



TPD6S300 USB Type-C™ Port Protector: Short-to- V_{BUS} Overvoltage and IEC ESD Protection

1 Features

- 4-Channels of Short-to- V_{BUS} Overvoltage Protection (CC1, CC2, SBU1, SBU2): 24- V_{DC} Tolerant
- 6-Channels of IEC 61000-4-2 ESD Protection (CC1, CC2, SBU1, SBU2, DP, DM)
- CC1, CC2 Overvoltage Protection FETs 600 mA Capable for passing V_{CONN} power
- CC Dead Battery Resistors Integrated for handling dead battery use case in mobile devices

2 Applications

- Laptop PC
- Tablets
- Smartphones
- Monitors and TVs
- Docking Stations

3 Description

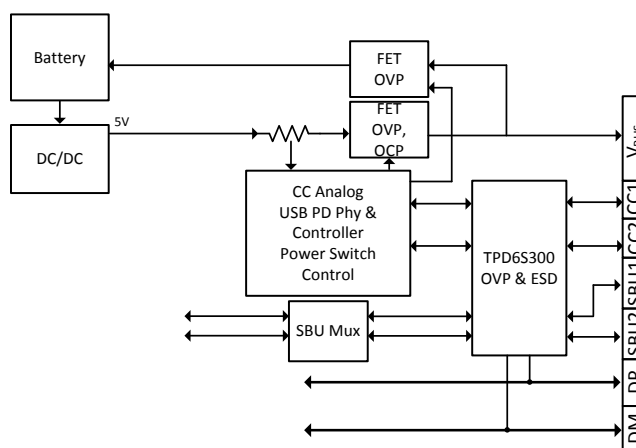
The TPD6S300 is a single chip USB Type-C port protection solution that provides 20-V Short-to- V_{BUS} overvoltage and IEC ESD protection.

Since the release of the USB Type-C connector, many products and accessories for USB Type-C have been released which do not meet the USB Type-C specification. One example of this is USB Type-C Power Delivery adaptors that only place 20 V on the V_{BUS} line. Another concern for USB Type-C is the mechanical sliding of the connector shorting pins, due to the close proximity they have in this small connector. This can cause 20-V V_{BUS} to be shorted to the CC and SBU pins. Also, due to the close proximity of the pins in the Type-C connector, there is a heightened concern that debris and moisture will cause the 20-V V_{BUS} pin to be shorted to the CC and SBU pins.

These non-ideal equipments and mechanical events make it necessary for the CC and SBU pins to be 20-V tolerant, even though they only operate at 5 V or lower. The TPD6S300 enables the CC and SBU pins to be 20-V tolerant without interfering with normal operation by providing overvoltage protection on the CC and SBU pins. The device places high voltage FETs in series on the SBU and CC lines. When a voltage above the OVP threshold is detected on these lines, the high voltage switches are opened up, isolating the rest of the system from the high voltage condition present on the connector.

Finally, most systems require IEC 61000-4-2 system level ESD protection for their external pins. The TPD6S300 integrates IEC 61000-4-2 ESD protection for the CC1, CC2, SBU1, SBU2, DP, DM pins, removing the need to place high voltage TVS diodes externally on the connector.

Application Diagram



PRODUCT PREVIEW



4 Device and Documentation Support

4.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

4.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

4.3 Trademarks

E2E is a trademark of Texas Instruments.

USB Type-C is a trademark of USB Implementers Forum.

All other trademarks are the property of their respective owners.

4.4 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

4.5 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

5 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com