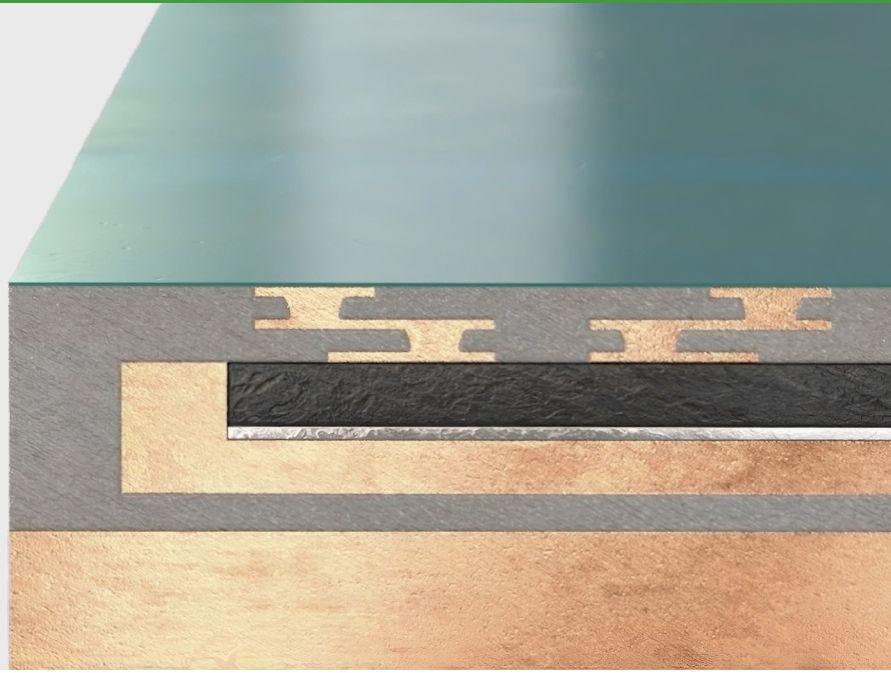




WIDE BANDGAP POWER ELECTRONICS

THE PACKAGE THAT STOPS HOLDING YOU BACK



GaN and SiC transistors are designed to switch extremely fast. But the packages around them add inductance that limits switching speed – and layer after layer of thermal resistance that forces designers to throttle power. TCLAD's Embedded Die Substrate (EDS) eliminates both constraints in a single architecture built on standard PCB fabrication equipment.

1-2 nH

Power loop inductance
– matches best
published results

6×

Faster switching vs.
equivalent surface-
mount designs

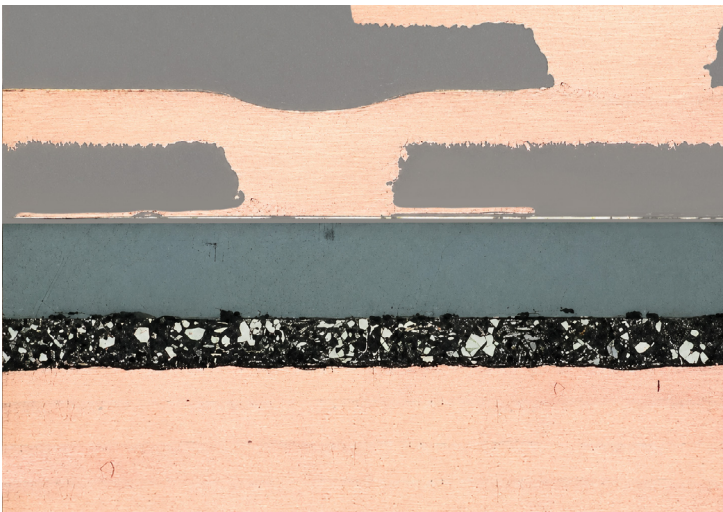
< 2%

Voltage overshoot at
switching node

2

Thermal interfaces
junction-to-heatsink vs.
6+ in conventional

EMBEDDED DIE WITH VIAS



1

Die buried in thick copper

Bare GaN/SiC sits in a precision-milled pocket in a Cu spreader up to 1 mm thick. No wire bonds, no package substrate, no TIM.

2

Sintered silver die attach

150 W/m•K conductivity – 2.5× better than SAC305 – with a 961°C melt point. Survives every downstream lamination and reflow step.

3

Laser-drilled copper microvias

Gate, source, and drain connected directly through plated vias – cutting power loop inductance to 1-2 nH measured.

HOW IT WORKS

1 Copper Heat Spreader

Thick copper plate heat spreader with pockets for integrated circuits (die).

2 Conductive die attach

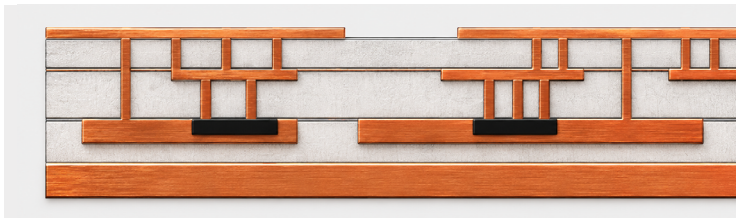
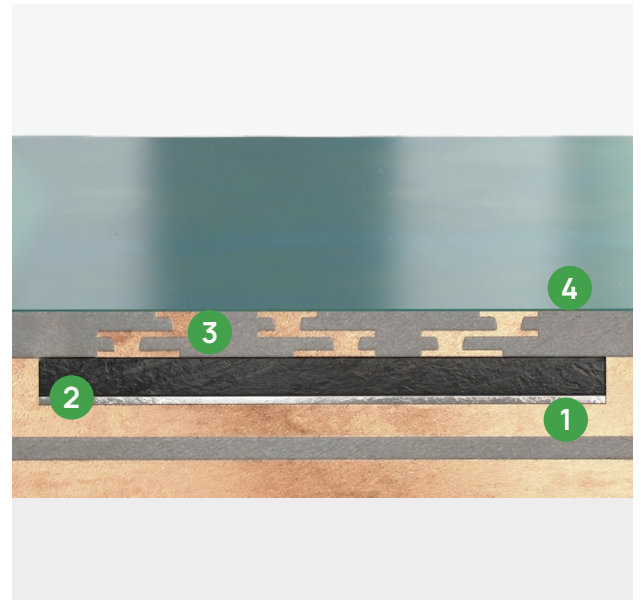
Bare GaN or SiC dies mounted in place with conductive die attach.

3 Laminate and drill microvias

High-performance dielectric materials layered over die with microvias directly attached to the die.

4 Signal and drive layers

PCB stack up layers created using standard PCB Fabrication processes, utilizing high-performance dielectric materials.



EDS stackup: thick Cu spreader (base) → sintered Ag die attach → SPL-15 dielectric → Cu foil → signal and drive layers

EDS VS. CONVENTIONAL APPROACHES

Thermal Path

CONVENTIONAL: 6+ interfaces: die attach → DBC → ceramic → baseplate → TIM → heatsink

EDS: 2 interfaces: sintered Ag → thick Cu spreader → SPL-15 dielectric → heatsink

Electrical Parasitics

CONVENTIONAL: Wire-bonded modules: 6.7–15 nH, voltage overshoot limits switching speed

EDS: 1–2 nH measured, < 2% overshoot, 6× faster switching confirmed

Reliability

CONVENTIONAL: Solder die attach reflows during assembly; wire bonds fail by heel fatigue

EDS: Sintered Ag: 961°C melt point, up to 10× longer power-cycling life vs. solder

TARGET APPLICATIONS

Aerospace &
Defense

EV Onboard
Chargers

Industrial Motor
Drives

High-Density
DC-DC

Power
Semiconductors

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