Portable information devices demand displays with high resolution and high image quality that are increasingly compact and energy-efficient. Microdisplays, consisting of a silicon CMOS backplane integrated with light-generating or -modifying devices, are being developed for direct-view and projection applications.

Toward the goal of a micro-projector suitable for portable applications, a microdisplay architecture, using silicon light emitters and image intensification, is developed. A standard low-voltage CMOS IC incorporating display drivers and an array of avalanche diodes produces a faint optical image, and an image intensifier efficiently amplifies the image to useful brightness. This architecture has high efficiency and the potential to achieve adequate luminance for projection applications. A proof-of-concept system with 16x32 arrays is implemented and evaluated.

A high-performance silicon backplane for the above system has been designed and evaluated. The backplane is a standard CMOS die including a 360x200-pixel array with silicon light emitters, and 10b precision current mode driver circuits. The driver circuits can support a number of emissive display technologies including silicon light emitters and organic LED (OLED). They employ a self-calibration technique based on the current copier circuit [1] to minimize variation and fixed-pattern noise, while reducing circuit area by half compared to a conventional solution. Two levels of calibration are used, as shown in Figure 1. A circuit technique to improve the retention time of dynamic analog memories is also developed. This technique allows a dynamic analog memory to retain 10b precision for 500ms at room temperature. A die micrograph is shown in Figure 2.

REFERENCES: