

# DESIGN NOTES

## Versatile TFT LCD Bias Supply and White LED Driver in a 4mm × 4mm QFN – Design Note 440

Eddy Wells

### Introduction

The makers of handheld medical, industrial and consumer devices use a wide variety of high resolution, small to medium sized color TFT LCD displays. The power supply designers for these displays must contend with shrinking board area, tight schedules, and variations in display types and feature requirements. The LTC<sup>®</sup>3524 simplifies the designer's job by combining a versatile, easily programmed, TFT LCD bias supply and white LED backlight driver in a low profile 4mm × 4mm QFN package.

The LTC3524's 2.5V to 6V input supply range is ideally suited for portable devices powered from Li-Ion or multiple alkaline or nickel cells. Both the LCD and LED drivers operate at 1.5MHz, allowing the use of tiny, low cost, inductors and capacitors.

The TFT bias portion of the circuit consists of a synchronous boost converter, adjustable between 3V and 6V, providing the main analog  $V_{OUT}$  for the TFT. Low current gate drive voltages ( $V_H$  and  $V_N$ ) are generated using integrated charge-pump circuits. These low noise outputs are programmable to  $\pm 20V$ , allowing optimal bias for multiple display types and makers. The TFT outputs are sequenced at power-up and discharged at power-down as shown in Figure 1.

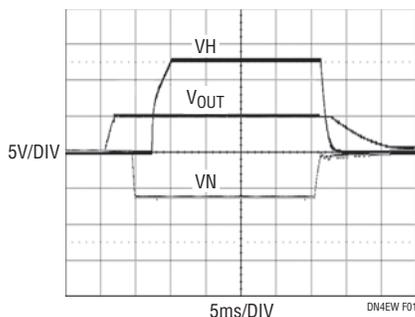


Figure 1. LTC3524 TFT LCD Supply Sequencing at Power-Up and Power-Down

A second nonsynchronous boost converter generates the voltage required to regulate one or two LED strings at up to 25mA each. LED current can be adjusted by either analog or digital means, optimizing the TFT display for varying ambient light conditions. Each string is independently enabled and can contain 1 to 5 LEDs in series. Internal circuitry maintains equal current in the strings, even when the forward voltage drops of the LEDs do not match. Open LED protection is provided to prevent the output from exceeding 24V.

### 3-Output TFT Supply with Digitally Dimmed LED Backlight

A LTC3524-based TFT and backlight solution for a 4 to 6 inch LCD is shown in Figure 2. High frequency operation of the power components and the QFN package shrinks the total converter footprint to approximately 120mm<sup>2</sup> (single sided).

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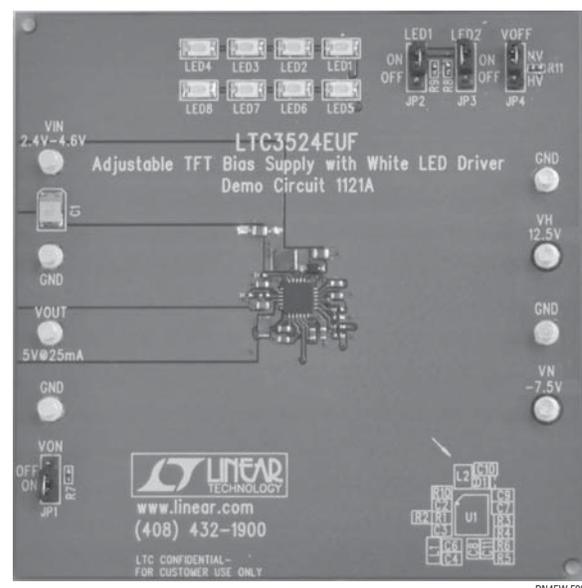


Figure 2. LTC3524-Based LCD and White LED Supply

