ALPHA® EF-6103

Low-Solids, High-Reliability, Pin-Testable, Lead-Free/SnPb Wave Flux

DESCRIPTION

ALPHA EF-6103 is an alcohol based flux designed to optimize solderability and reliability. It is formulated for both standard and thicker, high-density PCBs in both Lead-free (standard SAC and Low Ag SAC alloys) and eutectic SnPb processes. It is designed to have low bridging on bottom side QFPs, as well as provide superior performance in pin testing, hole-fill and solderballing. Additionally, it provides good Lead-free solder joint cosmetics with an evenly spread, tack free residue.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

Features for Lead-free:

- Pin testable
- Excellent post-soldering cosmetics on PCB
- Good hole fill in both dual and single wave soldering
- Low bridging performance on connectors, 0.65 mm and 0.80 mm QFPs.

Benefits:

- Evenly spread, tack free residue.
- Excellent Lead-free soldering performance on various board finishes.
- Can be used in Lead-free or SnPb processes
- Halide free

APPLICATION GUIDELINES

Preparation: To maintain consistent soldering performance and electrical reliability, it is important to begin the process with circuit boards and components that meet established requirements for solderability and ionic cleanliness. It is suggested that assemblers establish specifications on these items with their suppliers and that suppliers provide Certificates of Analysis with shipments and/or assemblers perform incoming inspection. A common specification for the ionic cleanliness of incoming boards and components is 5µg/in2 maximum, as measured by an ionic contamination tester.

Care should be taken in handling the circuit boards throughout the process. Boards should always be held at the edges. The use of clean, lint-free gloves is also recommended.

Conveyors, fingers and pallets should be cleaned. ALPHA AutoClean 40 cleaner is recommended for this process.

Flux Application: ALPHA EF-6103 can be applied by spray or foam. When spray fluxing, the uniformity of the coating can be visually checked by running a piece of cardboard over the spray fluxer or by processing a board-sized piece of tempered glass through the spray and then through the preheat section.

GENERAL GUIDELINES FOR MACHINE SETTINGS

General Guidelines for Machine Settings		
Operating Parameter	**SAC305 or Low Ag SAC alloys**	**63/37 Sn/Pb**
Amount of Flux Applied	Spray: 800 to 1200µg/in^2 of solids/in^2 for dual wave and 700 to 1000 µg/in^2 of solids/in^2 for single wave soldering	Spray: 800 to 1200µg/in^2 of solids/in^2 for dual wave and 600 to 900µg/in^2 of solids/in^2 for single wave soldering
Top-Side Preheat Temperature	95 to 125 °C	80 to 110 °C
Bottom side Preheat Temp.	0 to 40 °F (0 to 22 °C) vs. Top-Side	0 to 40 °F (0 to 22 °C) vs. Top-Side
Recommended Preheat Profile	Straight ramp to desired top-side temp.	Straight ramp to desired top-side temp.
Maximum Ramp Rate of Topside Temperature (to avoid component damage)	2 °C/second (3.5 °F/second) maximum	2 °C/second (3.5 °F/second) maximum

General Guidelines for Machine Settings		
Operating Parameter	**SAC305 or Low Ag SAC alloys**	**63/37 Sn/Pb**
Conveyor Angle	5 to 8° (6° most common recommended by equipment manufacturers)	5 to 8° (6° most common recommended by equipment manufacturers)
Conveyor Speed	1.0 to 2.0 meters/min (3.3 to 6.6 ft/min) ALPHA EF-6103 is capable of running at a slower conveyor speed for certain types of Lead-free wave soldering process	1.0 to 2.0 meters/minute
Contact Time in the Solder (includes Chip Wave & Primary Wave)	2 to 7 seconds (3 to 5 seconds most common)	1.5 to 4.0 seconds (2½ to 3 seconds most common)
Solder Pot Temperature:	255 to 265 °C	240 to 250 °C
These are general guidelines which have proven to yield excellent results; however, depending upon your equipment, components, and circuit boards, your optimal settings may be different. In order to optimize your process, it is recommended to perform a design experiment, optimizing the most important variables (amount of flux applied, conveyor speed, topside preheat temperature, solder pot temperature and board orientation).		

Flux Solids Control: If rotary drum spray fluxing, the flux solids will need to be controlled via thinner addition. For measuring the solids content, Alpha's Flux Solids Control Kit #3, a digital titrator, is suggested. Request Alpha's Technical Bulletin SM-458 for details on the kit and titration procedure. When operating a rotary drum fluxer continuously, the acid number should be checked every eight hours. Over time, debris and contaminants will accumulate in recirculating type flux applicators. For consistent soldering performance, dispose of spent flux every 40 hours of operation. After emptying the flux, the reservoir should be thoroughly cleaned with IPA.

Residue Removal: ALPHA EF-6103 is a no-clean flux and the residues are designed to be left on the board. If desired, flux residues can be removed with ALPHA 2110 saponifier cleaner and with other commercially available solvent cleaners and saponifier cleaners.

TECHNICAL DATA

Item	Typical Value	Item	Typical Value
Appearance	Clear, Light Amber Liquid	pH, 5% v/v aqueous solution	3.3
Solids Content, wt/wt	3.6%	Recommended Thinner	ALPHA 425
Specific Gravity @ 25 °C (77 °C)	0.796 ± 0.004	Shelf Life	360 days
Acid Number (mg KOH/g)	22.4 ± 1.3	IPC J-STD-004B Designation	ORL0
Flash Point (T.C.C.)	12 °C		

CORROSION & ELECTRICAL TESTING – SAC305 ALLOY

Corrosion Testing

Test	Requirement for ORL0	Results
Halide Testing IPC-TM 650 2.3.28.1	< 500ppm in flux solids	PASS
Copper Mirror Tests IPC-TM 650 Test Method 2.3.32	No complete removal of copper	PASS
Copper Corrosion Test IPC-TM 650 Test Method 2.6.15	No evidence of corrosion	No Evidence of Corrosion

IPC J-STD-004A Surface Insulation Resistance

Test	Conditions	Requirements	Results
"Comb-Down" Un-cleaned	85 °C/85% RH, 7 days	1.0×10^8 Ω minimum	6.6×10^9 Ω
"Comb-Up" Un-cleaned	85 °C/85% RH, 7 days	1.0×10^8 Ω minimum	2.1×10^{10} Ω
Control Boards	85 °C/85% RH, 7 days	1.0×10^9 Ω minimum	3.6×10^{10} Ω
IPC Test Condition (per J-STD-004A): -50V, measurement @ 100V/IPC B-24 board (0.4 mm lines, 0.5 mm spacing).			

IPC J-STD-004B Surface Insulation Resistance

Test	Requirements (<1.0 x 10^8 allowed during initial 24 hrs.)	Results (min. of all measurements recorded)		
		< 24 Hrs	24 to 168 Hrs	Visual
"Comb-Down" Un-cleaned	1.0 x 10^8 Ω minimum	1.6 x 10^8 Ω	8.6 x 10^8 Ω	PASS
"Comb-Up" Un-cleaned	1.0 x 10^8 Ω minimum	5.3 x 10^8 Ω	9.5 x 10^9 Ω	PASS
Control Boards	1.0 x 10^9 Ω minimum	2.7 x 10^9 Ω	9.4 x 10^9 Ω	NA
IPC Test Condition (per J-STD-004B TM2.6.3.7): IPC B-24 coupons, 12V, 40ºC, 90% RH, measurements recorded @ 20min intervals				

JIS Standard Surface Insulation Resistance

Test	Conditions	Requirements	Controls	Results
Initial	Ambient	1.0 x 10^{11} Ω minimum	1.2 x 10^{12} Ω	3.5 x 10^{11} Ω
After 7 days	40 °C / 90% RH	1.0 x 10^{10} Ω minimum	3.5 x 10^{11} Ω	3.9 x 10^{10} Ω
Recovered	25 °C/75% RH, 7 days	1.0 x 10^{11} Ω minimum	2.2 x 10^{11} Ω	1.4 x 10^{11} Ω
All Measurements @ 100V, JIS Boards (0.32mm lines, 0.32 mm spacing, same as IPC B25 Boards).				

Bellcore Surface Insulation Resistance

Test	Conditions	Requirements	Results
"Comb-Down" Un-cleaned	35 °C/85% RH, 4 days	1.0 x 10^{11} Ω minimum	1.7 x 10^{11} Ω
"Comb-Up" Un-cleaned	35 °C/85% RH, 4 days	1.0 x 10^{11} Ω minimum	2.1 x 10^{11} Ω
Control Boards	35 °C/85% RH, 4 days	2.0 x 10^{11} Ω minimum	2.4 x 10^{11} Ω
Bellcore Test Condition (per GR 78-CORE, Issue 1: 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing.			

Bellcore Electromigration

Test	SIR (Initial)	SIR (Final)	Requirements	Results	Visual Results
"Comb-Up" Un-cleaned	5.5 x 10^{10} Ω	2.9 x 10^{11} Ω	SIR (Initial) / SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	5.9 x 10^{9} Ω	2.4 x 10^{10} Ω	SIR (Initial) / SIR (Final) <10	Pass	Pass
Control	2.8 x 10^{11} Ω	7.0 x 10^{11} Ω	Not applicable	N/A	N/A
Bellcore Test Condition (per GR 78-CORE, Issue 1): 65 °C/85% RH/500 Hours/10V, measurement @ 100V/IPC B-25B Pattern (12.5 mil lines, 12.5 mil spacing).					

RECYCLING SERVICES

We provide safe and efficient recycling services to help companies meet their environmental and legislative requirements and at the same time, maximize the value of their waste streams.

Our service collects solder dross, solder scrap, and various forms of solder paste waste. Please contact your local sales representative for recycling capabilities in your area or link here.

SAFETY & WARNING

It is recommended that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use. **Safety Data Sheets are available at MacdermidAlpha.com/assembly-solutions/knowledge-base.**

CONTACT INFORMATION

To confirm this document is the most recent version, please contact Assembly@MacDermidAlpha.com

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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE . Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588

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