Qualitek Group Of Companies

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# DSP XP799
# Water Soluble (OA)
# SOLDER PASTE

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## Physical Properties

## Solder Composition

Sn63 alloy is the conventional eutectic solder used in most electronic assemblies. The Sn63 alloy conforms and exceeds the impurity requirements of J-Std-006 and all other relevant international standards.

**Typical Analysis**

| Sn | Pb | Cu | Ag | Sb | Bi | In | As | Fe | Ni | Cd | Al | Zn | Au |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 62.5-63.5 | Bal. | 0.030 Max | 0.020 Max | 0.050 Max | 0.050 Max | 0.050 Max | 0.010 Max | 0.010 Max | 0.005 Max | 0.001 Max | 0.001 Max | 0.001 Max | 0.002 Max |

| | Sn63 |
|---|---|
| Melting Point, $^{o}$ C | 183 E |
| Hardness, Brinell | 14HB |
| Coefficient of Thermal Expansion | 24.7 |
| Tensile Strength, psi | 4442 |
| Density, g/cc | 8.42 |
| Electrical Resistivity , (μohm-cm) | 14.5 |
| Electrical Conductivity, $10^{4}$/ohm-cm | 6.9 |

| | Sn63 |
|---|---|
| Yield Strength, psi | 3950 |
| Total Elongation,% | 48 |
| Joint Shear Strength, at 0.1mm/min 20 C | 23 |
| Joint Shear Strength, at 0.1mm/min 100 C | 14 |
| Creep Strength, N/mm$^2$ at 0.1mm/min 20 C | 3.3 |
| Creep Strength, N/mm$^2$ at 0.1mm/min 20 C | 1 |
| Thermal Conductivity, W/m.K | 50.9 |

## Particle Size

Sn63 alloy is available in Type 2 (75-45μm), 3(45-25μm), 4(38-20μm), and 5 (25-15μm) J-STD-005 powder distribution. Solder powder distribution is measured utilizing laser diffraction, optical analysis and sieve analysis. Careful control of solder powder manufacturing processes ensures the particles' shape are 95% spherical minimum (aspect ratio < 1.5) and that the alloy contains a typical maximum oxide level of 80 ppm.

**Classification of Solder Powders by Particle Size**

| Powder Type | Fines | Majority | | Coarse | | Typical Mesh |
|---|---|---|---|---|---|---|
| | <10% | >80% | >90% | <1% | 0% | |
| 1 | 20 | 75-150 | | 150 | 160 | 100/200 |
| 2 | 20 | 45-75 | | 75 | 80 | 200/325 |
| 3 | 20 | 25-45 | | 45 | 50 | 325/500 |
| 4 | 20 | | 20-38 | 38 | 40 | 400/635 |
| 5 | 15 | | 15-25 | 25 | 30 | 500 |
| 6 | 5 | | 5-15 | 15 | 20 | |

## Metal Loading

Typical metal loading for stencil printing application is **89.0-91.0 %.**

## Solder Paste

Delta Solder paste XP799 is a water soluble solder paste designed for surface mount and other electronic assembly applications. The unique properties of this formula provide excellent activity, long stencil life, long tack time, high print speed capability and a longer shelf life.

Main Features

- Extended stencil life
- Long tack time
- Excellent wettability on OSP
- Residues easily cleaned
- Low foam
- Residues can remain on assembly for 72 hrs. prior to cleaning

| | Specification | Test Method |
|---|---|---|
| **Flux Classification** | ORL1 | JSTD-004 |
| **Copper Mirror** | No removal of copper film | IPC-TM-650 2.3.32 |
| **Silver Chromate** | Pass | IPC-TM-650 2.3.33 |
| **Corrosion** | Pass | IPC-TM-650 2.6.15 |
| **SIR** | | |
| JSTD-004 (cleaned) | $7.45 \times 10^{12}$ ohms | IPC-TM-650 2.6.3.3 |
| Bellcore (Telecordia) | $4.12 \times 10^{12}$ ohms | Bellcore GR-78-CORE 13.1.3 |
| **Electromigration** | Pass | Bellcore GR-78-CORE 13.1.4 |
| **Post Reflow Flux Residue** | 65% | TGA Analysis |
| **Acid Value** | 43 | IPC-TM-650 2.3.13 |
| **Metal Loading** | 90% | IPC-TM-650 2.2.20 |
| **Viscosity** | | |
| Brookfield (1), kcps | 1000+/-10% kcps | IPC-TM-650 2.4.34 modified |
| Malcom (2), poise | 1900-2200 | IPC-TM-650 2.4.34.3 modified |
| Thixotropic Index | 0.50-0.60 | |
| **Slump Test** | | |
| 25 C, 0.63 vertical/horizontal | No bridges all spacings | IPC-TM-650 2.4.35 |
| 150 C, 0.63 vertical/horizontal | No bridges all spacings | IPC-TM-650 2.4.35 |
| 25 C, 0.33 vertical/horizontal | 0.15 /0.15 | IPC-TM-650 2.4.35 |
| 150 C, 0.33 vertical/horizontal | 0.20/0.20 | IPC-TM-650 2.4.35 |
| **Solder Ball Test** | Pass | IPC-TM-650 2.4.43 |
| **Tack** | | |
| Initial | 110.2 gm | JIS Z 3284 |
| Tack retention @ 24 hr | 98.76 gm | JIS Z 3284 |
| **Stencil Life** | 4-8 hrs | QIT 3.44.5 |
| **Abandon Time** | 30-60 min | QIT 3.44.6 |

## Printing

## Stencil

Use of chemical etched/electroformed stencil is preferred however XP799 has been used successfully with chemical etch, electroformed, and laser cut stencils.

## Squeegee

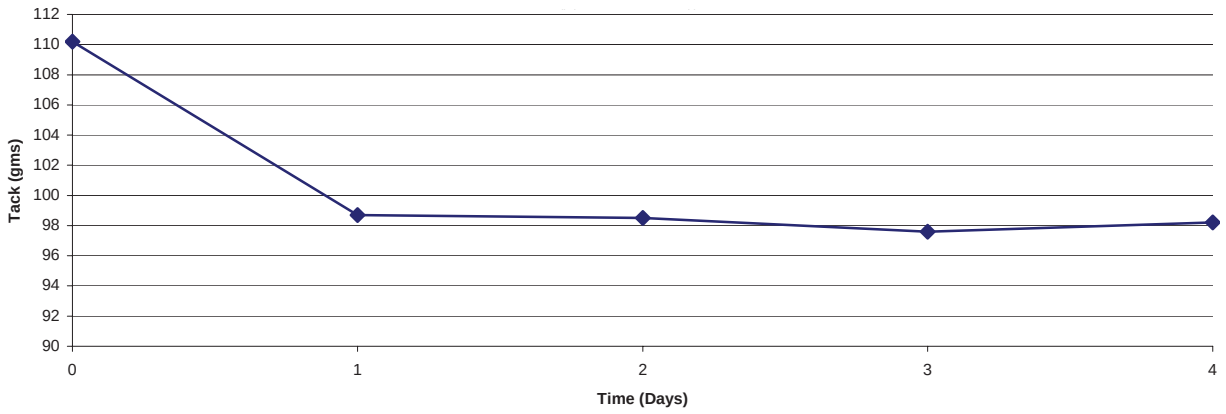
*Blades:* Metal (stainless steel) squeegee blades angled from 45-60$^{o}$ give the best print definition. Metal (nickel) squeegee blades angled from 45-60$^{o}$ give the best performance. 90 durometer polyurethane may also be used.

*Pressure:* Pressure should be adjusted at the point where the paste leaves a relatively clean stencil after each print pass. Typical pressure setting 0.6-1.5lb per linear inch of blade.

*Speed:* Normal print speeds are1.0-2.5 (25-50mm) per second. As print speeds increase pressure will need to be increased.

## Print Definition

XP799 provides excellent print definition characterized by brick-like prints. Good release is seen on 12-9 mil apertures. Tack values are high even after extended open time in both normal and high humidity environments.




## Open & Abandon Time

Tests have proven that XP799 will perform during continuous printing for up to 8 hrs. Field test have shown that an abandon time of at least 1 hr is possible, resulting in a perfect 1st pass print on resumption of printing.

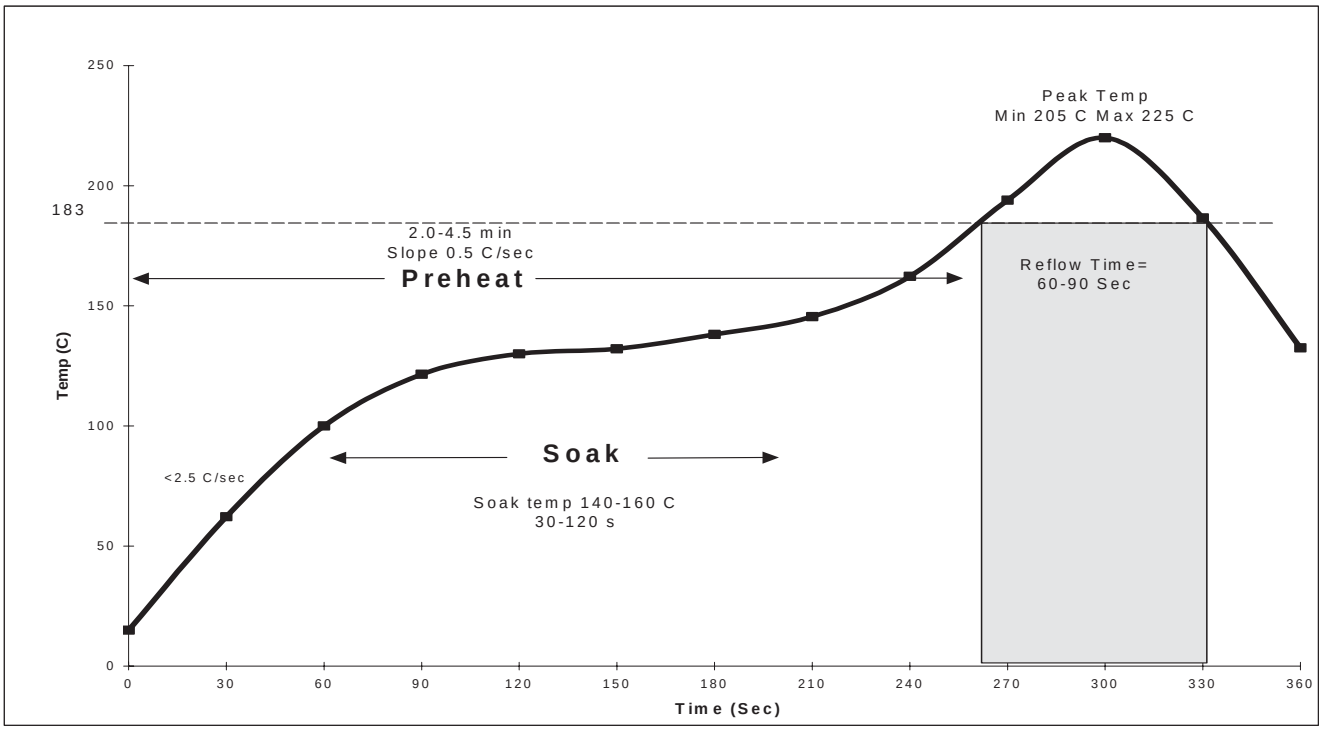
## Paste Application

Solder paste should be taken out of the refrigerator at least 3 to 6 hours prior to use. This will give the paste enough time to come to thermal equilibrium with the environment. Also, any fresh jar of solder paste should be gently mixed for at least one minute with a spatula. Be sure not to mix the paste too vigorously, as this will destroy the paste's viscosity characteristics and introduce entrapped air into the paste. The purpose of the mixing is to insure that the paste is smooth and consistent. If solder paste is supplied in cartridges pre-mixing is not necessary due to the shear action produced from the dispensing.

## Reflow

Best results have been acheived when XP799 is reflowed in a ***forced air convection*** oven with a minimum of 8 zones (top&bottom), however reflow is possible with a 4 zone oven (top & bottom).

The following is a recommended profile for a forced air convection reflow process. The melting temperature of the solder, the heat resistance of the components, and the characteristics of the PCB (i.e. density, thickness, etc.) determine the actual reflow profile.




***Preheat Zone****- The preheat zone, is also referred to as the ramp zone, and is used to elevate the temperature of the PCB to the desired soak temperature. In the preheat zone the temperature of the PCB is constantly rising, at a rate that should not exceed 2.5 C/sec. The oven's preheat zone should normally occupy 25-33% of the total heated tunnel length.*

***The Soak Zone-*** *normally occupies 33-50% of the total heated tunnel length exposes the PCB to a relatively steady temperature that will allow the components of different mass to be uniform in temperature. The soak zone also allows the flux to concentrate and the volatiles to escape from the paste.*

***The Reflow Zone-*** *or spike zone is to elevate the temperature of the PCB assembly from the activation temperature to the recommended peak temperature. The activation temperature is always somewhat below the melting point of the alloy, while the peak temperature is always above the melting point.*

## CLEANING

XP799 is water soluble formulation therefore the residues need to be removed. Residue removal is easily achieved, with the use of hot 60 °C (140 °F) de-ionized water in either a batch or conveyorized cleaner. Spray pressures should be maintained at 20-30 psi and conveyor speed of 3-6ft/min.

## Storage & Shelf Life

It is recommended that solder paste be stored at a temperature of between 35-50 °F (2-10 °C) to minimize solvent evaporation, flux separation, and chemical activity. If room temperature storage is necessary it should be maintain between 68-77°F (20-25 °C).

*Shelf life*

| | |
|---|---|
| Unopened Container (35-50°F/2-10 °C) | 6 months (from DOM) |
| Unopened Container (68-77°F/20-25 °C) | 3 months (from DOM) |
| Opened Container (68-77°F/20-25 °C) | 24 hours |

## Reusing Solder Paste

This is not normally recommended, because it typically generates more problems than it is worth. If you do decide to reuse solder paste, these pointers may be helpful. First, Qualitek recommends putting any used solder paste in an empty jar, so any fresh paste will not become contaminated. This paste should be tightly sealed and refrigerated. Then, the paste may be reused at a later date, provided that the paste has not separated or thickened significantly compared to its original properties. If you have success in printing the reused paste, the paste is acceptable for use. If significant printing problems occur, discard the paste. You also may want to mix 50% “used” and 50% new to get maximum utility of the paste. This will keep the paste relatively fresh while consuming the used paste.

## Working Environment

Solder paste performs best when used in a controlled environment. Maintaining ambient temperature of between 68-77 F (20-25 C) at a relative humidity of 40-65% will ensure consistent performance and maximum life of paste.

## Cleaning Misprint Boards

If you should have a misprinted board, the paste may be cleaned off manually with alcohol (IPA) or Qualitek stencil cleaner, SK-11. If you have a more elaborate board cleaner, the paste may be easily removed with use of a 5% saponifier solution in hot DI water. Qualitek SK-44 saponifier could be used in this process.

## Stencil Cleaning

Periodic cleaning of the stencil during production is recommended to prevent any paste from being deposited in unwanted areas of the board. Without stencil cleaning, solder balling will increase. We recommend a periodic dry wipe (every 5 to 10 boards) with an occasional wet wipe (every 15 to 25 boards). When running fine pitch boards, the cleaning may need to become more frequent. The wet wipes should be performed with either alcohol or a stencil cleaner. Qualitek SK-11 stencil cleaner is designed for this purpose. When cleaning the stencil at the end of a job, the cleaning should be more thorough. If you have stencil cleaning equipment Qualitek SK- 44 Stencil Cleaner Saponifier is highly recommended for stencil cleaning purposes.

## Disposal

XP799 should be stored in a sealed container and disposed of in accordance with state & local authority requirements.

## Packaging

| | |
|---|---|
| DEK Proflow Cassette | 800 gm |
| 6 oz Jar | 250-500 gm |
| 6 oz Cartridge | 500-700 gm |
| 12 oz Cartridge | 1000-1400gm |