

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
31 March 2005 (31.03.2005)

PCT

(10) International Publication Number
WO 2005/029580 A3

(51) International Patent Classification: ⁷ H01L 21/56, 33/00

(21) International Application Number:
PCT/US2004/029916

(22) International Filing Date:
13 September 2004 (13.09.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/666,399 18 September 2003 (18.09.2003) US

(71) Applicant (for all designated States except US): CREE, INC. [US/US]; 4600 Silicon Drive, Durham, NC 27703 (US).

(72) Inventors: LEUNG, Michael, S.; 509 4th Place, Port Hueneme, CA 93041 (US). TARSA, Eric, J.; 105 Dearborn Place #41, Goleta, CA 93117 (US). IBBETSON, James; 910 Randolph Road, Santa Barbara, CA 93111 (US).

(74) Agents: HEYBL, Jaye, G. et al.; Koppel, Jacobs, Patrick & Heybl, 555 St. Charles Drive, Suite 107, Thousand Oaks, CA 91360 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, 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, 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, NA, 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, US, UZ, VC, VN, YU, ZA, ZM, ZW.

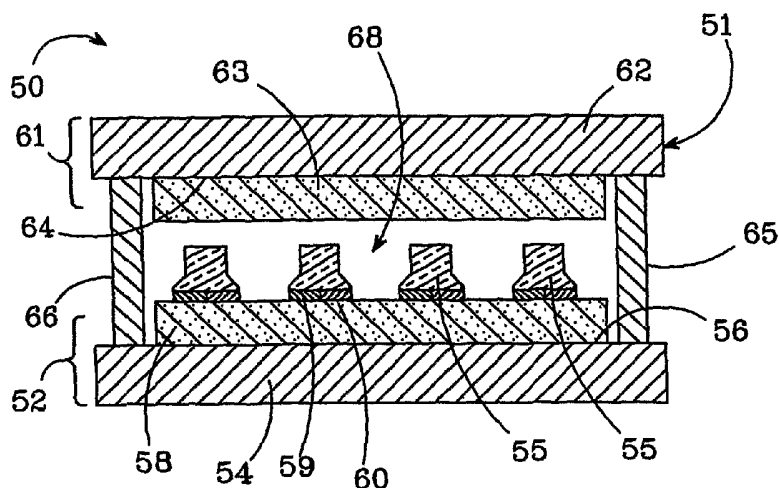
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, 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).

Published:
— with international search report

(88) Date of publication of the international search report:
18 May 2006

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.

(54) Title: CONNECTOR



(57) Abstract: A method and apparatus (50) for coating a plurality of semiconductor devices (55) that is particularly adapted to coating LEDs (55) with a coating material (70) containing conversion particles. One method according to the invention comprises providing a mold with a formation cavity (68). A plurality of semiconductor devices (55) are mounted within the mold formation cavity (68) and a curable coating material (70) is injected or otherwise introduced into the mold to fill the mold formation cavity (68) and at least partially cover the semiconductor devices (55). The coating material (70) is cured so that the semiconductor devices (55) are at least partially embedded in the cured coating material. The cured coating material (70) with the embedded semiconductor devices is removed from the formation cavity (68). The semiconductor devices (55) are separated so that each is at least partially covered by a layer of the cured coating material (70). One embodiment of an apparatus (50) according to the invention for coating a plurality of semiconductor devices comprises a mol housing (51) having a formation cavity (68) arranged to hold semiconductor devices (55), The formation cavity (68) is also arranged so that a durable coating material (70) can be injected into and fills the formation cavity (68) to at least partially covering the semiconductor devices (55).

WO 2005/029580 A3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/029916

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L21/56 H01L33/00

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 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, PAJ, 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	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 10, 17 November 2000 (2000-11-17) -& JP 2000 208820 A (STANLEY ELECTRIC CO LTD), 28 July 2000 (2000-07-28)	1-7, 11-26, 29,30, 33-37
Y	abstract	9,27,28, 31,32
A		8,10
X	----- EP 1 198 005 A (HITACHI, LTD) 17 April 2002 (2002-04-17)	1-4,7,8, 10-19
Y	paragraphs [0051], [0067]; figures 6,11	9,27,28, 31,32
A		5,6, 20-37
	----- -/--	

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

24 May 2005

Date of mailing of the international search report

03/06/2005

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

Krause, J

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/029916

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2002/096789 A1 (BOLKEN TODD O) 25 July 2002 (2002-07-25) paragraph [0020] - paragraph [0022]; figures 4-6	1-4,7, 10-19 5,6,8,9, 20-37
X A	----- US 6 087 202 A (EXPOSITO ET AL) 11 July 2000 (2000-07-11) column 2, line 35 - column 3, line 53; figures 3,5,6,8,9	1-4,7, 11-19 5,6, 8-10, 20-37
X A	----- PATENT ABSTRACTS OF JAPAN vol. 2002, no. 05, 3 May 2002 (2002-05-03) -& JP 2002 009097 A (OKI ELECTRIC IND CO LTD), 11 January 2002 (2002-01-11) abstract	1-4,7, 11-19 5,6, 8-10, 20-37
P,X P,A	-& US 6 624 058 B1 (KAZAMA TAKAO) 23 September 2003 (2003-09-23) column 5, line 25 - column 9, line 42; figures 3-5	1-4,7, 11-19 5,6, 8-10, 20-37
X A	----- US 6 338 813 B1 (HSU KAO-YU ET AL) 15 January 2002 (2002-01-15) column 2, line 49 - column 4, line 21; figures 2-5	1-4,7, 11-19 5,6, 8-10, 20-37
A	----- US 2002/001869 A1 (FJELSTAD JOSEPH) 3 January 2002 (2002-01-03) paragraph [0030] - paragraph [0036] paragraph [0041] - paragraph [0043] paragraph [0050] - paragraph [0052]; figures 3,7,12	1-37

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/029916

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 2000208820	A	28-07-2000	NONE	
EP 1198005	A	17-04-2002	WO 0059036 A1 EP 1198005 A1 TW 463334 B US 6627997 B1	05-10-2000 17-04-2002 11-11-2001 30-09-2003
US 2002096789	A1	25-07-2002	US 2004126933 A1 US 2005012227 A1	01-07-2004 20-01-2005
US 6087202	A	11-07-2000	FR 2764111 A1 EP 0883171 A1 JP 3013347 B2 JP 11074296 A	04-12-1998 09-12-1998 28-02-2000 16-03-1999
JP 2002009097	A	11-01-2002	US 2004029318 A1 US 6624058 B1	12-02-2004 23-09-2003
US 6624058	B1	23-09-2003	JP 2002009097 A US 2004029318 A1	11-01-2002 12-02-2004
US 6338813	B1	15-01-2002	NONE	
US 2002001869	A1	03-01-2002	US 2003136968 A1 US 2005035357 A1	24-07-2003 17-02-2005