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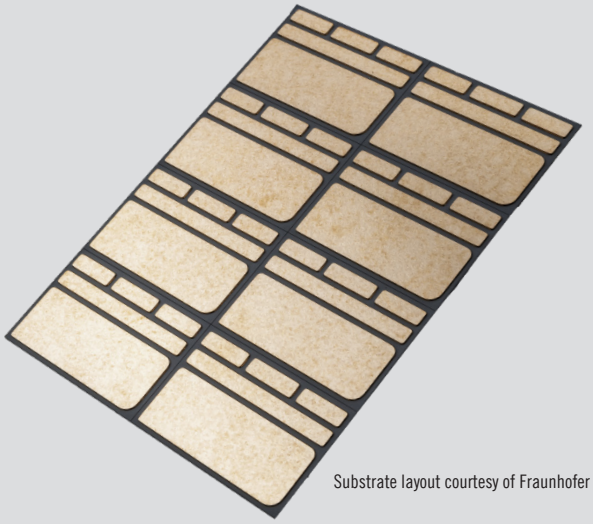
Condura®.ultra Si_3N_4 Ag free substrates DPIS(1)



Substrate layout courtesy of Fraunhofer IISB

Condura®.ultra-Si_3N_4 Ag free AMB Substrate facts

- Silicon nitride ceramic 60 W/m·K
  Thicknesses: 0.32 mm
  Silicon nitride ceramic 90 W/m·K
  Thicknesses: 0.25mm/0.32mm
- Active Metal Brazed Cu-OFC (99.99%)
  Thicknesses(2): 0.30 mm/0.40mm/0.50 mm/0.80mm
- Asymmetric brazing is possible up to 0.60 mm Cu thickness and a max. thickness difference of 0.10 mm
- Single unit or master card
- Surface finish: Ag optimized for silver sintering, bare Cu, Ni or NiAu selective Ag plating possible

Key features

- Excellent reliability for automotive applications (AMB has best in class reliability)
- Thermal conductivity:
  - ≥60 W/m.K
  - ≥90 W/m.K
- Cost effective high performance substrate
- Ag free AMB technology

Special features

- Best quality functional surfaces, e.g. Ag finish optimized for silver sintering technology
- Rimless Ag plating for more efficient and reliable surface area for bonding
- Special surface treatment to increase die shear strength
- Pre-applied sinter(3) / solder

Main properties of Si_3N_4 Ag free AMB

	60 W/m·K	90 W/m·K	
	Rating	**Rating**	**Unit**
Bending strength σ_0	≥650	≥650	MPa
Fracture toughness	≥6	≥6	$MPa \cdot m^{1/2}$
Thermal conductivity (@ 20 °C)	≥60	≥90	W/m·K
Coefficient of thermal expansion (20 °C - 500 °C)	2.6	2.6	$10^{-6}/K$
Young's modulus (@ 20 °C)	280	280	GPa
Dielectric strength (@ 50 Hz)	≥15	≥15	kV/mm
Volume resistivity (@ 20 °C)	$>10^{12}$	$>10^{12}$	Ω·m
Dielectric constant (@ 1 MHz)	8.1	8.1	
Dielectric loss factor (@ 1 MHz)	$1.5* 10^{-3}$	$1.5* 10^{-3}$	

(1) Development Product Information Sheet, preliminary values
(2) Different material combinations on request
(3) Under development

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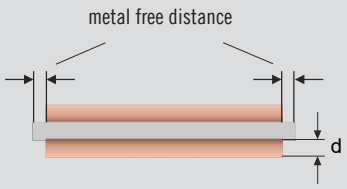
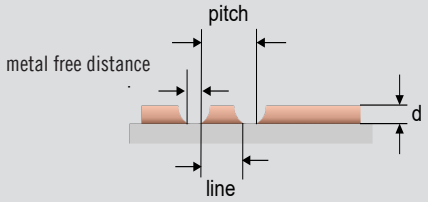
Design Rules Condura®.ultra-Si_3N_4 Ag free AMB DPIS(1)

Metal free distance



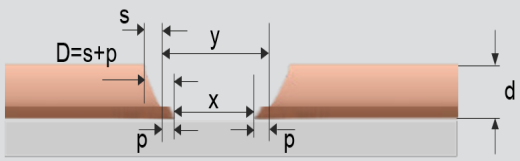
Thickness Cu d [mm]	Min. metal free distance [mm]
0.30	+/- 0.30
0.40	+/- 0.40
0.50	+/- 0.40
0.80	+/- 0.40

Structuring



Thickness Cu d [mm]	Min. metal free distance [mm]	Min. line [mm]	Min. pitch [mm]
0.30	0.50	0.50	1.00
0.40	0.70	0.70	1.40
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
0.40	±0.30
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	≤(½*d+0.1mm)

(1) Development Product Information Sheet, preliminary values
*Typical protruding length p < 0.1mm on each flank

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Mastercard / Single unit dimension & tolerances

Mastercard usable area	167mm · 127 mm
Single unit dimension*	≥ 15 mm · 15 mm
Tolerances	+0.2 / -0.05 mm

*Smaller dimensions on request

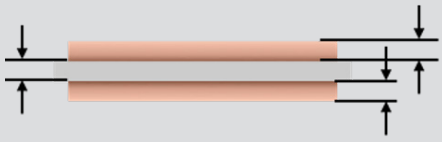
Thickness tolerances

Copper thickness (per each Cu-layer)	0.3 mm	0.4 mm	0.8 mm
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_3N_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_3N_4 Thickness (mm)	Cu Thickness* (mm)			
	0.3	0.4	0.5	0.8
0.32	√	√	√	√
0.25	√	√	√	

*Others on request

Surface plating

Plating	Thickness (µm)
Ag (immersion silver)	typically 0.3
Electroless Ni	3 - 7 (9% ± 2% P)
Immersion Au (ENIG, Au Class 1)	0.01 - 0.05
Immersion Au (ENIG, Au Class 2)	0.03 - 0.13

(1) Development Product Information Sheet, preliminary values

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Metal properties

Surface roughness*	Copper peeling strength
R_a < 1.5 µm, R_z < 16 µm	> 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.

04.2022, Layout: TU

Heraeus Electronics offers:

- Reliable IATF 16949 certified supply of:
  - ✓ Condura®.ultra Si_3N_4 (Ag-free Active Metal Brazed Si_3N_4)
  - ✓ Condura®.prime AMB-Si_3N_4 (Active Metal Brazed Si_3N_4)
  - ✓ Condura®.extra DCB-ZTA (zirconia-toughened alumina)
  - ✓ Condura®.classic DCB-Al_2O_3 (direct copper bonded Al_2O_3)
- 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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(1) Development Product Information Sheet, preliminary values

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