

**Description:** Ferro Corporation offers a full range of thick film inks for contacting the back surface of silicon solar cells. The most common class of materials for bus bar and grid applications is an aluminum-doped silver formulation. The purpose of the aluminum is to reduce the ohmic contact resistance between the thick film material and the p-doped silicon surface. The other classes of back surface metallizations offered are pure aluminum inks. These inks, which come in fritted and unfritted versions, are used to form a p+ back surface field layer. A variety of configurations and process sequences can be accommodated by combinations of our product offerings.

33-130 is a silver/aluminum thick film conductor paste designed for use on the back surface of mono and poly-crystalline silicon photovoltaic cells. The product has been engineered with optimized glass content in order to reduce stress on the silicon lattice generated by some interconnect processes.

### Processing Recommendations

**Printing:** 200 – 325 mesh screen with a 20  $\mu\text{m}$  – 25  $\mu\text{m}$  emulsion thickness is recommended.

**Drying:** The ink can be dried in an Infrared or conventional dryer under wide range of conditions. Inks are typically dried in a IR dryer with set points of 250°C – 300°C in less than 20 seconds.

**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, dry place away from direct sunlight. Properly stored material will have a shelf life in excess of 6 months.

Typical Properties	
	33-130
Viscosity (poise) <sup>1</sup> :	250 – 500
Solids Content	78.5 – 81.5 %
Fineness of Grind:	< 21 / 20 $\mu\text{m}$
Dried Thickness:	20 – 25 $\mu\text{m}$
Fired Thickness:	10 – 14 $\mu\text{m}$
Resistivity <sup>2</sup> (milliohms/square):	$\leq 2.2$
Drying Profile:	250 – 300 °C, < 20 seconds
Peak Firing Temp:	680 – 750 °C
Time at Peak:	1 – 20 seconds
Recommended Thinner:	0800

Notes:

<sup>1</sup> Viscosity as measured on Brookfield model HBT cone/plate viscometer; 2.5 rpm, 1.565" cone, 25°C.

<sup>2</sup> Milliohms/sq. normalized to 25 $\mu\text{m}$ .

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