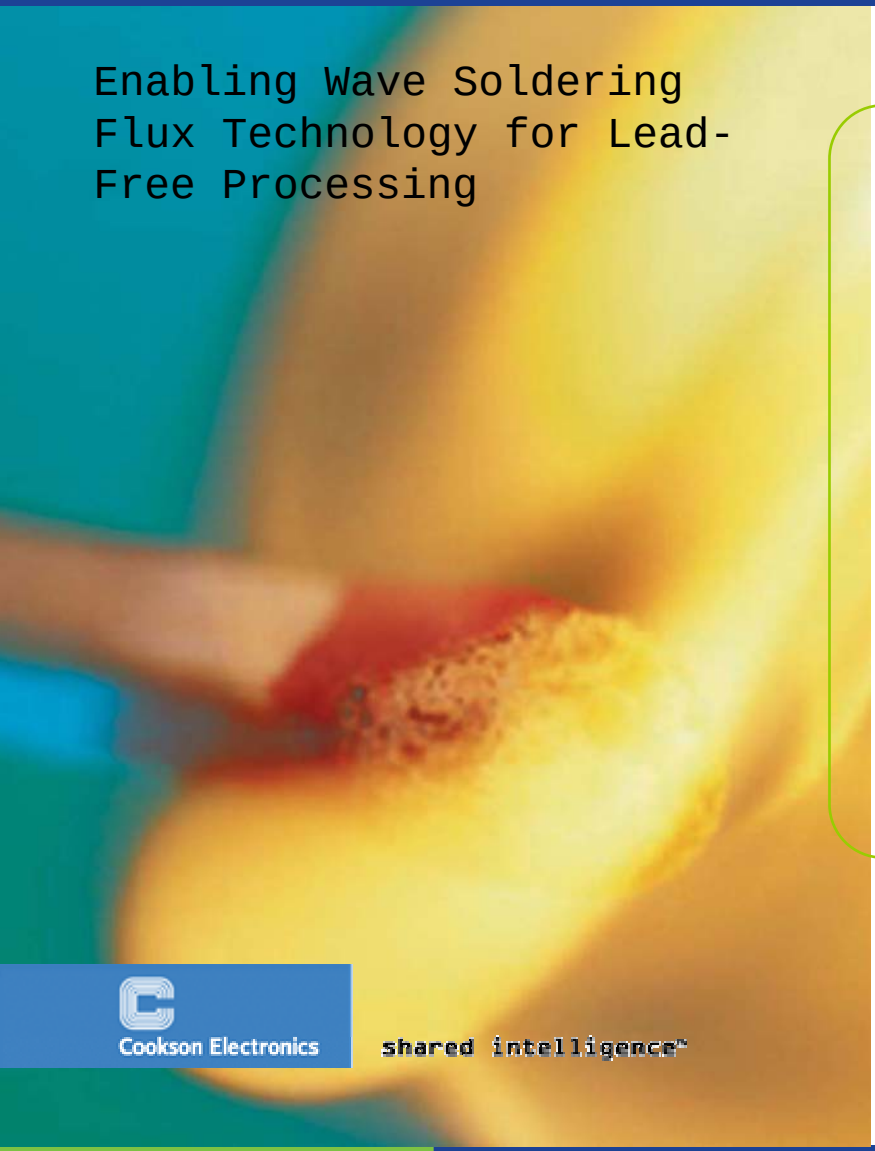
the product:

Enabling Wave Soldering Flux Technology for Lead-Free Processing



ALPHA® EF-8000

product guide

Cookson Electronics

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EF-8000

Introduction

EF-8000 is designed to make your transition from tin-lead to lead free wave soldering as efficient and profitable as possible. It provides best in class productivity with lead free wave soldering applications, and is an excellent choice for your remaining tin-lead production line(s).

Feature:	Benefit:
Wide Thermal Process Window	High Yields in Lead Free and Tin Lead Processes
Low Rosin Content	Low Residues on Equipment and Soldering Pallets
Excellent Electrical Reliability	Meets IPC, Bellcore, JIS and Leading OEM Requirements
Excellent Pin Testability	High First Pass Yield in conjunction with In-Line Circuit Testing
Best in Class Hole Fill with OSP	High Yields with Lower Cost surface finish materials
Broad Process Capability	One flux for all common pad finishes and alloy types.
Dual Alloy Capability	Enables Use one flux for Lead-Free and Tin-Lead Production Lines
Foam and Spray Flux Capable	Easy to Implement with current process equipment

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EF-8000

Performance Summary

ALPHA EF-8000 is an alcohol-based no-clean, low rosin content wave soldering flux, designed to enable efficient conversion to lead-free soldering over a broad range of process conditions.

Attribute	Results
Hole Fill	Best in Class Lead-Free. Superior lead-free yields vs. best in class tin-lead process
Cosmetics	Bright, shinny lead free joints; minimal amount of clear, colorless rosin residue.
Resistance to Bridging	Superior vs. best in class lead-free offering
Electrical Reliability	IPC, Bellcore, JIS and Major OEM Compliant
Pin Testability	>99.3% first pass yield SAC 305 99.9% first pass yield Sn 63
Equipment Maintenance	Lower maintenance frequency vs. higher rosin formulations

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Enabling Lead Free Soldering

Hole Fill

Flux/Alloy Combination	EF-8000 SAC 305(1)	RF-800 Sn63(2)	EF-8000 SAC 305(1)	RF-800 Sn63(2)	EF-8000 SAC 305(1)	RF-800 Sn63(2)
	No Reflow		One Reflow		Two Reflows	
10mil Ave. Hole Fill (%)	92.6	66.2	9.6	0	11	0
15mil Ave. Hole Fill (%)	99.8	99.4	9	1.2	4.4	0
20mil Ave. Hole Fill (%)	100	95.6	31.2	5.2	10	0.8

SAKT Boards, OSP Finish, Dual Wave

(1) 260°C Pot Temperature, 90° C Top Side Temperature

(2) 245°C Pot Temperature, 85°C Top Side Temperature

Superior Hole Fill in Lead-Free Process vs. Best in Class Tin-Lead Combination with 0, 1 and 2 prior reflow cycles.

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Enabling Lead Free Soldering

Resistance to Bridging on Bottom-Side QFPs

Flux/Alloy Combination	EF-8000 SAC 305 (1)	RF-800 Sn63 (2)	EF-8000 SAC 305 (1)	RF-800 Sn63 (2)	EF-8000 SAC 305 (1)	RF-800 Sn63 (2)
	No Reflow		One Reflow		Two Reflows	
Bridges/per .8mm QFP	0.00	0.20	0.00	0.20	0.00	0.00
Bridges/per .5mm QFP	20.20	22.80	18.40	19.00	25.60	27.40

SAKT Boards, OSP Finish, Dual Wave

(1) 260°C Pot Temperature, 90° C Top Side Temperature

(2) 245°C Pot Temperature, 85°C Top Side Temperature

Increased Resistance to Bottom Side QFP Bridging in Lead-Free Process vs. Best in Class Tin-Lead Process.

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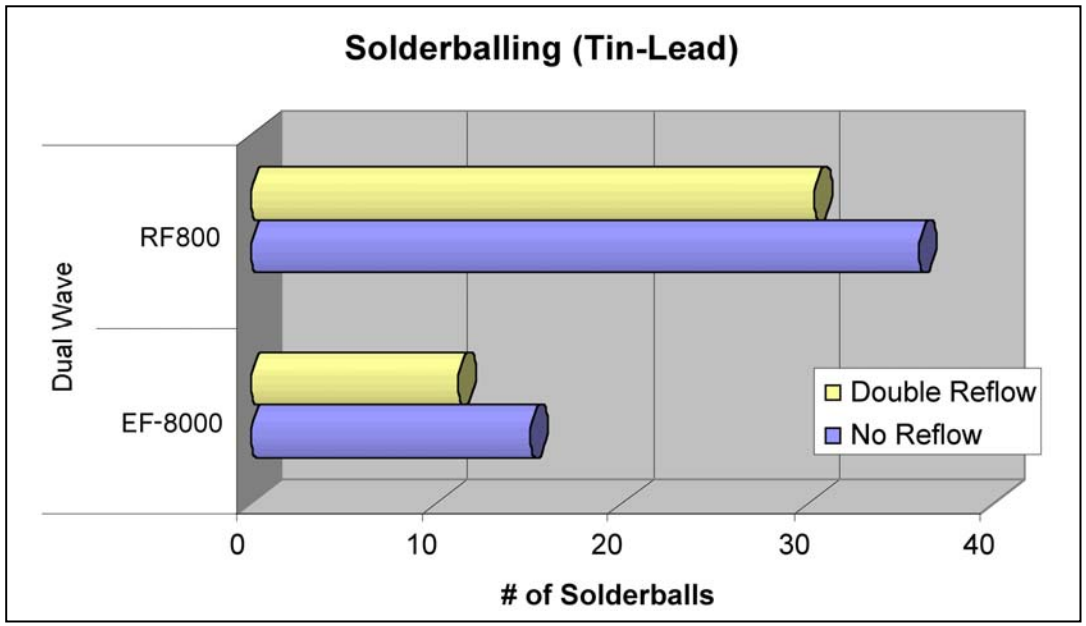
Tin-Lead Capability

Solderballing Comparison – Tin-Lead Process



50% fewer solderballs observed on connectors processed with EF-8000 even after double reflow

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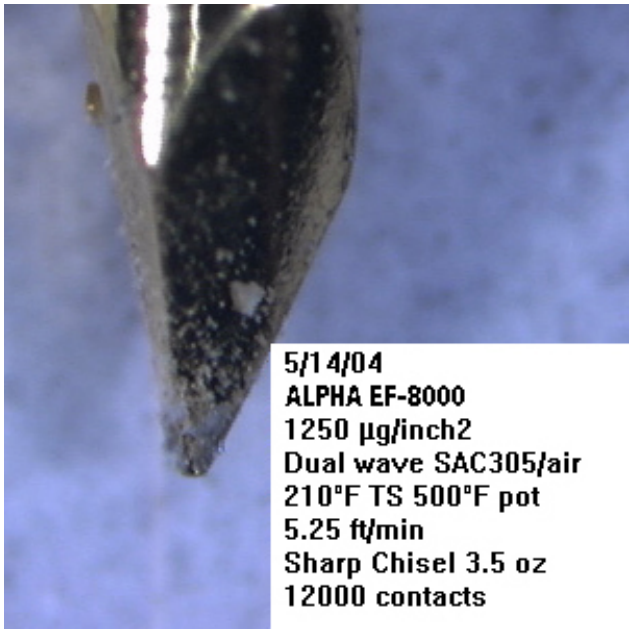
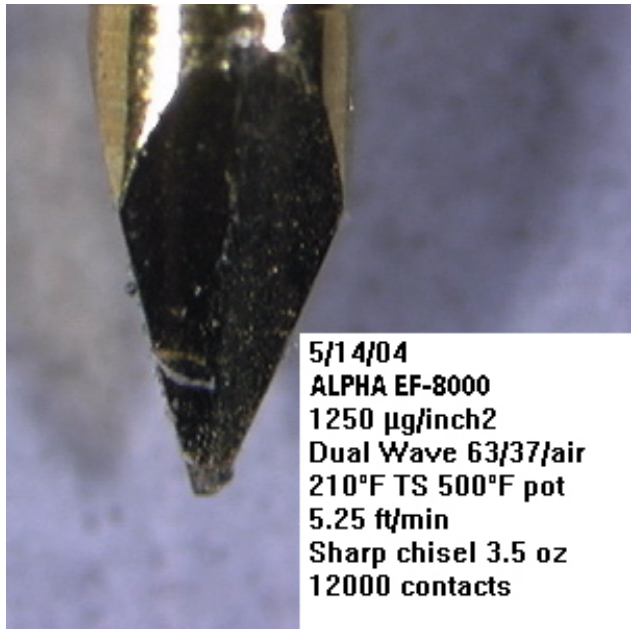
Excellent Pin Test Yields in Lead-Free and Tin Lead Applications



99.3% <5 Ohms
SAC 305



99.9% <5 Ohms
Sn63/Pb37

- Minimal Rosin Pick Up on Test Probes after 12,000 Contacts
- Worry Free In Circuit Pin Testing

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Soldering Performance: Best in Class Resistance to Bridging

Flux Type	Bridges/Connector		Bridges/PGA	
	No Prior Reflow	1 Prior Reflow	No Prior Reflow	1 Prior Reflow
RF-800	3.23	0.93	0.40	0.00
Leading Competitor	2.80	1.00	0.80	0.00
EF-8000	2.43	0.67	0.20	0.00

SAKT Boards, OSP Finish, Dual Wave, SAC 305 @ 265°C, 1200µg/in^2 flux solids loading

EF-8000 yields fewer solder bridges versus RF-800 and Leading Competitor in SAC 305

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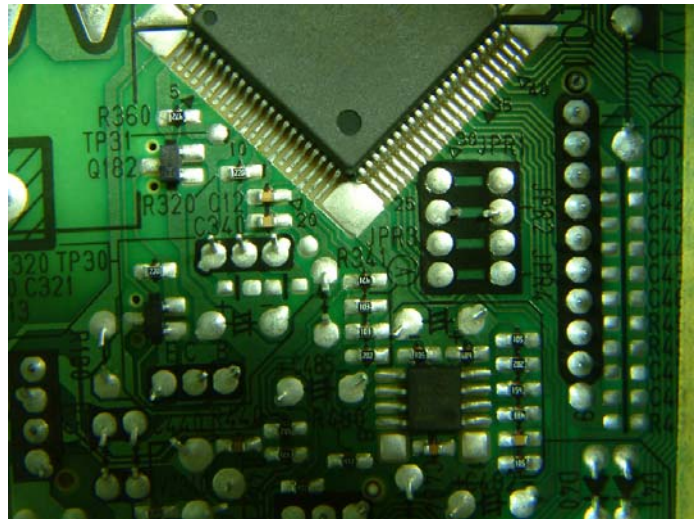
Cosmetics

Flux Residue and Solder Joints

<u>Flux Residue Cosmetics</u>:
Clear, colorless, non-tacky flux residues uniformly spread over the surface of the board.

<u>Solder Joint Cosmetics</u>:
Smooth solder joints typical of both tin-lead and lead-free alloys



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Application Guidelines

OPERATING PARAMETER	SAC 305	63/37 Sn/Pb
Amount of Flux Applied	Spray: 1200 to 1600 μg/in^2 of solids/in^2 for dual wave and 1000 to 1200 μg/in^2 of solids/in^2 for single wave soldering	Spray: 1000 to 1200 mg/in^2 of solids/in^2 for dual wave and 600 to 900 mg/in^2 of solids/in^2 for single wave soldering
Top-Side Preheat Temperature	80-110°C	75-95°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	1.5 – 2.0 meters/minute for single wave, 1.8 - 2.2 meters/minute for dual wave	1.5 – 2.0 meters/minute for single wave, 1.8 - 2.2 meters/minute for dual wave
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 - 4.0 seconds (2 - 3 seconds most common)	1.5 - 4.0 seconds (2 - 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).

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Summary of Properties

Meets all Soldering Performance Requirements Using:

- Entek® Plus and Rosin coated board finishes
- HASL, ENIG, Immersion Tin and Immersion Silver Pad Finishes
- FR4 and FR2 board types
- Taiyo PSR4000 and Enthone LPI solder masks

Electrical Reliability

- Meets Bellcore, IPC, JIS and Leading OEM Requirements
- JSTD-004 ROL0

Process Applications

- Tin Lead or Lead Free Alloys
- Spray or Foam Fluxing
- Reduced Equipment Maintenance vs. Higher Rosin Fluxes
- Compatible with Pallets/Selective Soldering

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EF-8000 Electrical Reliability

Corrosion and Electrical Testing

Corrosion Testing

Test	Requirement for ROL0	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 2.6.15	No complete removal of copper	PASS
Copper Corrosion Test IPC-TM 650 Test Method 2..3.32	No evidence of corrosion	No Evidence of Corrosion

J-STD-004 Surface Insulation Resistance

Test	Conditions	Requirements	Results
"Comb-Down" Un-cleaned	85°C/85% RH, 7 days	1.0×10^8 Ω minimum	9.2×10^9 Ω
"Comb-Up" Un-cleaned	85°C/85% RH, 7 days	1.0×10^8 Ω minimum	1.0×10^{10} Ω
Control Boards	85°C/85% RH, 7 days	2.0×10^8 Ω minimum	8.3×10^9 Ω
IPC Test Condition (per J-STD-004): -50V, measurement @ 100V/IPC B-24 board (0.4 mm lines, 0.5 mm spacing).			

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EF-8000 Electrical Reliability

Corrosion and Electrical Testing

JIS Standard Surface Insulation Resistance

Test	Conditions	Requirements	Controls	Results
Initial	Ambient	1.0 x 10^{11} Ω minimum	1.0 x 10^{11} Ω minimum	1.0 x 10^{12} Ω
After 7 days	40°C / 90% RH	1.0 x 10^{10} Ω minimum	1.0 x 10^{11} Ω minimum	2.0 x 10^{11} Ω
Recovered	25°C/75% RH, 7 days	1.0 x 10^{11} Ω minimum	2.0 x 10^{11} Ω minimum	1.0 x 10^{12} Ω
All Measurements @ 100V, JIS Boards (0.32 mm 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, 5 days	1.0 x 10^{11} Ω minimum	3.9 x 10^{11} Ω
"Comb-Up" Un-cleaned	35°C/85% RH, 5 days	1.0 x 10^{11} Ω minimum	2.5 x 10^{1} Ω
Control Boards	35°C/85% RH, 5 days	2.0 x 10^{11} Ω minimum	9.2 x 10^{11} Ω
Bellcore Test Condition (per GR 78-CORE, Issue 1: 48 Volts, measurement @ 100V/25 mil lines/50 mil spacing.			

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Technical Specifications

Physical Properties	Typical Values	Parameters/Test Method	Typical Values
Appearance	Clear, Pale Yellow Liquid	pH, 5% w/w aqueous solution	3.1
Solids Content, wt/wt	6.0	Recommended Thinner	ALPHA 425
Specific Gravity @ 25°C (77°C)	0.806	Shelf Life	12 months
Acid Number (mg KOH/g)	27.0	IPC J-STD-004 Designation	ROL0
Flash Point (T.C.C.)	17°C		

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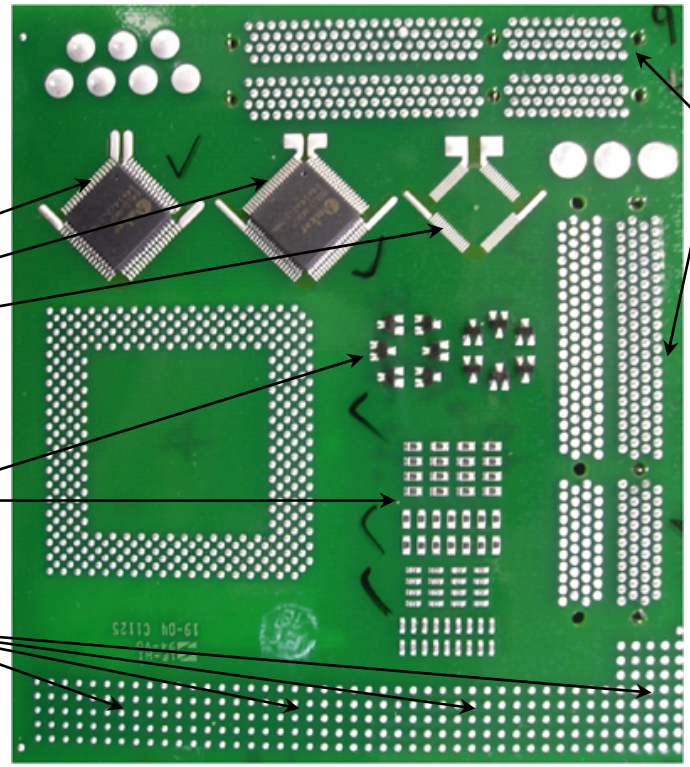
Test Vehicle Used: Cookson's SAKT Board

Designed to Differentiate Flux Performance Through Forced Failure of Through Hole Fill, Connector Bridging and Bottom Side Component Skips and Bridges



The SAKT board can be fabricated single sided or double sided, and finished with organic solder preservative, HASL, immersion tin, immersion silver or ENIG finishes.

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