

High performance, high peak pulse current TVS diodes for power line protection

"DF2SxxP2 series" is high-performance and high-peak-pulse TVS diode, which protects equipment from ESD and noises, which come from power line or quick charging.

Application of Toshiba's original Zener diode process to the DF2SxxP2 series has lowered dynamic resistance to 80 % that of existing products^[1], securing instant absorption of electrostatic discharge (ESD) and noise. The diodes also realize a high peak pulse current rating about 32 times^{[1][2]} larger than that of existing products^[1], which contributes to system reliability, while keeping electrostatic discharge unchanged at 30 kV.

The new diodes protect the power lines of smartphones and tablets by suppressing malfunctions and damage from ESD, noise that enters via the power cord and signal cable, and transient voltage at the time of turning equipment on or off. They can also be used to protect the USB Type-C™^[3] charging lines ($V_{BUS}=5\text{ V to }20\text{ V}$) that will be widely used in the future.



Features

- High peak pulse current
- Support for three-kind power supply line voltages: 5 V, 12 V and 20 V lines
- Two package types: SOD-963 package of small and thin [CST2C, 1.6×0.8 mm, t=0.48 mm (typ.)] SOD-323 standard package [USC, 2.5×1.25 mm, t=0.9 mm (typ.)]

Applications

- Mobile devices power supply connector of smart phone, tablet, Laptop PC and portable battery pack ,etc.
- Equipment with the USB connector of projector, printer, DSC, POS, Tester and LCD display, etc.



Smartphones



Tablets



Laptop PCs

Product Specifications

(@T_a=25°C)

Part number	Power supply line voltage (V)	Package		Absolute maximum ratings		Electrical characteristics	
		Name (Toshiba's name)	Size typ. (mm)	Electrostatic discharge V _{ESD} ^[3] (kV)	Peak pulse current I _{PP} (A)	Reverse breakdown voltage V _{BR} typ. (V)	Dynamic resistance R _{DYN} ^[4] typ. (Ω)
DF2S6P2CTC	5	SOD-963 (CST2C)	1.6×0.8, t=0.48	±30	80	6.7	0.08
DF2S14P2CTC	12				50	13.5	0.08
DF2S23P2CTC	20				14	24.1	0.13
DF2S6P2FU	5	SOD-323 (USC)	2.5×1.25, t=0.9	±30	80	6.7	0.08
DF2S14P2FU	12				50	13.5	0.08
DF2S23P2FU	20				14	24.1	0.13

Notes:

[1] Compared with the existing 5 V line product, "DF2S6.8ASL"

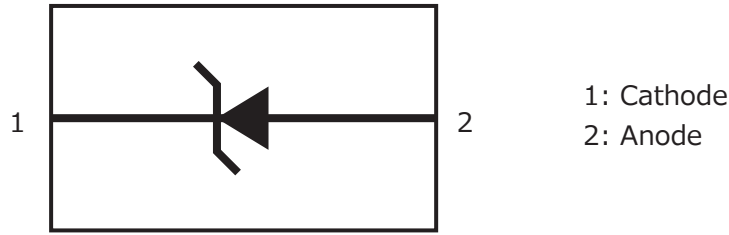
[2] Compared with the existing 5 V line product. The peak pulse current rating differs depending on the voltage class.

[3] USB Type-C is a trademark of USB Implementers Forum, Inc.

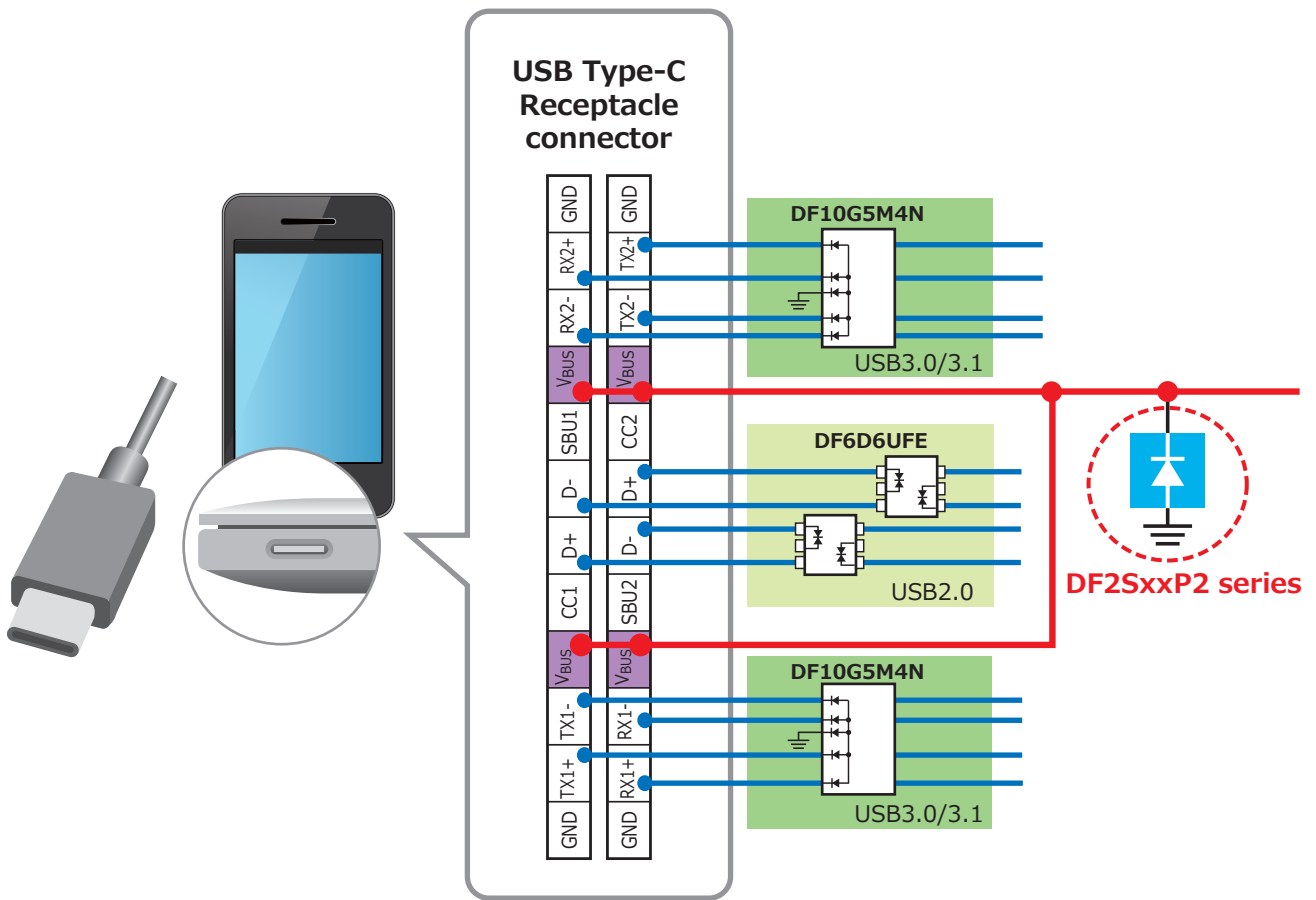
[4] @IEC61000-4-2 (contact discharge)

[5] @TLP parameter: Z₀=50 Ω, t_p=100 ns, t_r=300 ps, averaging window t₁=30 ns to t₂=60 ns

Equivalent Circuit



Application Circuit Example



V_{BUS} line protection of USB Type-C

The application circuits shown in this document are provided for reference purposes only. Thorough evaluation is required, especially at the mass-production design stage. Toshiba Electronic Devices & Storage Corporation does not grant any license to any industrial property rights by providing these examples of application circuits.

Before creating and producing designs and using, customers must also refer to and comply with the latest versions of all relevant information of this document and the instructions for the application that Product will be used with or for.