Recommended Soldering Techniques for ATC 500 Series Capacitors

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1.0. SCOPE. The following procedures have been successful in soldering ATC500 series capacitors to both soft and hard substrates with a variety of metallizations. For general handling and soldering recommendations as well as suggestions regarding epoxy bonding, kindly refer to **Bulletin Nos. 201 and 202**, included in our catalogue. The specific techniques and materials described herein have resulted in good solderability and die shear performance, but this is not to say that other procedures and materials may not be equally successful. It should be noted that the fluxes used may not necessarily be compatible with other board mounted components or processes and therefore appropriate caution in this regard is strongly advised.

2.0. SOLDERS AND FLUXES. The table below presents various solder-flux combinations that have yielded good results on substrates such as G10, Rogers Duroid, alumina, and beryllia, with metallizations that included gold, bare copper, and copper flashed with nickel/gold. The designation "Ind" refers to an "Indalloy" product of the Indium Corporation of America. "Integral flux" refers to flux incorporated directly into solder paste or as a core of wire solders. "WC" refers to water-clean flux, "NC" to no-clean flux. Solders designated only by a number had the compositions given in the following **key**: 1 = 50% In, 50% Pb; 2 = 60% Pb, 40% In; 3 = 60% Sn, 40% Pb; 4 = 63% Sn, 37% Pb; 5 = 96.5% Sn, 3.5% Ag

TABLE 1. SUGGESTED SOLDER–FLUX COMBINATIONS

Solder	Composition	Integral Flux	Flux (if Non-integral) & Manufacturer/Item	Substrate Metalization
Ind #155 (paste)	90 Pb, 5 Sn, 5 Ag	RMA	—	Copper
Ind #121 (paste)	90 Sn, 4 Ag	NC	—	Copper
Ind #182 (paste)	80 Aum, 20 Sn	RMA	—	Gold
Sn63 (paste)	63 Sn, 37 Pb	RMA	—	Copper
Ind #205 (paste)	60 In, 40 Pb	NC	—	Gold
4	Consult key	None	RMA	Copper
Ind #7	50 Pb, 50 In	None	RMA	Gold
1,2,3,4,5	Consult Key	None	WC Qualitek #737	Copper, Gold
1,2,3,4,5	Consult Key	None	NC Qualitek #302	Copper, Gold
1,2,3,4,5	Consult Key	None	NC Humiseal NCF-100	Copper, Gold
1,2,3,4,5	Consult Key	None	NC Kester #958	Copper, Gold
1,2,3,4,5	Consult Key	None	WC Kester #2331-ZX	Copper, Gold
1,2,3,4,5	Consult Key	None	NC Heraeus SURF11	Copper, Gold
1,2,3,4,5	Consult Key	None	NC Multicore Crystal 400	Copper, Gold

3.0. EQUIPMENT/SUPPLIES.

1. Hot plate with temperature control.
2. Surface thermometer.
3. Air circulating oven set at + 90 ± 5 °C (for solder paste high volume production).
4. IR or Air/Nitrogen furnace (for high volume production). Refer to Bulletins 201 and 202 for recommended profiles.
5. Soldering iron – pencil type with temperature control and multiple tip size options.
6. Fiberglass brush or "pencil eraser" type circuit board trace cleaner – to remove oxides from copper metallization.
7. Tweezers: One with fine metal tips #1 or #7 and one plastic or Teflon type with fine tips.
8. Vacuum pickup with a small rubber or a non-metallic tip.
9. Cotton swabs or other suitable cleaning swabs.
10. Wooden or high temp plastic probe stick.
11. Suitable solvent for flux used.
12. Microscope with at least 10X power, zoom preferred for inspection.
13. Paste dispensing machine with suitable tips for solder paste.
14. Solder wick.
15. Knife, X-acto type #11 blade.
16. Pin Vise.
17. Finger cots or gloves.
18. ATC500 series caps.

In all the following procedures, the soldering iron must be properly tinned with the solder that is going to be used. Failure to do so will lead to cross contamination of solders and possible solder joint failure.

Refer to equipment/supply list when appropriate in procedure, as well as solder chart for the applicable metallization/plating.

4.0. PROCEDURE FOR SOLDERING TO PC BOARDS/SUBSTRATES THAT ARE *NOT* MOUNTED INTO A HOUSING OR DO *NOT* CONTAIN A METAL CORE.

1. Place board on a non-metallic flat surface.
2. Gently clean area of attachment with the circuit board trace cleaner.
3. Using a cotton swab, remove any trace metal particles that may have come off during the cleaning.
4. *If you are using a solder paste or solder with an integral flux,* apply a small amount (approximately equal to the pad size of the capacitor).
5. With the soldering iron preheated to 30-50 °C higher then the melting point of the solder used, carefully flow (flux core) or reflow (paste) the solder on the trace (see Figure 1).
6. Repeat for the other side of the trace.
7. After the reflowing is done, carefully clean the solder sites with an approved solvent and a cleaning swab. Inspect areas for proper solder amount (see Figure 1), then skip to step #11.
8. *If you are not using solder that incorporates an integral flux,* apply flux (very sparingly) with a broken cotton swab stick or flux applicator.
9. Apply the solder using either preforms or cuttings from a roll; use the amount that will cover the area to be tinned.
10. Perform steps #5, 6, and 7.
11. For a proper solder joint, the capacitor must be tinned with the same solder that is used on the land. This can be accomplished either by solder dipping or by reflow using a soldering iron. (See Figure 2 for proper solder amount.) In either case, care must be taken to not thermally shock the capacitor; this is done by pre-heating it on a hot plate that is preset to approximately +125 °C. Remember to thoroughly clean the capacitor before attaching it to the board.
12. Apply a small amount of flux to the area where the capacitor will be attached.
13. Place the pre-tinned capacitor on the area of attachment.
14. Using the back of a cotton swab or a heat resistance probe, carefully hold the capacitor in place. DO NOT PRESS HARD. Apply the soldering iron to the area shown in Figure 3 and hold there until you can see the solder melt both on the trace and around one side of the capacitor.
15. Repeat the process for the other side of the capacitor.
16. Carefully clean the board with the proper solvent. It is now ready to use.

5.0. PROCEDURE FOR SOLDERING TO PC BOARDS/SUBSTRATES THAT ARE MOUNTED INTO A HOUSING OR CONTAIN A METAL CORE.

Steps 1 - 4 are the same as for Procedure 4.0 above.

5. Place assembly on a preheated hot plate set to +125 °C. (This is a safe temperature for most assemblies.) Leave standing until the top surface gets to about the temperature of the hot plate.

The remaining steps generally follow steps 5 – 16 of Procedure 4.0, except that the hot plate is always used to raise the temperature of the whole assembly before the soldering iron is applied.

6.0. PROCEDURE FOR SOLDERING TO CERAMIC SUBSTRATES.

Steps 1 – 4 are the same as for Procedure 4.0 above.

5. Place ceramic substrate in a preheated oven set at +90 °C for approx. 5 minutes.

Remove from oven; the remaining steps generally follow steps 5 – 16 of Procedure 5.0 above.

7.0. INSPECTION Inspection criteria for devices with metallized terminations on the bottom side only are given in ANSI/J-STD-001A (Rev. A, 1/95), section 9.2.6.7.

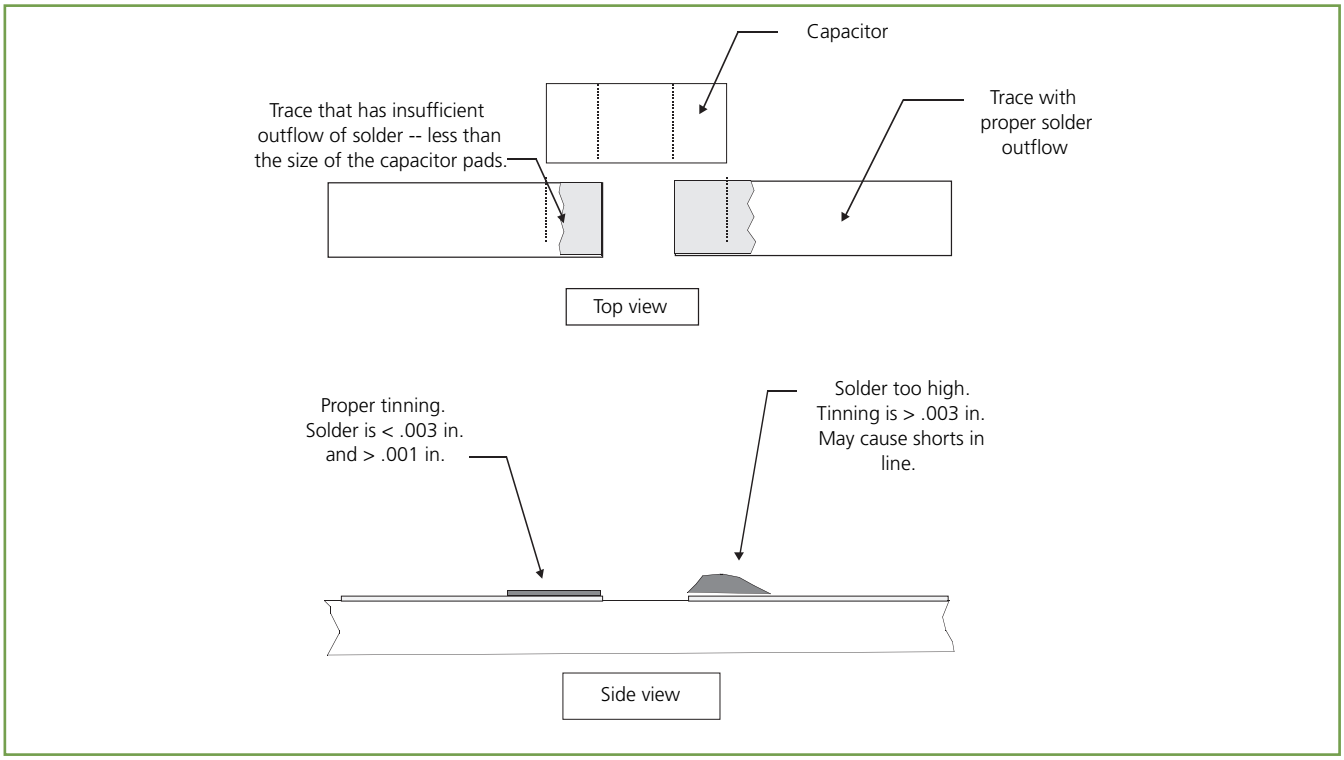

Figure 1. Proper trace reflow and solder amount needed for attachment

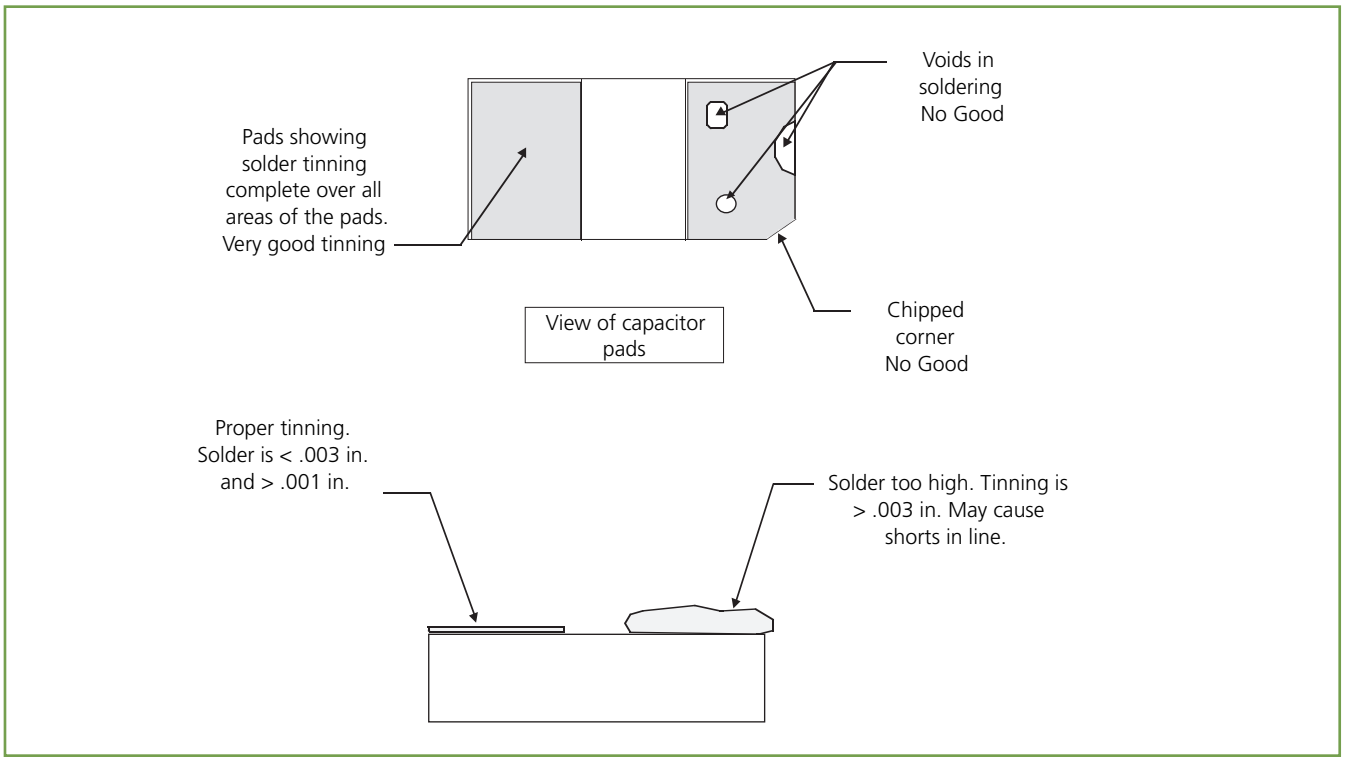

Figure 2. Showing proper capacitor tinning inspection

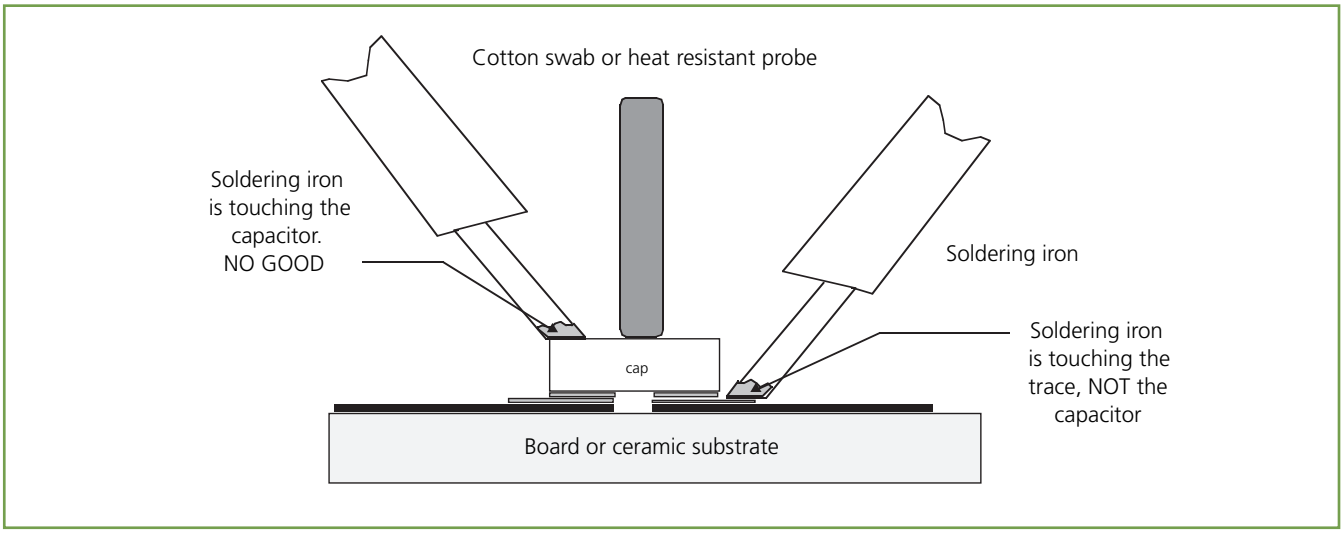

Figure 3. Showing proper soldering iron location

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