

CODED TRAY FOR HOLDING PACKAGED SEMICONDUCTOR DEVICES

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FIELD OF THE INVENTION

This invention relates to trays used in the semiconductor industry for carrying packaged integrated circuits such as Ball Grid Array ("BGA"), Quad Flat Pack ("QFP"), Thin Quad Flat Pack ("TQFP"), and similar packages. In particular, this invention relates to such a tray with a removable tab capable of being inserted into one edge of the tray thereby to allow a user to identify the particular contents of the tray by means of indicia or color associated with the tab.

BACKGROUND OF THE INVENTION

Trays for holding a plurality of assembled packaged semiconductor devices used in electronic equipment such as personal computers, cellular telephones, and servers are well known. A variety of semiconductor devices packages exist, including Ball Grid Array ("BGA") packages, Quad Flat Pack ("QFP") packages, and Thin Quad Flat Pack ("TQFP") packages, for example. Trays of the type shown in plan view in FIG. 1A, for example, are used for both carrying the packaged devices before and after they are tested, for shipping such packaged devices to the user and for the user to handle the packaged devices prior to the packaged devices being assembled onto circuit boards as part of the finished system in which the packaged devices are to be used. The tray 100 in FIG. 1A includes a frame 103 containing a plurality of openings 101-1 through 101-10 into which

the packaged semiconductor devices can be placed. Each opening 101-1 through 101-10 contains a shelf, such as shelves 102-1 through 102-10, to hold a packaged device before and after testing or during shipping from the manufacturer to the user. Two or more such trays can be stacked on top of each other, and wrapped tightly together for shipment from the manufacturer to the user. Typically, each such tray would hold any one of a number of different types of assembled packaged semiconductor devices. The invoice accompanying such trays would indicate which particular device was contained in each tray. However, because the user then had a plurality of different devices in essentially identical trays, mistakes were possible in that the wrong tray could be used by the user for the placement of packaged semiconductor devices in the intended system. Accordingly, a method and structure has been needed to allow the user to easily identify the particular type of packaged semiconductor devices contained in each tray.

SUMMARY OF THE INVENTION

In accordance with this invention, a method and structure are provided for allowing a user to easily identify the type of devices in a tray carrying packaged semiconductor devices.

In one embodiment of this invention, a removable tab, capable of being inserted into an edge of the tray, is used to allow the user, by means of indicia on the tab, to identify the particular type of devices contained in the tray.

In another embodiment, the removable tab denotes the type of devices contained in the tray by the color of the tab. The tab can have any one of a plurality of colors or combination of colors, the color or combination of colors indicating the type of devices contained in the tray.

In accordance with another embodiment of this invention, the tab contains indicia such as letters or numbers or a combination thereof identifying the particular packaged semiconductor devices contained in the tray.

5 An advantage of this invention is that a user is able to easily identify the type of devices contained in a tray by matching either the color of the tab or the indicia on the tab to a predetermined list identifying the particular device associated with each color or indicia. The possibility of error in placing an assembled packaged semiconductor device on a printed circuit board in an electronic system is substantially reduced, if not eliminated by the method and structure of this invention.

10 This invention will be more fully understood in accordance with the following detailed description taken together with the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1A shows a plan view of a tray of the type used with this invention.

FIG. 1B shows the cross-section AA of the tray shown in FIG. 1A.

15 FIG. 1C shows the cross-section B-B of the tray shown in FIG. 1A.

FIG. 1D shows in plan view an edge structure of the tray shown in FIG. 1A capable of receiving a tab in accordance with this invention.

FIG. 1E shows in more detail the edge of the tray capable of holding a tab in accordance with this invention.

20 FIGS. 2A, 2B, 2C and 2D show the side, cross-sectional top, back and edge view, respectively, of a tab suitable for use in this invention with the tray of FIG. 1A.

FIG. 3A through FIG. 3C show a plug capable of being used with the tab of this invention to allow various package types or operations on packages to be identified in accordance with the principles of this invention.

DETAILED DESCRIPTION OF THE INVENTION

The following detailed description illustrates several embodiments of this invention. This description is meant to be illustrative only and not limiting, and thus other embodiments of this invention will be obvious in view of this description to those
5 skilled in the art.

In accordance with this invention, the tray 100 of FIG. 1A has associated therewith a structure 105 on one edge of tray 100. As shown in FIG. 1A, structure 105 is located on right side 104-2 of the tray 100, as opposed to sides 104-1 and 104-3 or 104-4. A tab 200 (FIG. 2A) is capable of being removably inserted into structure 105 on side
10 104-2. Of course, tab 200 could be mounted on one of the two sides 104-1 and 104-3 or the other end 104-4 of tray 100, if desired, and if a structure such as structure 105 was fabricated on one of these sides. Alternatively, tabs can be mounted on two or more of the sides of tray 100, thereby to allow the types of devices contained within tray 100 to be determined by looking at any one of two or more sides of the tray 100.

15 FIGS. 1B and 1C show respectively cross-sections AA and BB of tray 100. As shown in FIGS. 1B and 1C, shelves 102-1, 102-2, 102-3 and 102-8 extend annularly around openings 101-1, 101-2, 101-3 and 101-8 respectively, to allow a packaged semiconductor device to rest within each of openings 101-1, 101-2, 101-3 and 101-8 on shelves 101-1, 102-2, 101-3 and 101-8. These semiconductor devices typically are held
20 on the shelf by gravity. However, if desired, tape or other structure can be used to hold the packaged devices in the tray regardless of the orientation taken by the tray 100 during shipping or other handling of the tray. Such mechanisms for holding packaged devices in the tray 100 are well known.

FIG. 1D illustrates a portion of the cross-section of end 104-2 of tray 100 adapted to hold the tab 200 of this invention. As shown in FIG. 1D, structure 105 include two beveled edges, 106-1 and 106-2. FIG. 1E shows in more detail the nature of these beveled edges 106-1 and 106-2. As shown in FIG. 1E, beveled edge 106-1 extends from surface 107 at an angle of about 60° (other appropriate angles can be used if desired) with surface 107 such that point 108-1 of beveled edge 106-1 is closer to point 108-2 of corresponding beveled edge 106-2 than point 109-1 of edge 106-1 is to point 109-2 of edge 106-2.

In one embodiment of the invention as shown in FIG. 1E, flat surfaces 110-1 and 110-2 extend perpendicularly from surface 107 for a short distance prior to point 109-1 at the start of angled surface 106-1 and prior to point 109-2 at the start of angled surface 106-2. Thus, the angled surfaces 106-1 and 106-2 are designed to receive a tab such as tab 200 having tapered ends and to hold this tab tightly against surface 107.

FIGS. 2A through 2D illustrate one embodiment of tab 200. Shown in FIG. 2A through FIG. 2D is basically a rectangular piece of material including a plurality of buttons, shown as three buttons 201-1, 201-2, and 201-3. This tab has beveled ends 202-1 and 202-2. The bevels on these ends are angled at the same angle from the flat back 204-2 of tab 200 (FIG. 2B), as edges 106-1 and 106-2 are angled from surface 107. In one embodiment, the angle of surfaces 202-1 and 202-2 is about 60° from the plane of back surface 204-2.

Tab 200 has three buttons 201-1, 201-2, and 201-3 protruding from face 204-1. When tab 200 is placed in structure 105 on edge 104-2 of tray 100, face 204-1 faces outward from edge 104-2. Back surface 204-2 of tab 200 is then pressed directly against

the outer surface of edge 104-2 of tray 100. Buttons 201-1 through 201-3 are shown as circular. Other shaped buttons can be used if appropriate and desired.

The back view of tab 200 is shown in FIG. 2C. Surface 204-2 of tab 200 has three openings 208-1, 208-2 and 208-3 formed therein, which extend partially into
5 buttons 201-1 through 201-3. These openings are part of the fabrication process and reduce the weight of the tab, but can be omitted if desired.

An indentation 206 is formed in the top edge of tab 200. Indentation 206 allows tab 200 to be properly aligned between angled surfaces 106-1 and 106-2 attached to the edge 104-2 of tray 100. Typically, groove 206 will face upward to insure that the tab is
10 properly placed in the groove of structure 105.

FIG. 2D shows the end view of tab 200 with button 201-3 clearly visible as well as the end 202-2.

Note that flat edges 207-1 and 207-2 are formed perpendicular to and directly adjacent to back surface 204-2 of tab 200, as shown in FIG. 2B. Flat surfaces 207-1 and
15 207-2, which are perpendicular to back surface 204-2, mate with the flats 109-1 and 109-2 (FIG. 1E) extending from surface 107, which along with angled surfaces 106-1 and 106-2, define the groove in structure 105 on the end 104-2 of tray 100.

A removable plug 300 is then capable of being attached to tab 200 by placing plug 300 over two of the circular plugs 201-1 through 201-3. Plug 300 has a button 301
20 formed in a hollow cavity 302. Section 302-1 of cavity 302 will receive, for example, button 201-2 on tab 200, while section 302-2 of cavity 302 will receive button 201-3 on tab 200. FIG. 3B shows an end view of button 300, while FIG. 3C shows a cross-sectional side view of plug 300 taken along line FF associated with plug 300.

Plug 300 can be any desired color, the particular color selected being associated with a particular device contained within tray 100. Alternatively, tab 200 can also have a color to indicate the type of devices contained in tray 100. In addition, indicia such as a series of numbers or letters or a combination of alphanumeric symbols can be placed on the outer surface of tab 200 or the outer surface 305 of plug 300 to indicate the type of device contained in tray 100. A user is then able to identify the devices contained in tray 100 by the color of or indicia on plug 300 and to easily replace plug 300 with a different color plug or with a plug containing different indicia to identify a different type of device in tray 100.

Of course, more than one tab 200 can be used with tray 100, if desired, to indicate not only the type of devices contained in tray 100 but the next operation to be carried out on the packaged devices in tray 100 or the last operation carried out on the packaged devices in tray 100. A plurality of structures 105 formed on one or more edges of tray 100 can be used to carry a plurality of pieces of information relating to the packaged devices in tray 100.

While several embodiments of this invention have been described, other embodiments of this invention will be obvious to those skilled in the art in view of the above description. This invention is intended to be limited only by the following claims.

CLAIMS

1. A tray for carrying packaged semiconductor devices comprising:
a frame containing a plurality of openings, each opening being capable of containing at least one packaged integrated circuit device, said tray also having at least one edge;
a structure attached to said at least one edge for receiving a tab; and
a tab for insertion into said structure.
2. A tray as in Claim 1, wherein said structure for receiving a tab comprises a groove formed as part of said edge, said groove having sides and a back surface, said sides being angled from said groove so as to form relative to said back surface an angle of less than 90° with said back surface, the portion of each side furthest from said back surface being closer to each other than the portion of each side closest to said back surface.
3. A tray as in Claim 2, wherein each side includes a surface portion substantially perpendicular to said back surface and directly adjacent to said back surface, the angled portions of said sides being attached to said perpendicular portions of said sides.
4. A tray as in Claim 1, 2 or 3, wherein said tab includes a plurality of circular buttons formed on one surface thereof, said one surface facing away from the edge of said tray.
5. A tray as in any one of the preceding claims, wherein said tab for insertion into said groove includes at least one indicia on one surface thereof, said indicia being selected from a plurality of indicia.
6. A tray as in Claim 5, wherein said indicia comprises a colour, said colour being selected from a plurality of different colours.





7. A tray as in Claim 4 including a plug, said plug being adapted to be press fit over at least one of the buttons on said tab, said plug having an indicia thereon to indicate the type of devices to be placed in said tray.
8. A tray as in Claim 7, wherein said indicia comprises a selected colour.
9. A tray as in Claim 5 or 7, wherein said indicia comprises an alphanumeric symbol.
10. A tray as in Claim 7, 8 or 9, wherein said plug comprises a block of material, said block of material containing at least two cavities therein, each cavity being designed to align in a press fit manner with a corresponding button on said tab.
11. A tray for holding packaged semiconductor devices in combination with a tab, said tray comprising:
 - a plurality of openings, each opening being adapted to hold at least one packaged semiconductor device;
 - at least one edge having thereon a groove for receipt of a tab; and
 - said tab being formed so as to be insertable into said groove.
12. A tray as in Claim 11, wherein said groove is such as to hold said tab directly against an edge of said tray.
13. A tray as in Claim 11 or 12, wherein said tab has formed on a surface thereof a plurality of buttons, a selected number of said buttons being adapted to receive a plug in a press fit relationship thereby to hold said plug directly adjacent to the surface of said tab.
14. A tray as in Claim 11, 12 or 13 including a plug attached to one surface of said tab, said plug having an indicia to indicate the type of devices in said tray.

15. A tray as in Claim 14, wherein said plug comprises a selected colour, said colour corresponding to a select type of device in said tray.

16. A tray as in Claim 14 or 15, wherein said plug has alphanumeric symbols thereon, said symbols corresponding to a select type of packaged semiconductor device in said tray.

17. A tray as in Claim 13, wherein said plug has one of a selected number of indicia thereon to indicate the type of devices in said tray.

18. A tray as in Claim 17, wherein said indicia comprise a selected number of colours.

19. A tray as in Claim 17, wherein said indicia comprise alphanumeric symbols.

20. A method of identifying a particular type of packaged semiconductor devices in a tray comprising:

forming on the edge of said tray a structure for receiving a material indicating the type of devices in said tray; and

placing on said structure the material to indicate the type of devices in said tray.

21. A tray for carrying packaged semiconductor devices comprising:

a frame containing a plurality of openings, each opening being capable of containing one or more packaged integrated circuit devices, said tray also having at least one edge; and

structure attached to said at least one edge for receiving a tab, said tab having characteristics which indicate the nature of the one or more packaged integrated circuit devices capable of being carried by said tray.

