

# MAX20069

## Automotive I<sup>2</sup>C-Controlled 4-Channel 150mA Backlight Driver and 4-Output TFT-LCD Bias

Industry's First Automotive TFT Bias with 4 CH LED Driver



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### Description

The MAX20069 is a highly integrated TFT power supply and LED backlight driver IC for automotive TFT-LCD applications. The IC integrates one buck-boost converter, one boost converter, two gate-driver supplies, and a boost/SEPIC converter that can power one to four strings of LEDs in the display backlight.

The source-driver power supplies consist of a synchronous boost converter and an inverting buck-boost converter that can generate voltages up to +18V and down to -7V. The positive source driver can deliver up to 150mA, while the negative source driver is capable of 100mA. The positive source-driver supply regulation voltage ( $V_{POS}$ ) is set by connecting an external resistor-divider on FBP or through I<sup>2</sup>C. The negative source-driver supply voltage ( $V_{NEG}$ ) is always tightly regulated to  $-V_{POS}$  (down to a minimum of -7V). The source-driver supplies operate from an input voltage between 2.8V and 5.5V

The gate-driver power supplies consist of regulated charge pumps that generate up to +28V and -21.5V and can deliver up to 3mA each.

The IC features a quad-string LED driver that operates off a separate input voltage ( $V_{BATT}$ ) and can power up to four strings of LEDs with 150mA (max) of current per string. The IC features logic-controlled pulse-width-modulation (PWM) dimming, with minimum pulse widths as low as 500ns with the option of phase shifting the LED strings with respect to each other. When phase shifting is enabled, each string is turned on at a different time, reducing the input and output ripple as well as audible noise. With phase shifting disabled, the current sinks turn on simultaneously and parallel connection of current sinks is possible.

The startup and shutdown sequences for all power domains are controlled using one of the seven preset modes, which are selectable through a resistor on the SEQ pin or through the I<sup>2</sup>C interface. The MAX20069 is available in a 40-pin (6mm x 6mm) TQFN package with an exposed pad, and operates over the -40°C to +105°C ambient temperature range.

## Key Features

- 4-Output TFT-LCD Bias Power
  - 2.8V to 5.5V Input for the TFT-LCD Section
  - Integrated 440kHz or 2.2MHz Boost and Buck-Boost Converters
  - Positive and Negative 3mA Gate Voltage Regulators with Adjustable Output Voltage
  - Flexible Resistor-Programmable Sequencing through the SEQ Pin
  - Undervoltage Detection on All Outputs
  - Low Quiescent Current Standby Mode
- 4-Channel LED Backlight Driver
  - Up to 150mA Current per Channel
  - 4.5V to 42V Input Voltage Range
  - Integrated Boost/SEPIC Controller (440kHz or 2.2MHz)
  - Dimming Ratio 10,000:1 at 200Hz
  - Adaptive Voltage Optimization to Reduce Power Dissipation in the LED Current Sinks
  - Open-String, Shorted-LED, and Short-to-GND Diagnostics
- Low EMI
  - Phase-Shift Dimming of LED Strings
  - Spread Spectrum on LED Driver and TFT
  - Selectable Switching Frequency
- I<sup>2</sup>C Interface for Control and Diagnostics
  - Fault Indication through the FLTB pin and I<sup>2</sup>C
- Overload and Thermal Protection
- -40°C to +105°C Ambient Temperature Operation
- 40-Pin (6mm x 6mm) TQFN Package with Exposed Pad

## Applications/Uses

- Automotive Central Information Displays
- Automotive Dashboards
- Automotive Head Up Displays
- Automotive Navigation System