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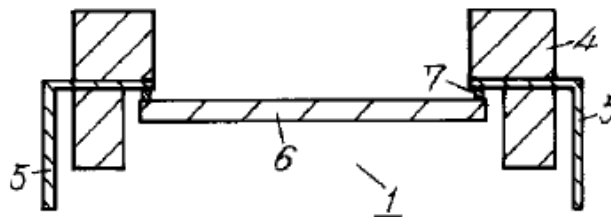
(54)(Title of the Invention)

SOLID-STATE IMAGE PICKUP DEVICE

(57)(Abstract)

(Object) Provide a solid-state image pickup device comprised of a small plastic package without degrading the CCD microlens effects.

(Construction) The solid-state image pickup device is comprised of a package 4 made of a transparent resin, leads 5, a CCD chip 6, and bumps 7 which join the inner leads to the CCD chip 4. A microlens is formed at the light-receiving face of the CCD chip 6. A space is provided between the microlens face provided at the light receiving face of the CCD chip 6 and the inner face of the light receiving section of the package 4. The spacing can be suitably selected. The package 4 and the leads 5 are produced by transfer molding, or the like, by clamping the lead frame with a pair of dies forming a prescribed cavity.



(Claims)

(Claim 1) A solid-state image pickup device characterized by comprising a CCD chip joined via bumps to the inner lead sections of a package made of a transparent resin comprising a light-receiving section and side wall sections integrally formed while interposing a lead frame and having, in its interior, a space for disposing a CDD chip, the inner lead sections of said lead frame being exposed to the space, and the face opposite to the light-receiving face being open.

(Claim 2) A solid-state image pickup device according to claim 1 characterized such that the back face of said CCD chip is sealed with an adhesive resin.

(Claim 3) A solid-state image pickup device according to claim 1 characterized such that said transparent resin is an epoxy-based resin.

(Detailed Explanation of the Invention)

(0001)

(Field of Industrial Applications) The present invention relates to a solid-state image pickup device using a CCD chip, and is particularly one having a package, including a light-receiving face, is constructed with plastic.

(0002)

(Prior Art) A conventional solid-state image pickup device is constructed by placing and adhering a CCD chip in a ceramic package, being joined to the inner leads by wire bonding and sealed using sealing glass. Since a conventional ceramic package is expensive, a less expensive and more compact plastic package has been desired.

(0003)

(Problems to be Solved by the Invention) Integrally forming an image pickup device using a transparent resin in the same manner as in the case of a regular resin molded semiconductor would cause a loss of the lens effects because the refractive indices of the transparent resin and the lens material used for the microlens formed on the CCD chip surface are similar.

(0004) One object of the present invention is to provide a solid-state image pickup device constructed with a compact plastic package without degrading the CCD microlens effects.

(0005)

(Means for Solving the Problems) The solid-state image pickup device according the invention has the basic construction of comprising a CCD chip joined via bumps to the inner lead sections of a package made of a transparent resin comprising a light-receiving section and side wall sections integrally

formed while interposing a lead frame and having, in its interior, a space for disposing a CDD chip, the inner lead sections of the lead frame being exposed to the space, and the face opposite to the light-receiving face being open.

(0006) In another aspect, the joining of the chip to the inner leads via the bumps is performed via the conductive adhesive layer formed on the surfaces of the bumps disposed on the bonding pads of the CCD chip.

(0007) In another aspect, it is constructed by sealing the back face side of the chip with an adhesive resin.

(0008)

(Operation) According to the construction of the invention, a space can be created between the microlens on the CCD chip surface and the inner face of the package's light-receiving section by joining the CCD chip to the inner leads of the package which is formed with a transparent resin so as to interpose a lead frame, thereby making of plastic packaging possible without degrading the optical characteristics of the CCD.

(0009)

(Example) The details of the solid-state image pickup device according to the invention will be explained below based on the drawings. FIG. 1 is a cross-sectional view explaining the basic construction of the invention.

(0010) In FIG. 1, reference numeral 1 is a cross section of the basic construction of the solid-state image pickup device, which includes a package 4 formed with a transparent resin, leads 5, a CCD chip 6, bumps 7 which join the inner lead sections to the CCD chip 4. A microlens is formed on the light-receiving face of the CCD chip 6.

(0011) In the basic construction of the invention, it is essential to provide a space between the microlens surface at the light-receiving face of the CCD chip 6 and the inner face of the light-receiving section of the package 4. The spacing can suitably be selected. The package 4 and the leads 5 are produced by transfer molding, or the like, by clamping a lead frame with a pair of dies forming a prescribed cavity.

(0012) In the package 4, the resin thicknesses of the light-receiving section and the side wall sections can be selected to form desirable shapes from the perspective of the optical characteristics and mechanical strength. The transparent resin used here can be suitably selected depending on the application from transparent resins, such as epoxy-based resins, acrylic-based resins, fluorine-based resins, polyimide-based resins, or the like. Among these resins,

thermosetting epoxy resins provide preferable results in terms of the formability and weather resistance.

(0013) For the leads 5, regularly used copper, iron-nickel alloy, or the like, can be employed. Providing gold or silver plating at the sections of the leads 5 where the bumps will be joined beforehand can highly reliably join them together. The bumps are formed on the bonding pads of the CCD chip 6 by stud bumping or plating beforehand, and the chip is bonded to the inner leads 5 within the package via the conductive layer disposed on the bump surfaces by thermosetting or photosetting.

(0014) For the conductive layer, for example, a silver-palladium-epoxy resin composite conductive adhesive or a resin-based anisotropic conductive adhesive can be suitably used.

(0015) FIG. 2 is a cross section of a solid-state image pickup device in which, in addition to the basic structure discussed above, the back face side of the chip is further sealed with an adhesive resin 7. By constructing the device in this way, the bump joints are reinforced, and at the same time, the penetration of dust from the outside can be prevented.

(0016) For the adhesive resin, epoxy-based potting resins known as the sealing materials for TAB, for example, can be suitably used.

(0017) As is made clear from the explanation above, by bonding a CCD chip via bumps to the inner leads of the package formed with a transparent resin while interposing a lead frame, a space can be created between the microlens on the CCD chip surface and the inner face of the light-receiving section of the package, thereby making plastic packaging possible without degrading the optical characteristics of the CCD.

(0018)

(Effect of the Invention) The construction of the invention can reduce the package size, as well as enabling inexpensive production, as compared to conventional wire bonding lead joining techniques.

(Brief Explanation of the Drawings)

FIG. 1 is a cross-sectional view explaining the basic structure of the solid-state image pickup device according to the invention.

FIG. 2 is a cross-sectional view explaining the construction of one example of the solid-state image pickup device according to the invention.

(Explanation of Reference Numerals)

- 1 cross section of a solid-state image pick up device
- 4 package
- 5 lead
- 6 CCD chip
- 7 bump section

FIG. 1

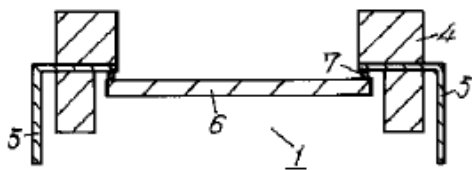
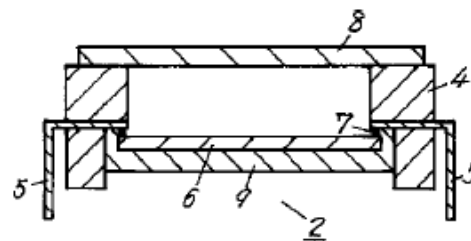


FIG. 2





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3. I certify that the English translation of the document identified below is a true and correct translation, to the best of my knowledge and ability, of the original Japanese document:

- Japanese Unexamined Patent Application Publication No. H07-45803

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Executed this 3rd day of March, 2016.

By: \_\_\_\_\_

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