INTEGRATED CIRCUIT PACKAGE

Background of the Invention

The present invention relates, in general, to integrated circuit (IC) packages and, more particularly, to integrated circuit packages having a channel disposed about a portion of a die attach area.

In typical manufacturing, a die attach material, such as a paste, is first deposited on a package substrate. Next, a die is pressed onto the paste. When this is done, the excess die attach material is forced out from under the die as can be seen in U.S. Patent 4,401,767 issued to Dietz et al. Because of the high viscosity of the die attach material the excess tends to remain near the sides of the die and can run up on top of the die causing damage from shorting and corrosion.

Summary of the Invention

Accordingly, it is an object of the present invention to provide an integrated circuit package the overcomes the above deficiencies.

A further object of the present invention is to provide an integrated circuit package that eliminates the problem of excess die attach material accumulating on top of a die.

In accordance with the present invention there is provided an integrated circuit package substrate comprising:

a die attach area for receiving a die to be attached; and

a die attach material overflow channel disposed about a portion of said die attach area.

Brief Description of the Drawings

FIGS. 1 and 2 are views, cross sectional and top planar, of a prior art integrated circuit package substrate;

FIGS. 3 and 4 are views, cross sectional and top planar, of an integrated circuit package substrate embodying the present invention;

FIG. 5 is a top planar view of a second embodiment of the present invention; and

FIG. 6 is a top planar view of a third embodiment of the present invention.

Detailed Description of the Drawings

Referring first to the FIGS. 1 and 2, views in cross section and top planar, respectively, of a prior art integrated circuit package substrate are shown. FIGS. 1 and 2 show a package 10 having a recessed portion 11. In manufacturing, a die bonding material 13 is placed in recessed area 11 and then a die 12 is deposited on material 13. In pressing die 12 onto material 13, an excess portion of material 13 is pushed out from under die 12. As shown in FIG. 2 most of excess material 13 is pushed out along the sides of die 12 as opposed to the corners.

Material 13 is generally made of a paste having a high viscosity because of the bonding requirements. This causes material 13 to have a tendency to remain along the edge of die 12 and, if enough exists, to extend onto the top surface of die 12. This can cause damage to the die thereby destroying a die that the manufacturer has already paid to produce.

Referring now to FIGS. 3 and 4, cross sectional and top planar views, respectively, of an integrated circuit package substrate, generally designated 20, embodying the present invention are illustrated. Substrate 20 consists of a recessed area 21 having a series of channels, or moats, 24 disposed about the periphery of recess 21, in what is sometimes referred to as the dead zone. Channels 24 are placed so as to allow an alternate place for any excess die bonding material to flow. As shown here, an excess die bonding material 23 has been pushed out from under a die 22. Because die bonding material 23 has a lower place to flow, gravity and surface tension will cause material 23 to flow down into channels 24 rather than up the side and on top of die 22.

As shown in FIG. 4, channels 24 are placed in the dead zone along where the sides of die 22 will be disposed. The location of channels 24 was selected because of the location of bonding material build up on the prior art. See FIG. 2.

Also, as shown in FIG. 3, channels 24 are tapered with the top opening being wider than the bottom. In one particular embodiment, the depth of channel 24 would be 0.010 inches with a top width of 0.010 inches and a bottom width of 0.006 inches. The actual dimensions of channel 24 are not critical but are dictated by several variables. First, channel 24 should be large enough to contain any excess material 23. Second, channel 24 should not be so large as to effect the structural integrity of substrate 20.

The location and size of channels 24 are generally compatible with existing dimensions of substrate 20. In packaging an IC, there is a

minimum amount of spacing, dead zone, required between the sides of die 22 and walls 25 of substrate 20. This is usually required to allow access by the bonding tools that place wires from bonding pads on die 22 to bonding posts on substrate 20. Therefore, the present invention does not require any additional spacing and is compatible with existing package designs.

Referring now to FIG. 5, a second embodiment of the present invention is illustrated. FIG. 5 shows a substrate 20 having a single channel 24. By properly placing die 22 during the die placement procedure, only one channel 24 may be required. By placing side 26 of die 22 at the appropriate height and then rolling die 22 until side 27 is at the desired height, the excess die attach material 23 can be directed out one side of die 22. This allows the problem to be resolved using only one channel 24.

Referring now to FIG. 6, a third embodiment of the present invention is illustrated. This shows substrate 20 having a single channel 24 disposed about the periphery of die 22. This would eliminate any problems caused if the flow of die attach material 23 changed such that some of material 23 flowed out at a corner of die 22.

While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alterations, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alterations, modifications and variations in the appended claims.

CLAIMS

1. An integrated circuit package substrate comprising:

a die attach area for receiving a die to be attached; and

a die attach material overflow channel disposed about a portion of said die attach area.

2. The integrated circuit package of claim 1 wherein the channel defined by said integrated circuit package is disposed about the periphery of said die attach area.

3. The integrated circuit package of claim 1 wherein the channel defined by said integrated circuit package is tapered such that a top width is wider than a bottom width.

4. An integrated circuit package substrate comprising:

a recessed area having a first portion defining a die attach area, and a second portion defining a dead zone, said dead zone being disposed about said die attach area; and

a die attach material overflow channel in said dead zone about a portion of said die attach area.

5. A method of attaching a die to a package substrate comprising the steps of:

providing a package substrate having a die attach area;

placing a die attach material on said package substrate in said die attach area;

placing a die on said die attach material;

pressing die onto said die attach material causing an excess of said die attach material to flow from under said die; and

providing a die attach material overflow channel in said package substrate for a portion of said excess die attach material to flow into.