

PRODUCT PROFILE

ELECTROLOY LEAD FREE BAR

Product Name

Product Code

SOLDER BAR – LEAD FREE ALLOY – Sn99.3/Cu0.7+Ni

LF- 801HL

**– LEAD FREE ALLOY – Sn99.6/Cu0.4+Ni
(TOP UP ALLOY)**

LF- 801HLE

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PRODUCT INFORMATION

Electroloy has entered into an agreement with Nihon Superior to be able to offer the patented lead free nickel stabilized tin/copper wave solder alloy under Electroloy Product Number LF-801HL in South East Asia and China.

The corresponding patented countries & patent numbers : Malaysia : MY-114845A
Thailand : 16212
Indonesia : ID 0010052
China : ZL 99800339.5

LF-801HL is a lead-free solder containing tin, copper and nickel that make this alloy suitable for Hot Air Solder Leveling (HASL) process. All of the final finishes available in the market today have both their merits and demerits. Many in the PCB industry are concerned about switching from HASL to a less forgiving final finish as they transit to the up and coming lead free era.

The LF-801HL alloy use in the HASL process should arise these concerns.

The patented addition of nickel to the tin-copper eutectic offers the following advantages:

- Low cost lead free alloy
- Low dross than other lead free alloy
- Excellent fluidity with very uniform and flat surfaces
- Bridge free coating and fine pitch circuitry
- Low copper erosion
- Good shelf life
- Minimal attack on stainless steel pot
- Close to eutectic temperature
- Easy to manage alloy composition
- Compatible with both 63/37 and lead free final assembly

EXCELLENT FLUIDITY

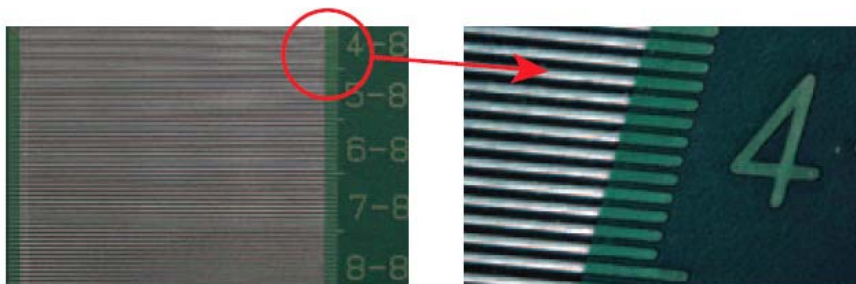


Fig. 1 Excellent fluidity of LF-801HL ensures no bridges on fine pitch track pattern

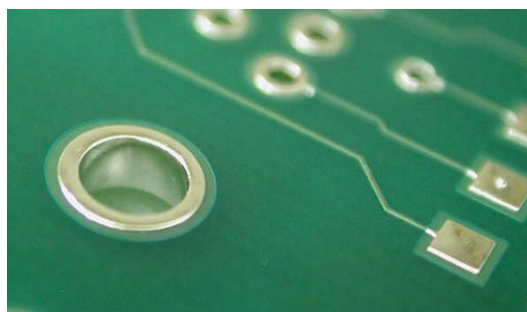


Fig. 2 Good penetration small diameters holes & uniform coating thickness and smooth bright finish

LOW COPPER EROSION

- LF-801HL does not corrode copper on through-hole walls and shoulders quickly.
- The quality of copper coatings and tracks are maintained.
- Less maintenance is required to maintain composition of solder bath.
- Presence of nickel retards the diffusion of copper and slows down corrosion.

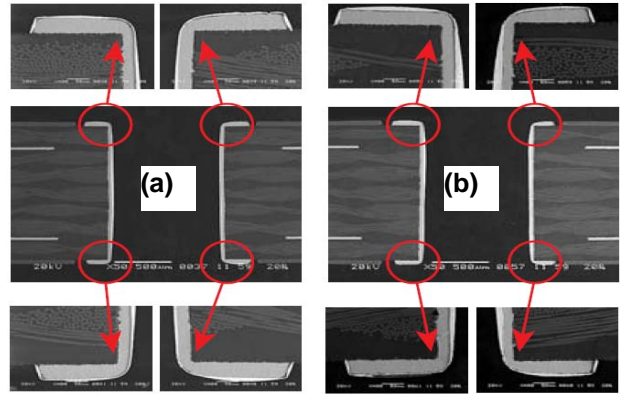
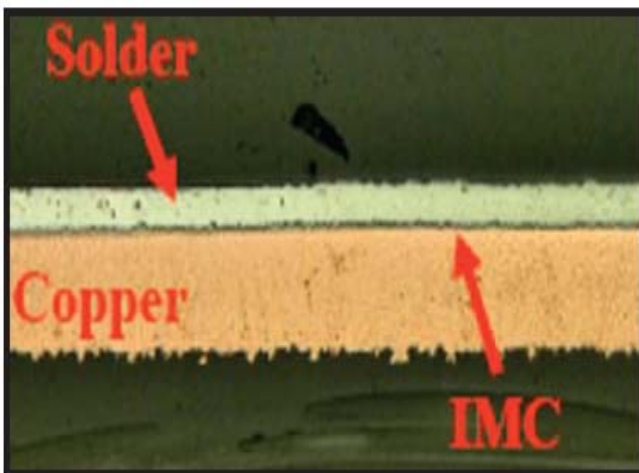


Fig.3 Copper thickness after immersion in a solder bath at 275°C for 3 seconds (a) and 8 seconds (b). Copper thickness decreases only by 0.5 μm to 2.0 μm after immersion for 8 seconds.

STABLE INTERMETALLIC FORMATION



Solder alloy Time (h)	Magnified cross section		
	LF-801HL	Sn-0.7Cu	Sn-3.0Ag-0.5Cu
0			
192			
768			

Fig. 4 Stability of the Intermetallic layer in LF-801HL coating

- Aging experiments at 120°C for 0, 192 and 768 hours shows that the intermetallic layer grows relatively slowly than that Sn-3.0Ag-0.5Cu.
- The thickness of the Intermetallic layer of LF-801HL remains effectively constant even after 768 hours of ageing at 120°C.
- Nickel in the Intermetallic layer slows down diffusion of copper atoms into this layer and improves the stability of this layer.
- Stability of the Intermetallic layer enables good solderability.

SOLDERABILITY

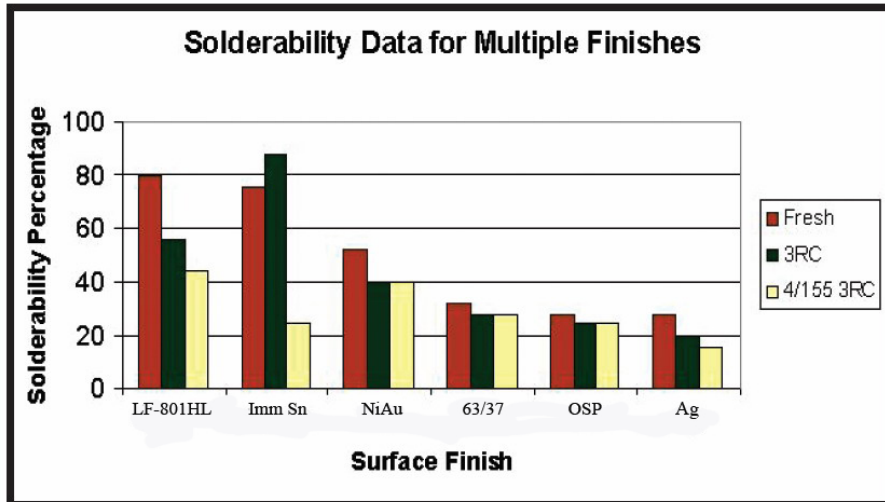


Fig. 5 Solderability of LF-801HL coating

- Solderability is lost when the Intermetallic layer grows through the surface.
- The stability of the Intermetallic layer in the presence of nickel ensures lasting solderability.
- The solderability can survive several cycles of adhesive curing or paste reflow.
- A properly applied LF-801HL coating has a solderability shelf life of about one year.
- Solderability of LF-801HL in comparison with other board finishes was tested as a function of thermal aging with reflow cycles and 4 hours 155°C aging.
- Solderability decreases expectedly with multiple reflow and heat aging steps. It can be seen from the result, however, that LF-801HL is a reliable surface finish and performs well.

THICKNESS CRITERIA

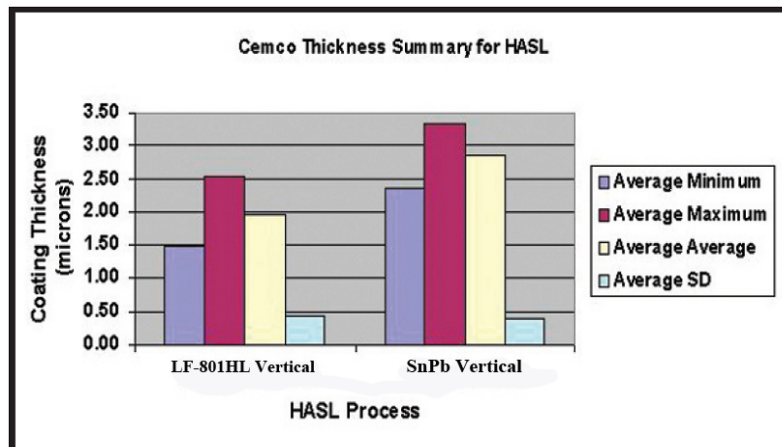


Fig. 6 Thickness obtainable in HASL LF-801HL coating

- Solder layer thickness in HASL are affected not only by the air pressure, pad size and board orientation, but also by the type of solder used.
- A thickness of pure LF-801HL of 0.9 μm is required for good solderability.
- Experiments to compare the thickness of HASL layer using LF-801HL and a leaded solder show that LF-801HL thickness of 1.5 to 2.5 μm is easily achievable.

CHEMICAL COMPOSITION OF ALLOY

The composition of LF-801HL & LF-801HLE lead free bar is strictly controlled to the following specification: -

<u>ELEMENT</u>	<u>LF-801HL SPECIFICATION</u>	<u>LF-801HLE SPECIFICATION (TOP UP ALLOY)</u>	<u>J-STD-006B Amendment 1</u>
TIN	REMAINDER	REMAINDER	REMAINDER
LEAD	MAX.0.050 %	MAX.0.050 %	MAX.0.070 %
ALUMINIUM	MAX 0.002 %	MAX 0.002 %	MAX.0.005 %
ANTIMONY	MAX 0.050 %	MAX 0.050 %	MAX.0.200 %
ARSENIC	MAX 0.030 %	MAX 0.030 %	MAX.0.030 %
BISMUTH	MAX 0.030 %	MAX 0.030 %	MAX.0.100 %
COPPER	0.5 – 0.7 %	MAX 0.4 %	-
IRON	MAX 0.020 %	MAX 0.020 %	MAX.0.020 %
ZINC	MAX 0.002 %	MAX 0.002 %	MAX.0.003 %
CADMIUM	MAX 0.002 %	MAX 0.002 %	MAX.0.002 %
SILVER	MAX 0.050 %	MAX 0.050 %	MAX.0.100 %
NICKEL	MAX 0.100 %	MAX 0.100 %	-
INDIUM	MAX 0.100 %	MAX 0.100 %	MAX.0.100 %
GOLD	MAX 0.050 %	MAX 0.050 %	MAX.0.050 %

PRODUCT APPLICATION

The LF-801HL lead free alloy can be used in both vertical and horizontal HASL machines.

As the LF-801HL solder bath is used, copper tends to dissolve into the solder from the bare board. If the copper content of the solder bath exceeds 0.85%, there is likely to be an increase in the incidence of bridges, and overall graininess.

In order to maintain the proper copper level in the bath, Electroloy recommends the LF-801HLE as the top-up alloy.

The recommended operating window for copper is between 0.5 and 0.85%. Verification of copper content is easy with free Solder Pot Analysis offered by Electroloy. The statistical analysis of your solder pot will help you monitor the copper level over time & make critical decision to achieve good production yield with the LF-801HL bars.

Recommended Operating Parameters

Setting/ Process type	Dip Time	Conveyor Speed	Contact Time	Air Knife Temp	Pot Temp
Vertical	1.0s – 3.0s	NA	NA	260-265°C	260-270°C
Horizontal	NA	10-15m/min.	0.5s – 1.0s	260-265°C	260-270°C

PHYSICAL APPEARANCE

The LF-801HL lead free bars come in triangle casted and extruded types. The LF-801HL exhibit a shiny appearance & uniform silver-grey in color. The brand & alloy code is embossed onto the surface of each bar. Each bar is approximately 700 – 900 grams in weight. The physical dimension is about 330mm x equal side of 24mm.



Fig. 7 LF-801HL solder bars

PACKAGING

The LF-801HL lead free bars are pack into “Green “carton boxes of 20kg each. Each box contains the following traceable information:

1. The Supplier
2. Grade
3. Product Code / Type
4. Lot Number
5. Weight per Box

DELIVERY

Each shipment shall be accompanied with a Certificate of Analysis for each lot, which indicates the impurity level of each element according to LF-801HL Specification.

STORAGE AND SHELF LIFE

The LF-801HL lead free bars have no limited shelf life when handled properly. Storage must be in a dry & non-corrosive environment.

To minimize the bars from further oxidation, ensure that the packaging is not damaged.

The solder surface may lose its shine & appear a dull shade of light yellow. This is a surface phenomenon & is not detrimental to product functionality & performance.

HEALTH AND SAFETY

Refer to the MSDS for guidance on safety and health issues.