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- (54) **Title:** APPARATUS AND METHODS FOR THERMAL MANAGEMENT OF ELECTRONIC DEVICES

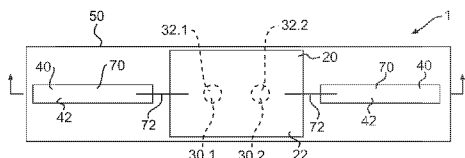


FIG. 1A

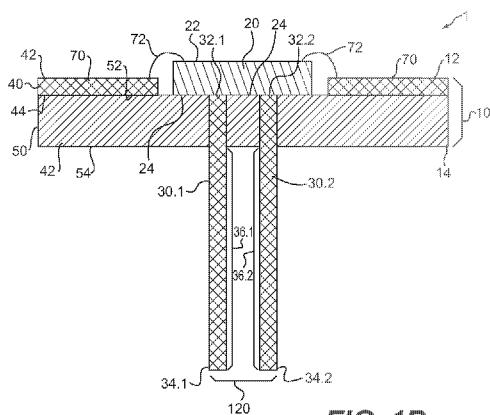


FIG. 1B

(57) **Abstract:** An apparatus is disclosed that may include a printed circuit board (PCB) and an electronics package may be disposed about the first surface of the PCB. The PCB may include a metal layer and a core, and, in some aspects, may include multiple cores interposed between multiple metal layers, and in some embodiments a backplane may be disposed along the core. The metal layer may be disposed on a core first surface. The metal layer may comprise metal or other conductive material suitable to define traces, which may be circuit paths for electronic components affixed to the PCB. In some aspects, the core may be electrically non-conducting, and may be thermally insulating, and, accordingly, inhibit the transfer of heat from the electronics package through the PCB. However, pins may be configured to pass through the PCB including the core from the core first surface to the core second surface to conduct heat generated by the electronics package away for dispersion. In some embodiments, the pins may pass into the backplane. A pad may be disposed between the electronic package and the core in some embodiments, the pins passing into the pad.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/080925**A. CLASSIFICATION OF SUBJECT MATTER*****F21V 29/00(2006.01)i, H05K 7/20(2006.01)i, F21V 29/00(2006.01)i***

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)

IPCC: H05K 7/20, H01R 4/60, F21V 29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility Models since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

D/B: eKIPASS(Searching System of KIPO)

PCB, printed circuit board, pin, dissipation, heat sink

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2003-178602 A (KOITO MFG CO. LTD.), 27 June 2003, See Figs. 1, 2, paragraphs [0010] to [0013]	1-36
X	US 2006/0018099 A1 (CHEN), 26 January 2006, See Figs. 1, 4, paragraphs [0017] to [0018]	1-36
X	US 6,466,440 B2 (KANEKO), 15 October 2002, See Figs. 1, 2, column 4 lines 24 to 59	1-36
X	US 6,840,794 B2 (CHIU), 11 January 2005, See Figs. 1, 2, column 2 line 28 to column 4 line 3	1-36
X	US 6,407,923 B1 (GERLOCK et al.), 18 June 2002, See Fig. 1, column 4 lines 6 to 27	1-36



Further documents are listed in the continuation of Box C.



See patent family annex.

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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
JP 2003-178602 A	27.06.2003	NONE	
US 2006-018099 A1	26.01.2006	US 7236366 B2	26.06.2007
US 6466440 B2	15.10.2002	EP 1195218 A2	10.04.2002
		EP 1195218 A3	28.12.2005
		JP 2002-118353 A	19.04.2002
		JP 3491199 B2	26.01.2004
		US 2002-041485 A1	11.04.2002
US 6840794 B2	11.01.2005	US 2004-192104 A1	30.09.2004
US 6407923 B1	18.06.2002	AU 2002-39773 A1	24.06.2002
		US 2002-071251 A1	13.06.2002
		WO 02-49102 A1	20.06.2002