



**DSP 825HF (Sn95/Sb5)  
X-TREME ACTIVITY-  
HALOGEN FREE  
LEAD FREE  
NO CLEAN SOLDER  
PASTE**

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**Description**

Sn95/Sb5 DSP 825HF is a lead-free, no clean, halogen-free solder paste designed specifically for a wide range of lead-free alloys. It provides an x-treme fluxing activity level with excellent wetting on copper OSP-coatings. Wide reflow process windows combined with high thermal stability yield solder joints with smooth surfaces.

In addition, DSP 825HF offers repeatable, consistent printing characteristics combined with long stencil and tack life to accommodate high speed printing. This material yields excellent printing capability across various board designs and ultra-fine pitch.

**Main Features**

- ❑ Excellent wetting and coalescence for pads as small as 0.25 µm (0.010”) with 4 mil stencil
- ❑ Halogen-Free
- ❑ Low Voiding
- ❑ Superior resistance to hot slump
- ❑ Extended stencil life
- ❑ Long tack time
- ❑ Medium soft non-cracking residue
- ❑ Suitable with air or nitrogen atmosphere
- ❑ Complies with RoHS Directive 2011/65/EU

**Technical Data**

|                                  | <b>Specification</b>         | <b>Test Method</b>           |
|----------------------------------|------------------------------|------------------------------|
| <b>Flux Classification</b>       | ROL0                         | 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                        | 2.01 x 10 <sup>10</sup> ohms | IPC-TM-650 2.6.3.3           |
| <b>Post Reflow Flux Residue</b>  | 5.5%                         | TGA Analysis                 |
| <b>Acid Value</b>                | 117                          | IPC-TM-650 2.3.13            |
| <b>Metal Loading</b>             | 88.5%                        | IPC-TM-650 2.2.20            |
| <b>Viscosity</b>                 |                              |                              |
| Malcom <sup>(2)</sup> , poise    | 1600-1900                    | 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  | No bridges all spacings      | IPC-TM-650 2.4.35            |
| 150 °C, 0.33 vertical/horizontal | No bridges all spacings      | IPC-TM-650 2.4.35            |
| <b>Solder Ball Test</b>          | Pass                         | IPC-TM-650 2.4.43            |
| <b>Tack</b>                      |                              |                              |
| Initial                          | 124 gm                       | JIS Z 3284                   |
| Tack retention @ 24 hr           | 111 gm                       | JIS Z 3284                   |
| Tack retention @ 72 hr           | 98 gm                        | JIS Z 3284                   |
| <b>Stencil Life</b>              | >8 hrs                       | QIT 3.44.5                   |
| <b>Abandon Time</b>              | 60 min                       | QIT 3.44.6                   |

**Physical Properties**

**Solder Composition**

Qualitek Sn95/Sb5 is designed as a lead-free alternative for Sn/Pb alloys for electronics assembly operations. The Qualitek Sn95/Sb5 alloy conforms and exceeds the impurity requirements of J-STD-006C and all other relevant international standards

| <b>Typical Analysis</b> |              |              |              |           |              |              |              |              |              |              |              |              |              |
|-------------------------|--------------|--------------|--------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <b>Sn</b>               | <b>Ag</b>    | <b>Cu</b>    | <b>Pb</b>    | <b>Sb</b> | <b>Bi</b>    | <b>In</b>    | <b>As</b>    | <b>Fe</b>    | <b>Ni</b>    | <b>Cd</b>    | <b>Al</b>    | <b>Zn</b>    | <b>Au</b>    |
| <b>Bal</b>              | 0.100<br>Max | 0.080<br>Max | 0.070<br>Max | 4.5-5.5   | 0.100<br>Max | 0.100<br>Max | 0.030<br>Max | 0.020<br>Max | 0.010<br>Max | 0.002<br>Max | 0.005<br>Max | 0.003<br>Max | 0.050<br>Max |

|                                    | <b>Sn95/Sb5</b> | <b>Sn63/Pb37</b> |                                              | <b>Sn95/Sb5</b> | <b>Sn63/Pb37</b> |
|------------------------------------|-----------------|------------------|----------------------------------------------|-----------------|------------------|
| Melting Point, °C                  | 232-240         | 183 E            | Yield Strength, psi                          | 3720            | 3950             |
| Hardness, Brinell                  | 15HB            | 14HB             | Total Elongation, %                          | 22              | 48               |
| Coefficient of Thermal Expansion   | 20.09           | 24.7             | Shear Strength, MPa at 1mm/min 20 °C,        | 38.7            | 34.5             |
| Tensile Strength, psi              | 5110            | 4442             | Shear Strength, MPa at 1mm/min 100 °C        | 21.3            | 21.6             |
| Density, g/cc                      | 7.26            | 8.42             | Fatigue Strength, MPa at 1000 cycles, 20 °C  | 20.9            | 16.2             |
| Electrical Resistivity , (μohm-cm) | 14.5            | 14.5             | Fatigue Strength, MPa at 1000 cycles, 100 °C | 14.1            | 10.2             |
| Electrical Conductivity, %IACS     | 11.9            | 11.9             | Stress to Rupture, MPa at 1000 hr, @ 20 °C   | 11.0            | 3.5              |
|                                    |                 |                  | 1000 hr, @ 100 °C                            | 3.6             | 1.1              |

**Particle Size**

Sn95/Sb5 is available in Type 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 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 825HF Lead Free provides as much as 10-12% higher metal volume than Sn63/Sn62. This increased in volume of DSP 825HF promotes better wetting and spreading of Sn95/Sb5 lead free alloy.

## **Printing of Solder Paste**

### **Stencil**

Use of chemical etched/electroformed stencil is preferred however DSP 825HF 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 825HF solder paste is capable of printing up to 6 inch per second.

### **Print Definition**

DSP 825HF 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 825HF 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.

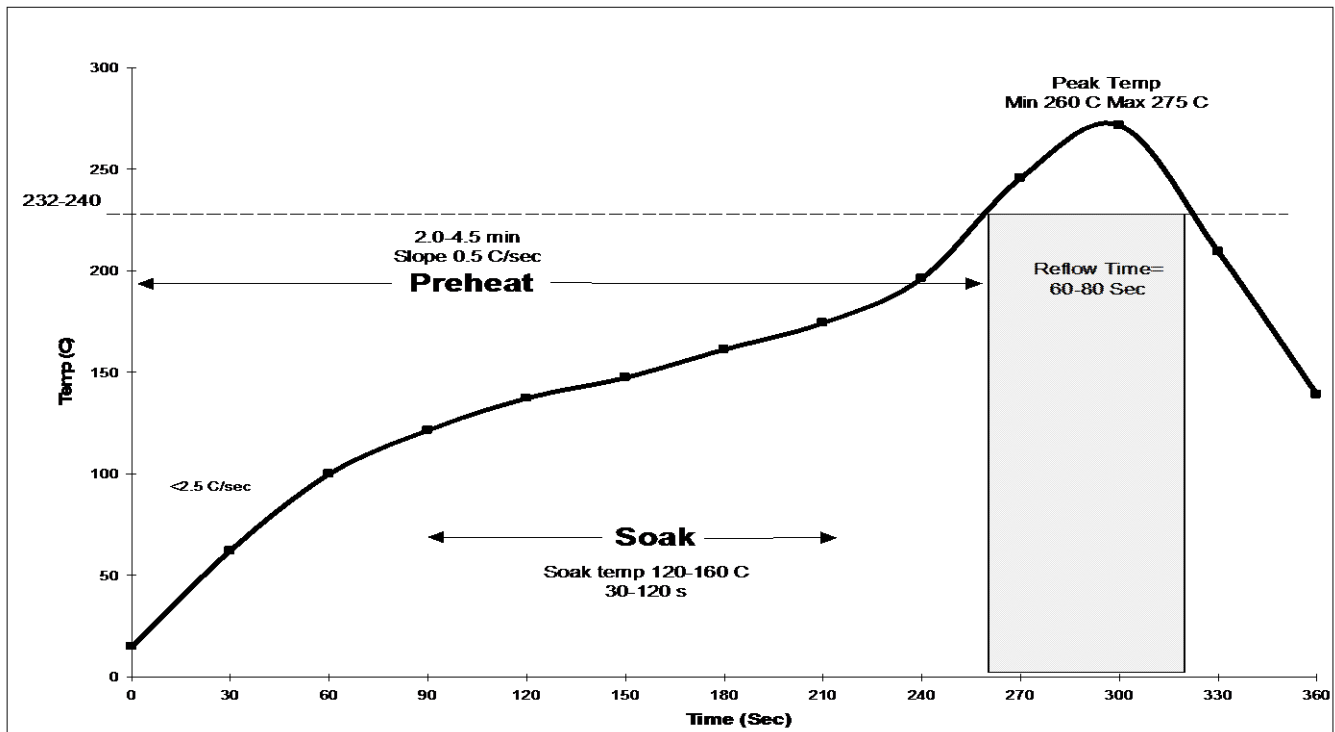
### **Paste Application**

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 Sn95/Sb5 DSP 825HF 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 825HF is a no clean formulation, therefore, the residues do not need to be removed for typical applications. If residue removal is desired, the use of Everkleen 1005 Buffered Saponifier with a 5-15% concentration in hot 60 °C (140 °F) will aid in residue removal.

## **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 | 1000-1400 gm |

## **Disposal**

DSP 825HF should be stored in a sealed container and disposed of in accordance with state & local authority requirements.