Simple DC/DC

Power supply circuit for RZ/A Series

R02AN0036EJ0101
Rev.1.01
Jul 17, 2019

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

RZ/A1 series : RZ/A1H, RZ/A1M, RZ/A1L, RZ/A1LU

Related documents

RAA23022x RAA23023x Datasheet (R18DS0017EJ0100)

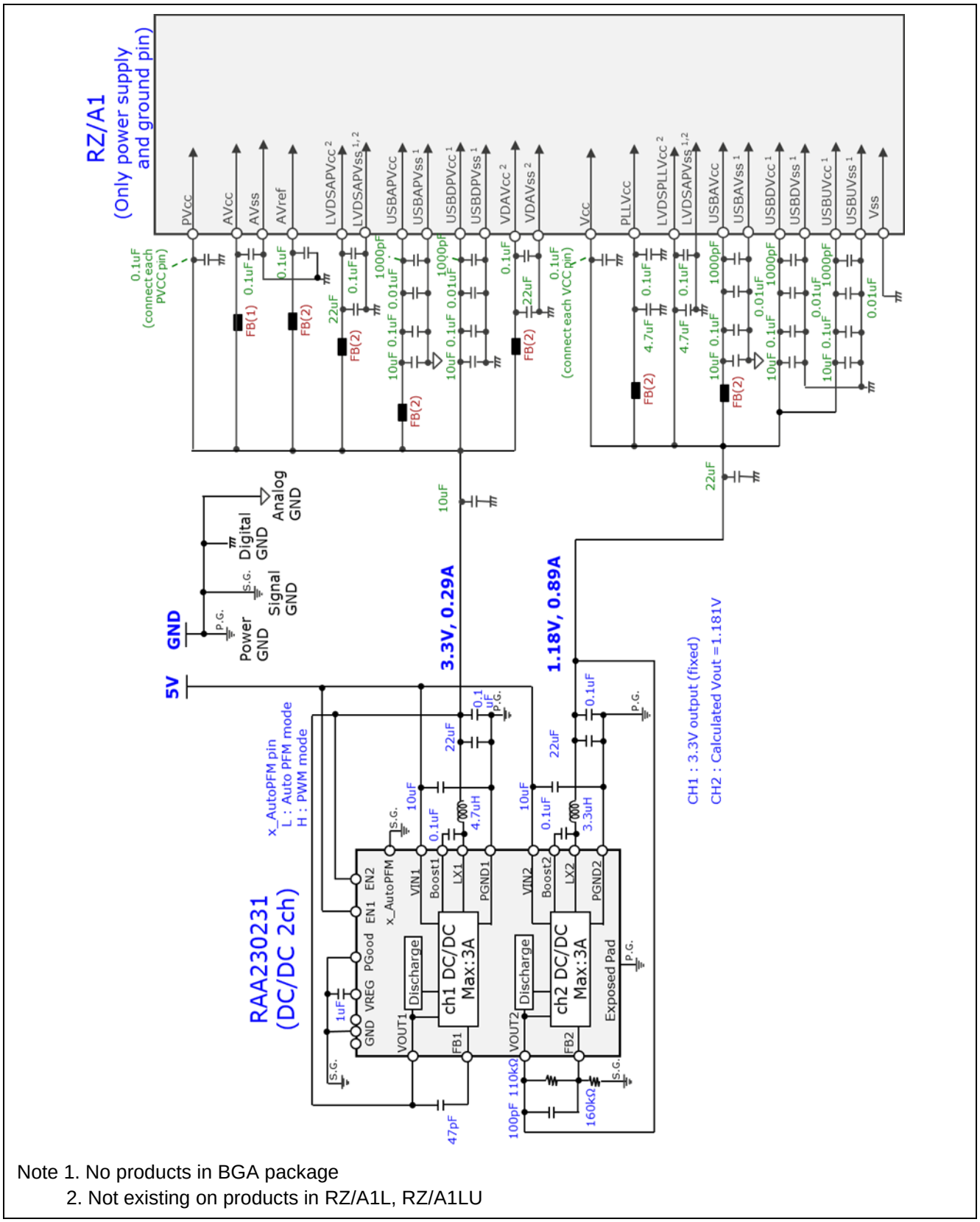
RZ/A1H Group, RZ/A1M Group User's Manual: Hardware (R01CP0031EJ0100)

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 1 External components example

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

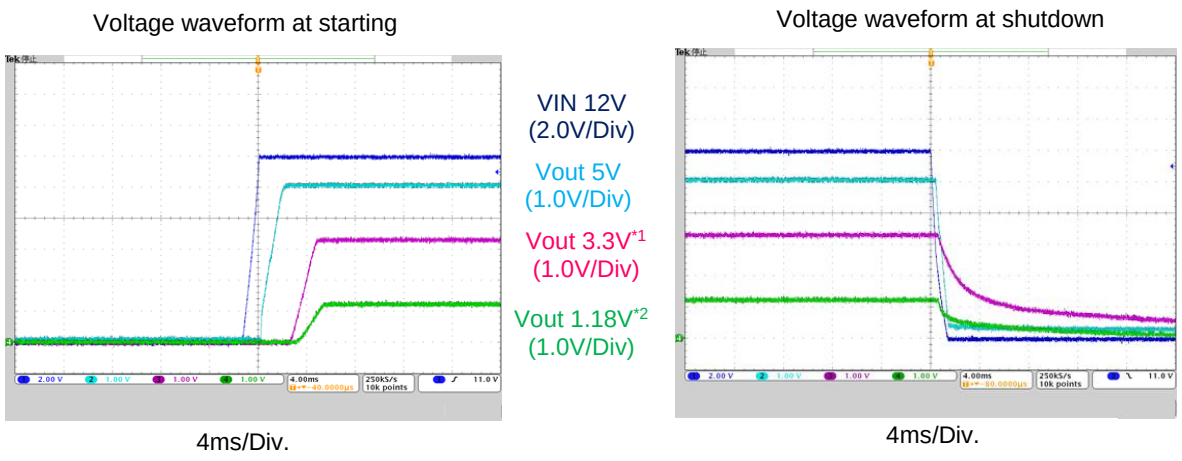
【Note】Please contact each maker for the detail information.

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.

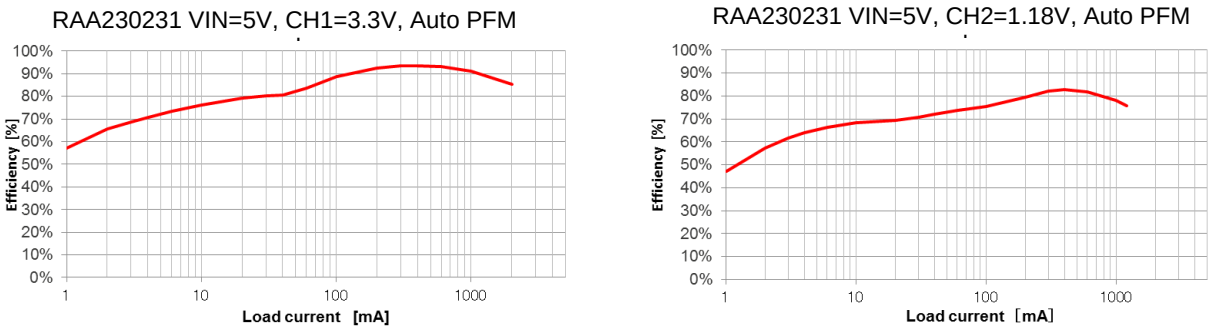


*1 : CH1 output of RAA230231 *2 : CH2 output of RAA230231

【Note】Reference data.

Fig2 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.



【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.

Website and support

Renesas Website
http://www.renesas.com

Contact Us
http://www.renesas.com/contact/

Revision history

Rev.	Date	Description	
		Page	Summary
1.00	Mar 30, 2016	-	First edition.
1.01	Jul 17, 2019	1-4	Revised Target device(Simple DC/DC)

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
5. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The intended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

   Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user’s manual or other Renesas Electronics document.
6. When using Renesas Electronics products, refer to the latest product information (data sheets, user’s manuals, application notes, “General Notes for Handling and Using Semiconductor Devices” in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

RENESAS

SALES OFFICES

Renesas Electronics Corporation

http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

Renesas Electronics Corporation
TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan

Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 101-T01, Floor 1, Building 7, Yard No. 7, 8th Street, Shangdi, Haidian District, Beijing 100085, China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai 200333, China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit No 3A-1 Level 3A Tower 8 UOA Business Park, No 1 Jalan Pengaturcara U1/51A, Seksyen U1, 40150 Shah Alam, Selangor, Malaysia
Tel: +60-3-5022-1288, Fax: +60-3-5022-1290

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338

Colophon 8.0