

Claims

What is claimed is:

1. An integrated circuit (IC) package assembly, comprising:
 - a first package substrate configured to route input/output (I/O) signals and ground between a die and a second package substrate, the first package substrate having a first side configured to receive the die and a second side opposite the first side, the first package substrate including:
 - a plurality of contacts disposed on the second side of the first package substrate; and
 - at least two ground vias of a same layer of vias,
 - wherein an individual contact of the plurality of contacts is configured to form an individual solder joint with the second package substrate, and
 - wherein the at least two ground vias form a cluster of ground vias electrically coupled with the individual contact.
2. The IC package assembly of claim 1, wherein the cluster of ground vias is part of a vertical interconnect between the first side and the second side of the first package substrate.
3. The IC package assembly of claim 1, wherein the same layer of vias is an outermost first layer of vias adjacent to the second side, a second layer of vias directly adjacent to the outermost first layer of vias, or a third layer of vias directly adjacent to the second layer of vias.
4. The IC package assembly of claim 1, wherein the cluster of ground vias is a part of a column of ground vias closest to an edge of the first package substrate.
5. The IC package assembly of claim 1, wherein the cluster of ground vias is surrounded by signal vias of the same layer of vias.

6. The IC package assembly of claim 5, wherein the signal vias are configured in a substantially hexagonal arrangement around the cluster of ground vias.
7. The IC package assembly of claim 1, wherein the cluster of ground vias includes three ground vias in a triangular arrangement.
8. The IC package assembly of claim 7, wherein a center of the triangular arrangement is disposed over a center of the individual contact.
9. The IC package assembly of claim 1, further comprising the second package substrate, wherein the second package substrate is coupled with the first package substrate through the individual solder joint.
10. The IC package assembly of claim 1, wherein a distance between the at least two ground vias is less than a diameter of the individual contact.
11. The IC package assembly of claim 1, wherein the at least two ground vias have a same diameter.
12. The IC package assembly of claim 1, wherein the individual solder joint is part of a ball grid array (BGA) configuration of solder joints.
13. The IC package assembly of claim 1, wherein the first package substrate is a stacked via laminate core package or a core BGA package.
14. A method of fabricating an integrated circuit (IC) package assembly comprising:
forming a plurality of contacts on a side of a first package substrate configured to route input/output (I/O) signals and ground between a die and a second package substrate;

forming a cluster of ground vias with at least two ground vias of a same layer of vias to electrically couple with an individual contact of the plurality of contacts; and

forming an individual solder joint on the individual contact to electrically couple the first package substrate to the second package substrate.

15. The method of claim 14, wherein forming the cluster of ground vias comprises forming a vertical interconnect including the cluster of ground vias between two sides of the first package substrate.
16. The method of claim 14, wherein forming the cluster of ground vias comprises forming the cluster of core vias in the same layer of vias.
17. The method of claim 14, wherein forming the cluster of ground vias comprises forming the cluster of ground vias surrounded by signal vias of the same layer of vias.
18. The method of claim 14, wherein forming the cluster of ground vias comprises forming three ground vias in a triangular arrangement.
19. The method of claim 18, wherein a center of the triangular arrangement is disposed over a center of the individual contact.
20. The method of claim 14, wherein forming the cluster of ground vias comprises forming two ground vias apart from each other.
21. The method of claim 14, wherein forming the cluster of ground vias comprises forming the cluster of ground vias in a column of ground vias closest to an edge of the first package substrate.

22. A package assembly, comprising:
- a first die;
 - a first package substrate, electrically coupled to the first die and configured to route input/output (I/O) signals and ground between the first die and a second package substrate, the first package substrate having a first side configured to receive the die and a second side opposite the first side, the first package substrate including a plurality of contacts disposed on the second side of the first package substrate; and at least two ground vias of a same layer of vias, wherein an individual contact of the plurality of contacts is configured to form an individual solder joint with the second package substrate, and wherein the at least two ground vias form a cluster of ground vias electrically coupled with the individual contact;
 - the second package substrate with an interconnect embedded in the second package substrate to electrically couple the first package substrate with a third package substrate; and
 - the third package substrate, electrically coupled to the second package substrate and a second die, configured to route input/output (I/O) signals and ground between the second die and the second package substrate.
23. The package assembly of claim 22, wherein the first package substrate is a stacked via laminate core package, wherein the second package substrate is an interposer, and wherein the third package substrate is a core ball grid array package.
24. The package assembly of claim 22, wherein the first die is a CPU, and wherein the second die is a switch.
25. The package assembly of claim 22, wherein the cluster of ground vias is a part of a column of ground vias closest to an edge of the first package substrate.