

Label Materials For Electronics

The Challenge of PC Board Manufacturing

PCB manufacturers use reflow or wave soldering to join the myriad of electrical connection on their PCBs. For labels to withstand the harsh demands of soldering, it is important to understand the process.

The reflow process typically includes many stages or zones as shown in the diagram at right. During the soldering process the PCB bond pads are covered with solder paste, a mixture of powdered solder alloy & flux that helps attach the electronic components to the circuit board. The PCB is then subjected to a preheat cycle with temperatures reaching 120°C. In some applications, there may also be a thermal soak stage that helps remove volatile substances and activates the flux. The PCB is then heated to the melting point of the solder and the molten solder permanently connects the component joints.

As a result of the RoHS lead-free initiative, lead-based solders, requiring 200-220°C to process, were replaced by silver solders which require temperatures of 240-260°C. Recently, tin/copper solders, which offer more cost effective solutions to silver, are also being used and require up to 280°C.

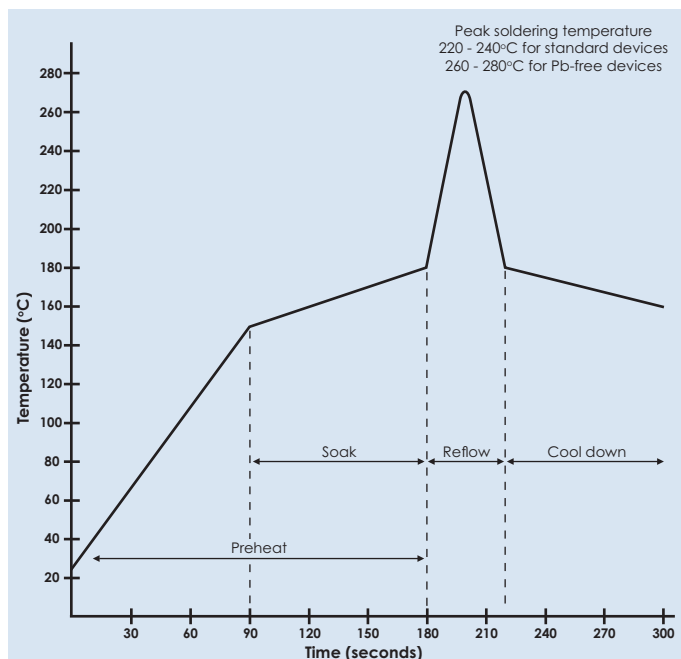
After the PCB cools down it is then cleaned in an aggressive chemical wash with, in many cases, the entire process repeated multiple times thus the need for durable top coats.

Chemical Resistant Label Solutions

Polyonics label materials with next generation coatings and adhesives have been engineered to not soften or yellow at the highest temperatures found in PCB manufacturing. These new label materials will also resist abrasion if contacted at elevated temperatures and will withstand the harshest, highly active fluxes used in the industry (e.g ORH1). In addition, they are also fully resistant to the most concentrated post-process cleaning chemistries.

The Polyonics durable tracking labels are designed to maintain the integrity of printed bar codes and images throughout the harshest, multi-cycle PCB manufacturing process helping manufacturers accurately control their PCB inventories.

The new label materials are available in one mil (XF-731) or two mil (XF-732) constructions and, as all Polyonics label materials, are halogen free and REACH & RoHS compliant.

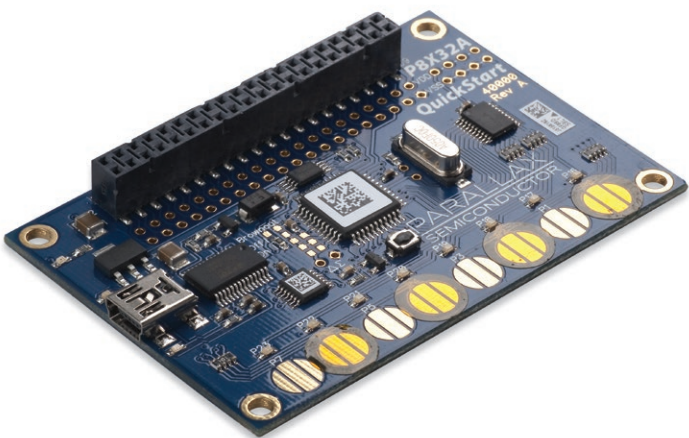


After multiple reflow processes including ORH1 flux, Polyonics XF-731 label (top) retains original contrast and readability compared to competitors' label.

High Temperature Label Solutions

Polyonics high temperature circuit board label materials are based on Thermogard™ technology. They are designed to meet and exceed the temperature requirements of today's reflow and wave solder processes. In addition, each label has been engineered to survive aggressive fluxes and multiple wash cycles that are commonly found in circuit board manufacturing.

Polyonics labels are available in 1 & 2 mil thicknesses. They include a variety of finishes and offer a wide selection of aggressive pressure sensitive adhesives (PSA) to meet the unique specifications of various military & ASTM standards.



Polyonics label materials are designed to withstand the high temperatures and harsh environment of PCB manufacturing

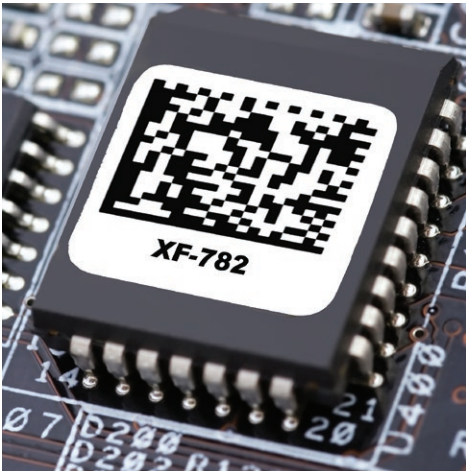
High Temperature Applications

- PCB identification
- Electronic component tracking
- Asset tracking
- Warranty labeling

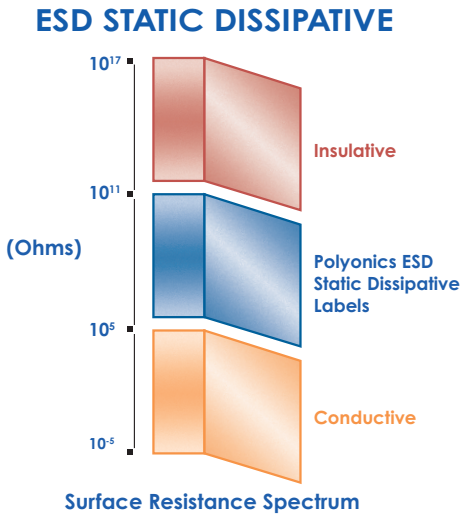
Antistatic Label Solutions

Today, electronic device manufactures face device failures that can be caused by an electrostatic discharge (ESD) event at the board level. Using antistatic labels can be an effective step to help prevent discharge on static sensitive devices. ESD damage affects production yield, product reliability and profitability in the electronics market. As electronic devices become smaller and more complex the more sensitive to ESD they become. Polyonics antistatic label materials are designed to address two major ESD concerns that standard labels can present. First, they minimize the triboelectric charge generated when the liner is removed from the label lowering the risk of static discharge during application. Secondly, the label materials prevent charges from building up on the label by dissipating them across its surface.

Utilizing Thermogard technology, Polyonics barcode labels are available with enhanced antistatic features that help protect PCB's and their components from ESD events during label application and through the life of the product.



Polyonics hi-res ESD label material



Low Tribocharging PSA		
With Liner Removal	XF-781 ESD Label	XF-581 Non-ESD Label
Peel Voltage	<100 v	> 500 v

Polyonics antistatic labels use TriboGard™ technology to produce low peel voltages of less than 100v per square inch when removed. This helps prevent the generation of electrostatic charges during assembly and minimizes the possibility of an ESD event damaging components and devices. The chart above shows the difference in peel voltages between ESD and non-ESD labels.

Antistatic Design Features

- Static dissipative top coat
- Low tribo-charging PSAs
- Polyimide and polyester films
- Non-conductive acrylic PSAs
- Halogen free, REACH & RoHS compliant

Antistatic Applications

- Identification of static sensitive PCB's
- Identification of components
- Static sensitive asset tracking
- Static sensitive ESD packaging
- Static sensitive warranty Labeling



Polyonics flame retardant labels help prevent the propagation of fire

Flame Retardant Label Solutions

There are many possible sources for fires in an electronics device. Manufacturers and product designers are increasingly concerned about selecting materials that will not propagate a flame in their products. Proper design and product operation will help prevent fires from occurring, however, short circuits can result from overheating and when near combustible materials a fire can occur. Although labels are not the source of fires, they can act as fuel for them. By using a flame retardant polyimide label in electronic devices product designers can help prevent the propagation of a fire in their products.

XF-603 is a 1mil flame retardant polyimide label material that uses Flamegard™ technology to help extinguish potential fires. This material has been designed to meet the UL94 VTM-0 flame retardant requirements. The XF-611 is a 1.5 mil white polyester label material that provides a lower cost alternative to the XF-603 label material and also meets the UL 94 VTM-0 requirements.

Flame Retardant Design Features

- Polyimide & Polyester films
- Flame retardant properties
- UL 94 VTM-0 recognized
- Meets FAR 25.853 flammability requirements
- Halogen free, REACH & RoHS compliant
- Meets BSS 7238 & 7239 Smoke & Toxicity requirements

Flame Retardant Applications

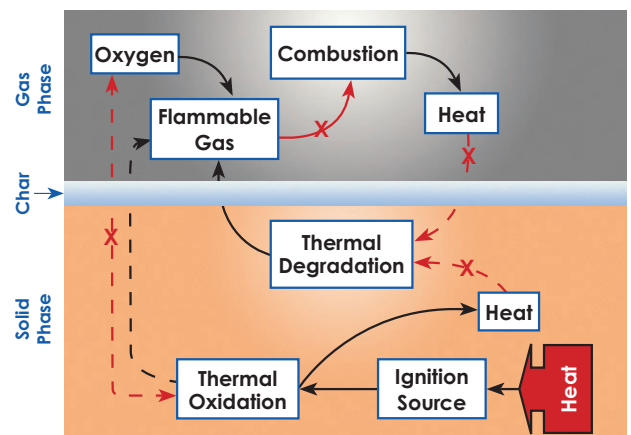
- Batteries
- Electronic insulation
- Product identification
- Network cards
- Power supplies

The Burn cycle diagram above depicts how heat contributes to burning (combustion). It also illustrates the areas (X) where the chemical mechanisms, incorporated in the Polyonics FlameGuard™ technology, actively help retard the burn cycle.

Polyonics employs resins and polymers that are dimensionally stable and don't generate significant amounts of flammable gasses when exposed to heat and flame. In addition, upon initial combustion, the fire retardant labels create char layers that act as heat shields (physical mechanisms) slowing the rate of thermal oxidation and reducing thermal degradation.

Polyonics Flame Retardant Mechanisms

- Reduce heat
- Remove oxygen
- Reduce gasses



Burn Cycle Diagram



Polyonics flame retardant labels help prevent the propagation of fires in a wide variety of electronic devices including cell phones (left) and batteries (right)



High Performance Label Solutions

Product	Film	Mil	Finish	UL/CUL	Auto-apply	Features	20 min. peel	24 hr. peel	Application
XF-518	Polyimide	1	Matte	UL969	No	High Temperature	≥25 ounces	≥28 ounces	PCB Identification
XF-519	Polyimide	2	Matte	UL969	Yes	High Temperature	≥35 ounces	≥40 ounces	PCB Identification
XF-528	Polyimide	1	High Gloss	UL969	No	High Res. Printing	≥25 ounces	≥28 ounces	PCB Identification
XF-529	Polyimide	2	High Gloss	UL969	Yes	High Res. Printing	≥35 ounces	≥40 ounces	PCB Identification
XF-552	Polyimide	2	High Gloss	-	Yes	High Res. Printing	≥41 ounces	≥55 ounces	PCB Identification
XF-581	Polyimide	1	Semi-gloss	UL969/CUL	No	High Temperature	≥25 ounces	≥28 ounces	PCB Identification
XF-582	Polyimide	2	Semi-Gloss	UL969	Yes	High Temperature	≥35 ounces	≥40 ounces	PCB Identification
XF-583	Polyimide	1	Matte	UL969/CUL	No	High Temperature	≥25 ounces	≥28 ounces	PCB Identification
XF-584	Polyimide	2	Matte	UL969	Yes	High Temperature	≥35 ounces	≥40 ounces	PCB Identification
XF-592	Polyimide	2	Semi-gloss	UL969	Yes	High Temperature	≥41 ounces	≥55 ounces	PCB Identification
XF-603	Polyimide	1	Semi-gloss	UL969/UL94	No	Flame Retardant	≥27 ounces	≥32 ounces	Electronic devices
XF-611	Polyester	1.5	Semi-gloss	UL969/UL94	Yes	Flame Retardant	≥27 ounces	≥32 ounces	Electronic devices
XF-616	Polyimide	0.5	Semi-gloss	UL969	No	Ultra-thin	≥25 ounces	≥28 ounces	Space constrained electronics
XF-731	Polyimide	1	Semi-gloss	UL969	No	Flux Resistant	≥25 ounces	≥28 ounces	PCB Identification
XF-732	Polyimide	2	Semi-gloss	UL969	Yes	Flux Resistant	≥35 ounces	≥40 ounces	PCB Identification
XF-781	Polyimide	1	Semi-gloss	UL969	No	ESD	≥27 ounces	≥30 ounces	Electronic Components
XF-782	Polyimide	2	Semi-gloss	UL969	Yes	ESD	≥35 ounces	≥40 ounces	Electronic Components
XF-784	Polyimide	1	Matte	UL969	No	No Preheat, ESD	≥25 ounces	≥28 ounces	PCB Identification
XF-500	Polyimide	1	Semi-gloss	UL969	No	Color Coding	≥25 ounces	≥28 ounces	PCB Identification
XF-503	Polyimide	1	Semi-gloss	UL969	No	Color Coding	≥25 ounces	≥28 ounces	PCB Identification
XF-504	Polyimide	1	Semi-gloss	UL969	No	Color Coding	≥25 ounces	≥28 ounces	PCB Identification
XF-505	Polyimide	1	Semi-gloss	UL969	No	Color Coding	≥25 ounces	≥28 ounces	PCB Identification
XF-506	Polyimide	1	Semi-gloss	UL969	No	Color Coding	≥25 ounces	≥28 ounces	PCB Identification
XF-507	Polyimide	1	Semi-gloss	-	No	Color Coding	≥25 ounces	≥28 ounces	PCB Identification
XF-508	Polyimide	1	Semi-gloss	UL969	No	Color Coding	≥25 ounces	≥28 ounces	PCB Identification



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