

# Surface Finish Overview

▲ recommended  
 ▲ good  
 ■ with limitations  
 ▼ not recommended  
 ▼ unsuitable

Abbreviated Designation	ASIG	ENAG	ENEPIG	ENIG	ENIPIG	EP	EPAG	EPIG	GalvNIG hard	GalvNIG soft	HAL lead free	HAL lead containing	IS	ISIG	IT	OSP
<b>Description (CONTI)</b>	Electroless Silver/ Immersion Gold	Electroless Nickel/ Electroless Gold	Electroless Nickel/ Electroless Palladium/ Immersion Gold	Reductive Nickel/ Immersion Gold	Electroless Nickel/ Immersion Palladium/ Immersion Gold	Electroless Palladium	Electroless Palladium/ Electroless Gold	Electroless Palladium/ Semireductive Gold			HAL	HAL lead containing	Immersion Silver	Immersion Silver/ Immersion Gold	Immersion Tin	OSP
<b>Remarks</b>	Semireductive Gold bath. The reductive Silver bath has proven too instable. Therefore, this process has been replaced by ISIG.	Phosphorous Ni. The reductive Au-bath is very instable. Therefore, this surface finish is increasingly replaced by Pd-containing alternatives.	Phosphorous Ni and Pd; higher Au-thickness is possible via semi-reductive Au-deposition (Umicore)	Phosphorous Ni	Phosphorous Ni and Pd; higher Au-thickness is possible via semi-reductive Au-deposition (Umicore)	Pd without Ph	Pd without Ph; Umicore uses a semireductive (TRG) Gold bath	Pd without Ph	Co- oder Fe-doped Gold baths; Ni-hardness 400-450HV, Au-hardness 140-170HV	Fine Gold electrolytes for bonding and soldering applications; Ni-hardness 400-450HV, Au-hardness 80-110HV	Often denoted as HASL	Often denoted as HASL		Semireductive Gold bath		Organic Surface Passivation
<b>Layer type and thickness</b>		Ni 3-7µm Au 0,1-0,3µm	Ni 3-7µm Pd 0,05-0,3µm Au 0,04-0,1µm	Ni 3-7µm Au 0,05-0,125µm	Ni 3-7µm Pd 0,01-0,05µm Au 0,04-0,1µm	Pd 0,1-0,2µm	Pd 0,1-0,2µm Au 0,1-0,2µm	Pd 0,1-0,2µm Au 0,04-0,2µm	Ni >4µm Au 0,8-3µm	Ni >4µm Au 0,2-0,5µm	SnCuNi-Leg. 1-50µm	SnPb-Leg. 1-50µm	Ag 0,2-0,4µm	Ag 0,2-0,3µm Au 0,04-0,15µm	Sn 0,8-1,3µm	Coating 0,2-0,6µm
<b>Soldering</b>		▲	▲	▲	▲	▲	▲	▲	■	▲	▲	▲	▲	▲	▲	▲
<b>Multiple Solderability</b>		2x	3x	3x	3x	3x	3x	3x	no	no	3x	3x	3x	3x	3x	1-2x
<b>Bonding Al-wire</b>		▲	▲	▲	▲	■	▲	▲	▼	▲	▼	▼	▲	▲	▼	▼
<b>Bonding Au-wire</b>		▲	▲	▼	▲	■	▲	▲	▼	▲	▼	▼	▲	▲	▼	▼
<b>Fine Pitch (Pad distance &lt;75µm)</b>		■	■	■	■	■	▲	▲	▼	▼	▼	▼	▲	▲	▲	▲
<b>High frequency application</b>		■	■	■	■	▲	▲	▲	■	■	■	■	▲	▲	■	▲
<b>Pressfit</b>		■	■	■	■	▲	▲	▲	■	■	▲	▲	■	■	▲	▼
<b>Key Press</b>		▲	▲	▲	▲	■	▲	▲	▲	▲	▼	▼	▼	▼	▼	■
<b>Corrosion resistance</b>		▲	▲	■	▲	■	▲	▲	▲	▲	▲	▲	■	■	▲	▼
<b>Shelf life</b>		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	■	▲	■	■
<b>Refreshable</b>		no	no	no	no	no	no	no	no	no	yes	yes	no	no	yes	yes
<b>Long term/market references</b>	■	▲	■	▲	■	▼	▼	▼	▲	▲	▲	▲	▲	■	▲	▲
<b>Serial costs</b>		140%	120%	100%	115%	90%	125%	125%	not specified (local spots)	>200%	70%	70%	50%	125%	60%	30%
<b>Chemistry suppliers (inter alia)</b>		Umicore	Atotech Umicore (TRG)	OMG Atotech Umicore	OMG Umicore (TRG)	Atotech (Pallabond) Umicore	Atotech (Pallabond)	Umicore (TRG)	Dow Atotech Umicore	Dow Atotech Umicore	Balver Zinn Felder Lote	Balver Zinn Felder Lote	MacDermid Umicore	Umicore (TRG)	Atotech (Smarttin)	Enthone (Entek+ HT)

▲ recommended  
 ▲ good  
 ■ with limitations  
 ▼ not recommended  
 ▼ unsuitable