

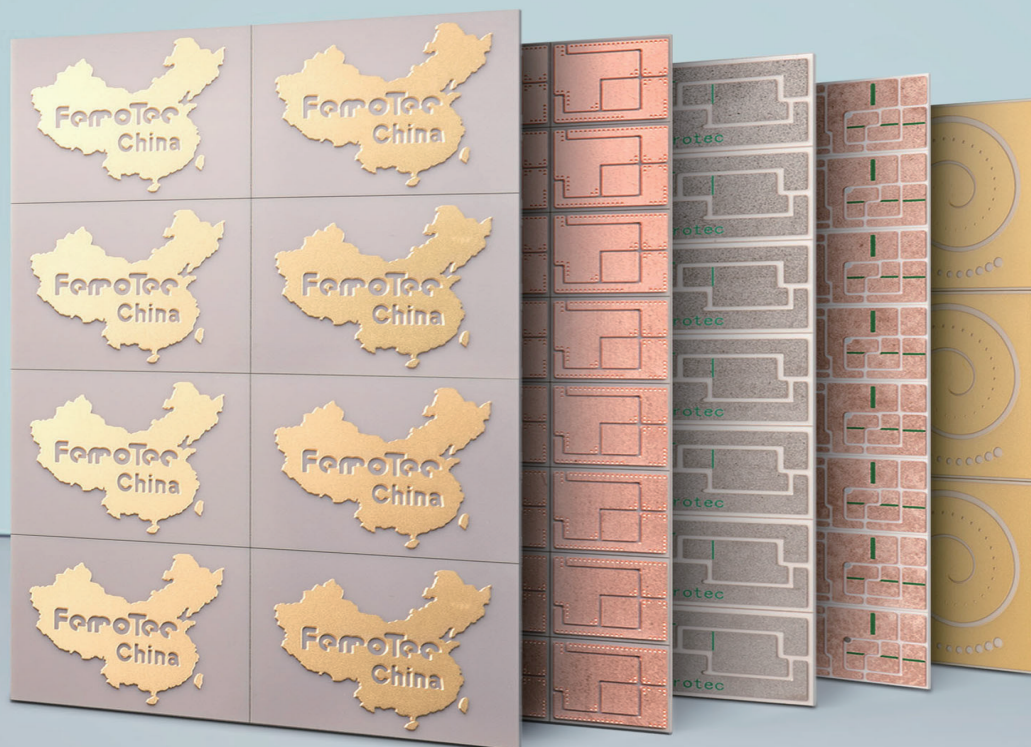
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Made in China



FerroTec Ceramic Substrates DCB Technology

Design Rule Version 2020.05.REV.E/2



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MATERIAL PROPERTIES

— 1.01 AVAILABLE CERAMIC TYPES AND PROPERTIES

Items/Types	Al ₂ O ₃ -ST Alumina Standard	Al ₂ O ₃ -HP High Performance	ZTA Alumina 9% ZrO ₂ Doped	AlN Aluminium Nitride	Unit
Content	96% Al ₂ O ₃	96% Al ₂ O ₃	90%Al ₂ O ₃ 9%ZrO ₂	-	%
Density	3.73	3.73	3.95	3.3	g/m ³
Thermal Conductivity	>24	>24	>27	>170	W/m.K
Coefficient of Thermal Expansion	6.8 (20°C~300°C)	6.8 (20°C~300°C)	7.5 (40°C~400°C) 8.4 (40°C~800°C)	4.7 (20°C~300°C)	x10 ⁻⁶ /K
Bending Strength (Σ0,M>10)	>350	>450	>600	>350	MPa
Dielectric Loss	0.0003	0.0003	0.0003	0.0005	1MHz
Dielectric Constant	9.8	9.8	10.5	9.0	1Mhz
Dielectric Strength	>20	>20	>20	>20	KV/mm
Electrical Resistivity	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴	Ω-cm
E-Modulus	340	340	310	320	Gpa

— 1.02 COPPER PROPERTIES

Items	Parameters	Unit
Purity	99.99	%
O ₂ Content	OFHC	-
Hardness	90~110	HV
Electrical Conductivity	58.6	MS/m

— 1.03 AVAILABLE CERAMIC TYPES/THICKNESSES

	Al ₂ O ₃ -ST	Al ₂ O ₃ -HP	ZTA	AlN
0.25mm		✓	✓	✓
0.32mm		✓	✓	
0.38mm	✓	✓		✓
0.5mm	✓			✓
0.63mm	✓			✓
0.76mm	✓			
0.89mm	✓			
1.0mm	✓			✓

— 1.04 COPPER THICKNESSES

0.127mm 0.20mm 0.25mm 0.30mm 0.40mm
other thicknesses on request, e.g. 0.1mm 0.235mm

— 1.05 AVAILABLE MATERIAL THICKNESS COMBINATIONS

	0.127mm	0.20mm	0.25mm	0.30mm	0.40mm
0.25mm	HP AlN ZTA	HP AlN ZTA	HP AlN ZTA	ZTA	/
0.32mm	HP ZTA	HP ZTA	HP ZTA	HP ZTA	ZTA
0.38mm	ST HP AlN	ST HP AlN	ST HP AlN	ST HP AlN	/
0.50mm	ST AlN	ST AlN	ST AlN	ST AlN	ST AlN
0.63mm	ST AlN	ST AlN	ST AlN	ST AlN	ST AlN
0.76mm	ST	ST	ST	ST	ST
0.89mm	ST	ST	ST	ST	ST
1.00mm	ST	ST	ST	ST	ST

ST Al₂O₃-ST
HP Al₂O₃-HP
ZTA Alumina 9% ZrO₂ Doped
AlN Aluminium Nitride

CERAMIC THICKNESS

COPPER THICKNESS

FONT Available
FONT Standard combinations
FONT SAMPLE ONLY

GENERAL PROPERTIES

— 2.01 DIMENSIONAL TOLERANCES

Dimension Tolerance	+0.2/-0.05mm
Master Card	138*190mm +/-1.5%
Copper Edge to Ceramic Edge	+/-0.15mm
Total Thickness	+/-7%
Laser Through Hole Diameter	+/-0.1mm
Laser Depth	+/-30µm

Note: Special tolerances on request.

— 2.02 MAX USABLE AREA

Laser scribed 127×178mm

— 2.03 DELIVERY FORM

Single Parts	Minimum dimension 15×15mm edge length,smaller on request
Master Card	With or without laser scribing;defect parts marked

— 2.04 WARPAGE

Warpage of single DBC or master cards cannot be guaranteed , due to several uncertain factors , e.g. copper/ceramic combinations , front and back side copper coverage , different aspect ratio of dimensions . Warpage (not 100% inspected) only can be determined after initial sample delivery.

Note:

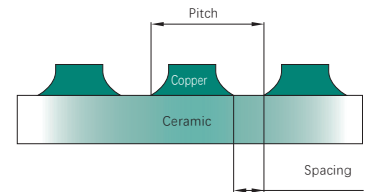
*If warpage is critical for products, please kindly remark on drawings or inform us.

*For the ultimate warpage, eg initial sample quantity is insufficient,not enough for analysis,FTS propose which will be determined after following two or three batches data being collected.

DESIGN FEATURES

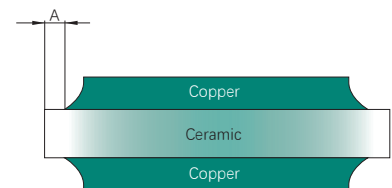
— 3.01 PATTERN MIN. WIDTH/SPACING DIMENSION

COPPER THICKNESS	SPACINGS	MIN. PITCH
0.127mm	0.3mm	0.6mm
0.2mm	0.35mm	0.7mm
0.25mm	0.4mm	0.8mm
0.3mm	0.45mm	0.9mm
0.4mm	0.55mm	1.1mm



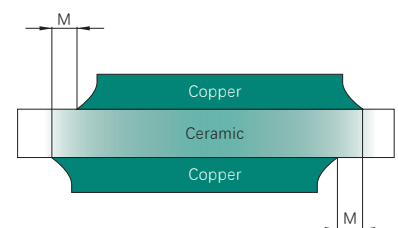
— 3.02 CERAMIC EDGE PERIMETER

COPPER THICKNESS	DISTANCE
$\leq 0.2\text{mm}$	$A \geq 0.2\text{mm}$
0.3mm	$A \geq 0.3\text{mm}$
0.4mm	$A \geq 0.4\text{mm}$



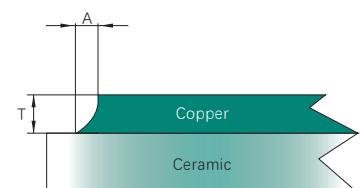
— 3.03 MISALIGNMENT COPPER PATTERN FRONT/BACK

DISTANCE
$M \leq 0.2\text{mm}$



— 3.04 ETCHING FACTOR

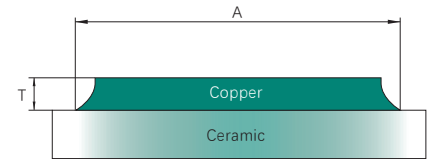
ETCHING FACTOR
$F = T/A > 2$



— 3.05 ETCHING TOLERANCE

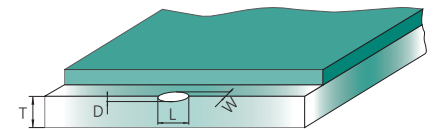
$A \pm 0.15\text{mm}$ @ $T \leq 0.25\text{mm}$
$A \pm 0.20\text{mm}$ @ $T \leq 0.30\text{mm}$
$A \pm 0.25\text{mm}$ @ $T \leq 0.40\text{mm}$

Note: Reference point is measured at bottom side of the copper.



— 3.06 CERAMIC EDGE CHIP OFF

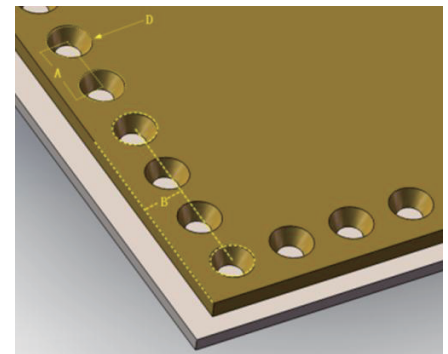
Length: MAX. $1 \times T$
Width: MAX. $1/2 \times T$
Depth: MAX. $1/2 \times T$



L : Length
W : Width
D : Depth
T : Ceramic Thickness

— 3.07 DIMPLES

COPPER THICKNESS	DIMPLE DIAMETER -D-	DIMPLE PITCH -A-	HOLE CENTER TO COPPER EDGE -B-
0.127mm	0.35mm	0.50mm	0.35mm
0.20mm	0.45mm	0.65mm	0.42mm
0.25mm	0.50mm	0.70mm	0.48mm
0.30mm	0.60mm	0.80mm	0.50mm
0.40mm	0.70mm	1.00mm	0.60mm



Special Note: 10% of total dimple quantity with edge defects is acceptable.

— 3.08 CERAMIC THROUGH HOLE/CONTOUR

Min. hole diameter 1mm, smaller on request
Ceramic Arc Shape or special contour on request

SURFACE PROPERTIES

— 4.01 COPPER SURFACE

SURFACE ROUGHNESS
$R_a \leq 3\mu\text{m}$; $R_z \leq 16\mu\text{m}$; $R_{\text{max}} = 50\mu\text{m}$

Note: Lower roughness on request.

— 4.02 SURFACE FINISH

Bare copper	-
Anti-oxidation	-
Electroless Ni	2~8 μm (6~10% P content)
Electroless NiAu	Au: 0.01~0.1 μm ; Ni: 2~8 μm
Electroless Ag	Ag: 0.1~0.6 μm

Note: Other thickness or special plating on request.

— 4.03 SOLDERMASK

Pattern width	Min. 0.3mm +/-0.2mm
Position tolerance	+/-0.2mm
Min. spacing between soldermask pattern	$\geq 0.3\text{mm}$
Min. Distance from soldermask edge to copper edge	$\geq 0\text{ mm}$ [copper thickness $\leq 0.3\text{mm}$] $\geq 1\text{mm}$ [copper thickness $> 0.4\text{mm}$]
Temperature resistance	$\leq 320^\circ\text{C}/10\text{s}$ (test in acc.with IPC-TM-650,2.6.8)

DCB SUBSTRATE PROPERTIES

— 5.01 PEELING STRENGTH

>5.0N/mm on Al₂O₃

>4.0N/mm on AlN

Note: Ferrotec internal Test condition @ 50mm/min @0.3mm Cu-thickness.

— 5.02 APPLICATION TEMPERATURE

-55°C~+850°C depending on time and atmosphere

Note: Not applicable at H₂ with > 400°C.

— 5.03 VOID

Front side	No visible void in bonding area Void diameter ≤ φ2mm in soldering area
Back side	Void diameter ≤ φ3mm

— 5.04 THERMAL CYCLE

45 cycles (0.3Cu / 0.38 Al₂O₃ / 0.3Cu, without dimple)

60 cycles (0.3Cu / 0.635 Al₂O₃ / 0.3Cu, without dimple)

35 cycles (0.3Cu / 0.635 ALN / 0.3Cu, without dimple)

Condition: -55°C~+150°C, hot/cold chamber system, 15min at min/max. Transfer time <30s.

Note: Tested by using Ferrotec internal layout, different design layout may influence the test result.

— 5.05 SOLDERABILITY

>95% Solder preforms Sn / Ag 3.5 / Cu0.5+Ni,Ge 100% H₂

— 5.06 WIRE BONDING

Shearing strength ≥ 1000gf

Aluminium Residue after shearing ≥ 50%

Condition: Al wire 300μm; Shear speed 500μm/s; Shear height ≤ 30μm.



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This specification is only a reference for customized designs.
The parameters are standard . For any special needs please contact with us

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