



**DSP 792 (Sn96.5/Ag3.5)
LEAD FREE
WATER SOLUBLE
SOLDER PASTE**

CORPORATE HEADQUARTERS USA: 315 Fairbank St. Addison, IL 60101¹ 630-628-8083¹ FAX 630-628-6543
EUROPE UK: Unit 9 Apex Ct. Bassendale Rd. Bromborough, Wirral CH62 3RE¹ 44 151 334 0888¹ FAX 44 151 346 1408
ASIA-PACIFIC HEADQUARTERS SINGAPORE: 6 Tuas South St. 5 Singapore 637790¹ 65 6795 7757¹ FAX 65 6795 7767
PHILIPPINES: Phase 1 Qualitek Ave. Mariveles, Bataan Philippines C-2106¹ 6347 935 4119¹ FAX 6347 935 5608
CHINA: 3B/F, YiPa Print Bldg. 351 # JiHua Rd., Buji Shenzhen, China 518112¹ 86 755 28522814¹ FAX 86 755 28522787

This data is based on information that the manufacturer believed to be reliable and offered in good faith. Qualitek International, Inc. makes no warranties expressed or implied as to its accuracy and assumes no responsibilities and liabilities arising out of its use by others as conditions and methods of use of the products is beyond the control of Qualitek International, Inc. The user must determine the suitability of the product before using it on a commercial basis. The warranties extend only to the conformity of the product to the physical descriptions. In no event will Qualitek International, Inc. be responsible for special, incidental and consequential damages whether the claim is in contract, negligence or otherwise. Qualitek specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.

Description

Qualitek has developed a water soluble flux system designed for both leaded and 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 792 Lead Free Solder paste will provide excellent cost savings.

In addition, DSP 792 Lead Free solder paste exhibits superior joint strength, excellent wettability and has extraordinary print definition and tack life.

Main Features

- Halide Free
- Excellent heat stability during reflow
- Excellent wettability
- Eliminates the use of solvents and saponifiers

Technical Data

Flux Classification	Specification	Test Method
	ORM0	J-STD-004
Copper Mirror	Complete removal of copper film	IPC-TM-650 2.3.32
Corrosion	Pass	IPC-TM-650 2.6.15
SIR		
J-STD-004	1.47x 10 ¹¹ ohms	IPC-TM-650 2.6.3.3
Electromigration	Pass	Bellcore GR-78-CORE 13.1.4
Post Reflow Flux Residue	45%	TGA Analysis
pH Value	7.0-8.0	IPC-TM-650 2.3.13
Metal Loading	89%	IPC-TM-650 2.2.20
Viscosity		
Brookfield ⁽¹⁾ , kcps	1000+/-10% kcps	IPC-TM-650 2.4.34 modified
Malcom ⁽²⁾ , kcps	245-280 kcps	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	95 gm	JIS Z 3284
Tack retention @ 24 hr	100gm	JIS Z 3284
Tack retention @ 72 hr	105 gm	JIS Z 3284
Stencil Life	4-8 hrs	QIT 3.44.5
Abandon Time	30-60 min	QIT 3.44.6

Physical Properties

Solder Composition

Qualitek Sn96.5/Ag3.5 is designed as a lead-free alternative for Sn/Pb alloys for electronics assembly operations. Qualitek Sn96.5/Ag3.5 alloy conforms and exceeds 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
Bal	3.0-4.0	0.080 Max	0.070 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

	Sn96.5/Ag3.5	Sn63/Pb37
Melting Point, °C	221 E	183 E
Hardness, Brinell	15HB	14HB
Coefficient of Thermal Expansion	Pure Sn= 30.2	24.7
Tensile Strength, psi	3873	4442
Density, g/cc	7.5	8.42
Electrical Resistivity , (μohm-cm)	12.3	14.5
Electrical Conductivity, %IACS	14.0	11.9

	Sn96.5/Ag3.5	Sn63/Pb37
Yield Strength, psi	3256	3950
Total Elongation,%	24	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 ² at 0.1mm/min 20 °C	13.7	3.3
Creep Strength, N/mm ² at 0.1mm/min 100 °C	5	1
Thermal Conductivity, W/m.K	55.3	50.9

Particle Size

Sn96.5/Ag3.5 alloy is available in 3(45-25μm) and 4(38-20μm) 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 **88-89%**. Compared to typical Sn63/Sn62 solder pastes manufactured with 90% by weight metal loading, DSP 792 Lead Free provides as much as 10-12% higher metal volume than Sn63/Sn62. This increased in volume of DSP 792 promotes better wetting and spreading of Sn96.5/Ag3.5 lead free alloy.

Printing of Solder Paste

Stencil

Use of chemical etched/electroformed stencil is preferred however DSP 792 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 792 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 792 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.

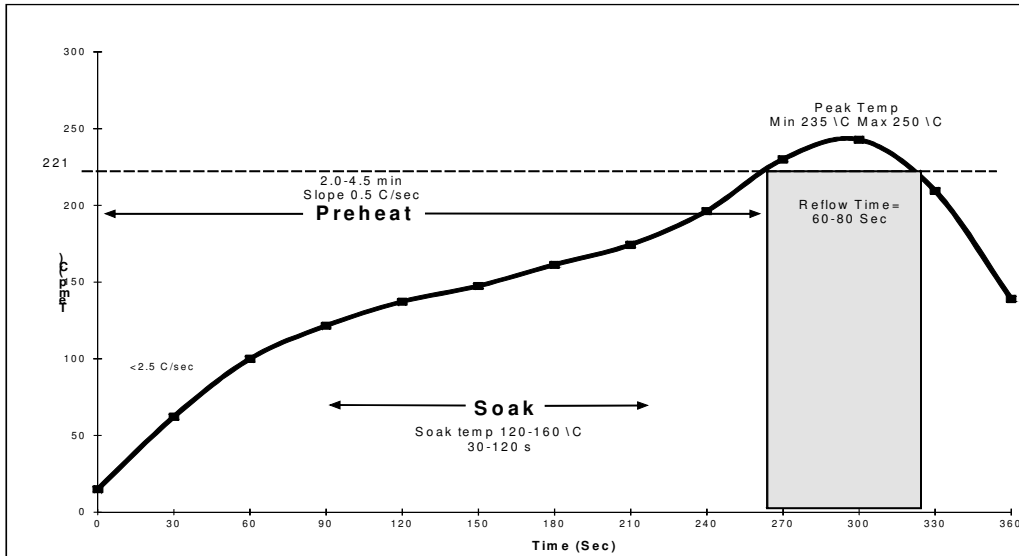
Paste Application

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 792 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 792 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 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 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)

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