## *Buck Controller with USB PD3.1 Source Controller Simplifies Automotive Charging*

Diodes' APK43070Q combines a highly integrated, automotive-compliant synchronous buck controller with a USB Type-C PD3.1 source controller. This level of integration reduces the number of external components, lowers BOM cost, and simplifies the design of high-power USB Type-C charging ports. Typical applications include single-port and multi-port USB Type-C charging modules in vehicles (Fig. 1).

Operating from a 4-V to 36-V input, the device supports USB PD3.1 extended power range (EPR) and adjustable voltage supply (AVS) up to 28 V, and standard power range (SPR) and programmable power supply (PPS) up to 21 V. These capabilities enable USB Type-C charging ports delivering up to 140 W.

The constant-frequency synchronous stepdown controller with high drive strength, optimized deadtime, and an elevated gate-drive voltage enables mid- to high-power charging using external n-channel MOSFETs. This allows designers to choose MOSFETs that optimize efficiency and thermal performance.

To further enhance converter power efficiency, the $V_{IN}$ dc power pass-through mode is supported. This architecture allows the high-side MOSFET to act as the $V_{BUS}$ switch, eliminating the need for an additional output switch and further reducing system cost.

The APK43070Q integrates an $I^2C$ interface with a controller/target addressing scheme. This enables smart power sharing across up to eight USB Type-C ports through resistor selection without an external microcontroller (Fig. 2). The result is a simpler system architecture for multi-port charging platforms.

The device includes several protection features—overvoltage, overcurrent, undervoltage, and overtemperature protection, plus connector moisture detection. The CC1/CC2 and DP/DN pins tolerate short-to-$V_{BUS}$ events up to 30 V, helping protect the system from accidental faults.

The APK43070Q is available in the 4-mm x 4-mm W-QFN4040-24/SWP (Type A1-B) package and priced at $0.80 in 1,000-piece quantities. A standard-compliance version, the APK43070, is also available and is suitable for industrial and commercial applications. For more information, see the APK43070 page.

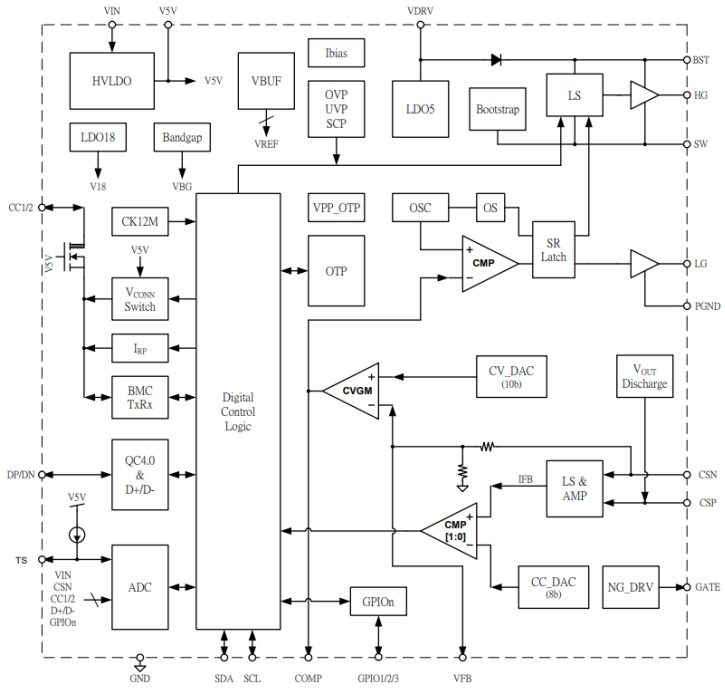


*Fig. 1. The buck controller in the APK43070Q is a constant-frequency synchronous stepdown controller to cover middle- and high-power charging with integrated low-side and high-side drivers for external n-channel MOSFETs. The internal regulator supplies internal bias rails as well as the MOSFET gate drivers.*

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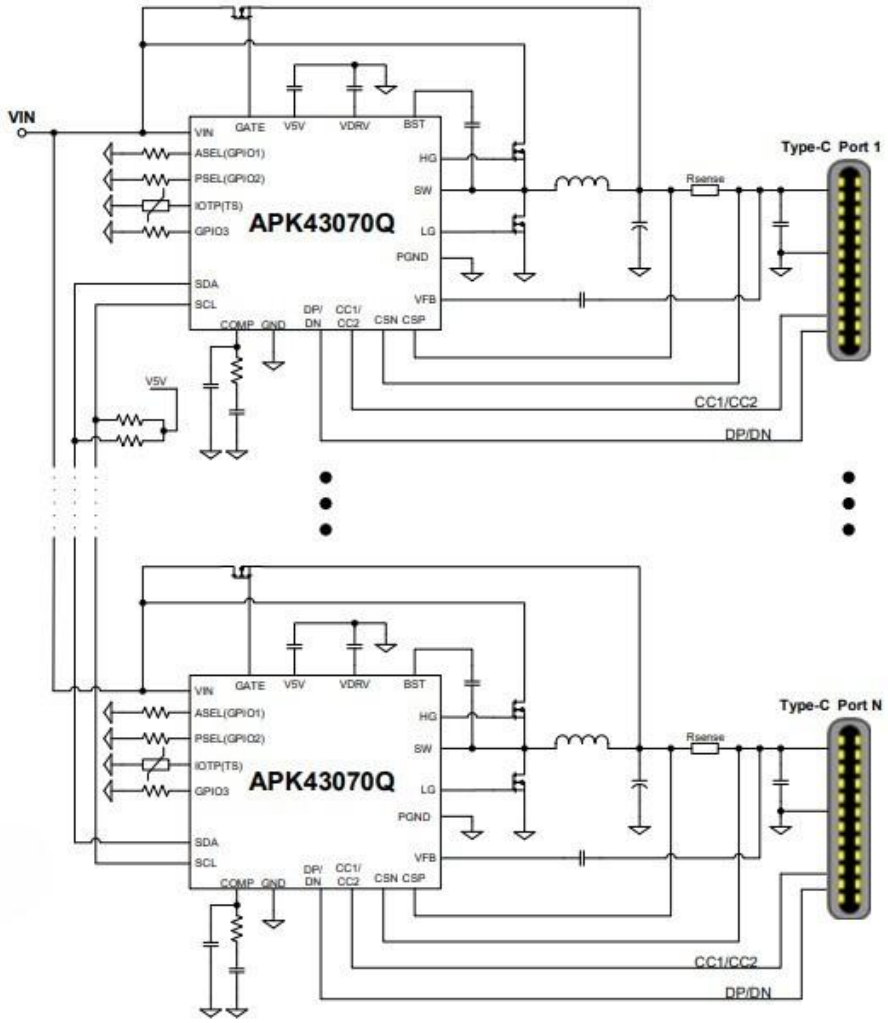


*Fig. 2. The APK43070Q synchronous buck controller with USB PD3.1 EPR decoder supports either single-port charging or multiple-port charging (shown here) at optimal system BOM with extremely low standby power consumption, according to the vendor.*

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