

Vitronics Soltec

Solderable coatings

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Introduction

Components and boards must have a level of solderability that matches with good solder quality in automatic soldering processes. This solderability level and the test method is defined in industrial standards like the ANSI, IPC and J-STD standards

Lasting solderability

For a good preservation of the solderability the galvanic solderable layer (e.g. tin) should be at least 3 microns, to guarantee a good solderability after one-year storage. The 3 microns are necessary to ensure that always a pure tin layer is present between the intermetallic layer and the oxide on top of the finish. This pure tin layer will melt and alloy during soldering, which makes the oxide skin 'float' away from the surface. Due to this mechanism main part of the flux activity is left for the joint formation.

Often thinner coatings are applied e.g. immersion tin or silver. These layers have a limited protection, normally < 6 months.

These layers have often a thickness of less than 1-micron. With such thin layers it is possible that the layer will migrate to a large extent in the copper base metal, leaving only a copper-tin intermetallic on the surface.

This intermetallic layer will oxidise in due time after storage, depending on the storage conditions.

It is known that the common flux activators can some times hardly remove the oxides on these intermetallics. As a result one will end up with a layer that partly is not completely wettable. This will cause dewetting.

Another risk of very thin layers is that they can be porous, so the base metal is not completely covered. This might also cause dewetting. Last but not least, the copper surface should be absolutely clean before the plating process starts. If oxides or dirt are entrapped in the finish layer one can expect solder defects. (See also chapter 2.3.3 from Soldering in Electronics Second Edition by R. J. Klein Wassink)

Note: The poor solderability of these thin oxidised intermetallics is also known with HASL treated boards that have been stored too long before soldering. As a result of this oxidation the through holes will get unsolderable knees or edges. A common effect related to these unsolderable knees is that the solder is not able to wet the topside fillet of the joint. On the solderside this even can give open joint fillets in some cases.

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