

WHAT IS CLAIMED IS:

1. A manufacturing method of a semiconductor device with a metal film, the manufacturing method comprising:

a cut groove forming step of causing a cutting blade to cut into a first surface of a workpiece having the first surface under which an electrode of a semiconductor element is disposed in each of regions marked out by a plurality of planned dividing lines disposed in a lattice manner and a second surface on an opposite side to the first surface, and forming cut grooves with a depth that exceeds a finished thickness of the workpiece along the planned dividing lines;

a protective member sticking step of sticking a protective member to the first surface of the workpiece after the cut groove forming step;

a grinding step of holding the workpiece on a chuck table through the protective member and grinding a side of the second surface until a thickness of the workpiece becomes the finished thickness to divide the workpiece into a plurality of semiconductor devices;

a metal film covering step of directly covering, by a metal film, a side surface and a back surface of each of the plurality of semiconductor devices for which the

protective member is stuck to a side of the first surface after the grinding step; and

a protective member removing step of removing the protective member from the side of the first surface after the metal film covering step,

wherein the manufacturing method further comprises:

a protective film covering step of covering the side of the first surface by a protective film before the cut groove forming step,

a protective film removing step of removing the protective film after the protective member removing step,

wherein the protective member is brought into tight contact with the protective film in the protective member sticking step, and

a laser-processed groove forming step of irradiating the side of the first surface of the workpiece on which the protective film is formed with a laser beam and forming laser-processed grooves, in the protective film, with a larger width than the cut grooves along the planned dividing lines after the protective film covering step and before the cut groove forming step.

2. The manufacturing method of a semiconductor

device with a metal film according to claim 1, the manufacturing method further comprising:

a debris removing step of carrying out treatment of the workpiece with an etching gas and removing debris adhering to at least one of the laser-processed grooves and the cut grooves after the laser-processed groove forming step or the cut groove forming step, and, before the protective member sticking step.

3. The manufacturing method of a semiconductor device with a metal film according to claim 1, the manufacturing method further comprising:

an adhesion tape sticking step of sticking an adhesion tape directly to the metal film of the plurality of semiconductor devices after the metal film covering step and before the protective member removing step.

4. The manufacturing method of a semiconductor device with a metal film according to claim 1, wherein the workpiece comprises a semiconductor substrate, and the metal film is in direct contact with the semiconductor substrate.

5. The manufacturing method of a semiconductor device with a metal film according to claim 4, wherein protective member stuck in the semiconductor substrate comprises silicon.

6. The manufacturing method of a semiconductor device with a metal film according to claim 4, wherein the semiconductor substrate comprises gallium arsenide.

7. The manufacturing method of a semiconductor device with a metal film according to claim 4, wherein the semiconductor substrate comprises silicon carbide.

8. A manufacturing method of a semiconductor device with a metal film, the manufacturing method comprising:

a cut groove forming step of causing a cutting blade to cut into a first surface of a workpiece having the first surface under which an electrode of a semiconductor element is disposed in each of regions marked out by a plurality of planned dividing lines disposed in a lattice manner and a second surface on an opposite side to the first surface, and forming cut grooves with a depth that exceeds a finished thickness of the workpiece along the planned dividing lines;

a protective member sticking step of sticking a protective member to the first surface of the workpiece after the cut groove forming step;

a grinding step of holding the workpiece on a chuck table through the protective member and grinding a side of the second surface until a thickness of the workpiece becomes the finished thickness to divide the workpiece into

a plurality of semiconductor devices;

a metal film covering step of directly covering, by a metal film, a side surface and a back surface of each of the plurality of semiconductor devices for which the protective member is stuck to a side of the first surface after the grinding step; and

a protective member removing step of removing the protective member from the side of the first surface after the metal film covering step,

wherein the manufacturing method further comprises:

a protective film covering step of covering the side of the first surface by a protective film before the cut groove forming step,

a protective film removing step of removing the protective film after the protective member removing step,

wherein the protective member is brought into tight contact with the protective film in the protective member sticking step,

a laser-processed groove forming step of irradiating the side of the first surface of the workpiece on which the protective film is formed with a laser beam and forming laser-processed grooves with a larger width than the cut grooves along the planned dividing lines after the protective film covering step and before the cut groove forming

step, and

a protective film removal line forming step of forming protective film removal lines obtained through removal of the protective film with a larger width than both the cut grooves and the laser-processed grooves along the planned dividing lines by irradiating the protective film with a laser beam with a wavelength having absorbability with respect to the protective film along the planned dividing lines after the protective film covering step and before the laser-processed groove forming step.

9. The manufacturing method of a semiconductor device with a metal film according to claim 8, wherein the semiconductor substrate comprises silicon.

10. The manufacturing method of a semiconductor device with a metal film according to claim 9, wherein the workpiece comprises a semiconductor substrate, and the metal film is in direct contact with the semiconductor substrate.

11. The manufacturing method of a semiconductor device with a metal film according to claim 10, wherein the semiconductor substrate comprises silicon.

12. The manufacturing method of a semiconductor device with a metal film according to claim 10, wherein the semiconductor substrate comprises gallium arsenide.

13. The manufacturing method of a semiconductor device with a metal film according to claim 10, wherein the semiconductor substrate comprises silicon carbide.