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Fiducial Marks for Alignment in Solder Printed Flexible Printed Circuits

ABSTRACT

This disclosure describes use of fiducial marks for alignment of solder paste in a solder printing process for manufacture of flexible printed circuits (FPC). Per techniques of this disclosure, two diagonal fiducial marks and a central fiducial mark are placed on a FPC and utilized in the solder printing process for optimal alignment of deposited solder paste. The fiducial marks are placed in a central region of the FPC and have a smaller spacing than conventionally utilized fiducial marks. The central fiducial mark is placed at a location that lies perpendicular to a line connecting the diagonal fiducial marks. Spacing between the fiducial marks is designed to compensate for FPC deformation by limiting the shift in the fiducial marks during deformation of the FPC. During the printing process, the spacing between the FPC and printing stencil is automatically adjusted (scaled) to ensure printing alignment.

KEYWORDS

- Solder printer
- Solder paste
- Solder cream
- Printed circuit board (PCB)
- Alignment mark
- Flexible printed circuit (FPC)
- Surface Mount Technology (SMT)
- SMT carrier

BACKGROUND

Surface-mount technology (SMT) is commonly utilized to attach (mount) electrical components directly onto the surface of a printed circuit board (PCB). Prior to the mounting of components, solder paste is deposited onto the PCB surface by solder printing, which is the process of screen-printing the solder paste using a stencil or foil, or in some cases, jet printing the solder paste onto the PCB surface.

Alignment of the applied solder paste is a key factor in solder printing. Errors in the solder printing process account for a majority of SMT assembly defects. Fiducial marks are alignment marks placed in a field of view of an imaging system and are commonly utilized in SMT solder printers to assist with printing alignment in solder printers.

However, due to deformation of flexible printed circuits (FPC) and in-flatness on the carrier, the performance of current recognition techniques, e.g., that utilize two corner diagonal marks, is limited. In this case, the fiducial spacing is too far leading to large deformation of the whole product. When a printer identifies fiducial marks on the products and stencil, auto-scaling of the spacing of two sides is uneven. In these situations, SMTs have to sort the flex shrinkage to different bins and use different stencils to match different shrinkages.

DESCRIPTION

This disclosure describes use of fiducial marks for alignment of solder paste in a solder printing process for manufacture of flexible printed circuits (FPC). Per techniques of this disclosure, two diagonal fiducial marks and a central fiducial mark are placed on the FPC and are utilized in the solder printing process for alignment of deposited solder paste.

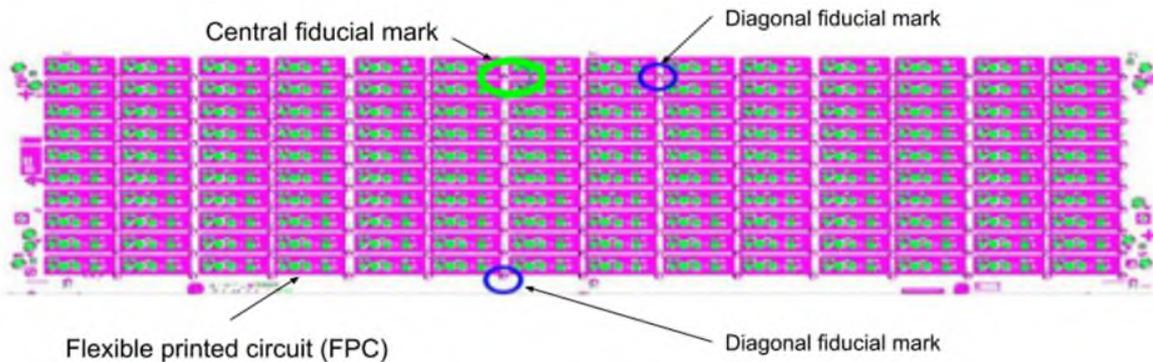


Fig. 1: Three fiducial marks are utilized for optimal alignment of solder paste

Fig. 1 depicts an example use of the fiducial marks in a solder printing process, per techniques of this disclosure. As illustrated in Fig. 1, two diagonal fiducial marks (indicated by blue ovals) and a central fiducial mark (indicated by the green oval) are placed on the FPC. The fiducial marks are placed in a central region of the FPC, and have a smaller spacing than conventionally utilized fiducial marks. The central fiducial mark is placed at a location (e.g., at an edge of the FPC) that lies perpendicular to a line connecting the diagonal fiducial marks.

A lower spacing between the fiducial marks enables compensation of FPC deformation during the printing process by limiting the shift in the fiducial marks during deformation of the FPC. During the printing process, the spacing between the FPC and a printing stencil is automatically adjusted (scaled) to ensure optimal printing alignment based on preserving central symmetry between the FPC and the stencil.

CONCLUSION

This disclosure describes use of fiducial marks for alignment of solder paste in a solder printing process for manufacture of flexible printed circuits (FPC). Per techniques of this disclosure, two diagonal fiducial marks and a central fiducial mark are placed on a FPC and utilized in the solder printing process for optimal alignment of deposited solder paste. The

fiducial marks are placed in a central region of the FPC and have a smaller spacing than conventionally utilized fiducial marks. The central fiducial mark is placed at a location that lies perpendicular to a line connecting the diagonal fiducial marks. Spacing between the fiducial marks is designed to compensate for FPC deformation by limiting the shift in the fiducial marks during deformation of the FPC. During the printing process, the spacing between the FPC and printing stencil is automatically adjusted (scaled) to ensure printing alignment.

REFERENCES

[1] [SMEMA FIDUCIAL MARK STANDARD Standard 3.1](#), accessed on Apr. 29, 2020.