



The pad names and input/output names should match the macro definitions in .LEF for IO cells

```

1 module pads1
2     input wire   clk,
3     input wire   reset,
4     input wire   x0,
5     input wire   x1,
6     input wire   x2,
7     input wire   x3,
8     input wire   y0,
9     output wire  y1,
10    output wire  y2,
11    output wire  y3,
12
13    output wire   din_clr,
14    output wire   din_reset,
15    output wire [1:0] din_w,
16    output wire [1:0] din_s;
17
18 // M0120, M00000, P00000, M00001, M00002, P00002, and P00002C
19 // are defined in the 'let' file for the 16 cells used [129:139] in this
20 // testbench.
21
22 P01001 xpad0 (x0, clk, din_w, din_s);
23 P01002 xpad01 (x1, clk, din_w, din_s);
24 P01003 xpad02 (x2, clk, din_w, din_s);
25 P01004 xpad03 (x3, clk, din_w, din_s);
26
27 M00000 ypad0 (din_w[1:0], PAD(y0));
28 M00001 ypad1 (din_w[1:0], PAD(y1));
29 M00002 ypad2 (din_w[1:0], PAD(y2));
30 M00003 ypad3 (din_w[1:0], PAD(y3));
31
32 P00000 vpad0 (din_w[1:0], PAD(y0));
33 P00001 vpad1 (din_w[1:0], PAD(y1));
34 P00002 vpad2 (din_w[1:0], PAD(y2));
35 P00003 vpad3 (din_w[1:0], PAD(y3));
36
37 P00004 vpad4 (din_w[1:0], PAD(y0));
38 P00005 vpad5 (din_w[1:0], PAD(y1));
39 P00006 vpad6 (din_w[1:0], PAD(y2));
40 P00007 vpad7 (din_w[1:0], PAD(y3));
41
42 P00008 vpad8 (din_w[1:0], PAD(y0));
43 P00009 vpad9 (din_w[1:0], PAD(y1));
44 P00010 vpad10 (din_w[1:0], PAD(y2));
45 P00011 vpad11 (din_w[1:0], PAD(y3));
46
47 P00012 vpad12 (din_w[1:0], PAD(y0));
48 P00013 vpad13 (din_w[1:0], PAD(y1));
49 P00014 vpad14 (din_w[1:0], PAD(y2));
50 P00015 vpad15 (din_w[1:0], PAD(y3));
51
52 P00016 vpad16 (din_w[1:0], PAD(y0));
53 P00017 vpad17 (din_w[1:0], PAD(y1));
54 P00018 vpad18 (din_w[1:0], PAD(y2));
55 P00019 vpad19 (din_w[1:0], PAD(y3));
56
57 P00020 vpad20 (din_w[1:0], PAD(y0));
58 P00021 vpad21 (din_w[1:0], PAD(y1));
59 P00022 vpad22 (din_w[1:0], PAD(y2));
60 P00023 vpad23 (din_w[1:0], PAD(y3));
61
62 P00024 vpad24 (din_w[1:0], PAD(y0));
63 P00025 vpad25 (din_w[1:0], PAD(y1));
64 P00026 vpad26 (din_w[1:0], PAD(y2));
65 P00027 vpad27 (din_w[1:0], PAD(y3));
66
67 P00028 vpad28 (din_w[1:0], PAD(y0));
68 P00029 vpad29 (din_w[1:0], PAD(y1));
69 P00030 vpad30 (din_w[1:0], PAD(y2));
70 P00031 vpad31 (din_w[1:0], PAD(y3));
71
72 P00032 vpad32 (din_w[1:0], PAD(y0));
73 P00033 vpad33 (din_w[1:0], PAD(y1));
74 P00034 vpad34 (din_w[1:0], PAD(y2));
75 P00035 vpad35 (din_w[1:0], PAD(y3));
76
77 P00036 vpad36 (din_w[1:0], PAD(y0));
78 P00037 vpad37 (din_w[1:0], PAD(y1));
79 P00038 vpad38 (din_w[1:0], PAD(y2));
80 P00039 vpad39 (din_w[1:0], PAD(y3));
81
82 P00040 vpad40 (din_w[1:0], PAD(y0));
83 P00041 vpad41 (din_w[1:0], PAD(y1));
84 P00042 vpad42 (din_w[1:0], PAD(y2));
85 P00043 vpad43 (din_w[1:0], PAD(y3));
86
87 P00044 vpad44 (din_w[1:0], PAD(y0));
88 P00045 vpad45 (din_w[1:0], PAD(y1));
89 P00046 vpad46 (din_w[1:0], PAD(y2));
90 P00047 vpad47 (din_w[1:0], PAD(y3));
91
92 P00048 vpad48 (din_w[1:0], PAD(y0));
93 P00049 vpad49 (din_w[1:0], PAD(y1));
94 P00050 vpad50 (din_w[1:0], PAD(y2));
95 P00051 vpad51 (din_w[1:0], PAD(y3));
96
97 P00052 vpad52 (din_w[1:0], PAD(y0));
98 P00053 vpad53 (din_w[1:0], PAD(y1));
99 P00054 vpad54 (din_w[1:0], PAD(y2));
100 P00055 vpad55 (din_w[1:0], PAD(y3));
101
102 P00056 vpad56 (din_w[1:0], PAD(y0));
103 P00057 vpad57 (din_w[1:0], PAD(y1));
104 P00058 vpad58 (din_w[1:0], PAD(y2));
105 P00059 vpad59 (din_w[1:0], PAD(y3));
106
107 P00060 vpad60 (din_w[1:0], PAD(y0));
108 P00061 vpad61 (din_w[1:0], PAD(y1));
109 P00062 vpad62 (din_w[1:0], PAD(y2));
110 P00063 vpad63 (din_w[1:0], PAD(y3));
111
112 P00064 vpad64 (din_w[1:0], PAD(y0));
113 P00065 vpad65 (din_w[1:0], PAD(y1));
114 P00066 vpad66 (din_w[1:0], PAD(y2));
115 P00067 vpad67 (din_w[1:0], PAD(y3));
116
117 P00068 vpad68 (din_w[1:0], PAD(y0));
118 P00069 vpad69 (din_w[1:0], PAD(y1));
119 P00070 vpad70 (din_w[1:0], PAD(y2));
120 P00071 vpad71 (din_w[1:0], PAD(y3));
121
122 P00072 vpad72 (din_w[1:0], PAD(y0));
123 P00073 vpad73 (din_w[1:0], PAD(y1));
124 P00074 vpad74 (din_w[1:0], PAD(y2));
125 P00075 vpad75 (din_w[1:0], PAD(y3));
126
127 P00076 vpad76 (din_w[1:0], PAD(y0));
128 P00077 vpad77 (din_w[1:0], PAD(y1));
129 P00078 vpad78 (din_w[1:0], PAD(y2));
130 P00079 vpad79 (din_w[1:0], PAD(y3));
131
132 P00080 vpad80 (din_w[1:0], PAD(y0));
133 P00081 vpad81 (din_w[1:0], PAD(y1));
134 P00082 vpad82 (din_w[1:0], PAD(y2));
135 P00083 vpad83 (din_w[1:0], PAD(y3));
136
137 P00084 vpad84 (din_w[1:0], PAD(y0));
138 P00085 vpad85 (din_w[1:0], PAD(y1));
139 P00086 vpad86 (din_w[1:0], PAD(y2));
140 P00087 vpad87 (din_w[1:0], PAD(y3));
141
142 P00088 vpad88 (din_w[1:0], PAD(y0));
143 P00089 vpad89 (din_w[1:0], PAD(y1));
144 P00090 vpad90 (din_w[1:0], PAD(y2));
145 P00091 vpad91 (din_w[1:0], PAD(y3));
146
147 P00092 vpad92 (din_w[1:0], PAD(y0));
148 P00093 vpad93 (din_w[1:0], PAD(y1));
149 P00094 vpad94 (din_w[1:0], PAD(y2));
150 P00095 vpad95 (din_w[1:0], PAD(y3));
151
152 P00096 vpad96 (din_w[1:0], PAD(y0));
153 P00097 vpad97 (din_w[1:0], PAD(y1));
154 P00098 vpad98 (din_w[1:0], PAD(y2));
155 P00099 vpad99 (din_w[1:0], PAD(y3));
156
157 P00100 vpad100 (din_w[1:0], PAD(y0));
158 P00101 vpad101 (din_w[1:0], PAD(y1));
159 P00102 vpad102 (din_w[1:0], PAD(y2));
160 P00103 vpad103 (din_w[1:0], PAD(y3));
161
162 P00104 vpad104 (din_w[1:0], PAD(y0));
163 P00105 vpad105 (din_w[1:0], PAD(y1));
164 P00106 vpad106 (din_w[1:0], PAD(y2));
165 P00107 vpad107 (din_w[1:0], PAD(y3));
166
167 P00108 vpad108 (din_w[1:0], PAD(y0));
168 P00109 vpad109 (din_w[1:0], PAD(y1));
169 P00110 vpad110 (din_w[1:0], PAD(y2));
170 P00111 vpad111 (din_w[1:0], PAD(y3));
171
172 P00112 vpad112 (din_w[1:0], PAD(y0));
173 P00113 vpad113 (din_w[1:0], PAD(y1));
174 P00114 vpad114 (din_w[1:0], PAD(y2));
175 P00115 vpad115 (din_w[1:0], PAD(y3));
176
177 P00116 vpad116 (din_w[1:0], PAD(y0));
178 P00117 vpad117 (din_w[1:0], PAD(y1));
179 P00118 vpad118 (din_w[1:0], PAD(y2));
180 P00119 vpad119 (din_w[1:0], PAD(y3));
181
182 P00120 vpad120 (din_w[1:0], PAD(y0));
183 P00121 vpad121 (din_w[1:0], PAD(y1));
184 P00122 vpad122 (din_w[1:0], PAD(y2));
185 P00123 vpad123 (din_w[1:0], PAD(y3));
186
187 P00124 vpad124 (din_w[1:0], PAD(y0));
188 P00125 vpad125 (din_w[1:0], PAD(y1));
189 P00126 vpad126 (din_w[1:0], PAD(y2));
190 P00127 vpad127 (din_w[1:0], PAD(y3));
191
192 P00128 vpad128 (din_w[1:0], PAD(y0));
193 P00129 vpad129 (din_w[1:0], PAD(y1));
194 P00130 vpad130 (din_w[1:0], PAD(y2));
195 P00131 vpad131 (din_w[1:0], PAD(y3));
196
197 P00132 vpad132 (din_w[1:0], PAD(y0));
198 P00133 vpad133 (din_w[1:0], PAD(y1));
199 P00134 vpad134 (din_w[1:0], PAD(y2));
200 P00135 vpad135 (din_w[1:0], PAD(y3));
201
202 P00136 vpad136 (din_w[1:
```

```

1 module chip(
2     input wire clk,
3     input wire reset,
4     input wire x0,
5     input wire x1,
6     input wire x2,
7     input wire x3,
8     output wire y0,
9     output wire y1,
10    output wire y2,
11    output wire y3);
12
13    wire die_clk;
14    wire die_reset;
15    wire [3:0] die_x;
16    wire [3:0] die_y;
17
18    pads thepads(.clk(clk),
19                .reset(reset),
20                .x0(x0),
21                .x1(x1),
22                .x2(x2),
23                .x3(x3),
24                .y0(y0),
25                .y1(y1),
26                .y2(y2),
27                .y3(y3),
28                .die_clk(die_clk),
29                .die_reset(die_reset),
30                .die_x(die_x),
31                .die_y(die_y));
32
33    mavg thecore(.x(die_x),
34                .y(die_y),
35                .reset(die_reset),
36                .clk(die_clk));
37
38 endmodule
39

```

```

1 (globals
2  version = 3
3  io_order = default
4 )
5 (topad
6   (topright
7     (inst name="thepads/ur")
8   )
9   (top
10    (inst name="thepads/x0pad")
11    (inst name="thepads/vdd1")
12    (inst name="thepads/vss1")
13    (inst name="thepads/xlpad")
14   )
15   (toptleft
16     (inst name="thepads/ul")
17   )
18   (left
19     (inst name="thepads/x2pad")
20     (inst name="thepads/x3pad")
21     (inst name="thepads/vdd2")
22     (inst name="thepads/vss2")
23     (inst name="thepads/resetpad")
24   )
25   (bottomleft
26     (inst name="thepads/ll")
27   )
28   (bottom
29     (inst name="thepads/y0pad")
30     (inst name="thepads/vdd3")
31     (inst name="thepads/vss3")
32     (inst name="thepads/ylpad")
33   )
34   (bottomright
35     (inst name="thepads/lr")
36   )
37   (right
38     (inst name="thepads/y2pad")
39     (inst name="thepads/y3pad")
40     (inst name="thepads/vdd4")
41     (inst name="thepads/vss4")
42     (inst name="thepads/clcpad")
43   )
44 )

```

```

1 module mavg(
2     input [3:0] x,
3     output [3:0] y,
4     input reset,
5     input clk
6 );
7
8     reg [3:0] tap0, tap1, tap2;
9     reg [3:0] newtap0, newtap1, newtap2;
10
11     always @(posedge clk or posedge reset) begin
12         if (reset) begin
13             tap0 <= 4'b0;
14             tap1 <= 4'b0;
15             tap2 <= 4'b0;
16         end else begin
17             tap0 <= newtap0;
18             tap1 <= newtap1;
19             tap2 <= newtap2;
20         end
21     end
22
23     reg [4:0] sum0;
24     reg [5:0] sum1;
25     reg [5:0] sum2;
26     reg [3:0] sum2scaled;
27
28     always @(*) begin
29         newtap0 = x;
30         newtap1 = tap0;
31         newtap2 = tap1;
32         sum0 = tap0 + x;
33         sum1 = sum0 + tap1;
34         sum2 = sum1 + tap2 + 6'h2;
35         sum2scaled = sum2[5:2];
36     end
37
38     assign y = sum2scaled;
39
40 endmodule

```