AMB Substrates for SiC Modules - Material & Spec Sheet

Silicon nitride substrates for active-metal-brazed packages - strength, CTE and thermal cycling

As SiC devices push power density and junction temperature higher, the substrate - not the chip - is often the weak link. A traction inverter sees thousands of thermal cycles per year, each one flexing the ceramic-copper joint. These are the values our AMB silicon nitride substrates are supplied to.

Why Si3N4 AMB

Property	Si3N4 (AMB)	Why it matters
Bending strength	>= 600 MPa	Survives thermal cycling - roughly double alumina and AlN
Thermal conductivity	>= 80 W/m*K	Dissipates module heat without going brittle
Thermal expansion	~3.0 x10^-6/K	Matches the SiC chip, so the braze joint is not worked every cycle
Size	Up to ~140 x 190 mm	Covers large module footprints
Bonding	AMB (active metal brazing)	Titanium-containing braze bonds copper directly to the ceramic

Substrate material comparison

Property	Al2O3 (Alumina)	AlN	Si3N4
Bending strength (MPa)	~300	~300	>= 600
Thermal conductivity (W/m*K)	~24	~170	>= 80
Thermal expansion (x10^-6/K)	~7.2	~4.5	~3.0
Thermal-cycle reliability	Fair	Good	Excellent
Best for	Cost-sensitive	Max heat removal	Harsh cycling

When AlN wins: if the bottleneck is pure heat flux - a high-current industrial converter with stable mounting and few cycles - AlN at ~170 W/m*K still conducts better. Choose Si3N4 when mechanical shock, vibration and thermal cycling dominate, which is the case in every vehicle.

Standard capability and inspection

Item	Specification
Material	Gas-pressure sintered Si3N4, >= 3.20 g/cm3, produced on dedicated substrate lines with controlled thickness and flatness.
Surface	Fine-ground for AMB brazing; thickness and flatness controlled, surface state agreed per project.
Delivery form	Substrate blanks ready for the customer AMB / DBC process, or finished brazed substrates to your pattern.
Inspection	In-house density, phase (XRD), microstructure (SEM) and strength testing; on-site reliability (Weibull) lab.
Documentation	Material certificate naming grade, route and measured density (> 99% of theoretical).

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Applications

EV traction inverters (800 V SiC modules); photovoltaic and energy-storage converters that cycle daily; rail, wind and industrial drives where a substrate failure means pulling a converter out of service; SiC module baseplates and other power-electronics assemblies.

From module requirement to volume supply

Step	What happens	Lead time
1. Drawing and duty cycle	Substrate footprint, thickness, pattern and the thermal profile the module will see.	-
2. Engineering review	Grade, sintering route, size capability and surface state, returned before you commit.	24-48 h
3. Sample substrates	Supplied with density, strength and phase data for your own brazing and cycling trials.	-
4. Production	Per-lot records and material certificates; scheduled volume supply.	-

Why NitriCeram

NitriCeram is a brand of Shandong Dolphin Technology Co., Ltd., operating an integrated line from powder synthesis through forming, gas-pressure sintering, HIP, precision machining and in-house testing. The AMB Si3N4 substrate line was launched in 2023 for EV power modules and today runs as two dedicated production lines. Sintering fleet: 15 x gas-pressure sintering furnaces, 9 x HIP, 3 x hot press. About 100 R&D; staff (15 PhDs, 40+ MSc). ISO 9001 quality management system.

Send your substrate drawing and thermal profile to dolphintec@aliyun.com - we reply within 24-48 hours with a manufacturability review, recommended grade and price. NDA signed on request.