

7-Channel DC/DC Converter IC with Built-in Switching FET

MB39C306

In the past, FUJITSU has devoted great effort to the development of power supply IC products for high-function portable devices such as digital still cameras and has developed numerous products as a result. This time, we have developed a 7-channel DC/DC converter IC “MB39C306” with built-in switching FET that is optimal for built-in multi-power supply systems in high-function portable devices.

Overview

High-function development in portable devices has been advancing rapidly and there is strong demand for the miniaturization of built-in power supplies. This product is a 7-channel DC/DC converter IC with built-in switching FET that utilizes the pulse width modulation (PWM) type adopting the CMOS process.

By adopting the current mode method and built-in switching FET with low Q_g for channels 1 to 4 and channel 6, high efficiency can be realized for high frequency. It also has built-in phase compensation circuits for channels 1 to 3 and channel 6, which contributes to the reduction in the number of parts.

This product has 7 channels on a small 6mm square FBGA-103P package and is optimal for the power supplies of high-function portable devices such as digital still cameras that use 1 cell of an Li-ion secondary battery.

Product Features

■ DC/DC control function

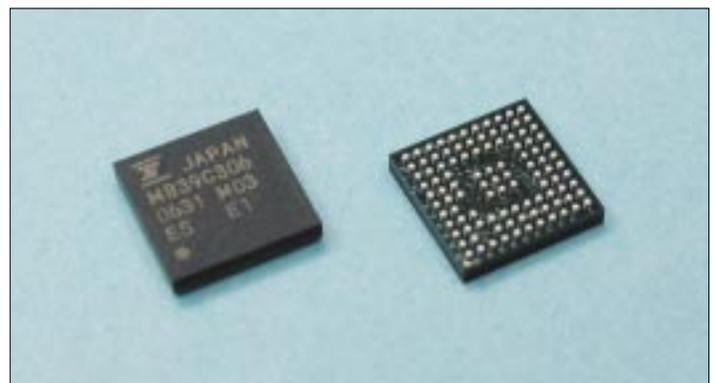
- Built-in switching FET for a total of 7 channels
- Current mode: Down conversion method (channels 1 and 2)
Up/down conversion H-bridge method (channels 3 and 6)

- Up conversion method (channel 4)
- Voltage mode: Inversion method (channel 5)
Up conversion method (channel 7)
- Built-in phase compensation circuits (channels 1 to 3 and channel 6)
- Built-in output setting resistors (channels 1 to 3 and 6 and 7)
- Switching of output voltage possible (channels 2, 6, and 7)

■ Protective functions

- Undervoltage lockout circuit (UVLO)
- Short-circuit protection circuit (SCP)

Photo 1 External View



- Over-temperature protection circuit (OTP)

Start-up/shutdown functions

- Soft-start circuit with no load dependency (channels 1 to 7)
- Built-in start-up/shutdown sequence circuit (channel 1 to 3, channel 4 to 5)

Other functions and specifications

- Input voltage range: 2.5V to 6.0V
- Standby current: 0μA (Typ.)
- Built-in switching FET leak current: 1μA (Max.)
- Operation temperature: -30°C to +85°C
- Oscillation frequency: 1.5MHz

Description of Functions

Start-up/shutdown sequence circuit with no load dependency

A start-up/shutdown sequence specialized for digital camera systems is equipped on channels 1 to 3, which supply the voltage for the image processing engine. The start-up/shutdown sequence in which one of the 2 types of sequences specialized for digital camera systems can be selected is equipped in channels 4 and 5, which supply the CCD voltage. In addition, channel 4 prevents drops in the power supply voltage caused by the rush current at start-up by carrying out the H-bridge operation at start-up only in order to realize start-up from 0V.

Fig.1 shows the diagram of start-up/shutdown sequence for

channel 1 to 3, channel 4 to 5, and Fig.2 shows the start-up operation of channel 4.

Timer latch short-circuit protection circuit (SCP function)

Each channel operates with continual comparison of the error amplifier output level to the reference voltage at the short-circuit detection comparator (SCP Comp.). When the error amplifier output level exceeds the reference voltage, charging starts in the capacitor connected to the CSCP terminal. When the capacitor voltage exceeds the threshold voltage, the switching FET is turned OFF.

Photo 2 Evaluation Board (7cm×7cm)

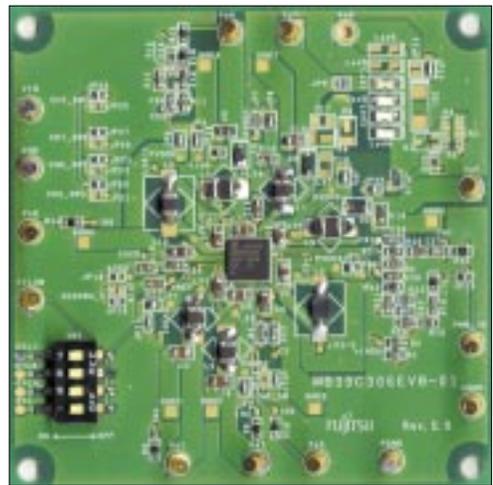


Figure 1 Diagram of Start-up/Shutdown Sequence for Channel 1 to 3, Channel 4 to 5

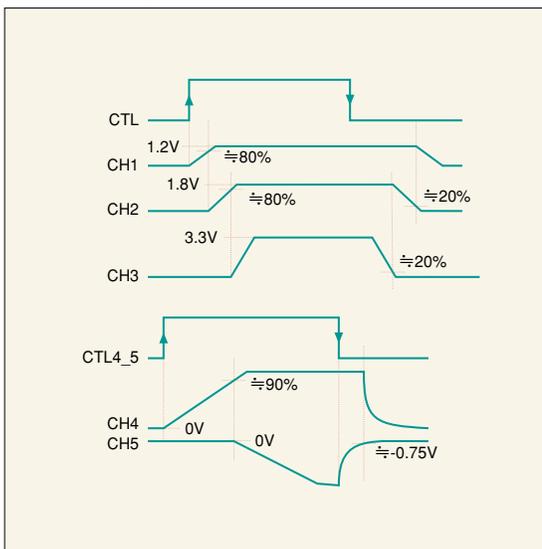
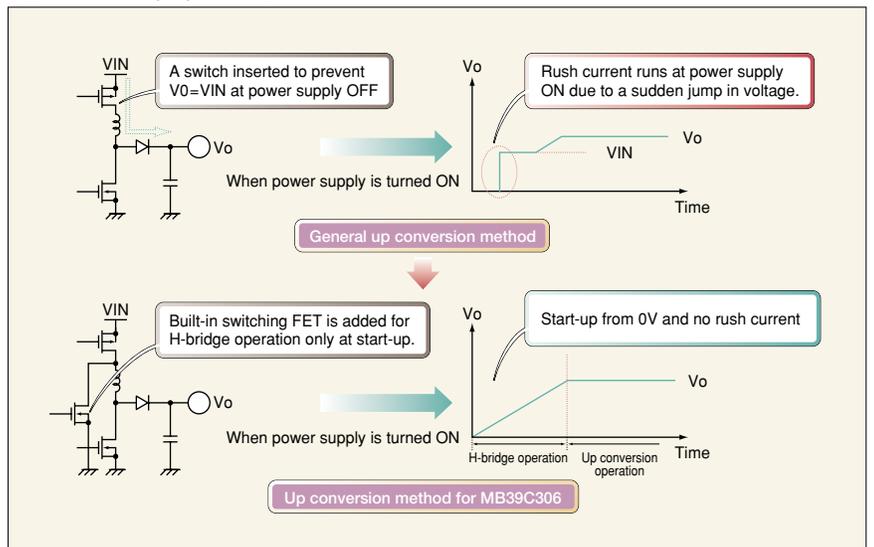


Figure 2 Start-up Operation by Channel 4



Undervoltage lockout circuit (UVLO function)

To prevent malfunctions due to drops in IC input voltage, this product has a built-in undervoltage lockout circuit. The switching FET is turned OFF when the input voltage falls below the UVLO threshold voltage.

Over-temperature protection circuit (OTP function)

The built-in over-temperature protection circuit protects the IC when it heats up. The switching FET is turned OFF when the junction temperature reaches 150°C. Switching is resumed when the junction temperature drops to 125°C and output begins with a soft-start.

Constant current setting method for the white LED driver

Channel 7 is the channel for the white LED driver with a built-in LED constant current circuit. By connecting a current setting resistor (RLED) to the RLED terminal and varying the duty of the PWM signal to be input at the PWM_IN terminal, it is possible to change the average current for the white LED and adjust its brightness.

Fig.3 shows an example of application drawing.

Evaluation Board and Package

Evaluation board

- Quantity of main parts: 50 (including IC)
- Area occupied by parts: 171mm² (including IC)

Area of the evaluation board occupied by parts has been reduced by 60% due to on-chip development of external parts and the adoption of small coil enabled by high frequency operation.

* The area is calculated by body size.

Package

6mm square, 0.5mm pitch flip chip structure FBGA (103-pin) *

NOTES

* Other company names and brand names are the trademarks or registered trademarks of their respective owners.

Figure 3 Example of Application Drawing

