SKYWORKS®

APPLICATION NOTE

Solder Reflow Information

Assembly of a surface mount device depends on many process material and equipment parameters. Two of the most common processes used are infrared (IR) and convection reflow. Skyworks products come in three different termination finishes, depending on the package.

- Au (Cu/Ni/Au) for MCM and LGA (laminate-based) packages
- SnPb (Sn 70-90%, Pb 30-10%, 300-1,000 micro-inches thick) for lead frame-based solder plated products
- Sn (100% 300-1,000 micro-inches thick) as a lead (Pb)-free replacement for SnPb

This finish is compatible with all commonly used processes. The most common attachment process is the convection reflow process.

The reflow process requires applying solder and flux in the form of a paste to the areas of the substrate or PC board where the surface mount component connections are to be made. The solder and flux are applied to the circuit by screening, stenciling, or dot placement. This paste acts as a temporary adhesive holding the device in place until reflow soldering takes place. Optionally, a chip-bonding epoxy can be used to hold the device in place.

Solder paste manufacturers generally provide a recommended profile for the specific solder being used. The manufacturer's profile or the typical solder reflow profiles table in this document can be used as a starting point for profiling the process.

Caution: *Please contact your solder paste manufacturer for exact solder profile requirements.*

When using thermocouples for profiling, it should be noted that the outside edges and corners of an assembly heat up faster than the center, and components of greater thermal mass will heat more slowly than those of lesser thermal mass.

A thermal reflow process profile typically undergoes five transitions:

1. **Preheat** — Brings the assembly from 25 °C to preheat zone and evaporates solvents from solder paste. A slow ramp-up rate will prevent any damage due to thermal shock. The time and temperature to evaporate the solvents will depend upon the solder paste that is used.
2. **Flux Activation (Preheat–T_L)** — Dried solder paste is heated to a temperature in which the flux will react with the oxide and contaminants on the surfaces to be joined. The time and temperature should be long enough to allow the flux to fully clean these surfaces but not too long that the flux may be exhausted before soldering takes place.
3. **Thermal Equalization (Preheat–T_L)** — Achieves temperature equalization approximately 20–40 °C below the peak reflow temperature. Time and temperature will depend upon the mass and materials.
4. **Reflow (T_L–T_P)** — In this stage, the assembly is briefly brought to the temperature sufficient to produce reflow of solder.
5. **Cool Down** — This is the final stage in the solder process. Gradual cooling should be used. The end result should be as fast as possible without causing thermal shock to the components. Cool down in this manner will produce a finer grain structure in the solder joint, which will yield a more fatigue-resistant solder joint.

Recommended Solder Reflow Profiles

Profile Feature	SnPb Eutectic	Lead (Pb)-Free (SnAgCu)
Ramp rate	0.5–2.0 °C/sec.	0.5–2.0 °C/sec.
Preheat (soak) Temperature min. (T_{SMIN}) Temperature max. (T_{SMAX}) Time (ts_{MIN} to ts_{MAX})	Reference solder paste manufacturer recommended profile	Reference solder paste manufacturer recommended profile
Time above liquidus (TAL) Temperature (T_L) Time (t_L)	30–90 sec.	30–90 sec.
Peak temperature (T_P)	205–220 °C	235–245 °C
Ramp-down rate	4 °C/sec. max.	4 °C/sec. max.

Caution: *Please contact your solder paste manufacturer for exact solder profile requirements.*