Hand Soldering of MNA Amplifiers (AN-60-031)

Introduction

Mini-Circuits MNA Amplifiers are manufactured in a 3 x 3mm (.118 x .118-inch) plastic molded package, Case Style DQ849. This surface mount package is designed for installation on a user's PC board via a process that typically includes the following steps:

- stencil printing of solder paste on the board,
- automated placement (pick-and-place) of the MNA and other components on the solder pattern, and
- reflow soldering in a conveyor oven or vapor phase equipment.

For evaluation and prototyping, the production equipment to accomplish that process might not be available to the user, who would therefore seek an alternative means. This Application Note suggests method of hand soldering of MNA amplifiers using a hot plate that has been used successfully at Mini-Circuits.

Hand Soldering Method

The leads of the MNA amplifier are flush with the sides of the package, and its lead frame includes a pad in the center of its bottom surface that must be grounded for proper electrical performance and adequate heat sinking. A soldering iron cannot reach the center joint area, and soldering the leads one at a time would risk damage due to uneven heating of the device. Instead, the following process is recommended. Instructions are given both for tin-lead solder and lead-free solder. Read all instructions before starting.

1. Prepare solder paste containing tin-lead solder, Sn/Pb 63/37 or 60/40, or lead-free solder Sn/Ag/Cu in a dispensing syringe if available. Otherwise, use a probe capable of placing uniform .031 and .062-inch diameter dots of solder paste on the printed circuit pattern. Practice placing the solder paste on scrap material.
2. Pre-heat an electric hot plate to 250°C for tin-lead solder, or 300°C for lead-free solder, monitored by a calibrated surface thermometer. Take note of the area where the temperature of the plate is uniform, and see that it is large enough to accommodate the PC board.
3. Prepare tweezers suitable for putting the PC board onto the hot plate, holding it down firmly, and picking up the PC board from the hot plate.

4. Before putting the PC board on the hot plate, dispense solder paste or apply it with the probe as follows: .062-inch diameter dot in the center where the center ground pad of the MNA amplifier will be located, and .031-inch diameter dot for each of the 8 leads of the device. Then, check the orientation of the MNA amplifier and place it carefully on the pattern. Be careful not to spread the solder paste sideways, and do not apply any more downward force than necessary just to contact the solder blobs.
5. Check the hot plate temperature again with the surface thermometer, carefully put the PC board on the hot plate, and hold it firmly in place with tweezers.
6. For PC board thickness of .020 inch, as an example, it should take less than one minute for the solder to reflow, as indicated by smoke rising from the flux that is contained in the solder paste. As soon as smoke is visible, lift the PC board up from the hot plate and place it where it can cool safely.
7. Inspect the solder joints at the 8 leads. There should be a solder fillet covering at least a portion of the exposed thickness (height) of the metal as well as the adjacent area of the PC board metalization.