TECHNICAL BULLETIN alpha®

ALPHA® CVP-390

ZERO-HALOGEN, LOW VOIDS, FINE FEATURE, EXCELLENT PIN TEST PERFORMANCE, NO-CLEAN, LEAD-FREE SOLDER PASTE. SAC305 AND LOW AG CAPABLE.

DESCRIPTION

ALPHA® CVP-390 is a lead-free, Zero-halogen no-clean solder paste designed for applications where residue with excellent pin testing property and ability to pass JIS Copper Corrosion test are required.

This product is also designed to enable consistent fine pitch printing capability, down to 180µm circle printed with 100µm thickness stencil. Its excellent print volume deposit repeatability also provides value by reducing defects associated with print process variability. Additionally, **ALPHA CVP-390** achieves IPC7095 Class III voiding performance.

FEATURES & BENEFITS

- **Long Stencil Life:** consistent performance for at least 8 hours of continuous printing without addition of new paste
- **Long, High Tack Force Life:** ensures high pick-and-place yields, good self-alignment
- **Wide Reflow Profile Window:** allows best quality solderability of complicated, high density PWB assemblies in both air and nitrogen reflow, using ramp and soak profiles, as high as 175 to 185°C
- **Reduced Random Solder Ball Levels:** minimizes rework and increases first time yield
- **Excellent Coalescence and Wetting Performance:** coalesced 180µm circle deposit, even at high soak profile environment
- **Excellent Solder Joint and Flux Residue Cosmetics:** after reflow soldering, even using long/high thermal soaking, without charring or burning
- **Excellent Voiding Performance:** Meets IPC7095 Class III Requirement
- **Halogen Content:** Zero Halogen, no halogen intentionally added
- **Residue:** Excellent Pin Testing property and Pass JIS Copper Corrosion Test
- **Safe and Environmentally Friendly:** Materials comply with RoHS and Halogen-free requirement (see table below), as well as TOSCA & EINECS

PRODUCT INFORMATION

Alloys:	SAC305 (96.5%Sn/3.0%Ag/0.5%Cu) SACX Plus™0307 (99%Sn/0.3%Ag/0.7%Cu) SACX Plus™ 0807 (98.5%Sn/0.8%Ag/0.7%Cu) For other alloys, contact your local Cookson Electronics Sales Office
Powder Size:	Type 4 (20 - 38µm per IPC J-STD-005) Type 5 (15 - 25µm per IPC J-STD-005) – available upon request
Packaging Sizes:	500 gram jars, 6” & 12” cartridges
Flux Gel:	Flux gel is available in 10 and 30 cc syringes for rework applications
Lead Free:	Complies with RoHS Directive 2002/95/EC.

APPLICATION

Formulated for both standard and fine pitch stencil printing, at print speeds of between 25mm/sec (1”/sec) and 150mm/sec (6”/sec), with stencil thickness of 0.100mm (0.004”) to 0.150mm (0.006”), particularly when used in conjunction with ALPHA® Stencils. Blade pressures should be 0.21-0.36 kg/cm of blade (1.25 -1.5 lbs/inch), depending upon the print speed. The higher the print speed employed, the higher the blade pressure that is required. The reflow process window will give high soldering yield with good cosmetics and minimized rework.

HALOGEN STATUS

ALPHA® CVP-390 is 'Zero Halogen' product. It passed all the standards listed in the Table below:

Halogen Standards			
Standard	**Requirement**	**Test Method**	**Status**
JEITA ET-7304 *Definition of Halogen Free Soldering Materials*	< 1000 ppm Br, Cl, F in solder material solids	**TM EN 14582** *Solids extraction per IPC TM 2.3.34*	Pass
IEC 612249-2-21	Post Soldering Residues contain < 900 ppm each or total of < 1500 ppm Br or Cl from flame retardant source		Pass
JEDEC *A Guideline for Defining "Low Halogen" Electronics*	Post soldering residues contain < 1000 ppm Br or Cl from flame retardant source		Pass
Zero Halogen: *- No halogenated compounds have been intentionally added to this product*			

CATEGORY	RESULTS	PROCEDURES/REMARKS
CHEMICAL PROPERTIES		
Activity Level	ROL0 = J-STD Classification	IPC J-STD-004B
Halide Content	Halide free (by titration).	IPC J-STD-004B
Fluoride Spot Test	**Pass**	JIS-Z-3197-1999 8.1.4.2.4
Halogen Test	Pass, Zero Halogen - No halogen intentionally added	EN14582, by oxygen bomb combustion, Non detectable (ND) at < 50 ppm
Ag Chromate Test	**Pass**	IPC J-STD-004B
	Pass	JIS-Z-3197-1999 8.1.4.2.3
Copper Mirror Test	**Pass**	IPC J-STD-004B
	Pass	JIS-Z-3197-1999 8.4.2
Copper Corrosion Test	**Pass** (No evidence of Corrosion)	IPC J-STD-004B
	Pass (No evidence of Corrosion)	JIS-Z-3197-1999 8.4.1
ELECTRICAL PROPERTIES		
Water Extract Resistivity	13,400 ohm-cm	JIS-Z-3197-1999 8.1.1
SIR (7 days, 40°C/93%RH, 10 V bias)	**Pass**	IPC J-STD-004B TM 2.6.3.7 (Pass ≥ 1 x 10^8ohm)
Electromigration (Bellcore 500 hours @ 65°C/85%RH 10V)	**Pass**	Bellcore GR78-CORE (Pass=final > initial/10)
JIS Electromigration (1000 hours @ 85°C/85%RH 48V)	**Pass**	JIS-Z-3197-1999 8.5.4

PHYSICAL PROPERTIES		
Color	Clear, Colorless Flux Residue	SAC 305 alloy
Tack Force vs. Humidity	**Pass** -> 100gf over 24 hours at 25%, 50% and 75 % Relative Humidity	JIS Z-3284-1994, Annex 9
Tack Force at 32°C/35%RH, measured after 0, 1, 2, 3 & 4 hours print duration	> 100gf	JIS Z-3284-1994, Annex 9
Viscosity	88.8% metal load, Type 4 designated M17 for printing Viscosity (Typical) 1700 poise at 10 RPM Malcom	Malcom Spiral Viscometer; J-STD-005
Viscosity Stability at 25ºC for 20 days	Pass	Malcom Spiral Viscometer
Continuous Viscosity Measurement at 25ºC for 24 hours	Pass	Malcom Spiral Viscometer
Coalescence Test	Able to reflow at > 200 µm Cu pad circle size	Internal
Solder Ball	Preferred	IPC TM-650 2.4.43
Wetting Time	Pass 0.34 second	Rhesca Test, Test Time T2 , 3 seconds
Spread	80%	JIS-Z-3197-1999 8.3.1.1
Cold Slump	No bridge for 0.2 mm space	JIS-Z-3284-1994
Hot Slump	No bridge for 0.4 mm space	JIS-Z-3284-1994 Annex 8
Dryness Test (Talc)	Pass	JIS-Z-3197-1999 8.5.1

SAFETY

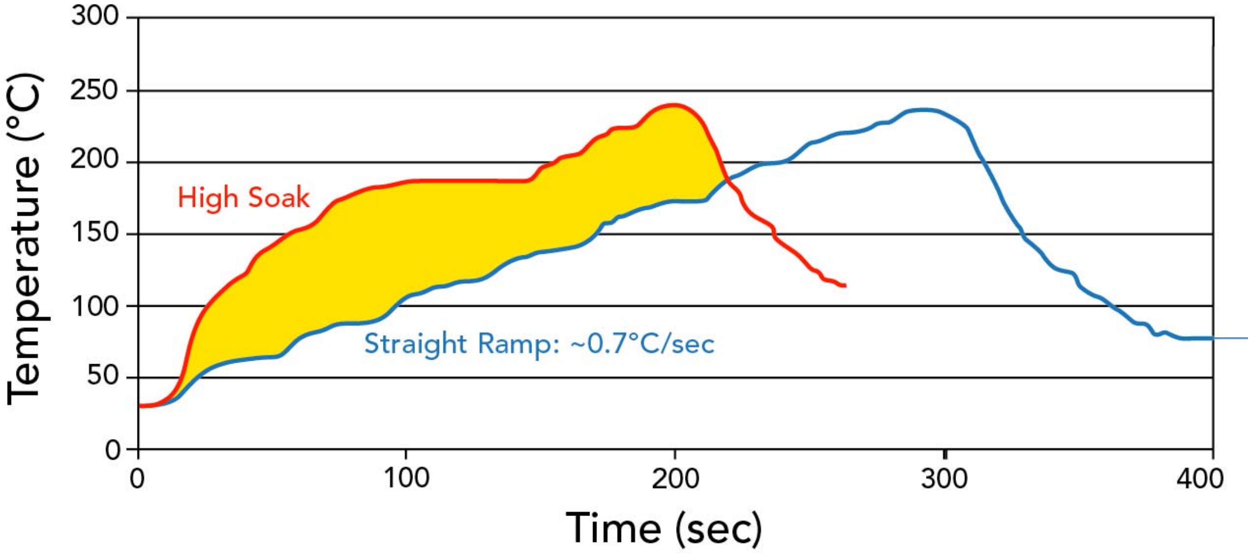
While the **ALPHA® CVP-390** flux system is not considered toxic, its use in typical reflow will generate a small amount of reaction and decomposition vapors. These vapors should be adequately exhausted from the work area. Consult the MSDS for additional safety information.

STORAGE

ALPHA® CVP-390 should be stored in a refrigerator upon receipt at 0 to 10°C (32-50°F).
ALPHA® CVP-390 should be permitted to reach room temperature before unsealing its package prior to use (see handling procedures on page 4). This will prevent moisture condensation build up in the solder paste.

STORAGE AND HANDLING	PRINTING	REFLOW (see Fig. 1)	CLEANING
1. Refrigerate to guarantee stability @ 0-10°C (32-50°F) 2. Paste can be stored for 2 weeks at room temperature up to 25°C(77°F) prior to use 3. When refrigerated, warm up paste container to room temperature for up to 4 hours. Paste must be 19°C (66°F) before processing. Verify paste temperature with a thermometer to ensure paste is at 19°C (66°F) or greater before set up of printer. 4. Paste can be manually stirred before use. A rotating/Centrifugal force mixing operation is not required. If a rotating/centrifugal force mixing is used, 30 - 60 seconds at 300 RPM is adequate. 5. Do not remove worked paste from stencil and mix with unused paste in jar. This will alter the rheology of unused paste. 6. These are starting recommendations and all process settings should be reviewed independently.	STENCIL: Recommend Cookson Electronics ALPHA CUT or ALPHA FORM stencils @ 0.100mm - 0.150 mm (4-6 mil) thick for 0.4 - 0.5 mm (0.016" or 0.020") pitch. Stencil design is subject to many process variables. Contact your local Cookson Electronics stencil site for advice. **SQUEEGEE:** Metal (recommended) **PRESSURE:** 0.21 - 0.36 kg/cm of blade (1.25 -2.0 lbs/inch) **SPEED:** 25 – 150 mm per second (1 – 6 inches per second). **PASTE ROLL:** 1.5-2.0 cm diameter and make additions when roll reaches 1-cm (0.4") diameter (min). Max roll size will depend upon blade. **STENCIL RELEASE SPEED:** 1 – 5 mm/sec. **LIFT HEIGHT:** 8 – 14mm (0.31- 0.55")	ATMOSPHERE: Clean-dry air or nitrogen atmosphere. **PROFILE (SAC Alloys):** Straight Ramp: 0.7°C/sec & 1.3°C/sec ramp profiles, 45 - 60 TAL, Peak Temperature 235 - 245°C. Soak: 155 – 175 °C, 60 to 100 sec soak profiles have been determined to give optimal results. If required, good results are also achievable with high soak temperature profiles of 175 – 185°C for 60 s. Typical peak temperature is 235 to 245°C. Note 1: Keeping the peak temperature below 241ºC may reduce the number and size of BGA and QFN voids. Note 2: Refer to component and board supplier data for thermal properties at elevated temperatures. Lower peak temperatures require longer TAL for improved joint cosmetics.	ALPHA CVP-390 residue is designed to remain on the board after reflow. If reflowed residue cleaning is required, Vigon A201 (in line cleaning), Vigon A 250 (Batch Cleaning) or Vigon US (Ultrasonic Cleaning) are recommended. Vigon is a registered trademark of Zestron Misprints and stencil cleaning may be done with ALPHA SM-110E, ALPHA SM-440, ALPHA BC-2200 and Bioact™ SC-10E cleaners. Bioact is a registered trademark of Petroferm.

Fig 1: ALPHA® CVP-390 SAC305 Typical Reflow Profile



General Reflow Profile Guidelines		
Parameter	**Guideline**	**Additional Information**
Atmosphere	Air or N2	
SAC305, SAC405, SACX Plus™ 0807	217 -225°C Melting Range	
SACX Plus™ 0307	217 - 227°C Melting Range	
Setting Zone*	**Optimal Dwell Period**	**Extended window**
40°C to 225^{o}C	2:30 to 4:30 min.	< 5:00 min.
170°C to 225°C	0:30 to 2:00 min	< 2:30 min.
120°C to 225°C	1:25 to 3:00 min.	< 3:30 min.
TAL (217 - 225°C)	45 - 90 sec.	Not Recommended
Peak temperature	235 - 245°C	Compatible with most common surface finishes. (Entek HT, Entek OM, Alpha Star, ENIG, SACX HASL)
Joint cool down rate from 170°C	1 - 6°C	Recommended to prevent surface cracking issues.

* Above recommendations are for SAC305. For alternative alloys, please follow the liquidus temperature of the respective alloy.