CLAIMS

We claim:

1. A probe card assembly comprising:

a substrate;

probes disposed on the substrate and arranged to contact connection structures including ends of through-device vias of an electronic device; and

a first electrical connection electrically connecting a first probe and a second probe in a first pair of the probes, wherein the first probe, the second probe, and the first electrical connection form a first direct return loop from a first one of the through-device vias to a second one of the through-device vias while the first probe is in contact with the first through-device via and the second probe is in contact with the second through-device via.

2. The probe card assembly of claim 1 further comprising a second electrical connection electrically connecting a third probe and a fourth probe in a second pair of the probes, wherein the third probe, the fourth probe, and the second electrical connection form a second direct return loop from a third one of the through-device vias to a fourth one of the device vias while the third probe is in contact with the third through-device via and the fourth probe is in contact with the fourth through-device via.

3. The probe card assembly of claim 2 further comprising a third electrical connection electrically connecting the first electrical connection and the second electrical connection.

4. The probe card assembly of claim 3, wherein the third electrical connection comprises a switch that selectively connects and disconnects the first electrical connection and the second electrical connection.

5. The probe card assembly of claim 2 further comprising an electrical interface to a tester configured to control testing of the electronic device.

6. The probe card assembly of claim 5, wherein the first electrical connection is not directly connected to the electrical interface.

7. The probe card assembly of claim 6, wherein the electrical interface is directly connected to ones of the probes.

8. The probe card assembly of claim 1 further comprising a switch that selectively connects and disconnects the first electrical connection to and from ground.

9. The probe card assembly of claim 1, wherein the substrate is rigid and the probes are elongate, flexible, and resilient.

10. An electronic device comprising:

through-device vias;

a driver circuit coupled to a first one of the through-device vias;

a first receiver circuit coupled to a second one of the through-device vias;

a test circuit coupled to the driver circuit and the first receiver circuit, the test circuit configured to cause the driver circuit to drive a test signal onto the first through-device via and determine whether the test signal is received at the first receiver from the second through-device via.

11. The electronic device of claim 10 further comprising a second receiver circuit coupled to a third one of the through-device vias,

wherein the test circuit is further coupled to the second receiver circuit, and the test circuit is further configured to determine whether the test signal is received at the second receiver from the third through-device via.

12. The electronic device of claim 11 further comprising a switch that selectively connects and disconnects the second through-device via and a fourth through-device via.

13. The electronic device of claim 10, wherein the electronic device is a semiconductor device comprising:

a semiconductor substrate, the through-device vias being vias from one side of the semiconductor substrate to an opposite side of the semiconductor substrate; and

an integrated circuit formed in the semiconductor substrate.

14. The electronic device of claim 13 further comprising a contact structure on the one side of the semiconductor substrate electrically connected to the test circuit.

5

CLAIMS

1. A method of testing an electronic device, wherein the electronic device comprises a plurality of through-device vias, the method comprising:

bringing electrically conductive probes of a probe card assembly into contact with a first electronic device and thereby making electrical connections between the probe card assembly and the first electronic device through the probes, wherein a set of the probes are electrically connected to each other within the probe card assembly and are brought into contact with a set of through-device vias of the first electronic device;

providing from within the first electronic device a test signal to a first one of the through-device vias in the set of the through-device vias of the first electronic device; and

determining whether the test signal is present on a second one of the through-device vias in the set of the through-device vias of the first electronic device.

2. The method of claim 1, wherein:

the set of the probes comprises a first pair of the probes electrically connected to each other by a first electrical connection in the probe card assembly and a second pair of the probes electrically connected to each other by a second electrical connection in the probe card assembly; and

the bringing effects electrical connections between:

a first probe of the probes of the first pair and the first through device via,

a second probe of the probes of the first pair and the second through device via,

a third probe of the probes of the second pair and a third one of the through-device vias in the set of the through device vias, and

a fourth probe of the probes of the second pair and a fourth one of the through-device vias in the set of the through device vias.

3. The method of claim 2, wherein:

the method further comprises electrically connecting within the probe card assembly the first pair of the probes to the second pair of the probes; and

the determining further comprises determining whether the test signal is present on the fourth through-device via.

4. The method of claim 2, wherein:

the method further comprises electrically connecting within the first electronic device the second through-device via and the third through-device via; and

the determining further comprises determining whether the test signal is present on the fourth through-device via.

5. The method of claim 1 further comprising

prior to said bringing, connecting within the probe card assembly the set of the probes to ground, and

after said bringing, disconnecting within the probe card assembly the set of the probes from ground.

6. The method of claim 1 further comprising:

prior to the bringing, coupling the probe card assembly to a testing structure;

after the bringing, the providing, and the determining with respect to the first electronic device, breaking the contact of the probe card assembly with the first electronic device; and

while the probe card assembly remains coupled to the testing structure:

bringing electrically conductive probes of the probe card assembly into contact with a second electronic device and thereby making electrical connections between the probe card assembly and the second electronic device through the probes, wherein the set of the probes electrically connected to each other within the probe card assembly are brought into contact with a set of through-device vias of the second electronic device;

providing from within the second electronic device a test signal to a first one of the through-device vias in the set of the through-device vias of the second electronic device; and

determining whether the test signal is present on a second one of the through-device vias in the set of the through-device vias of the second electronic device.

7. A probe card assembly comprising:

a substrate;

probes disposed on the substrate and arranged to contact connection structures including ends of through-device vias of an electronic device; and

a first electrical connection electrically connecting a first probe and a second probe in a first pair of the probes, wherein the first probe, the second probe, and the first electrical connection form a first direct return loop from a first one of the through-device vias to a second one of the through-device vias while the first probe is in contact with the first through-device via and the second probe is in contact with the second through-device via,

wherein the first direct return loop is the only direct electrical connection between the first through-device via and the second through-device via while the first probe is in contact with the first through-device via and the second probe is in contact with the second through-device via.

8. The probe card assembly of claim 7 further comprising a second electrical connection electrically connecting a third probe and a fourth probe in a second pair of the probes, wherein the

third probe, the fourth probe, and the second electrical connection form a second direct return loop from a third one of the through-device vias to a fourth one of the device vias while the third probe is in contact with the third through-device via and the fourth probe is in contact with the fourth through-device via.

9. The probe card assembly of claim 8 further comprising a third electrical connection electrically connecting the first electrical connection and the second electrical connection.

10. The probe card assembly of claim 9, wherein the third electrical connection comprises a switch that selectively connects and disconnects the first electrical connection and the second electrical connection.

11. The probe card assembly of claim 8 further comprising an electrical interface to a tester configured to control testing of the electronic device.

12. The probe card assembly of claim 11, wherein the first electrical connection is not directly connected to the electrical interface.

13. The probe card assembly of claim 12, wherein the electrical interface is directly connected to ones of the probes.

14. The probe card assembly of claim 7 further comprising a switch that selectively connects and disconnects the first electrical connection to and from ground.

15. The probe card assembly of claim 7, wherein the substrate is rigid and the probes are elongate, flexible, and resilient.

16. An electronic device comprising:

a semiconductor substrate;

through-device vias passing through the semiconductor substrate from one side of the semiconductor substrate to an opposite side;

a driver circuit coupled to a first one of the through-device vias;

a first receiver circuit coupled to a second one of the through-device vias;

a test circuit coupled to the driver circuit and the first receiver circuit, the test circuit configured to cause the driver circuit to drive a test signal onto the first through-device via and determine whether the test signal is received at the first receiver from the second through-device via,

wherein the driver circuit, the first receiver circuit, and the test circuit are part of the semiconductor substrate.

17. The electronic device of claim 16 further comprising a second receiver circuit coupled to a third one of the through-device vias,

wherein the test circuit is further coupled to the second receiver circuit, and the test circuit is further configured to determine whether the test signal is received at the second receiver from the third through-device via.

18. The electronic device of claim 17 further comprising a switch that selectively connects and disconnects the second through-device via and a fourth through-device via.

19. The electronic device of claim 16 further comprising a contact structure on the one side of the semiconductor substrate electrically connected to the test circuit.

20. The method of claim 1, wherein:

the set of probes comprises a first pair of two of the probes that are directly connected electrically to each other within the probe card assembly,

the set of through-device vias comprises a first pair of two of the through-device vias,

the bringing comprises bringing the first pair of probes into contact with the first pair of through-device vias, and

the first pair of probes is the only direct electrical connection between the two through-device vias of the first pair of through-device vias.

21. The method of claim 20, wherein the first electronic device is a semiconductor die, and the through-device vias extend from one side of the semiconductor die to an opposite side of the semiconductor die.

22. The method of claim 20, wherein:

the bringing comprises bringing the electrically conductive probes of the probe card assembly into contact with the first electronic device while the probes are connected to ground, and

the method further comprises disconnecting the probes from ground while the probes are in contact with the first electronic device and before the providing.

23. The electronic device of claim 16, wherein the driver circuit, the receiver circuit, and the test circuit are integrated circuits in the semiconductor substrate.