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TECHNICAL BULLETIN

ALPHA® EF-6000

No-Clean Flux for Lead-Free & Tin-Lead Wave Soldering

DESCRIPTION

ALPHA EF-6000 was specifically developed to deliver outstanding board cosmetics and to eliminate the tendency for solder balling and solder bridging, two types of defects which are normally associated with the use of the chip wave. Of all low solids (< 4% solids), no-clean fluxes, **ALPHA EF-6000** exhibits the lowest tendency for solder ball generation over a wide variety of solder masks during wave soldering and Selective Soldering operations. **ALPHA EF-6000** should be considered for use by any assembler who has board designs which are sensitive to solder bridging, performs pin testing, or whose specification requires an extremely low frequency of solder balls.

ALPHA EF-6000 is an active, low solids, no-clean flux. It has been designed with a wide thermal process window enabling best-in-class productivity with lead-free wave soldering applications and is an excellent choice for remaining tin-lead production lines. It is formulated with a proprietary mixture of organic activators. Several proprietary additives are formulated into **ALPHA EF-6000** to reduce the surface tension between the solder mask and the solder; thereby, dramatically reducing the tendency of solder ball generation. The formulation of **ALPHA EF-6000** is also more thermally stable, thereby, reducing the occurrence of solder bridging during lead-free dual wave soldering.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

- Thermally stable activators provide the lowest solder bridging in a low-solids, no-clean flux for wave soldering and Selective Soldering in tin-lead and lead-free applications.
- Reduces the surface tension between solder mask and solder to provide the lowest solder ball frequency of any low solids, no-clean flux.
- Very low level of non-tacky residue to reduce interference with pin testing and exhibit no visible residue.
- Cleaning is not required which reduces operating costs.
- IPC-J-STD-004 compliant for long term electrical reliability.

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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 (0.77µg/cm^2) 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. When switching from one flux to another, the flux reservoir, flux tank, and lines of the spray fluxer assembly should be purged with IPA. Conveyors, fingers, and pallets should be cleaned periodically with DI Water, IPA, or other commercial Solvent Cleaners to eliminate residues on the assembly edges.

FLUX APPLICATION: ALPHA EF-6000 is formulated to be applied by spray methods. A uniform coating of flux is essential to successful soldering. 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.

Operating Parameter	SAC305 / SACX0307	63/37 Sn-Pb
Amount of Flux Applied by Spray	Single Wave: 500 to 800 µg/in^2 (78 to 124 µg/cm^2) of solids Dual Wave: 850 to 1400 µg/in^2 (132 to 217 µg/cm^2) of solids	Single Wave: 200 to 600 µg/in^2 (31 to 93 µg/cm^2) of solids Dual Wave: 600 to 1000 µg/in^2 (93 to 155 µg/cm^2) of solids
Topside Preheat Temperature	105 to 120 °C (221 to 248 °F)	75 to 100 °C (167 to 212 °F)
Bottom side Preheat Temperature	about 35 °C (95 °F) higher than topside	about 35 °C (95 °F) higher than topside
Maximum Ramp Rate of Topside Temperature (to avoid component damage)	2 °C/second maximum	2 °C/second maximum
Conveyor Angle	4 to 7° (6° typical)	4 to 7° (6° typical)
Conveyor Speed	3 to 6 ft./min. (0.9 to 1.8 m./min.)	3 to 6 ft./min. (0.9 to 1.8 m./min.)
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 to 3.5 seconds (2.5 to 3 seconds most common)	1.5 to 3.5 seconds (2.5 to 3 seconds most common)
Solder Pot Temperature	255 to 265 °C (491 to 509 °F)	240 to 250 °C (464 to 482 °F)
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 designed experiment, optimizing the most important variables (amount of flux applied, conveyor speed, topside preheat temperature, solder pot temperature, and board orientation).		

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FLUX SOLIDS CONTROL: As with any flux with less than 5% solids content, specific gravity is **not** an effective measurement for assessing and controlling the solids content. Monitoring and controlling the acid number is recommended for maintaining the solids content. The acid number should be controlled to between 16.5 and 18.5. Alpha's Titration Kit #3, (digital titrator), is suggested. Request the Application Bulletin “Solids Control of Low Solids Flux” for more information.

RESIDUE REMOVAL: ALPHA EF-6000 is a no-clean flux and the residues are designed to be left on the board. However, if desired, ALPHA EF-6000 residues can be removed with hot DI Water, ALPHA 2110 Saponifier, or commercial solvent cleaners.

TOUCH-UP/REWORK - Use of the ALPHA Cleanline Write Flux Applicator with ALPHA NR-205 flux and ALPHA Telecore Series cored solder is recommended for hand soldering applications.

TECHNICAL DATA

Item	Typical Values	Item	Typical Values
Appearance	Clear, pale-yellow liquid	Pounds Per Gallon	6.8
Solids Content, wt/wt	2.2 %	Recommended Thinner	ALPHA 425
Specific Gravity @ 25 °C (77 °F)	0.790 ± 0.003	Shelf Life (from Date of Mfg.)	360 days
Acid Number (mg KOH/g)	17.5 ± 1.0	IPC J-STD-004 Designation	ORL0
pH (5% aqueous solution)	3.3	Packaging Size	1, 5 & 55 Gallons
Flash Point (T.C.C.)	53 °F (12 °C)		

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CORROSION & ELECTRICAL TESTING

Corrosion Testing

Test	Requirements for ORL0	Results
Silver Chromate Paper Test	No Detection of Halide	PASS
Copper Mirror Test	No Complete Removal of Copper	PASS
IPC Copper Corrosion Test	No evidence of corrosion	PASS

J-STD-004 Surface Insulation Resistance

Test Condition	Requirements	Results
IPC J-STD-004 Comb-Down – Un-cleaned	1.0×10^8 minimum	1.7×10^{10}
IPC-J-STD-004 Comb-Up – Un-cleaned	1.0×10^8 minimum	1.5×10^{10}
IPC J-STD-004 Control Board	1.0×10^9 minimum	2.7×10^{10}
IPC Test Condition (per J-STD-004): 85 °C/85%RH/7days/-50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing). All values in ohms.		

Bellcore Electromigration

Test Condition	SIR (Initial)	SIR (Final)	Requirement	Result
Bellcore "Comb-Up" Un-cleaned	7.8×10^9	1.7×10^{11}	SIR (Initial)/SIR (Final) < 10	PASS
Bellcore "Comb-Down" Un-cleaned	1.6×10^{10}	1.4×10^{11}	SIR (Initial)/SIR (Final) < 10	PASS
Bellcore Test Condition (per GR 78-CORE, Issue 1): 65 °C/85%RH/500 Hours/10V, measurement @100V/IPC B-25 B Pattern (12.5 mil lines, 12.5 mil spacing). All values in ohms.				

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TECHNICAL BULLETIN

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

www.macdermidalpha.com

North America 109 Corporate Blvd. South Plainfield, NJ 07080, USA 1.800.367.5460	**Europe** Unit 2, Genesis Business Park Albert Drive Woking, Surrey, GU21 5RW, UK 44.01483.758400	**Asia** 8/F., Paul Y. Centre 51 Hung To Road Kwun Tong, Kowloon, Hong Kong 852.3190.3100

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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