

Step-Up Regulator, Internal Charge Pumps, Switch Control, and Operational Amplifier for TFT LCDs

General Description

The MAX8784 generates supply rails for the thin-film (TFT) liquid-crystal display (LCD) panels in TVs and monitors. It includes a step-up regulator, a regulated positive- and a negative-charge pump, three high-current operational amplifiers, and Dual Mode™, logic-controlled, high-voltage switch control block. HVS mode automatically increases the output voltages of the boost regulator and the positive-charge pump to stress test display panels during production. The MAX8784 can operate from input voltages of 4V to 5.5V and is optimized for LCD TV panel and LCD monitor applications.

The step-up DC-DC regulator provides a regulated supply voltage for TFT source drivers. The step-up regulator is a high-frequency (1.2MHz), high-efficiency, current-mode regulator. The step-up regulator has a built-in 110mΩ (typ) power MOSFET. The high-switching frequency allows the use of ultra-small inductors and ceramic capacitors. The current-mode architecture provides fast transient response and easy compensation. The step-up regulator features output undervoltage protection, soft-start, internal current limit, and adjustable output voltage by an external resistive divider.

The three operational amplifiers drive the LCD back-plane and the gamma-correction-divider string. Each operational amplifier has a fast slew rate (45V/μs), a wide bandwidth (20MHz), and a high-output short-circuit current (200mA). Each op amp has rail-to-rail input and rail-to-rail output operation.

The positive-charge pump regulator and the negative-charge pump regulator provide regulated supply voltages for the TFT gate drivers. The positive-charge pump is a two-stage charge pump, which requires no external diodes. The output voltages of both charge pumps are resistor adjustable. The logic-controlled high-voltage switch allows the manipulation of the positive TFT gate-driver supply.

The MAX8784 is available in a small (5mm x 5mm), low-profile (0.8mm), 40-pin thin QFN package and operates over the -40°C to +85°C temperature range.

Applications

LCD TVs and LCD Monitors

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX8784ETL+	-40°C to +85°C	40 Thin QFN 5mm x 5mm	T4055-1

Dual Mode is a trademark of Maxim Integrated Products, Inc.

Features

- ◆ **Step-Up Regulator Supply for LCD Panel Source Driver**
 - Fast Transient Response to Pulsed Load
 - Built-In 18V, 4A, 0.11Ω n-Channel Power MOSFET with Lossless Current Sensing
 - Cycle-by-Cycle Current-Limit Comparator
 - 90% Efficiency (5V In to 15V Out)
 - 1.2MHz Switching Frequency
- ◆ **Three High-Current 19V**
 - 180mA Output Short-Circuit Current
 - 45V/μs Slew Rate
 - 20MHz Bandwidth
 - Rail-to-Rail Input and Output Operation
- ◆ **Regulated Charge-Pump Tripler with Integrated Diodes for TFT Gate-On Supply**
- ◆ **Regulated Charge Pump for TFT Gate-Off Supply**
- ◆ **Built-In Sequencing**
 - Internal Digital Soft-Start
 - 36V Gate-On Switch
 - Startup Timing Capacitors for AVDD and GON
- ◆ **Undervoltage and Thermal Protection**
- ◆ **4V to 5.5V Input Operating Range**

Simplified Operating Circuit

