

Description

This invention relates to an electrostatic discharge (hereafter referred to as "ESD") protection device in combination with a semiconductor chip package (hereinafter referred to as "SCP") of the type having a plurality of connector pins which are continuously shorted and then, upon insertion of the connector pins into complementary receptacles, automatically unshorted.

For a plurality of connector pins of a SCP which mates with a corresponding plurality of receptacles in a connector, typically, a printed circuit board, it is frequently necessary to short together the connector pins of the SCP until they are inserted into complementary receptacles in the connector in order to protect the semiconductor's circuitry from ESD. Present ESD protection devices consist primarily of ESD packaging of the SCP in electrically conductive strips, pellets, boxes and plastic tubing which provides effective ESD protection until the user is about to insert the connector pins of the SCP into the complementary receptacles in the connector. At that point, however, the user must remove this ESD packaging from the SCP, thus rendering the SCP vulnerable to ESD, in order to position and insert the connector pins into the receptacles. Accordingly, as the user inserts the connector pins of the SCP into the receptacles, the semiconductor dies housed within these SCP's could be destroyed by ESD and would have to be replaced. Moreover certain types of SCPs typically EPROMs, UV-PROMs, and DRAMs, are plug-in devices which have connector pins which are repeatedly inserted into and then removed from the receptacles. These types of SCPs require ESD protection during the repeated insertions into and removals from the receptacles. Specifically, the connector pins of these SCPs require ESD protection from the moment that their connector pins are removed from the receptacles until their connector pins are again inserted therein. Consequently, a need existed within the semiconductor chip packaging industry for a true ESD protection device, rather than ESD packaging, which effectively protects the semiconductor die from ESD until the connector pins of the SCP are inserted into the receptacles of the connector and then protects the semiconductor die from ESD again when the connector pins are removed from their respective receptacles.

DE-OS-2348630 discloses an electrostatic discharge protection device according to the preamble of Claim 1. This document describes a method and device for protecting devices from damage due to electrostatic charges by shorting the connectors with individual electrically conducting members.

JP-A-59-13353 describes an annular conductor slidable across a package to maintain an electrical connection.

Navy Technical Disclosure Bulletin, Vol. 6, No. 3, March 1981, pp33-36 discloses an electrostatic discharge protection device in combination with a semiconductor chip package of the type having a top surface and

opposite bottom surface and a pair of interface surfaces disposed between the top and bottom surfaces, each interface surface having a plurality of connector pins disposed thereon in a substantially parallel and spaced apart relationship with respect to each other, each connector pin having a portion extending outward from the interface surface and downward at its distal end so as to extend beyond the bottom surface, the electrostatic discharge protection device including:

- a) a base section having a planar surface overlaid on and secured to the top surface of the semiconductor chip package; and
- b) a plurality of shorting arms integral to the base section and extending outward therefrom in spaced apart relationship with respect to each other.

In accordance with the present invention, an electrostatic discharge protection device is provided in combination with a semiconductor chip package of the type having a top surface, an opposite bottom surface and a pair of interface surfaces disposed between the top and bottom surfaces, each interface surface having a plurality of connector pins disposed thereon in a substantially parallel and spaced apart relationship with respect to each other, each connector pin having a portion extending outward from the interface surface and downward at its distal end so as to extend beyond the bottom surface, the connector pins being adapted for electrical connection to a connector having a plurality of receptacles, the electrostatic discharge protection device including:

- a) a base section having a planar surface overlaid on and secured to the top surface of the semiconductor chip package; and
- b) a plurality of shorting arms integral to the base section and extending outward therefrom in a parallel and spaced apart relationship with respect to each other, wherein each shorting arm has a first portion integral to the base section and extending outwardly and downwardly therefrom to define at least one transverse edge portion at its distal end, the transverse edge portion being moveable into electrical engagement with respect to at least one of the connector pins for shorting between the connector pins via the shorting arms and the base section, characterized in that each shorting arm has a second portion integral with the first portion and extending outward therefrom with distal end portions such that upon insertion of the plurality of connector pins into said receptacles the plurality of shorting arms are automatically disengaged from the plurality of connector pins by moving and deflecting upwards the distal end portions.

In one example, an adhesive is provided for securely mounting the base section to the semiconductor chip package.

In another example, end portions extend from opposite ends of the base section and integral therewith, each end portion defining a clip which can be removably secured around the top and bottom surfaces of the semiconductor chip package so that the base section is securely mounted to the semiconductor chip package.

The present invention provides an ESD protection device on a SCP which operates in a simple, economical, and effective manner to automatically short a plurality of connector pins together while the SCP is disconnected from a connector.

The present invention thus provides an ESD protection device on a SCP which operates to automatically open the shorts between the plurality of connector pins upon the SCP's connection to a connector which need not be specifically adapted to effect such opening.

The SCPs are of the type that have a top surface, a bottom surface, and, disposed between the top and bottom surfaces, a plurality of interface surfaces each having a plurality of substantially parallel and evenly spaced apart connector pins disposed thereon. Each connector pin comprises a first portion extending outward from the interface surface, a second portion of substantially the same width as the first portion extending in a downward direction, a bent portion interconnecting the first and second portions, a third portion extending downward to its distal end, and an interface portion interconnecting the second and third portions.

In one embodiment, the ESD protection device comprises a base section secured to the top surface of the SCP and a plurality of shorting arms and gripping members which are both integral to the base section. The plurality of shorting arms extend outwardly from the base section in spaced apart relationship with respect to each other and in spaced apart alignment with respect to the plurality of connector pins. Each shorting arm has a first portion which is integral to the base section and which extends outwardly and downwardly from the base section to define a transverse edge portion. Each transverse edge portion engages the first portion of a respective one of the connector pins so as to electrically connect the shorting arm and the connector pin. Similarly, the plurality of gripping members extend from integral connection to the base section in an interdigitated spaced apart relationship with respect to the plurality of shorting arms so as to provide the base section with support and stability against lateral movement. Each gripping member has a first portion extending along the top surface of the SCP and an integral second portion which securely grasps the SCP at an interface surface. Finally, an adhesive disposed on the base section or a pair of clips disposed on the ends of the base section provide this ESD protection device with a secure attachment to the SCP.

In another embodiment, the ESD protection device comprises a base section secured to the top surface of the SCP and a plurality of shorting arms and gripping members which are both integral to the base section.

The plurality of shorting arms extend outwardly from the base section with distal end portions in spaced apart relationship with respect to each other and in spaced apart alignment with respect to the plurality of connector pins. Each shorting arm has a first portion which is integral to the base section and which extends outwardly from the base section in an integral connection to a respective one of the distal end portions. Moreover, each first portion is wider than its distal end portion so as to define a transverse edge portion. Similarly, the plurality of gripping members extend from integral connection to the base section in an interdigitated spaced apart relationship with respect to the plurality of shorting arms so as to provide the base section with support and stability against lateral movement. Each gripping member has a first portion extending along the top surface of the SCP and an integral second portion which securely grasps the SCP at an interface surface. Each shorting arm further comprises means for yieldably biasing the shorting arm so as to urge its transverse edge portion against the first portion of the respective one of the connector pins thereby creating an electrical connection therebetween when the plurality of connector pins are not inserted into a complementary plurality of receptacles. When the connector pins are inserted into the complementary receptacles, each distal end portion of the shorting arms moves towards the bottom surface of the SCP against its yieldable bias so as to disengage its transverse edge portion from its respective connector pin to break the electrical connection therebetween. Finally, an adhesive disposed on the base section or a pair of clips disposed on the ends of the base section provide this ESD protection device with a secure attachment to the SCP.

In a third embodiment, the ESD protection device comprises a base section which may be overlaid on and secured to the top surface of the SCP and a plurality of shorting arms which are integral to the base section. The plurality of shorting arms extend outwardly from the base section with distal end portions in spaced apart relationship with respect to each other and in spaced apart alignment with respect to the plurality of connector pins when the ESD protection device is secured to the SCP. Each shorting arm has a first portion which is integral to the base section and which extends outwardly from the base section in an integral connection to a respective one of the distal end portions. Moreover, each first portion is wider than its distal end portion so as to define at least one transverse edge portion which is moveable into engagement with the first portion of at least one respective connector pin. Each shorting arm further comprises means for yieldably biasing the respective shorting arm so as to urge the transverse edge portions of adjacent pairs of shorting arms against the first portion of respective ones of the connector pins thereby creating an electrical connection therebetween when the plurality of connector pins are not inserted into a complementary plurality of receptacles. When the connector pins are inserted into the complementary receptacles, each distal end

portion of the shorting arms moves apart from its respective connector pin against its yieldable bias so as to disengage its transverse edge portion from its respective connector pin to break the electrical connection therebetween. A pair of clips disposed on the ends of the base section or an adhesive provide this ESD protection device with a secure attachment to the SCP. Finally, a stiffening rib disposed integrally within the base section provides stiffness to the base section while pull tabs disposed on the ends of the stiffening rib provide for the quick and easy removal of this ESD protection device from the SCP.

In the accompanying drawings:

Figure 1A is an exploded perspective view of a first example of an ESD protection device of this invention disposed above a SCP;

Figure 1B is a perspective view of the ESD protection device shown in Figure 1A mated to the top surface of the SCP shown in Figure 1A;

Figure 1C is a perspective view of the ESD protection device-SCP sub-assembly shown in Figure 1B mated to a printed circuit board;

Figure 2A is an exploded perspective view of another ESD protection device of this invention disposed above a SCP;

Figure 2B is a perspective view of the ESD protection device shown in Figure 2A mated to the top surface of the SCP shown in Figure 2A; and,

Figure 2C is a perspective view of the ESD protection device-SCP sub-assembly shown in Figure 2B mated to a printed circuit board.

Referring now to Figures 1A-1C, there is shown generally a SCP-ESD protection device combination comprising an ESD protection device 64 of this invention, a SCP 12', and a complementary connector 38'. The SCP 12' comprises a top surface 14', a bottom surface 16', and, between the top and bottom surfaces, a pair of interface surfaces 18' and 20'. A plurality of connector pins 22 and 24', respectively, are disposed on each interface surface 18' and 20', respectively, in a substantially parallel and spaced apart relationship with respect to each other. Each of the plurality of connector pins 22,24' further comprises a first portion 26' extending outwardly from the corresponding interface surface 18',20', a second portion 28' of substantially the same width as the first portion 26' extending in a downward direction, a bent portion 30' interconnecting the first portion 26' and the second portion 28', a third portion 32' narrower than the first portion 26' and extending downward to its distal end 34', and an interface portion 36' which interconnects the second portion 28' and the third portion 32'. As will be readily understood, the SCP 12' may house either a VLSI, LSI, or MSI semiconductor die or dies.

The plurality of the connector pins 22,24' are adapted for physical and electrical connection to the connector 38', typically a printed circuit board, having a substantial-

ly planar surface on one selected side thereof. A plurality of elongated receptacles 44' extend inwardly from the planar surface in a substantially parallel spaced apart insulated relationship and in a complementary relationship with respect to the connector pins 22,24' so as to accommodate the ready insertion of the third portion 32' of the connector pins 22,24' into the respective ones of the receptacles 44'.

In order to ensure that the connector pins 22,24' are shorted until they are secured in the complementary receptacles 44', the ESD protection device 64 is provided.

The unitary ESD protection device 64 comprises a base section 66 secured to the top surface 14' of the SCP 12' and a plurality of shorting arms 68 and gripping members 70. The plurality of shorting arms 68 extend outwardly from the base section 66 with distal end portions 72 in spaced apart relationship with respect to each other and in spaced apart alignment with respect to the plurality of connector pins 22',24'. Each of the plurality of shorting arms 68 has a first portion 74 which is integral to the base section 66 and which extends outwardly from the base section 66 in an integral connection to a respective one of the distal end portions 72. Moreover, each first portion 74 is wider than its distal end portion 72 so as to define a transverse edge portion 76.

Similarly, the plurality of gripping members 70 extend from integral connection to the base section 66 in an interdigitated spaced apart relationship with respect to the plurality of shorting arms 68 so as to provide the base section 66 with support and stability against lateral movement. Each of the gripping members 70 has a first portion 78 extending along the top surface 14' of the SCP 12' and an integral second portion 80 which securely grasps the SCP 12' at one of the interface surfaces 18',20'. Furthermore, an adhesive (not shown) disposed on the base section 66 or a pair of clips 82,84 disposed on the ends of base section 66 provides the ESD protection device 64 with a secure attachment to the SCP 12'.

The shorting arms 68 are yieldably biased by means well known in the art such as a built in resilient spring bias so as to urge their respective transverse edge portions 76 against the first portions 26' of the plurality of connector pins 22',24', respectively, thereby creating an electrical interconnection between the plurality of shorting arms 68 and the plurality of connector pins 22',24'. Thus, as is readily apparent from Figures 1A-1C, when the plurality of connector pins 22',24' are not inserted into the corresponding plurality of receptacles 44', the shorting arms 68 urge their respective transverse edge portions 76 against and into respective electrical connection with the first portions 26' of the respective plurality of connector pins 22',24'. In this manner, the shorting of all or some of the plurality of connector pins 22',24' is accomplished so as to effectively protect the semiconductor die (not shown) within the SCP 12' from the ESD which could operate to damage the electrical circuitry within the semiconductor die.

Insertion of the connector pins 22',24' into the com-

plementary receptacles 44' operates to move and deflect upwards the distal end portions 72 of the shorting arms 68 against their yieldable bias, thereby moving the transverse edge portions 76 out of respective physical and electrical connection with the first portions 26' of the connector pins 22',24'.

As will be readily apparent, the number of connector pins 22',24' on either interface surface 18',20' to be shorted together by this ESD protection device 64 need not include all the connector pins 22',24' as shown in Figures 1A-1C but may also be limited to any subset of all the conductive pins. Moreover, only a subset of all the connector pins 22',24' on just one interface surface 18',20' may be shorted together by this ESD protection device 64 while all the other connector pins 22',24' remain unshorted.

Referring now to Figures 2A-2C where like numerals designate previously described elements, there is shown a second embodiment of the ESD protection 158 for the SCP 12' and the connector 38'. This unitary ESD protection device 158 comprises a base section 160 which may be overlaid on and secured to the top surface 14' of the SCP 12' and a plurality of shorting arms 162. The plurality of shorting arms 162 extend outwardly from the base section 160 with distal end portions 168 in spaced apart relationship with respect to each other and in spaced apart alignment with respect to the plurality of connector pins 22',24'. Each of the plurality of shorting arms 162 has a first portion 166 which is integral to the base section 160 and which extends outwardly from the base section 160 in an integral connection to a respective one of the distal end portions 168. Moreover, each first portion 166 is also wider than its distal end portion 168 so as to define a transverse edge portion 170.

A pair of clips 172,174 are disposed on the ends of the base section 160 of the ESD protection device 158 which grip the top surface 14' and the bottom surface 16' of the SCP 12' and secure the base section 160 of the ESD protection device 158 to the top surface 14' of the SCP 12'. Alternatively, an adhesive (not shown) disposed on either base section 160 or the top surface 14' of the SCP 12' can also provide the ESD protection device 158 with a secure attachment to the SCP 12'. A stiffening rib 176 is disposed integrally within the base section 160 to provide stiffness to the base section 160 so as to prevent lateral movement from occurring in the base section 160 when the distal end portions 168 of the shorting arms 162 move away from their respective connector pins 22'. Cantilevered end portions of the stiffening rib 176 extend beyond the corresponding end portions of the base section 160 and define a pair of pull tabs 178,180 which provide for the quick and easy removal of the ESD protection device 158 from the SCP 12'.

The shorting arms 162 are yieldably biased by means well known in the art such as a built in resilient spring bias so as to urge the transverse edge portions 170 of adjacent pairs of shorting arms 162 against the

first portions 26' of respective ones of the connector pins 22',24' thereby creating an electrical interconnection between the plurality of the shorting arms 162 and the plurality of connector pins 22',24'. Thus, as is readily apparent from Figures 2A-2C, when the plurality of connector pins 22',24' are not inserted into the corresponding plurality of receptacles 44', the shorting arms 162 urge their respective transverse edge portions 170 against and into electrical connection with the first portions 26' of respective connector pins 22',24'. In this manner, the shorting of all of the plurality of connector pins 22',24' is accomplished so as to effectively protect the semiconductor die (not shown) within the SCP 12' from the ESD which could operate to damage the electrical circuitry within the semiconductor die. Insertion of the connector pins 22',24' into the complementary receptacles 44' operates to move and deflect upwards the distal end portions 168 of the shorting arms 162 against their yieldable bias, thereby moving the transverse edge portions 170 out of physical and electrical connection with the first portions 26' of the connector pins 22',24'.

As can be seen from Figures 2A-2C, the shorting arms 162 at the ends of the base section 160 define only one transverse edge portion 170 while the intermediate shorting arms 162 each define two transverse edge portions 170 that engage respectively adjacent connector pins 22',24'. In this manner, each connector pin 22',24' is shorted by being engaged by two transverse edge portions 170 from two adjacent shorting arms 162. This redundancy, as should be readily apparent, operates to substantially improve the reliability of the ESD protection device 158.

As will be readily apparent, the number of connector pins 22',24' to be shorted together by this ESD protection device 158 need not include all the connector pins 22',24' as shown in Figures 2A-2C but may also be limited to any subset of all the conductive pins. Moreover, only a subset of all the connector pins 22',24' on just one interface surface 18',20' may be shorted together by this ESD protection device 158 while all the other connector pins 22',24' remain unshorted.

Claims

1. An electrostatic discharge protection device (64;158) in combination with a semiconductor chip package (12') of the type having a top surface (14'), an opposite bottom surface (16') and a pair of interface surfaces (18';20') disposed between the top and bottom surfaces, each interface surface having a plurality of connector pins (22',22',24') disposed thereon in a substantially parallel and spaced apart relationship with respect to each other, each connector pin having a portion extending outward from the interface surface and downward at its distal end so as to extend beyond the bottom surface, the connector pins being adapted for electrical connection

plementary receptacles 44' operates to move and deflect upwards the distal end portions 72 of the shorting arms 68 against their yieldable bias, thereby moving the transverse edge portions 76 out of respective physical and electrical connection with the first portions 26' of the connector pins 22',24'.

As will be readily apparent, the number of connector pins 22',24' on either interface surface 18',20' to be shorted together by this ESD protection device 64 need not include all the connector pins 22',24' as shown in Figures 1A-1C but may also be limited to any subset of all the conductive pins. Moreover, only a subset of all the connector pins 22',24' on just one interface surface 18',20' may be shorted together by this ESD protection device 64 while all the other connector pins 22',24' remain unshorted.

Referring now to Figures 2A-2C where like numerals designate previously described elements, there is shown a second embodiment of the ESD protection 158 for the SCP 12' and the connector 38'. This unitary ESD protection device 158 comprises a base section 160 which may be overlaid on and secured to the top surface 14' of the SCP 12' and a plurality of shorting arms 162. The plurality of shorting arms 162 extend outwardly from the base section 160 with distal end portions 168 in spaced apart relationship with respect to each other and in spaced apart alignment with respect to the plurality of connector pins 22',24'. Each of the plurality of shorting arms 162 has a first portion 166 which is integral to the base section 160 and which extends outwardly from the base section 160 in an integral connection to a respective one of the distal end portions 168. Moreover, each first portion 166 is also wider than its distal end portion 168 so as to define a transverse edge portion 170.

A pair of clips 172,174 are disposed on the ends of the base section 160 of the ESD protection device 158 which grip the top surface 14' and the bottom surface 16' of the SCP 12' and secure the base section 160 of the ESD protection device 158 to the top surface 14' of the SCP 12'. Alternatively, an adhesive (not shown) disposed on either base section 160 or the top surface 14' of the SCP 12' can also provide the ESD protection device 158 with a secure attachment to the SCP 12'. A stiffening rib 176 is disposed integrally within the base section 160 to provide stiffness to the base section 160 so as to prevent lateral movement from occurring in the base section 160 when the distal end portions 168 of the shorting arms 162 move away from their respective connector pins 22'. Cantilevered end portions of the stiffening rib 176 extend beyond the corresponding end portions of the base section 160 and define a pair of pull tabs 178,180 which provide for the quick and easy removal of the ESD protection device 158 from the SCP 12'.

The shorting arms 162 are yieldably biased by means well known in the art such as a built in resilient spring bias so as to urge the transverse edge portions 170 of adjacent pairs of shorting arms 162 against the

first portions 26' of respective ones of the connector pins 22',24' thereby creating an electrical interconnection between the plurality of the shorting arms 162 and the plurality of connector pins 22',24'. Thus, as is readily apparent from Figures 2A-2C, when the plurality of connector pins 22',24' are not inserted into the corresponding plurality of receptacles 44', the shorting arms 162 urge their respective transverse edge portions 170 against and into electrical connection with the first portions 26' of respective connector pins 22',24'. In this manner, the shorting of all of the plurality of connector pins 22',24' is accomplished so as to effectively protect the semiconductor die (not shown) within the SCP 12' from the ESD which could operate to damage the electrical circuitry within the semiconductor die. Insertion of the connector pins 22',24' into the complementary receptacles 44' operates to move and deflect upwards the distal end portions 168 of the shorting arms 162 against their yieldable bias, thereby moving the transverse edge portions 170 out of physical and electrical connection with the first portions 26' of the connector pins 22',24'.

As can be seen from Figures 2A-2C, the shorting arms 162 at the ends of the base section 160 define only one transverse edge portion 170 while the intermediate shorting arms 162 each define two transverse edge portions 170 that engage respectively adjacent connector pins 22',24'. In this manner, each connector pin 22',24' is shorted by being engaged by two transverse edge portions 170 from two adjacent shorting arms 162. This redundancy, as should be readily apparent, operates to substantially improve the reliability of the ESD protection device 158.

As will be readily apparent, the number of connector pins 22',24' to be shorted together by this ESD protection device 158 need not include all the connector pins 22',24' as shown in Figures 2A-2C but may also be limited to any subset of all the conductive pins. Moreover, only a subset of all the connector pins 22',24' on just one interface surface 18',20' may be shorted together by this ESD protection device 158 while all the other connector pins 22',24' remain unshorted.

Claims

1. An electrostatic discharge protection device (64;158) in combination with a semiconductor chip package (12') of the type having a top surface (14'), an opposite bottom surface (16') and a pair of interface surfaces (18';20') disposed between the top and bottom surfaces, each interface surface having a plurality of connector pins (22',22',24') disposed thereon in a substantially parallel and spaced apart relationship with respect to each other, each connector pin having a portion extending outward from the interface surface and downward at its distal end so as to extend beyond the bottom surface, the connector pins being adapted for electrical connection



to a connector (38') having a plurality of receptacles (44'), the electrostatic discharge protection device including:

- a) a base section (66;160) having a planar surface overlaid on and secured to the top surface (14') of the semiconductor chip package; and
 - b) a plurality of shorting arms (68;162) integral to the base section (66;160) and extending outward therefrom in a parallel and spaced apart relationship with respect to each other, wherein each shorting arm (68;162) has a first portion (74;166) integral to the base section (66;160) and extending outwardly and downwardly therefrom to define at least one transverse edge portion (76;170) at its distal end, the transverse edge portion being moveable into electrical engagement with respect to at least one of the connector pins for shorting between the connector pins via the shorting arms and the base section, characterized in that each shorting arm has a second portion integral with the first portion (74;166) and extending outward therefrom with distal end portions (72;168) such that upon insertion of the plurality of connector pins (22';24') into said receptacles (44') the plurality of shorting arms (68;162) are automatically disengaged from the plurality of connector pins (22';24') by moving and deflecting upwards the distal end portions (72;168)
2. A device according to claim 1, characterised in that each first portion (74) is wider than the respective distal end portion (72) so as to define the at least one transverse edge portion (76) therebetween, each shorting arm (68) further including means for yieldably biasing each shorting arm so as to urge the transverse edge portions thereof against at least one of the connector pins thereby creating an electrical connection therebetween.
 3. A device according to claim 1 or 2, characterised by a plurality of spaced apart elongated gripping members extending from and integrally connected to the base section (66) in interdigitated spaced apart relationship with respect to the plurality of shorting arms, each gripping member having a first portion (78) extending along the top surface and an integral second portion (80) for securely grasping the semiconductor chip package at an interface surface.
 4. A device according to claim 1 or 2, characterised in that the base section further comprises a stiffening rib (176) disposed integrally within the base section, the stiffening rib (176) having end portions which extend beyond the opposite end portions of the base section, each end portion of the stiffening rib defining a tab (178;180) which can be gripped so that the

electrostatic discharge protection device can be easily removed from the top surface.

5. A device according to claim 1 or claim 2, characterised by an adhesive for securely mounting the base section to the semiconductor chip package.
6. A device according to claim 1 or claim 2, characterised by end portions extending from opposite ends of the base section and integral therewith, each end portion defining a clip (82;84; 172;174) which can be removably secured around the top and bottom surfaces of the semiconductor chip package so that the base section is securely mounted to the semiconductor chip package.

Patentansprüche

1. Elektrostatische Entladungsschutzvorrichtung (64; 158) in Kombination mit einem Halbleiterchippack (12') jener Bauart, die eine obere Fläche (14'), eine gegenüberliegende untere Fläche (16') und zwei Seitenflächen (18'; 20') aufweist, welche letztere zwischen der oberen und unteren Fläche angeordnet sind, wobei jede Seitenfläche mehrere Verbinderstifte (22, 22', 24') trägt, die im wesentlichen parallel und im Abstand zueinander angeordnet sind, und wobei jeder Verbinderstift einen Abschnitt aufweist, der sich von der Seitenfläche nach außen und nach unten an seinem distalen Ende derart erstreckt, daß er über die untere Fläche vorsteht und wobei die Verbinderstifte elektrisch mit einem Verbinder (38') verbunden werden können, der mehrere Buchsen (44') aufweist und wobei die elektrostatische Entladungsschutzvorrichtung folgende Teile aufweist:
 - a) einen Basisabschnitt (66; 160) mit einer ebenen Oberfläche, die über der oberen Fläche (14') des Halbleiterchippacks zu liegen kommt, und
 - b) mehrere Kurzschlußarme (68; 162), die integral mit dem Basisabschnitt (66; 160) hergestellt sind und sich von dem Basisabschnitt nach außen parallel im Abstand zueinander erstrecken, wobei jeder Kurzschlußarm (68; 162) einen ersten Abschnitt (74; 166) aufweist, der integral mit dem Basisabschnitt (66; 160) hergestellt ist und sich nach außen und nach unten erstreckt, um wenigstens einen querverlaufenden Stufenabschnitt (76; 170) an seinem distalen Ende zu bilden, wobei der querverlaufende Stufenabschnitt in elektrische Kontaktverbindung mit wenigstens einem Verbinderstift beweglich ist, um einen Kurzschluß zwischen den Verbinderstiften über die Kurzschlußarme und dem Basisabschnitt herzustellen, dadurch gekennzeichnet, daß jeder Kurzschlußarm einen zwei-



ten Abschnitt aufweist, der integral mit dem ersten Abschnitt (74; 166) hergestellt ist und sich von dort nach außen erstreckt, wobei die distalen Endabschnitte (72; 168) derart ausgebildet sind, daß nach Einstecken der Verbinderstifte (22', 24') in die Buchsen (44') die Kurzschlußarme (68; 162) automatisch von den Verbinderstiften (22', 24') freikommen, indem die distalen Endabschnitte (72; 168) nach oben bewegt und abgelenkt werden.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß jeder erste Abschnitt (74) breiter ist als der jeweilige distale Endabschnitt (72), sodaß wenigstens ein querverlaufender Stufenabschnitt (76) dazwischen gebildet wird und jeder Kurzschlußarm (68) außerdem Mittel aufweist, um jeden Kurzschlußarm elastisch so vorzuspannen, daß der querverlaufende Stufenabschnitt gegen wenigstens einen Verbinderstift gedrückt wird, wodurch dazwischen eine elektrische Verbindung zustandekommt.
3. Vorrichtung nach den Ansprüchen 1 oder 2, gekennzeichnet durch mehrere im Abstand zueinander angeordnete langgestreckte Greifer, die sich von dem Basisabschnitt (66), mit dem sie integral verbunden sind, erstrecken, wobei sie jeweils zwischen den Kurzschlußarmen zu liegen kommen und jeder Greifer einen ersten Abschnitt (78) aufweist, der sich über die obere Oberfläche erstreckt und außerdem einen zweiten Abschnitt (80), mit dem das Halbleiterchippack an einer Seitenfläche erfaßt wird.
4. Vorrichtung nach den Ansprüchen 1 oder 2, dadurch gekennzeichnet, daß der Basisabschnitt außerdem eine Versteifungsrippe (176) aufweist, die integral innerhalb des Basisabschnitts liegt, wobei die Versteifungsrippe (176) Endabschnitte aufweist, die über die gegenüberliegenden Endabschnitte des Basisteils vorstehen und jeder Endabschnitt der Versteifungsrippe eine Lasche (178, 180) definiert, die so erfaßt werden können, daß die elektrostatische Entladungsschutzvorrichtung auf einfache Weise von der Oberseite entfernt werden kann.
5. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß ein Kleber den Basisabschnitt mit dem Halbleiterchippack fest verbindet.
6. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß Endabschnitte auf gegenüberliegenden Enden des Basisabschnitts, die integral mit diesem ausgebildet sind, vorstehen und jeweils eine Klammer (82, 84; 172, 174) bilden, die abnehmbar an der Oberseite und der Unterseite des Halbleiterchippacks angreifen, so daß der Basisab-

schnitt fest mit dem Halbleiterchippack verbunden ist.

5 Revendications

1. Dispositif (64; 158) de protection contre les décharges électrostatiques associé à un boîtier (12') de puce semi-conductrice du type qui comprend une face supérieure (14'), une face inférieure (16') en vis-à-vis et une paire de faces intermédiaires (18'; 20') placées entre les faces supérieure et inférieure, chaque face intermédiaire comportant une pluralité de broches de connexion (22, 22', 24') disposées sur ces faces en étant sensiblement parallèles et espacées les unes des autres, chaque broche de connexion comportant une partie qui s'étend depuis la face intermédiaire vers l'extérieur et vers le bas en son extrémité distale de façon à aller au-delà de la face inférieure, les broches de connexion étant conçues pour une connexion électrique avec un connecteur (38') qui comporte une pluralité de prises de courant (44), le dispositif de protection contre les décharges électrostatiques comprenant :
 - a) une partie de base (66; 160) avec une surface plane qui recouvre la face supérieure (14') du boîtier de puce semi-conductrice et lui est fixée, et
 - b) une pluralité de pattes de court-circuitage (68; 162) qui font corps avec la partie de base (66; 160) et en partent vers l'extérieur en étant parallèles et espacées les unes des autres, sachant que chaque patte de court-circuitage (68; 162) comprend une première partie (74; 166) qui fait corps avec la partie de base (66; 160) et s'en étend vers l'extérieur et vers le bas pour définir au moins une partie formant bord transversal (76; 170) en son extrémité distale, la partie formant bord transversal pouvant être amenée en contact électrique avec l'une au moins des broches de connexion pour établir un court-circuit entre les broches de connexion par l'intermédiaire des pattes de court-circuitage et de la partie de base, caractérisé en ce que chaque patte de court-circuitage comprend une seconde partie qui fait corps avec la première partie (74; 166) et s'en étend vers l'extérieur avec des parties formant extrémités distales (72; 168) de telle sorte que lorsqu'on introduit la pluralité de broches de connexion (22', 24') dans lesdites prises (44'), la pluralité de pattes de court-circuitage (68; 162) se dégage automatiquement de la pluralité de broches de connexion (22', 24') par déplacement et flexion vers le haut des parties formant extrémités distales (72; 168).



2. Dispositif selon la revendication 1, caractérisé en ce que chaque première partie (74) est plus large que la partie formant extrémité distale correspondante (72) de façon à définir entre elles la partie formant bord transversal (76) au nombre d'au moins une, 5
chaque patte de court-circuitage (68) comprenant en outre un moyen pour solliciter élastiquement chaque patte de court-circuitage de façon à pousser leur partie formant bord transversal contre l'une au moins des broches de connexion et créer ainsi une connexion électrique entre ces éléments. 10
3. Dispositif selon la revendication 1 ou 2, caractérisé par une pluralité d'organes d'accrochage, allongés et espacés les uns des autres, qui s'étendent depuis la partie de base (66) à laquelle ils sont couplés de manière intégrante et qui s'entrecroisent de manière espacée avec la pluralité de pattes de court-circuitage, chaque organe d'accrochage comprenant une première partie (78) qui s'étend le long de la face supérieure et une seconde partie (80) intégrée destinée à pincer de façon sûre le boîtier de puce semi-conductrice au niveau d'une face intermédiaire. 15
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4. Dispositif selon la revendication 1 ou 2, caractérisé en ce que la partie de base comprend en outre une nervure de rigidité (176) disposée intégralement à l'intérieur de la partie de base, la nervure de rigidité (176) ayant des parties d'extrémités qui s'étendent au-delà des parties d'extrémités opposées de la partie de base, chaque partie d'extrémité de la nervure de rigidité définissant une languette (178, 180) que l'on peut saisir afin de retirer facilement le dispositif de protection contre les décharges électrostatiques de la face supérieure. 30
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5. Dispositif selon la revendication 1 ou 2, caractérisé par un adhésif servant à monter de façon sûre la partie de base sur le boîtier de la puce semi-conductrice. 40
6. Dispositif selon la revendication 1 ou 2, caractérisé par des parties d'extrémités qui partent des extrémités opposées de la partie de base en faisant corps avec elles, chaque partie d'extrémité définissant une agrafe (82, 84; 172, 174) qui peut être fixée de façon amovible autour des faces supérieure et inférieure du boîtier de la puce semi-conductrice afin que la partie de base soit montée de façon sûre sur le boîtier de puce semi-conductrice. 45
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