

# SOLDER CONNECTION

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## QUALITEK® Technical Bulletin

### Delta DSP 818 63/37 No Clean Solder Paste

#### DESCRIPTION

Delta DSP 818 is a no clean solder paste designed for surface mount and other electronic assembly applications. DSP 818 is available in standard leaded solders such as Sn63/Pb37 and Sn62/Pb36/Ag2. The unique properties of this formula provide excellent activity, long stencil life, long tack time and high print speed. The post soldering residues of DSP 818 are transparent, non-corrosive and non-conductive.

#### FEATURES AND BENEFITS

- Excellent wetting on OSP
- Long stencil life
- Transparent residue
- Low residue

#### TECHNICAL DATA

	Specification	Test Method
<b>Flux Classification</b>	ROLO	IPC-J-STD-004B
<b>Corrosion</b>	Pass	IPC-TM-650 2.6.15
<b>SIR (Cleaned)</b>	$>1 \times 10^8$ ohm	IPC-TM-650 2.6.3.3
<b>Metal Loading</b>	90%	IPC-TM-650 2.2.20
<b>Viscosity</b>		
Brookfield <sup>(1)</sup> KCPS	1000+/-10%	IPC-TM-650 2.4.34 modified
Malcom <sup>(2)</sup> , poise	1750-2050	IPC-TM-650 2.4.34.3 modified
Thixotropic Index	0.50-0.60	IPC-TM-650 2.4.35 IPC-
<b>Slump Test</b>	Pass	TM-650 2.4.43 IPC-TM-650
<b>Solder Ball Test</b>	Pass	2.6.15
<b>Tack</b>		
Initial	95gm	JIS Z 3284
Tack retention @ 24 hr	82gm	JIS Z 3284
<b>Stencil Life</b>	4-8hrs	QIT 3.44.5
<b>Abandon Time</b>	30-60 min	QIT 3.44.6

#### PARTICLE SIZE

Sn63/Pb37 alloy is available in Type 3(45-25µm) and 4(38-20µm), 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.

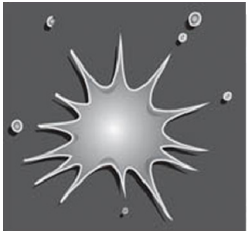
#### SOLDER COMPOSITION

Sn63/Pb37 alloy is the conventional eutectic solder used in most electronic assemblies. Sn63 alloy conforms and exceeds the impurity requirements of IPC-J-STD-006C and all other relevant international standards.

#### TYPICAL ANALYSIS

Typical Analysis													
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

Issue 1 - 25/02/20



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	Sn63/Pb37
Melting Point, °C	183 E
Hardness, Brinell	14 HB
Coefficient of Thermal Expansion	24.7
Tensile Strength, psi	4442
Density, g/cc	8.42
Electrical Resistivity, ( $\mu\text{ohm-cm}$ )	14.5
Electrical Conductivity, $10^4/\text{ohm-cm}$	6.9

	Sn63/Pb37
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/mK	50.9

## 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, Sn63 DSP 818 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. Although slower print speeds are desirable, Delta solder paste is capable of printing up to 6 inch per second.

## PRINT DEFINITION

Sn63/Pb37 DSP 818 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).

## APPLICATION

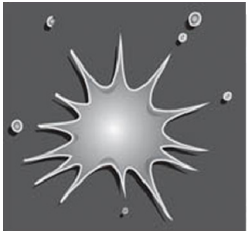
Solder paste should be taken out of the refrigerator at least 3 to 6 hours prior to use. This will give the paste enough time to come to thermal equilibrium with the environment. Also, any fresh jar of solder paste should be gently mixed for at least one minute with a spatula. Be sure not to mix the 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.

## OPEN & ABANDON TIME

Tests have proven that DSP 818 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.

## 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.



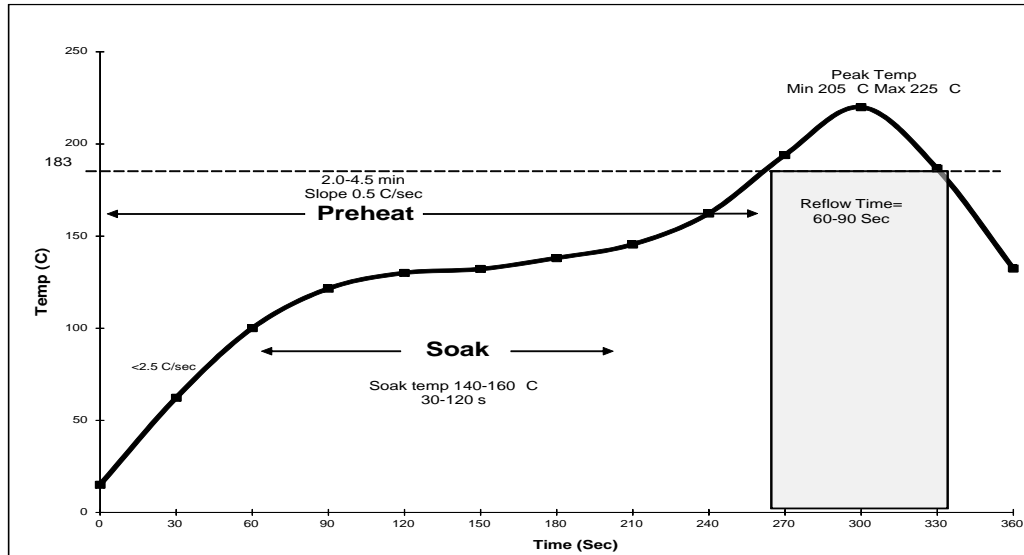
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## REFLOW

Best results have been achieved when 63/37 DSP 818 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 818 is a no clean formulation; therefore, the residues do not need to be removed for typical applications. If cleaning is required please contact one of our Sales Offices to discuss your requirements.

## 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.

## 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.

## DISPOSAL

63/37 DSP 818 should be stored in a sealed container and disposed of in accordance with federal, state and local authority requirements.

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