

WE EXCELERATE
YOUR PERFORMANCE



BB Electronics
DfM – Land Pattern Design:
The bad and good ones.

2011-10, CNN – PE/DL

DfM – Land Pattern Design. The bad and good ones.

Abstract:

A series of examples of bad land pattern designs will be given supported by descriptions of the risks connected to the bad design and eventually followed by land pattern design recommendation based on IPC and BBE experience.

DfM – Land Pattern Design. The bad and good ones.

IPC-7351B:

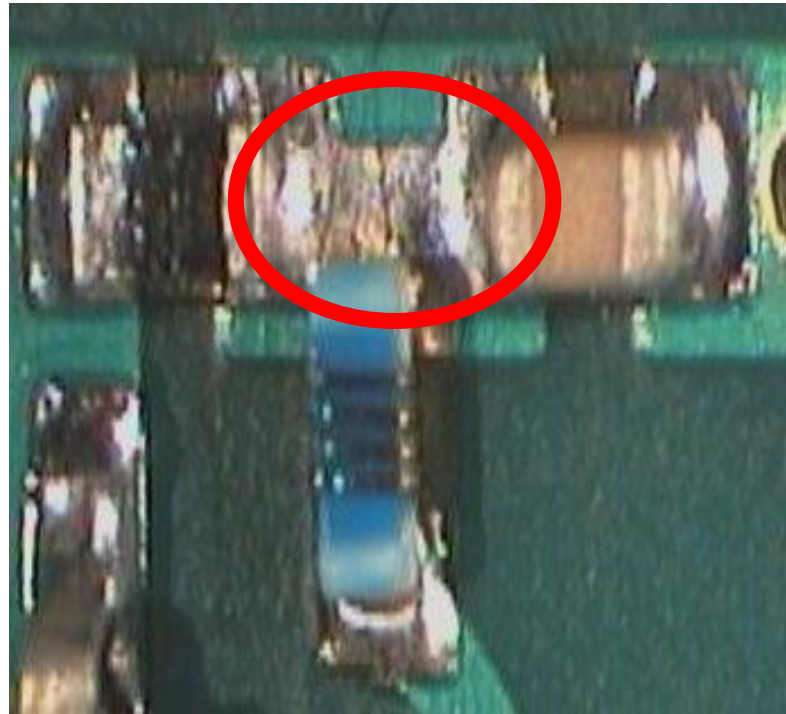
Generic Requirements for Surface Mount Design and Land Pattern Standard

DfM – Land Pattern Design. The bad and good ones.

EXAMPLES

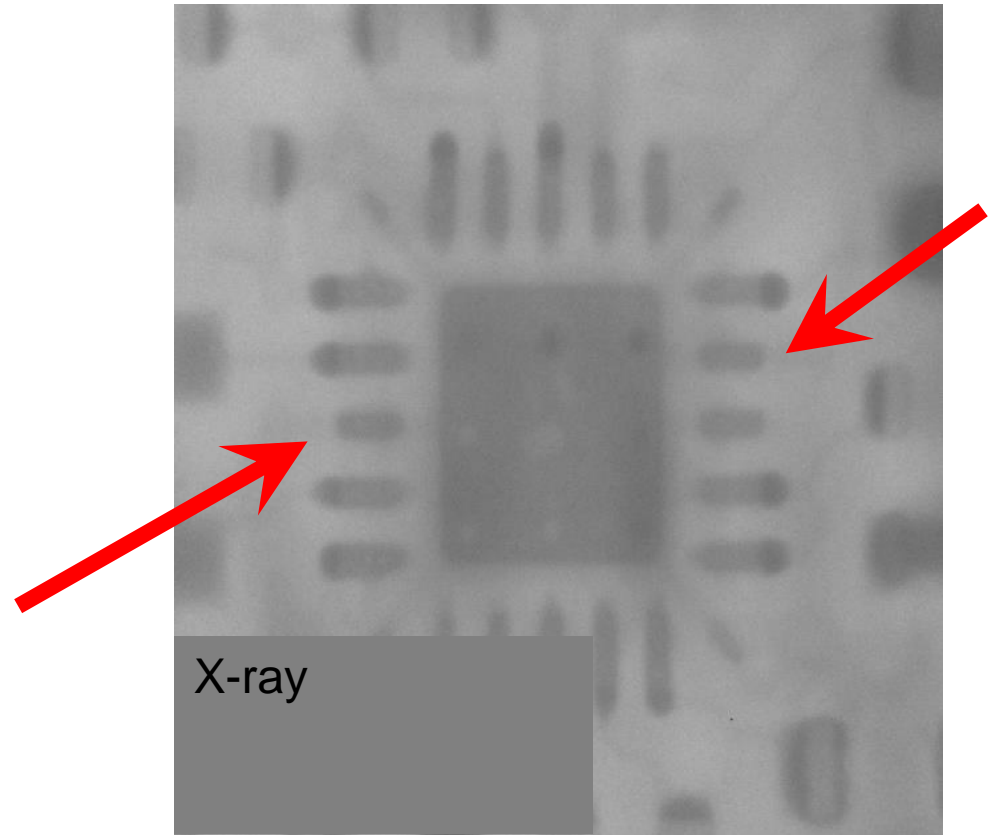
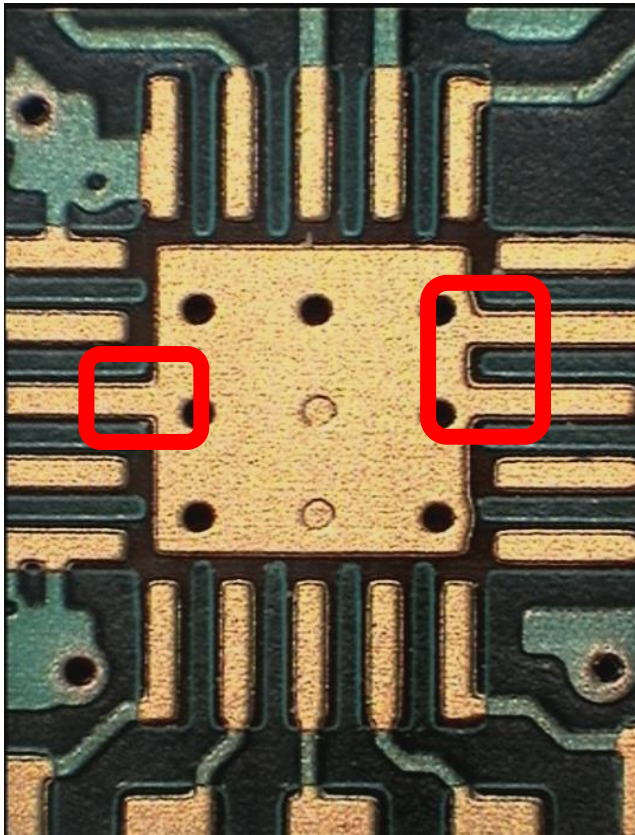
DfM – Land Pattern Design. The bad and good ones.

Reflow: Solder mask issue.



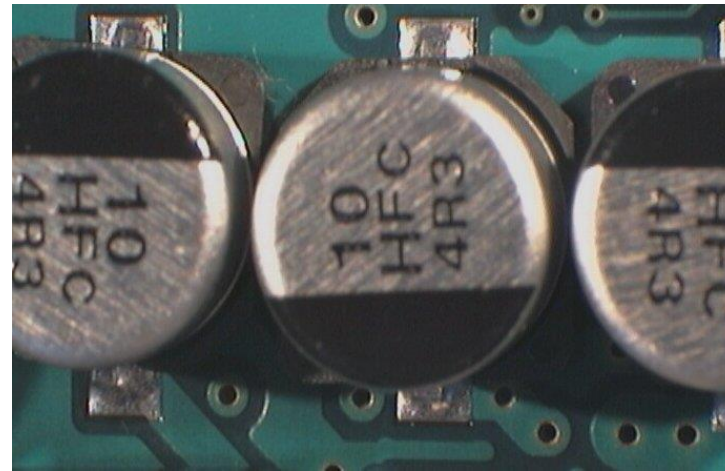
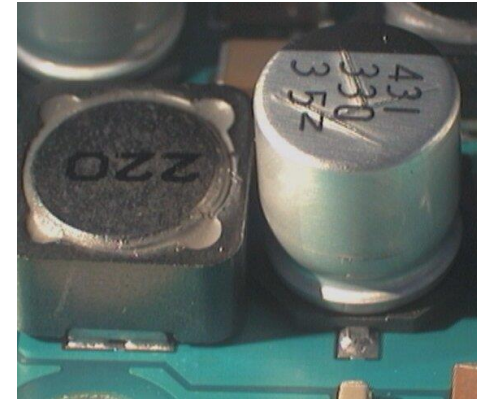
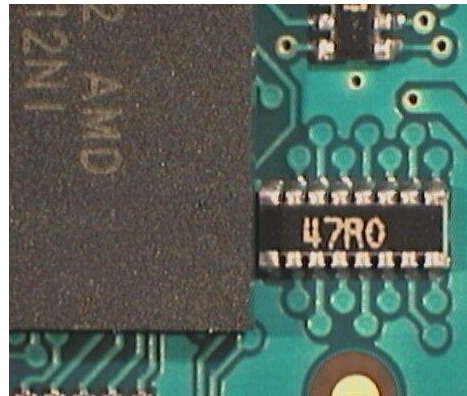
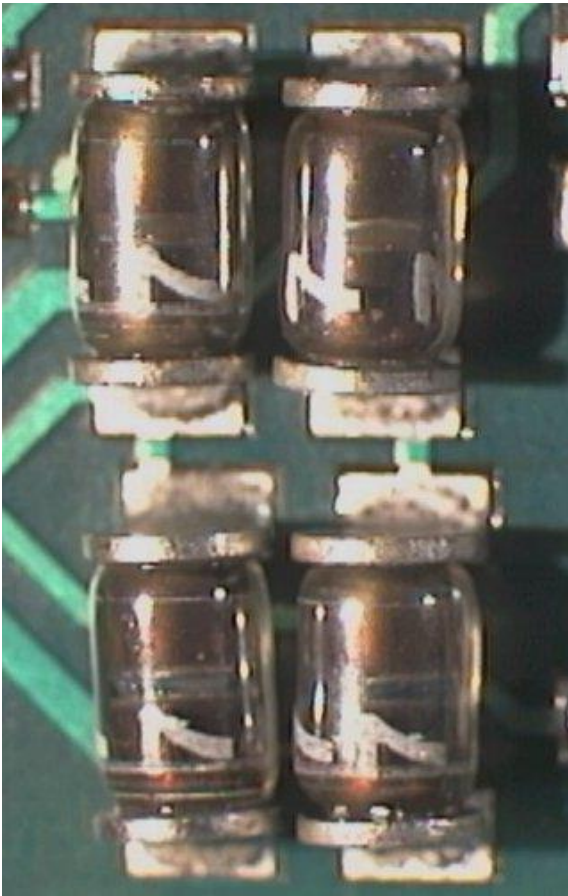
DfM – Land Pattern Design. The bad and good ones.

Reflow: Solder mask issue.



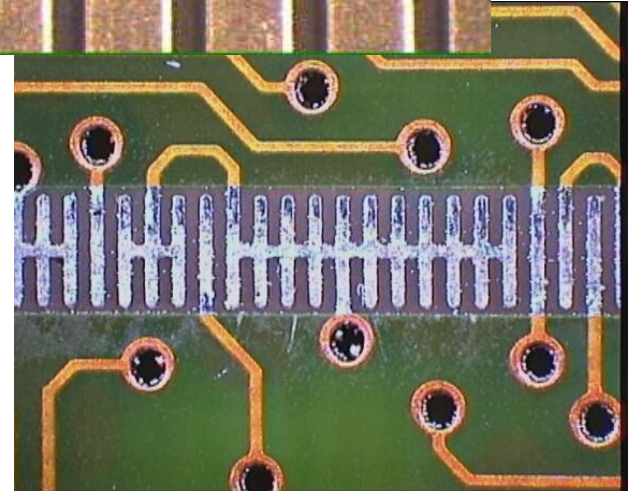
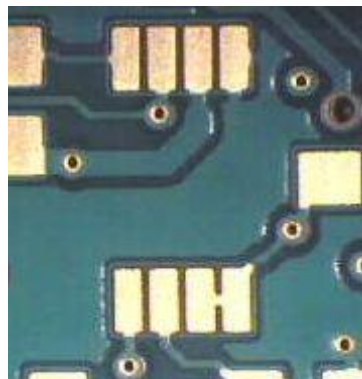
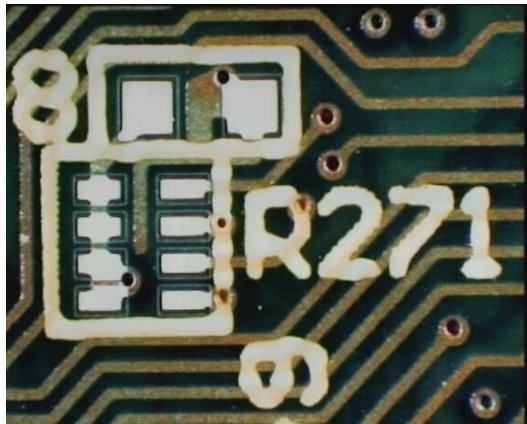
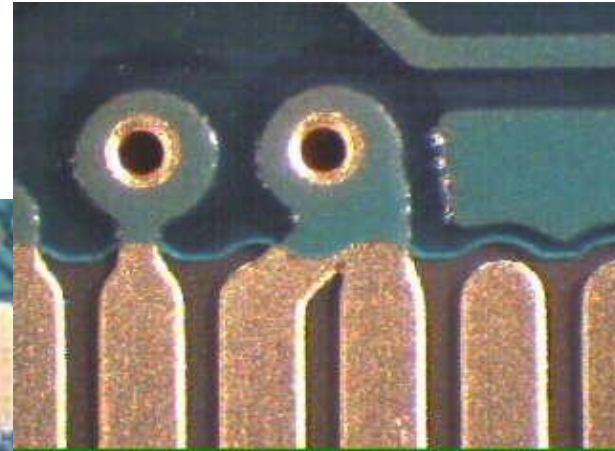
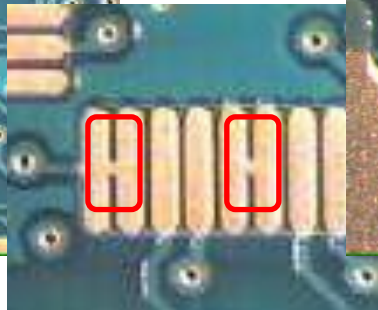
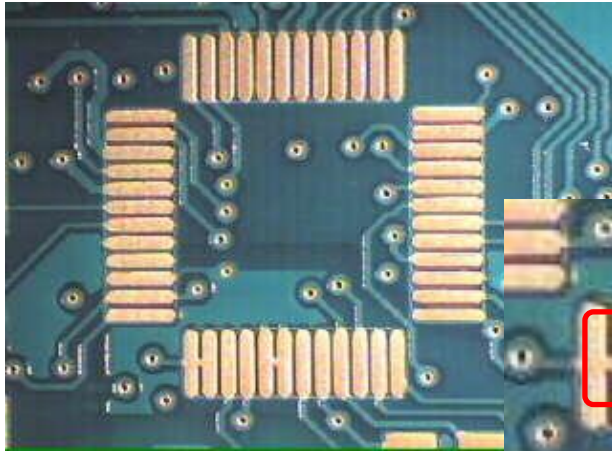
DfM – Land Pattern Design. The bad and good ones.

Reflow: Insufficient component spacing.



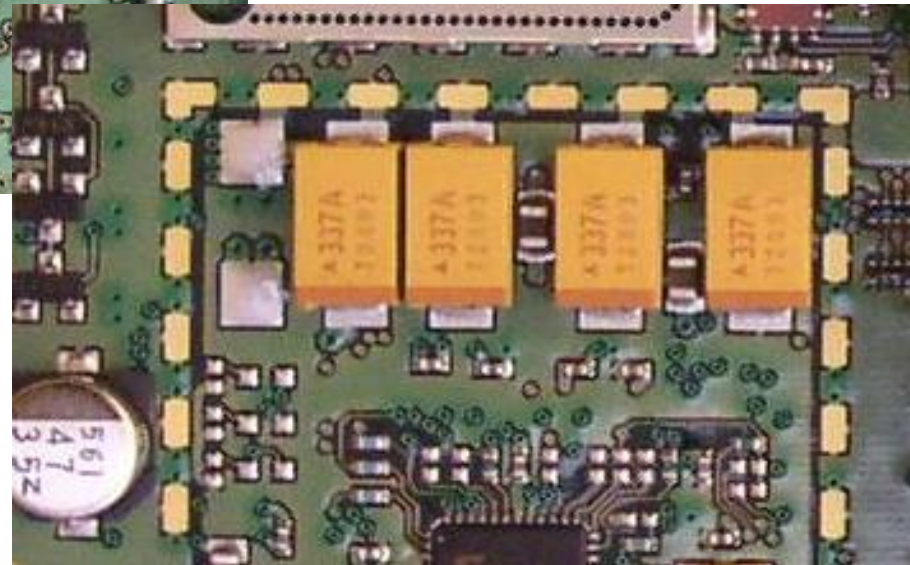
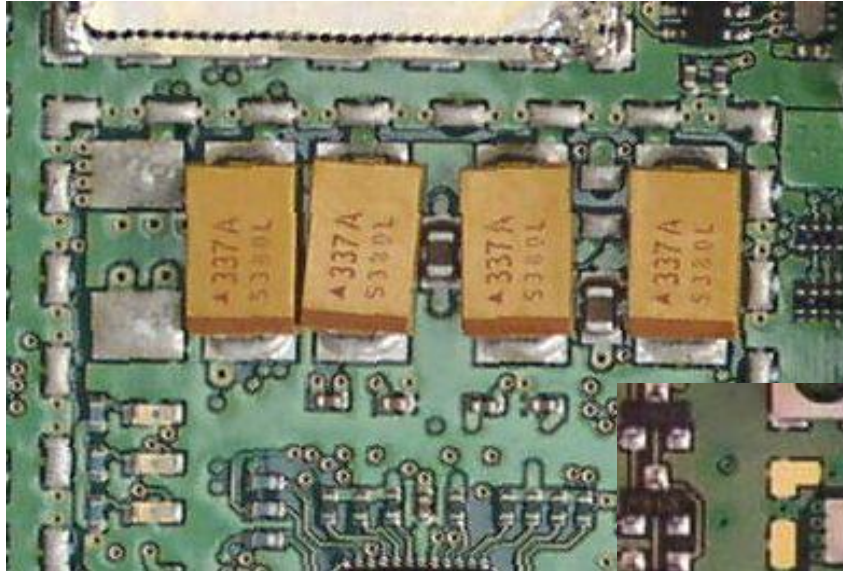
DfM – Land Pattern Design. The bad and good ones.

Reflow: Natural bridging.



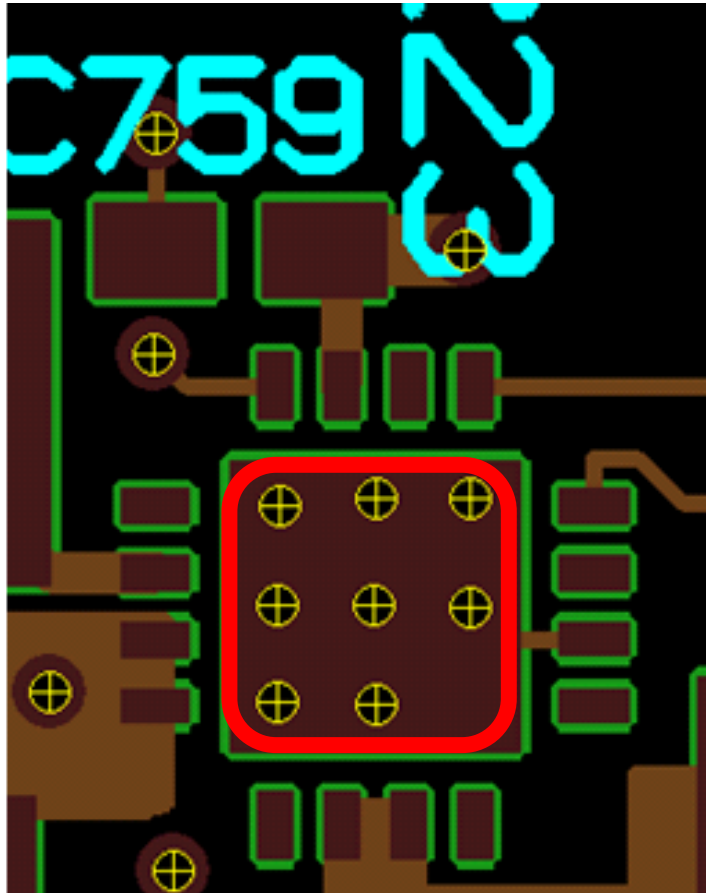
DfM – Land Pattern Design. The bad and good ones.

Reflow: Pad layout – Before and after.



DfM – Land Pattern Design. The bad and good ones.

Reflow: Vias in pads.



Numerous occasions with via in pad;

IC206, IC221, IC222, IC223 & IC802 all have vias in ground pad. Where this is considered necessary due to thermal relief, we recommend, that the vias should be plugged according to IPC-4761.

For other occurrences of vias in pad, it is recommended to route the via outside the pad.

DfM – Land Pattern Design. The bad and good ones.

Reflow: Vias in pads.

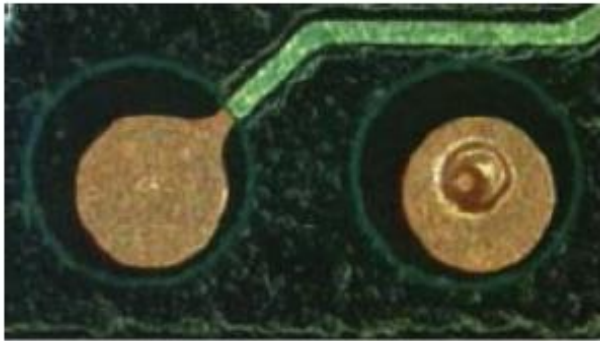


Figure 1. The left μ BGA pad does not have a microvia, while the right pad does. The pads are 0.010" in diameter; the via is 0.006" in diameter. The directional lighting that was used when taking the photograph highlights the "dimple" in the pad on the right.

Vias in pads are not a critical design problem, but they can cause voids in the solder joints if they are not filled. Studies are not conclusive to whether the voids cause more or less failures than BGA components soldered on to PCB's without vias in pads.

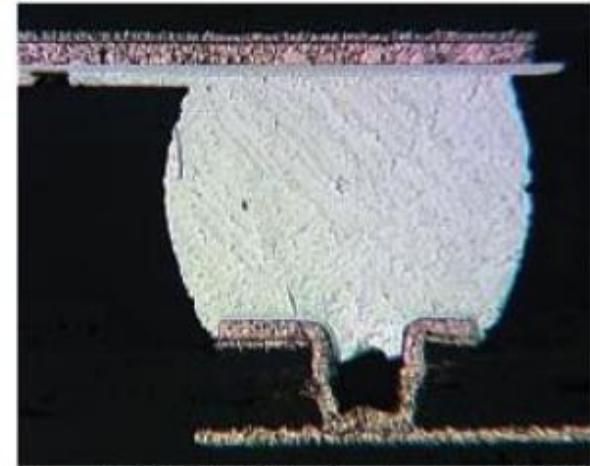


Figure 2. BGA solder joint with microvia on OSP finish.

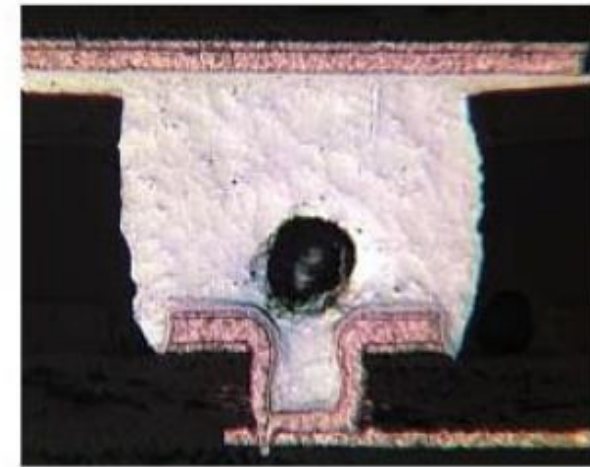


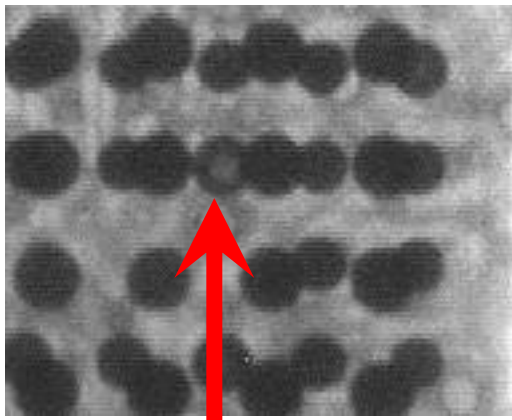
Figure 3. Similar BGA solder joint with microvia on ENIG finish.

DfM – Land Pattern Design. The bad and good ones.

Reflow: Vias in pads.

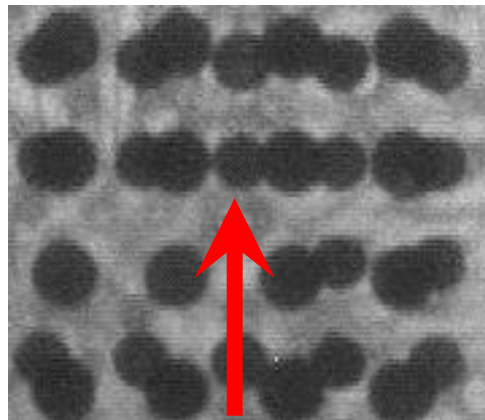
The pictures below show the same area on two PCBA's inspected in X-Ray equipment.

Picture one has a void caused by a via in the pad, while the second PCB does not. For AXI (Automated X-ray Inspection) this is a big problem leading to many false defects, and virtually no possibility to program a "golden solder joint".



Picture 1

The void is present.



Picture 2

The solder ball has no void.

What should be defined for AXI?

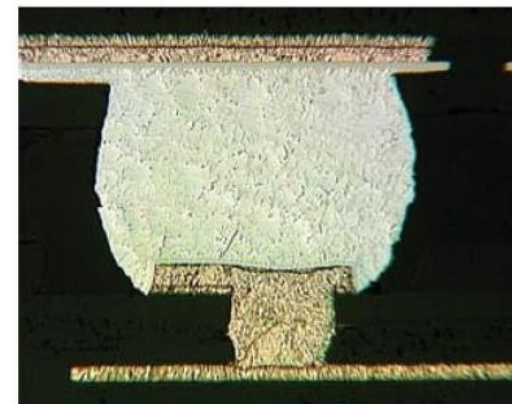


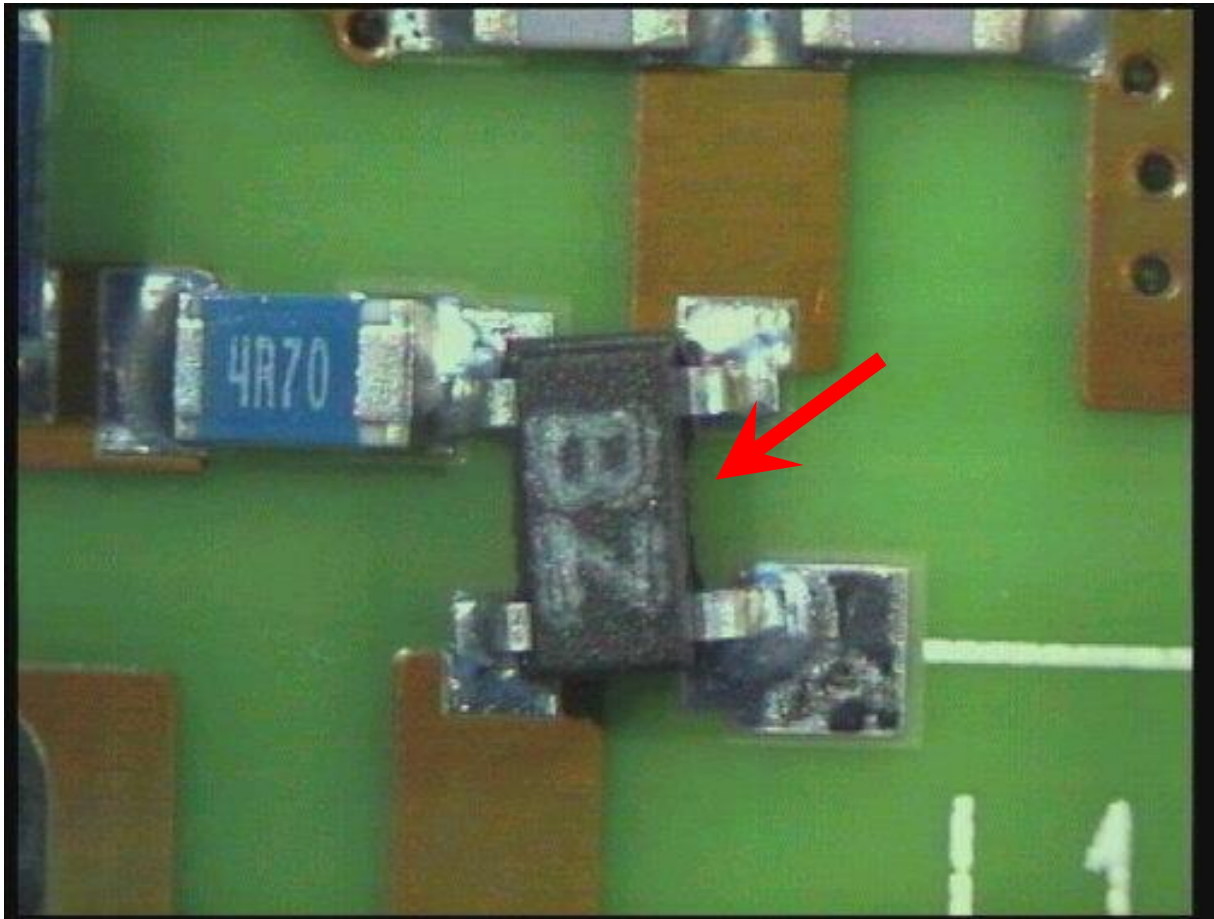
Figure 6. A 0.5 mm CABGA with copper-filled microvia.

Picture 3

Filled via – no voids.

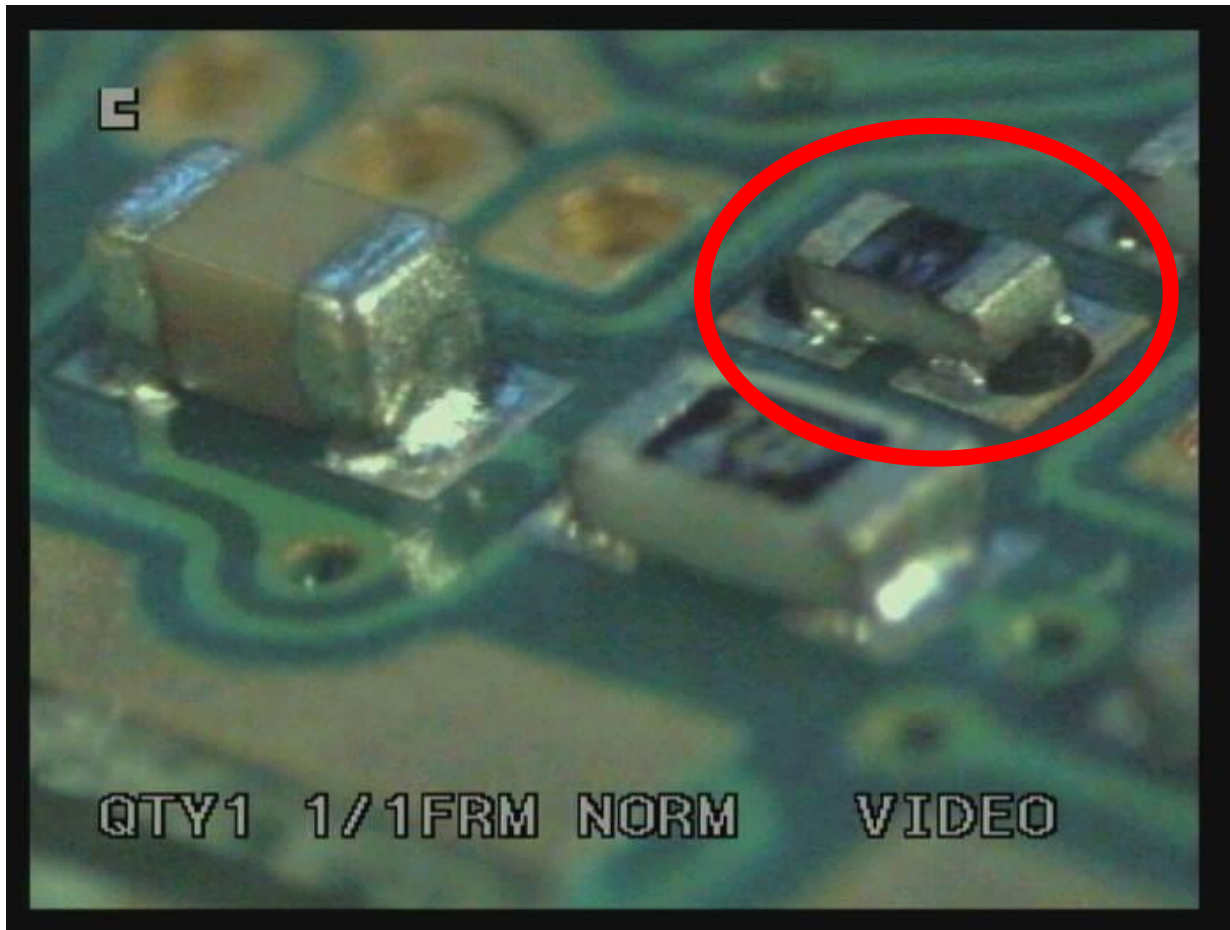
DfM – Land Pattern Design. The bad and good ones.

Reflow: Insufficient pad layout.



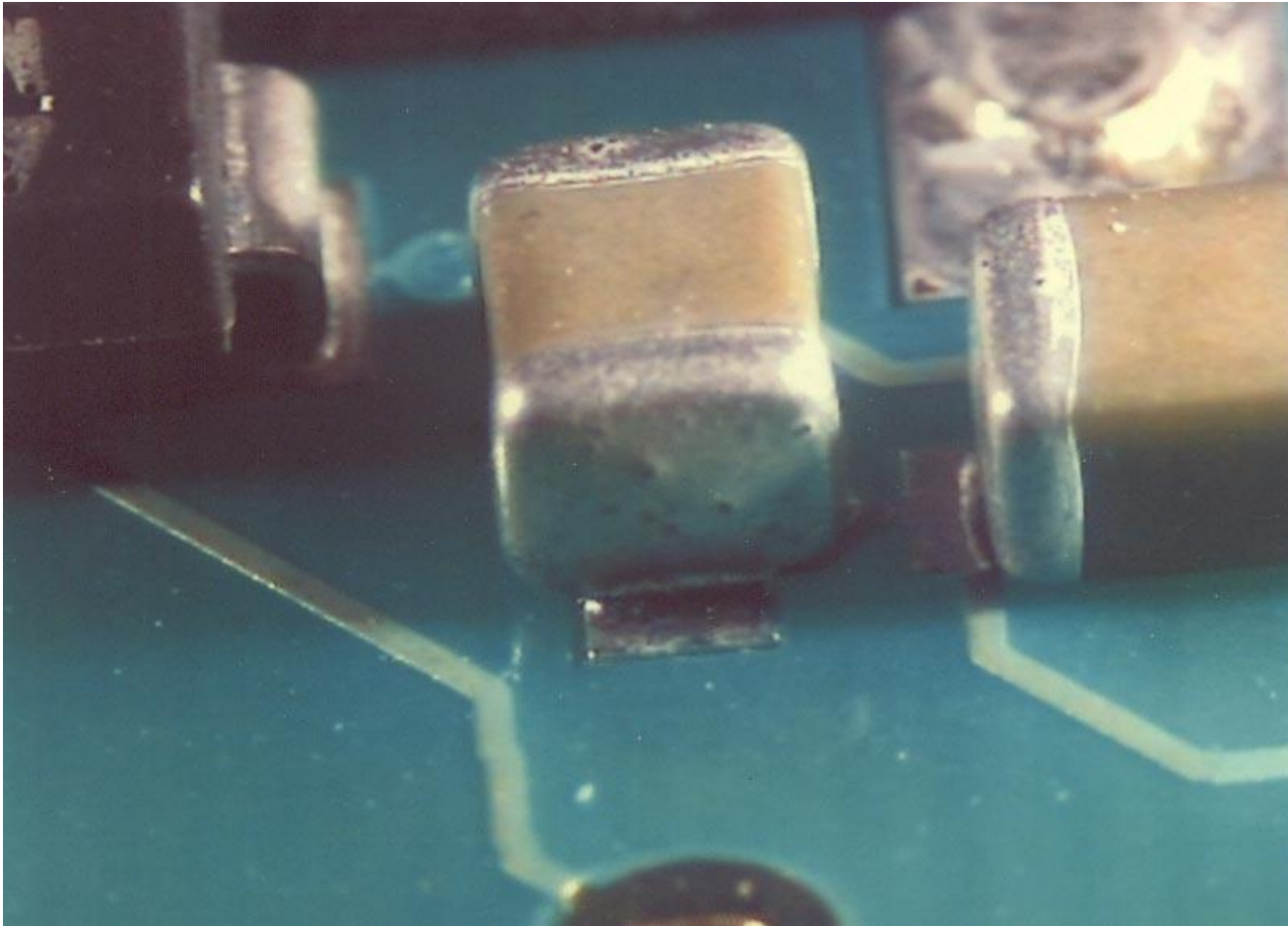
DfM – Land Pattern Design. The bad and good ones.

Reflow: Vias in pads.



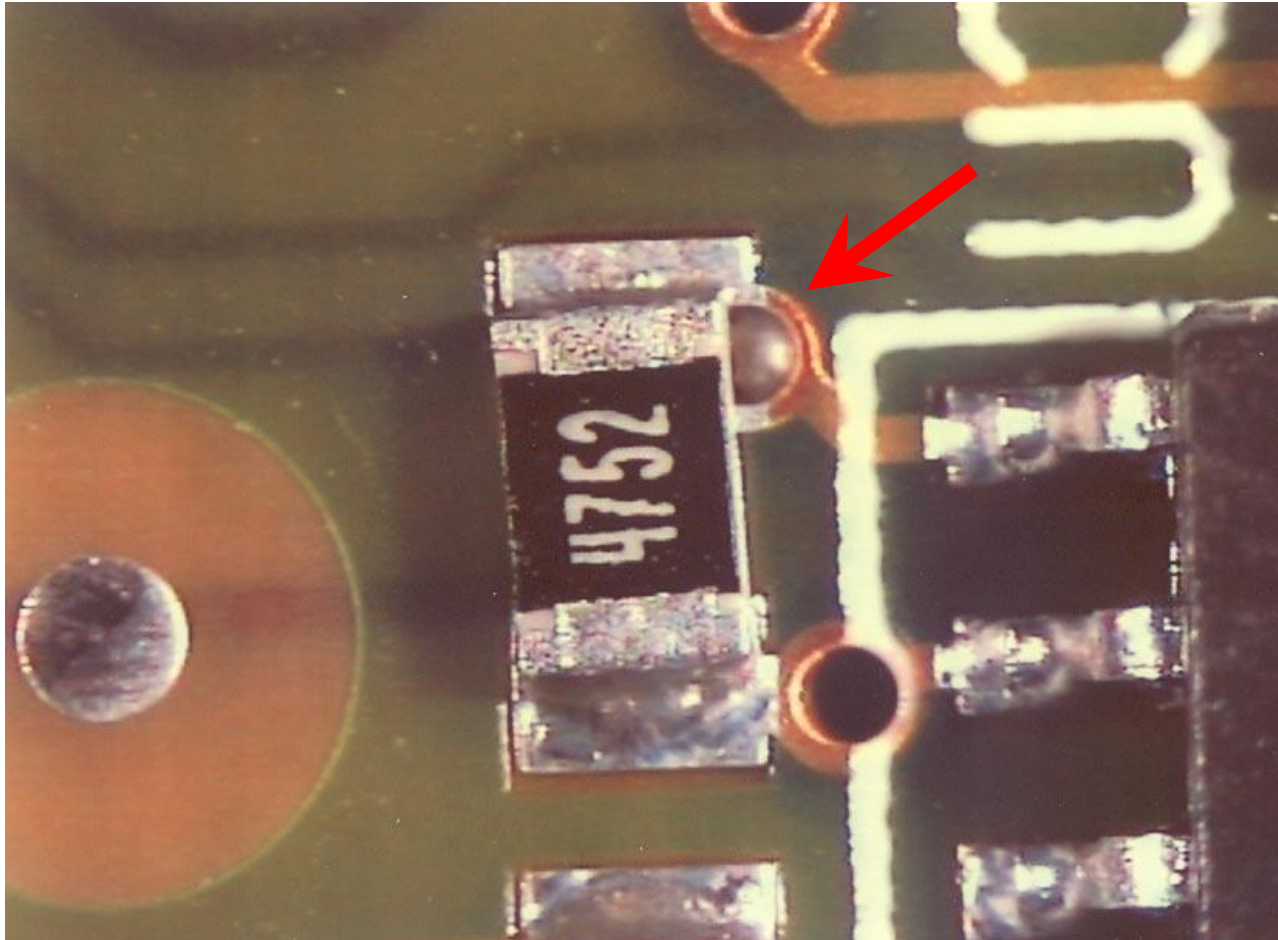
DfM – Land Pattern Design. The bad and good ones.

Reflow: Insufficient pad layout.



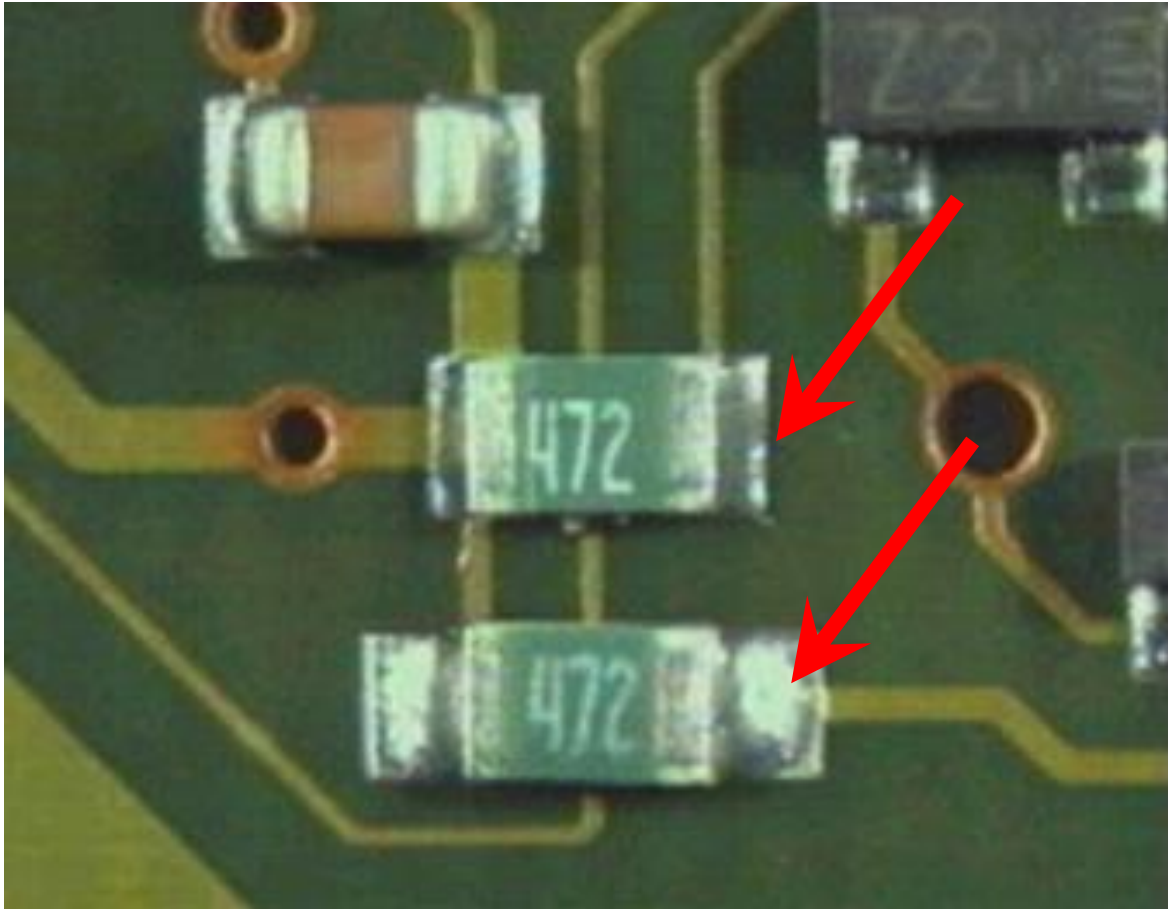
DfM – Land Pattern Design. The bad and good ones.

Reflow: Via in pad.



DfM – Land Pattern Design. The bad and good ones.

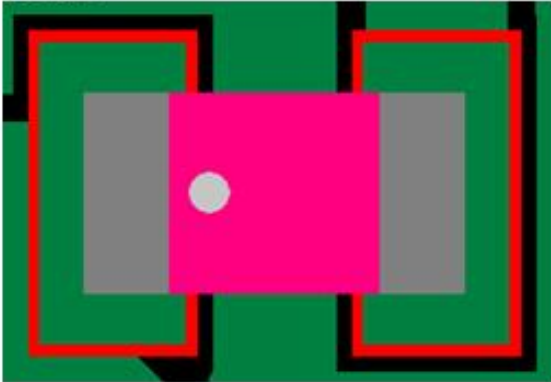
Reflow: Same housing - different pad layout.



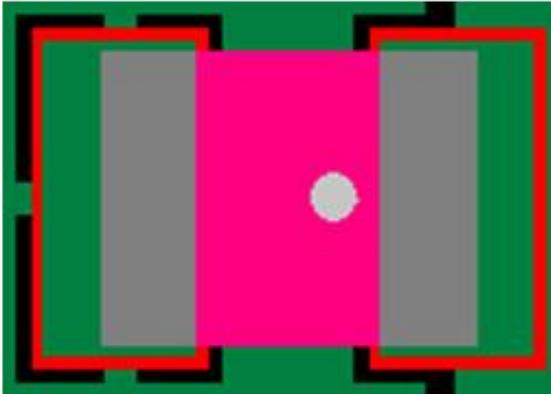
DfM – Land Pattern Design. The bad and good ones.

Reflow: Same pad layout - different housing.

C903:



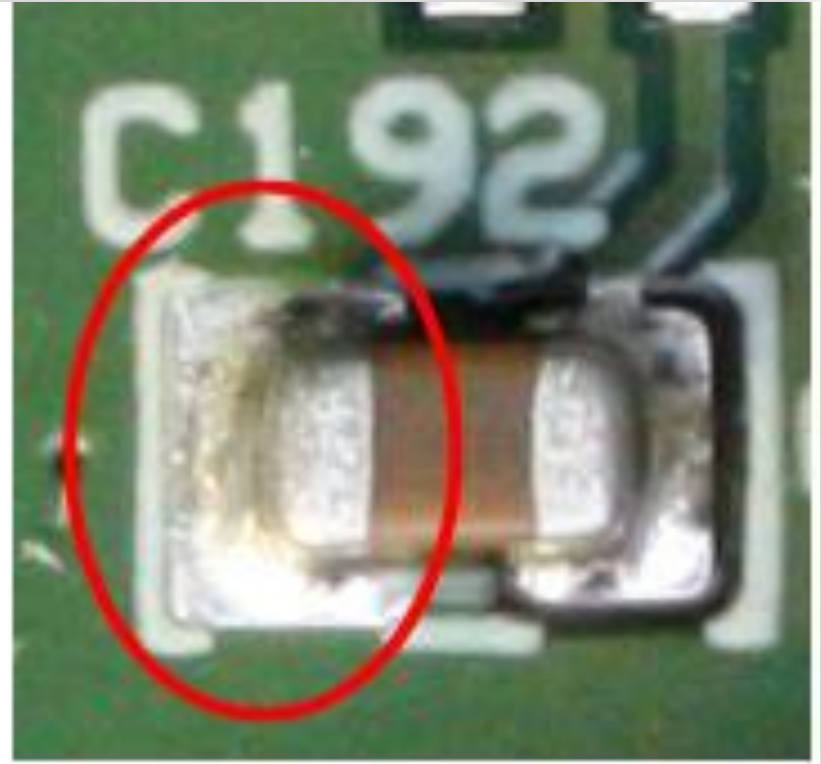
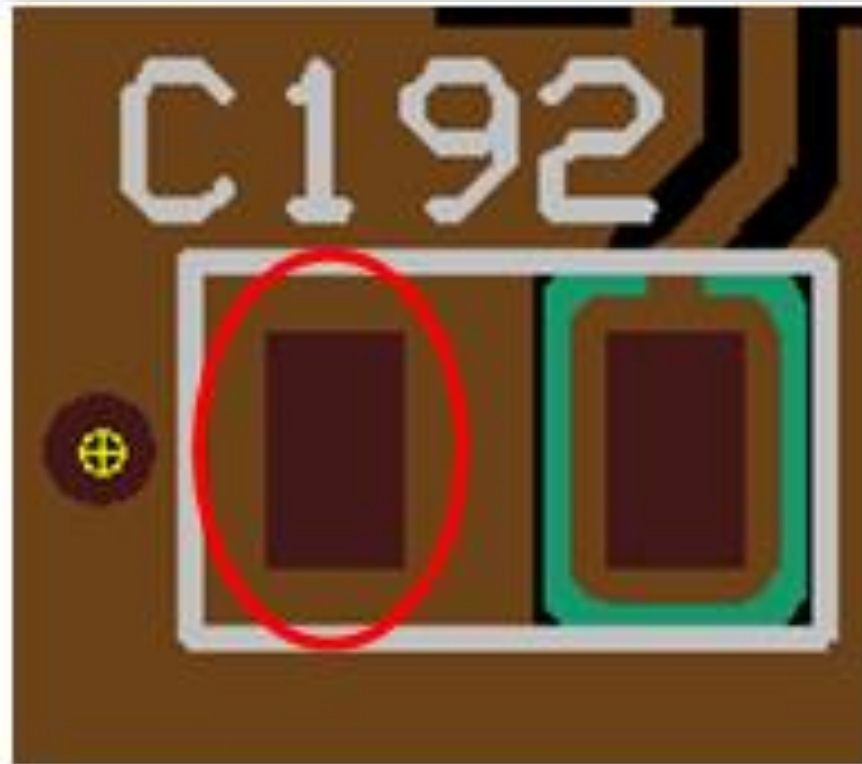
C917:



DfM – Land Pattern Design. The bad and good ones.

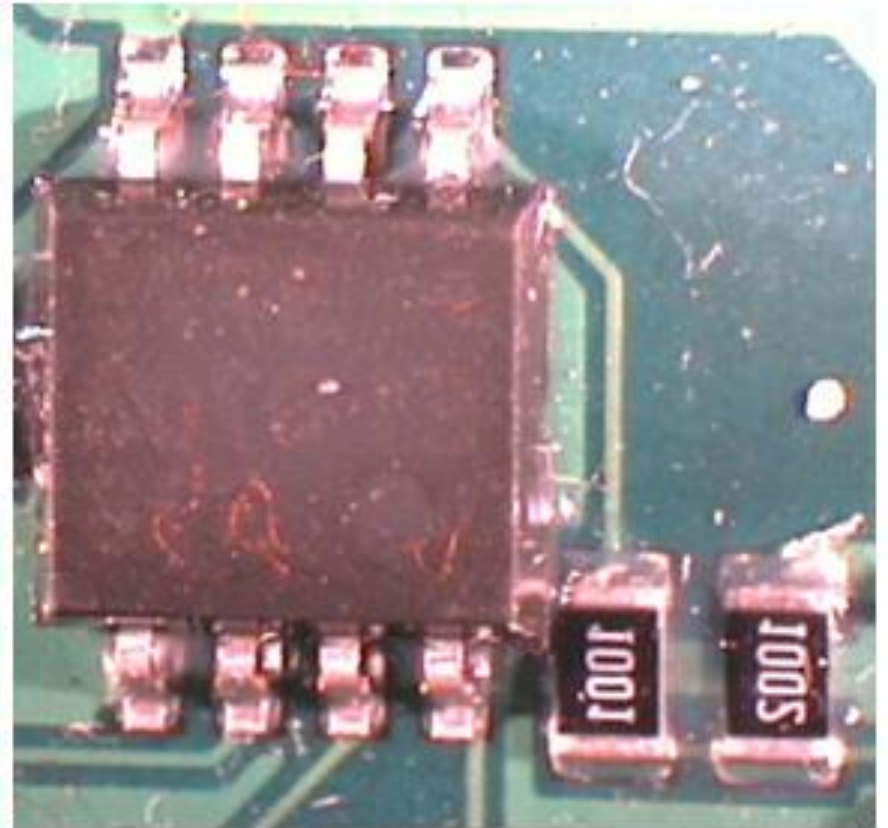
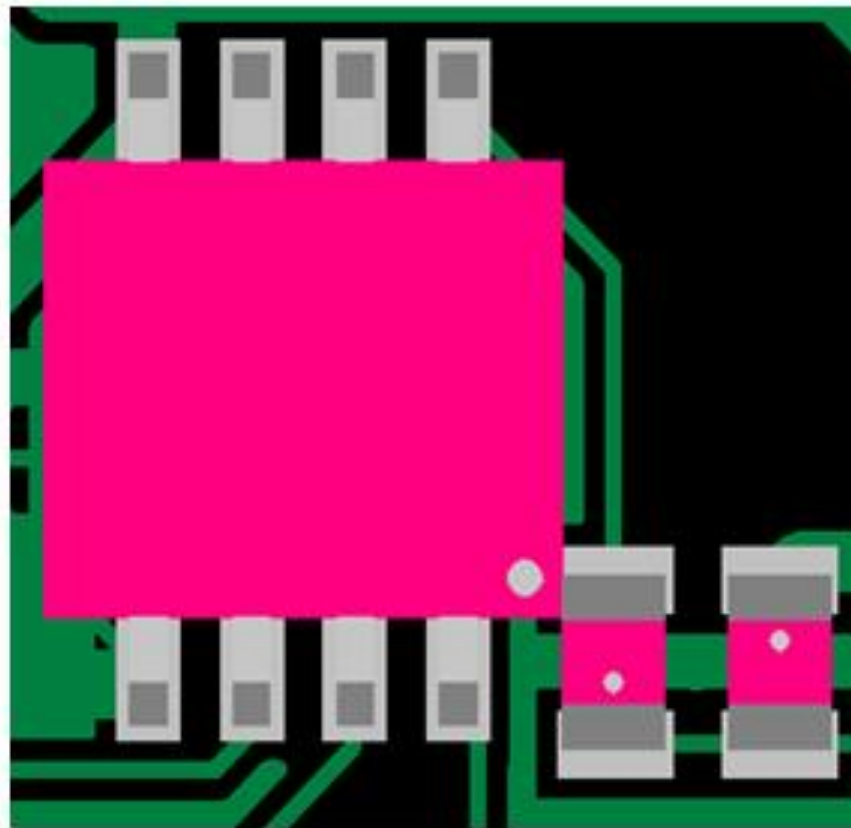
Reflow:

Solder Mask Defined versus Non Solder Mask Defined.



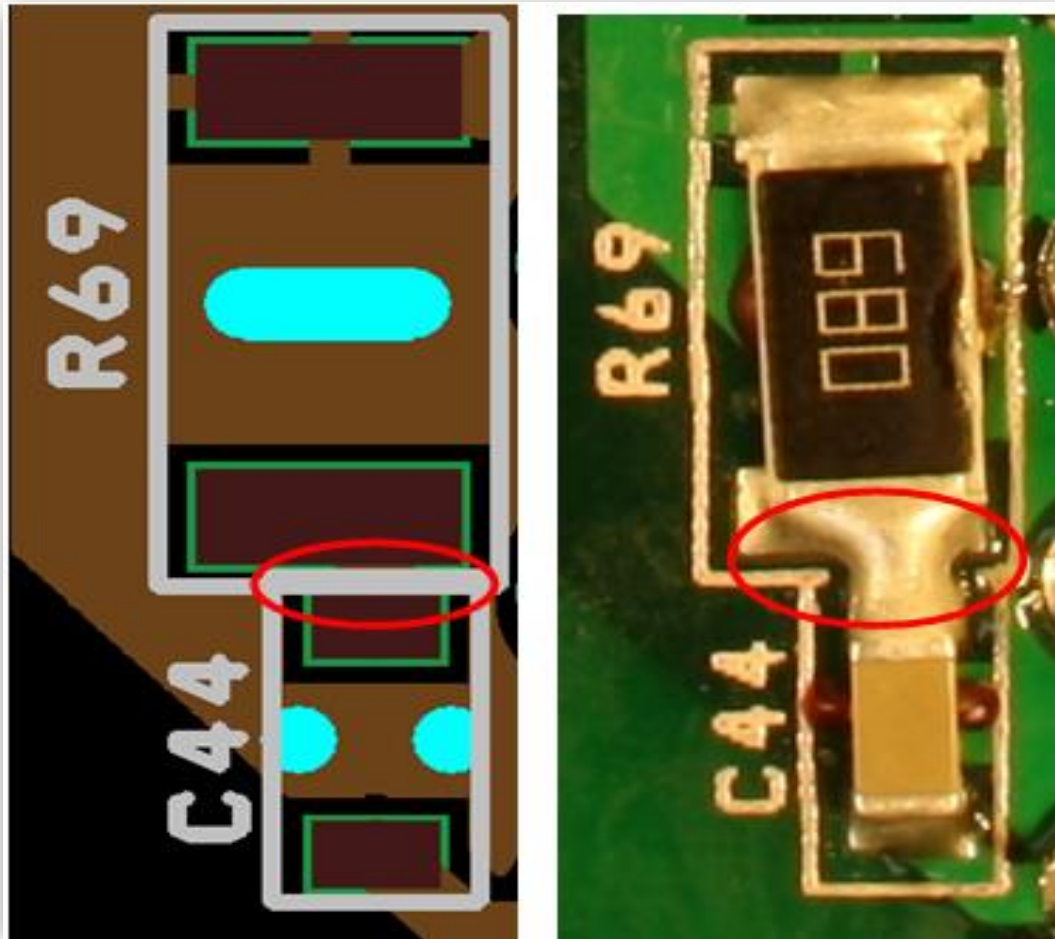
DfM – Land Pattern Design. The bad and good ones.

Reflow: Insufficient component spacing.



DfM – Land Pattern Design. The bad and good ones.

SMT Adhesive: Components too close to each other.



DfM – Land Pattern Design. The bad and good ones.

Thanks for your attention.

Author: Claus E. Nielsen
cnn@bbelectronics.dk