Photovoltaic Materials

PS 33-612
Rear Silver Conductor

Description: PS 33-612 is a cadmium free, pure silver conductor paste that has been thrifted to reduce precious metal laydown. It is designed to be used as a back contact for p+/p/n+ type silicon solar cells which utilize an aluminum back surface field (BSF).

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

Typical Properties	
	PS 33-612
Viscosity (Pa·s)[1]:	60–90
Solids Content:	68.5–71.5%
Fineness of Grind:	< 14/11 μm
Dried Thickness:	20–25 μm
Fired Thickness:	10–14 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 compliant[4]
- Cadmium free[5]
- High adhesion with lead free and leaded tabbing ribbon
- Low interfacial resistance yields improved electrical performance
- Complete compatibility with Al inks
- Hot Melt & conventional printing versions available

Photovoltaic Materials

PS 33-612
Rear Silver Conductor

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 ± 2° to insure 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 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:
[4] Complies 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 Free[5] materials.
[5] Initial product composition was certified by SGS laboratories to be below the detection level for cadmium. This conductor paste is not routinely analyzed for 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