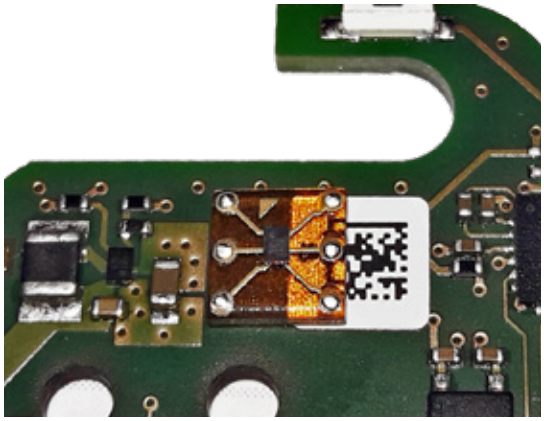
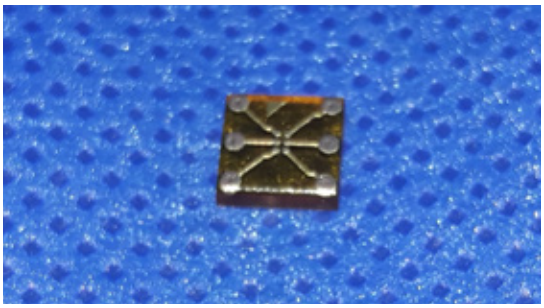
NANODIMENSION
Electrifying Additive Manufacturing®

Nano Dimension's DragonFly™ Pro enables agile workflows and reduces rework time by up to 97% and 34 days

Background

- A leading European communications and sensor company ordered 24 prototypes (0 series) of a high level HDI Processor PCB, including multiple BGAs.
- Nano Dimension's German partner Phytec New Dimensions produced ~30 boards, soldered and prepared them. 2 days before the delivery deadline, an urgent problem arose – insufficient power in one of the circuits; this arose during first commission/powering up of the board.
- Phytec checked the drawings and found the problem – an error in the drawing of a small 0.4mm pitch BGA on the board.





Bare 6-pin BGA 4 x 4mm

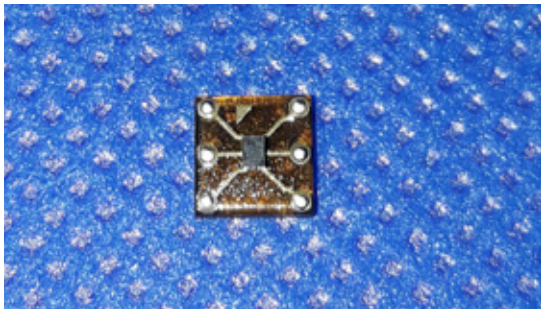
What actually happened

Phytec completed the entire rework process in just one day! Leveraging the DragonFly Pro 3D printer, Phytec was able to fix the problem by isolating the rework process to be almost entirely centered around the specific BGA that was reworked and not the entire board rework, which would usually be the case. Thus layout, redesign & first power-up was much faster as one can redesign the individual part only and not the whole board. The screen-printing, pick and place and soldering was also much faster as there was only the need for manual placement of the solder paste and of the BGA PCB, and then a Vapor Phase soldering of the entire board.

Possible solutions

Phytec was thus confronted with two options:

- Take the traditional rework path, reworking the entire set of BGA PCB but delaying the project by at least two weeks and risk losing business with a key customer. As the problem was with a BGA, there was no possibility for direct soldering or repair.
- Use Nano Dimension's DragonFly Pro 3D printer to solve the problem, reprint 24 samples of the corrected BGA PCB, solder them to the existing prototypes and meet the important customer deadline.



6-pin BGA assembled at 240°C using Vapor Phase with standard soldering paste

Comparison of time required:

Activity	DragonFly 3D Printing delivery time	Delivery time range (Standard to Rush)
Layout redesign for fabrication	1 hour	1 day
Internal approval of ~25 drawings approved by 3 Engineers	1 hour (only the BGA related drawing)	1 day (entire set of drawings need to be approved)
Delivery of PCBs	6 hours (time to print 30 BGA PCBs on the DragonFly 3D printer)	5-10 days
Power up of board	2 hours (only need to power up circuits with relevant BGA	1-2 days (Power up entire board from scratch)
Production time slot to screen print, pick and place and solder on the Vapor Phase (including preparation of screen and reordering components). Note: Soldering was done at 240˚C with standard solder paste for this 4x4 PCB	3 hours (Easy to fit in as no additional solder mask or annotation was required).	5-21 days
Total	**1 day**	**13-35 days**

Cost comparison

DragonFly printed BGA related costs ~ €700

- Bare PCB cost and Nano Dimension inks
- Cost of materials and components
- Screen print, Pick& place and Vapor Phase soldering setup machine time
- Screen print, Pick& place and Vapor Phase soldering machine time
- Not including labor

Traditional rework costs ~€5,100 (Rush delivery costs can increase this by a factor of 2)

- Express delivery PCBs
- Extra components and materials for entire batch of new boards
- Extra machine time for screen printing, pick and place and soldering – both requiring setup
- Stencils
- Powerup of whole board again

Conclusion:

Nano Dimension's DragonFly enables agile hardware rework, reducing time by up to 97% and costs by over 85%. The DragonFly opens up a whole range of rework and intermediary board possibilities, which can be prepared quickly.