ECMF™ series portfolio overview

Common-mode filters embedding ESD protection

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Is this presentation suited for you?

Where do you stand with common-mode noise filtering?

Beginner?	**Intermediate?**	**Advanced?**
I am not familiar with this subject. I am in the discovery phase and would like an overview and a basic understanding of the technology.	I have a basic understanding of this subject. I would like to go deeper in details and tackle more aspects of this subject.	I am very familiar with this subject. I would like to deepen my knowledge and become an expert.
Click here to continue to next slide	**Click here to open new presentation**	**Click here to open new presentation**
Overview	**Basic**	**In depth**

Purpose of common-mode filtering

- When subjected to common-mode noise, high-speed differential lines generate unwanted radiated noise.

- Common-mode filters prevent differential lines from radiating and interfering with other RF signals nearby.

Differential transmission

NO radiated noise

Radiated
noise is generated !

Receiver

Emitter

D+

D-

CMF

| D1+ | | D1+ |
| D1- | | D1- |

CMF symbol

Conduction noise
Ex : internal clock, …

Coupled noise
Ex : RF spike

Noise + Skew
Ex : +100 ps on D-

**Common mode sources**

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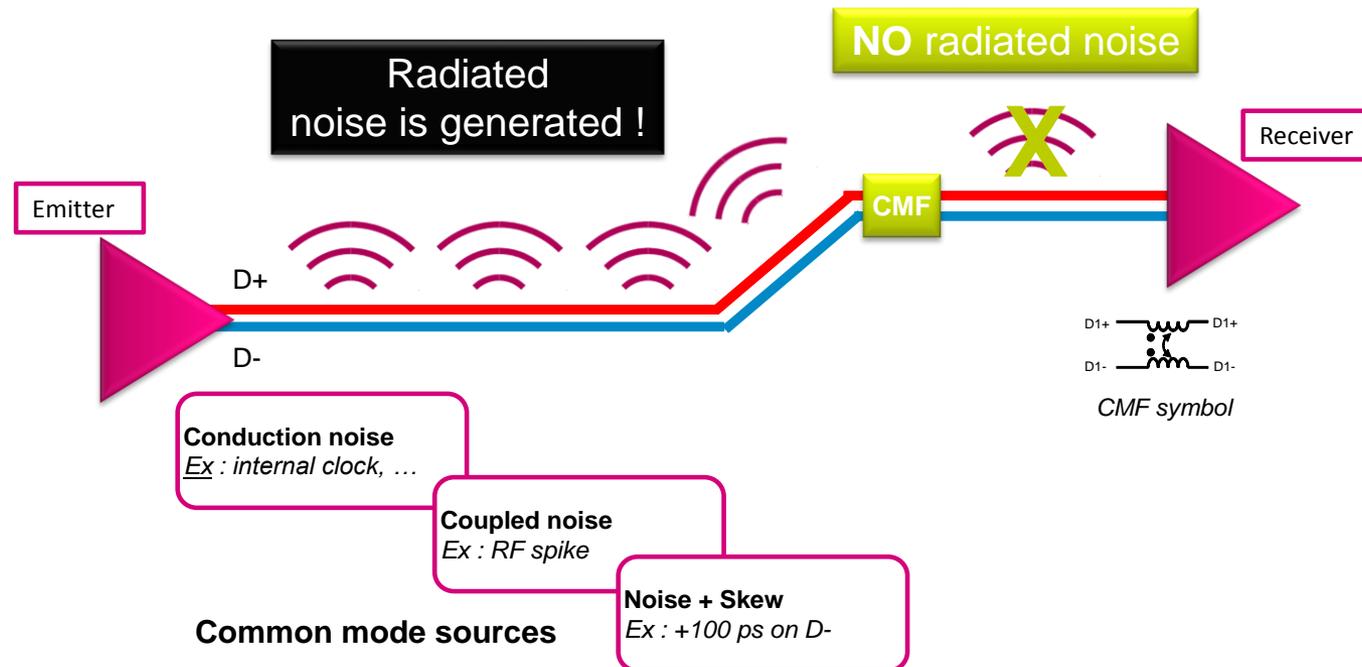
Troubleshooting antenna desense

- The sensitivity of reception antennas is degraded by radiated noise from high-speed data lines when there is:
  - Proximity between the 2 elements
  - Radiated common-mode noise at the antennas reception frequency spectrum

- By eliminating radiated common-mode noise, ECMF™ preserves the antenna sensitivity.

Example with Wi-Fi antenna / USB 3.0 port:

Without ECMF

Antenna wifi

D+

D-

High speed differential line
E.g. : USB3.0
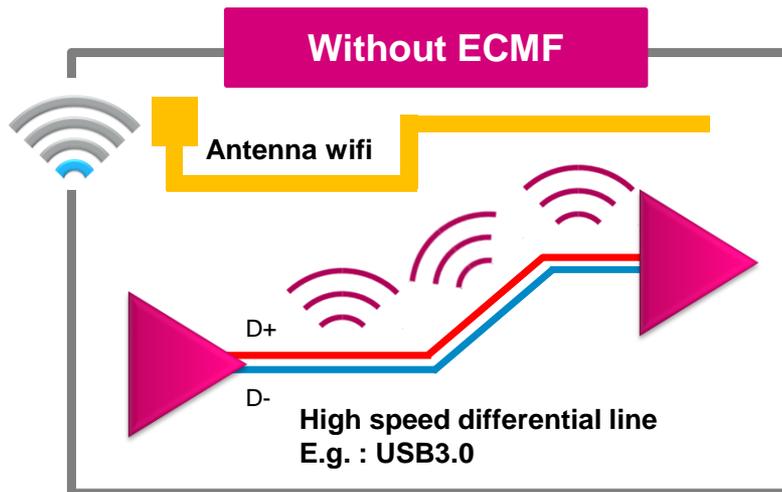
**Degraded sensitivity
Loss of connection**

With ECMF

Antenna wifi

D+

CMF

D-

High speed differential line
E.g. : USB3.0
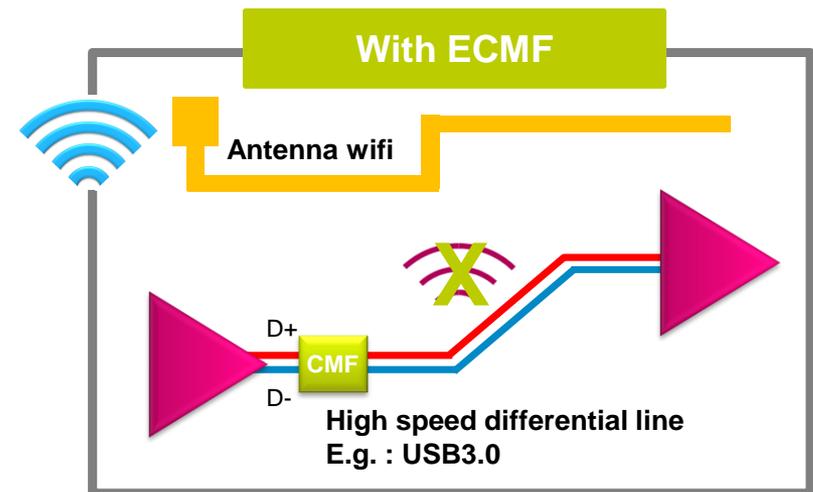
Sensitivity preserved

When you have to implement high-speed lines in your RF system, you need to think CMF

High-speed lines

CMF

Antenna

D+
D-
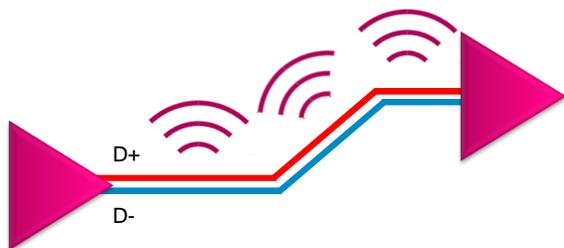
Avoid desense

- **MIPI**
- **SATA**
- **HDMI**
- **DisplayPort**
- **USB 2.0**
- **USB 3.1**

- **Wi-Fi**
- **Bluetooth**
- **GPS**
- **WCDMA**
- **LTE**
- **Sub-GHz**
- **ZigBee**

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ESD protection

CMF
(Common-mode filter)

- Low dispersion semiconductor process
- Advanced technology for optimized performances
- Very small size
- High and deep rejection
- Low clamping voltage
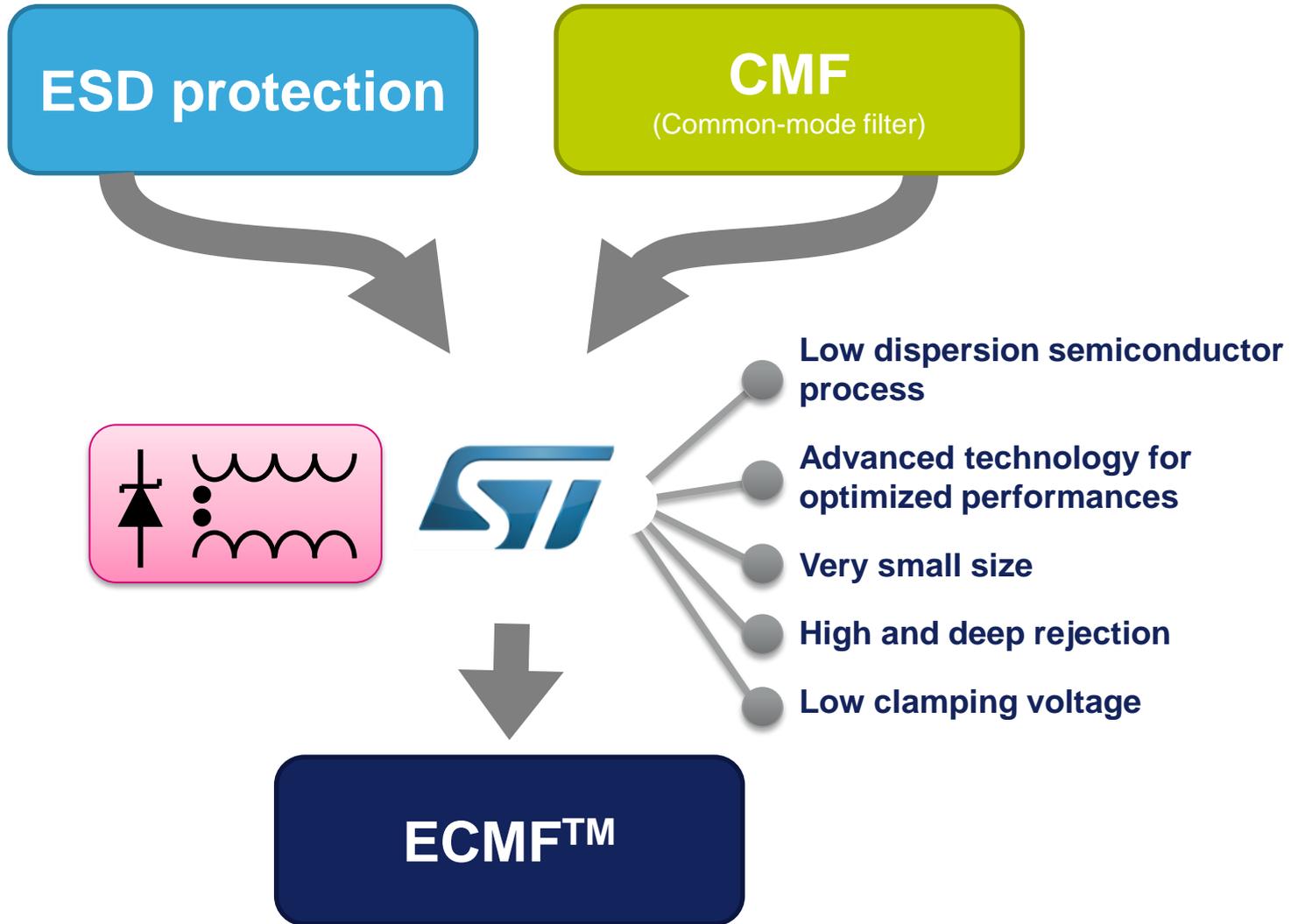
ECMF™

Selection guide – ECMF™

DIFFERENTIAL BANDWIDTH
complies with the following standards

Speed Class 1
• **MIPI D-PHY (DSI & CSI)**
• **USB 2.0, MHL 2.0**
• **HDMI 1.4**
• **DisplayPort™**
• **SATA**

Speed Class 2
• **Speed Class 1 interfaces**
• **MIPI M-PHY (DSI & CSI)**
• **USB 3.0**
• **USB 3.1**
• **HDMI 2.0**

Part number	Number of lanes			Peak rejection frequency (> -20 dB) (GHz)				Z_{CC21} @ 100 MHz (Ω)	Speed class		Package type	Package size X × Y (mm)
	1	2	3	0.7-0.9	1.5	1.8-2.4	5		I	II		
ECMF02-3F3	●			●				24	●		Flip-Chip	0.83 x 1.33
ECMF02-2BF3	●			●	●			14	●		Flip-Chip	0.83 x 1.23
ECMF02-4CMX8	●			●	●			16	●		µQFN-8L	1.20 x 2.50
ECMF02-2HSMX6	●			●	●	●	●	50		●	µQFN-6L	1.50 x 1.70
ECMF02-2AMX6	●			●	●			16	●		µQFN-6L	1.50 x 1.70
ECMF02-3HSM6	●			●				30		● (*)	µQFN-6L	1.35 x 1.60
ECMF04-4HSM10		●		●				30		● (*)	µQFN-10L	1.35 x 2.60
ECMF04-4HSWM10		●			●	●		30		●	µQFN-10L	1.35 x 2.60
ECMF04-4AMX12		●		●	●			16	●		µQFN-12L	1.50 x 3.30
ECMF06-6HSM16			●	●				30		● (*)	µQFN-16L	1.35 x 4.10
ECMF06-6AM16			●	●	●	●		15	●		µQFN-16L	1.35 x 3.30

Let's go further

Basic presentation

Intermediate product presentation soon available:
'Understanding ST's ECMF™ series specification'

In-depth information

Application Notes:
- Common-mode filters (AN4511)
- Antenna desense on handheld equipment (AN4356)
- MHL filtering and protection (AN4540)

Models - S parameters

Selection

- Selection guide *[pdf]*
- www.st.com/ecmf-ipad

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Thank you