CLAIMS

[Claim 1]. A temporary protective film for semiconductor encapsulation molding, used for temporarily protecting a lead frame during encapsulation molding of forming an encapsulation layer that encapsulates a semiconductor element mounted on the lead frame, the temporary protective film comprising:

a support film;

an adhesive layer provided on one surface of the support film; and

a non-adhesive layer provided on a surface of the support film on an opposite side of a surface provided with the adhesive layer,

wherein a thickness of the non-adhesive layer is 10 μm or less,

a thickness of the adhesive layer is 4 to 10 μm, and

a surface of the non-adhesive layer on an opposite side of a surface in contact with the support film has a surface roughness Ra of 0.10.15 μm or more, and the surface roughness Ra is a value measured by a laser microscope under such condition that a magnification ratio of an object lens is 50 times.

[Claim 2]. The temporary protective film for semiconductor encapsulation molding according to claim 1, wherein, when the temporary protective film is attached to a lead frame having a die pad and an inner lead so that the adhesive layer is in contact with the lead frame, a 90° peel strength between the adhesive layer and the lead frame is 5 N/m or more at 25°C.

[Claim 3]. The temporary protective film for semiconductor encapsulation molding according to claim 1 or 2, wherein, when the temporary protective film is attached to a lead frame having a die pad and

an inner lead so that the adhesive layer is in contact with the lead frame, a semiconductor element is mounted on a surface of the die pad on an opposite side from the temporary protective film, and an encapsulation layer encapsulating the semiconductor element while being in contact with the adhesive layer is formed, a 90° peel strength between the adhesive layer and the lead frame as well as the encapsulation layer is 1000 N/m or less in at least a portion of a temperature range of 0°C to 250°C.

[Claim 4] The temporary protective film for semiconductor encapsulation molding according to claim 3, wherein a 90° peel strength, between the adhesive layer and the lead frame as well as the encapsulation layer, is 1000 N/m or less in at least a portion of a temperature range of 80°C to 250°C.

[Claim 5] The temporary protective film for semiconductor encapsulation molding according to claim 3 or 4, wherein the 90° peel strength between the adhesive layer and the lead frame as well as the encapsulation layer is 1000 N/m or less at a temperature at which the temporary protective film is detached from the lead frame and the encapsulation layer.

[Claim 6] The temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 5, wherein a glass transition temperature of the adhesive layer is 100°C to 300°C.

[Claim 7] The temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 6, wherein an elastic modulus of the adhesive layer is 1 MPa or more at 230°C.

[Claim 8] The temporary protective film for semiconductor

encapsulation molding according to any one of claims 1 to 7, wherein a 5% weight reduction temperature of the adhesive layer is 300°C or higher.

[Claim 9]. The temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 8, wherein the adhesive layer comprises a thermoplastic resin having at least one functional group selected from the group consisting of an amide group, an ester group, an imide group, an ether group, and a sulfone group.

[Claim 10]. The temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 8, wherein the adhesive layer comprises a thermoplastic resin having at least one functional group selected from the group consisting of an amide group, an ester group, an imide group, and an ether group.

[Claim 11]. The temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 8, wherein the support film is a film comprising a polymer selected from the group consisting of an aromatic polyimide, an aromatic polyamide, an aromatic polyamideimide, an aromatic polysulfone, an aromatic polyethersulfone, polyphenylene sulfide, an aromatic polyether ketone, a polyallylate, an aromatic polyether ether ketone, and polyethylene naphthalate.

[Claim 12]. The temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 11, wherein a ratio of a thickness of the adhesive layer to a thickness of the support film is 0.5 or less.

[Claim 13]. The temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 12, wherein an elastic modulus of the non-adhesive layer is 10 MPa or more at 230°C.

[Claim 14] A reel body comprising a winding core and the temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 13 wound around the winding core.

[Claim 15] A temporary protective film-attached lead frame, comprising:

a lead frame having a die pad and an inner lead; and

the temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 13,

wherein the temporary protective film is attached to the lead frame so that the adhesive layer of the temporary protective film is in contact with one surface of the lead frame.

[Claim 16] A temporary protective film-attached encapsulation molded body, comprising:

a lead frame having a die pad and an inner lead;

a semiconductor element mounted on the die pad;

a wire connecting the semiconductor element and the inner lead;

an encapsulation layer encapsulating the semiconductor element and the wire; and

the temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 13,

wherein the temporary protective film is attached to a surface of the lead frame so that the adhesive layer of the temporary protective film is attached to a surface of the lead frame on an opposite side of a surface where the semiconductor element is mounted.

[Claim 17] A method for manufacturing a semiconductor device, the method comprising, in the following order:

a step of attaching the temporary protective film for semiconductor encapsulation molding according to any one of claims 1 to 13 to a surface of a lead frame having a die pad and an inner lead, in such a direction so that the adhesive layer of the temporary protective film is in contact with the lead frame;

a step of mounting a semiconductor element to a surface of the die pad on an opposite side from the temporary protective film;

a step of providing a wire connecting the semiconductor element and the inner lead;

a step of forming an encapsulation layer encapsulating the semiconductor element and the wire to obtain an encapsulation molded body having the lead frame, the semiconductor element, and the encapsulation layer; and

a step of detaching the temporary protective film from the encapsulation molded body.

[Claim 18] The method for manufacturing a semiconductor device according to claim 17, further comprising a step of connecting the semiconductor element mounted on the die pad and the inner lead using an electroconductive material by reflow.