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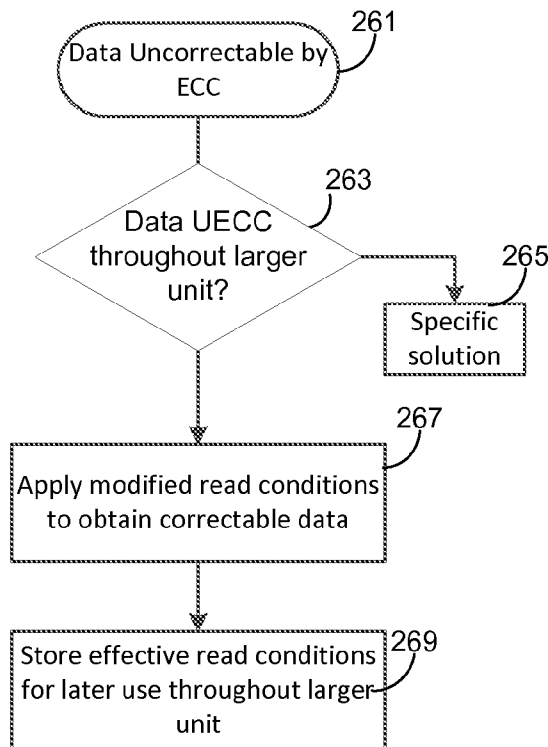
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[Continued on next page]

(54) Title: ADAPTIVE OPERATION OF THREE DIMENSIONAL MEMORY



(57) Abstract: When data from a portion of a three dimensional NAND memory array is determined to be uncorrectable by Error Correction Code (ECC), a determination is made as to whether data is uncorrectable by ECC throughout some unit that is larger than the portion. If modified read conditions provide ECC correctable data, the modified read conditions are recorded for subsequent reads of the larger unit.

FIG. 12

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MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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B. FIELDS SEARCHED
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G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/080858 A1 (LEE SANG HOON [KR] ET AL) 28 March 2013 (2013-03-28) paragraphs [0014] - [0023], [0027], [0042], [0045] - [0054], [0087], [0088], [0115], [0120] - [0129] claims 16-19,32 figures 1,2,6a,6b	1-38
Y	US 2011/239088 A1 (POST DANIEL J [US]) 29 September 2011 (2011-09-29) paragraphs [0007], [0031], [0032], [0048] - [0052], [0057], [0058] figures 1,3,4	1-38
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Date of the actual completion of the international search 30 March 2015	Date of mailing of the international search report 17/04/2015
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Johansson, Ulf

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2012/265927 A1 (CHO KYOUNG-LAE [KR] ET AL) 18 October 2012 (2012-10-18) paragraphs [0014] - [0019], [0056] - [0071], [0085] - [0089], [0104] - [0107], [0123], [0124] claims 1,2,10-16 figures 3,5-8,11 -----	1-38

INTERNATIONAL SEARCH REPORT

Information on patent family members

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PCT/US2014/036664

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013080858	A1	28-03-2013	
		CN 103035294 A	10-04-2013
		JP 2013073669 A	22-04-2013
		KR 20130034522 A	05-04-2013
		US 2013080858 A1	28-03-2013

US 2011239088	A1	29-09-2011	
		AU 2011229938 A1	08-11-2012
		CN 103038830 A	10-04-2013
		EP 2550745 A2	30-01-2013
		JP 5675954 B2	25-02-2015
		JP 2013522792 A	13-06-2013
		KR 20120134144 A	11-12-2012
		KR 20120139830 A	27-12-2012
		US 2011239088 A1	29-09-2011
		US 2014143634 A1	22-05-2014
		WO 2011119255 A2	29-09-2011

US 2012265927	A1	18-10-2012	
		KR 20120117542 A	24-10-2012
		US 2012265927 A1	18-10-2012
