DSP 230 (Sn/Ag/Cu Alloys)
LEAD FREE
R.M.A. SOLDER PASTE

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Description

Qualitek has developed a unique R.M.A. flux system that may be used with leaded alloys as well as 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 230 Lead Free Solder paste will provide excellent cost savings.

In addition, DSP 230 Lead Free solder paste exhibits superior joint strength, with excellent wettability, print definition and tack life. The post soldering residues of DSP 230 are non-conductive, non-corrosive and highly insulated.

Main Features

- Low tombstoning
- Excellent wettability using SAC alloys
- Hard non-conductive residues
- ROL0 J-STD-004 flux classification

Technical Data

	Specification	Test Method
Flux Classification	ROL0	IPC-J-STD-004B
Copper Mirror	No removal of copper film	IPC-TM-650 2.3.32
Corrosion	Pass	IPC-TM-650 2.6.15
SIR (cleaned)	3.25 x 10^{10} ohms	IPC-TM-650 2.6.3.3
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), poise	1650-1950	IPC-TM-650 2.4.34.3 modified
Thixotropic Index	0.50-0.60	
Slump Test	Pass	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	82 gm	JIS Z 3284
Stencil Life	>4 hrs	QIT 3.44.5
Abandon Time	30 min	QIT 3.44.6

Physical Properties

Solder Composition

Qualitek Sn/Ag/Cu (Tin/Silver/Copper) alloys are designed as a lead-free alternative for Sn/Pb alloys for electronics assembly operations. Qualitek Sn/Ag/Cu alloys conform and exceed the impurity requirements of IPC-J-STD-006C and all other relevant international standards.

Typical Analysis

	Sn	Ag	Cu	Pb	Sb	Bi	In	As	Fe	Ni	Cd	Al	Zn	Au
LF955-38	Bal	3.6-4.0	0.5-0.9	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
LF958-35	Bal	3.3-3.7	0.5-0.9	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
LF965-30	Bal	2.8-3.2	0.3-0.7	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
LF217	Bal	3.8-4.2	0.3-0.7	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

	Sn/Ag/Cu
Melting Point, °C	217-221
Hardness, Brinell	15 HB
Coefficient of Thermal Expansion	Pure Sn= 23.5
Tensile Strength, psi	4312
Density, g/cc	7.39
Electrical Resistivity (μohm-cm)	13.0
Electrical Conductivity, %IACS	16.6

	Sn/Ag/Cu
Yield Strength, psi	3724
Total Elongation,%	27
Joint Shear Strength, at 0.1mm/min 20 °C	27
Joint Shear Strength, at 0.1mm/min 100 °C	17
Creep Strength, N/mm^2 at 0.1mm/min 20 °C	13.0
Creep Strength, N/mm^2 at 0.1mm/min 100 °C	5
Thermal Conductivity, W/m.K	58.7

Particle Size

SAC alloys are available in 3(45-25μm), 4(38-20μm) and 5(25-15μm) 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 150 ppm.

Metal Loading

Typical metal loading for R.M.A. 230 lead free stencil printing application is **88-89%.** Compared to typical Sn63/Sn62 solder pastes manufactured with 90% by weight metal loading, DSP 230Lead Free provides as much as 10-12% higher metal volume than Sn63/Sn62. This increased in volume of DSP 230 promotes better wetting and spreading of Sn/Ag/Cu lead free alloy.

Printing of Solder Paste

Stencil

Use of chemical etched/electroformed stencil is preferred however Lead-Free DSP 230 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 45-60º 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 are1.0-2.5 (25-50mm) per second. As print speeds increase pressure will need to be increased. Although slower print speeds are desirable, Qualitek 230 solder paste can print up to 6 inches per second.

Print Definition

DSP 230 provides excellent print definition characterized by brick-like prints. Good release is seen on 12-9 mil apertures with prints speeds in the range of 1.0-6.0 inch per second (25mm-150mm).

Open & Abandon Time

Tests have proven that DSP 230 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.

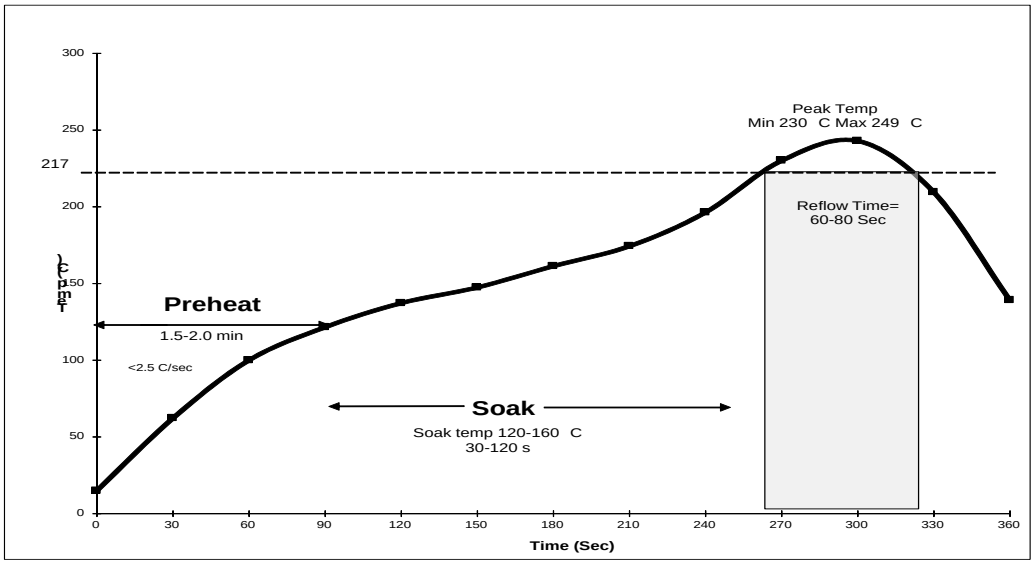
Paste Application

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 acheived when DSP 230 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 230 is an R.M.A. formulation, therefore, the residues should 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 Delta Solder Paste be stored at a temperature of between 35-50 °F (2-10 °C) to minimize solvent evaporation, flux separation, and chemical activity. Shelf life is 6 months from date of manufacture.

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.

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. Qualitek offers Multi-Cleaner 1515 that may be used for this purpose. Qualitek SK- 45 Stencil Cleaner is highly recommended with stencil cleaning equipment.

Packaging

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

Disposal

DSP 230 should be stored in a sealed container and disposed of in accordance with international, federal, state and local authority requirements.