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# FRAME FOR SEMICONDUCTOR PACKAGE

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a frame for semiconductor package in which a semiconductor device is mounted on a lead frame and the outside thereof, particularly the upper surface of semiconductor device is encapsulated with molding compound.

### 2. Description o the Prior Art

In recent years, it has been required to miniaturize and shape semiconductor product mounted on a substrate thinner, as packaging of semiconductor is made denser. It has been severely required for LSI to reduce the number of chips by improving integration level and to miniaturize and make a package lighter. The popularization of so-called CSP (Chip Size Package) is rapidly advancing. Particularly, in the development of thin semiconductor product with lead frame, the semiconductor package of single side encapsulation type has been developed in which a semiconductor device is mounted on a lead frame and the surface of semiconductor device mounted on a lead frame is encapsulated with molding compound.

Fig. 1 is a sectional view of one example of semiconductor package. Fig. 2 is a plan view thereof. The semiconductor package shown in Figs. 1 and 2 is comprised of a lead frame 1, a semiconductor device 4 mounted on die-pad 3 supported with suspending leads 2 of lead frame 1, metallic thin wires 6 electrically connecting electrodes provided on the top face of the semiconductor device 4 with terminals 5 of lead frame 1, respectively and molding compound 7 for encapsulating the outside region of semiconductor device 4 including the upper side of semiconductor device 4 and the lower side of die-pad 3. The semiconductor package is of non-lead type in which so-called outer leads are not projected from the semiconductor package and the two of inner leads and outer leads are integrated into terminals 5, wherein used

lead flame 1 is half-cut by etching in such a manner that die-pad 3 is positioned higher than terminals 5. Since such a step is formed between die pads 3 and terminals 5, molding compound 7 can be inserted into the lower side of die-pad 3 so that a thin semiconductor package can be realized even though the semiconductor package has non-exposed die-pad.

Since semiconductor device is miniature, a matrix type frame is mainly used for the above-mentioned semiconductor package of non-lead type, in which plural semiconductor devices are arranged in a direction of a width of the matrix type frame. Further, recently, from a demand for cost down, it is thought to switch over a frame of individually molding type shown in Fig. 3 to a frame of collectively molding type shown in Fig.4.

In the frame of individually molding type, as shown in Fig. 3(A), individual molding cavities C of small size are provided separately within a frame F. After molding, individual semiconductor packages are stamped out so that semiconductor packages S shown in Fig. 3(B) are obtained. Namely, semiconductor devices are mounted on die-pads of lead frames through silver paste and others, and wire bonding is carried out. Thereafter, respective semiconductor devices are individually molded with molding compound and the respective molded semiconductor devices are stamped out to form individual semiconductor packages.

In the frame of collectively molding type, as shown in Fig. 4(A), some molding cavities C of large size are provided within a frame F. Multiple semiconductor devices are arranged in matrix within each molding cavity C, respectively and collectively molded with molding compound. Thereafter, the collectively molded semiconductor devices are cut at grid-leads L by means of dicing saw so that a semiconductor package S shown in Fig. 4(B) is obtained. Namely, semiconductor devices are mounted on die-pads of lead frames through silver pastes and others and wire bonding is carried out. Thereafter, plural semiconductor devices arranged are collectively molded with molding

compound to a given cavity size, and then the collectively molded semiconductor devices are cut to form individual semiconductor packages by dicing.

The above-mentioned frame of collectively molding type has the advantage that multiple resin-encapsulated packages can be produced all at once, therefore the productive efficiency being high. However, when collectively molded semiconductor devices are cut to form individual packages by means of dicing saw, molding compound and metallic lead frames are cut at the same time, in which cut burrs of metal of lead frame are projected largely to adjacent terminals of lead frame by which short circuit is formed. Further, there is a problem that metal powders dusts generated pollute the environment and dicing saw is apt to wear out since metal is shaved with the dicing saw.

## BRIEF SUMMARY OF THE INVENTION

An object of the present invention is to provide a frame for semiconductor package of collectively molding type used for the production of semiconductor package, in which cut burrs of metal generated when cutting molded resin and metal of lead frame by means of dicing saw are reduced or the generation of dusts of metal is inhibited, and the wear of dicing saw is reduced.

In order to achieve the above-mentioned object, a frame for semiconductor package of the present invention comprises plural lead frames arranged in matrix through grid-leads, in which individual semiconductor devices are mounted on the individual lead frames, respectively, the semiconductor devices are collectively molded with molding compound and the collectively molded semiconductor devices are cut at grid-leads by means of dicing saw to obtain individual semiconductor packages, wherein the grid-leads are provided with groove portions which are formed by half-cutting by etching areas of the frame for semiconductor package corresponding to the grid-leads

from the front or back thereof in such a manner that thin grid-leads are formed.

In the above-mentioned lead frame, a width of groove portions may be larger or smaller than the width of dicing saw.

## BREIF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of one example of semiconductor package.

Fig. 2 is a plan view of semiconductor package shown in Fig. 1.

Fig. 3 is an explanatory view of a frame of individually molding type.

Fig. 4 is an explanatory view of a frame of collectively molding type.

Fig. 5 is a plan view of one example of a frame of the present invention seen from the front side thereof.

Fig. 6 is a partial enlarged plan view of a frame shown in Fig. 5.

Fig. 7 is a sectional view taken on line A-A of Fig. 6.

Fig. 8 is a sectional view showing a modification of example of Fig. 6.

Fig. 9 is a sectional view of another example of frame shown corresponding to Fig. 7.

Fig. 10 is a sectional view showing a modification of example of Fig.9.

## DETAILED DESCRIPTION

Then, referring to figures, embodiments of the present inventions are explained. Fig. 5 is a plan view of one example of a frame of the present invention. Fig. 6 is a partial enlarged plan view of the frame. Fig. 7 is a sectional view taken on line A-A of Fig. 6.

In Fig.5, F designates a metal frame for lead frame, in which lead frames 10 are arranged in a matrix of $3 \times 4$ through grid-leads L. The grid-leads L connect terminals 11 of adjacent lead frames 10 with each other. Then, as shown in Figs. 6 and 7, the metal frame has linear groove portions 12 which pass through areas of backside of lead frame corresponding to grid-leads L. The groove portions 12 are formed by half-cut by etching the metal frame.

Further, groove portions 12 with the same width are provided around the whole of twelve lead frames.

Process for producing semiconductor packages using the frame F is as follows. First, semiconductor devices are mounted on die-pads 13 of the respective lead frames 10 of frame F through silver pastes and wire bonding is made between terminals 11 of lead frame and electrodes provided on the top face of semiconductor devices. Thereafter, twelve semiconductor devices are collectively molded with molding compound to a given cavity size and then the collectively molded semiconductor devices are cut at grid-leads L by means of dicing saw in such a manner that terminals 11 of individual lead frames are left, by which the collectively molded semiconductor devices are divided into individual semiconductor packages.

In this case, when a width of groove portions 12 is the same as a width of dicing saw, there is a case where edge of dicing saw fits into groove potion 12 so that cutting does not go smoothly. Further, according to accuracy of setting of dicing saw to groove portions 12, shapes of section of metal varies with individual sides so that variation in connecting strength of substrate is generated in mounting of semiconductor device. Therefore, a width of groove portions 12 is set to be larger or smaller than a width of dicing saw in such a manner that cutting can be carried out smoothly.

When cutting the collectively molded semiconductor devices, metal and resin are cut at grid-leads L from the front side of collectively molded semiconductor devices, in which when a width groove portions 12 is larger than width a of dicing saw as shown in Fig. 7, since metal is removed at groove portions 12, the generation of metal burrs becomes smaller. Further, even if grove portions 12 having a width larger than width "a" of dicing saw is provided on the front side of frame for semiconductor package, burrs also become hard to occur. However, since the collectively molded semiconductor

devices are cut from the front side of frame for semiconductor package, it is preferable that groove portions 12 are provided on the backside of frame.

Further, when a width of groove portions 12 is smaller than width a of dicing saw as shown in Fig. 9, metal is cut to generate burrs. However, since amount of metal to be cut is small, the generation of metal powder dusts is inhibited and even if time required for cutting is small, cutting is made sufficiently.

As above-mentioned, a frame for semiconductor package of the present invention comprises plural lead frames arranged in matrix through grid-leads. Individual semiconductor devices are mounted on the individual lead frames, respectively, the semiconductor devices are collectively molded with molding compound and the collectively molded semiconductor devices are cut at grid-leads by means of dicing saw to obtain individual semiconductor packages, wherein the grid-leads are provided with groove portions which are formed by half-cutting by etching areas of frame for semiconductor package corresponding to the groove portions from the front or back thereof in such a manner that thin grid-leads are formed. When a width of groove portions is larger than a width of dicing saw, area of cross section to be cut by dicing is decreased so that cut burrs are lessened in such an extent that burrs are not projected largely. Therefore, accident of short circuit becomes nothing. Further, when a width of groove portions is smaller than a width of dicing saw, amount of metal to be cutting is decreased so that the generation of metal powder dusts is inhibited, time required for cutting becomes smaller and damage of dicing saw is lessened.

What is claimed is:

1. A frame for semiconductor package comprising plural lead frames arranged in matrix through grid-leads, in which individual semiconductor devices are mounted on the individual lead frames, respectively, the semiconductor devices are collectively molded with molding compound and the collectively molded semiconductor devices are cut at grid-leads by means of dicing saw to obtain individual semiconductor packages, wherein the grid-leads are provided with groove portions in such a manner that thin grid-leads are formed.
2. A frame for semiconductor package as claimed in claim 1, wherein groove portions are formed by half-cutting by etching areas of the frame for semiconductor package corresponding to the grid-leads from the front or back thereof.
3. A frame for semiconductor package as claimed in claim 1, wherein a width of groove portions is larger than a width of dicing saw.
4. A frame for semiconductor package as claimed in claim 1, wherein a width of groove portions is smaller than a width of dicing saw.

