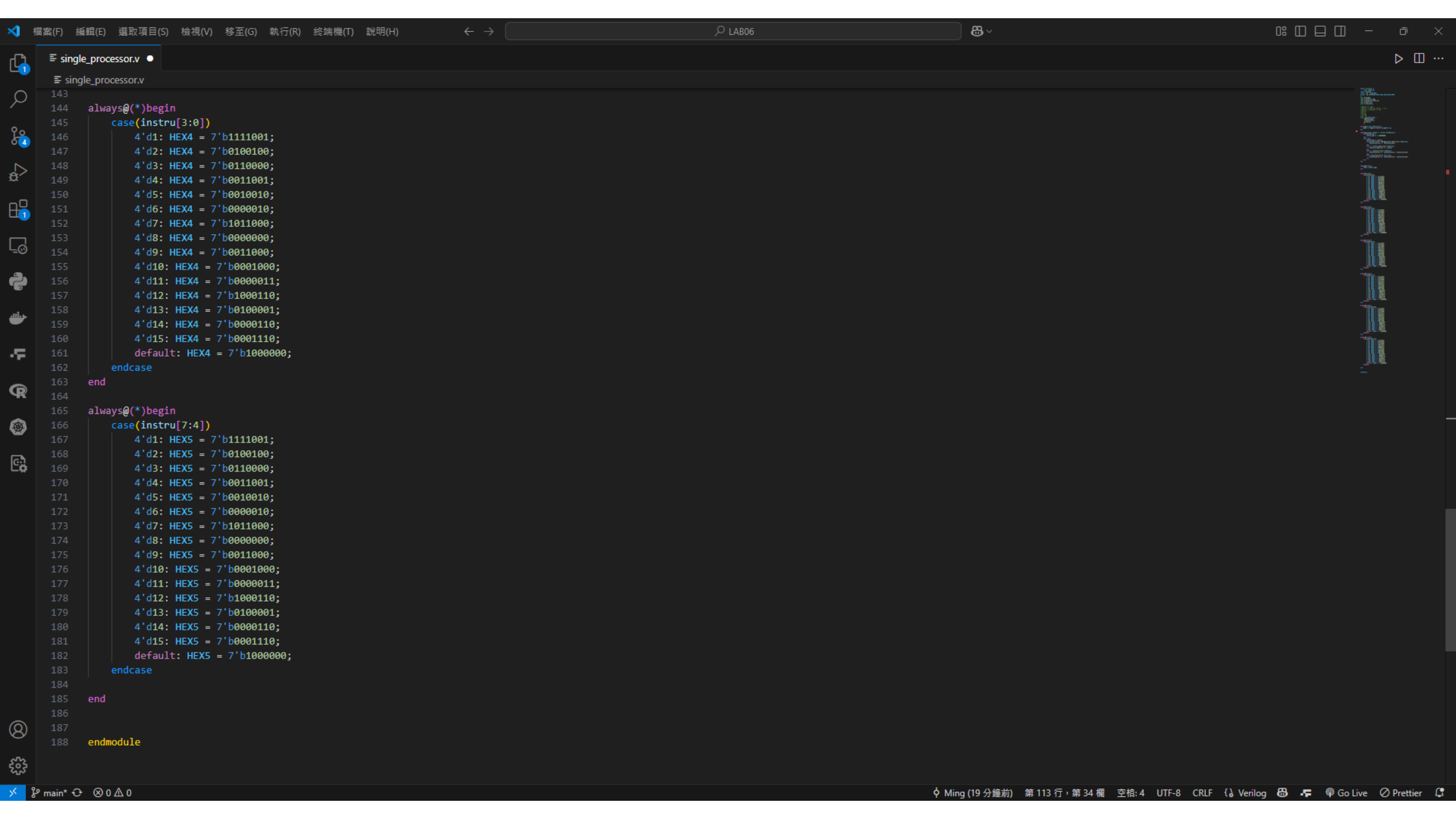
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1 module processor (  
2     input CLOCK_50,  
3     input [2:0]KEY,  
4     output reg [9:0]LEDR,  
5     output reg [6:0]HEX0,HEX1,HEX2,HEX3,HEX4,HEX5  
6 );  
7 reg [4:0]addr;  
8 reg [7:0]instru_tmp;  
9 reg [7:0]instru_ff[31:0];  
10 reg [7:0]R[7:0];  
11 wire [7:0]instru;  
12  
13 //KEY[0] is reset  
14 //KEY[1] is ROM and counter 's clk  
15 //KEY[2] is procesor 's clk  
16 //00 mvi  
17 //01 mv  
18 //10 add  
19 //11 sub  
20 rom_1 rom_test_inst (  
21     .address(addr),  
22     .clock(KEY[1]),  
23     .q(instru)  
24 );  
25  
26 always@(posedge KEY[1])begin  
27     addr <= (addr==5'd31)?5'd0:addr+5'd1;  
28 end  
29  
30 always@(negedge KEY[2] or negedge KEY[0])begin  
31     if(!KEY[0])begin  
32         instru_tmp <= 8'b00000000;  
33     end  
34     else begin  
35         instru_tmp <= instru;  
36         if((instru[7:6]==2'b00)&&(instru_tmp[7:6]!=2'b01))begin  
37             R[instru[5:3]] <= R[instru[2:0]];  
38         end  
39         else if (instru_tmp[7:6]==2'b01)begin  
40             R[instru_tmp[5:3]] <= instru;  
41         end  
42         else if (instru[7:6]==2'b10)begin  
43             R[instru[5:3]] <= R[instru[5:3]] + R[instru[2:0]];  
44         end  
45         else if(instru[7:6]==2'b11) begin  
46             R[instru[5:3]] <= R[instru[5:3]] - R[instru[2:0]];  
47         end  
48     end  
end
```



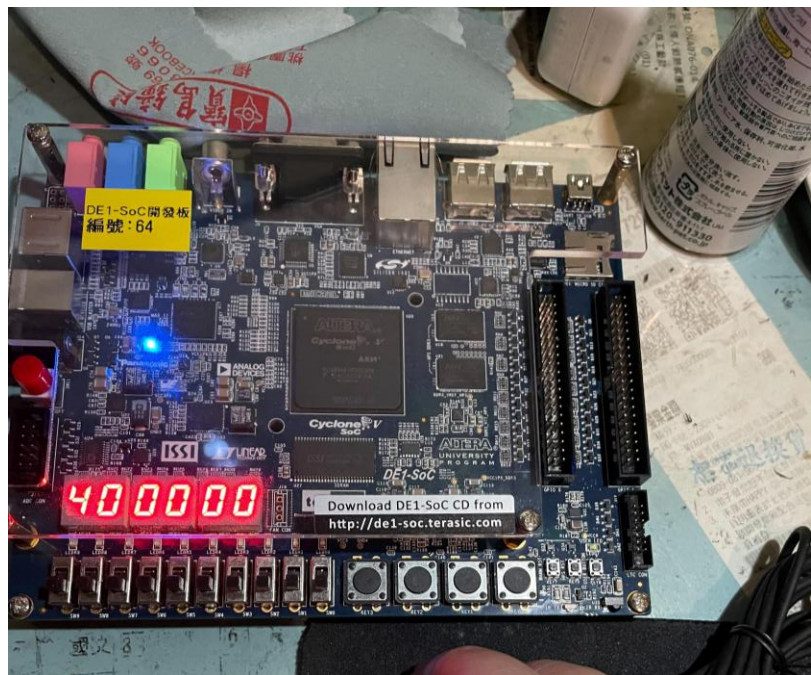
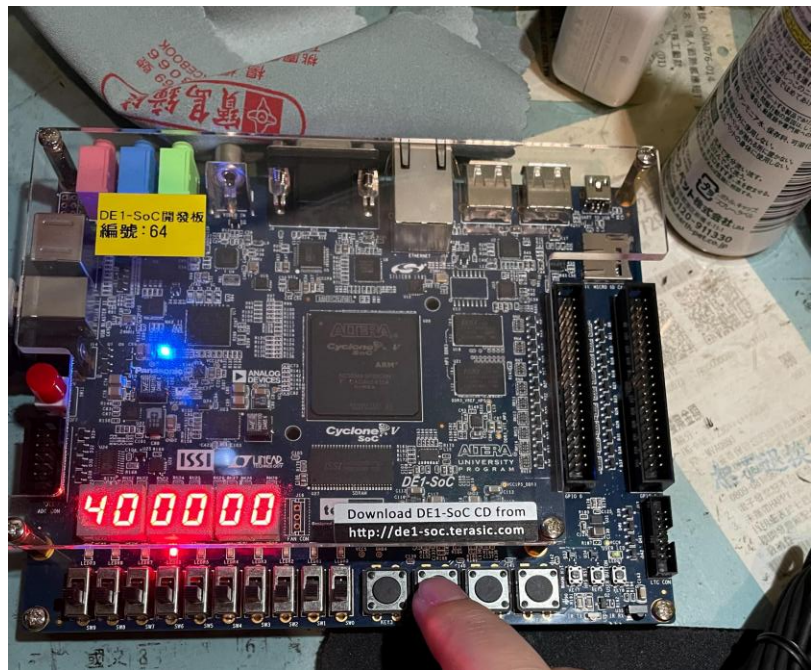
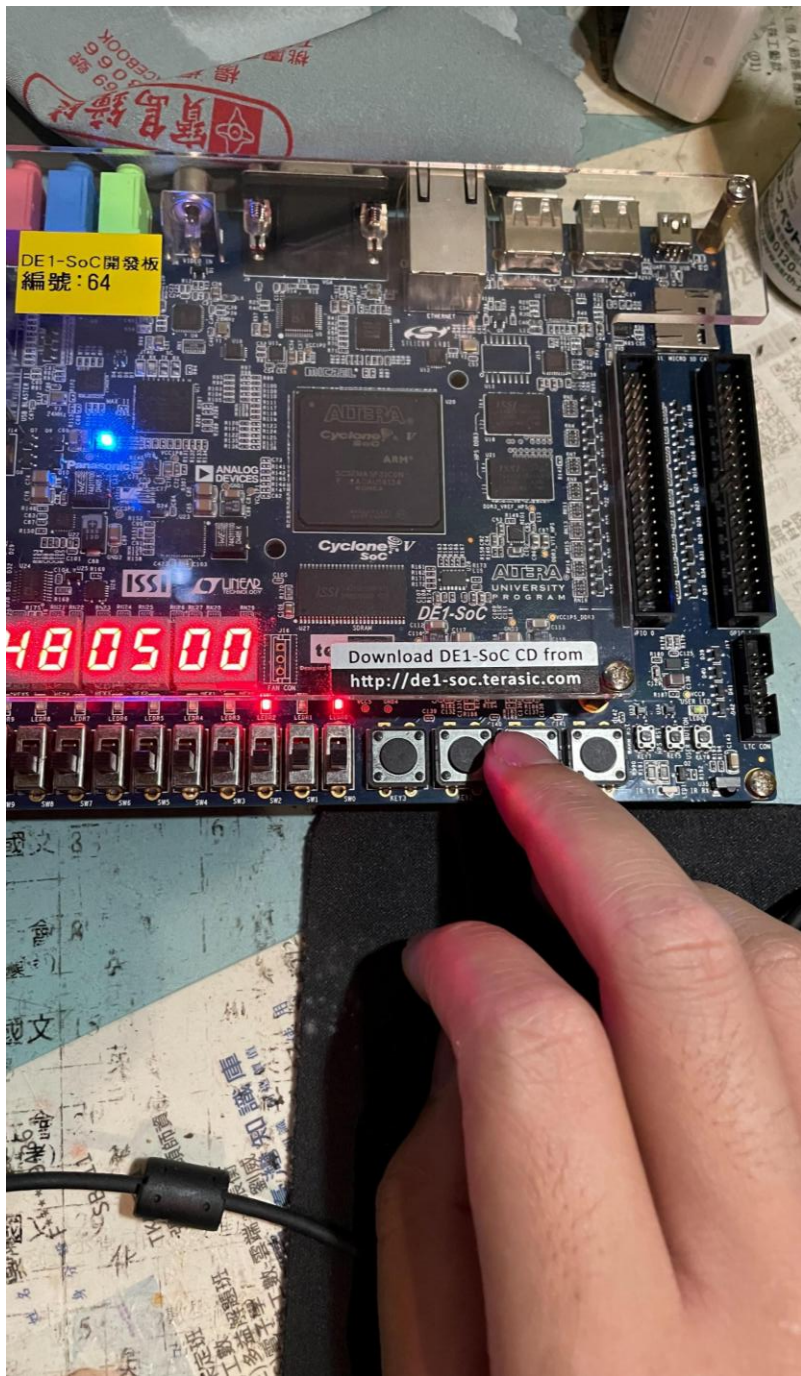
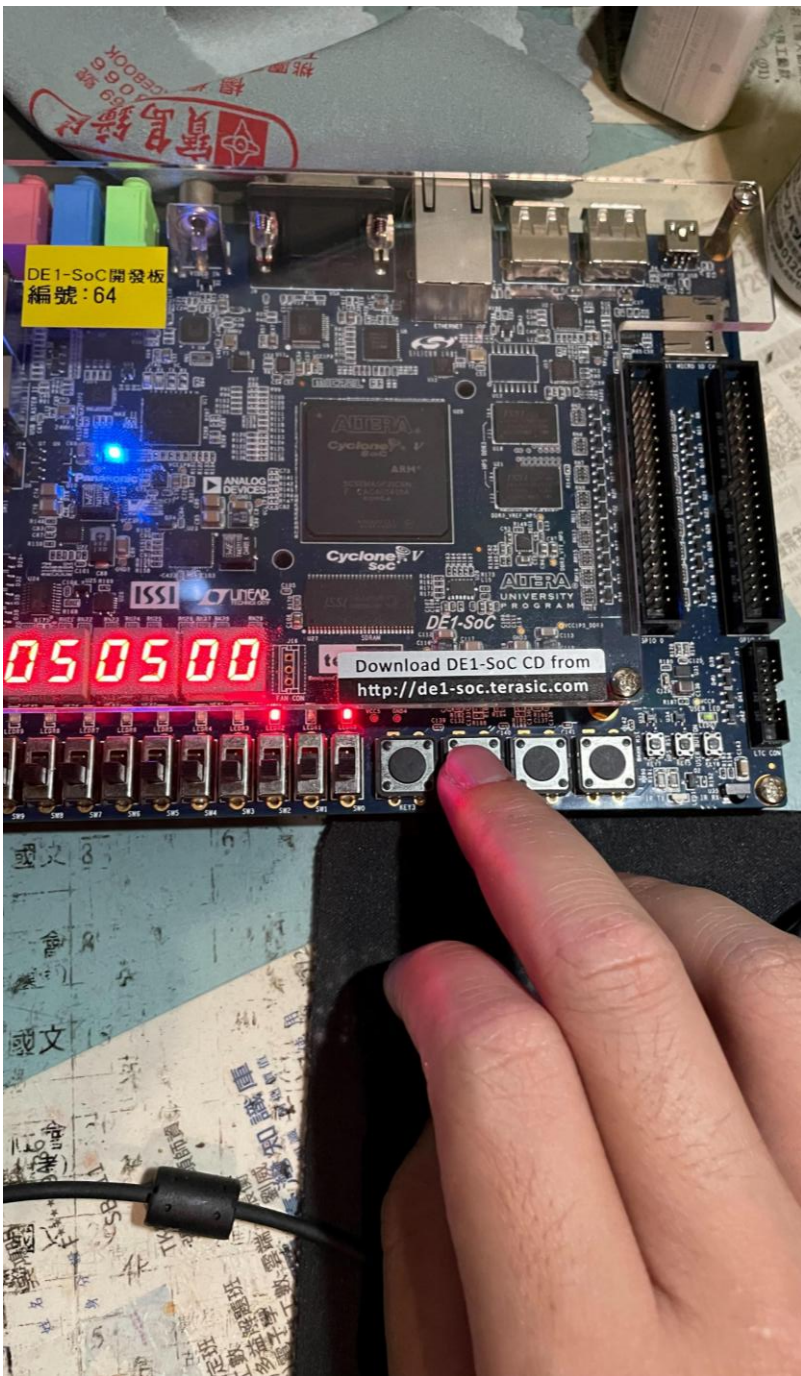


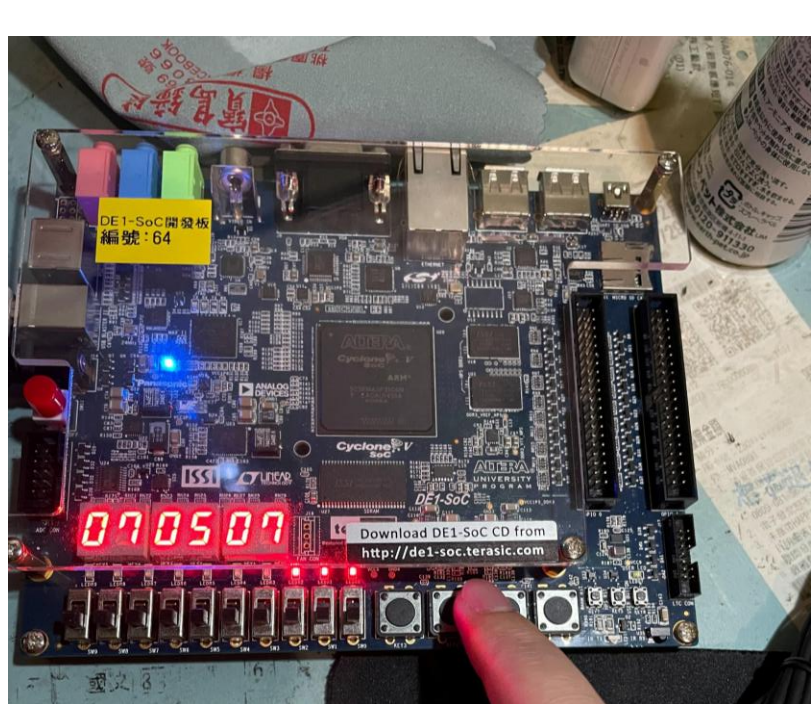
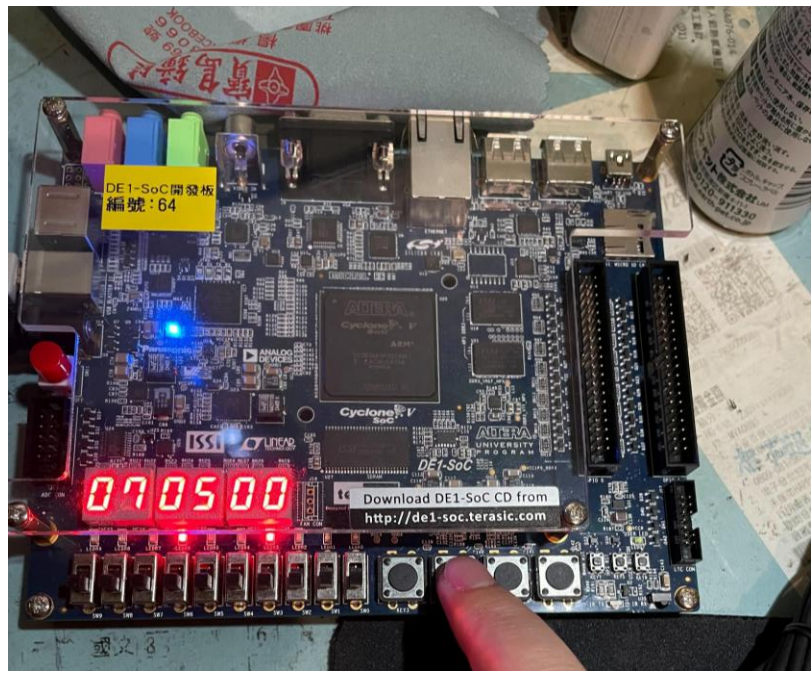
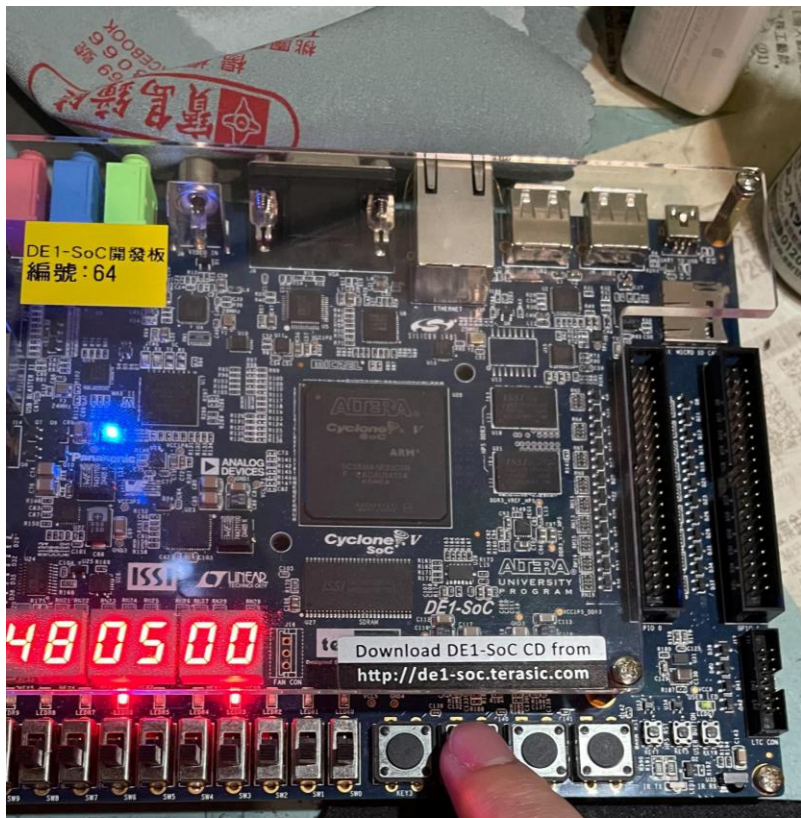
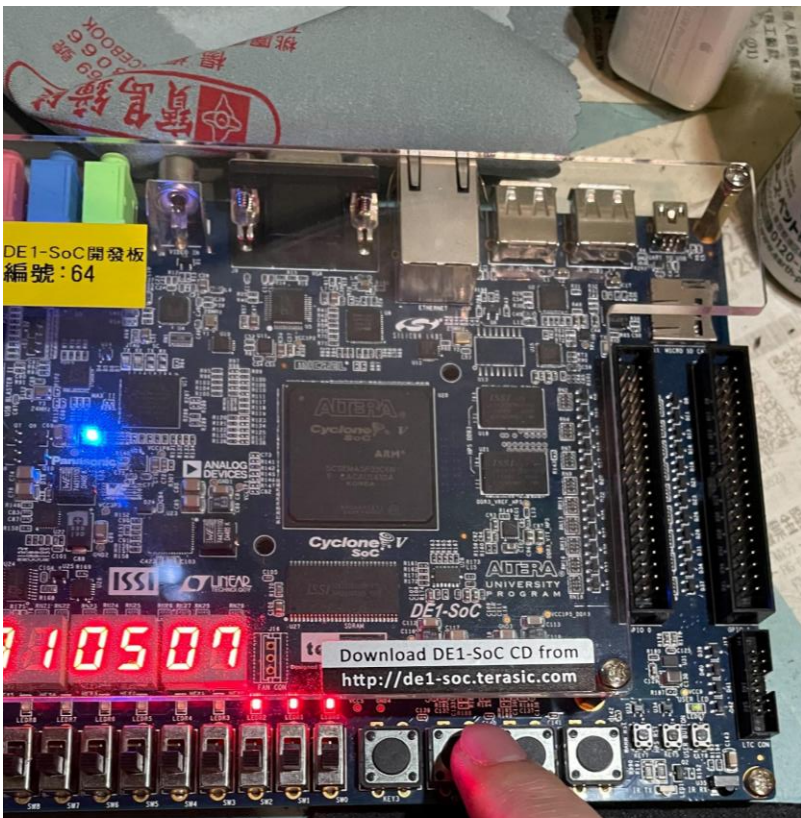


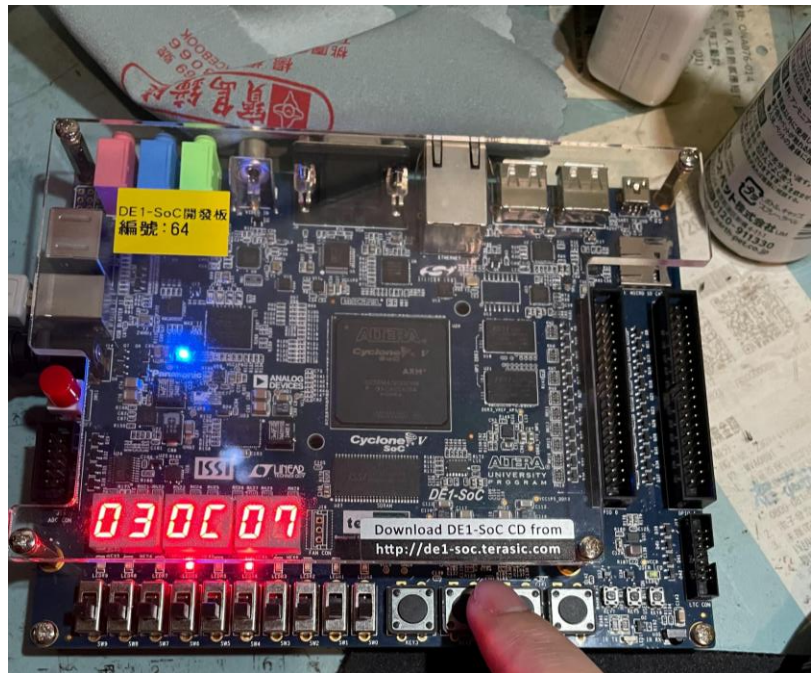
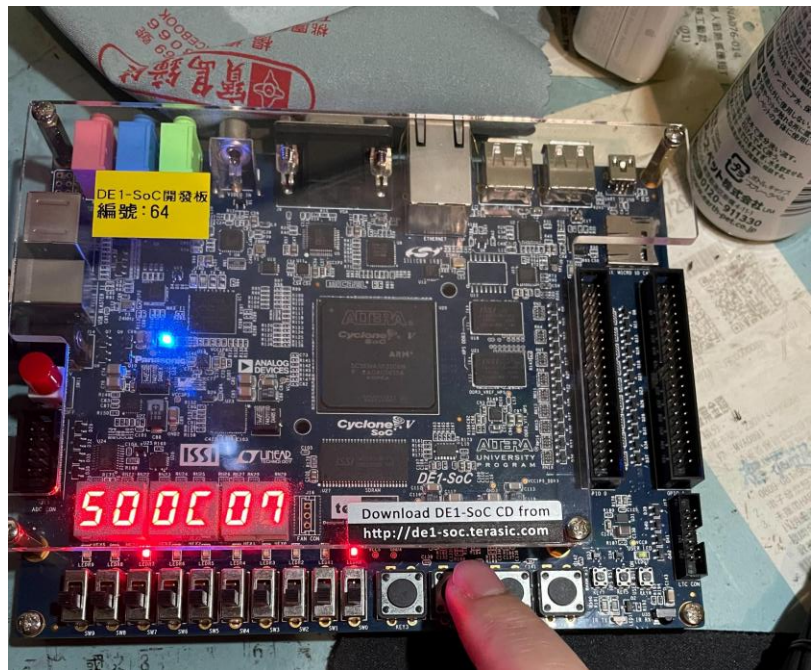
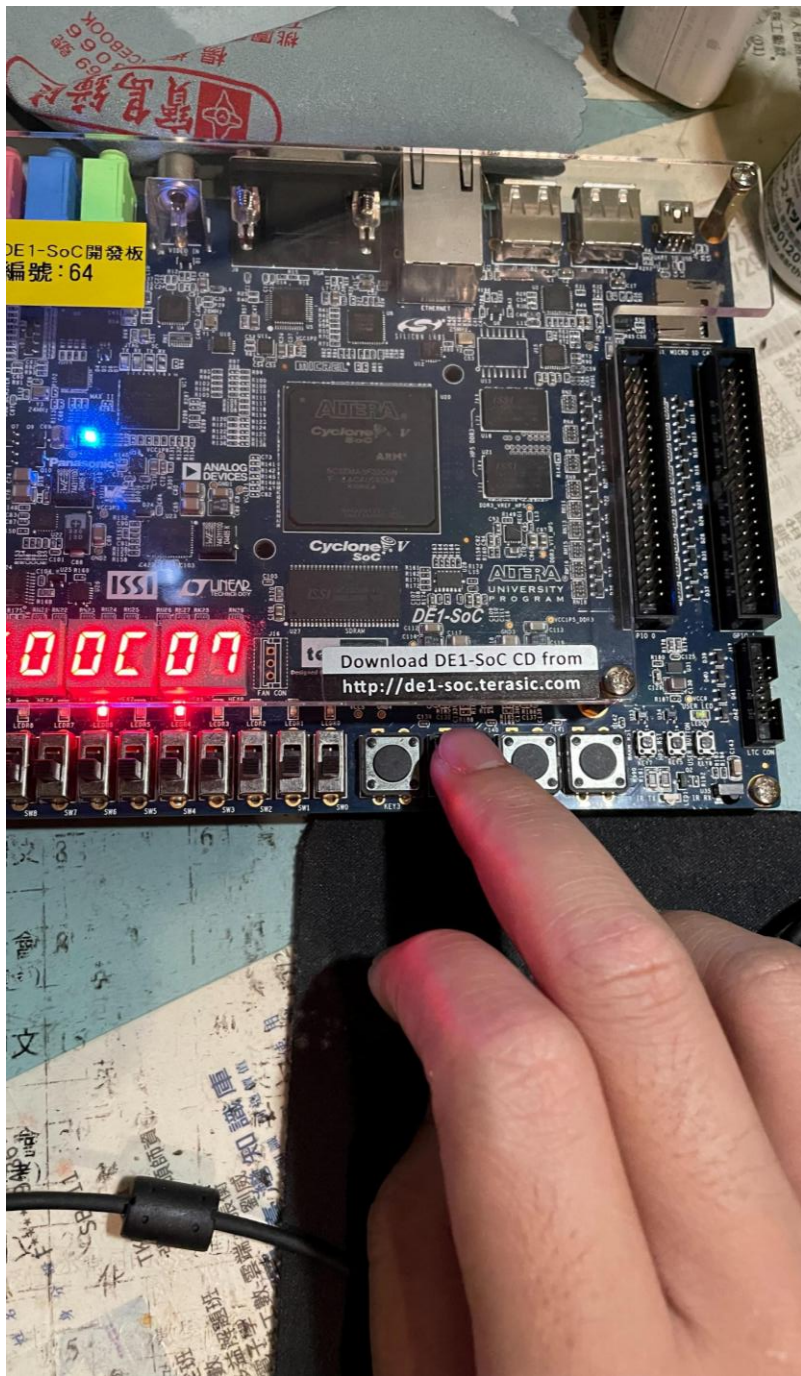
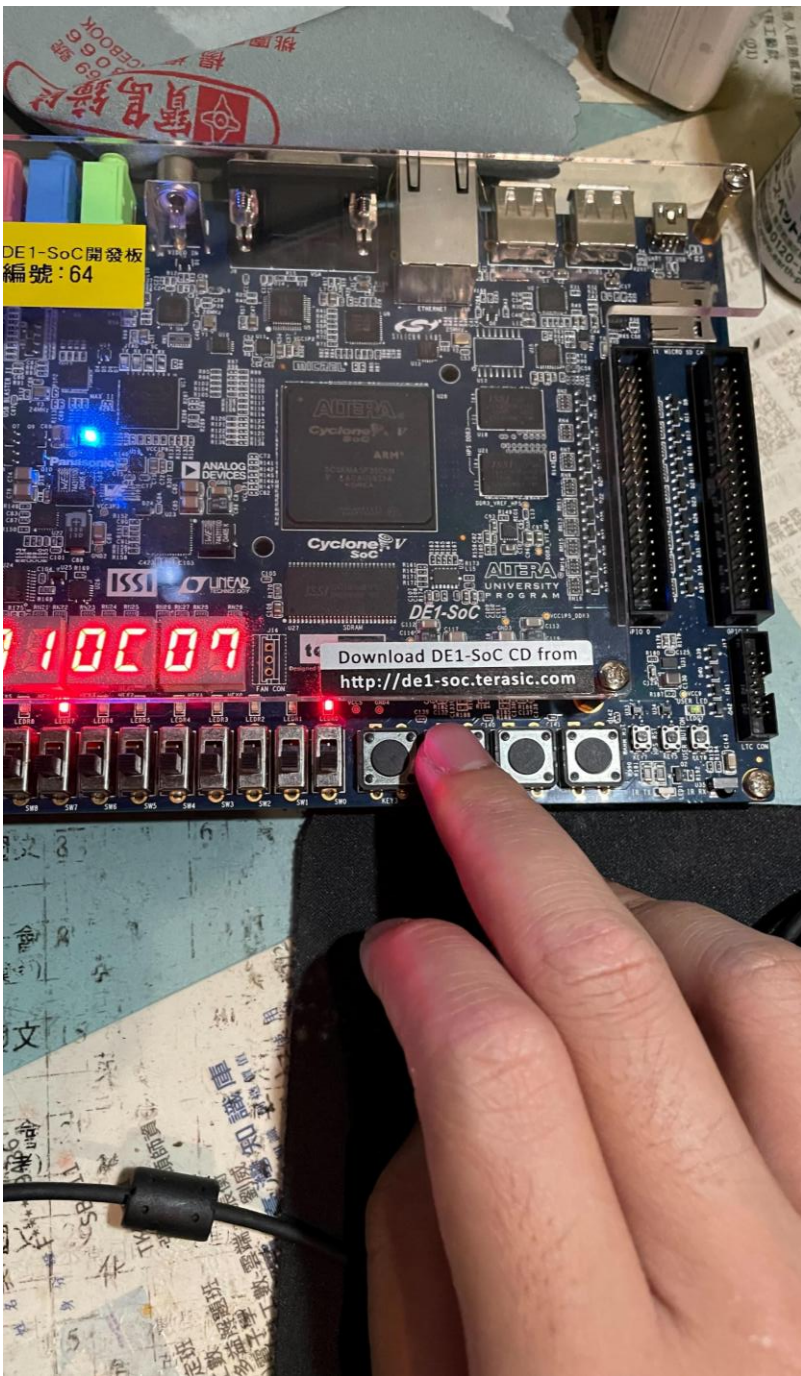


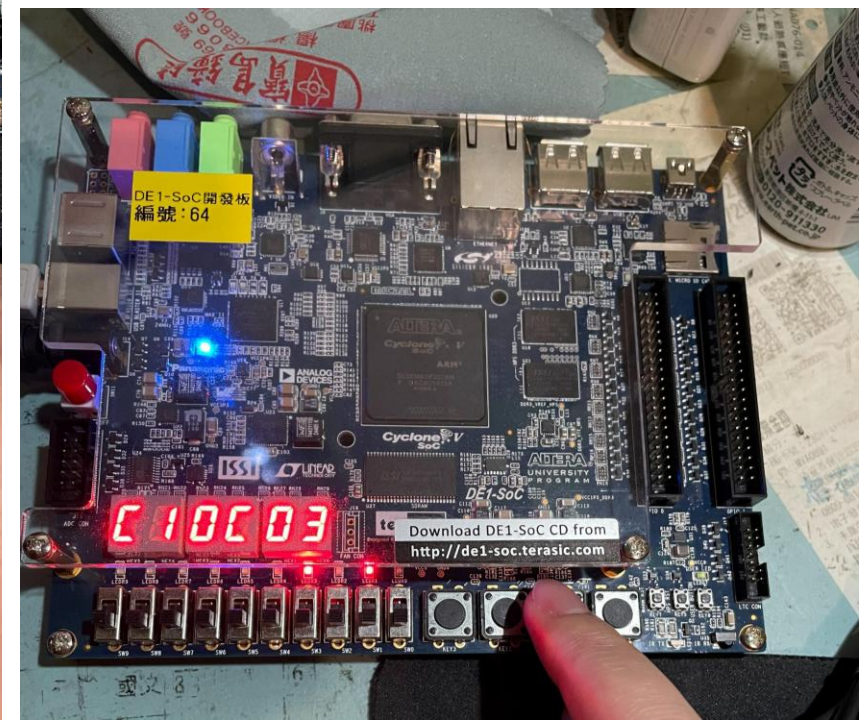
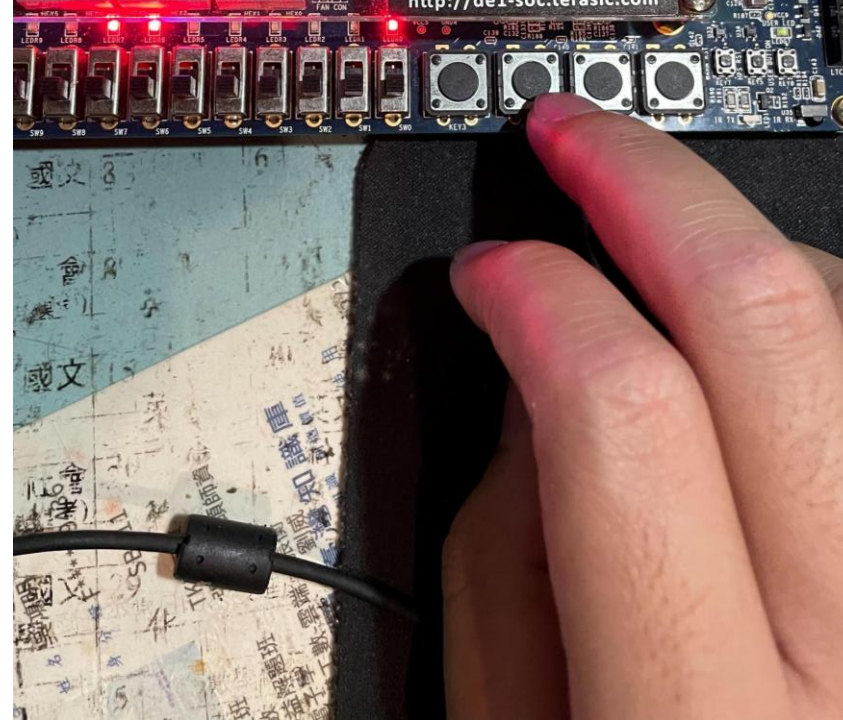
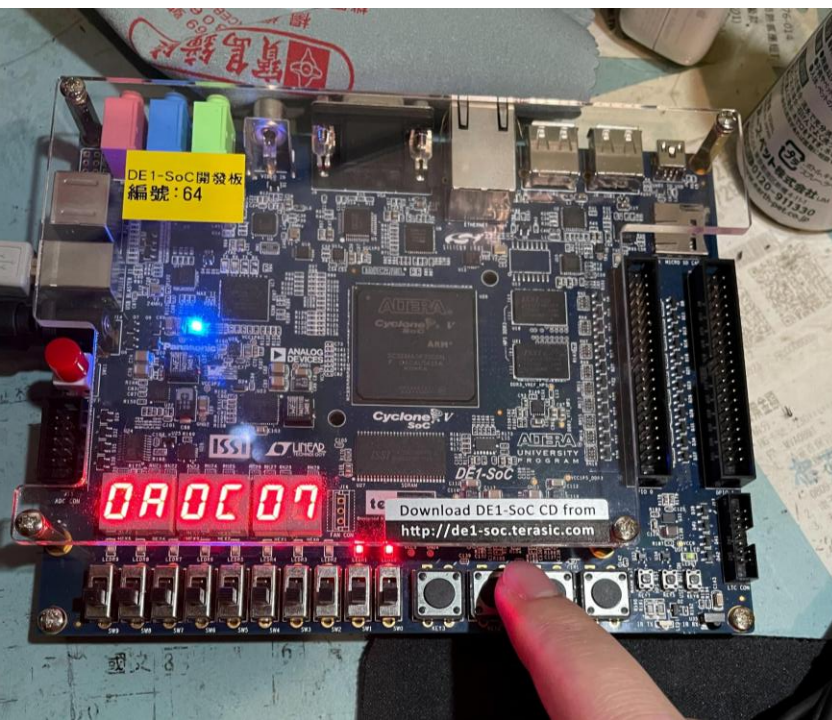
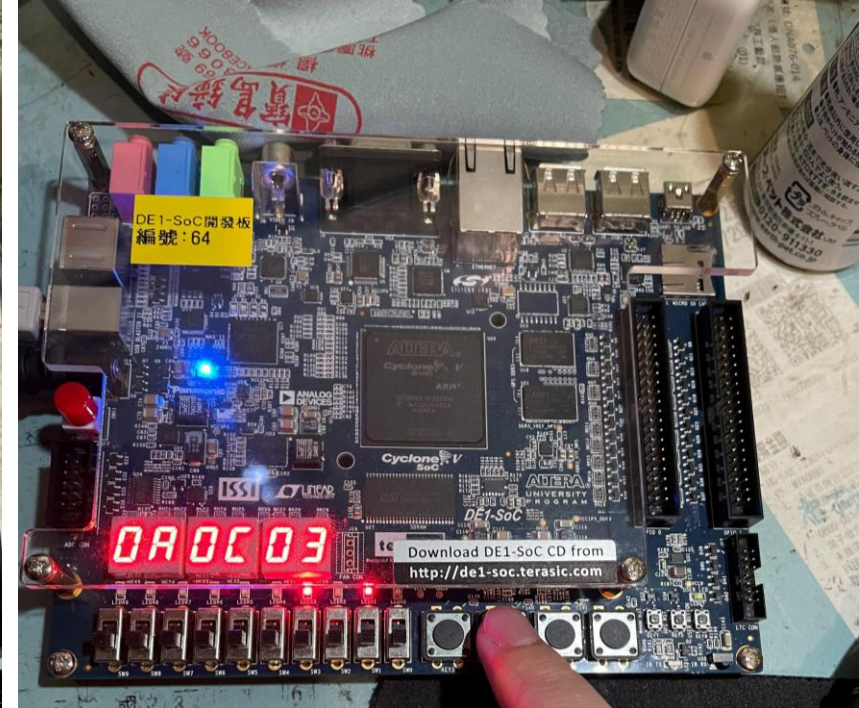
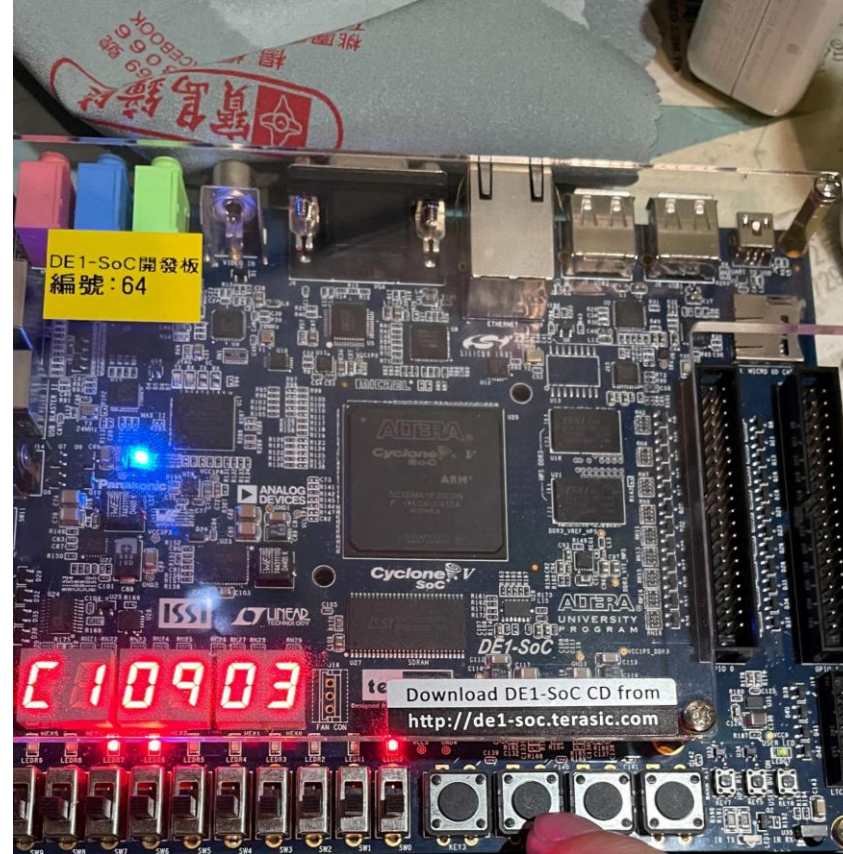
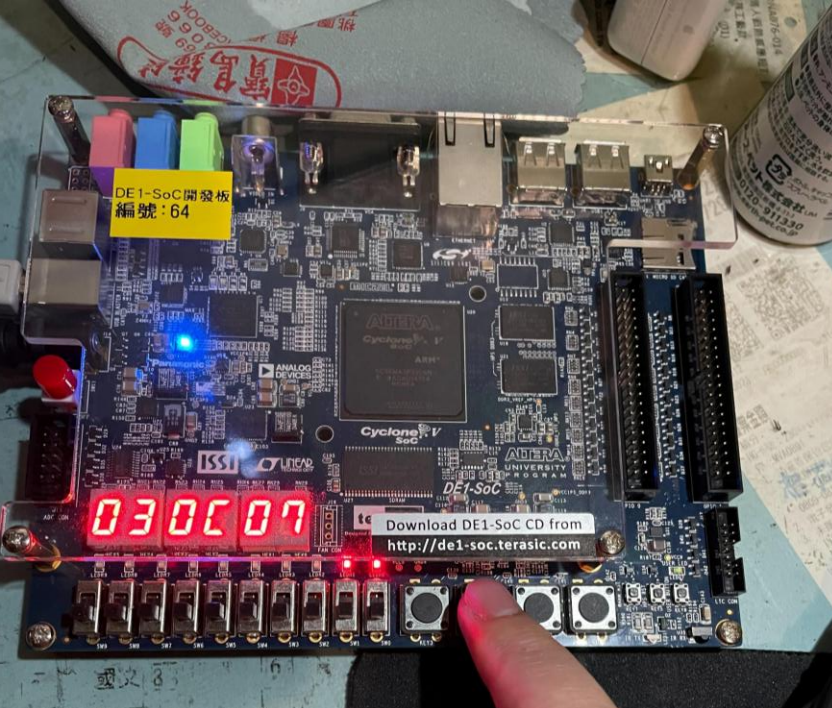


實驗結果照片









RTL佈局

如附檔RTL_syn.pdf所示

問題與討論

問題：在撰寫CODE時，遇到ROM所讀出的第一個值不是IM中的第一個位置的值，以及在做mvi的時候其他R1會跳出奇怪得值。

討論：在仔細端詳code後發覺，if-else寫的條件有誤
(解決：mvi R1出現錯誤)以及counter與ROM的CLK需要都是正緣觸發，才可以正確地讀出第一個值。