



PS 33-600 Rear Silver Conductor Lead Free

Description: PS 33-600 is a lead and cadmium free, pure silver conductor paste designed as a back contact for p+/p/n+ type silicon solar cells that use an aluminum back surface field (BSF).

The conductor is compatible with all Ferro AL 53-series lead free aluminum pastes and has excellent solderability and adhesion when used with lead free solders.

Typical Properties	
	PS 33-600
Viscosity (Pa·s) ¹ :	90–130
Solids Content:	73–76%
Fineness of Grind:	< 16/12 μm
Dried Thickness:	15–20 μm
Fired Thickness:	10–15 μm
Resistivity ² (milliohms/square):	< 3.0
Drying Profile ³ :	250–300°C, < 60 seconds
Firing ³ :	810–940°C, < 1–3 seconds
Recommended Thinner	0800

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

Notes:

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

² Milliohms/sq. at 25μm.

³ Recommended set points °C in infrared firing furnace.

Product Advantages:

- RoHS compliant⁴
- Lead and Cadmium free⁵
- Complete compatibility with lead free Al inks
- Excellent solderability and adhesion when using lead free solders
- Hot Melt and conventional printing versions available

www.ferro.com

DISCLAIMER: Reasonable care has been taken in the preparation of this information, but **FERRO EXTENDS NO WARRANTIES, MAKES NO REPRESENTATIONS AND ASSUMES NO RESPONSIBILITY AS TO ACCURACY OR SUITABILITY OF THIS INFORMATION OF THIS PRODUCT FOR ANY PURCHASER'S OR USER'S USE OR FOR ANY CONSEQUENCE OF ITS USE. FERRO DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR ANY PARTICULAR USE.** All statements, technical information and recommendations contained herein are based on Seller's or Manufacturer's test and the test of others, and are believed to be accurate, but no guarantee of accuracy is made. Judgment as to the suitability of information herein or the user's purposes are necessarily the user's responsibility. Users shall determine the suitability of the products for their own intended application.

Users assume all risk of use or handling whether or not in accordance with any statements or recommendation of the seller or manufacturer. Liability, if any, is and shall be limited to the replacement of such quantity of material proved not to conform to specifications as set out in product specification. Statements concerning the possible use of these products are not intended as recommendation to use these products in infringement of any patent. No guarantee is made that any use of the products does not infringe third-party intellectual property or patent rights anywhere in the world.

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 $\pm 2^\circ\text{C}$ to ensure consistent printing results. The printing area should be clean and well-ventilated.

Screen: 200–325 mesh screen with a 20–25 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.

Soldering: Recommended soldering conditions (ribbons) are 290°C for 96.5Sn/3.5Ag; and 220°C for 62Sn/36Pb/2Ag.

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 can 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 because 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.

⁵Initial product composition was certified by SGS laboratories to be below the detection level for lead and cadmium. This conductor paste is not routinely analyzed for lead and cadmium content and is not the basis for product specification or warranty.

Rev. 08/09

Vista, CA, USA
760-305-1000

Tsukuba, Japan
+81 29-889-2144

Suzhou, China
+86 512-62562258

Hanau, Germany
+49 61-81594739

www.ferro.com

DISCLAIMER: Reasonable care has been taken in the preparation of this information, but **FERRO EXTENDS NO WARRANTIES, MAKES NO REPRESENTATIONS AND ASSUMES NO RESPONSIBILITY AS TO ACCURACY OR SUITABILITY OF THIS INFORMATION OF THIS PRODUCT FOR ANY PURCHASER'S OR USER'S USE OR FOR ANY CONSEQUENCE OF ITS USE. FERRO DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR ANY PARTICULAR USE.** All statements, technical information and recommendations contained herein are based on Seller's or Manufacturer's test and the test of others, and are believed to be accurate, but no guarantee of accuracy is made. Judgment as to the suitability of information herein or the user's purposes are necessarily the user's responsibility. Users shall determine the suitability of the products for their own intended application.

Users assume all risk of use or handling whether or not in accordance with any statements or recommendation of the seller or manufacturer. Liability, if any, is and shall be limited to the replacement of such quantity of material proved not to conform to specifications as set out in product specification. Statements concerning the possible use of these products are not intended as recommendation to use these products in infringement of any patent. No guarantee is made that any use of the products does not infringe third-party intellectual property or patent rights anywhere in the world.