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# Protection & filters Docking station





# Protection & Filters solutions for docking stations

USB-C PD Vbus
<a href="#">ESD051-1F4</a>
<a href="#">ESDA8P30-1T2</a>
<a href="#">ESDL20-1BF4</a>
<a href="#">ESDZV201-1BF4</a>
<a href="#">ESDA25P35-1U1M</a>
<a href="#">SMAJ</a>

USB-C PD Power management
<a href="#">TCPP01-M12</a>
<a href="#">TCPP02-M18</a>
<a href="#">TCPP03-M20</a>

DC input
<a href="#">ESDAP series</a>
<a href="#">SMA6J series</a>
<a href="#">SMBJ series</a>
<a href="#">SMCJ series</a>

Audio jack speaker
<a href="#">ESDZV053-1BF5</a>
<a href="#">ESDZV5-1BV2</a>
<a href="#">ESDL031-1BF4</a>
<a href="#">EMIF02-SPK03F2</a>

Audio jack µphone
<a href="#">ESDZV053-1BF5</a>
<a href="#">ESDZV5-1BV2</a>
<a href="#">ESDL031-1BF4</a>
<a href="#">ESDZV5-1BF4</a>

USB 3.2 / USB2.0 D+ / D-
<a href="#">ESDAXLC5-1U2</a>
<a href="#">USBLC6-2SC6</a>
<a href="#">ECMF2-40A100N6</a>



USB 3.2 SSRx / SSTx
<a href="#">HSP053-4M5</a>
<a href="#">HSP051-4N10</a>
<a href="#">ESDARF02-1BU2CK</a>
<a href="#">ECMF4-40A100N10</a>

HDMI	
TMDS / FRL lines	Control lines
<a href="#">HSP053-4M5</a>	<a href="#">HDMI2C4-5F2</a>
<a href="#">HSP051-4N10</a>	<a href="#">HDMI2C2-5F2</a>
<a href="#">ECMF4-40A100N10</a>	<a href="#">ESDALC6V1-5M6</a>

DisplayPort++	
Main link	Control lines
<a href="#">HSP053-4M5</a>	DPHDMI01-5M12(*)
<a href="#">HSP051-4N10</a>	
<a href="#">ESDARF02-1BU2CK</a>	
<a href="#">ECMF4-40A100N10</a>	

SD and µSD card
<a href="#">ESDARF02-1BU2CK</a>
<a href="#">EMIF06-HSD03F3</a>
<a href="#">EMIF06-MSD02N16</a>
<a href="#">EMIF06-MSD04F3</a>
<a href="#">HSP051-4M5</a>
<a href="#">ESD051-1F4</a>

Touch controller Buttons and joysticks
<a href="#">ESDZV5-1BF4</a>
<a href="#">ESDZL5-1F4</a>
<a href="#">EMIF01-1007AF4 (*)</a>

1G / 10GEthernet
<a href="#">HSP051-4M5</a>
<a href="#">HSP051-4N10</a>
<a href="#">HSP051-4M10</a>

(\*) Contact our sales office

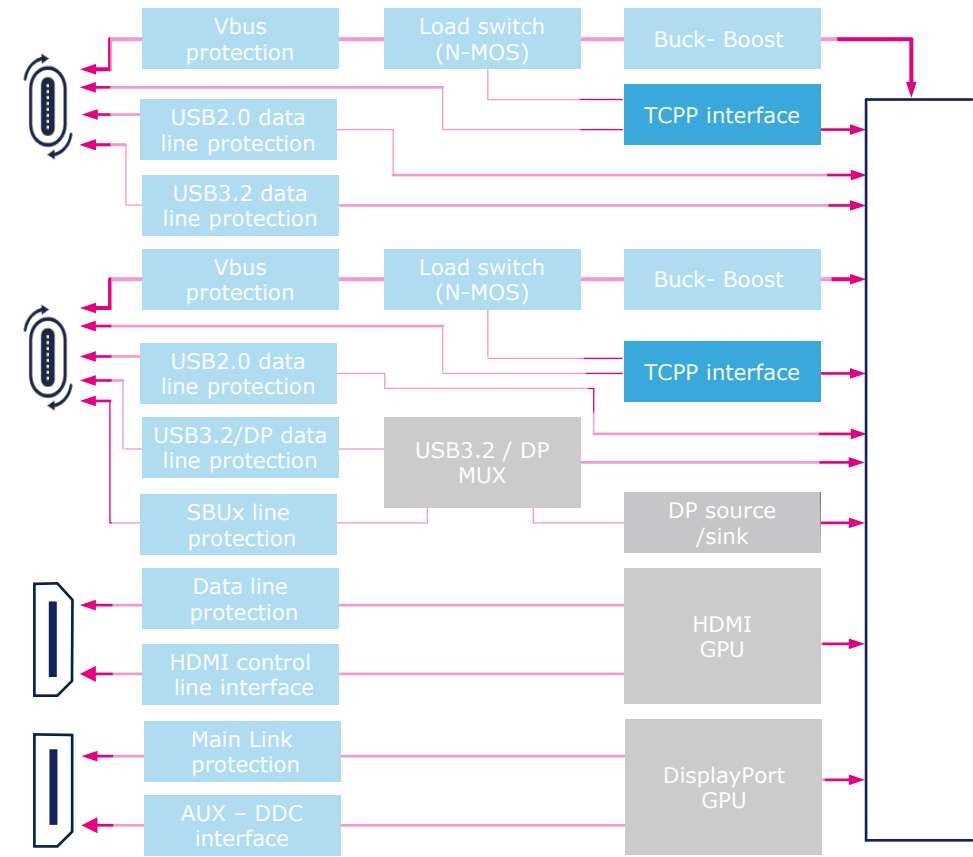


# USB Type-C Power Delivery Power management

**Compatible and reliable up to 100 W with TCPP0 series and 240 W with TCPPE series**  
**Compliant with USB PD 3.2 including PPS: USB-IF certification available.**

Needs for USB-C PD management0	Product key parameters	ST solutions
Compliance with USB PD 3.2 specification	USB-IF certification available TCPP01 for Sink → USB-IF – TID:5205 TCPP02 for source → USB-IF – TID:7884 TCPP03 for DRP → USB-IF – TID:6408	<p><b><u>TCPP01-M12</u></b></p> <p><b><u>TCPP02-M18</u></b></p> <p><b><u>TCPP03-M20</u></b></p> <p><b><u>TCPP series</u></b></p>
Fast charging	Compliant with USB PD 3.1 including PPS up to 20 V -5 A	
Compatible with all chargers from the market	Vcc = 24 V for TCPP0x	
Able to survive current or voltage surges and short-circuit with Vbus	Overcurrent and overvoltage protection on VBUS, CC lines VThreshold = 6 V on CC lines	
Cost effectiveness	Companion chip of STM32 with UCPD Reuse the STM32 of the application	
Use of low cost MOSFET	Integrated VBUS load switch gate driver for external N-MOSFET	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: ≥ 8 kV Air discharge: ≥ 15 kV	

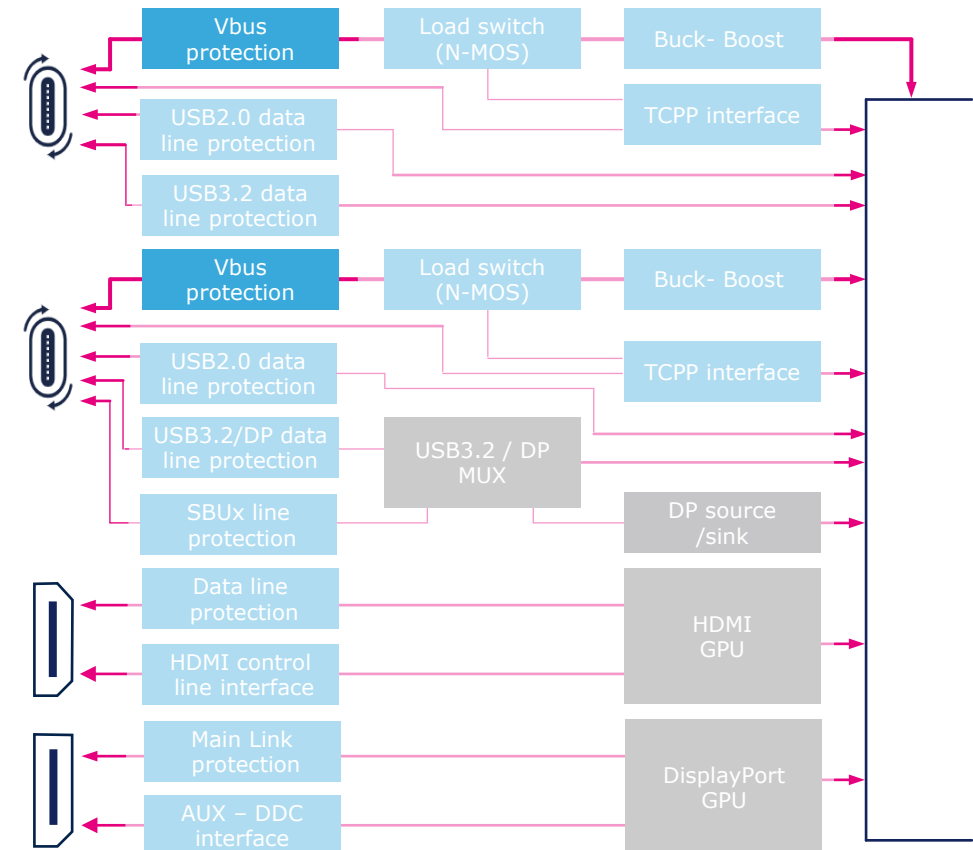
Expansion boards available		
<b><u>X-NUCLEO-SNK1M1</u></b>	<b><u>X-NUCLEO-SRC1M1</u></b>	<b><u>X-NUCLEO-DRP1M1</u></b>





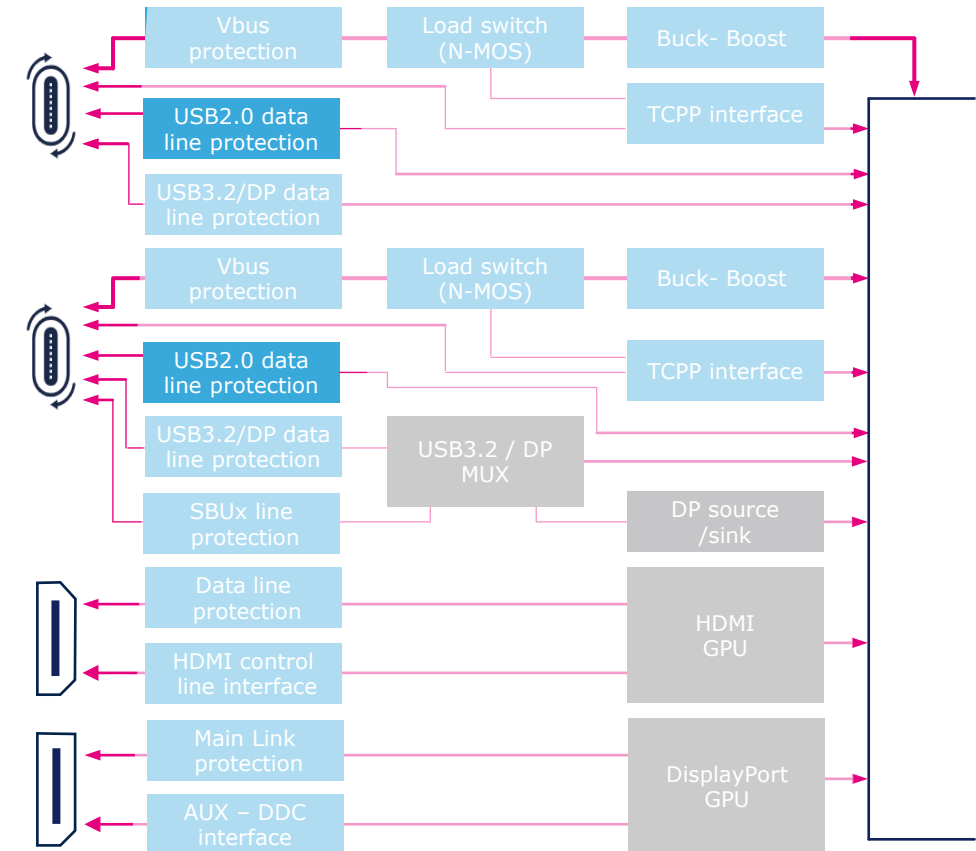
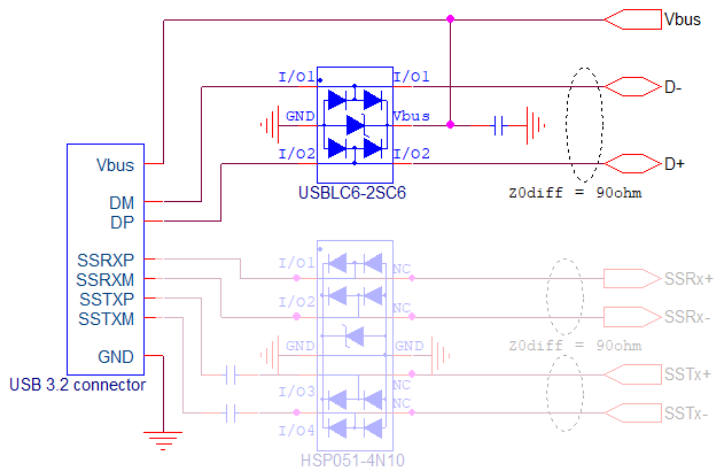
## ESD and EOS protections in CSP, QFN and SMD packages

Needs for Vbus input	Product key parameters	ST solutions
V <sub>max</sub> = 5.5 V	V <sub>RM</sub> = 5.5 V	<b><u>ESD051-1F4</u></b>
DC signal	Unidirectional	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: up to 8 kV Air discharge: up to 15 kV	
V <sub>max</sub> = 5.5 V	V <sub>RM</sub> = 6.3 V	<b><u>ESDA8P30-1T2</u></b>
DC signal	Unidirectional	
IEC 61000-4-5	Surge capability: 30 A 8/20 μs	
V <sub>max</sub> = 20 V (Power Delivery)	V <sub>RM</sub> = 20 V	<b><u>ESDL20-1BF4</u></b> <b><u>ESDZV201-1BF4</u></b>
DC signal	Bidirectional is also compatible	
IEC 61000-4-5	Surge capability: up to 4.5 A 8/20 μs	
V <sub>max</sub> = 20 V (Power Delivery)	V <sub>RM</sub> = 22 V	<b><u>ESDA25P35-1U1M</u></b>
DC signal	Unidirectional	
IEC 61000-4-5	Surge capability: 35 A 8/20 μs	
V <sub>max</sub> = 28 V, 36 V or 48 V +15% (EPR)	V <sub>RM</sub> = 30 V, 40 V, 58 V	<b><u>SMAJ</u></b>
DC signal	Unidirectional	
IEC 61000-4-5	8/20 μs surge capability: 36 A, 27 A, 19 A	



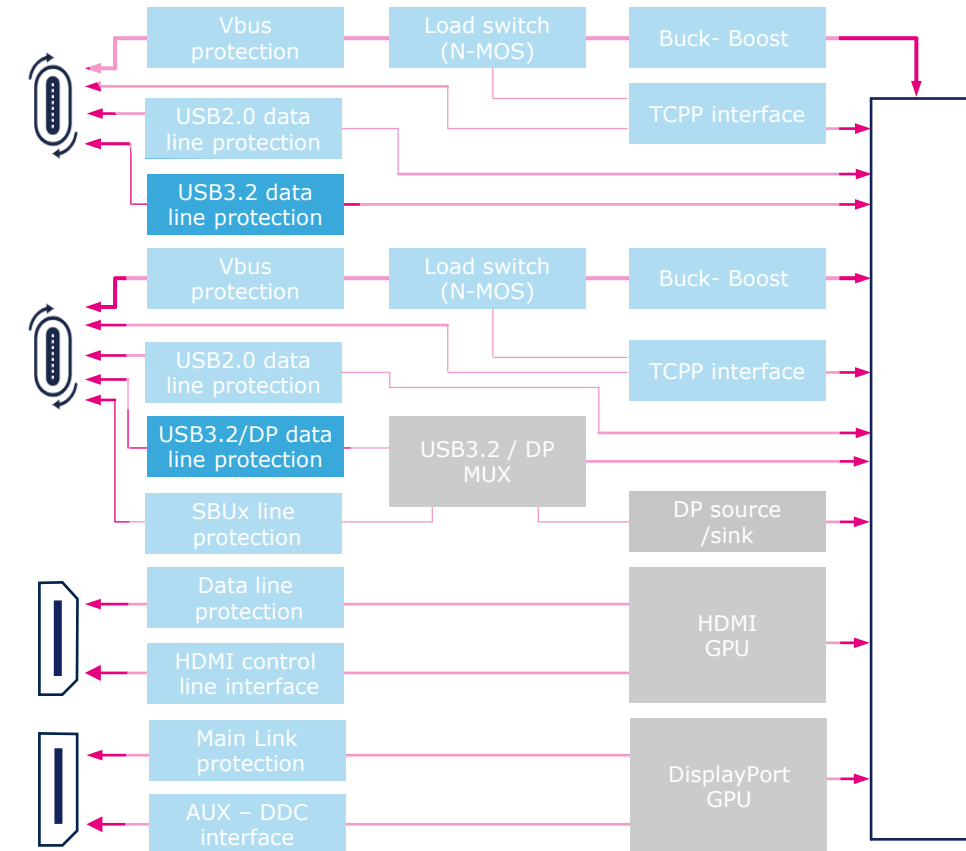
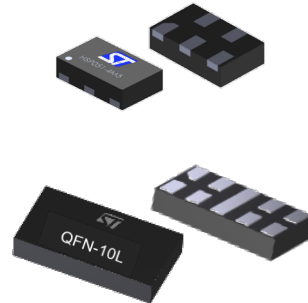
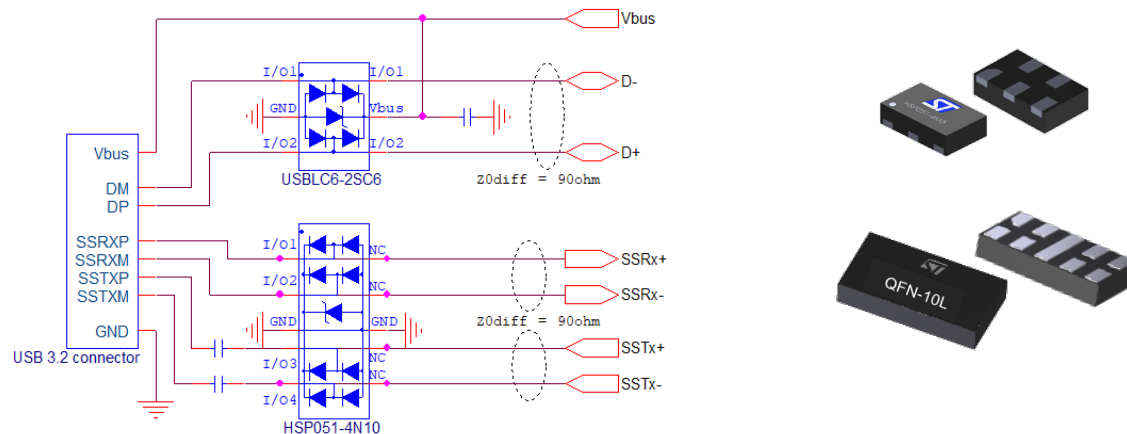
## ESD protections compliant with USB standard

Needs for D+/D-	Product key parameters	ST solutions
Voltage $\leq 3.0$ V	$V_{RM} = 5.25$ V	<b><u>ESDAXLC5-1U2</u></b>  <b><u>USBLC6-2SC6</u></b>
Positive signal	Unidirectional	
Data rate: 480 Mbps Maximum equivalent frequency 240 MHz	Bandwidth 2.6 GHz Compliant with eye diagram	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	<b><u>ECMF2-40A100N6</u></b>
Avoid to disturb Wifi and Bluetooth antenna (2.4GHz/5GHz/6 GHz)	CMF rejection $\geq -15$ dB (2.4 MHz to 6.5 GHz)	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	



## ESD protections compliant with SuperSpeed USB standard

SSRx/SSTx needs	Product key parameters	ST solutions
Voltage $\leq 2.5$ V	$V_{RM} \geq 3.6$ V (HSP051-4N10) $V_{RM} \geq 5$ V (HSP053-4M5)	<b>HSP053-4M5</b> (pitch 500 $\mu$ m)
Positive signal	Unidirectional	<b>HSP051-4N10</b> (pitch 400 $\mu$ m)
Data rate: 10 Gbps and 20 Gbps	Bandwidth: >10 GHz Compliant with eye diagram	<b>ESDARF02-1BU2CK</b> (single line)
Design flexibility	Single line, bidirectional, 0201 package size	<b>ECMF4-40A100N10</b>
Avoid to disturb Wifi and Bluetooth antennas (2.4GHz/5GHz/6 GHz)	CMF rejection $\geq -15$ dB (2.4 GHz to 6.5 GHz)	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	



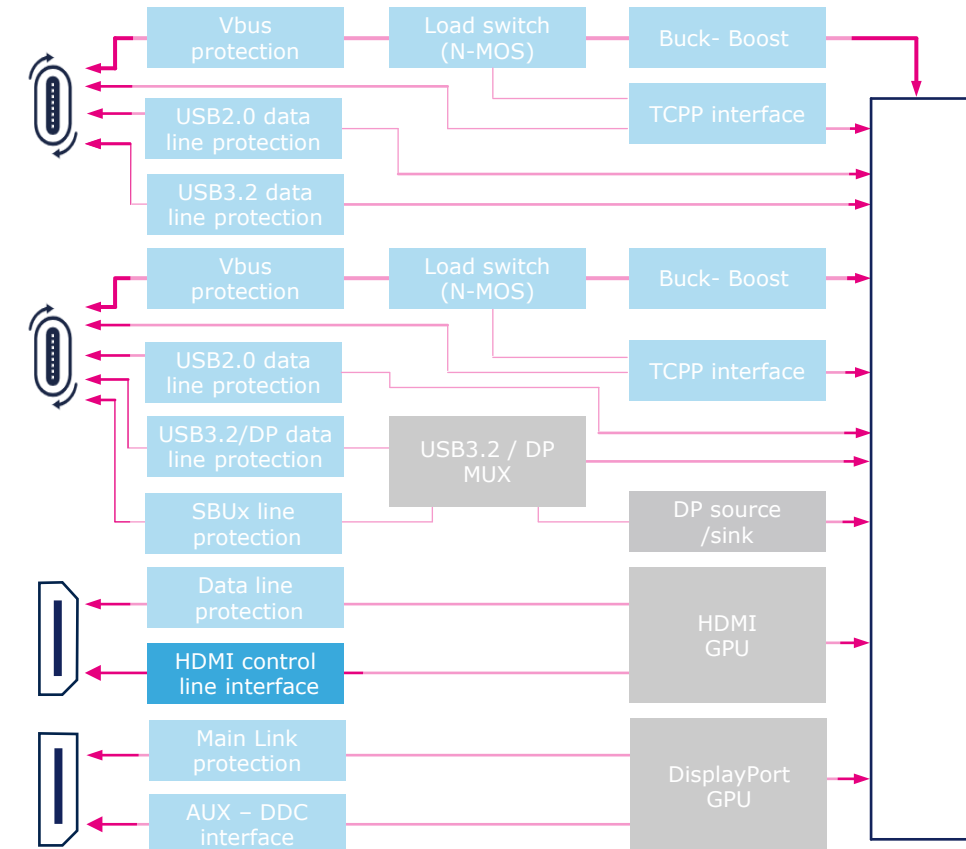


# HDMI2.x Control lines

## Integrated solution and ESD protections 100% compliant with HDMI standard

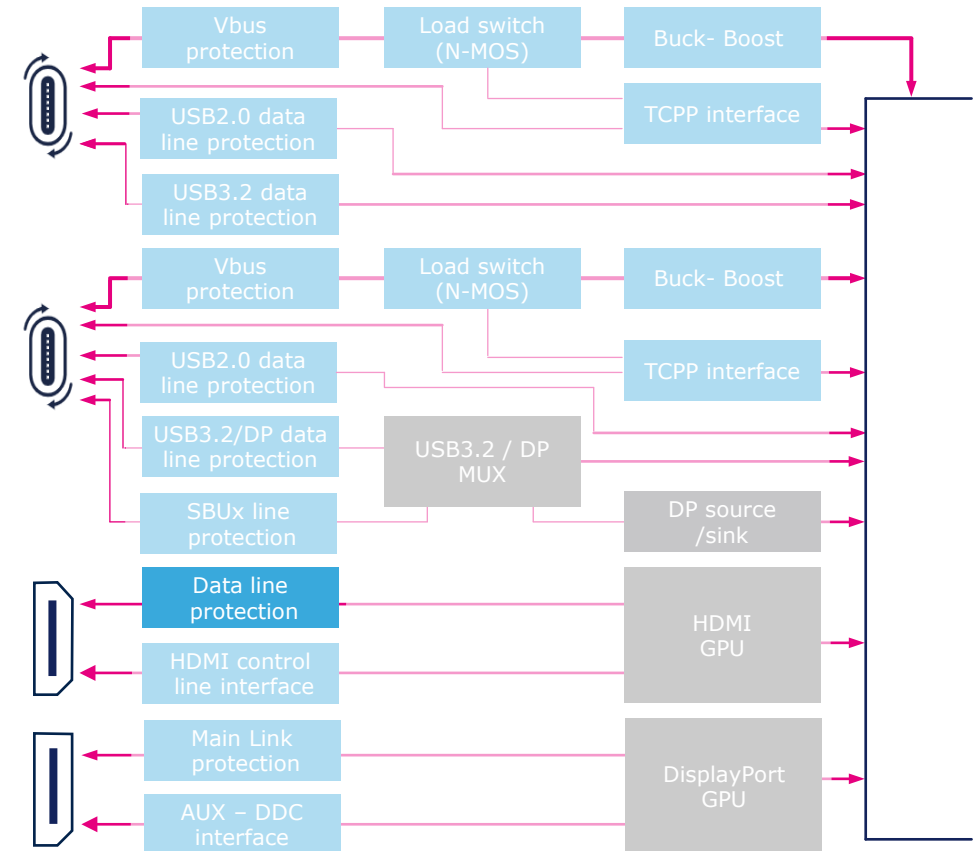
Control lines (integrated smart solutions)	Product key parameters	ST solutions
Voltage ≤ 5.0 V Level shifter from video chipset voltage to HDMI voltages	HDMI chipset voltage compatibility from 1.8 V to 5 V	<b>HDMI2C4-5F2</b> (source – HDMI 2.x)  <b>HDMI2C2-5F2</b> (sink – HDMI 2.x)
Positive signal	Unidirectional	
Data rate: 3.4 Mbps	Bandwidth > 400 MHz	
Capability to drive long cable	DDC bus with dynamic pull-up Buffer for signal reshaping	
Glitch filter in HDMI2C4-5F2	For HDMI2.x Clock stretching operation	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: ≥ 8 kV Air discharge: ≥ 15 kV	

Control lines (ESD protection)	Product key parameters	ST solutions
Voltage ≤ 5.0 V	$V_{RM} = 5 V$	<b>ESDALC6V1-5M6</b>
Positive signal	Unidirectional	
Data rate: 3.4 Mbps	Bandwidth > 400 MHz	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: ≥ 8 kV Air discharge: ≥ 15 kV	



## ESD protection or EDS + CMF integrated solution offer flexibility or space saving

TMDS needs	Product key parameters	ST solutions
Voltage $\leq 3.3$ V	$V_{RM} \geq 3.6$ V (HSP051-4N10) $V_{RM} \geq 5$ V	<b>HSP053-4M5</b> (pitch: 500 $\mu$ m)  <b>HSP051-4N10</b> (pitch: 400 $\mu$ m)  <b>ECMF4-40A100N10</b> (pitch: 400 $\mu$ m)
Positive signal	Unidirectional	
Data rate: 18 Gbps (HDMI 2.0) Eye diagram compliancy	Bandwidth: >10 GHz Compliant with eye diagram	
Avoid to disturb Wi-Fi antenna (2.4GHz / 5GHz)	CMF rejection $\geq -15$ dB (2.4 GHz to 6.5 GHz)	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	



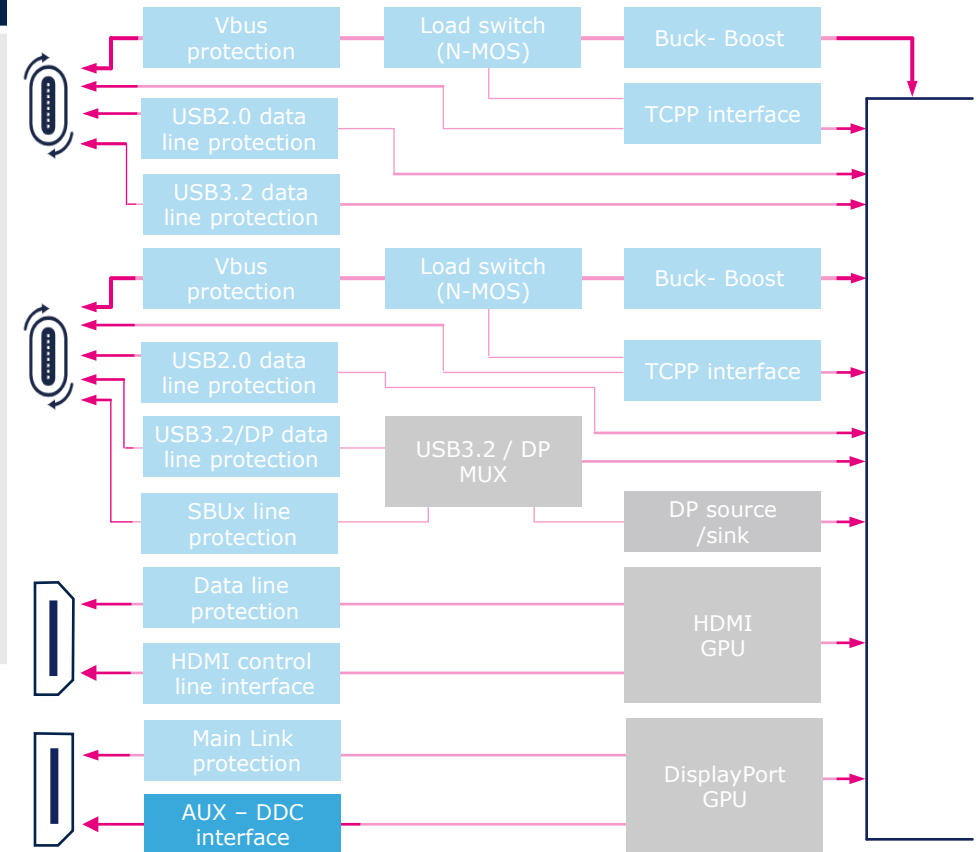
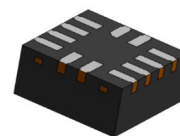




# DisplayPort++ Control and auxiliary lines

## DisplayPort to DVI, HDMI or DisplayPort interface

Control lines and auxiliary bus needs	Product key parameters	ST solutions
Compatibility with low voltage GPU	IC input voltage : $1\text{ V} < V_{in} < 5.3\text{ V}$	<b>DPHDMI01-5M12(*)</b>
Selection of DP or HDMI mode	Selection with 1 pin : AUX bus or DDC bus	
Capability to protect very sensitive GPU : To prevent Overshoot / high surge applied to AUX_IC GPU pins during cable plug & deplug	Fast clamping protection : around 20ns - 2V VCL	
HPD standby activation	2.6 ms delay to avoid HPD_IRQ test failure	
Capability to drive poor quality cable	Buffer for I2C signal reshaping $t_r < 400\text{ ns}$	
Glitch filter	For HDMI Clock stretching operation	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8\text{ kV}$ Air discharge: $\geq 15\text{ kV}$	

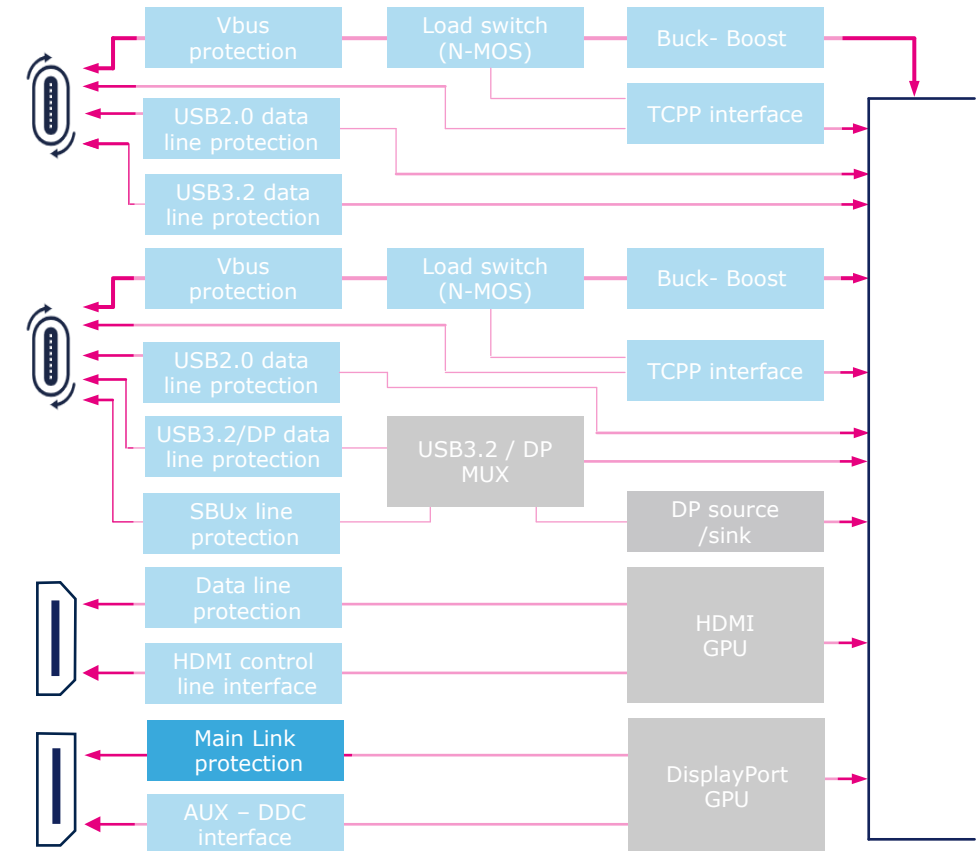


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## ESD protection or EDS + CMF integrated solution offer flexibility or space saving

TMDS needs (integrated smart solutions)	Product key parameters	ST solutions
Voltage $\leq 3.3$ V	$V_{RM} \geq 3.6$ V (HSP051-4N10) $V_{RM} \geq 5$ V	<b>HSP053-4M5</b> (pitch: 500 $\mu$ m)
Positive signal	Unidirectional	
Data rate: 18 Gbps (HDMI 2.0) Eye diagram compliancy	Compliant with eye diagram	<b>HSP051-4N10</b> (pitch: 400 $\mu$ m)
Design flexibility	Single line bidirectional 0201 package size	<b>ESDARF02-1BU2CK</b> (single line)
Avoid to disturb Wi-Fi antenna (2.4GHz / 5GHz)	CMF rejection $\geq -15$ dB (2.4 GHz to 6.5 GHz)	<b>ECMF4-40A100N10</b> (pitch 400 $\mu$ m)
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	

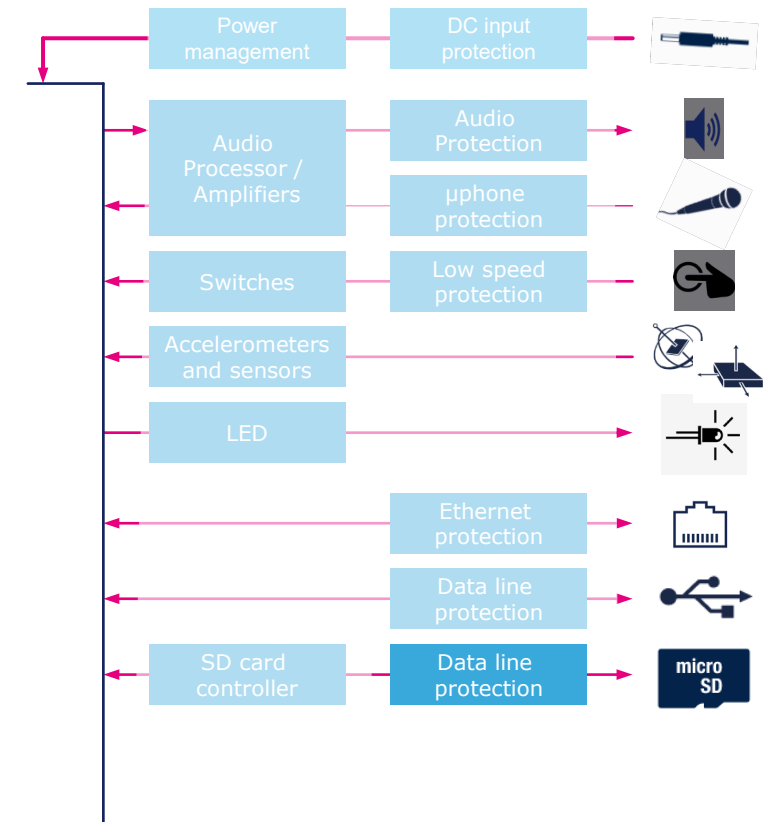




## ESD protections and EMI filters compliant with SD 2.0 and SD 3.0 standards

Needs for Data/Clock	Product key parameters	ST solutions
Voltage ≤ 3.3V	$V_{RM} \geq 3.6 \text{ 3.3 V}$	<b><u>ESDARF02-1BU2CK</u></b>  <b><u>EMIF06-HSD03F3</u></b>  <b><u>EMIF06-MSD02N16</u></b>  <b><u>EMIF06-MSD04F3</u></b>  <b><u>HSP051-4M5</u></b>
Positive signal	Unidirectional (bidirectional also suitable)	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: ≥ 8 kV Air discharge: ≥ 15 kV	
<b>SD 3.0:</b> Cmax = 21 pF (including card cap. ~10 pF)	C < 3 pF	
<b>SD 2.0:</b> Cmax = 40 pF (including card cap. ~10 pF)	C < 20 pF	
Avoid to disturb LTE, WiFi, Bluetooth antennas	Peak rejection frequency > 1950 MHz	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: ≥ 8 kV Air discharge: ≥ 15 kV	

Needs for V <sub>CC</sub>	Product key parameters	ST solutions
Voltage ≤ 5V	$V_{RM} \geq 5 \text{ 5 V}$	<b><u>ESD051-1F4</u></b>
Positive signal	Unidirectional (bidirectional also suitable)	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: ≥ 8 kV Air discharge: ≥ 15 kV	

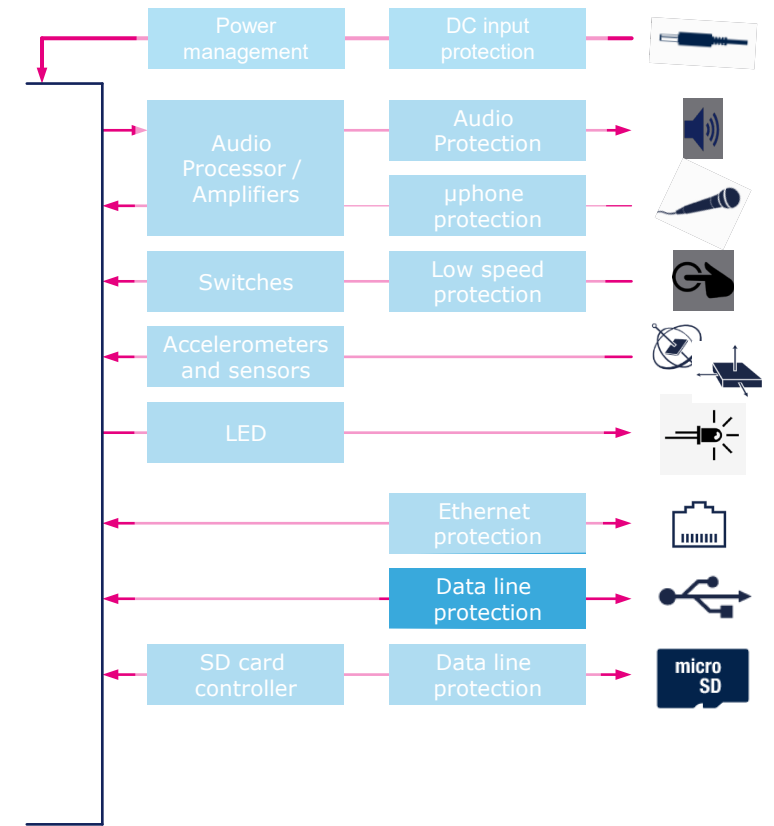
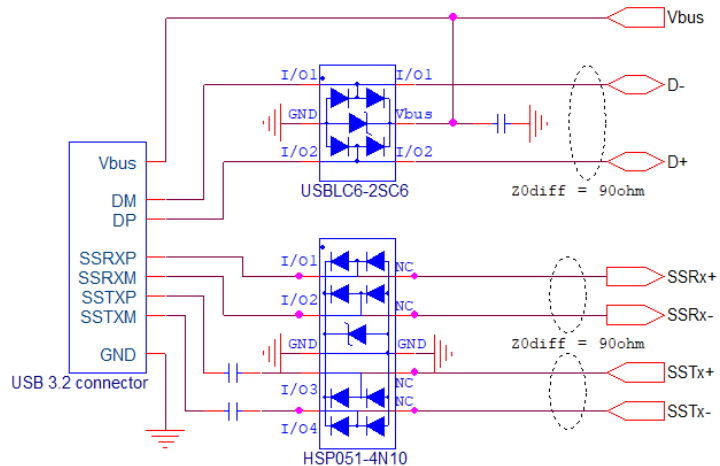




# USB 2.0 D+ / D- and Vbus

## ESD protections compliant with USB 2.0 standard

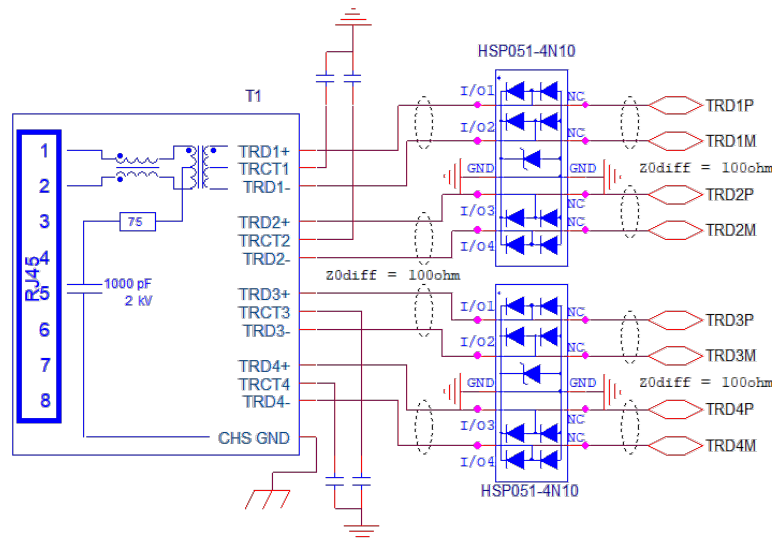
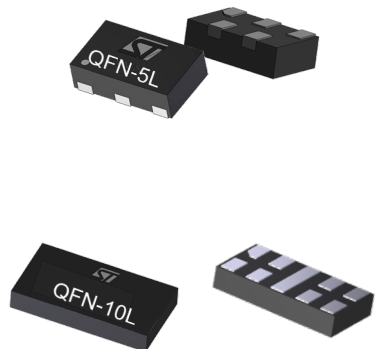
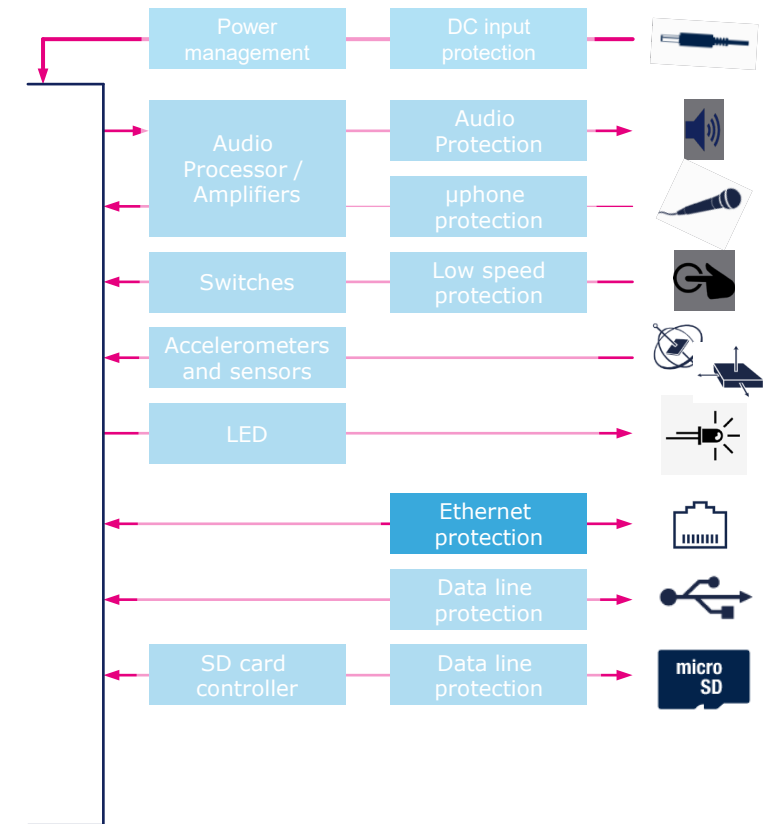
Needs for D+/D-	Product key parameters	ST solutions
Voltage $\leq 3.0$ V	$V_{RM} = 5.25$ V	<b><u>ESDAXLC5-1U2</u></b> (single line)
Positive signal	Unidirectional	
Data rate: 480 Mbps Maximum equivalent frequency 240 MHz	Bandwidth 2.6 GHz Compliant with eye diagram	<b><u>USBLC6-2SC6</u></b> (dual lines)
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	
Avoid to disturb Wifi and Bluetooth antenna (2.4GHz/5GHz/6 GHz)	CMF rejection $\geq -15$ dB (2.4 MHz to 6.5 GHz)	<b><u>ECMF2-40A100N6</u></b>
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	





## HSP series is compliant with all Ethernet lines

Needs for D+/D-	Product key parameters	ST solutions
1GEthernet voltage: 2.5 V 10GEthernet voltage: 1 V	$V_{RM}=3 V$	<b><u>HSP051-4M5</u></b>
Positive signal	Unidirectional	<b><u>HSP051-4N10</u></b>
Data rate: up to 10 Gbps	Bandwidth > 8.7GHz	<b><u>HSP051-4M10</u></b>
IEC 61000-4-2 level 4	Contact discharge: 8 kV Air discharge: 15 kV	

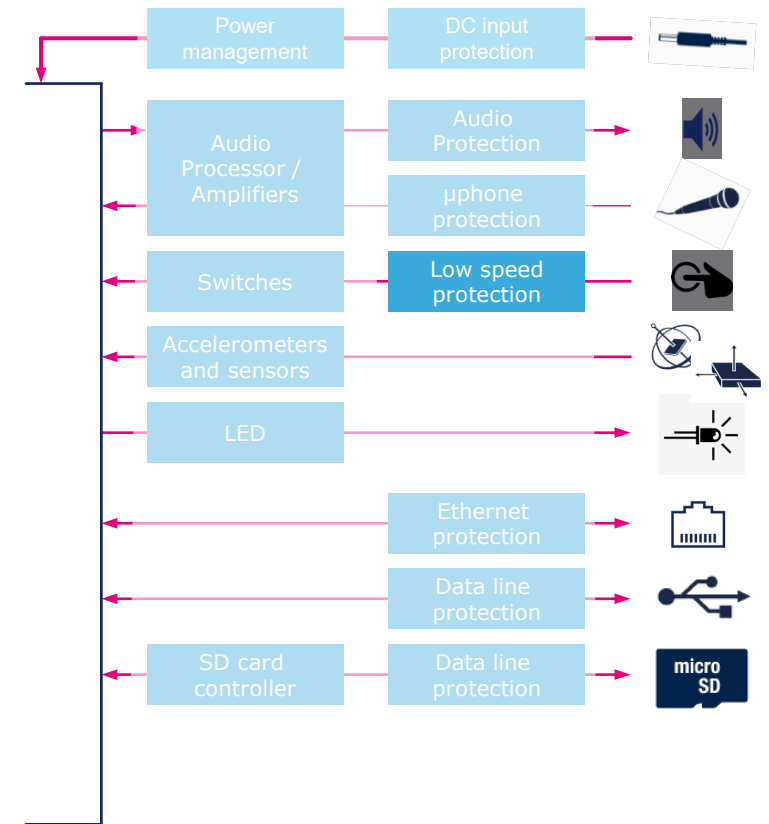
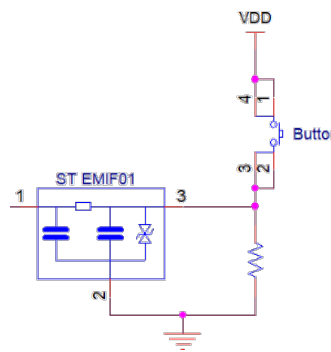
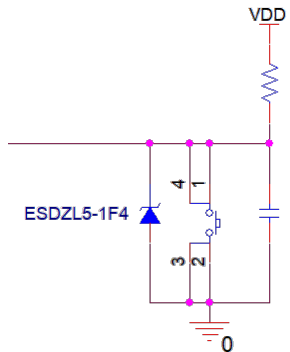




# Touch controller Buttons and joysticks

## ESD protections and EMI filters in CSP packages

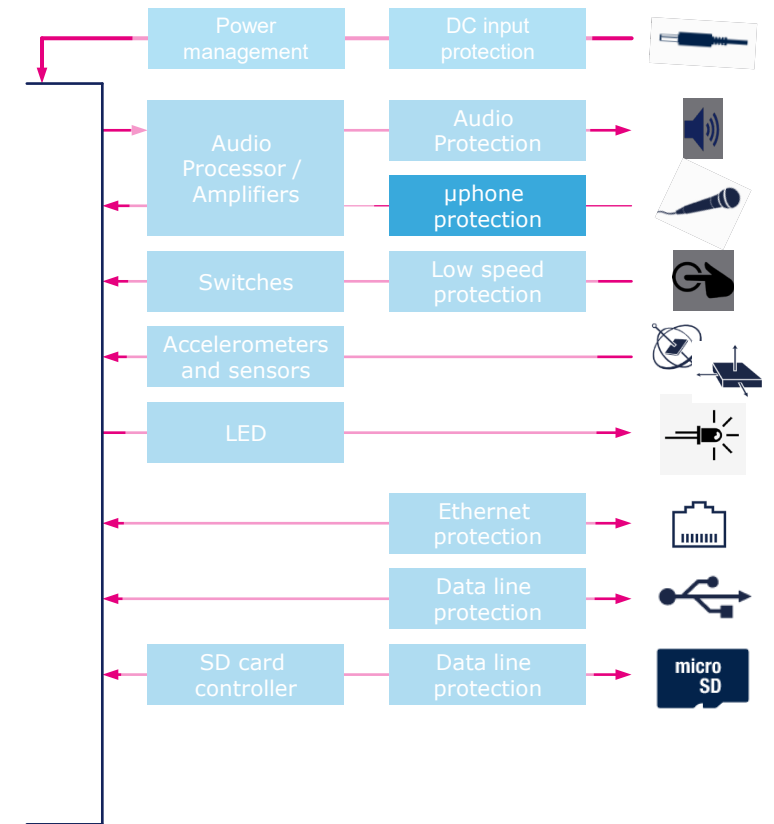
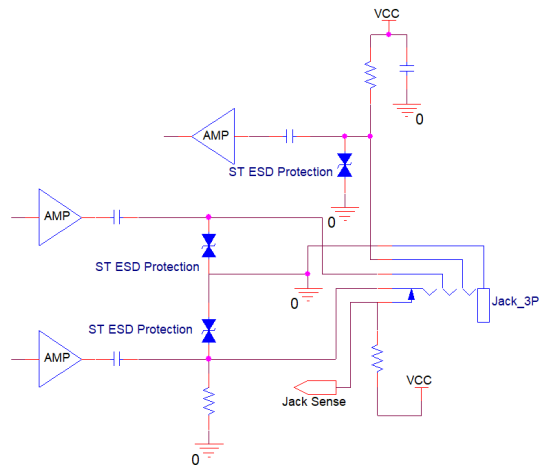
Needs for switches	Product key parameters	ST solutions
MCU power supply, usually 3.3 V or less	$V_{RM} \geq 5.5 V$	<b><u>ESDZV5-1BF4</u></b>  <b><u>ESDZL5-1F4</u></b>
Digital positive signal	Unidirectional (bidirectional also suitable)	
Low frequency application	No constraints on capacitance Cline < 9.5 pF	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 15 kV$ Air discharge: $\geq 30 kV$	<b>EMIF01-1007AF4 (*)</b>
Avoid EMI	Reject frequency > 700 MHz	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 15 kV$ Air discharge: $\geq 30 kV$	



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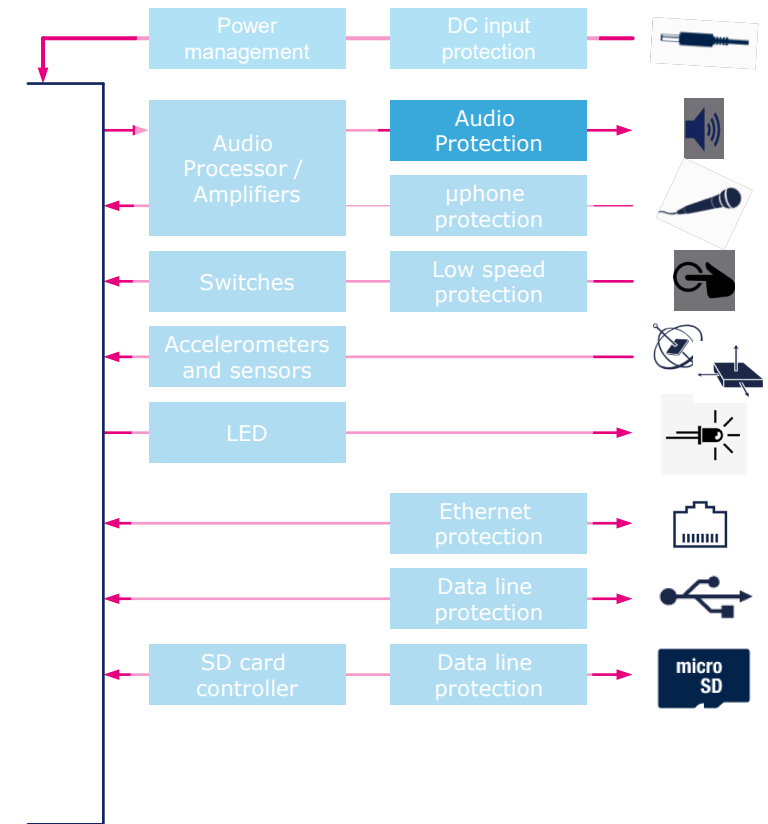
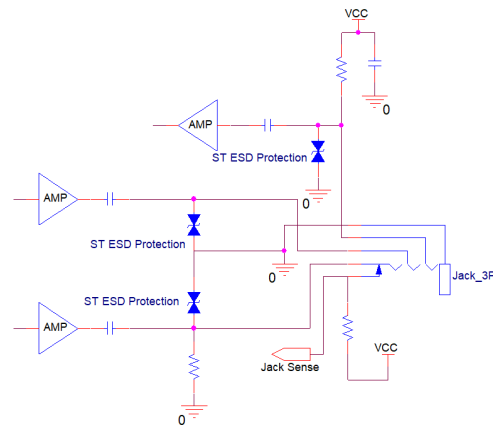
## Single line ESD protections and dual-line CMF for headset

Needs for jack microphone	Product key parameters	ST solutions
Voltage $\leq 3.3$ V	$V_{RM} \geq 3.3$ V	<b><u>ESDZV053-1BF5</u></b>  <b><u>ESDZV5-1BV2</u></b>  <b><u>ESDL031-1BF4</u></b>  <b><u>ESDZV5-1BF4</u></b>
Audio analog signal	Bidirectional	
$f < 20$ kHz	No constraints on capacitance	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 8$ kV Air discharge: $\geq 15$ kV	



## Single line ESD protections and dual-line for headset

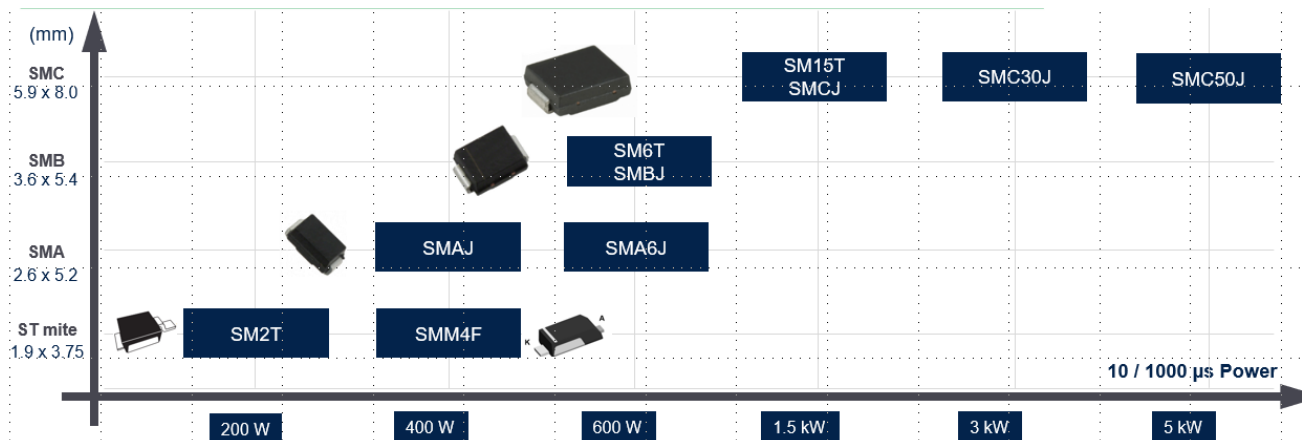
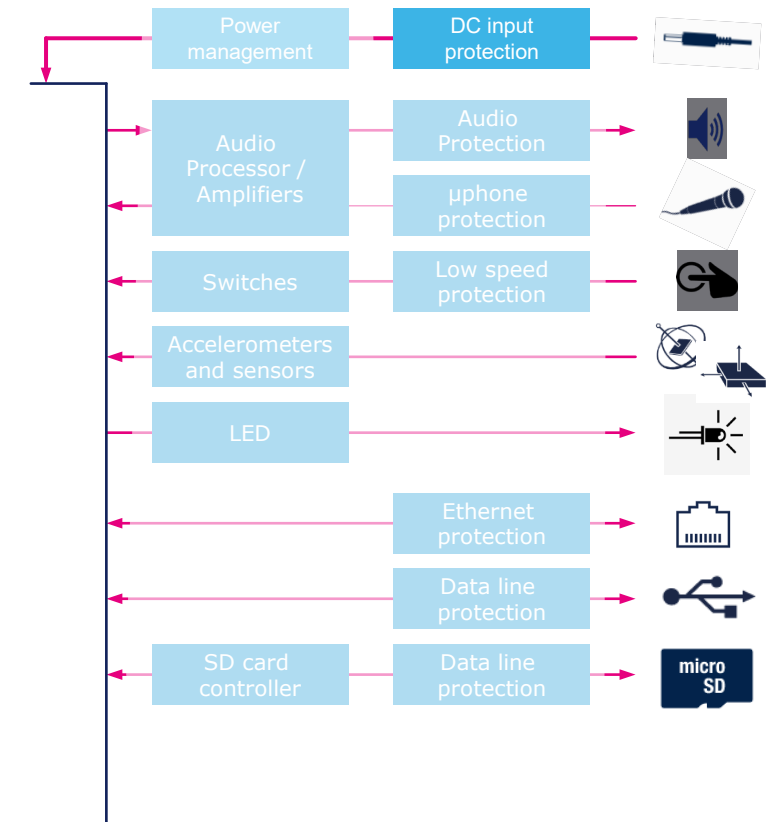
Needs for jack earphone	Product key parameters	ST solutions
Voltage < 3.6 V	$V_{RM} > 3.6 V$	<b><u>ESDZV053-1BF5</u></b>
Audio analog signal	Bidirectional	<b><u>ESDZV5-1BV2</u></b>
$f < 20 \text{ kHz}$	No constraints on capacitance	<b><u>ESDZV5-1BF4</u></b>
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: up to 15 kV Air discharge: up to 25 kV	<b><u>EMIF02-SPK03F2</u></b>
Avoid to be disturbed by GSM TDMA demodulation	Rejection @ 900 MHz: -38 dB	
IEC 61000-4-2 level 4 (8 kV contact / 15 kV air)	Contact discharge: $\geq 30 \text{ kV}$ Air discharge: $\geq 30 \text{ kV}$	





## Wide range of voltage and surge capabilities

Socket requirements	Product key parameters	ST solutions
DC input voltage	$V_{RM} > V_{DC\ max}$	<b><u>ESDAP series</u></b>
Positive voltage	Unidirectional or bidirectional	<b><u>SMA6J series</u></b>
Need to withstand 8/20 $\mu$ s surge (IEC 61000-4-5)	$I_{PP}$ up to 100 A with $V_{RM}$ 48 V	<b><u>SMBJ series</u></b>
IEC 61000-4-2 level 4 8 kV contact/15 kV air	Contact discharge: >30 kV Air discharge: >30 kV	<b><u>SMCJ series</u></b>



- **CMF**: common mode filter
- **DP++**: Dual-mode DisplayPort
- **DRP** : Dual Role Power
- **ECMF** : : ESD protection and CMF
- **EOS**: electrical overstress
- **EPR** : Extended Power Range
- **ESD**: electrostatic discharge
- **MCU**: microcontroller
- **PD** : Power Delivery
- **SSRx** : SuperSpeed Receive
- **SSTx** : SuperSpeed Transmit
- **T CPP** : USB Type-C Port Protection
- **TVS**: transient voltage suppressor diode
- **UCPD**: USB Type-C Power Delivery (STM32 embedded USB-C PD controller)
- **USB**: Universal serial bus

# Our technology starts with You



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