



(51) International Patent Classification:  
*H02M 3/155* (2006.01) *H02M 3/04* (2006.01)

(21) International Application Number:  
PCT/US2008/084993

(22) International Filing Date:  
26 November 2008 (26.11.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
11/967,314 31 December 2007 (31.12.2007) US

(71) Applicant (for all designated States except US): INTEL CORPORATION [US/US]; 2200 Mission College Boulevard, Santa Clara, California 95052 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): NGUYEN, Don J. [US/US]; 16960 NW Skyline Blvd, Portland, Oregon 97231 (US).

(74) Agents: KACVINSKY, John et al.; KACVINSKY LLC, c/o INTELLEVATE LLC, P.O. Box 52050, Minneapolis, MN 55402 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, 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, ST, 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, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(88) Date of publication of the international search report:  
11 September 2009

(54) Title: BIDIRECTIONAL POWER MANAGEMENT TECHNIQUES

100

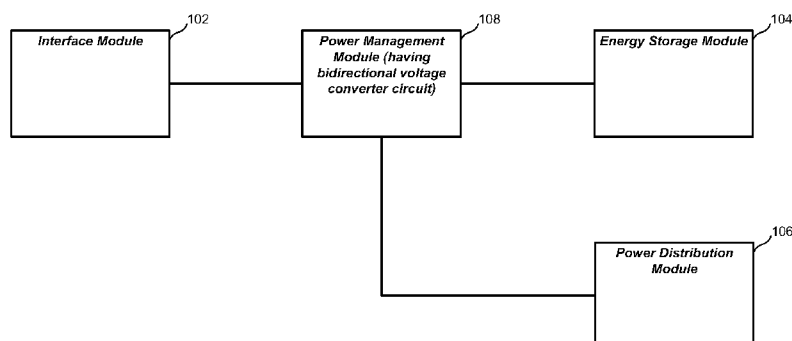


FIG. 1

(57) Abstract: Power management techniques are disclosed. For instance, an apparatus may include a bidirectional voltage converter circuit, and a control module that selectively operates the bidirectional voltage converter circuit in a charging mode and a delivery mode. The charging mode converts a voltage provided by an interface (e.g., a USB interface) into a charging voltage employed by an energy storage module (e.g., a rechargeable battery). Conversely, the delivery mode converts a voltage provided by the energy storage module into a voltage employed by the interface.

**A. CLASSIFICATION OF SUBJECT MATTER*****H02M 3/155(2006.01)i, H02M 3/04(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)

IPC G05F 1/445, G05F 1/613, H01M 10/44, H02J 7/00, H02J 7/34, H02H 7/18, H02M 3/04, H02M 3/155, H02M 3/355, H02M 7/00

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 since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

e-KIPASS(KIPO internal) "bidirectional", "converter", "dc to dc", "charge", "delivery", "energy storage"

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6320358 B2 (Motorola Inc) 20 Nov. 2001 see the abstract, claims 1-20, column 3 line 29 - column 5 line 60, figures 1-3	1-20
X	JP 2007-336698 A (Mitsumi Electric Co) 27 Dec. 2007 see the abstract, claims 1-14, figures 1-19	1-20
A	US 6205035 B1 (Ascom Energy Systems AG, Daimler-Chrysler AG) 20 Mar. 2001 see the abstract, claims 1-12, figures 1-7	1-20
A	US 6690585 B2 (OQO Inc) 10 Feb. 2004 see the abstract, claims 1-11, figures 1-7	1-20



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 application or patent 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 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

23 JUNE 2009 (23.06.2009)

Date of mailing of the international search report

**24 JUNE 2009 (24.06.2009)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office  
Government Complex-Daejeon, 139 Seonsa-ro, Seo-  
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

BAE, Jin Yong

Telephone No. 82-42-481-8503



**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/US2008/084993**

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 6243277 B1 (Rockwell Collins Inc) 05 Jun. 2001 see the abstract, claims 1-28, figures 1-9	1-20
A	JP 2003-304644 A (Fujitsu Access Inc) 24 Oct. 2003 see the abstract, claims 1-4, figures 1-4	1-20
A	JP 2007-097252 A (Nayuta Inc) 12 Apr. 2007 see the abstract, claims 1-6, figures 1-7	1-20
A	Leon M. Tolbert et. al., "A Bi-Directional DC-DC Converter with Minimum Energy Storage Elements" 2002 IEEE Industry Applications Conference, Vol. 3, Oct. 2002.	1-20

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2008/084993**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6320358 B2	20.11.2001	DE 10063289 A1 GB 2357641 A GB 2357641 B US 2001-0004205 A1	05.07.2001 27.06.2001 20.02.2002 21.06.2001
JP 2007-336698 A	27.12.2007	NONE	
US 6205035 B1	20.03.2001	DE 19829777 A1 DE 29824307 U1 EP 0969585 A2 EP 0969585 A3	05.01.2000 14.12.2000 05.01.2000 14.03.2001
US 6690585 B2	10.02.2004	US 2003-0043597 A1	06.03.2003
US 6243277 B1	05.06.2001	NONE	
JP 2003-304644 A	24.10.2003	NONE	
JP 2007-097252 A	12.04.2007	NONE	