TECHNICAL PAPER

Solder Reflow Mounting "TACmicrochip" Tantalum Capacitor

KYOCERA AVX

SOLDER REFLOW MOUNTING
"TACmicrochip" TANTALUM CAPACITOR

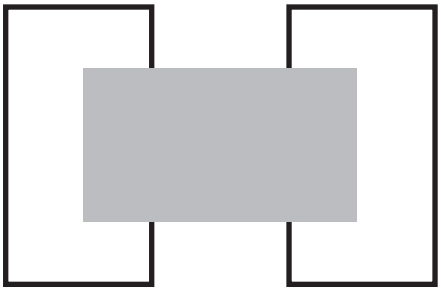
Solder reflow mounting of the small 0603 "TACmicrochip" requires a rethink from the established mounting of the 0603 ceramic chip or molded TAJ R type tantalum capacitors.

The new design of the 0603 chip tantalum capacitor has only end faces metallized to accept the solder connection, unlike the ceramic which has end faces and edges metallized. The change to only end face metallization means that the mounting pad footprint design has to be changed to allow for no edge soldering.

Footprint pad design has two major differences:

PRINTED CIRCUIT BOARD PAD AREA COMPARISON FOR 0603 CAPACITOR

STANDARD CERAMIC PAD DESIGN



TOTAL PAD AREA 3.36mm Sq

NEW TANTALUM DESIGN

TOTAL PAD AREA 2.18mm Sq

1. The width of the pad can be the same as the capacitor as there is no requirement of edge solder fillets. The pad design will therefore require less PCB board area thus increasing package density on the PCB.

2. Distance between pads under the capacitor has to be increased (when compared with the ceramic) in order to reduce the mass of solder under the end of the capacitor. Reducing this mass will stop the capacitor floating away from the PCB on a ball of solder, inhibiting soldering to the end face termination.

SOLDER PAD DESIGN

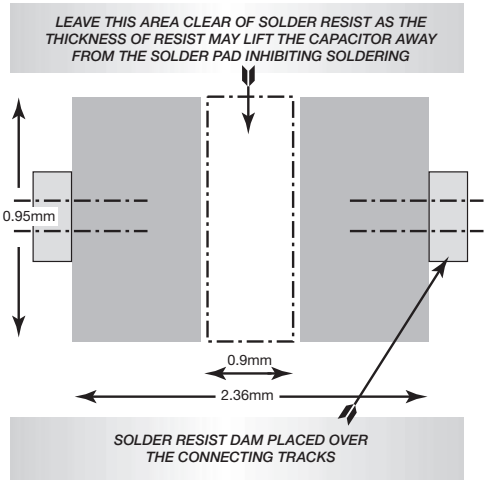
CORRECT PAD DESIGN

INCORRECT PAD DESIGN

EXCESS PAD EXTENDING UNDER THE CAPACITOR WILL RESULT IN CAPACITOR LIFTING AWAY FROM SUBSTRATE

It also has a beneficial effect on minimizing the electrical leakage current path under the capacitor by increasing the path length between the pads. This will become more important as the capacitors become smaller.

The suggested pad design for the 0603 TACmicrochip:



The small pad area required for this size of capacitor makes solder mass added to the pad critical. To obtain the correct solder fillet, it is important to restrict solder flowing into or out of the pad area by the use of solder resist dams, which will block the movement of solder to and from the connecting solder tracks.

In order to obtain the correct solder fillet on the end connections, the mass of solder added to the pad is important.

VERY SMALL FILLET WILL GIVE A POOR SOLDER YIELD

CORRECT SOLDER FILLET

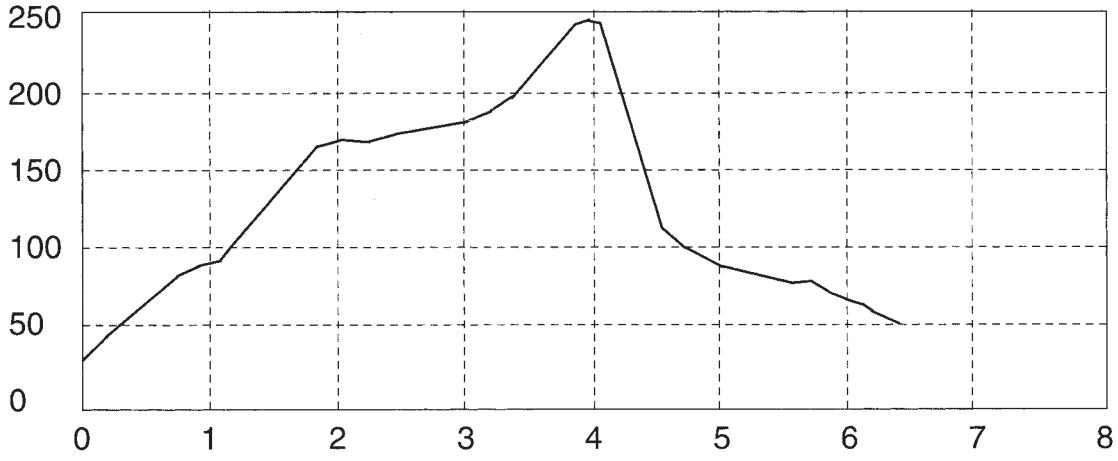
LARGE SOLDER FILLET CAN CAUSE TOMBSTONING

Unfortunately it is not a simple matter to give the weight of solder required to form the correct solder fillet. We have found that the flux added to the solder by the various suppliers can vary from 1% to 60%. Loss of flux and other volatiles control the resulting mass of solder after solder reflow process.

In AVX tests Solder Plus ESP 62 RA-A has been found satisfactory for the 0603 capacitor (0.015 grams ±0.005 grams was found to give results).

The solder heating profile used peaked at 235∞C, details of the profile is given below.

SOLDER REFLOW TEMPERATURE CYCLE



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