

Technical Information

4550 Thin-Print Etchable Gold Conductor

The thick film gold composition 4550 is designed for applications requiring narrow lines and spaces, smooth pattern edges, and high electrical conductivity. It is deposited by screen printing, fired, then patterned and etched using normal photolithographic techniques. The gold particles in this paste are extremely small, allowing the deposition of very thin layers. As a result, the 4550 produces nearly pinhole-free films with three micron-thick layers. It is suitable for

RF and microwave circuits. Its key features include:

- High Conductivity
- High Adhesion
- Clean Etched Area Footprint
- Fires on 96% Alumina
- High Film Density
- Economy
- Compatibility with Dielectrics and Resistors.

TYPICAL FIRED FILM CHARACTERISTICS⁽¹⁾

Fired Thickness 3 P/D/F	2-3 μm
Resistivity Milliohms / square at 3 μm fired thickness	≤ 9.0

(1) Typical properties are based on testing of several batches under various processing conditions. They are not intended as specification limits.

COMPOSITION PROPERTIES

Viscosity: 150 \pm 30 Kcps, when measured with Brookfield HBT, Spindle #14, utility cup, 10 RPM, 25°C.
Specific Gravity: 1.8 – 2.2 g/cm ³
Recommended Thinner: KOARTAN B-1194

RECOMMENDED PROCESSING PROCEDURE

Printing: Printing with 325 mesh stainless steel screen using .005" emulsion and 45 degree angle is recommended. Other mesh counts, 400-280, and emulsion thicknesses, .001-.005", may be used for special applications. Squeegee speeds of up to 10 inches/sec may be utilized.

Coverage is approximately 140 cm²/g per layer, when utilizing a 325 mesh screen and a wet print thickness of about 30 μm.

Drying: Wet prints should be allowed to level for 5-10 minutes prior to drying. Dry for 10-15 minutes in a convection oven or belt dryer at 125°C-150°C.

Firing: Firing in air using a belt furnace and a 36-60 minute profile, with 10 minutes at a peak temperature of 850°C is recommended. Air flow rates must be optimized to ensure that the products of binder burn-off discharge properly and create a fully oxidizing atmosphere in the muffle.

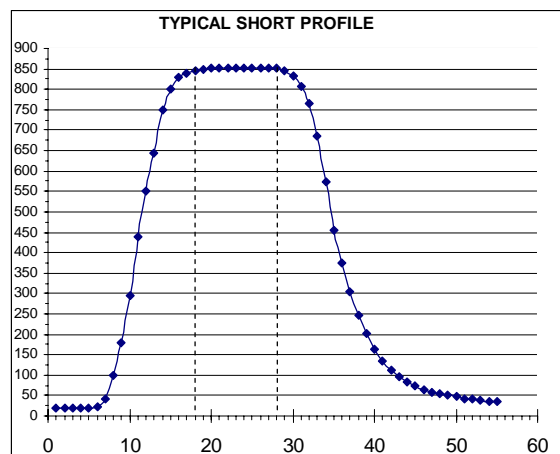
Application Notes: A fired thickness of 2-3 μm and good photolithographic technique allow the etching of 1.5-2 mil lines with only minor undercutting. A 325 mesh screen with thin emulsion or a 400 mesh calendared screen may be used to obtain the desired thickness and surface morphology.

The 4550 gold has excellent adhesion to 96%, 99.5%, and polished alumina substrate. However, at the recommended thickness, the surface of the fired film is hard and requires optimization of the wire bonder set up. Lower force and power settings than those used for standard thick film gold should be used.

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The recommended steps for etching are as follows:

1. Clean fired substrates in methanol and bake at 150 °C to drive off moisture.
2. Apply Shipley S1800 photoresist or equivalent at about 4000 rpm. Bake at 110-120 °C for 1 hour.
3. Expose to UV light. Exposure time depends on source intensity, but should generally be about 30 seconds.
4. Develop using Shipley 351 developer or equivalent.
5. Rinse in distilled water and immerse in potassium iodide/iodine or especially formulated etch solution. In order to minimize undercutting, stirring or agitation of the solution is not recommended. It may, however, be heated to speed up the etching process.
6. Use Shipley 1165 or equivalent to remove photoresist from the developed pattern.



Storage and Shelf Life: Store in tightly capped containers at room temperature. Shelf life is 6 months for unopened jars. Under ordinary conditions of storage and use the product should not require thinning. However, solvent loss during extended printing runs may be replaced by incorporating up to 0.5% of Koartan A-1039 thinner.