



US005389810A

United States Patent [19]

[11] **Patent Number:** 5,389,810

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.

Primary Examiner—Edward Wojciechowicz
Attorney, Agent, or Firm—Renner, Otto, Boisselle & Sklar

[75] **Inventors:** Masashi Agata, Osaka; Hiroyuki Yamauchi, Takatsuki; Toshio Yamada, Kadoma, all of Japan

[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

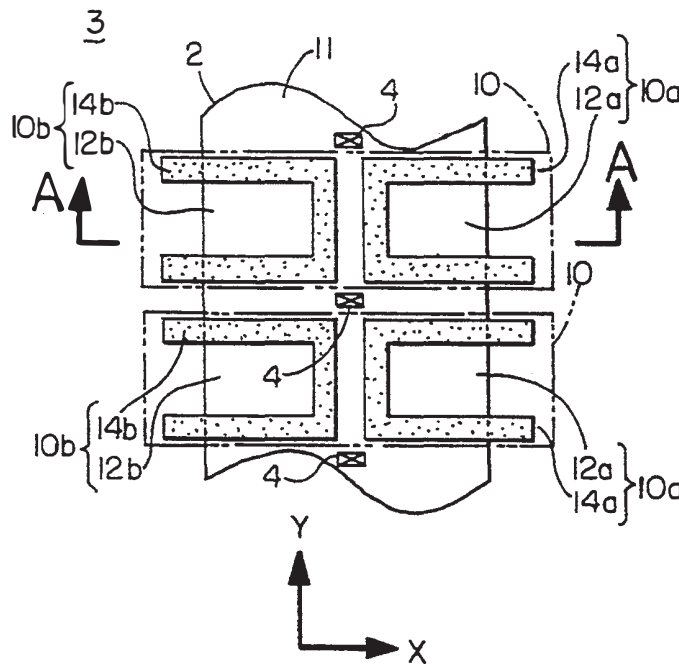
FOREIGN PATENT DOCUMENTS

- 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

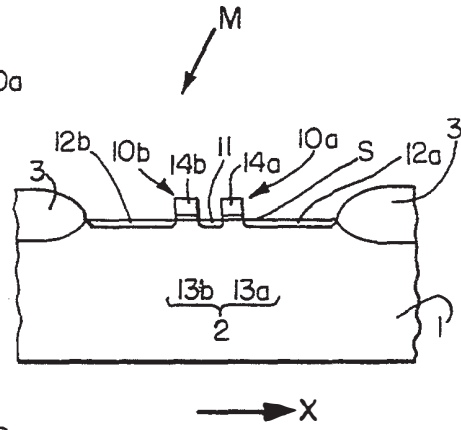
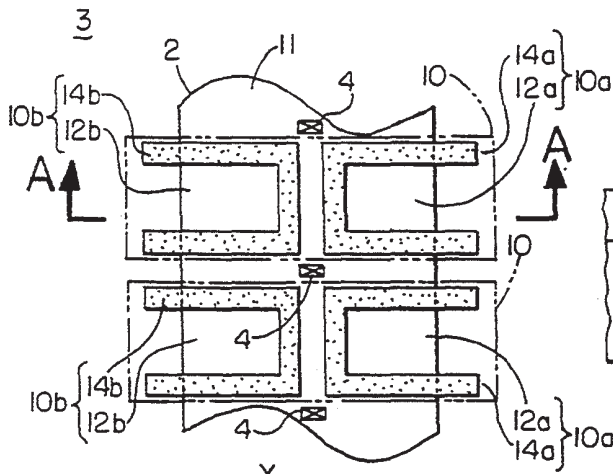


FIG. 2

FIG. 1

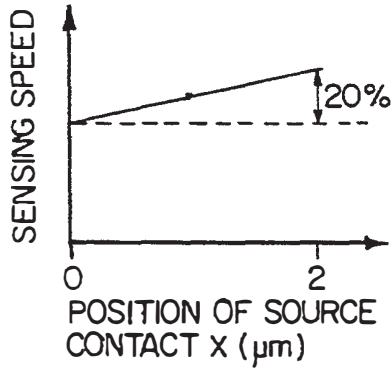


FIG. 5

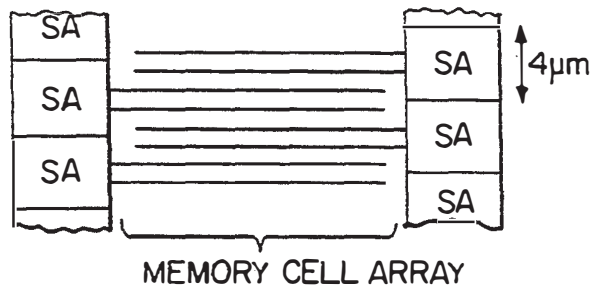


FIG. 3

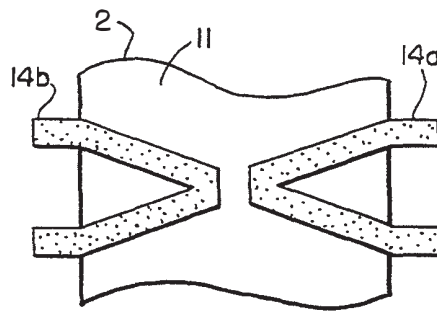


FIG. 6

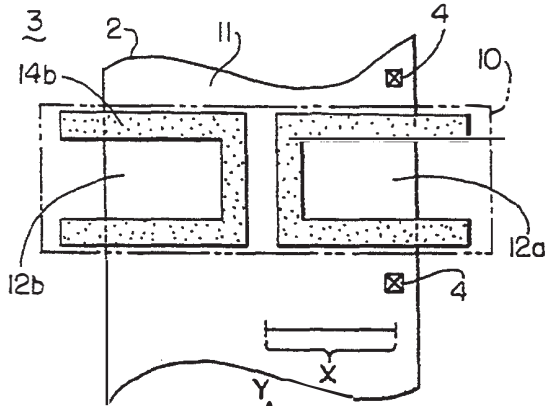


FIG. 4

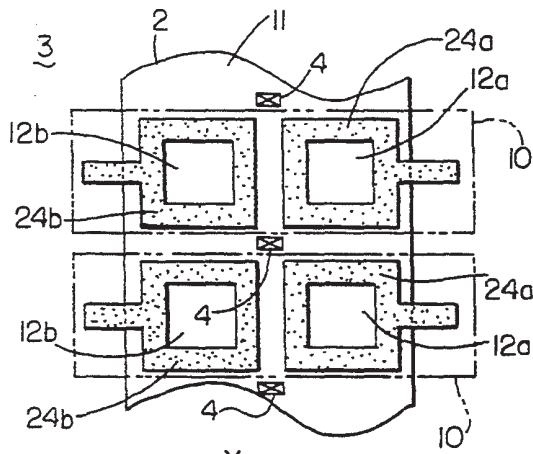


FIG. 7

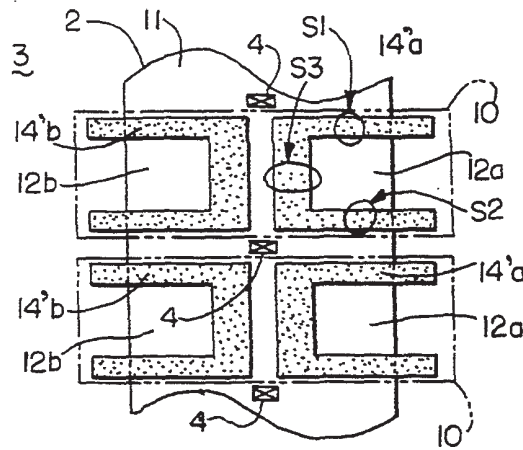


FIG. 8

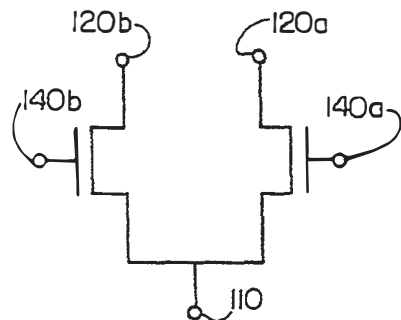


FIG. 12

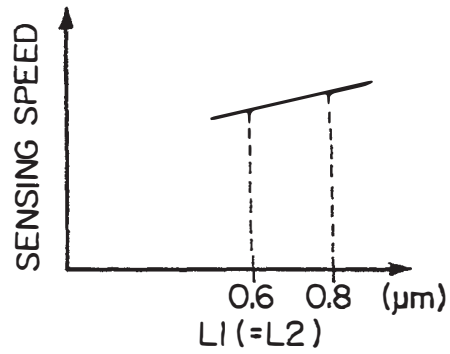


FIG. 9

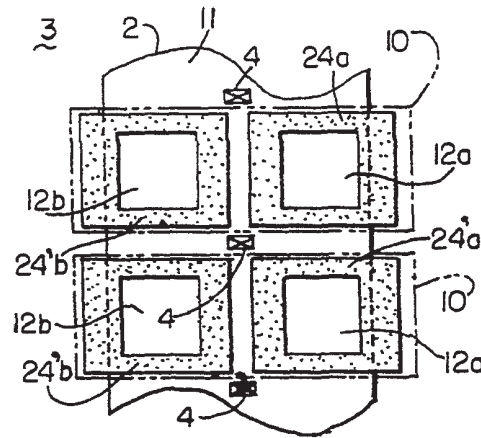


FIG. 10

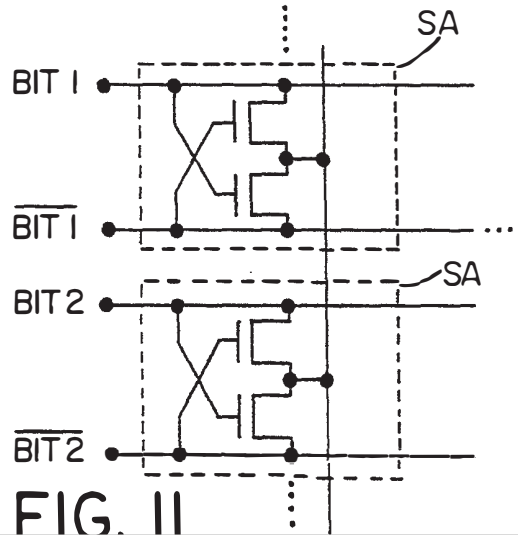


FIG. 11

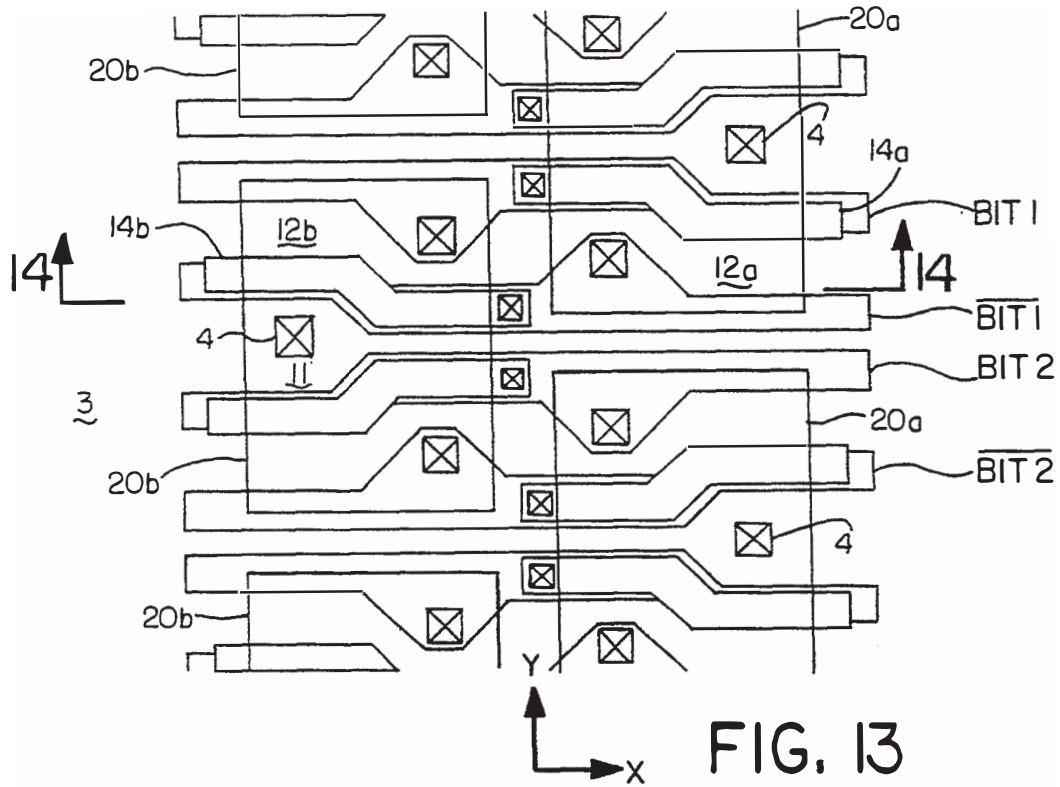


FIG. 13

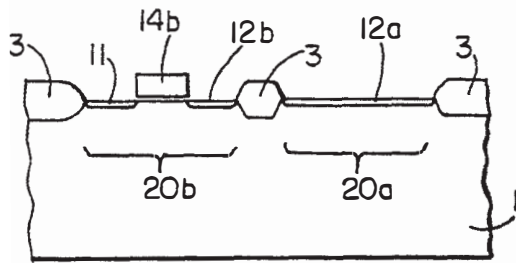


FIG. 14

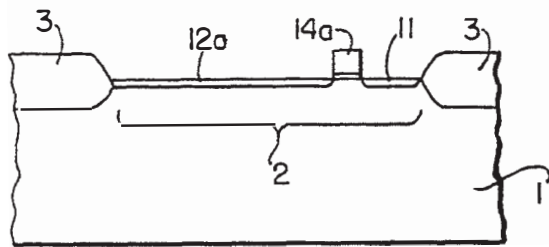


FIG. 16

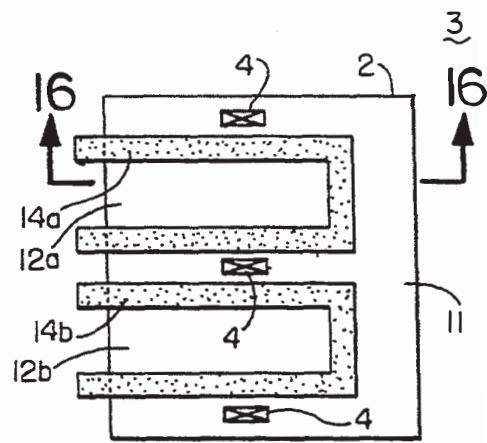


FIG. 15

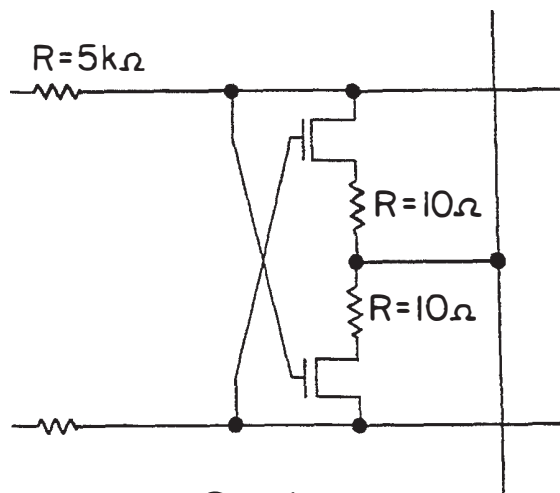


FIG. 17A

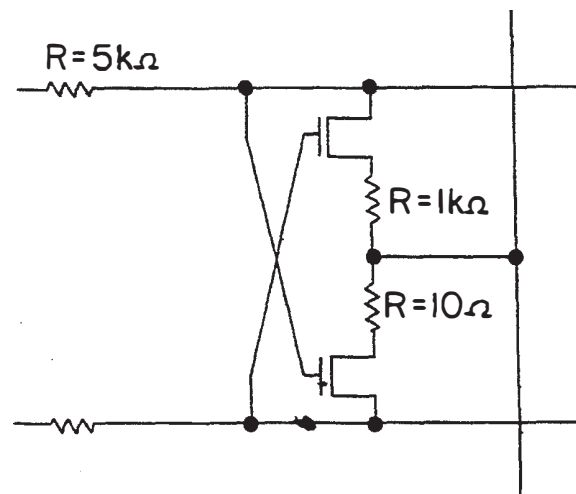


FIG. 17B

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.