

Importance of Step up stencil

Kaynes technology India private limited, Mysore

1. Purpose:

This document explains the importance of lead thickness termination height while making a stencil design for Surface mount technology.

2. Scope:

This document is limited to the stencil design with respect to the lead/termination height to get sufficient solder paste height while solder paste printing process.

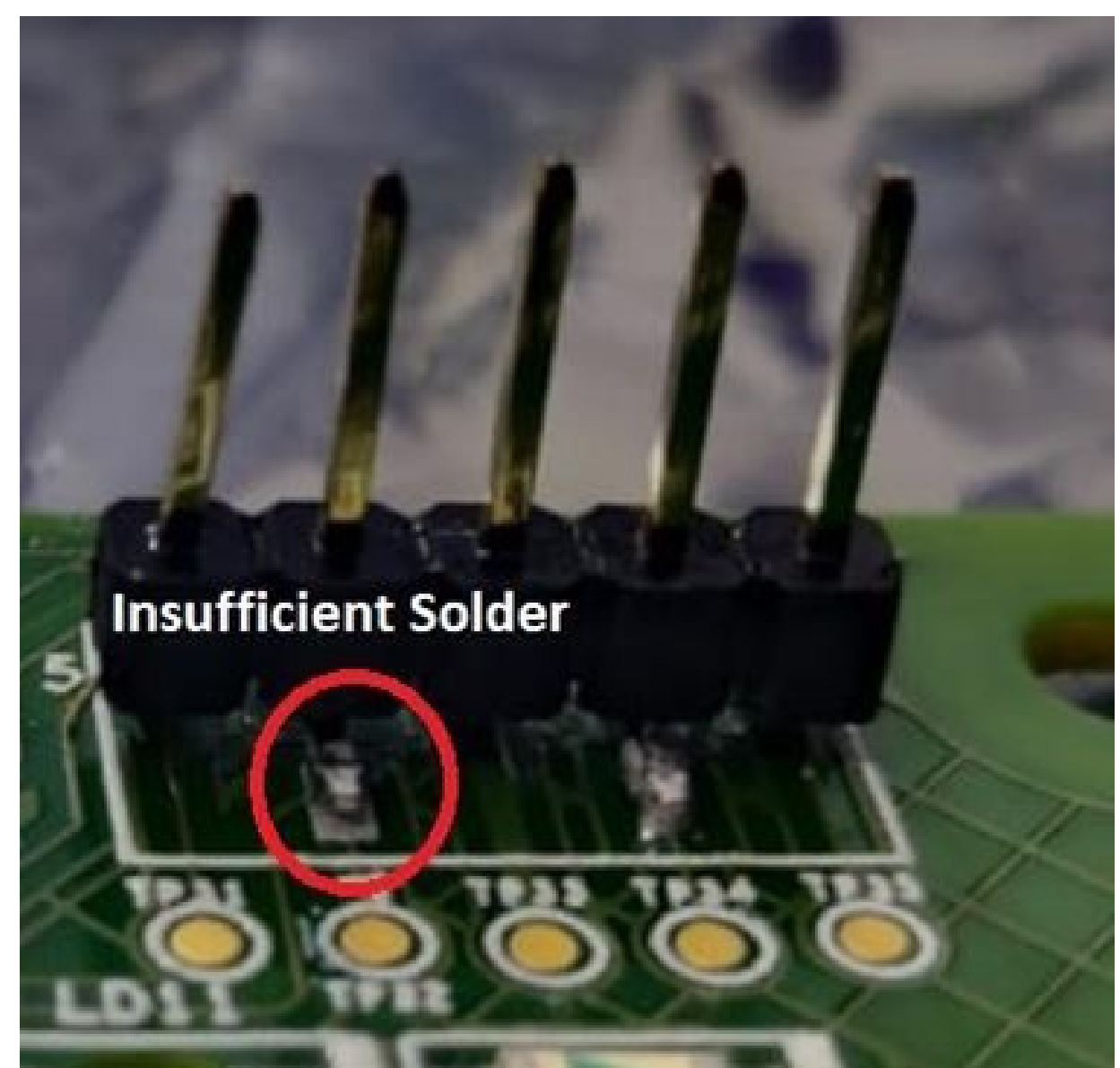
3. Reference:

IPC 7525-Stencil design guidelines • IPC A 610 G-Acceptability of electronic assemblies. • Yield improvement document from Kaynes technology India Private limited.

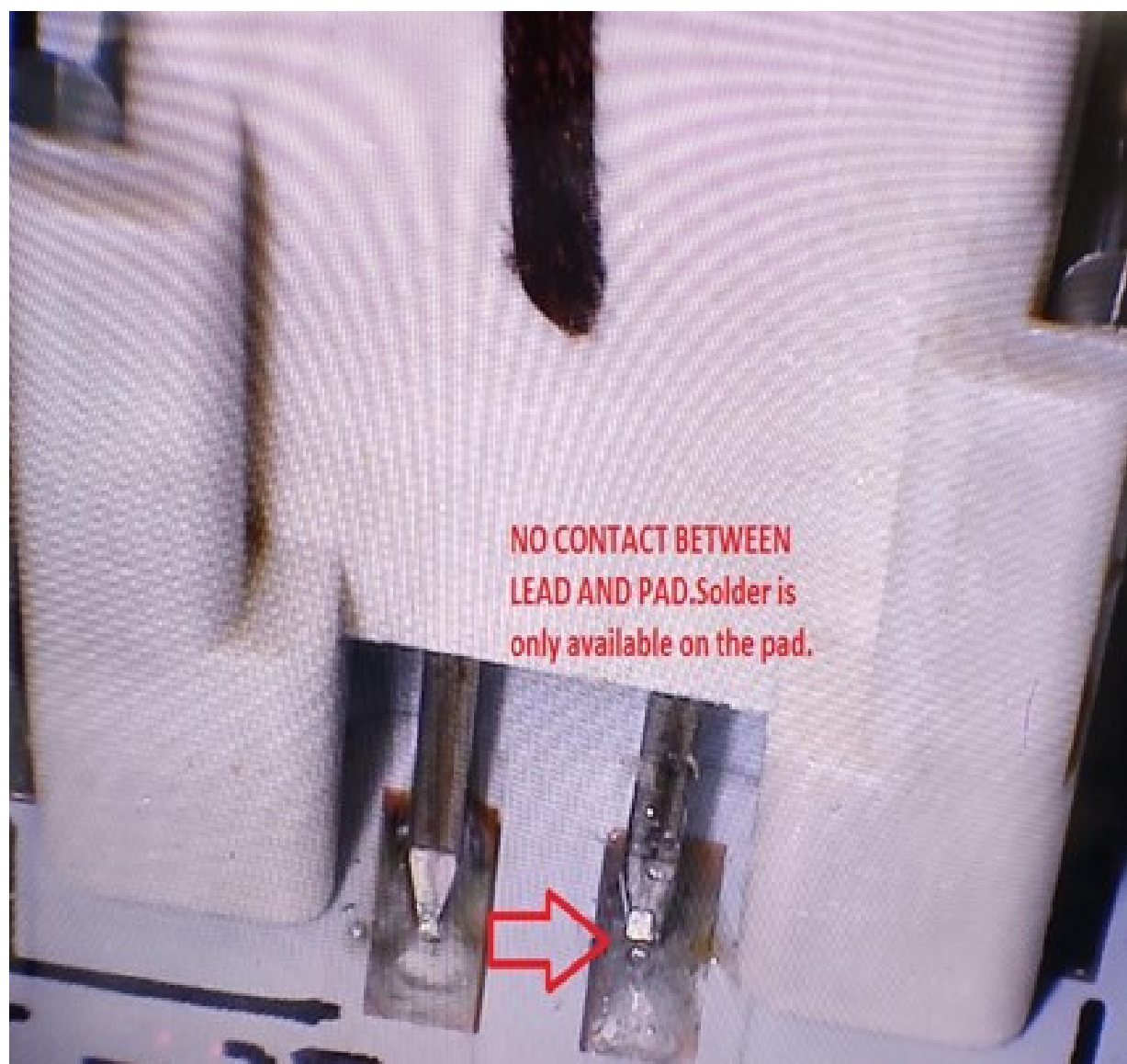
3. Details :

3.1 Description of the problem:

In various occasions, we encountered insufficient solder or insufficient minimum heel fillet in the SMD connector, SMD MOSFET & SMD Capacitor which are having lead thickness /termination height greater than 1.25mm. Also we understood that in few occasion the solder ability issue is because of a random co planarity issue (0.1mm to 0.3mm) in the SMD connector and SMD MOSFET which are having lead thickness /termination height greater than 1.25mm.



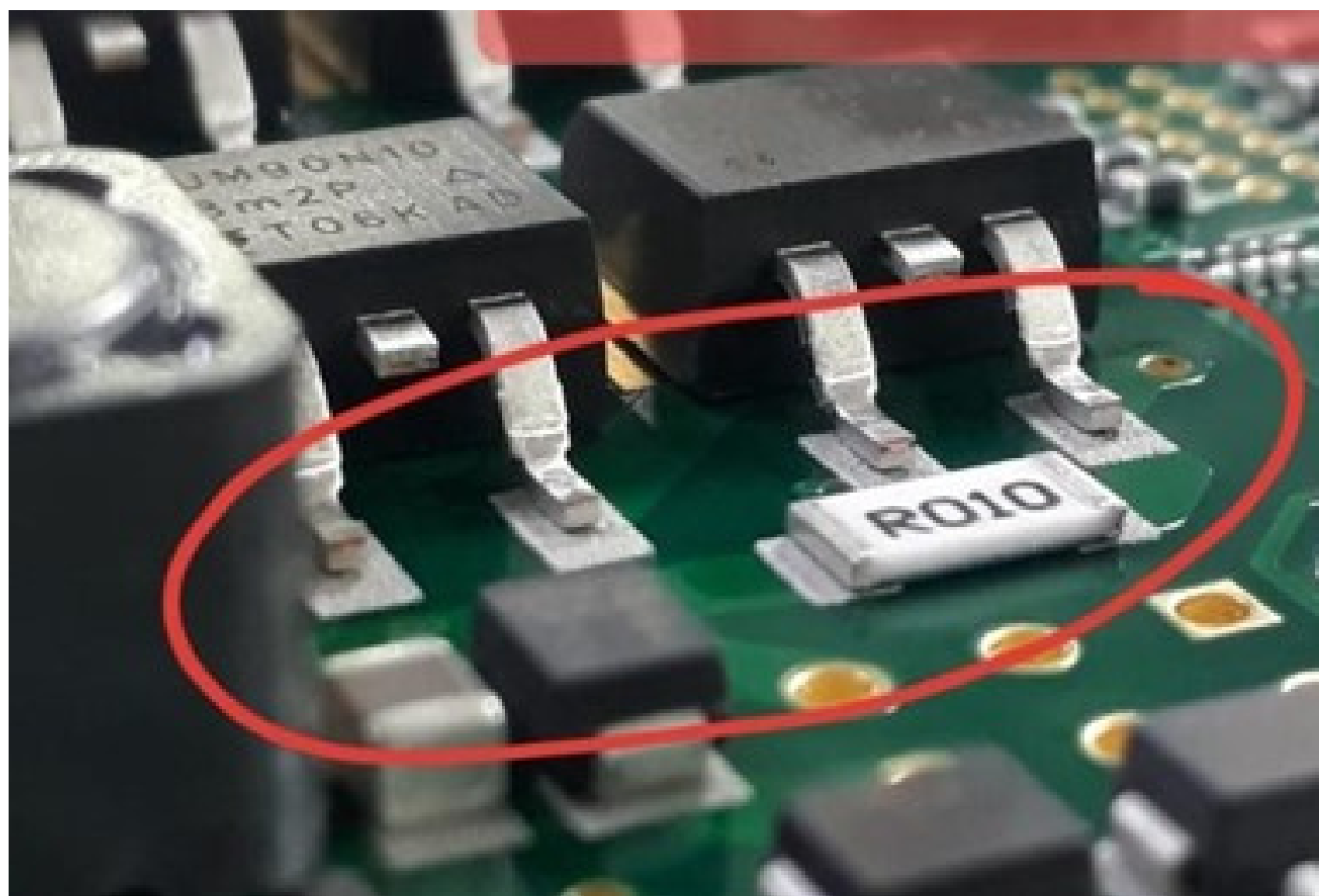
Lead thickness is 1.25mm



**Lead thickness 2 mm
(Insufficient solder thickness).**



**Termination height-3 mm
(Half solder)**



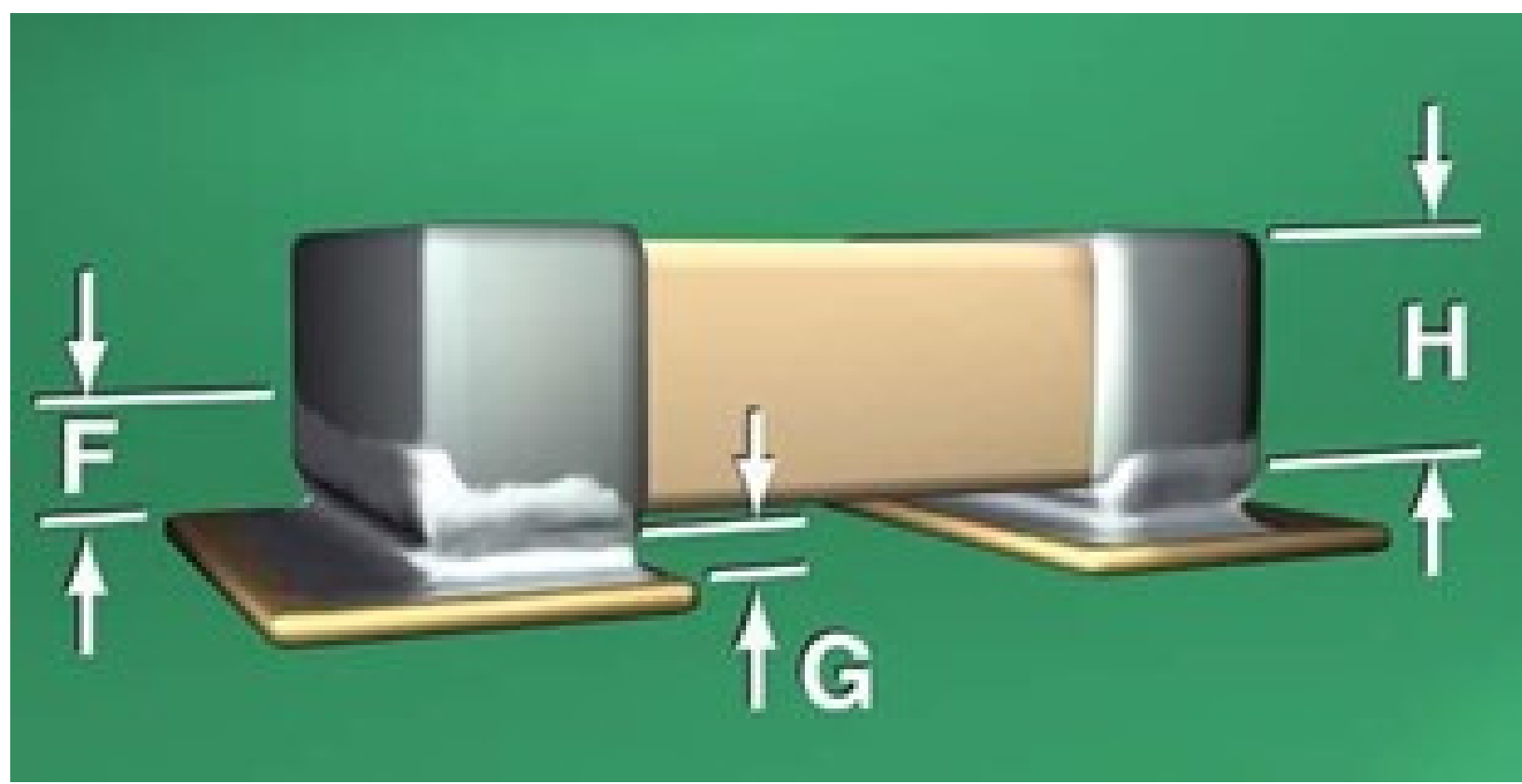
**Lead thickness 1.25mm.
(Paste not touching at least 10% of lead thickness)**

4. Analysis:

The insufficient solder is because insufficient solder paste height. The stencil thickness is 4mil where we will get 102 microns as an average solder paste height.

In the same PCB we are having 0.5mm pitch components also. But the selected stencil thickness was not suitable for the components which are having lead thickness greater than 1.25mm and in another occasion the stencil thickness was not suitable for a component which is having 3mm termination height.

All these components need little more solder paste height to get minimum heel fillet specified in IPC A 610 G as mentioned below. Gull wing lead, For class 3 product, Minimum heel fillet height (F) is equal to solder thickness (G) plus lead thickness (T) at connection side.



5. Possible solution :

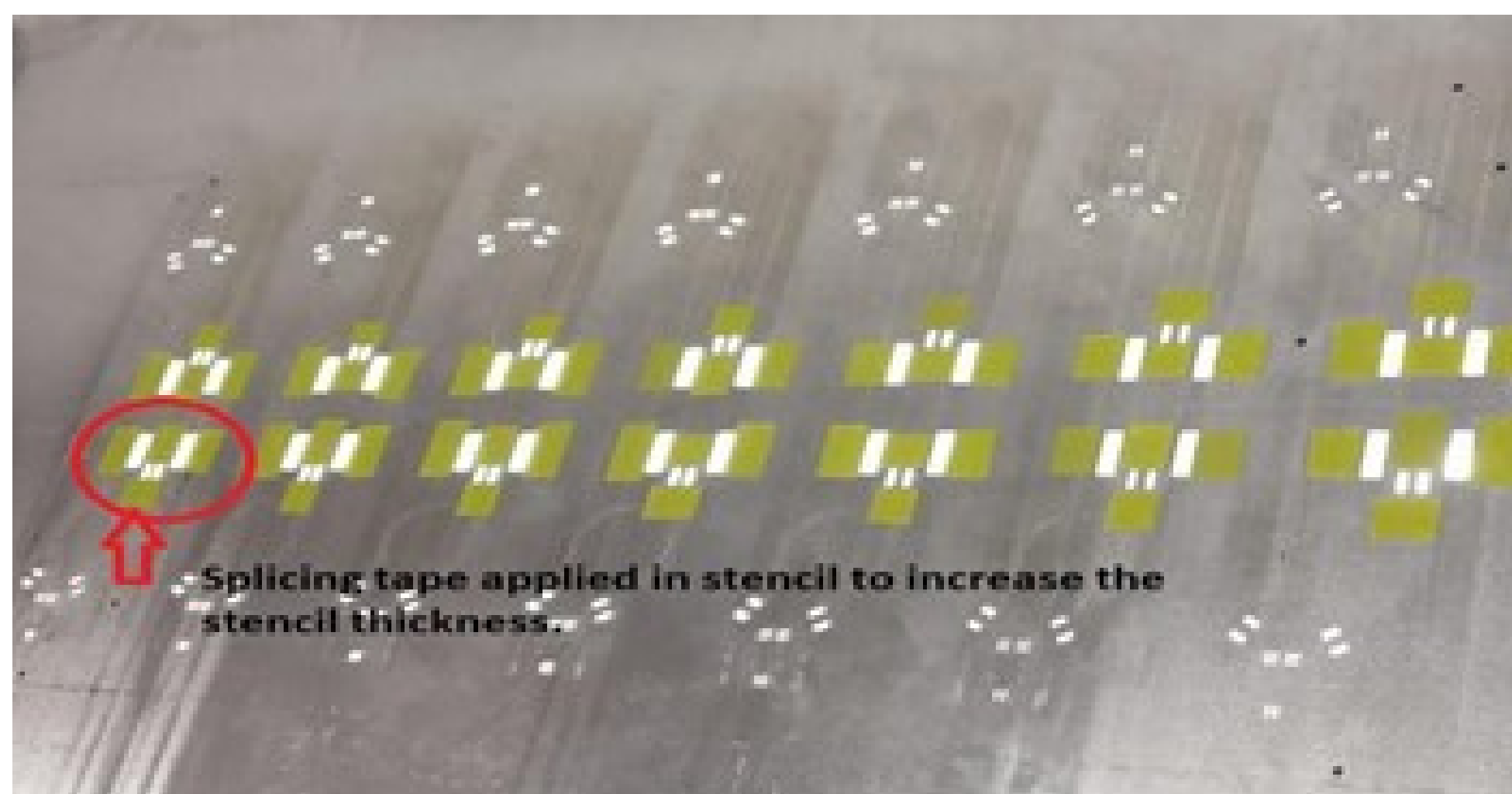
To get sufficient amount of solder thickness and minimum heel fillet, we need to increase the solder paste height.

To increase the solder paste height, we need to adjust the solder paste printing parameters. But, since many other critical components are also involved in the product the adjustment in solder paste printing parameters like squeegee speed and squeegee pressure will not provide good result. Hence, the only way to increase solder paste height in the specific location is to increase the stencil thickness in the specific locations.

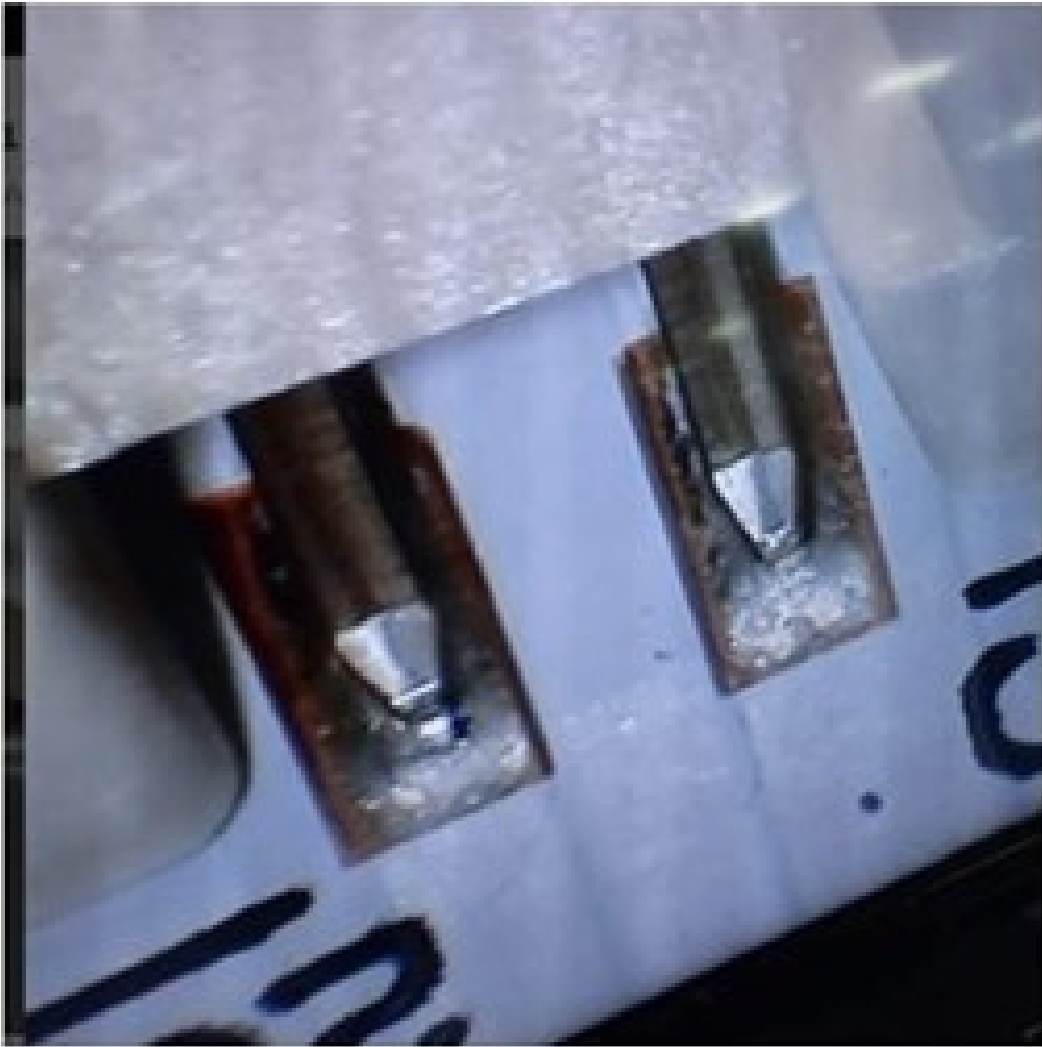
To increase stencil thickness in a specific location, we need to go for a step up stencil. Assume a BGA or a QFN package IC having 0.5mm pitch and in the same board we are having a connector with 1.25mm to 2mm lead thickness then we can go for a 4mil to 6 mil step up stencil. Means the specified connector location will have 6 mil stencil thickness and all other location including the BGA location will have 4 mil stencil thickness.

6. Experiment:

To validate the results, we did an experiment by applying a splicing tape over the stencil in the specified connector and capacitor location and increased the stencil thickness in those areas. Before applying the tape, the solder paste height is 105 microns and after applying the tape the solder paste height is 155 microns and the solder ability was excellent compared to the previous one.



Before



After (Fully Covered)



Based on the above experiments we went for a 4 to 6 mil step up stencil instead of a 4 mil stencil and we achieved zero defects in all the batches produced.

Recommendation:

IPC 7525 Guidelines can clearly specify to look for lead thickness or termination height while defining the type of stencil. Also can recommend step up stencil in that occasion. Like it is specified for co planarity in BGA and through hole edge connectors.

So that many of the EMS industries will get benefit.

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