
Logic and Computer Design Fundamentals

Verilog

Part 4 – Chapter 7 – Registers and Counters

Charles Kime & Thomas Kaminski

© 2004 Pearson Education, Inc.

[Terms of Use](#)

(Hyperlinks are active in View Show mode)

Overview

■ Part 4

- **Registers**
- **Shift Registers**
- **Counters**
- **Example**
 - **4-bit Left Shift Register with Reset**
 - **4-bit Binary Counter with Reset**

Verilog for Registers and Counters

- Register – same as flip-flop except multiple

bits: `reg[3:0] Q;`

`input[3:0] D;`

`always@ (posedge CLK or posedge RESET)`

`begin`

`if (RESET) Q <= 4'b0000;`

`else Q <= D;`

`end`

- Shift Register – use concatenate:

`Q <= {Q[2:0], SI};`

- Counter – use increment/decrement:

`count <= count + 1; or count <= count - 1`

Verilog Description of Left Shift Register

```
// 4-bit Shift Register with Reset
always@(posedge CLK or
        posedge RESET)
module srg_4_r_v (CLK,
    RESET, SI, Q, SO);
    begin
        input CLK, RESET, SI;
        if (RESET)
            output [3:0] Q;
            Q <= 4'b0000;
        output SO;
        else
            reg [3:0] Q;
            Q <= {Q[2:0], SI};
        assign SO = Q[3];
    end
endmodule
```

Verilog Description of Binary Counter

```
// 4-bit Binary Counter with Reset
module count_4_r_v (CLK,
  RESET, EN, Q, CO);
  input CLK, RESET, EN;
  output [3:0] Q;
  output CO;

  reg [3:0] count;
  assign Q = count;
  assign CO = (count ==
4'b1111 && EN == 1'b1) ? 1
: 0;

  always@(posedge CLK or
    posedge RESET)
  begin
    if (RESET)
      count <= 4'b0;
    else if (EN)
      count <= count + 1;
  end
endmodule
```

Terms of Use

- © 2004 by Pearson Education, Inc. All rights reserved.
- The following terms of use apply in addition to the standard Pearson Education [Legal Notice](#).
- Permission is given to incorporate these materials into classroom presentations and handouts only to instructors adopting Logic and Computer Design Fundamentals as the course text.
- Permission is granted to the instructors adopting the book to post these materials on a protected website or protected ftp site in original or modified form. All other website or ftp postings, including those offering the materials for a fee, are prohibited.
- You may not remove or in any way alter this Terms of Use notice or any trademark, copyright, or other proprietary notice, including the copyright watermark on each slide.
- [Return to Title Page](#)