Then, preferred embodiments of a semiconductor package and a method of producing the semiconductor package of the present invention will be described in detail with reference to the drawings. Note that, in the descriptions and drawings below, the same reference numerals are given to the same or corresponding components, and overlapping descriptions will be omitted. Figs. 1 to 7 are schematic longitudinal cross-sectional views each illustrating a preferred embodiment of each step of a method of producing a semiconductor package of the present invention.

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In the method of producing a semiconductor package of the present invention, as a first step, as illustrated in Fig. 1, firstly, the film-like adhesive of the present invention is thermocompression bonded to the back surface of a semiconductor wafer 1 in which at least one semiconductor circuit is formed on the surface (that is, a surface of the semiconductor wafer 1 on which the semiconductor circuit is not formed) to provide an adhesive layer 2, and then the semiconductor wafer 1 and a dicing tape 3 are provided with the adhesive layer 2 interposed therebetween. At this time, a product in which the adhesive layer 2 and the dicing tape 3 are combined may also be thermocompression bonded simultaneously. The condition for thermocompression bonding is not particularly limited as long as the effect of the present invention is not impaired due to thermal curing of the epoxy resin (A), and a condition of a temperature of 70°C and a pressure of 0.3 MPa is exemplified.

As the semiconductor wafer 1, a semiconductor wafer in which at least one semiconductor circuit is formed on the surface can be appropriately used. Examples of such a wafer include a silicon wafer, a SiC wafer, and a GaN wafer. As the adhesive layer 2, one layer of the thermally conductive film-like adhesive of the present invention may be used alone, or two or more layers thereof may be laminated and used. As a method of providing such an adhesive layer 2 on the

on the surface of the substrate.

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A method of mounting the semiconductor chip 5 with an adhesive layer on such a wiring board 6 is not particularly limited. A conventional method that enables to bond the semiconductor chip 5 with an adhesive layer to the wiring board 6 or the electronic component mounted on the surface of the wiring board 6 by utilizing the adhesive layer 2 can be appropriately employed. Examples of such a mounting method include publicly known heating and pressurizing methods such as a method using a mounting technique using a flip chip bonder having a heating function from the upper part, a method using a die bonder having a heating function from only the lower part, and a method using a laminator.

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As such, mounting the semiconductor chip 5 with an adhesive layer on the wiring board 6 via the adhesive layer 2 formed from the film-like adhesive of the present invention allows the film-like adhesive to conform to the unevenness on the wiring board 6, formed due to the electronic component, and thereby enables to firmly adhere and fix the semiconductor chip 4 and the wiring board 6.

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Then, as a fourth step, the film-like adhesive of the present invention is thermally cured. The temperature for thermal curing is not particularly limited as long as it is a temperature equal to or more than the thermal curing start temperature of the film-like adhesive of the present invention. The temperature varies depending on the type of the epoxy resin (A), the polymer component (C), and the epoxy curing agent (B) to be used. The temperature is, although it cannot be said unconditionally, for example, preferably 100 to 180°C, and more preferably 140 to 180°C from the viewpoint that curing at higher temperature allows curing in a short time. When the temperature is less than the thermal

{0097}

[Table 2-4]

Table 2-4

			CEx. 1	CEx. 2	CEx. 3	CEx. 4	CEx. 5
Material [parts by mass]	Epoxy resin (A)	EPPN-501H (Triphenylmethane type epoxy resin)	56	56	56	56	56
		YD-128 (Liquid Bis-A type epoxy resin)	49	49	49	49	49
	Polymer component (C)	YP-50 (Bis-A type phenoxy resin)	30	30	30	30	30
	Inorganic filler (D)	No.1A (AO502)	313	-	-	-	313
		No.2A (ASFP-20)	-	313	-	-	-
		No.3A (DAW-03)	-	-	313	-	-
		No.4A (SC0280-SF)	-	-	-	350	-
	Surface treatment agent	S-510 (Epoxysilane type silane coupling agent)	3	3	3	3	3
	Epoxy resin curing agent (B)	2PHZ-PW (Imidazole-based curing agent)	8.5	8.5	8.5	8.5	8.5
The blended amount in terms of total solid content [parts by mass]			459	459	459	496	459
Inorganic filler amount [vol%]			40	40	40	40	40
Characteristics/ evaluation	Arithmetic average roughness Ra [μm]		4.3	3.3	5.5	4.2	4.3
	Melt viscosity at 70°C [Pa·s]		8360	32500	7000	21500	8360
	Melt viscosity at 120°C [Pa·s]		1160	11000	800	3100	1160
	Thermal conductivity [W/m·K]		1.2	0.9	0.9	6.1	1.2
	Wafer laminate evaluation		B	B	B	B	A*
	Die attach evaluation		B	B	B	B	A*
	Adhesive force evaluation		C	C	B	A	C*

Remarks: 'CEx.' means Comparative Example.

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<Notes of tables>

The symbol “-” in the row of the inorganic filler means not containing the corresponding component.

The symbol “*” in the wafer laminate evaluation, die attach property evaluation, and adhesive force evaluation of Comparative Example 5 means that each evaluation was performed by changing the bonding temperature to the wafer from 70°C to 100°C, and thermocompression bonding temperature to the lead frame substrate from 120°C to 150°C.

The “inorganic filler material [vol%]” is the proportion (% by volume) of the inorganic filler (D) in the total content of the epoxy resin (A), the epoxy resin curing agent (B), the polymer component (C), and the inorganic filler (D).

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The following is clear from Table 2.

The film-like adhesives of Examples 1 to 13 are obtained from the adhesive composition of the present invention containing the epoxy resin (A), the epoxy resin curing agent (B), the polymer component (C), and the inorganic filler (D), in which the proportion of the inorganic filler (D) in the total content of these components (A) to (D) is 30 to 70% by volume, the average particle diameter (d50) of the inorganic filler (D) is 0.1 to 3.5 μm, and the ratio of the particle diameter at 90% cumulative distribution frequency (d90) to the average particle diameter (d50) is 5.0 or less. For the film-like adhesives of these Examples 1 to 13 which have thermal conductivity and are a thin film having a thickness of 8 μm, generation of voids was not observed in all the semiconductor chips observed in the die attach property evaluation, and high adhesive force and excellent adhesiveness were exhibited.

{0100}

In contrast, the film-like adhesives of Comparative Examples 1 to 4 are