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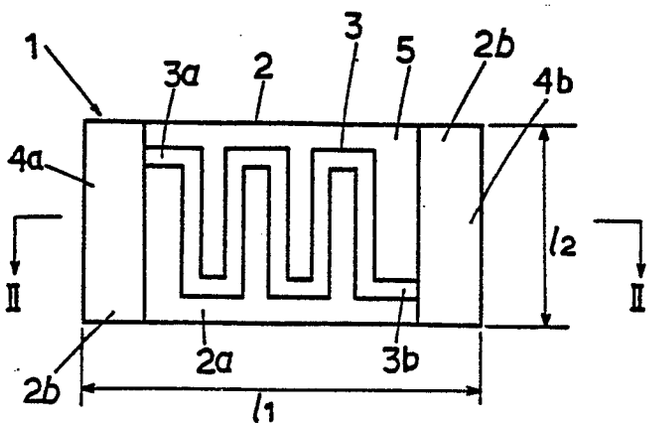
(54) Chip-type fuse.

(57) A chip-type fuse (1) which includes an insulating member (2), a pair of electrode members (4a, 4b) disposed on the insulating member, a conducting member (3) for electrically connecting the pair of electrode members to each other, and a protecting member (5) disposed on the insulating member for protecting the conducting member. The conducting member is deposited or printed on the insulating member. The insulating member is made rectangular so that it can be easily automatically mounted on a printed circuit board.

FIG. 1



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CHIP-TYPE FUSE

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to a chip-type fuse for interrupting overcurrents which damage electronic parts mounted on a printed circuit board (PCB), and more particularly, to an improved chip-type fuse which is inexpensive and can be easily automatically monted on a PCB.

Discussion of the Related Arts

Generally, a fuse is used to inrterrupt overcurrents which damage electronic parts mounted on a PCB. For that purpose, chip-type fuses which are mounted on a PCB have been developed in recent years.

One of the conventional chip-type fuses includes an insulating substrate and a conductor. The insulating substrate has two electrodes disposed thereon, and the conductor electrically connects the two electrodes to each other. The conductor is made of thin-film metal and disposed in a recess formed on the lower surface of the substrate.

Another conventional chip-type fuse includes an insulating substrate having a pair of electrodes, a gold (Au) wire wire-bonded to the electrodes, and a resin which is disposed on the substrate to seal the gold wire.

The conventional fuses are very expensive because the recess for housing the conductor must be formed or the wire must be wire-bonded to the electrodes. In addition, the conventional fuses have so complicated shapes that they can not easily automatically mounted on a PCB.

SUMMARY OF THE INVENTION

It is, therefore, an object of this invention to provide a chip-type fuse which can be produced at low cost.

It is another object of this invention to provide a chip-type fuse which can be easily automatically mounted on a PCB.

According to this invention, there is provided a chip-type fuse which includes (1) an insulating member, (2) a pair of electrode members which are made of thin-film metal and disposed on the insulating member, (3) a conducting member which is formed on the upper surface of the insulating membear and electrically connects the pair of electrode members to each other, and (4) a protecting member disposed on the insulating member for protecting the conducting member.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, advantages and features of this invention will be more fully understood when considered in conjunction with the following figures, of which:

Fig.1 is a plan view of a first embodiment of the invention;

Fig.2 is a sectional view taken along a line II-II in Fig.1;

and Fig.3 is a plan view of a second embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[First Embodiment]

Figs. 1 and 2 show a chip-type fuse according to a first embodiment of the invention.

A chip-type fuse 1 includes a ceramic substrate 2 as an insulating substrate which is rectangular like a rectangular chip-type resistor and whose size is 3.2mm(l1) x 1.6mm(l2). Formed on an upper surface of ceramic substrate 2 is a conducting member 3 made of thin-film metal which is deposited or printed on upper surface 2a. Conducting member 3 can be made of a silver-palladium (Pd) alloy, silver-platinum (Pt) alloy, silver, copper, or gold. Electrodes 4a and 4b are formed on side ends 2b and 2c of substrate 2, respectively. Electrodes 4a and 4b are made of thin-film metal which is deposited on side ends 2b and 2c or disposed theron with other known methods. Conducting member 3 is a ractangular parallelepiped and both ends 3a and 3b are connected to electrodes 4a and 4b, respectively. Upper surface 2a of substrate 2 is coated with a silicone resin film (protecting film) 5 to completely cover conducting member 3.

Since chip-type fuse 1 has the same shape as micro-chip resistors, it can be easily automatically mounted on a PCB to reduse the mounting cost.

The operation of fuse 1 is descrived hereinafter.

If an overcurrent flows through fuse 1, conducting member 3 is melted and broken somewhere between ends 3a and 3b to interrupt the overcurrent. Since conducting member 3 is covered with silicone resin film 5, metal vapor generated at the

melted portion are prevented from scattering outside fuse 1. Moreover, arc discharge caused by the metal vapor is prevented from continuing because the silicone resin functions as an arc-extinguishing medium, completely protecting the electronic parts. In addition, since conducting member 3 is formed directly on upper surface 2a of substrate 2, it has a high heat-radiating effect to allow flows of high-level currents despite the small size of fuse 1.

On the other hand, since conducting member 3 is not made of a golden wire unlike the conventional chip-type fuse, conducting member 3 is hardly broken, easy to handle, and highly heat-resistant.

[Second Embodiment]

Fig. 3 shows a chip-type fuse according to a second embodiment of the invention.

A chip-type fuse 11 has a ceramic substrate 12 as an insulating substrate having the size of 3.2mm x 1.6mm which is equal to that of fuse 1 according to the first embodiment. Side ends 12b in the longitudinal direction respectively have semicircular holes 12c which extend through in height.

A rectangular conducting member 13 is deposited or printed on an upper surface 12a of substrate 12. Conducting member 13 has trimmed portions 13b which are trimmed with laser light to obtain appropriate resistance. Electrodes 14 are formed on side ends 12b of substrate 12, respectively. Electrodes 14 are made of thin-film metal as electrodes 4a and 4b described in the first embodiment. Ends 13a of conducting member 13 are connected to electrodes 14. Upper surface 12a of substrate 12 is coated with a silicone resin film (protecting film) 15 to completely cover conducting member 13.

The operation of chip-type fuse 11 is described hereinafter.

If an overcurrent flows through fuse 11, one of trimmed portions 13b is melted and broken to interrupt the overcurrent. The reliability of fuse 11 increases because trimmed portions 13b are easily melted and broken by an overcurrent.

Although conducting members 3 and 13 are rectangular in all the embodiments, they can have another shape. Moreover, protecting films 5 and 15 can be made of a glass material.

The above description and the accompanying drawings are merely illustrative of the application of the principles of the present invention and are not limiting. Numerous other arrangement which employ the principles of the invention and which fall within its spirits and scope may be readily devised by those skilled in the art. Accordingly, the invention is not limited by the foregoing description, but only limited by the scope of the appended claims.

Claims

1. A chip-type fuse comprising:
an insulating member;
a pair of electrode members which are made of thin-film metal and disposed on said insulating member;
a conducting member which is formed on the upper surface of said insulating member and electrically connects said pair of electrode members to each other; and
a protecting member disposed on said insulating member for protecting said conducting member.

2. The fuse as in Claim 1, wherein said insulating member is a rectangular parallelepiped.

3. The fuse as in Claim 1, wherein said insulating member is made of a ceramic material.

4. The fuse as in Claim 1, wherein said protecting member is made of a silicone resin material.

5. The fuse as in Claim 1, wherein said protecting member is made of a glass material.

6. The fuse as in Claim 1, wherein said conducting member is rectangular.

7. The fuse as in Claim 1, wherein said conducting member includes a trimmed portion which is easily melted and broken by an overcurrent.

FIG. 1

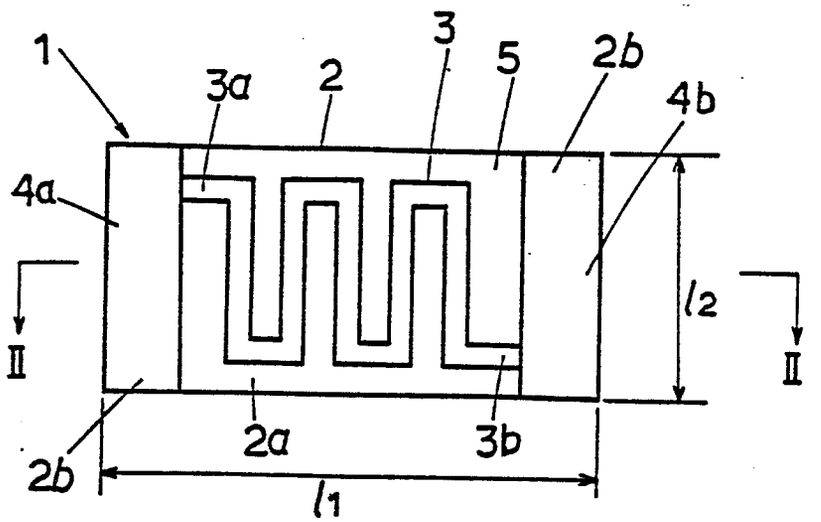


FIG. 2

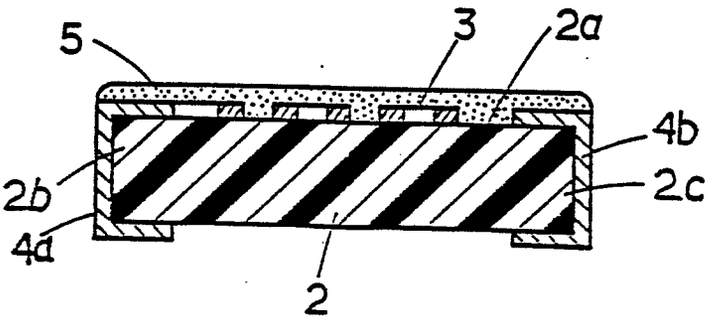
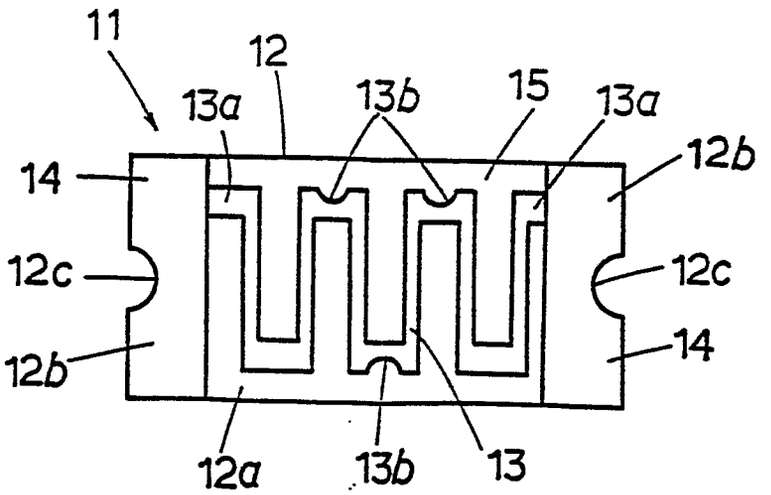


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 87 11 7577

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	WO-A-8 001 331 (J.D. McGALLIARD) * claim 28; page 26, line 10 - page 27, line 19; figures 11-11b *	1,2,7	H 01 H 85/04
Y	US-A-4 599 596 (H. ARIKAWA et al.) * column 1, line 25 - column 2, line 9; column 2, line 35 - column 3, line 25; figures 2-6 *	1,2	
Y	DE-A-2 109 760 (TELEFONAKTIEBOLAGET LM ERICSSON) * page 1, paragraph 1 - page 2, last line; figures 1, 2 *	1-3,6	
A	* page 4, paragraphs 2, 3; figures 4-6 *	7	
Y	FR-A- 901 549 (N.V. PHILIPS'GLOEILAMPENFABRIEKEN) * page 3, lines 14-30; figure 1 *	1-3,6	
A	DE-A-2 444 375 (ALLEN-BRADLEY CO.) * claims 1, 7, 14, page 10, paragraph 3; figure 4 *	1,3,4	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	DE-A-2 845 540 (DRALORIC ELECTRONIC GMBH) * claim 3; page 3, paragraph 3 *	4	H 01 H 85/00 H 01 C 1/00
A	US-A-4 139 832 (Y. YOSHINO et al.) * abstract *	5	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	29-02-1988	RUPPERT W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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