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ESD Protection
FOR THE MOST COMMON MICROCONTROLLER INTERFACES
FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS

Nexperia ESD Protection

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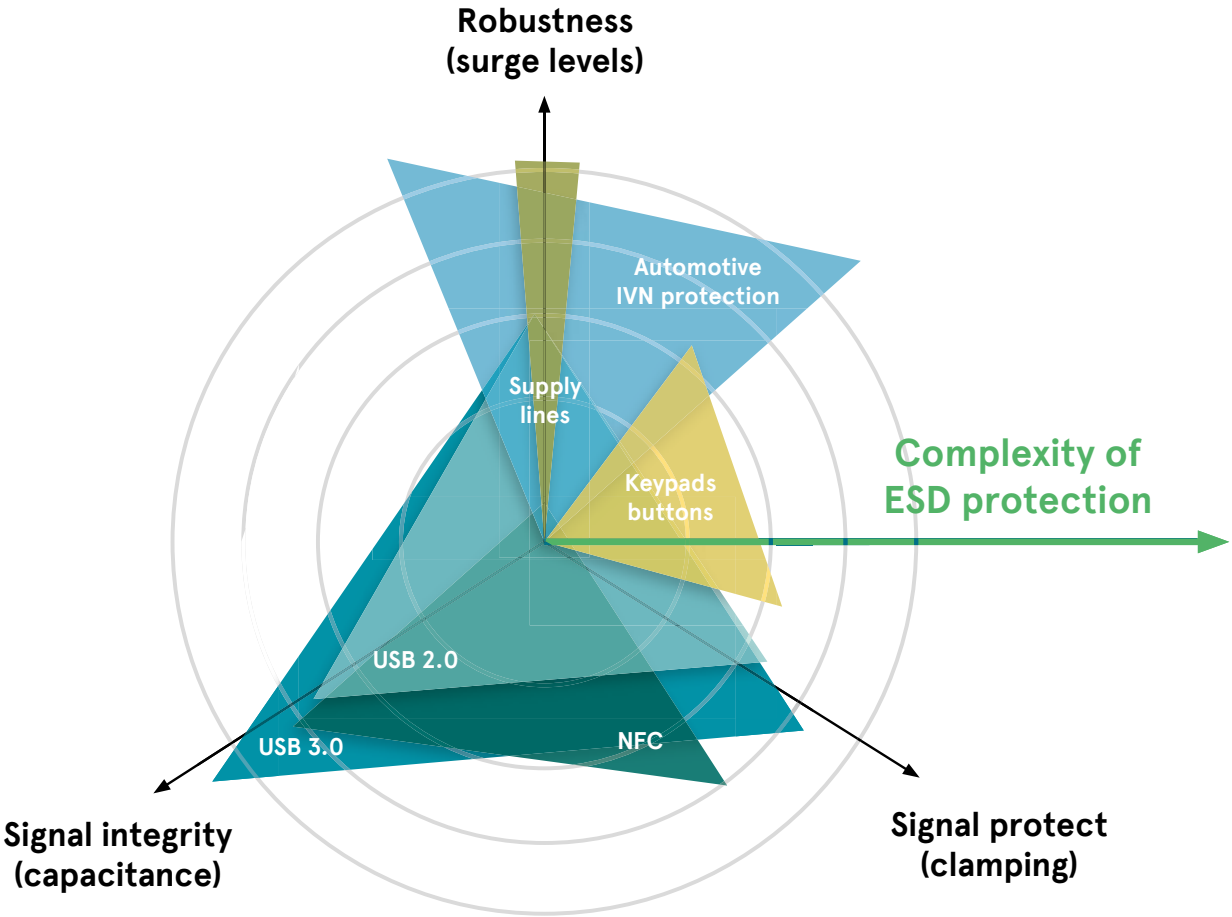
Nexperia ESD Technology delivers optimum performance satisfying the key parameters for ESD protection. Superior ESD protection offers increased robustness against ESD and surge pulses, low clamping/ dynamic resistance to protect system devices and, finally, low capacitance to maintain excellent signal integrity in high-speed interfaces such as USB Type-C or In-Vehicle networks e.g. LIN, CAN (FD) or 100BASE-T1 Ethernet.

Hence, Nexperia offers ideal solutions for every application in the automotive and industrial market.

What you get when you choose Nexperia for ESD protection:

- Greater system-level immunity (IEC61000-4-2 level 4 standard and beyond) and AEC-Q101 qualification/automotive grade
- Ultra-low clamping voltages, to safeguard even the latest, smallest geometries in SoC devices
- Minimized impact on bus and interface signal integrity
- Low leakage current, for maximum energy efficiency and minimum distortion on analog interfaces
- Arrays that combine multiline protection in single devices
- Packages that simplify PCB design for optimized layouts incl. DFN leadless packages with side-wettable flanks (SWF)



Explore the benefits of Nexperia ESD protection with samples of the most common solutions:

Interface	Part numbers	Key electrical features	Automotive Qualification	Package
Ethernet, SPDIF	PESD5V0U1BA	V_{RWM} of 5V, V_{ESD} = 10kV, $C_D$max = 3.5pF, single line bidirectional	AEC-Q101	SOD323
Digital GPIO low voltage comparator	PESD5V0S1BA	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 45pF, single line bidirectional	AEC-Q101	SOD323
Digital GPIO low voltage comparator	PESD5V2S2UT	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 152pF, two line unidirectional	AEC-Q101	SOT23
Digital GPIO low voltage comparator	PESD3V3S4UD	V_{RWM} of 3.3V, V_{ESD} = 30kV, $C_D$max = 300pF, two line unidirectional		SOT457
Analog GPIO	PESD36VS1UJ	V_{RWM} of 36V, V_{ESD} = 30kV, $C_D$max = 30pF, single line unidirectional	AEC-Q101	SOD323F
Analog GPIO	PESD36VS2UT	V_{RWM} of 36V, V_{ESD} = 30kV, $C_D$max = 35pF, two line unidirectional	AEC-Q101	SOT23
I²C SPI/SSI	NUP1301	V_{RWM} of 80V, V_{ESD} = 30kV, $C_D$max = 0.75pF, single line unidirectional (rail-to-rail)	AEC-Q101	SOT23
I²C SPI/SSI Ethernet	IP4220CZ6	V_{RWM} of 5.5V, V_{ESD} = 8kV, $C_D$max = 40pF, bidirectional ESD protection		SOT457
RS-232, RS-485	PESD15VS2UT	V_{RWM} of 15V, V_{ESD} = 30kV, $C_D$max = 70pF, two line unidirectional	AEC-Q101	SOT23
USB2.0 USB2.0 OTG HDMI, I²C SPI/SSI	PUSB2X4Y	V_{RWM} of 5.5V, V_{ESD} = 12kV, $C_D$max = 0.85pF, 4 lines, ultra-low clamping		SOT363
USB2.0 USB2.0 OTG	PRTR5V0U4D	V_{RWM} of 5.5V, V_{ESD} = 8kV, $C_D$max = 1pF, 4 lines, AEC-Q101 qualified	AEC-Q101	SOT457
USB2.0 USB2.0 OTG Headphones	PESD5V0V1BB	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 13pF, single line, bi-directional ESD protection	AEC-Q101	SOD523
In-Vehicle networks LIN CAN (FD) FlexRay	PESD2CAN PESD1IVN27-A PESD2IVN24-T PESD1FLEX	V_{RWM} of 24/27 V, V_{ESD} up to 30 kV, $C_D$max = 30 pF, single/dual line bidirectional	AEC-Q101	SOT23 SOT323 SOD323
Ethernet SPDIF I²C SPI/SSI	PESD1LVDS PESD2ETH-AX PRTR5V0U4D PESD5V0U1BA IP4220CZ6	V_{RWM} of 5.5 V, V_{ESD} up to 30 kV, $C_D$max = 16 pF, bidirectional	AEC-Q101	DFN2510-10 SOT143B SOT457 SOD323
I²C SPI/SSI	NUP1301	V_{RWM} of 80V, V_{ESD} = 30kV, $C_D$max = 0.75pF, single line unidirectional (rail-to-rail)	AEC-Q101	SOT23
Digital GPIO low voltage comparator	PESD5V0S1BA	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max= 45pF, single line bidirectional	AEC-Q101	SOD323
	PESD5V2S2UT	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 152pF, two line unidirectional	AEC-Q101	SOT23
	PESD3V3S4UD	V_{RWM} of 3.3V, V_{ESD} = 30kV, $C_D$max = 300pF, two line unidirectional		SOT457
Analog GPIO	PESD36VS1UJ	V_{RWM} of 36V, V_{ESD} = 30kV, $C_D$max = 30pF, single line unidirectional	AEC-Q101	SOD323F
	PESD36VS2UT	V_{RWM} of 36V, V_{ESD} = 30kV, $C_D$max = 35pF, two line unidirectional	AEC-Q101	SOT23
RS-232, RS-485	PESD15VS2UT	V_{RWM} of 15V, V_{ESD} = 30kV, $C_D$max = 70pF, two line unidirectional	AEC-Q101	SOT23
USB2.0 USB2.0 OTG HDMI, I²C SPI/SSI	PUSB2X4Y	V_{RWM} of 5.5V, V_{ESD} = 12kV, $C_D$max = 0.85pF, 4 lines, ultra-low clamping		SOT363
	PUSB2X4D PRTR5V0U4D	V_{RWM} of 5.5V, V_{ESD} = 8kV, $C_D$max = 1pF, 4 lines	AEC-Q101	SOT457
	PESD5V0V1BB	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 13pF, single line, bidirectional ESD protection	AEC-Q101	SOD523

Available Packages

Package	Size / mm
SOD323	1.7 x 1.25
SOD323F	1.7 x 1.25
SOD523	1.2 x 0.8

Package	Size / mm
SOT23	2.9 x 1.3
SOT363	2.0 x 1.25
SOT457	2.9 x 1.5

Package	Size / mm
DFN1006-3	0.6 x 1.0
DFN2111-7	2.1 x 1.1
DFN2510-10	2.5 x 1.0
DFN2510A-10	2.5 x 1.0
DSN0603-2	0.6 x 0.3

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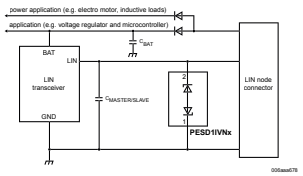
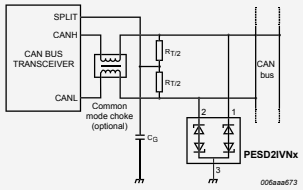
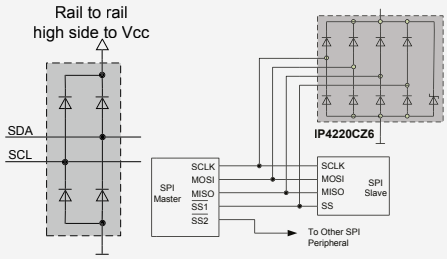
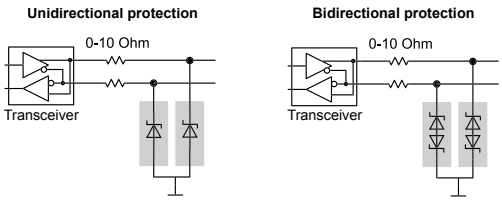
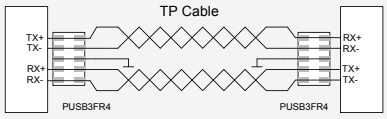
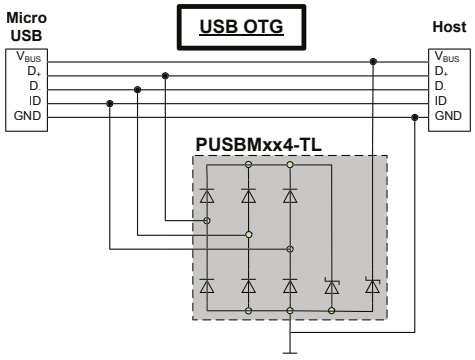
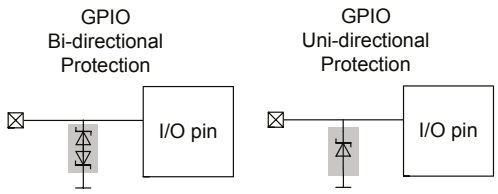
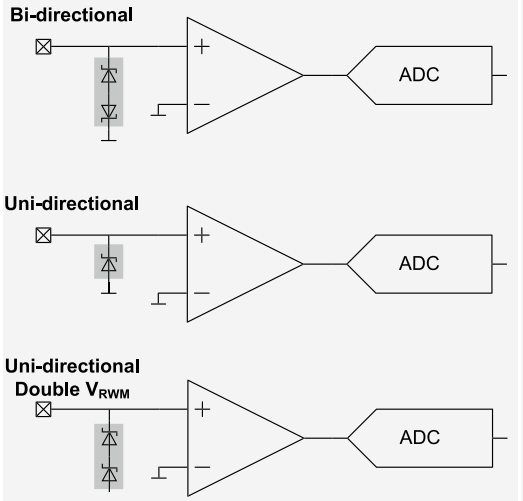
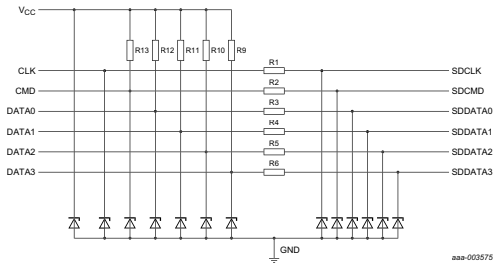
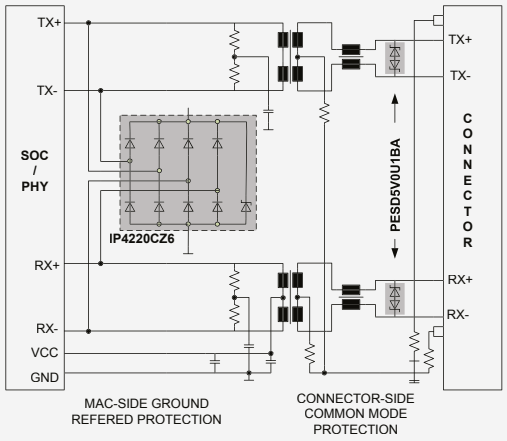
In-Vehicle Networks

Interface	Product	Part Number	Key electrical features	Packages
LIN		**PESDxCAN family** **PESDxIVN family**	V_{RWM} of 24/27 V, V_{ESD} up to 30 kV, $C_D$max = 30 pF, single line bidirectional	**SOD323**
CAN (FD) **FLEXRAY** **SENT**		**PESDxCAN family** **PESDxIVN family** **PESD1FLEX**	V_{RWM} of 24/27 V, V_{ESD} up to 30 kV, $C_D$max = 30 pF, single line bidirectional	**SOT23** **SOT323**

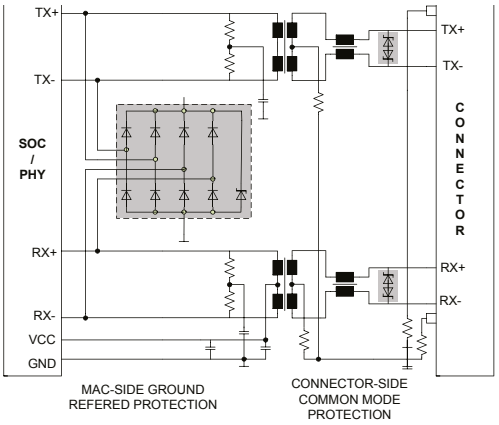
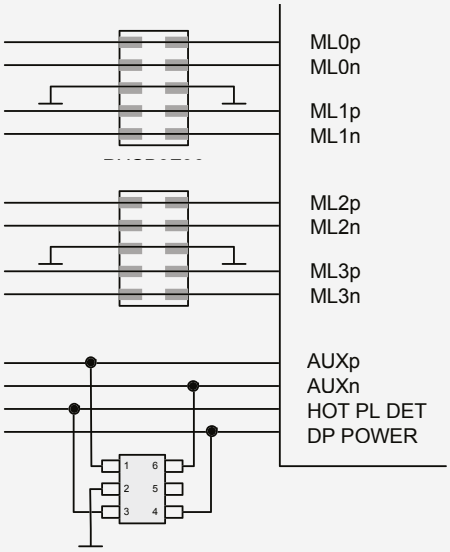
ESD protection for serial buses

I²C **SPI/SSI**	 ESD protection for 100 – 400kHz fast mode I²C and 100 MHz SSI with rail-to-rail configuration to minimize capacitive loading	**NUP1301** **IP4220CZ6** **PUSB2X4Y**	V_{RWM} = 80V, V_{ESD} = 30kV, $C_D$max = 0.75pF, single line unidirectional (rail-to-rail) V_{RWM} = 5.5V, V_{ESD} = 8kV, $C_D$max = 40pF, bidirectional ESD protection V_{RWM} = 5.5V, V_{ESD} = 12kV, $C_D$max = 0.85pF, 4 lines, ultra-low clamping	**SOT23** **SOT457** **SOT363**
RS-232, **RS-485**		**PESD18VF1BL** **PESD15VS2UT**	V_{RWM} of 18V, V_{ESD} = 10kV, $C_D$max = 0.5pF, single line bidirectional V_{RWM} of 15V, V_{ESD} = 30kV, $C_D$max = 70pF, dual line unidirectional	**DFN1006-2** **SOT23**
LVDS, CML, **TMDS**	 High-speed differential mode signaling	**PUSB3FR4** **PESD1LVDS**	V_{ESD} = 15kV, $C_D$max = 0.34pF V_{RWM} = 5V, V_{ESD} = 8kV, $C_D$max = 0.6pF	**DFN2510-10** **DFN2510-10**
USB2.0 **USB2.0 OTG**	 USB2.0 OTG protection USB2.0 OTG VBUS protection	**PUSB2X4Y** **PRTR5V0U4D** **PESD5V0X1ULD** **PESD5V0U2BM** **PESD5V0V1BB** **PUSBMxxVX4-TL**	V_{RWM} = 5.5V, V_{ESD} = 12kV, $C_D$max = 0.85pF, 4 lines, ultra-low clamping V_{RWM} = 5.5V, V_{ESD} = 8kV, $C_D$max = 1pF, 4 lines, AEC-Q101 qualified V_{RWM} = 5.5V, V_{ESD} = 8kV, $C_D$max = 1.1pF, 1 line, uni-directional V_{RWM} = 5V, V_{ESD} = 10kV, $C_D$max = 3.5pF, 2 high-speed data lines (D+/D-) V_{RWM} = 5V, V_{ESD} = 30kV, $C_D$max = 13pF, single line, bi-directional ESD protection (ID) V_{RWM} = 5.5V, V_{ESD} = 8 kV, 3x high speed data and 1x integrated VBUS protecion for USB OTG	**SOT363** **SOT457** **DFN1006-2** **DFN1006-3** **SOD523** **DFN1616**

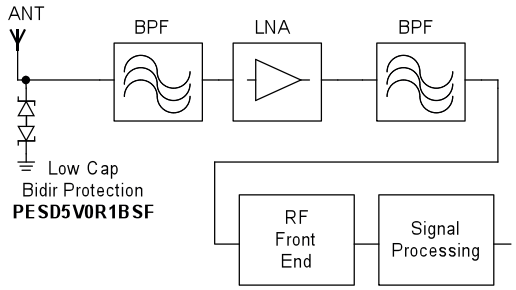
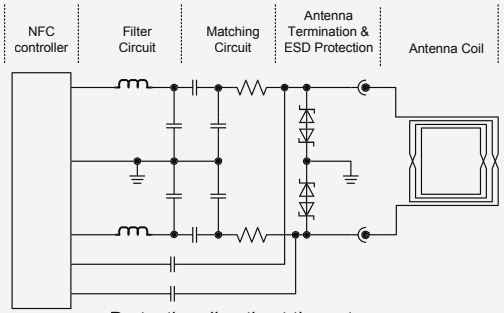
ESD protection for general I/O interfaces, microSD, Ethernet

Interface	Product	Part Number	Key electrical features	Packages
Digital GPIO low voltage comparator		**PESD5V0S1BL**	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 45pF, single line bidirectional	**DFN1006-2**
		PESD5V0S1BA	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 45pF, single line bidirectional	**SOD323**
		PESD5V2S2UT	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 152pF, two line unidirectional	**SOT23**
		PESD3V3S4UD	V_{RWM} of 3.3V, V_{ESD} = 30kV, $C_D$max = 300pF, two line unidirectional	**SOT457**
Analog GPIO		**PESD36VS1UL**	V_{RWM} of 36V, V_{ESD} = 30kV, $C_D$max = 30pF, single line unidirectional	**DFN1006-2**
		PESD36VS1UJ	V_{RWM} of 36V, V_{ESD} = 30kV, $C_D$max = 30pF, single line unidirectional	**SOD323F**
		PESD36VS2UT	V_{RWM} of 36V, V_{ESD} = 30kV, $C_D$max = 35pF, two line unidirectional	**SOT23**
microSD card power		**IP4340CX15**	V_{RWM} of 5V, V_{ESD} = 15kV, $C_D$max = 14pF, $_{ESD}$ + EMI	**DFN2514-12**
Ethernet		**PESD5V0U1BA**	V_{RWM} of 5V, V_{ESD} = 10kV, $C_D$max = 3.5pF, single line bidirectional ESD protection	**SOD323**
		IP4220CZ6	V_{RWM} of 5.5V, V_{ESD} = 8kV, $C_D$max = 40pF, bidirectional ESD protection	**SOT457**

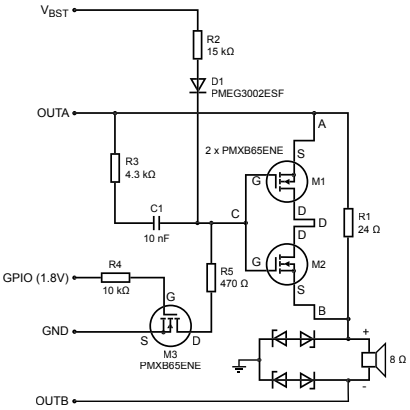
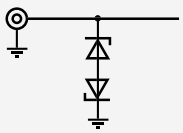
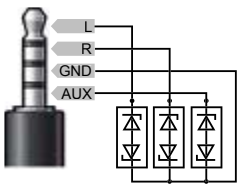
ESD protecion for display interfaces

Interface	Product	Part Number	Key electrical features	Packages
HDMI	 Companion IC for HDMI protection, LDO, level shift, buffering HDMI ultra-low capacitance ESD protection only	**IP4786CZ32** **PHDMI2F4** **PUSB2X4Y**	TX, single-chip HDMI companion V_{RWM} of 5.5V, V_{ESD} = 10kV, $C_D$max = 0.6pF, 2 channel high-speed TMDS line protection V_{RWM} of 5.5V, V_{ESD} = 12kV, $C_D$max = 0.85pF, 4 lines, ultra-low clamping	**DFN5050-32** **DFN2510A-10** **SOT363**
Display Port	 Display Port differential data pairs ultra-low capacitance ESD protection	**PUSB3FR4** **PUSB2X4Y**	V_{RWM} of 3.3V, V_{ESD} = 15kV, $C_D$max = 0.34 V_{RWM} of 5.5V, V_{ESD} = 12kV, $C_D$max = 0.85pF, 4 lines, ultra-low clamping	**DFN2510A-10** **SOT363**

ESD protection for RF / wireless

Interface	Product	Part Number	Key electrical features	Packages
PGS / GNS WLAN	 RF antenna extremly low capacitance ESD protection	**PESD5V0R1BSF**	V_{RWM} of 5V, V_{ESD} = 10kV, $C_D$max = 0.15pF, single line bidirectional	**DSN0603**
NFC	 Protection directly at the antenna	**PESD18VF1BL** **PESD24VF1BL**	V_{RWM} of 18V, V_{ESD} = 10kV, $C_D$max = 0.5pF V_{RWM} of 24V, V_{ESD} = 10kV, $C_D$max = 0.5pF	**DFN1006-2** **DFN1006-2**

ESD protection for audio interfaces

Interface	Product	Part Number	Key electrical features	Packages
Audio Codec		**PESD12VV1BL**	V_{RWM} = 12V, $C_D$max = 17pF , V_{ESD} = 30kV	**DFN1006-2**
SPDIF	 digital port ESD protection	**PESD5V0X1BCAL** **PESD5V0U1BA**	V_{RWM} of 5.5V, V_{ESD} = 15kV, $C_D$max = 0.95pF, single line bidirectional V_{RWM} of 5V, V_{ESD} = 10kV, $C_D$max = 3.5pF, single line bidirectional	**SOD323** **SOD323**
Headphones		**PESD5V0V1BB**	V_{RWM} of 5V, V_{ESD} = 30kV, $C_D$max = 13pF, single line, bi-directional ESD protection	**SOD523**

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