

## Example: Conditional MUX Design

//-----

### File: mux\_defines.vh

```
`define MUX_WIDTH 4
`define DATA_WIDTH 8
```

//-----

### File: mux.v

```
`include "mux_defines.vh"
module mux #(parameter W = `DATA_WIDTH)(
    input [W-1:0] in0, in1, in2, in3,
    input [1:0] sel,
    output [W-1:0] out
);
`ifdef MUX_WIDTH
    assign out = (sel == 2'd0) ? in0 :
        (sel == 2'd1) ? in1 :
        (sel == 2'd2) ? in2 :
        in3;
`endif
endmodule
//-----
```

### Testbench

```
`timescale 1ns/1ps
module mux_tb;
    // Local parameters from the macro file
    localparam W = `DATA_WIDTH;

    // Testbench signals
    reg [W-1:0] in0, in1, in2, in3;
    reg [1:0] sel;
    wire [W-1:0] out;

    // Instantiate the MUX
    mux #(W) uut (
        .in0(in0),
        .in1(in1),
        .in2(in2),
        .in3(in3),
```

```
.sel(sel),  
.out(out)  
);
```

```
// VCD dump  
initial begin  
    $dumpfile("dump.vcd");  
    $dumpvars(0, mux_tb);  
end
```

```
// Stimulus  
initial begin  
    // Assign test values  
    in0 = 8'hA0;  
    in1 = 8'hB1;  
    in2 = 8'hC2;  
    in3 = 8'hD3;
```

```
    sel = 2'd0; #10;  
    $display("SEL=0, OUT=%h", out);
```

```
    sel = 2'd1; #10;  
    $display("SEL=1, OUT=%h", out);
```

```
    sel = 2'd2; #10;  
    $display("SEL=2, OUT=%h", out);
```

```
    sel = 2'd3; #10;  
    $display("SEL=3, OUT=%h", out);
```

```
    $finish;  
end
```

```
endmodule
```

```
//-----
```

## Testing / Debugging

```
`define DEBUG
```

```
module top;
```

```
`ifdef DEBUG
```

```
    initial $display("Debug Mode Active");
```

```
`endif
```

```
endmodule
```

```
//-----
```