



free  
halogen®

DSP 798LF  
LEAD FREE  
Water Soluble SOLDER  
PASTE

**CORPORATE HEADQUARTERS** USA: 315 Fairbank St. Addison, IL • 630-628-8083 or 1-800-365-3750 • FAX 630-628-6543

**EUROPE** UK: Unit 9 Apex Ct. Bassendale Rd. Bromborough, Wirral CH62 3RE • 44 151 334 0798LF • FAX 44 151 346 1408

**ASIA-PACIFIC HEADQUARTERS** SINGAPORE: 6 Tuas South St. 5 Singapore 637790 • 65 6795 7757 • FAX 65 6795 7767

**PHILIPPINES:** Phase 1 Qualitek Ave. Mariveles, Bataan Philippines C-2106 • 6347 935 4163 • FAX 63475613717

**CHINA:** 3B/F, YiPa Print Bldg. 351 # JiHua Rd., Buji Shenzhen, China 518112 • 86 755 28522814 • FAX 86 755 28522787

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**Physical Properties**

**Solder Composition**

Qualitek Sn/Ag/Cu (Tin/Silver/Cu) Alloys are designed as a lead-free alternative for Sn/Pb alloys for electronics assembly operations. The Qualitek Sn/Ag/Cu alloys conform and exceed the impurity requirements of J-Std-006 and all other relevant international standards.

Typical Analysis														
	Sn	Ag	Cu	Pb	Sb	Bi	In	As	Fe	Ni	Cd	Al	Zn	Au
LF955-38	Bal	3.6-4.0	0.5-0.9	0.050 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
LF958-35	Bal	3.3-3.7	0.5-0.9	0.050 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
LF965-30	Bal	2.8-3.2	0.3-0.7	0.050 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
LF217	Bal	3.8-4.2	0.3-0.7	0.050 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

	Sn/Ag/Cu	Sn63/Pb37
Melting Point, ° C	217-221	183 E
Hardness, Brinell	15HB	14HB
Coefficient of Thermal Expansion	Pure Sn= 23.5	24.7
Tensile Strength, psi	4312	4442
Density, g/cc	7.39	8.42
Electrical Resistivity , (μohm-cm)	13.0	14.5
Electrical Conductivity, %IACS	16.6	11.9

	Sn/Ag/Cu	Sn63/Pb37
Yield Strength, psi	3724	3950
Total Elongation,%	27	48
Joint Shear Strength, at 0.1mm/min 20 C	27	23
Joint Shear Strength, at 0.1mm/min 100 C	17	14
Creep Strength, N/mm <sup>2</sup> at 0.1mm/min 20 C	13.0	3.3
Creep Strength, N/mm <sup>2</sup> at 0.1mm/min 100 C	5	1
Thermal Conductivity, W/m.K	58.7	50.9

**Particle Size**

Sn/Ag/Cu alloys are 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	<10%	>80%	>90%	<1%	0%	100/200
2	20	20	75-150		150	160	200/325
3	20	20	45-75		75	80	325/500
4	20	20	25-45		45	50	400/635
5	15	20		20-38	38	40	500
6	5	15		15-25	25	30	
		5		5-15	15	20	

**Metal Loading**

Typical metal loading for stencil printing application is **88-89.5 %**. Compared to typical Sn63/Sn62 solder pastes manufactured with 90% by weight metal loading, DSP798LF Lead Free provides as much as 10-12% higher metal volume than Sn63/Sn62. This increased in volume of DSP798LF promotes better wetting and spreading of Sn/Ag/Cu Lead Free alloy.

**Solder Paste**

Qualitek has developed a unique flux system designed specifically for high temperature lead free alloys. It provides the fluxing activity levels that promote thermal stability and prevents thermal degradation when reflowing under air atmosphere (normal). Since use of nitrogen is not required, DSP 798LF Lead Free Solder paste will provide excellent cost savings.

In addition, DSP 798LF Lead Free solder paste exhibits superior joint strength, excellent wettability, extraordinary print definition and tack life.

Main Features

- Low foaming
- Extended stencil life
- Long tack time
- Excellent wettability

<b>Flux Classification</b>	<b>Specification</b>	<b>Test Method</b>
	ORH1	JSTD-004
<b>Copper Mirror</b>	No removal of copper film	IPC-TM-650 2.3.32
<b>Silver Chromate</b>	Pass	IPC-TM-650 2.3.33
<b>Corrosion</b>	Pass	IPC-TM-650 2.6.15
<b>SIR</b>		
JSTD-004	2.38 x 10 <sup>10</sup> ohms	IPC-TM-650 2.6.3.3
Bellcore (Telecordia)	6.12 x 10 <sup>10</sup> ohms	Bellcore GR-78-CORE 13.1.3
<b>Electromigration</b>	Pass	Bellcore GR-78-CORE 13.1.4
<b>Post Reflow Flux Residue</b>	60%	TGA Analysis
<b>Acid Value</b>	55	IPC-TM-650 2.3.13
<b>Metal Loading</b>	89%	IPC-TM-650 2.2.20
<b>Viscosity</b>		
Brookfield <sup>(1)</sup> , kcps	900+/-10% kcps	IPC-TM-650 2.4.34 modified
Malcom <sup>(2)</sup> , poise	2200-2500	IPC-TM-650 2.4.34.3 modified
Thixotropic Index	0.50-0.60	
<b>Slump Test</b>		
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
<b>Solder Ball Test</b>	Pass	IPC-TM-650 2.4.43
<b>Tack</b>		
Initial	70 gm	JIS Z 3284
Tack retention @ 24 hr	72 gm	JIS Z 3284
Tack retention @ 72 hr	66.1 gm	JIS Z 3284
<b>Stencil Life</b>	4-6 hrs	QIT 3.44.5
<b>Abandon Time</b>	30 min	QIT 3.44.6
<b>Ionic Residues (Cleaned)</b>	<1.56 ug/cm <sup>2</sup>	IPC-TM-650 2.4.25

## Printing

### Stencil

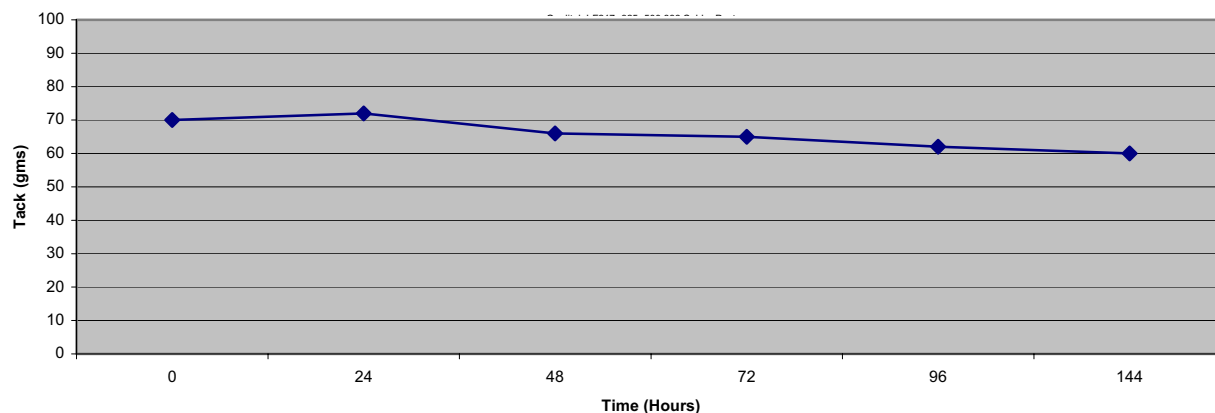
Use of chemical etched/electroformed stencil is preferred however DSP798LF has been used successfully with chemical etch, electroformed, and laser cut stencils.

### 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 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.

### Print Definition

DSP798LF 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 DSP798LF 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.

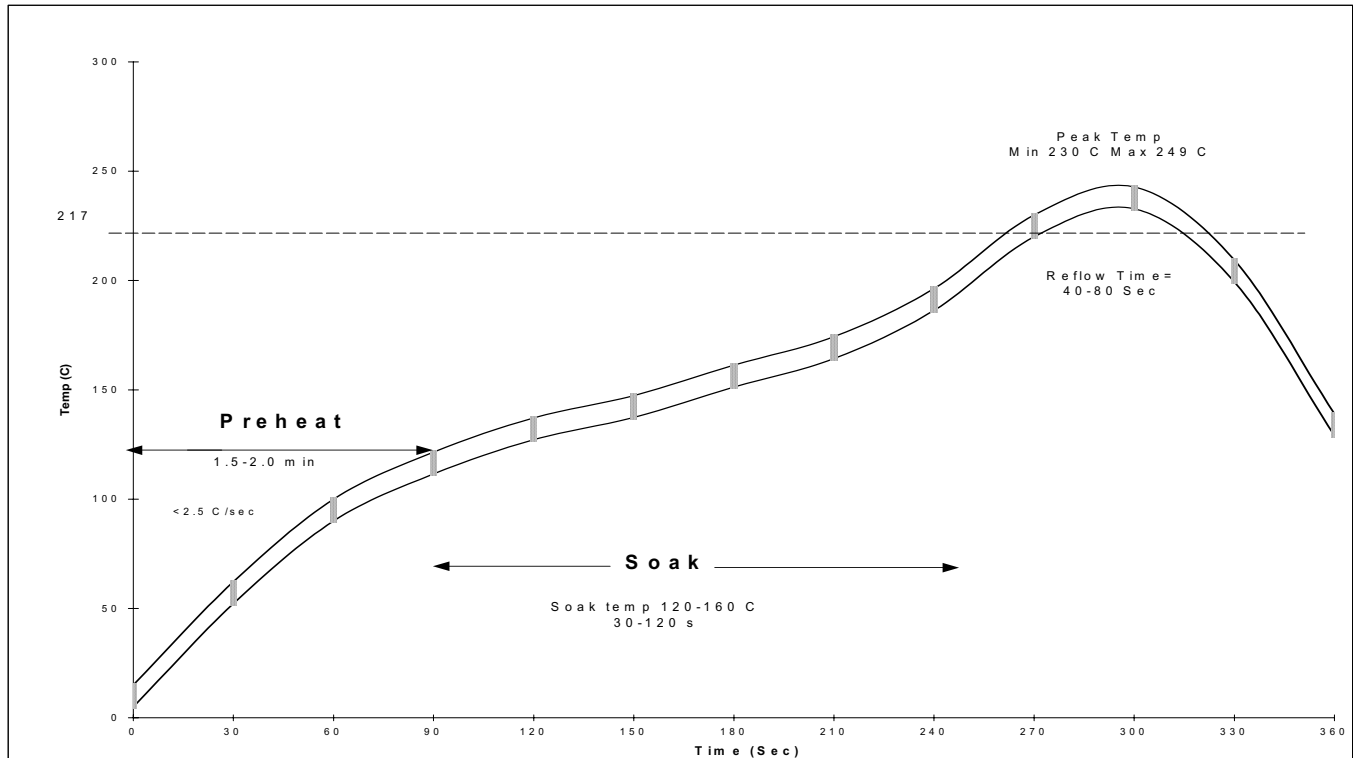
### Paste Application

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.

## CLEANING

DSP798LF 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 so 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 68-77F (20-25 C) .

### *Shelf life*

Unopened Container (35-50F/2-10C) 6 months (from DOM)

Unopened Container (68-77F/20-25 C) 1 months (from DOM)

Opened Container (68-77F/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**

DSP 798LF should be stored in a sealed container and disposed of in accordance with state & local authority requirements.

## **Packaging**

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