

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
22 January 2004 (22.01.2004)

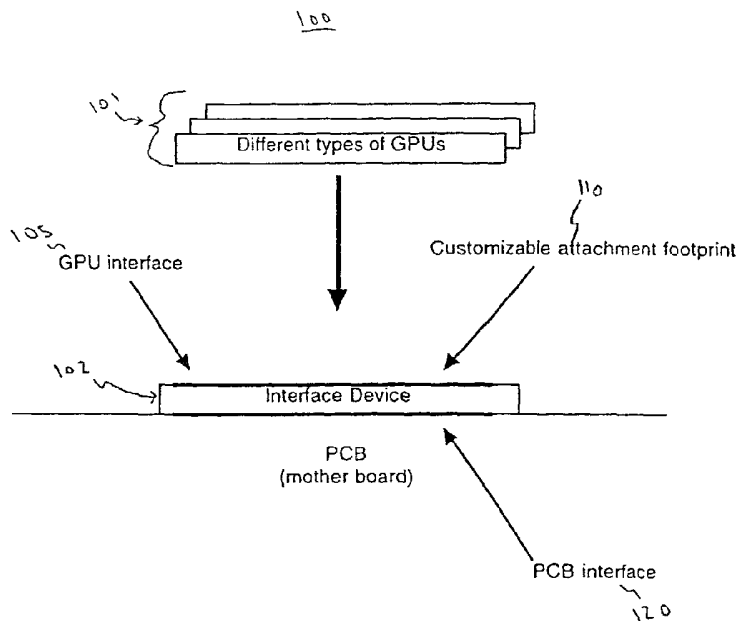
PCT

(10) International Publication Number
WO 2004/008327 A3

- (51) International Patent Classification⁷: **G06F 13/40**
- (21) International Application Number:
PCT/US2003/022194
- (22) International Filing Date: 15 July 2003 (15.07.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
10/197,071 16 July 2002 (16.07.2002) US
- (71) Applicant: **NVIDIA CORPORATION** [US/US]; 2701 San Tomas Expressway, Santa Clara, CA 95050 (US).
- (72) Inventors: **DEWEY, Thomas, E.**; 1161 Werth Avenue, Menlo Park, CA 94025 (US). **DOBBINS, James, K.**; 384 McKenzie Drive, Santa Clara, CA 95051 (US). **MINACAPPELLI, Joseph, S.**; 1168-E La Rouchelle Terrace, Sunnyvale, CA 94089 (US). **THOMAS, Simon, A.**; 300 Apple Blossom Lane, Campbell, CA 95008 (US).
- (74) Agents: **GALLENSON, Mavis, S.** et al.; Ladas & Parry, 5670 Wilshire Boulevard, Suite 2100, Los Angeles, CA 90036-5679 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report

[Continued on next page]

(54) Title: A MULTI-CONFIGURATION GPU INTERFACE DEVICE



(57) Abstract: A multi-configuration interface device for coupling different types of GPUs (graphic processor units) to a PCB (printed circuit board). The interface device comprises a GPU interface for a connection to the GPU and a PCB interface for a connection to the PCB. The GPU interface is implemented using a customizable attachment footprint for effectuating a connection to differing GPU types while maintaining the PCB interface for the connection to the PCB. The ball array for different GPUs can be configured to respectively support them. The interface device maintains a consistent PCB interface. Thus, as GPU characteristics change and evolve, or as different GPU versions are implemented, a consistent connection can be maintained for the PCB.

WO 2004/008327 A3



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

17 June 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/22194

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F13/40

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 7 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 practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 5 918 023 A (OLSON DAVID M ET AL) 29 June 1999 (1999-06-29)</p> <p>abstract column 1, line 21 - column 2, line 31 column 2, line 66 - column 3, line 26 column 3, line 47 - column 5, line 4 figures 1,2A,4,5</p> <p>-----</p>	<p>1,2,5, 16-18, 27,30</p>

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

☒ Patent family members are listed in 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 December 2003

Date of mailing of the international search report

03/03/2004

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

Rudolph, S

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/22194

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1,2,5,16-18,27,30

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 2, 5, 16, 17, 18, 27, 30

Interface device (method) for coupling GPUs (graphics processor units) to a PCB (printed circuit board); supporting of wire bond attachment.

2. claim: 3

Supporting a surface mount attachment to a GPU

3. claims: 4, 19, 20, 31

Supporting a flip chip mounted GPU

4. claim: 6

The footprint is configured to support an attachment to at least one memory component and a GPU.

5. claims: 7, 8, 5, 22, 29

Supporting/providing AGP interface.

6. claim: 9

The attachment footprint includes a plurality of gound balls.

7. claim: 10

Supporting at least two DACs.

8. claim: 11

Supporting a digital video output for a digital display.

9. claims: 12, 21

Supporting differential signaling.

10. claims: 13, 14, 23

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

The second interface is free of a memory interface.

11. claims: 15, 24

The attachment footprint is free of a memory interface.

12. claim: 25

Supporting external frame buffer clock termination circuits.

13. claim: 26

Supporting frame buffer voltage reference circuits.

14. claim: 28

Configuring a plurality of fan out signal traces included in the interface device between the GPU interface and the PCB interface.

15. claim: 32

The GPU interface supporting a plurality of RAM components.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internal Application No

PCT/US 03/22194

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5918023	A	29-06-1999	NONE
