

Surface Finishing						
Process / requirement	HAL lead-free	ENIG	Immersion tin	HAL Leaded	Galvanic Au	Immersion Ag*
Thickness (µm)	2–40	Ni 3–6 Au 0.05	0.9–1.1	2–30	Ni 3–6 Au 1	0.1
Max. PCB dimension (mm)	265 × 465	265 × 465	265 × 465	265 × 465	265 × 363	265 × 465
RoHS compatible; Pb free	+	+	+	–	+	+
Suitable for fine pitch	–	++	++	–	>> 2	++
Planarity	--	++	++	--	~	++
Multiple soldering	++	+	~	++	>> 2	+
Al bonding	--	++	--	--	>> 2	+
Au bonding	--	–	--	--	>> 2	–
Storage life (months)	12	12	3	12	12	6

Legend: ++ excellent + good ~ average – fair -- poor >> 2 depends on the second surface

Immersion silver



Immersion silver * external production, only 5-7 product. days

Immersion silver has the best usage in HF applications. Because of missing Nickel it's ideal for high frequency signals. Silver is better conductor than Au or Cu. It is easily solderable finish - Ag thickness is only 0.1 µm so even flatless is great. It is commonly used for high construction classes of the printed boards. Storing shouldn't exceed 6 months.

HAL lead-free



HAL (Hot Air Solder Levelling) for PCB 0,8-2,5mm only

The PCB is immersed in a molten. Solder is applied to exposed pads. Excess solder is blown off by „air knives“ which blow hot air across the surface of the board. The thickness depends on the solder surface tension and used to be in range 2–40 µm.

HAL SnPb



Chemical gold (ENIG)



ENIG (Electroless Nickel Immersion Gold)

From the chemical point of view, the gold is an optimal element for a top covering of PCB. Regarding the fact, gold doesn't oxidize and temperature and storage conditions have practically zero influence on a lifetime in comparison with others surface finishes. Gold is melted in the solder and the solder itself creates joint with a nickel layer.

Immersion tin

Chemical tin



Immersion tin creates really thin layer of chemical tin, common 0.9 up to 1.1 µm, which protects base copper against oxidation and provides high solderable surface. We are using acid electroless bath, which avoid to creating of whiskers and bath is in vertical application. Due to the extreme sensitivity of immersion tin, care should be taken to handle and storage conditions. In every step of processing is recommended manipulation only in gloves. Fulfillment of storage conditions, < 25°C and < 50 % RH, ensures soldering for 6 months. High-quality and trouble-free soldering is achieved by the early processing of panels with this surface finish.