Data Short

To request the full datasheet, visit the ISL91211AIK and ISL91211BIK product pages.

ISL91211AIK, ISL91211BIK

Triple/Quad Output Power Management IC for Industrial and Computing Applications

The ISL91211AIK is a 4-phase, three output programmable Power Management IC (PMIC) and the ISL91211BIK is a 4-phase, four output programmable PMIC. Optimized with highly efficient synchronous buck converters for multiphase and single-phase operations, these converters deliver up to 5A per phase maximum output current. Featuring four buck controllers that can reconfigure their power stages to the controllers, both PMICs offer flexibility and allow seamless, design-in for a wide range of applications that need high output power and a small solution size.

ISL91211AIK and ISL91211BIK integrate low ON-resistance MOSFETs at 2MHz switching frequency, allowing smaller external inductors and capacitors to be used. With automatic Diode Emulation and Pulse Skipping modes under light-load conditions, this feature improves efficiency and maximizes battery life. The ISL91211AIK and ISL91211BIK deliver a highly robust power solution through a controller based on the Renesas proprietary Rapid Robust Ripple Regulator (R5) technology, offering tight output accuracy and load regulation, ultra-fast transient response, seamless DCM/CCM transitions, and no required external compensation.

In addition to the standard interrupt, chip enable, and watchdog reset functions, the ISL91211AIK and ISL91211BIK also feature four MPIOs and three GPIOs that supports SPI, I2C communication protocol, and various other pin mode functions.

Features

- Triple output 2+1+1 phases (ISL91211AIK) or quad output, four single phases (ISL91211BIK)
- 2.7V to 5.5V supply voltage
- 5A per phase peak current capability
- Small solution size (for four phase design)
- High efficiency (92.2%, L = 220nH for $3.8V_{IN}/1.8V_{OUT}$)
- Low I_Q in low power mode
- Proprietary control scheme reduces output capacitor and supports fast load transient (such as >50A/µs per phase)
- ±0.7% system accuracy, remote voltage sensing
- I2C programmable output from 0.3V to 2V
- Independent Dynamic Voltage Scaling (DVS) for each output
- Soft-start and fault detection (UV, OV, OC, OT), short-circuit protection
- 4.70mm x 6.30mm 35 ball BGA with 0.8mm pitch

Applications

- Industrial controls and FPGAs
- Computing servers and systems
- Home gateways and appliances

Related Literature

For a full list of related documents, visit our website:
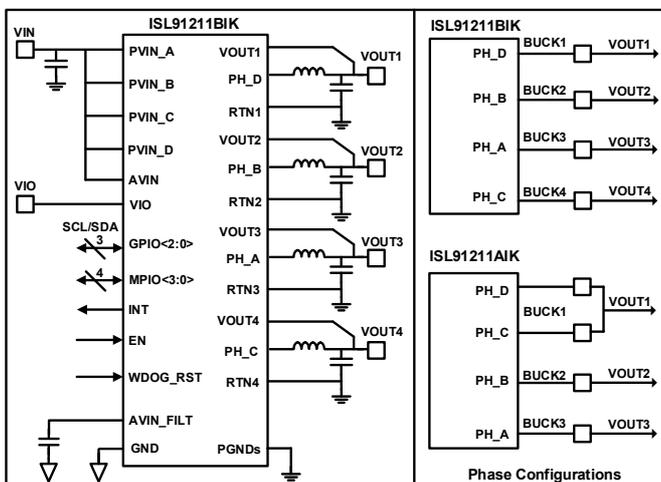
ISL91211AIK and ISL91211BIK device pages
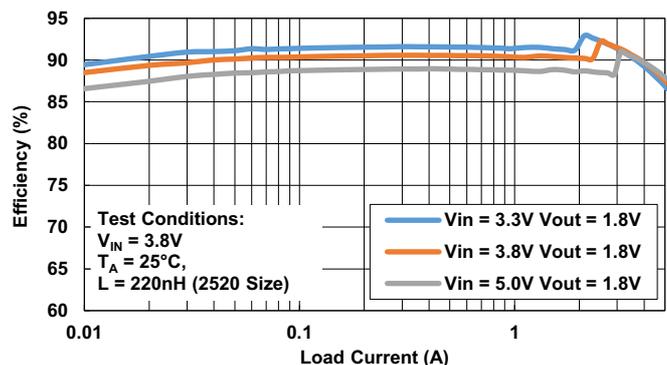

Figure 1. Simplified Block Diagram

Figure 2. Single-Phase Efficiency vs Load Current

1. Addendum

Complete Part Number	Configuration	I²C Address (7-bit)	PinMode	VOUT Defaults (DVS)	DVS0	DVS1	DVS2	DVS3	Auto/ FCCM	Recommended Inductor	Recommended Output Capacitor	Power Up/Down Delays	Power Up/Down Ramp Rates
ISL91211AIKZ-TR5818	2+1+1	0x60	0x2	VOUT1	0.9V	0.92V	0.42V	0V	Auto	330nH	4x22µF	1ms, 4ms	1.5mV/µs, 1.5mV/µs
				VOUT2	1.8V	1.54V	0.705V	0V	Auto	330nH	2x22µF	8ms, 0ms	1.5mV/µs, 1.5mV/µs
				VOUT3	1.8V	1.54V	0.705V	0V	Auto	330nH	2x22µF	1ms, 4ms	3mV/µs, 3mV/µs
ISL91211AIKZ-TR5843	2+1+1	0x1E	0xC	VOUT1	1.03V	0.92V	0.42V	0V	Auto	220nH	8x22µF	10ms, 0ms	3mV/µs, 3mV/µs
				VOUT2	1.35V	1.15V	0.53V	0V	FCCM	220nH	6x22µF	10ms, 0ms	6mV/µs, 6mV/µs
				VOUT3	0.675V	0.92V	0.42V	0V	FCCM	220nH	4x22µF	10ms, 0ms	3mV/µs, 3mV/µs
ISL91211AIKZ-TR5873	2+1+1	0x60	0x4	VOUT1	0.95V	1.0V	1.0V	1.0V	Auto	220nH	7x22µF	3ms, 4ms	3mV/µs, 3mV/µs
				VOUT2	1.0V	1.0V	1.35V	1.5V	Auto	470nH	4x22µF	3ms, 4ms	3mV/µs, 3mV/µs
				VOUT3	1.2V	1.2V	0.675V	0.75V	FCCM	470nH	4x22µF	3ms, 4ms	3mV/µs, 3mV/µs
ISL91211AIKZ-TR5874	2+1+1	0x60	0x4	VOUT1	1.0V	0.95V	0.95V	0.95V	Auto	220nH	7x22µF	3ms, 4ms	3mV/µs, 3mV/µs
				VOUT2	1.2V	1.2V	1.35V	1.35V	Auto	470nH	4x22µF	3ms, 4ms	3mV/µs, 3mV/µs
				VOUT3	0.6V	0.6V	0.675V	0.675V	FCCM	470nH	4x22µF	3ms, 4ms	3mV/µs, 3mV/µs
ISL91211AIKZ-TR5893	2+1+1	0x60	0x2	VOUT1	1.2V	1.0V	1.0V	1.0V	Auto	330nH	3x22µF	4ms, 0ms	3mV/µs, 3mV/µs
				VOUT2	1.1V	1.5V	1.5V	1.5V	Auto	330nH	1x22µF	4ms, 0ms	3mV/µs, 3mV/µs
				VOUT3	0.85V	1.2V	1.8V	1.8V	FCCM	330nH	1x22µF	4ms, 2ms	3mV/µs, 3mV/µs
ISL91211AIKZ-TR5894	2+1+1	0x62	0x2	VOUT1	1.2V	1.0V	1.0V	1.0V	Auto	330nH	3x22µF	0ms, 0ms	3mV/µs, 3mV/µs
				VOUT2	1.8V	1.5V	1.5V	1.5V	FCCM	470nH	4x22µF	0ms, 0ms	3mV/µs, 3mV/µs
				VOUT3	1.8V	1.2V	1.8V	1.8V	FCCM	470nH	4x22µF	0ms, 0ms	3mV/µs, 3mV/µs
ISL91211AIKZ-TR5937	2+1+1	0x1E	0x2	VOUT1	1V	1V	1V	0V	Auto	220nH	8x22µF	1ms, 1ms	3mV/µs, 3mV/µs
				VOUT2	1.35V	1.35V	1.35V	0V	FCCM	220nH	3x22µF	42ms, 2ms	3mV/µs, 3mV/µs
				VOUT3	1.8V	1.8V	1.8V	0V	Auto	220nH	3x22µF	0ms, 3ms	3mV/µs, 3mV/µs
ISL91211BIKZ-TR5844	1+1+1+1	0x1E	0xC	VOUT1	1.8V	1.54V	0.705V	0V	Auto	220nH	4x22µF	0ms, 10ms	6mV/µs, 6mV/µs
				VOUT2	1.5V	1.15V	0.53V	0V	FCCM	220nH	4x22µF	3ms, 0ms	6mV/µs, 6mV/µs
				VOUT3	0.75V	0.92V	0.42V	0V	FCCM	220nH	4x22µF	3ms, 0ms	3mV/µs,3mV/µs
				VOUT4	1.03V	0.92V	0.42V	0V	Auto	220nH	4x22µF	3ms, 0ms	3mV/µs,3mV/µs

Complete Part Number	Configuration	I²C Address (7-bit)	PinMode	VOUT Defaults (DVS)	DVS0	DVS1	DVS2	DVS3	Auto/ FCCM	Recommended Inductor	Recommended Output Capacitor	Power Up/Down Delays	Power Up/Down Ramp Rates
ISL91211BIKZ-TR5875	1+1+1+1	0x62	0x4	VOUT1	OFF	OFF	OFF	OFF	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT2	1.35V	1.35V	1.5V	1.5V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT3	1.8V	1.8V	1.8V	1.8V	Auto	220nH	4x22µF	6ms, 2ms	3mV/µs,3mV/µs
				VOUT4	0.6V	0.6V	0.75V	0.75V	FCCM	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
ISL91211BIKZ-TR5876	1+1+1+1	0x62	0x4	VOUT1	OFF	OFF	OFF	OFF	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT2	1.2V	1.2V	1.5V	1.5V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT3	1.8V	1.8V	1.8V	1.8V	Auto	220nH	4x22µF	6ms, 2ms	3mV/µs,3mV/µs
				VOUT4	0.6V	0.6V	0.75V	0.75V	FCCM	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
ISL91211BIKZ-TR5877	1+1+1+1	0x62	0x4	VOUT1	0.9V	0.95V	1.0V	1.0V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT2	1.0V	1.0V	1.0V	1.0V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT3	1.2V	1.2V	1.2V	1.2V	Auto	220nH	4x22µF	6ms, 2ms	3mV/µs,3mV/µs
				VOUT4	0.6V	0.6V	0.6V	0.6V	FCCM	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
ISL91211BIKZ-TR5878	1+1+1+1	0x62	0x4	VOUT1	0.95V	1.0V	0.95V	1.0V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT2	1.35V	1.35V	1.5V	1.5V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT3	1.8V	1.8V	1.8V	1.8V	Auto	220nH	4x22µF	6ms, 2ms	3mV/µs,3mV/µs
				VOUT4	0.675V	0.675V	0.75V	0.75V	FCCM	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
ISL91211BIKZ-TR5879	1+1+1+1	0x62	0x4	VOUT1	0.95V	1.0V	0.9V	0.9V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT2	1.2V	1.2V	1.35V	1.35V	Auto	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
				VOUT3	1.8V	1.8V	1.8V	1.8V	Auto	220nH	4x22µF	6ms, 2ms	3mV/µs,3mV/µs
				VOUT4	0.6V	0.6V	0.675V	0.675V	FCCM	220nH	4x22µF	3ms, 4ms	3mV/µs,3mV/µs
ISL91211BIKZ-TR5895	1+1+1+1	0x61	0x2	VOUT1	1.8V	1.0V	0.95V	1.0V	Auto	330nH	2x22µF	2ms, 2ms	3mV/µs,3mV/µs
				VOUT2	1.8V	1.35V	1.5V	1.5V	Auto	330nH	1x22µF	4ms, 0ms	3mV/µs,3mV/µs
				VOUT3	0.9V	1.8V	1.8V	1.8V	Auto	330nH	2x22µF	2ms, 2ms	3mV/µs,3mV/µs
				VOUT4	OFF	OFF	OFF	OFF	N/A	N/A	N/A	N/A	N/A

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.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks

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

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/