

(12) **United States Patent**
Hardee

(10) **Patent No.:** **US 6,249,469 B1**
(45) **Date of Patent:** **Jun. 19, 2001**

(54) **SENSE AMPLIFIER WITH LOCAL SENSE DRIVERS AND LOCAL READ AMPLIFIERS**

329 910 A1 8/1989 (EP) .
2 662 844 12/1991 (FR) G11C/7/00
2 260 839 4/1993 (GB) .
2-18785 1/1990 (JP) .
2-27591 1/1990 (JP) .
4-228171 8/1992 (JP) .
4-252493 9/1992 (JP) .

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1149 days.

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(21) Appl. No.: **08/674,282**

(22) Filed: **Jul. 1, 1996**

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Related U.S. Application Data

(63) Continuation of application No. 07/976,312, filed on Nov. 12, 1992, now abandoned.

(51) **Int. Cl.**⁷ **G11C 7/00**

(52) **U.S. Cl.** **365/205; 365/208; 365/189.05**

(58) **Field of Search** **365/205, 207, 365/208, 189.05, 189.01**

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(74) *Attorney, Agent, or Firm*—Cook, Alex, McFarron, Manzo, Cummings & Mehler, Ltd.

(57) **ABSTRACT**

A sense amplifier for a very high density integrated circuit memory using CMOS technology is described. Each sense amplifier includes first and second local sense amplifier drive transistors, one connecting the P channel transistors to VCC; the other connecting the N channel transistors to VSS. A read amplifier circuit is provided within each sense amplifier and is operated by read control signals. Internal nodes of the latch of the sense amplifier are coupled by pass transistors that are responsive to column write control signals. Local data write driver transistors are also provided to selectively couple the pass transistors to VCC-Vt or VSS in response to further data write control signals. A relatively wider power line is coupled to the drive transistors to provide VCC thereto, and a narrower line is used to control those first sense amplifier drive transistors. Corresponding wide and narrow lines are used for the second local sense amplifier drive transistors which couple the N channel transistors to ground. Each sense amplifier may be shared between first and second pairs of bit lines through the use of isolation transistors and a corresponding isolation signal.

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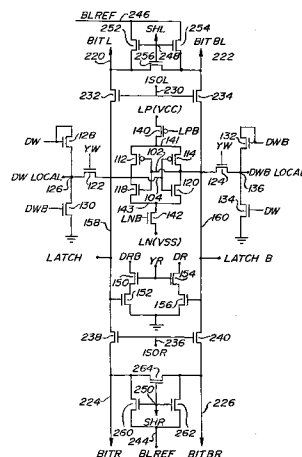
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22 Claims, 7 Drawing Sheets



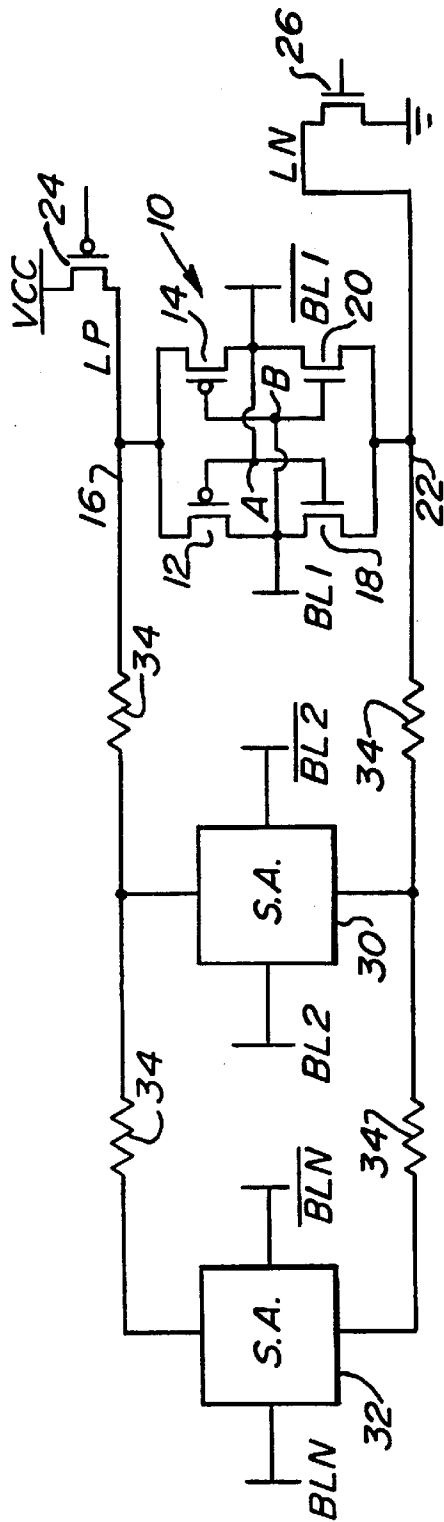


FIG. 1 (PRIOR ART)

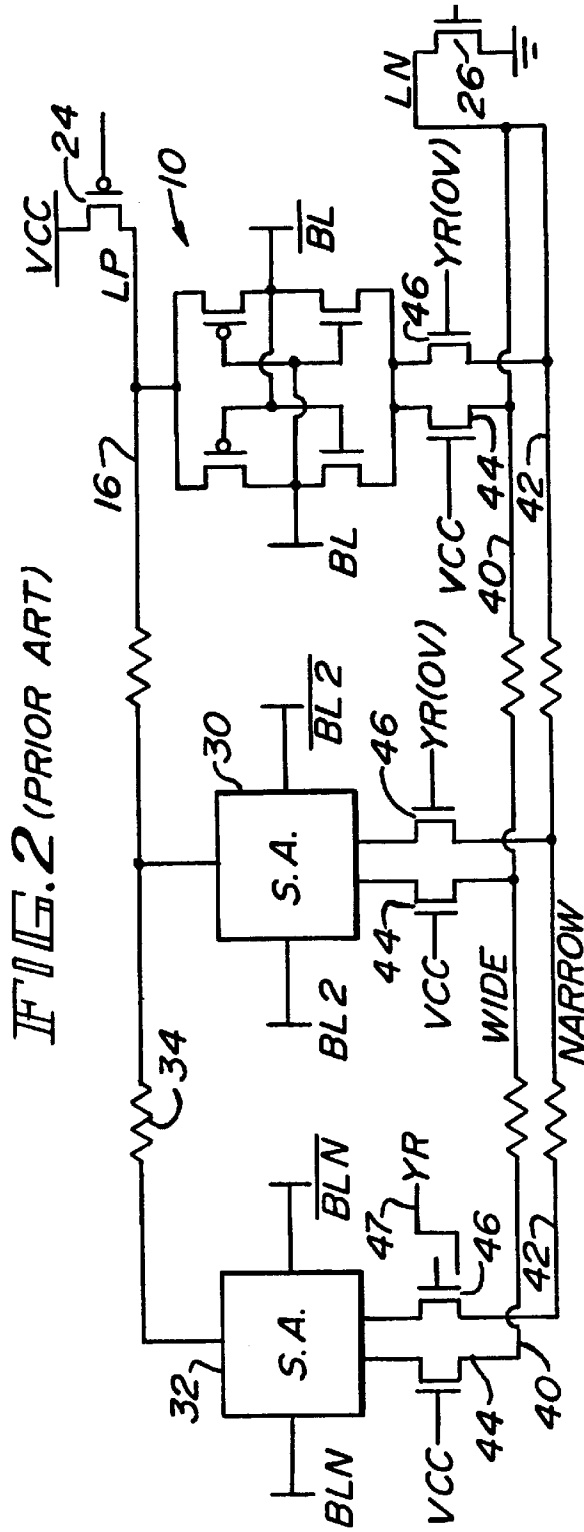


FIG. 2 (PRIOR ART)

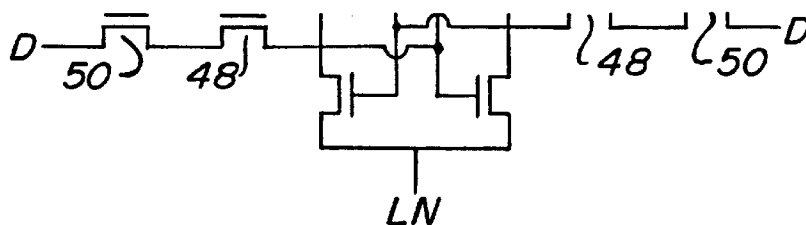
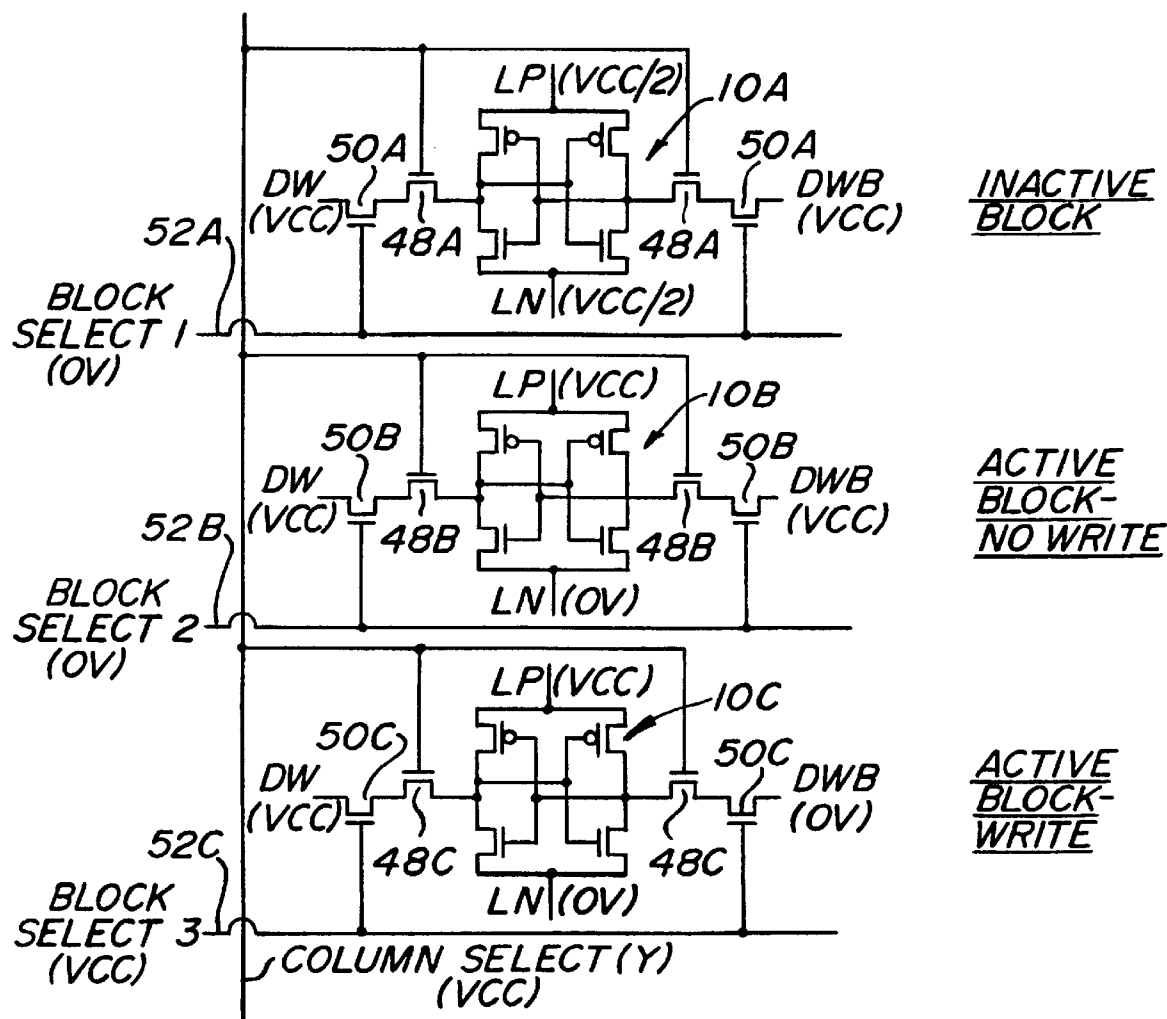


FIG. 3 (PRIOR ART)

FIG. 4 (PRIOR ART)



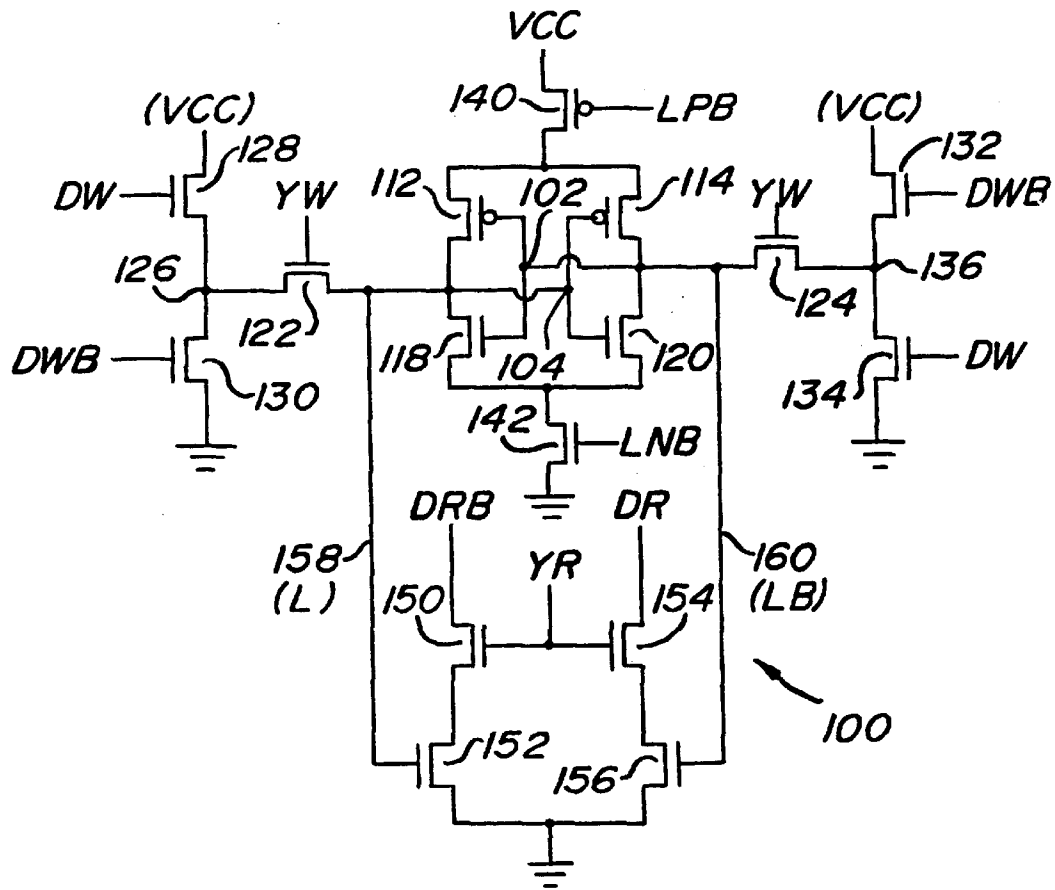


FIG. 5

FIG. 6

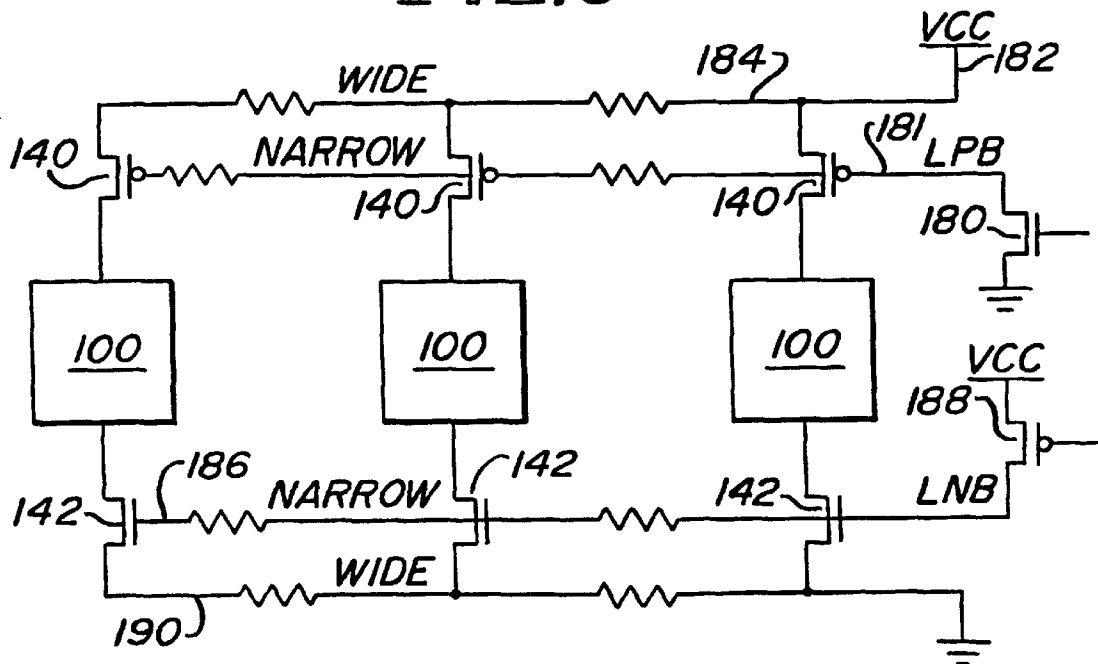
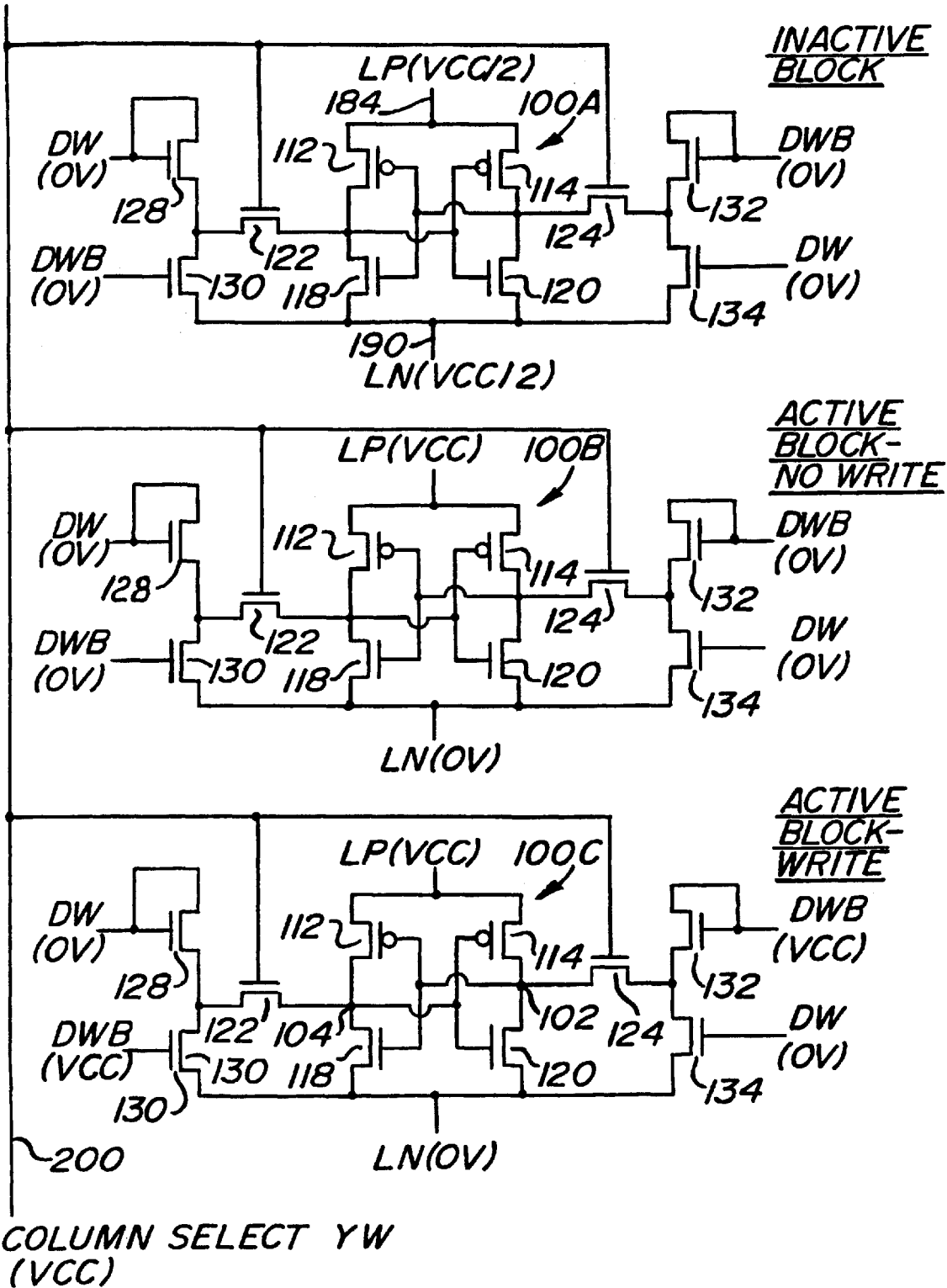


FIG. 7



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