CLAIMS

1. An interface element (20) for a testing apparatus of electronic devices, the interface element (20) comprising at least one support (21) provided with a plurality of through openings (22) that house respective interconnection elements (23), said interconnection elements (23) being made of a conductive elastomer that fills the openings (22), each of said interconnection elements (23) comprising a body (23') which extends between a first end (23a) and a second end (23b), wherein the body (23') and the ends (23a, 23b) of the interconnection elements (23) are made of said conductive elastomer, each of the interconnection elements (23) forming a conductive channel between different and opposing faces (Fa, Fb) of the support (21), wherein at least one of the first end (23a) and the second end (23b) of the interconnection elements (23) protrudes from the openings (22), and wherein the end (23a, 23b) protruding from the openings (22) has a section (S1) that is less than a section (S2) of a portion of the interconnection elements (23) housed inside said openings (22), wherein the section of the at least one end (23a, 23b) protruding from the openings is configured to allow a deformation thereof while pressing onto the contact pads of the device under test in such a way that there is no electric connection between adjacent interconnection elements, and wherein the spacing between said adjacent interconnection elements (23) is less than 150 μm.

2. The interface element (20) according to claim 1, wherein a terminal portion of the end (23a, 23b) protruding from the openings (22) comprises a coating metal portion (28).

~~3. The interface element (20) according to claim 1, wherein at least one of the ends (23a, 23b) of the interconnection elements (23) comprises a conductive contact element (29), a first end portion of the conductive contact element (29) being inserted in the at least one of said ends (23a, 23b), and a second end portion, opposite the first end portion, of the conductive contact element (29) protruding from the at least one of said ends (23a, 23b).~~

43. The interface element (20) according to claim 1, wherein the interconnection elements (23) have a length between 100 μm and 300

μm, said length being measured along a longitudinal axis (H-H) of the interconnection elements (23).

~~5~~4. The interface element (20) according to claim 1, wherein the conductive elastomer forming the interconnection elements (23) comprises an elastomeric material in turn including micro or nano particles of conductive material (23p).

~~6~~5. The interface element (20) according to claim 1, wherein at least one portion of walls of the openings (22) is coated by a conductive portion (22w).

~~7~~6. The interface element (20) according to claim 1, wherein one of the ends (23a, 23b) of the interconnection elements (23) is adapted to contact contact pads (24) of a device under test, and the other one of said ends (23b, 23a) of said interconnection elements (23) is adapted to contact contact pads (26) of a space transformer (27) associated with the interface element (20).

~~8~~7. The interface element (20) according to claim 1, wherein the ends (23a, 23b) of the interconnection elements (23) are adapted to contact pads of components associated with the interface element (20) and between which the interface element (20) is arranged, the interface element (20) providing the mechanical and electrical connection among said components.

~~9~~8. A probe card (40) for a testing apparatus of electronic devices, comprising at least one interface element (20) according to claim 1, said at least one interface element (20) being adapted to perform the contact with contact pads (24) of a device under test by means of the interconnection elements (23) and/or acting as an electrical and mechanical connection element among different components of the probe card (40).

~~10~~9. The probe card (40) according to claim ~~9~~8, wherein the interface element (20) is arranged between a space transformer (27) and a testing head (35) that comprises a plurality of contact probes (36), the contact probes (36) extending between a tip portion (36a) adapted to contact the contact pads (24) and a head portion (36b) and being housed in guide holes (37h) of at least one guide (37), the head portion (36b) of

the contact probes (36) being associated with the first end (23a) of the interconnection elements (23).

~~11~~10. The probe card (40) according to claim ~~10~~9, wherein the contact probes (36) are T-shaped, wherein the head of the T corresponds to the head portion (36b) of the contact probes (36) and is adapted to abut onto the protruding first end (23a) of the interconnection elements (23).

~~12~~11. A method for manufacturing an interface element (20) for a testing apparatus of electronic devices, the method comprising at least the steps of:

- providing a substantially plate-like support (21) having different and opposing faces (Fa, Fb);
- forming a plurality of through openings (22) in the support (21);
- arranging a mask (33) on at least one of said faces (Fa, Fb) of said support (21), said mask (33) being provided with openings (22m) at said openings (22) of said support (21); and
- filling the openings (22) by means of a conductive elastomer, forming a plurality of interconnection elements (23) housed in the openings (22), the interconnection elements (23) extending between a first end (23a) and a second end (23b),

wherein each of the interconnection elements (23) forms a conductive channel between said faces (Fa, Fb) of the support (21), and

wherein at least one of said ends (23a, 23b) protrudes from said openings (22, 22m) and has a section (S1) that is less than a section (S2) of a portion of said interconnection elements (23) housed inside said openings (22),

the method further comprising a step of selecting a thickness (33t) of the mask (33) in order to select a length of the protruding ends (23a, 23b), and/or a step of selecting a diameter of the openings (22m) of said mask (33) in order to select the section (S1) of the protruding ends (23a, 23b),

wherein said thickness and/or said diameter of are selected to allow a deformation of the protruding ends while pressing onto the contact pads of the device under test in such a way that there is no electric connection between adjacent interconnection elements, and

and wherein the spacing between said adjacent interconnection elements (23) is less than 150 µm.

~~13~~12. The method according to claim ~~12~~11, wherein the step of filling the openings (22) of the support (21) is performed by means of a polymerization process.

~~14~~13. The method according to claim ~~13~~12, wherein the polymerization process is performed by means of thermal cycles.

~~15~~14. The method according to claim ~~12~~11, further comprising a step of depositing a conductive portion (22w) onto at least one portion of walls of the openings (22) of the support (21).