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Synchronous-Rectifier Controllers For Non-Complementary Active Clamp Flyback

STMicroelectronics' SRK1004 synchronous-rectifier controllers save space and increase efficiency in the secondary side of active-clamp, resonant, and quasi-resonant flyback (ACF, AHB, QR) converters for chargers, power adapters, and switched-mode power supplies. The minuscule 2-mm x 2-mm ICs supersede the SRK1001 and implement a new switch-off algorithm for increased efficiency and robustness (see the figure).

With six variants available, the SRK1004 series lets designers choose logic-level or standard MOSFET gate drive, and 25-ns or 150-ns turn-off delay to compensate for drain inductance (see the table). Suitable for active clamp, resonant and quasi-resonant flyback topologies, the controllers also contain circuitry that creates a turn-on window to prevent unwanted switching. The output can sink up to 1.6 A and source 0.6 A to the gate, while the switching frequency of 500 kHz permits a compact and low-cost design.

Leveraging ST's robust silicon-on-insulator (SOI) process, the SRK1004 devices can control the MOSFET in either low-side or high-side connection with up to 190-V drain-source voltage. With a wide supply-voltage range, from 4 V to 36 V, the ICs can be powered from the converter's output in a low-side configuration or from the transformer in a high-side configuration.

This capability lets designers avoid providing a dedicated auxiliary power supply and so minimize the bill of materials. The devices contain a linear regulator that supplies the ICs' internal circuitry and gate driver as well as providing power at an output pin for off-chip circuitry.

Six individual evaluation boards, EVLSRK1004A-F, are available to help start new projects quickly and identify the SRK1004 variant best suited to the converter circuit and MOSFET. The SRK1004 series is in production now, in a six-lead thermally enhanced DFN package, from $0.36 for orders of 1000 pieces. For more information, see the SRK1004 page.

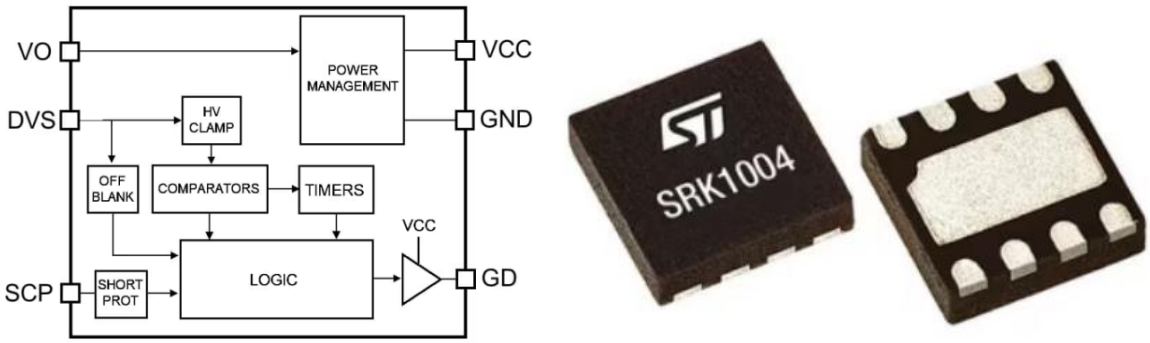

Figure. The SRK1004 controllers are intended for secondary-side synchronous rectification (SR) in non-complementary active clamped flyback, resonant flyback, and quasi-resonant flyback converters. An internal block diagram and package photo are shown here. These ICs provide a gate-drive output suitable for n-channel logic-level or standard-level power MOSFETs.

Table. SRK1004 models offer different values for turn-off delay and turn-on enable window.

Order code	VCC (V)	Typ. turn-off delay (ns)	Typ. turn-on enable window (ns)	Package marking
SRK1004ATR	5.5	25	125	S4A
SRK1004BTR	5.5	150	125	S4B
SRK1004CTR	9.0	25	125	S4C
SRK1004DTR	9.0	150	125	S4D
SRK1004ETR	5.5	25	215	S4E
SRK1004FTR	9.0	25	215	S4F