

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2024/0213164 A1 LIU et al.

Jun. 27, 2024 (43) **Pub. Date:**

(54) TSV-TYPE EMBEDDED MULTI-DIE INTERCONNECT BRIDGE ENABLING WITH THERMAL COMPRESSION NON-CONDUCTIVE FILM (TC-NCF) **PROCESS**

(71) Applicant: Intel Corporation, Santa Clara, CA

(72) Inventors: Minglu LIU, Chandler, AZ (US); Gang DUAN, Chandler, AZ (US); Liang HE, Chandler, AZ (US); Ziyin LIN, Chandler, AZ (US); Elizabeth NOFEN, Phoenix, AZ (US); Yiqun BAI, Chandler, AZ (US); Jonathan ATKINS, Phoenix, AZ (US); Jesus S. NIETO PESCADOR, Chandler, AZ (US); Srinivas V. PIETAMBARAM, Chandler, AZ (US); Kristof **DARMAWIKARTA**, Chandler, AZ (US)

(21) Appl. No.: 18/089,483

(22) Filed: Dec. 27, 2022

Publication Classification

(51)	Int. Cl.	
	H01L 23/538	(2006.01)
	H01L 23/00	(2006.01)
	H01L 23/522	(2006.01)
	H01L 23/528	(2006.01)

(52) U.S. Cl. CPC H01L 23/5381 (2013.01); H01L 23/5226 (2013.01); H01L 23/5283 (2013.01); H01L 24/14 (2013.01); H01L 2224/16104 (2013.01)

(57)ABSTRACT

Embodiments disclosed herein include an electronic package. In an embodiment, the electronic package comprises a package substrate, and an opening in the package substrate. In an embodiment, a plurality of first pads are provided at a bottom of the opening, and a bridge die is in the opening. In an embodiment, the bridge die comprises a plurality of second pads that are coupled to the first pads by solder. In an embodiment, a non-conductive film (NCF) is around the solder between the first pads and the second pads.

