Double-Side Cooled Power Modules with Sintered-Silver Interposer

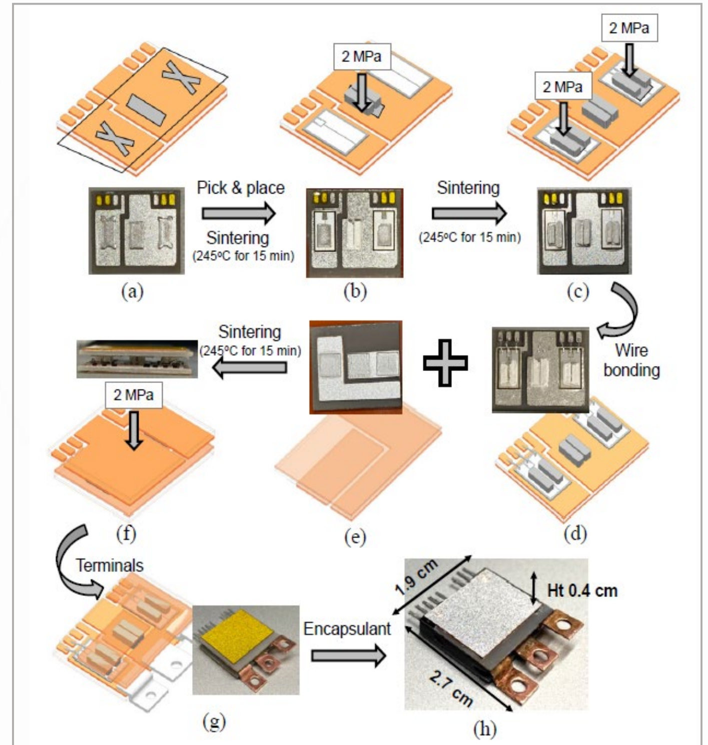
VTIP 21-004 “Double-Side Cooled Power Modules with Sintered-Silver Interposer”

THE CHALLENGE

Advances of wide bandgap devices, e.g. SiC and GaN, enable power electronics converters with higher efficiency and higher power-density, but pose significant challenges on power module packaging. Planar, double-side cooled power modules are emerging in electric-drive inverters because of their low profile, better heat extraction, and lower package parasitic inductances. However, the double-side cooled package is structurally more rigid than its single-side cooled wire-bonded package from the interconnection between copper interposers and device chips, raising concerns for its thermo-mechanical reliability.

OUR SOLUTION

Guo-Quan Lu and his team at Virginia Tech have developed an alternative interposer material instead of copper for the double-side cooled power module that is well suited to the needs of an electric vehicle or alternative machines using a similar amount of power. This power module with sintered-silver interposers has a number of advantages over the state of the art including a high density and low profile packaging structure, double-side cooling technology leading to 33% reduction in junction temperature, high-temperature capability due to the sintered-silver joints for attachment layers, notably reduced thermo-mechanical stress resulting in improved thermo-mechanical reliability, low parasitic inductance for fast switching and reduced switching loss, and adjustable height and no additional coating for the interposers for ease of fabrication.



Fabrication steps of the double-side cooled module.

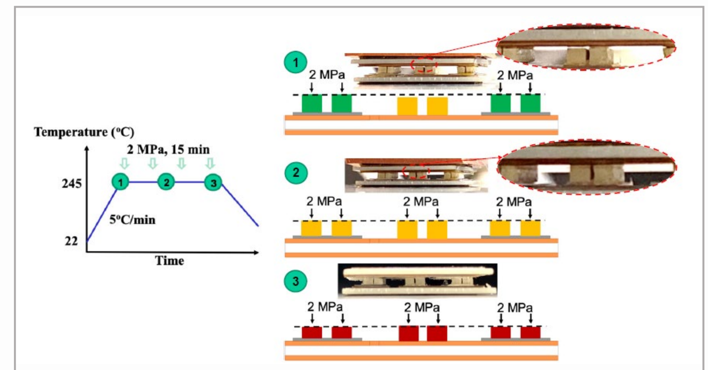


Illustration of the adjustable height of sintered-silver interposers at three marked steps.

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