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(54) Title: CARBON NANOTUBES SOLDER COMPOSITE FOR HIGH PERFORMANCE INTERCONNECT

(57) Abstract: An embodiment of the present invention is an interconnect technique. Carbon nanotubes (CNTs) are prepared. A CNT-solder composite paste is formed containing the CNTs and solder with a pre-defined volume fraction.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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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)
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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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	US 2004/151885 A1 (JAYARAMAN SAIKUMAR [US] ET AL) 5 August 2004 (2004-08-05)	1, 3, 4, 8, 11-14
Y	paragraphs [0023] - [0031]; figure 3 paragraphs [0049], [0050]; figure 8 -----	2, 9, 10
X	US 2005/139642 A1 (KONING PAUL A [US] ET AL) 30 June 2005 (2005-06-30)	1-4
Y	paragraphs [0012] - [0030], [0041]; figures 1, 2A, 2B -----	2, 9, 10
X	US 2005/061496 A1 (MATABAYAS JAMES CHRISTOPHER [US]) 24 March 2005 (2005-03-24)	1, 3, 4, 8, 13, 14
	paragraphs [0019], [0024]; figure 2 paragraphs [0034] - [0037]; figures 4, 5 -----	
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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 2003/089892 A1 (FOX RICHARD T [US] ET AL FOX RICHARD T [US] ET AL) 15 May 2003 (2003-05-15) paragraphs [0006] - [0026] -----	1-20
A	US 2005/161489 A1 (PIKULSKI JOSEPH L [US]) 28 July 2005 (2005-07-28) paragraphs [0009], [0010], [0015], [0016], [0019], [0020]; figure 1 paragraphs [0027] - [0032] -----	1-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004151885 A1	05-08-2004	US 2007251639 A1	01-11-2007
US 2005139642 A1	30-06-2005	NONE	
US 2005061496 A1	24-03-2005	CN 1853268 A	25-10--2006
		DE 112004001783 T5	17-08--2006
		JP 2007506642 T	22-03--2007
		KR 20060056394 A	24-05--2006
		TW 241005 B	01-10--2005
		US 2005269726 A1	08-12--2005
		WO 2005031864 A1	07-04--2005
US 2003089892 A1	15-05-2003	US 2003173550 A1	18-09-2003
US 2005161489 A1	28-07-2005	NONE	