Improvement of touch sensitivity through the optimization of the pattern gap and the stack-up on touch sensor

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Most of the smart-phone and tablet PC devices recently use the touch screen panels(TSP) as a input devices. So, the sensitivity of TSP is very important factor for the convience of users and we can realize the various function such as multi hovering, glove touch and passive pen touch through the improvement of the sensitivity. Generally in the capacitive TSP, the sensitivity of TSP is the same as the mutual capacitance difference(delta Cm) between Tx electrode and Rx electrode in touch and non-touch status. So, the delta Cm is decided by the distribution of the fringe field between Tx electrode and Rx electrode and the distribution of the fringe field between TSP sensor and finger.

In this paper we did the experiment about the delta Cm by changing the pattern gap between Tx electrode and Rx electrode and the arrangement about the permittivity of the stack-up material between TSP sensor and finger.

As shown in figure 2, the delta Cm is decreased when the pattern gap is increased from 150um to 300um, so the sensitivity is decreased. But when the pattern gap is less than 150um, the delta Cm depends on the arrangement about the permittivity of the stack-up material on TSP sensor. In case that high permittivity material is located at near TSP sensor and low permittivity material is located at near finger, the delta Cm is increased, so the sensitivity is increased. Generally the mutual capacitance is larger in less 150um pattern gap, so the fringe field formed on TSP sensor is decreased. But the fringe field on TSP sensor is increased because high permittivity material is located on the TSP sensor.

As a result high fringe field is formed on TSP sensor and then the fringe field transferred at finger is increased and the sensitivity is improved.

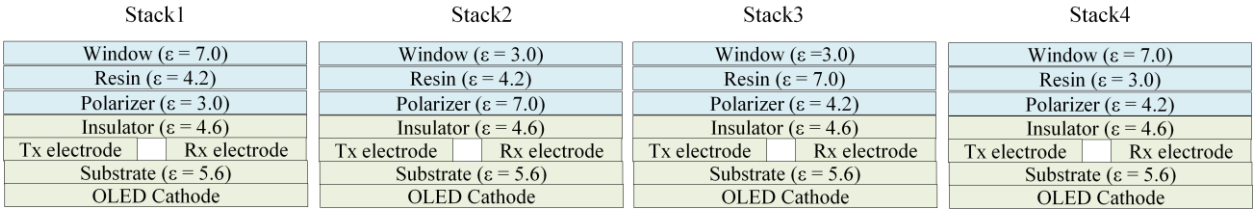

Fig. 1 The tested device structure

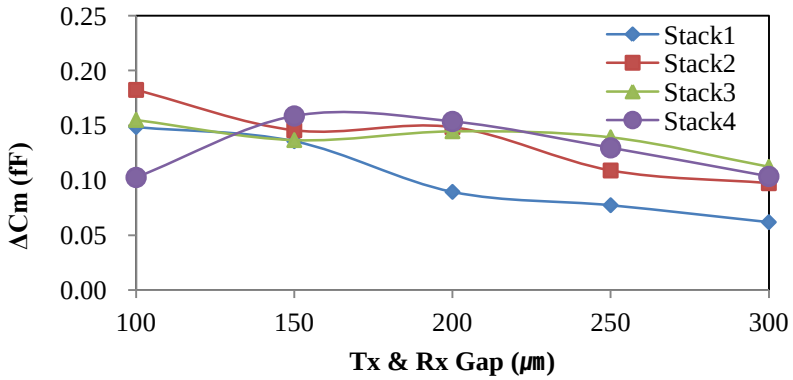

Fig. 2 Delta Cm(Mutual Capacitance) versus Tx & Rx Gap

References

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