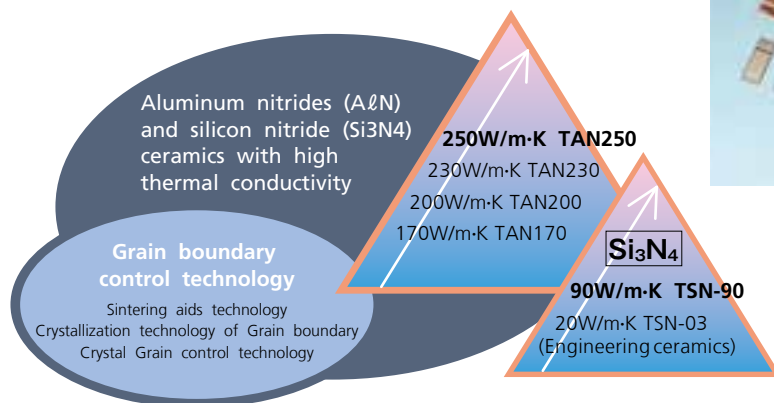
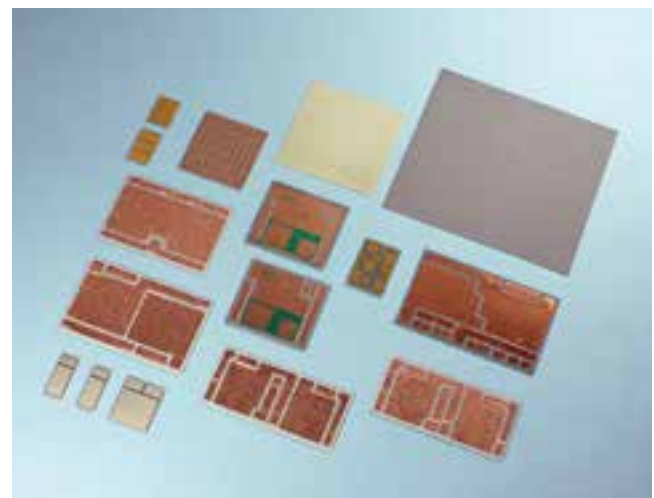


Fine Ceramics for Electronics

Aluminum nitride (AlN),
Silicon nitride (Si₃N₄) ceramics

Fine ceramic substrates with high thermal conductivity are becoming indispensable components under the circumstances needs for high power, high integration, slim and lightweight, high frequency and environmental friendliness prevail. We take advantage of one of our core technologies, the grain boundary control of ceramic microstructure, to produce the aluminum nitride (AlN) and the silicon nitride (Si₃N₄) substrates with the world highest thermal conductivity on a commercial basis.

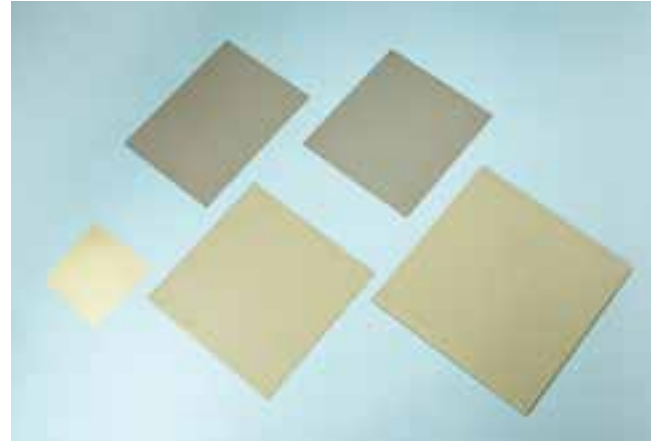


Typical values for properties of fine ceramics for electronics

Item	Unit	Aluminum nitride (AlN)				Si ₃ N ₄		
		TAN-170	TAN-200	TAN-230	TAN-250	TSN-90		
Density	Mg/m ³	3.3				3.2		
Water absorption	%	0.00				0.00		
Color		White				Gray		
Thermal properties	Specific heat		J/kg·K				740	
	Thermal conductivity		W/m·K	160-180	190-210	220-235	240-255	85-95
	Coefficient of thermal expansion	RT-500°C	x10 ⁻⁶ /K	4.6				2.6
	Critical diff. temperature	(ΔTc)	°C	600				800
Electrical properties	Dielectric strength	50Hz	kV/mm	15				15
	Volume resistivity	25°C	Ω·m	>10 ¹²				>10 ¹²
	Dielectric constant	1MHz		8.8				8.1
	Dielectric factor	1MHz	tanδx10 ⁻⁴	5.0				3.0
Mechanical properties	Hardness	HV(0.5kgf)		1,000				1,500
	Bending strength		MPa	>300				600-700
	Fracture toughness	at RT	MPa·m ^{1/2}	2.5-3.5				6-7
	Young's modulus	at RT	GPa	330				317
	Poisson's ratio			0.24				0.27
Chemical resistance	Acid		Excellent				Excellent	
	Alkali		Good				Excellent	
Features		High thermal conductivity Low loss at high frequency				High thermal conductivity High strength		
Main applications		Substrates for semiconductor assembly Radiator plates Heat sinks				Substrates for semiconductor assembly Radiator plates (for compression force) Heat sinks		

Plain substrates (AlN, Si₃N₄)

We offer plain substrates, which have a dense, minute microstructure made by our material and sintering technology that took a long time to develop. To meet diversified needs of customers, we line up four kinds of aluminum nitride (AlN) plain substrates that differ in thermal conductivity and a high thermal conductive silicon nitride (Si₃N₄) plain substrate with excellent mechanical properties. Our plain substrates have a low thermal expansion coefficient similar to those of silicon semiconductor chips, which means that they are best fit for semiconductor mounting substrates. They are widely applied to various substrates including submount substrates and thick/thin microwave circuit substrates.



Standard design

Item	Unit	Aluminum nitride (AlN)			Silicon nitride (Si ₃ N ₄)
		TAN-170	TAN-200	TAN-230	TSN-90
Outer dimensions	mm	MAX 160×160 φ 210	MAX 160×160	MAX 100×100	MAX 170×130
	Tolerance	Standard ±1% ±0.2mm (Laser cut)			±0.15 (Laser cut)
Thickness	mm	0.4~2.5	0.4~1.5	0.635	0.32 0.635
	Tolerance	Standard ±10% ±0.02mm (Abrasive processing)			±0.05mm
Warp	mm/mm	0.4% Under			0.4% Under (≤50mm)
Surface area	—	Standard / Blast processing (Honing) / Lapped / Polished / No surface finish (As-Fired)			Blast processing (Honing)

Temperature dependency of thermal conductivity and coefficient of thermal expansion

