

(54) **SEMICONDUCTOR MEMORY DEVICE WITH NORMAL MODE AND POWER DOWN MODE**

5,959,927 * 9/1999 Yamagata et al. 365/229

FOREIGN PATENT DOCUMENTS

(75) Inventor: **Tsukasa Ooishi**, Hyogo (JP)

9-231756 9/1997 (JP) .

(73) Assignee: **Mitsubishi Denki Kabushiki Kaisha**, Tokyo (JP)

* cited by examiner

(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

Primary Examiner—David Nelms
Assistant Examiner—Thong Le
(74) *Attorney, Agent, or Firm*—McDermott, Will & Emery

(21) Appl. No.: **09/323,819**

(57) **ABSTRACT**

(22) Filed: **Jun. 2, 1999**

A semiconductor memory device includes a logic unit, a DRAM unit, and first and second PMOS transistors. In a normal mode, the first PMOS transistor is off and the second PMOS transistor is on, whereby power supply voltage is supplied to all the circuits. In a power down mode, the first PMOS transistor is on and the second PMOS transistor is off, so that power is not supplied to circuitry that is not required for a self refresh operation. Power supply voltage is provided to circuitry that is required for a self refresh operation. Thus, current consumption during self refresh can be reduced.

(30) **Foreign Application Priority Data**

Dec. 4, 1998 (JP) 10-346051

(51) **Int. Cl.**⁷ **G11C 7/00**

(52) **U.S. Cl.** **365/222; 365/229; 365/226**

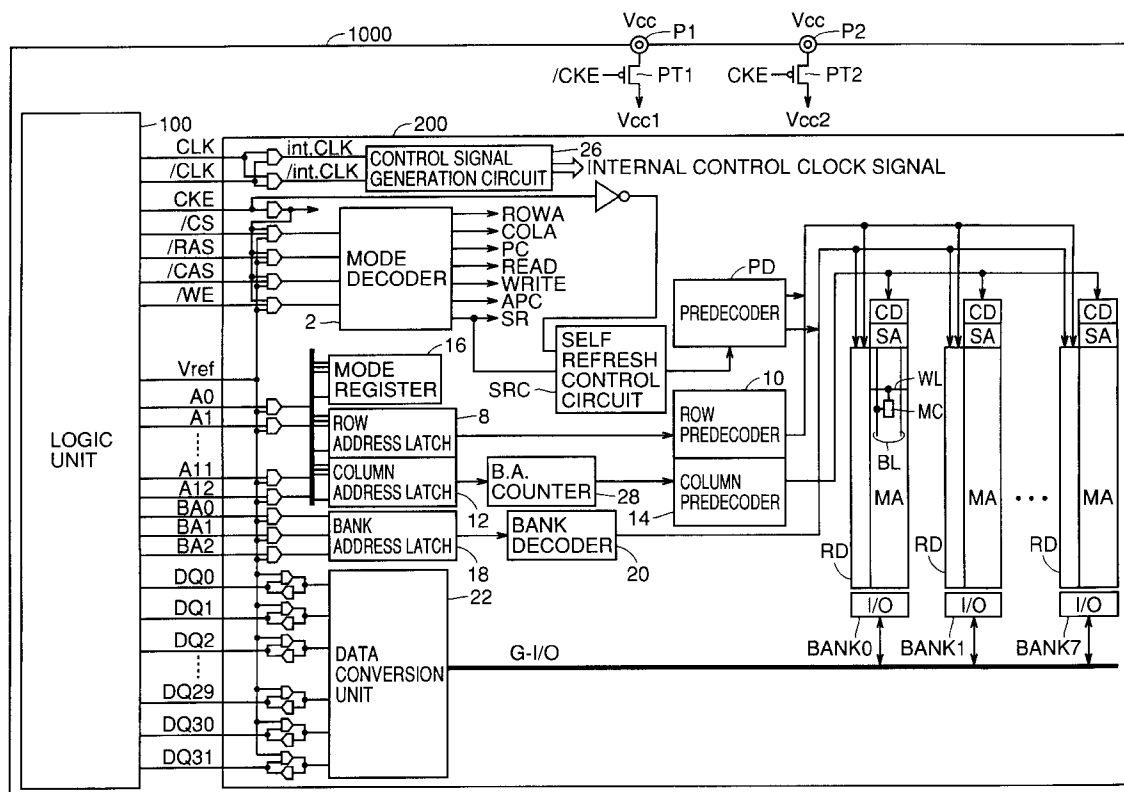
(58) **Field of Search** **365/226, 222, 365/229, 230.06, 189.05**

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,856,951 * 1/1999 Arimoto et al. 365/226

16 Claims, 19 Drawing Sheets



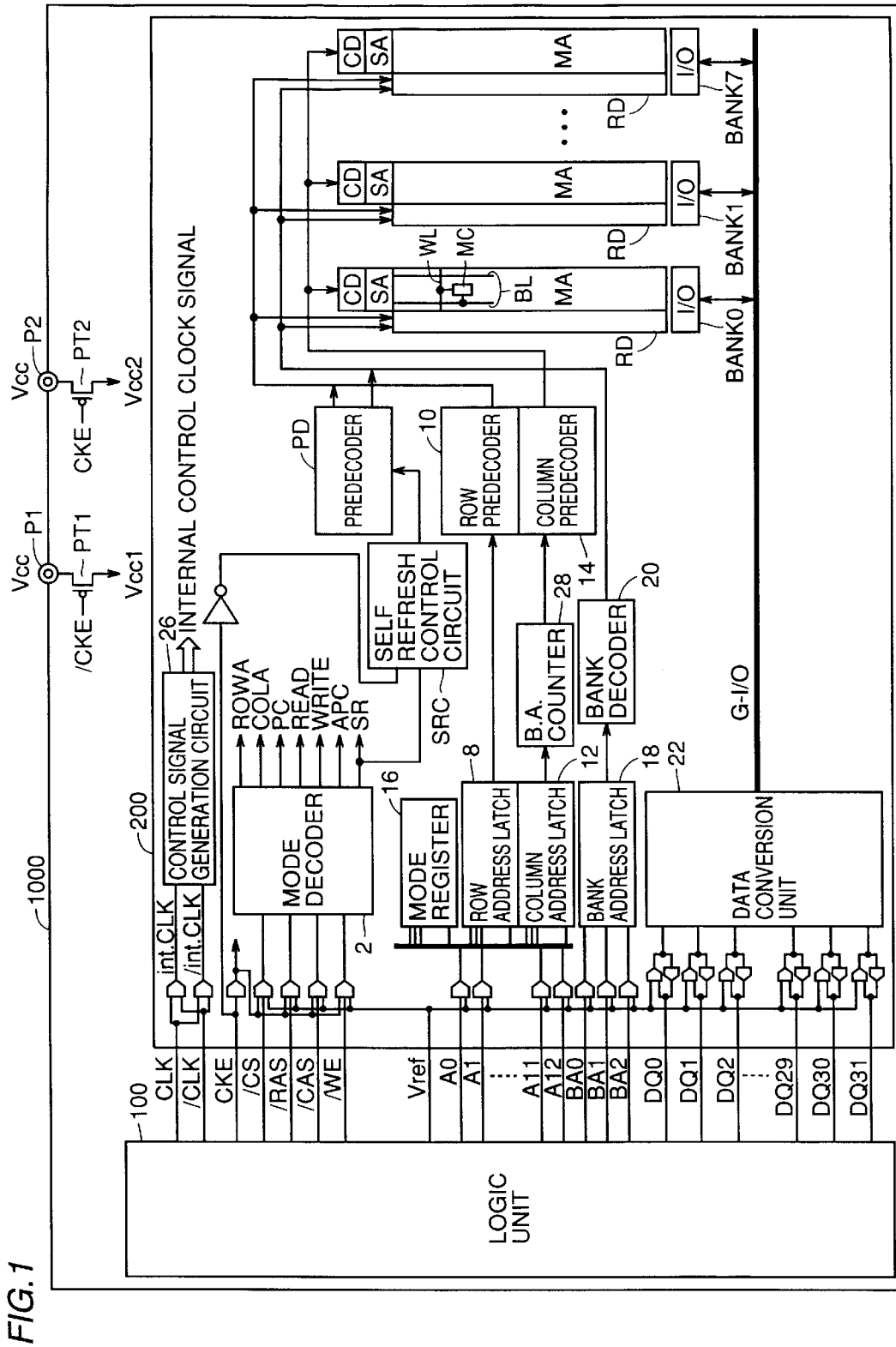


FIG. 1

FIG.2

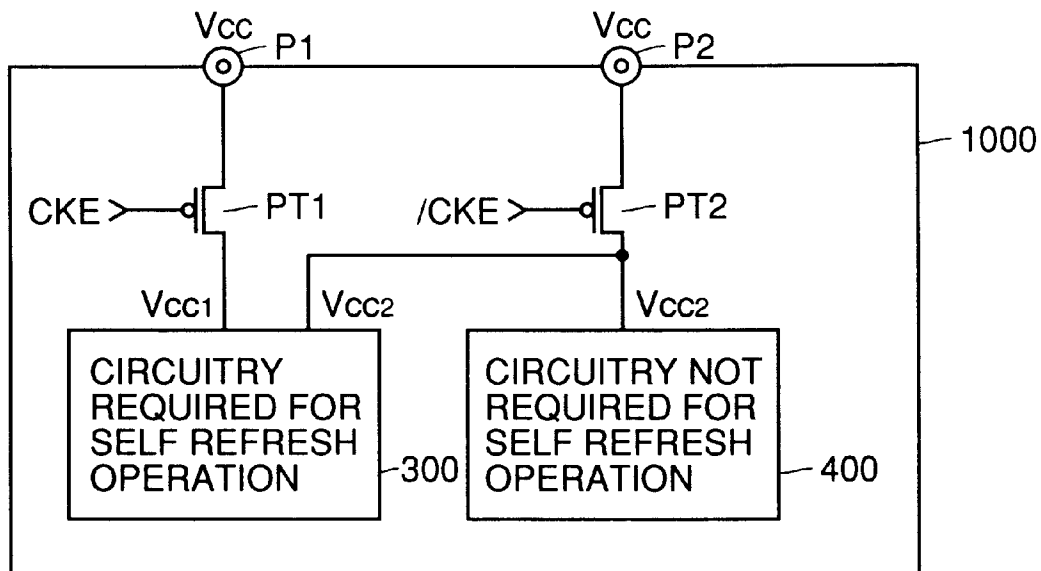


FIG. 3

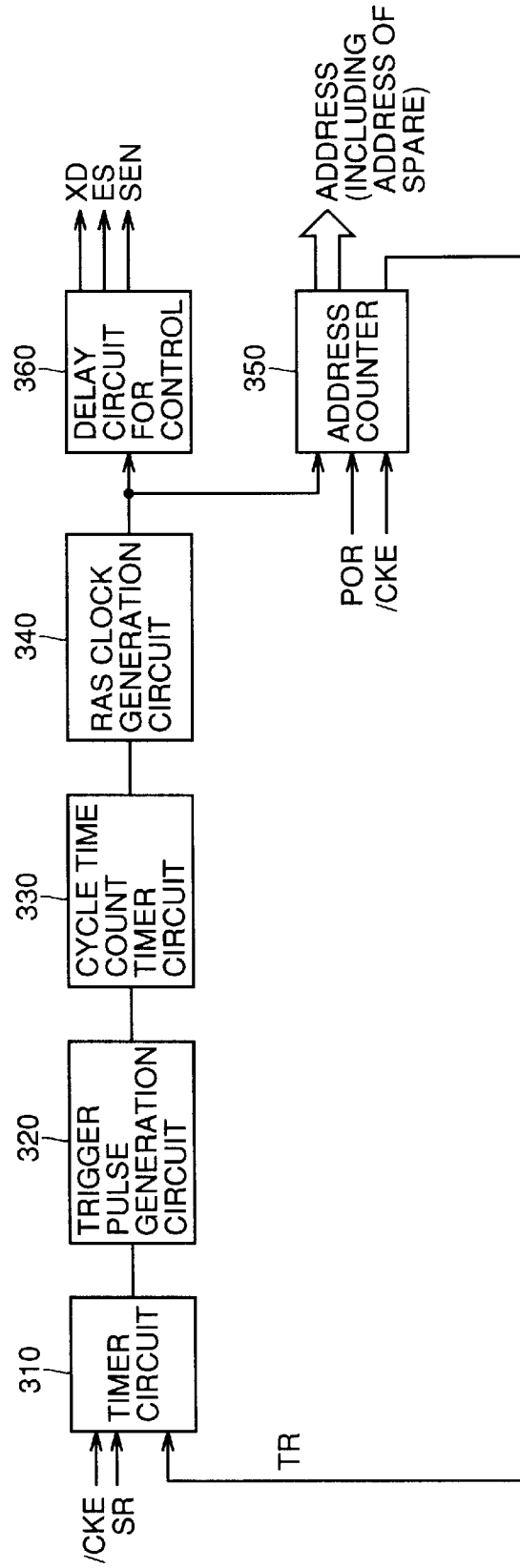
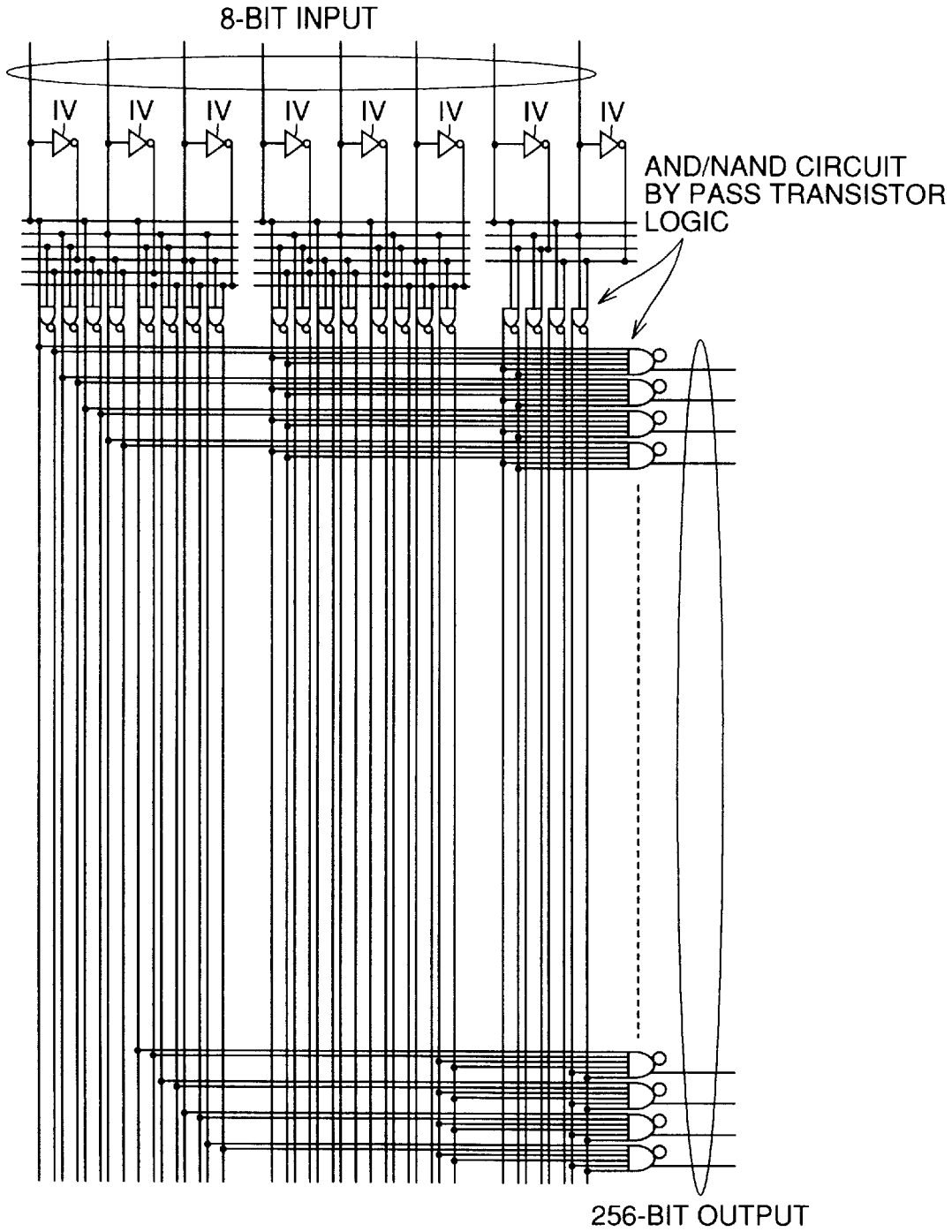


FIG. 4



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