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(54) Title: CHARGE EXTRACTION FROM FERROELECTRIC MEMORY CELL

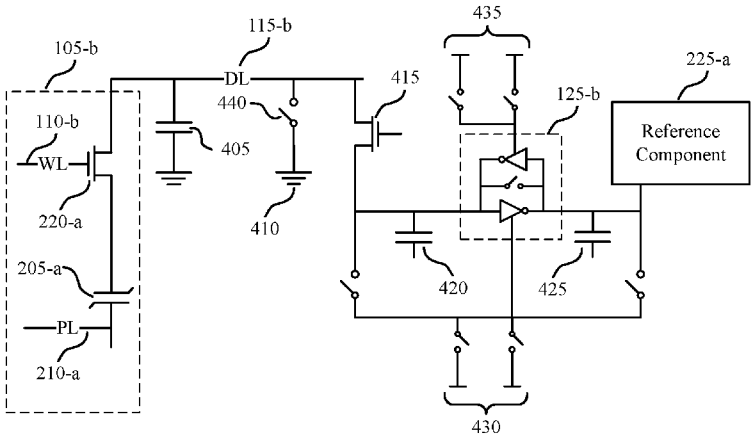

FIG. 4

(57) Abstract: Methods, systems, and devices for operating a ferroelectric memory cell or cells are described. A ferroelectric capacitor of a memory cell may be in electronic communication with a sense capacitor through a digit line. The digit line may be virtually grounded during memory cell sensing, limiting or avoiding voltage drop across the digit line, and allowing all or substantially all of the stored charge of the ferroelectric capacitor to be extracted and transferred to the sense capacitor. Virtually grounding the digit line may be achieved by activating a switching component (e.g., a p-type field-effect transistor) that is electronic communication with the digit line. The charge of the ferroelectric capacitor may be transferred through the switching component. A sense amplifier may compare the voltage of the sense capacitor to a reference voltage in order to determine the stored logic state of the memory cell.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

G11C 11/22(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G11C 11/22; G11C 7/00; G11C 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: ferroelectric, memory, bitline, ground, sense, amplifier, reference, capacitor, and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6188601 B1 (DUCK-JU KIM et al.) 13 February 2001 See column 3, lines 31-59; column 4, lines 19-38; column 4, lines 47-55; and figures 2-3.	1,3,22,27
Y		15-21,24-26
A		2,4-14,23
Y	US 2004-0190327 A1 (R. J. BAKER) 30 September 2004 See paragraphs [0018], [0022]-[0023]; claim 1; and figures 3, 5.	15-21,24-26
A	US 05487030 A (JOHN J. DRAB et al.) 23 January 1996 See column 3, line 34 - column 7, line 65; and figures 1-5.	1-27
A	US 2012-0069623 A1 (TADASHI MIYAKAWA et al.) 22 March 2012 See paragraphs [0014]-[0042]; and figures 1-4.	1-27
A	US 2004-0141353 A1 (SUDHIR K. MADAN) 22 July 2004 See paragraphs [0026]-[0040]; and figures 2-4.	1-27

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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