

CHIP-TYPE MICRO-FUSE

5 The present invention relates to electric fuses and more specifically to chip-type micro-fuses which are useful in, for example, electronic printed-circuit boards (PCBs) and can be surface-mounted, that is, mounted directly on the surface of a PCB by, for example, soldering thereto.

10 Sub-miniature fuses are now widely used in PCBs in various electric and electronic equipment. Recently, such equipment has been needed to be more miniature. Thus, further miniaturisation of devices for use in the electric and electronic equipment has been also
15 demanded. The devices such as capacitor have been sufficiently miniaturised while no chip-type micro-fuse which meet the demands for the further miniaturisation thereof, high reliability and high productivity has been realised because of difficulty and troublesomeness
20 in assembling parts into such a chip-type micro-fuse.

 It is accordingly an object of the present invention to provide a chip-type micro-fuse which is not only of simple structure and high reliability but
25 also allows a high output and low production cost without increasing the number of parts and which can be preferably surface-mounted.

 To accomplish the aforementioned object, in
30 accordance with an aspect of the present invention, there is provided a chip-type micro-fuse comprising:

 a body made of heat-resistant and insulative material, said body having a pair of quadrangular end faces spaced opposed to each other, four side faces
35 attached to and extending between said pair of end faces, a hole defined in said body and passing through

said body between said pair of end faces, and two recesses, one of said two recesses being provided on one of said four side faces at one of said pair of end faces of said body, and the other one of said two recesses being provided on another one of said four side faces at the other one of said pair of end faces of said body such that said other one of said two recesses is positioned diagonally with said one of said two recesses;

an elongated fusible element, the length of said fusible element being longer than that of said hole, said fusible element being disposed within and extending through said hole in said body, one of a pair of end portions of said fusible element being disposed on one of said pair of end faces and in one of said recesses provided at one of said pair of end faces of said body, the other one of said pair of end portions of said fusible element being disposed on the other one of said pair of end faces and in the other one of said recesses provided at the other one of said pair of end faces of said body, and the remaining portion of said fusible element extending diagonally between said pair of end faces through said hole in said body; and

a pair of conductive and solderable terminal members fitted onto respectively corresponding end faces of said body for electrically connecting said body with extend circuits, each one of said pair of terminal members including a quadrangular wall having an inner face opposing the respective end face of said body, and four side walls extending from and substantially perpendicular to the periphery of said quadrangular wall and covering said four side faces at each of one of said pair of end faces of said body, each one of said end portions of said fusible element disposed on each of said end faces being firmly held between each of one of said pair of end faces of said

body and each of said inner faces of said terminal members, and each one of said end portions of said fusible element being electrically connected to each one of said inner faces of said pair of terminal members.

5

Thereby, a highly reliable chip-type micro-fuse can readily be made simply by firmly fitting the end portions of the body into the terminal means by, for example, what is called a press fit.

10

The foregoing and other objects, features and advantages of the invention will be apparent from the following

15

20

25

30

35

more particular description of preferred embodiments of the invention, as illustrated in the accompanying drawings in which like reference numerals refer to like parts throughout the different views, and in which:

5 Fig. 1 is a perspective view of a finished chip-type fuse made in accordance with the present invention;

 Fig. 2 is a perspective view of a chip-type fuse embodying the present invention; and

 Fig. 3 is a perspective view of another chip-type
10 fuse embodying the present invention.

 Referring first to Fig. 1, there is shown an exterior of a finished chip-type micro-fuse made in accordance with the present invention. As shown in this figure, the fuse
15 has a prism shaped body 1 and a pair of end caps or terminals 8 and 9 attached to ends of the body 1.

 Next, referring to Fig. 2 which shows parts of the fuse of Fig. 1 prior to their assembling, a cylindrical space 2 is provided or bored within the interior of the body
20 1 made of heat-resistant and insulative materials. Further, notches or recesses 5 and 6 are formed along the outer periphery of the body 1 near both longitudinal ends 3 and 4 of the body 1.

 The pair of end caps 8 and 9 are connected with both
25 of the ends 3 and 4 to electrically connect the fuse with external circuits located on a PCB on which the fuse is also provided, and to fix a fusible element 7 stretched across the cylindrical space 2 in the body 1.

While the ends 3 and 4 and the end caps 8 and 9 are respectively press-fitted into the body 1, the notches 5 and 6 at both ends 3 and 4 of the body 1 are intended to prevent the fusible element from being damaged when end portions 11 and 12 of the fusible element 7 tensionally stretched across the cylindrical space 2 are drawn out of the interior of the body 1 to the exterior thereof.

When the fusible element 7 is connected at both ends thereof with the end caps 8 and 9, one end 11 of the fusible element 7 may be drawn out from the recess 5 formed at the edge of the end face 3 through the cylindrical space 2, while the other end 12 of the fusible element 7 may be drawn out from another recess 6 which is formed on another end face 4 diagonally with respect to the recess 5. The end portions 3 and 4 of the body 1 are respectively fitted into the end caps 8 and 9, the inner surfaces of which have already been soldered, by the use of a press, while outer surfaces 13 and 14 of the end caps 8 and 9 are simultaneously heated to solder the fusible element 7 with the end portions of the element 7 being held between the end caps 8 and 9 and the end surfaces 3 and 4. The fusible element 7 can be fixed in the fuse without being subjected to any unnecessary tension by drawing each of end portions 11 and 12 of the element 7 out through a corresponding one of the recesses 5 and 6 formed on the end faces 3 and 4.

Unless the recesses are formed on the outer peripheral surface of the body 1, when the end portions of the body 1 are fitted into the end caps, the portions of the fusible element 7 held between the outer peripheral surface

6

of the body and the surfaces of the inner walls of the caps can outwardly be drawn by frictional force created between them with the result that the fusible element can be elongated or torn off to change its fusing characteristics or cause its accidental fusing or melting.

In contrast, according to the present invention, when the end portions of the body 1 are fitted into the end caps, the respective end portions of the fusible element 7 are drawn outwardly through the corresponding recesses formed on the outer peripheral surfaces of the body near the ends thereof. Thereby, the chip-type micro-fuse of the present invention can obtain stable fusing characteristics without applying any undesirable force to the fusible element.

As described above, an aspect of the present invention resides in that a highly reliable and chip-type micro-fuse can readily be made simply by drawing the end portions of the fusible element out from the notches or recesses formed on the outer surface thereof near the ends of the body and fitting the notched end portions of the body into the end caps or terminals of the fuse with the end portions of the fusible element being firmly held between the outer surface of the body and the inner surface of the end caps.

Having described the present invention as related to the embodiments shown in the accompanying drawings, it is our intension that the invention be not limited by any of the details of description, other than as set out in the appended claims.



CLAIMS

1. A chip-type micro-fuse comprising:

5 a body made of heat-resistant and insulative material, said body having a pair of quadrangular end faces spaced opposed to each other, four side faces attached to and extending between said pair of end faces, a hole defined in said body and passing through said body between said pair of end faces, and two
10 recesses, one of said two recesses being provided on one of said four side faces at one of said pair of end faces of said body, and the other one of said two recesses being provided on another one of said four side faces at the other one of said pair of end faces
15 of said body such that said other one of said two recesses is positioned diagonally with said one of said two recesses;

an elongated fusible element, the length of said fusible element being longer than that of said hole,
20 said fusible element being disposed within and extending through said hole in said body, one of a pair of end portions of said fusible element being disposed on one of said pair of end faces and in one of said recesses provided at one of said pair of end faces of
25 said body, the other one of said pair of end portions of said fusible element being disposed on the other one of said pair of end faces and in the other one of said recesses provided at the other one of said pair of end faces of said body, and the remaining portion of said
30 fusible element extending diagonally between said pair of end faces through said hole in said body; and

a pair of conductive and solderable terminal members fitted onto respectively corresponding end faces of said body for electrically connecting said
35 body with external circuits, each one of said pair of terminal members including a quadrangular wall having



an inner face opposing the respective end face of said body, and four side walls extending from and substantially perpendicular to the periphery of said quadrangular wall and covering said four side faces at each of one of said pair of end faces of said body, each one of said end portions of said fusible element disposed on each of said end faces being firmly held between each of one of said pair of end faces of said body and each of said inner faces of said terminal members, and each one of said end portions of said fusible element being electrically connected to each one of said inner faces of said pair of terminal members.

2. A chip-type micro-fuse as claimed in claim 1, wherein eight recesses including said two recesses are provided on said four side faces such that a recess is disposed on each side face at each of said pair of end faces of said body.

3. A chip-type micro-fuse substantially as described herein and with reference to and as illustrated in Figures 1 and 2 of the accompanying drawings.

4. A chip-type micro-fuse substantially as described herein and with reference to and as illustrated in Figure 3 of the accompanying drawings.

30

35