The use of reverse pulse plating is growing due to new requirements of the PCB and electronics industries. We take a look at some practical examples of this technique and the way the process is handled with the appropriate software in systems proposed by Dutch specialist PPCS.

Experience reveals that during plating, a layer is produced on the cathode surface with a lower metal concentration than the original plating solution (diffusion or barrier layer). The reverse pulse has a significant influence on the metal distribution on the cathode surface due to mass transport effects.

To get the maximum result out of the pulse plating technique, it is very important to minimise the diffusion layer. Key parameters for minimising the diffusion layer, to be optimised first, are a proper bath geometry and kinetic energy (agitation, eductors, vibration etc.). A moderate flow will be laminar and produce a thick diffusion layer (80–100 micron), while a turbulent flow (>2000 Reynolds = 7–8 m/sec) minimises the diffusion layer on the cathode (50 micron). A reverse pulse (Figure 1) will also reduce the diffusion layer (10–50 micron). When the metal concentration on the surface is too low compared with the current, the crystal structure starts to become amorphous (This is also called burned deposit). PPCS has developed the shifted wave form, called Pseudo Pulse, which even under very poor plating conditions provides a smooth crystal structure, improved MTP (Metal Throwing Power) as well as better metal distribution.

The Pseudo Synchronic wave form

Figure 2 is a schematic illustration of the Pseudo Synchronic wave form, while the bipolarity on the cathode surface caused by the shifted waves from the Pseudo Pulse is shown in Figure 3. According to PPCS, this upgrades the metal migration. The polarity changes up to 500 times per second. The Pseudo Pulse wave shows great advantages with aspect ratios greater than 1:6 (holes less than 200 micron, blind vias and small tracks).

In addition, a multi-step, diagnostic program developed by PPCS, Easy Plate, enables to write an 11-step program and to optimise all systems parameters for any situation. The Easy Plate program can run the reverse pulse with the same parameters as DC. The operator only has to give the current density, the surface, and the time.

Figure 4 illustrates an Easy Plate micro section (high aspect ratio greater than 1:6 for mix through hole and blind via plating; board thickness greater than 1.6 mm; forward 1.5–3.5 A/dm²).

Pulse Power Current Source has also developed other programmes like:

Mix plate:
- a) low aspect ratio less than 1:6 for through hole and blind via plating;
- b) board thickness less than 1.6 mm;
- c) forward 2–4 A/dm²

Micro Plate:
- a) high aspect ratio boards greater than 1:6 for blind filling;
- b) board thickness max 1.6 mm;
- c) forward 2–3.5 A/dm²

Fast Plate:
- a) low aspect ratio less than 1:6 for through hole plating without blind vias;
- b) board thickness less than 1.6 mm;
- c) forward 3–6 A/dm²

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