EMPA

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## Open Degradation on ITO Lines for an LCD Driver

Reliability problems on LCD displays with an integrated LCD driver device were reported. The failure showed up as missing segments on display; all problems reported the same segments missing.

Failure analysis found that always one ITO line, which controls the missing segment, was interrupted exactly at the border between a silicone gel and final mould compound of the driver device. Further investigations have shown that this line was neighboured to the VLCD line, which is at maximum potential of the whole setup all the time. Also the neighboured signal line on the other side of the VLCD line was slightly attacked, but it never came to an open due to the big line width of this line.

Final investigations turned out that an electrochemical reaction was the root cause for the open. The open occurred always at exactly the same geometrical position, where the two mould compounds of the LCD driver touch each other, enclosing some humidity. This humidity together with dissolved ions of the silicone gel, acted as an electrolyte of a parasitic “accumulator cell” which was in a continuously charged mode, generating ITO metallic ion transport.

For ITO layouts, it is important to avoid abrupt potential changes with high levels between neighboured signal- or supply-lines. Potential lines with known max/min potentials like Vdd or Vss should be arranged at the corners of the layout (both in chip and LCD-ITO layout) and minimum distances should be obeyed.

Since device pin pitch scaling is more and more reduced, this aspect will become very important in the future.