ECMF™ series portfolio overview

Common-mode filters embedding ESD protection
Is this presentation suited for you?

Where do you stand with common-mode noise filtering?

- **Beginner?**
  - 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.

- **Intermediate?**
  - I have a basic understanding of this subject. I would like to go deeper in details and tackle more aspects of this subject.

- **Advanced?**
  - 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
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**

- **Radiated noise is generated!**
- **No radiated noise**
- **Common mode sources**
  - Conduction noise  
    *Ex: internal clock, …*
  - Coupled noise  
    *Ex: RF spike*
  - Noise + Skew  
    *Ex: +100 ps on D-*

**CMF symbol**
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
- High speed differential line
  E.g. : USB3.0

**With ECMF**

- Antenna wifi
- High speed differential line
  E.g. : USB3.0

**Degraded sensitivity**

- Loss of connection

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

**High-speed lines**
- MIPI
- SATA
- HDMI
- DisplayPort
- USB 2.0
- USB 3.1

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

Avoid desense
… With integrated ESD protection

- 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™

<table>
<thead>
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<th>Part number</th>
<th>Number of lanes</th>
<th>Peak rejection frequency (&gt; -20 dB) (GHz)</th>
<th>$Z_{CC21}$ @ 100 MHz (Ω)</th>
<th>Speed class</th>
<th>Package type</th>
<th>Package size X x Y (mm)</th>
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### 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
Let’s go further

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

Basic presentation

In-depth information

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

Models - S parameters
- Selection guide [pdf]
- www.st.com/ecmf-ipad
Thank you