Novel Driving Voltage Optimization Scheme for Avoiding Image Sticking in ADSDS TFT-LCDs

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Due to the persistent efforts of many researchers and engineers [1-3], the image sticking (IS) issue in TFT-LCDs has already been driven out of concerns for the general consumers. However, from fundamentalist nature of researchers/engineers, it may be a never-ending struggle to improve IS characteristic toward the perfectness.

We evaluated the IS property of the 4.7 inch ADSDS TFT-LCD sample panels for variation of driving voltage settings. Our focus was to optimize how much the center voltages for each gray levels, $V_{center}=(V_{+}(L)+V_{-}(L))/2$, should be inclined between L_0 and L_{255}. It should meet the dependency of ΔV_p on gray levels. For simplicity, we just varied the maximum difference, $\Delta V_{center}=V_{center}(L_0)-V_{center}(L_{255})$, and adopted a linear inclination between L_0 and L_{255}. The amplitude of the gamma voltages for each gray levels, $Vamp(L)=(V_{+}(L)-V_{-}(L))/2$, were set so that the gamma curve would be fitted gamma = 2.2 through the experiments. The common voltage V_{com} was set so as to minimize the flicker amplitude at the middle gray level L_{127}.

Fig. 1 shows an example of our evaluation results(ΔVcenter =0 V). Here, the original aspect of the IS just after the switching appeared in positive type, which means the white (L_{255}) area in the checker pattern turned brighter than black (L_0) area, as shown in Fig. 1(b). When the V_{com} value was adjusted upward to $V_{com}+\Delta V$, the positive aspect of the IS become more obvious (Fig. 1(c)). On the other hand, the IS became faint at first and then turned into negative type, while the V_{com} value was adjusted downward to $V_{com}-\Delta V$ (Fig. 1(d)). By observing how the panel reacted on the V_{com} change, the potential image sticking became visible, and then we could know the fact that the driving voltage had not been balanced well. It even could teach us the clues for the better settings. If the original image sticking nature is positive, increasing the V_{com} voltage would intensify the original DC charge accumulation, which leads to the enhancement of positive image sticking. On the contrary, decreasing the V_{com} voltage would cancel the residual DC. Finally we do the IS evaluation with the ΔV_{center} changes of 0.000 V, 0.025 V, 0.062 V and 0.100 V, as shown in Fig. 2 to testify our speculation. The split of ΔV_{center} = 0.025V showed the best IS performance and the results were consistent with our speculation. This is a guide which simplifies the optimization process of the driving voltage setting for improvement of image sticking.

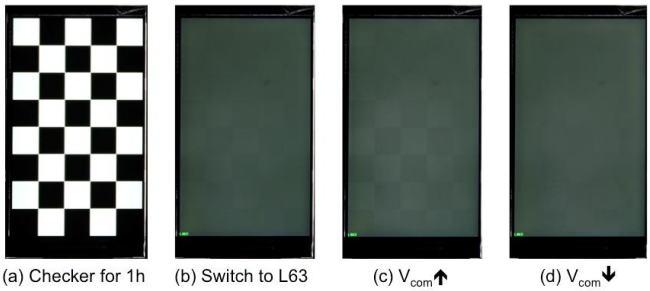

Fig. 1. The process of potential I/S convert to visualization.

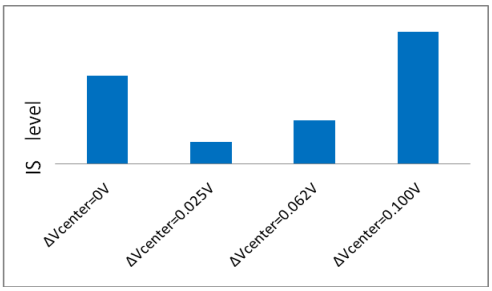

Fig. 2. IS evaluation results of different .

References

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