Qualitek Group Of Companies

QUALITEK
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DSP 862
LEAD FREE
NO CLEAN SOLDER PASTE

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Physical Properties

Solder Composition

Qualitek Sn/Ag/Cu (Tin/Silver/Cu) is designed as a lead-free alternative for Sn/Pb alloys for electronics assembly operations. The Qualitek Sn/Ag/Cu 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	3.6-4.0	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

	Sn/Ag/Cu	Sn63/Pb37
Melting Point, ^{o} 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^2 at 0.1mm/min 20 C	13.0	3.3
Creep Strength, N/mm^2 at 0.1mm/min 20 C	5	1
Thermal Conductivity, W/m.K	58.7	50.9

Particle Size

Sn/Ag/Cu is 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.

Powder Type	Fines	Majority		Coarse		Typical Mesh
	<10%	**>80%**	**>90%**	**<1%**	**0%**	
1	20	75-150		150	160	100/200
2	20	45-75		75	80	200/325
3	20	25-45		45	50	325/500
4	20		20-38	38	40	400/635
5	15		15-25	25	30	500
6	5		5-15	15	20	

Classification of Solder Powders by Particle Size

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, DSP862 Lead Free provides as much as 10-12% higher metal volume than Sn63/Sn62. This increased in volume of DSP862 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 862 Lead Free Solder paste will provide excellent cost savings.

In addition, DSP 862Lead Free solder paste exhibits superior joint strength, excellent wettability, extraordinary print definition and tack life. The post soldering residues of DSP862 are non-conductive, non-corrosive and highly insulated.

Main Features

- Low Voiding
- Excellent wettability
- Long tack time
- Excellent hot slump resistance
- Medium soft non-cracking residues
- Extended stencil life

	Specification	**Test Method**
Flux Classification	ROL0	JSTD-004
Copper Mirror	No removal of copper film	IPC-TM-650 2.3.32
Silver Chromate	Pass	IPC-TM-650 2.3.33
Corrosion	Pass	IPC-TM-650 2.6.15
SIR		
JSTD-004	1.58×10^{11} ohms	IPC-TM-650 2.6.3.3
Bellcore (Telecordia)	2.61×10^{11} ohms	Bellcore GR-78-CORE 13.1.3
Electromigration	Pass	Bellcore GR-78-CORE 13.1.4
Post Reflow Flux Residue	55%	TGA Analysis
Acid Value	168	IPC-TM-650 2.3.13
Metal Loading	88%	IPC-TM-650 2.2.20
Viscosity		
Brookfield [(1)], kcps	900+/-10% kcps	IPC-TM-650 2.4.34 modified
Malcom [(2)], poise	1700-2050	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	0.06/0.06	IPC-TM-650 2.4.35
Solder Ball Test	Pass	IPC-TM-650 2.4.43
Tack		
Initial	130 gm	JIS Z 3284
Tack retention @ 24 hr	124 gm	JIS Z 3284
Tack retention @ 72 hr	57 gm	JIS Z 3284
Stencil Life	>8 hrs	QIT 3.44.5
Abandon Time	30-60 min	QIT 3.44.6

Printing

Stencil

Use of chemical etched/electroformed stencil is preferred however DSP862 has been used successfully with chemical etch, electroformed, and laser cut stencils.

Squeegee

Blades: Metal (stainless steel) squeegee blades angled from 45-60^{o} give the best print definition. Metal (nickel) squeegee blades angled from 45-60^{o} 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 are1.0-2.5 (25-50mm) per second. As print speeds increase pressure willneed to be increased.

Print Definition

DSP862 provides excellent print definition characterized by brick-like prints. Good release is seen on 12-9 mil apertures with print speeds in the range 0f 25mm -150mm per second.

Open & Abandon Time

Tests have proven that DSP862 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.

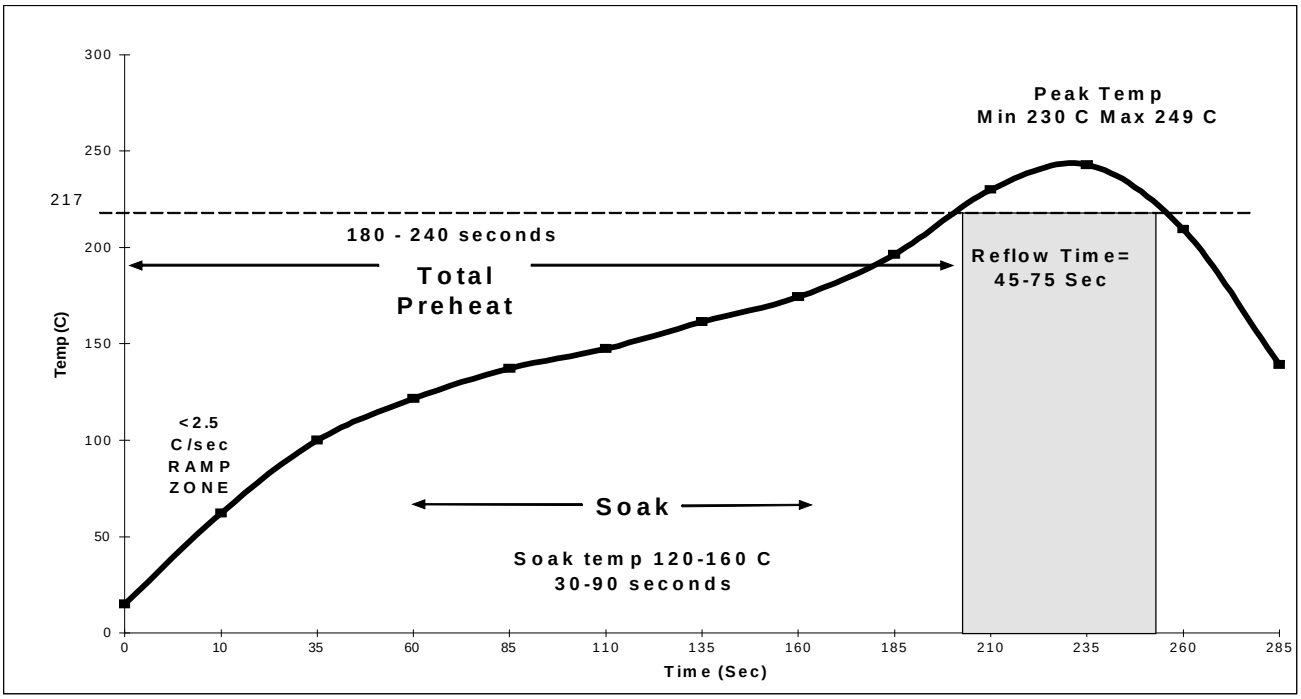
Paste Application

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 destroy 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 acheived when DSP 862 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.



Ramp Zone*- the ramp zone is used to elevate the temperature of the PCB to the desired soak temperature. In the ramp zone the temperature of the PCB is constantly rising, at a rate that should not exceed 2.5 C/sec. The oven's ramp 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

DSP 862 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 2015 Buffered cleaner with a 50% 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 68-77F (20-25 C) .

Shelf life

Unopened Container (35-50F/2-10C)	9 months (from DOM)
Unopened Container (68-77F/20-25 C)	3 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 862 should be stored in a sealed container and disposed of in accordance with state & local authority requirements.

Packaging

DEK Proflow Cassette	750 gm
6oz Jar	500 gm
6 oz Cartridge	500-600 gm
12 oz Cartridge	1000-1200gm