

PRODUCT PROFILE

ELECTROLOY LEAD FREE BAR

Product Name

Product Code

SOLDER BAR – LEAD FREE ALLOY – Sn99.0/Ag0.3/Cu0.7+Bi

LF- 315XB

**– LEAD FREE ALLOY – Sn99.7/Ag0.3+Bi
(TOP UP ALLOY)**

LF- 315XBE

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DOC CATEGORY: 3

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. China . Malaysia . Singapore

Solder Connections

PRODUCT INFORMATION

LF-315X was developed to offer an alternative to SAC305 and yet maintain a good reliability. It is also a more economical option to other lead free alloys. LF-315X exhibits better reliability than SnCu alloy because of having better mechanical joint strength as well as have a product yield comparable to SAC305. This is a RoHS compliance solder bar which is able to meet and fulfill International & Environmental requirements.

Electroloy Product number : LF-315XB.

Characteristics of LF-315XB

- Good Wetting
- Good through hole fill
- Minimal hot tear
- Comparable reliability to SAC
- Low Cost
- Lower copper dissolution rate compared to SAC

CHEMICAL COMPOSITION OF ALLOY

The composition of Electroloy's LF-315XB & LF-315XBE lead free bar is strictly controlled to the following specification: -

<u>ELEMENT</u>	<u>LF-315X SPECIFICATION</u>	<u>LF-315XBE SPECIFICATION (TOP UP ALLOY)</u>	<u>J-STD-006B*</u>
TIN	REMAINDER	REMAINDER	REMAINDER
LEAD	MAX.0.050 %	MAX.0.050 %	MAX.0.070 %
ALUMINIUM	MAX 0.005 %	MAX 0.005 %	MAX.0.005 %
ANTIMONY	MAX 0.050 %	MAX 0.050 %	MAX.0.200 %
ARSENIC	MAX 0.030 %	MAX 0.030 %	MAX.0.030 %
BISMUTH	0.09 – 0.12 %	0.09 – 0.12 %	-
COPPER	0.6 – 0.8 %	MAX 0.080 %	-
IRON	MAX 0.010 %	MAX 0.010 %	MAX.0.020 %
ZINC	MAX 0.003 %	MAX 0.003 %	MAX.0.003 %
CADMIUM	MAX 0.002 %	MAX 0.002 %	MAX.0.002 %
SILVER	0.2–0.4 %	0.2–0.4 %	-
NICKEL	MAX 0.010 %	MAX 0.010 %	MAX 0.010%
INDIUM	MAX 0.050 %	MAX 0.050 %	MAX.0.100 %
GOLD	MAX 0.050 %	MAX 0.050 %	MAX.0.050 %

* IPC J-STD-006B Amendment 1

COMPARISON BETWEEN LF- 315XB and Sn63/Pb37

Comparison of LF-315XB with Sn63/Pb37 on mechanical characteristics

Characteristics	LF-315XB	Sn63/Pb37
Alloy composition	Sn99.0/Ag0.3/Cu0.7+Bi	Sn63/Pb37
Specific gravity	7.3	8.4
Solidus temperature (°C)	216	183
Liquidus temperature (°C)	228	EUTECTIC
Specific heat (J/KgK)	218	176
Tensile strength (MPa)	30	42
Thermal Conductivity (J/m.s.K°)	64	50
Electrical Resistivity ($\mu\Omega$ -cm)	17	14.5
Elongation (%)	46	25

Characteristics of SAC –LF-315XB

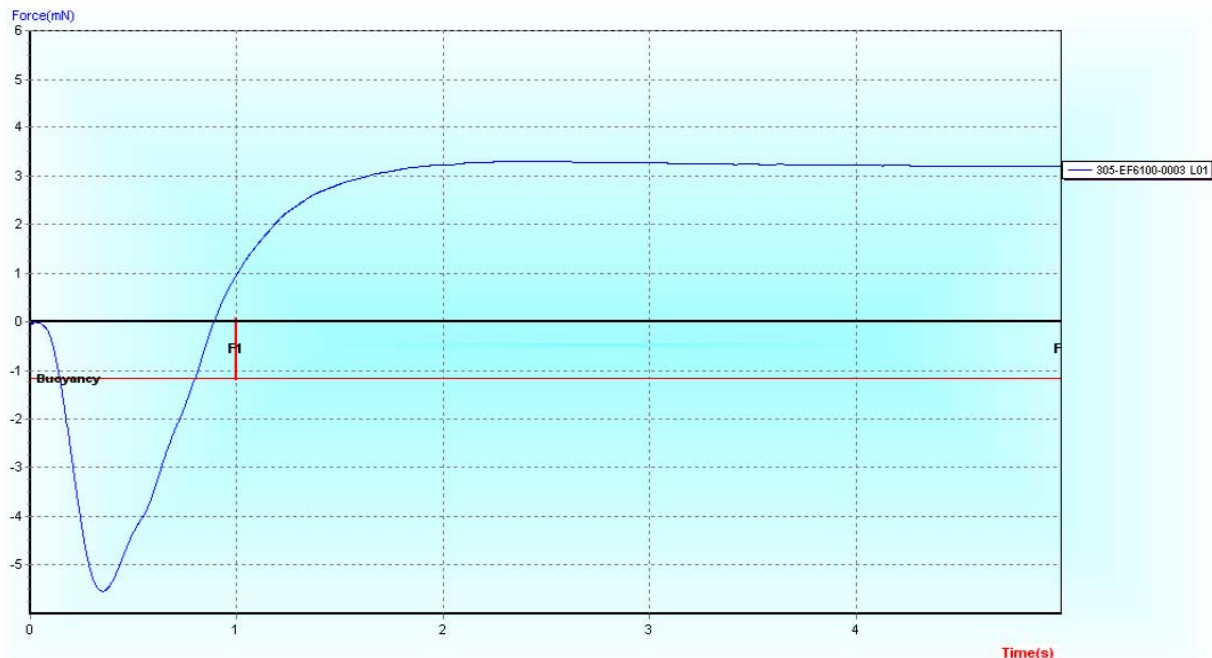
Good Wetting

Test Temperature : 260°C
Dwell Time : 5 sec.

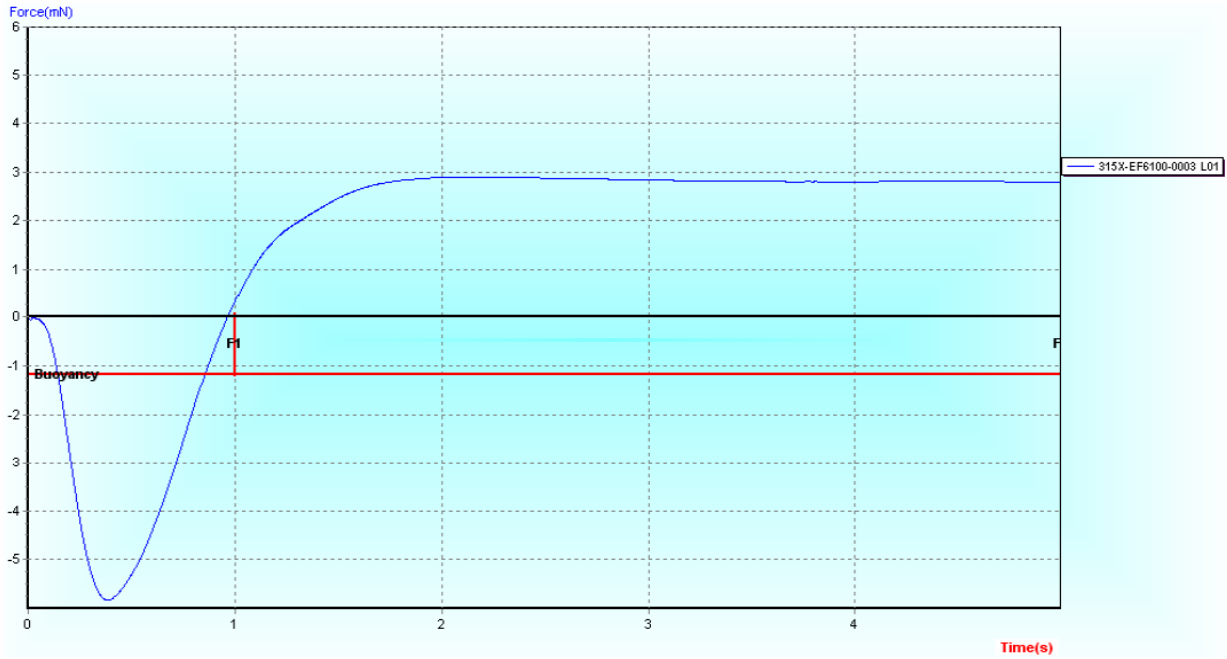
Immersion Depth : 5 mm
Immersion Speed : 20mm/s

Preheat Time : 10s

SAC Alloy



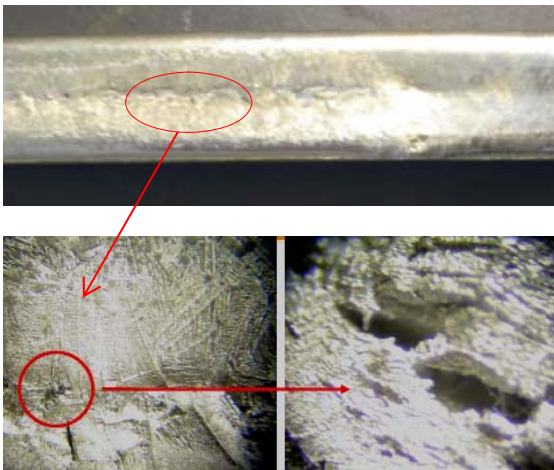
LF-315XB



Alloy	Ta (s)	Tb (s)	Fmax (mN)	Time to Fmax (s)
SAC305	0.795	0.891	3.299	2.391
LF-315X	0.855	0.966	2.898	2.193

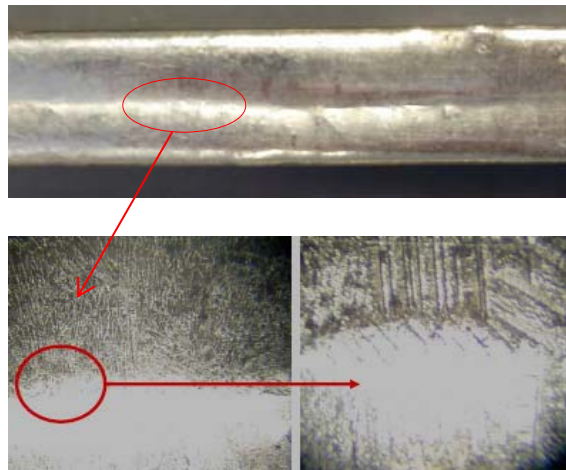
Minimal Hot Tear

Major hot tear



Major hot tear observed in the SAC305 alloy for the same cooling rate. Due to a large amount of the Ag_3Sn IMC, this is one of the causes for the shrinkage cracks.

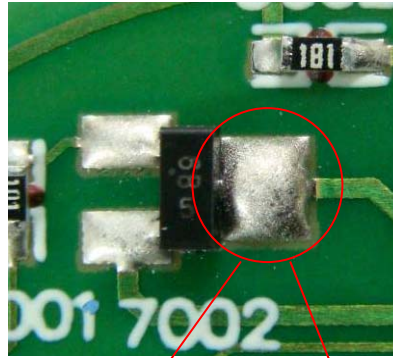
Minimal or no hot tear



LF-315X alloy shows minimal or no hot tear for the same cooling rate. However the LF-315X retains reliability of the SAC alloy due to Ag_3Sn , but do not exhibit the shrinkage cracks.

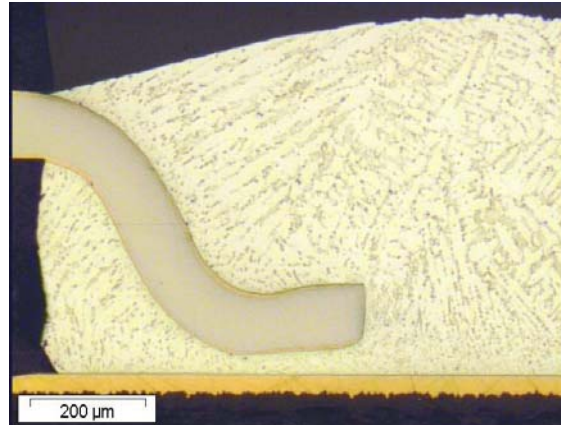
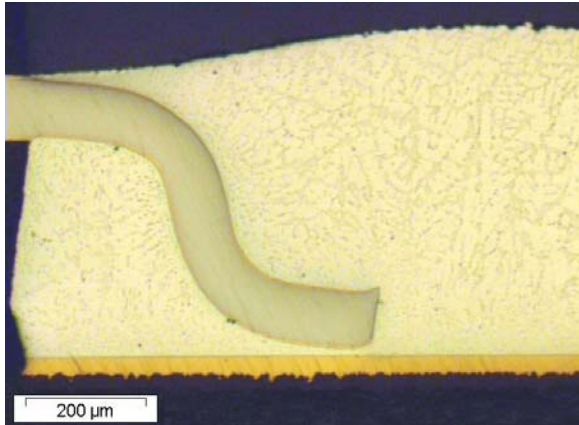
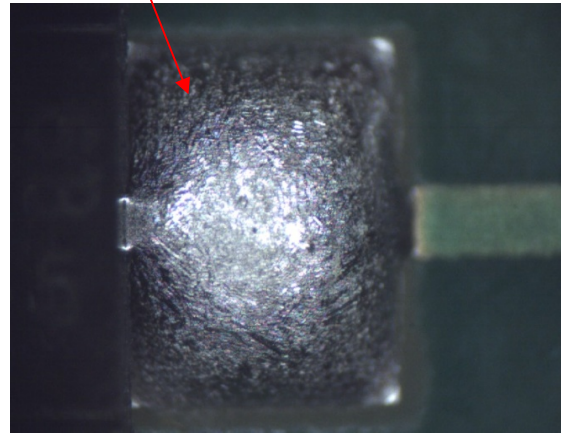
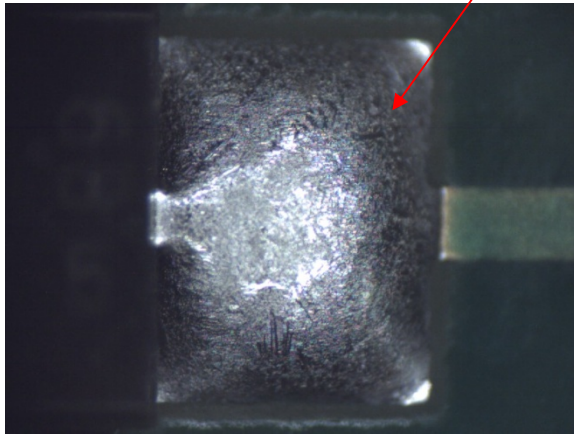
Reliability

SOT23 Component



Before Thermal Cycle

After Thermal Cycle



The physical appearance of the solder joint of component before & after thermal cycling showed very little difference except for the surface exhibiting a rougher finishing after the aging process. The cross section of the component also showed good wetting as the lead soldered well without any delamination. Thus ensuring good reliability & strength of joint.

PRODUCT APPLICATION

LF-315XB lead free solder has proven to perform well in automated wave soldering, selective soldering, and static solder pots.

In the LF-315XB solder bath, copper tends to dissolve into the solder from the boards and component leads. If the copper content of the solder bath exceeds 0.85%, it is likely to cause an increase in the incidence of bridges, icicles, and other defects.

In order to maintain the copper level within the permissible limit in the solder bath, Electroloy recommends the LF-315XBE top-up alloy. The LF-315XBE has a lower copper content than the LF-315XB to ensure that the copper content in the solder pot stays below the critical level of 0.85%.

Verification of copper content is easy with the free Solder Pot Analysis offered by Electroloy. The statistical analysis of your LF-315XB solder pot will help you monitor the copper level over time & make critical decision to achieve good production yield with our LF-315XB bars.

- **Wave soldering**

Recommended Process Parameter Setting

Recommended Process Setting	
PROCESS PARAMETERS	LF-315XB
Pot Temperature	250-260°C
Top Side Preheat	100-130°C
Conveyer Speed	1.0m – 1.5m/min.
Contact Time	2.0s – 3.0s

- **Dip Soldering**

The LF-315XB bars are also suitable to be used in high temperature dip thinning of fine copper wire in component Manufacturing.

PHYSICAL APPEARANCE

The LF-315XB 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 20mm X 13mm. The LF-315XB also comes in 4 kg bar of dimension about 535mm X 50mm X 20mm.

PACKAGING

The LF-315XB lead free bars are pack into “Green “carton boxes of 20kg each. Each box contain the following traceable information:

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

For 4 kg bar type, the packing can be in palletized form.

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-315X Specification.

STORAGE AND SHELF LIFE

Electroloy's LF-315XB 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.