



Solder reflow recommendations

Solder reflow profiles consist of four stages. They are:

- Preheat
- Pre-flow
- Reflow
- Cool down

It is critical to have the rate of temperature change, maximum temperature, and time duration within each stage controlled to create solder joints that have flowed properly. An example of a solder reflow profile is shown in Figure 1.

Preheat stage

The preheat stage is used to bring the entire assembly up to about +125°C ($\pm 25^\circ\text{C}$). Typical temperature increase rates used on convection systems are about 2-3°C per second. A temperature rise rate lower than 5°C per second should be used because higher rates may cause the solder paste to bubble and “explode”, potentially causing solder balls to form. It is also possible to damage some of the components being mounted on the board if the temperature rise rate is not held to below this level.

Pre-flow stage

The pre-flow stage starts at the end of the preheat stage and allows the temperature across the surface of the board to achieve equilibrium at a level near the melting point of solder. The rate of temperature rise in the pre-flow stage is reduced to less than 1°C per second, and is typically around 0.5°C per second. If the temperature is allowed to get too hot in the pre-flow zone, the solder paste will oxidize and solder balls will form. A pre-flow period of less than 120 seconds is recommended, during which the temperature can rise up to (but should not exceed) +180°C.

Reflow stage

The reflow stage is the time period where the solder changes from a solid to a liquid, and will flow in the areas where solder paste has been applied and solder mask is not present. The rate of temperature change increases rapidly to a specified level, then the PCB has a dwell time at the specified temperature where the flux action occurs and good wetting is obtained. After remaining at the specified temperature for the required dwell time the heat is removed and the cool-down stage is started.

We recommend using a maximum of 235°C, with the time at any temperature above 215°C less than 30 seconds. The total time above +183°C should be less than 180 seconds.

Cool Down stage

This is the final stage, and refers to the period after reflow where the temperature is decreasing and is below the solder liquidus (+183°C) once again. The solder grain size and fatigue resistance of the joint is controlled by the rate the temperature drops, and generally you would like to cool the PCB down as quickly as possible. Cool down rate should be approximately 2-4°C/second and should not exceed 5°C/second.

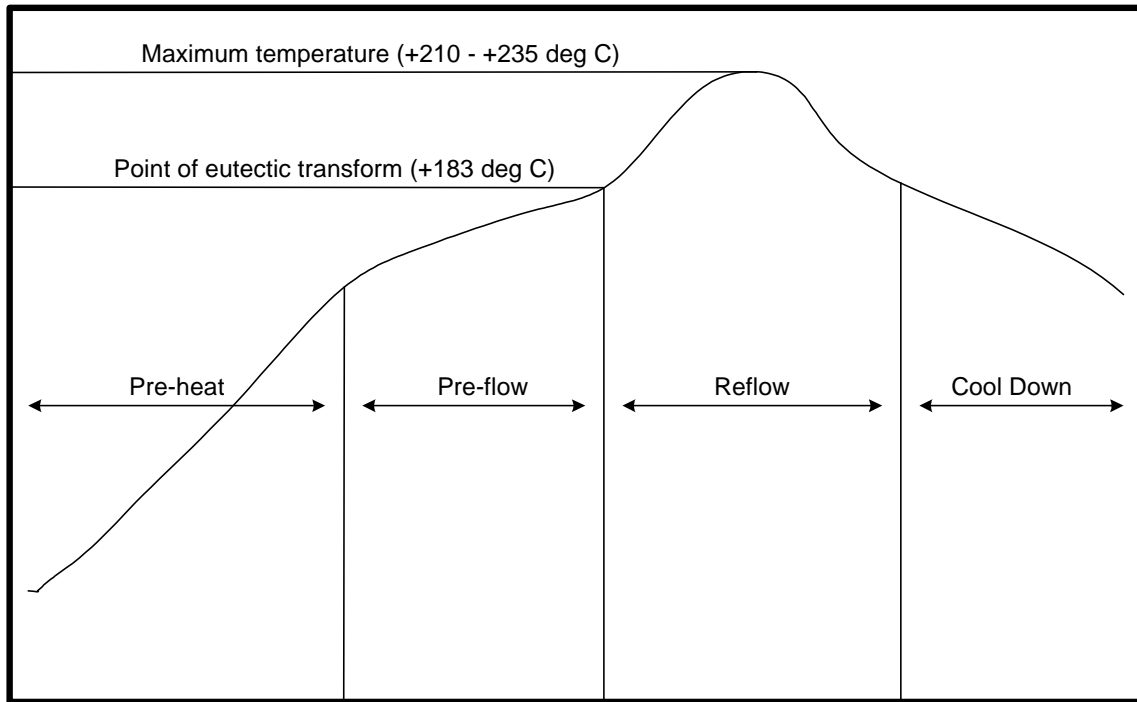


Figure 1 – Solder reflow profile