

MANUAL ASSEMBLY SOP PACKAGES (SnPb soldering process)

**ONLY APPLICABLE for MODULES GUARANTEED by 3D PLUS for
MANUAL SOLDERING**

**(Stated in 3D PLUS Certificate of Conformity (CoC)
and/or End Item Data Package (EIDP))**

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1. HANDLING

Components manufactured by 3D PLUS must be handled with care. Operators are requested to wear antistatic gloves and antistatic brackets.

The use of tools that could damage sides of components is also prohibited.

Note : Manual handling may increase the risk of mechanical and/or ESD damage

2. STORAGE

2.1. Background

The vapor pressure of moisture inside a non hermetic package increases greatly when the package is exposed to the high temperature of solder reflow. Under certain conditions, this pressure can cause internal delamination of the packaging materials from the die and/or leadframe/substrate, internal cracks that do not extend to the outside of the package, bond damage, wire necking, bond lifting, die lifting, thin film cracking, or cratering beneath the bonds. In the most severe case, the stress can result in external package cracks. This is commonly referred to as the “popcorn” phenomenon because the internal stress causes the package to bulge and then crack with an audible “pop”.

2.2. Recommendations

In order to avoid degradation due to humidity, components must be handled according to the following procedure.

- **Opened moisture barrier bag**

Any duration exposure : Components which have been exposed only to ambient conditions of $\leq 60\%$ RH for any length of time may be adequately dried by high temperature baking at 125°C during 24 hours for re-bake prior to reflow or 125°C during 48 hours for drying prior to dry pack.

Short duration exposure : Previously dry components, which have been exposed only to ambient conditions not exceeding 30°C / 60% RH may be adequately dried by room temperature dessication using a dry pack or a dry cabinet. If dry pack is used and the total dessicant exposure is not great than 30 minutes, the original dessicant may be reused. If partial lots are used, the remaining components must be resealed or placed in safe storage within one hour of bag opening.

- **Un-opened moisture barrier bag**



The calculated duration for dry sealed packed components is 12 months from the pack seal date, when stored in a non-condensing atmospheric environment of $< 40^\circ\text{C}$ and $< 90\%$ RH. Beyond this period, the reconditioning is mandatory; modules shall be backed at 125°C during 48hours.

Note :

High temperature Carriers : Unless otherwise indicated by 3D PLUS, modules shipped in high temperature trays can be baked in the trays at 125°C (see annex 1).

Low temperature carriers : Modules shipped in low temperature carriers (e.g. plastic box, low temperature trays, tape and reel,...) may not be baked in the carriers at any temperature higher than 40°C. If a higher bake temperature is required, modules must be removed from the low temperature carriers to thermally safe carriers, baked, and returned to the low temperature carriers (see annex 1).

Labelling : A specific label that details the recommendations is stamped on the sealed bag, see below.

	ELECTROSTATIC SENSITIVE DEVICES DO NOT OPEN OR HANDLE EXCEPT AT A STATIC FREE WORKSTATION		CAUTION This bag contains MOISTURE-SENSITIVE DEVICES
WARNING - HAND SOLDERING DEVICES -			
<ol style="list-style-type: none">1. Storage in sealed bag : 12 months <40°C and <90% relative humidity (RH)2. Peak package body temperature $\leq 183^{\circ}\text{C}$3. Before mounting, devices must be baked for 24h at $125 \pm 5^{\circ}\text{C}$,			
Note : device container cannot be subjected to temperature $> 50^{\circ}\text{C}$, so devices must be baked on another tray			
Bag seal date : _____			
Note : baking conditions and body temperature defined by application note 3300-1300			

3. ASSEMBLY RECOMMENDATIONS

After the sealed bag is opened, the maximum duration is 6 hours under environmental conditions $\leq 30^{\circ}\text{C}$ and $< 60\% \text{ RH}$.

The use of scotch tape (e.g. Kapton) on the side of the module during assembly is prohibited.

A wide range of tin-lead solder paste is available in the industry. The solder alloy selected should be non-hazardous, mechanically reliable, thermal fatigue resistant, good wetting, and must be compatible with a variety of lead-bearing and surface coatings.

3D PLUS recommends solder paste Sn(63)Pb(37) with melting point at $+183^{\circ}\text{C}$ (eutectic point) or Sn(62)Pb(36)Ag(2) with melting point at $+179^{\circ}\text{C}$.

3D PLUS recommends the using of leads tinning as specified on annex 2.

The temperature of soldering equipment must be defined so that the temperature, measured on body module, is below 215°C . If that temperature exceeds the time-temperature limitations beyond the scope of this specification may be required; 3D PLUS should be consulted.

The soldering iron temperature recommended is $+250^{\circ}\text{C} \sim +280^{\circ}\text{C}$ with a maximum of 4s. per lead at this temperature.

Module cleaning after manual assembly must be done only with de-ionizer water and/or Isopropyl Alcohol. For other product, please consult 3D-PLUS.

Note :

The high soldering temperature requires that the soldering iron must remain clean and coated with the solder alloy. The high soldering temperatures can result in the soldering iron tip becoming oxidized if not cleaned and coated. The soldering performance can be improved by more active solder flux and soldering in Nitrogen atmosphere. The technicians performing the operation must be properly trained in soldering operation.

4. MODULE REWORK RECOMMENDATIONS

The rework process for SOP modules typically consists of the following steps:

- Thermal pre heating depending on board structure
- Removal of defective component
- Site re-dressing
- Solder replenishment or flux application
- New component placement
- Manual reflow soldering
- Post reflow inspection

4.1. Module removal

- Solder from each lead shall be removed with a specific brush to remove solder,
- Soldering iron temperature is +250°C to +280°C maximum,
- Module has to be carefully removed from the board,
- Each lead is individually cleaned with the soldering iron and/or the specific wick to remove solder.

For these steps the flux recommended is: Flux Multicore 6381-35 /Solvant : Isopropyl Alcohol.

4.2. Module replacement

After cleaning of the pads and the leads of the removed module, it may be re-soldered on the board in line with the Reflow Guidelines (see paragraph 3 of this document).

The modules being reworked should be baked prior to reflow if they have been exposed to moisture (see paragraph 2 of this document). The baking parameters depend on the moisture sensitivity level of the package.

5. MODULE RE-INFORCEMENT RECOMMENDATION

To guarantee a high level of mechanical requirements (vibrations, accelerations, and shocks), modules may be reinforced with epoxy adhesive product. 3D-PLUS recommends the use of 3M 2216B/A Gray Scotch-Weld™ epoxy adhesive.

6. BOARD COATING RECOMMENDATION

Upon customer request, modules may be delivered coated with MAPSIL 213B or ARATHANE 5750. In that case, customers must check the compatibility of module coating products with these products.

7. ANNEX 1 : Carriers Description

7.1. High temperature carrier description



Plastic tray for modules



Maximum temperature 150°C for Baking

7.2. Low temperature carrier description



Plastic box for modules



Low temperature plastic tray

8. ANNEX 2 : Leads tinning – SOP packages

Prior to De-golding, parts must be bake as mentioned in assembly recommendation just before lead-tinning process.

8.1. De-Golding

- Pre-heating the modules at 125 °C for 2hrs (the part must be warm during following steps),
- Fluxing of the leads by dipping in a flux bath or with the use of a brush,

Flux = Multicore Liquid flux ref : 6381-35 (35% Rosin based flux – J-STD-004 type A).

- Dipping the leads for 2 seconds per row inside a solder bath of 62Sn36Pb2Ag (or 63Sn37Pb) heated at 220 - 230 °C.

Large bath has to be used (at least 20cl or 200cc) in order to maintain a relatively low concentration of gold after the treatment of several hundreds of modules. The dipping is made one row by one row. The epoxy body of the module must not be in contact with the liquid solder bath.

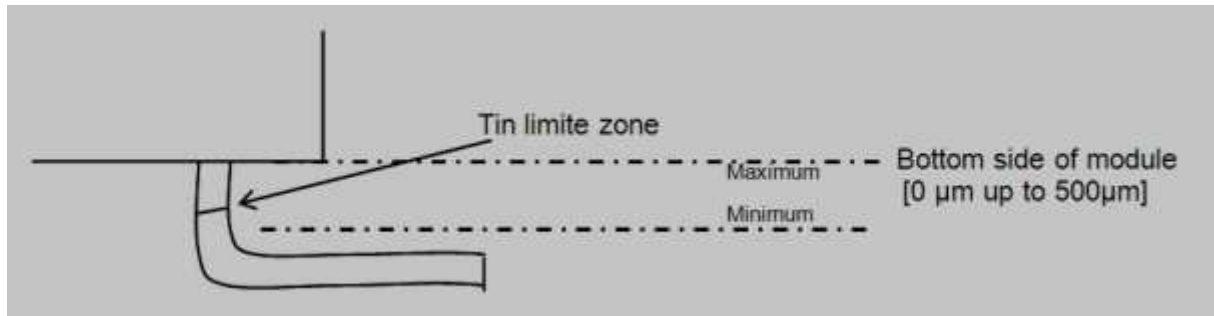
- 3D PLUS recommends to immediately proceed to tinning (see step b), however a storage for a short time (1...2 minutes at 125°C on a heating plate) before pre-tinning is possible.

8.2. Tinning

- Fluxing of the leads,
- Dipping the leads for 2 seconds per row inside a solder bath of 62Sn36Pb2Ag (or 63Sn37Pb) heated at 220 - 230 °C. The dipping is made row by row within a maximum time of 2 seconds per row. The epoxy body of the module must not be in contact with the upper surface of the liquid bath,
- Cleaning the leads with Isopropyl alcohol

8.3. Tinned lead geometry

The lead will be tinned in accordance with the following drawing : the tin limit must be within 0µm and 500µm from the bottom of the stack :



8.4. Visual inspection criteria

- No traces (tooling marks, scratches...) on the module sides,
- No « solder splash » on the module sides,
- No tin on the bottom of the module,
- No damaged leads,
- No contaminants on the module,
- Respect of the tin limit (see point c) above),
- No flux traces on the leads,
- Tin aspect must be smooth and bright.