

## RAA228227

Digital Dual Output, 16-Phase PWM Controller with Adaptive Voltage Scaling Bus (AVSBus)

The [RAA228227](#) is a digital dual output multiphase ( $X+Y \leq 16$ ) PWM controller with an Adaptive Voltage Scaling Bus (AVSBus) interface.

The RAA228227 controller can be configured to support any required phase assignment up to a maximum of 16 phases across the two outputs (X+Y). For example, 15+1, 14+2, 13+3, 8+8, or even single output operation as a 16+0 configuration are supported. Increased power density, combined with support for the PMBus V1.3 and Adaptive Voltage Scaling Bus (AVSBus) interfaces, allows the RAA228227 to support any demanding power supply requirement.

The RAA228227 AVSBus interface complements PMBus by providing a common high-speed interface that accelerates point-to-point communication. The communication occurs between the controller and the load to statically and dynamically control the processor voltage, which delivers a balanced power-efficient design.

The RAA228227 uses the proprietary Renesas digital synthetic current modulation scheme to achieve the industry-best combination of transient response, ease of tuning, and efficiency across the full load range. The diode emulation and automatic phase add/drop features allow you to extract maximum efficiency from the converter regardless of load conditions. You can use the intuitive Renesas PowerNavigator™ software to configure and monitor the RAA228227.

With minimal external components, easy configuration, robust fault management, and highly accurate regulation capability, implementing a high-performance multiphase regulator has never been easier.

### Related Literature

For a full list of related documents, visit our website:

- [RAA228227](#) device page

### Features

- Advanced linear digital modulation scheme
  - Auto phase add/drop with PFM mode for excellent load vs efficiency profile
  - Dual edge modulation with optional diode braking for faster transient response
  - Excellent  $V_{OUT}$  transition performance
  - Zero latency synthetic current control for excellent high-frequency current balance
- Flexible phase assignment from 0 to 16 phases per output
- Up to 2MHz switching frequency operation for high density designs
- Differential remote voltage sensing supports  $\pm 0.5\%$  closed-loop system accuracy over load, line, and temperature
- Highly accurate current sensing for excellent load line regulation and accurate OCP
- Supports the full range of Renesas Smart Power Stage (SPS) devices
- Comprehensive fault management enables high reliability systems
  - Pulse-by-pulse (per phase) and total output current limiting
  - Black Box status recording capability with first fault indicator
- Intuitive configuration using [PowerNavigator](#)
- SMBus/PMBus V1.3 and AVSBus compatible
- Up to 16 user configurations stored in device Non-Volatile Memory (NVM)

### Applications

- Artificial Intelligence/accelerator cards (FPGA, ASIC)
- Network equipment
- Server/storage equipment
- Telecom/datacom equipment

# 1. Overview

## 1.1 Typical Application

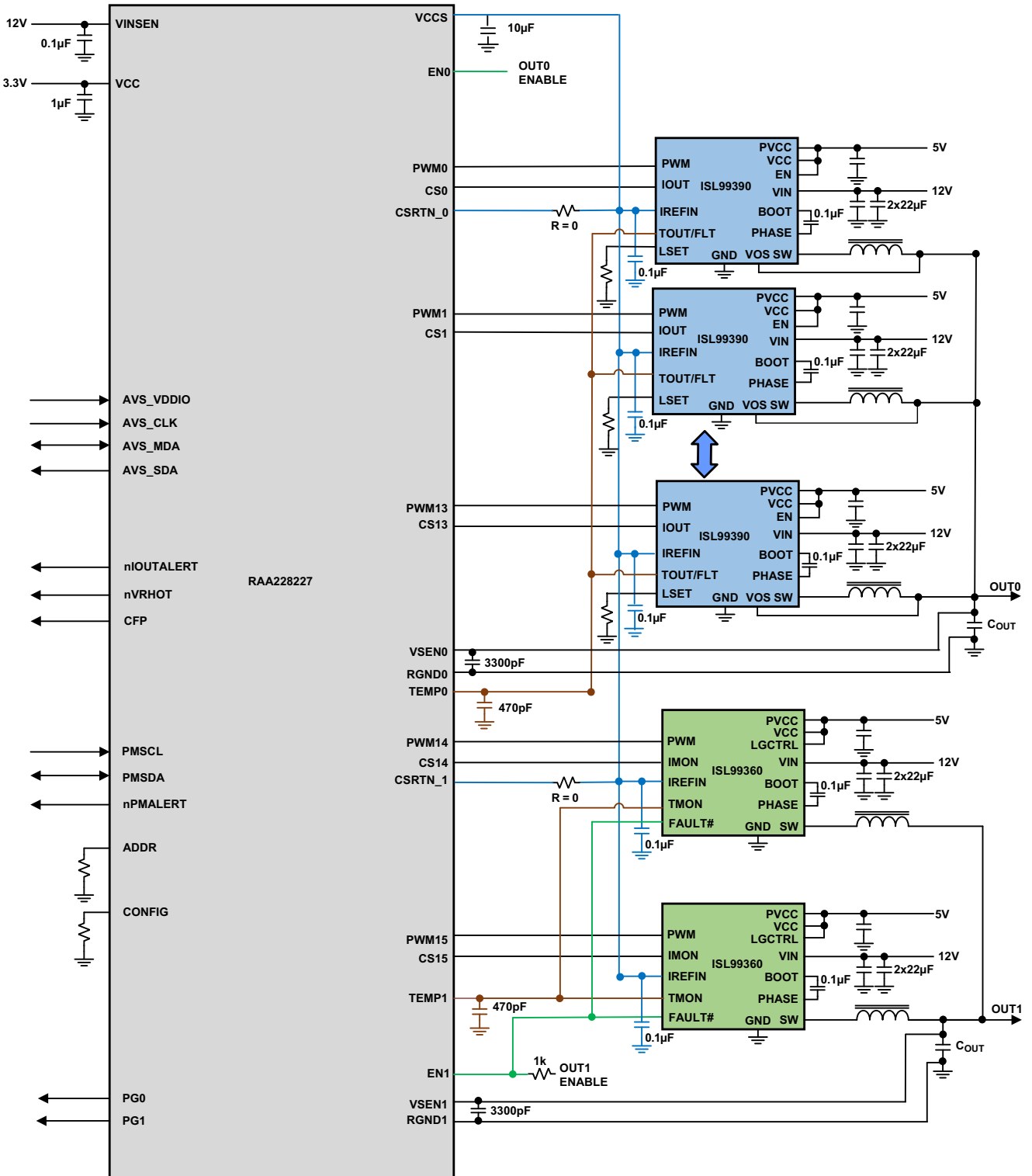


Figure 1. 14+2 Smart Power Stage

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Rev.1.0 Mar 2020)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:  
[www.renesas.com/contact/](http://www.renesas.com/contact/)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.