Manufacturability Report
Bandwidth Board

10/30/11

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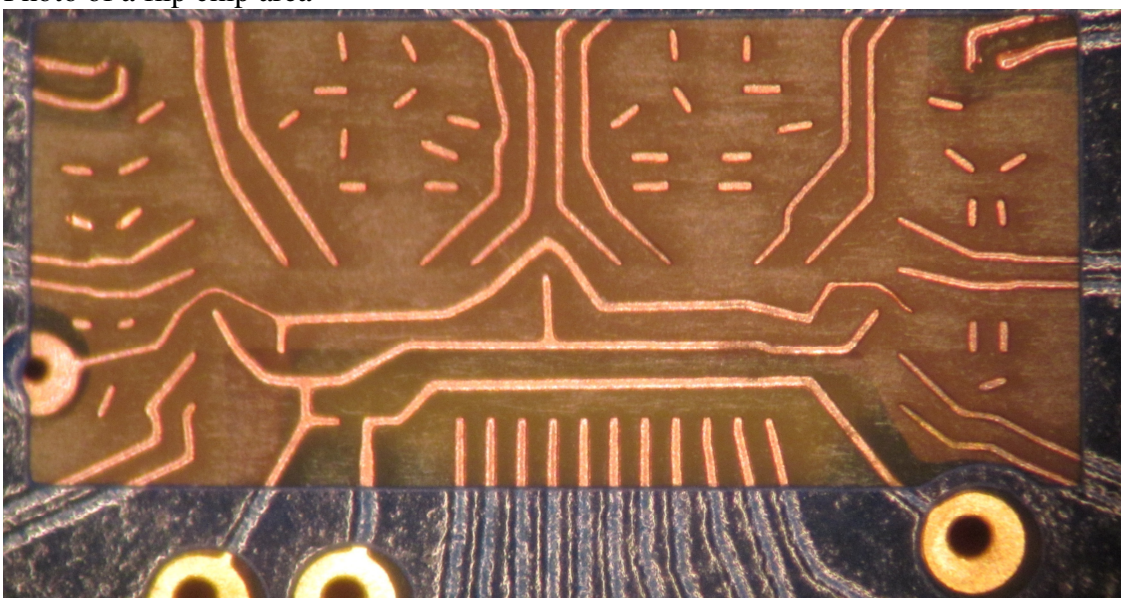
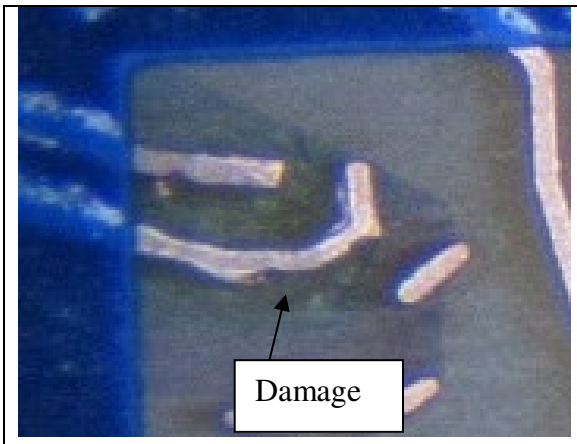
Summary:
ATC has been providing incoming inspection feedback on several quick-turn boards provided by XXX. This report will summarize the findings for printed circuit board number 11TC0548 PCB (ATC 36387). This bandwidth circuit board is approximately 5"X8" with a single flip chip mounting location centered approximately 1/3 from then end of the board. The board is gold plated with exception of the flip chip area which is selective OSP coated. This board displayed several issues in the flip chip area that could have been deemed rejectable. In order to meet production demands, these boards were processed. The underlying issues need to be addressed at the design and/or fabrication level. The trace width and spacing requirements would make this board understandably difficult to fabricate.

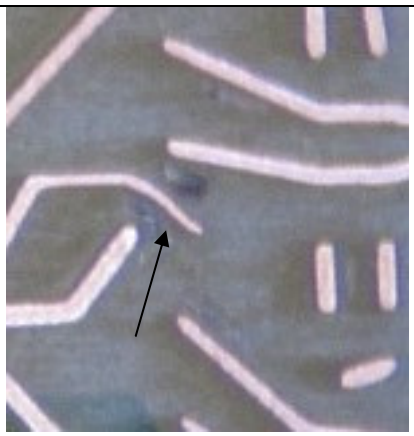
Photo of a flip chip area



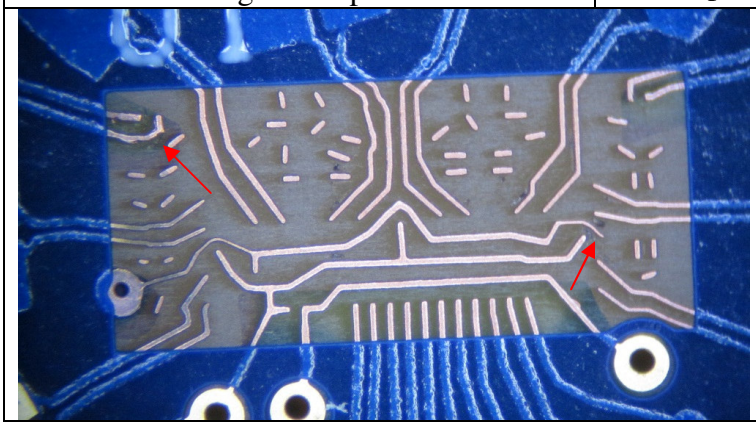
Issues:
Trace etching – Trace etching was an issue in the case of both under- and over-etching. Under-etched areas appear to have been manually cut, leaving inconsistent trace widths and damaged solder ball lands. Over-etched areas resulted in ultra thin land areas for attachment.



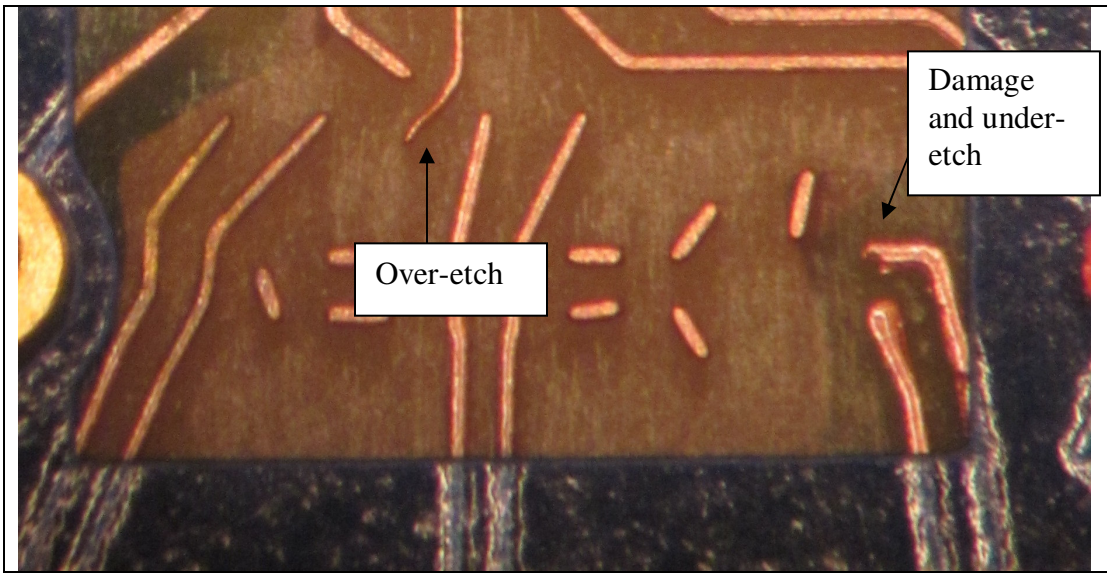
Under-etched area that was manually modified resulting in compromised traces



Over-etched area, trace too thin where solder sphere lands

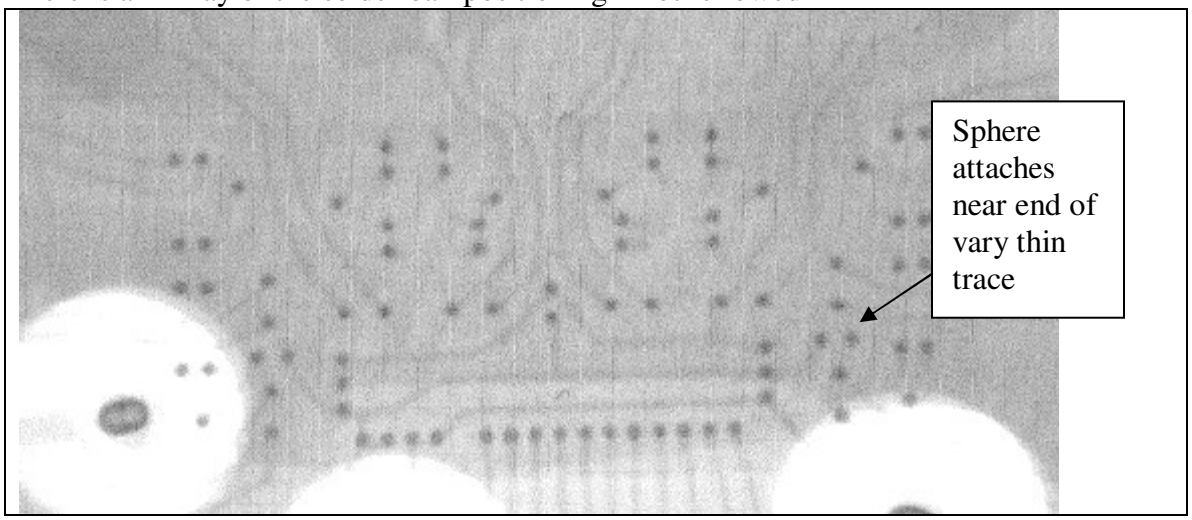


Further evidence

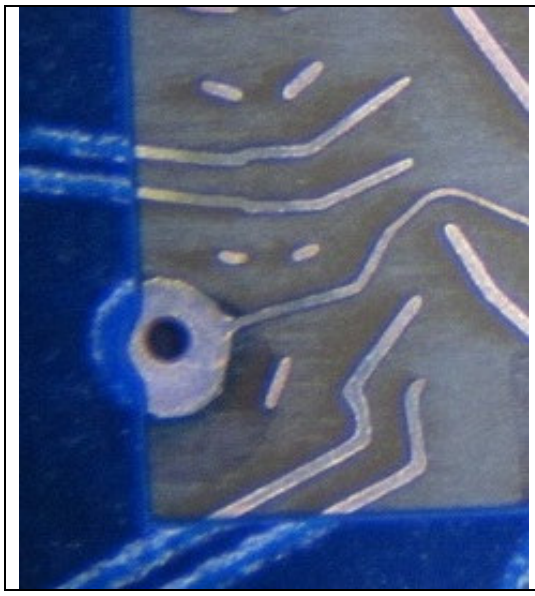


Many of the traces on in the flip chip area are over etched. This ultimately affects the collapse of the chip during processing and reliability.

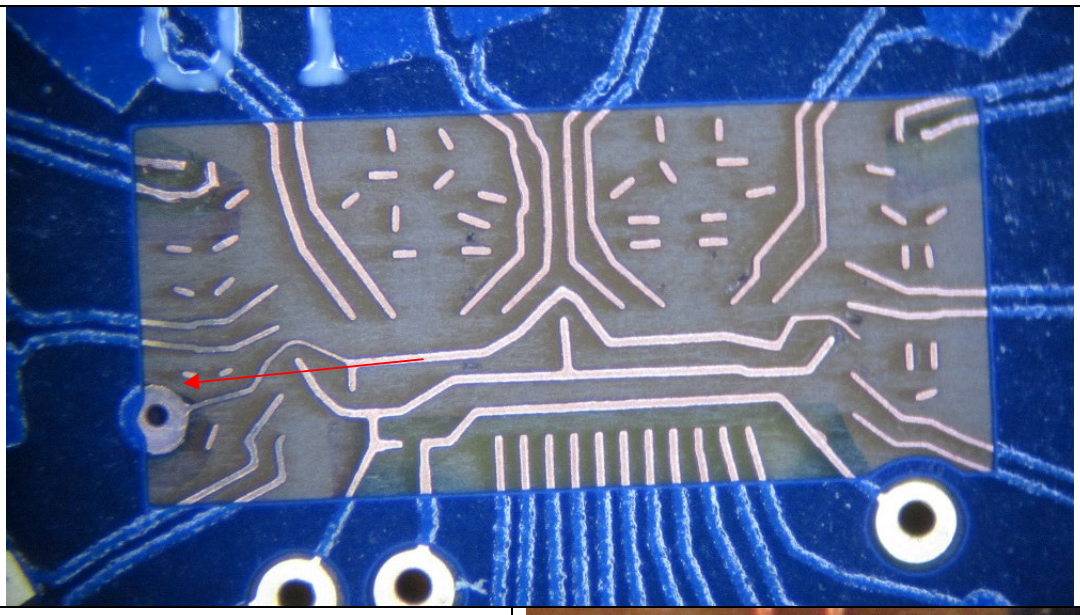
Here is an X-ray of the solder ball positioning – not reflowed



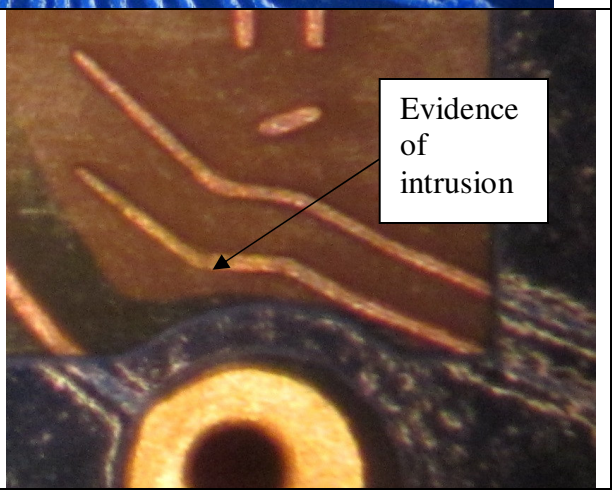
Plating – The gold plating process appears to have undesirable side affects could impact flip chip attachment. There appears to be some attack on the flip chip copper that is occurring during nickel or gold plating. Several traces appear to be discolored in the flip chip area. There are typically two sources for discoloration in the flip chip area. If the OSP coating is too thin or has degraded, the copper traces can oxidize. Secondly, if the plating chemistry reacts with the copper during gold and nickel plating processes, the attachment lands for the flip chip can be affected. This is especially true if the surface of the copper is compromised in such a way that the solder spheres cannot properly wet or form intermetalics with the surface.



Evidence if Gold and nickel plating attack



Plating penetration evidence from a second board. The plating chemistry intrusions appear to be in areas where the solder mask geometry is not consistently flat and straight.



Suggestions:
Please feed this back to the PCB fabricator. With tight process control and best practices, board houses are consistently achieving these lines and spaces. The board vendor may have to look at their internal process to see what adjustments they can make. They may have some ideas for design practices that working in conjunction with their processes can minimize these types of anomalies. For example, based on the above photographs, one might suggest that if there is a constant mask boarder without nearby via features that affect the mask geometry, the plating chemistry intrusion can be reduced significantly.