Bus Bar Implementation by Multi-layer Metal Deposition

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Abstract

In on-cell type touch panel structure, screen printing technology which uses Ag paste on ITO film is one of the general processes for Bus bar formation. Considering the growing of capacitance touch panel industry and slim design trend, decreasing the Bezel width is necessary. The high technology should be developed for Bus bar printing. Thus, Bus bar formation process was designed by metal deposition and photo lithography in this theory. By applying multiple layers structure process, the comparisons of adhesion strength between ITO films, resistances and pitch width were proceeded. Based on the comparisons, Mo/Al/Mo structure was known as the best for fine pitch bus bar formation process.

Keywords: *touch panel, screen print, photo lithography, bus bar*

1. Introduction

After launching I-phone of Apple Co., touch panel industry prefer capacitanceand focus on technical development of it.

Resulting from needs-growing of user's multi-touching and advance in mobile phone technology, decreasing the Bezel width is necessary. The development of high integrated Bus bar is emerging.

The realization of Bus bar in TSP recently commercialization apply printing-skill using Ag paste.

This technology can be appliedby relatively simple process, but it is impossible to use line width of below 50um [1-3].

Thus, it is suggested that Photo lithography can realize Bus bar of line width of below 10um On-cell using ITO film of TSP in this theory.

It is believed that high integrated Bus bar is realized by applying Photo Lithography process on Mo/Al/Mo multiple structure. Measuring resistance demonstrate that it has higher integration and weaker resistance than existing printing-skill [4].

2. Description of TSP

Capacitive TSP was composed two ITO films, one is X-axis and the other is Y-axis.To make electric potential uniform, linear ITO pattern was proper.

This is shield at the top of ITO film, designed to prevent incorrect touch from outside influence.

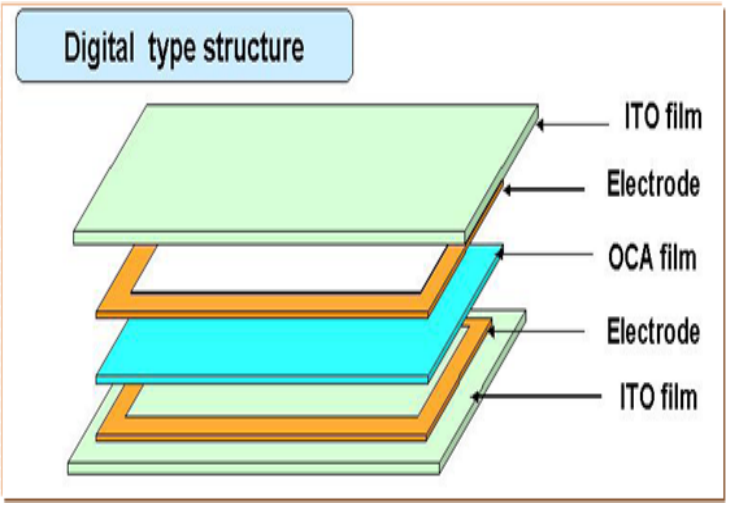

Figure 1. Stack up of Capacitance TSP

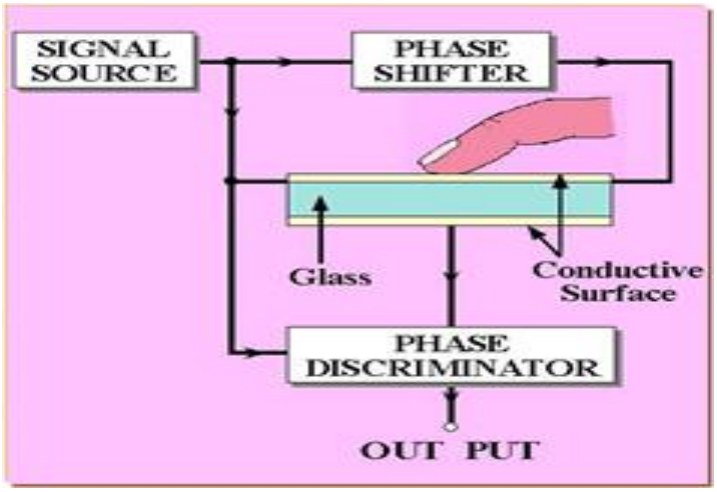

Figure 2. Drive Theory of Capacitance TSP

A high frequency signal is applied sequentially between pairs in this two-dimensional grid array. The current that passes between the nodes is proportional to the capacitance. When a virtual ground, such as a finger, is placed over one of the intersections between the conductive layer some of the electrical field is shunted to this ground point, resulting in a change in the apparent capacitance at that location [5, 6].

3. Bus-bar Electrode Process

Screen printing consists of three elements: the screen which is the image carrier; the squeegee; and ink.

Screen printing ink is applied to the substrate by placing the screen over the material. Ink with a paint-like consistency is placed onto the top of the screen. Ink is then forced through the fine mesh openings using a squeegee that is drawn across the screen, applying pressure thereby forcing the ink through the open areas of the screen. Ink will pass through only in areas where no stencil is applied, thus forming an image on the printing substrate.

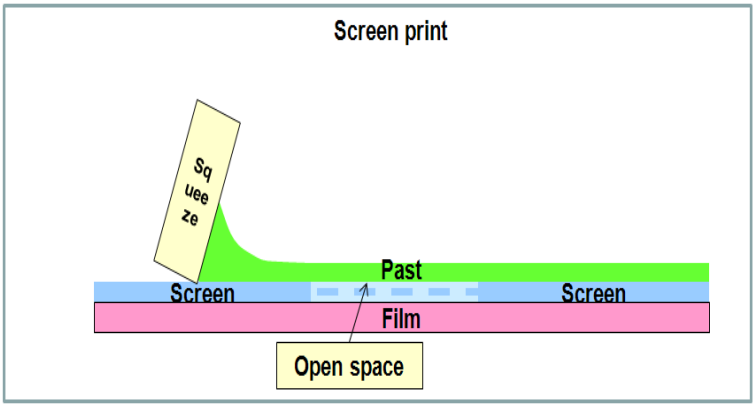

Figure 3. 3A Theory of Screen Print

Fig. 4. Process Flow Photolithography

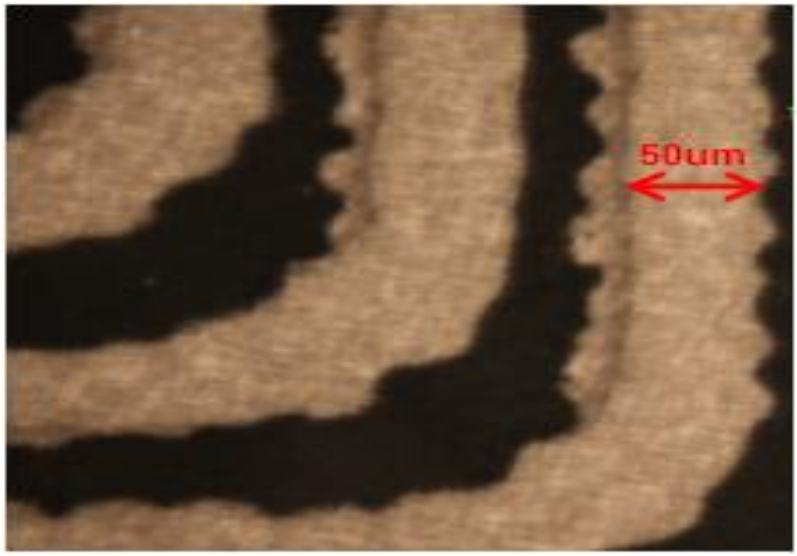

Figure 5. The Result of Screen Print Process

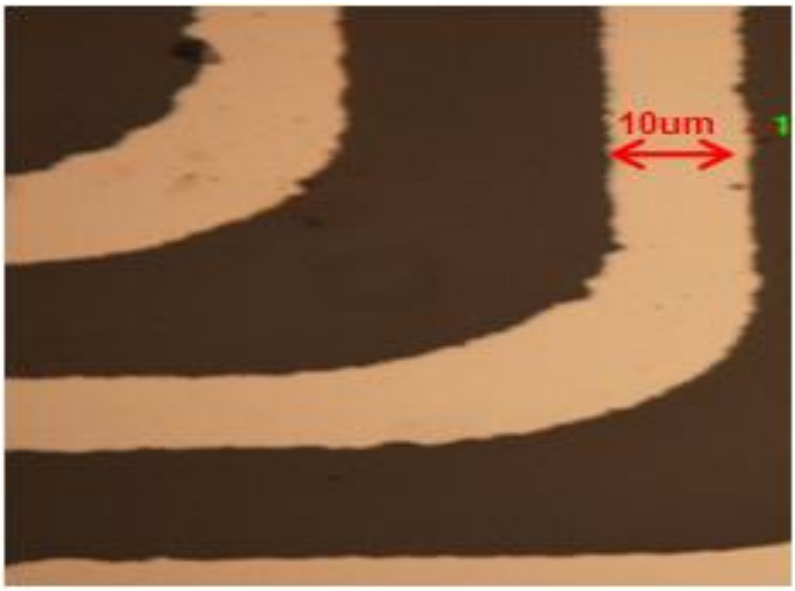

Figure 6. The Result of Screen Print Process

Photolithography process is to work out design component or to array trace in semiconductor industry.

Regarding to bus-bar element, particular materials were selected which is available for bus-bar electrode.

Resistance and thickness of adequate element were indicated in Table 1.

The result of making bus-bar on Mo/Al/Mo structure, which was most pertinent to adhesion with ITO film, that was successfully maintained the 10um line width.

Classfied by process method, test result was showed in Table 2.

Table. 1 Available Element for Sputtering

	Material	Thickness	Remark
1	Al	2.655	Available
2	Cr	1.29E-04	Thick
3	Mo	5.17	Available
4	Ag	1.59	High price
5	Cu	1.673	High price

Table. 2 Compare Result of Process Method

	Material	Resistance	Line width
Screen print	Ag paste	100Ω	50um
Multiple structure	Mo/Al/Mo	100Ω	10um

4. Conclusion

In this paper the bus-bar process flow are derived using multiple deposition structure on On-cell type of TSP.To review of process plan, photolithography process are adopted in Fig.5. And Mo/Al/Mo structure are selected considering the characteristic of ITO film.

After formation of bus-bar electrode, photolithography process was better than screen print to lessen the line width.

The derived output characteristics of a photolithography process can be usefully applied to the design of bus-bar electrode.

Acknowledgements

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