

## Active matrix mini-LEDs backlights driven by circuits of 2T1C and 1T1MOS based on a-Si

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### 1. Introduction

Mini-LEDs and micro-LEDs have surfaced as a candidate for future displays [1,2]. As for LEDs, there are many advantages such as low investment in production equipments, mature technology of display backplanes, and high reliability. While there are some obstacles towards mass transfer, cost of LEDs and appropriate applications. So far, mini-LEDs backlights with the function of local dimming would be a good choice to introduce this technology into the market [3]. For now, most of mini-LEDs backlights are presented through passive matrix (PM) driving on FPC or PCB substrates. The complexity of layout and patterning process limit the resolution, in addition, FPC or PCB substrates also increase the costs. Hence, active matrix (AM) backplanes on cheap substrates such as glass for mini-LEDs is necessary.

In this work, an AM mini-LEDs backlight with the size of 21.2-inch based on a-Si, function like 432-zones local dimming and switchable BLU modes on a glass substrate, is realized. The two kinds of driving schematics (2T1C and 1T1MOS) are discussed in detail.

### 2. Results and discussion

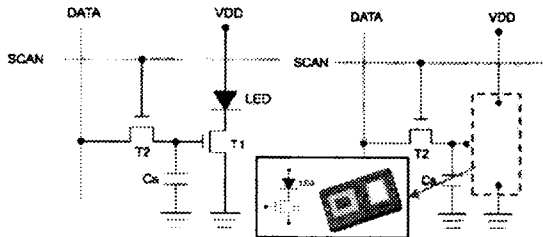


Figure 1: The active driving mechanism of AM mini-LEDs backplane:(a) 2T1C (b) 1T1MOS

16×27 pixels (432-zone) are designed and each pixel owes four LEDs with one set of driving circuits. We employ two kinds of circuit designs (2T1C and 1T1MOS) to output current through voltage of driving switch. The driving schematics of mini-LEDs plane design are shown in Fig. 1. The 1T1MOS-based circuit design is mainly in order to improve the reliability of backlights. Through our researches, the brightness decay of 1T1MOS-based backplane is improved obviously compared with that of 2T1C-based backplane.

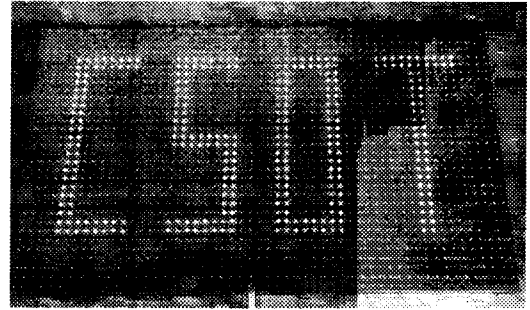


Figure 2: The photograph of AM mini-LEDs

Figure 2 shows the photo of AM mini-LED backplane. Each pixel (zone) can be controlled through active-matrix operation. The blue light emitting by LEDs would be converted to white with stacked films, and then achieved better uniformity through a diffuser film. In the next moment, we will test the reliability of the backplane and more improvements are on-going.

### 3. Conclusion

An AM mini-LED backlight with the size of 21.2-inch, based on a-Si, is demonstrated. The two kinds of driving circuit designs are discussed in detail. The above results provides a universal and practical avenue for mass production of AM mini-LEDs backlights.

### 4. Acknowledgements

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### 5. References

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