



## DSP 788 (Sn63/Pb37) WATER SOLUBLE SOLDER PASTE

**CORPORATE HEADQUARTERS** USA: 315 Fairbank St. Addison, IL 60101 ! 630-628-8083! FAX 630-628-6543  
**EUROPE** UK: Unit 9 Apex Ct. Bassendale Rd. Bromborough, Wirral CH62 3RE ! 44 151 334 0888! 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 4119 ! FAX 6347 935 5608  
**CHINA:** 3B/F, YiPa Print Bldg. 351 # JiHua Rd., Buji Shenzhen, China 518112 ! 86 755 28522814 ! FAX 86 755 28522787

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**Description**

Delta Solder Paste 788 is a halide-free, slump resistant water soluble solder paste designed for surface mount and other electronic assembly applications. DSP 788 utilizes a low volatility solvent system, resulting in a tack time of over 8 hours. Post soldering residue can be easily removed with warm de-ionized water cleaning systems.

Main Features

- Halide-free
- Non-hygroscopic
- High tack force
- High slump resistance
- Easy removal of flux residues
- Extended stencil life

**Technical Data**

<b>Flux Classification</b>	<b>Specification</b>	<b>Test Method</b>
	ORLO	J-STD-004
<b>Copper Mirror</b>	No removal of copper film	IPC-TM-650 2.3.32
<b>Corrosion</b>	Pass	IPC-TM-650 2.6.15
<b>SIR</b>		
J-STD-004 (cleaned)	2.50 x 10 <sup>11</sup> ohms	IPC-TM-650 2.6.3.3
Bellcore (Telecordia)	4.20 x 10 <sup>11</sup> ohms	Bellcore GR-78-CORE 13.1.3
<b>Post Reflow Flux Residue</b>	65%	TGA Analysis
<b>Metal Loading</b>	90%	IPC-TM-650 2.2.20
<b>Viscosity</b>		
Brookfield <sup>(1)</sup> , kcps	1000+/-10% kcps	IPC-TM-650 2.4.34 modified
Malcom <sup>(2)</sup> , kcps	210-250	IPC-TM-650 2.4.34.3 modified
<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	38.9 gm	JIS Z 3284
Tack retention @ 24 hr	23.2 gm	JIS Z 3284
<b>Stencil Life</b>	4-8 hrs	QIT 3.44.5
<b>Abandon Time</b>	30-60 min	QIT 3.44.6

**Physical Properties**

**Solder Composition**

Sn63/Pb37 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.

<b>Typical Analysis</b>													
Sn	Pb	Cu	Ag	Sb	Bi	In	As	Fe	Ni	Cd	Al	Zn	Au
62.5-63.5	Bal.	0.080 Max	0.100 Max	0.200 Max	0.100 Max	0.100 Max	0.030 Max	0.020 Max	0.010 Max	0.002 Max	0.005 Max	0.003 Max	0.050 Max

	<b>Sn63/Pb37</b>
Melting Point, °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 <sup>4</sup> /ohm-cm	6.9

	<b>Sn63/Pb37</b>
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 <sup>2</sup> at 0.1mm/min 20 °C	3.3
Creep Strength, N/mm <sup>2</sup> at 0.1mm/min 20 °C	1
Thermal Conductivity, W/m.K	50.9

**Particle Size**

Sn63 alloy is available in Type 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.

**Metal Loading**

Typical metal loading for stencil printing application is **89 - 90 %**.

## **Printing of Solder Paste**

### **Stencil**

Use of chemical etched/electroformed stencil is preferred however DSP 788 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 is capable of printing up to 6 inch per second.

### **Print Definition**

DSP 788 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 788 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.

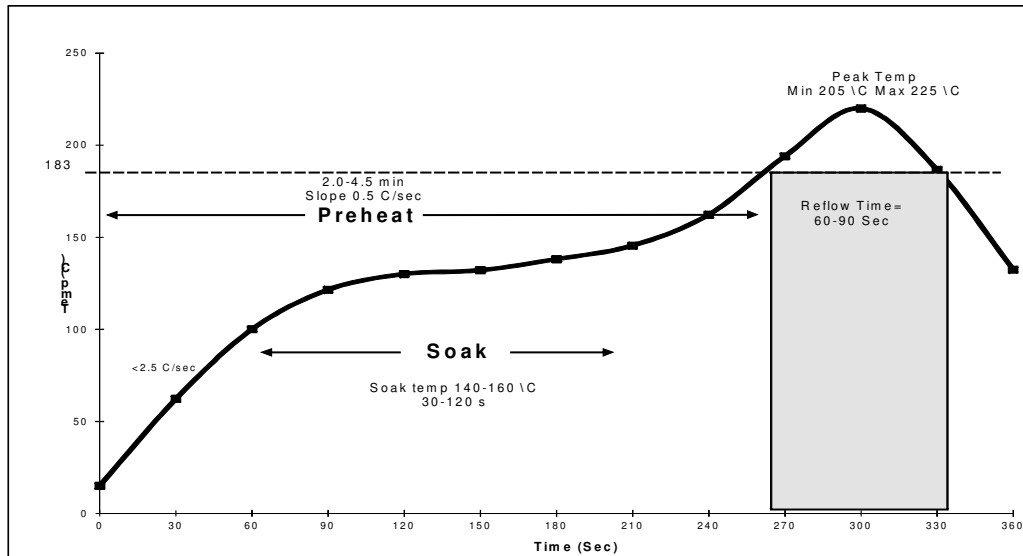
### **Paste Application**

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 788 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 788 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 conveyor 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) 1 month (from DOM)

## **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.

## **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-45 Stencil Cleaner 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- 45 Stencil Cleaner is highly recommended for stencil cleaning purposes.

## **Packaging**

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

## **Disposal**

DSP 788 should be stored in a sealed container and disposed of in accordance with state & local authority requirements.