CLAIMS

1. In a method for producing a sealed body wherein a structure comprising a substrate, a semiconductor element and connection terminals is disposed in a mold comprising an upper mold and a lower mold, of which at least one has a depth of at least 3 mm, and sealed with a curable resin to form a resin sealed portion having a thickness of at least 3 mm, a mold release film to be disposed on a surface, to be in contact with the curable resin, of said at least one of the upper mold and the lower mold having a depth of at least 3 mm, characterized in that

it has a first layer to be in contact with the curable resin at the time of forming the resin sealed portion, and a second layer,

the first layer has a thickness of from 5 to 30 μm and is made of at least one member selected from the group consisting of a fluororesin and a polyolefin having a melting point of at least 200°C, and

the second layer has a thickness of from 38 to 100 μm, a product of the tensile storage modulus (MPa) at 180°C and the thickness (μm) being at most 18,000 (MPa·μm), and a product of the tensile stress at break (MPa) at 180°C and the thickness (μm) being at least 2,000 (MPa·μm).

2. The mold release film according to Claim 1, wherein the first layer is made of a fluoroolefin type polymer or a polymethylpentene.

3. The mold release film according to Claim 1, wherein the first layer is made of a copolymer having units based on a tetrafluoroolefin and units based on ethylene.

4. The mold release film according to any one of Claims 1 to 3, wherein the second layer is made of a resin for the second layer, and the glass transition temperature of the resin for the second layer is from 40 to 105°C.

5. The mold release film according to any one of Claims 1 to 4, wherein the second layer is made of at least one member selected from the group consisting of non-stretched polyamide, polybutylene terephthalate and highly formable polyethylene terephthalate.

6. The mold release film according to any one of Claims 1 to 5, wherein the arithmetic mean roughness (Ra) of the surface on the mold surface side of the second layer is from 1.5 to 2.1 μm.

7. The mold release film according to any one of Claims 1 to 6, wherein (the tensile

storage modulus (MPa) at 180°C × the thickness (μm))/(the tensile stress at break (MPa) at 180°C × the thickness (μm)) of the second layer is less than 3.8.

8. A process for producing a sealed body having a resin sealed portion with a thickness of at least 3 mm, formed from a substrate, a semiconductor element, connection terminals and a curable resin, by means of a mold comprising an upper mold and a lower mold, of which at least one has a depth of at least 3 mm, characterized by comprising:

a step of disposing the mold release film as defined in any one of Claims 1 to 4 on a surface, to be in contact with the curable resin, of said at least one of the upper mold and the lower mold having a depth of at least 3 mm,

a step of disposing a structure comprising a substrate, a semiconductor element and connection terminals in the mold and filling a pace in the mold with the curable resin, followed by curing to form a resin sealed portion having a thickness of at least 3 mm, and

a step of releasing the resin sealed portion together with the structure from the mold.

9. The process for producing a sealed body according to Claim 8, which comprises the following steps (α1) to (α5):

(α1) a step of disposing the mold release film on the lower mold of the mold comprising the lower mold having a concave portion with a depth of at least 3 mm and the upper mold not having a concave portion with a depth of at least 3 mm, so that the mold release film covers the concave portion of the lower mold,

(α2) a step of vacuum-suctioning the mold release film to the side of the cavity surface of the lower mold,

(α3) a step of filling the curable resin in the concave portion of the lower mold,

(α4) a step of disposing a structure comprising a substrate, a laminate structure and through-silicon vias between the upper mold and the lower mold, closing the upper mold and the lower mold, and filling the curable resin in a cavity formed between the upper mold and the lower mold, followed by curing to form a resin sealed portion thereby to obtain a sealed body.

10. The process for producing a sealed body according to Claim 8, which comprises the following steps (β1) to (β5):

(β1) a step of disposing the mold release film on the upper mold of the mold comprising the upper mold having a concave portion with a depth of at least 3 mm and the lower mold not having a concave portion with a depth of at least 3 mm, so that the mold release film covers the concave portion of the upper mold,

(β2) a step of vacuum-suctioning the mold release film to the side of the cavity surface of the upper mold,

(β3) a step of disposing a structure comprising a substrate, a laminate structure and through-silicon vias at a predetermined position in the lower mold, and closing the upper mold and the lower mold,

(β4) a step of filling the curable resin in a cavity formed between the upper mold and the lower mold, followed by curing to form a resin sealed portion thereby to obtain a sealed body, and

(β5) a step of taking out the sealed body from the mold.

CLAIMS

1. In a method for producing a sealed body wherein a structure comprising a substrate, a semiconductor element and connection terminals is disposed in a mold comprising an upper mold and a lower mold, of which at least one has a depth of at least 3 mm, and sealed with a curable resin to form a resin sealed portion having a thickness of at least 3 mm, a mold release film to be disposed on a surface, to be in contact with the curable resin, of said at least one of the upper mold and the lower mold having a depth of at least 3 mm, characterized in that

it has a first layer to be in contact with the curable resin at the time of forming the resin sealed portion, and a second layer,

the first layer has a thickness of from 5 to 30 μm and is made of at least one member selected from the group consisting of a fluororesin and a polyolefin having a melting point of at least 200°C, and

the second layer has a thickness of from 38 to 100 μm, a product of the tensile storage modulus (MPa) at 180°C and the thickness (μm) being at most 18,000 (MPa·μm), and a product of the tensile stress at break (MPa) at 180°C and the thickness (μm) being at least 2,000 (MPa·μm).

2. The mold release film according to Claim 1, wherein the first layer is made of a fluoroolefin type polymer or a polymethylpentene.

3. The mold release film according to Claim 1, wherein the first layer is made of a copolymer having units based on a tetrafluoroolefin and units based on ethylene.

4. The mold release film according to any one of Claims 1 to 3, wherein the second layer is made of a resin for the second layer, and the glass transition temperature of the resin for the second layer is from 40 to 105°C.

5. The mold release film according to any one of Claims 1 to 4, wherein the second layer is made of at least one member selected from the group consisting of non-stretched polyamide, polybutylene terephthalate and highly formable polyethylene terephthalate.

6. The mold release film according to any one of Claims 1 to 5, wherein the arithmetic mean roughness (Ra) of the surface on the mold surface side of the second layer is from 1.5 to 2.1 μm.

7. The mold release film according to any one of Claims 1 to 6, wherein (the tensile

storage modulus (MPa) at 180°C × the thickness (μm))/(the tensile stress at break (MPa) at 180°C × the thickness (μm)) of the second layer is less than 3.8.

8. A process for producing a sealed body having a resin sealed portion with a thickness of at least 3 mm, formed from a substrate, a semiconductor element, connection terminals and a curable resin, by means of a mold comprising an upper mold and a lower mold, of which at least one has a depth of at least 3 mm, characterized by comprising:

a step of disposing the mold release film as defined in any one of Claims 1 to 4 on a surface, to be in contact with the curable resin, of said at least one of the upper mold and the lower mold having a depth of at least 3 mm,

a step of disposing a structure comprising a substrate, a semiconductor element and connection terminals in the mold and filling a pace in the mold with the curable resin, followed by curing to form a resin sealed portion having a thickness of at least 3 mm, and

a step of releasing the resin sealed portion together with the structure from the mold.

9. The process for producing a sealed body according to Claim 8, which comprises the following steps (*α*1) to (*α*5):

(*α*1) a step of disposing the mold release film on the lower mold of the mold comprising the lower mold having a concave portion with a depth of at least 3 mm and the upper mold not having a concave portion with a depth of at least 3 mm, so that the mold release film covers the concave portion of the lower mold,

(*α*2) a step of vacuum-suctioning the mold release film to the side of the cavity surface of the lower mold,

(*α*3) a step of filling the curable resin in the concave portion of the lower mold,

(*α*4) a step of disposing a structure comprising a substrate, a laminate structure and through-silicon vias between the upper mold and the lower mold, closing the upper mold and the lower mold, and filling the curable resin in a cavity formed between the upper mold and the lower mold, followed by curing to form a resin sealed portion 19 thereby to obtain a sealed body, and

(a5) a step of taking out the sealed body from the mold.

10. The process for producing a sealed body according to Claim 8, which comprises

the following steps (β1) to (β5):

(β1) a step of disposing the mold release film on the upper mold of the mold comprising the upper mold having a concave portion with a depth of at least 3 mm and the lower mold not having a concave portion with a depth of at least 3 mm, so that the mold release film covers the concave portion of the upper mold,

(β2) a step of vacuum-suctioning the mold release film to the side of the cavity surface of the upper mold,

(β3) a step of disposing a structure comprising a substrate, a laminate structure and through-silicon vias at a predetermined position in the lower mold, and closing the upper mold and the lower mold,

(β4) a step of filling the curable resin in a cavity formed between the upper mold and the lower mold, followed by curing to form a resin sealed portion thereby to obtain a sealed body, and

(β5) a step of taking out the sealed body from the mold.