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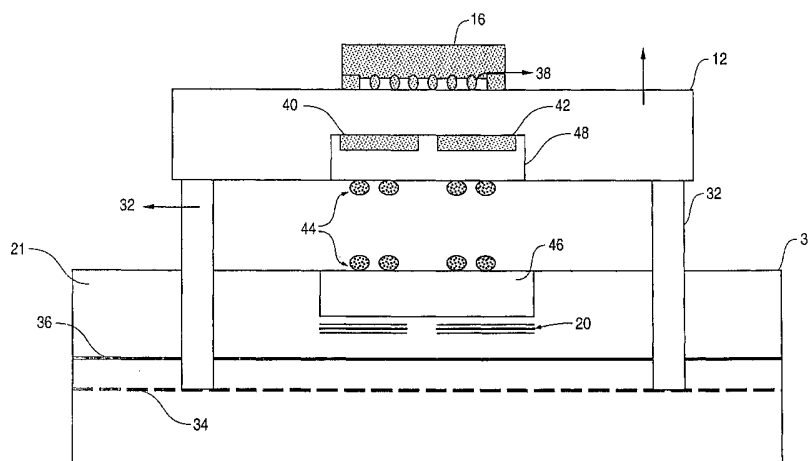
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(54) Title: OPTICAL/ELECTRICAL INTERCONNECTS AND PACKAGE FOR HIGH SPEED SIGNALING



(57) Abstract: An opto-electrical printed circuit board (PCB) and compatible opto-electrical package (12). The PCB (30) includes a base material (21), one or more optical fibers (20) imbedded in or on top of the base material, and one or more transparent substrates (46) imbedded in or on top of the base material covering the optical fibers. The optical fibers provide a high speed interconnect between two or more electronic devices (16) attached to the PCB. The electronic devices interface to the optical fibers through the transparent substrate. The opto-electrical package includes a base material, an optical receiver (40) and an optical transmitter (42) attached to the bottom side of the base material, an encapsulating polymer (48) that covers the optical receiver and optical transmitter, and one or more power and ground connection points (32) attached to the bottom side of the base material.



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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/25079

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G02B6/43 H01L33/00 H01L31/12 H05K3/34

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 G02B H01S H01L H05K

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 943 021 A (LINDSEY RICHARD W) 9 March 1976 (1976-03-09) column 2, line 18 -column 3, line 2; figures 1-3	1-8
Y	---	9-16
Y	US 5 902 435 A (MEIS MICHAEL ALAN ET AL) 11 May 1999 (1999-05-11) column 3, line 10 - line 33; figure 1 column 7, line 6 - line 32; figure 7	9-16
A	US 6 233 376 B1 (UPDEGROVE DARRYL G) 15 May 2001 (2001-05-15) the whole document	1,9
A	FR 2 795 872 A (COMMISSARIAT ENERGIE ATOMIQUE) 5 January 2001 (2001-01-05) page 4, line 10 - line 28; figures 1,2	1,9

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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

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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

5 March 2003

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14/03/2003

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INTERNATIONAL SEARCH REPORT

 International Application No
 PCT/US 02/25079

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 6 005 991 A (KNASEL DONALD LEE) 21 December 1999 (1999-12-21) column 4, line 34 -column 5, line 26; figure 1 ----	1,9
A	US 5 521 992 A (LEBBY MICHAEL S ET AL) 28 May 1996 (1996-05-28) the whole document ----	1,9
A	US 5 054 870 A (FLORJANCIC MATJAZ ET AL) 8 October 1991 (1991-10-08) the whole document ----	1,9
Y	US 6 252 252 B1 (KUNII HIDEO ET AL) 26 June 2001 (2001-06-26) column 7, line 33 -column 10, line 52; figures 1-3 ----	17-22
Y	DE 199 47 889 A (INFINEON TECHNOLOGIES AG) 23 May 2001 (2001-05-23) the whole document ----	17-22
Y	FR 2 690 304 A (MARELLI AUTRONICA) 22 October 1993 (1993-10-22) page 1 -page 2; figure 1 ----	17-22
Y	DE 42 43 823 A (TELEFUNKEN MICROELECTRON) 7 July 1994 (1994-07-07) the whole document ----	17-22
Y	WO 01 54321 A (INFINEON TECHNOLOGIES AG) 26 July 2001 (2001-07-26) page 2, line 5 - line 15 -----	19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 02/25079

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.:

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: 1-16

High speed interconnection of electrical devices using optical fibres on or in a board base material

2. Claims: 17-22

Opto-electrical package for transmitter and receiver

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/25079

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3943021	A	09-03-1976	US 3777154 A	04-12-1973
US 5902435	A	11-05-1999	EP 1202094 A1	02-05-2002
			EP 0950203 A1	20-10-1999
			JP 2001507813 T	12-06-2001
			WO 9829771 A1	09-07-1998
			US 6427034 B1	30-07-2002
US 6233376	B1	15-05-2001	NONE	
FR 2795872	A	05-01-2001	FR 2795872 A1	05-01-2001
			EP 1190270 A1	27-03-2002
			WO 0101181 A1	04-01-2001
US 6005991	A	21-12-1999	NONE	
US 5521992	A	28-05-1996	DE 19523580 A1	08-02-1996
			JP 8062458 A	08-03-1996
US 5054870	A	08-10-1991	DE 3910710 A1	04-10-1990
			AT 108027 T	15-07-1994
			AU 625465 B2	09-07-1992
			AU 5214490 A	04-10-1990
			CA 2013455 A1	03-10-1990
			DE 59006275 D1	04-08-1994
			EP 0391248 A2	10-10-1990
			ES 2058648 T3	01-11-1994
			JP 1992211 C	22-11-1995
			JP 3040446 A	21-02-1991
			JP 7019900 B	06-03-1995
US 6252252	B1	26-06-2001	JP 11354828 A	24-12-1999
			JP 2000036642 A	02-02-2000
			JP 2000004067 A	07-01-2000
			JP 2000077683 A	14-03-2000
			CN 1232297 A	20-10-1999
			TW 406439 B	21-09-2000
DE 19947889	A	23-05-2001	DE 19947889 A1	23-05-2001
FR 2690304	A	22-10-1993	FR 2690304 A1	22-10-1993
DE 4243823	A	07-07-1994	DE 4243823 A1	07-07-1994
WO 0154321	A	26-07-2001	DE 10002521 A1	09-08-2001
			WO 0154321 A1	26-07-2001
			EP 1249088 A1	16-10-2002
			US 2002061174 A1	23-05-2002