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TECHNICAL BULLETIN

ALPHA® EF-9301

Wave Soldering Flux for Tin-Lead and Lead-Free Applications

DESCRIPTION

ALPHA EF-9301 is a rosin-containing full dulling flux that provides the unique attributes of excellent solderability and reliability in both Lead-Free and Tin-Lead processes. It is designed to have best in class bridging on bottom side SMT components as well as superior performance in hole fill and solderballing. Additionally, it provides dull joints with an evenly spread, low-tack flux.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES & BENEFITS

Best-In-Class Features for Lead-Free and Tin-Lead Processes

- Low bridging performance on connectors and bottom side SMT components
- Excellent hole fill demonstrated by >95% yield on 10 mil holes.
- Low solderballing performance

Benefits

- Smooth solder joints with full dulling
- Evenly spread, low tack, flux residue
- Capable for Tin-Lead and Lead-Free processes
- Can be applied via spraying or foaming

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/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 SM-110 Solvent Cleaner has been found to be very useful for these cleaning applications.

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FLUX APPLICATION: ALPHA EF-9301 can be applied by spraying or foaming. 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.

FLUX SOLIDS CONTROL: The solids content of ALPHA EF-9301 should be maintained by the addition of thinner to compensate for evaporation losses. Only ALPHA 425 Thinner should be used for this purpose, to ensure consistency of flux foaming and soldering characteristics. Flux solids content is readily controlled by simple hydrometer measurement. After emptying the flux, the reservoir should be thoroughly cleaned with IPA.

RESIDUE REMOVAL: ALPHA EF-9301 is a no-clean flux and the residues are designed to be left on the board. If their removal is required, ALPHA 2110 and saponifiers are recommended.

Operating Parameter	Recommendation
Flux application	Spray
Amount of Flux Applied	Spray: <1500 µg/in^2 of solids/in^2 dual wave, <1200 µg/in^2 of solids/in^2 single wave
Top-Side Preheat Temperature	85 to 110 °C for Lead-Free and 75 to 95 °C for Tin-Lead
Bottom side Preheat Temperature	0 to +22 °C (0 to +40 °F) vs. Top-Side
Maximum Ramp Rate of Topside Temperature (to avoid component damage)	2 °C/second (3.5°F/second) maximum
Conveyor Speed	1.5 to 2.2 meters/minute for single wave, 0.8 to 2.0 m/min for Lead-Free. *ALPHA EF-9301 is capable of running at slower conveyor speeds to accommodate certain types of Lead-Free wave soldering processes
Contact Angle	5 to 8° (6° most common recommended by equipment manufacturers)
Contact Time	1.5 to 4.0 seconds (2½ to 3 seconds most common)
Solder Pot Temperature	Sn63/Pb37 Alloy: 235 to 260 °C, Lead-Free Alloy (SAC305): 255 to 265 °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).	

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TECHNICAL DATA

Physical Properties	Typical Values	Parameters/Test Method	Typical Values
Appearance	Clear, Pale Yellow Liquid	Flash Point (T.C.C.)	12 °C
Solids Content, wt/wt	7.0	Recommended Thinner	ALPHA 425
Specific Gravity @ 25 °C (77 °C)	0.798 ± 0.005	Shelf Life	360 days
Acid Number (mg KOH/g)	16.0 to 17.0	IPC Classification	ROM1
pH, as is	3.6	JIS & Bellcore status	Compliant

CORROSION & ELECTRICAL TESTING – SAC305 ALLOY

CORROSION TESTING

Test	Requirement for ROM1	Results
Silver Chromate Paper IPC-TM 650 Test Method 2.3.33	Halides detected	Contains halides
Copper Mirror Tests (IPC/Bellcore Method)	<50% Breakthrough in test area	No evidence of mirror breakthrough
Copper Corrosion Test IPC-TM 650 Test Method 2.6.15	Minor corrosion acceptable	No evidence of corrosion

IPC-J-STD-004A SURFACE INSULATION RESISTANCE (All values shown are in ohms)

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	85 °C/85% RH, 7 days	> 1.0×10^8	6.5×10^9
"Comb-Up" Uncleaned	85 °C/85% RH, 7 days	> 1.0×10^8	2.6×10^{10}
Control Boards	85 °C/85% RH, 7 days	>1.0×10^9	1.3×10^{10}
IPC Test Condition (per J-STD-004A): -50V, measurement @ 100V/IPC B-24 board (0.4mm lines, 0.5mm spacing)			

JIS STANDARD SURFACE INSULATION RESISTANCE (All values shown are in ohms)

Test	Conditions	Requirements	Controls	Results
Initial	Ambient	> 1.0×10^{11}	2.9×10^{12}	1.1×10^{12}
After 168 Hours	40 °C / 90% RH	> 1.0×10^{10}	3.3×10^{10}	1.8×10^{10}
Recovered	35 °C/85% RH, 5 days	> 1.0×10^{11}	1.0×10^{12}	9.0×10^{11}
All Measurements @ 100V, JIS Boards (0.32mm lines, 0.32 mm spacing, same as IPC B25 Boards)				

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BELLCORE SURFACE INSULATION RESISTANCE (All values shown are in ohms)

Test	Conditions	Requirements	Results
"Comb-Down" Uncleaned	35 °C/85% RH, 5 days	> 1.0×10^{11}	1.0×10^{12}
"Comb-Up" Uncleaned	35 °C/85% RH, 5 days	> 1.0×10^{11}	2.3×10^{11}
Control Boards	35 °C/85% RH, 5 days	> 2.0×10^{11}	2.2×10^{12}
Bellcore Test Condition (per GR 78-CORE, Issue 1): 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing			

BELLCORE ELECTROMIGRATION (All values shown are in ohms)

Test	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
"Comb-Up" Uncleaned	6.1×10^{10}	1.4×10^{11}	SIR (Initial)/SIR (Final) <10	Pass	Pass
"Comb-Down" Uncleaned	4.5×10^{11}	7.3×10^{11}	SIR (Initial)/SIR (Final) <10	Pass	Pass
Control	5.1×10^{10}	8.8×10^{10}	SIR (Initial)/SIR (Final) <10	Pass	Pass
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)					

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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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