CLAIMS:

1. A semiconductor package handling system comprising:

a package holder for receiving and holding singulated semiconductor packages;

a first inspection device arranged and configured to inspect a first surface of the packages while they are being held by the package holder;

an offloading device for receiving the packages from the package holder and to convey the packages to an offloader; and

a second inspection device arranged and configured to inspect a second surface of the packages which is opposite from the first surface while they are being held by the offloading device.

2. The semiconductor package handling system as claimed in claim 1, wherein the package holder is operative to pick up individual singulated semiconductor packages that have been mounted on an adhesive tape.

3. The semiconductor package handling system as claimed in claim 1 or claim 2, wherein the package holder comprises rotary pick arms.

4. The semiconductor package handling system as claimed in claim 3, wherein the rotary pick arms comprise four pick heads that are equally spaced from one another.

5. The semiconductor package handling system as claimed in claim 4, wherein the rotary pick arms are driven by a direct drive motor with a hollow shaft at its center, and the hollow shaft further comprises a PR alignment optical system for determining an alignment of each package relative to the rotary pick head.

6. The semiconductor package handling system as claimed in claim 5, wherein the rotary pick heads are configured such that a view of a package by the PR alignment optical system is blocked by a rotary pick head at a pick-up position of the rotary pick head, and the package is viewable between adjacent rotary pick heads when the rotary pick head is offset from the pick-up position.

7. The semiconductor package handling system as claimed in any one of claims 4 to 6, wherein the offloading device is operative to receive a package from a rotary pick head while the first inspection device is inspecting another package held by another rotary pick head.

8. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the offloading device comprises multiple offloading pick heads that are arranged in a single row.

9. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the offloading device comprises first and second offloading arms.

10. The semiconductor package handling system as claimed in claim 9, wherein each offloading arm comprises a single row of offloading pick heads which are configured to hold one package each, and which are aligned along a straight center line at a position for receiving packages from the package holder such that their pick and place points lie along the same center line.

11. The semiconductor package handling system as claimed in claim 10, wherein each offloading pick head is configured to be independently projectable relative to the other offloading pick heads.

12. The semiconductor package handling system as claimed in claim 10 or claim 11, wherein the offloading pick heads are arranged in two separate groups.

13. The semiconductor package handling system as claimed in claim 12, wherein the second inspection device comprises two cameras such that a pitch between the centers of the two cameras corresponds to a pitch between respective offloading pick heads comprised in the two separate groups of offloading pick heads.

14. The semiconductor package handling system as claimed in any one of the preceding claims, further comprising a gang précisor comprising a pair of parallel bars which close onto the packages held by the offloading device so as to align all the packages held by the offloading device simultaneously.

15. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the package holder comprises a buffer boat for holding an array of packages.

16. The semiconductor package handling system as claimed in claim 15, further comprising a flipping platform for transferring packages onto the buffer boat, and which is operative to flip the packages by 180° prior to transferring the packages to the buffer boat.

17. The semiconductor package handling system as claimed in claim 16, wherein the flipping platform is operative to flip the packages to expose the mold surfaces of the packages for inspection by the first inspection device.

18. The semiconductor package handling system as claimed in any one of the claims 15 to 17, wherein the offloading device is operative to receive a row of packages from the array of packages held by the buffer boat and to convey the row of packages at the same time to the offloader.

19. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the package pick-up device comprises two buffer

boats for holding two separate blocks of arrays of semiconductor packages simultaneously.

20. The semiconductor package handling system as claimed in claim 19, wherein the offloading device is operative to receive the packages held on one buffer boat substantially while other packages are being received by the other buffer boat.

CLAIMS

1. A semiconductor package handling system comprising:

a package holder for receiving and holding singulated semiconductor packages;

a first inspection device arranged and configured to inspect a first surface of the packages while they are being held by the package holder;

an offloading device configured to receive the packages from the package holder and to convey the packages to an offloader;

wherein the offloading device comprises first and second offloading arms that are configured so that each offloading arm moves in a linear path between the package holder and the offloader, each offloading arm comprising a single row of offloading pick heads, each pick head being configured to hold one package and to convey the package to the offloader, the pick heads of the first and second offloading arms being arranged such that the pick and place points of the pick heads lie along the same center line, the pick heads of the first offloading arm being arranged below the pick heads of the second offloading arm to prevent collision between the pick heads of the first offloading arm and the pick heads of the second offloading arm when each offloading arm moves in a linear path between the package holder and the offloader; and

a second inspection device arranged and configured to inspect a second surface of the packages, which is opposite from the first surface, while they are being held by the offloading device.

2. The semiconductor package handling system as claimed in claim 1, wherein the package holder is operative to pick up individual singulated semiconductor packages that have been mounted on an adhesive tape.

3. The semiconductor package handling system as claimed in claim 1 or claim 2, wherein the package holder comprises rotary pick arms.

4. The semiconductor package handling system as claimed in claim 3, wherein the rotary pick arms comprise four pick heads that are equally spaced from one another.

5. The semiconductor package handling system as claimed in claim 4, wherein the rotary pick arms are driven by a direct drive motor with a hollow shaft at its center, and the hollow shaft further comprises a PR alignment optical system for determining an alignment of each package relative to the rotary pick head.

6. The semiconductor package handling system as claimed in claim 5, wherein the rotary pick heads are configured such that a view of a package by the PR alignment optical system is blocked by a rotary pick head at a pick-up position of the rotary pick head, and the package is viewable between adjacent rotary pick heads when the rotary pick head is offset from the pick-up position.

7. The semiconductor package handling system as claimed in any one of claims 4 to 6, wherein the offloading device is operative to receive a package from a rotary pick head while the first inspection device is inspecting another package held by another rotary pick head.

8. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the offloading device comprises multiple offloading pick heads that are arranged in a single row.

9. The semiconductor package handling system as claimed in any one of the preceding claims, wherein each offloading pick head is configured to be independently projectable relative to the other offloading pick heads.

10. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the offloading pick heads are arranged in two separate groups.

11. The semiconductor package handling system as claimed in claim 10, wherein the second inspection device comprises two cameras such that a pitch between the centers of the two cameras corresponds to a pitch between respective offloading pick heads comprised in the two separate groups of offloading pick heads.

12. The semiconductor package handling system as claimed in any one of the preceding claims, further comprising a gang précisor comprising a pair of parallel bars located at the same level, the pair of parallel bars being configured to close onto the packages held by the offloading device so as to align all the packages held by the offloading device simultaneously.

13. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the package holder comprises a buffer boat for holding an array of packages.

14. The semiconductor package handling system as claimed in claim 13, further comprising a flipping platform for transferring packages onto the buffer boat, and which is operative to flip the packages by 180° prior to transferring the packages to the buffer boat.

15. The semiconductor package handling system as claimed in claim 14, wherein the flipping platform is operative to flip the packages to expose the mold surfaces of the packages for inspection by the first inspection device.

16. The semiconductor package handling system as claimed in claim 13 or claim 14, wherein the offloading device is operative to receive a row of packages

from the array of packages held by the buffer boat and to convey the row of packages at the same time to the offloader.

17. The semiconductor package handling system as claimed in any one of the preceding claims, wherein the package pick-up device comprises two buffer boats for holding two separate blocks of arrays of semiconductor packages simultaneously.

18. The semiconductor package handling system as claimed in claim 17, wherein the offloading device is operative to receive the packages held on one buffer boat substantially while other packages are being received by the other buffer boat.