

Stacked Daisy Chain – 3 Package Stacking

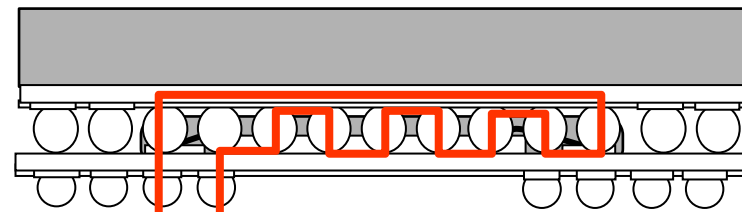
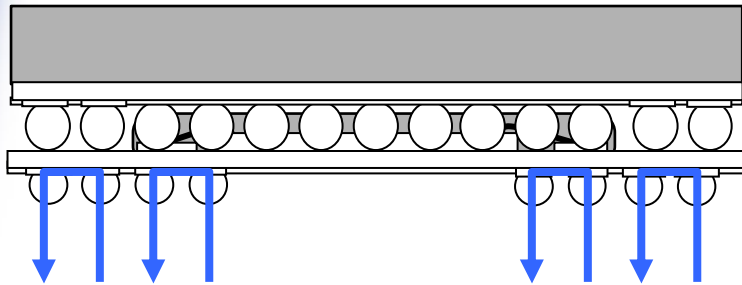
May 2006 updated

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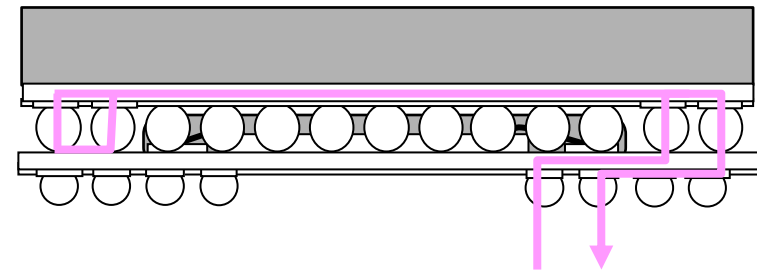


POP Daisy Chain 3 Net Design – 2 Package Stack



M4 N4

Bottom package called:
Package Stackable very thin fine pitch BGA
(PSvfBGA)



L20 M20

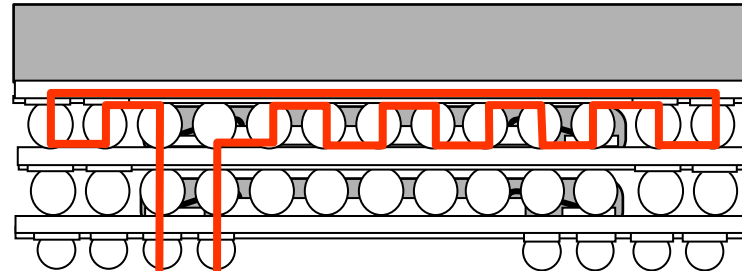
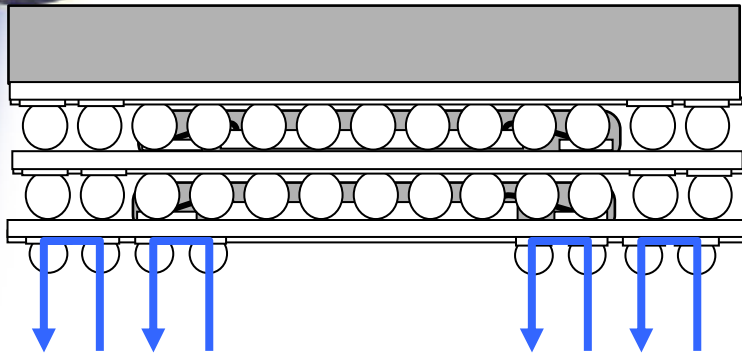
Blue line: daisy chain netlist of PSvfBGA, Bottom package balls

Red line: daisy chain netlist of top side (Top FBGA to PSvfBGA 116 pin memory interface)

Pink line: daisy chain netlist of top side (Top FBGA to PSvfBGA 12 corner balls reserved for NC or additional supplies as memory combinations may require).

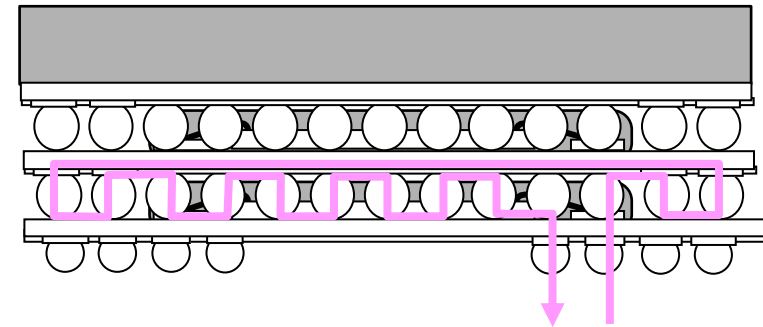


POP Daisy Chain 3 Net Design – 3 Package Stack



M4 N4

Bottom/middle package called:
Package Stackable very thin fine pitch BGA
(PSvfBGA)



L20 M20

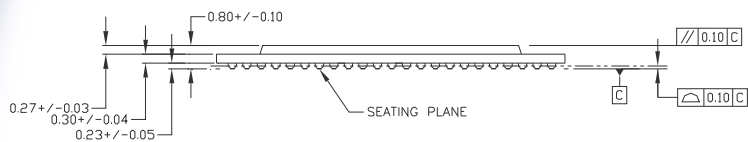
Blue line: daisy chain netlist of PSvfBGA, Bottom package balls

Red line: daisy chain netlist of middle/top side (top FBGA to middle PSvfBGA 128 balls)

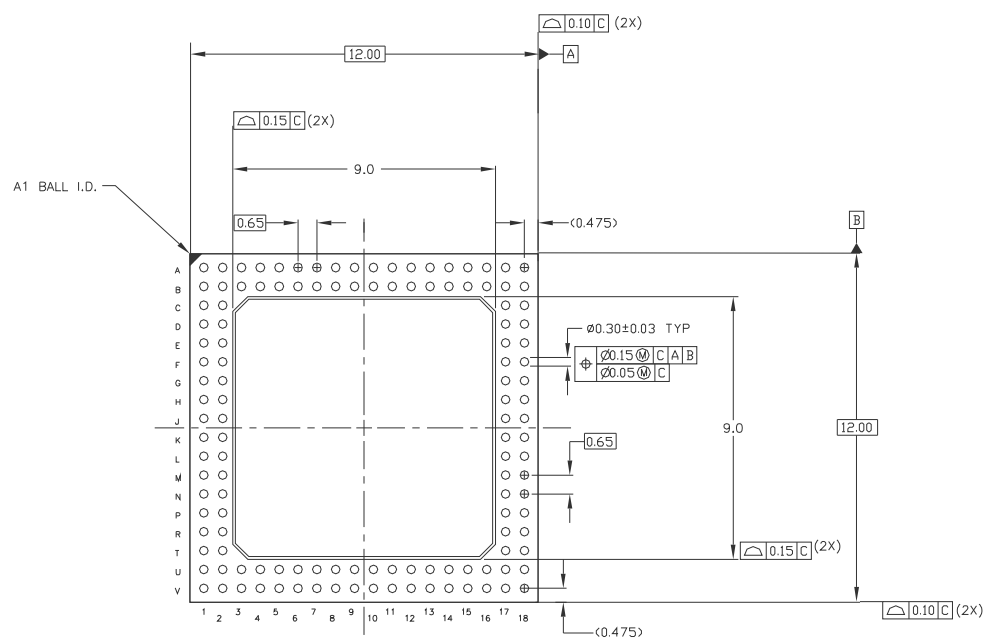
Pink line: daisy chain netlist of middle/bottom side (middle PSvfBGA to bottom PSvfBGA 128 balls)



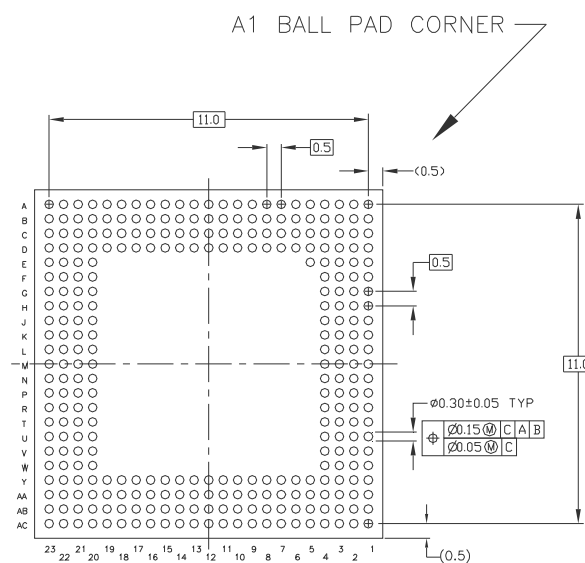
POD – PSvfBGA 305 (Bottom Package)



SIDE VIEW



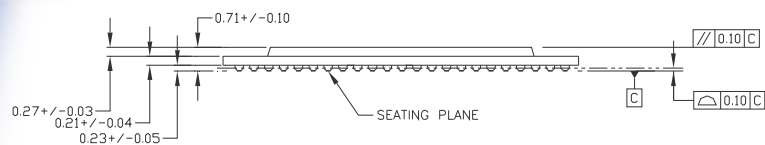
DIE TOP
128 LAND PATTERNS



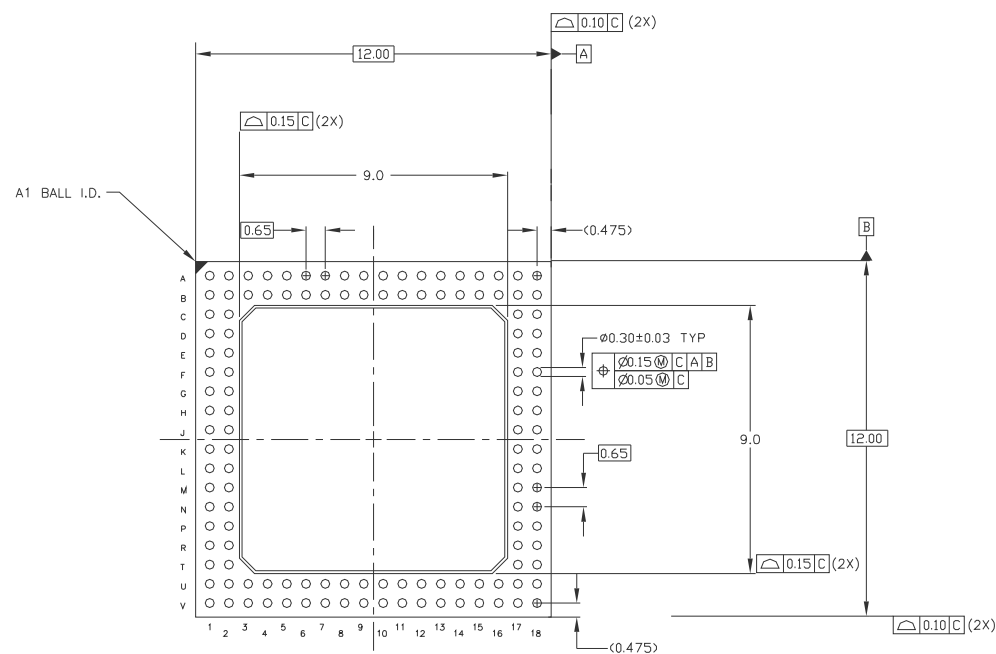
DIE BOTTOM / BALL SIDE VIEW
305 SOLDER BALLS



POD – PSvfBGA 128 (Middle Package)

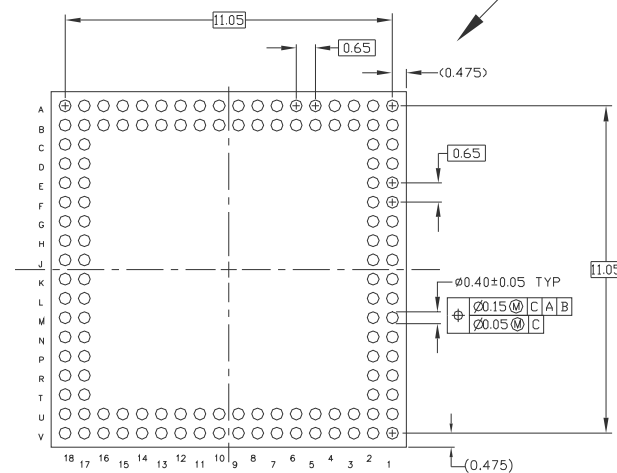


SIDE VIEW

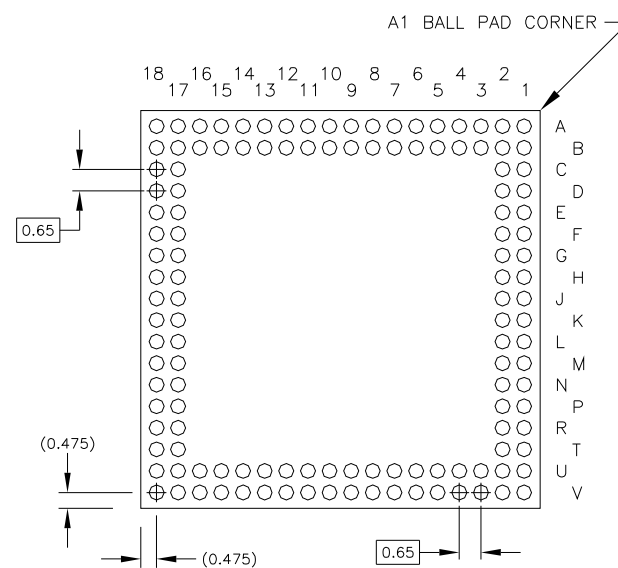


DIE TOP
128 LAND PATTERNS

A1 BALL PAD CORNER

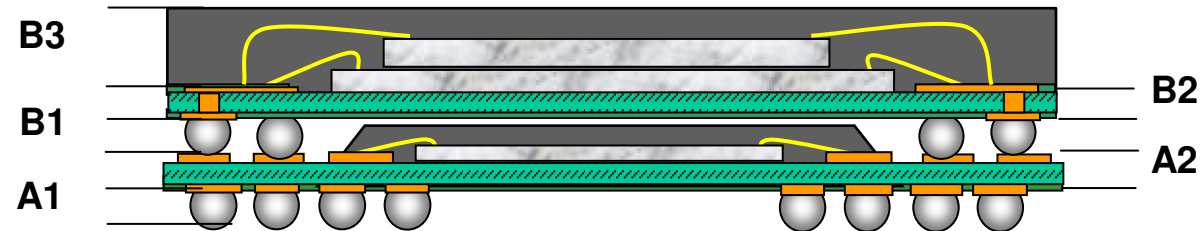


DIE BOTTOM / BALL SIDE VIEW
128 SOLDER BALLS





POP Overall Stack Up – 2 Package Stack

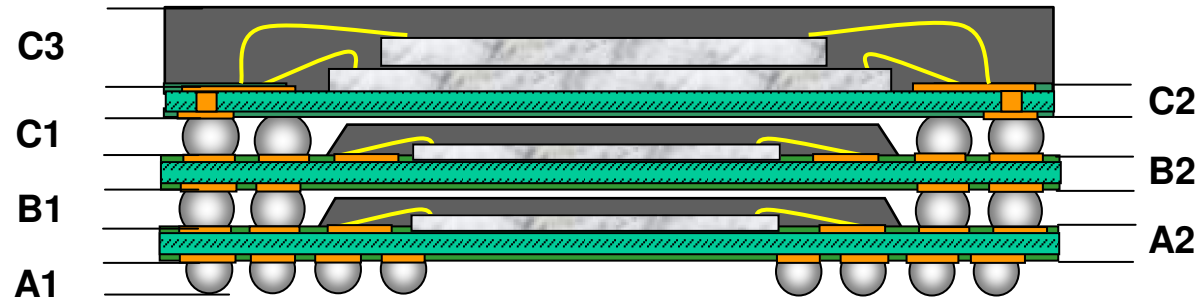


Symbol	unit	Min	Nom	Max
A1 (Ball, 0.5 pitch)	mm	0.180	0.230	0.280
A2 (4L laminate)	mm	0.260	0.300	0.340
B1 (Ball, 0.65 pitch)	mm	0.270	0.300	0.330
B2 (2L laminate)	mm	0.180	0.210	0.240
B3 (Mold cap)	mm	0.420	0.450	0.480
Overall Pkg height	mm	1.408	1.490	1.572

Assumed standard DC substrate
Thinner stack up feasible in future build



POP Overall Stack Up – 3 Package Stack



Symbol	unit	Min	Nom	Max
A1 (Ball, 0.5 pitch)	mm	0.180	0.230	0.280
A2 (4L laminate)	mm	0.260	0.300	0.340
B1 (Ball, 0.65 pitch)	mm	0.270	0.300	0.330
B2 (2L laminate)	mm	0.180	0.210	0.240
C1 (Ball, 0.65 pitch)	mm	0.270	0.300	0.330
C2 (2L laminate)	mm	0.180	0.210	0.240
C3 (Mold cap)	mm	0.420	0.450	0.480
Overall Pkg height	mm	1.907	2.000	2.093

Assumed standard DC substrate
Thinner stack up feasible in future build



Package Netlist

Top package

Bottom side net (black)

1	A1	A2
2	B2	B3
3	A3	A4
4	B4	B5
5	A5	A6
6	B6	B7
7	A7	A8
8	B8	B9
9	A9	A10
10	B10	B11
11	A11	A12
12	B12	B13
13	A13	A14
14	B14	B15
15	A15	A16
16	B16	B17

17	A17	A18
18	B18	B19
19	C17	D17
20	E17	F17
21	G17	H17
22	J17	K17
23	L17	M17
24	N17	P17
25	R17	T17
26	C18	D18
27	E18	F18
28	G18	H18
29	J18	K18
30	L18	M18
31	N18	P18
32	R18	T18

33	U17	U16
34	U15	U14
35	U13	U12
36	U11	U10
37	U9	U8
38	U7	U6
39	U5	U4
40	U3	U2
41	V18	V17
42	V16	V15
43	V14	V13
44	V12	V11
45	V10	V9
46	V8	V7
47	V6	V5
48	V4	V3

49	V2	V1
50	B1	U1
51	C1	D1
52	E1	F1
53	G1	H1
54	J1	K1
55	C2	D2
56	E2	F2
57	G2	H2
58	J2	K2
59	L1	L2
60	M1	M2
61	N1	P1
62	R1	T1
63	N2	P2
64	R2	T2

Bottom package

Top side net (red)

1	A1	B1
2	A2	A17
3	A3	C1
4	A4	A5
5	A6	A7
6	A8	A9
7	A10	A11
8	A12	A13
9	A14	A15
10	A16	C18
11	B2	C2
12	B3	B4
13	B5	B6
14	B7	B8
15	B9	B10
16	B11	B12

17	B13	B14
18	B15	B16
19	B17	C17
20	D1	E1
21	D2	E2
22	D17	E17
23	D18	E18
24	F1	G1
25	F2	G2
26	F17	G17
27	F18	G18
28	H1	J1
29	H2	J2
30	H17	J17
31	H18	J18
32	K1	L1

33	K17	L17
34	K18	L18
35	M1	N1
36	M2	N2
37	M17	N17
38	M18	N18
39	P1	R1
40	P2	R2
41	P17	R17
42	P18	R18
43	T1	V3
44	T2	U2
45	U3	U4
46	U5	U6
47	U7	U8
48	U9	U10

49	U11	U12
50	U13	U14
51	U15	U16
52	T17	U17
53	T18	V16
54	U1	V1
55	V2	V17
56	V4	V5
57	V6	V7
58	V8	V9
59	V10	V11
60	V12	V13
61	V14	V15
62	U18	V18

Middle package

Top side net (red)

1	A1	B1
2	A2	A3
3	A4	A5
4	A6	A7
5	A8	A9
6	A10	A11
7	A12	A13
8	A14	A15
9	A16	C18
10	A17	C1
11	A18	B18
12	B2	C2
13	B3	B4
14	B5	B6
15	B7	B8
16	B9	B10

17	B11	B12
18	B13	B14
19	B15	B16
20	B17	C17
21	D1	E1
22	D2	E2
23	D17	E17
24	D18	E18
25	F1	G1
26	F2	G2
27	F17	G17
28	F18	G18
29	H1	J1
30	H2	J2
31	H17	J17
32	H18	J18

33	K1	L1
34	K17	L17
35	K18	L18
36	M1	N1
37	M2	N2
38	M17	N17
39	M18	N18
40	P1	R1
41	P2	R2
42	P17	R17
43	P18	R18
44	T1	V3
45	T2	U2
46	T17	U17
47	T18	V16
48	U1	V1

49	U3	U4
50	U5	U6
51	U7	U8
52	U9	U10
53	U11	U12
54	U13	U14
55	U15	U16
56	U18	V18
57	V2	V17
58	V4	V5
59	V6	V7
60	V8	V9
61	V10	V11
62	V12	V13
63	V14	V15

Bottom side net (black)

64	A1	A2
65	A3	A4
66	A5	A6
67	A7	A8
68	A9	A10
69	A11	A12
70	A13	A14
71	A15	A16
72	A17	A18
73	B1	U1
74	B2	B3
75	B4	B5
76	B6	B7
77	B8	B9
78	B10	B11
79	B12	B13

80	B14	B15
81	B16	B17
82	B18	D17
83	C1	D1
84	C2	D2
85	C17	D18
86	C18	U18
87	E1	F1
88	E2	F2
89	E17	F17
90	E18	F18
91	G1	H1
92	G2	H2
93	G17	H17
94	G18	H18
95	J1	K1

96	J2	M2
97	J17	K17
98	J18	K18
99	L1	M1
100	L17	M17
101	L18	M18
102	N1	P1
103	N2	P2
104	N17	P17
105	N18	P18
106	R1	T1
107	R2	T2
108	R17	T17
109	R18	T18
110	U2	U3
111	U4	U5

112	U6	U7
113	U8	U9
114	U10	U11
115	U12	U13
116	U14	U15
117	U16	U17
118	V1	V2
119	V3	V4
120	V5	V6
121	V7	V8
122	V9	V10
123	V11	V12
124	V13	V14
125	V15	V16
126	V17	V18

Bottom side net (black)

63	A3	A4
64	A5	A6
65	A7	A8
66	A9	A10
67	A11	A12
68	A13	A14
69	A15	A16
70	A17	A18
71	A19	A20
72	B21	B22
73	B19	B20
74	B17	B18
75	B15	B16
76	B13	B14
77	B11	B12
78	B9	B10
79	B7	B8
80	B5	B6
81	B3	B4
82	B2	C2
83	C1	D1
84	D2	E2
85	C3	D3
86	C4	C5
87	C6	C7
88	C8	C9
89	C10	C11
90	C12	C13
91	C14	C15
92	C16	C17
93	C18	C19
94	C20	C21
95	C22	D22
96	D21	E21
97	D19	D20
98	D17	D18

99	D15	D16
100	D13	D14
101	D11	D12
102	D9	D10
103	D7	D8
104	D5	D6
105	D4	E4
106	E1	F1
107	G1	H1
108	J1	K1
109	L1	M1
110	N1	P1
111	R1	T1
112	U1	V1
113	W1	Y1
114	AA2	Y2
115	V2	W2
116	T2	U2
117	P2	R2
118	M2	N2
119	K2	L2
120	H2	J2
121	F2	G2
122	E3	F3
123	G3	H3
124	J3	K3
125	L3	M3
126	N3	P3
127	R3	T3
128	U3	V3
129	W3	Y3
130	V4	W4
131	T4	U4
132	P4	R4
133	K4	L4
134	H4	J4

135	F4	G4
136	E20	F20
137	G20	H20
138	J20	K20
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140	R20	T20
141	U20	V20
142	W20	Y20
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146	P21	R21
147	M21	N21
148	K21	L21
149	H21	J21
150	F21	G21
151	E22	F22
152	G22	H22
153	J22	K22
154	L22	M22
155	N22	P22
156	R22	T22
157	U22	V22
158	W22	Y22
159	AA22	AB22
160	AA23	Y23
161	V23	W23
162	T23	U23
163	P23	R23
164	M23	N23
165	K23	L23
166	H23	J23
167	F23	G23
168	D23	E23
169	Y4	Y5
170	Y6	Y7

171	Y8	Y9
172	Y10	Y11
173	Y12	Y13
174	Y14	Y15
175	Y16	Y17
176	Y18	Y19
177	AA19	AA20
178	AA17	AA18
179	AA15	AA16
180	AA13	AA14
181	AA11	AA12
182	AA9	AA10
183	AA7	AA8
184	AA5	AA6
185	AA3	AA4
186	AA1	AC3
187	AB2	AB3
188	AB4	AB5
189	AB6	AB7
190	AB8	AB9
191	AB10	AB11
192	AB12	AB13
193	AB14	AB15
194	AB16	AB17
195	AB18	AB19
196	AB20	AB21
197	AC20	AC21
198	AC18	AC19
199	AC16	AC17
200	AC14	AC15
201	AC12	AC13
202	AC10	AC11
203	AC8	AC9
204	AC6	AC7
205	AC4	AC5
206	A21	C23

Top-to-bottom side net (red:top, black:bottom)

127	K2	K2
-----	----	----

128	L2	L2
-----	----	----

Top-to-bottom side net (red:top, black:bottom)

207	M4	K2
-----	----	----

208	N4	L2
-----	----	----

209	M20	B18
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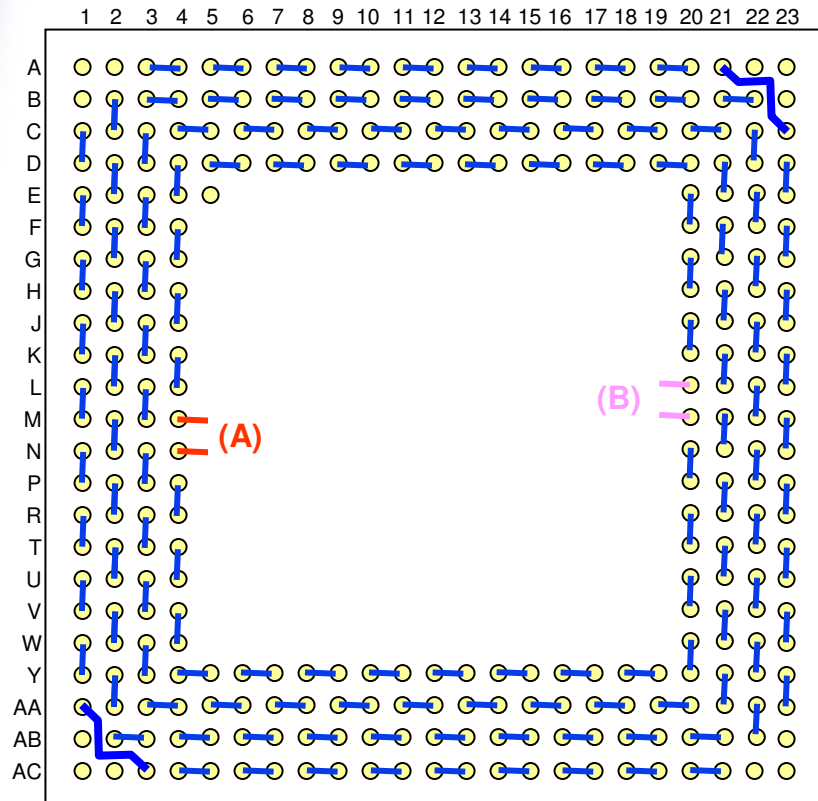
210	L20	A18
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PSvfBGA 305 (Bottom Package) Daisy Chain Nets

**Bottom side of bottom package
(top view through package)**

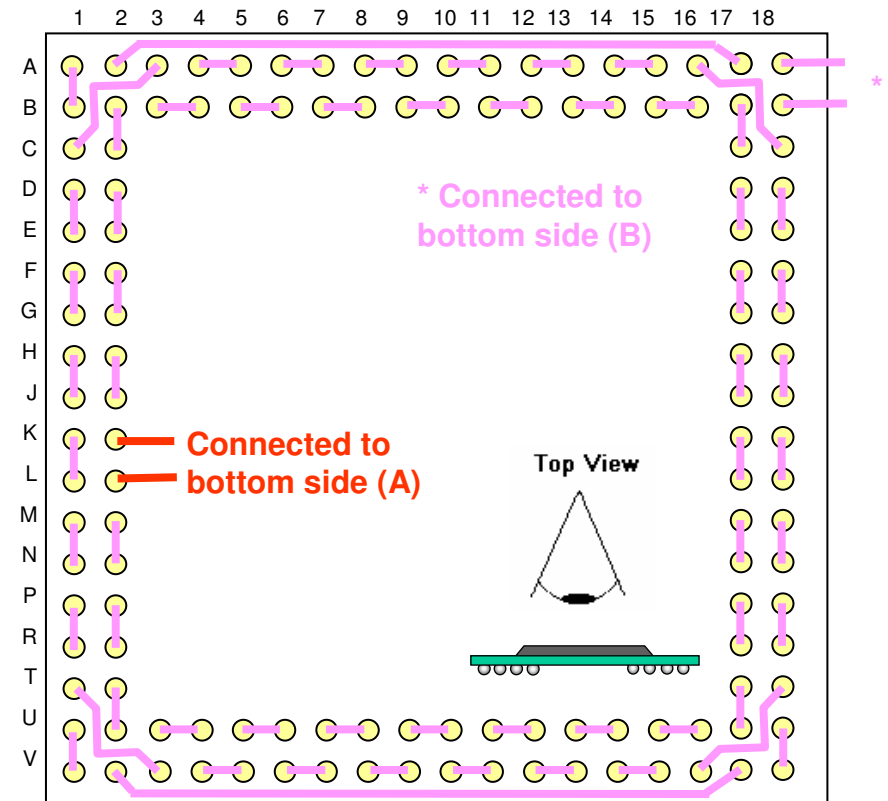
12x12mm, 0.5 mm PSvfBGA305, 23x23 ball matrix



Top side of bottom package

Top/Middle package interface (top view)

0.65 mm pitch, 128 pads, 18x18 ball matrix



Blue line: daisy chain pattern of PSvfBGA - Bottom BGAs

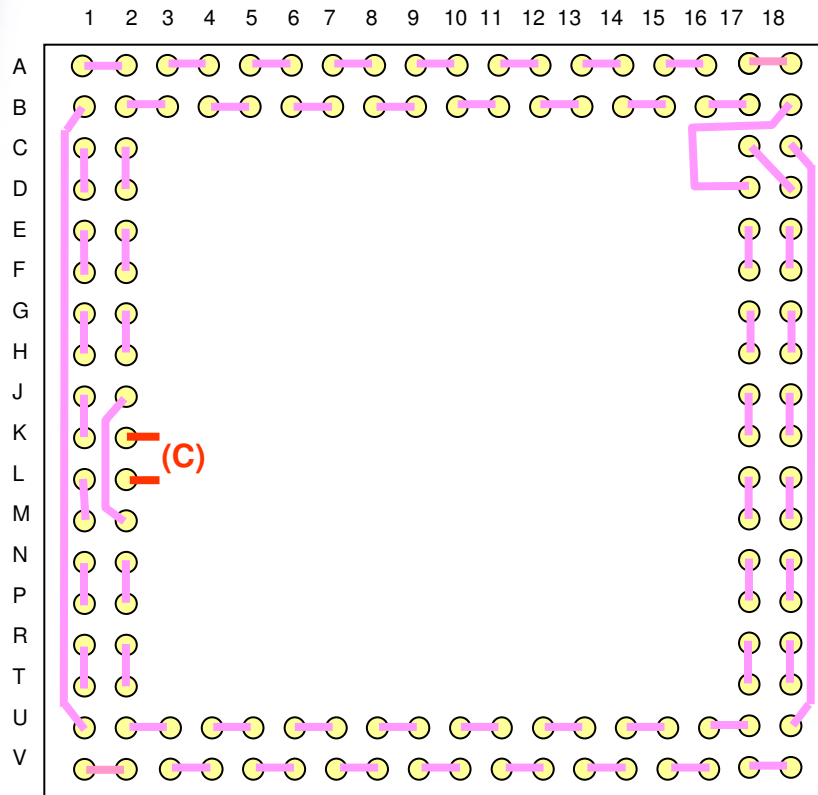
Red line: daisy chain pattern of PSvfBGA -Top memory pads

Pink line: Top side 12 corner ball DC net

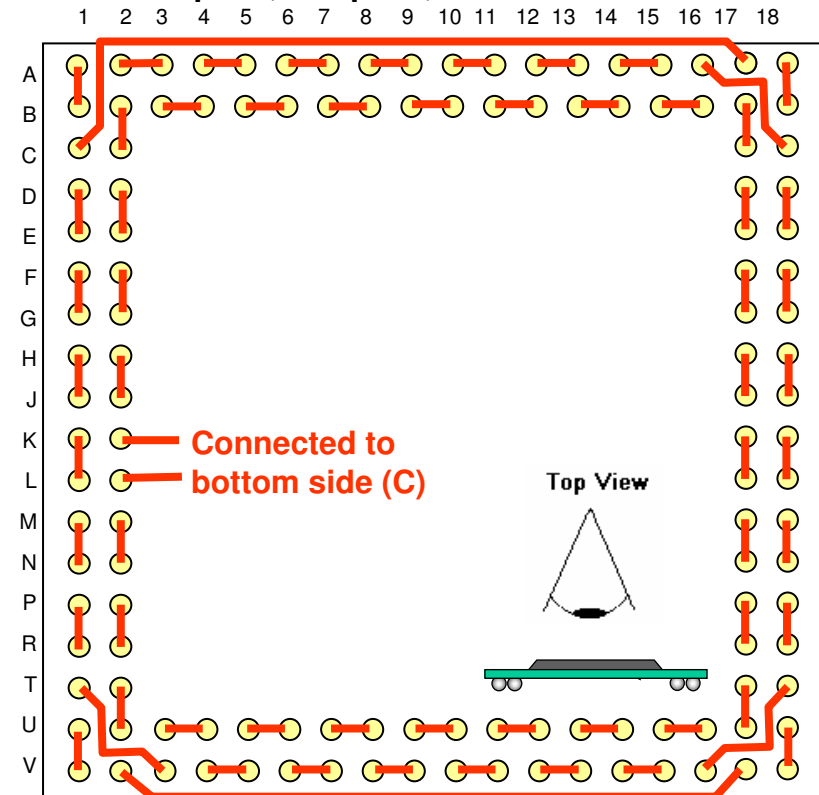


PSvfBGA 128 (Middle Package) Daisy Chain Netlist

**Bottom side of middle package
(top view through package)
12x12mm, 0.65 mm PSvfBGA128, 18x18 ball matrix**



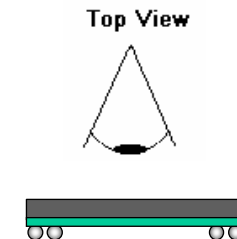
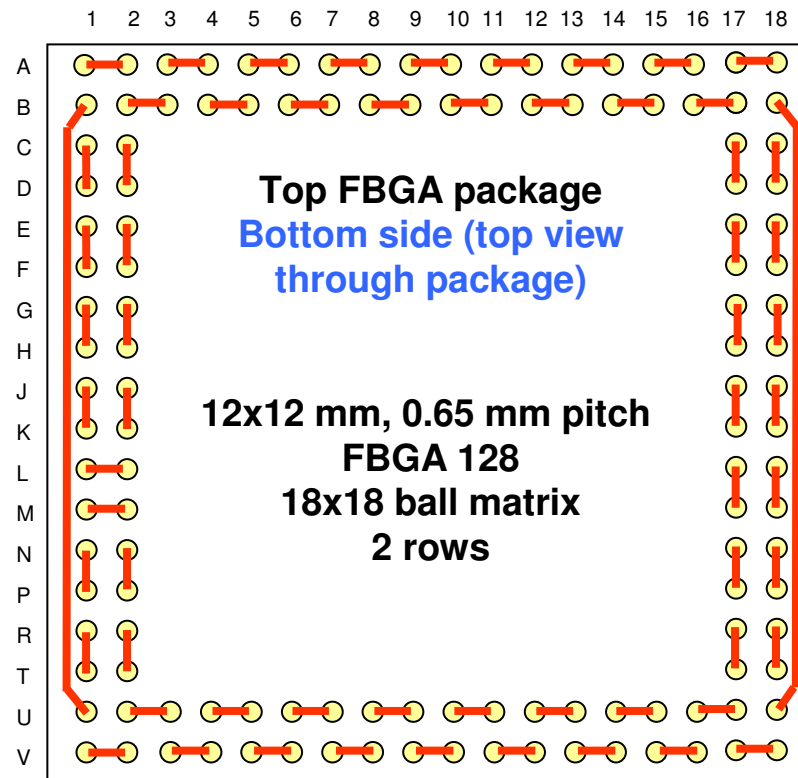
**Top side of middle package
Top package interface (top view)
0.65 mm pitch, 128 pads, 18x18 ball matrix**



Each pad on the top side is connected to the corresponding pad on the bottom side through via.



FBGA 128 (Top Package) Daisy Chain Netlist

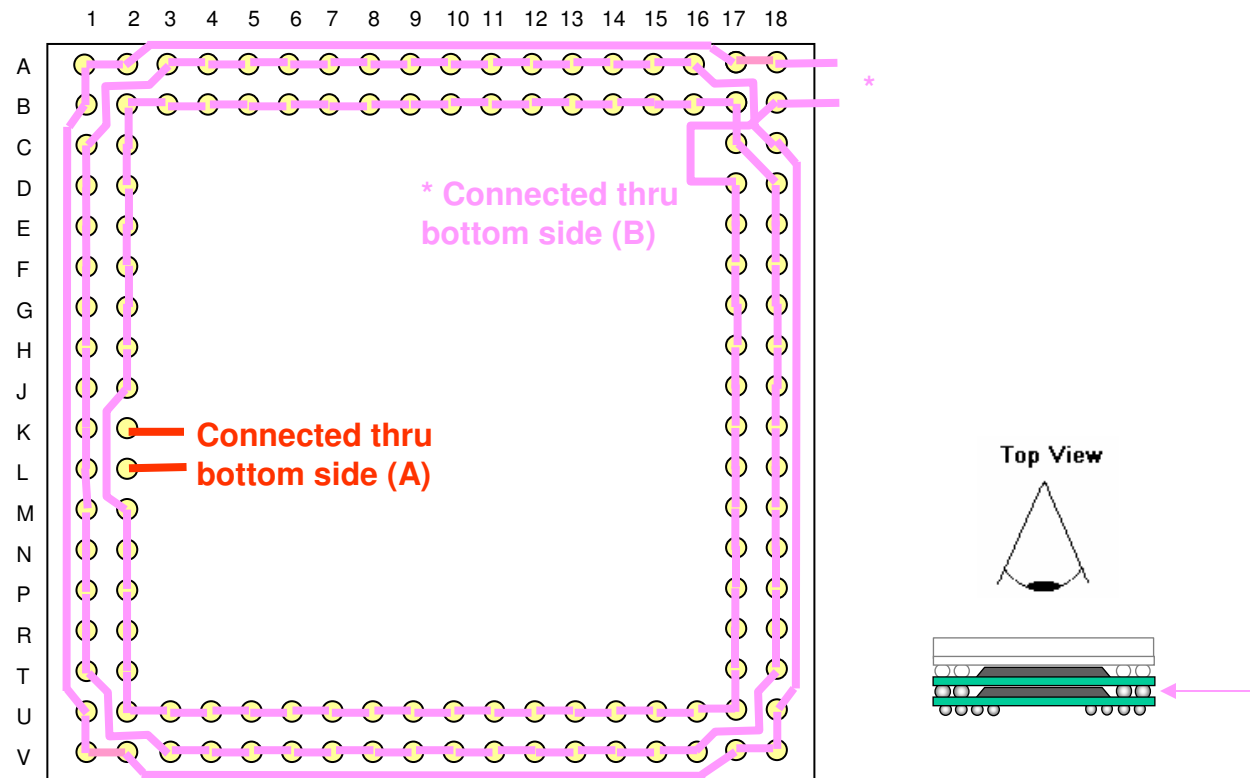


Red line: daisy chain pattern of Top package for 116 I/O memory interface

Pink line: daisy chain pattern for 12 corner balls (typically reserved as NC for applications with no underfill, or option to add additional I/O or memory supplies as required for high density combinations)



Middle-to-Bottom Package Connection after 3 PKG Stack

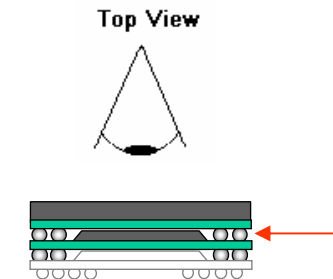
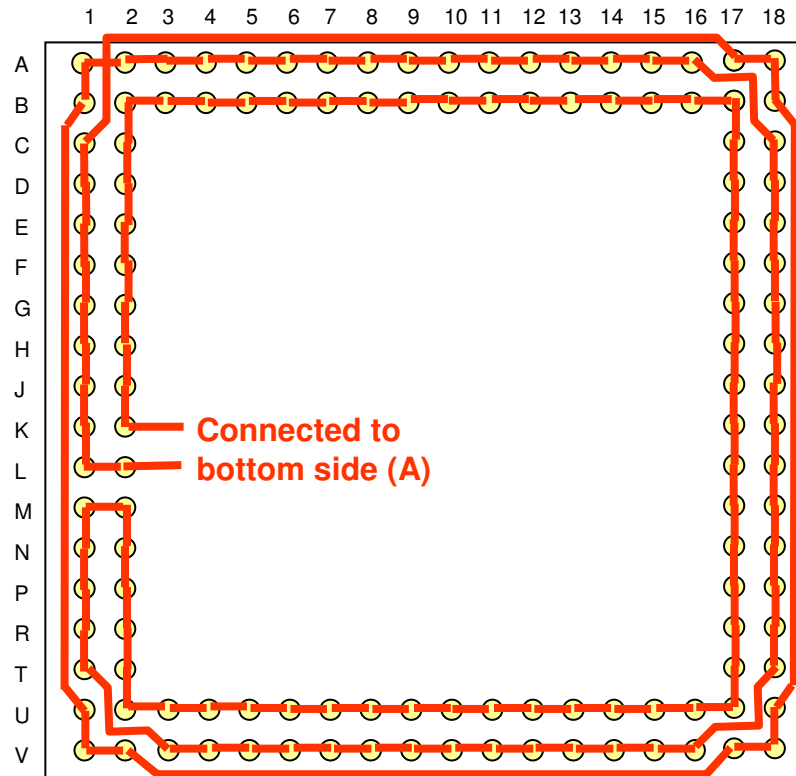


Red line: daisy chain pattern of Top package for 116 I/O memory interface

Pink line: daisy chain pattern for 12 corner balls (typically reserved as NC for applications with no underfill, or option to add additional I/O or memory supplies as required for high density combinations)



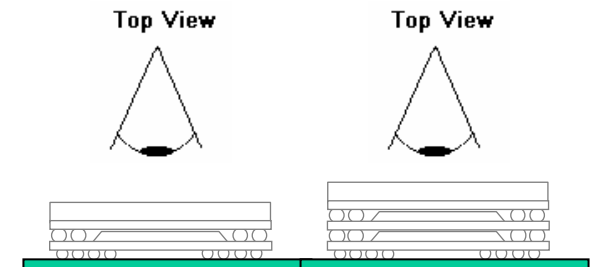
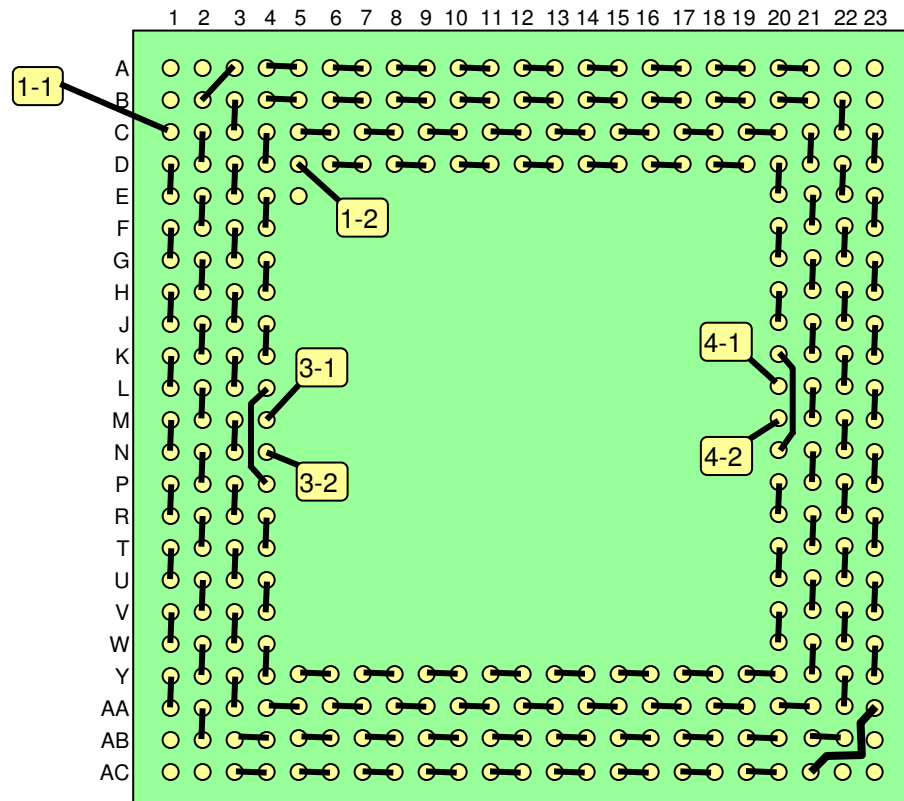
Top-to-Middle Package Connection after 3 PKG Stack



Red line: daisy chain pattern of Top package for 116 I/O memory interface

Pink line: daisy chain pattern for 12 corner balls (typically reserved as NC for applications with no underfill, or option to add additional I/O or memory supplies as required for high density combinations)

PWB Netlist Pattern for BLR Testing



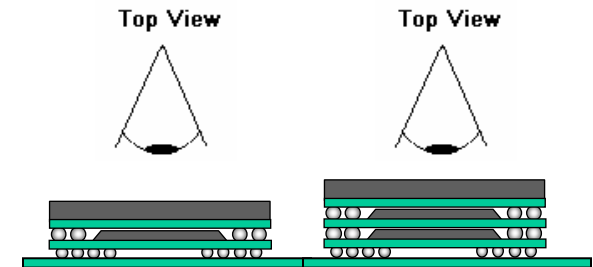
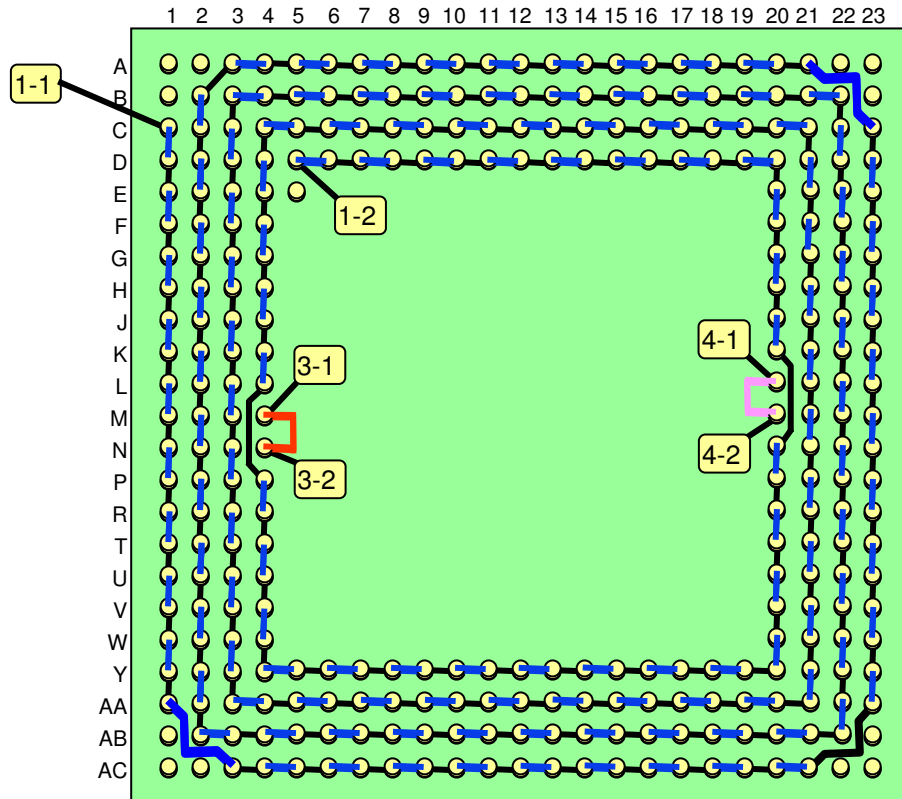
Black line: PWB pattern

In: 1-1, 3-1, 4-1

Common: 1-2, 3-2, 4-2



Stacked view of 3 DC Nets for BLR testing



Black line: PWB pattern
 In: 1-1, 3-1, 4-1
 Common: 1-2, 3-2, 4-2