

We have over three decades of Direct Bond Copper Experience. Let us be your thermal management experts. From design concept to finished submount, our expertise will be there for every step.

Direct Bond Copper Design Guide

STELLAR INDUSTRIES CORP.

Content

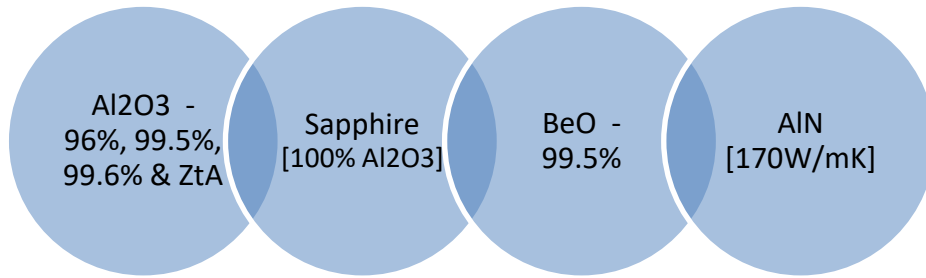
- I. Geometric Information:**
 - A. Standard Direct Bond Copper Options
 - B. Design Constraints and Tolerances
 - B.1: Finished Ceramic [only] Thickness
 - B.2: Finished Overall Direct Bond Copper Thickness
 - B.3: Pattern Space & Trace Requirements
 - B.4: Finished Part Metal Pullback Requirements
 - B.5: Front to Back Alignment

- II. Additional Options:**
 - A. Proprietary Copper Filled Vias
 - B. Flying Direct Bonded Lead Technology
 - C. Stress Relief Dimpling

- III. Finish Options:**
 - A. Bare copper
 - B. Electroless Plating
 - C. Proprietary Selective Gold/Tin Deposition
 - D. Laser Ablated Solder Stops/Dams

- IV. Singulate Options:**
 - A. Dice to Final Size
 - B. Laser Machine to Final Size
 - C. Laser Scribe and Snap to Final Size

Ceramic Types Available:



I. Geometric Information:

A. Standard Direct Bond Copper Options Available:

Al₂O₃ - Alumina

Ceramic Thickness:	0.005" [0.127mm] Cu	0.008" [0.203mm] Cu	0.012" [0.305mm] Cu
0.010" [0.254mm]	X	X	
0.015" [0.381mm]		X	X
0.025" [0.635mm]			X
0.040" [1.016mm]		X	X

- 96%, 99.5%, 99.6% & ZtA (Zirconium toughened Alumina) and Sapphire: Custom bonded ceramic and copper thicknesses available upon request

BeO – Beryllium Oxide

Ceramic Thickness:	0.005" [0.127mm] Cu	0.008" [0.203mm] Cu	0.012" [0.305mm] Cu
0.025" [0.635mm]			X
0.040" [1.016mm]			X

- Custom bonded ceramic and copper thicknesses available upon request

AlN – Aluminum Nitride

Ceramic Thickness:	0.005" [0.127mm] Cu	0.008" [0.203mm] Cu	0.012" [0.305mm] Cu
0.015" [0.381mm]		X	X
0.025" [0.635mm]			X
0.040" [1.016mm]		X	X

- Custom bonded ceramic and copper thicknesses available upon request

B. Design Constraints and Tolerances:

B.1 Finished Ceramic [only] Thickness:

- Lapped: Standard to $\pm 0.001''$ [$\pm 0.25\text{mm}$], Special to $\pm 0.0005''$ [$\pm 0.0127\text{mm}$]
- As Fired: $\pm 10\%$

B.2 Finished Overall Direct Bond Copper Thickness [Cu both sides or single side]:

- Lapped or Etched to $\pm 0.002''$ [$\pm 0.05\text{mm}$]
- As Fired: $+7\%/-10\%$

B.3 Pattern Space & Trace Requirements:

C. Copper Thickness:	Minimum Space/Trace:	Space/Trace Tolerance:
0.002" [0.05mm]	0.006" [0.152mm]	$\pm 0.002''$ [$\pm 0.05\text{mm}$]
0.003" [0.075mm]	0.008" [0.203mm]	$\pm 0.002''$ [$\pm 0.05\text{mm}$]
0.004" [0.10mm]	0.009" [0.229mm]	$\pm 0.003''$ [$\pm 0.075\text{mm}$]
0.005" [0.127mm]	0.010" [0.254mm]	$\pm 0.004''$ [$\pm 0.10\text{mm}$]
0.008" [0.203mm]	0.013" [0.330mm]	$\pm 0.006''$ [$\pm 0.152\text{mm}$]
0.010" [0.254mm]	0.015" [0.381mm]	$\pm 0.007''$ [$\pm 0.178\text{mm}$]
0.012" [0.305mm]	0.017" [0.432mm]	$\pm 0.008''$ [$\pm 0.203\text{mm}$]

Traces are measured at the top of the pads. Spaces measured at the bottom

B.4 Finished Part Metal Pullback Requirements:

- From Diced Edge: $0.005'' \pm 0.005''$ [$0.127\text{mm} \pm 0.127\text{mm}$]
- From Laser Scribe & Snap Edge: $0.010'' \pm 0.005''$ [$0.254\text{mm} \pm 0.127\text{mm}$]
- A smaller Critical Edge pullback can be offered on one edge (Cu thickness dependent)

B.5 Front to Back Alignment:

- Tolerance: $\pm 0.005''$

II. Additional Options:

A. Proprietary Copper Filled Vias:

Ceramic Options: 96% Al₂O₃, 99.6% Al₂O₃ and BeO

Ceramic Thickness Requirement: Preferred: 0.040"[1mm], Optional: 0.030"[0.762mm]

Via Hole Diameter Requirement: Preferred: 0.040"[1mm], Optional: 0.030"[0.762mm]

Copper Thickness Requirement: 0.012"[0.30mm] Both Sides

Minimum Distance Requirement: Via Edge to Via Edge or to Finished Part Edge equal to via diameter

Minimum Capture Pad Over Via Requirement: 0.015"[0.381mm] all around filled via

B. Flying Direct Bonded Lead Technology:

Lead Options: Single Edge and Double [Opposite] Edges. Bonded both sides or one side.

Ceramic Options: 96% Al₂O₃, 99.6% Al₂O₃ and BeO

Copper Thickness Requirement: 0.010"[0.254mm] or 0.012"[0.30mm]

Lead Requirement: 0.350"[8.89mm] MAX Length & 0.050"[1.27mm] MIN Width

Tie Bars: Excluded from Lead length & Width limits. Design dependent. Customer removed.

Custom Options: Available upon request. Can be provided with filled vias as well.

C. Stress Relief Dimpling:

Options: Standard or customer specific options are both available

Tolerance: Dimples may or may not fully resolve and are not held to tolerance.

III. Finish Options:

A. Bare Copper:

Packaging: Vacuum sealed with a desiccant packet to reduce possible oxidation.

B. Electroless Plating:

Standards: Mil-C-26074E, Class I (Ni) and Mil-G-45204C, Type III, Grade A (Au)

Nickel (Phosphorous): Standard Thickness: 100-300 μ -in. Custom thicknesses available.

Gold (over Ni): Standard Thickness: 2-6 μ -in. Design requirements dependent.

Solderable and Wire Bondable: Gold thickness may vary based on requirements.

Customer Specified Options: Available upon request.

C. Proprietary Selective AuSn Deposition:

Plating Requirement: A Ni/Au plated finish under the AuSn is required.

Single Critical Edge Metal Pullback Option: Copper thickness dependent.

Standard Options: Available from 3-7 μ m with a Platinum barrier underneath.

Custom Options: Available upon request.

D. Laser Ablated Solder Stops/Dams:

Plating Requirement: Plating is required. A Ni/Au plated finish is preferred. Ni only accepted.

Process with Ni and Au Plating: Gold is ablated away to expose nickel which oxidizes.

Process with Ni only Plating: Nickel is ablated away to expose copper which oxidizes.

IV. Singulate Options:

A. Dice to Final Size:

Array Requirement: A dicing lane based on ceramic thickness required between parts.

Length & Width Tolerance: Standard: $\pm 0.002''$ [$\pm 0.05\text{mm}$] up to $0.040''$ [1mm] thick ceramic.

Custom Options: Available upon request.

B. Laser Machine to Final Size:

Array Requirement: Used for designs that cannot be diced complete. $0.100''$ [2.54mm] between parts required.

Length & Width Tolerance: Ceramic thickness and design dependent.

Custom Options: Available upon request.

C. Laser Scribe and Snap to Final Size:

Array Requirement: No spacing between parts is required.

Length & Width Tolerance: Standard: $\pm 0.005''$ [$\pm 0.127\text{mm}$] up to $0.040''$ [1mm] thick ceramic.

Edge Quality: Edges may have a scalloped effect.

Custom Options: Available upon request. Can offer scribed, but not snapped depending on ceramic thickness.