

Basic 4-layer manufacturing process

Erwin Lemmens - AQC BV

7-11 D&E BE / Booth 1

8-11 D&E NL / Booth 18

**DESIGN AUTOMATION
& EMBEDDED SYSTEMS**

FPGA - SECURITY - INTERNET OF THINGS - ELECTRONIC DESIGN & PRODUCTION - EMBEDDED - DESIGN FOR EXCELLENCE - EMBEDDED DESIGN CHALLENGES

7 NOV ←
TECHNOPOLIS, MECHELEN

8 NOV ←
VAN DER VALK HOTEL, EINDHOVEN



AQC (Advanced Quality Control) BV

- Supplying pcb's, flex, flex-rigids, aluminium, etc...
 - standard and fast turnaround LT.
 - proto – and volume
- Support & knowledge centre.
 - DFM Check, layerstack – and material proposal.
- Quality check (intern labo)
 - Metallurgical and mechanical inspection
 - Digital Leica microscopes
- Logistic
 - Conditioned warehouse
 - Support Air, Train and Seafreight
 - Urgent deliveries done by AQC drivers

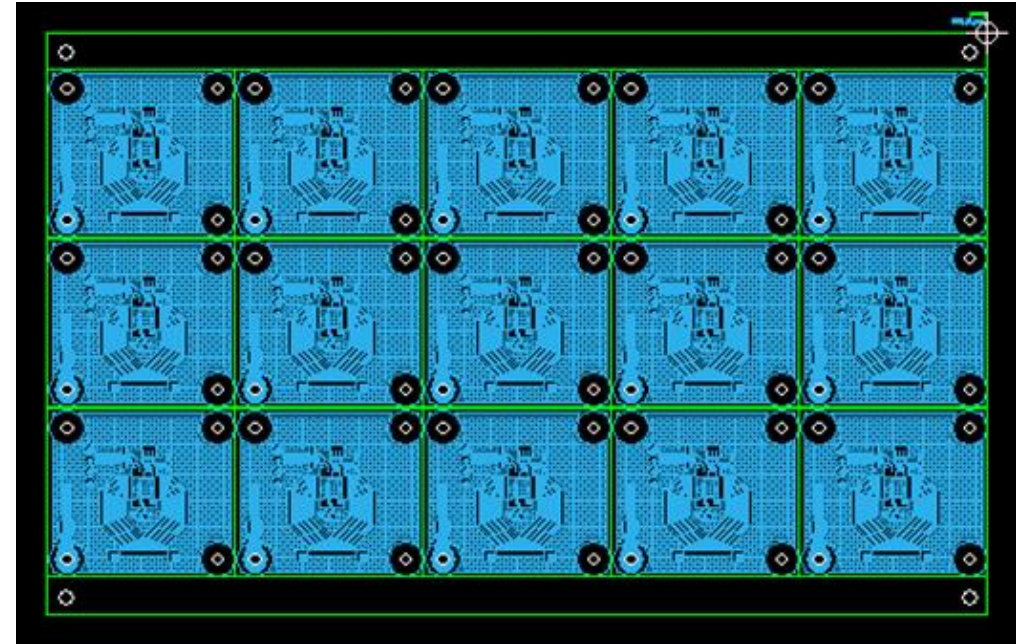


Basic 4-layer manufacturing process

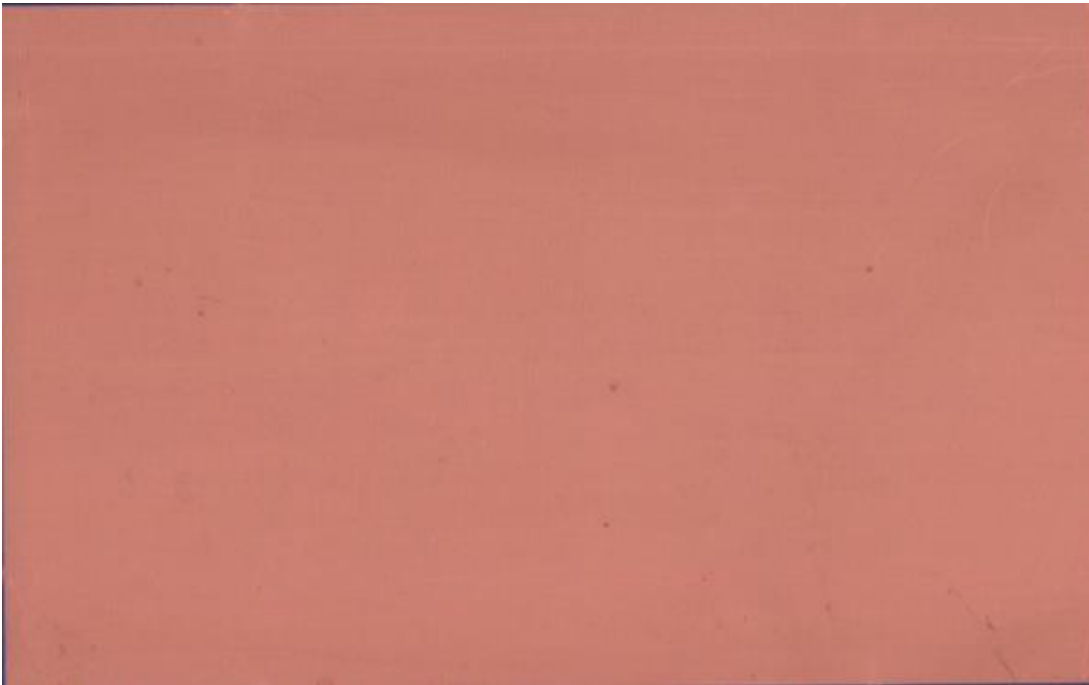


Tooling

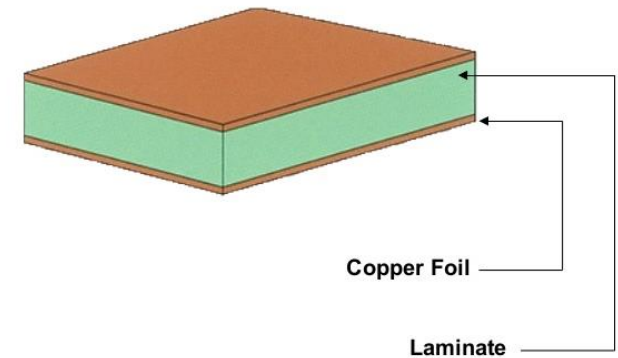
- Design Rule Check (DRC)
- Gerber files panelizing (if requested)
- Create stackup
- Drill program generated at same time
- Artwork plotting
- Preparing test program



1. Blank inner layer 2-3



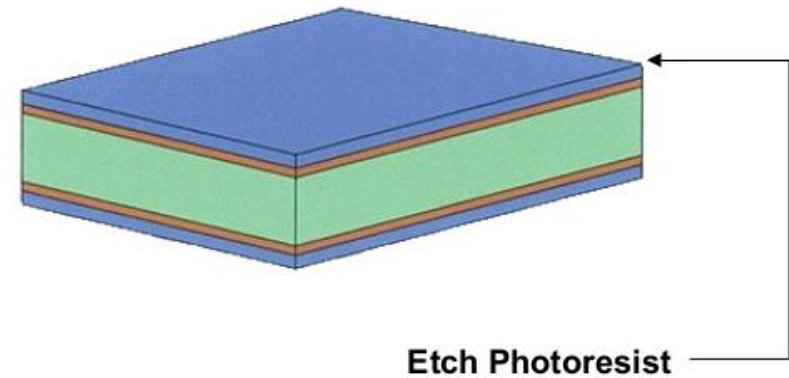
- Copper clad blank laminate (epoxy resin/glasfiber core with copper each side)
- Clean copper
- Adding registration holes in frame



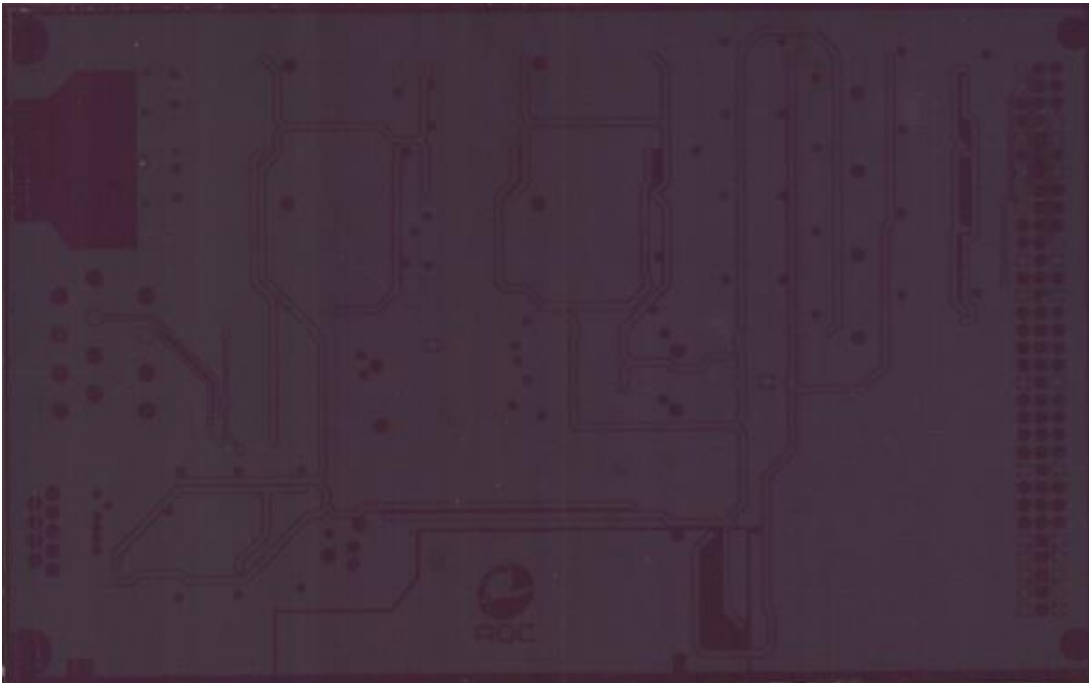
2. Laminated blank inner layer 2-3



- Laminate with dry film etch resist
- Both sides (Top and Bottom)

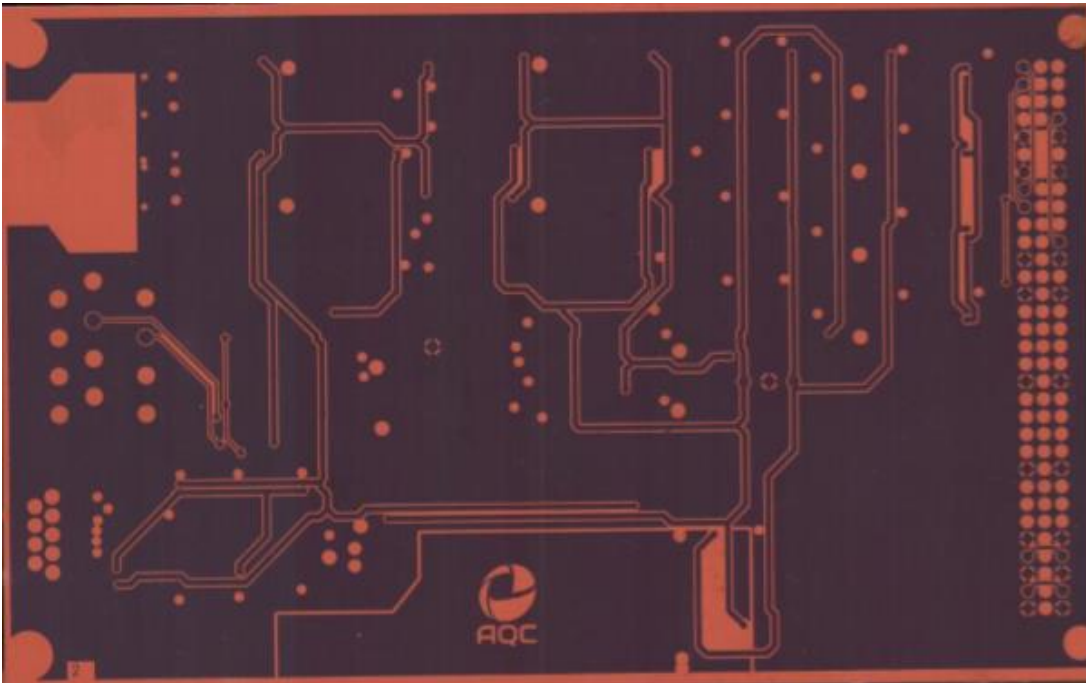


3. Exposed inner layer 2-3



- Using photo plotted artwork
“positive image / negative artwork”
- Inner layer image has been exposed onto laminate by UV light
- Dark areas not hardened. (Not exposed)

4. Developed inner layer 2-3



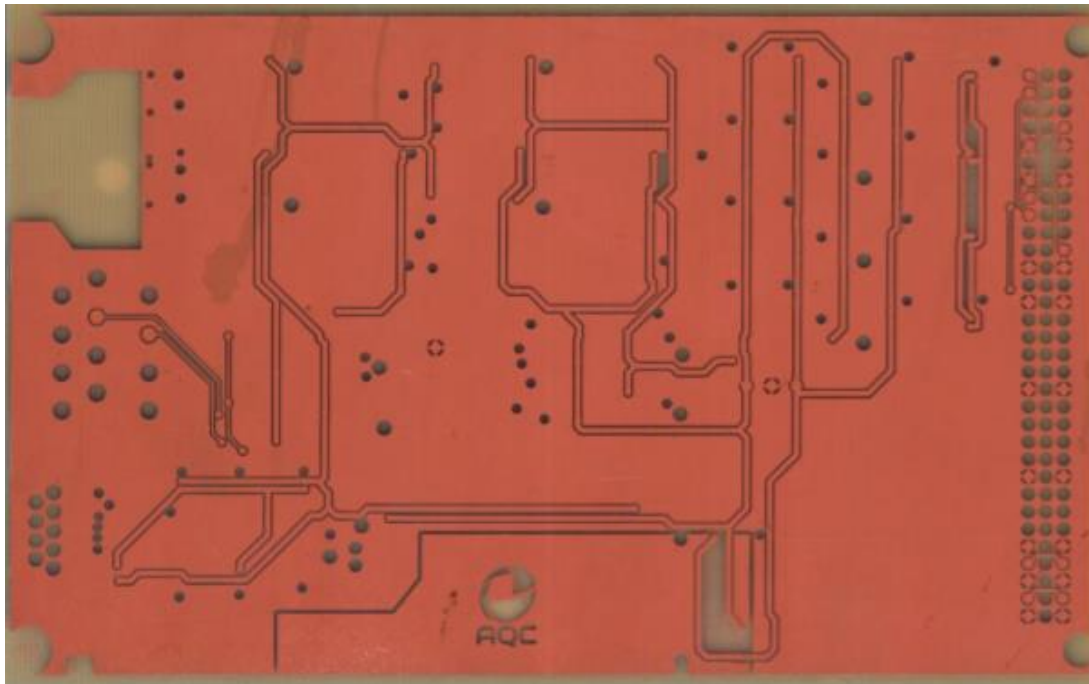
- Inner layer went through a development process to remove unwanted etch resist film.
- Blue areas will protect copper

5. Etched inner layer 2-3



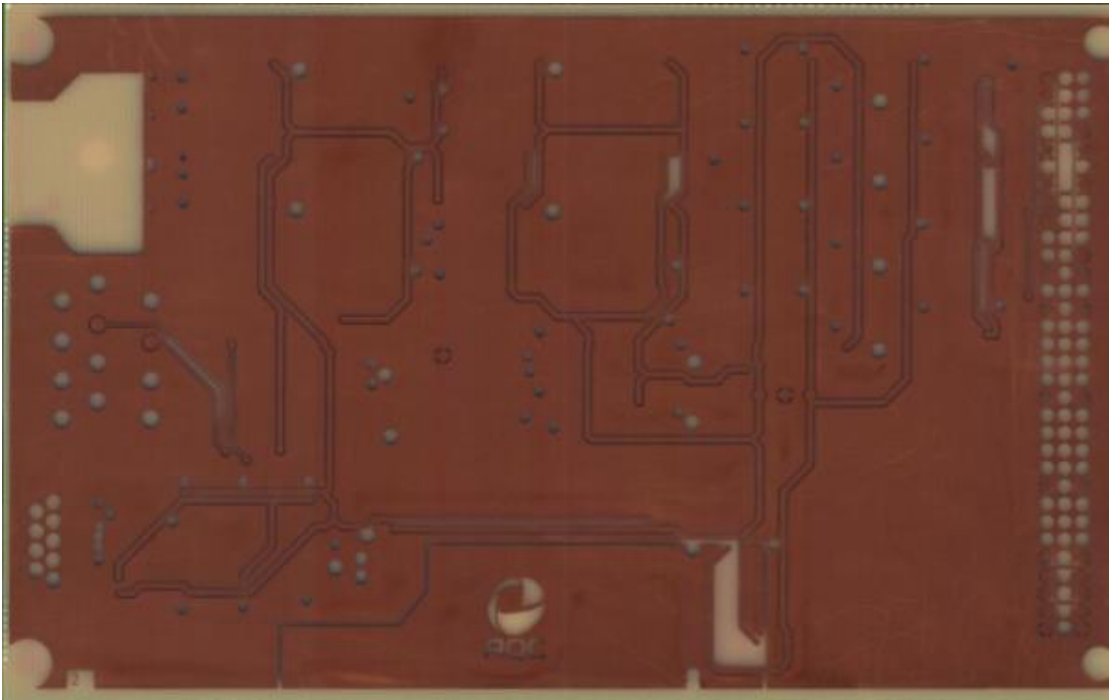
- Inner layer has been through an acid etch process
- Remove exposed copper from the surface that is not covered by resist film.

6. Resist stripped inner layer 2-3



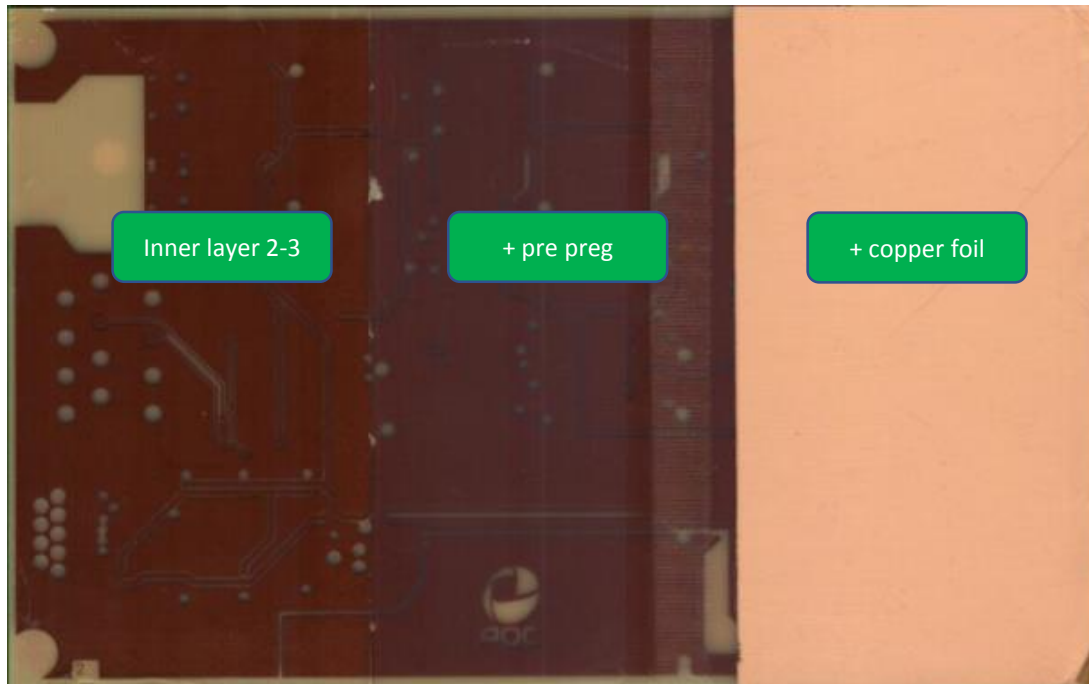
- Etch resist film is no longer required and is stripped from the panel.

7. Oxide inner layer 2-3

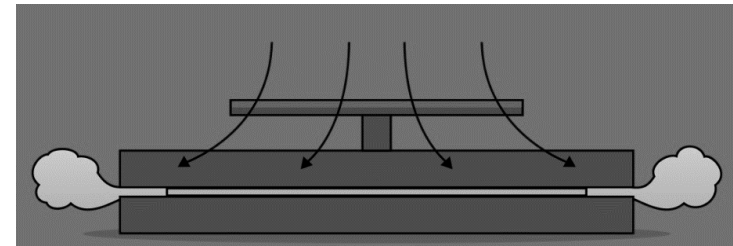


- Inner layer goes through an oxide treatment to oxidise the Copper surface in preparation for bonding process to ensure adhesion to the pre-preg.

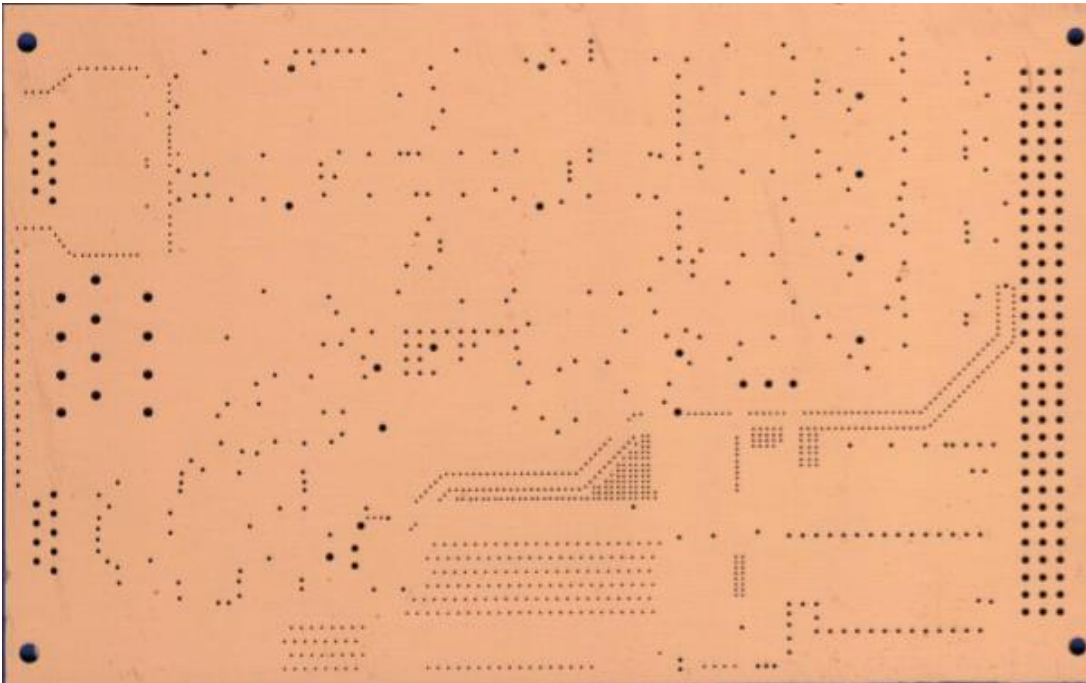
8. Bonded Stack layer 1-4



- PCB stackup created by placing innerlayer 2-3 between sheets of prepreg and copper foil each side.
- Foil bonded to inner layer using pre preg which made of glass fibre/resin.
- Resin melts and spreads under heat and pressure binding the separate Copper layers

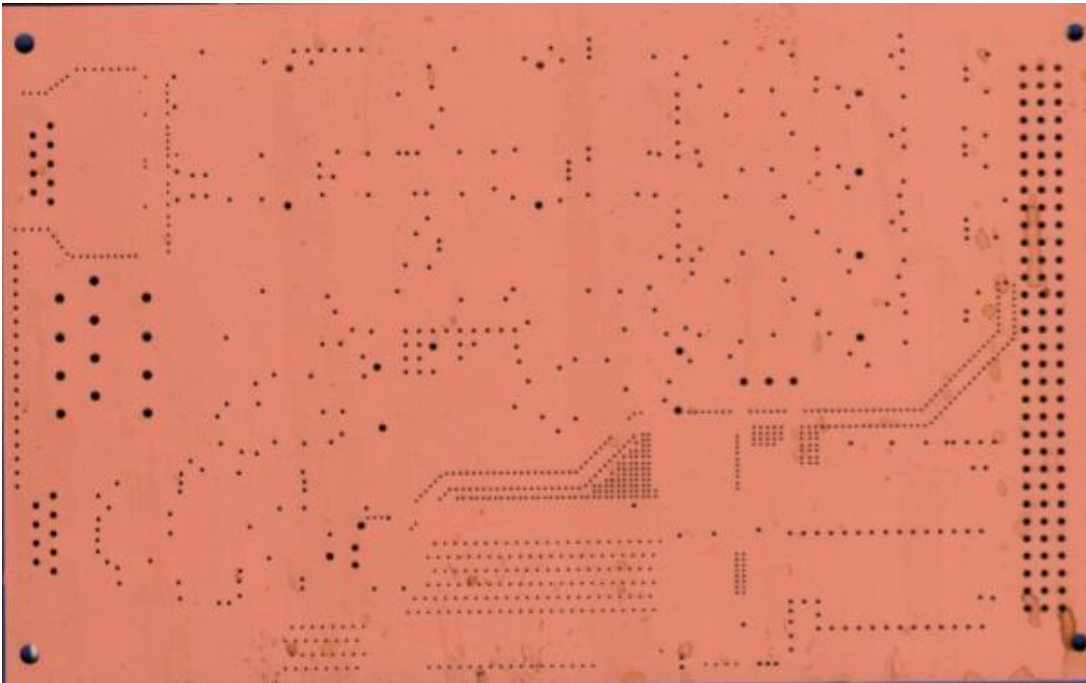


9. Drilled construction layer 1-4



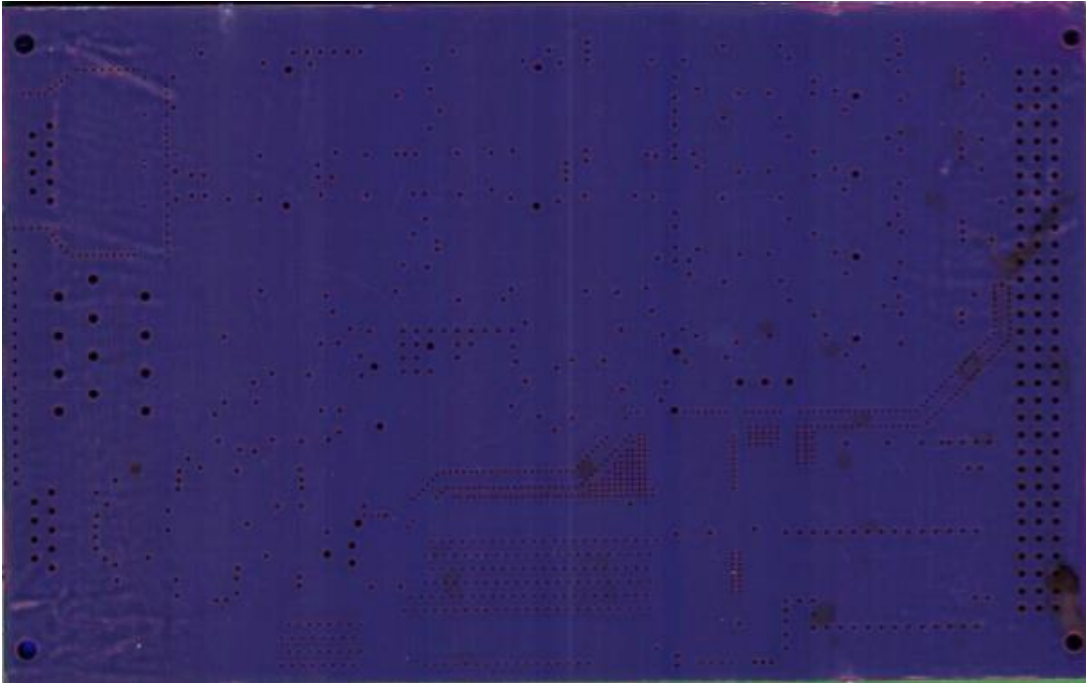
- Panel has been through an X-ray
- Adding tooling points
- Followed by the main CNC drill process to input holes/vias.

10. Electroless Copper construction layer 1-4



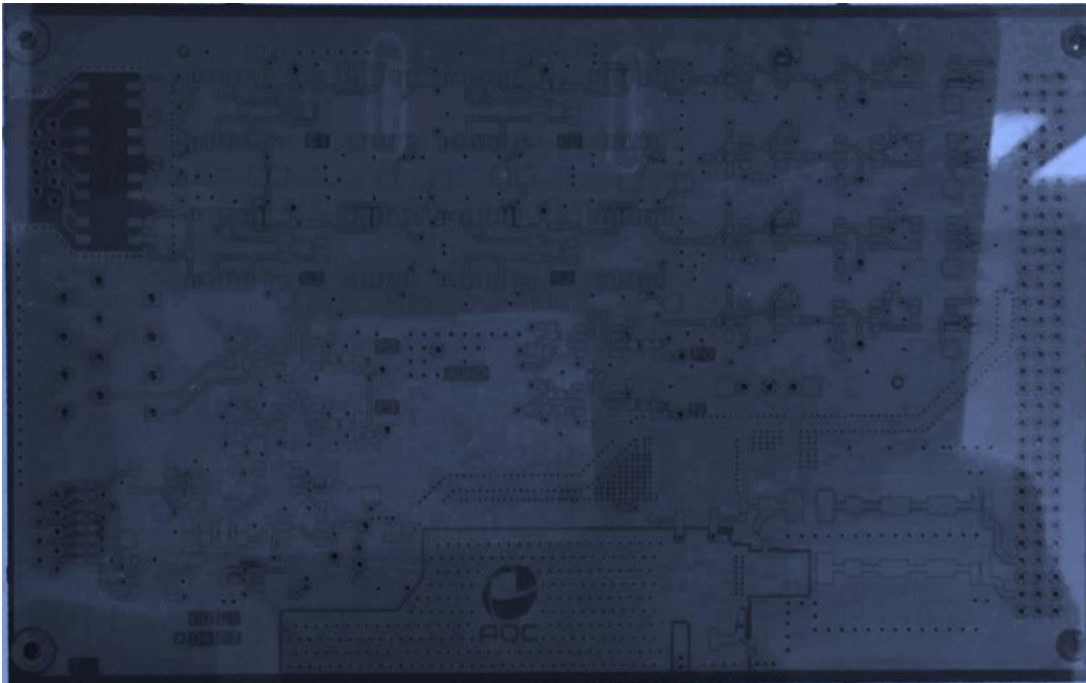
- After drilling the panel passes through a desmear process.
- Remove any swarf and smeared resin from holes
- Deposit a conductive layer over the hole walls
- Electroless copper, deposit chemically layer of about 1 micron thick over the walls of the hole

11. Laminated construction layer 1-4



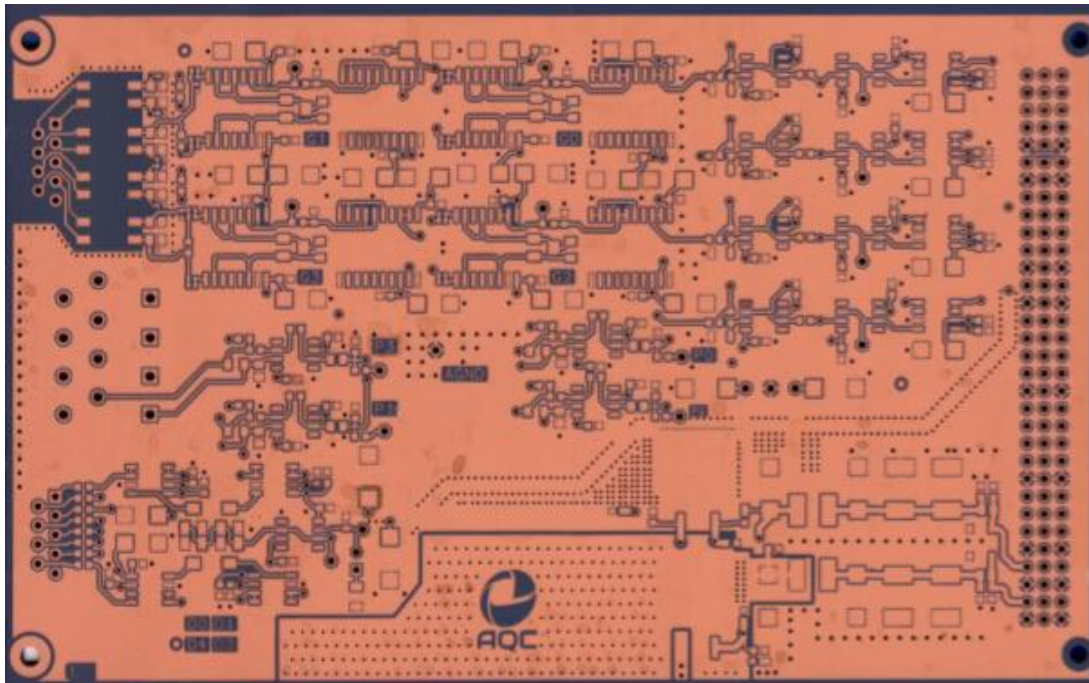
- Outer layers of the construction are laminated with a resist film

12. Exposed construction layer 1-4



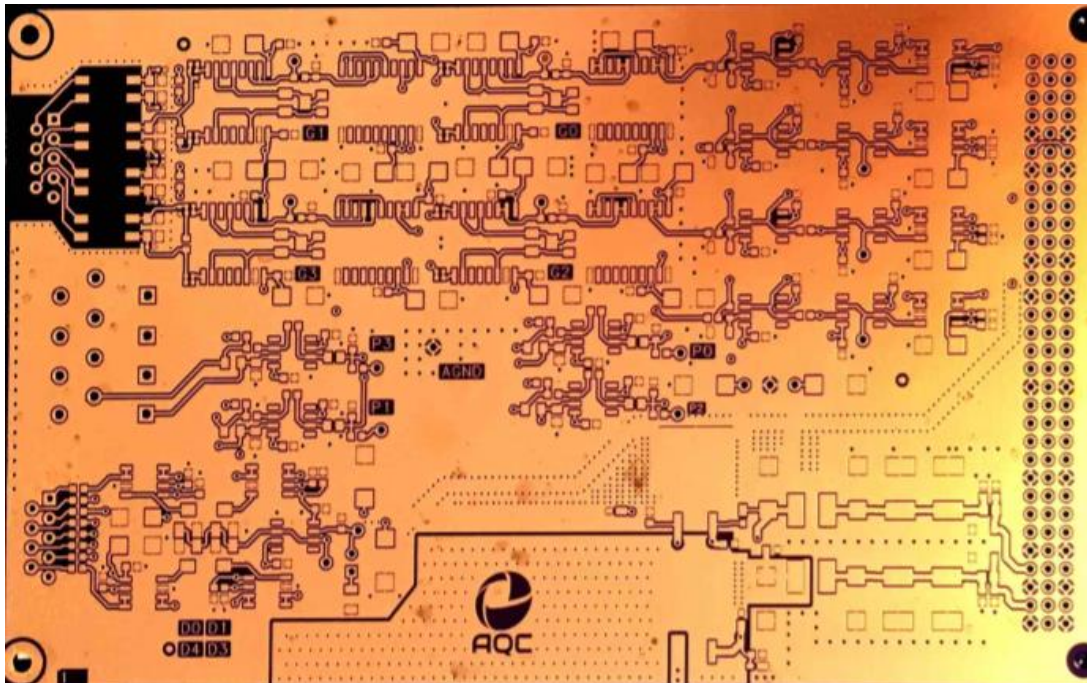
- Outer layer image aligned to the drilled holes
- Using photo plotted artwork
“negative image / positive artwork”
- Outer layer image has been exposed onto laminate by UV light
- Dark areas hardened. (exposed)

13. Developed construction layer 1-4



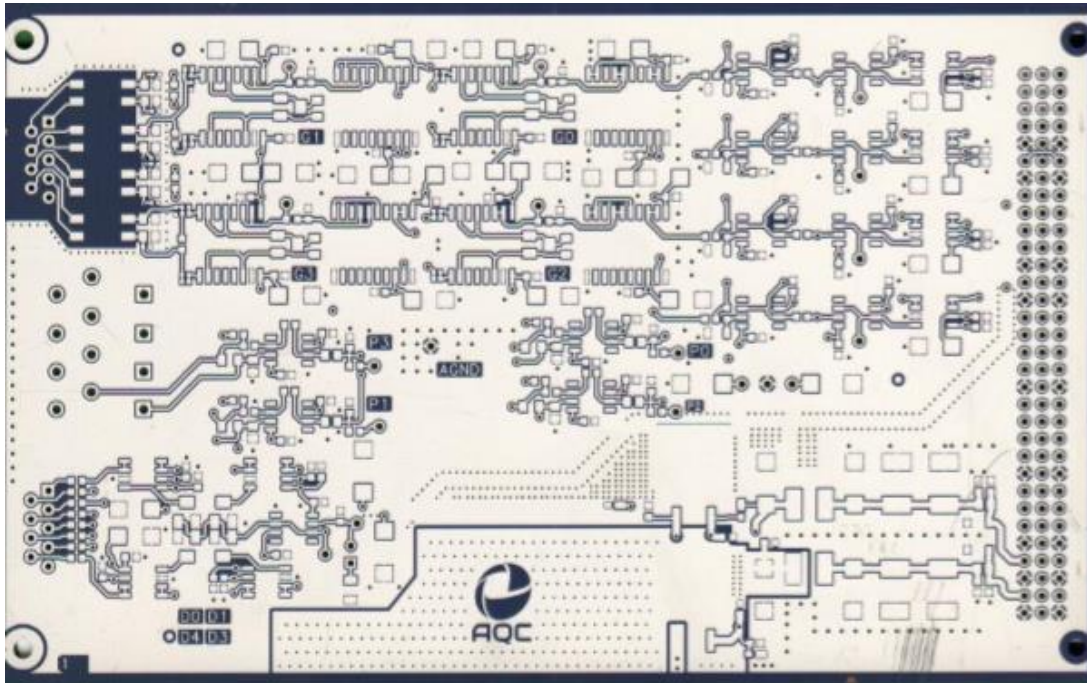
- Outer layers have been developed to remove the resist film from all areas of the outer layer and holes that will require plating deposit to be applied.
- Outer layer went through a development process to remove unwanted etch resist film.
- Blue areas will protect copper

14. Electroplated Construction layer 1-4



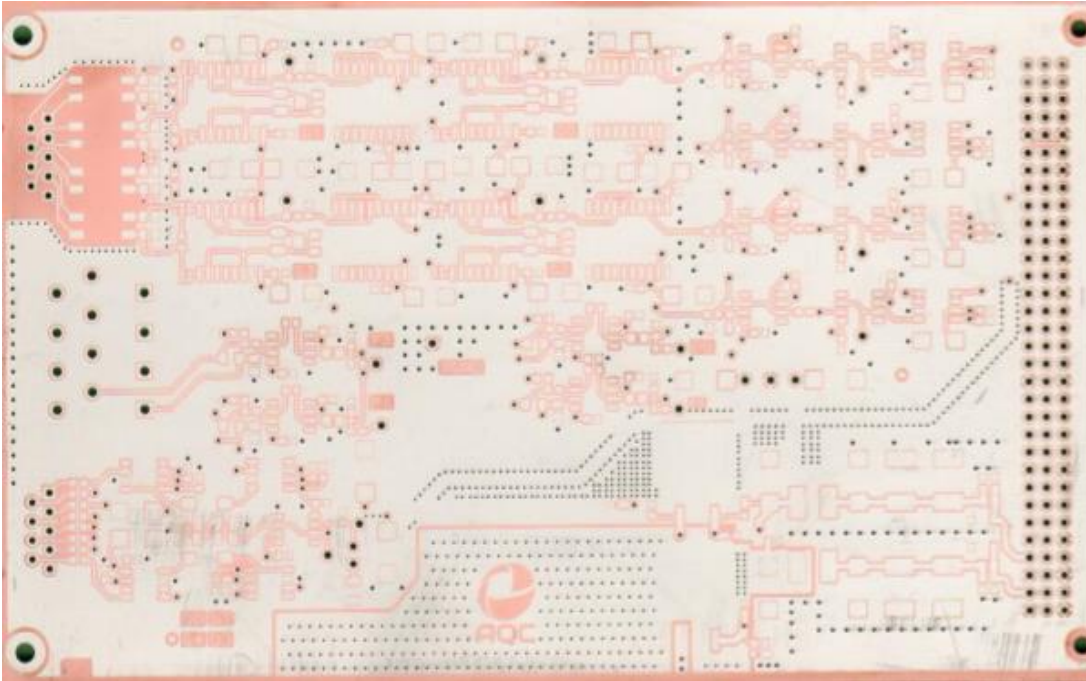
- Construction passed through an electroplating copper process to deposit the final plating thickness to all areas not protected by the resist film.
- Copper plating thickness holes 20 ~ 25 μm

15. Tin Plated Construction layer 1-4



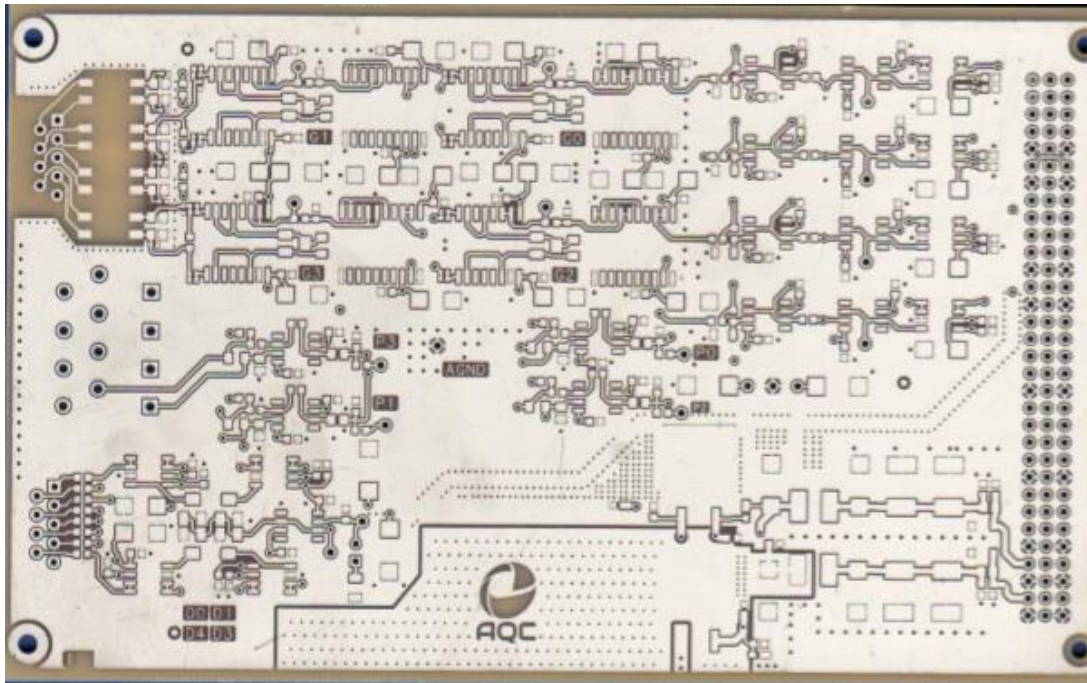
- Deposit of tin applied to protect the plated Copper from the upcoming etch process.

16. Resist stripped construction layer 1-4



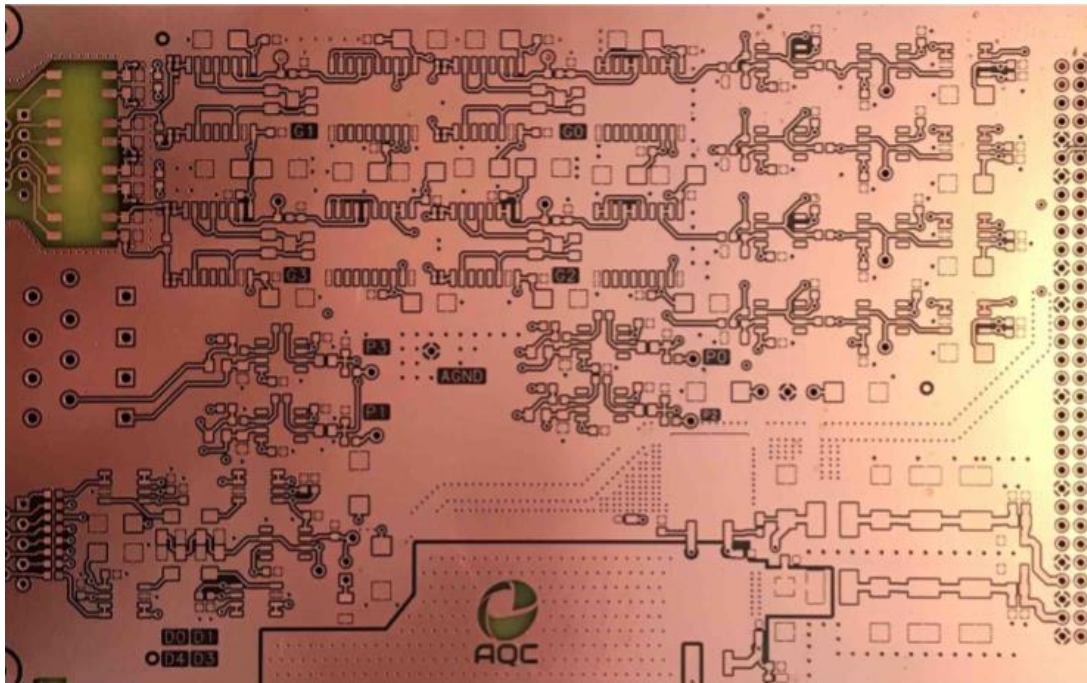
- Resist film has been stripped away exposing copper to the upcoming etch process, leaving the design protected by tin

17. Etched construction layer 1-4



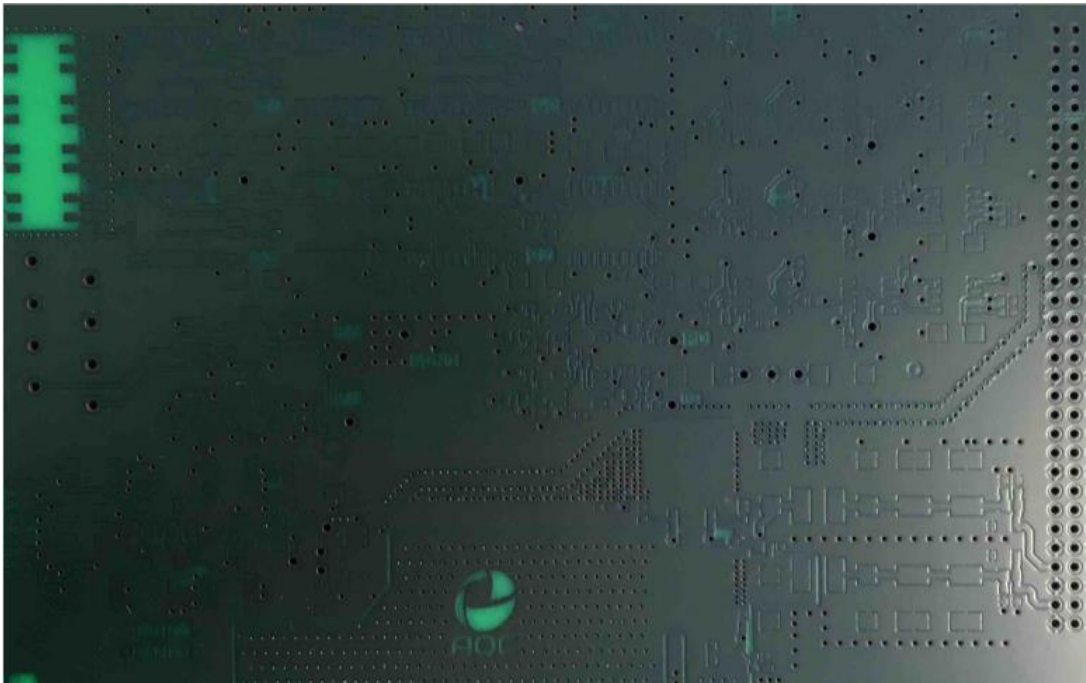
- Outer layer image has been through an ammoniacal etch process
- Final outer layer image stays with copper and tin with the required track, gap and feature size measurements.

18. Tin stripped process layer 1-4



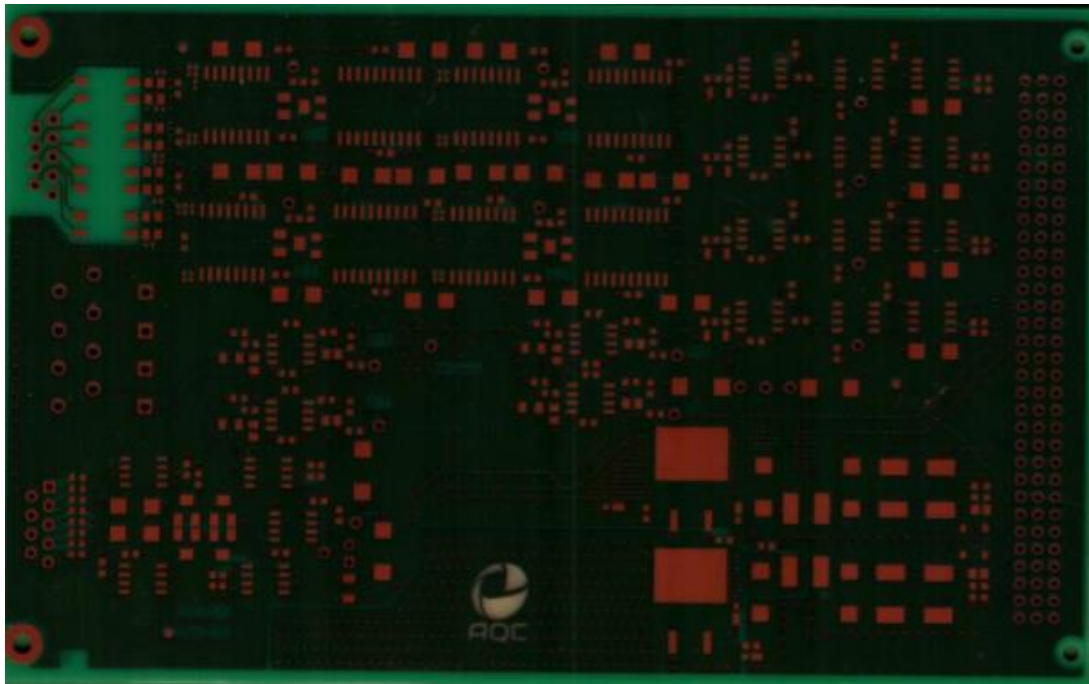
- Tin removed from construction. (strip process)

19. Applied solder resist construction layer 1-4



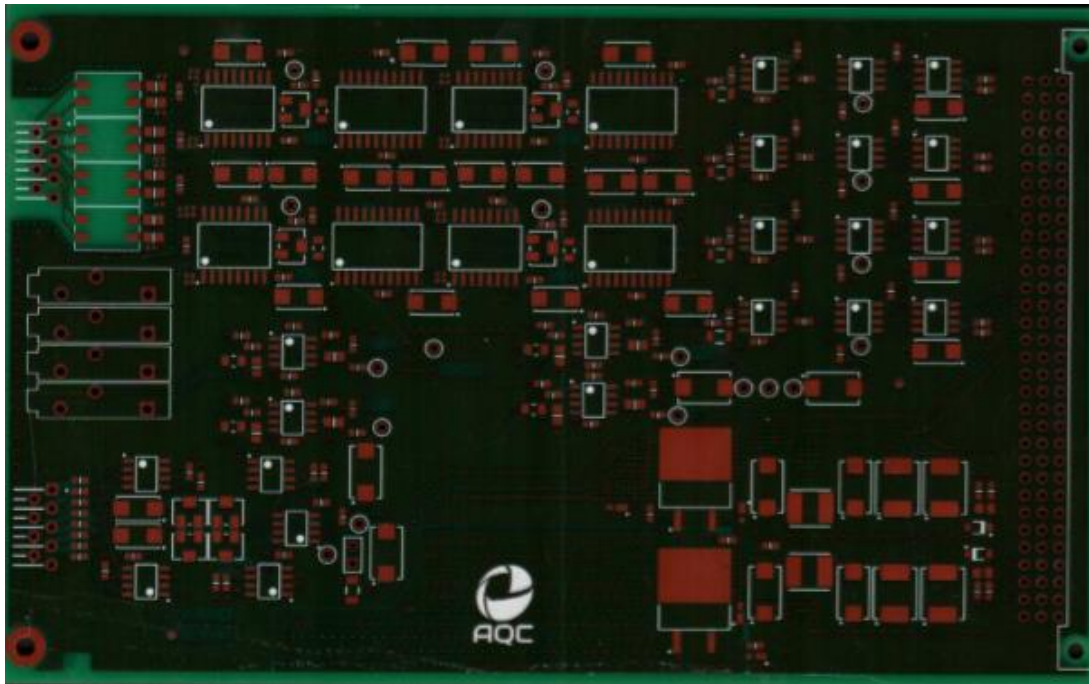
- Outer layers flooded with solder resist ink prior to the application of the solder resist image.
- Solder resist will protect features on the outer layers that will not be soldered during assembly such as tracks.
- Protect the copper surface to oxidation.

20. Developed solder resist construction layer 1-4



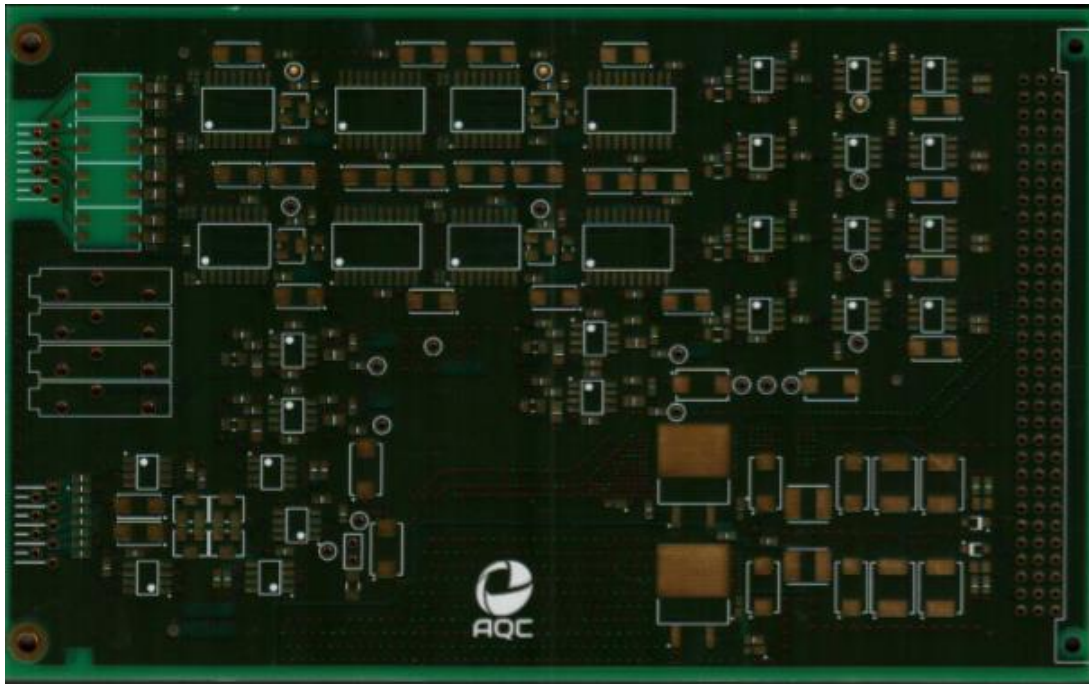
- Solder resist image is exposed onto the outer layers using photo plotted artwork.
- Developing process:
 - Unharded areas will be stripped
 - surface mount pads
 - holes
- Baking soldermask

21. Applied Legend construction layer 1-4



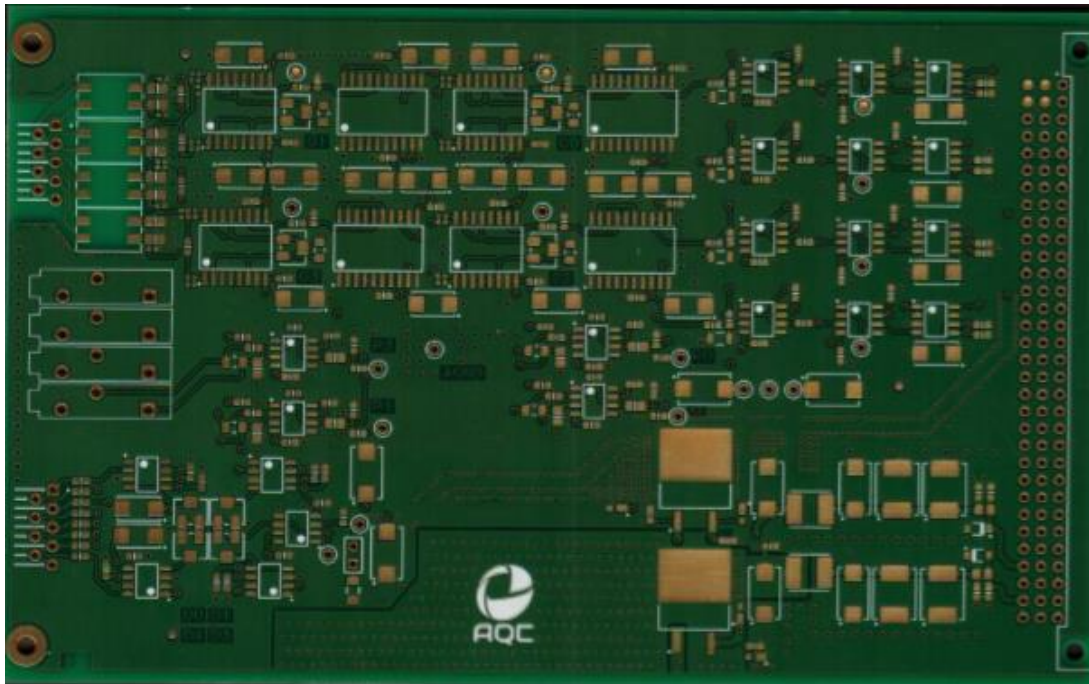
- Legend is applied to the outer layers using a form of resist ink.
- The legend is applied to identify features such as:
 - surface mount pads
 - holes
 - logos
 - part numbers etc.

22. Applied finish construction layer 1-4



- The requested finish is applied to the exposed Copper features and hole walls to protect the Copper surface and act as a point for soldering.
- Finishes can include ENIG, Electrolytic Au, NiPdAu, OSP, Sn, Ag, HASL etc.

23. Routed Construction layer 1-4



- The construction is routed from the production panel to give the finished PCB the final dimensions within the required customer specifications
- If required any second stage drilling, scoring, chamfers etc are also completed at this stage.

Thank you very much for your presence

Erwin Lemmens - AQC BV

- 7-11 D&E BE / Booth 1
- 8-11 D&E NL / Booth 18

www.aqcbv.com

