

PMICs Boast Better Efficiency And Solution Size For Powering Processors

[Renesas Electronics'](#) ISL91302B, ISL91301A, and ISL91301B programmable power management ICs (PMICs) are said to offer the highest power efficiency and smallest footprint for powering application processors in smartphones and tablets. The PMICs also deliver power to artificial intelligence (AI) processors, FPGAs, and industrial microprocessors (MPUs), and are well suited for powering the supply rails in solid-state drives (SSDs), optical transceivers, and a wide range of consumer, industrial and networking devices.

The ISL91302B dual/single output, multiphase PMIC provides up to 20 A of output current and 94% peak efficiency in a 70-mm² solution size that is said to be more than 40% smaller than competitive PMICs (Fig. 1). In addition to the ISL91302B, the ISL91301A triple-output PMIC and the ISL91301B quad-output PMIC both deliver up to 16 A of output power with 94% peak efficiency (Fig. 2).

These programmable PMICs leverage Renesas' R5 modulation technology to provide fast single-cycle transient response, digitally tuned compensation, and ultra-high 6-MHz (max) switching frequency during load transients. These features make it easier for power supply designers to design boards with 2-mm x 2-mm x 1-mm low-profile inductors, small capacitors, and only a few passive components. Other key specifications are given in Tables 1 and 2.

Renesas PMICs also do not require external compensation components or external dividers to set operating conditions. Each PMIC dynamically changes the number of active phases for optimum efficiency at all output currents. Their low quiescent current, superior light load efficiency, regulation accuracy, and fast dynamic response significantly extend battery life for today's feature-rich, power hungry devices, according to the vendor.

"Smartphone and tablet application processors require smaller footprint power supplies and higher output current and efficiency to maximize battery life," said Mark Downing, vice president, Core Power Solutions Division, Renesas Electronics. "The ISL91302B and ISL91301A/B PMICs offer designers everything they need to solve their toughest PCB layout challenges, dynamically scale performance, and extend battery run-time."

The ISL91302B dual/single output PMIC is available in a 2.551-mm x 3.670-mm, 54-ball WLCSP package and is priced at \$3.90 each in 1,000-piece quantities. For more information on the ISL91302B, visit www.intersil.com/products/isl91302B.

The ISL91301A triple-output PMIC and ISL91301B quad-output PMIC are available in 2.551-mm x 2.87-mm, 42-ball WLCSP packages, both priced at \$3.12 each in 1000-piece quantities. For more information on the ISL91301A, visit www.intersil.com/products/isl91301A. For more on the ISL91301B, visit www.intersil.com/products/isl91301B. Also see the website for more on the [R5 Modulation Technology](#).

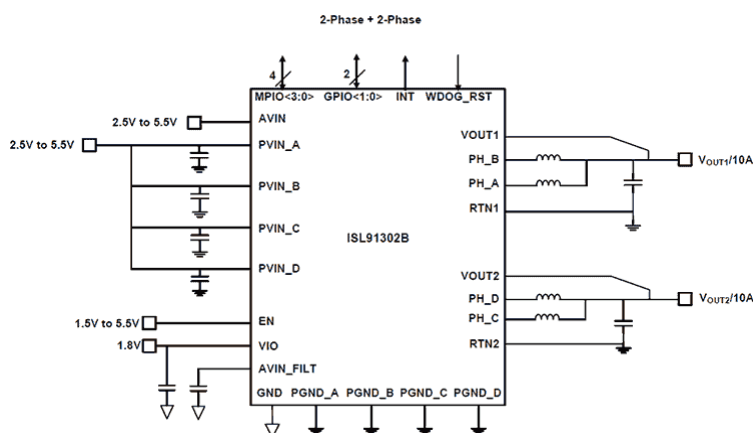
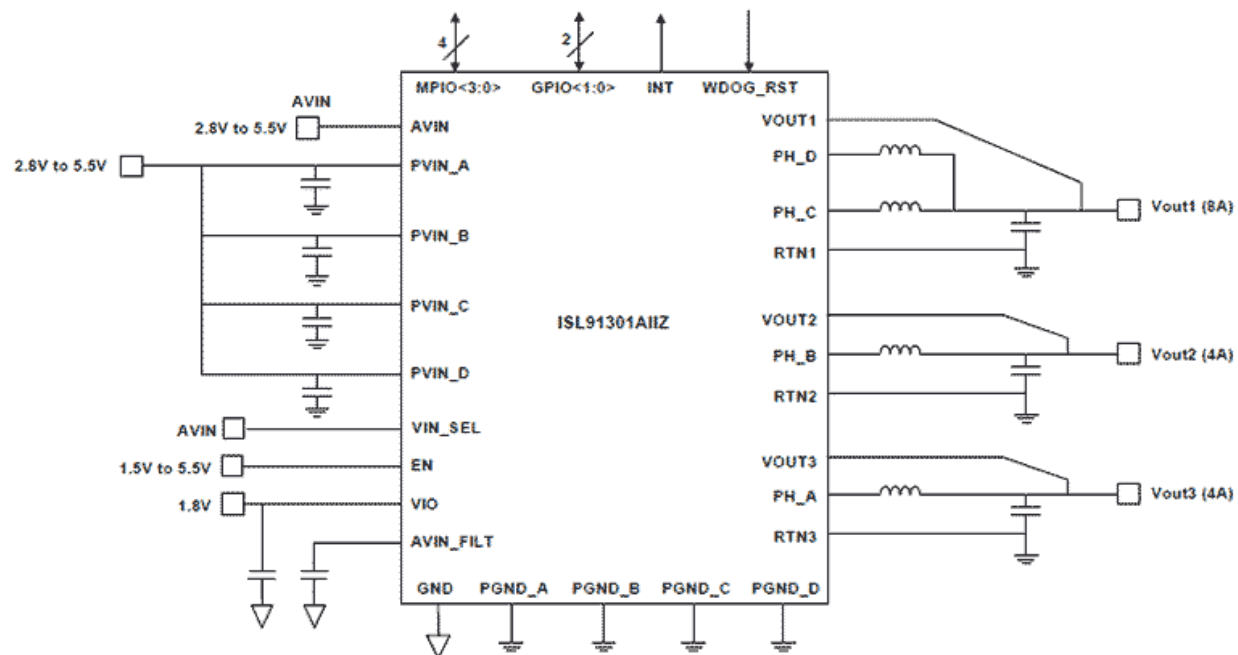
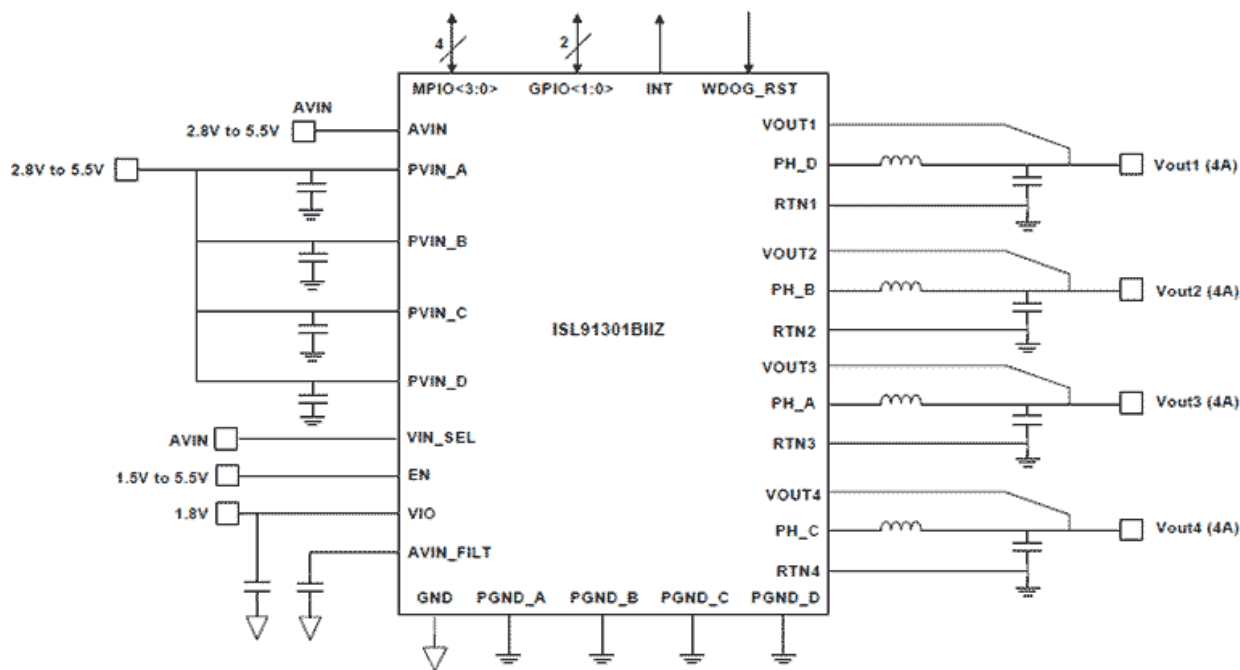


Fig. 1. The ISL91302B delivers up to 20 A and 94% peak efficiency in a 70-mm² solution size for application processors, AI processors, industrial MPUs, and FPGAs. This model is available in a dual-phase (2 + 2) configuration supporting 10 A from each output, a triple-phase (3 + 1) configuration supporting 15 A from one output and 5 A from the second output and a quad-phase (4 + 0) configuration supporting 20 A from one output. The ISL91302B's 2.551-mm x 3.670-mm, 54-ball WLCSP package is pictured on the right.



(a)



(b)

Fig. 2. The ISL91301A triple-output PMIC (a) and the ISL91301B quad-output PMIC (b) both deliver up to 16 A of output power with 94% peak efficiency. The ISL91301A is dual-phase buck converter with three output rails configured as 2+1+1 phase. The ISL91301B is a single-phase buck with four output rails configured as 1+1+1+1 phase.

Table 1. Key specs and features of the ISL91302B PMIC.

Single or dual output options (factory configurable)	Dual-phase (2 + 2) configuration, 10 A from each output
	Triple-phase (3 + 1) configuration, 15 A from one output and 5 A from the second output
	Quad-phase (4 + 0) configuration, 20 A from one output
Solution size	7 mm x 10 mm for four-phase design
Input supply voltage range	2.5 V to 5.5 V
Vout	0.3 V to 2 V, I2C or SPI programmable
Phase adding/shedding	R5 modulator architecture balances current loads with smooth phase adding and dropping for power efficiency optimization
Quiescent current	75-µA quiescent current in discontinuous current mode
Voltage scaling	Independent dynamic voltage scaling for each output
System accuracy	±0.7% system accuracy for -10°C to 85°C with remote voltage sensing
Telemetry	Integrated telemetry ADC senses phase currents, output current, input/output voltages, and die temperature, enabling PMIC diagnostics during operation
Fault protection	Soft-start and fault protection against undervoltage (UV), overvoltage (OV), overcurrent (OC), overtemperature (OT) and short circuit.

Table 2. Key specs and features of the ISL91301A and ISL91301B PMICs.

Output options (factory configurable)	Dual-phase, three output rails configured as 2+1+1 phase (ISL91301A)
	Single-phase, four output rails configured as 1+1+1+1 phase (ISL91301B)
Solution size	7 mm x 10 mm for 4-phase design
Input supply voltage range	2.5 V to 5.5 V
Output current	4 A per phase for 2.8-V to 5.5-V supply voltage
	3 A per phase for 2.5-V to 5.5-V supply voltage
Vout	0.3 V to 2 V, I2C or SPI programmable
Phase adding/shedding	R5 modulator architecture balances current loads with smooth phase adding and dropping for power efficiency optimization
Quiescent current	62-µA quiescent current in discontinuous current mode
Voltage scaling	Independent dynamic voltage scaling for each output
System accuracy	±0.7% system accuracy for -10°C to 85°C with remote voltage sensing
Telemetry	Integrated telemetry ADC senses phase currents, output current, input/output voltages, and die temperature, enabling PMIC diagnostics during operation
Fault protection	Soft-start and fault protection against undervoltage (UV), overvoltage (OV), overcurrent (OC), overtemperature (OT) and short circuit.