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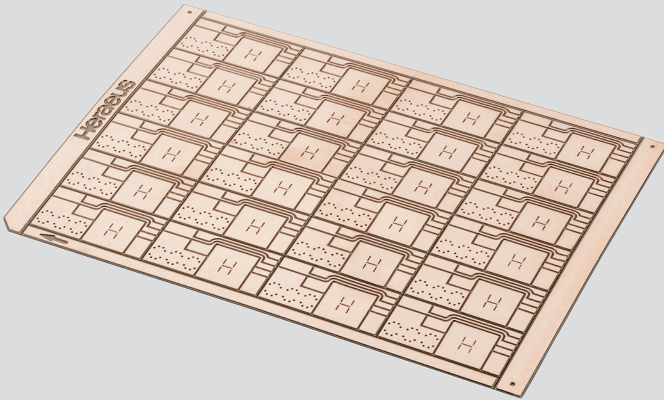
Metal Ceramic Substrates DPIS(1)



Alumina DCB facts

- Alumina ceramic Al_2O_3 (96 %)
  Thicknesses(2): 0.25 mm/0.32 mm/0.38 mm/0.63 mm
- Direct Copper Bonding Cu-OFE
  Thicknesses(2): 0.2 mm/0.25 mm/0.3 mm/0.4 mm
- Single unit or master card size 7 " x 5 " (usable area)
- Surface finish: bare Cu, Ni, Ni/Au (others planned)

Key features

- Pre-qualified solutions & optimized surfaces
- Fast sample delivery target for standard material combinations
  Europe: 5 working days
  Worldwide: 15 working days (after drawing approval)
- Improved warpage / customization possible

Main properties raw Al_2O_3

	Rating	Unit
Thermal conductivity @ 20 °C	≥ 20	W/m.K
Bending strength	> 450	N/mm^2
Young's modulus	≥ 300	GPa
Coefficient of thermal expansion (Al_2O_3) @ 100 °C - 600 °C	6.7 - 8.7	ppm/k

*Picture: substrate layout by courtesy of Fraunhofer IISB
(1) Development Product Information Sheet, preliminary values
(2) Different material combinations on request

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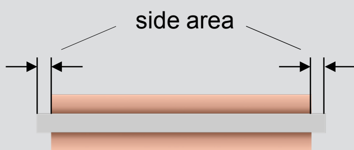
Material properties raw Al_2O_3 [3]

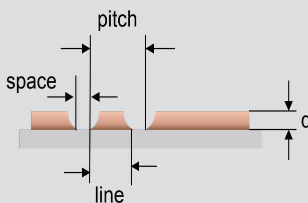
	Rating	Unit
Density	> 3.73	g/cm³
Electrical resistivity	≥ 10^{13}	Ohm·cm
Dielectric strength	> 15	kV/mm

Copper free area



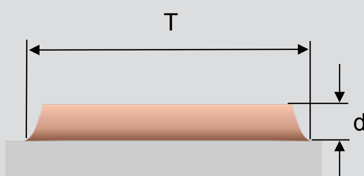
Thickness Cu [mm]	Min. side area [mm]
0.20	0.20
0.25	0.23
0.30	0.25
0.40	0.35

Structuring



Thickness Cu [mm]	Min. space [mm]	Min. line [mm]	Min. pitch [mm]
0.20	0.40	0.40	0.80
0.25	0.45	0.45	0.90
0.30	0.50	0.50	1.00
0.40	0.60	0.60	1.20

Etching tolerance



Tolerance length & width [mm]	Thickness Cu [mm]
$T_{typ.} = \pm 0.15$	d = 0.2
$T_{typ.} = \pm 0.20$	d ≤ 0.3
$T_{typ.} = \pm 0.20$	d ≤ 0.4

(1) Development Product Information Sheet, preliminary values
(3) Depends on supplier

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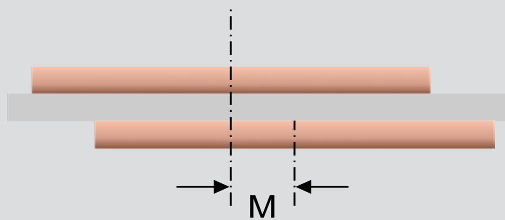
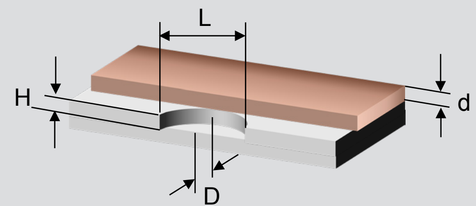
Tolerance and chip off

Tolerance



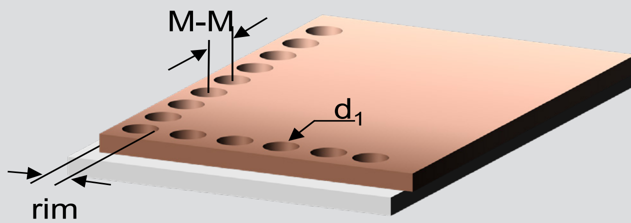
Mismatch M ≤ 0.1 mm
Tolerance of total thickness = + 7 % / -10 %

Chip-off at ceramic edge



Length L ≤ d
Depth D ≤ ½d
Height H ≤ ½d

Dimple structure



Thickness Cu [mm]	Dimple area rim [mm]	Dimple diamter d_1 [mm]	Dimple pitch M-M [mm]
0.20			
0.25		To be agreed	
0.30			
0.40			

Dimensions

General dimensions	Rating (mm)
Master card	138 x 190.5
Max. usable area	127 x 178
Minimum dimension for ceramic thickness ≤ 0.63 mm	10 x 10 (smaller on request)

Tolerances of single parts	Rating (mm)
Ceramic thickness ≤ 0.63 mm	+ 200 µm - 50 µm

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

Surface plating

Plating Method	Thickness (um)
Electroless Ni	3 - 7 (9% ± 2 % P)
Electroless NiAu	Ni 3 - 7 (9 % ± 2 % P)
	Au Class 1: 0.01 - 0.05
	Au Class 2: 0.03 - 0.13

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Metal & hole properties

Roughness
Rmax = 50 µm
Ra ≤ 3.5 µm
Rz ≤ 24 µm

Minimum hole diameter
d_{hole} = 1 mm

Electrical conductivity raw copper
$G_{Cu} = 58 \cdot 10^6$ S/m

Thickness Cu	Copper peeling Strength
0.30mm	> 4 N/mm

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.

Application conditions and assembly optimization

Thermal shock test cycles
-55 °C up to +150 °C
Under Investigation

Customized surface for assembly process

Optimization of surface and assembly process parameters available or in developement cooperation for:
- Sintering
- Solder wetting
- Heavy wire bondability

03.2019, Layout: CF

Heraeus Electronics offers:

- Reliable IATF 16949 certified supply of:
  - ✓ 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