

Surface Finish *Common Types*

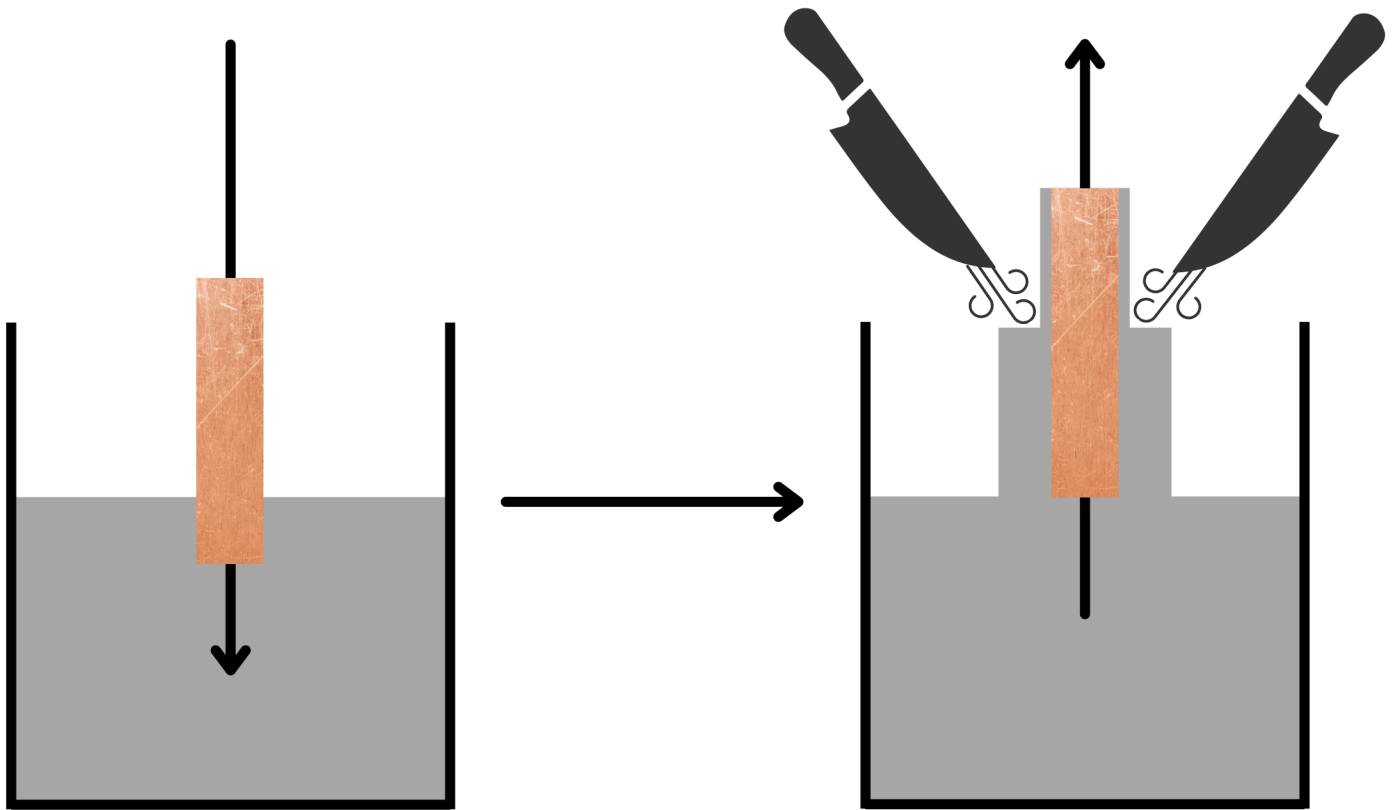
Type	Process	Shelf Life	Cost
HASL (Hot Air Solder Level)	<ul style="list-style-type: none"> Immersion 	+++++	\$
Immersion Silver	<ul style="list-style-type: none"> Immersion Copper replacement reaction 	++	\$\$
Immersion Tin	<ul style="list-style-type: none"> Immersion Copper replacement reaction 	++	\$\$
ENIG	<ul style="list-style-type: none"> Chemical Electroless Immersion 2-layer coating 	+++++	\$\$\$\$\$
ENIG	<ul style="list-style-type: none"> Chemical Electroless Immersion 3-layer coating 	+++++	\$\$\$\$\$

Type	Pros	Cons
HASL (Hot Air Solder Level)	<ul style="list-style-type: none"> Nothing solders like solder Tried and true 	<ul style="list-style-type: none"> Fine Pitch BGA parts Environmental regulations (Lead) Can be mounded and not planar
Immersion Silver	<ul style="list-style-type: none"> RoHS Compliant Very planar (flat) Inspectable AL wire bonding 	<ul style="list-style-type: none"> High insertion friction (not suitable for press fit)
Immersion Tin	<ul style="list-style-type: none"> RoHS Compliant Good for press fit insertions Very planar (flat) 	<ul style="list-style-type: none"> Not great for multiple reflow cycles
ENIG	<ul style="list-style-type: none"> Very planar (flat) Long shelf life (encapsulated) Low contact resistance AL wire bondable 	<ul style="list-style-type: none"> Lossy RF
ENIG	<ul style="list-style-type: none"> Very planar (flat) Long shelf life (encapsulated) Low contact resistance Gold wire bondable 	<ul style="list-style-type: none"> Lossy RF Palladium / Lead intermetallic (not ideal)



Surface Finish *HASL Immersion*

During HASL, the manufacturing panel is immersed in a tank of molten solder, allowing the solder to stick to the exposed copper pads. The panel is then quickly withdrawn from the solder and passed through high-pressure air knives, where the excess solder is blown off and leveled on the surface.



Lowered into Solder Vat

Lifted through "air knives"

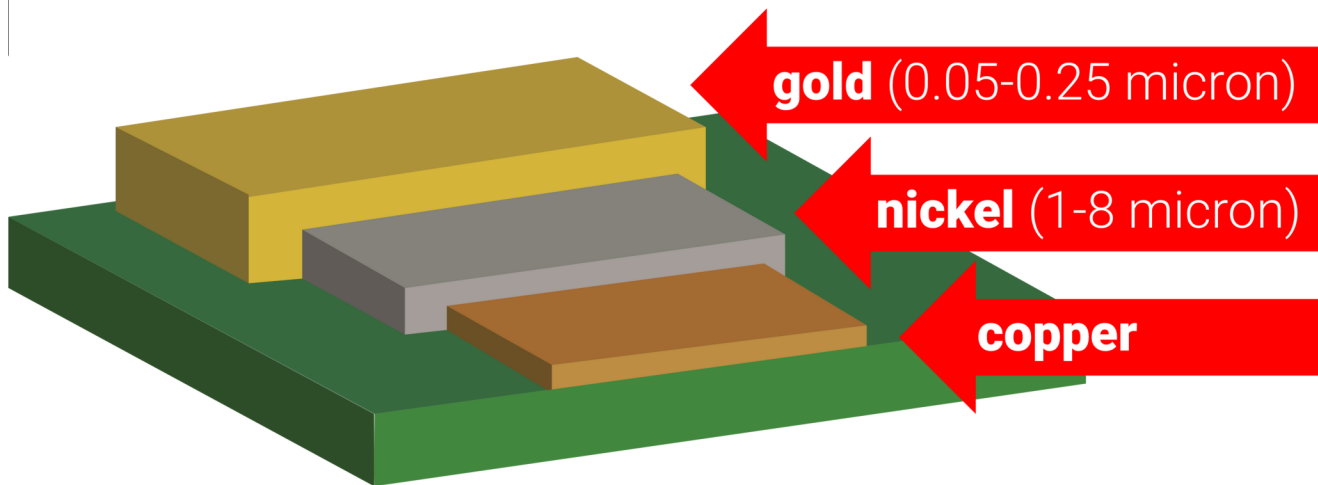


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ENIG *Electroless Nickel Immersion Gold*

A more expensive option is to use gold with electroless nickel, a process known as ENIG (electroless nickel immersion gold).

One important design consideration for ENIG is to use soldermask. Designs without solder mask have been known to allow the metal to plate directly on to the laminate under certain conditions, which can cause electrical issues. Typically, the manufacturer will have processes and checks in place to minimize this particular risk, but best practice is to use soldermask.



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