6-channel DC/DC Converter IC with Gamma Voltage Generator for Large-Screen LCD Panels
MB39C307A

A system power-supply LSI integrating power-supply and generation of high picture quality gamma functions in 1 chip for application in the large-screen panels of recent LCD TVs and high-vision, high-quality panels. This product incorporates power-supply management functions for large-screen LCD panels including voltage generation for the driver IC that directly drives the LCD panel, voltage generation for the digital image data-processing LSI in the controller block and gamma voltage generator for the display of various colors on the LCD panel.

Introduction

In recent years, the popularization of flat-panel TVs has been prominent—they are expected to comprise 50% of the world’s TV market in 2008. Approximately 70% of these flat-panel TVs utilize LCD panels. Furthermore, the ratio of large-screen LCD TVs which are 40 inches or larger is expected to expand significantly in 2008—approximately 10% or more increase over 2007.

Large-screen LCD panels are growing rapidly in the market as a result of cost reduction due to production efficiency and quality improvement. Large-screen, high picture quality flat-panel TVs with digital high vision or full high vision with higher quality are currently being introduced into the market. This trend is expected to continue for some time into the future.

As screen size increases and high picture quality development advances in flat-panel TVs, the amount of data, number of panel-driving ICs, and amount of current required for the entire panel also increase. As such, the use of a DC/DC
Converter capable of operating high current at high efficiency for power-supply ICs for large-screen panels is ideal. In addition, high picture quality panels require gamma voltage adjustment for color correction in real time.

Overview

This product is a system power-supply LSI for applications in large-screen, high picture quality LCD panels. To generate voltage for panel driving and the controller LSI, it is equipped with a 6-channel DC/DC converter output with a simple component configuration. Furthermore, it mounts 20 outputs for gamma voltage generator for the display of high-quality colors on the LCD with 10-bit precision voltage and 1 output for voltage generation for the LCD backplane. For each of these outputs, it is possible to set up a gamma voltage best suited to the panel features. This product provides an optimal power-supply solution for large-screen LCD panels as its functions reduce the mounting area and support high currents and high picture quality. Furthermore, the power-supply management functions required in large-screen LCD panels are incorporated in 1 chip to reduce the mounting area.

Product Features

- High-current driving/high efficiency:
  - Up to 5A
  - 80% efficiency or higher (Vo1, Vo2)

- Multiple functions
  - DC/DC converter
    - Step-down × 3 channels, step-up × 2 channels, invert × 1 channel
  - Gamma voltage generator
    - 10-bit D/A converter × 20 channels
  - Vcom voltage generator
    - 10-bit D/A converter × 1 channel
  - SPI interface

- Various built-in protective functions
  - Output short-circuit protection
  - Thermal protection (thermal shutdown)

- Package
  - BCC92S++, a miniature package with good heat release performance is adopted.

- Conforms to the lead-free/RoHS directive

Functions

- Voltage power-supply functions
  - It is possible to set up 12V or 5V or both, which are the general input voltages for LCD panels. It generates 6 outputs: 15V for the source driver, 32V and −5V for the gate driver, and 3.3V, 2.5V, and 1.2V for the controllers.

- Sequence function
  - The ON/OFF sequence for the power-supply IC’s 6 outputs is fixed in the IC.
  - Input voltage → Vo1, 2, 3 (Control LSI) → Vo4 (Source driver IC) → Vo5 (Gate driver IC) → Vo6 (Gate driver IC)

- Gamma voltage generator
  - When a LCD panel displays color, it applies voltage on the LCD of each RGB pixel. This voltage is called gamma voltage. This gamma voltage is a fixed value of the LCD panel. This product generates a reference voltage for this gamma voltage.
Based on this reference voltage, each data driver drives the panel by compensating for intermediate gradation. There can be 10 outputs on the High side and 10 outputs on the Low side to make a total of 20 for the reference voltage corresponding to the Vcom voltage. Each comprises 10-bit D/A equivalent. A buffer circuit is used for output, and the voltage can be changed in real time from an external source using the SPI interface.

- **Vcom voltage generation function**
  The reference voltage for the LCD backplane. It is made up of a 10-bit D/A equivalent near the common voltage (VDD/2).

- **SPI interface function**
  The SPI interface is used to communicate with the CPU. It is possible to rewrite the Vcom voltage or the gamma voltage values in this product.

- **Thermal protection function**
  To protect the IC when it generates heat, there is an thermal protection function.

- **Operation frequency setting function**
  It is possible to vary the operation frequency from approximately 100KHz to 600KHz by connecting 15KΩ to 90KΩ as an external resistor to the RT terminal.

### Application Examples

**Figs.1 and 2** present application examples of this product.

### Evaluation Board

To simplify the single unit evaluation of this product, we offer an evaluation board with the following features:
- The power-supply terminal, input/output terminal, and GND terminal necessary for evaluation are equipped as monitor terminals
- There is a dip switch for the ON/OFF of each output and Low/High setting is possible.

*The signals to control the gamma voltage are supplied from an external source via the SPI interface*

### Future Development

FUJITSU has developed power-supply ICs for LCD panels by integrating D/A converters and DC/DC converters using our core analog technology for power-supply ICs. In the future, we will continue to develop products to address the needs of our customers through further integration of peripheral functions and cost reduction.

### NOTES

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