

## ***Buck-Boost Converter With Ultra-Low Quiescent Current Powers Sensors And Other Devices***

[Renesas Electronics'](#) ISL9122A is a flexible buck-boost switching regulator with bypass mode that provides ultra-low quiescent current ( $I_Q$ ) for powering sensors, microcontrollers (MCUs), wireless devices, and other system components. Operating with battery output from 1.8 V to 5.5 V, the ISL9122A extends the battery life of smart IoT devices powered by coin-cell, lithium and multiple series alkaline batteries (Fig. 1). Target applications include wireless earbuds, fitness bands, smart watches, water and gas meters, portable medical devices, and a wide range of battery-operated smart IoT devices.

The ISL9122A buck-boost switching regulator implements dynamic voltage scaling (DVS) in I<sup>2</sup>C programmable 25-mV steps to optimize system power consumption. The regulator's power boost up to 5.375 V maximizes RF capabilities of IoT devices across their battery range. Its PFM and PWM functionality maximizes efficiency over the whole output current range. In forced PWM mode, the regulator always switches at a 2.5-MHz frequency, which improves EMI performance of the system.

"With the explosive growth of IoT wireless connectivity applications, the ISL9122A buck-boost regulator's fast transitions from no load to full load is ideal for powering the newest generation of devices," said Andrew Cowell, vice president, Mobility, Infrastructure and IoT Power Business Division at Renesas. "Our customers praise the ISL9122A's flexibility, dynamic voltage scaling and lowest regulated standby power consumption."

The ISL9122A has automatic bypass functionality for situations in which the input voltage is close to the output voltage, and it automatically transitions between buck and boost modes without significant output disturbance. In addition to the automatic bypass functionality, the forced bypass power-saving mode can be chosen if voltage regulation is not required. Forced bypass power saving mode is accessible using the I<sup>2</sup>C interface bus.

The ISL9122A buck-boost regulator joins the recently released ISL9123 buck regulator. Both ultra-low  $I_Q$  switching regulators can power the Renesas RL78 family of 8/16-bit ultra-low energy MCUs, the RA family of 32-bit MCUs with Arm Cortex-M Core, and the RE family of embedded controllers for wearables and energy harvesting applications.

Features of the ISL9122A include:

- Ultra-low  $I_Q < 1.3 \mu\text{A}$  and low shutdown mode current of 7 nA to extend battery life
- High efficiency at light load (84% at 10  $\mu\text{A}$ ) and 97% peak efficiency to reduce power drain and heat buildup (see Fig. 2)
- Automatic and selectable forced bypass power saving mode reduces  $I_Q$
- Wide input-voltage range from 1.8 V to 5.5 V, works with multiple battery topologies
- Large adjustable output voltage range from 1.8 V to 5.375 V in 25-mV increments
- Max output current up to 500 mA ( $V_{\text{out}} = 3.3 \text{ V}$ ,  $V_{\text{in}} = 3.6 \text{ V}$ )
- Ultra-small footprint with a 1.8- x 1.0-mm WLCSP package or a 3-mm x 2-mm DFN package
- Only requires three external components: one inductor, and input and output capacitors
- Full protection against overcurrent, short circuit and overheating.

The ISL9122A is available now from Renesas' worldwide distributors and is priced at \$0.89 (8-lead DFN package) and \$0.78 (8-bump WLCSP package) each in 1,000-unit quantities. For more information, see the ISL9122A product [page](#).

Two ISL9122A evaluation boards are also available—the ISL9122AIRN-EVZ with 3.3-V default output (DFN) and ISL9122AIIN-EVZ with 3.3-V default output (WLCSP), both priced at \$70.

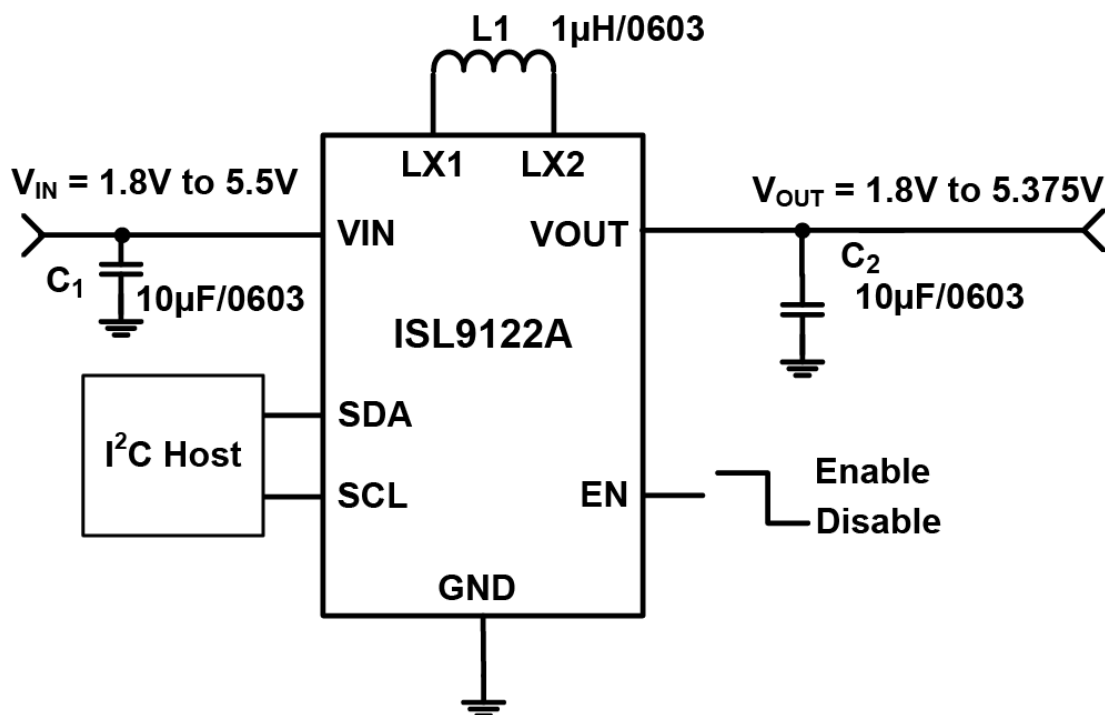


Fig. 1. The ISL9122A is a flexible buck-boost switching regulator with bypass mode, which, extends battery life for wireless and smart IoT devices. It features an extremely low quiescent current consumption of 1300 nA in regulation mode, 120 nA in forced bypass mode, and 8 nA in shutdown mode.

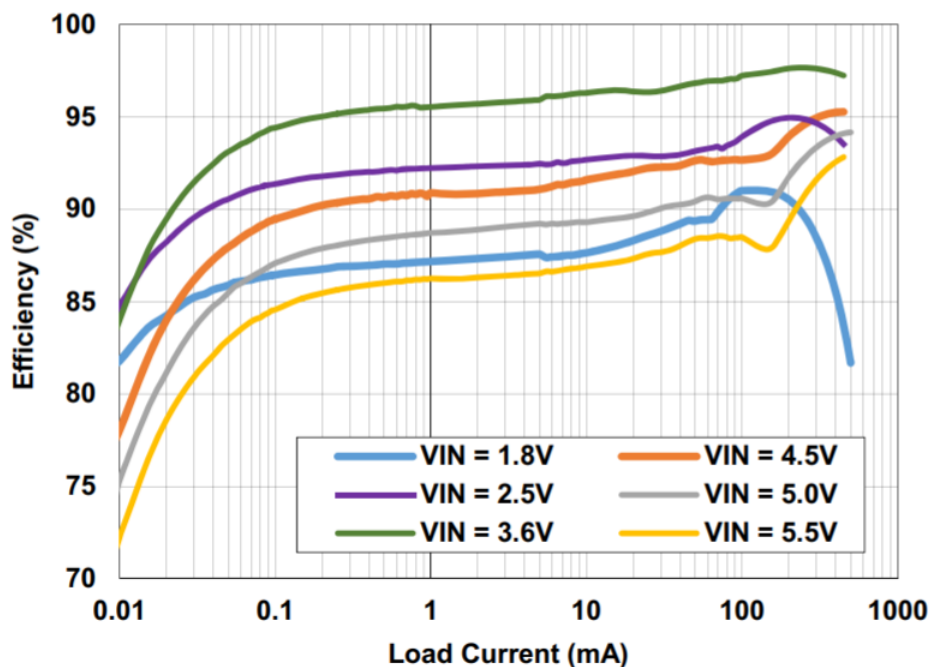


Fig. 2. Because of its adaptive frequency hysteretic control, the ISL9122A provides excellent efficiency. Efficiency plots shown here are for a  $V_{OUT}$  of 3.3. V and various input voltages and a 25°C ambient.