Global Well Tech Limited
vs
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PCB Surface Finishes Comparison

No.	Surface finish	Description	Advantage	Disadvantage
1	HASL and lead-free HASL	For decades HASL was one of the most popular surface finish choices. Yet, in recent years, manufacturers have realized its limitations. While a surface finish may be low cost and robust, fundamental changes in the PCB industry—namely, the rise complex surface mount technology—have exposed its shortcomings. HASL leaves uneven surfaces and is not suitable for fine pitch components. Although it does come in lead-free, there are other lead-free options which will likely make more sense for a high-reliability product.	Low-cost	Uneven surfaces
			Available	Not good for fine pitch components
			Repairable	Thermal Shock
				Not good for plated through-hole (PTH)
				Poor Wetting
2	OSP (Organic Solderability Preservative)	OSP is a water-based, organic surface finish that is typically used for copper pads. It selectively bonds to copper and protects the copper pad before soldering. OSP is environmentally friendly, provides a coplanar surface, is lead-free, and requires low equipment maintenance. However, it's not as robust as HASL and can be sensitive while handling.	Leed-Free	Not good for PTH
			Flat surface	Sensitive
			Simple process	Short shelf life
			Repairable	
3	Immersion Tin	Immersion Tin (ISn) is a good surface finish for planar, fine pitch products and is popular with press fit and backplanes. But for the most part, ISn has more pros than cons. While it works well to protect underlying copper from oxidation, it's intermetallic relationship with copper can be problematic. The diffusion of one metal into the other can impact shelf life and the performance of the finish.	Leed-Free	Not good for PTH
			High reliability	Contains Thiourea,A known Carcingen
			Planar	Limited rework
			Cost Effective	Tin wiskering
			Can subsitute for reflowed solder	Could damage soldermask
				Handling concerns
4	Immersion Silver	This is a surface finish whose benefits far outweight its costs. It gained widespread popularity since the RoHS and WEEE directive took effect, and can be a good alternative to ENIG for fine pitch and flat pack coating. It's a stable finish with a moderate shelf-life (roughly 12 months) and relatively simple process control. Immersion silver contains OSP, which works to prevent tarnishing. But it can be sensitive to contaminants, both in the air and on the board, and should be packaged as soon as possible. It is commonly used for membrane switches, EMI shielding, and aluminum wire bonding.	ROHS Complaint	Tarnishes
			Planar	Silver Whiskering
			Fine pitch	Some systems cannot throw into microvias aspect ratios of > 1:1
			Cost effective	High friction coefficient/not suited for compliant-pin intertion (Ni-Au Pins)
			Good alternative to ENIG	
			High stability	
5	ENIG(Electroless Nickel Immersion)	ENIG is quickly becoming the most popular surface finish in the industry. It's a double layer metallic coating, with nickel acting as both a barrier to the copper and a surface to which components are soldered. A layer of gold protects the nickel during storage. ENIG is an answer to major industry trends such as lead-free requirements and rise of complex surface components (especially BGAs and flip chips), which require flat surfaces. But ENIG can be expensive, and at times can result in what is commonly known as "black pad syndrome," a buildup of phosphorous between the gold and nickel layers that can result in fractured surfaces and faulty connections.	Flat surfaces	Black pad syndrome
			Strong	Expensive
			Lead-free	Not good for rework
			Good for PTH	