Impact of RoHS on Surface Mount Soldering

What is RoHS?

The member states of the European Union have issued a law, referred to as **R**estriction of **H**azardous **S**ubstances (**RoHS**) Directive 2002/95/EU, restricting the use of certain hazardous substances in electrical and electronic equipment manufactured and/or sold within the EU. This Directive requires that all **E**lectrical and **E**lectronic **E**quipment (**EEE**) sold within the EU be free of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenly ethers (PBDE), .

The goal of this Directive is to protect human health, animal health and the environment from the risks associated with these substances.

Aimtec is fully committed to the RoHS initiative and to supporting its clients' efforts in producing end products that are safer for humans, animals and the environment overall.

Impact of RoHS Compliance for Electrical Component Manufacturers

Of the six (6) substances included in RoHS, lead is the one of primary concern for internal components and soldering of electrical converters.

Actions Taken by Aimtec to ensure RoHS Compliance

There are various types of lead solder, but conventional Sn60/Pb40 eutectic tin/lead solder has a reflow temperature of 220°C. By comparison, most lead-free solder alloys have a reflow temperature of 240-260°C. To meet the RoHS lead-free requirements, while maintaining our high product standards, Aimtec undertook the following changes to its manufacturing processes:

- Selected the correct lead-free termination finish that was compatible to both the lead-free and traditional tin/lead solders.
- Reviewed all design parameters to ensure that each product would cope with the higher thermal stress coming from the higher reflow temperatures associated with the higher melting points of most lead-free solder pastes.
- Replaced all necessary materials, where possible, in order to reduce the thermal stress threshold inside the component.

Impact of These Manufacturing Changes on Surface Mount Soldering

- Modify the flux composition based on nitrogen atmosphere to minimize the higher solder oxidation associated with lead-free solders.
- Lower the peak temperature in the bonding process to a level that matches the heat resistance of the electronic components and minimizes the heating time in order to avoid any overheating of any internal components that have yet to be redesigned to withstand temperatures beyond 220°C.

Current Situation

- Ideal soldering conditions would maintain temperature uniformity throughout the board and lower peak temperatures during the soldering process.

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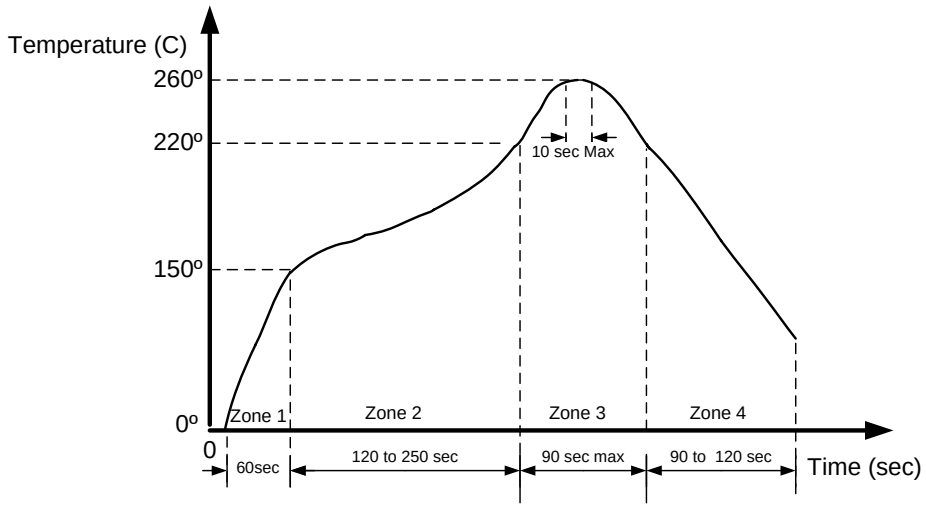
- The most common method used to surface mount components is reflow soldering, where a soldering paste is printed onto the paths of the circuit board, the components are set into place, with the pins placed into the paste and the board is then passed through a reflow oven. In this oven, the soldering paste is heated and melts to bond with the pins, securing the components to the board. In a single zone oven, all the pins are uniformly heated.

Potential Problem

- If the circuit board contains a mixture of components which require different soldering temperatures to bond to the board, will all components withstand the 260°C peak soldering temperature required to mount a lead-free electrical converter?

Options

- In low volume manufacturing situations, manual soldering may be an option.
- In other situations, the reflow soldering method, using liquid solder wave may be appropriate.
- Three (3) heat zone reflow ovens allow the soldering temperature to slowly increase to a designated temperature. The three heat zone ovens produce
- varying temperatures during the mounting process, but traditionally, all within range of the components mounted on the board.
- Seven (7) to nine (9) zone reflow ovens provide the most flexibility and versatility for temperature control. Each designated zone is assigned a temperature according to the threshold of component(s) in that zone. Circuit boards mounted through such ovens can have numerous components, requiring a variety of soldering temperatures, accurately mounted with minimum temperature variances to the board.



Zone 1: Pre-Heat Ramp-up
Zone 2: Heating Ramp-up
Zone 3: Peak Temperature
Zone 4: Ramp Down