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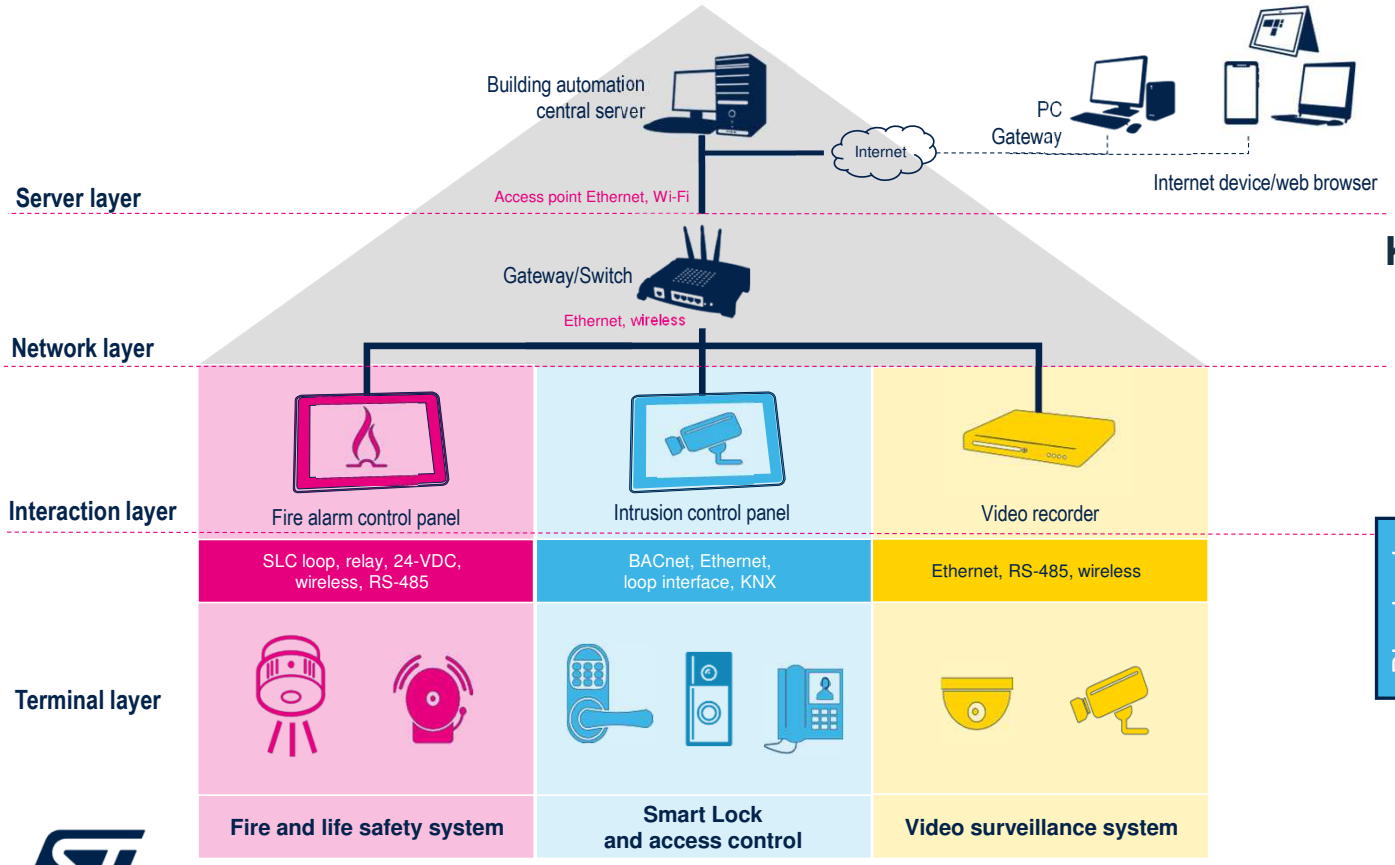
PROTECTION & FILTERS
Building Safety and Security

Smart locks and access control

PROTECTION & FILTERS BUSINESS UNIT

ST PROTECT

Building safety and security overview



Key applications:

- **Fire and life safety system**
  - Smoke & heat detector
  - Gas and flame detector
  - Digital alarm communicator
  - Remote annunciator
  - Voice & audio amplifier

Blue book focus

- **Smart Lock and access**
  - Smart lock
  - Central alarm system
  - Video doorbell
  - Fingerprint/3D face/Iris recognition

- **Video surveillance system**
  - NVR/DVR
  - IP network camera
  - Analog video surveillance systems

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Find out more at www.st.com

Protection & Filters solutions for smart locks, video doorbells, and central alarm panels

Power supply

SM15T series
SMA6J series

Charging connector Battery (V_{BUS}; V_{BATT})

ESDAxP series
SM6F series
SMA6J series

POE

SMA6J series
SM15T series

Display

Data / Clock	HSP053-4M5 ECMF4-40A100N10 (differential lines) EMIF08-LCD04M16 (parallel link)
I²C	ESDZV5-1BF4 USBLC6-2SC6

SD card

EMIF06-MSD02N16
EMIF06-HSD03F3

Buttons/switches

ESDZL5-1F4
ESDZV5-1BF4
EMIF01-1007AF4 (*)

Speaker

ESDZV5H-1BU2

Microphone

ESDZV5-1BF4

Ethernet

HSP053-4M5

RS-485/RS-232

ESDA14V2BP6

USB Type-C® (integrated solution)

Vbus and CC lines	TCPP01-M12

USB 3.x type A

Vbus	ESDA7P120-1U1M
Data D+/D-	USBLC6-2SC6 HSP053-4M5 ECMF2-40A100N6

RF antennas

ESDZX168B-1BF4

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** Under development*

Antennas
Wi-Fi, Bluetooth

Complete BOM link

Antennas are ESD protected according to IEC 61000-4-2 level 4
Very low harmonics generation ensures no disturbance in application

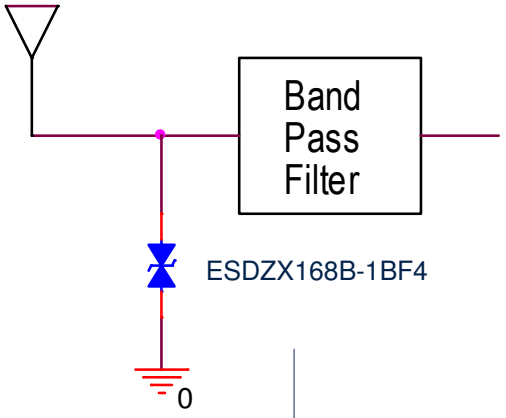
Wi-Fi antenna needs	Key product parameters	ST solutions
RF power = 23 dBm (V_{PEAK} = 4.5 V with 50 Ω load)	V_{RM} ≥16 V	ESDZX168B-1BF4
Alternative signal	Bidirectional device	
f = 2.4 GHz f = 5.0 GHz	Extra low capacitance = 0.12 pF Bandwidth >40 GHz	
Very low harmonic <41dBm @ 23 dBm	H3 = -61 dBm @ 23 dBm, f = 2.4 GHz H3 = -62 dBm @ 23 dBm, f = 5.0 GHz	

Needs for Bluetooth antenna	Product key parameters	ST solutions
RF power = 20 dBm (V_{PEAK} = 3.2 V with 50 Ω load)	V_{RM} = 16 V	ESDZX168B-1BF4
Alternative signal	Bidirectional device	
f = 2.4 GHz	Extra low capacitance: 0.12 pF - Bandwidth >40 GHz	
Very low harmonic <41dBm @ 20 dBm	H3 = -70 dBm @ 20 dBm, f = 2.4 GHz	

Socket specifics

ST product parameter impact

ST recommended product



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Block diagram or schematic

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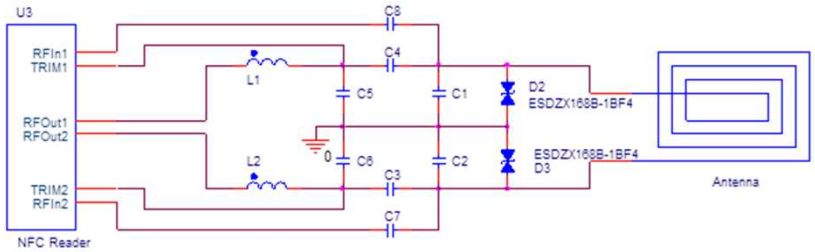
Complete BOM link

Antennas
NFC reader

Antennas are ESD protected according to IEC 61000-4-2 level 4
Very low harmonics generation ensures no disturbance in application

NFC reader needs	Key product parameters	ST solutions
Max voltage = 18V	V_{TRIG} ≥ 18V	**ESDZX168B-1BF4**
Alternative signal	Bidirectional device	
f = 13.56 MHz, Line capacitance must be well below the value of matching capacitance	Extra low capacitance = 0.12 pF Bandwidth >40 GHz	
Very low harmonic < 41 dBm @ 20 dBm	H3 = -65.8 dBm @ 20 dBm, f = 2.4 GHz	
IEC 61000-4-2 level 4 8kV contact / 15 kV air	Contact discharge: 12 kV Air discharge: 30 kV	



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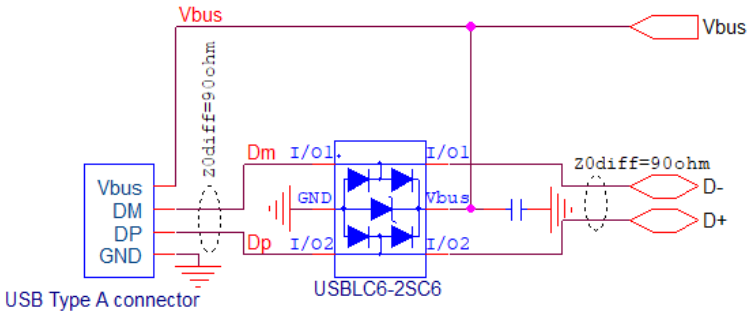
Complete BOM link

USB 2.0 type A

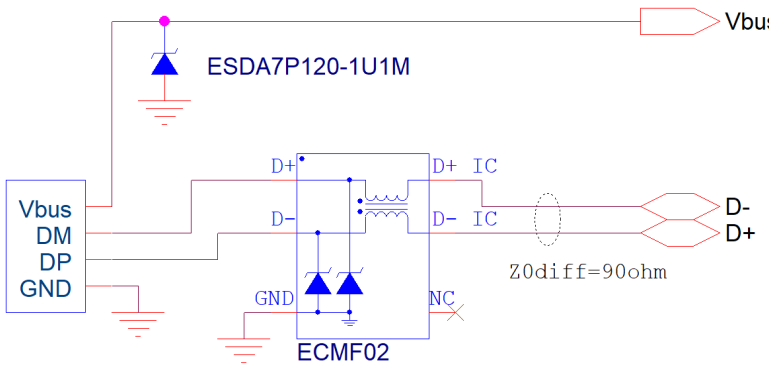
Complete solution portfolio for USB granting flexibility in design
All sockets are ESD protected according to IEC 61000-4-2 level 4

USB type A/B/µB

USB2.0 (D+/D-) needs	Product key parameters	ST solutions
Voltage ≤3.6 V	V_{RM} = 5.25 V	**USBLC6-2SC6** (dual lines) **HSP053-4M5** (pitch 500µm) **ECMF2-40A100N6**
Positive signal	Unidirectional	
Data rate: 480 Mbps Maximum equivalent frequency 240 MHz	Bandwidth : 3 GHz USBLC6-2SC6 Bandwidth : 18 GHz HSP053-4M5	
Avoid Wi-Fi antenna desense (2.4/5 GHz)	CMF rejection ≥-15dB (2.4 to 6.5 GHz)	
IEC 61000-4-2 level 4 8 kV contact/15 kV air	Contact discharge: ≥8 kV Air discharge: ≥15 kV	



USB2.0 (Vbus) needs	Product key parameters	ST solutions
Voltage ≤5.5 V	V_{RM} = 5.5 V	**ESDA7P120-1U1M**
Positive signal	Unidirectional	
Need to withstand 8/20 µs surge (IEC 61000-4-5)	I_{PP} up to 120 A	
IEC 61000-4-2 level 4 8 kV contact/15 kV air	Contact discharge: >30 kV Air discharge: >30 kV	



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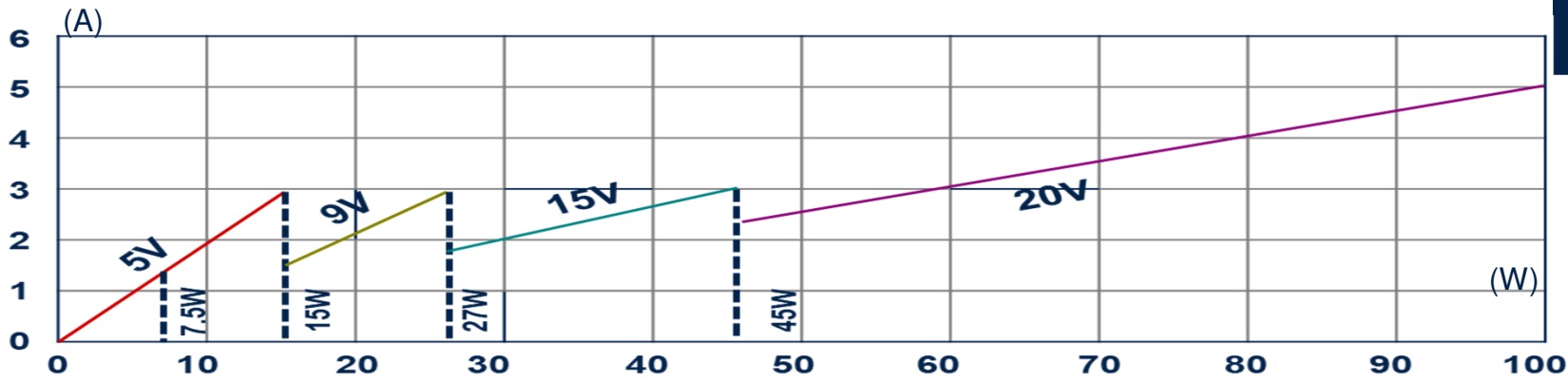
USB4 & USB 3.x / USB-C complete portfolio offer



Role Type	Application STM32 based	Pins	5V – 15 W	9V – 27 W	15 V – 45 W	20 V – 100 W
All	With or without STM32	D+/D-	**ASIP = ESD + CMF: ECMF2-40A100N6** // standalone ESD: USBLC6-2SC6			
		SSRx / SSTx	**ASIP = ESD + CMF: ECMF4-40A100N10** // standalone ESD: HSP053-4M5			
		CC1 / CC2	ESDZV5-1BF4	*ESD141-1BU2**	*ESDZ161-1BF4**	ESDALC20-1BF4
		SBU1 / SBU2	ESDA6V1L	ESDA14V2L	ESDA25L	ESDA25L
		Vbus	ESDA7P60-1U1M ESDA7P120-1U1M ESDA8P30-1T2 SMAJ6.0A-TR	ESDA13P70-1U1M SMAJ12A-TR	*ESDZ161-1BF4** SMAJ18A-TR	ESDA25P35-1U1M SMAJ24A-TR
Sink	YES	TCPP01-M12				
Source	YES	TCPP02-M18				
DRP	YES	TCPP03-M20				

TCPP series is compliant with USB Power Delivery Standard Power Range up to 100 W (5, 9, 15, 20V / 5 A)

**product under development*

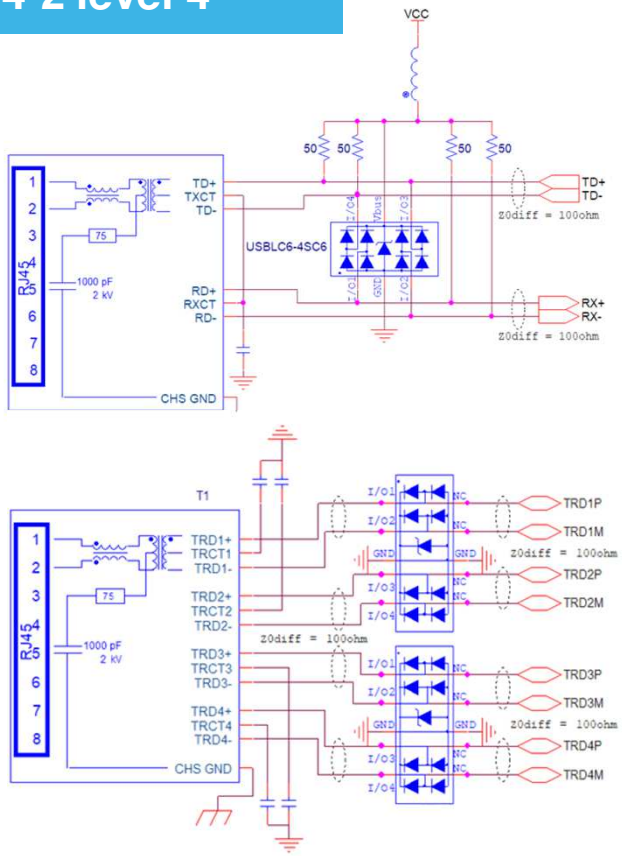
Ethernet port

Complete BOM link

HSP series is compliant with all Ethernet lines
All sockets are ESD protected according to IEC 61000-4-2 level 4

Needs for Ethernet 10/100M	Product key parameters	ST solutions
Voltage: ≤ 3.0 V	V_{RM} ≥ 3.0 V	**USBLC6-4SC6** **HSP053-4M5** (pitch 500µm)
Positive signal	Unidirectional	
Data rate: up to 100 Mbps Maximum equivalent frequency 100 MHz	Bandwidth > 800 MHz	
IEC 61000-4-2 level 4 8kV contact / 15 kV air	Contact discharge: ≥15 kV Air discharge: ≥15 kV	

Needs for Ethernet 1G / 10G	Product key parameters	ST solutions
1GEthernet voltage: 2.5V 10GEthernet voltage: 1.0V	V_{RM} ≥ 3.3V	**HSP053-4M5** (pitch 500µm)
Positive signal	Unidirectional (bidirectional also suitable)	
Data rate per pair = 2.5 Gbps, 800 Msymbols/s Maximum equivalent frequency 500 MHz	Bandwidth > 5.0 GHz	
IEC 61000-4-2 level 4 – 8kV contact / 15 kV air	Contact discharge: ≥ 20 kV Air discharge: 30 kV	

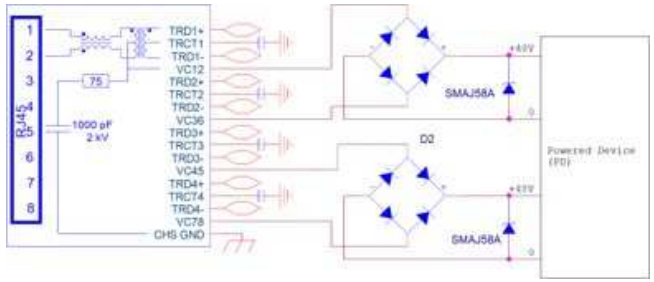


Complete BOM link

Power over Ethernet (PoE)

Flexibility in TVS selection according to requested IEC 6100-4-5 level

Needs	Product key parameters	ST solutions
Maximum voltage: 57 V	V_{RM}= 58 V	**SMAJ58A** **SMA6J58A** **SM15T68A**
Operating ambient temperature up to 85°C	Leakage current rated at 85°C	
IEC 61000-4-5 (500 V–1.2/50 µs, 12 A–8/20 µs) (1 kV–1.2/50 µs, 24 A–8/20 µs)	SMAJ58A: I_{PP}=19 A SMA6J58A: I_{PP}=33 A SM15T68A: I_{PP}=83 A	



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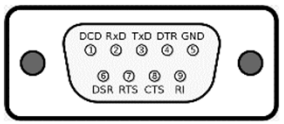
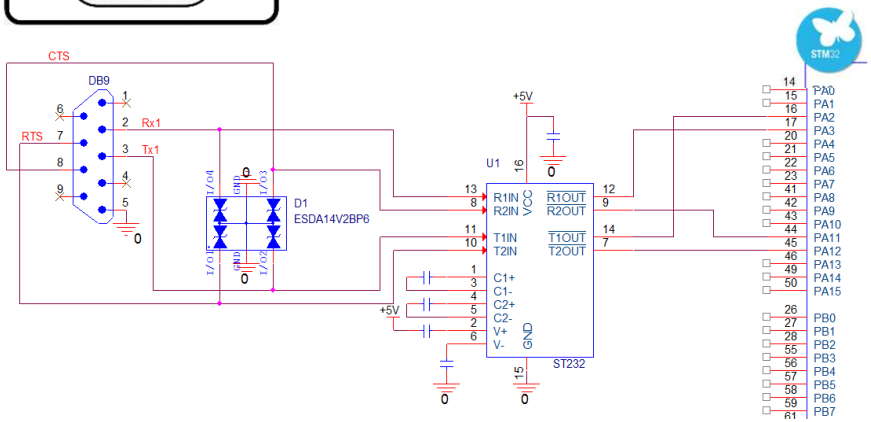
Complete BOM link

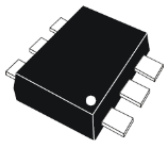
RS-232

Always place the ESD protection close to ESD source
In this case, close to RS-232 connector

Needs for RS-232	Product key parameters	ST solutions
Voltage: ≤ 12V	V_{RM} ≥ 12V	**ESDA14V2BP6**
Positive and negative signal	Bidirectional – 4 lines	
Maximum data rate : 256 kb/s Maximum equivalent frequency < 1 MHz	Low constraint on capacitance Typical line capacitance 25pF Bandwidth >> 1 MHz	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: ≥8 kV Air discharge: ≥15 kV	







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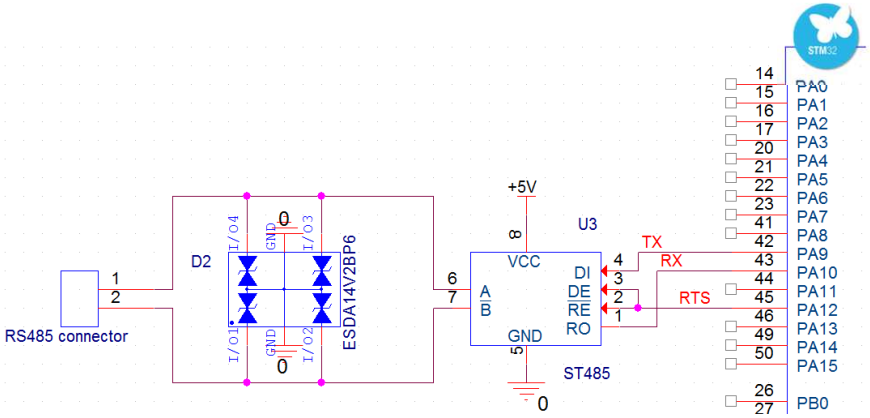
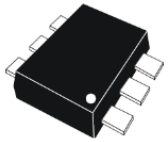
Complete BOM link

RS-485

Always place the ESD protection close to ESD source
Here, close to RS-485 connector

Needs for RS-485	Product key parameters	ST solutions
Voltage range : -7V to + 12V	V_{RM} ≥ 12V	**ESDA14V2BP6**
Positive and negative signal	Bidirectional – 4 lines	
Maximum data rate : 20 Mb/s Maximum equivalent frequency < 10 MHz	Low constraint on capacitance Typical line capacitance 25pF Bandwidth >> 10 MHz	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: ≥8 kV Air discharge: ≥15 kV	





SOT666-6L

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SD card

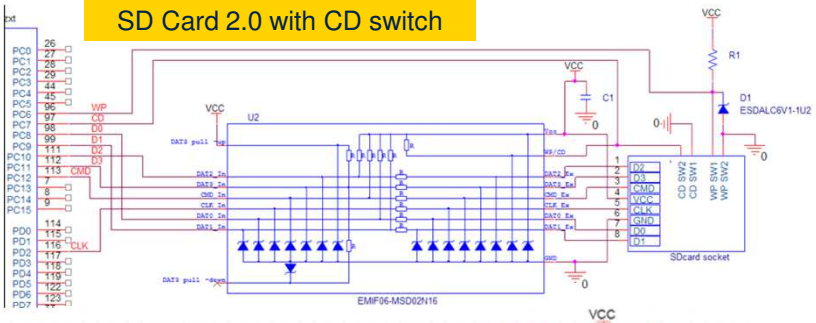
Complete BOM link

Complete product offer for SD card protection; Integrated EMI and ESD solution; Flexibility brought by ESD standalone products

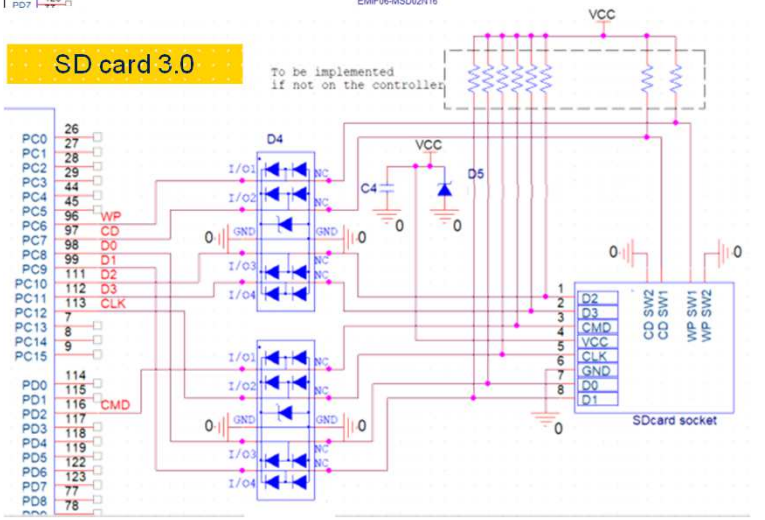
Needs for Data / Clock	Product key parameters	ST solutions
Voltage ≤ 3.3V	V_{RM} ≥ 3.0V	**EMIF06-MSD02N16** (SD 2.0) **EMIF06-HSD03F3** (SD 3.0) **HSP053-4M5** (SD 3.0)
Positive signal	Unidirectional	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: ≥8 kV Air discharge: ≥15 kV	
SD 2.0: Cmax = 40pF (including card cap. ~10pF)	C < 20 pF	
Avoid LTE, Wi-Fi, and Bluetooth antenna disturbance	Peak rejection frequency > 1950 MHz	
SD 3.0: Cmax = 21pF (including card cap. ~10pF)	C < 0.7pF Minimize Cline in order to give room for SD card	

Needs for V_{CC}	Product key parameters	ST solutions
Voltage ≤ 5V	V_{RM} = 5.5V	**ESDA5-1F4**
Positive signal	Unidirectional (bidirectional also suitable)	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge = 30 kV Air discharge = 30 kV	

SD Card 2.0 with CD switch



SD card 3.0



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LCD Display

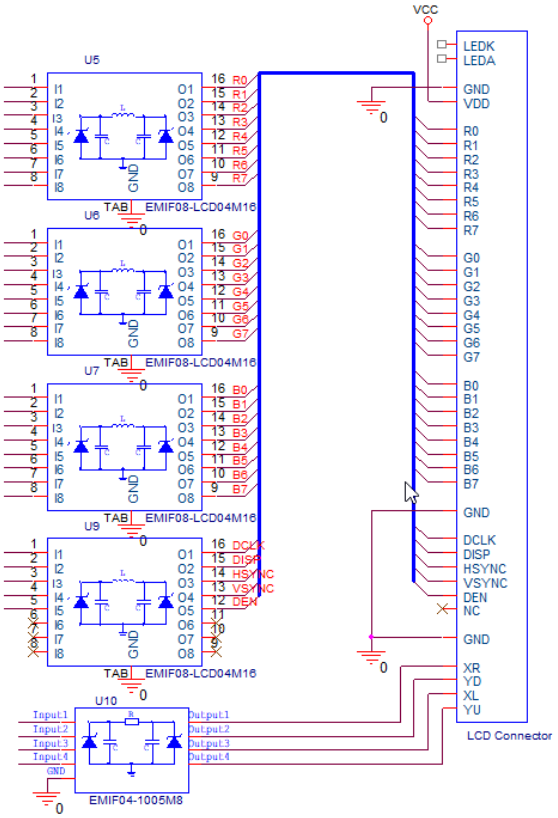
Complete BOM link

High efficiency EMI filtering
All sockets ESD protected according to IEC 61000-4-2 level 4

Needs for parallel interface	Product key parameters	ST solutions
Voltage ≤ 3.3V (high speed HS)	V_{RM} ≥ 3.3V	EMIF08-LCD04M16
Positive signal	Unidirectional (bidirectional also suitable)	
Clock frequency < 33 MHz	Bandwidth > 400MHz (-6dB)	
Avoid to disturb LTE, Wi-Fi, Bluetooth reception	Rejection of 700MHz, 2.4 GHz and 5 GHz	

Needs for MIPI (Data / Clock)	Product key parameters	ST solutions
Voltage ≤ 385 mV (high speed HS) Voltage ≤ 1.3V (low power LP)	V_{RM} ≥ 3.6V	HSP053-4M5
Positive signal	Unidirectional	
Data rate up to 1.5 Gbps	Bandwidth > 5 GHz	
Avoid to disturb Wifi antenna (2.4GHz / 5GHz)	CMF Rejection ≥ -15dB (2.4 GHz to 6.5 GHz)	ECMF4-40A100N10

Needs for I2C	Product key parameters	ST solutions
Line voltage range: 0 to 3.3V	V_{RM} ≥ 3.3V	USBLC6-2SC6 ESDZV5-1BF4 ESDZL5-1F4
Positive signal	Unidirectional (bidirectional also suitable)	
Small consumption on digital communication	Capacitance <10 pF to reduce consumption	
Data rate: 3.4 Mbps	Bandwidth : > 700 MHz	



Audio interfaces

Complete BOM link

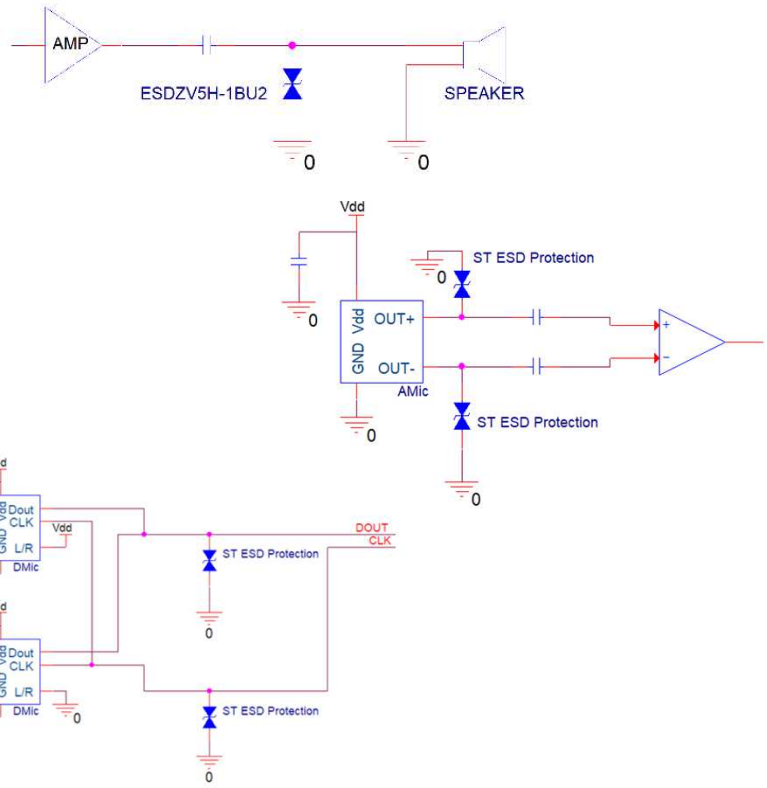
All sockets are ESD protected according to IEC 61000-4-2 level 4

Needs for speaker	Product key parameters	ST solutions
High power output ≤ 11 V (internal speaker)	V_{RM} ≥ 15 V	*ESD141-1BU2 **
Standard power < 3.6 V	V_{RM} > 3.6 V	**ESDZV5H-1BU2**
Audio Analog (alternative signal)	Bidirectional	
f < 20 kHz	No constraints on capacitance	

Needs for analog microphone	Product key parameters	ST solutions
Voltage ≤ 3.3 V	V_{RM} ≥ 3.3 V	**ESDL031-1BF4** **ESDZV5-1BF4**
Audio Analog	Bidirectional	
f < 20 kHz	No constraints on capacitance	

Needs for digital microphone	Product key parameters	ST solutions
Voltage ≤ 3.3V	V_{RM} ≥ 3.3V	**ESDZV5-1BF4** **ESDZL5-1F4**
Positive signal	Unidirectional (but bidirectional also suitable)	
Small consumption during digital communication	Capacitance <10 pF	

** Under development*



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Buttons / Switches

Complete BOM link

All sockets are ESD protected according to IEC 61000-4-2 level 4
Very low clamping thanks to soft snapback type protection

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

(*) Contact our sales office

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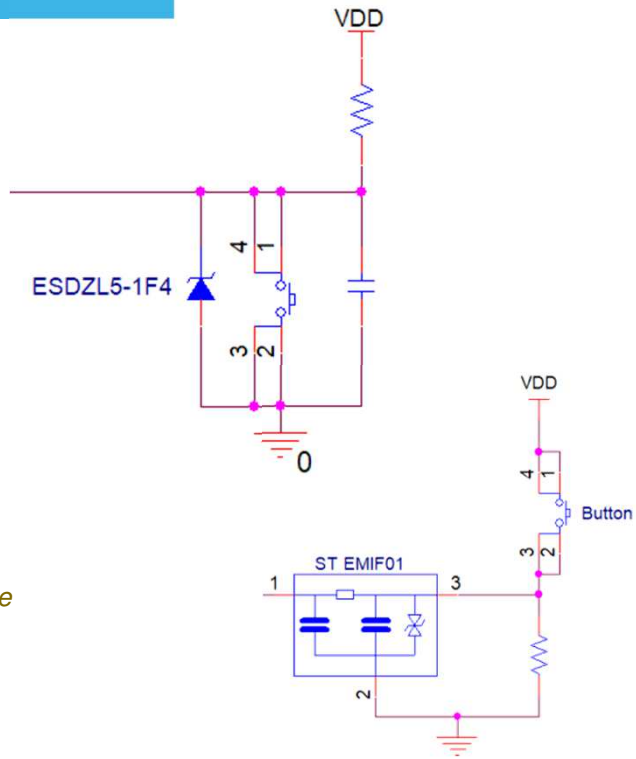

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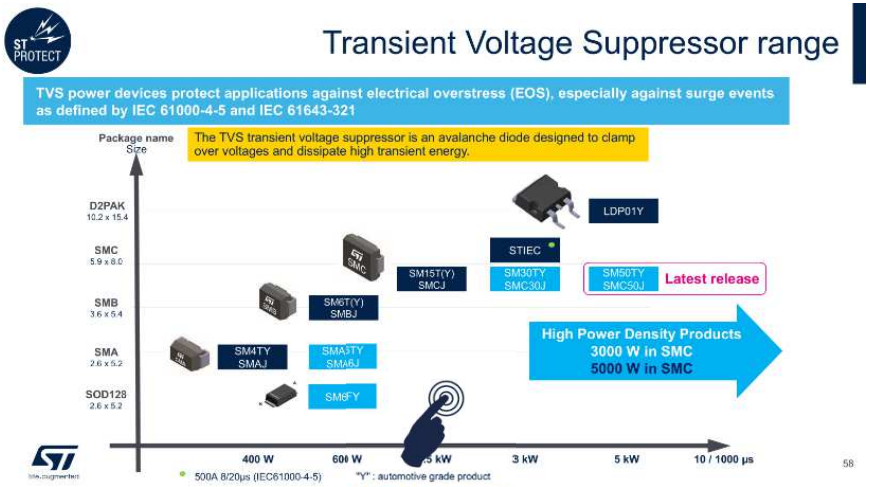
Complete BOM link

Power supply

Wide range of Ipp surge capabilities
Flexibility with various voltages and package sizes

Power supply needs	Product key parameters	ST solutions in SMD
DC input voltage	$V_{RM} \geq V_{DC}$ (V_{DC} + 10% margin)	**SMA6J series** (SMA) **SM15T** (SMC)
	Unidirectional	
AC input voltage	$V_{RM} \geq \sqrt{2} \times V_{AC}$ (V_{AC} + 10% margin)	
	Bidirectional	
Need to withstand 8/20 µs surge (IEC 61000-4-5)	I_{PP} up to 169A with V_{RM} 28 V	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: >30 kV Air discharge: >30 kV	



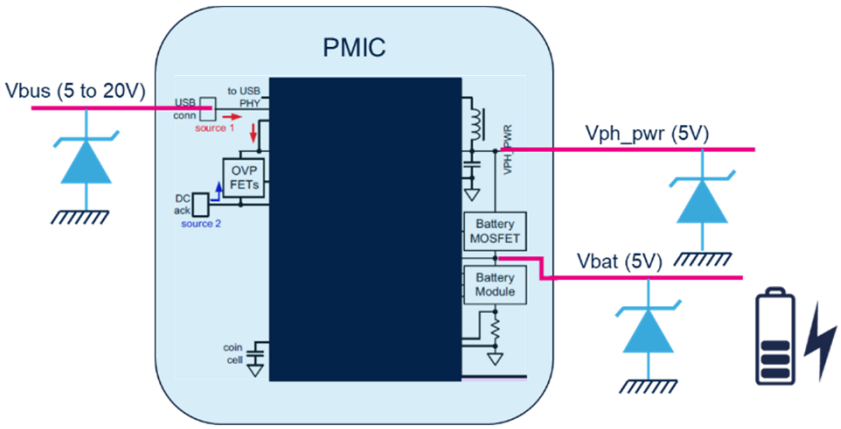
Full TVS range link

Charging connector & Battery

Complete BOM link

Wide range of Ipp surge capabilities
Flexibility with various voltages and package sizes

Power supply needs	Product key parameters	ST solutions in SMD
Voltage according to battery or specification	$V_{RM} \geq V_{bat}$ (generally V_{bat} = 5 V to 7 V)	**ESDAxP series** (QFN) **SM6F series** (SOD128)
	Unidirectional	
Need to withstand 8/20 µs surge (IEC 61000-4-5)	I_{PP} up to 120 A with V_{RM} 7 V	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: >30 kV Air discharge: >30 kV	



Glossary

- **EMC:** Electromagnetic compatibility
- **ESD:** Electrostatic discharge
- **EOS**: Electrical overstress
- **TVS:** Transient voltage suppressor diode
- **CMF:** Common-mode filter
- **MOV:** Metal oxide varistor
- **HMI:** Human machine interface

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