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(12) **United States Patent**
Shimanuki

(10) **Patent No.:** **US 8,115,298 B2**
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- (54) **SEMICONDUCTOR DEVICE**
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- (73) Assignees: **Renesas Electronics Corporation**, Kanagawa (JP); **Hitachi Yonezawa Electronics Co., Ltd.**, Yonezawa (JP)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Related U.S. Application Data

- (60) Continuation of application No. 12/610,900, filed on Nov. 2, 2009, now Pat. No. 7,821,119, which is a division of application No. 12/222,099, filed on Aug. 1, 2008, now Pat. No. 7,777,312, which is a division of application No. 10/879,010, filed on Jun. 30, 2004, now Pat. No. 7,804,159, which is a continuation of application No. 10/227,817, filed on Aug. 27, 2002, now abandoned, which is a continuation of application No. 09/623,344, filed as application No. PCT/JP00/04340 on Jun. 30, 2000, now abandoned.

Foreign Application Priority Data

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- (51) **Int. Cl.**
H01L 23/495 (2006.01)
- (52) **U.S. Cl.** **257/692; 257/666; 257/E23.043; 438/123**

- (58) **Field of Classification Search** 257/692, 257/666, E23.043; 438/123
See application file for complete search history.

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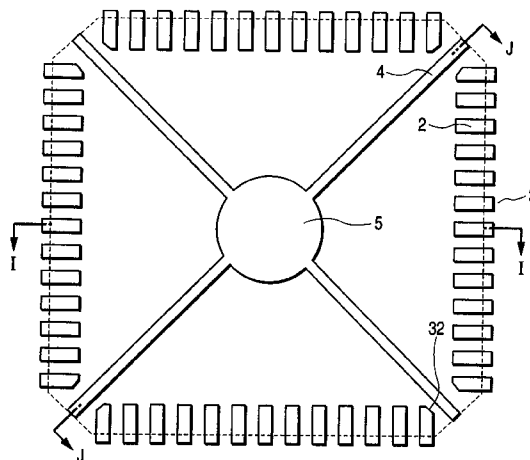
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(57) **ABSTRACT**

A semiconductor device is disclosed which includes a tab (5) for use in supporting a semiconductor chip (8), a seal section (12) as formed by sealing the semiconductor chip (8) with a resin material, more than one tab suspension lead (4) for support of the tab (5), a plurality of electrical leads (2) which have a to-be-connected portion as exposed to outer periphery on the back surface of the seal section (12) and a thickness reduced portion as formed to be thinner than said to-be-connected portion and which are provided with an inner groove (2e) and outer groove (2f) in a wire bonding surface (2d) as disposed within the seal section (12) of said to-be-connected portion, and wires (10) for electrical connection between the leads (2) and pads (7) of the semiconductor chip (8), wherein said thickness reduced portion of the leads (2) is covered by or coated with a sealing resin material while causing the wires (10) to be contacted with said to-be-connected portion at specified part lying midway between the outer groove (2f) and inner groove (2e) to thereby permit said thickness reduced portion of leads (2) and the outer groove (2f) plus the inner groove (2e) to prevent occurrence of any accidental lead drop-down detachment.

14 Claims, 38 Drawing Sheets



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FIG. 1

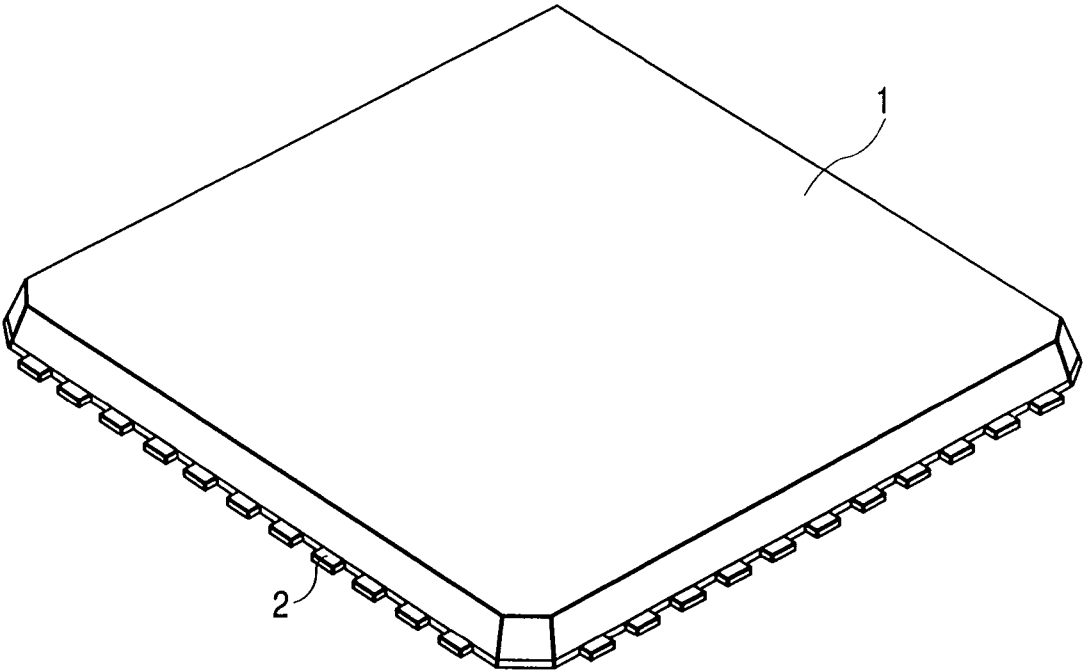


FIG. 2

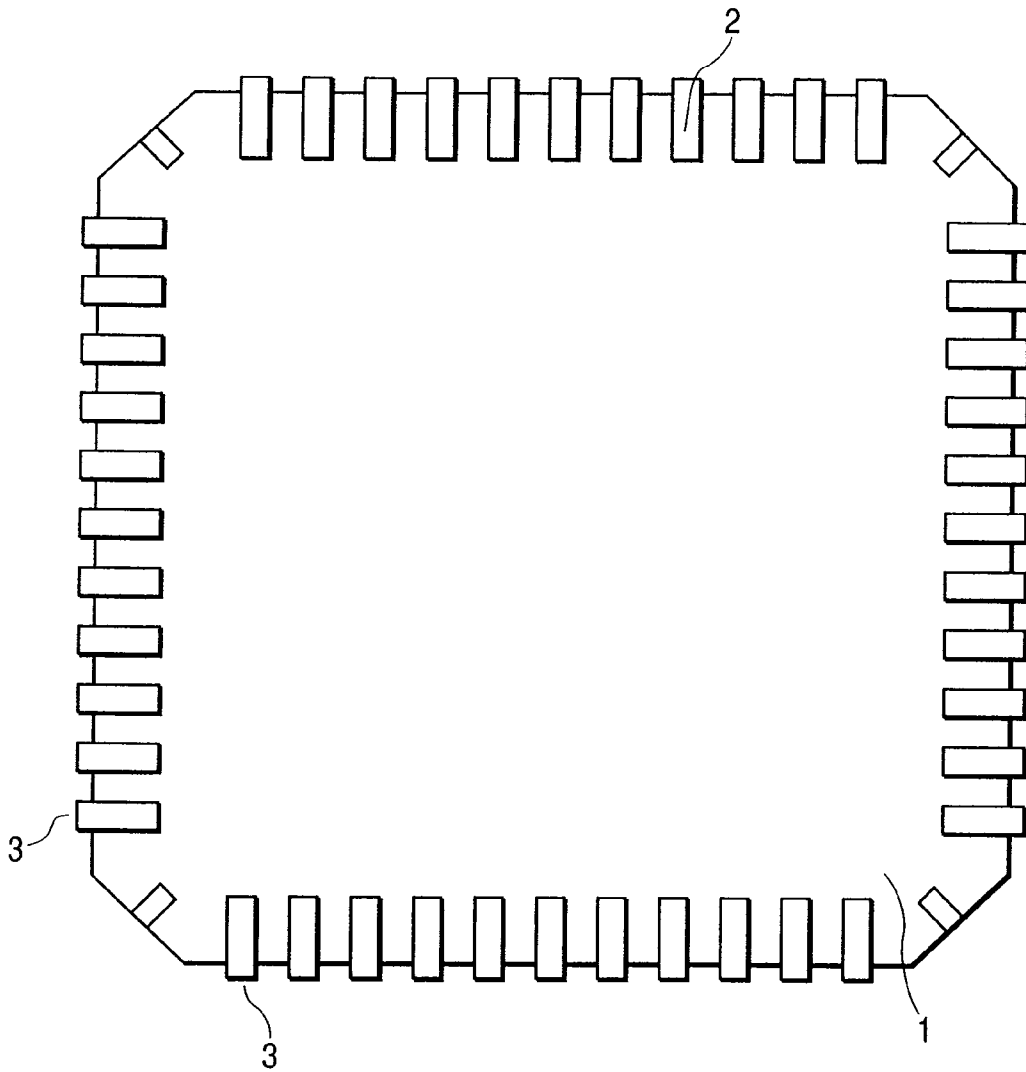


FIG. 3

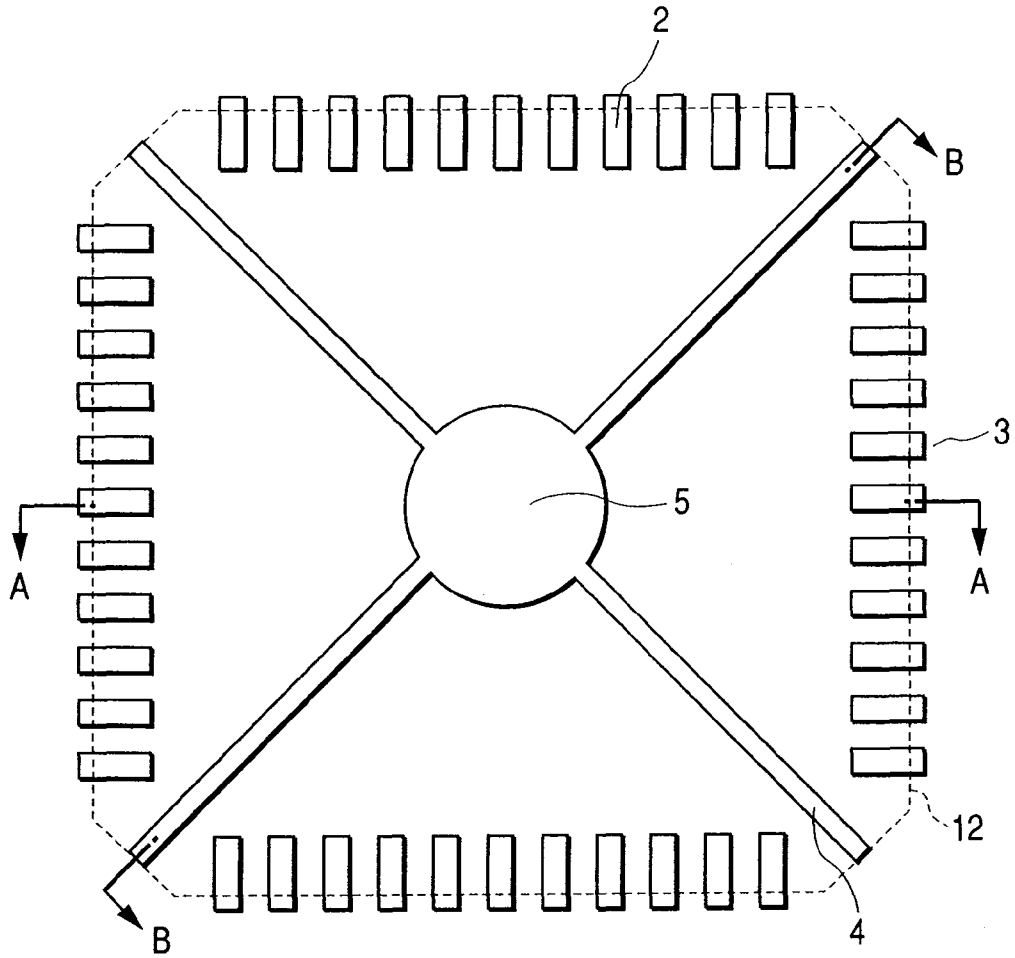


FIG. 4

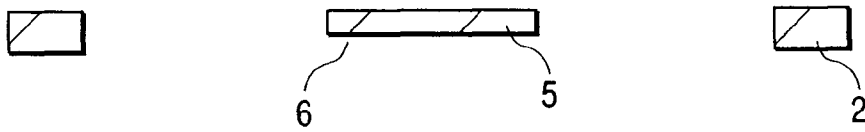
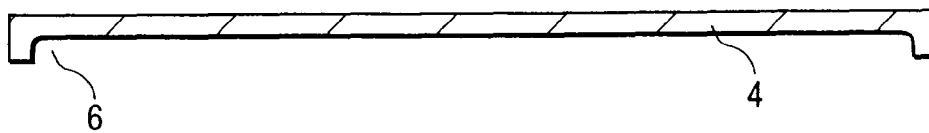


FIG. 5



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