



**DSP 798LF (DELTA 99C)
LEAD FREE
WATER SOLUBLE
SOLDER PASTE**

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Description

Delta® Solder Paste 798LF is a water soluble flux system designed specifically for high temperature lead free alloys, such as Delta 99C. Delta 99C is a Sn99.3/Cu0.7/Ni/Ge based lead-free alloy that does not contain silver so it provides cost savings.

In addition, DSP 798LF lead free solder paste exhibits superior joint strength, excellent wettability that is designed to print bricks every time. DSP 798LF residues are easily removed so yields bright, shiny solder joints.

Main Features

- Low foaming
- Silver-free alloy (Delta 99C)
- Extended stencil life
- Excellent wettability

Technical Data

Flux Classification	Specification	Test Method
	ORH0	IPC-J-STD-004B
Copper Mirror	> 50% removal of copper film	IPC-TM-650 2.3.32
Corrosion (Cleaned)	Pass	IPC-TM-650 2.6.15
SIR (Cleaned)	>1 x 10 ⁸ ohms	IPC-TM-650 2.6.3.3
Post Reflow Flux Residue	60%	TGA Analysis
Metal Loading	88 - 89%	IPC-TM-650 2.2.20
Viscosity		
Brookfield ⁽¹⁾ , kcps	900+/-10% kcps	IPC-TM-650 2.4.34 modified
Malcom ⁽²⁾ , poise	2300-2650	IPC-TM-650 2.4.34.3 modified
Thixotropic Index	0.50-0.60	
Slump Test	Pass	IPC-TM-650 2.4.35
Solder Ball Test	Pass	IPC-TM-650 2.4.43
Tack		
Initial	90 gm	JIS Z 3284
Tack retention @ 24 hr	75 gm	JIS Z 3284
Stencil Life	4-6 hrs	QIT 3.44.5
Ionic Residues (Cleaned)	<1.50 ug/cm ²	IPC-TM-650 2.4.25

Physical Properties

Solder Composition

Qualitek has developed a lead-free, silver-free Delta 99C (Sn99.3/Cu0.7/Ni/Ge) alloy. Qualitek alloys conform to and exceed the impurity requirements of IPC-J-STD-006C.

Typical Analysis														
Sn	Ag	Cu	Pb	Sb	Bi	In	As	Fe	Ni	Cd	Al	Zn	Au	Ge
Bal	0.100 Max	0.60- 0.70	0.070 Max	0.200 Max	0.100 Max	0.100 Max	0.030 Max	0.020 Max	0.04 – 0.07	0.002 Max	0.005 Max	0.003 Max	0.050 Max	0.006- 0.007

	Delta 99C
Melting Point, °C	227 E
Coefficient of Thermal Expansion	Pure Sn= 23.5
Tensile Strength, Mpa	33
Density, g/cc	7.40
Electrical Resistivity (μohm-cm)	13
Thermal Conductivity (J/m-s-K)	64

Particle Size

Delta 99C is available in Type 3(45-25μm) IPC-J-STD-005A 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 100 ppm.

Metal Loading

Typical metal loading for stencil printing application is **88-89%**. Compared to typical Sn63/Sn62 solder pastes manufactured with 90% by weight metal loading, DSP 798LF Lead Free provides as much as 10-12% higher metal volume than Sn63/Sn62. This increased in volume of DSP 798LF promotes better wetting and spreading of Delta 99C lead free alloy.

Printing of Solder Paste

Stencil

Use of chemical etched/electroformed stencil is preferred however DSP 798LF has been used successfully with chemical etch, electroformed, and laser cut stencils.

Squeegee

- Blades:* Metal (stainless steel) squeegee blades angled from 45-60° give the best print definition. Metal (nickel) squeegee blades angled from 45-60° 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 is 0.6-1.5lb per linear inch of blade.
- Speed:* Normal print speeds are 1.0-2.5 (25-50mm) per second. As print speeds increase pressure will need to be increased. Although slower print speeds are desirable, Qualitek solder paste can print up to 6 inches per second.

Print Definition

DSP 798LF provides excellent print definition characterized by brick-like prints. Good release is seen on 12-9 mil apertures with print speeds in the range of 1.0-6.0 inch per second (25mm-150mm).

Open & Abandon Time

Tests have proven that DSP 798LF 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.

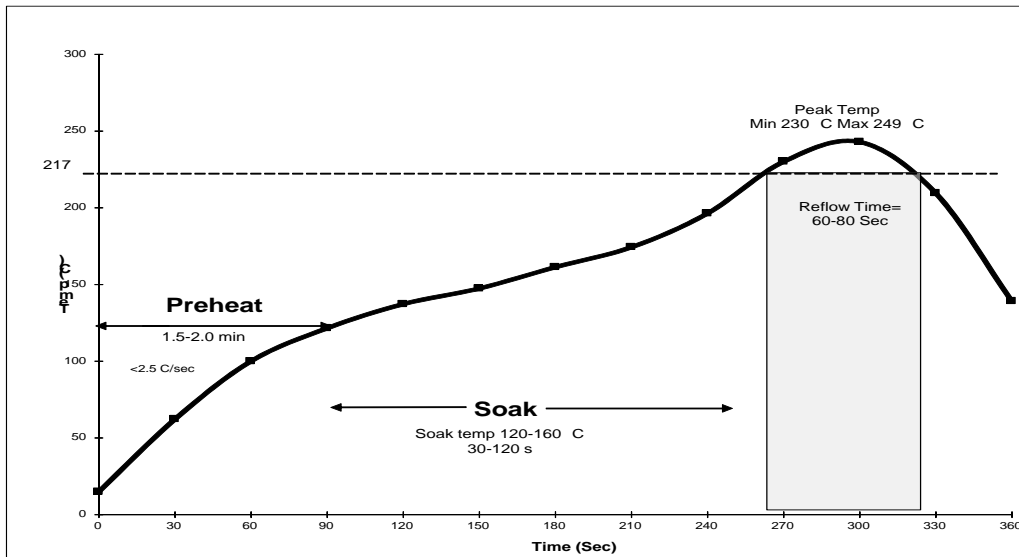
Paste Application

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 degrade 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 achieved when DSP 798LF 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.

Flux Residues & Cleaning

DSP 798LF is water-soluble formulation, therefore, residue removal is required. Residue removal is easily achieved, with the use of hot 60 °C (140 °F) de-ionized water in either a batch or conveyor cleaner system. 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, maintain temperatures between 68-77 °F (20-25 °C). Shelf life is 6 months from date of manufacture.

Working Environment

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

Stencil Cleaning

Periodic cleaning of the stencil during production is recommended to prevent any paste from being deposited in unwanted areas of the board and to eliminate solder balling. Qualitek offers Multi-Cleaner 1515 that may be used for this purpose. Qualitek SK- 45 Stencil Cleaner is highly recommended with stencil cleaning equipment.

Packaging

6 oz. Jar	250-500 gm
6 oz. Cartridge	500-700 gm
12 oz. Cartridge	1000-1400gm

Disposal

DSP 798LF should be stored in a sealed container and disposed of in accordance with all local/regional/national and international regulations.

Qualitek and Delta are brands of Qualitek International, Inc. For Health and Safety information refer to Safety Data Sheet.