

# HAND SOLDERING GUIDE

**PRODUCT TYPE:** Surface Mount Chip Components

**Operations:** Rework/Touch-up, Prototyping / Bread-boarding & Replacement / Repair

**Component Type:** The following hand soldering technique is recommended for proper installation and rework of NIC's two terminal chip components (i.e. **capacitors, resistors, inductors, ferrite chip beads, varistors, and diodes**) across two land areas (pads) of a Printed Circuit Board (PCB) or substrate.

**Background:** Hand soldering with a hand solder iron is an individual process, unlike reflow or wave soldering where the soldering conditions are controlled. During hand soldering, each soldering operation can see different temperatures, stresses and amounts of solder.

➔ The most important part of hand soldering is the operator!

The operator must fully understand the operation he or she is performing. Care should be taken not only in soldering, but also in correct component handling.

**Component Attachment:**

- A.) The component and PCB/Substrate must be clean. The PCB/ Substrate land areas (pads) should be **pre-tinned with solder**.
- B.) Pick up the component with a pair of tweezers. For most components stainless steel or ceramics tipped tweezers are preferred. The component will not be damaged if handled correctly.
- C.) Apply a drop of flux on each termination of the component.
- D.) Place the component onto the PCB-Substrate bridging the two land pads. For the best results, and to minimize the possibility of thermal shock, it is recommended that the PCB-Substrate be slowly preheated (less than 3°C/second) to a temperature approximately 50°C below the working range of the solder alloy.
- E.) Compare the size of the two land patterns. The smaller of the two should be soldered first (see Figure 1).
- F.) Assuring the component is lying flat on the PCB/Substrate; place the soldering iron tip adjacent to the termination-land interface (see Figures 2., 2.1 & 2.2). The soldering iron tip temperature should be controlled not to exceed +315°C (600°F). When the

solder starts to flow, slowly move the tip of the soldering iron towards the component. Add any additional solder needed to generate a solder fillet. As the solder flows onto the component termination, remove the soldering iron.

G.) Examine the component to assure that it is flat on the PCB/ Substrate.

H.) Then repeat step "F" on the opposite termination.

I.) Visually inspect both solder joints. The solder fillet should be clean and continuous (see Figure 3).

J.) The assembly operation is now complete. Any flux residue should be cleaned off the after the PCB/Substrate has been allowed to cool to room temperature. Accelerated cooling, or quenching, is strongly discouraged as thermal stress damage may result.

**Component Removal:**

A.) To minimize the possibility of thermal shock, it is recommended that the PCB/Substrate be slowly preheated (less than 3°C/second) to a temperature approximately 50°C below the working range of the solder.

B.) Ideally the part should be unsoldered by heating both terminations at the same time (focused hot air or using dual tip irons is suggested). If this is not practical, determine if either of the two land patterns is larger than the other. The larger of the two should be unsoldered first.

C.) Solder removal aids (solder suckers, solder wick, etc.) should be used to free the component from the PCB/Substrate. Place the soldering iron tip adjacent to the termination-land interface (see Figure 4). The soldering iron tip temperature should be controlled not to exceed +315°C (600°F). When the solder starts to flow, use the solder removal aid to extract as much solder as possible from the solder fillet. Repeat on the opposite termination. This should allow removal of the component by tweezers. If not, repeat heating and solder removal until part is free from the PCB/Substrate.

D.) Remove any excessive solder on the PCB/Substrate land pattern using solder iron and solder removal aid. Once this is accomplished the new/replacement component can be installed (see steps A~J of "Component Attachment section").

**- NOTICE -**  
 HAND SOLDERING IS UNDERSTOOD TO BE A NECESSITY OF BREAD-BOARDING, REWORK, REPAIR OPERATIONS OF SMT COMPONENTS.  
**HAND SOLDERING IS NOT RECOMMENDED AS FULLTIME MANUFACTURING TECHNIQUE.**  
 THIS GUIDE IS PROVIDED SOLELY AS AN AID TO BREAD-BOARDING, REWORK & REPAIR

