WHAT IS CLAIMED IS:

1. A wafer processing method for dividing a wafer along a plurality of division lines to obtain a plurality of individual device chips, the division lines being formed on a front side of the wafer, the wafer processing method comprising:

a preparing step of preparing a ring frame having an inside opening for accommodating the wafer;

a providing step of positioning the wafer in the inside opening of the ring frame and providing a polyolefin sheet on a back side of the wafer and on a back side of the ring frame, such that the polyolefin sheet is in direct contact with the back side of the wafer and the back side of the ring frame, without an adhesive layer provided between the polyolefin sheet and the back side of the wafer;

a uniting step of heating the polyolefin sheet while applying a pressure to the polyolefin sheet after performing the polyolefin sheet providing step, thereby uniting the wafer and the ring frame through the polyolefin sheet by thermocompression bonding to form a frame unit in a condition where the front side of the wafer and a front side of the ring frame are exposed;

a dividing step of cutting the wafer along each

division line by using a cutting apparatus including a rotatable cutting blade after performing the uniting step, thereby dividing the wafer into the individual device chips; and

a pickup step of blowing out air from the polyolefin sheet side to push up each device chip and picking up the device chip from the polyolefin sheet after performing the dividing step.

2. The wafer processing method according to claim 1, wherein the uniting step includes a step of applying infrared light to the polyolefin sheet, thereby performing the thermocompression bonding.

3. The wafer processing method according to claim 1, wherein the polyolefin sheet is larger in size than the ring frame, and the uniting step includes an additional step of cutting the polyolefin sheet after heating the polyolefin sheet, thereby removing a part of the polyolefin sheet outside an outer circumference of the ring frame.

4. The wafer processing method according to claim 1, wherein the pickup step includes a step of expanding the polyolefin sheet to thereby increase a spacing between any adjacent ones of the device chips.

5. The wafer processing method according to claim

1, wherein the polyolefin sheet is formed of a material selected from the group consisting of polyethylene, polypropylene, and polystyrene.

6. The wafer processing method according to claim 5, wherein the polyolefin sheet is formed of polyethylene, and the polyolefin sheet is heated in the range of 120 °C. to 140 °C. in the uniting step.

7. The wafer processing method according to claim 5, wherein the polyolefin sheet is formed of polypropylene, and the polyolefin sheet is heated in the range of 160 °C. to 180 °C. in the uniting step.

8. The wafer processing method according to claim 5, wherein the polyolefin sheet is formed of polystyrene, and the polyolefin sheet is heated in the range of 220 °C. to 240 °C. in the uniting step.

9. The wafer processing method according to claim 1, wherein the wafer is formed of a material selected from the group consisting of silicon, gallium nitride, gallium arsenide, and glass.

10. The wafer processing method according to claim 1, wherein the pickup step includes moving a pushup mechanism to a position directly below a target one of the device chips and also includes moving a collet to a position directly above the target one of the device

chips, wherein the pushup mechanism is configured and arranged to blow air upon the polyolefin sheet and the collet is configured and arranged to provide a suction force to hold the target one of the device chips.

11. The wafer processing method according to claim 10, wherein the pickup step is repeated for each of the device chips.

12. A wafer processing method for dividing a wafer along a plurality of division lines to obtain a plurality of individual device chips, the division lines being formed on a front side of the wafer, the wafer processing method comprising:

a preparing step of preparing a ring frame having an inside opening for accommodating the wafer;

a providing step of positioning the wafer in the inside opening of the ring frame and providing a polyolefin sheet on a back side of the wafer and on a back side of the ring frame, such that the polyolefin sheet is in direct contact with the back side of the wafer and the back side of the ring frame, without an adhesive layer provided between the polyolefin sheet and the back side of the wafer;

a uniting step of heating the polyolefin sheet while applying a pressure to the polyolefin sheet after

performing the polyolefin sheet providing step, thereby uniting the wafer and the ring frame through the polyolefin sheet by thermocompression bonding to form a frame unit in a condition where the front side of the wafer and a front side of the ring frame are exposed;

a dividing step of cutting the wafer along each division line by using a cutting apparatus including a rotatable cutting blade after performing the uniting step, thereby dividing the wafer into the individual device chips; and

a pickup step of blowing out air from the polyolefin sheet side to push up each device chip and picking up the device chip from the polyolefin sheet after performing the dividing step,

wherein the pickup step includes moving a pushup mechanism to a position directly below a target one of the device chips and also includes moving a collet to a position directly above the target one of the device chips, wherein the pushup mechanism is configured and arranged to blow air upon the polyolefin sheet and the collet is configured and arranged to provide a suction force to hold the target one of the device chips, wherein the polyolefin sheet is continuously provided between the wafer and the pushup mechanism in an uninterrupted

manner.

13. The wafer processing method according to claim 12, wherein the pickup step is repeated for each of the device chips.

14. The wafer processing method according to claim 12, wherein the uniting step includes a step of applying infrared light to the polyolefin sheet, thereby performing the thermocompression bonding.

15. The wafer processing method according to claim 12, wherein the polyolefin sheet is larger in size than the ring frame, and the uniting step includes an additional step of cutting the polyolefin sheet after heating the polyolefin sheet, thereby removing a part of the polyolefin sheet outside an outer circumference of the ring frame.

16. The wafer processing method according to claim 12, wherein the pickup step includes a step of expanding the polyolefin sheet to thereby increase a spacing between any adjacent ones of the device chips.

17. The wafer processing method according to claim 12, wherein the polyolefin sheet is formed of a material selected from the group consisting of polyethylene, polypropylene, and polystyrene.

18. The wafer processing method according to claim

17, wherein the polyolefin sheet is formed of polyethylene, and the polyolefin sheet is heated in the range of 120 °C. to 140 °C. in the uniting step.

19. The wafer processing method according to claim 17, wherein the polyolefin sheet is formed of polypropylene, and the polyolefin sheet is heated in the range of 160 °C. to 180°C. in the uniting step.

20. The wafer processing method according to claim 17, wherein the polyolefin sheet is formed of polystyrene, and the polyolefin sheet is heated in the range of 220 °C. to 240 °C. in the uniting step.

21. The wafer processing method according to claim 12, wherein the wafer is formed of a material selected from the group consisting of silicon, gallium nitride, gallium arsenide, and glass.