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 the 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 polyester sheet having no adhesive layer on a back side of the wafer and on a back side of the ring frame, such that the polyester sheet is in direct contact with the back side of the wafer and the back side of the ring frame;

a uniting step of heating the polyester sheet while applying a pressure to the polyester sheet after performing the polyester sheet providing step, thereby uniting the wafer and the ring frame through the polyester sheet by thermocompression bonding to form a frame unit in a condition where the wafer and 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 applying an ultrasonic wave to the polyester sheet in each of the plurality of separate regions corresponding to each device chip, pushing up each device chip through the polyester sheet, then picking up each device chip from the polyester 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 polyester sheet, thereby performing the thermocompression bonding.

3. The wafer processing method according to claim 1, wherein the polyester sheet is larger in size than the ring frame, and the uniting step includes an additional step of cutting the polyester sheet after heating the polyester sheet, thereby removing a part of the polyester 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 polyester 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 polyester sheet is formed of a material selected from the group consisting of polyethylene terephthalate and polyethylene naphthalate.

6. The wafer processing method according to claim 5, wherein the polyester sheet is formed of polyethylene terephthalate, and the polyester sheet is heated in the range of 250° C. to 270° C. in the uniting step.

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

8. 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.

9. The wafer processing method according to claim 1, wherein the polyester sheet is transparent to visible light.

10. The wafer processing method according to claim 1, wherein the polyester sheet is translucent to visible light.

11. The wafer processing method according to claim 1, wherein the uniting step includes applying pressure to the polyester sheet with a heat roller.

12. 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 configured and arranged to push upon the polyester sheet, and the collet is configured and arranged to provide a suction force to hold the target one of the device chips.

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

14. 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 polyester sheet having no adhesive layer on a back side of the wafer and on a back side of the ring frame to fully cover the back side of the wafer and the back side

of the ring frame, such that the polyester sheet is in direct contact with the back side of the wafer and the back side of the ring frame;

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

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

a pickup step of applying an ultrasonic wave to the polyester sheet in each of the plurality of separate regions corresponding to each device chip, pushing up each device chip through the polyester sheet, then picking up each device chip from the polyester sheet after performing the dividing step.

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

16. The wafer processing method according to claim 14, wherein the polyester sheet is larger in size than the ring frame, and the uniting step includes an additional step of cutting the polyester sheet after heating the polyester sheet, thereby removing a part of the polyester sheet outside an outer circumference of the ring frame.

17. The wafer processing method according to claim 14, wherein the pickup step includes a step of expanding the polyester sheet to thereby increase a spacing between any adjacent ones of the device chips.

18. The wafer processing method according to claim 14, wherein the polyester sheet is formed of polyethylene terephthalate, and the polyester sheet is heated in the range of 250° C. to 270° C. in the uniting step.

19. The wafer processing method according to claim 14, wherein the polyester sheet is formed of polyethylene naphthalate, and the polyester sheet is heated in the range of 160° C. to 180° C. in the uniting step.

20. The wafer processing method according to claim 14, 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 configured and arranged to push upon the polyester sheet, and the collet is configured and arranged to provide a suction force to hold the target one of the device chips.