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[Continued on next page]

(54) Title: SYSTEMS AND METHODS PROVIDING ARRANGEMENTS OF VIAS

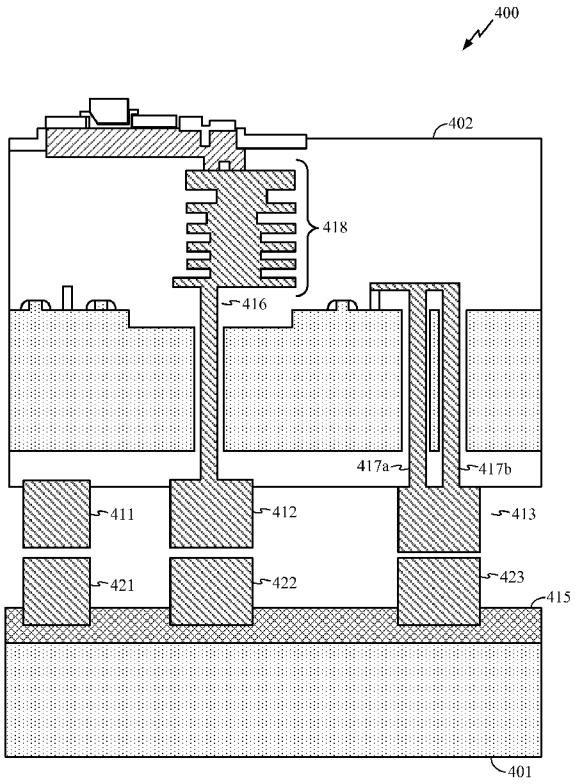


FIG. 4

(57) Abstract: A semiconductor chip, (402) includes an array of electrical contacts, (412, 413) and multiple vias (416, 417) coupling at least one circuit in the semiconductor chip to the array of electrical contacts. A first one of the electrical contacts, (412) of the array of electrical contacts is coupled to N vias (416), and a second one of the electrical contacts (413) of the array of electrical contacts is coupled to M vias (417a, 4176). M and N are positive integers of different values.

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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, PE, PG, PH, PL, PT, RO, RS, RU, 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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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

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

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. H01L25/065 H01L23/48 H01L23/00 H01L23/367 H01L23/528
H01L21/60 H01L23/50
ADD.
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)
H01L

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.
A	WO 2006/097893 A2 (KONINKL PHILIPS ELECTRONICS NV [NL]; BLEDNOV IGOR [NL]) 21 September 2006 (2006-09-21) page 12, line 9 - line 19; figures 3,6 last sentence; page 6 page 9, line 17 - line 22	1,18,21
X	EP 1 071 126 A2 (AGILENT TECHNOLOGIES INC [US]) 24 January 2001 (2001-01-24) paragraphs [0012], [0034], [0049]; figure 5	1,3-5, 18,19, 21,23
X Y	US 2006/118965 A1 (MATSUI SATOSHI [JP]) 8 June 2006 (2006-06-08) paragraphs [0160], [0164], [0165]; figures 19,20	1-6, 10-24 7,8

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[X] Further documents are listed in the continuation of Box C.

[X] 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

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"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	Date of mailing of the international search report
25 July 2011	04/08/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Manook, Rhoda

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/024058

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 2004/212086 A1 (DOTTA YOSHIHISA [JP] ET AL) 28 October 2004 (2004-10-28) paragraphs [0102], [0106]; figure 11	6
Y	US 2009/045504 A1 (SUH MIN SUK [KR]) 19 February 2009 (2009-02-19) paragraph [0242]; claim 24; figure 17	7,8
X	US 2007/290300 A1 (KAWAKAMI MASARU [JP]) 20 December 2007 (2007-12-20) paragraphs [0122], [0242], [0256], [0258], [0259]; figures 1a,1b,19a,19b,19c,20a,20b	1,6,9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/024058

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 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 fees, this Authority did not invite payment of additional fees.

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.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ 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, 3-5, 18, 19, 21, 23

A semiconductor chip containing an array of electrical contacts connecting to a plurality of vias coupling at least one circuit, a first electrical contact is coupled to N vias and a second electrical contact is coupled to M vias (where M and N are positive integers of different values).

1.1. claim: 3

Vias are thermal vias

1.2. claim: 4

Vias are through silicon vias (TSV)

1.3. claim: 5

Direct connection of the via to the electrical contact

1.4. claims: 19, 23

Multiple stacking of semiconductor chips with the chip package

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2. claim: 2

Defining the electrical signals to be transmitted to the 1st and 2nd electrical contacts on the semiconductor chip.

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3. claim: 6

A semiconductor chip where an RDL enables one electrical contact to contact multiple circuits within the same chip.

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4. claims: 7, 8

A semiconductor chip where a mechanical support for the chip is defined by means of non-electrically-functional solder bumps on the periphery of chip.

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5. claim: 9

Optimising the design layout for the electrical contacts on the semiconductor chip, according to the signals used.

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6. claims: 10, 20, 24

Use of the semiconductor chip itself within different products.

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7. claim: 22

Defining the appropriate external electrical contacts (solder bumps) for a semiconductor chip.

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8. claims: 11-17

A semiconductor chip containing two circuits where there are means of connecting the circuits to external contact means. The number of first circuit coupling means is different than a number of second circuit coupling means.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2011/024058

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