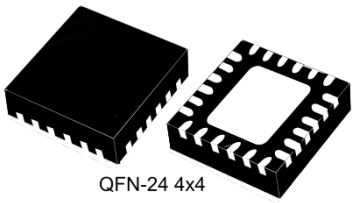
STUSB4500

Datasheet

Standalone USB PD sink controller with short-to-VBUS protections

WLCSP-25 2.6x2.6



QFN-24 4x4

Product status link
STUSB4500

Device summary	
Order code	STUSB4500QTR
	STUSB4500BJR
Description	Standalone USB PD sink controller (auto-run mode)
Package	QFN-24 EP (4x4)
	WLCSP-25 (2.6x2.6x0.5)
Marking	4500

Features

- Auto-run Type-C™ and USB PD sink controller
- Dead battery mode support
- Up to 3 sink PDO configurable profiles
- Dual high power charging path support
- Integrated V_{BUS} switch gate drivers (PMOS)
- Integrated V_{BUS} voltage monitoring
- Internal and/or external V_{BUS} discharge paths
- Short-to-VBUS protections on CC pins (22 V)
- High voltage capability on V_{BUS} pins (28 V)
- Dual power supply (V_{SYS} and/or V_{DD}):
  - V_{SYS} = [3.0 V; 5.5 V]
  - V_{DD} = [4.1 V; 22 V]
- Debug accessory mode support
- Temperature range: -40 °C up to 105 °C
- ESD: 3 kV HBM - 1.5 kV CDM
- Certified:
  - USB Type-C™ rev 1.2
  - USB PD rev 2.0 (TID #1000133)
- Interoperable with USB PD rev 3.0

Applications

- Printers, camcorders, cameras
- IoT, drones, accessories and battery powered devices
- LED lighting and industrial
- Toys, gaming, POS, scanner
- Healthcare and handheld devices
- Any Type-C sink device

Description

The STUSB4500 is a USB power delivery controller that addresses sink devices. It implements a proprietary algorithm to allow the negotiation of a power delivery contract with a source without MCU support (auto-run mode). PDO profiles are configured in an integrated non-volatile memory.

The device supports dead battery mode and is suited for sink devices powered from dead battery state and requiring high power charging profile to be fully operational.

Thanks to its 20 V technology, it implements high voltage features to protect the CC pins against short-circuits to V_{BUS} up to 22 V and to support high voltage on the V_{BUS} pins directly connected to the V_{BUS} power path up to 28 V.

1 Functional description

The STUSB4500 is a USB Type-C™ and power delivery controller IC for sink applications. It is able to negotiate a power delivery contract with a source without MCU support (auto-run mode). It relies on proprietary algorithms and configurable PDO (power data objects) thanks to an integrated non-volatile memory. It supports dead battery mode to allow a system to be powered from an external source directly. Combined with its capability to negotiate directly a power contract, the STUSB4500 is the ideal controller device for autonomous systems requiring high power charging profile to be fully operational.

The STUSB4500 major role is to:

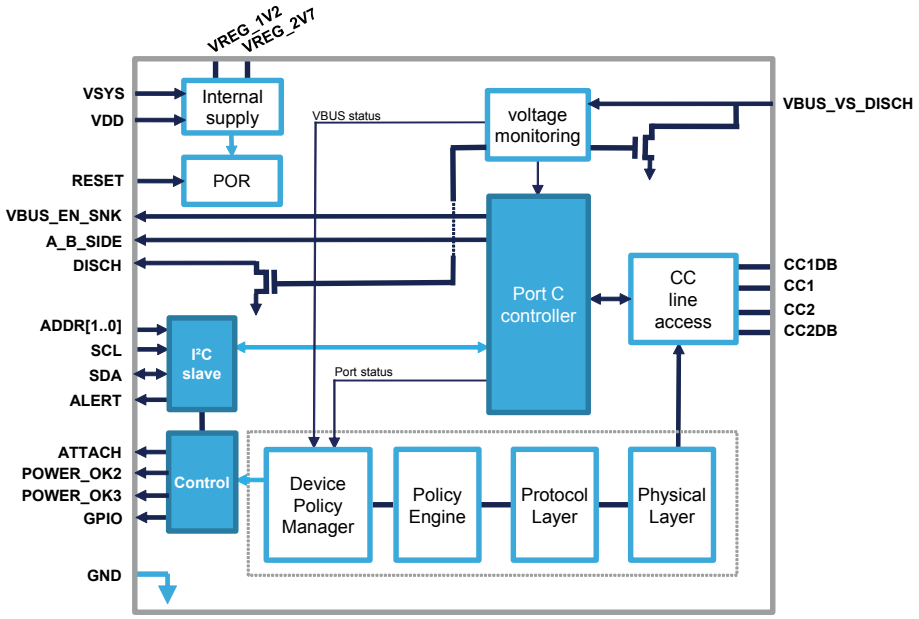
1. Detect the connection between two USB Type-C ports (attach detection)
2. Establish a valid source-to-sink connection
3. Determine the attached device mode: source or debug accessory
4. Resolve cable orientation and twist connections to establish USB data routing (MUX control)
5. Negotiate a USB power delivery (PD) contract with a PD capable source device
6. Configure the incoming V_{BUS} power path and the charging paths accordingly
7. Monitor the V_{BUS} power path and manage the V_{BUS} voltage transitions
8. Handle the high voltage protections

The STUSB4500 also provides:

- Dead battery mode
- PDO (power data object) customization through NVM
- Internal and/or external V_{BUS} discharge paths
- Dual high power charging path support
- Debug accessory mode detection
- Customization of the device configuration through NVM to support specific applications

1.1 Block overview

Figure 1. Functional block diagram



2 Inputs/outputs

2.1 Pinout

Figure 2. **QFN-24 pin connections (top view)**

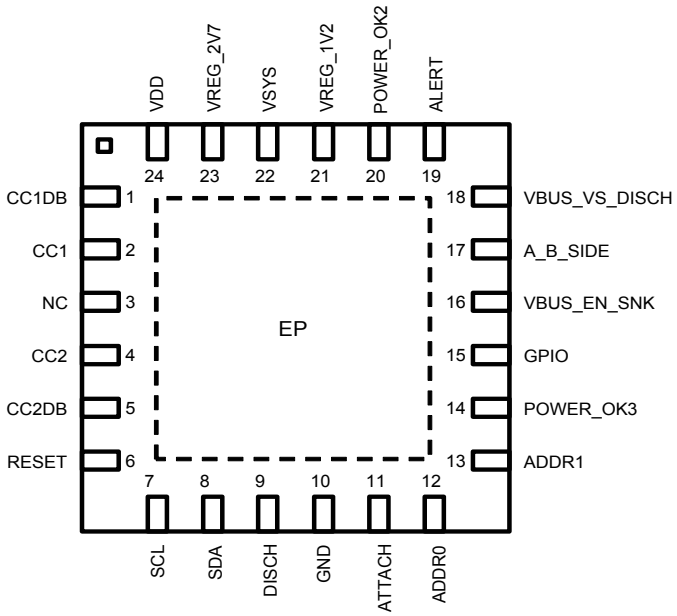


Figure 3. **WLCSP-25 pin connections (top view)**