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700-V, 2-W To 8-W Buck Regulators Suit A Range Of Home And Industrial Uses

Members of [Renesas Electronics'](#) RAA2230XX a family of monolithic 700-V buck regulators are said to deliver superior power consumption, noise and EMI suppression, as well as reduced overall system cost versus competing solutions. The family includes 2-W (RAA223012), 4-W (RAA223011) and 8-W (RAA223021) versions. These are the first 700-V rated regulators offered by Renesas.

Regulators in this family are well suited for a wide range of applications, including home appliances, sensing systems such as smoke alarms and gas sensors, white goods, power meters and industrial controls. They support both nonisolated buck and isolated flyback topologies, allowing customers to develop multiple types of ac input power supplies (see Fig. 1). In addition, these devices complement Renesas' MCU and sensor lines.

The RAA2230XX buck regulators consume only 10 mW to 30 mW when idle, helping system designers meet ever-tightening standby power regulations. They feature a unique switching algorithm which minimizes electromagnetic interference (EMI) and eliminates audible noise, such as "humming" or "whining" that can affect competitors' solutions. See Fig. 2.

The power team at Renesas explains the switching algorithm in these conceptual terms, "We reduce the amount of peak current allowed at light load (when the part is operating below 20 kHz, in the audible frequency band). That limits the amount of energy available to excite the output filter elements, and thus they don't make any noise. Other devices on the market do a more simple PWM/PFM control. For example, at light load, their frequency stays the same, but may stop switching for long time, while the peak current stays the same. It's easy to design, but may result in high audible noise and require different ways to fix it on the external circuit design."

They continue saying, "With the Renesas devices, when the load starts to drop, the peak current first starts to go lower while the frequency stays the same. Then, when the load goes very low, the frequency also starts to drop, but the peak current is already very low so it is hard to generate noise within the magnetics."

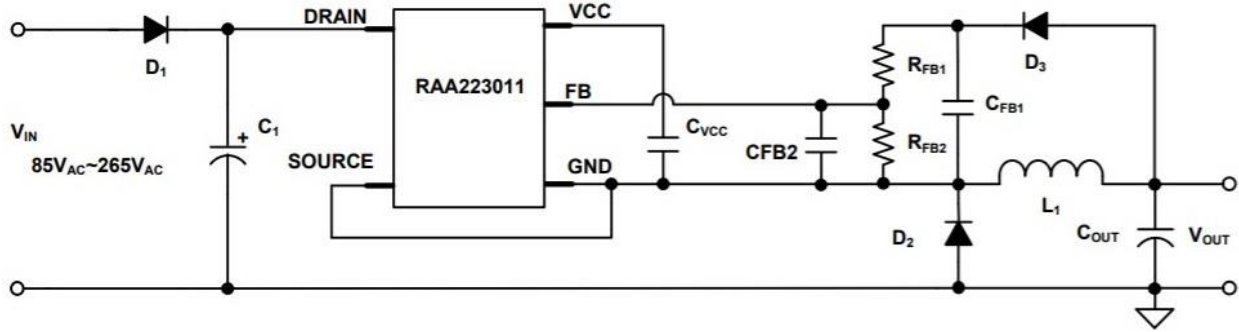
The new regulators also can supply as low as 3.3-V output, enabling designers to eliminate an LDO post regulator, saving BOM cost and board space.

The buck regulators connect to the ac line to power Renesas MCUs, sensors and other digital ICs. Renesas has developed numerous Winning Combinations that include the new devices. Renesas' Winning Combinations are vetted system architectures made from mutually compatible devices across the company's analog, power, and embedded processing portfolios that work together seamlessly. For example, the Household Smoke Detector Winning Combination demonstrates a turnkey architecture for a residential smoke alarm, suitable for smart industrial control terminals.

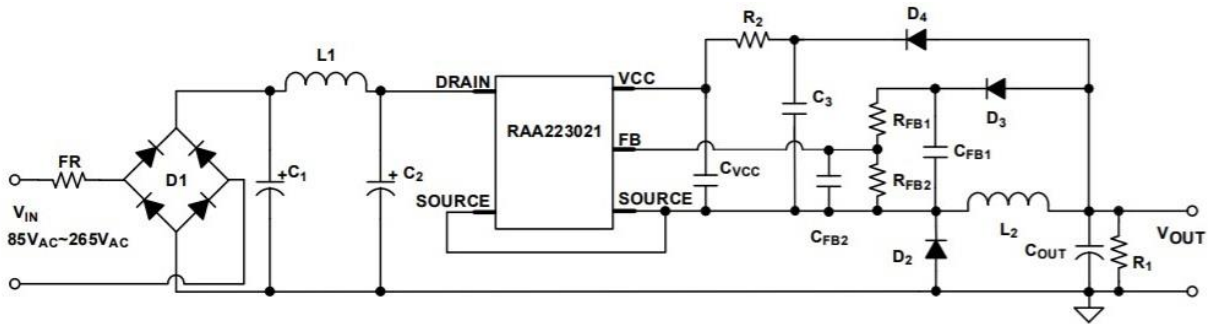
"The RAA2230XX family is a superior solution that complements our deep and broad line of products for the home and industrial markets," said Philip Chesley, vice president of the Industrial and Communications Business Division at Renesas. "This is an excellent example of Renesas' ability to combine great products with design and applications expertise to help our customers get to market faster with differentiated end products."

Available now in TSOT23-5, SOIC-8 and SOIC-7 package options, the RAA2230XX buck regulators offer pin-to-pin compatibility with competitors' products for easy replacement. Renesas also offers numerous evaluation boards for different package and output combinations.

For more information and to order samples and/or evaluation boards, see the Non-Isolated AC/DC Buck Converters [page](#). For more information on Renesas' Winning Combinations, see the Winning Combinations [page](#). For more details on the algorithm, check out Section 5.2 of the RAA223011 [datasheet](#).



(a)



(b)

Fig. 1. Typical buck application circuits for the RAA223011 (4 W) and RAA223012 (2 W) (schematic shown in (a)) and RAA223021 (8 W) (schematic shown in (b)). These regulators feature low power consumption, low EMI, no audible noise, and reduced BOM costs. They target a wide range of applications, including home appliances, sensing systems such as smoke alarms and gas sensors, white goods, power meters and industrial controls.

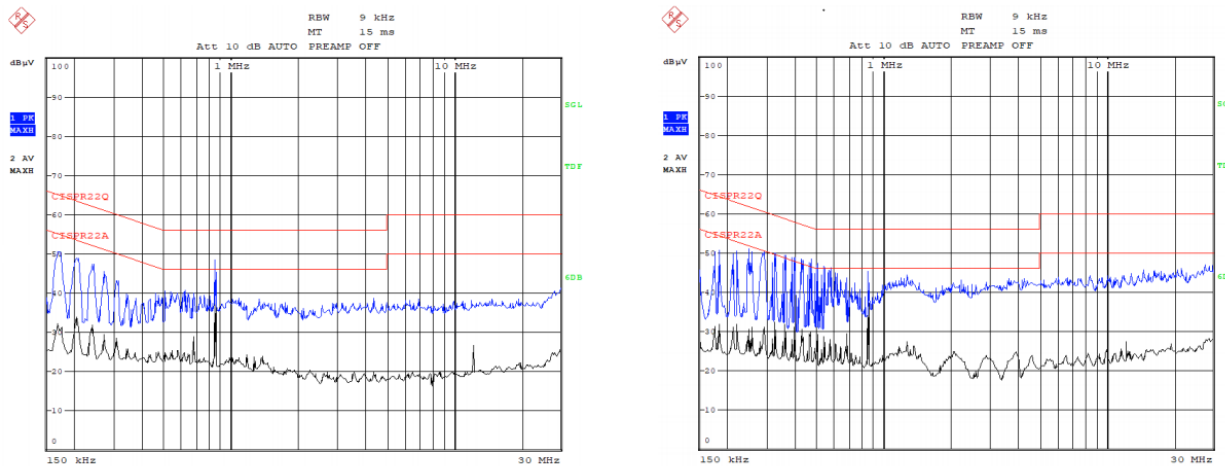


Fig 2. Conducted and radiated EMI performance of the RAA223011 tested per EN55022/CISPR22. Units were tested with 12-V and 260-mA output, with results shown on the left for 120-Vac input and on the right for 230-Vac input.