GEM 369

ELECTRONIC MODULE FOR CHIP CARD

The present invention concerns electronic modules intended particularly to be fixed in electronic units in the form of cards, comprising a medium with at least one side provided with contact pads and a microcircuit which is fixed on said medium and which comprises exit hubs, each connected to a contact pad on the medium.

Such systems in the form of cards comprise in particular integrated circuit cards, also called chip cards, along with electronic elements medium for televisions, VCR's, etc.

A chip card comprises a card body and a module comprising the chip integrated within the body of the card.

A chip card module comprises a medium, generally made of epoxy glass, with a metal plated surface in order to show the contact pads and a chip which is glued to the other side of the medium and which includes exit hubs on its outer side. Connection holes in the medium allow for passage of connecting wires which connect exit hubs to contact pads.

The connecting wires, made of stainless metal such as gold or aluminium, are soldered using various technologies such as soldering via ultra-sound or thermocompression which requires later coating ("glob top") of the connecting wires with a resin to protect them. It is sometimes necessary to first fix a retaining barrier for the resin, such as a metallic or silicon ring, to the medium.

The mass of the resin is deposited in a non-controllable way and, when it is polymerised, it forms a very thick drop which exceeds the height of the chip card specifications. A milling operation is therefore necessary to reduce the thickness of the module to the required value. This milling operation can damage the module and is the main cause of production rejects.

In the body of a chip card, a cavity is made which is to receive the module and which must be relatively deep in order to receive a high module. The thickness of the body of the card at the cavity is low, leading to significant deformation when the body of the chip card is bent, thus limiting the reliability and the working life of the card.

In addition, polymerisation of this drop of resin provokes swelling of the module.

This swelling can lead to deterioration of chip card readers.

The main purpose of the invention is to provide a shorter electronic module in order to eliminate the above mentioned problems.

The electronic module according to the invention is remarkable in that the connections between the exit hubs and the contact pads are made of a cord of an adhesive conducting substance which moulds to the relief of the medium.

These connections do not require a protective coating, allowing for reduction in the height of the module. Production is thus simplified and in particular the milling operation is eliminated, substantially reducing the rate of production rejects.

Advantageously, the conducting substance is an isotropic conducting glue.

A metal deposited by screen printing can also be used.

If the medium has connection holes, these are filled with the conducting substance.

The medium may have two sides provided with contact pads and the connections are made directly on two sides without using the connection holes.

Advantageously, one of the sides of the medium is covered with an activatable adhesive film.

This is an additional protection for the microcircuit and makes it possible to simplify the fixing of the module into the body of the card.

The microcircuit exit hubs may have connection bumps in order to reduce contact resistance.

The object of the invention is also a method for making an electronic module characterised in that the cord is made by depositing a viscous conducting substance.

This technique of depositing using a syringe or similar device is rapid and easy to use.

The object of the invention also is a chip card characterised in that it has at least one electronic module of the previously mentioned type.

Other characteristics and advantages of the invention will appear when reading the detailed description which follows. These will be more clearly

understood by consulting the appended drawings in which:

- figure 1 is a diagram of a cross section of an electronic module of a known type;
- figure 2 shows an electronic module according to the present invention;
- figure 3 is a top view of an embodiment of a module whose medium includes two sides provided with contact pads;

Figure 1 shows an electronic module of a known type.

It comprises a medium 10, for example in epoxy glass. One of its sides 12 includes contact pads 14 made by metallisation. The other side 16 includes a layer of glue 18 used for fixing the lower side a microcircuit 20 which includes exit hubs 22 on its upper free side.

The connections between the exit hubs 22 and the contact pads 14 are made by soldering metal wires 24 which each go through a connection hole 26 made in the medium 10. After the soldering of the wires 24, these are coated with a polymerisable resin which forms a drop 28 which is retained by a peripheral ring 30 made of silicone.

This drop 28 is applied in a non-controlled manner and has a substantial thickness which considerably increases the height of the module so much so that it is necessary to make its upper part even by a machining operation such as milling, as shown through the dotted line 32.

As indicated above, the presence of this drop 28 may reduce the mechanical strength of the chip card at the cavity which receives the module so that the mechanical strength of the card at this place is

insufficient and that, in addition, the card may swell at this place.

Figure 2 shows an electronic module according to the present invention. The medium 40 includes connection holes 42. The lower side 44 of the medium 40 is metallised and includes contact pads 46, 48 and 50. The upper side 52 of the medium 40 has a layer 54 of glue used for fixing a chip 56 which has, on its upper side 58, exit hubs 60 and 62 which can be provided with contact bumps which are not shown. A surfacing 64 of insulating adhesive is applied on the periphery of the chip 56, on the side 52 of the medium next to the chip and in the connection holes 42.

In accordance with the invention, connections 66 and 68 between exit hubs 60 and 62 and contact pads 46 and 50 are composed of a cord of an adhesive conducting substance which moulds to the relief of the medium, particularly that part which is in contact with the adhesive surfacing 64 and whose extremities are in contact with the exit hub and the associated contact pad. This substance is applied in a viscous state.

The application of this substance, for example an isotropic conducting glue, is done by a deposit technique called "dispensing" according to which a liquid or low-viscosity substance is applied using a syringe or similar device with controlled outflow and opening.

This dispensing operation is done for example using a commercially-available unit called CAM/ALOT made by the American company Camelot Systems Inc. and used for mass production of electronic circuits. The movement and opening of the syringe is controlled by a computer program.

These connections can also be made using metal deposited by screen printing.

In order to improve the electrical contact, the exit hubs can have contact bumps and the contact of the extremities of the cords of the conducting substances is made with these latter.

The invention also applies to cases in which the medium includes two metallised sides which include contact pads.

This is illustrated in Figure 3 which is a partial top view of the module where a chip 70 can be seen with its exit hubs 72, 74, 76, 78 and 80. Hubs 72, 74 and 76 are connected to a contact pad on the lower side of the medium and the hubs 78 and 80 are connected to a pad 82, respectively 84, arranged on the upper side of the medium, and also by a cord of an adhesive conducting substance 86, respectively 88.

The electronic module according to the invention may be covered with an activatable adhesive film, for example by heating or with ultraviolet rays in order to increase the protection of the chip and to simplify the fixing of the module in the cavity of the card body.

The making of the direct connections according to the present invention applies to the production of all electronic units in the form of cards such as video or kitchen appliance control cards.

As can be seen, the invention makes it possible to eliminate the coating of the connections and thus reduce the thickness of the modules.

Also, the resins used as conducting substances are very flexible, thus increasing the reliability of the module.

The operations related to coating of the connections, i.e. the placing of a retaining barrier

such as a silicone ring, the depositing of the coating resin and the machining of the resin drop, are eliminated. Production is simplified and production costs are reduced.

The invention makes it possible for the body of the card to be thicker at the module and consequently increases the mechanical strength of the card.

Thanks to the invention, the dimensions of the modules in the plane of the microcircuit can be reduced, allowing for mass production of modules with two adjacent module lines.

The invention eliminates the swelling phenomenon and the resulting deterioration of card readers.

CLAIMS

1. An electronic module (94), designed in particular to be fixed in an electronic unit in the form of a card comprising a medium (10; 40; 108) comprising at least one side (12 ; 44) provided with contact pads (14; 46; 48; 50) and a microcircuit (20; 56; 70; 98) which is fixed to the said medium (10; 40; 108) and which comprises exit hubs (22; 60, 62; 72,74, 76, 78, 80), each connected to a contact pad of the medium, characterised in that the connections (66, 68; 86, 88) between the exit hubs and the contact pads are made through a cord of adhesive conducting substance moulded to the relief of the medium.

2. A method for making an electronic module according to claim 1, characterised in that the cord is made by depositing a viscous conducting substance.

3. An electronic module according to claim 1, characterised in that the conducting substance is an isotropic conducting glue.

4. An electronic module according to any of claims 1 to 3, characterised in that the medium includes two sides provided with contact pads.

5. An electronic module according to any of claims 1 to 4, characterised in that one of the sides of the module is covered by an activatable adhesive film.

6. An electronic module according to any of claims 1 to 5, characterised in that the exit hubs of the module have connection bumps.

7. A chip card characterised in that it includes at least one electronic module according to any of claims 1 to 6.