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MacDermid Alpha ELECTRONICS SOLUTIONS

TECHNICAL DATA SHEET

ALPHA® EF-6100

Low Solids, High Reliability, Alcohol Based Wave Soldering Flux for Lead-Free and Tin-Lead Applications

DESCRIPTION

ALPHA EF-6100 was specifically developed to deliver high reliability and excellent soldering performance combined with outstanding board cosmetics and pin-testability. **ALPHA EF-6100** exhibits a low tendency for solder ball generation over a wide variety of solder masks during wave soldering and Selective Soldering operations. **ALPHA EF-6100** should be considered for use by any assembler who has board designs which require high reliability, good through-hole-fill, reduced component bridging and reduced skips.

ALPHA EF-6100 is a high-reliability, IPC, Bellcore, and JIS compliant, 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. **ALPHA EF-6100** is formulated with a proprietary mixture of organic activators to give more thermal stability, thereby reducing the occurrence of solder bridging during lead-free dual wave soldering.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

- Exhibits exceptional electrical reliability for a low-solids wave soldering flux. Complies with IPC-J-STD-004 SIR, Bellcore SIR, Bellcore ECM, JIS ECM, and JIS SIR.
- Thermally stable activators provide minimized solder bridging in a low-solids, no-clean flux for wave soldering and Selective Soldering in lead-free and tin-lead applications.
- Reduces the surface tension between solder mask and solder to resist solder ball formation
- Very low level of non-tacky residue to reduce interference with pin testing and exhibit no visible residue.

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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 onic cleanliness of incoming boards and components is 5µg/in2 (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, IPA or other commercial Solvent Cleaners to eliminate residues on the assembly edges.

Flux Application: ALPHA EF-6100 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 pH sensitive paper matching the footprint of the assembly over the spray fluxer.

General Guidelines for Machine Settings		
Operating Parameter	**SAC305 / SACX0307**	**63Sn37Pb**
Flux application	Spray	Spray
Amount of Flux Applied (Single Wave)	1200 to 1800 µg/in^2 (190 to 280 µg/cm^2) of solids	1000 to 1400 µg/in^2 (155 to 220 µg/cm^2) of solids
Amount of Flux Applied (Dual Wave)	1600 to 2000 µg/in^2 (250 to 310 µg/cm^2) of solids	1500 to 1800 µg/in^2 (230 to 280 µg/cm^2) of solids
Top-Side Preheat Temperature	90 to 120 °C (194 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/sec maximum	2 °C/sec maximum
Conveyor Angle	4 to 7° (6° typical)	4 to 7° (6° typical)
Contact 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)

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General Guidelines for Machine Settings		
Operating Parameter	**SAC305 / SACX0307**	**63Sn37Pb**
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 to 3.5 sec (2.5 to 3 sec most common)	1.5 to 3.5 sec (2.5 to 3 sec 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 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: 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 22.7 and 25.1.

Residue Removal: ALPHA EF-6100 is a no-clean flux and the residues are designed to be left on the board. However, if desired, ALPHA EF-6100 residues can be easily removed with various cleaning products including, 2110 saponifier, IPA or commercial solvent cleaners.

Touch-Up/Rework: Use of the 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, colorless to pale yellow liquid	Flash Point (T.C.C.)	12 °C (53 °F)
Solids Content, %wt/wt	3.8%	Recommended Thinner	**ALPHA 425**
Specific Gravity @ 25 °C (77 °F)	0.794 ± 0.003	Shelf Life (from Date of Mfg.)	360 days
Acid Number, mg KOH/g	23.9 ± 1.2	IPC J-STD-004B Designation	ORL0
pH (5% aqueous solution)	3.3	Packaging Size	1, 5 and 55 gallons
Pounds per Gallon	6.6		

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CORROSION & ELECTRICAL TESTING

Corrosion Test

Test	Requirement	Results
Silver Chromate Paper IPC-TM-650 Test Method 2.3.33	No discoloration for halides detection	PASS
Quantitative Halide IPC-TM-650 Test Method 2.3.28.1	<0.5% for L Classification	PASS
Copper Mirror Test IPC-TM-650 Test Method 2.3.32	No evidence of mirror breakthrough for L Classification	PASS
Copper Corrosion Test IPC-TM-650 Test Method 2.6.15	No evidence of corrosion	PASS

IPC J-STD-004 Surface Insulation Resistance (All values in ohms)

Test	Requirement	Results
"Comb-Down" Un-cleaned	1.0×10^8 minimum	2.3×10^{10}
"Comb-Up" Un-cleaned	1.0×10^8 minimum	2.2×10^{10}
Control Boards	2.0×10^8 minimum	2.3×10^{10}
Test Condition (per IPC J-STD-004): 85 °C / 85% RH / 7 days / -50V, measurements @ 100V / IPC B-24 Board (0.4mm lines, 0.5mm spacing)		

IPC J-STD-004B SURFACE INSULATION RESISTANCE

Test	Requirements (<1.0×10^8 allowed during initial 24 hrs.)	Results		
		< 24 Hrs	24 to 168 Hrs	Visual
"Comb-Down" Un-cleaned	$1.0 \times 10^8\ \Omega$ minimum	$3.84 \times 10^9\ \Omega$	$5.34 \times 10^9\ \Omega$	PASS
"Comb-Up" Un-cleaned	$1.0 \times 10^8\ \Omega$ minimum	$1.04 \times 10^{11}\ \Omega$	$1.20 \times 10^{11}\ \Omega$	PASS
Control Boards	$1.0 \times 10^9\ \Omega$ minimum	$5.06 \times 10^{11}\Omega$	$5.95 \times 10^{11}\ \Omega$	NA
IPC Test Condition (per J-STD-004B TM 2.6.3.7): IPC B-24 coupons, 12V, 40 ºC, 90% RH, measurements recorded @ 20min intervals				

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Bellcore Surface Insulation Resistance (All values in ohms)

Test	Requirement	Results
"Comb-Down" Un-cleaned	1.0 x 10^{11} minimum	1.1 x 10^{12}
"Comb-Up" Un-cleaned	1.0 x 10^{11} minimum	3.6 x 10^{11}
Control Boards	2.0 x 10^{11} minimum	7.8 x 10^{11}
Test Condition (per Bellcore GR 78-CORE, Issue 1): 48V, measurements @ 100V / 25mil lines, 50mil spacing		

JIS Surface Insulation Resistance (All values in ohms)

Test	Condition	Requirement	Control	Result
Initial "Comb-Down" Un-cleaned	Ambient	1.0 x 10^{11} minimum	5.2 x 10^{11}	3.4 x 10^{11}
After 168 Hours "Comb-Down" Un-cleaned	40 °C / 93% RH	1.0 x 10^{10} minimum	1.5 x 10^{11}	8.8 x 10^{10}
Recovered "Comb-Down" Un-cleaned	35 °C / 85% RH, 5 days	1.0 x 10^{11} minimum	4.7 x 10^{11}	2.8 x 10^{11}
Initial "Comb-Up" Un-cleaned	Ambient	1.0 x 10^{11} minimum	5.2 x 10^{11}	2.5 x 10^{11}
After 168 Hours "Comb-Up" Un-cleaned	40 °C / 93% RH	1.0 x 10^{10} minimum	1.5 x 10^{11}	3.2 x 10^{10}
Recovered "Comb-Up" Un-cleaned	35 °C / 85% RH, 5 days	1.0 x 10^{11} minimum	4.7 x 10^{11}	1.7 x 10^{11}
Test Condition (per JIS Standard): measurements @ 100V / JIS Boards (0.32mm lines, 0.32mm spacing, same as IPC B-25 Boards)				

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Bellcore Electrochemical Migration Resistance

Test	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
"Comb-Up" Un-cleaned	9.3 x 10^9	2.3 x 10^{11}	SIR (Initial) / SIR (Final) < 10	PASS	PASS
"Comb-Down" Un-cleaned	7.2 x 10^9	6.6 x 10^9	SIR (Initial) / SIR (Final) < 10	PASS	PASS
Test Condition (per Bellcore GR 78-CORE, Issue 1): 65 °C / 85% RH / 500 Hours / 10V, measurement @100V / IPC B-25 B Pattern (12.5mil lines, 12.5mil spacing)					

JIS Standard Electromigration

Electrical and visual requirements of JIS standards: PASS

Geometric Mean SIR value: 4.9 x 10^{10} ohm (@85 deg °C / 85% RH / 48VDC / 1000hrs)

Migration: No evidence of electrochemical migration

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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.



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.**

CONTACT INFORMATION

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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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