How Can I Reduce the Power Consumed by My Liquid Crystal Display?

Traditional Liquid Crystal Display (LCD) controllers implement the switching of charge across their capacitive segments in an inefficient manner. On the physical LCD, each segment can be thought of as a capacitor. At a given refresh rate, the bias across the capacitors must change from \( -\text{VLCD} \) to \( +\text{VLCD} \).

Figure 1 shows the traditional method for switching segments. First, the segment is charged to \(+3 \text{ V}\). Next, the segment is disconnected from the voltage drivers. Finally, the segment is charged to \(-3 \text{ V}\) by switching to the next voltage setting.

![Figure 1. Traditional LCD Segment Transition](image)

As shown in Figure 1, there is a 6 V swing across the capacitor (from \(-3 \text{ V}\) to \(+3 \text{ V}\)), and the battery must provide 2x the charge. By grounding the capacitor before reverse biasing it, the new charge redistribution architecture only requires 1x the charge from the battery when the bias changes from \(-3 \text{ V}\) to \(+3 \text{ V}\). Figure 2 shows how the charge redistribution architecture works.
Silicon Labs’ SiM3L1xx ultra-low-power 32-bit microcontroller family’s innovative charge redistribution architecture reduces the current of the physical display by approximately 40 percent without compromising performance, and the power savings scale with the size of the physical display. In addition, the LCD can continue to operate while the MCU is in sleep mode and incorporates a voltage regulator that can maintain constant LCD contrast over the entire product life. The SiM3L1xx 32-bit microcontroller family with a 128 or 160-segment low-power LCD controller is an ideal MCU solution for power-sensitive applications requiring an LCD.

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Silicon Labs invests in research and development to help our customers differentiate in the market with innovative low-power, small size, analog intensive mixed-signal solutions. Silicon Labs’ extensive patent portfolio is a testament to our unique approach and world-class engineering team. Patent: [www.silabs.com/patent-notice](http://www.silabs.com/patent-notice)

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