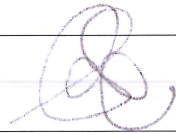
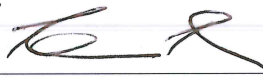



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# MEMO

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<b>From</b>	Stan Heltzel TEC-MSP 	<b>Visa</b>	T Rohr 
<b>To</b>	Users of Thermount 85NT PCB technology for ESA programmes		
<b>Copy</b>	PCB/SMT WG		

**Subject: Thermount 85NT PCBs**

## 1 SCOPE

The present memo provides updated recommendations for the use of 85NT PCB technology. It supersedes paragraph A4 from memo QT/2014/317/SH, and amends the ESA alert EA-2006-MAT-06-A. The alert is kept open to have an early indication of the use of 85NT in projects.

PCB technology with low in-plane thermal expansion can be used to reduce CTE mismatch to assembled packages. 85NT from Arlon, also known as Thermount, has been used and was qualified at Printca. This material was announced to be obsolete in 2006, as described in ESA alert EA-2006-MAT-06-A. Following the closure of Printca, as described in EA-2014-MAT-6A, ESA issued the memo QT/2014/317/SH to provide advice on alternative sources for various PCB technologies.

The up-to-date qualification status can be found on [escies.org/pcb/](http://escies.org/pcb/). This web portal also includes the referenced memos. Some of the memos have been implemented and superseded by clauses in the new ECSS-Q-ST-70-60C, which can also be found at this web portal.

This memo has been reviewed by the PCB/SMT working group.



## 2 TRACEABILITY OF OLD AND NEW 85NT FORMULATIONS

85NT is the laminate/prepreg system from Arlon using 85N polyimide resin with non-woven aramid fibre reinforcement named Thermount® from DuPont. The laminate/prepreg 85NT is specified in IPC4101/53. The non-woven aramid fibre reinforcement is specified in IPC-4411. DuPont announced obsolescence of Thermount fibres in 2006. Since 2015 Arlon have implemented replacement fibres that conform to IPC-4411 such that the laminate/prepreg system 85NT conforms to IPC4101/53.

Due to the conformance to these specifications, Arlon considers the new 85NT equivalent to the old 85NT, but also recommends users to evaluate the new 85NT by testing. ESA treats the new 85NT as a new material. Regardless of this consideration, the need to perform batch-by-batch project qualification due to the absence of generic qualification is already identified in memo QT/2014/148/SH and paragraph 5.1 below.

Arlon can provide 85NT with Thermount fibres from a limited stock or with the new replacement fibres for continued future production. Both types are provided with the same brand name 85NT. The part number on the Arlon CoC allows distinction between the types, as indicated in the table below. Arlon qualified two new suppliers of aramid fibres. No further traceability of these suppliers is given in the Arlon part number, although this information can be provided by Arlon to the PCB manufacturer upon request.

- The type of 85NT shall be identified by the PCB manufacturer in the checklist of the Manufacturing Readiness Review (MRR) and the PCB CoC and by the procurement authority in the PCB Definition Dossier.

Arlon 85NT part nr	with Thermount fibres from DuPont	with new aramid fibres
Laminate	85T0200CWWAAAUZ	Letter “J” included: 85T0200CWWJAAUZ
Prepreg	85NT347...HOUZ	Letter “A” included: 85NT347A...HOUZ

## 3 REVIEW ITEMS FOR 85NT

Arlon 85NT is obsolete with the aramid fibres from DuPont. Several organizations have a limited stock of the old 85NT formulation. Replacement fibres have been implemented by Arlon. However, this new 85NT formulation has no space heritage.

85NT is used because of low CTE in-plane, i.e. in X,Y-direction. However, it has high CTE in Z-direction below Tg of 93 ppm/K according to its datasheet. This causes high stress in the plated copper barrel of through-holes and increases the risk of open circuit failure due to thermal excursions.

85NT prepreg is not suitable for backfilling of blind vias and encapsulating high copper profile. Standard prepreg with better flow properties can be used.

## 4 RECOMMENDATION FOR ALTERNATIVES TO 85NT

- Generic qualification of PCBs with the old 85NT formulation is currently not available or foreseen. The new 85NT formulation is generally lacking space heritage. Project specific qualification of 85NT remains optional, but because of the high CTE in Z-direction of both 85NT formulations and associated risks of failure, it is recommended replacing it with alternative PCB technology.
- In case the alternative PCB technology is not available from qualified sources, it shall be project qualified.

Alternative technology for reduced thermal expansion of PCBs is available, such as Molybdenum inserts and Invar layers. In addition, alternative materials with low CTE in X,Y-direction as well as in Z-direction have been identified. Several PCB manufacturers reported positively about the manufacturability of Hitachi MCL-E-700G. Also, Megtron GX could be a candidate material for low CTE. However, the effect of raw laminate CTE on the final PCB can be limited due to the presence of copper layers and a dense footprint of vias.

Some space industries have succeeded at replacing 85NT by standard polyimide technology whilst maintaining an acceptable assembly verification of sensitive components, such as LCC or BGA. In particular, six sigma columns on CCGA packages provide some stress relief that can accommodate the CTE mismatch between ceramic package and polyimide PCB.

## 5 RECOMMENDATIONS FOR 85NT

### 5.1 Project qualification

The use of 85NT with the old formulation, as well as with the new formulation, does not hold a generic ESA qualification as per ECSS. Because of the high CTE in Z-direction of 85NT, there is a risk that IST and/or group 6 testing may fail, especially on complex PCB designs. Project qualification has been undertaken by PriDana (DK), Cistelaier (IT) and Invotec (UK). Also, several of the described alternative technologies do not hold a generic qualification at the time of issue of the present memo.

- In case the PCB technology is not available from qualified sources, it shall be project qualified under RFA, as already specified in memo QT/2014/148/SH (or clause 7.7 from ECSS-Q-ST-70-60C). This is done using the group 6 test flow on a spare PCB, preferably from the FM batch.
- In addition, IST testing shall be performed on all via types on all panels as already specified in memo QT/2014/030/SH (or clause 9.5.5 from ECSS-Q-ST-70-60C).
- Any changes in PCB material or manufacturer shall be assessed in accordance with clause 6.13c from ECSS-Q-ST-70-60C.

## **5.2 Design review**

- It is important to perform the Design Review or Manufacturing Readiness Review with the customer chain and the PCB manufacturer, as specified in 2.1.b from QT/2014/148/SH.

It typically requires several manufacturing batches and tuning of PCB design and manufacturing processes to achieve a successful qualification. The PCB manufacturer may indicate a high risk during the PCB Manufacturing Readiness Review depending on the design.

## **5.3 Procurement management**

- Timely procurement and second source management can be effective mitigations against the risk of failing the project qualification.