

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
10 October 2024 (10.10.2024)



(10) International Publication Number
WO 2024/211017 A1

(51) International Patent Classification:

H01L 23/373 (2006.01) H01L 23/051 (2006.01)
H01L 23/433 (2006.01) H01L 25/07 (2006.01)
H05K 7/20 (2006.01) H01L 25/11 (2006.01)
H01L 23/14 (2006.01) H01L 23/367 (2006.01)
H01L 23/10 (2006.01) H01L 23/40 (2006.01)
H01L 23/31 (2006.01) H01L 23/538 (2006.01)

(21) International Application Number:

PCT/US2024/017614

(22) International Filing Date:

28 February 2024 (28.02.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

18/295,217 03 April 2023 (03.04.2023) US

(71) Applicant: SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC [US/US]; 5701 N. Pima Road, Scottsdale, Arizona 85250 (US).

(72) Inventors: YUN, Changsun; Mokdongseo-ro 340, 928/906, Seoul, Seoul 08089 (KR). JEON, Oseob; Raemian shinbanpo palace, 103-dong, 502-ho, 35, Jamwon-ro 8-gil, Seocho-gu, Seoul, Seoul 06518 (KR).

(74) Agent: LEIJA, Javier M. et al.; Onsemi, 5701 N. Pima Road, Scottsdale, Arizona 85250 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,

(54) Title: POWER MODULE UTILIZING INJECTABLE CONDUCTIVE COMPONENT FOR DIRECT COOLING

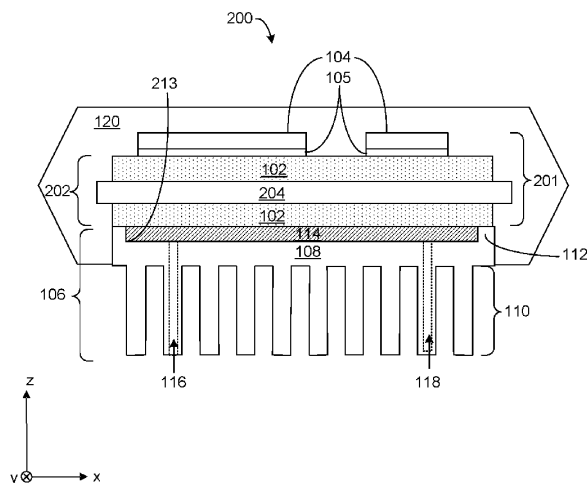


FIG. 2

(57) Abstract: An injectable conductive component (114) can be used to couple a high-power semiconductor chip assembly (101) to a heat sink (106), in automotive and industrial applications. The injectable conductive component (114) provides a low-resistance interface material and also acts as a bonding agent (105). A cavity (113) bounded by the chip assembly (101) and the heat sink (106) can form a container for the injectable conductive component (114), which remains in a liquid phase during operation of the chip assembly (101). The container can be formed as a cavity (113) by either removing a portion of the heat sink (106), or by introducing a spacer between the chip assembly (101) and the heat sink (106), using a sealing material. The injectable conductive component (114) can be introduced into the cavity (113) by injection through a hole (116) formed in a back side of the heat sink (106).

[Continued on next page]

MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,
NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,
RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,
TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST,
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,
RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE,
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*