

Patent Application

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Procedure for the Electrical Contacting of Two Metal Structures

The present invention concerns a procedure for the contacting of conductive layers of a metal-plastic laminate.

A procedure for the manufacture of a metal-plastic laminate is known from DE 198 52 832, in which initially at least one metal foil is made to adhere to at least one plastic film, for instance through the use of an adhesive, whereupon the metal foil is shaped by embossing and/or deep-drawing of at least one metal contact area and then the metal foil is laminated to the at least one plastic film while the shape of the metal foil is (almost) preserved. Moreover, it is described therein to shape at least one metal foil by embossing and/or deep-drawing at least one metal contact area and to laminate the metal foil to at least one plastic film such that the profile of the metal contact area of the metal foil is nearly preserved, wherein the at least one metal contact area has a surface profile height of 20 to 50 μm after lamination.

It was determined that the conductive layers of the laminate can be contacted at the desired locations while the step of lamination is ongoing. For this purpose, either recesses are provided in the insulating layer at the designed contact locations or the embossed protrusions on the metal layer push through or displace the insulating layer – which is soft at the temperatures used – such that an electrical contact can be established, e.g. by welding, soldering, pressing, crimping, riveting, bonding, sintering, reaction welding, or reaction jointing.

In this procedure, at least one embossed metal contact area is used. The embossing is done employing state-of-the-art procedures and tools, e.g. using adjustable

precision embossing stamps. The surface profile of the metal foil is established in accordance with the electrical properties required in each individual case.

The present invention thus concerns a procedure for the electrical contacting of two metal structures, wherein at least one of the metal structures is provided on its side facing the second metal structure with a contact zone protruding from a plane, wherein an electrically insulating layer is arranged between the metal structures, wherein one metal structure is laminated to the electrically insulating layer and the second metal structure is laminated to the electrically insulating layer subsequently or simultaneously, and wherein the two metal structures are electrically contacted while the lamination of the second metal structure to the electrically insulating layer is ongoing.

Preferably, the second metal structure is a conductor track structure.

Preferably, the contact zones of at least one metal structure are pushed through the insulating layer in order to establish an electrical contact.

It is advantageous to have both metal structures comprise contact zones which protrude from the respective metal structure and face each other and become connected to each other.

Preferably, one of the metal structures is provided as a self-supporting structure.

It is possible for one of the metal structures to be provided by the contacting sites of an electronic component.

It is particularly preferred to laminate one metal structure to a continuous insulating layer such that the contact zones of at least one of the metal structures are pushed through the insulating layer.

Lamination is advantageously performed at a pressure of approx. 1.5 to 3 bar and at a temperature of approx. 120 – 180°C.

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It is also advantageous to provide for the possibility of re-embossing for the at least one metal contact area in order to deepen and thus improve its profile.

It is preferable to use copper foil to provide the metal foil. Suitable plastic films (transfer films) are known to the expert in this field, e.g. polyacrylic film:

A laminate with electrical contacts established according to the present invention may be used e.g. as a semi-conductor carrier, part of an IC housing, laminated connector, slider, brush, connector (flip chip), sensor or similarly designed other contact facility of electrical engineering.

In the following, the invention is illustrated on the basis of figures without limiting the invention to the figures provided:

Fig. 1 shows a top view of an embossed contact structure,

Fig. 2 shows a cross-section of the two partial structures before they are joined,

Fig. 3 shows the corresponding joined structure,

Fig. 4 shows the two structures before they are joined,

Fig. 5 shows the option of producing the electrical bond by embossing from two opposite sides,

Fig. 6 shows the relationships when the metal structure is provided by a lead frame,

Fig. 7 shows a cross-section of the two partial structures before they are joined,

Fig. 8 shows the corresponding joined structure,

Fig. 9 shows the two structures before they are joined,

Fig. 10 shows the option of producing the electrical bond by embossing from two opposite sides,

Figs. 11 and 12 show the establishment of an electrical contact between the laminate and an electronic component, and

Fig. 13 shows a cross-section of the device with established electrical contacts.

Fig. 1 shows a top view of conductor tracks with embossed metal structures, Fig. 2 shows a cross-section of the two partial structures before they are joined, and Fig. 3 shows the corresponding joined structure, in which an electrical bond is established from 1 to 3, wherein 3 identifies a second metal structure with no embossing. The

transfer film is identified by ref. no. 2 and may or may not be structured. Ref. no. 4 identifies the location, in which the electrical bond can be closed, if desired, by suitable measures, e.g. by welding, soldering, pressing, crimping, riveting, bonding, sintering, reaction welding, or reaction jointing.

Fig. 5 shows the option of producing the contact 4 by embossing from two opposite sides. 5 identifies a metal structure similar to 3 in Fig. 1, with the difference being that the structure is embossed from below. Fig. 4 shows the two structures before they are joined.

Fig. 6 shows the relationships when the metal structure is provided by a lead frame 6. Fig. 7 shows a cross-section of the two partial structures before they are joined, and Fig. 8 shows the corresponding joined structure, in which an electrical contact is established from 6 to 3.

Similar to Fig. 5, Fig. 10 shows the option of producing the electrical bond by embossing from two opposite sides. Fig. 9 shows the two structures before they are joined.

Figures 11 and 12 show the establishment of an electrical contact between the laminate and electronic component 7 at the designated contact sites 8. As before, 2 identifies the transfer film. Conductor track 9 is free of plastic at its contact sites. Fig. 13 shows a cross-section of the device with established electrical contacts.

Patent Claims

1. Procedure for the electrical contacting of two metal structures (1,5), wherein at least one of the metal structures is provided on its side facing the second metal structure with a contacting zone (4) protruding from a plane, wherein an electrically insulating layer (2) is arranged between the metal structures, wherein one metal structure (5) is laminated to the electrically insulating layer (2) and the second metal structure (1) is laminated to the electrically insulating layer subsequently or simultaneously, and wherein the two metal structures (1,5) are electrically contacted while the lamination of the second metal structure to the electrically insulating layer is ongoing.
2. Procedure according to Claim 1, characterised in that the contact zones (4) of at least one of the metal structures (1,5) are pushed through the electrically insulating layer (2) for the purpose of establishing an electrical contact.
3. Procedure according to Claim 1 or 2, characterised in that both metal structures (1,5) comprise contact zones (4) which protrude from the plane of the respective metal structure and face each other and become connected to each other.
4. Procedure according to at least one of the Claims 1 through 3, characterised in that one of the metal structures is provided as a self-supporting structure.
5. Procedure according to at least one of the Claims 1 through 3, characterised in that one of the metal structures is provided as contacting sites of an electronic component.

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6. Procedure according to at least one of the Claims 1 through 5, characterised in that one metal structure (1,5) is laminated to a continuous insulating layer (2) and that subsequently the contact zones (4) of at least one of the metal structures are pushed through the insulating layer.

7. Procedure according to at least one of the Claims 1 through 6, characterised in that the lamination is performed at a pressure of approx. 1.5 bar to 3 bar.

8. Procedure according to at least one of the Claims 1 through 7, characterised in that the lamination is performed at a temperature of approx. 120 to 180°C.