Handling, Soldering and Cleaning of Power Converters

To maintain the performance, reliability, and appearance of the power modules or of customer's end products, a power module should not be exposed to an excessive mechanical, thermal, or environmental stress in handling and processing. This application note presents general guidelines of the handling, soldering and cleaning procedures for NetPower's power converter products. However, if handling, soldering, or cleaning guidelines are listed in a data sheet for a specific product, then the data sheet overrides this document.

HANDLING

Power converters are electronic assemblies, which can be damaged from poor handling, mechanical stress, environmental contamination, or from a static electric discharge. To maintain the integrity of power converters, they should be carefully handled, especially in transportation. A power converter is an ESD sensitive device, and should be kept from ESD during assembly, transportation, storage, and in the process being installed onto system boards. The shipping packages from NetPower are specially designed to provide protection against ESD and mechanical stress and can be used to store or transport converters.

SOLDERING

NetPower's power converters use multi-layer PCBs (printed circuit boards) often in heavy copper of inner layers. Therefore, it is important during the soldering process to consider the big thermal mass and quick heat transfer between the pins and the rest of the power converter. NetPower's through-hole power converters are designed to be wave-soldered or hand soldered, and the surface-mount power converters are designed to be reflow-soldered.

A proper soldering process should result in good solder joints between the power converter's pins and the system board. The melting temperature of the solder pastes used on NetPower's converters is 183°C for non Lead-free products, and around 210℃ for Lead-free products. The soldering time and temperature in a specific application can be determined by monitoring the temperature of the pins at a spot close to the converter's PCB, or of a copper on the PCB connected to or right next to the pins.

Sometimes thermal reliefs may be used on the system board to improve the solderability of the power converters, or to ease rework of the converter. As a general guide line, one may use a four-spoke thermal relief with a spoke width of .040 to .080 inches and spoke length of .010 to .020 inches.

Hand Soldering

The quality of hand soldering is affected by the amount of solder, the temperature of the solder iron, and the length of the soldering. Considering the relatively large thermal mass and heat transfer effect of a power converter, it is preferred to preheat the power converter to about 120℃. The soldering iron is better to be rated >90W with a relatively big tip (a 1/8" wide tip is recommended). Since the size of the converter, the design of the system board, the solder used and pre-heating all greatly impact the optimal

soldering process, it's desirable to try various settings of tip temperature and soldering time for optimal results. As a reasonable starting point, the iron temperature can be set to 750 ℉ (400 ℃), and soldering time can be about 3 - 5 seconds for smaller pins (diameter 0.040" or below), and 6 - 10 seconds for bigger pins (diameter 0.059" or higher).

Wave Soldering

Wave soldering is the most popular means for soldering power converters with through-hole pins. The recommended preheat temperature range is 100 - 150 ℃ on the top side of the converter, and 120-170 ℃ on the bottom side (pin side) of the converter, with a typical preheat rate of 4 ℃/s. The maximum solder pot temperature is 260 ℃ for lead-free solder, with the solder-wave dwell time of 4 seconds typical and 10 seconds maximum. During the wave soldering process, the temperature of the components on the power converters should be kept below the solder melting temperature.

Reflow Soldering

When using reflow soldering to solder surface-mount power converters on to the system board, recommendations of the reflow temperature profile from the solder paste manufacturer must be followed. Considering the relatively large thermal mass of a power converter, it's recommended that a soaking zone between 30 – 90 seconds is included in the reflow temperature profile. The temperature of the soaking zone can be set to about 40 – 60 ℃ below the melting point of the solder paste used.

Certain components on through-hole power converters might not be able to withstand the temperature of the reflow soldering. Using reflow to solder through-hole power converters could lead to damages of certain components or reduction of the power converter reliability. The product warranty will be void if a through-hole converter is subjected to reflow soldering.

CLEANING

NetPower converters use solder pastes with no clean fluxes, thus do not need to be cleaned after soldering. NetPower converters can withstand typical water wash processes. De-ionized (DI) water with a minimum resistivity level of 1 MΩ-cm should be used in the cleaning. Power converters should be cooled to room temperature after the soldering process before washing begins.

The converters should be dried immediately after washing, and shall be in a complete dry condition before they are powered on. The drying system should have blowers to blow off most water and moisture, so that the amount of rinse water to be dried off with heat is minimal. The converters should be baked at around 125 ℃ (at least 100 ℃) for at least 30 minutes to drive out all moisture.

NetPower offers customers a broad portfolio of dc-dc power conversion products, including isolated converters, non-isolated POLs, and custom products. If you have a power conversion requirement, or need assistance related to NetPower's products, please email NetPower at support@netpowercorp.com.