WHAT IS CLAIMED IS:

1. A method of processing a wafer including a plurality of devices formed in respective areas on a face side thereof that are demarcated by a plurality of projected dicing lines extending in a first direction and a plurality of projected dicing lines extending in a second direction across the projected dicing lines extending in the first direction, to divide the wafer into individual device chips, comprising:

a first modified layer forming step of applying, by a laser beam applying unit, a laser beam having a wavelength transmittable through the wafer to the wafer while positioning a focused spot of the laser beam inside the wafer along the projected dicing lines extending in the first direction, thereby forming first modified layers in the wafer along the projected dicing lines extending in the first direction; and

a second modified layer forming step of, after the first modified layer forming step is performed, applying, by the laser beam applying unit, the laser beam having a wavelength transmittable through the wafer to the wafer while positioning the focused spot of the laser beam inside the wafer along the projected dicing lines extending in the second direction intersecting with the

first direction, thereby forming second modified layers in the wafer along the projected dicing lines extending in the second direction,

wherein, in the second modified layer forming step,

a processing start position on unprocessed projected dicing lines extending in the second direction on the wafer is positioned directly below a beam condenser of the laser beam applying unit, the focused spot of the laser beam being positioned inside the wafer below the unprocessed projected dicing lines extending in the second direction,

an undulating means that is part of the laser beam applying unit is energized to shift the focused spot of the laser beam to form the second modified layers up to the first modified layers in a position not along centers of the projected dicing lines extending in the second direction, but along a line shifted toward one of two opposite of the plurality of devices, by a first distance from the centers of the projected dicing lines extending in the second direction, the focused spot of the laser beam staying in the projected dicing lines extending in the second direction,

when the focused spot of the laser beam applied to the wafer along the projected dicing lines extending in

the second direction reaches the first modified layers, the undulating means that is part of the laser beam applying unit is energized to shift the focused spot of the laser beam along the first modified layers by a second distance, the focused spot of the laser beam staying in the projected dicing lines extending in the second direction, to thereby undulate the laser beam in a staggered pattern to prevent the second modified layers from being formed straight in the wafer along the projected dicing lines extending in the second direction, and

wherein the undulating means of the laser beam applying unit is adjusted in its operation each time the focused spot of the laser beam reaches the first modified layers to form the second modified layers undulated in the staggered pattern within a width of the projected dicing lines extending in the second direction.

2. The method of processing a wafer according to claim 1,

wherein, in the second modified layer forming step, the laser beam is undulated in the staggered pattern by use of either one of a spatial light modulator, an acousto-optic device, a diffractive optical element, a galvanoscanner, and a resonant scanner.

3. The method of processing a wafer according to claim 1,

wherein, in the first modified layer forming step, the first modified layers are formed in the wafer as extending along and through centers of the projected dicing lines extending in the first direction.

4. The method of processing a wafer according to claim 1,

wherein, in the first modified layer forming step, the first modified layers are formed in the wafer, shifted sideways from centers of the projected dicing lines extending in the first direction.

5. A laser processing apparatus comprising:

a chuck table for holding a wafer thereon;

a laser beam applying unit for applying a laser beam to the wafer held on the chuck table;

a feed mechanism for processing-feeding the chuck table and the laser beam applying unit relatively to each other; and

a control unit,

wherein the laser beam applying unit includes

a laser oscillator for oscillating pulsed laser and emitting a pulsed laser beam,

a beam condenser including an fθ lens and

converging the laser beam emitted from the laser oscillator and applying the converged laser beam to the wafer held on the chuck table, and

undulating means disposed between the laser oscillator and the beam condenser and undulating the laser beam in a staggered pattern within a width of each of the projected dicing lines extending in the second direction, and

the control unit performs a control process for applying a laser beam having a wavelength transmittable through the wafer to the wafer while positioning a focused spot of the laser beam inside the wafer along the projected dicing lines extending in the first direction, thereby forming first modified layers in the wafer along the projected dicing lines extending in the first direction, performs a control process for storing coordinates where the first modified layers are formed and applying a laser beam having a wavelength transmittable through the wafer to the wafer while positioning the focused spot of the laser beam inside the wafer along the projected dicing lines extending in the second direction intersecting with the first direction, thereby forming second modified layers in the wafer along the projected dicing lines extending in the second

direction,

wherein

a processing start position on unprocessed projected dicing lines extending in the second direction on the wafer is positioned directly below the beam condenser of the laser beam applying unit, the focused spot of the laser beam being positioned inside the wafer below the unprocessed projected dicing lines extending in the second direction,

the undulating means that is part of the laser beam applying unit is energized to shift the focused spot of the laser beam to form the second modified layers up to the first modified layers in a position not along centers of the projected dicing lines extending in the second direction, but along a line shifted toward one of two opposite of the plurality of devices, by a first distance from the centers of the projected dicing lines extending in the second direction, the focused spot of the laser beam staying in the projected dicing lines extending in the second direction,

when the focused spot of the laser beam applied to the wafer along the projected dicing lines extending in the second direction reaches the coordinates of the first modified layers, the control unit energizes the

undulating means that is part of the laser beam applying unit to shift the focused spot of the laser beam along the first modified layers by a second distance, the focused spot of the laser beam staying in the projected dicing lines extending in the second direction, to thereby undulate the laser beam in the staggered pattern to prevent the second modified layers from being formed straight in the wafer along the projected dicing lines extending in the second direction, and

wherein the undulating means of the laser beam applying unit is adjusted in its operation each time the focused spot of the laser beam reaches the first modified layers to form the second modified layers undulated in the staggered pattern within the width of the projected dicing lines extending in the second direction.

6. The laser processing apparatus according to claim 5,

wherein the undulating means is selected from a group consisting of a spatial light modulator, an acousto-optic device, a diffractive optical element, a galvanoscanner, and a resonant scanner.

7. The laser processing apparatus according to claim 5,

wherein the first modified layers are formed in the

wafer as extending along and through centers of the projected dicing lines extending in the first direction.

8. The laser processing apparatus according to claim 5,

wherein the first modified layers are formed in the wafer, shifted sideways from centers of the projected dicing lines extending in the first direction.