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United States Patent [19]

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Agata et al.

[45] **Date of Patent:** Feb. 14, 1995

[54] **SEMICONDUCTOR DEVICE HAVING AT LEAST ONE SYMMETRICAL PAIR OF MOSFETS**

336301 5/1991 Japan .
513713 1/1993 Japan .

OTHER PUBLICATIONS

Search Report for European Appl. 93104940.7 mailed Oct. 4, 1993.

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[73] **Assignee:** Matsushita Electric Industrial Co., Ltd., Osaka, Japan

[21] **Appl. No.:** 35,731

[22] **Filed:** Mar. 23, 1993

[30] Foreign Application Priority Data

Mar. 27, 1992 [JP] Japan 4-070755

[51] **Int. Cl.⁶** H01L 29/78

[52] **U.S. Cl.** 257/369; 257/390; 257/401; 257/618; 257/653; 257/773

[58] **Field of Search** 257/369, 390, 401, 618, 257/653, 773

[56] References Cited

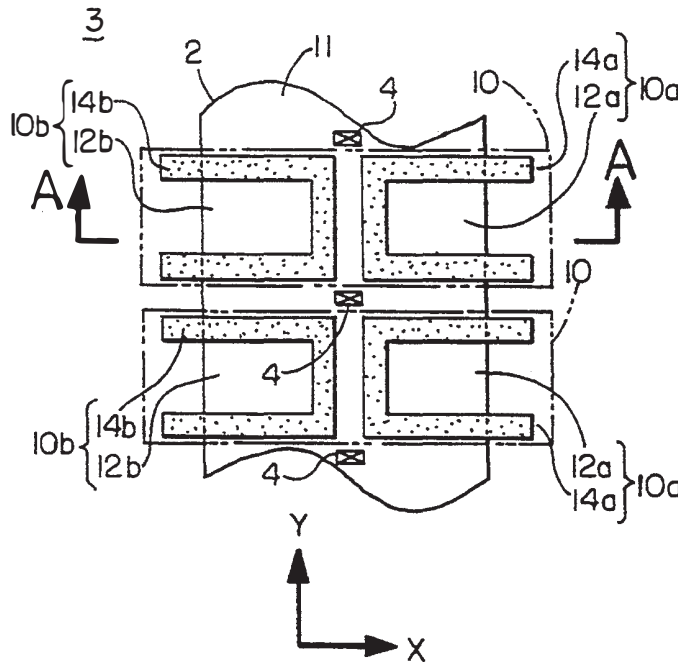
FOREIGN PATENT DOCUMENTS

- 0222396 5/1987 European Pat. Off. .
- 0445725 9/1991 European Pat. Off. .
- 58-207677 2/1983 Japan .
- 61-290767 12/1986 Japan .
- 62-115861 5/1987 Japan .
- 2159054 6/1990 Japan .

[57] ABSTRACT

A semiconductor device having at least one symmetrical pair of MOSFETs is provided. The device includes a semiconductor layer having an upper surface, an active region formed in the upper surface, an isolation region formed in the upper surface and enclosing the active region, and a pair of MOSFETs formed in the active region, wherein the pair of MOSFETs are symmetrical with respect to a first symmetric plane substantially vertical to the upper surface and also with respect to a second symmetric plane vertical both to the upper surface and to the first symmetric plane, each of the pair of MOSFETs includes a source region, a drain region, and a channel region formed in an upper surface of the active region, the source region is shared by the pair of MOSFETs, and the drain region is spatially isolated from the source region by the channel region.

30 Claims, 4 Drawing Sheets



TSMC 1025

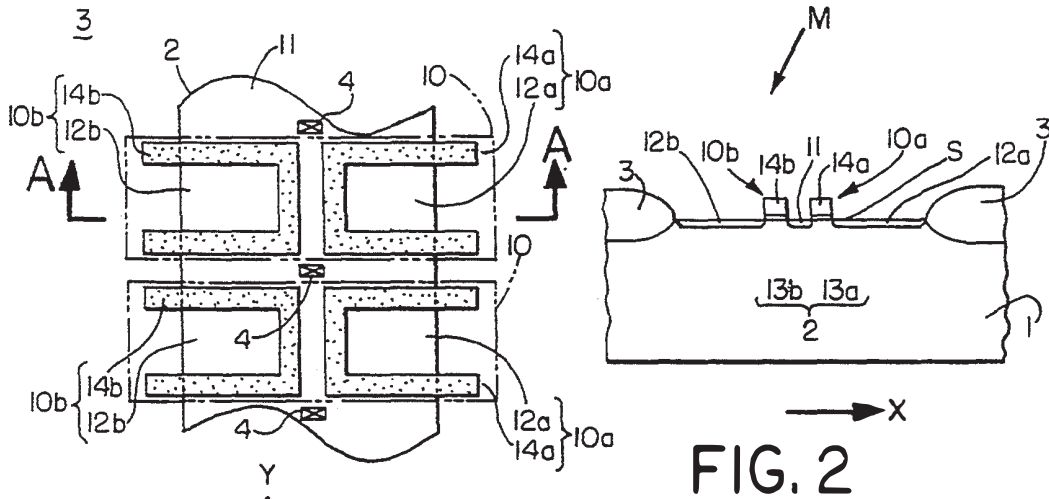


FIG. 1

FIG. 2

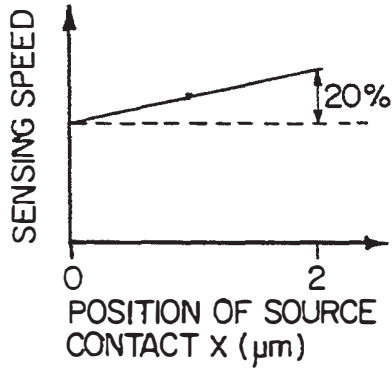


FIG. 5

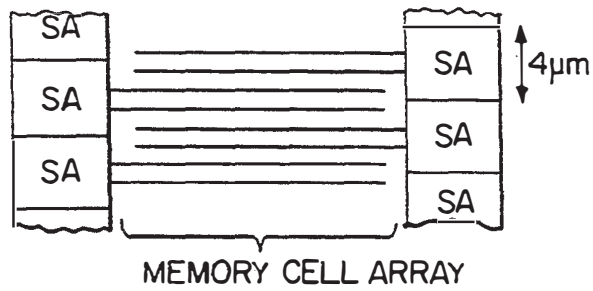


FIG. 3

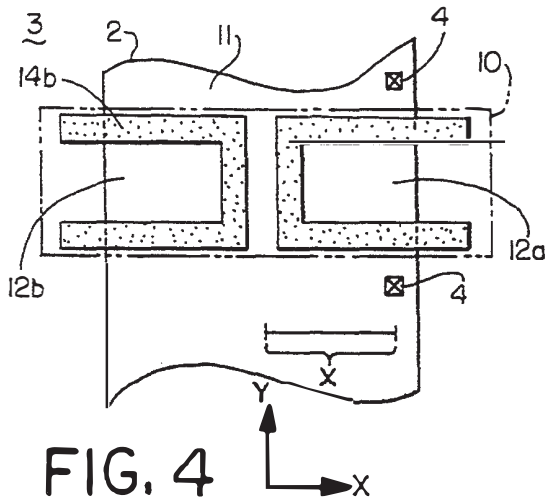


FIG. 4

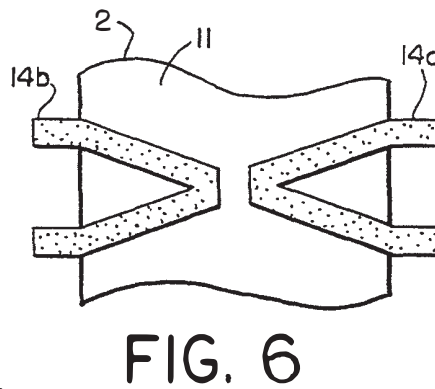


FIG. 6

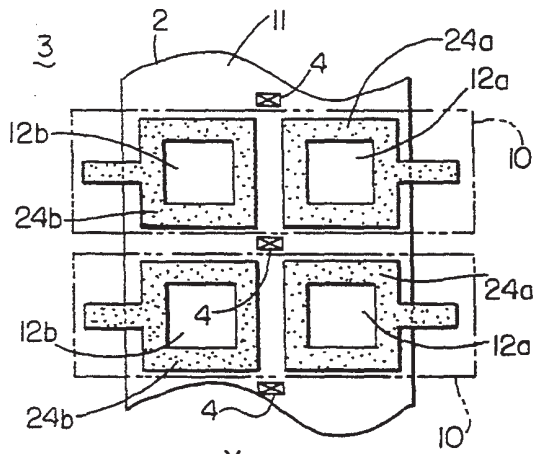


FIG. 7

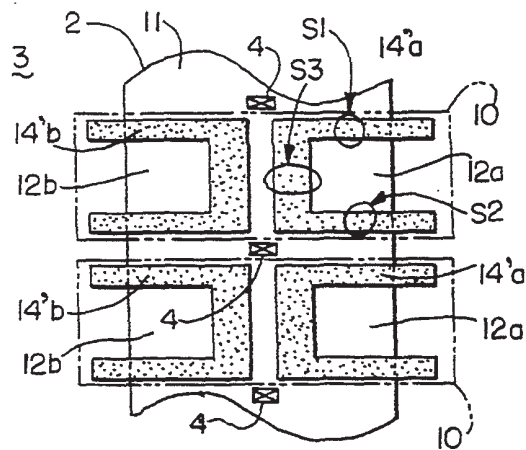


FIG. 8

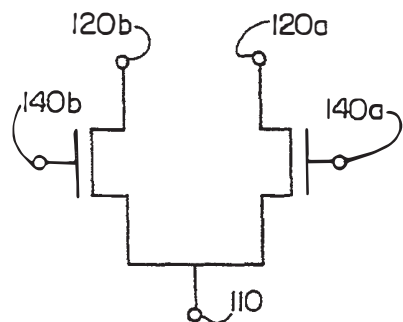


FIG. 12

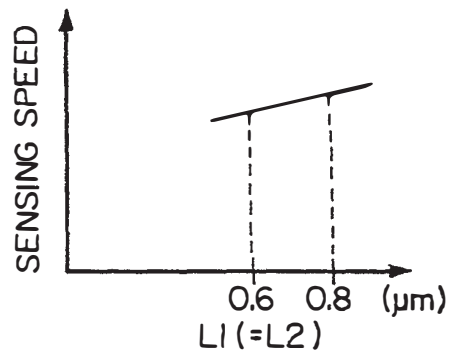


FIG. 9

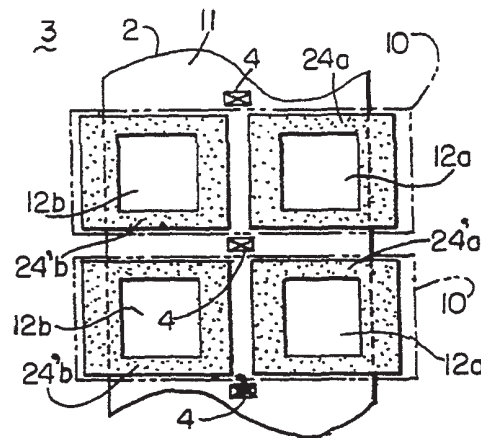


FIG. 10

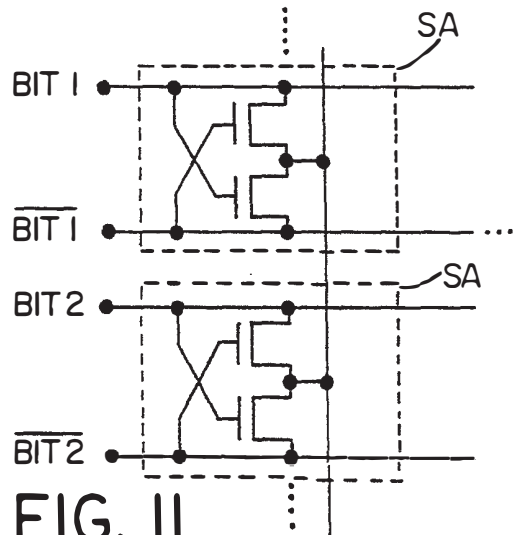


FIG. 11

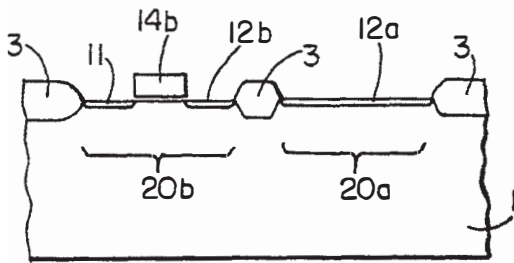
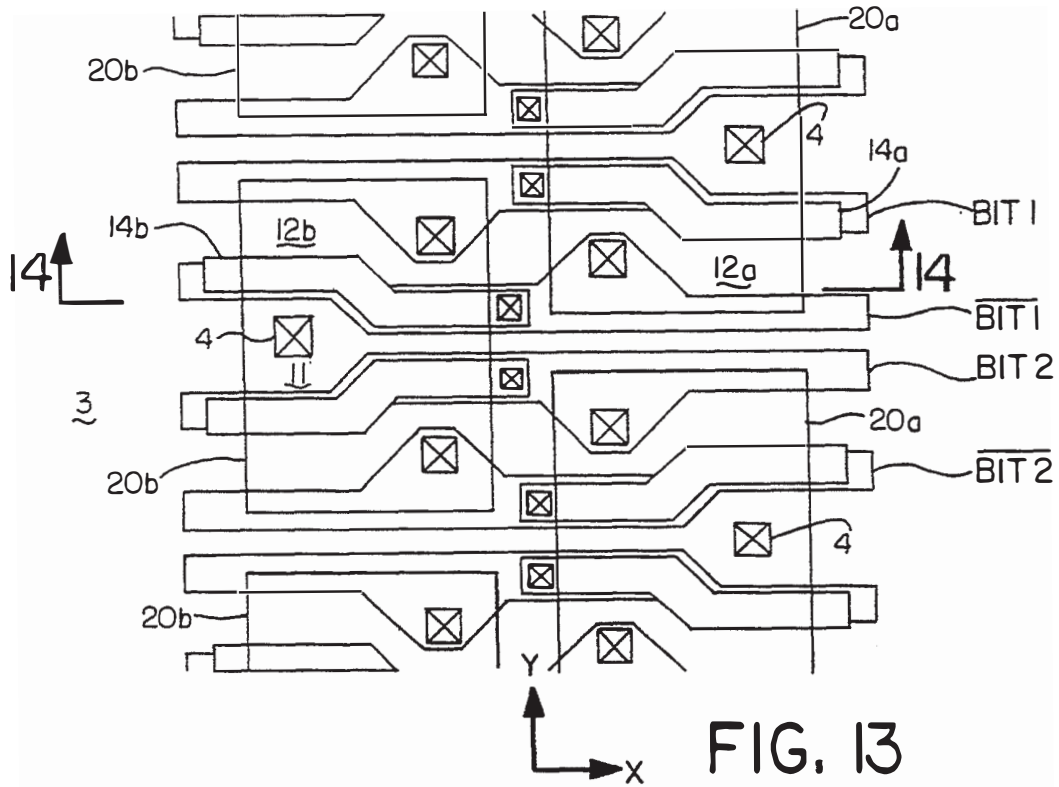


FIG. 14

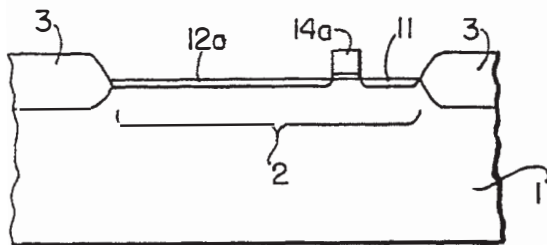


FIG. 16

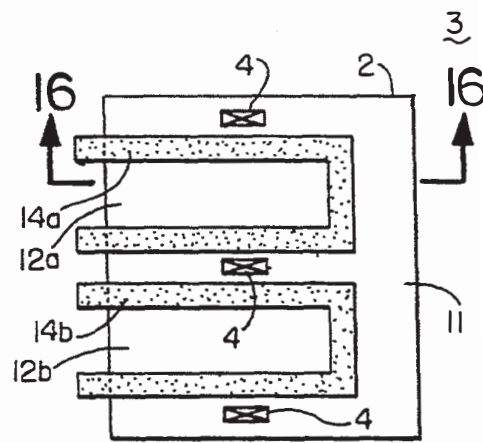


FIG. 15

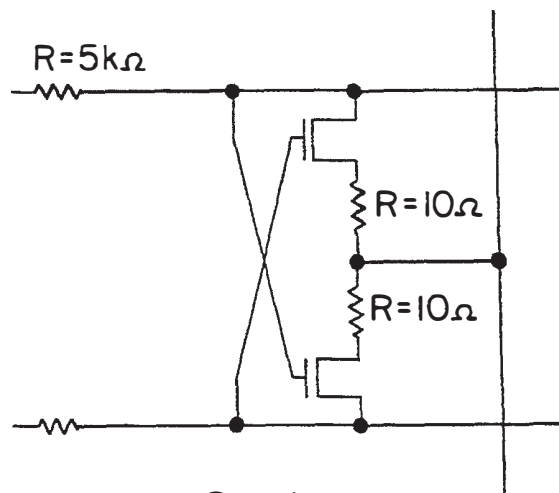


FIG. 17A

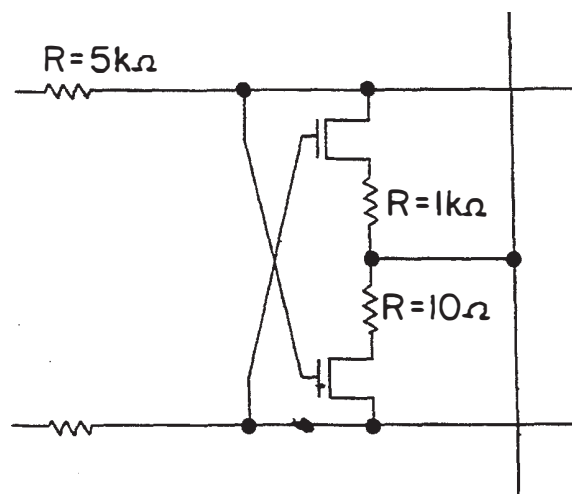


FIG. 17B

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