

```
1  `timescale 1ns / 1ps
2  /*****
3   * File Name: vga_sync.v
4   * Project: VGA Sync
5   * Designer: Marc Cabote
6   * Email: marcdominic011@gmail.com
7   * Rev. Date: 11 October, 2017
8   *
9   * Purpose: This module will generate the hsync signal. Hsync
10  *           specifies the time required to scan a row. This module also
11  *           generates the vsync signal which takes care of the time
12  *           required to scan the entire screen. This will take into account
13  *           a screen with 640 x 480 resolution with has a 25Mhz refresh rate.
14  *
15  * Notes:   - This module has an asynchronous reset input.
16  *           - vide_on enables objects to be displayed
17  *****/
18  module vga_sync(input      clk, rst,
19                  output [9:0] pixel_x, pixel_y,
20                  output      hsync, vsync, video_on);
21
22      /*****
23       *Counter to generate 25Mhz clock
24       *****/
25      reg [1:0] count;
26      wire tick;
27
28      assign tick = (count == 2'b11);
29
30      always @ (posedge clk, posedge rst)
31          if (rst) count <= 2'b0; else
32              if (tick) count <= 2'b0; else
33                  count <= count + 2'b1;
34
35
36      /*****
37       *Horizontal count 0-799
38       *****/
39      reg [9:0] hcount;
40      wire endh;
41
42      assign pixel_x = hcount ;
43      assign endh = (hcount == 799);
44
45      always @ (posedge clk, posedge rst)
46          if (rst) hcount <= 10'b0; else
47              if (tick)
48                  if (endh) hcount <= 10'b0; else
49                      hcount <= hcount +10'b1;
50
51      assign hsync = ~(hcount >= 656 & hcount <= 751);
52
53      /*****
54       *Vertical count 0-524
55       *****/
56      reg [9:0] vcount;
57      wire endv;
```

```
58
59     assign pixel_y = vcount;
60     assign endv = (vcount == 524);
61
62     always @ (posedge clk, posedge rst)
63         if (rst) vcount <= 10'b0; else
64             if (tick)
65                 if(endh)
66                     if(endv) vcount <= 10'b0; else
67                         vcount <= vcount + 10'b1;
68
69     assign vsync = ~(vcount >= 490 & vcount <= 491);
70
71     //display would be on when vsync and hsync are "inside" the
72     //vga monitor
73     assign video_on = ((hcount<656) && (vcount<490));
74
75 endmodule
76
```