

SPECIFICATION

Printed Circuit Boards

This invention relates to printed circuit boards, and more particularly to printed circuit boards on which lead-less circuit components can be mounted.

Figures 1 and 2 of the accompanying drawings show a known cylindrical lead-less circuit component 4 having caps 2 and 3 forming electrodes and attached to respective ends of a cylindrical body 1. To mount the component 4 on a printed circuit board 5, it is first provisionally attached in the required predetermined position with adhesive 6. Patterns 7 and 8 of copper foil and a solder-resisting layer 9 are formed on the circuit board 5, and the component 4 is provisionally attached to the circuit board 5 so that the caps 2 and 3 contact electrode portions 7a and 8a of the patterns 7 and 8. The circuit board 5 with the component 4 is then dipped into a solder bath, so that the caps 2 and 3 are soldered to the electrode portions 7a and 8a.

In the provisional attaching process, the predetermined position between the electrode portions 7a and 8a, on which the component 4 should be mounted, is coated with the adhesive 6 by a screen-printing method or a dispenser injection method. It is important that the predetermined position is accurately coated with adhesive 6 in a predetermined area. However, it is difficult to tell whether the predetermined area has been accurately coated with adhesive 6 or not. Particularly in a hybrid integrated circuit in which numerous components are to be mounted, it is very difficult with the naked eye to find defects such as coating deflections from exact positions and unwanted spread of adhesive.

According to the present invention there is provided a printed circuit board comprising:

- an insulating board;
- at least one pair of conductive patterns arranged on said insulating board and spaced from each other by a predetermined distance;
- a solder-resisting layer having a predetermined colour formed on said insulating board;
- an adhesive layer visual boundary guide in the form of a paint layer covering a predetermined area of the solder-resting layer in the space between said conductive patterns;
- such paint layer having another colour contrasting with said predetermined colour of the solder-resting layer;
- an adhesive layer applied onto said paint layer but not substantially beyond its boundaries; and
- a lead-less electric circuit part fixed in contact with said conductive patterns by said adhesive layer;

said paint layer having a good affinity with said solder resisting-layer and said adhesive layer such that said lead-less electric part is fixed securely in position.

The invention will now be described by way of example with reference to the accompanying drawings, throughout which like references

denote like elements, and in which:

Figure 1 is a perspective view of a part of a conventional printed circuit board, showing a cylindrical component provisionally attached to the board;

Figure 2 is a cross-sectional view taken along the line II—II in Figure 1;

Figure 3 is a plan view of part of a first embodiment of printed circuit board according to the invention;

Figure 4 is a cross-sectional view taken along the line IV—IV in Figure 3;

Figure 5 is a side cross-sectional view of the printed circuit board of Figure 1 with a cylindrical component;

Figure 6 is a plan view of part of a second embodiment of printed circuit board according to the invention;

Figure 7 is a plan view of part of a third embodiment of printed circuit board according to the invention; and

Figure 8 is a cross-sectional view taken along the line VIII—VIII in Figure 7.

Figures 3 to 5 show the first embodiment of the invention. A paint layer 10 is formed between electrode portions 7a and 8a of conductive patterns 7 and 8 by applying paint on a solder-resisting layer 9. The area on which an adhesive 6 is applied, is indicated by the paint layer 10. Figure 5 shows that a cylindrical lead-less circuit component 4 is provisionally attached to an insulating printed circuit board 5 with the adhesive 6 applied to the paint layer 10. Material which has a good affinity with the solder-resisting layer 9 and the adhesive 6 is preferable for the paint layer 10. A thermosetting resin is generally used for the solder-resisting layer 9 and the adhesive 6. However, an ultra-violet ray setting resin is preferable, since it does not require a heating process, in contrast to the thermosetting resin, and it is rapidly hardened by ultra-violet rays. When the ultra-violet ray setting resin is used, spread of the resin due to temperature rise is small, and thermal stress is minimized. Accordingly, although a thermo-setting resin may be used as the paint layer 10, an ultra-violet ray setting resin is preferable, since a sufficient combining strength and coating accuracy can be obtained for the provisional attachment.

The paint layer 10 may be formed by a screen printing method. Generally, the circuit patterns 7 and 8 on the board 5 are formed by an automatic drawing system using a computer, and information defining positions for screen printing or dispenser injection of the adhesive 6 are read out from the automatic drawing system. When the adhesive 6 is applied by a screen printing method, a film for forming the screen is manufactured on the basis of the positional information read out from the automatic drawing system. Also, when the paint layer 10 is formed by a screen printing method, a film for forming a screen can be easily manufactured on the basis of the above-mentioned information. Examples of thicknesses of the patterns 7 and 8 are 35

microns. The thicknesses of the solder-resisting layer 9 and the paint layer 10 may be 30 microns and 10 microns to several tens of microns, respectively. The paint layer 10 has a predetermined area which is sufficiently wide for a predetermined holding strength (for example, 2 Kg in the horizontal direction in the drawings) can be obtained for the component 4 attached with the adhesive 6 applied to the paint layer 10. The coating amount of adhesive 6 can be determined in the screen printing method or the dispenser injection method.

If the paint layer 10 and the adhesive 6 are coloured, they can be clearly discriminated. For example, the solder-resisting layer 9 may be green, the paint layer 10 white, and the adhesive 6 sky-blue. The shape of the paint layer 10 may be square, circular or any other suitable shape.

Because of the paint layer 10, defects such as coating deflection of the adhesive 6 from the predetermined position and spread of the adhesive 6 can easily be discriminated. Moreover, the positions on which the components 4 should be mounted can easily be discriminated.

Figure 6 shows a second embodiment of the invention. In this case an identifying character, such as a letter or figure 11, represents the kind, number or denomination of a component 4 to be mounted is printed on the board 5 near the electrode portions 7a and 8a of the patterns 7 and 8. In the manufacture of the screen for printing the letter or figure 11 and the paint layer 10, a film for the letter or figure 11 and another film for the paint layer 10 are superimposed on each other. Accordingly, the letter or figure 11 and the paint layer 10 are printed on the board 5 in one common process and an extra process for forming the paint layer 10 is not necessary.

Figures 7 and 8 show a third embodiment of the invention. In this embodiment, a cross pattern 12 is formed on the board 5 across the electrode portions 7a and 8a of the patterns 7 and 8. The paint layer 10 is formed overlying the cross pattern 12. Thus, the insulation between the component 4 and the cross pattern 12 is improved in comparison with a conventional printed circuit board.

In the above-described embodiments, the invention is applied to a cylindrical lead-less

component. However, it may also be applied to a chiplike lead-less circuit component which is in the shape of a rectangular parallelepiped and in which electrodes are provided at both ends.

Claims

1. A printed circuit board comprising:
 - an insulating board;
 - at least one pair of conductive patterns arranged on said insulating board and spaced from each other by a predetermined distance;
 - a solder-resisting layer having a predetermined colour formed on said insulating board;
 - an adhesive layer visual boundary guide in the form of a paint layer covering a predetermined area of the solder-resisting layer in the space between said conductive patterns;
 - said paint layer having another colour contrasting with said predetermined colour of the solder-resisting layer;
 - an adhesive layer applied onto said paint layer but not substantially beyond its boundaries; and
 - a lead-less electric circuit part fixed in contact with said conductive patterns by said adhesive layer;
 - said paint layer having a good affinity with said solder-resisting-layer and said adhesive layer such that said lead-less electric part is fixed securely in position.
2. A printed circuit board according to claim 1, wherein characters representing the kind, number or denomination of said lead-less electric circuit part to be mounted is printed adjacent to said paint layer.
3. A printed circuit board according to claim 1, wherein a conductive cross pattern is formed on said insulating board between said pair of conductive patterns and under said solder-resisting layer, said paint layer and said adhesive layer.
4. A printed circuit board substantially as hereinbefore described with reference to Figures 3 to 5 of the accompanying drawings.
5. A printed circuit board substantially as hereinbefore described with reference to Figure 6 of the accompanying drawings.
6. A printed circuit board substantially as hereinbefore described with reference to Figures 7 and 8 of the accompanying drawings.

6



microns. The thicknesses of the solder-resisting layer 9 and the paint layer 10 may be 30 microns and 10 microns to several tens of microns, respectively. The paint layer 10 has a predetermined area which is sufficiently wide for a predetermined holding strength (for example, 2 Kg in the horizontal direction in the drawings) can be obtained for the component 4 attached with the adhesive 6 applied to the paint layer 10. The coating amount of adhesive 6 can be determined in the screen printing method or the dispenser injection method.

If the paint layer 10 and the adhesive 6 are coloured, they can be clearly discriminated. For example, the solder-resisting layer 9 may be green, the paint layer 10 white, and the adhesive 6 sky-blue. The shape of the paint layer 10 may be square, circular or any other suitable shape.

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Claims

1. A printed circuit board comprising: an insulating board; at least one pair of conductive patterns arranged on said insulating board and spaced from each other by a predetermined distance;
- a solder-resisting layer having a predetermined colour formed on said insulating board;
- an adhesive layer visual boundary guide in the form of a paint layer covering a predetermined area of the solder-resisting layer in the space between said conductive patterns;
- said paint layer having another colour contrasting with said predetermined colour of the solder-resisting layer;
- an adhesive layer applied onto said paint layer but not substantially beyond its boundaries; and
- a lead-less electric circuit part fixed in contact with said conductive patterns by said adhesive layer;
- said paint layer having a good affinity with said solder resisting-layer and said adhesive layer such that said lead-less electric part is fixed securely in position.
2. A printed circuit board according to claim 1, wherein characters representing the kind, number or denomination of said lead-less electric circuit part to be mounted is printed adjacent to said paint layer.
3. A printed circuit board according to claim 1, wherein a conductive cross pattern is formed on said insulating board between said pair of conductive patterns and under said solder-resisting layer, said paint layer and said adhesive layer.
4. A printed circuit board substantially as hereinbefore described with reference to Figures 3 to 5 of the accompanying drawings.
5. A printed circuit board substantially as hereinbefore described with reference to Figure 6 of the accompanying drawings.
6. A printed circuit board substantially as hereinbefore described with reference to Figures 7 and 8 of the accompanying drawings.