System Power Management IC for Mobile Terminals

MB39C316

A power management IC for mobile terminals that has a 3-channel DC/DC converter and 4-channel LDO and offers extended operation lifetime with 1-cell lithium ion battery using a high-efficiency buck/boost conversion 1-channel DC/DC converter. Each DC/DC converter circuit has a function to detect the load current. It automatically switches between Normal mode (PWM) and Eco-mode (PFM). It also supports communication interfaces conforming to I²C bus and is capable of notifying internal status, power reset, and so forth.

* LDO : Low Drop Output (Regulator)

Product Features

Small size and light-weight
- WL-CSP (Wafer Level-Chip Size Package)
- 49-pin 0.4mm pitch
- Size (3.14mm×3.11mm×0.8mm)

Multiple functions
- Power supply voltage range: 2.7V to 5.5V
  - Supporting 1-cell lithium ion battery
- Constant-voltage power supply
  - DC/DC converter: 3-channel,
  - LDO: 4-channel
- Buck/boost DC/DC converter (3.3V output) enables operation even when the voltage from the lithium ion battery is 3.3V or lower
- ON/OFF control of LDO and DC/DC converters by external signals or register setting
- Conforms to I²C bus (400kbps at max.):
  - Various status notifications and controls
- Protective functions: over-current protection (OCP), short-circuit protection (SCP), under-voltage lockout (UVLO), and over-temperature protection (OTP)
- 32kHz output for RTC: stable clock generation achieved by connecting an external crystal oscillator
- Current consumption: 150μA at standby

Table 1 shows the specifications of the constant-voltage power management.

MB39C316 is a power management IC that is capable of...
supplying the power voltage to the application processor and so forth utilized in the development of products for a ubiquitous network society. Each power output sequence for this product is fixed by the startup/shutdown conditions for both rising and falling.

**Standard Characteristics**

The following section presents the standard characteristics for typical constant-voltage power output. **Figure 1** presents the conversion efficiency-load current characteristic as buck conversion DC/DC characteristics (DCDC1), **Figure 2** the characteristics of load step response, and **Figure 3** the ripple of output voltage. **Figure 4** presents the conversion efficiency-load current characteristic as buck/boost conversion DC/DC characteristics (DCDC3), **Figure 5** the ripple of output voltage, and **Figure 6** the LDO characteristics (LDO1).

**Application Examples**

**Figure 7** presents the mobile terminal system configuration.

**Evaluation Board**

To simplify the single-unit evaluation of this product, we offer an evaluation board with the following features (Photo 2):

*All power management terminals, input/output terminals,

**Table 1** Specifications of the Constant-Voltage Power Management

<table>
<thead>
<tr>
<th>Constant-voltage power management</th>
<th>Output voltage</th>
<th>Output current (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC/DC down conversion</td>
<td>1.2V</td>
<td>800mA</td>
</tr>
<tr>
<td></td>
<td>1.8V</td>
<td>600mA</td>
</tr>
<tr>
<td>DC/DC up/down conversion</td>
<td>3.3V</td>
<td>650mA</td>
</tr>
<tr>
<td></td>
<td>2.85V</td>
<td>200mA</td>
</tr>
<tr>
<td></td>
<td>2.9V</td>
<td>6.5mA</td>
</tr>
<tr>
<td></td>
<td>1.2V/1.3V</td>
<td>84mA</td>
</tr>
<tr>
<td></td>
<td>1.2V</td>
<td>260mA</td>
</tr>
</tbody>
</table>

**Figure 1** Conversion Efficiency-load current characteristic (DCDC1)

**Figure 2** Characteristics of Load Step Response (DCDC1)

**Figure 3** Ripple of output voltage (DCDC1)

**Figure 4** Conversion Efficiency-load current characteristic (DCDC3)

**Figure 5** Ripple of output voltage (DCDC3)

**Figure 6** LDO characteristics (LDO1)
and GND terminals necessary for evaluation are set up as monitor terminals
* An SW is integrated on the external setup terminal to enable “L” and “H” settings
* A PC interface may be attached using USB1.0 for an I2C bus interface

**Future Development**

FUJITSU has developed numerous system power management ICs for cell phones. This product has been developed for mobile devices by applying our accumulated technology and know-how. In the future, we plan to develop power management IC products that offer the characteristics required in power management voltage for CPUs and high-speed FPGA cores (output voltage precision, load step response characteristics, low ripple, PSRR, and so forth) for applications in portable devices.

**NOTES**

* I2C bus is a registered trademark of Phillips.
New Products

MB39C316

Photo 2  External view of Evaluation Board (MB39C316EVB)

Figure 7  Mobile Terminal System Configuration

![Diagram of Mobile Terminal System Configuration]

- **VIN**: 2.7V to 5.5V
- **Lithium battery**
- **Crystal oscillator**
- **MB39C316**
  - DC/DC 3 channels
  - LDO 4 channels

**System block**
- **FLASH**
- **SDRAM**
- **SoC**

**Application block**
- 3.3V/650mA
- 1.8V/600mA
- 1.2V/800mA
- 2.85V/200mA
- 1.2V/260mA
- (1.2/1.3V)/84mA
- 2.9V/6.5mA

32.76kHz