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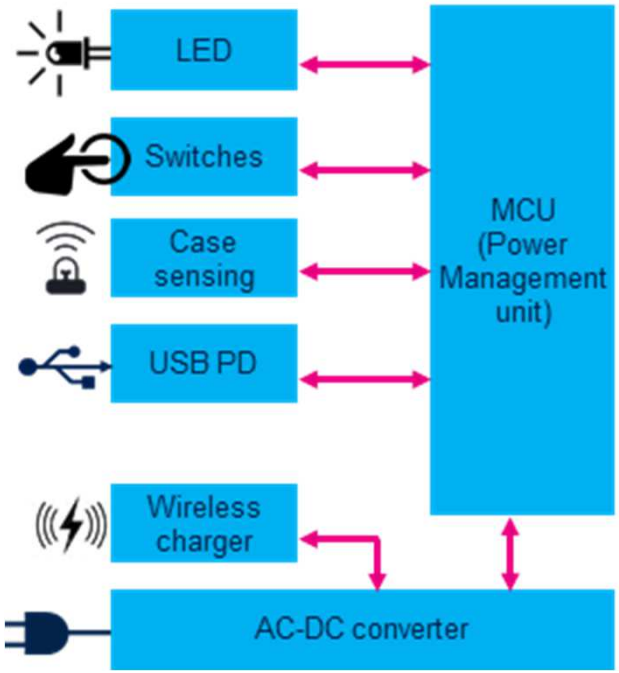
Protection & Filter application book for:
Hearing aids

ST PROTECT

Protection for hearing aids

Hearing aids
Charging case

All sockets are ESD protected according to IEC 61000-4-2
8 kV contact discharge and 15 kV air discharge



Needs for LED	Product key parameters	ST solutions
Voltage < 3.3 V	V_{RM} = 5 V	ESDZV5-1BF4
Positive signal	Unidirectional (bidirectional also suitable)	ESDZL5-1F4
Needs for switches and case sensing	**Product key parameters**	**ST solutions**
Voltage < 3.3 V	V_{RM} = 5 V	ESDZV5-1BF4
Positive signal	Unidirectional (bidirectional also suitable)	ESDZL5-1F4
Needs for USB2.0 (D+/ D-)	**Product key parameters**	**ST solutions**
Voltage < 3.6 V	V_{RM} = 5.25 V	USBLC6-2SC6
Positive signal	Unidirectional (bidirectional also suitable)	
Data rate: 480 Mbps	Bandwidth 3.0 GHz	
Needs for UBS2.0 (Vbus)	**Product key parameters**	**ST solutions**
Voltage < 5.5 V	V_{RM} > 5 V	ESDA5-1F4 ESDA8P30-1T2 ESDALC20-1BF4
Positive signal	Unidirectional (bidirectional also suitable)	
Need to withstand 8/20 µs surge	I_{PP} = 11 A, 30 A and 2.4 A	
Vbus & CC lines full protection compliant with USB PD 3.0 including PPS: TCPP01-M12 (see next slides)		
Needs for wireless charger	**Product key parameters**	**ST solutions**
Uovp in Qi Wireless Power 1.2.3 recommendation	V_{RM} = 20 V	ESDALC20-1BF4
Alternative signal	Bidirectional	
Frequency around 100 kHz	Capacitance < 20 pF	

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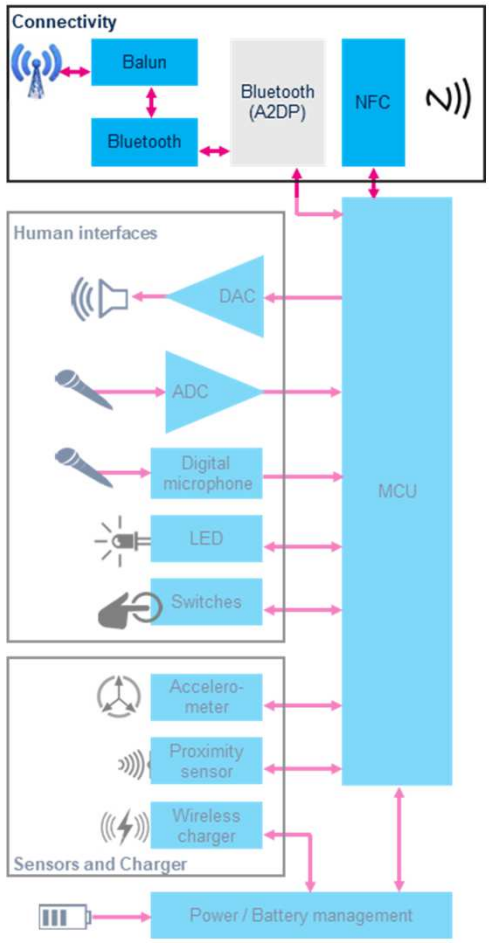
Hearing aids
Earbud: connectivity

All antennas can be protected with the same device

Wi-Fi antenna needs	Key product parameters	ST solutions
RF power = 23 dBm (V_{PEAK} = 4.5 V with 50 W 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	



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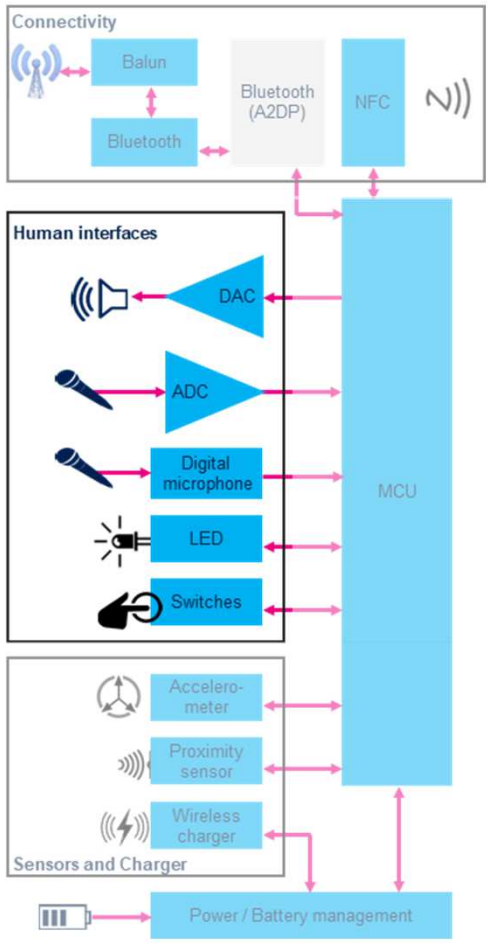
Hearing aids
Earbud: human interfaces

The same product can protect all human interfaces

Needs for analog microphone	Product key parameters	ST solutions
$V_{RM} > V_{BAT}$	$V_{RM} > V_{BAT}$ (4.2 V)	ESDZV5-1BF4 ESDZV5H-1BU2
Audio analog	Bidirectional	
f < 20 kHz	No constraints on capacitance	
IEC 61000-4-2 level 4	Contact discharge: 8 kV - air discharge: 15 kV	

Needs for digital microphone	Product key parameters	ST solutions
$V_{RM} > 3.3$ V	$V_{RM} > 3.3$ V	ESDZV5-1BF4 ESDZL5-1F4
Digital positive signal	Unidirectional (bidirectional also suitable)	
Small consumption on digital communication	Capacitance <10 pF to reduce consumption	
IEC 61000-4-2 level 4	Contact discharge: 8 kV - air discharge: 15 kV	

Needs for switches	Product key parameters	ST solutions
MCU power supply	$V_{RM} > 3.3$ V	ESDZV5-1BF4 ESDZL5-1F4
Digital positive signal	Unidirectional (bidirectional also suitable)	
Low frequency application	No constraints on capacitance	
IEC 61000-4-2 level 4	Contact discharge: 8 kV - air discharge: 15 kV	



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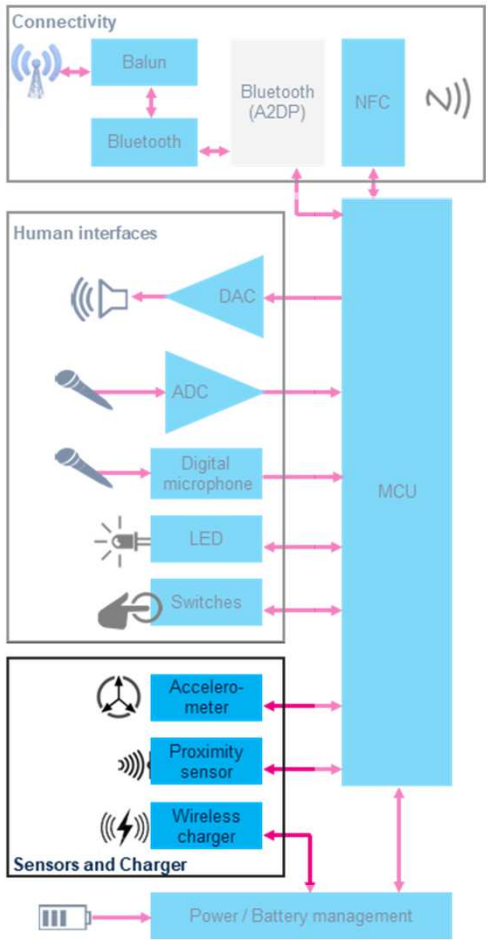
Hearing aids
Earbud: sensors and charger

The same device can be used for all sensors rated less than 5 V

Needs for sensors	Product key parameters	ST solutions
Voltage < 3.3 V	V_{RM} = 5 V	ESDZV5-1BF4 ESDZL5-1F4
Positive signal	Unidirectional (bidirectional also suitable)	
Small consumption on digital communication	Capacitance <10 pF to reduce consumption	
IEC 61000-4-2 level 4	Contact discharge: 8 kV - air discharge: 15 kV	

Needs for sensors with SPI/I²C bus	Product key parameters	ST solutions
Voltage < 3.3 V	V_{RM} = 5 V	ESDZV5-1BF4 ESDZL5-1F4
Positive signal	Unidirectional (bidirectional also suitable)	
Small consumption on digital communication	Capacitance <10 pF to reduce consumption	
IEC 61000-4-2 level 4	Contact discharge: 8 kV - air discharge: 15 kV	

Needs for wireless charger	Product key parameters	ST solutions
Uovp in Qi Wireless Power 1.2.3 recommendation	V_{RM} = 20 V	ESDALC20-1BF4
Alternative signal	Bidirectional	
Frequency around 100 kHz	Capacitance < 20 pF	
IEC 61000-4-2 level 4	Contact discharge: 20 kV - air discharge: 30 kV	



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Glossary

- **ESD:** Electrostatic discharge
- **EOS**: Electrical overstress
- **MCU:** Microcontroller
- **PPS**: Programmable Power Supply
- **TCPP**: Type-C port protection
- **TVS:** Transient voltage suppressor diode

Our technology starts with You

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