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# USB-C PD Fast Role Swap – The consumer experience uninterrupted

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No one likes interruptions, especially from our beloved media devices. As technology consumers, we have high expectations from our devices. Data bandwidth and streaming have reached levels where we are accustomed to seamless media delivery without interruption. Interruptions and down time from our devices won't be tolerated, especially from the latest and greatest technology, which at times can be a little power hungry.

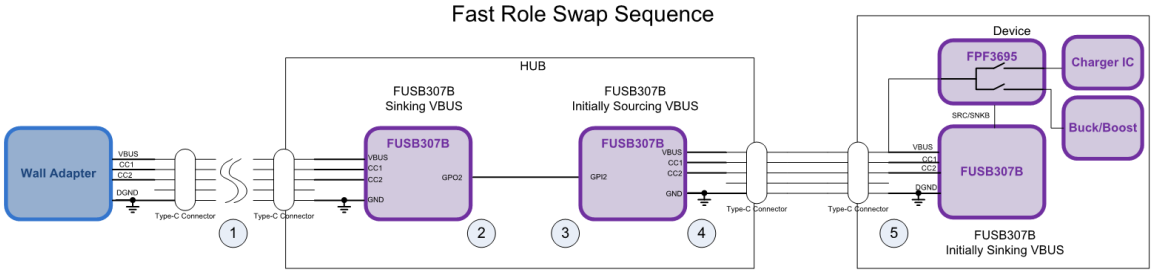
USB-C™ is slated as the connectivity standard of the future, catering to the user experience with universal connectors. Additionally, USB-C™ has a suite of features within the Power Delivery (PD) protocol lending to higher power charging and SuperSpeed data transmission. While the concepts of connector uniformity and higher performance sound attractive, these can be challenging to implement simultaneously for product developers.

The rotationally symmetric cable allows for devices to either source or sink power. Devices such as docks or hubs can quickly swap roles depending on the power sourcing needs. Consider the situation where a dock is plugged into a wall outlet adapter and a user decides to charge their tablet from the dock. In this scenario, the wall adapter is sourcing the dock and the dock is sourcing the tablet. If the wall adapter is removed from the wall, the entire system needs to respond to the removal of the power source. The dock will transition from sourcing power between adapter and tablet to sinking power from tablet. During this transition, the user shouldn't be inconvenience with interruptions in data on their tablet. Due to scenarios like this, the USB-C™ PD "Fast Role Swap" specification was written.

This isn't a new scenario as a similar power negotiation specification existed in USB 2.0 known as USB "On The Go" or OTG. The legacy OTG spec enabled two devices to communicate without the need for a PC. With the proliferation of handheld and portable electronics, the OTG specification is no longer practical and hierarchical power roles are no longer applicable.

The latest version of the USB-C™ PD specification includes the Fast Role Swap (FRS) spec to ensure power role swapping occurs in a timely fashion without disrupting the data transmission. The key to achieving FRS is to change the power sourcing within the time specified by the USB-C™ PD specification so that the device(s) connected to the dock never experience momentary power loss or glitching. This can be challenging as power management ICs are often large, capacitive, and slow to change states. The product

designer must choose a USB-C™ PD controller and power switches that can meet the FRS timing requirements.  A controller such as the FUSB307B from ON Semiconductor handles the time-critical power delivery functionality autonomously, without the sometimes slow interjection of a host microprocessor or USB-C™ Port Manager. This is accomplished through GPIO communication between the controllers in the dock, Fast Role Swap signaling between dock and device via USB-C™, and the timely transition of the SRC/SNKB pin to control the power switches.




With an automotive-qualified variant, the FUSB307BV can also form the basis for an in-car docking station. Check our new USB PD reference design for automotive application.

The USB-C™ connector with PD is likely to change the way we use our portable devices and other consumer electronics.  Thanks to the forethought of specifications like FRS, our devices can seamlessly power swap without interrupting us.