SCS7 HCLF490

Halide Free No Clean Core Wire

INTRODUCTION

SCS7* is Asahi's latest lead free alloy development. As an enhanced tin/copper lead free alloy, it is highly recommended to directly replace existing SnCu0.7 solder. This alloy not only exhibits the excellent ductility of SnCu0.7 solder, it also possesses superior mechanical strength both in ambient and high temperature environments. SCS7's fatigue resistance is now comparable to tin/lead solder and as such, SCS7 has addressed the fundamental concerns of SnCu alloys.

SCS7 HCLF490 lead free no clean core flux solder wire is designed for normal soldering temperature and also high temperature application in manual or auto soldering. The flux residue is translucent even at high temperature yet provides excellent instant wetting action and superior solderability on a variety of surface finishes. The spattering and smokes are minimal.

SPECIFICATIONS

Item	Specifications	Test Standards
Flux Content	2.0 +/- 0.3 wt% to 2.5 +/- 0.3 wt%	Singapore Asahi
Halide Content	<0.02% (wire as a whole)	BS EN 14582
Water Extract Resistivity	>1 x 10^5 Ω-cm	JIS Z 3197: 1999 8.1.1
Surface Insulation Resistance (85°C, 85 %RH, 1000hrs)	>1 x 10^9 Ω, Pass >1 x 10^{12} Ω, Pass	IPC-TM-650 2.6.3.3 JIS Z 3197: 1999 8.5.3
Electromigration (85 °C, 85 %RH, 1000hrs)	No dendrite growth, Pass	JIS Z 3197:1999 8.5.4
Copper Corrosion Test	Pass	IPC-TM-650 2.6.15 JIS Z 3197: 1999 8.4.1
Copper Mirror Test	Classified as "M", Pass	IPC-TM-650 2.3.32 JIS Z 3197: 1999 8.4.2
Flux Activity Classification	ROM0	IPC J-STD-004A
Spread Factor	>75% (SCS7)	JIS Z 3197: 1999 8.3.1.1
Residue Dryness Test	Dry	JIS Z 3197: 1999 8.5.1
Residue Appearance	Transparent & Minimal	Visual

*** World Patent No. 2006/045995 A1**

*** US Patent No. 7472817**

*** Japanese Patent No. 4048288**

ALLOY COMPOSITIONS

Main Composition		**IPC J-STD-006B Specs (Wt %)**
Tin	Sn	Remainder
Copper	Cu	0.7 +/- 0.1
Silicon	Si	0.02 +/- 0.01
Contamination		
Silver	Ag	0.10 max
Aluminium	Al	0.005 max
Arsenic	As	0.03 max
Bismuth	Bi	0.10 max
Cadmium	Cd	0.002 max
Iron	Fe	0.02 max
Indium	In	0.10 max
Nickel	Ni	0.01 max
Lead	Pb	0.05 max
Antimony	Sb	0.05 max
Zinc	Zn	0.003 max

PHYSICAL PROPERTIES

Melting Temperature	227^{o}C
Coefficient of Thermal Expansion	22.7 µm/m^{o}C
Density	7.30 g/cm^{3}

MECHANICAL PROPERTIES (As-Cast) (ASTM E8M 3mm/min at 23^{o}C)

Tensile Strength	45.83 MPa
Yield Strength	38.78 MPa
Max Percent Strain	68.16 %
Energy to Yield Point	0.203 J
Energy to Break Point	18.05 J
Toughness	25.54 MPa
Creep Resistance (Load at 1kg @ 145^{o}C)	>40hrs

APPLICATION

SCS7 HCLF490 lead free no clean core flux solder wire is easy to use for automatic, manual, rework, point and brush soldering. For the best soldering results, the recommended parameters are shown:

Solder Iron Tips:	All Types especially the tapered types
Soldering Temp:	380 - 480 ^{o}C
Soldering Time:	1 - 3 secs

- Keep solder iron tips clean.
- Tinned iron tips before use.
- Wear gloves when soldering to avoid contaminating the wire.

(Note: Soldering parameters are dependent on tip type, soldering station wattage configuration, wire diameter and type of applications.)

RESIDUAL REMOVAL

Since the residues are transparent, minimal, dry, non-tacky and practically inert after soldering, removal is usually not necessary. For assemblies that require cleaning, the residue of SCS7 HCLF490 lead free no clean core flux solder wire can be completely removed by any solvent type flux cleaner available in the market.

STORAGE

Store the solder wire in a cool, dry and non-corrosive environment. Wrap up the solder wire when not in use to reduce exposure to environment. SCS7 HCLF490 lead free no clean core flux solder wire can be kept for 2 years if proper storage conditions are observed.

HEALTH and SAFETY

Wear a chemical mask if the operators are allergic to the fumes released during soldering. For more information, please refer to Material Safety Data Sheet.

PACKAGING

SCS7 HCLF490 lead free no clean core flux solder wire is commonly available in various diameters such as 0.5, 0.6, 0.8, 1.0, 1.2, 1.6 and 2.0 mm. For different diameters, please specify your requirements.

Packaging	0.25kg	0.50kg	1.0kg
Diameter (mm)	0.5 to 2.0	0.5 to 2.0	0.8 to 2.0

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TEST ANALYSIS

Various tests were conducted to evaluate the performance and reliability of HCLF490 core flux.

HALIDE CONTENT

This test is to determine the amount of halide present in the cored flux.

Method:

By titration method with end point determination. The % chlorides calculated based on the following formula:

$$\text{Halides, as \% Chlorides} = \frac{3.55\ VN \times 100}{ms}$$

Result:
The halide is <0.02% (wire as a whole).

WATER EXTRACT RESISTIVITY

This test measures the resisitivity of the flux constituents.

Method:

- Take an amount of the flux containing solid portion equivalent to 0.05 +/- 0.005g as the sample.
- Put the sample in a beaker with 50ml of purified water. Cover the beaker with a watch glass.
- Heat and boil it for about 5 mins, and continue heating for about 1 min.
- Cool the beaker for about 10 secs at room temperature, then place beaker in a water bath of about 20°C to obtain the test solution.
- Immediately measure the resistance of this water solution using a conductivity meter.

Result:
The water extract resistivity is > 1 x 10^5 Ω-cm.

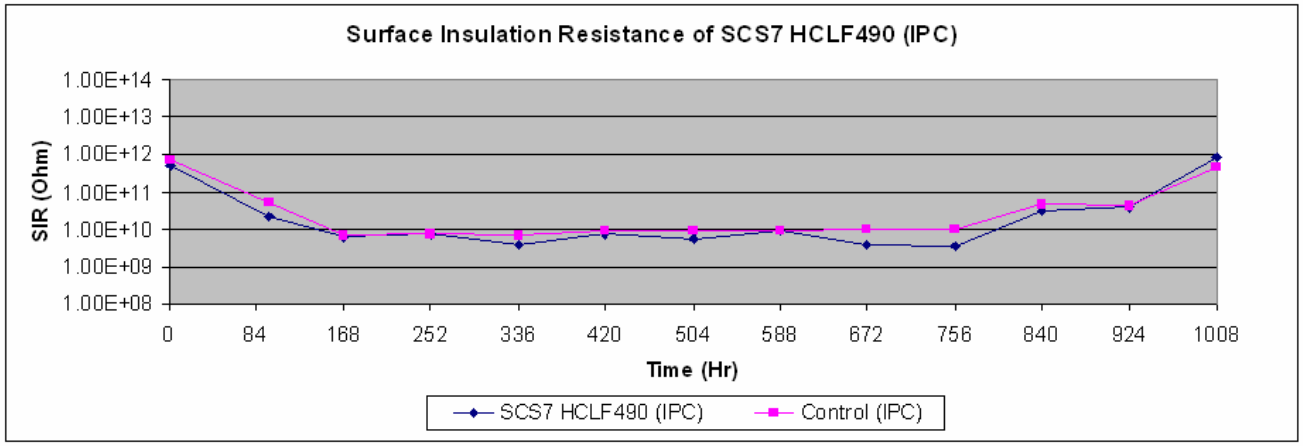
SURFACE INSULATION RESISTANCE

It determines the surface insulation properties of the flux on the finished product. Thus, it determines the reliability of the residue if left on board without cleaning.

Test Conditions (IPC-TM-650 2.6.3.3)

Humidity	:	85 %RH
Temperature	:	85°C
Duration	:	1000hrs
Bias Voltage	:	+50V DC
Test Voltage	:	-100V DC
Test Coupon	:	IPC-B-24

Result:

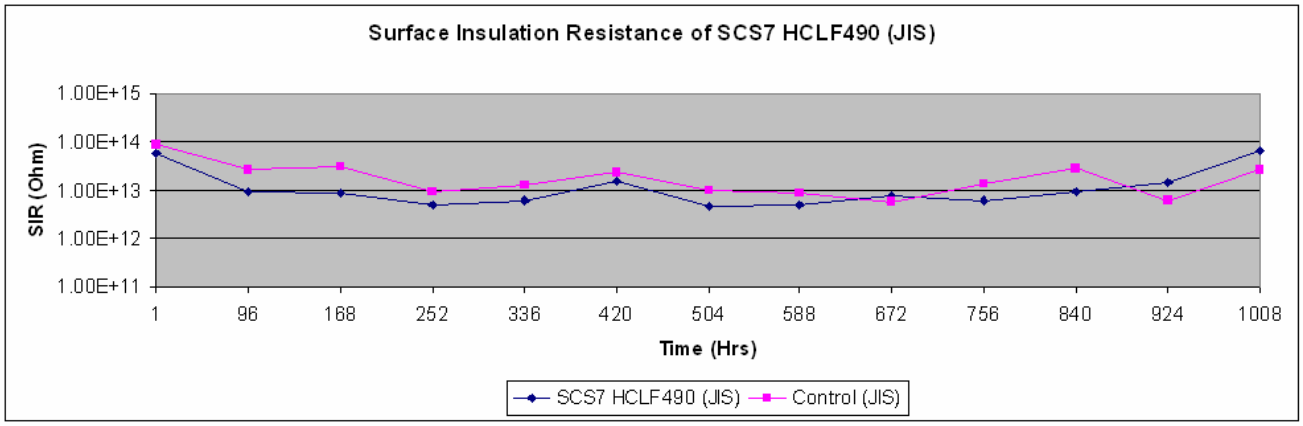


Surface Insulation Resistance: >1 x 10^9 Ω, Pass.

Test Conditions (JIS Z 3197: 1999 8.5.3)

Humidity	:	85 %RH
Temperature	:	85°C
Duration	:	1000hrs
Test Voltage	:	100V DC
Test Coupon	:	JIS C 6480

Result:



Surface Insulation Resistance: >1 x 10^{12} Ω, Pass.

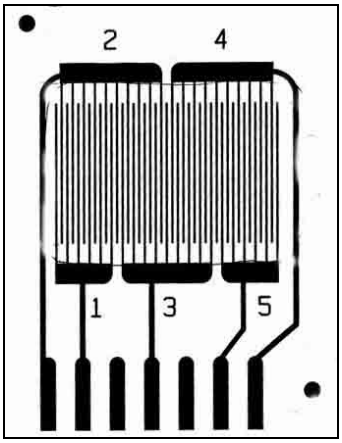
ELECTROMIGRATION

This test determines the existence of migration due to flux residue after soldering.

Standard : JIS Z 3197: 1999 8.5.4

Conditions :

Temperature	:	85°C
Humidity	:	85 %RH
Test Voltage	:	50V DC
Test Coupon	:	JIS C 6480 coupon
Duration	:	1000hrs



Test Coupon: "Typical Comb Pattern" (JIS C 6480 coupon)

Result : No dendrite growth, Pass.

COPPER CORROSION TEST

Evaluate the extent of corrosion due to the flux residue after soldering under moisture.

Method:

- Weigh 1 gram of solder and make into a coil with a 3mm mandrel.
- Place the cleaned copper coupon on the surface of solder bath set to 280°C.
- Let the specimen remain on the solder bath surface for 5 secs after solder fusing.
- Allow the specimen to cool for 15mins.
- Place the specimen in a humidifier set at 40°C, 90 %RH for 96 hrs.
- Inspect the specimen for growth of corrosive compounds that are assumed to be green, bluish green or white.

Result:
No drastic change in appearance of copper under the residue or at the flux boundary. HCLF490 has passed the corrosion test.

COPPER MIRROR TEST

This test provides a visual check on the corrosive effect of the flux on the substrate.

Method:

- Place one drop of test flux onto the copper mirror.
- Keep copper mirror at 23 +/- 2°C & 50 +/- 5 %RH for 24 hrs.
- Remove test flux by immersion in clean 2-propanol.

Result:
The results showed that HCLF490 is classified as "M".

SPREAD TEST

The purpose of this test is to measure the spread capability of the HCLF490 core flux.

Method:

- Maintain hot plate temperature at 280°C.
- Place the solder wire (∅3mm) on a copper coupon.
- Place the coupon on hot plate for 15 secs.
- Lift the test piece from hot plate and cool down to room temperature.
- Measure rate of spread with the formula below:

Rate of Spread = (D-H)/D x 100%

where D = $1.24 \times V^{1/3}$

V = Mass / Specific Gravity

H = Height of Spread Solder

Result:

The result showed that HCLF490 had a spread factor of >75% with SCS7 solder.

RESIDUE DRYNESS TEST

This test determines the tackiness of the residue after soldering.

Method:

- Place circular solid solder wire preform on Cu coupon.
- Add 0.035 to 0.040g of solid portion of flux to centre of wire preform.
- Set solder bath temperature at 50 +/2 ^{o}C above the alloy's liquidus temperature.
- Place the Cu coupon on solder bath.
- After fusing of solder, leave it for 5 secs.
- Take the test piece out of the bath and cool it for 30 mins.
- Sprinkle powder talc onto the flux residue on the test piece.
- Brush the surface of the residue in the same direction twice and inspect test piece.

Result:

Powder falls off test piece easily. The flux residue has passed the dryness test.

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