

A Diamond Hole Pattern with High Sensitivity and Linearity for Capacitive Touch Screen Panels

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Recently, capacitive touch screen panel (TSP) requires a faster and more accurate touch operation with high sensitivity and linearity which are key performance of the touch screen capability. A sensitivity is defined as a $\Delta C_M / C_M$ in percentage, where C_M is a mutual capacitance, and a linearity is represented as a measure of how accurately TSP responds to the touch input. The sensitivity and linearity are influenced by the pattern of the touch panel.

Figure 1 (a) and (b) show the conventional diamond pattern and the proposed hole diamond pattern of the panel, respectively, with the transmitter electrode (Tx) and receiver electrode (Rx). The proposed hole diamond pattern is implemented by making four holes inside of the conventional diamond pattern. Both conventional and proposed patterns were simulated using Ansys Q3D extractor [1], and the simulation results were analyzed and compared in order to investigate the sensitivity and linearity performance. The simulation result of the conventional diamond pattern shows a low sensitivity and linearity since the pattern of the Rx has a wide area [2]. On the other hand, in the proposed diamond hole pattern, as the area of the Rx pattern decreases, C_M is decreased and the ΔC_M is increased. Accordingly, both sensitivity and linearity are improved by decreasing the area of the Rx pattern.

To verify the performance of the proposed diamond hole pattern, we implemented a TSP qualification system with Arduino [3], PC, TSP, and detection circuits. The linearity of the conventional diamond and proposed diamond hole patterns is tested using a TSP with PCB and a TSP with indium-tin-oxide (ITO). A linearity error was obtained from measuring the difference between the input and output coordinates. As shown in Figure 1 (c), the measurement results shows that the diamond hole pattern has about 47% lower average linearity error than conventional diamond pattern, representing that the proposed pattern has a better linearity than the conventional diamond pattern.

In this paper, a diamond hole pattern is proposed to improve the sensitivity and linearity of the capacitive touch screen panel, by making four holes inside of an unit Rx pattern. Therefore, the proposed pattern of the touch panel is suitable for the high performance capacitive TSP applications.

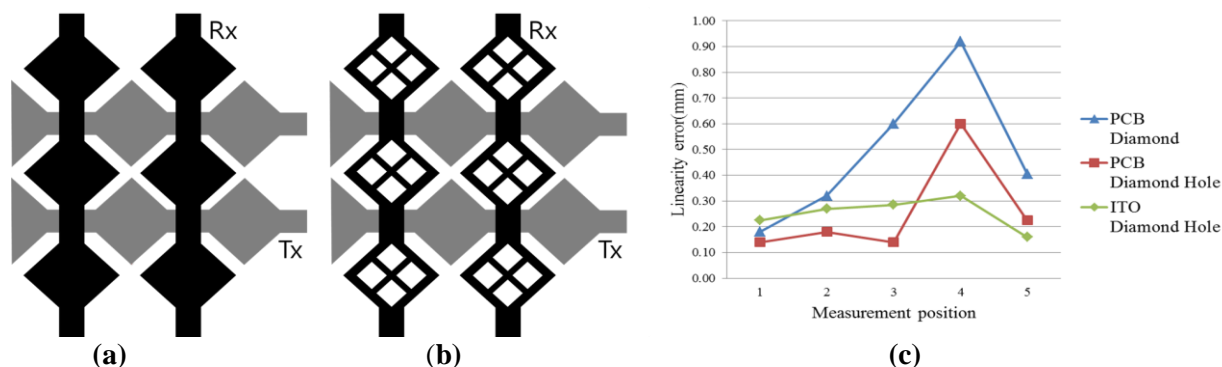


Figure 1. (a) Conventional diamond pattern, (b) proposed diamond hole pattern, and (c) measurement result of linearity error according to the measurement position.

Acknowledgment

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Reference

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3. Arduino, Inc. <http://www.arduino.cc/>