

**A New Surface Finish for the Electronics Industry**  
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The performance expectations for printed circuit board surface finishes are greater than just solderability preservation. Historically, final finishes were designed solely to protect copper from oxidation prior to the soldering of components. Now the expectations are much greater; superior solderability, contact performance, wire bondability, corrosion resistance, and all this must be achieved at low cost.

For the past few years the electronics industry has been investigating the effects of harsh environments on printed circuit assemblies. The general consensus is that the environments electronics experience today are particularly aggressive, being frequently exposed to high levels of contaminants such as sulfur, sulfide, SO<sub>x</sub> and NO<sub>x</sub>.

One common surface finish now frequently used in the electronics industry is immersion silver. The popularity of this technology has increased over the last decade and now likely accounts for about 10% of the final finish market. The popularity of immersion silver is driven by factors such as, excellent solderability, very low contact resistance, easy of assembly and testing, and it is a relatively low cost option. As mentioned above, electronic components are now frequently exposed to harsh, corrosive environmental and use conditions. Long term exposure to such environments can result in the onset of varying degrees of corrosion phenomena, such as creeping corrosion, peeling and coating tarnish. These phenomena can be mitigated by the adoption of best application practices and assembly processing, in conjunction with the use of specially formulated anti-corrosion coatings.

An alternative final finish frequently used for high reliability applications is electroless nickel-immersion gold (ENIG), however this technology also is not without its problems, a common example, which can arise through the use of a poorly formulated process, is “black line nickel”. This issue has been a concern to the electronics industry for some time and has hurt the reputation of ENIG as a final finish, limiting in some cases its wider adoption. With this in mind, coupled with the very high price gold currently achieves on the open market (in excess of \$1300 per troy ounce) the industry is looking for an alternative technology. Recently restrictions on cyanide in certain regions of the world have also put pressure on those using ENIG. Ideally, a suitable alternative would retain the positive features of the ENIG finish whilst, at the same time, eliminate the black line nickel concern and be much more economical without the use of cyanide.

This paper details such a process, electroless nickel-immersion silver. Careful choice of the electroless nickel and immersion silver processes result in a surface finish that has superior function, performance and is low cost.