**ECO is in our SEMICONDUCTORs**

Digital Network built on personal computer and digital home appliances are growing rapidly in recent years. Multi-function electrical appliances are increasingly available making it more convenient for family and society.

On the other hand, increasing use of various types of electrical equipment will result in higher energy consumption. Global warming and environmental concern need to be addressed especially when usage is expected to spread widely.

Hence, integrating more features into the products while maintaining high energy efficiency and environmental friendliness have become more important for product development.

Fujitsu Semiconductor strives to contribute to green environment by developing power management ICs focusing on attributes like; high power efficiency for saving power, miniaturize packaging, reduce external components, and effective control technique for fast transient response and lower output voltage.

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**Lineup from Application**

- General-purpose DC/DC Converter
- DC/DC Converter with Switching FET
- DC/DC Converter with Switching FET + LDO

**Lineup from Category**

- General-purpose DC/DC Converter
- DC/DC Converter with Switching FET
- DC/DC Converter with Switching FET + LDO
- LED Driver
- Charge Controller
- Power Voltage Monitoring Applications
- Power Management Switches
- AGDC Converter

**Product Analysis/Technical Analysis**

- Web-Based Design Simulation Tool for Power Management ICs
- Easy DesignSim™
- Power Management IC for Portable Instruments
- 6MHz Synchronous Rectification
- Buck-Boost DC/DC Converter IC

**Package**

- Evaluation Board
- Search of Product and Document
- Online Design Simulator

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*Eco; An onomatopoeic word between Ecology and Economy.
Provided for different digital appliances from PC, cellular phones and other mobile terminals to digital TV, digital cameras and DVC, power management ICs of Fujitsu Semiconductor combine state-of-the-art semiconductor design and production technology, system technology and application technology, and have risen to prominence as core technology of digital appliances.

Combining the above advanced technology, Fujitsu offers power management ICs featuring high performance, advanced functions and user-friendliness.

### Notebook computer power management IC

- **General purpose DC/DC converter**
  - MB3800
  - MB39A135
  - MB39A136
  - MB39A130A
  - MB39A214A

- **Monitoring of power supply voltage**
  - MB3771
  - MB3773

- **For charging control**
  - MB39A134
  - MB39A132A

- **Power management switch**
  - MB3841
  - MB3842

### Mobile phone power management IC

- **Recommended device**
  - MB39C022
  - MB39C326

### Portable device power management IC (GPS/PND/PMP)

- **Charger**
  - MB39C006A
  - MB39C007
  - MB39C316

- **Boost**
  - MB39C005

- **Invert**
  - MB39C013

- **Backlight driver**
  - MB39C014

- **Solution Chip**
  - MB39C015

### For RF

- **Recommended device**
  - MB39C011A
  - MB39A214A

### GDC power management IC

- **Recommended devices**
  - MB39C011A
  - MB39A214A

### Smart Meter power management IC

- **Recommended devices**
  - MB39C012
  - MB39A135
  - MB39A136

- **Recommended Micro controller**
  - Fujitsu FM3
  - Fujitsu FRAM

- **Recommended Memory**
  - Fujitsu FRAM
Fujitsu Semiconductor provides various power management IC covering a vast range of specifications: the number of output channels ranges from 1 to 6 and the input voltage from 1.7V to 28V.

**Output channels**

- **6ch**
  - MB39A123
  - MB39A302
  - MB39C313A

- **4ch**
  - MB39C313A
  - MB39C315
  - MB39C014
  - MB39C006A

- **3ch**
  - MB39C315
  - MB39C014
  - MB39C006A

- **2ch**
  - MB39C315
  - MB39C014
  - MB39C006A

- **1ch**
  - MB39C315
  - MB39C014
  - MB39C006A

**Recommended devices**

- **MB39A135**
- **MB39A136**
- **MB39A130A**
- **MB39A132A**
- **MB39A134**
- **MB39A136**
- **MB39A302**

**Explanation of a Functional Display**

- **E**: Easy DesignSim
- **Online Design Simulator**: 
- **OTP**: Over-temperature protection circuit
- **OVP**: Overvoltage protection circuit
- **UVP**: Under-voltage protection circuit
- **OCP**: Overcurrent protection circuit
- **SCP**: Short-circuit protection
- **Buck**: Buck-conv.
- **B/B**: Buck/Boost-conv.
- **Boost**: Boost-conv.
- **Inv**: Invert-conv.
- **FET**: Built-in switching FET
- **SCP**: Short-circuit protection
- **LDO**: Low Dropout regulator
- **Charge Control**: Charge control
- **DC/DC**: DC/DC converter
- **LDO**: Low Dropout regulator

**General**

- **Central (sch FET)**
- **DC/DC LDO**
- **GM12 DC/DC**
- **For System DC/DC**
- **LCD**
- **LED Driver**
- **Charge Control**
- **Power supply voltage**

**For LCD panel**

- **MB39C313A**
- **MB39C315**
- **MB39C014**
- **MB39C006A**

**Transcoder power management IC**

- **MB39C326**
- **MB39A135**
- **MB39A136**
- **MB39A130A**
- **MB39A132A**
- **MB39A134**
- **MB39A136**
- **MB39A302**

**Smart phones, e-Books and Tablet PC**

- **MB39C326**
- **MB39A135**
- **MB39A136**
- **MB39A132A**

**Recommended device**

- **MB39C326**
- **MB39A135**
- **MB39A136**
- **MB39A130A**
- **MB39A132A**

**AC adapter**

- **1-cell Li-ion battery**
- **MB39C326**
- **MB39A136**
- **MB39A130A**
- **MB39A132A**
- **MB39A134**
- **MB39A136**
- **MB39A302**

**DDR2 SDRAM**

- **MB39C326**
- **MB39A135**
- **MB39A136**
- **MB39A130A**
- **MB39A132A**
- **MB39A134**
- **MB39A136**
- **MB39A302**

**Recommended Transcoder LSI**

- **MB86M01**
- **MB86M02**
- **MB86M03**
- **MB86M04**

**MB39C313A**

- **MB39C315**
- **MB39C014**
- **MB39C006A**
- **MB39C315**
- **MB39C014**
- **MB39C006A**
- **MB8800**
- **MB39C326**
- **MB39A135**
- **MB39A136**
- **MB39A132A**

**IC Lineup of DC/DC Converter**

- **Output channels**
  - **6ch**
  - **4ch**
  - **3ch**
  - **2ch**
  - **1ch**

**Transcoder: Image compression and restoration**

**Recommended devices**

- **MB39C326**
- **MB39A135**
- **MB39A136**
- **MB39A130A**
- **MB39A132A**

**Recommended devices for LCD panel**

- **MB39C313A**
- **MB39C315**
- **MB39C014**
- **MB39C006A**

**Recommended devices for Transcoder LSI**

- **MB86M01**
- **MB86M02**
- **MB86M03**

**Application example**

- **For digital home appliances**
  - **AC/DC**
  - **MB39A135**
  - **MB39A136**
  - **MB39A130A**

- **Transcoder**
  - **MB39C326**
  - **MB39A135**
  - **MB39A136**
  - **MB39A130A**

- **Smart phones, e-Books and Tablet PC**
  - **AC adapter**
  - **Charger**
  - **MB39C326**

**Fujitsu Power Management IC**

- **FUJITSU Power Management IC**
- **FUJITSU Power Management IC**
- **FUJITSU Power Management IC**
**MB39A130A** Nch/Nch Synchronous Rectification 1-channel DC/DC Buck Converter IC

**Ultra-rapid response, High efficiency**

- **Description**
  - MB39A130A is a 1ch DC/DC buck converter equipped with a bottom detection comparator and Nch/Nch synchronous rectification. It supports low on-duty operation, enabling stable low voltage output when there is a large difference between input and output voltages. It achieves ultra-rapid response and high efficiency with sufficient internal protection function, and is suitable for the power supply of a core circuit having low voltage and large current, such as the AV and PGB made by 45nm or 65nm process technology.

- **Features**
  - Wide range of power supply voltage: 4.5V to 25V
  - High efficiency of power conversion
  - Adjustable frequency setting by an external resistor: 10kHz to 600kHz
  - High accuracy reference voltage: ±1.0%
  - Output voltage setting range: 0.7V to 5V or 1.2V / 5.3V
  - Built-in soft-stop circuit
  - Built-in discharge control circuit
  - Built-in soft-start circuit independent of loads
  - Standby current: 0µA (typ)
  - High frequency operation: 100kHz to 1.0MHz
  - Wide range of power supply voltage: 4.5V to 25V

- **Application**
  - Digital TV, Photocopiers, Projectors, STB
  - Blu-ray, DVD players/recorders, Digital devices

**MB39A214A** Nch/Nch Synchronous Rectification 2-channel DC/DC Buck Converter IC

**Ultra-rapid response, High efficiency**

- **Description**
  - MB39A214A is a 2ch DC/DC buck converter equipped with a bottom detection comparator for low output voltage ripple and Nch/Nch synchronous rectification. It supports low on-duty operation to allow stable output of low voltages when there is a large difference between input and output voltages. MB39A214A achieves ultra-rapid response and high efficiency with built-in enhanced protection features. The MB39A214A is suitable for the power supply of the core circuit which is low voltage and large current, such as the AV/SG and PGB made by 45nm or 65nm process technology.

- **Features**
  - Wide range of power supply voltage: 6V to 28V
  - High efficiency of power conversion
  - Frequency setting by internal preset function: 310kHz / 620kHz / 1000kHz
  - High accuracy reference voltage: ±0.7%
  - Output voltage setting range: 0.7V to 5.3V
  - Possible to select the automatic PWM selection mode or PWM fixed mode
  - PWM frequency limitation function (Pulse Stop Frequency): >30 kHz (Min)
  - Built-in diode for boost strap
  - Standby current: 0mA (typ)
  - Built-in soft-start circuit independent of loads
  - Built-in discharge control circuit
  - Substantial protective function type output driver for N-ch MOS FET

- **Application**
  - Digital TV, Photocopiers, Projectors, STB
  - Blu-ray, DVD players/recorders, Digital devices
  - Image equipment

**MB39A135** Nch/Nch Synchronous Rectification 1-channel DC/DC Buck Converter IC

**Substantial protective functions**

- **Application**
  - Digital TV, Digital AV devices etc.
  - Smart Meter

**MB39A136** Nch/Nch Synchronous Rectification 2-channel DC/DC Buck Converter IC

**Substantial protective functions**

- **Application**
  - Digital TV, Digital AV devices etc.
**General-purpose DC/DC Converter**

### MB39C011A

**P/N synchronous, Pch asynchronous**

- **Description**
  - MB39C011A is a PWM-type Pch/Nch synchronous rectification 2-channel DC/DC buck converter IC. It has a wide power supply voltage range and supports ceramic capacitors.

- **Features**
  - Wide range of power supply voltage: 4.5V to 17V
  - High frequency operation: 100kHz to 2.0MHz
  - Any output voltage setting by external resistor
  - Built-in soft-start circuit
  - Supporting ceramic condensers

- **Application**
  - For various electronic devices including digital AV devices

![Application circuit example](Diagram)

- **Application**: P4,5

### MB39A112

**3ch DC/DC Buck Converter IC**

- **Description**
  - MB39A112 is a PWM-type 3-channel DC/DC buck converter IC. 3 channels are installed in the TSSOP20 package. It is capable of implementing an efficient high frequency DC/DC converter.

- **Features**
  - Wide range of power supply voltage: 7V to 25V
  - High frequency operation: 250kHz to 2.6MHz
  - Any output voltage setting by external resistor
  - Built-in soft-start circuit
  - Supporting ceramic condensers

- **Application**
  - IP-STB, Surveillance camera, ADSL Modem etc.

![Application circuit example](Diagram)

### Lineup of General-purpose DC/DC Converter

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of channels</th>
<th>Switching frequency (max)/kHz</th>
<th>Power supply voltage range V</th>
<th>Reference voltage accuracy %</th>
<th>Package</th>
<th>Topology</th>
<th>I/PET compatible</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB3800</td>
<td>1</td>
<td>1000</td>
<td>+1.8 to +15</td>
<td>±4</td>
<td>SOP8, SSOP8</td>
<td>N/B</td>
<td>O</td>
<td>Not available</td>
</tr>
<tr>
<td>MB39A105A</td>
<td>1</td>
<td>600</td>
<td>+4.5 to +25</td>
<td>±1.5</td>
<td>TSSOP16</td>
<td>N/B</td>
<td>O</td>
<td>Available</td>
</tr>
<tr>
<td>MB39A105</td>
<td>1</td>
<td>1000</td>
<td>+4.5 to +25</td>
<td>±1</td>
<td>SOP8</td>
<td>N/B</td>
<td>O</td>
<td>Available</td>
</tr>
<tr>
<td>MB39A104</td>
<td>2</td>
<td>1500</td>
<td>+7 to +19</td>
<td>±1</td>
<td>SOP8</td>
<td>N/B</td>
<td>O</td>
<td>Available</td>
</tr>
<tr>
<td>MB39A103</td>
<td>2</td>
<td>1000</td>
<td>+4.5 to +25</td>
<td>±1</td>
<td>SOP8</td>
<td>N/B</td>
<td>O</td>
<td>Available</td>
</tr>
<tr>
<td>MB39A206A</td>
<td>2</td>
<td>310/620/1000</td>
<td>±6.0 to ±26.0</td>
<td>±0.7</td>
<td>TSSOP24</td>
<td>N/B</td>
<td>O</td>
<td>Available</td>
</tr>
<tr>
<td>MB39C011A</td>
<td>2</td>
<td>2000</td>
<td>+4.5 to +17</td>
<td>±1</td>
<td>TSSOP16</td>
<td>N/B</td>
<td>O</td>
<td>Available</td>
</tr>
</tbody>
</table>

For various types of power supplies such as LCD backlight, car navigation devices, audio devices, game consoles and portable devices.

* Recommended  ○ Possible with the addition of outside parts  PAF=Prohibit Audio Frequency
**DC/DC Converter with Switching FET**

**MB39C006A 3.2MHz/2MHz, Output Current 800mA(max), 1-channel DC/DC Buck Converter IC**

**Internal FET, High efficiency**

- **Description**
  MB39C006A is a current mode 1-channel DC/DC buck converter IC. The selection of operation frequency is possible at 3.2MHz or 2MHz. This IC has realized the high-speed response, high efficiency and low ripple voltage by a current mode system. This product has built-in phase-compensation circuit and soft-start circuit, contributes to the reduction in total area including external parts.

- **Features**
  - PFM/PWM function
  - High efficiency: 96% (max)
  - Power supply voltage range: 2.5V to 5.5V
  - Output current (DC/DC): 800mA (max)
  - Operating frequency: 2.0MHz or 3.2MHz
  - POWERGOOD Function

- **Application**
  - IP-Phone, Equipment of PLC etc.
  - Portable device, DVD recorder etc.

**MB39C007 Output Current 800mA(max), 2-channel DC/DC Buck Converter IC built-in Voltage Detection**

**Internal FET, High efficiency**

- **Description**
  MB39C007 is a 2-channel DC/DC buck converter IC built-in voltage detection. This IC has realized the high-speed response, high efficiency and low ripple voltage by a current mode system. A power supply starting sequence can be constituted using a voltage detection circuit and a soft-start circuit.

- **Features**
  - PFM/PWM function
  - High efficiency: 96% (max)
  - Power supply voltage range: 2.5V to 5.5V
  - Output voltage range: 0.45V to 3.9V
  - Output current (DC/DC): 800mA/ch (max)
  - Operating frequency: 2.0MHz

- **Application**
  - Portable device, DVD recorder etc.
  - IP-Phone, Equipment of PLC etc.

**MB39C014 3.2MHz/2MHz, Output Current 800mA(max), 1-channel DC/DC Buck Converter IC**

**Internal FET, High-speed response**

- **Description**
  MB39C014 is a PWM-type 1-channel DC/DC buck converter IC. The selection of operation frequency is possible at 3.2MHz or 2MHz. This IC has realized the high-speed response, high efficiency and low ripple voltage by a current mode system.
  This product has built-in phase-compensation circuit and soft-start circuit, contributes to the reduction in total area including external parts.

- **Features**
  - High efficiency: 96% (max)
  - Power supply voltage range: 2.5V to 3.5V
  - Operating frequency: 2.0MHz or 3.2MHz
  - Output voltage range: 0.4V to 3.6V
  - POWERGOOD Function

- **Application**
  - Surveillance camera, photograph printer etc.
  - Portable device such as 1-seg TV & 3-seg Radio etc.
  - DVD Recorder, Hard Disk Recorder etc.

**MB39C015 Output Current 800mA(max), 2-channel DC/DC Buck Converter IC built-in Voltage Detection**

**Internal FET, High-speed response**

- **Description**
  MB39C015 is a 2-channel DC/DC buck converter IC built-in voltage detection. This IC has realized the high-speed response, high efficiency and low ripple voltage by a current mode system. A power supply starting sequence can be constituted using a voltage detection circuit and a soft-start circuit.

- **Features**
  - High efficiency: 96% (max)
  - Power supply voltage range: 2.5V to 5.5V
  - Output current (DC/DC): 800mA/ch (max)
  - Operating frequency: 2.0MHz

- **Application**
  - Portable device, DVD recorder etc.
  - IP-Phone, Equipment of PLC etc.

**Lineup of DC/DC Converter with Switching FET**

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of channels</th>
<th>Switching frequency MHz</th>
<th>Output voltage (Vin) Vol</th>
<th>Power supply voltage (V)</th>
<th>Output current (max) mA</th>
<th>Switching FET</th>
<th>Package</th>
<th>Topology</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB39C014</td>
<td>1</td>
<td>2.5 2.5 (fixed)</td>
<td>2.5 ±4 +2.5 to +5.5</td>
<td>800 0.3 0.2</td>
<td>SON10</td>
<td>Back</td>
<td>P3,5</td>
<td></td>
<td>0-5V</td>
</tr>
<tr>
<td>MB39C015</td>
<td>1</td>
<td>2.5 2.5 (fixed)</td>
<td>2.5 ±4 +2.5 to +5.5</td>
<td>800 0.3 0.2</td>
<td>SON10</td>
<td>Back</td>
<td>P3,5</td>
<td></td>
<td>0-5V</td>
</tr>
<tr>
<td>MB39C017</td>
<td>2</td>
<td>2.0 2.0 (fixed)</td>
<td>2.5 ±4 +2.5 to +5.5</td>
<td>800 0.3 0.2</td>
<td>QFN24</td>
<td>Back</td>
<td>P3,5</td>
<td></td>
<td>0-5V</td>
</tr>
<tr>
<td>MB39C018</td>
<td>2</td>
<td>2.0 2.0 (fixed)</td>
<td>2.5 ±4 +2.5 to +5.5</td>
<td>800 0.3 0.2</td>
<td>QFN24</td>
<td>Back</td>
<td>P3,5</td>
<td></td>
<td>0-5V</td>
</tr>
</tbody>
</table>

Suitable for internal power supply in portable devices such as cellular phones, PDA, and in DVD, HDD, etc.
**DC/DC Converter with Switching FET + LDO**

**MB39C022 Series**

1-channel DC/DC Buck Converter IC + 1-channel Low-Noise LDO + POR

**For Portable Devices with digital circuits and with analog circuits**

- **Description**
  - An optimal IC for power management systems in portable devices with one built-in channel of DC/DC step-down converter for digital circuits and one built-in channel of low-noise LDO for analog circuits.
  - Two power management systems in a 10-pin package of 3.0mm x 3.0mm. The built-in switching FET enable the construction of a power management system at a low BOM cost. There are four variations of the fixed output voltage in the LDO block.

- **Features**
  - Output voltage/current of LDO block:
    - Output voltage (fixed) 3.3V (MB39C022G)
    - 2.85V (MB39C022I)
    - 1.8V (MB39C022L)
    - 1.2V (MB39C022N)
  - Current: 300mA (Max.)
  - Power on Reset (POR)
  - Package: SON-10

- **Application**
  - Portable applications
  - GPS, PND
  - MP3, MP4

**DC/DC Converter IC for System Power Supply**

**MB39C316**

3-channel DC/DC Converter + 4-channel LDO

- **Description**
  - MB39C316 is a power management IC equipped with 3ch DC/DC converter and the 4ch linear regulator (LDO). MB39C316 operate in the range of power supply voltage with 1-cell Li-ion power by 1ch buck boost DC/DC converter of high efficiency, and has 4ch LDO which is suitable to supply voltage for mobile terminals.

- **Features**
  - Power supply voltage range: 2.7V to 5.5V
  - Sequence control: Gv/Off control of power supply voltage
  - I²C bus interface: Control and notice of internal condition
  - ITRC: Possible to output the 32.768kHz clock by connecting crystal oscillator

- **Application**
  - Portable products such as PDA
  - Mobile WMAX terminals
  - Mobile terminals with MB86K22 (BaseBand) and MB86K52 (RF).

- **Package**
  - WL-CSP49 33 x 33 x 1.1 mm (Top)

**System configuration of Mobile Terminals**

**MB39A123**

6ch DC/DC Converter IC with Synchronous Rectification

- **Description**
  - MB39A123 is a 6-channel DC/DC converter IC using pulse width modulation (PWM), and it is suitable for boost conversion, buck conversion, and boost/buck conversion.

- **Features**
  - Power supply voltage range: 1.7V to 11V
  - Supports for buck converter with synchronous rectification
  - Negative voltage output (inverting amplifier)
  - Low voltage start: 1.7V
  - Supports for the output voltage of 1.0V
  - Support for control and soft-start of each channel

- **Application**
  - Digital still camera
  - Digital video camera
  - Surveillance camera

**Linewidth of DC/DC Converter with Switching FET + LDO**

**Model**

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of channels</th>
<th>Switching frequency kHz</th>
<th>Power supply voltage V</th>
<th>Output voltage (min) V</th>
<th>Output current (min) A</th>
<th>Topology</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB39C022</td>
<td>1</td>
<td>0.8 to 5</td>
<td>3.3</td>
<td>0.3</td>
<td>300</td>
<td>Back</td>
<td>SON10</td>
</tr>
<tr>
<td>MB39C022G</td>
<td>1</td>
<td>0.8 to 5</td>
<td>3.3</td>
<td>0.3</td>
<td>300</td>
<td>Back</td>
<td>SON10</td>
</tr>
<tr>
<td>MB39C022I</td>
<td>1</td>
<td>0.8 to 5</td>
<td>3.3</td>
<td>0.3</td>
<td>300</td>
<td>Back</td>
<td>SON10</td>
</tr>
<tr>
<td>MB39C022L</td>
<td>1</td>
<td>0.8 to 5</td>
<td>3.3</td>
<td>0.3</td>
<td>300</td>
<td>Back</td>
<td>SON10</td>
</tr>
<tr>
<td>MB39C022N</td>
<td>1</td>
<td>0.8 to 5</td>
<td>3.3</td>
<td>0.3</td>
<td>300</td>
<td>Back</td>
<td>SON10</td>
</tr>
<tr>
<td>MB39C316</td>
<td>3</td>
<td>0.8 to 5</td>
<td>3.3</td>
<td>0.3</td>
<td>300</td>
<td>Back</td>
<td>WLPQ49</td>
</tr>
</tbody>
</table>

**Application circuit example**

**6MHz Buck-Boost DC/DC Converter with Switching FET**

**MB39C326**

6MHz Synchronous Buck-Boost DC/DC Converter IC

- **Description**
  - MB39C326 is a high efficiency, low noise synchronous, 6MHz buck-boost DC/DC converter designed for powering the radio frequency power amplifiers (RFPA) in mobile handsets or other mobile applications with single-cell Li-ion battery. MB39C326 DC/DC converter supports 2 channels to compare to conventional DC/DC converters that have switching frequencies between 2 to 3MHz, allowing smaller inductor to be used and expect to reduce the overall board space of the power management circuits by half. Its buck boost operation automatically extend the operating voltage of lithium battery while maintaining stable power supply to the power amplifier.

- **Features**
  - High efficiency
  - Power Supply voltage range: 2.5V to 5.5V
  - Adjustable output voltage range: 0.4V to 5.0V
  - Input current limit value: 2A/1A/0.5A
  - 6MHz PWM operation allows 0.5 µH small form inductor
  - Less than 20 µs step response for 3G
  - Automatic Transition between buck mode and boost mode
  - Selectable output voltage with external resistor

- **Application**
  - Mobile phones, Smart phones, Smart TVs, iPods
  - RF-Rx powered by 1cell Li-ion battery
  - RF-PC cards

- **Package**
  - WL-CSP-24 3.0 x 2.0 x 0.8 mm (Top)

- **Application circuit example**

**6MHz Buck-Boost DC/DC Converter with Switching FET**

**MB39A123**

6ch DC/DC Converter IC with Synchronous Rectification

- **Description**
  - MB39A123 is a 6-channel DC/DC converter IC using pulse width modulation (PWM), and it is suitable for boost conversion, buck conversion, and boost/buck conversion.

- **Features**
  - Power supply voltage range: 1.7V to 11V
  - Supports for buck converter with synchronous rectification
  - Negative voltage output (inverting amplifier)
  - Low voltage start: 1.7V
  - Supports for the output voltage of 1.0V
  - Support for control and soft-start of each channel
  - Oscillation frequency range: 200kHz to 2MHz

- **Application**
  - Digital still camera
  - Digital video camera
  - Surveillance camera

**Linewidth of DC/DC Converter IC for System Power Supply**

**Model**

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of channels</th>
<th>Switching frequency kHz</th>
<th>Power supply voltage V</th>
<th>Reference voltage V</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB39A123</td>
<td>6</td>
<td>0.8 to 5</td>
<td>3.3</td>
<td>1.3</td>
<td>LQFP48</td>
</tr>
</tbody>
</table>

**Remarks**

- Synchronous rectification individual channel control, soft-start function, support for external input short-circuit detection.
**MB39C313A** 4-channel DC/DC Converter IC for LCD Panel

**Description**

MB39C313A is a 4-channel power management IC. It consists of 2-ch DC/DC converter and 2-ch charge pump type DC/DC converter.

**Features**

- **Power supply voltage range:** BV to 14V
- **Input voltage range:** 100VAC to 230VAC
- **Model:** MB39A302
- **Number of channels:** 1ch
- **Switching frequency:** 18kHz
- **Output features:** VLOGIC, VS
- **Package:** SOP8
- **Remarks:** Vin~8V

**System configuration of LCD panel**

![Block Diagram](MB39C313A.png)

**Application**: Large size LCD panel

---

**MB39A302** System Power Management IC for LCD Panel with VCOM Regulator

**Description**

MB39A302 consists of 2-ch DC/DC converter, 2-ch charge pump type DC/DC converter, 1ch LDO, an operational amplifier for VCOM calibration and a gate voltage shaping circuit. The DC/DC converter is a voltage mode asynchronous converter with integrated switching FET. The boost converter integrates a switching regulator with a voltage mode control.

**Features**

- **Power supply voltage range:** VIN (8V to 14V)
- **Input voltage range:** 100VAC to 230VAC
- **Output features:** VLOGIC, VS
- **Package:** SOP8
- **Remarks:** Vin~8V

**Lineup of DC/DC Converter for LCD Panels**

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of channels</th>
<th>Number of VCC</th>
<th>Supply voltage (.nc voltage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB39C313A</td>
<td>4</td>
<td>5/6/7/8</td>
<td>1.8V, 1.25V, 1.5V, 1.213V</td>
</tr>
<tr>
<td>MB39A302</td>
<td>4</td>
<td>5/6/7/8</td>
<td>1.8V, 1.25V, 1.5V, 1.213V</td>
</tr>
</tbody>
</table>

**Application**: Large size LCD panel

---

**MB39C601** LED Driver IC

**Description**

MB39C601 is a flyback switching regulator controller with the Flyback topology. This product is designed to drive 6W or 25W LED lighting in series, and supports worldwide AC input voltage ranging from 85 to 265 volts. Based on the LED load, the MB39C601 can control the switching on-time (constant on-time mode) or the switching frequency (peak current mode) to achieve a high power factor and high efficiency to save energy. It is suitable for general lighting applications that require few peripheral components and a low price.

**Features**

- **Power supply voltage range:** BV to 14V
- **Flyback switching regulator controller**
- **High efficiency at the light load for the peak current mode**
- **Switching method: peak current operation, constant on-time operation**
- **Frequency setting:** 30kHz to 130kHz (depending on the FB pin current)
- **High efficiency: 85% or more**
- **High power factor for the constant on-time mode**
- **Input voltage range:** 100VAC to 230VAC
- **Lineup of LED Driver**

**Application**: Suitable for LED lighting (6W to 25W)

**Application**: P5

---

**Lineup of LED Driver**

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of channels</th>
<th>Number of VCC</th>
<th>Supply voltage (nc voltage)</th>
<th>Output for LED W</th>
<th>SW FET</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB39C601</td>
<td>1</td>
<td>1</td>
<td>30 to 130</td>
<td>85 to 265</td>
<td>9 to 20</td>
</tr>
</tbody>
</table>

**Application**: Suitable for LED lighting (6W to 25W)

---

**Application circuit example**

![Application Circuit](MB39C601.png)
**Charge Control**

**MB39A134**  DC/DC Converter IC for Charging Li-ion Battery

**Preset output-voltage, CVM**

**Description**
MB39A134 is a DC/DC converter IC for charging Li-ion battery, which is suitable for buck conversion, and uses pulse width modulation (PWM) for controlling the output voltage and current independently.

**Features**
- Power supply voltage range: 8V to 25V
- Support 2, 3 and 4 Cell battery pack
- Topology: Pch/Nch synchronous, Asynchronous rectification
- AC adapter voltage detection function (ACOK terminal)
- Output voltage setting accuracy: ±0.7% (Ta=+10°C to +85°C)
- Charging voltage can be set without externally attached resistor
- Charging current can be set without externally attached resistor
- High accuracy current detection amplifier (±1%)

**Application**
- Charging device in products such as Notebook PC

**MB39A132A**  DC/DC Converter IC for Charging Li-ion Battery

**Nch/Nch synchronous, Preset output-voltage**

**Description**
MB39A132A is a DC/DC converter IC for charging Li-ion battery, which is suitable for buck conversion, and uses pulse width modulation (PWM) for controlling the output voltage and current independently.

**Features**
- Power supply voltage range: 8V to 26V
- Support 2, 3 and 4 Cell battery pack
- Topology: Nch/Nch synchronous rectification
- AC adapter voltage detection function (ACOK terminal)
- Output voltage setting accuracy: ±0.5% (Ta=+25°C to +85°C)
- Charging voltage can be set without externally attached resistor
- Charging current can be set without externally attached resistor
- High accuracy current detection amplifier (±1%)

**Application**
- Charging device in products such as Notebook PC

**Power Voltage Monitoring Applications**

**MB3793**  Power voltage monitoring IC with dual-system watchdog timer

**Built-in Watchdog timer**

**Description**
MB3793 is a power voltage monitoring IC with dual-system watchdog timer. A reset signal is output at transient power cut-off or power fall. When the power resumes, the IC outputs a power-on reset signal to MPU to monitor power voltage. Using this IC in an MCU system can provide such a system with a fail-safe function.

**Features**
- Detection voltage: 4.5%V±3.7%V±4.4%V±3.0V±2.8%V±2.7%V ±7type
- Precise detection of power voltage fall: ±2.5%
- Detection voltage with hysteresis
- Internal dual-input watchdog timer
- Watchdog-timer halt function (by inhibit pin)
- Independently-set watchdog and reset times

**Application**
- Arcade Amusement
- PBX and base stations
- Vending machines etc.

**Lineup of Power Voltage Monitoring Application**

**Model**
- MB3771: Power supply voltage monitor
- MB3772: DC/DC converter
- MB3773: DC/DC converter
- MB3774: Power supply voltage monitor

**Detection voltage**
- Voltage other than 4.2V: +20% (max)

**Power supply voltage**
- Voltage other than 4.2V: +20% (max)

**Package**
- SOP8

**Remarks**
- Used in power supplies for various applications, including automobiles, home appliances, and vending machines.

**Lineup of Power Management Switches**

**Model**
- MB3841
- MB3842

**Consumption current**
- 0.4A

**Drive current**
- 5.5A

**Switching voltage**
- 2.5V

**Package**
- SOP8

**Remarks**
- 1 channel USB

**Lineup of AC/DC Converter**

**Model**
- MB3789
- MB3784

**frequency**
- 360Hz

**Power supply voltage**
- Max:

**Maximum output current**
- 12A

**Package**
- SOP8

**Remarks**
- Power MOS-FET

---

*For portable devices using Li-ion battery, such as Notebook PC, Netbook PC etc.*
The Easy DesignSim is a comprehensive online design support tool for power circuit designers. With the SIMPLIS simulator, this online design support tool enables power circuit designers to automatically select suitable parts for the printed circuit board according to the input/output voltages and load current parameters, and enables designers to quickly display several operation waveforms such as load transient response, startup, shutdown and efficiency.

**Introduction**
Fujitsu develops, manufactures and provides power management ICs, which feature small size and have many excellent characteristics, such as low power consumption. Power supply circuit requires some external electrical components such as capacitors, resistors, inductors, and MOSFETs. It is time consuming even for skilled and experienced engineer to select the external components and verify its operations to ensure that it meets the required specification. Recently, the time and effort of the design work concerning the peripheral components selection can be mitigated, and for that reason, power management ICs integrated with peripheral components, such as MOSFETs and voltage setting resistors, are also increasing in number. This tool offers an easy-to-use on-line simulation environment, enable the power design engineers to quickly select the necessary parts and easily design the power supply circuit. Fujitsu has started to offer the Easy DesignSim online design simulation service, customized and optimized for Fujitsu's products. The Easy DesignSim is the result of a collaborative venture between Fujitsu and Transim Technology Co., Ltd., whose online design simulator has been adopted widely around the world. Table 1 is application parts at July 2012.

**Features**
- By using the Easy DesignSim, power design engineers can easily select peripheral components associated with the input/output, which may cause problems in power circuit design.
- Schematic creation:
  - Performs automatic calculation of the parameters for the parts that the user can select from a list of commercially available parts. Users may also input parameters directly.
- High-speed simulation:
  - Easily displays load transient response characteristics necessary for the evaluation of power supply circuit operation, waveforms at the time of startup/shutdown, At analysis for confirming feedback circuit oscillation margins, and an efficiency graph that shows the conversion efficiency of the power supply.
- BOM (Bill of Materials) list:
  - Displays a parts list. Users can select a part name and the list displays an estimated price for the part from selected parts distributors. Customers may purchase the parts online from some distributors.
- Summary display:
  - Shows the configurations, parts list, circuit diagram, and simulation waveforms which are downloadable to a PDF file.

Get started from the following URL:
http://edevice.fujitsu.com/pmic/en-easy/

**Using Easy DesignSim**
From the example of 2 channels output power supply IC - "MB39K022 Series", the features of Easy DesignSim are introduced. The MB39K022 series is a 2 channel power supply IC, which consists of a one channel buck DC/DC converter and a one channel LDO regulator. The MB39K022 series also has a built-in low noise LDO, suited for the power supplies used on RF, PLL, and analog circuits and packaged in a small SON10. This IC has a very easy-to-use feature and is optimal for electronic devices with an analog digital mixed circuit. The following 7 steps show you how to use the Easy DesignSim. (Fig. 1) Especially useful features are explained as follows.

**Table 1 Application parts**
<table>
<thead>
<tr>
<th>Features</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>For digital home appliances, Office equipment</td>
<td>2ch DC/DC Converter IC</td>
</tr>
<tr>
<td>MB39C014A (Ultra-rapid response)</td>
<td></td>
</tr>
<tr>
<td>For Mobile terminal, Portable device</td>
<td>6MHz Buck-Boost DC/DC Converter IC</td>
</tr>
<tr>
<td>MB39C026</td>
<td></td>
</tr>
<tr>
<td>1ch DC/DC + 1ch Low noise LDO + POR</td>
<td>MB39C022G (LDO 3.3V)</td>
</tr>
<tr>
<td>MB39C022J (LDO 2.8V)</td>
<td></td>
</tr>
<tr>
<td>MB39C022L (LDO 1.8V)</td>
<td></td>
</tr>
<tr>
<td>MB39C022N (LDO 1.2V)</td>
<td></td>
</tr>
<tr>
<td>1ch DC/DC Converter IC</td>
<td>MB39C06A (PFM/PWM)</td>
</tr>
<tr>
<td>MB39C014 (PWM)</td>
<td></td>
</tr>
<tr>
<td>2ch DC/DC Converter IC</td>
<td>MB39C007 (PFM/PWM)</td>
</tr>
<tr>
<td>MB39C015 (PWM)</td>
<td></td>
</tr>
</tbody>
</table>

**Selection of product**
The Easy DesignSim has a quick search feature where the parameters of input/output voltages and load current can be set with a slide bar so the desired parts can be searched for instantly. Moreover, the desired parts can also be searched for from the table by the functional specifications for each product. (Fig. 2)

**How to select the circuit components**
The schematic is automatically drawn after inputting the operating parameters such as input voltage and output voltage/current. Users can automatically re-select parts from the distributor’s parts list and also select the parts using the filter search function for each parameter. Additionally, users can change the parameter value for each electronic component and easily view and check the operation waveforms of the circuit. This tool has a particularly convenient feature where users can search for the parts on the schematic just by clicking it, and they can save time and effort getting the parts by not having to visit the parts distributor’s Web site. (Fig. 3)

**Table 1 Application parts**

![Image](image-url)
Verifying waveform behavior
Conventionally, without the Easy DesignSim, a circuit designer calculates the operation waveform with a pen on his/her desk and tests the circuit with an evaluation board. With the Easy DesignSim, which is an online tool, the waveform of the power supply circuit is automatically calculated so that the operation of confirming of the circuit can be performed very easily. Moreover, the Easy DesignSim provides the maximum of five simulation waveforms which a designer can use to verify the operation. (Fig. 4)
- Load response characteristics (Transient):
  - Display the output voltage change when the load current is changed.
- Startup/Shutdown waveform (Startup/Shutdown):
  - The waveform at the time of startup and shutdown can be checked.
- AC Analysis:
  - Displays the oscillation margin for the circuit.
- Efficiency:
  - For products with an external FET, the Easy DesignSim displays a graph by using formulas. For products with built-in FETs, the Easy DesignSim displays a measured waveform.
- DC Analysis (Steady-State):
  - Users can check the operation waveform at each node of the power supply circuit.

BOM list display
The Easy DesignSim displays the BOM list of selected parts for every parts distributor. It also displays the sample price of distributor’s parts and the BOM cost of sample’s price. For some distributors, customers may be able to purchase the electronic components online. (Fig. 5)

Output summary and design saving
The Easy DesignSim displays input/output setting conditions, parameters for the parts, and a graphical representation of the results. Users can output the summary to a downloadable PDF file. Moreover, users can save the operation conditions of the simulation and the Circuit Parts Parameter. If necessary, the simulation can be redone by opening the saved parameters set (from a tab on the screen). (Fig. 6)

Future Deployment
Recent electronic devices require smaller size, higher performance and further reduction of power consumption. In addition, due to higher integration of the IC, switching power supply circuits must be provided with lower operation voltage for the ASIC core and faster load transient response characteristics against the increased load current. Fujitsu focuses on the development of power management ICs, which realize lower power consumption, faster load transient response, and more multi-channels.
Fujitsu continues to enrich its service in order to help customers design power management ICs with the Easy DesignSim and at the same time, continue to enhance the Easy DesignSim.

*Easy DesignSim™ is a trademark of Fujitsu Semiconductor Ltd.

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**Note:** Fujitsu has verified the simulation results, based on the actual measurement, however, operation of the device based on this simulation tool is not guaranteed. It is advised that circuit designers confirm operations with the actual applications.
MB39C326

This product is a power management IC for portable instruments that has a highly effective buck boost DC/DC converter, which expands the available input voltage range. It can be loaded on a small 2.15mm × 1.94mm package (Photo 1), and can configure a power system with a small footprint at low BOM cost, with its built-in switching FET. By inputting signals such as DAC, it can control the output voltage value dynamically.

Introduction

This product is a highly effective and low-noise 6MHz buck boost DC/DC converter IC that has been developed for mobile instruments using a one-cell lithium-ion battery. With its high operating frequency (6MHz), the inductor size can be significantly reduced compared with existing 2 to 3MHz products, and the board area of the power part can be downsized by half (Figure 1). Since our unique buck boost circuit switches automatically between the voltage increasing operation and the voltage decreasing operation against input voltage, power is supplied stably even when the inputting battery voltage decreases, and the system driving time can be expanded through the effective utilization of the remaining power in the battery.

Functions

DC/DC control method

The internal oscillator (square-wave oscillation circuit) operates the synchronous rectification of the built-in P-ch MOSFET and the N-ch MOSFET at the predetermined frequency (6MHz). Our unique circuit technology allows seamless switching between the voltage increasing mode and the voltage decreasing mode, thereby realizing high efficiency operation.

Overcurrent protection function

This function controls the current to prevent higher output current than the setting from flowing. Also, when the output current reaches the current limit value, the output voltage starts dropping. The overcurrent protection function detects current flowing from the built-in P-ch MOSFET (overcurrent protection function) that connects the VDD terminal to the external inductor. The current limit value can be selected from three values, according to the XPS terminal and the ILIMSEL terminal, as shown in Table 2.

Output voltage setting function

- Output voltage setting by FB splitting resistance (constant output)
  \[ V_{\text{OUT}} = V_{\text{FB}} \times \frac{R_1}{R_2} \]
- Output voltage setting by the XPSILMSEL terminal (selecting an output from two values)
  Two output setting voltages can be switched between by inputting the XPS terminal signal (Figure 3):
  \[ -\text{VSEL} = L \quad \text{VSEL} = +H \]
  \[ V_{\text{OUT}} = V_{\text{FB}} \times \frac{R_1}{R_3} + \frac{R_2}{R_3} \]
- Output voltage setting by input signal (output is arbitrarily variable)
  By inputting DAC signals, the output voltage can be changed arbitrarily according to the setting formula (Figure 6).
  \[ V_{\text{OUT}} = -\frac{R_3}{R_2} \left( V_{\text{DAC}} + V_{\text{FB}} \times \frac{R_3}{R_4} + \frac{1}{R_4} \right) \]

Relation between output and DAC

Figure 5 shows the relation between the output and the DAC when the settings are \( R_1 = 620\, \Omega \), \( R_2 = 110\, \Omega \), and \( R_3 = 330\, \Omega \).
### Package Lineup

<table>
<thead>
<tr>
<th>Series</th>
<th>SOP8</th>
<th>SOP8</th>
<th>SOP16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Size</td>
<td>Lead Pitch</td>
<td>Body Size</td>
<td>Lead Pitch</td>
</tr>
<tr>
<td>3.9×5.0×0.7</td>
<td>1.2mm</td>
<td>5.3×6.8×0.7</td>
<td>1.2mm</td>
</tr>
<tr>
<td>3.9×7.0×0.7</td>
<td>1.75mm</td>
<td></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Series</th>
<th>SSOP8</th>
<th>SSOP20</th>
<th>SSOP24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Size</td>
<td>Lead Pitch</td>
<td>Body Size</td>
<td>Lead Pitch</td>
</tr>
<tr>
<td>4.2×3.5×0.6</td>
<td>0.8mm</td>
<td>4.4×4.8×1.3</td>
<td>0.8mm</td>
</tr>
<tr>
<td>4.2×7.5×1.4</td>
<td>0.8mm</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Series</th>
<th>TSSOP16</th>
<th>TSSOP20</th>
<th>TSSOP24</th>
<th>TSSOP28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Size</td>
<td>Lead Pitch</td>
<td>Body Size</td>
<td>Lead Pitch</td>
<td>Body Size</td>
</tr>
<tr>
<td>4.4×5.0×1.1</td>
<td>0.65mm</td>
<td>4.4×5.0×1.2</td>
<td>0.65mm</td>
<td></td>
</tr>
<tr>
<td>4.4×7.5×1.4</td>
<td>0.65mm</td>
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<table>
<thead>
<tr>
<th>Series</th>
<th>LQFP48</th>
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</thead>
<tbody>
<tr>
<td>Body Size</td>
<td>Lead Pitch</td>
</tr>
<tr>
<td>7.0×7.0</td>
<td>1.70mm</td>
</tr>
</tbody>
</table>

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### RoHS Compliance Information

**Lead (Pb) Free Version**

Fujitsu LSI products are compliant with RoHS Directive, and observe the standards of lead, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE).

An RoHS-compliant product is indicated by trailing characters "E1" in its part number.

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### Evaluation Board

Fujitsu Semiconductor provides evaluation boards for you to evaluate our semiconductor devices.

- **Example: MB39C015 evaluation board**
- **Example: MB39C015 connection diagram**

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### Search of Product and Document/Online Design Simulator

You can search our products at the following homepage.


- **Easy DesignSim**
- **Catalog of Power Management ICs**
- **IC Lineup of DC/DC Converter Data sheets**
- **Applications**

For detailed electric properties and operating conditions, refer to the data sheet of each product.
Global Network

**EUROPE**
- Fujitsu Semiconductor Europe GmbH (FSEU)
  - Germany - Langen, Munich, UK - Maidenhead, France - Paris, Italy - Milan, Turkey - Istanbul, Hungary - Budapest
- Fujitsu Semiconductor Embedded Solutions Austria GmbH (FEAT)
  - Lintz

**AMERICA**
- Fujitsu Semiconductor America, Inc. (FSA)
  - Sunnyvale, CA, San Diego, CA, Irvine, CA, Austin, TX, Boston, MA
- Fujitsu Semiconductor Wireless Products, Inc. (FSWP)
  - Tempe, AZ

**JAPAN**
- Fujitsu Semiconductor Limited (FSL)
  - Yokohama

**ASIA**
- Fujitsu Semiconductor (Shanghai) Co., Ltd. (FSS)
  - Shanghai, Beijing, Shenzhen, Dalian, Qingdao, Xian, Yumen
- Fujitsu Semiconductor Korea Limited (FSK)
  - Seoul, Daegu
- Fujitsu Semiconductor Pacific Asia Limited (FSP)
  - Hong Kong, Taipei
- Fujitsu Semiconductor Asia Pte. Ltd. (FSAL)
  - Singapore, Penang, Bangalore, Delhi
- Fujitsu Semiconductor Design (Chengdu) Co. Ltd. (FSDC)
  - Chengdu
- Nanjing Fujitsu Microelectronics Co., Ltd. (NFME)
  - Nanjing

**OTHERS**
- Fujitsu Semiconductor America, Inc. (FSA)
  - Sunnyvale (CA)
- Fujitsu Semiconductor Europe GmbH (FSEU)
  - Langen
- Fujitsu Semiconductor (Shanghai) Co., Ltd. (FSS)
  - Shanghai
- Fujitsu Semiconductor Limited (FSL)
  - Yokohama
- Fujitsu Semiconductor Limited (FSL)
  - Yokohama
## Table of Power Management ICs

<table>
<thead>
<tr>
<th>Model</th>
<th>Package</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB39A135</td>
<td>SSOP8</td>
<td>0.98</td>
<td>1.5</td>
</tr>
<tr>
<td>MB39C326</td>
<td>TSSOP24</td>
<td>0.45</td>
<td>3.6</td>
</tr>
<tr>
<td>MB39C022G</td>
<td>WL-CSP49</td>
<td>0.8</td>
<td>4.5</td>
</tr>
</tbody>
</table>

### Metrics

- **Gate Voltage Shaping**:
  - 2.925 V

- **Charge pump**:
  - 1.0 M

- **DC/DC**:
  - 0.8 to 4.5 V

- **LDO**:
  - 0.25 V

- **Dissipation**:
  - 2.5 to 8.0 W

### Additional Features

- **Pch/Nch synchronous rectification**:
  - PFM/PWM automatic shift

- **Short-circuit protection**:
  - ✓

- **Under voltage protection**:
  - ✓

- **Max output current (A)**:
  - 2.5 to 8.0

- **Control**:
  - Gate Voltage Shaping

### Notes

1. Check with the sales representative for the stock status.
2. FUJITSU Power Management ICs have a small number of numbers and technical specification.
3. The table was created using the data from the manufacturer's datasheet.