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Active Metal Brazed (AMB) Si₃N₄ Substrates DPIS⁽¹⁾



AMB-Si₃N₄ Substrate facts

- Silicon nitride ceramic TSN-90-F
Thicknesses: 0.25 mm/ 0.32 mm
- Active Metal Brazed Cu-OFC (99.99 %)
Thicknesses⁽²⁾: 0.30 mm/ 0.50 mm/ 0.80 mm
- Asymmetric brazing is possible up to 0.50 mm Cu thickness and a max. thickness difference of 0.10 mm
- Single unit or master card
- Surface finish: Ag optimized for silver sintering, Ni or NiAu, bare Cu
selective (partial) plating possible

Key features

- Best in class reliability
- Enables thick Cu layers (e.g. 0.8 mm)
- Thinner ceramics vs. AlN possible for equal thermal resistance
- Thermal conductivity > 80 W/m·K of Si₃N₄ ceramic

Special features

- Best quality functional surfaces, e.g. Ag finish optimized for silver sintering technology
- Pre-applied sinter⁽³⁾ / solder

Main properties of Si₃N₄ TSN-90-F

	Rating	Unit
Bending strength σ_b	> 650	MPa
Fracture toughness	6 - 7	MPa·m ^{1/2}
Thermal conductivity (@ 20 °C)	≥ 80	W/m·K
Coefficient of thermal expansion (20 °C - 500 °C)	2.6	10 ⁻⁶ /K
Young's modulus (@ 20 °C)	> 280	GPa
Thermal shock resistance ΔT_c (critical temperature difference)	800	K
Dielectric strength (@ 50 Hz)	15	kV/mm
Volume resistivity (@ 20 °C)	> 10 ¹²	Ω·m
Dielectric constant (@ 1 MHz)	8.1	
Dielectric loss factor (@ 1 MHz)	1.5	10 ⁻³

(1) Development Product Information Sheet, preliminary values

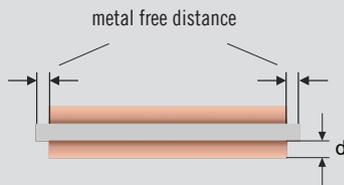
(2) Different material combinations on request

(3) Under development

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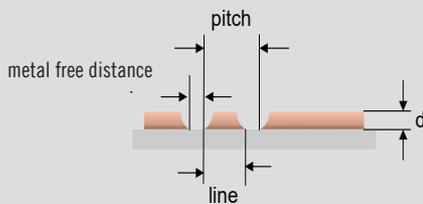
Design Rules AMB-Si₃N₄ DPIS⁽¹⁾

Metal free distance



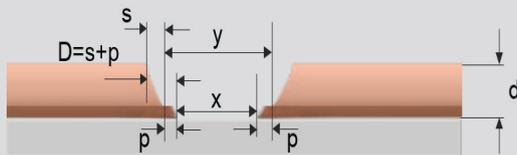
Thickness Cu d [mm]	Min. metal free distance [mm]
0.30	0.35
0.50	0.40
0.80	0.50

Structuring



Thickness Cu d [mm]	Min. metal free distance [mm]	Min. line [mm]	Min. pitch [mm]
0.30	0.50	0.50	1.00
0.50	0.70	0.70	1.40
0.80	1.00	1.00	2.00

Structuring tolerance



Thickness Cu d [mm]	Tolerance of structuring dimensions x, y [mm]
0.30	±0.20
0.50	±0.30
0.80	±0.40

Sidewall of structured pattern + protruding length

Thickness Cu d [mm]	D = sidewall of structured pattern (s) + protruding length (p*) [mm]
0.30 - 0.80	≤ 1/2 · d

(1) Development Product Information Sheet, preliminary values
*Typical protruding length p < 50 μm on each flank

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Mastercard / Single unit dimension & tolerances

Mastercard usable area	177.8 mm · 127 mm
Single unit dimension*	≥ 15 mm · 15 mm
Tolerances	+0.2 / -0.05 mm

*Smaller dimensions on request

Thickness tolerances

	0.3 mm	0.5 mm	0.8 mm
Copper thickness (per each Cu-layer)			
Copper thickness tolerance (per each Cu-layer)	+10 / -30 µm	+10 / -30 µm	+55 / -55 µm
Ceramic thickness tolerance	± 50 µm		
Total thickness (Cu+Si ₃ N ₄ +Cu) tolerance	± 10 %		

Warpage behavior depends on specific layout, single unit size and material combination and can only be specified after initial sample preparation.

Thickness combinations



Si ₃ N ₄ Thickness (mm)	Cu Thickness* (mm)		
	0.3	0.5	0.8
0.32	√	√	√
0.25	√	√	

*Others on request

Surface plating

Plating	Thickness (µm)
Ag (immersion silver)	typically 0.2 - 0.3
Electroless Ni	3 - 7 (8% ± 2% P)
Immersion Au (ENIG, Au Class 1)	0.01 - 0.05
Immersion Au (ENIG, Au Class 2)	0.03 - 0.13

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Metal properties

Surface roughness*

R_a < 1.5 µm, R_z < 16 µm

Copper peeling strength

> 9.8 N/mm

*Lower roughness on request

Customized surfaces for assembly process

Optimization of surface and assembly process parameters available or in development cooperation for:

- Silver sintering
- Solder wetting
- Heavy wire bondability

HET Academy R&D Application Center

Besides offering Assembly Materials, Bonding Wires and Metal Ceramic Substrates, Heraeus Electronics provides matching material solutions and R&D oriented partnerships to create individual solutions.

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Heraeus Electronics offers:

- Reliable IATF 16949 certified supply of:
 - ✓ Condura®.prime AMB-Si₃N₄ (active metal brazed Si₃N₄)
 - ✓ Condura®.extra DCB-ZTA (zirconia-toughened alumina)
 - ✓ Condura®.classic DCB-Al₂O₃ (direct copper bonded Al₂O₃)
- Condura®+ for example:
 - ✓ Engineering Services (Simulation, Prototype Design & Assembly, Testing and Qualification, Material Analysis)
 - ✓ Pre-applied sinter / solder
- To be your competent **one-stop materials solutions partner!**

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