

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
19 December 2002 (19.12.2002)

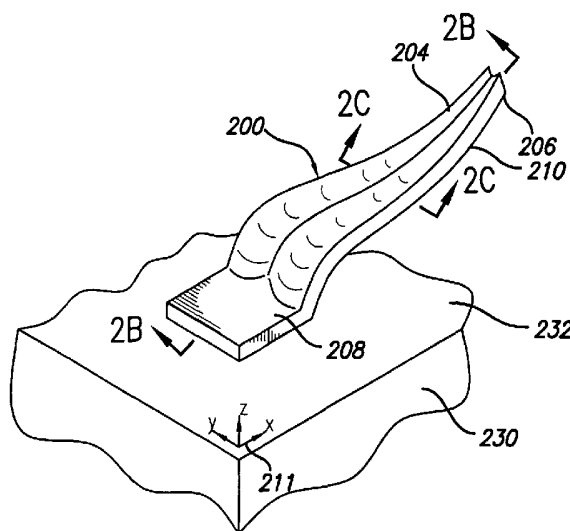
PCT

(10) International Publication Number
WO 02/101830 A3

- (51) International Patent Classification⁷: H01L 23/48, G01R 1/073
- (21) International Application Number: PCT/US02/17970
- (22) International Filing Date: 6 June 2002 (06.06.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 09/880,658 13 June 2001 (13.06.2001) US
- (71) Applicant (for all designated States except US): FORMFACTOR, INC. [US/US]; 2140 Research Drive, Livermore, CA 94550 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): ELDRIDGE, Benjamin, N. [US/US]; 651 Sheri Lane, Danville, CA 94526 (US). WENZEL, Stuart, W. [US/US]; 3726 Linwood Avenue, Oakland, CA 94602 (US).
- (74) Agents: MERKADEAU, Stuart, L. et al.; FORMFACTOR, INC., 2140 Research Drive, Livermore, CA 94550 (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, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, 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, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Declaration under Rule 4.17:
— of inventorship (Rule 4.17(iv)) for US only

[Continued on next page]

(54) Title: ELECTRONIC COMPONENTS WITH PLURALITY OF CONTOURED MICROELECTRONIC SPRING CONTACTS



(57) Abstract: An electronic component having a plurality of microelectronic spring contacts mounted to a planar face of the component. Each of the microelectronic spring contacts has a contoured beam, which may be formed of an integral layer of resilient material deposited over a contoured sacrificial substrate, and comprises a base mounted to the planar face of the component, a beam connected to the base at a first end of the beam, and a tip positioned at a free end of the beam opposite to the base. The beam has an unsupported span between its free end and its base. The microelectronic spring contacts are advantageously formed by depositing a resilient material over a molded, sacrificial substrate. The spring contacts may be provided with various innovative contoured shapes. In various embodiments of the invention, the electronic component comprises a semiconductor die, a semiconductor wafer, a LGA socket, an interposer, or a test head assembly.



WO 02/101830 A3



Published:

— *with international search report*

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.

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

1 May 2003

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/17970

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H01L23/48 G01R1/073

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 G01R H01R

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	WO 01 09952 A (FORMFACTOR INC) 8 February 2001 (2001-02-08) cited in the application	1,2,8,9, 16
Y		5-7,12, 14,28-33
A	page 8, paragraph 6 -page 26, paragraph 1; figures 2-4,6-9	3,4,10, 11,13, 15,17-27
X	US 5 914 614 A (BEAMAN BRIAN SAMUEL ET AL) 22 June 1999 (1999-06-22)	1,10,11, 13
Y		3,28
A	column 3, line 42 -column 4, line 12; figures 1,2,7	2,4-9, 12, 14-27, 29-33
	--- -/--	

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

30 January 2003

Date of mailing of the international search report

10/02/2003

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/US 02/17970

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 064 213 A (KHANDROS IGOR Y ET AL) 16 May 2000 (2000-05-16)	3,12,14, 29
A	cited in the application column 7, line 43 -column 8, line 38; figure 1A	1,2, 4-11,13, 15-28, 30-33
	column 14, line 27 - line 52; figure 6C	
X	US 5 173 055 A (GRABBE DIMITRY G) 22 December 1992 (1992-12-22)	1,4
A	column 1, line 64 -column 3, line 30; figures 7-9	2,3,5-33
Y	WO 00 33096 A (FORMFACTOR INC) 8 June 2000 (2000-06-08)	5-7, 30-33
A	page 3, line 24 -page 5, line 2; figure 3	1-4,8-29
X	US 5 152 695 A (GRABBE DIMITRY G ET AL) 6 October 1992 (1992-10-06)	1,4,8, 12,15
A	column 1, line 55 -column 3, line 24; figures 1-12	2,3,5-7, 9-11,13, 14,16-33
X	WO 99 38229 A (KINETRIX INC ;SLOCUM ALEXANDER H (US)) 29 July 1999 (1999-07-29)	1
A	page 6, line 2 -page 8, line 28; figures 1A-C	2-33

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/17970

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0109952	A	08-02-2001	AU 6385600	A 19-02-2001
			EP 1208595	A2 29-05-2002
			WO 0109952	A2 08-02-2001
			US 2001001080	A1 10-05-2001
			US 2001044225	A1 22-11-2001
US 5914614	A	22-06-1999	US 5811982	A 22-09-1998
			US 6329827	B1 11-12-2001
US 6064213	A	16-05-2000	US 5772451	A 30-06-1998
			US 5974662	A 02-11-1999
			US 5829128	A 03-11-1998
			US 5601740	A 11-02-1997
			US 5741668	A 21-04-1998
			US 5917707	A 29-06-1999
			US 5476211	A 19-12-1995
			AU 3073797	A 05-12-1997
			AU 3073997	A 05-12-1997
			AU 3136697	A 05-12-1997
			CN 1197514	A 28-10-1998
			CN 1225724	A 11-08-1999
			EP 0898712	A2 03-03-1999
			EP 0839321	A1 06-05-1998
			EP 0839322	A1 06-05-1998
			EP 0839323	A1 06-05-1998
			JP 2001526833	T 18-12-2001
			JP 2002509604	T 26-03-2002
			JP 11504725	T 27-04-1999
			JP 2001526772	T 18-12-2001
			JP 2001156223	A 08-06-2001
			KR 2000011125	A 25-02-2000
			WO 9744676	A1 27-11-1997
			WO 9743656	A2 20-11-1997
			WO 9743653	A1 20-11-1997
			WO 9743654	A1 20-11-1997
			US 6483328	B1 19-11-2002
			US 2002004320	A1 10-01-2002
			US 6429029	B1 06-08-2002
			US 6184053	B1 06-02-2001
			AU 4159896	A 06-06-1996
			AU 4159996	A 17-06-1996
			AU 4160096	A 06-06-1996
			AU 4237696	A 06-06-1996
AU 4283996	A 19-06-1996			
AU 5939796	A 11-12-1996			
AU 5964096	A 11-12-1996			
AU 5964196	A 11-12-1996			
AU 5965796	A 22-05-1997			
AU 6028796	A 11-12-1996			
AU 6377796	A 11-12-1996			
AU 6635296	A 18-12-1996			
CN 1171167	A 21-01-1998			
CN 1208368	A 17-02-1999			
CN 1191500	A 26-08-1998			
DE 69623294	D1 02-10-2002			
EP 1198001	A2 17-04-2002			
EP 1232828	A1 21-08-2002			
EP 1262782	A2 04-12-2002			

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 02/17970

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6064213	A	EP 0795200 A1	17-09-1997
US 5173055	A	22-12-1992	NONE
WO 0033096	A	08-06-2000	US 6483328 B1 19-11-2002 AU 1933700 A 19-06-2000 CN 1328644 T 26-12-2001 EP 1135693 A1 26-09-2001 JP 2002531836 T 24-09-2002 WO 0033096 A1 08-06-2000
US 5152695	A	06-10-1992	NONE
WO 9938229	A	29-07-1999	US 2002053463 A1 09-05-2002 AU 2560699 A 09-08-1999 TW 424145 B 01-03-2001 WO 9938229 A1 29-07-1999