

[0007]

Patent Document 1: International Publication WO
2011/004706

Patent Document 2: Japanese Patent Laid-open
5 Publication No. 2009-270054

~~SUMMARY OF THE INVENTION~~

~~PROBLEMS TO BE SOLVED BY THE INVENTION~~

[0008]

10 Here, since a fine gap between structures formed on a board
or a chip needs to be filled with the underfill material, the
inorganic particles mixed in the underfill material also needs
to be fine. However, when fine inorganic particles are mixed
in large amounts in the underfill material, there has been a
15 problem that a distribution of the inorganic particles is
nonuniform in the film thickness direction in forming a film.
The reason for this is that when the distribution of the
inorganic particles is nonuniform, this causes a thermal stress
difference in the film thickness direction, and therefore there
20 is a possibility that connection reliability is deteriorated
in connecting between the chips.

[0009]

On the other hand, in the technology of mixing a polyimide
for the purpose of imparting heat resistance to the underfill
25 material (refer to Patent Document 1) and the technology of

mixing rubber particles for the purpose of relaxing stress exerted on a cured underfill material (refer to Patent Document 2), there have been concerns that dispersion of the inorganic particles in forming a film is insufficient or a coefficient of linear expansion of the underfill material increases due to mixing of rubber particles. That is, as with the above description, these technologies have had a possibility that connection reliability becomes insufficient in connecting between the chips.

[0010]

In order to solve the above-mentioned problem, the present invention provides a semiconductor resin composition and a semiconductor resin film which impart heat resistance and in which a coefficient of linear expansion of a cured product is adequately small while relaxing stress and a distribution of the inorganic particles is uniform in the film thickness direction of a semi-cured film formed; and a semiconductor device using these.

SOLUTIONS TO THE PROBLEMS

[0011]

In an aspect, there is provided~~The present invention pertains~~ to a semiconductor resin composition which contains (a) an epoxy compound, (b) inorganic particles, (c) a polyimide, and (d) a solvent, wherein the semiconductor resin composition further contains (e) rubber

particles and a ratio of the (b) inorganic particles in the weight of the total solid fraction resulting from subtracting the weight of the (d) solvent from the total weight of the semiconductor resin composition is 60 wt% or more and 92 wt%
5 or less.

[0012]

~~Further, the present invention pertains to~~In another
aspect, there is provided a semiconductor resin film having,
on a support, a semiconductor resin layer containing (a) an
10 epoxy compound, (b) inorganic particles, (c) a polyimide and
(e) rubber particles, wherein a ratio of the (b) inorganic
particles in the weight of the semiconductor resin layer is 60
wt% or more and 92 wt% or less.

[0012a]

15 In another aspect, there is provided a semiconductor device
having a cured product of the composition resulting from
removing the (d) solvent from the semiconductor resin
composition as defined above, or a cured product of the
semiconductor resin layer as defined above.

20 ~~EFFECTS OF THE INVENTION~~

[0013]

In accordance with the present ~~invention~~disclosure, it
is possible to attain a semiconductor resin composition and a
semiconductor resin film which impart heat resistance and in
25 which a coefficient of linear expansion of a cured product is

adequately small while relaxing stress and a distribution of the inorganic particles is uniform in the film thickness direction of a semi-cured film formed; and a semiconductor device using these.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 shows an example of a SEM image of a semiconductor