

AL 53-120, -122 Aluminum Boron Conductors Lead Free

Description: AL 53-120 series aluminum boron conductor pastes provide a low bow, strong back surface field (BSF) with excellent electrical performance. Each product provides a different reactivity with the silicon wafer: AL 53-120 has a moderate reaction whereas AL 53-122 exhibits a stronger reaction. These aluminum boron conductors are designed to form a p⁺ doped layer when fired on p-doped silicon photovoltaic devices 160–200 microns thick. When properly processed on 156 mm x 156 mm wafers at 160

micron thickness, the material exhibits <1.0 mm distortion. The materials have been optimized to eliminate Al bead formation during the firing process. The products are lightly fritted using an environmentally friendly lead free glass composition and can be fired over a broad range of conditions including co-fire process techniques with front contact silver inks. Combinations of our product offerings can accommodate a variety of configurations and process sequences.

Typical Properties	
	AL 53-120, -122
Viscosity (Pa-s) ¹ :	20–45
Fineness of Grind:	< 50 μm
Dried Thickness:	30–40 μm
Fired Thickness:	20–30 μm
Wet Deposition (mg/square cm):	5–7
Bowing (160 micron wafer):	< 1.0 mm
Back Surface Field Thickness:	6–8 μm
Resistivity ² (milliohms/square):	< 15
Drying Profile ³ :	250–300°C, < 60 seconds
Firing ³ :	810–940°C, < 1–3 seconds
Recommended Thinner:	0804

All properties are target values and are not meant to represent product specifications

Notes:

¹Viscosity as measured on Brookfield model HBT cone/plate viscometer; 9.6 reciprocal seconds, 1.565° cone, 25°C.

²Milliohms/sq. at 25μm.

³ Recommended set points °C in infrared firing furnace.

Product Advantages:

- Exhibits < 1 mm camber on 156 mm x 156 mm wafers at 160 microns thickness
- RoHS compliant⁴
- Lead & Cadmium free⁵
- Shallow eutectic & uniform BSF yield a smooth surface, no dust & high electrical efficiency

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Processing Recommendations

Printing: It is recommended that the paste temperature be between 20–25°C prior to printing, and it is advisable to control the ambient room temperature within $\pm 2^\circ$ to insure consistent printing results. The printing area should be clean and well-ventilated.

Screen: 200–250 mesh screen with a 10–25 μm emulsion thickness is recommended.

Drying: The ink can be dried in an Infrared or conventional dryer under a wide range of conditions. Inks are typically dried in an IR dryer with set points of 250–300°C in less than 60 seconds.

Firing: An Infrared fast process furnace with three or more firing zones and belt speeds of > 200 inches per minute is highly recommended, although the product may be fired in a variety of furnaces with belt speeds > 120 inches per minute. Optimum firing conditions must be established by the customer based on the cell configuration, thickness, and manufacturing process. Peak set point temperatures between 810–940°C with a dwell time above 700°C ranging from > 1 to 3 seconds is typical.

Compatibility: Ferro has tested this material according to the recommended processing conditions described here, however, it is imperative that customers evaluate the material in their manufacturing process and conditions to insure suitability for their intended use. Ferro technical personnel can help facilitate testing, and can assist with integration into customer manufacturing processes.

Thinning: Thinning is not recommended, since the paste is supplied at the correct viscosity for application. Contact your local Ferro Representative for appropriate solvent details, should thinning become necessary to replace solvent lost through evaporation.

Paste Storage & Shelf Life: The paste should be stored in tightly capped containers in a cool (5–30°C) dry place away from direct sunlight. When properly stored, unopened material will have a shelf life of up to 6 months.

Notes:

⁴Complies with EU Directives on Restriction of the use of Hazardous Substances (RoHS; 2002/95/EC) and Waste from Electrical and Electronic Equipment (WEEE; 2002/96/EC). Current exemptions allow lead contained in the glass system of thick film materials used in electronic components. In anticipation of future amendments and more stringent environmental regulations, Ferro continues to expand its range of Lead Free⁵ materials.

³Initial product composition was certified by SGS laboratories to contain less than 25 ppm of lead; less than the RoHS allowable level of 1000 ppm in electronic equipment. The cadmium content is below the detection level. This conductor paste is not routinely analyzed for lead and cadmium content and is not the basis for product specification or warranty.

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