

MEMO

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To	ESA PA Managers, ESA Approved assembly lines	Copy	TEC-MSP, TEC-QQ

Subject: Guideline for the review of Approval status of electronics assembly configurations during MPCB

One of the purposes of the Materials and Processes Control Board (MPCB) is to ensure that the assembly of electronic components on Printed Circuit Board (PCB) substrates is in compliance with the ECSS-Q-ST-70-07, 08, 28 and 38. The following memo provides guidelines for the assessment of the assembly configurations during MPCBs.

It is under the responsibility of the prime contractor to ensure that the information is available for the MPCB.

It is recalled that assembly experts from the customer supply chain shall participate to the MPCB. The SOC issued by the supplier shall be reviewed during the meeting to determine the partial or non-compliance with the PA requirements.

1. [To determine the PCB technology according to ECSS-Q-ST-70-60C requirement 5.11.b.](#)
2. [To determine the substrate trademark and the used conformal coating.](#)
3. Compliance matrix of EEE parts packages assembled on the flight hardware with its associated ESA Approval status and reference to Summary tables (see Annex 1 for template).
 - The list of all packages, including devices assembled through holes, shall be extracted from the last issue of the DCL. An RFA shall be issued for all packages for which the assembly is not covered by ESA approved Summary tables or by similarity rules in compliance with the ECSS-Q-ST-70-38. RFA shall be issued for the meeting.
 - All packages for which an ESA Approved assembly status has been granted shall have the indication of the Summary Table reference.
 - All packages that are covered by similarity with other packages, in compliance with the ECSS-Q-ST-70-38C Rev 1 rules, shall have the indication of the similarity rules and associated ESA Approved Summary Table reference.
 - When no ESA Approval has been granted yet, reference to the assembly verification programme and report shall be identified in the table with associated RFA reference.

- When no assembly verification has yet been performed then an RFA shall be issued with associated verification programme to be reviewed.
 - When verification by similarity is considered, then detailed justification shall be provided to ensure compliance with similarity rules. For FP the lead forming shall be identical as well as the pitch, lead section and materials. Special care shall be taken that the lead forming is exactly the same (in case lead forming setting is made using the stand off between the bottom of the component and the PCB then thickness of the device may have an impact). A thinner package cannot be used as justification by similarity for a thicker package.
 - When sensitive devices (see ESA-TECQTM-MO-1143 latest issue) are assembled on the board, confirmation that 5 parts were assembled and microsectioned for verification purposes shall be provided. If not, the parts shall be added in a new verification programme and an RFA shall be issued.
4. Confirmation shall be provided, that the applicable PID issue is the one having been reviewed and approved by ESA. If this is not the case, then all changes shall be identified including also new issues of assembly procedures.
 5. To confirm that the Audit has been performed in compliance with the ECSS-Q-ST-70-38C Rev 1. An Audit shall be performed every 4 years or for a change of process that request a delta verification.
 6. Confirmation, based on project thermal analysis, that the temperature of the solder on the PCB during mission using design TRP as input is within $-55/+85^{\circ}\text{C}$ in compliance with the ECSS-Q-ST-70-08 and 38. An RFA shall be issued in case the temperature is outside this temperature range. It is the responsibility of the prime to provide the TRP input to allow the supplier to make his calculation.
 7. Confirmation based on project thermal analysis, that the number of thermal cycles made for the verification of the assembly is sufficient to cover the mission with a minimum margin of 2 when microsection is performed, margin of 3 when electrical monitoring of min 32 devices is performed, and margin of 6 for electrical monitoring with limited number of parts (e.g. Area array devices). The calculation shall be performed using the Norris Landzberg model ($AF=[\Delta T_1/\Delta T_f]^{1.9} (f_f/f_i)^{1/3} \exp (1414\{(1/T_{max_f})-(1/T_{max_i})\})$).
 8. Confirmation, based on project vibration requirements, that the vibration tests performed for the claimed assembly verification covers the application. An RFA shall be issued in case the vibration levels do not cover the application.
 9. To confirm, when applicable, that parts incoming inspection is in compliance with the ECSS-Q-ST-60C rev 2.
 10. To provide confirmation that none of the EEE parts are procured with pure tin. In case pure tin finish parts are procured, evidence of re-processing verification shall be provided with evidence that the parts have not been damaged in compliance with the ECSS-Q-ST-60-13. Microsections to demonstrate that all pure tin has been alloyed shall be provided.
 11. To provide confirmation that PCB design is in compliance with the ECSS-Q-ST-70-12 and compliant to PCB manufacturer PID. Otherwise to provide RFA.
 12. To provide the certification status of the solder operators and inspectors.

13. To confirm absence of contact between gold and aluminium also if surface treatments such as Alodine or alternative is present. Such contact concerns usually the attachment of the connectors on the aluminium case. In case of contact an RFD shall be issued.
14. To provide an overview of the schedule for QM and PFM or FM MRR dates.
15. To provide, when available, photos of representative assembled boards.
16. When MPCB concerns new rebuilt to provide the list of the assembly NCRs that were issued and associated preventive, corrective actions.
17. To identify any solderless assembly. An RFA shall be issued with proposed test plan in compliance with the ESA-TECMSP-MO-006249.
18. To identify the use of sculptured flex. Proposed test plan to demonstrate reliability of the assembly shall be provided in a RFA.
19. To identify presence of harness within the unit and the associated harness specification used.
20. To confirm that the bake out of the parts is in compliance with the MSL class (Moisture sensitive levels) identified in the J-STD-033. It is recommended by ESA to have all tantalum capacitors baked out prior assembly also when no recommendation are provided.
21. To confirm that PADS are generated for all in house manufactured magnetic parts (e.g. inductor, transformers,...).
22. To confirm that in case the PCB is not with tin lead finish or thick gold, a dedicated Assembly verification is proposed (See ESA-TECQTM-1892).

Annex 1: Example of expected information to be provided in the components/ Assembly Approval status compliance matrix

Component or package family	Manufacturer	For leaded parts: Pitch, thickness and width of leads	Reflow assembly method (when applicable)	Hand soldering
Co805 T2	Y	NA	Reference to ESA Approval or verification report	Reference to ESA Approval or Verification report
C1825 T2	Y	NA	By similarity with Co805 T2 and C2225 T2 from Y. Reference to ESA Approval or verification report	By similarity with Co805 T2 and C2225 T2 from Y. Reference to ESA Approval or verification report
C2225 T2	Y	NA	Reference to ESA Approval or verification report	Reference to ESA Approval or verification report
C1210 T1	X	NA	Reference to ESA Approval or verification report	Reference to ESA Approval or verification report
CDFP4-F16	Y	1.27mm pitch 0.10-0.18 mm thick	By similarity with CDFP4-F20	By similarity with CDFP4-F20

		0.38-0.48 mm width	(Reference to ESA Approval or verification report Package characteristic: 1.27 mm pitch 0.10-0.18 mm thick 0.38-0.56 mm width. Same stacking and bonding configuration)	(Reference to ESA Approval or verification report Package characteristic: 1.27 mm pitch 0.10-0.18 mm thick 0.38-0.56 mm width. Same stacking and bonding configuration)
CDFP4-F20	Y	1.27mm pitch 0.10-0.18 mm thick 0.38-0.48 mm width	Reference to ESA Approval or verification report Package characteristic: 1.27 mm pitch 0.10-0.18 mm thick 0.38-0.56 mm width	Reference to ESA Approval or verification report Package characteristic: 1.27 mm pitch 0.10-0.18 mm thick 0.38-0.56 mm width
CQFP352	Z	0.5 mm pitch 0.10-0.20 mm thick 0.18-0.25 mm width		Not yet approved. RFA references

The following shall be considered for the evaluation:

- The lead thickness and width may be different due to the presence or absence of the finish.

Examples

- Lead width of 0.38 -0.48 mm is often without plating whilst with plating it would be 0.38-0.56 mm.
- Lead Thickness of 0.10-0.18 mm is often without plating whilst with plating it would be 0.10-0.23 mm.
- Two types of bottom brazed packages are possible and shall be considered as different family: Straight bottom brazed package and non-straight brazed package.
- Some packages can be delivered as CDFP or GDFP under the same procurement identification. It is under the responsibility of the supplier to ensure that the part procured is in compliance with the declared approval status.