

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
22 November 2007 (22.11.2007)

PCT

(10) International Publication Number  
WO 2007/134253 A3

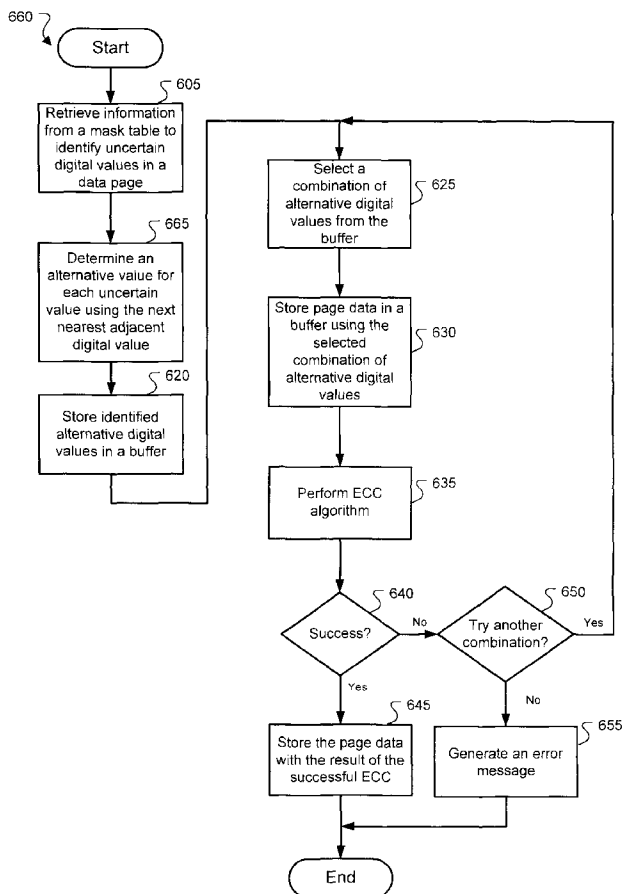
- (51) International Patent Classification:  
*GIIC H/56* (2006.01)     *GIIC 29/42* (2006.01)  
*GIIC 16/26* (2006.01)
- (21) International Application Number:  
 PCT/US2007/068810
- (22) International Filing Date:     11 May 2007 (11.05.2007)
- (25) Filing Language:                     English
- (26) Publication Language:                English
- (30) Priority Data:  
 60/800,357                     15 May 2006 (15.05.2006)     US  
 11/694,728                     30 March 2007 (30.03.2007)     US
- (71) Applicant (for all designated States except US): **APPLE INC.** [US/US]; 1 Infinite Loop, Cupertino, California 95014 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **CORNWELL, Michael J.** [US/US]; 116 South Third Street, San Jose, California 95112 (US). **DUDTE, Christopher P.** [US/US];

Apt. 205, 4331 Renaissance Drive, San Jose, California 95134 (US).

- (74) Agents: **SHIPSIDES, Geoffrey P.** et al.; Fish & Richardson P.C., P.O. Box 1022, Minneapolis, Minnesota 55440-1022 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: USE OF ALTERNATIVE VALUE IN CELL DETECTION



(57) Abstract: A system and method, including computer software, allows reading data from a flash memory cell (124). Voltages from a group of memory cells are detected (350). The group of memory cells have associated metadata for error detection (605), and each memory cell stores a voltage representing a data value selected from multiple possible data values. Each possible data value corresponds to one range of multiple non-overlapping ranges of analog voltages. Memory cells having uncertain data values are identified based on the detected voltages (330). Alternative data values for the memory cells having the uncertain data values are determined (665), and a combination of alternative data values is selected (625). An error detection test is performed (635) using the metadata associated with the multiple memory cells and the selected combination of alternative data values.

WO 2007/134253 A3



FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,  
PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments*

**Published:**

— *with international search report*

**(88) Date of publication of the international search report:**

6 March 2008

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2007/068810

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. G11C11/56 G11C29/42 G11C16/26

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

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 practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/217323 A1 (GUTERMAN DANIEL C [US] ET AL) 20 November 2003 (2003-11-20) the whole document	1-32
A	EP 1 426 971 A (SHARP KK [JP]) 9 June 2004 (2004-06-09) paragraphs [0019] - [0038]; figures 2,3	1, 15, 24, 28
A	WO 98/10425 A (INTEL CORP [US]) 12 March 1998 (1998-03-12) figures 4,5,9	1, 15, 24, 28
A	EP 1 624 461 A (SANDISK CORP [US]) 8 February 2006 (2006-02-08) figures 5,6	1, 15, 24, 28

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

8 January 2008

Date of mailing of the international search report

22/01/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Stocken, Christian

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/068810

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 2003217323	A1	20-11-2003	AU 2003241428 A1	12-12-2003
			CN 1653554 A	10-08-2005
			EP 1506552 A1	16-02-2005
			JP 2005527062 T	08-09-2005
			KR 20050027216 A	18-03-2005
			TW 277099 B	21-03-2007
			WO 03100791 A1	04-12-2003
			US 2004225947 A1	11-11-2004
			EP 1426971	A
JP 2004185753 A	02-07-2004			
KR 20040049293 A	11-06-2004			
TW 232456 B	11-05-2005			
US 2004114427 A1	17-06-2004			
WO 9810425	A	12-03-1998	AU 4251697 A	26-03-1998
			CN 1235691 A	17-11-1999
			DE 69721076 D1	22-05-2003
			DE 69721076 T2	06-11-2003
			EP 1019821 A1	19-07-2000
			HK 1030998 A1	27-02-2004
			US 5754566 A	19-05-1998
			EP 1624461	A