ALPHA® EF-6103

Low solids, high reliability, pin testable, Lead-free/SnPb Wave Flux

GENERAL DESCRIPTION

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.

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: In order 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/in^2 maximum, as measured by an Omegameter with heated solution.

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® brand 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.

HEALTH & SAFETY

Please refer to the Material Safety Data Sheet as the primary source of health and safety information. Inhalation of the volatilized flux activator fumes, which are generated at soldering temperatures, may cause headaches, dizziness and nausea.
Suitable fume extraction equipment should be used to remove the flux from the work area. An exhaust at the exit end of the wave solder machine may also be needed to completely capture the fumes. Observe precautions during handling and use. Suitable protective clothing should be worn to prevent the material from coming in contact with skin and eyes.

OPERATING PARAMETER	SAC 305 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	95-125°C	80-110°C
Bottom side Preheat Temperature	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 temperature	Straight ramp to desired top-side temperature
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
Conveyor Angle	5 - 8° (6° most common recommended by equipment manufacturers)	5-8° (6° most common recommended by equipment manufacturers)
Conveyor Speed	1.0 – 2.0 meters/minute (3.3 – 6.6 ft/min) EF-6103 is capable of running at a slower conveyor speed for certain types of Lead-free wave soldering process	1.0–2.0 meters/minute
Contact Time in the Solder (includes Chip Wave and Primary Wave)	2 – 7 seconds (3 - 5 seconds most common)	1.5 - 4.0 seconds (2½ - 3 seconds most common)
Solder Pot Temperature:	255-265°C	240-250°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.

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TECHNICAL SPECIFICATIONS – EF-6103

Physical Properties	Typical Values	Parameters/Test Method	Typical Values
Appearance	Clear, Pale Yellow Liquid	pH, 5% v/v aqueous solution	3.1
Solids Content, wt/wt	3.6%	Recommended Thinner	ALPHA 425
Specific Gravity @ 25°C (77°C)	0.797	Shelf Life	12 months
Acid Number (mg KOH/g)	22.4	IPC J-STD-004A Designation	ORL0
Flash Point (T.C.C.)	17°C		

CORROSION AND ELECTRICAL TESTING- SAC 305 Alloy

CORROSION TESTING

Test	Requirement for ORL0	Results
Silver Chromate Paper IPC-TM 650 Test Method 2.3.33	No detection of halide	PASS
Copper Mirror Tests IPC-TM 650 Test Method 2.6.32	No complete removal of copper	PASS
Copper Corrosion Test IPC-TM 650 Test Method 2..3.15	No evidence of corrosion	No Evidence of Corrosion

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

JIS STANDARD SURFACE INSULATION RESISTANCE

Test	Conditions	Requirements	Controls	Results
Initial	Ambient	> 1.0×10^{11} Ω	1.2×10^{12} Ω	3.5×10^{11} Ω
After 7 days	40°C / 90% RH	> 1.0×10^{10} Ω	3.5×10^{11} Ω	3.9×10^{10} Ω
Recovered	25°C/75% RH, 7 days	> 1.0×10^{11} Ω	2.2×10^{11} Ω	1.4×10^{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[1]	Results[1]
"Comb-Down" Un-cleaned	35°C/85% RH, 4 days	> 1.0×10^{11} Ω	1.7×10^{11} Ω
"Comb-Up" Un-cleaned	35°C/85% RH, 4 days	> 1.0×10^{11} Ω	2.1×10^{11} Ω
Control Boards	35°C/85% RH, 4 days	> 2.0×10^{11} Ω	2.4×10^{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)[1]	SIR (Final)[1]	Requirement	Result	Visual Result
"Comb-Up" Un-cleaned	5.5×10^{10} Ω	2.9×10^{11} Ω	SIR (Initial)/SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	5.9×10^9 Ω	2.4×10^{10} Ω	SIR (Initial)/SIR (Final) <10	Pass	Pass
Control	2.8×10^{11} Ω	7.0×10^{11} Ω	Not applicable	Not applicable	Not applicable
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).					