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SIDE STAKING OF A SOP MODULE

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1. GENERAL

1.1. PURPOSE AND SCOPE

This document aims to describe the process of mounted on board SOP modules mechanical reinforcements by side staking. This process is used at 3D PLUS for assembly verifications according to ECSS-ST-70-38 standard.

1.2. APPLICABLE DOCUMENTS

AD1 : Assembly Recommendations - Manual Reflow - SOP packages – Ref: 3300-1300

AD2 : Assembly Recommendations - Automatic Reflow - SOP and BGA packages – Ref: 3300-1301

AD3 : Underfilling of a SOP module – Ref : 3641-0841

AD4: Validation of the mounting of 3D PLUS memory stacks on pcb – Ref : 3300-1303-1

1.3. DOCUMENTS IN REFERENCE

RD1 : Datasheet of 3M 2216 B/A Gray

RD2 : Datasheet of Eccobond 285 with catalyst 11

1.4. DEFINITION

Active areas : Areas of the the module with laser-engraved tracks. Signals pass through these tracks between the module's different levels.

Side staking of a SOP module : resin mechanical reinforcement between non-active areas of the component and the board, avoiding any contact with the module's leads.

2. PROPOSED SOLUTIONS FOR MECHANICAL REINFORCEMENT

2.1. RECOMMENDED SOLUTION (1): UNDERFILLING OF A SOP MODULE

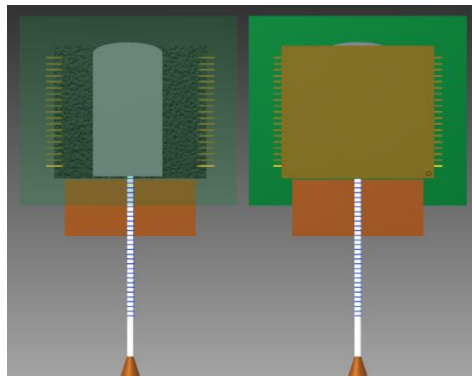
The underfill method is the recommended method for staking of 3D PLUS modules, as described in the document [AD4].

PROS :

- Every active side remains untouched.

CONS :

- Some holes on the board may be required for underfilling, making the routing more complex.
- Need of large access on the module side to dispense the resin under the module.
- Defining the parameters of dispense (such as dip, pressure, time, rest time, pot life) is more difficult.



For further information on the process, please refer to [AD3].

2.2. RECOMMENDED SOLUTION (2): SIDE STAKING WITH 2 SPOTS OF ADHESIVE

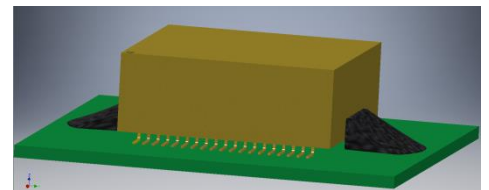
The method for staking with 2 spots of 3M 2216 (or equivalent) seems a good alternative solution : some small acceptable cracks in non-critical areas that might appear at the end of verification procedure should be considered as acceptable.

PROS :

- This solution is the easiest solution to perform, no need of large access around the module

CONS :

- A free area around the module is required at the adhesive spots location.
- Avoiding any overlapping of adhesive onto the laser tracks on the active sides is required.
- Avoiding any adhesive contact with the leads, to guarantee stress relaxation.



This solution is explained in the following chapter.

2.3. IMPORTANT REMARKS BEFORE PROCESSING

2.3.1. FIRST REMARK : NO GLUE ON ACTIVE TRACKS

IMPORTANT NOTE : The glue must not overlap the tracks on active sides of the module.

If every side of the module is laser-engraved, it is recommended to underfill the module (solution 1). Most of 3D PLUS SOP modules have active tracks only on the leads sides.

2.3.2. SECOND REMARK : NO KAPTON TAPE ON THE MODULE

IMPORTANT NOTE : The use of Kapton tape or any other adhesive tape is absolutely forbidden on the module. It might damage the module after removal (see AD1).

2.3.3. THIRD REMARK : NO GLUE ON THE MODULE'S LEADS

IMPORTANT NOTE : At visual inspection, the glue must not touch any leads.

2.3.4. FOURTH REMARK : NO VARNISH ON THE GLUED AREAS

IMPORTANT NOTE : Either it is on the module body or on the board, the glued areas must be free of any varnish in order to ensure good adhesion.

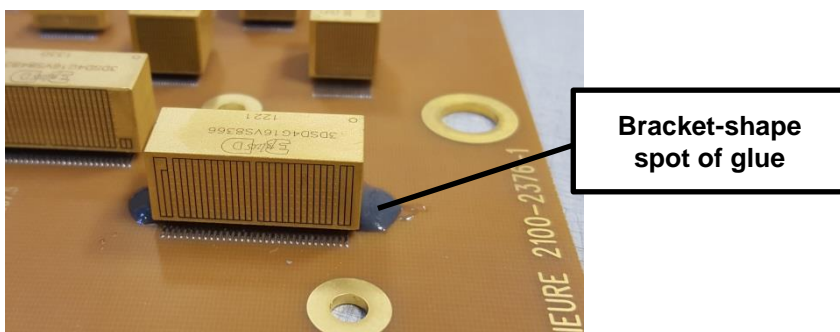
3. MODUS OPERANDI FOR REINFORCEMENT WITH SPOTS OF ADHESIVE (SOLUTION 2)

In this document, it is important to note that before any staking operation, the module is mounted on the board according to the assembly recommendations for automatic reflow [AD1] or [AD2], available on the website.

3.1. OBJECTIVE

The modus operandi explains how to obtain 2 bracket-shape spots of glue, dispensed on the 2 sides of the module.

Note that the spot might flow on less than 1mm below the body.



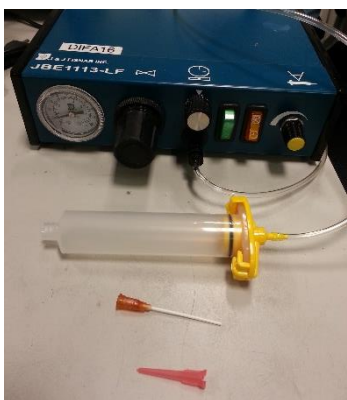
3D PLUS module 3DSR32M32VS8504 with 2 spots of glue

3.2. MATERIALS AND TOOLINGS

Adhesive : 3M 2216 B/A Gray or Hysol Eccobond 285 with catalyst 11

Toolings :

- Wood stick or small metallic micro-spatula



Optional toolings :

- Time/Pressure-controlled dispenser with adjustable timer
- Low volume syringe : 10cc or 30cc for example
- Dipenser dip : flexible dip with a diameter below 1.6mm or conic dip with hole below 1.0mm

3.3. CHOICE OF ADHESIVE

The glue used for mechanical reinforcement is the bi-component thermal epoxy adhesive : 3M 2216 B/A Gray (see **RD1**)

It has been qualified with a wide range of 3D PLUS products.

Eccobond 285 with catalyst 11 seems to be a good alternative, but has only been tested on one 3D PLUS product.

This combination of Eccobond 285 / Catalyst 11 is compatible with space applications in terms of outgassing, and is well adapted for thermo-mechanical behaviors (CTE, temperature range ...) and ease of process (pot life, viscosity, thixotropy...). (see **RD2**) – the thixotropy is an important parameter to avoid any overflow on tracks or on solder balls.

In terms of workability, Eccobond shows higher viscosity than 3M 2216.

3.4. MIXTURE PREPARATION

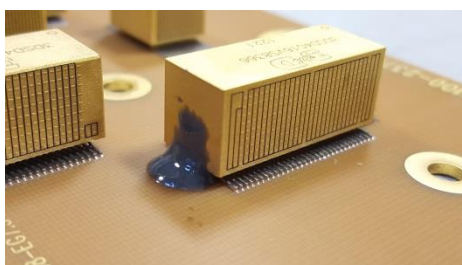
- Respect the recommendation of mix ratio from the manufacturer.
- Outgas the mixture in a vacuum chamber.
- Let the adhesive mixture stand for 45 min. **It is important to wait until the viscosity of the adhesive permits good workability.**

(Following steps are optional)

- Put the mix into a syringe, in order to use the dispenser – avoid bubbles as much as possible when putting the adhesive mix into the syringe.
- Let the adhesive mixture stand in the syringe for 15 mn at least before any use.

3.5. DEFINITION OF AREAS WITH GLUE

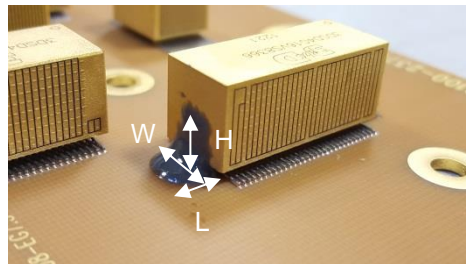
- Visualize the two areas on the module where the glue is to be dispensed :
 - o One area at each laser track free side
 - o Height : a good practice is a minimum of 3 mm on the module or a third of the module body height.



- Check that the corresponding areas on the board where the glue is to be dispensed :
 - o Have no components in these areas.
 - o Are similar and free of varnish.

For instance on 3DSR32M32VS8504, the recommended areas on module sides respect following conditions:

- Areas : 2 glued areas, none of them touching laser tracks
- Width (W): half module's width minimum
- Height (H): more than 3 mm on the module
- Length (L) : $L \geq H$



3.6. MODUS OPERANDI WITH MICRO-SPATULA

- Get a small amount of mixture at the end of the micro-spatula.
- Verify that the viscosity is high enough to avoid overflow on leads or laser tracks.
- Put down this small amount of glue on the board area at the angle between the board and the module's body – take care not to push the glue below the module body to avoid overflow under the module's body. Create a line of glue along the module's edge, until the glue line is longer than half the module's width minimum.
- Repeat these steps to make the spot grow up, until its shape looks like a bracket.
- Cure the glue at low temperature preferentially, according to the manufacturer's datasheet.

3.7. MODUS OPERANDI WITH DISPENSER

- Set up the parameters of the dispenser (time, pressure), according to the size of syringe and dip, in order to get a small amount of mixture at the end of the dip.
- Verify that the viscosity is high enough to avoid overflow on leads or laser tracks.
- Inject a small line of resin on the board at the angle between the board and the module's body, on a length of half the module's width as a minimum – take care not to push the glue below the module's body to avoid overflow under the module's body.
- Repeat these steps to make the spot grow up, until its shape looks like a bracket.
- Cure the glue at low temperature preferentially, according to the manufacturer's datasheet.