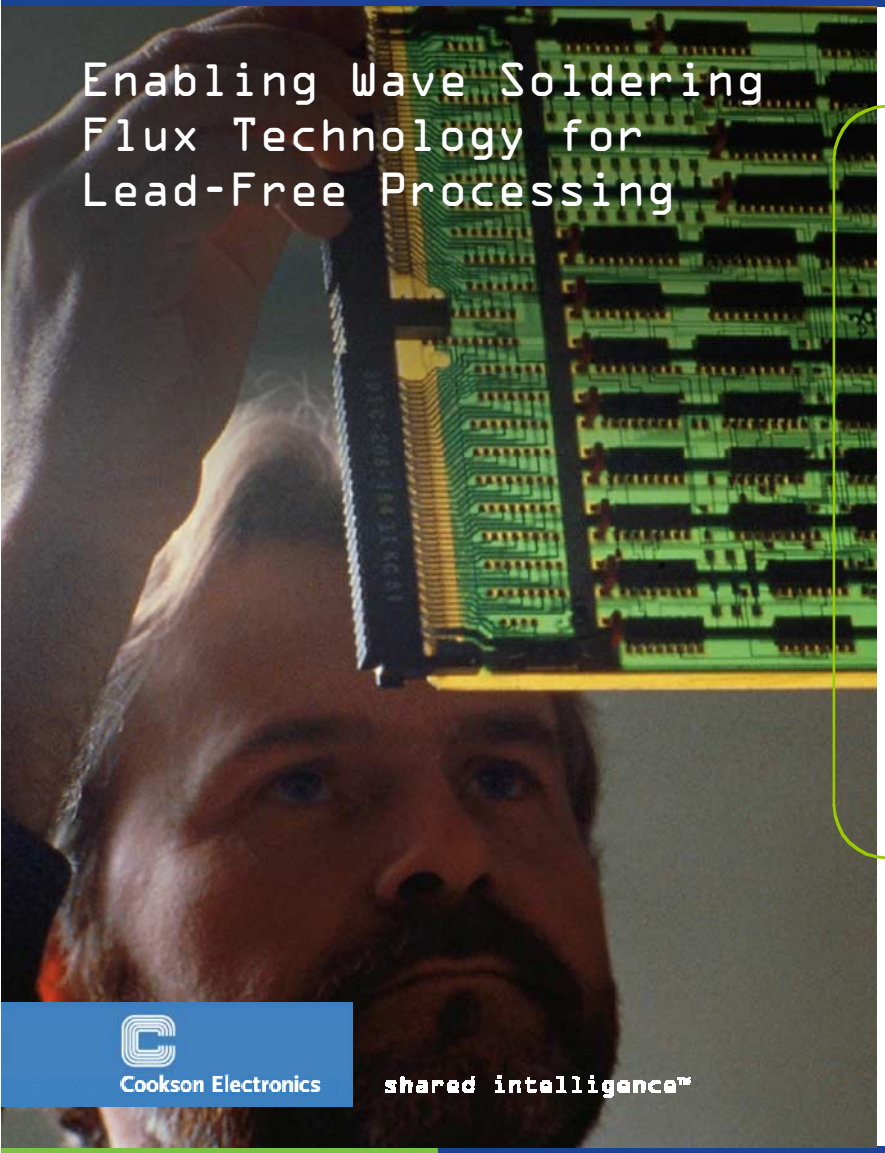
the product:



ALPHA® EF-6000

product guide

alpha

EF-6000

Contents

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EF-6000

Introduction

ALPHA EF-6000 is designed to make the transition from tin-lead to lead-free wave soldering as efficient and profitable as possible. EF-6000 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:
Multi-Alloy Capability	Wide thermal process window enables high yields in Lead-Free and Tin-Lead Processes
Rosin-Free	Non-tacky, clear, colorless residue. Reduces cleaning and maintenance of pallets and equipment
Excellent Pin Testability	100% First Pass Yield in conjunction with In-Line Circuit Testing
Minimized Micro-Solderball Formation	Increased reliability and reduction of electrical shorts
Best-in-Class Bridging Resistance	Minimizes touch-up/rework of bottom side components
Excellent Hole Fill	High Yields with OSP, and metallic pad finishes
Broad Process Capability	One flux for all common pad finishes and alloy types.
Good Electrical Reliability	Meets IPC-TM-650 Requirements

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EF-6000

Performance Summary

ALPHA EF-6000 is an alcohol-based, rosin-free, no-clean, wave soldering flux, designed to enable efficient conversion to lead-free soldering over a broad range of process conditions. EF-6000 is classified as ORL0 per IPC J-STD-004

Benefit	ALPHA EF-6000 Attributes	Performance Capability
Process Window	Dual-Alloy Performance	Wide thermal process window enables high yields in Lead-Free and Tin-Lead Processes
	Broad Process Compatibility	One flux for all common board types and pad finishes
HIgh Process Yeild	Resistance to Micro-Solderball Formation	Strongly outperforms the leading offering. Increased reliability and reduction of electrical shorts
	Resistance to Bridging	Best-in-class versus leading competitive offering. Minimizes touch-up/rework of bottom side components
	Hole-fill	Excellent Lead-Free and Tin-Lead yields versus leading competitive product
	Residue Cosmetics	Clear, colorless residue. No rosin build-up on selective soldering pallets
	Equipment Maintenance	Very low cleaning/maintenance frequency versus rosin-bearing formulations
	Pin Testability	100% First pass yield Lead-Free 100% First pass yield Tin-Lead

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Enabling Lead-Free Soldering —SAC305 Alloy

Resistance to Bridging on Bottom-Side QFPs

	Single Wave		Dual Wave	
	EF-6000	**#1 Selling Tin-Lead Rosin-Free Flux**	**EF-6000**	**#1 Selling Tin-Lead Rosin-Free Flux**
Bridges per 0.8mm QFP:	5.3	18.4	4.0	24.2
Bridges per 0.65mm QFP:	6.2	12.0	4.2	9.0

Result:

Increased Resistance to Bottom Side QFP Bridging in Lead-Free Process vs. Top Selling Tin-Lead Rosin-Free Flux.

PROCESS CONDITIONS	SAC305
Conveyor Speed (ft./min):	5
Board Type / Finish:	SAKT FR4 / Entek HT OSP
Thermal Profile:	1 Glue Cure
Pot Temperature:	260°C
Top-Side Preheat:	110°C
Flux Loading (µg/in^2):	800 (Single), 950 (Dual)

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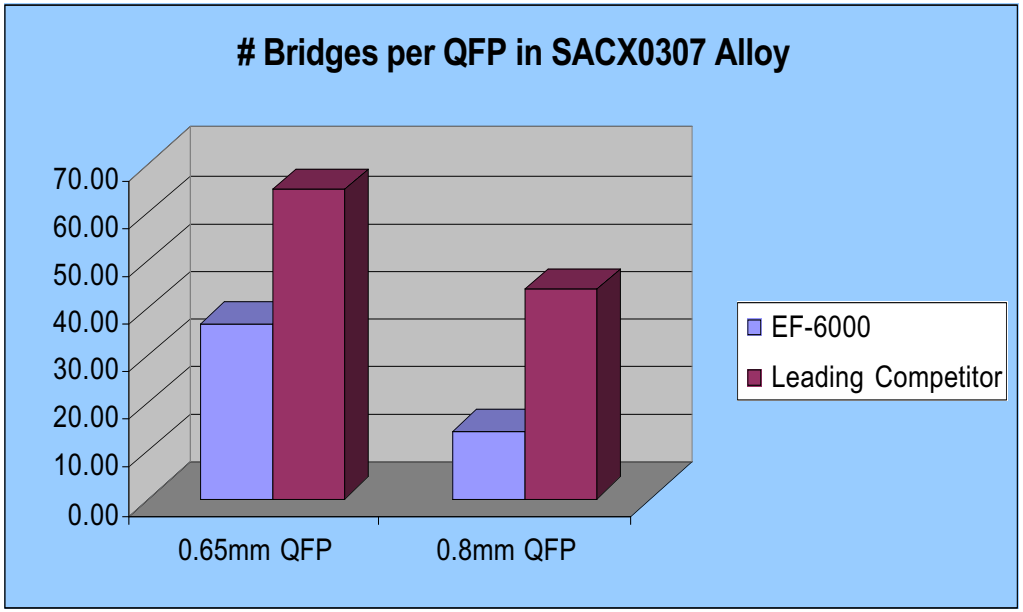
Enabling Lead-Free Soldering —Compatibility with ALPHA Vaculoy SACX0307 Alloy

Resistance to Bridging on Bottom-Side QFPs

Result:

Superior Soldering Performance Versus the Leading Competitive Product with Innovative SACX0307 Lead-Free Alloy



PROCESS CONDITIONS	SACX0307
Conveyor Speed (ft./min):	5
Board / Finish:	SAKT FR4 / Entek HT OSP
Thermal Profile:	1 Glue Cure
Pot Temperature:	260°C
Top-Side Preheat:	110°C
Flux Loading (µg/in²):	1225

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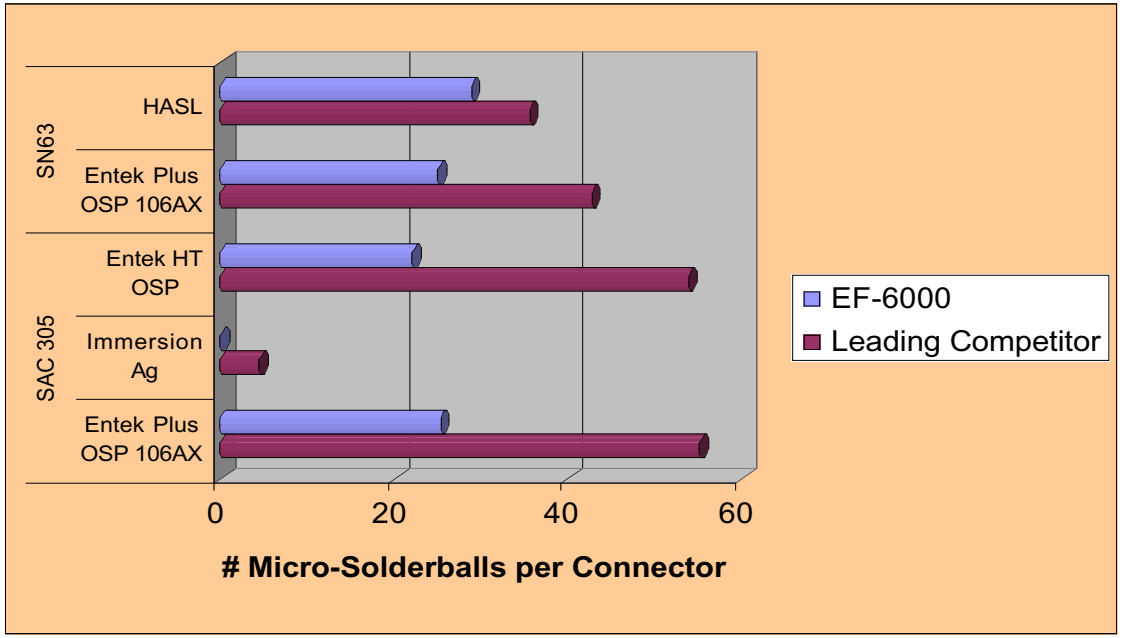
Soldering Performance: Resistance to Micro-Solderball Formation

Lead-Free and Tin-Lead Process Conditions

Result: Superior Resistance to Micro-Solderballs vs. Leading Competitor for both Lead-Free and Tin-Lead Processes



PROCESS CONDITIONS	SAC305	Sn63
Conveyor Speed (ft./min):	5	5
Board Type:	SAKT FR4	SAKT FR4
Thermal Profile:	1 Glue Cure + 1 LF Reflow	1 Glue Cure + 1 Sn63 Reflow
Pot Temperature:	260°C	245°C
Top-Side Preheat:	110°C	85°C
Wave:	Dual	Dual

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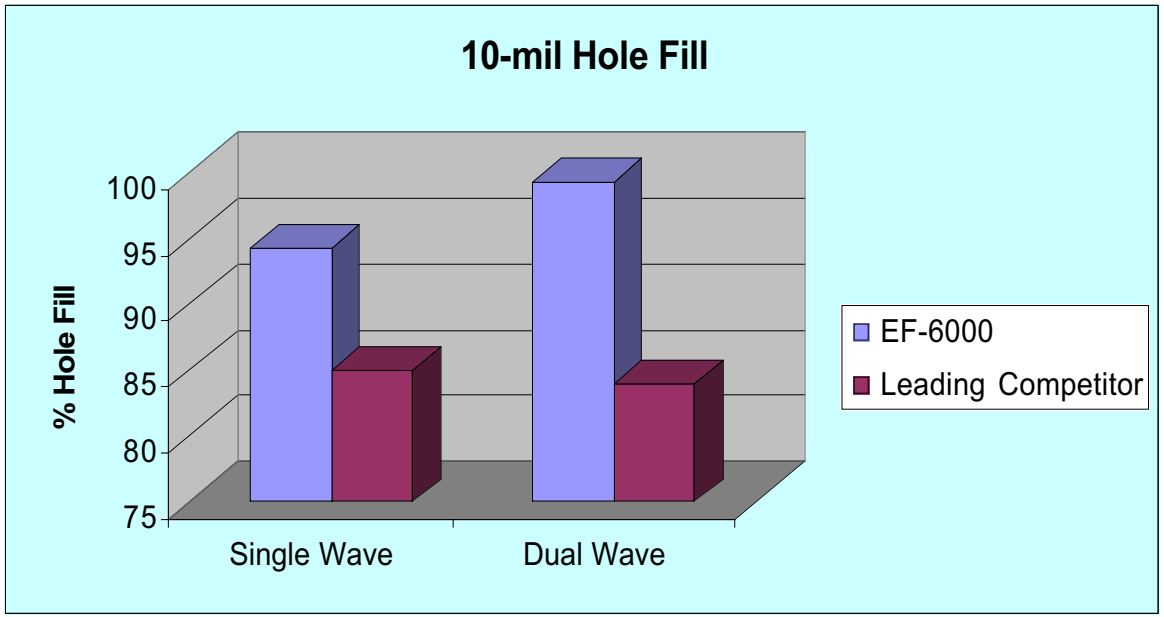
EF-6000

Lead-Free Soldering Performance: Hole-Fill

Result:
ALPHA EF-6000 Exhibits Superior Solderability Versus the Leading Competitor



PROCESS CONDITIONS	SAC305
Conveyor Speed (ft./min):	5
Board / Finish:	SAKT FR4 / Entek HT OSP
Thermal Profile:	1 Glue Cure + 1 LF Reflow
Pot Temperature:	260°C
Top-Side Preheat:	110°C

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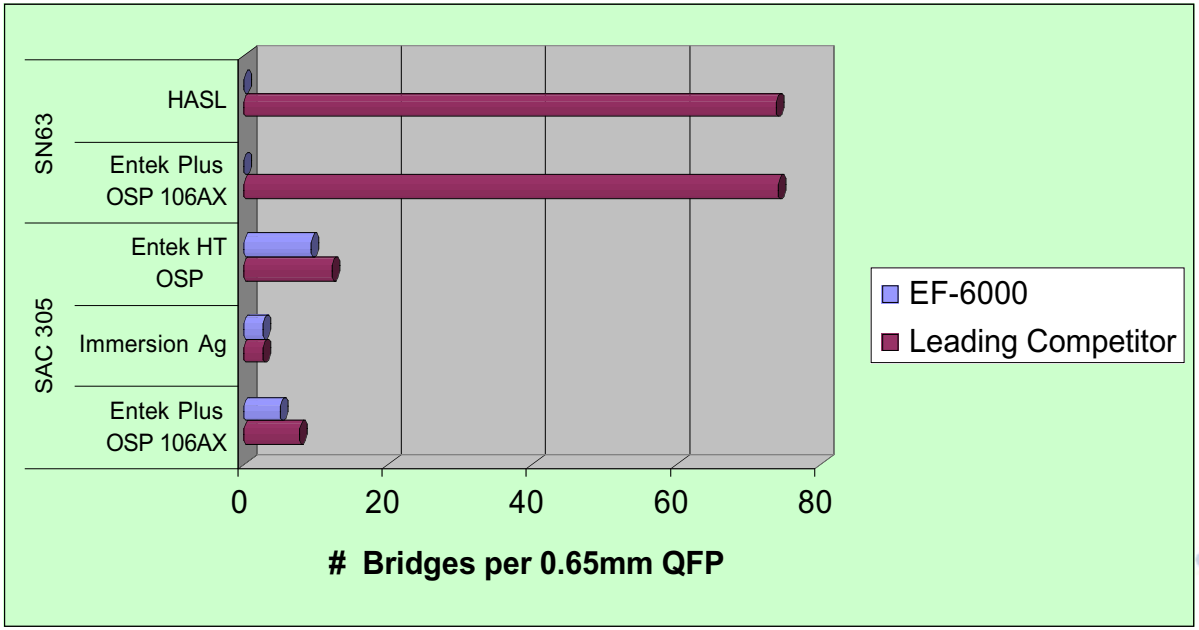
Soldering Performance: Resistance to 0.65mm Pitch QFP Bridging

Lead-Free and Tin-Lead Process Conditions

Result:
Better Bridging Resistance vs. Leading Competitor for both Lead-Free and Tin-Lead Processes



PROCESS CONDITIONS	SAC305	Sn63
Conveyor Speed (ft./min):	5	5
Board Type:	SAKT FR4	SAKT FR4
Thermal Profile:	1 Glue Cure + 1 LF Reflow	1 Glue Cure + 1 Sn63 Reflow
Pot Temperature:	260°C	245°C
Top-Side Preheat:	110°C	85°C
Wave:	Dual	Dual

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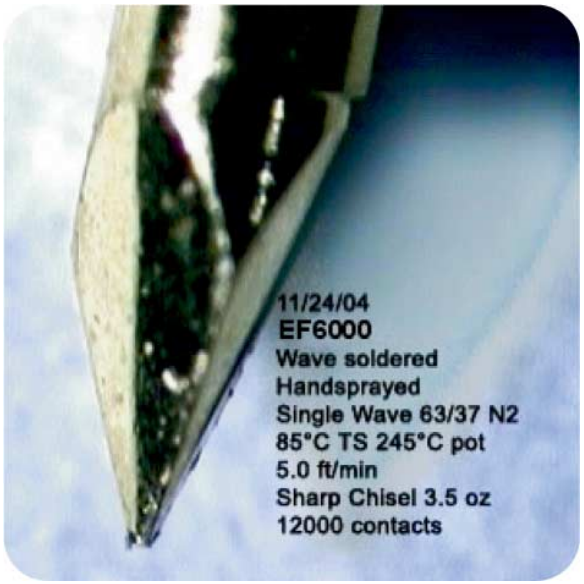
EF-6000

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

100% <5 Ohms
SAC 305



100% <5 Ohms
Sn63/Pb37

- 100% First Pass Yield after 12,000 Contacts in both Tin-Lead and Lead-Free Applications
- Worry Free In Circuit Pin Testing

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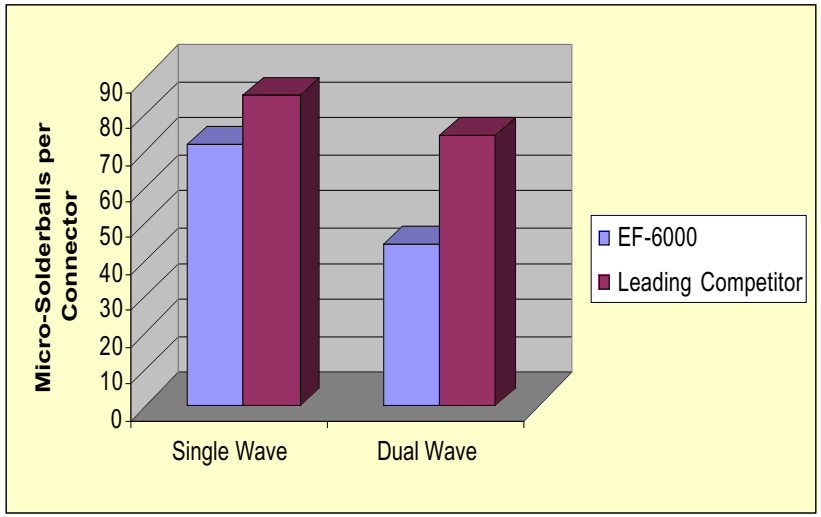
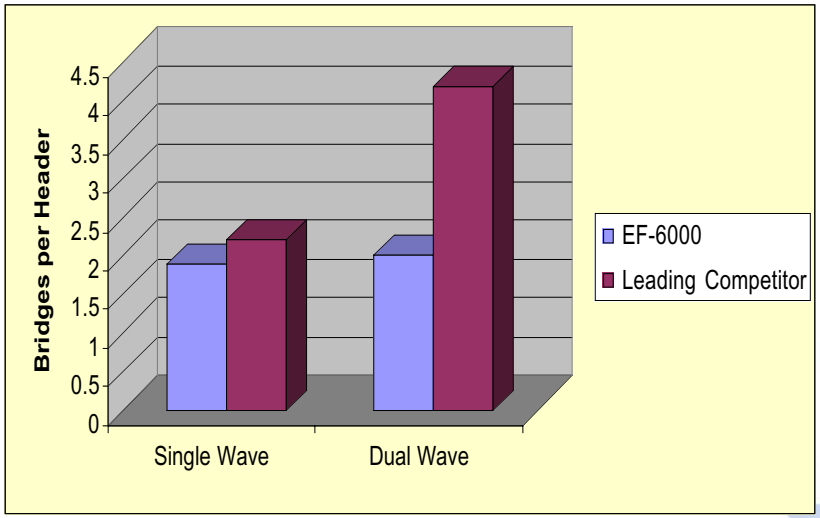
EF-6000

Soldering Performance: Micro-Solderballs and Bridging on FR2 Boards

Micro-Solderballs on FR2 PWBs



Header Bridging on FR2 PWBs



Result:
Superior Lead-Free Solderability with Low Cost PWB substrates

PROCESS CONDITIONS	SAC305
Conveyor Speed (ft./min):	5
Board Type / Finish:	FR2 with Rosin Coating
Pot Temperature:	260°C
Top-Side Preheat:	110°C

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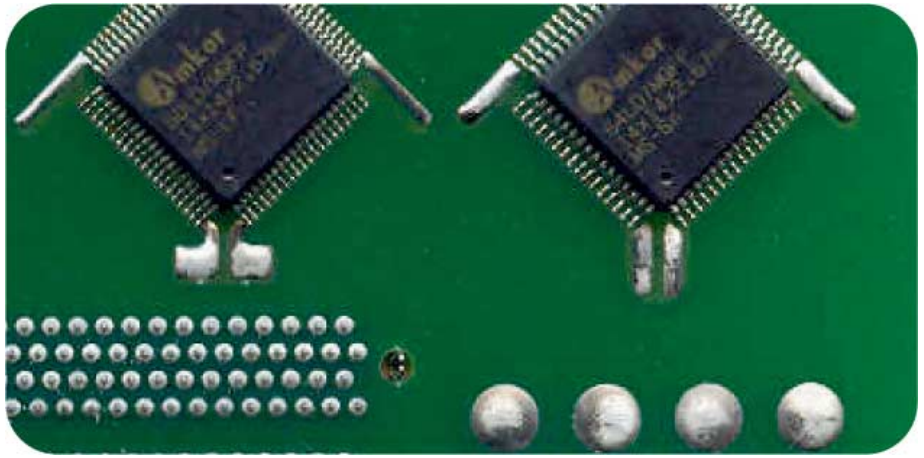
EF-6000

Flux Residue and Joint Cosmetics

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

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



PROCESS CONDITIONS	SAC305
Conveyor Speed (ft./min):	5
Board Type / Finish:	SAKT FR4/Entek Plus OSP
Pot Temperature:	260°C
Top-Side Preheat:	110°C

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Application Guidelines

OPERATING PARAMETER	SAC305 / SACX0307	63/37 Tin-Lead
Amount of Flux Applied by Spray	Single Wave: 500 – 800 µg/in^2 (78 – 124 µg/cm^2) of solids Dual Wave: 850 – 1400 µg/in^2 (132 – 217 µg/cm^2) of solids	Single Wave: 200 – 600 µg/in^2 (31 – 93 µg/cm^2) of solids Dual Wave: 600 – 1000 µg/in^2 (93 – 155 µg/cm^2) of solids
Topside Preheat Temperature	105°C - 120°C (221°F - 248°F)	75°C -100°C (167°F - 212°F)
Bottom side Preheat Temperature	about 35°C 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°- 7° (6° typical)	4°- 7° (6° typical)
Conveyor Speed	3 - 6 ft./min. (0.9 - 1.8 m./min.)	3 - 6 ft./min. (0.9 - 1.8 m./min.)
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 - 3.5 seconds (2.5-3 seconds most common)	1.5 - 3.5 seconds (2.5-3 seconds most common)
Solder Pot Temperature	255°C - 265°C (491°F - 509°F)	240°C - 250°C (464°F - 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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EF-6000

Summary of Properties

Meets all Soldering Performance Requirements Using:

- Entek® Plus and Entek® HT OSP, Immersion Silver, HASL, and Rosin coated pad finishes
- FR4 and FR2 board types

Electrical Reliability

- Meets IPC Requirements
- Meets Bellcore Electromigration Requirements
- ORL0 Classification per IPC J-STD-004

Process Applications

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

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Electrical Reliability

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 2.3.32	No complete removal of copper	PASS
Copper Corrosion Test IPC-TM 650 Test Method 2.6.15	No evidence of corrosion	PASS

Electrical Reliability

J-STD-004 Surface Insulation Resistance

Test	Conditions	Requirements	Results
"Comb-Down" Un-cleaned	85°C/85% RH, 7 days	$1.0 \times 10^8\ \Omega$ minimum	$1.7 \times 10^{10}\ \Omega$
"Comb-Up" Un-cleaned	85°C/85% RH, 7 days	$1.0 \times 10^8\ \Omega$ minimum	$1.5 \times 10^{10}\ \Omega$
Control Boards	85°C/85% RH, 7 days	$2.0 \times 10^8\ \Omega$ minimum	$2.7 \times 10^{10}\ \Omega$
IPC Test Condition (per J-STD-004): -50V, measurement @ 100V/IPC B-24 board (0.4 mm lines, 0.5 mm spacing).			

Bellcore Electromigration

Test Condition	SIR (Initial)	SIR (Final)	Requirement	Result	Visual Result
Bellcore "Comb-Up" Un-cleaned	$7.8 \times 10^9\ \Omega$	$1.7 \times 10^{11}\ \Omega$	SIR (Initial)/SIR (Final) < 10	PASS	PASS
Bellcore "Comb-Down" Un-cleaned	$1.6 \times 10^{10}\ \Omega$	$1.4 \times 10^{11}\ \Omega$	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-25 B Pattern (12.5 mil lines, 12.5 mil spacing).					

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EF-6000

Technical Specifications

Parameters	Typical Values	Parameters/Test Method	Typical Values
Appearance	Clear, pale-yellow liquid	pH (5% aqueous solution)	3.3
Solids Content, wt/wt	2.20%	Recommended Thinner	425 Thinner
Acid Number (mg KOH/g)	17.5 – 1.0	Shelf Life	12 Months
Specific Gravity @ 25°C (77°F)	0.790 – 0.003	Container Size Availability	1, 5, and 55 Gal.
Pounds Per Gallon	6.8	IPC J-STD-004 Designation	ORL0
Flash Point (T.C.C.)	53°F (12°C)		

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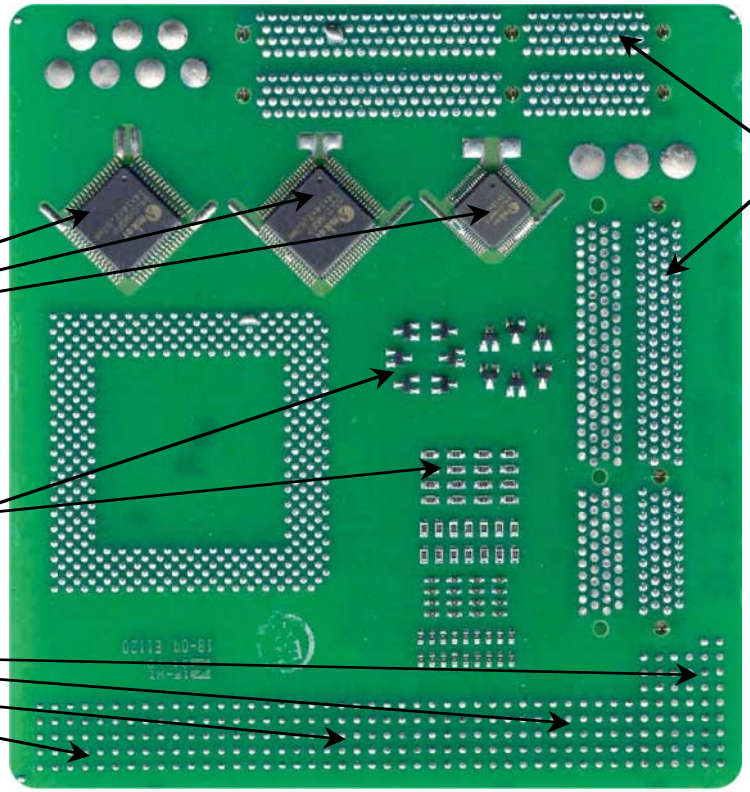
Test Vehicle Used: Cookson s SAKT FR4 Board

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



Edge Connectors in the X and Y direction (No Solder Thieves)

.80mm, .65mm and .50mm pitch bottom side QFP s-Designed to create solder bridges

Bottom Side Passives to Evaluate Dual Wave vs. Single Wave Performance

0.25mm, 0.37mm, 0.5mm and 1.0mm through holes

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

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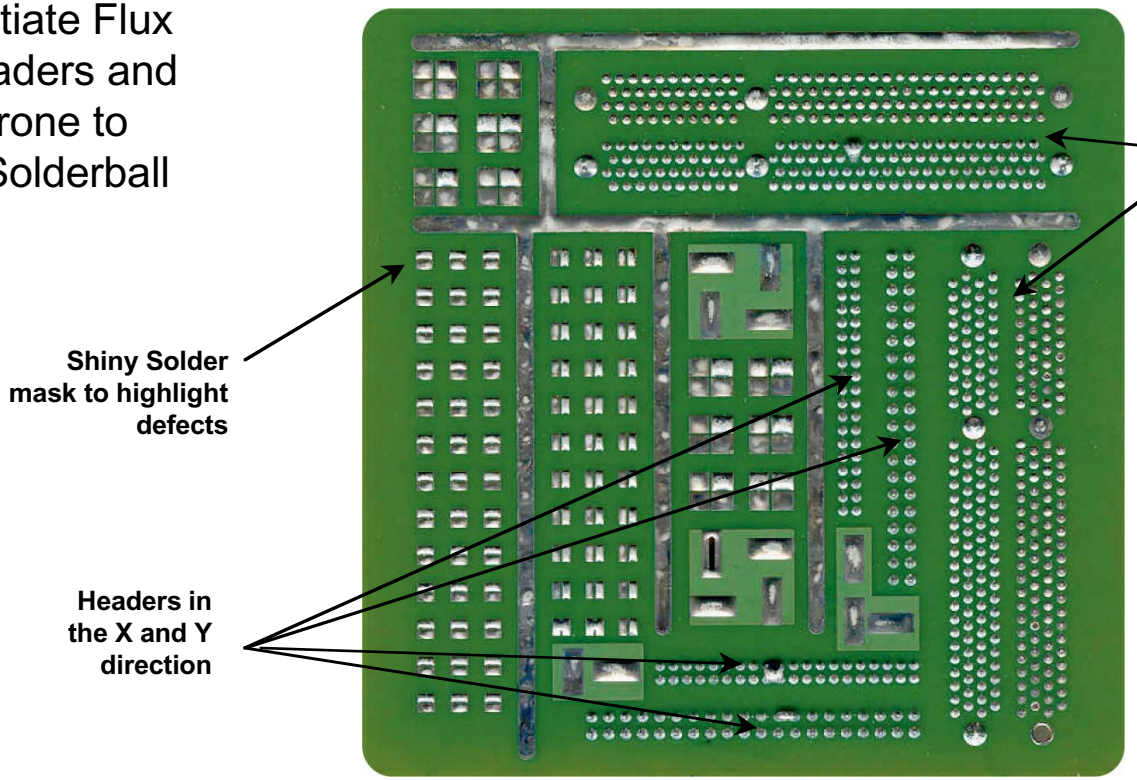
Test Vehicle #2: Cookson s FR2 Board

Designed to Differentiate Flux Performance via Headers and Connectors Highly prone to Bridging and Micro-Solderball Defects



The FR2 board is single-sided and finished with Rosin Protective Coating

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ALPHA EF-6000

No-Clean Flux for LEAD-FREE & Sn-Pb WAVE SOLDERING

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.

GENERAL DESCRIPTION

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.

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.

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 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. 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.

Cookson Electronics ASSEMBLY MATERIALS

GENERAL "GUIDELINES" FOR MACHINE SETTINGS

OPERATING PARAMETER	SAC305 / SACX0307	63/37 Sn-Pb
Amount of Flux Applied by Spray	Single Wave: 500 – 800 µg/in^2 (78 - 124 µg/cm^2) of solids Dual Wave: 850 – 1400 µg/in^2 (132 – 217 µg/cm^2) of solids	Single Wave: 200 – 600 µg/in^2 (31 – 93 µg/cm^2) of solids Dual Wave: 600 – 1000 µg/in^2 (93 – 155 µg/cm^2) of solids
Topside Preheat Temperature	105°C – 120°C (221°F – 248°F)	75°C -100°C (167°F - 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°- 7° (6° typical)	4°- 7° (6° typical)
Conveyor Speed	3 - 6 ft./min. (0.9 – 1.8 m./min.)	3 - 6 ft./min. (0.9 - 1.8 m./min.)
Contact Time in the Solder (includes Chip Wave and Primary Wave)	1.5 - 3.5 seconds (2.5 - 3 seconds most common)	1.5 - 3.5 seconds (2.5 - 3 seconds most common)
Solder Pot Temperature	255°C – 265°C (491°F – 509°F)	240°C - 250°C (464°F – 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).		

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 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.

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 Cleanline Write Flux Applicator with ALPHA NR-205 flux and Telecore Plus cored solder is recommended for hand soldering applications.

HEALTH & SAFETY

Please refer to the Material Safety Data Sheet as the primary source of health and safety information. Inhalation of the flux solvent and volatilized 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.

ALPHA EF-6000 flux contains a highly flammable solvent with a flash point of 53°F (12°C). The flux must not be used near open flames or near non-flameproof electrical equipment.

Cookson Electronics ASSEMBLY MATERIALS

TECHNICAL SPECIFICATION

Parameters	Typical Values	Parameters/Test Method	Typical Values
Appearance	Clear, pale-yellow liquid	pH (5% aqueous solution)	3.3
Solids Content, wt/wt	2.2 %	Recommended Thinner	425 Thinner
Acid Number (mg KOH/g)	17.5 ± 1.0	Shelf Life	12 Months
Specific Gravity @ 25°C (77°F)	0.790 ± 0.003	Container Size Availability	1, 5, and 55 Gal.
Pounds Per Gallon	6.8	IPC J-STD-004 Designation	ORL0
Flash Point (T.C.C.)	53°F (12°C)		

CORROSION AND 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	2.0×10^8 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	Visual Result
Bellcore "Comb-Up" Un-cleaned	7.8×10^9	1.7×10^{11}	SIR (Initial)/SIR (Final) < 10	PASS	PASS
Bellcore "Comb-Down" Un-cleaned	1.6×10^{10}	1.4×10^{11}	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-25 B Pattern (12.5 mil lines, 12.5 mil spacing). All values in ohms.					

Cookson Electronics
A Division of Cookson Group plc

MATERIAL SAFETY DATA SHEET

Alpha Metals
600 Route 440
Jersey City, New Jersey 07304
(201) 434-6778
(201) 434-7508 *fax*
www.alphametals.com

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: ALPHA EF-6000 FLUX

MANUFACTURER'S NAME: ALPHA METALS, INC
ADDRESS: 600 ROUTE 440
JERSEY CITY, NJ 07304
TRANSPORT EMERGENCY #: CHEMTREC: 1-800-424-9300

BUSINESS PHONE: 1-201-434-6778

2. INGREDIENT AND EXPOSURE LIMIT INFORMATION

CHEMICAL NAME	CAS #	% W/W	OSHA PEL - TWA
ISOPROPANOL	67-63-0	96 - 99	400 ppm TWA; 980 mg/m3 TWA
SUCCINIC ACID	110-15-6	1 - 3	N/E

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: MODERATE TO SEVERE EYE IRRITANT.
HIGHLY FLAMMABLE
MODERATE GASTROINTESTINAL TRACT IRRITANT.
MINOR RESPIRATORY TRACT IRRITANT.
CAUSES MILD SKIN IRRITATION

HMIS RATING SYSTEM:
Health: 1 ; Flammability: 3 ; Reactivity: 0 ; Protection: B

NFPA RATING SYSTEM:
ISOPROPYL ALCOHOL health-1; flammability-3; reactivity-0

ROUTES OF ENTRY: EYE CONTACT; SKIN CONTACT; INHALATION
TARGET ORGANS: SKIN; RESPIRATORY TRACT; EYES; NERVOUS SYSTEM
MEDICAL CONDITIONS AGGRAVATED: RESPIRATORY DISEASE INCLUDING ASTHMA AND BRONCHITIS

IMMEDIATE (ACUTE) SYMPTOMS OVER-EXPOSURE BY ROUTE OF EXPOSURE:
INHALATION: CAN CAUSE MINOR RESPIRATORY IRRITATION, DIZZINESS, WEAKNESS, FATIGUE, NAUSEA, AND HEADACHE.
IRRITATION MAY BE DELAYED FOR SEVERAL HOURS.
EYES: CONTACT WITH THE EYES MAY CAUSE MODERATE TO SEVERE EYE INJURY. EYE CONTACT MAY RESULT IN TEARING AND REDDENING, BUT NOT LIKELY TO PERMANENTLY INJURE EYE TISSUE. TEMPORARY VISION IMPAIRMENT (CLOUDY OR BLURRED VISION) IS POSSIBLE.
SKIN CONTACT: CAN CAUSE MINOR SKIN IRRITATION, DEFATTING, AND DERMATITIS.
SKIN ABSORPTION: NO ABSORPTION HAZARD IN NORMAL INDUSTRIAL USE.
INGESTION: IRRITATING TO MOUTH, THROAT, AND STOMACH. CAN CAUSE ABDOMINAL DISCOMFORT, NAUSEA, VOMITING AND DIARRHEA.

MATERIAL SAFETY DATA SHEET

Alpha Metals
600 Route 440
Jersey City, New Jersey 07304
(201) 434-6778
(201) 434-7508 *fax*
www.alphametals.com

3. HAZARDS IDENTIFICATION (Cont.)

LONG TERM (CHRONIC) HEALTH EFFECTS:

CARCINOGENICITY: NONE OF THE SUBSTANCES HAVE BEEN SHOWN TO CAUSE CANCER IN LONG TERM ANIMAL STUDIES. NOT A CARCINOGEN ACCORDING TO NTP, IARC, OR OSHA.

REPRODUCTION: NO DATA AVAILABLE TO INDICATE PRODUCT OR ANY COMPONENTS PRESENT AT GREATER THAN 0.1% MAY CAUSE BIRTH DEFECTS.

4. FIRST AID MEASURES

SKIN EXPOSURE: WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION DEVELOPS OR PERSISTS.

EYE EXPOSURE: IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 20 MINUTES RETRACTING EYELIDS OFTEN. TILT THE HEAD TO PREVENT CHEMICAL FROM TRANSFERRING TO THE UNCONTAMINATED EYE. GET IMMEDIATE MEDICAL ATTENTION AND MONITOR THE EYE DAILY AS ADVISED BY YOUR PHYSICIAN.

INHALATION: REMOVE TO FRESH AIR. IF BREATHING IS DIFFICULT, HAVE A TRAINED INDIVIDUAL ADMINISTER OXYGEN.

INGESTION: DO NOT INDUCE VOMITING AND SEEK MEDICAL ATTENTION IMMEDIATELY. DRINK TWO GLASSES OF WATER OR MILK TO DILUTE. PROVIDE MEDICAL CARE PROVIDER WITH THIS MSDS.

NOTES TO DOCTOR: NO ADDITIONAL FIRST AID INFORMATION AVAILABLE

5. FIRE FIGHTING MEASURES

FLAMMABILITY SUMMARY: HIGHLY FLAMMABLE
FLASH POINT: 12 deg. C
AUTOIGNITION TEMPERATURE: 450 deg. C
EXPLOSIVE LIMITS VOLUME % IN AIR:Lower-2.0 Upper-12.0

EXTINGUISHING MEDIA: USE ALCOHOL RESISTANT FOAM, CARBON DIOXIDE, OR DRY CHEMICAL EXTINGUISHING AGENTS. WATER MAY BE INEFFECTIVE BUT WATER SPRAY CAN BE USED EXTINGUISH A FIRE IF SWEPT ACROSS THE BASE OF THE FLAMES. WATER CAN ABSORB HEAT AND KEEP EXPOSED MATERIAL FROM BEING DAMAGED BY FIRE.

FIRE AND EXPLOSION HAZARDS: VAPORS MAY BE IGNITED BY SPARKS, FLAMES OR OTHER SOURCES OF IGNITION IF MATERIAL IS ABOVE THE FLASH POINT GIVING RISE TO A FIRE (CLASS B). VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK.

FIRE FIGHTING METHODS: DO NOT ENTER FIRE AREA WITHOUT PROPER PROTECTION INCLUDING SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT. FIGHT FIRE FROM A SAFE DISTANCE AND A PROTECTED LOCATION DUE TO THE

MATERIAL SAFETY DATA SHEET

Alpha Metals
600 Route 440
Jersey City, New Jersey 07304
(201) 434-6778
(201) 434-7508 *fax*
www.alphametals.com

5. FIRE FIGHTING MEASURES (Cont.)

POTENTIAL OF HAZARDOUS VAPORS AND DECOMPOSITION PRODUCTS.
FLAMMABLE COMPONENT(S) OF THIS MATERIAL MAY BE LIGHTER THAN WATER AND BURN WHILE FLOATING ON THE SURFACE.

HAZARDOUS COMBUSTION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

6. ACCIDENTAL RELEASE MEASURES

PRECAUTIONS AND EQUIPMENT: EXPOSURE TO THE SPILLED MATERIAL MAY BE IRRITATING OR HARMFUL. FOLLOW PERSONAL PROTECTIVE EQUIPMENT RECOMMENDATIONS FOUND IN SECTION VIII OF THIS MSDS.

METHODS FOR CLEAN-UP: PREVENT THE SPREAD OF ANY SPILL TO MINIMIZE HARM TO HUMAN HEALTH AND THE ENVIRONMENT IF SAFE TO DO SO. WEAR COMPLETE AND PROPER PERSONAL PROTECTIVE EQUIPMENT FOLLOWING THE RECOMMENDATION OF SECTION VIII AT A MINIMUM. DIKE WITH SUITABLE ABSORBENT MATERIAL LIKE GRANULATED CLAY. GATHER AND STORE IN A SEALED CONTAINER PENDING A WASTE DISPOSAL EVALUATION.

7. HANDLING AND STORAGE

HANDLING MEASURES: MILDLY IRRITATING MATERIAL. AVOID UNNECESSARY EXPOSURE. USE SPARK-PROOF TOOLS AND EXPLOSION-PROOF EQUIPMENT

STORAGE MEASURES: STORE IN A COOL DRY VENTILATED LOCATION. ISOLATE FROM INCOMPATIBLE MATERIALS AND CONDITIONS. KEEP CONTAINER(S) CLOSED.
KEEP AWAY FROM SOURCES OF IGNITION

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

ENGINEERING MEASURES: GENERAL ROOM VENTILATION MIGHT BE REQUIRED TO MAINTAIN OPERATOR COMFORT UNDER NORMAL CONDITIONS OF USE.

RESPIRATORY PROTECTION: NO RESPIRATORY PROTECTION REQUIRED UNDER NORMAL CONDITIONS OF USE. PROVIDE GENERAL ROOM EXHAUST VENTILATION IF SYMPTOMS OF OVEREXPOSURE OCCUR AS EXPLAINED IN SECTION III. A RESPIRATOR MAY BE REQUIRED.

EYE PROTECTION: WEAR CHEMICALLY RESISTANT SAFETY GLASSES WITH SIDE SHIELDS WHEN HANDLING THIS PRODUCT. WEAR ADDITIONAL

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8. EXPOSURE CONTROLS AND PERSONAL PROTECTION (Cont.)

	EYE PROTECTION SUCH AS CHEMICAL SPLASH GOGGLES AND/OR FACE SHIELD WHEN THE POSSIBILITY EXISTS FOR EYE CONTACT WITH SPLASHING OR SPRAYING LIQUID, OR AIRBORNE MATERIAL. DO NOT WEAR CONTACT LENSES. HAVE AN EYE WASH STATION AVAILABLE.
SKIN PROTECTION:	WEAR PROTECTIVE GLOVES. INSPECT GLOVES FOR CHEMICAL BREAK-THROUGH AND REPLACE AT REGULAR INTERVALS. CLEAN PROTECTIVE EQUIPMENT REGULARLY. WASH HANDS AND OTHER EXPOSED AREAS WITH MILD SOAP AND WATER BEFORE EATING, DRINKING, AND WHEN LEAVING WORK
GLOVES:	NEOPRENE; NITRILE

CONTROL PARAMETERS:

	----------ACGIH EXPOSURE LIMITS----------		
CHEMICAL NAME	TLV-TWA	STEL	CEILING
ISOPROPANOL	(400) ppm TWA; (983) mg/m3 TWA	(500) ppm STEL; (1230) mg/ m3 STEL	

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	CLEAR, COLORLESS TO PALE YELLOW LIQUID
ODOR:	MODERATE ALCOHOL
pH:	3.0
VAPOR DENSITY:	2.1 (air= 1)
SPECIFIC GRAVITY:	0.790
SOLUBILITY IN WATER:	COMPLETE; 100%
VAPOR PRESSURE, mm Hg at 20C:	31
MELTING POINT or RANGE (C):	-82
BOILING POINT (C):	90
VAPORATION RATE:	1(butyl acetate= 1)

10. STABILITY AND REACTIVITY

INCOMPATIBLE MATERIALS:	STRONG OXIDIZING AGENTS ELEVATED TEMPERATURES

11. TOXICOLOGICAL INFORMATION

COMPONENT TOXICOLOGY DATA (NIOSH)

CHEMICAL NAME	LD50/LC50
ISOPROPYL ALCOHOL	Inhalation LC50 Rat : 16000 ppm/8H; Oral LD50 Rat : 5045 mg/kg; Oral LD50

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11. TOXICOLOGICAL INFORMATION (Cont.)

Mouse : 3600 mg/kg; Dermal LD50 Rabbit : 12800 mg/kg

12. ECOLOGICAL INFORMATION

OVERVIEW: THIS MATERIAL IS NOT EXPECTED TO BE HARMFUL TO THE ECOLOGY.

13. DISPOSAL CONSIDERATIONS

WASTE DESCRIPTION: SPENT OR DISCARDED MATERIAL IS A HAZARDOUS WASTE.
DISPOSAL METHODS: DISPOSE OF BY INCINERATION FOLLOWING FEDERAL, STATE, LOCAL, OR PROVINCIAL REGULATIONS.
EPA WASTE CODES: D001

14. TRANSPORT INFORMATION

SHIPPING BASIC DESCRIPTION: ISOPROPANOL SOLUTION, 3, UN1219, PG II. LABEL REQUIRED: FLAMMABLE LIQUID

15. REGULATORY INFORMATION

TSCA STATUS: ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY OF EXISTING CHEMICAL SUBSTANCES.

16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed of implied regarding the accuracy of these data or the results to be obtained from the use thereof. Additionally, Alpha Metals, Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

Cookson Electronics ASSEMBLY MATERIALS

Purpose:
The declaration below is intended for use as disclosure of the substances contained in products supplied by Cookson Electronics Assembly Material Group, and is provided for manufacturers of Electrical and Electronic Equipment (EEE) and sub-assemblies of EEE.

DATE:	January 25, 2004
COMPANY NAME:	Cookson Electronics
PRODUCT NAME & NUMBER:	ALPHA EF-6000 Flux
PRODUCT MASS (g):	Not applicable – bulk material, concentrations reported in ppm

Cookson Electronics is committed to comply with the upcoming ROHS directive with regards to six (6) of the listed banned substances including Lead, Cadmium, Mercury, Hexavalent Chromium, PBB and PBDE. These directives are aimed at reducing the hazardous materials content in electronic products as well as increasing the recycling efforts for these products and take effect July 1, 2006. RoHS specifically bans or restricts the use of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE). This directive applies to most electronics, but has exemptions for certain very high reliability applications.

Materials and Substances:
The table below references Level A and B materials and substances indicated in the Joint Industry Guide – Material Composition Declaration Guide, September 19, 2003. This includes the materials defined in Article 4.1 of the European Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive).

Chemical Compound	Threshold Level	Substance Concentration
Asbestos	Intentionally added	Less than threshold
Azo colorants	Intentionally added	Less than threshold
Lead (Pb) **	1000 ppm or 0.1% by mass or intentionally added	Less than threshold
Cadmium (Cd) **	100 ppm or intentionally added	Less than threshold
Mercury (Hg) **	100 ppm or intentionally added	Less than threshold
Hexavalent Chromium/Hexavalent Chromium compounds **	1000 ppm or intentionally added	Less than threshold

Chemical Compound	Threshold Level	Substance Concentration
Polybrominated diphenyl ethers (PBDE) **	1000 ppm or 0.1% by mass or intentionally added	Less than threshold
Polybrominated Diphenyl ethers (PBDE) **	1000 ppm or 0.1% by mass or intentionally added	Less than threshold
Ozone Depleting Substances (CFCs, HFCs, HBFCs, carbon tetrachloride, etc	Class 1: Intentionally added Class 2: HCFCs: 1000 ppm	Less than threshold Less than threshold
Polychlorinated biphenyls (PCBs)	Intentionally added	Less than threshold
Polychlorinated Napthalenes (more than 3 chlorine atoms)	Intentionally added	Less than threshold
Radioactive substances	Intentionally added	Less than threshold
Shortchain chlorinated parafins	Intentionally added	Less than threshold
Tributyl tin (TBT) and Triphenyl tin (TPT)	Intentionally added	Less than threshold
Tributyl tin oxide (TBTO)	Intentionally added	Less than threshold
Antimony/Antimony Compounds	1000 ppm	Less than threshold
Arsenic/Arsenic Compounds	1000 ppm	Less than threshold
Beryllium/Beryllium Compounds	1000 ppm	Less than threshold
Bismuth/Bismuth Compounds	1000 ppm	Less than threshold
Brominated flame retardants	1000 ppm	Less than threshold
Copper/Copper Compounds	1000 ppm	Less than threshold
Gold/Gold Compounds	1000 ppm	Less than threshold
Magnesium	1000 ppm	Less than threshold
Nickel/Nickel Compounds	1000 ppm	Less than threshold
Palladium/Palladium Compounds	1000 ppm	Less than threshold
Phthalates	1000 ppm	Less than threshold
Selenium/Selenium Compounds	1000 ppm	Less than threshold
Silver/Silver Compounds	1000 ppm	Less than threshold
Vinyl Chloride Polymer (PVC)	1000 ppm	Less than threshold

** RoHS regulated substance

The information contained herein is based on data considered accurate and is offered at no charge. No warranty is expressed or implied regarding the accuracy of this data. Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated.

Susan Becker
Corporate EH&S Manager