Simple DC/DC
Power supply circuit for RZ/A Series

Introduction
This application note indicates the example of power supply circuit used Simple DC/DC for RZ/A series.

Description
The simple DC/DC provides the best power supply system for Renesas MCU and SoC having the following features.

- Multi channel DC/DC built-in the main circuit for power supply are ready to market, and simple DCDC minimizes a PCB area and components. The devices are the most suitable for RZ/A series which need 2 power supply.
- Simple DC/DC has the discharge circuit and this function helps customers to reduce a time frame of power down, and it is easy for customers to reduce a design time without adding external components.
- Auto PFM mode keeps the high efficiency even though light load and reduces the standby power, and then this mode helps to be long life battery.
- Simple DCDC and RZ/A1H are mounted on GR-Peach (ARM® mbed™ board, on sale). Customers can reduce the development time by the circuit diagrams and pattern diagrams.

Target device
Simple DC/DC : RAA230231GSB

Related documents
RAA23022x RAA23023x Datasheet (R18DS0017EJ0100)
RZ/A1H Group, RZ/A1M Group User’s Manual: Hardware (R01CP0031EJ0100)
RZ/A1L Group User’s Manual: Hardware (R01UH0437EJ0200)
SH7262/SH7264 Guidelines for Hi-Speed USB 2.0 Board Design (REJ05B1216-0100)
1. Circuit example

Fig 1 shows the circuit example of power supply system for RZ/A by Simple DC/DC.

Note 1. No products in BGA package
2. Not existing on products in RZ/A1L, RZ/A1LU

Fig.1 Circuit example of power supply system for RZ/A by Simple DC/DC
2. External components example

Table 1 shows example of external components.

<table>
<thead>
<tr>
<th>Part</th>
<th>Part number / Maker</th>
<th>Value and Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inductor RAA230231 CH1</td>
<td>NRS5040T4R7NMGK / Taiyo Yuden</td>
<td>4.7uH, 4.1A, 4.9x4.9x2.4mm</td>
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<tr>
<td>Inductor RAA230231 CH2</td>
<td>NRS5030T3R3MMGJ / Taiyo Yuden</td>
<td>3.3uH, 3.6A, 4.9x4.9x2.4mm</td>
</tr>
<tr>
<td>Ferrite bead (1) RZ/A AVcc filter</td>
<td>BK1005HS121 / Taiyo Yuden</td>
<td>Z=120Ω (100MHz), 500mA, 1x0.5x0.5mm</td>
</tr>
<tr>
<td>Ferrite bead (2) RZ/A other filter</td>
<td>BK1005HS241 / Taiyo Yuden</td>
<td>Z=240Ω (100MHz), 400mA, 1x0.5x0.5mm</td>
</tr>
</tbody>
</table>

【Note】 Please contact each maker for the detail information.
3. Remark

Maximum output current of CH1 and CH2 in RAA230231 are 3A.

Maximum consumption current of RZ/A Series are 1.18V:0.89A, 3.3V:0.29A.

Fig.2 shows input and output voltage waveform of GR-Peach (ARM® mbed™ board) when starting and shutdown. The discharge circuits in Simple DC/DC turn off the output voltage quickly and avoid system malfunction caused by residual charge in the capacitors.

![Image of voltage waveform at starting and shutdown](image)

*1 : CH1 output of RAA230231  *2 : CH2 output of RAA230231

[Note] Reference data.

Fig.2 Voltage waveform at starting and shutdown on GR-Peach

Fig.3 shows the power conversion efficiency of GR-Peach. High efficiency over all road condition is achieved during Auto PFM mode, and it reduces the power consumption in the system and helps a long life battery.

![Image of efficiency chart](image)

[Note] Reference data

Fig.3 Efficiency at GR-Peach

When customers make actual pattern, separate a ground of control signal from a ground of a power line like the circuit diagram on page 2, so that these grounds do not have a common impedance as much as possible.
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## Revision history

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<tr>
<td>1.00</td>
<td>Mar 30, 2016</td>
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<td>First edition.</td>
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<td>1.01</td>
<td>Jul 17, 2019</td>
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<td>Revised Target device(Simple DC/DC)</td>
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