|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 31  12 | 27  11 | 20  10 | 13  9 | Hm1[3]  8 | 6  7 | 2  6 | 9  5 | Hm1[2]  4 | 16  3 | Hm1[1]  2 | Hm1[0]  1 | H0 |
| 23  24 | 30  23 | 26  22 | 19  21 | Hm2[3]  20 | 12  19 | 5  18 | 1  17 | Hm2[2]  16 | 8  15 | Hm2[1]  14 | Hm2[0]  13 | H1 |
| 15  36 | 22  35 | 29  34 | 25  33 | Hm3[3]  32 | 18  31 | 11  30 | 4  29 | Hm3[2]  28 | 0  27 | Hm3[1]  26 | Hm3[0]  25 | H2 |
| 7  48 | 14  47 | 21  46 | 28  45 | Hm4[3]  44 | 24  43 | 17  42 | 10  41 | Hm4[2]  40 | 3  39 | Hm4[1]  38 | Hm4[0]  37 | H3 |

2 3 6 7 10 11

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| V0 | V1 | V2 | V3 | V4 | V5 | V6 | V7 |

module c\_encoder(

input clk,

input reset,

input[31:0]msg,

output [59:0]O);

reg [59:0]O;

reg [3:0]Hm1 ;

reg [3:0]Hm2;

reg [3:0]Hm3;

reg [3:0]Hm4;

reg [3:0]H;

reg [7:0]V;

reg [7:0]m0;

reg [7:0]m1;

reg [7:0]m2;

reg [7:0]m3;

always @(posedge clk)

begin

If(reset==1'b1)

begin

m0[7:0] = msg[7:0];

m1[7:0] = msg[15:8];0

m2[7:0] = msg[23:16];

m3[7:0] = msg[31:24];

H[0] = m0[0]^m0[1]^m0[2]^m0[3]^m0[4]^m0[5]^m0[6]^m0[7];

H[1] = m1[0]^m1[1]^m1[2]^m1[3]^m1[4]^m1[5]^m1[6]^m1[7];

H[2] = m2[0]^m2[1]^m2[2]^m2[3]^m2[4]^m2[5]^m2[6]^m2[7];

H[3] = m3[0]^m3[1]^m3[2]^m3[3]^m3[4]^m3[5]^m3[6]^m3[7];

V[0] = m0[0]^m1[0]^m2[0]^m3[0];

V[1] = m0[1]^m1[1]^m2[1]^m3[1];

V[2] = m0[2]^m1[2]^m2[2]^m3[2];

V[3] = m0[3]^m1[3]^m2[3]^m3[3];

V[4] = m0[4]^m1[4]^m2[4]^m3[4];

V[5] = m0[5]^m1[5]^m2[5]^m3[5];

V[6] = m0[6]^m1[6]^m2[6]^m3[6];

V[7] = m0[7]^m1[7]^m2[7]^m3[7];

Hm1[0] = m1[0]^m0[1]^m1[4]^m2[3]^m3[6];

Hm1[1] = m1[0]^m0[5]^m1[4]^m3[2]^m3[6];

Hm1[2] = m0[1]^m0[5]^m1[4]^m2[7];

Hm1[3] = m2[3]^m3[2]^m3[6]^m2[7];

Hm2[0] = m2[0]^m1[1]^m0[6]^m1[5]^m3[3];

Hm2[1] = m2[0]^m0[2]^m0[6]^m2[4]^m3[3];

Hm2[2] = m1[1]^m0[2]^m0[6]^m3[7];

Hm2[3] = m1[5]^m2[4]^m3[3]^m3[7];

Hm3[0] = m0[0]^m0[4]^m2[2]^m3[1]^m2[6];

Hm3[1] = m0[0]^m1[3]^m2[2]^m3[5]^m2[6];

Hm3[2] = m0[4]^m1[3]^m0[6]^m3[7];

Hm3[3] = m3[1]^m2[5]^m2[6]^m1[7];

Hm4[0] = m0[3]^m1[2]^m3[0]^m3[4]^m1[6];

Hm4[1] = m0[3]^m2[1]^m3[0]^m2[5]^m1[6];

Hm4[2] = m1[2]^m2[1]^m3[0]^m0[7];

Hm4[3] = m3[4]^m2[5]^m1[6]^m3[7];

O[59:0] = {m3[7],m3[3],m2[4],m1[5],Hm1[3],m0[6],m0[2],m1[1],Hm1[2],m2[0],Hm1[1],Hm1[0],H0,m2[7],m3[6],m3[2],m2[3],Hm2[3],m1[4],m0[5],m0[1],Hm2[2],m1[0],Hm2[1],Hm2[0],H1,m1[7],m2[6],m3[5],m3[1],Hm3[3],m2[2],m1[3],m0[4],Hm3[2],m0[0],Hm3[1],Hm3[0],H2,m0[7],m1[6],m2[5],m3[4],Hm4[3],m3[0],m2[1],m1[1],Hm4[2],m3[3],Hm4[1],Hm4[0],H3,V7,V6,V5,V4,V3,V2,V1,V0};

end

end

endmodule