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PROTECTION & FILTERS

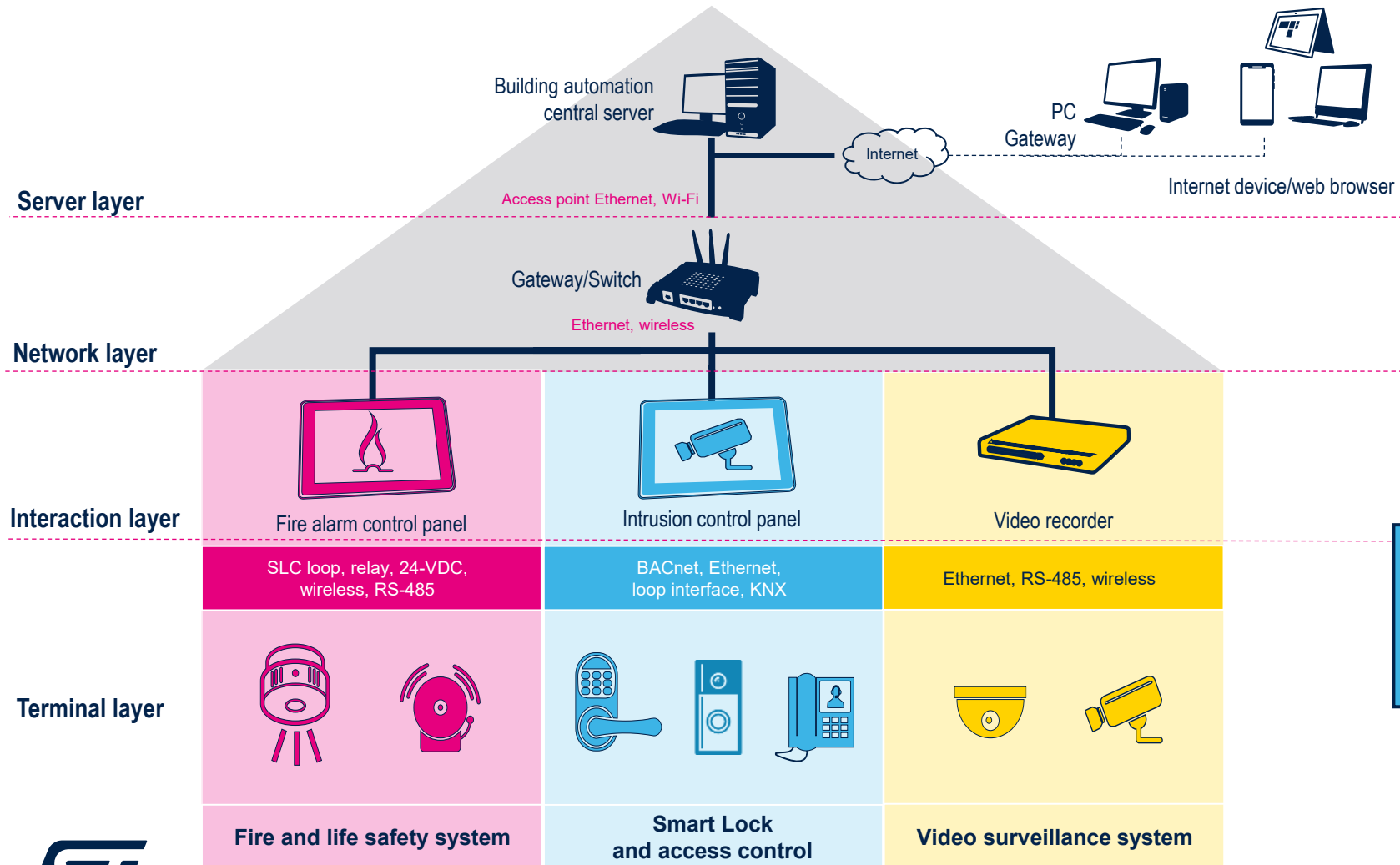
Building Safety and Security

Smart locks and access control

PROTECTION & FILTERS BUSINESS UNIT



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



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 | TCPPO1-M12

USB 3.x type A

Vbus | ESDA7P120-1U1M

Data D+/D- | USBLC6-2SC6
HSP053-4M5
ECMF2-40A100N6

RF antennas

ESDZX168B-1BF4





[Complete BOM link](#)

Antennas Wi-Fi, Bluetooth

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 ($V_{PEAK} = 4.5\text{ V}$ with $50\ \Omega$ load)	$V_{RM} \geq 16\text{ V}$	<u>ESDZX168B-1BF4</u>
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	

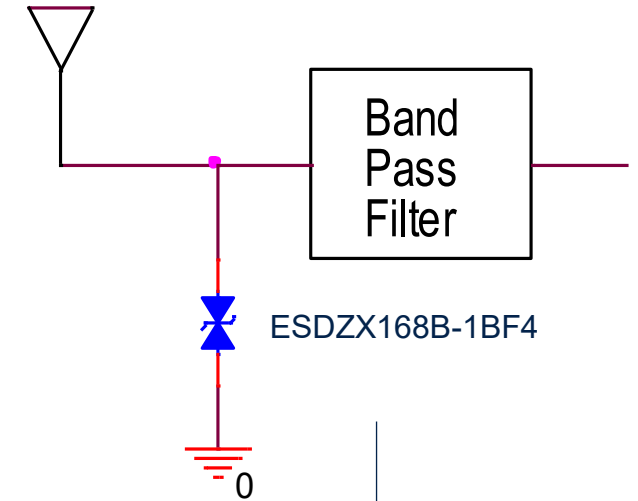
Needs for Bluetooth antenna	Product key parameters	ST solutions
RF power = 20 dBm ($V_{PEAK} = 3.2\text{ V}$ with $50\ \Omega$ load)	$V_{RM} = 16\text{ V}$	<u>ESDZX168B-1BF4</u>
Alternative signal	Bidirectional device	
f = 2.4 GHz	Extra low capacitance: 0.12 pF - Bandwidth >40 GHz	
Very low harmonic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

Socket specifics

ST product
parameter impact

ST recommended
product

0201



Block diagram or schematic



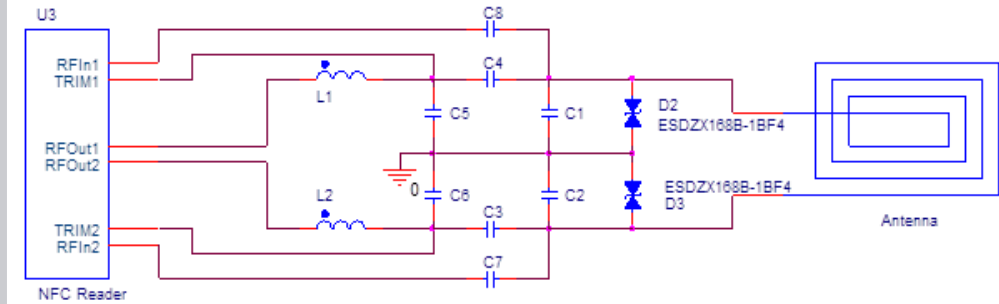


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Antennas NFC reader

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	$V_{TRIG} \geq 18V$	<u>ESDZX168B-1BF4</u>
Alternative signal	Bidirectional device	
$f = 13.56\text{ MHz}$, 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	$H3 = -65.8\text{ dBm @ } 20\text{ dBm, } f = 2.4\text{ GHz}$	
IEC 61000-4-2 level 4 8kV contact / 15 kV air	Contact discharge: 12 kV Air discharge: 30 kV	



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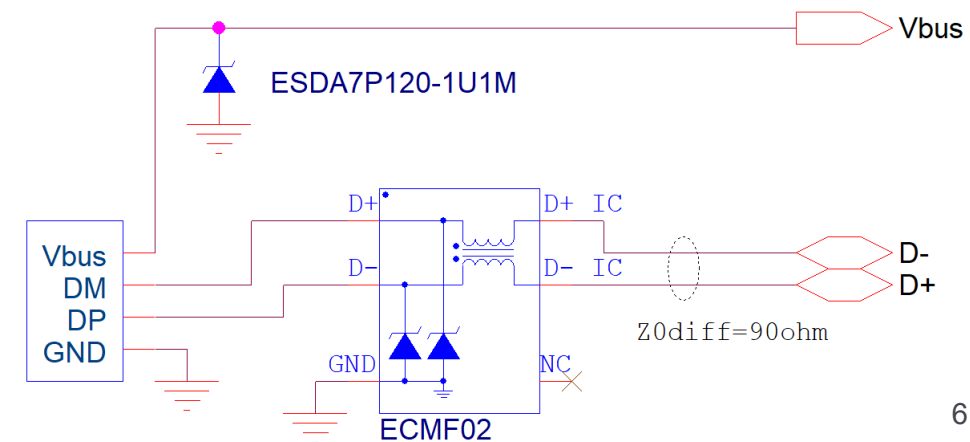
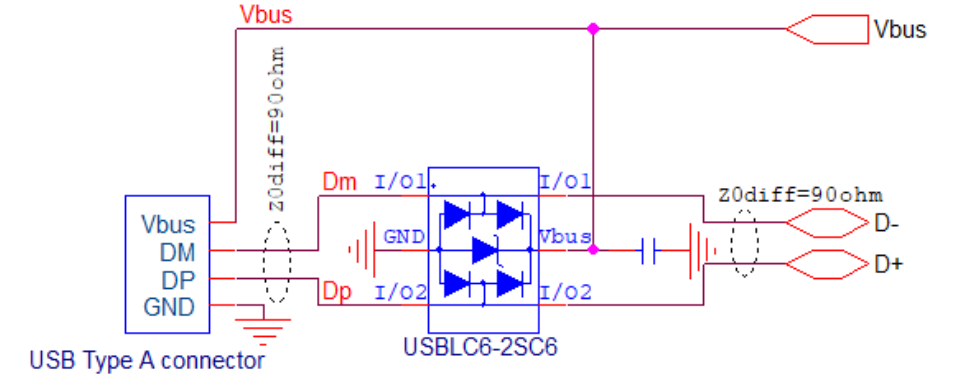
USB 2.0 type A

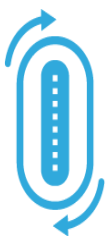
Complete solution portfolio for USB granting flexibility in design
All sockets are ESD protected according to IEC 61000-4-2 level 4

USB type A/B/μB

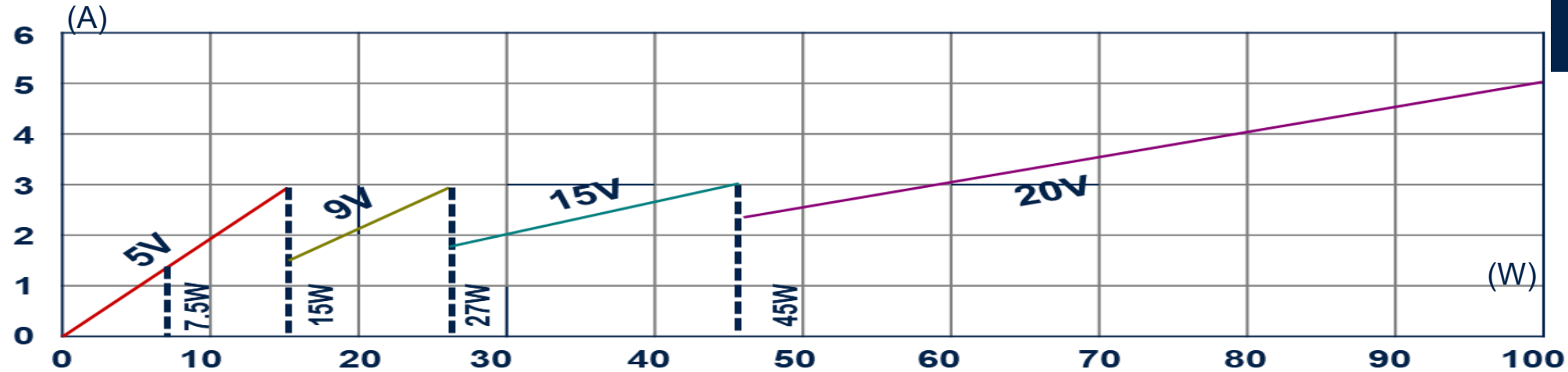
USB2.0 (D+/D-) needs	Product key parameters	ST solutions
Voltage ≤ 3.6 V	$V_{RM} = 5.25$ V	USBLC6-2SC6 (dual lines) HSP053-4M5 (pitch 500μm) ECMF2-40A100N6
Positive signal	Unidirectional	
Data rate: 480 Mbps Maximum equivalent frequency 240 MHz	Bandwidth : 3 GHz USBLC6-2SC6 Bandwidth : 18 GHz HSP053-4M5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





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	<i>ESD141-1BU2*</i>	<i>ESDZ161-1BF4*</i>	ESDALC20-1BF4
		SBU1 / SBU2	ESDA6V1L	ESDA14V2L	ESDA25L	ESDA25L
		Vbus	ESDA7P60-1U1M ESDA7P120-1U1M ESDA8P30-1T2 SMAJ6.0A-TR	ESDA13P70-1U1M SMAJ12A-TR	<i>ESDZ161-1BF4*</i> 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

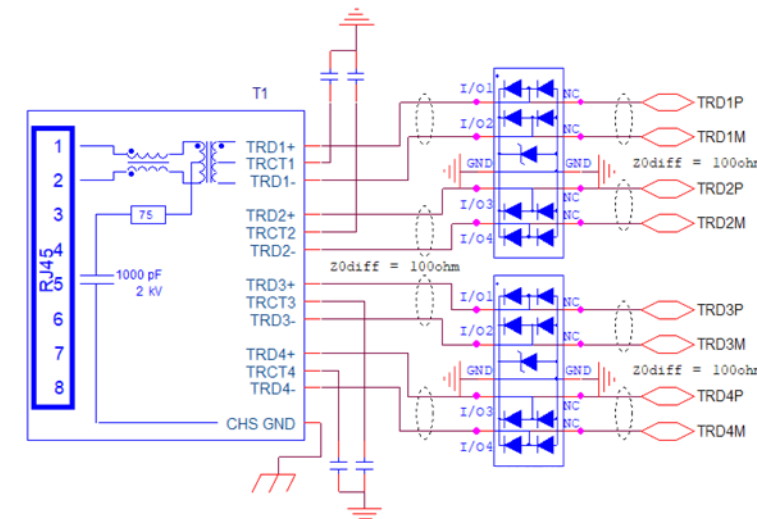
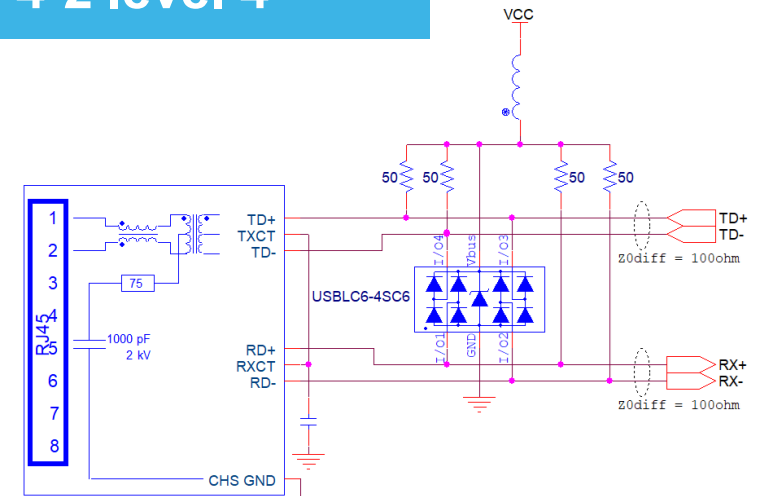


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Ethernet port

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	$V_{RM} \geq 3.0$ V	USBLC6-4SC6 HSP053-4M5 (pitch 500 μ m)
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	$V_{RM} \geq 3.3$ V	HSP053-4M5 (pitch 500 μ m)
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	



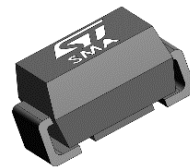
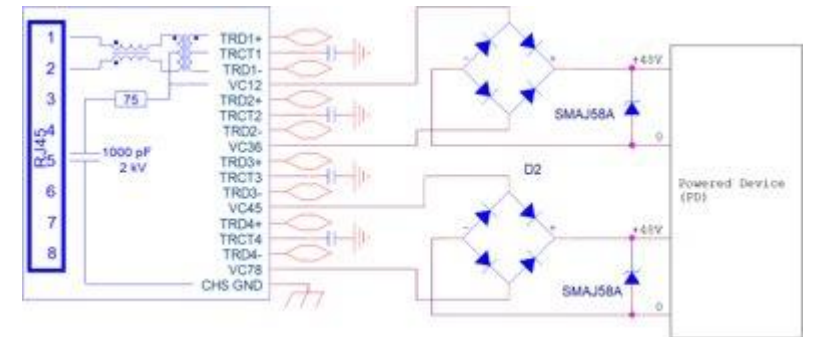


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Power over Ethernet (PoE)

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

Needs	Product key parameters	ST solutions
Maximum voltage: 57 V	$V_{RM} = 58 V$	<p><u>SMAJ58A</u></p> <p><u>SMA6J58A</u></p> <p><u>SM15T68A</u></p>
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)	<p>SMAJ58A: $I_{PP} = 19 A$</p> <p>SMA6J58A: $I_{PP} = 33 A$</p> <p>SM15T68A: $I_{PP} = 83 A$</p>	



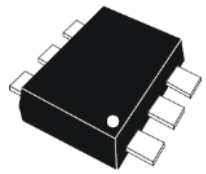
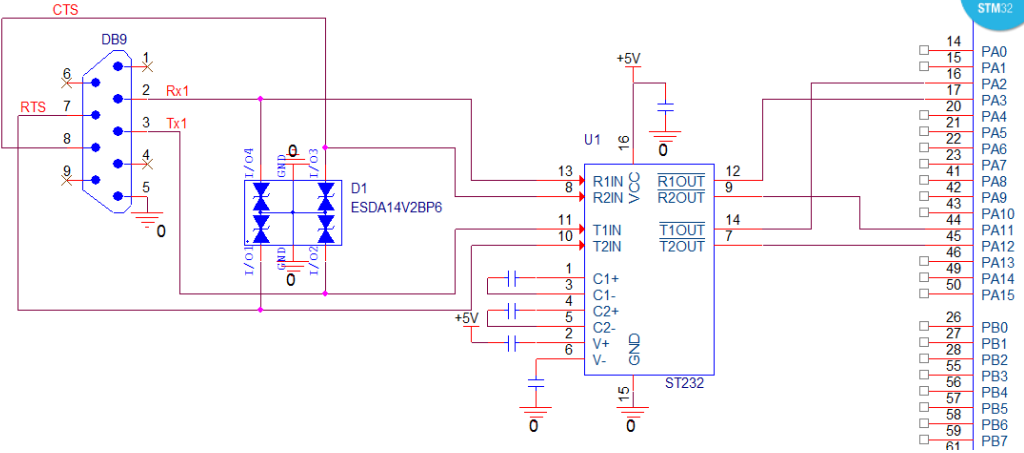
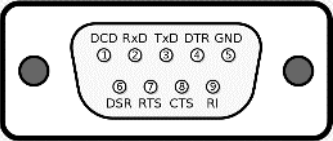


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RS-232

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: $\leq 12V$	$V_{RM} \geq 12V$	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: $\geq 8 kV$ Air discharge: $\geq 15 kV$	



SOT666-6L

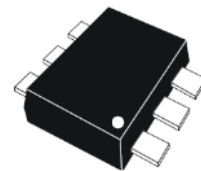
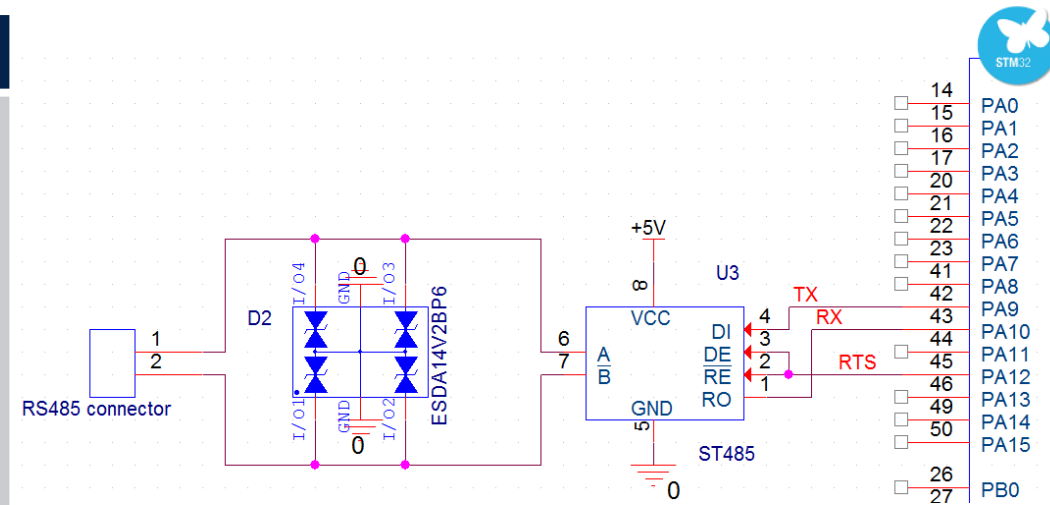


[Complete BOM link](#)

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	$V_{RM} \geq 12V$	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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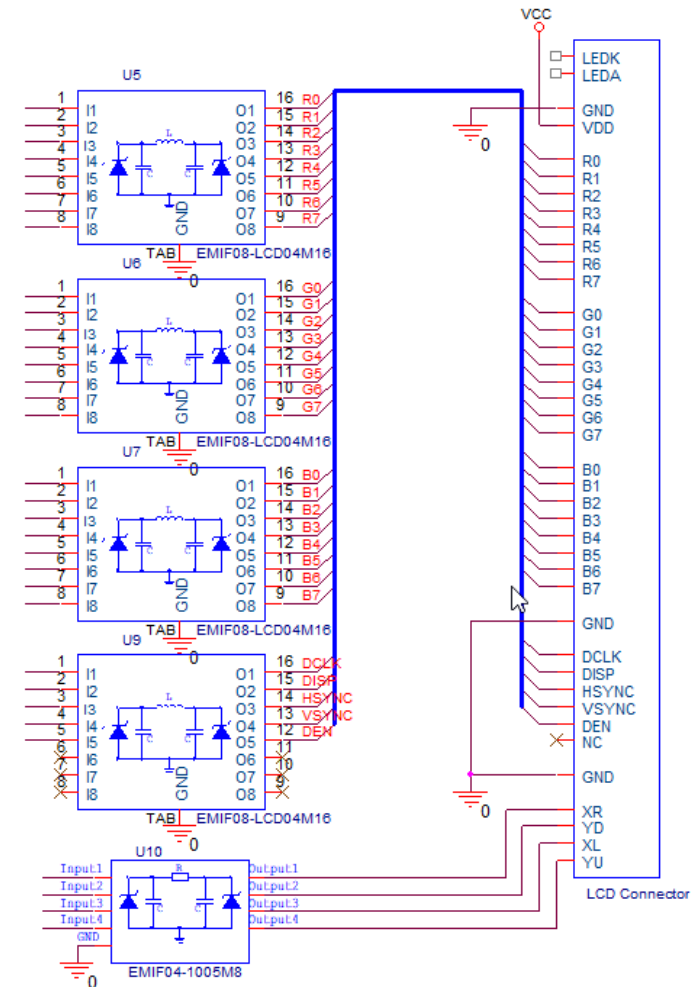
LCD Display

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 \leq 3.3V (high speed HS)	$V_{RM} \geq 3.3V$	<u>EMIF08-LCD04M16</u>
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 \leq 385 mV (high speed HS) Voltage \leq 1.3V (low power LP)	$V_{RM} \geq 3.6V$	<u>HSP053-4M5</u>
Positive signal	Unidirectional	
Data rate up to 1.5 Gbps	Bandwidth > 5 GHz	
Avoid to disturb Wifi antenna (2.4GHz / 5GHz)	CMF Rejection \geq -15dB (2.4 GHz to 6.5 GHz)	<u>ECMF4-40A100N10</u>

Needs for I2C	Product key parameters	ST solutions
Line voltage range: 0 to 3.3V	$V_{RM} \geq 3.3V$	<u>USBLC6-2SC6</u> <u>ESDZV5-1BF4</u> <u>ESDZL5-1F4</u>
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	





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Audio interfaces

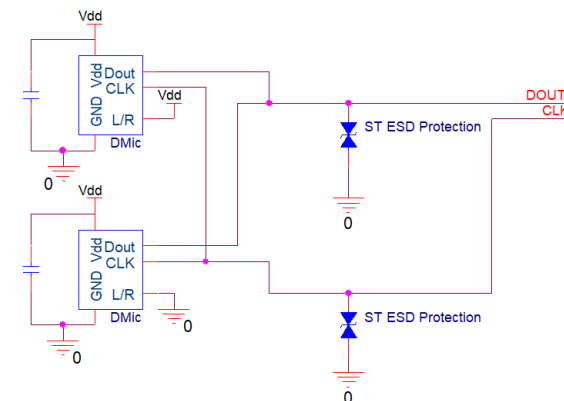
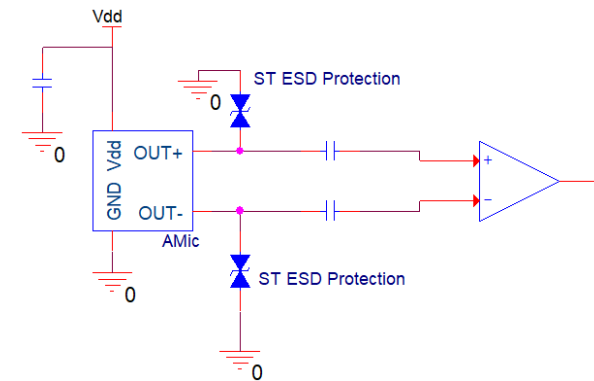
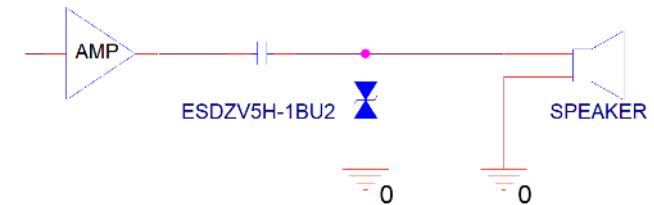
All sockets are ESD protected according to IEC 61000-4-2 level 4

Needs for speaker	Product key parameters	ST solutions
High power output ≤ 11 V (internal speaker)	$V_{RM} \geq 15$ V	<i>ESD141-1BU2</i> *
Standard power < 3.6 V	$V_{RM} > 3.6$ V	<u>ESDZV5H-1BU2</u>
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	$V_{RM} \geq 3.3$ V	<u>ESDL031-1BF4</u> <u>ESDZV5-1BF4</u>
Audio Analog	Bidirectional	
$f < 20$ kHz	No constraints on capacitance	

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

* Under development



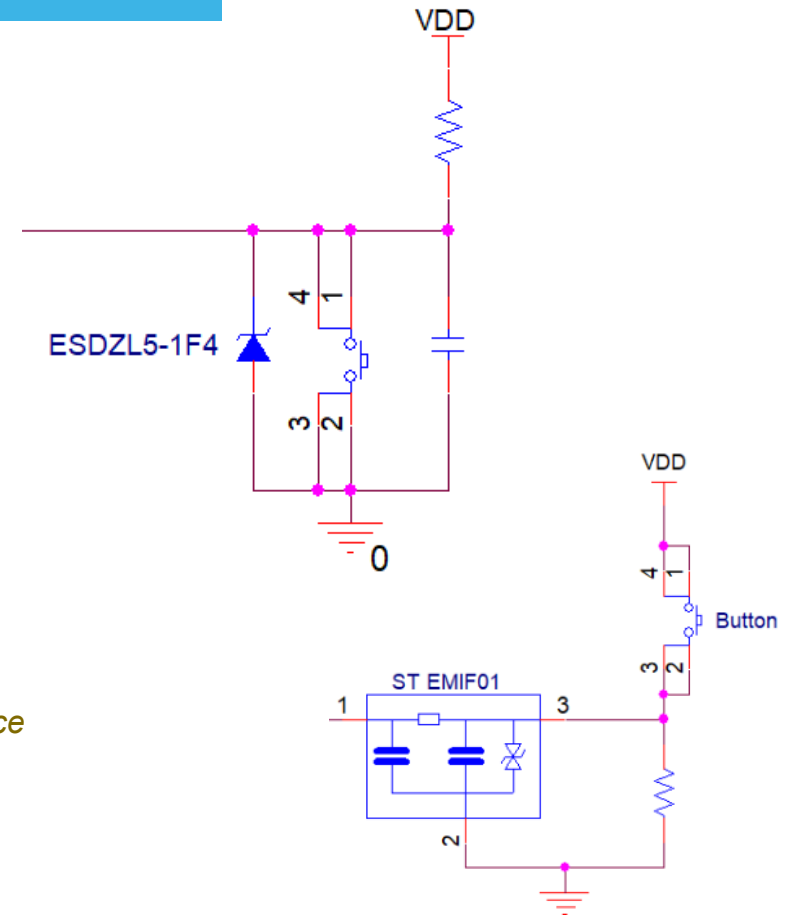


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Buttons / Switches

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	$V_{RM} \geq 5.5V$	ESDZV5-1BF4 (single line)
Digital positive signal	Unidirectional (bidirectional also suitable)	
Low frequency application	No constraints on capacitance Cline < 9.5pF	ESDZL5-1F4 (single line)
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: ≥ 15 kV Air discharge: ≥ 30 kV	EMIF01-1007AF4 (*)
Avoid EMI (antenna desense)	Reject frequency > 700 MHz	
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



0201 package



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Power supply

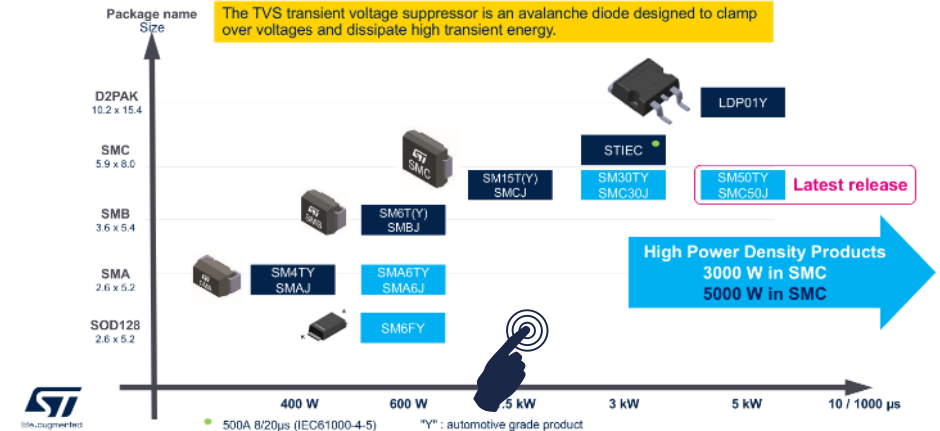
Wide range of Ipp surge capabilities
Flexibility with various voltages and package sizes

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



Transient Voltage Suppressor range

TVS power devices protect applications against electrical overstress (EOS), especially against surge events as defined by IEC 61000-4-5 and IEC 61643-321



[Full TVS range link](#)



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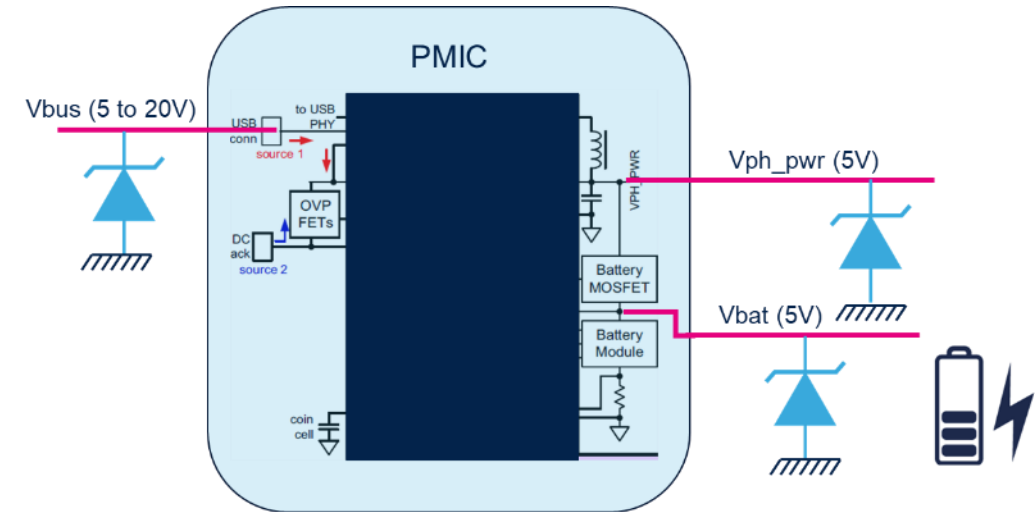


[Complete BOM link](#)

Charging connector & Battery

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 $V_{bat} = 5\text{ V to }7\text{ V}$)	ESDAxP series (QFN)
Need to withstand 8/20 μs surge (IEC 61000-4-5)	Unidirectional	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	I_{PP} up to 120 A with $V_{RM} 7\text{ V}$	SM6F series (SOD128)
	Contact discharge: >30 kV Air discharge: >30 kV	



- **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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