

# Integrated common mode filter & protection solving EMI & electrostatic challenges



High-speed wired lines and popular wireless standards frequently interfere in the Gigahertz range, resulting in EMI disturbance for mobile users. Nexperia has designed common mode filters with electrostatic discharge protection for 1, 2 and 3 differential line pairs that attenuate common mode signals and deliver superior communications experiences. Our solutions provide common mode noise suppression over all bands, with high suppression at 2.5 GHz and 5 GHz, the fundamentals of USB 3.x



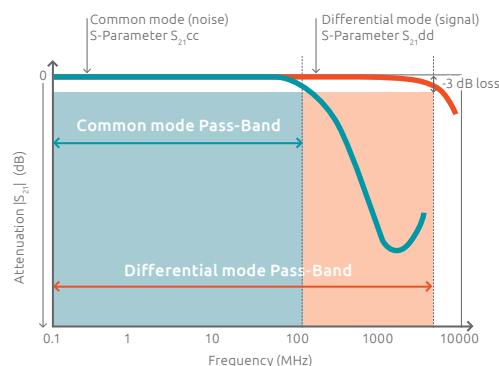
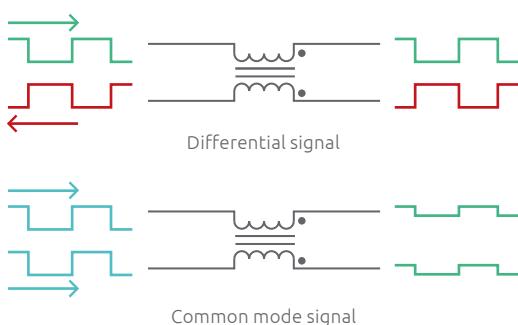
## Benefits

- › Effective 1, 2 & 3 line pairs protection and filtering
- › USB 3.x & HDMI2 optimized common mode suppression
- › Proven 10+ Gbps communications lines protection
- › Providing high system-level robustness for sensitive SoCs
- › Minimized reflections compared to discrete CMF + additional ESD
- › Low clamping and dynamic resistance using TrEOS technology

## Features

- › Protection up to 6 lines (Tx +/-, Rx +/-, D +/-)
- › Wide differential passband (up to 8.1 GHz 3dB frequency)
- › Up to -32 dB CM rejection at 2.5 GHz & up to -19 dB at 5 GHz (USB3 fundamentals)
- › Up to -31 dB CM rejection at 3 GHz HDMI fundamental
- › Low-inductance & space-saving WLCSP packages
- › Footprint-compatible with ESD-only solutions
- › Exceeding IEC 61000-4-2 ESD ruggedness standard

## Common Mode Filter lets differential signals pass and attenuates common-mode noise



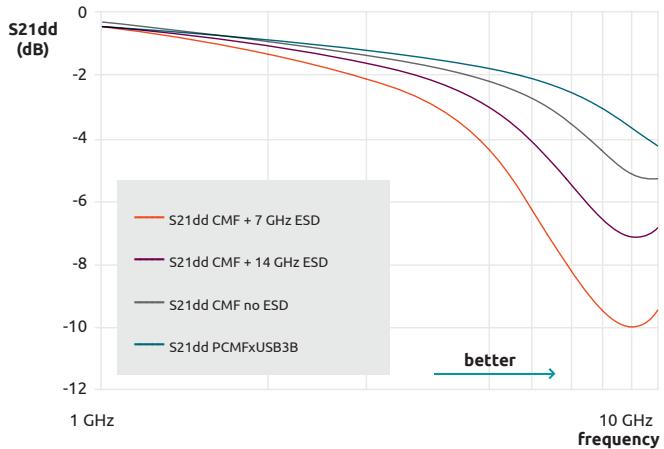
**nexperia**

EFFICIENCY WINS.

## PCMF - Performance advantage thanks to integration

Nexperia's PCMF series integrate ESD protection and CMF in a single device which offers an unmatched overall performance. When comparing a standalone CMF solution to a combination of discrete CMF and discrete 7 GHz or 14 GHz differential pass band ESD protection, performance losses are notable. In contrast to this, our PCMFxUSB3B already delivers a performance advantage of more than 1 GHz compared to the standalone CMF without ESD protection. Our PCMFxUSB3B also brings an advantage in Common Mode Rejection at the critical USB3 fundamentals: while the standalone CMF shown has an attenuation of -18 dB at 2.5 GHz and -13.7 dB at 5 GHz, PCMFxUSB3B offers respectively -22 dB and -16.4 dB Common Mode Rejection at these fundamentals.

## Differential pass-band performance



Types in **bold** represent new products

## Parametrics

	Function	Line pairs	Layout	RF key data	Outline	Robustness		System protection (lower is better)
				Differential pass-band* (GHz)		Package	Robustness ESD contact at IEC61000-4-2 (kV)	
<b>PCMF1USB3B/C</b>	CMF + ESD	1	Bidirectional	8.1	WLCSP5	20	9.5	0.2
PCMF1USB3S	CMF + ESD		Unidirectional	> 6		15	7	0.14
PCMF1HDMI2S	CMF + ESD		Unidirectional	> 6		15	7	0.16
PESD1USB3S	ESD protection		Unidirectional	17		15	8	0.16
<b>PESD1USB3B/C</b>	ESD protection		Bidirectional	16.1		20	9.5	0.2
<b>PCMF2USB3B/C</b>	CMF + ESD	2	Bidirectional	8.1	WLCSP10	20	9.5	0.2
PCMF2USB3S	CMF + ESD		Unidirectional	> 6		15	7	0.14
PCMF2HDMI2S	CMF + ESD		Unidirectional	> 6		15	7	0.16
PESD2USB3S	ESD protection		Unidirectional	17		15	8	0.16
<b>PESD2USB3B/C</b>	ESD protection		Bidirectional	16.1		20	9.5	0.2
<b>PCMF3USB3B/C</b>	CMF + ESD	3	Bidirectional	8.1	WLCSP15	20	9.5	0.2
PCMF3USB3S	CMF + ESD		Unidirectional	> 6		15	7	0.14
PCMF3HDMI2S	CMF + ESD		Unidirectional	> 6		15	7	0.16
PESD3USB3S	ESD protection		Unidirectional	17		15	8	0.16
<b>PESD3USB3B/C</b>	ESD protection		Bidirectional	16.1		20	9.5	0.2

\* Normalized to attenuation at 1 MHz

## Package details

Our PCMF family is available in wafer level chip-size package known as WLCSP. Five, ten and fifteen bump variants of this package are proposed, respectively catering to single-, dual- and triple-channel needs.

Package name	Dimensions (L x W x H, in mm)	
WLCSP5	0.8 x 1.2 x 0.6, 0.4	
WLCSP10	1.6 x 1.2 x 0.6, 0.4	
WLCSP15	2.4 x 1.2 x 0.6, 0.4	

Browse our full portfolio of common mode filtering with ESD protection:

<https://www.nexperia.com/products/esd-protection-tvs-filtering-and-signal-conditioning-esd-protection/emi-solutions-with-integrated-protection/common-mode-filter-for-usb-ports>

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