

PRODUCT PROFILE

ELECTROLOY in partnership with FCT Asia Pte Limited

in Manufacturing

Nihon Superior Lead Free Solder Bar

SN100CL

Product Name

Product Code

**LEAD FREE BAR
LEAD FREE BAR
(TOP UP ALLOY)**

**SN100CL
SN100CLe**

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PRODUCT INFORMATION

Electroloy has entered into an agreement with FCT Asia Pte Limited to manufacture SN100CL solder alloy with patent license from Nihon Superior.

SN100CL is a lead-free solder containing tin, copper, nickel and other proprietary elements 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 SN100CL 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

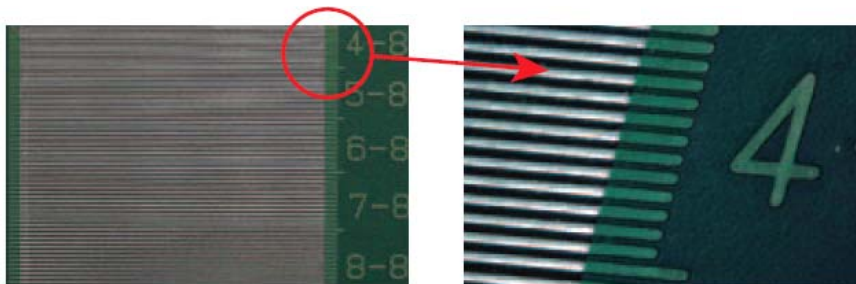


Fig. 1 Excellent fluidity of SN100CL ensures no bridges on fine pitch track pattern

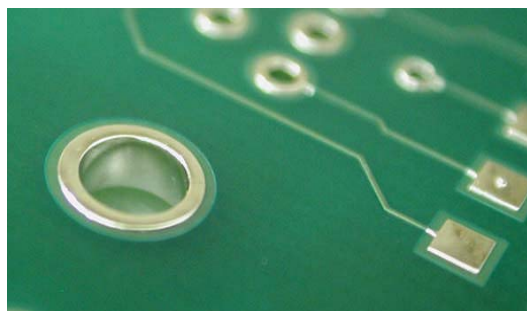


Fig. 2 Good penetration small diameters holes & uniform coating thickness and smooth bright finish

LOW COPPER EROSION

- SN100CL 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.

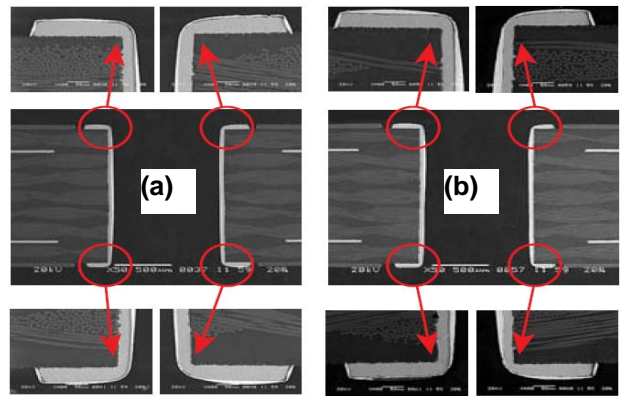
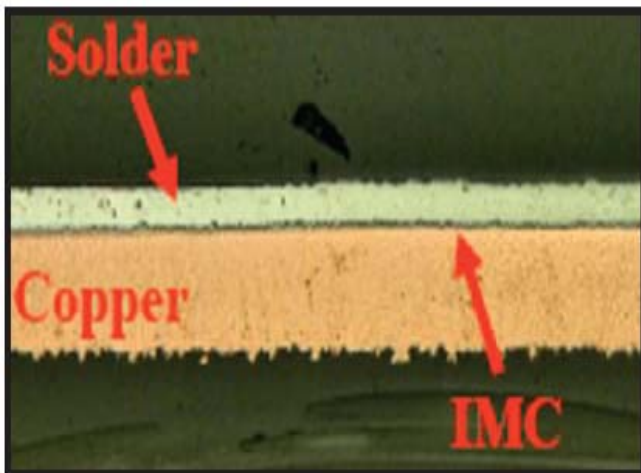


Fig.3 Copper thickness after immersion in a solder bath at 275°C for 3 seconds (a) and 8 seconds (b). Copper thickness decreases only by 0.5 μm to 2.0 μm after immersion for 8 seconds.

STABLE INTERMETALLIC FORMATION



Solder alloy	Magnified cross section		
	SN100CL	Sn-0.7Cu	Sn-3.0Ag-0.5Cu
Time (h)			
0			
192			
768			

Fig. 4 Stability of the Intermetallic layer in SN100CL 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 SN100CL 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

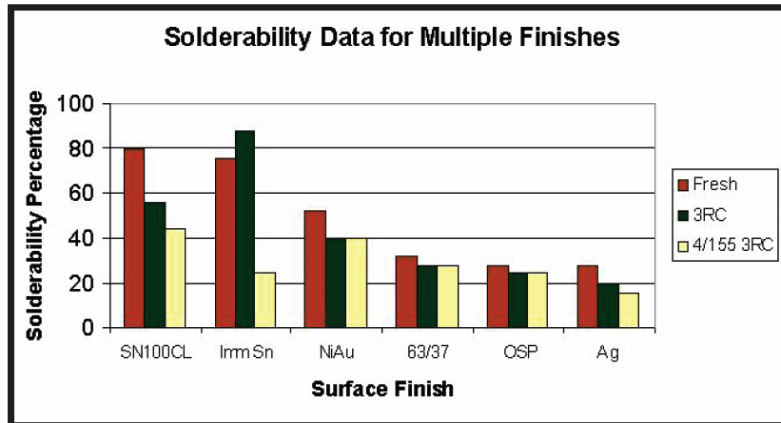


Fig. 5 Solderability of SN100CL coating

- 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 SN100CL coating has a solderability shelf life of about one year.
- Solderability of SN100CL 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 SN100CL is a reliable surface finish and performs well.

THICKNESS CRITERIA

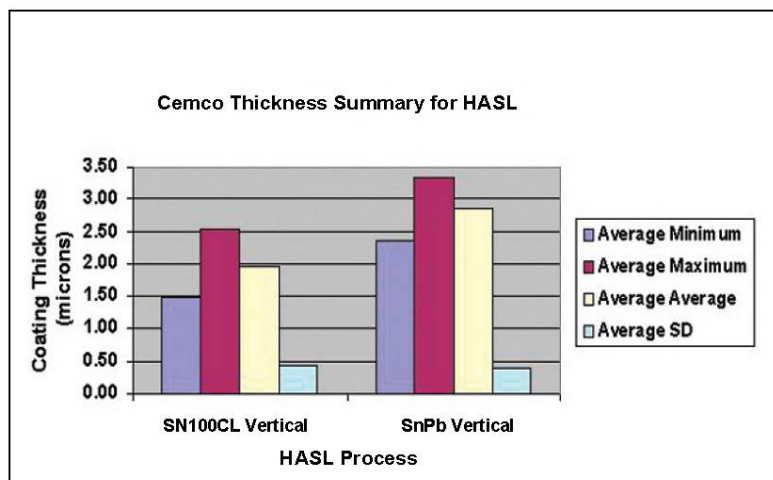


Fig. 6 Thickness obtainable in HASL SN100CL coating

- 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 SN100CL of 0.9 μm is required for good solderability.
- Experiments to compare the thickness of HASL layer using SN100CL and a leaded solder show that SN100CL thickness of 1.5 to 2.5 μm is easily achievable.

CHEMICAL COMPOSITION OF ALLOY

The composition of SN100CL & SN100CLe lead free bar is strictly controlled to the following specification: -

ELEMENT	SN100CL SPECIFICATION	SN100CLe SPECIFICATION (TOP UP ALLOY)	J-STD-006B Amendment 1
TIN	REMAINDER	REMAINDER	REMAINDER
LEAD	< 0.050 %	< 0.050 %	MAX.0.070 %
ALUMINIUM	< 0.002 %	< 0.002 %	MAX.0.005 %
ANTIMONY	< 0.050 %	< 0.050 %	MAX.0.200 %
ARSENIC	< 0.030 %	< 0.030 %	MAX.0.030 %
BISMUTH	< 0.030 %	< 0.030 %	MAX.0.100 %
COPPER	0.65 ± 0.05 %	< 0.1 %	-
IRON	< 0.020 %	< 0.020 %	MAX.0.020 %
ZINC	< 0.002 %	< 0.002 %	MAX.0.003 %
CADMIUM	< 0.002 %	< 0.002 %	MAX.0.002 %
SILVER	< 0.050 %	< 0.050 %	MAX.0.100 %
NICKEL	0.05 ± 0.01 %	0.05 ± 0.01 %	-
INDIUM	-	-	MAX.0.100 %
GOLD	-	-	MAX.0.050 %

PRODUCT APPLICATION

The SN100CL lead free alloy can be used in both vertical and horizontal HASL machines.

As the SN100CL 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 SN100CLe 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 SN100CL 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 SN100CL lead free bars come in triangle casted and extruded types. The SN100CL 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 SN100CL solder bars

PACKAGING

The SN100CL lead free bars are pack into “White “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 SN100CL Specification.

STORAGE AND SHELF LIFE

The SN100CL 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.