Improved conversion efficiency
Significantly lower heat generation
Achieves greater space savings
Simplifies configuration of primary side power supplies
Supports a wide range of applications, from general industrial equipment to consumer products
ROHM Power Supply Modules
Insert on the primary side of the power supply board containing many through-hole components
For customers demanding greater energy savings
For customers with little time for power supply design
For customers that cannot support large heat sinks for heat dissipation
For customers with space constraints
18 kWh/year
*Calculated using an operating time of 1,440hrs/year
5.5W
5.0W
12.5W
Efficiency improved 10% or more over competitor products
50% higher efficiency than LDO
Competitor DC/DC Converter
BP5293-50
60% lower power consumption
High efficiency operation minimizes heat generation, facilitating thermal design by eliminating the need for a heat sink
Supports large currents
Enables thermal design with temperature derating margin
Insertion-type design saves valuable board space
Contributes to smaller, lighter sets
LDO + Heat Sink
HOT
90.3°C
90.3°C
90.3°C
90.3°C
90.3°C
90.3°C
90.3°C
90.3°C
90.3°C
COOL
46.2°C
46.2°C
46.2°C
46.2°C
46.2°C
46.2°C
46.2°C
46.2°C
46.2°C
ROHM 3-Pin DC/DC Converter
Thermal countermeasures for peripheral components unnecessary
Mounting Area Comparison (1,000mA Output)
Competitor DC/DC Converter
ROHM 3-Pin DC/DC Converter
TO-220
LDO + Heat Sink
50mm×25mm
17mm×8mm
20mm×20mm
3× smaller
9× smaller
Power Supply Module Selection Guide
Isolated AC/DC Converter
Isolated DC/DC Converters
Power Supply Modules AC/DC Converters Non-Isolated AC/DC Converters
DC/DC Converters Non-Isolated DC/DC Converters
Board Costs
Competitor DC/DC Converter
LDO
ROHM 3-Pin DC/DC Converter
Board costs significantly reduced
Product Life
Significantly longer product life
Reduces set size
Technological innovation is occurring in a variety of markets to achieve IoT, expanding from consumer to industrial applications, and providing breakthroughs in functionality.
To meet these needs, ROHM offers standardized switching power supply modules that can be installed into virtually any system without placing a design load.
Our broad lineup of high efficiency, high performance switching power supplies eliminate the need for thermal design and contribute to set miniaturization due to their compact, highly integrated design. In particular, our AC/DC converters are capable of direct DC conversion from the primary AC side without a transformer, reducing both size and weight. In addition, an original molded package is used to provide greater reliability. Both isolated and non-isolated types are available that have seen widespread adoption in a variety of applications, ensuring worry-free use.
ROHM Power Supply Modules

Supports a wide range of applications, from general industrial equipment to consumer products.

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Power Supply Module Selection Guide

- **Power Supply Modules**
  - **AC/DC Converters**
    - **Non-Isolated AC/DC Converters**
    - **Isolated AC/DC Converter**
  - **DC/DC Converters**
    - **Non-Isolated DC/DC Converters**
    - **Isolated DC/DC Converters**
**Improved conversion efficiency**

- 60% lower power consumption
- **60% lower power consumption**
- Insert on the primary side of the power supply board containing many through-hole components

**For customers with little time for power supply design**

Simplifies configuration of primary side power supplies

**For customers demanding greater energy savings**

- Reduced power consumption
- **60% lower power consumption**
- Efficiency improved 10% or more over competitor products
- **50% higher efficiency than LDO**

**For customers that cannot support large heat sinks for heat dissipation**

Significantly lower heat generation

- High efficiency operation minimizes heat generation, facilitating thermal design by eliminating the need for a heat sink
- Supports large currents
- Enables thermal design with temperature derating margin
- **LDO + Heat Sink**
- **ROHM 3-Pin DC/DC Converter**
- Thermal countermeasures for peripheral components unnecessary

**For customers with space constraints**

Achieves greater space savings

- Insertion-type design saves valuable board space
- Contributes to smaller, lighter sets

**Mounting Area Comparison (1,000mA Output)**

- **9x smaller**
- **3x smaller**
- **Board costs significantly reduced**
- **Reduces set size**

---

Technological innovation is occurring in a variety of markets to achieve IoT, expanding from consumer to industrial applications, and providing breakthroughs in functionality.

To meet these needs, ROHM offers standardized switching power supply modules that can be installed into virtually any system without placing a design load.

Our broad lineup of high efficiency, high performance switching power supplies eliminate the need for thermal design and contribute to set miniaturization due to their compact, highly integrated design. In particular, our AC/DC converters are capable of direct DC conversion from the primary AC side without a transformer, reducing both size and weight. In addition, an original molded package is used to provide greater reliability. Both isolated and non-isolated types are available that have seen widespread adoption in a variety of applications, ensuring worry-free use.
AC/DC Converters

- Transformerless (Non-Isolated AC/DC Converters)
  - Enables easy configuration of a DC power supply circuit without a transformer using few external parts.
- Contributes to smaller, lighter power supply circuits (Non-Isolated AC/DC Converters)
  - The transformerless design reduces size and weight by 4x and 30x over conventional transformer solutions.
- Broad voltage range
- Ideal for industrial equipment, lighting, and home appliances

### 141VDC Input Models

<table>
<thead>
<tr>
<th>Output Current (mA)</th>
<th>BP5038A1</th>
<th>BP5033-12</th>
<th>BP5037-12</th>
<th>BP5037B12</th>
<th>BP5039A</th>
<th>BP5039B12</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>200</td>
<td>BP5063-5</td>
<td>BP5039-15</td>
<td>BP5039B12</td>
<td>BP5039A</td>
<td></td>
<td>BP5037B15</td>
</tr>
<tr>
<td>100</td>
<td>BP5033-12</td>
<td>BP5034D15</td>
<td>BP5034D12</td>
<td>BP5034D15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>BP5038A1</td>
<td>BP5034D24</td>
<td>BP5034D15</td>
<td>BP5034D15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 311VDC Input Models

<table>
<thead>
<tr>
<th>Output Current (mA)</th>
<th>BP5048</th>
<th>BP5048-24</th>
<th>BP5048-15</th>
<th>BP5047A24</th>
<th>BP5047B15</th>
<th>BP5047A24</th>
<th>BP5047B15</th>
<th>BP5045A5</th>
<th>BP5045A</th>
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<tr>
<td>300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>BP5048</td>
<td>BP5047A24</td>
<td>BP5047B15</td>
<td>BP5047A24</td>
<td>BP5047B15</td>
<td>BP5047A24</td>
<td>BP5047B15</td>
<td>BP5047A24</td>
<td>BP5047B15</td>
</tr>
<tr>
<td>50</td>
<td>BP5041A5</td>
<td>BP5041A5</td>
<td>BP5041B15</td>
<td>BP5041A5</td>
<td>BP5041A5</td>
<td>BP5041A5</td>
<td>BP5041A5</td>
<td>BP5041A5</td>
<td>BP5041A5</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. Output Power (W)</th>
<th>Max. External Dimensions (mm)</th>
<th>Number of Pins</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5063-5</td>
<td>0.15</td>
<td>18.0×16.8×9.1</td>
<td>6</td>
</tr>
<tr>
<td>BP5067-12</td>
<td>1.2</td>
<td>28.2×17.9×10.1</td>
<td>10</td>
</tr>
<tr>
<td>BP5067-15</td>
<td>4.5</td>
<td>35.0×22.0×9.9</td>
<td>12</td>
</tr>
</tbody>
</table>

### Transformerless (Non-Isolated AC/DC Converters)

- Enables easy configuration of a DC power supply circuit without a transformer using few external parts.
- Contributes to smaller, lighter power supply circuits (Non-Isolated AC/DC Converters)
  - The transformerless design reduces size and weight by 4x and 30x over conventional transformer solutions.
- Broad voltage range
- Ideal for industrial equipment, lighting, and home appliances
## Non-Isolated AC/DC Converters

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Input Voltage (V)</th>
<th>Output Voltage (V)</th>
<th>Output Current (mA)</th>
<th>Dimensions (mm)</th>
<th>Package*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5038A1</td>
<td>113 to 170 (AC voltage conversion 80 to 120VAC)</td>
<td>+5</td>
<td>30</td>
<td>18.0x16.8x9.1</td>
<td>SIP6</td>
</tr>
<tr>
<td>BP5063-5</td>
<td>113 to 195 (AC voltage conversion 80 to 138VAC)</td>
<td>+5</td>
<td>200</td>
<td>28.2x17.9x9.1</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5033-12</td>
<td>120 to 405 (AC voltage conversion 85 to 286VAC)</td>
<td>+12</td>
<td>100</td>
<td>28.2x15.5x10.5</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5037B12</td>
<td>180 to 390 (AC voltage conversion 127 to 276VAC)</td>
<td>+12</td>
<td>200</td>
<td>28.2x16.8x9.0</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5039B12</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+12</td>
<td>300</td>
<td>35.0x18.0x9.1</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5067-12</td>
<td>240 to 358 (AC voltage conversion 170 to 253VAC)</td>
<td>+12</td>
<td>350</td>
<td>34.5x20.0x9.9</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5037B15</td>
<td>240 to 420 (AC voltage conversion 170 to 300VAC)</td>
<td>+12</td>
<td>250</td>
<td>28.2x21.5x9.9</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5039-15</td>
<td>180 to 390 (AC voltage conversion 127 to 276VAC)</td>
<td>+15</td>
<td>300</td>
<td>35.0x19.5x9.1</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5067-15</td>
<td>180 to 390 (AC voltage conversion 127 to 276VAC)</td>
<td>+15</td>
<td>300</td>
<td>35.0x22.0x9.2</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5039A</td>
<td>180 to 390 (AC voltage conversion 127 to 276VAC)</td>
<td>+24</td>
<td>200</td>
<td>35.0x19.5x9.1</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5034D5</td>
<td>113 to 195 (AC voltage conversion 80 to 138VAC)</td>
<td>+5</td>
<td>100</td>
<td>28.2x15.7x10.0</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5034D12</td>
<td>113 to 195 (AC voltage conversion 80 to 138VAC)</td>
<td>+12</td>
<td>100</td>
<td>28.2x15.7x10.0</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5034D15</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+12</td>
<td>80</td>
<td>28.2x15.7x10.0</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5034D24</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+24</td>
<td>50</td>
<td>32.5x19.3x11.5</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5041A5</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+5</td>
<td>100</td>
<td>32.5x19.3x11.5</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5041A</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+12</td>
<td>100</td>
<td>32.5x19.3x11.5</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5048</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+12</td>
<td>300</td>
<td>34.5x19.1x9.2</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5041B15</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+15</td>
<td>80</td>
<td>32.5x19.3x11.5</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5047B15</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+15</td>
<td>150</td>
<td>32.5x19.1x10.1</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5048-15</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+15</td>
<td>200</td>
<td>34.5x19.1x9.2</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5047A24</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+24</td>
<td>150</td>
<td>34.5x19.1x9.2</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5048-24</td>
<td>226 to 358 (AC voltage conversion 160 to 253VAC)</td>
<td>+24</td>
<td>200</td>
<td>34.5x19.1x9.2</td>
<td>SIP12</td>
</tr>
<tr>
<td>BP5045A5</td>
<td>−113 to −390 (AC voltage conversion 80 to 276VAC)</td>
<td>−5</td>
<td>200</td>
<td>28.2x17.9x10.1</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5045A</td>
<td>−113 to −390 (AC voltage conversion 80 to 276VAC)</td>
<td>−12</td>
<td>200</td>
<td>28.2x17.9x10.1</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5053-12</td>
<td>−240 to −420 (AC voltage conversion 170 to 300VAC)</td>
<td>−12</td>
<td>200</td>
<td>28.2x17.9x10.1</td>
<td>SIP10</td>
</tr>
<tr>
<td>BP5055-12</td>
<td>−420 to −600 (AC voltage conversion 300 to 425VAC)</td>
<td>−12</td>
<td>250</td>
<td>28.2x21.5x9.9</td>
<td>SIP10</td>
</tr>
</tbody>
</table>

*All module packages are original.

## Isolated AC/DC Converters

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Input Voltage (V)</th>
<th>Output Voltage (V)</th>
<th>Output Current (mA)</th>
<th>Dimensions (mm)</th>
<th>Package*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5710-1</td>
<td>120 to 162 (AC voltage conversion 85 to 115VAC)</td>
<td>+12</td>
<td>350</td>
<td>35.0x24.0x14.9</td>
<td>SIP11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Input Voltage (V)</th>
<th>Output Power (W)</th>
<th>Switching Method</th>
<th>Dimensions (mm)</th>
<th>Package*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5725</td>
<td>120 to 405 (AC voltage conversion 85 to 286VAC)</td>
<td>6</td>
<td>PWM (Light Load Mode)</td>
<td>22.5x24.0x7.8</td>
<td>SIP7</td>
</tr>
</tbody>
</table>

*All module packages are original.
Non-Isolated AC/DC Converters

**AC/DC Converter Block Diagrams**

The operating principle is a chopper-type switching regulator.

**With Built-in Coil**
(Positive Power Supply)

**With External Coil**
(Positive Power Supply)

100V rectified (converted to 141VDC) is supplied between the input and common pins, switched between 0 and 141V like the waveform at Point A in the internal circuit, then output (subjected to smoothing by the output capacitor).

**Regarding Pattern Layout**

When mounting a non-isolated AC/DC converter, we recommend the following layout.

Ex: BP5045A5
(Top View)

When connecting an external coil, to prevent cases where the electrical characteristics are not satisfied due to effects of magnetic flux leakage of L1 or ringing noise is generated from the coil, please perform wiring as shown on the left. Regarding wiring, please minimize the area in grey and do not magnetically couple with the coil. Even when incorporating a coil, we recommend minimizing the grey area.

**Application Examples**

Utilizing the BP5034D15 for DC Motor Control

Utilizing the BP5034D24 for Relay Drive

Utilizing the BP5034D5 for MCU (100VAC Compatible)

Utilizing the BP5041A for MCU (200VAC Compatible)
DC/DC Converters

- **High Efficiency**
  - High power conversion efficiency (86 to 90%) reduces power supply size and enables energy efficient design.
- **Fewer External Parts**
  - Only two external parts required (input/output capacitors) makes it easy to configure a power supply circuit.
- **Wide Input Range**
  - Wide input range supports use in main power supplies with large fluctuations (BP5220A/BP5221A: 8 to 38V)
- **Multiple Functions**
  - Output switch, protection circuits, output voltage adjustment, and other functions are offered based on application requirements.
- **Space Saving**
  - SIP package enables mounting in small spaces (substrate area: 123mm²)

### Compact Non-Isolated 3-Pin Buck DC/DC Converters

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Input Voltage (V)</th>
<th>Output Voltage (V)</th>
<th>Output Current (mA)</th>
<th>Output Voltage Accuracy (%)</th>
<th>Dimensions (mm)</th>
<th>Package*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5293-33</td>
<td>7 to 26</td>
<td>+3.3</td>
<td>1,000</td>
<td>±3.0</td>
<td>17.0×17.8×7.2</td>
<td>SIP3</td>
</tr>
<tr>
<td>BP5293-50</td>
<td>7 to 26</td>
<td>+5.0</td>
<td>1,000</td>
<td>±2.0</td>
<td>17.0×17.8×7.2</td>
<td>SIP3</td>
</tr>
<tr>
<td>BP5293-12</td>
<td>17 to 26</td>
<td>+12.0</td>
<td>1,000</td>
<td>±5.0</td>
<td>17.0×17.8×7.2</td>
<td>SIP3</td>
</tr>
</tbody>
</table>

Input/output capacitors, an inductor, and other components are built in, making it possible to configure a power supply circuit using minimal external parts. In addition, pin compatibility with 3-pin LDOs enable easy replacement without board modification.

### Non-Isolated Buck DC/DC Converters

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Input Voltage (V)</th>
<th>Output Voltage (V)</th>
<th>Output Current (mA)</th>
<th>Dimensions (mm)</th>
<th>Package*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5220A</td>
<td>8 to 38</td>
<td>+5.0</td>
<td>1,000</td>
<td>28.0×19.5×12.0</td>
<td>SIP9</td>
</tr>
<tr>
<td>BP5221A</td>
<td>8 to 38</td>
<td>+5.0</td>
<td>500</td>
<td>28.0×19.5×12.0</td>
<td>SIP9</td>
</tr>
<tr>
<td>BP5222A</td>
<td>15 to 38</td>
<td>+12.0</td>
<td>500</td>
<td>28.0×19.5×12.0</td>
<td>SIP9</td>
</tr>
</tbody>
</table>

*All module packages are original.

### Non-Isolated Negative Voltage DC/DC Converter

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Input Voltage (V)</th>
<th>Output Voltage (V)</th>
<th>Output Current (mA)</th>
<th>Dimensions (mm)</th>
<th>Package*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5122</td>
<td>8 to 20</td>
<td>−12.0</td>
<td>100</td>
<td>26.7×19.5×12.7</td>
<td>SIP9</td>
</tr>
</tbody>
</table>

*All module packages are original.

### Isolated DC/DC Converters

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Input Voltage (V)</th>
<th>Output Voltage (V)</th>
<th>Output Current (mA)</th>
<th>Isolation Voltage (V)</th>
<th>Dimensions (mm)</th>
<th>Package*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP5512A</td>
<td>4.5 to 6.5</td>
<td>+5.0</td>
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<td>AC2300</td>
<td>28.2×21.4×17.2</td>
<td>SIP7</td>
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<tr>
<td>BP5324A</td>
<td>4.5 to 5.5</td>
<td>+12.0</td>
<td>250</td>
<td>AC500</td>
<td>38.5×27.0×13.6</td>
<td>SIP12</td>
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<tr>
<td>BP5510-24</td>
<td>10.8 to 13.2</td>
<td>+24.0</td>
<td>200</td>
<td>AC500</td>
<td>32.6×24.2×13.6</td>
<td>SIP11</td>
</tr>
</tbody>
</table>

*All module packages are original.

### Usage Example

#### DC/DC Converter with Protection Circuit

![Diagram of DC/DC Converter with Protection Circuit]

A resistor is used to increase the output during power ON. The resistance value must be selected based on the input voltage value. In this example, the values shown are standard. Since the control current will vary due to variations in the circuit and parts, please set the control current value with sufficient margin for the normal operating current.

#### Output ON/OFF Control

![Diagram of Output ON/OFF Control]

Be sure to use a fuse for safety.
1) The information contained in this document is current as of April 1st, 2018.

2) The information contained herein is subject to change without notice. Before you use our Products, please contact our sales representative (as listed below) and verify the latest specifications.

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors. Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the detailed characteristics, implementing redundant and fire prevention designs, and utilizing back-ups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other party. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

6) The Products are intended for use in general electronic equipment (i.e., AV/OVM devices, communication, consumer systems, gaming/entertainment sets) as well as the applications indicated in this document.

7) The Products specified in this document are not designed to be radiation tolerant.

8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative: transportation equipment (i.e., cars, ships, trains), primary communication equipment, traffic lights, fire/warfare prevention, safety equipment, medical systems, servers, water-cool, and power transmission systems.

9) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

10) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

11) ROHM has used reasonable care to ensure the accuracy of the information contained in this document. However, ROHM does not warrant that such information is error-free and ROHM shall not be held liable for any damages arising from any inaccuracy or misprint of such information.

12) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office as listed below.

13) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.

14) This document, in part or in whole, may not be reprinted or reproduced without prior consent of ROHM.