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Protections and Filters Application book for : Building Safety and Security Fire alarms and detectors

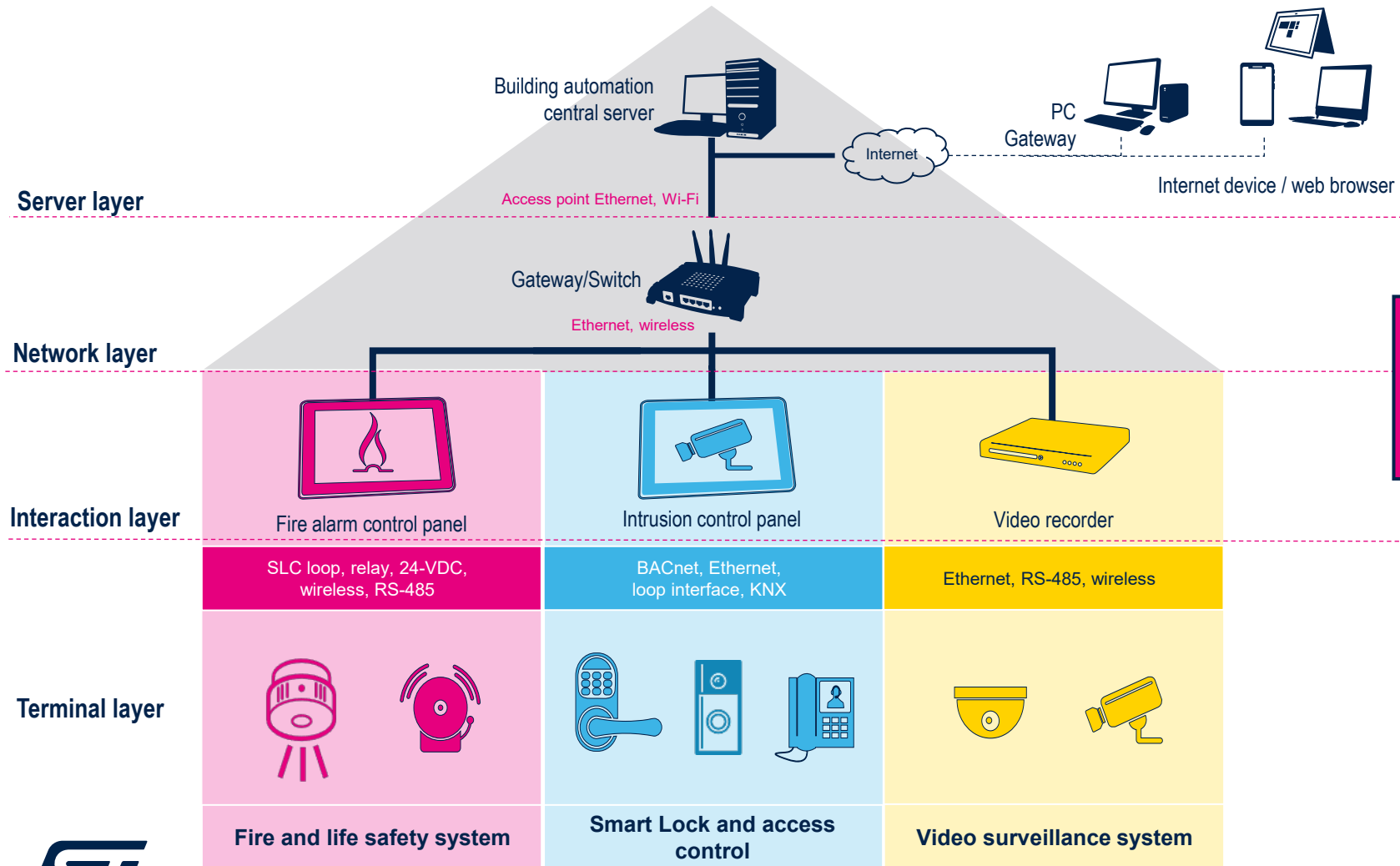
Power & Discrete Sub-Group

APMS PRODUCT GROUP





Building safety and security overview



Key applications:

focus

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

- 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 fire safety systems

Power supply

SM15T series
SMA6J series

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

ESDAxP series
SM6FY series
SMA6J series

RF antennas (Wi-Fi / BLE)

ESDARF02-1BU2CK

Display

Data /
clock

HSP051-4M5
ECMF4-40A100N10 (differential lines)
EMIF08-LCD04M16 (parallel link)

I²C

ESDZV5-1BF4
USBLC6-2SC6

Buttons/ switches

ESDZL5-1F4
ESDZV5-1BF4
EMIF01-1K03AF4*

Ethernet

HSP051-4N10
HSP051-4M5

RS-485 / RS-232

ESDA14V2BP6

USB-C (integrated solution)

Vbus and CC lines

TCPP01-M12

USB Vbus and D+/D-

Vbus

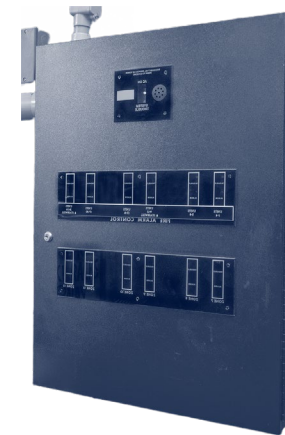
ESDA7P120-1U1M

Data
D+ / D-

USBLC6-2SC6
ECMF2-40A100N6

Detectors inputs (SLC com)

SMAJ24A
SMAJ12A
ESDA13P70-1U1M



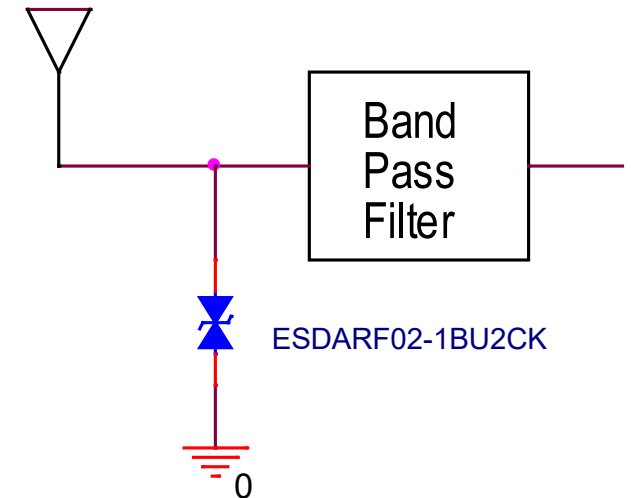


Antennas Wi-Fi/Bluetooth

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 = 20 dBm ($V_{PEAK} = 3.2\text{ V}$ with $50\ \Omega$ load)	$V_{RM} \geq 3.6\text{ V}$	<u>ESDARF02-1BU2CK</u>
Alternative signal	Bidirectional device	
f = 2.4 GHz f = 5.0 GHz	Extra low capacitance ($\leq 0.3\text{ pF}$) Bandwidth = 30 GHz	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: 8 kV Air discharge: 20 kV	

Needs for Bluetooth antenna	Product key parameters	ST solutions
RF power = 20 dBm ($V_{PEAK} = 3.2\text{ V}$ with $50\ \Omega$ load)	$V_{RM} \geq 3.6\text{ V}$	<u>ESDARF02-1BU2CK</u>
Alternative signal	Bidirectional device	
f = 2.4 GHz	Extra low capacitance ($\leq 0.3\text{ pF}$) Bandwidth = 30 GHz	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: 8 kV Air discharge: 20 kV	



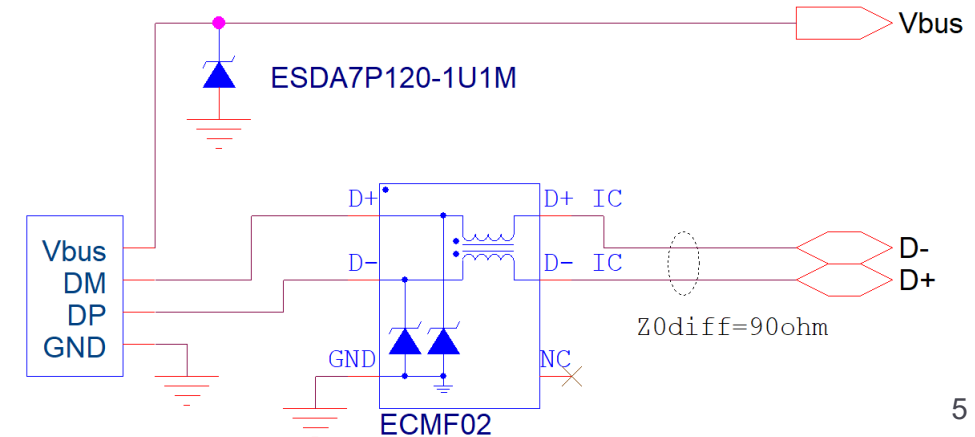
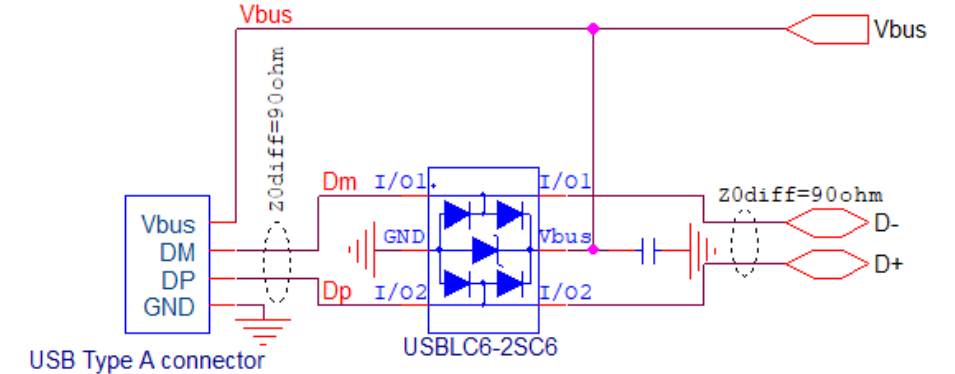


USB 2.0

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

USB2.0 (D+ / D-) needs	Product key parameters	ST solutions
Voltage ≤ 3.0 V	$V_{RM} = 5.25$ V	USBLC6-2SC6 (dual lines)
Positive signal	Unidirectional	
Data rate: 480 Mbps Maximum equivalent frequency 240 MHz	Bandwidth 3.0 GHz	
Avoid Wi-Fi antenna desense (2.4 GHz / 5 GHz)	CMF rejection ≥ -15 dB (2.4 GHz to 6.5 GHz)	ECMF2-40A100N6
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 μ s surge (IEC 61000-4-5)	I_{PP} up to 120A	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: >30 kV Air discharge: >30 kV	

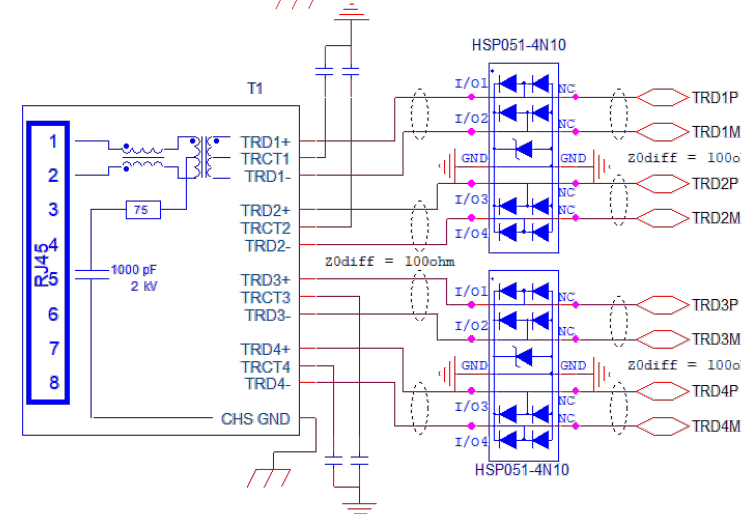
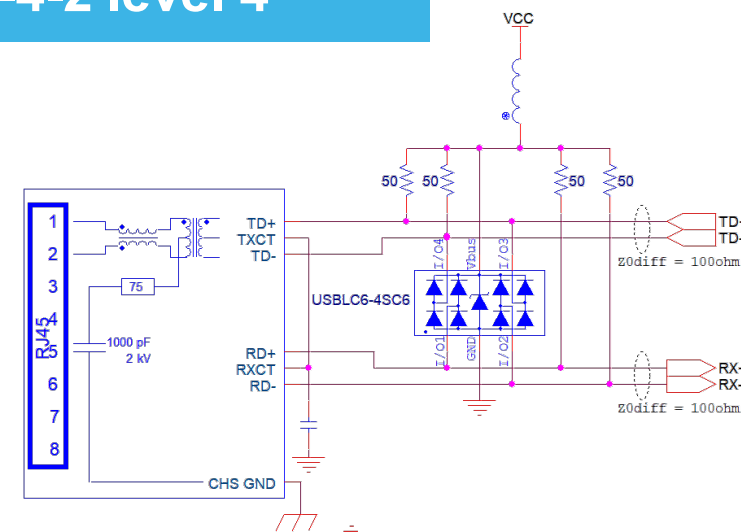




Ethernet port

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	<u>USBLC6-4SC6</u> <u>HSP051-4M5</u>
Positive signal	Unidirectional	
Data rate: up to 100 Mbps Maximum equivalent frequency 100 MHz	Bandwidth > 800 MHz	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: ≥ 15 kV Air discharge: ≥ 15 kV	
Needs for Ethernet 1G / 10G	Product key parameters	ST solutions
1GEthernet voltage: 2.5 V 10GEthernet voltage: 1.0 V	$V_{RM} \geq 3.3$ V	<u>HSP051-4M5</u> (pitch 500 μ m) <u>HSP051-4N10</u> (pitch 400 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 4–8 kV contact / 15 kV air	Contact discharge: ≥ 20 kV Air discharge: 30 kV	

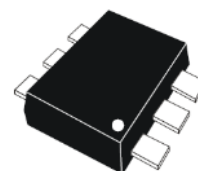
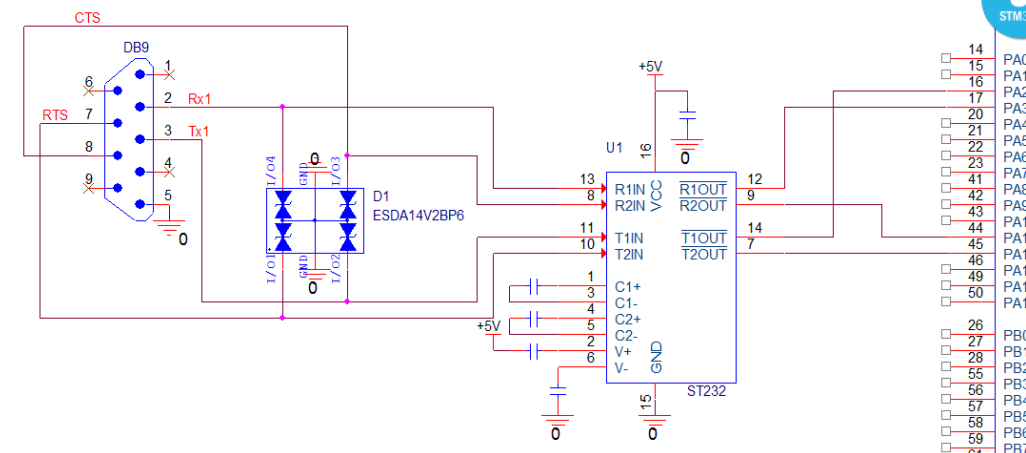
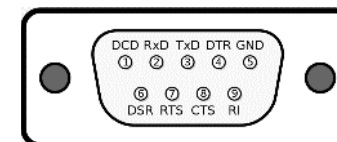




RS-232

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: $\leq 12\text{ V}$	$V_{RM} \geq 12\text{ V}$	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 25 pF Bandwidth $\gg 1\text{ MHz}$	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: $\geq 8\text{ kV}$ Air discharge: $\geq 15\text{ kV}$	



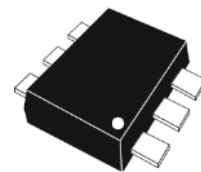
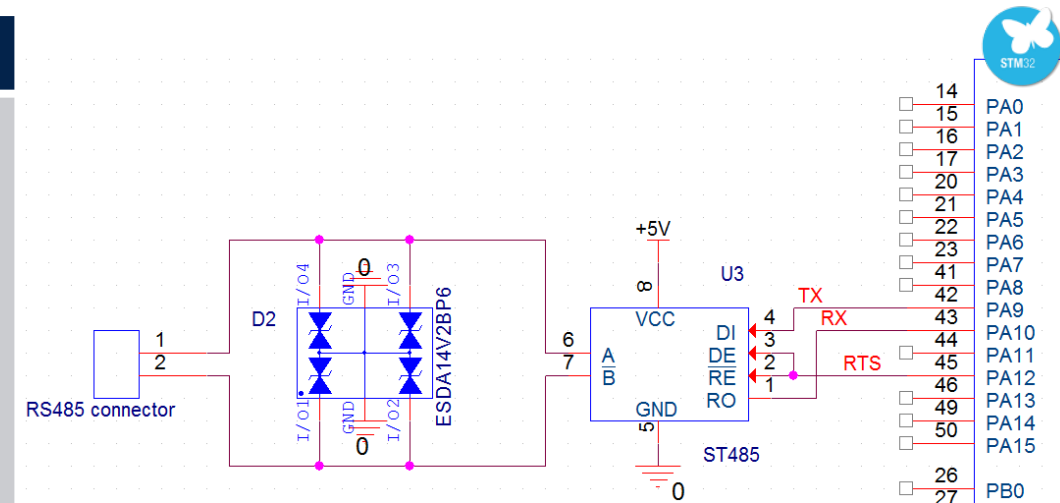
SOT666-6L



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 +12 V	$V_{RM} \geq 12 V$	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 25 pF Bandwidth >> 10 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



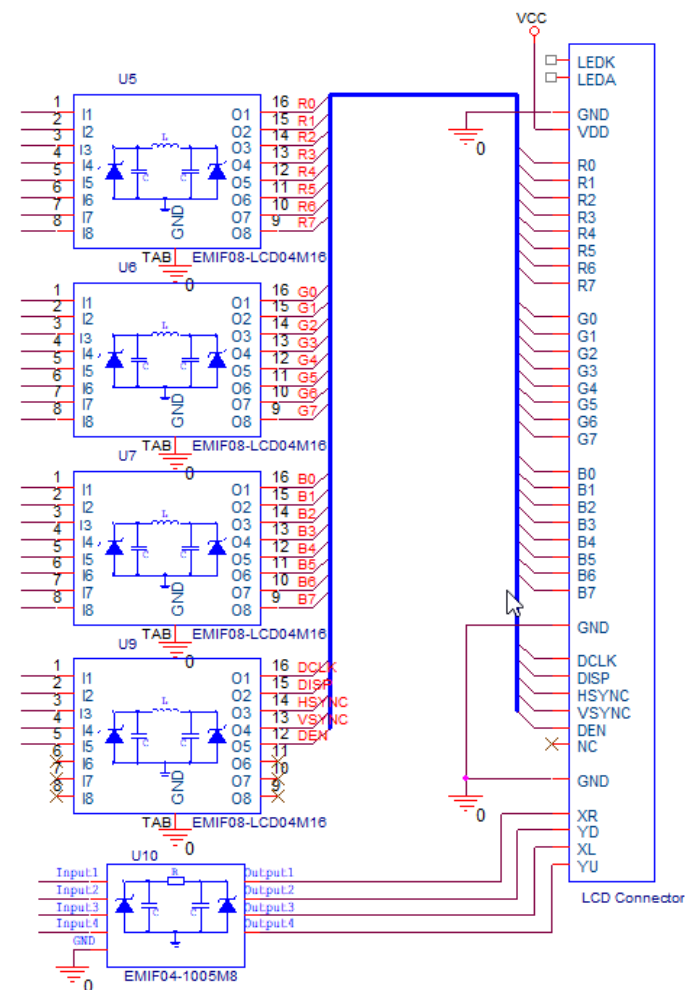
LCD display

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 ≤ 3.3 V (high speed HS)	$V_{RM} \geq 3.3$ V	EMIF08-LCD04M16
Positive signal	Unidirectional (bidirectional also suitable)	
Clock frequency < 33 MHz	Bandwidth > 400 MHz (-6 dB)	
Avoid to disturb LTE, Wi-Fi, Bluetooth reception	Rejection of 700 MHz, 2.4 GHz, and 5 GHz	

Needs for MIPI (data / clock)	Product key parameters	ST solutions
Voltage ≤ 385 mV (high speed HS) Voltage ≤ 1.3 V (low power LP)	$V_{RM} \geq 3.6$ V	HSP051-4M5
Positive signal	Unidirectional (bidirectional also suitable)	
Data rate up to 1.5 Gbps	Bandwidth > 5 GHz	
Avoid to disturb Wi-Fi antenna (2.4 GHz / 5 GHz)	CMF rejection ≥ -15 dB (2.4 GHz to 6.5 GHz)	ECMF4-40A100N10

Needs for I ² C	Product key parameters	ST solutions
Line voltage range: 0 to 3.3V	$V_{RM} \geq 3.3$ V	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	

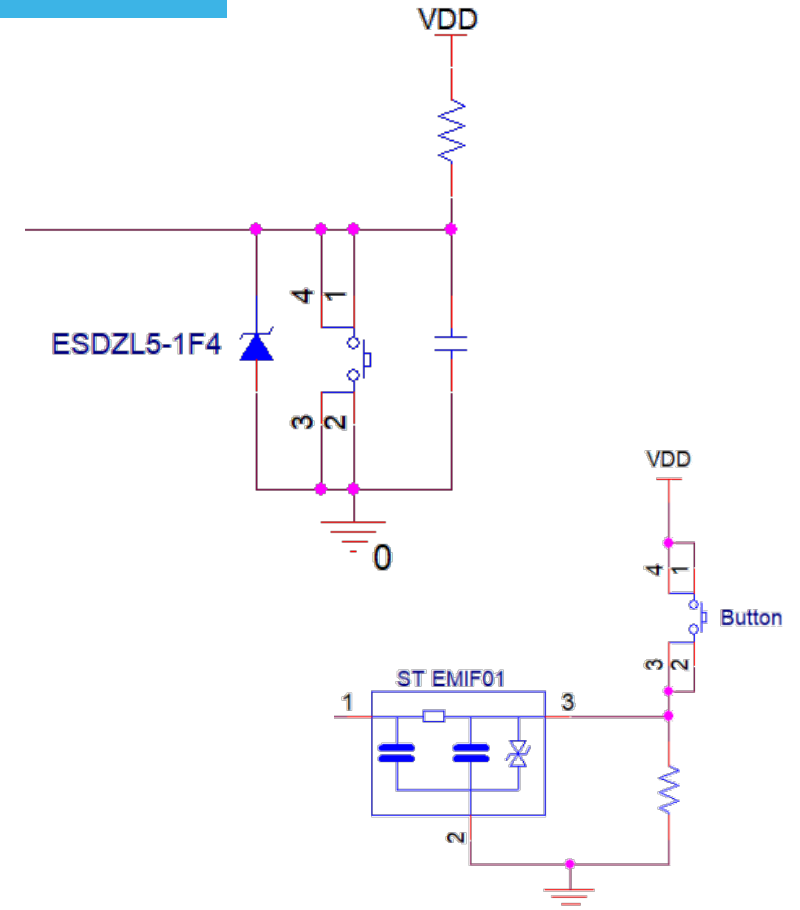




Buttons/switches

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 3.3 V or less	$V_{RM} \geq 5.5$ V	<u>ESDZV5-1BF4</u> (single line)
Digital positive signal	Unidirectional (bidirectional also suitable)	
Low frequency application	No constraints on capacitance Cline < 9.5 pF	<u>ESDZL5-1F4</u> (single line)
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: ≥ 15 kV Air discharge: ≥ 30 kV	<u>EMIF01-1K03AF4*</u>
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	

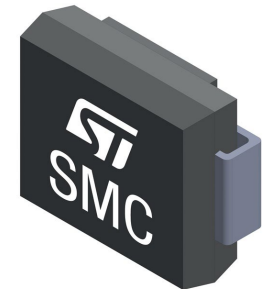
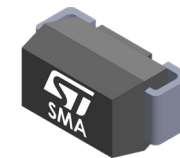




Power supply

Wide range of I_{PP} 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)	<u>SMA6J series</u> (SMA) <u>SM15T series</u> (SMC)
	Unidirectional	
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	
IEC 61000-4-2 level 4 8 kV contact / 15 kV air	Contact discharge: >30 kV Air discharge: >30 kV	

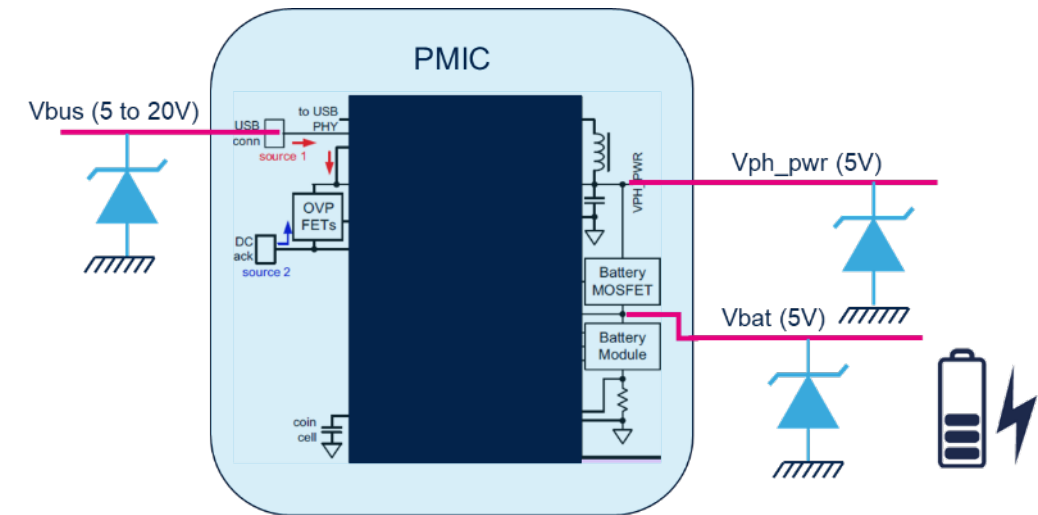




Charging connector & battery

Wide range of I_{PP} 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 169A with $V_{RM} 28\text{ V}$	SM6FY series (SOD128)
	Contact discharge: >30 kV Air discharge: >30 kV	



- **CMF**: common-mode filter
- **ESD**: electrostatic discharge
- **EOS**: electrical overstress
- **MCU** : microcontroller
- **T CPP** : Type-C™ port protection
- **TVS**: transient voltage suppressor diode
- **FACP**: fire alarm control panel
- **HMI**: human machine interface
- **PLC**: power line communication
- **SLC com**: signal line circuit communication is used to transmit power and data to devices connected in a closed loop. This is a 24V nominal DC current limited bus.

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