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[Summary of Invention]

[Technical Problem]

[0005]

However, there was a problem that, in the case of making solder joints through an adhesive film using a protective film thereof, a resin of the adhesive film is caught between bumps and electrode pads to cause continuity failure.

[0006]

An object of the present invention is to provide a method and an apparatus for producing a semiconductor device, which is capable of satisfactory making solder joints without causing catching of a resin of an adhesive film between bumps and electrode pads, and contamination of a heat tool.

[Solution to Problem]

[0007]

In one aspect, there is provided a~~A~~ first method for producing a semiconductor device of the present ~~invention~~ disclosure which is a method for producing a semiconductor device in which solder joints are made between semiconductor chips with bumps and a substrate with electrodes corresponding to the bumps through a thermosetting adhesive layer, the method including the successive steps of:

(A) forming a thermosetting adhesive layer in advance on a surface including bumps of the semiconductor chip;

(B) laying a surface on the thermosetting adhesive layer side of the semiconductor chip, on which the thermosetting adhesive layer is formed, and a substrate one upon another, followed by pre-bonding using a heat tool to obtain a pre-bonded laminate; and

(C) interposing a protective film having a thermal conductivity of 100 W/mK or more between the heat tool and a surface on the semiconductor chip side of the pre-bonded laminate, melting a solder between the semiconductor chips and the substrate and simultaneously curing the thermosetting adhesive layer using the heat tool.

[0008]

A second method for producing a semiconductor device of the present ~~invention~~ disclosure is a method for producing a semiconductor device according to claim 1, wherein solder joints are made between a plurality of semiconductor chips with bumps and through-silicon vias, and a substrate with electrodes corresponding to the bumps through a thermosetting adhesive layer, the method including the successive steps of:

(A') forming a thermosetting adhesive layer in advance on each surface including bumps of a plurality of semiconductor chips to obtain a plurality of semiconductor chips on which the thermosetting adhesive layer is formed,

(B') obtaining a multistage pre-bonded laminate by passing through the step of laying a surface on the thermosetting adhesive layer side, on which the thermosetting adhesive layer is formed, of one

semiconductor chip and a substrate one upon another, followed by pre-bonding using the heat tool, and one or more step(s) of laying a surface on the semiconductor chip side of the semiconductor chips and a surface on the thermosetting adhesive layer side of the other semiconductor chips, on which the thermosetting adhesive layer is formed, one upon another, followed by pre-bonding using the heat tool, and

(C') interposing a protective film having a thermal conductivity of 100 W/mK or more between the heat tool and a surface on the semiconductor chip side of the multistage pre-bonded laminate, melting a solder between a plurality of semiconductor chips, and a solder between the semiconductor chips and the substrate, and simultaneously curing the thermosetting adhesive layer using the heat tool.

[0009]

In another aspect, there is provided a method for producing a semiconductor device, wherein a thermosetting adhesive film is laminated in advance on a surface including bumps of the semiconductor chip to form a thermosetting adhesive layer in the step (A).

In yet another aspect, there is provided an~~An~~ apparatus for producing a semiconductor device of the present ~~invention~~ disclosure which is an apparatus for producing a semiconductor device by bonding a substrate with a semiconductor chip, including a bonding device including a stage for disposing the substrate and a heat tool having a mechanism for heating and pressurizing

the semiconductor chip; a supply reel for supplying a protective film having a thermal conductivity of 100 W/mK or more; and a take-up reel for taking up the protective film; which are disposed so that the protective film supplied from the supply reel passes between the heat tool and the stage, thus being taken up by the take-up