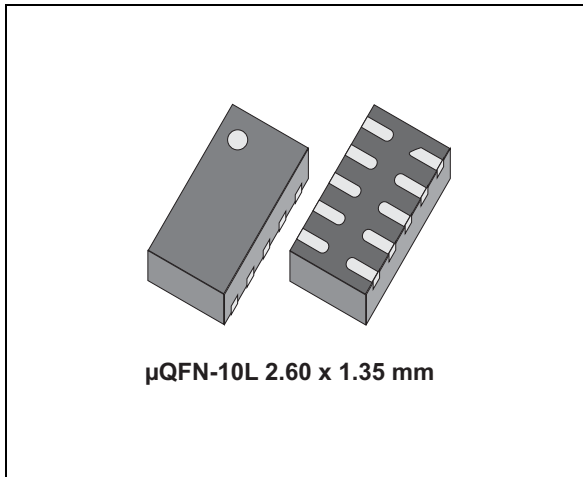
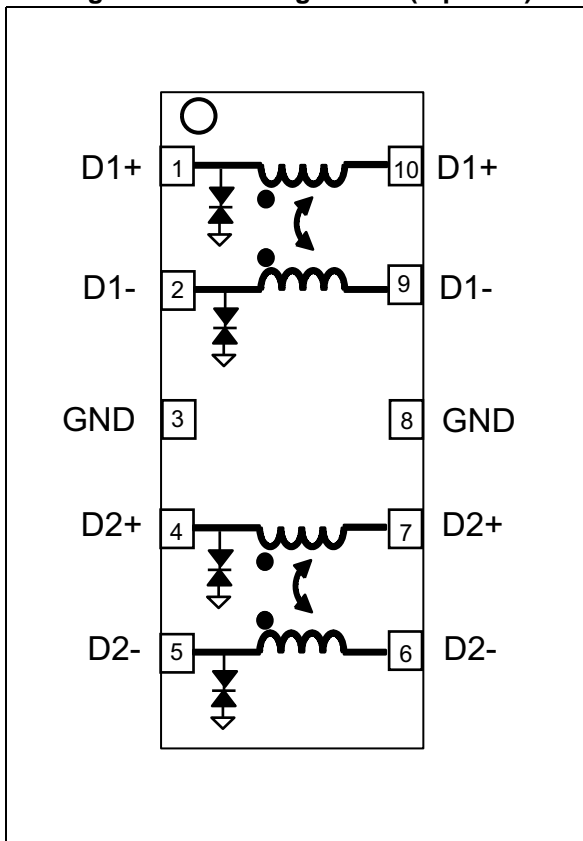


## Common-mode filter with ESD protection

[Datasheet - production data](#)



**Figure 1. Pin configuration (top view)**



### Features

- Very large differential bandwidth to comply with HDMI 2.0, USB3.0, MIPI, DisplayPort and other high speed serial interfaces
- High common mode attenuation on WLAN frequencies:
  - 28 dB at 2.4 GHz and -16 dB at 5.0 GHz
- Very good attenuation at LTE, GSM and GPS frequencies
- Large bandwidth: 4.2GHz
- Very low PCB space consumption
- Thin package: 0.55 mm max.
- Lead-free package
- High reduction of parasitic elements through integration

### Complies with the following standards:

- IEC 61000-4-2 level 4:
  - ±15 kV (air discharge)
  - ±8 kV (contact discharge)

### Applications

- Set top box
- Game console
- Portable devices

### Description

The ECMF04-4HSWM10 is a highly integrated common-mode filter designed to suppress EMI/RFI common mode noise on high-speed differential serial buses like HDMI 2.0, USB3.0, Ethernet, MIPI, DisplayPort and other high-speed serial interfaces. The device has a very large differential bandwidth to comply with these standards and can also protect and filter 2 differential lanes.

# Contents

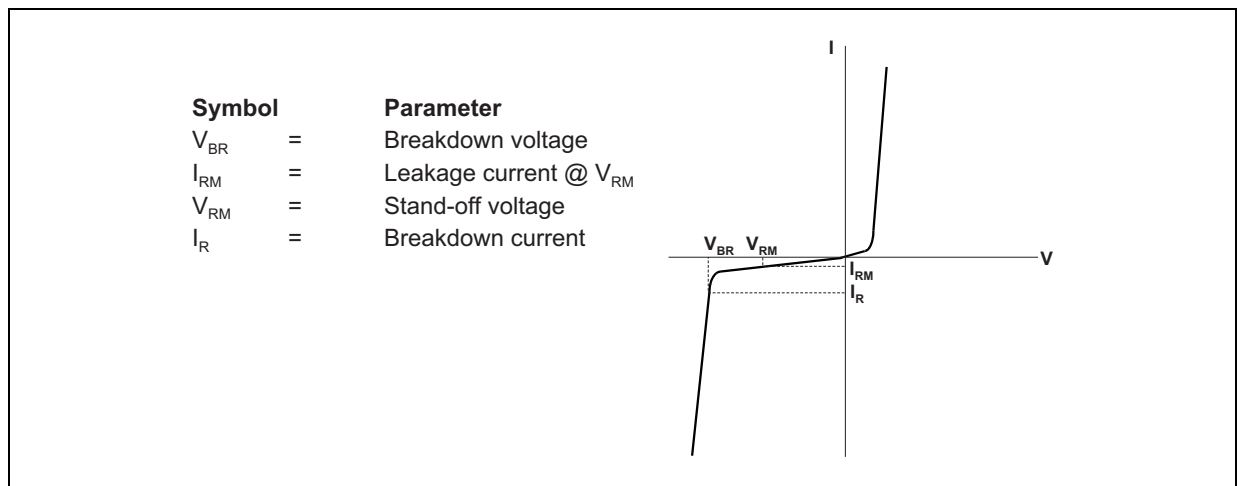
1	Characteristics .....	3
2	Application information .....	8
3	PCB layout recommendations .....	9
4	Package information .....	10
5	Ordering information .....	12
6	Revision history .....	12

# 1 Characteristics

**Table 1. Absolute maximum ratings ( $T_{amb} = 25\text{ °C}$ )**

Symbol	Parameter		Value	Unit
$V_{PP}$	Peak pulse voltage	IEC 61000-4-2 Contact discharge (connector side) Air discharge (connector side)	8 15	kV
$I_{RMS}$	Maximum RMS current		100	mA
$T_{op}$	Operating temperature range		-55 to +125	°C
$T_j$	Maximum junction temperature		125	°C
$T_{stg}$	Storage temperature range		-55 to +150	°C

**Figure 2. Electrical characteristics (definitions)**



**Table 2. Electrical characteristics ( $T_{amb} = 25\text{ °C}$ )**

Symbol	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR}$	$I_R = 1\text{ mA}$	4.5	5.5		V
$I_{RM}$	$V_{RM} = 3\text{ V per line}$			100	nA
$R_{DC}$	DC serial resistance		5		$\Omega$
$F_C$	-3dB differential mode cut-off frequency		4.2		GHz

Table 3. Pin description

Pin number	Description	Pin number	Description
1	D1+ to connector	6	D2- to IC
2	D1- to connector	7	D2+ to IC
3	GND	8	GND
4	D2+ to connector	9	D1- to IC
5	D2- to connector	10	D1+ to IC

Figure 3. Differential attenuation versus frequency ( $Z_{0\text{ diff}} = 100 \Omega$ )

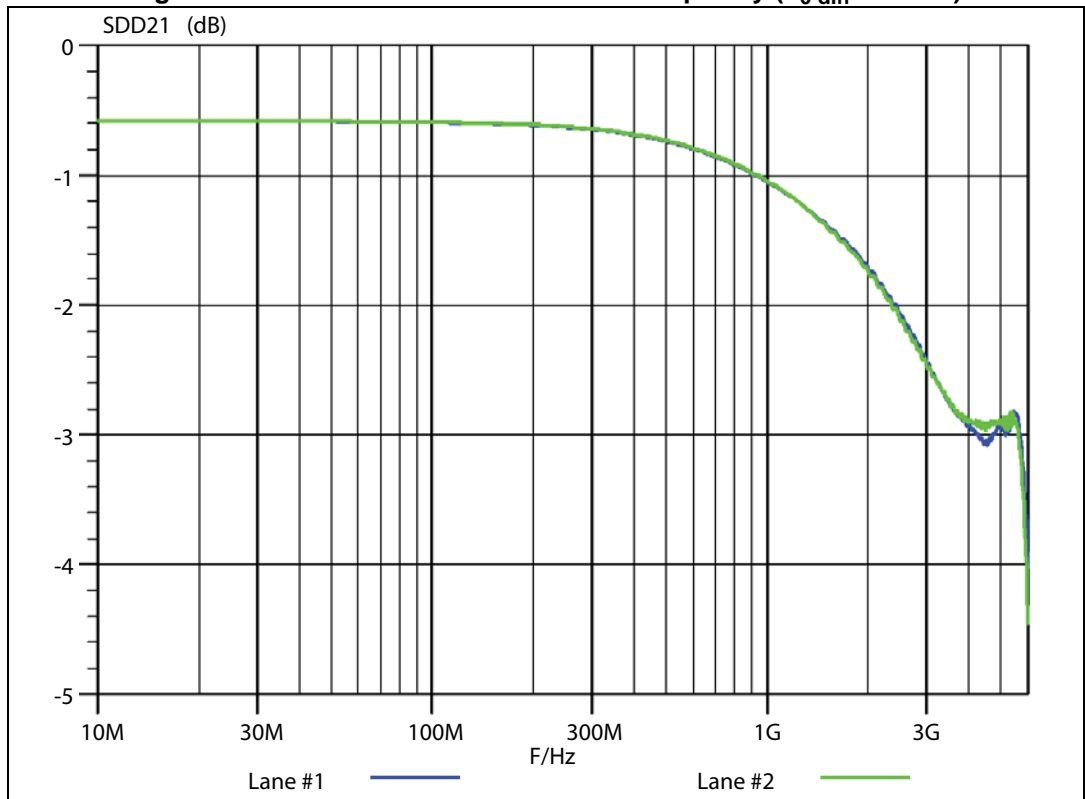


Figure 4. Common mode attenuation versus frequency ( $Z_{0\text{ com}} = 50 \Omega$ )

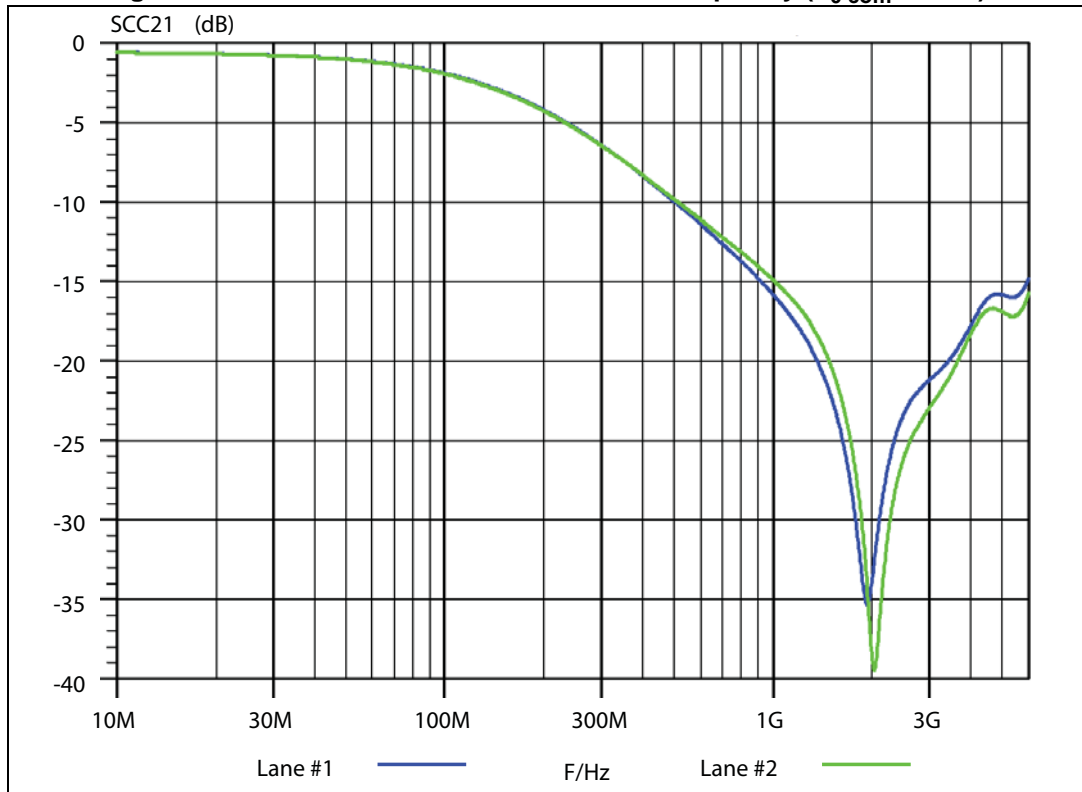


Figure 5. ESD response to IEC61000-4-2 (+8 kV contact discharge)

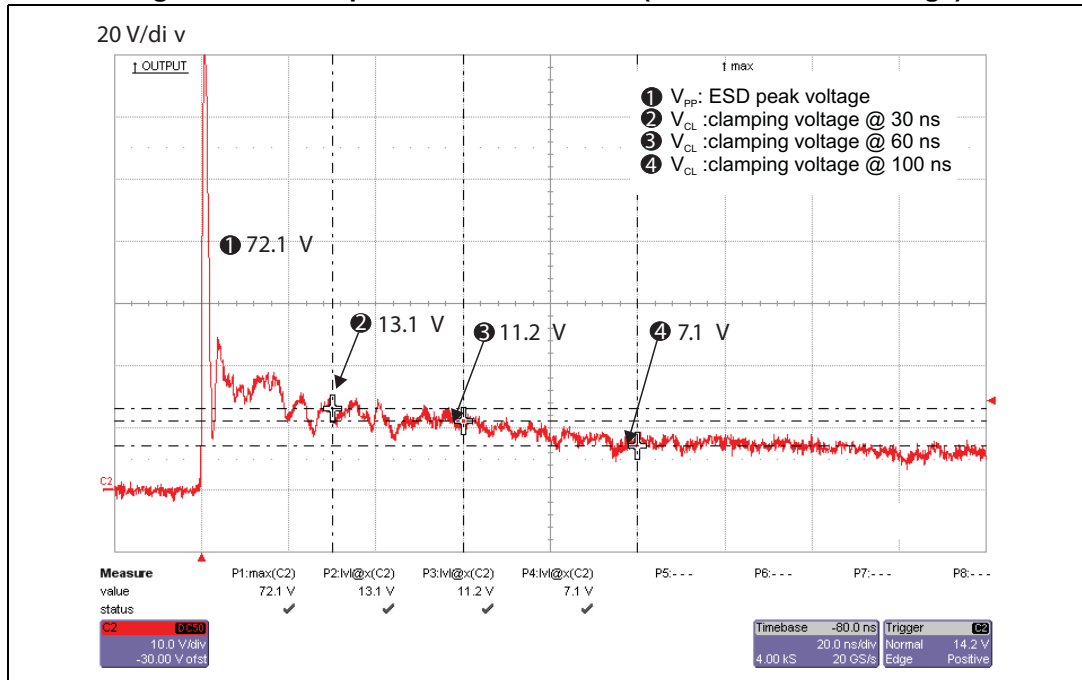


Figure 6. ESD response to IEC61000-4-2 (-8 kV contact discharge)

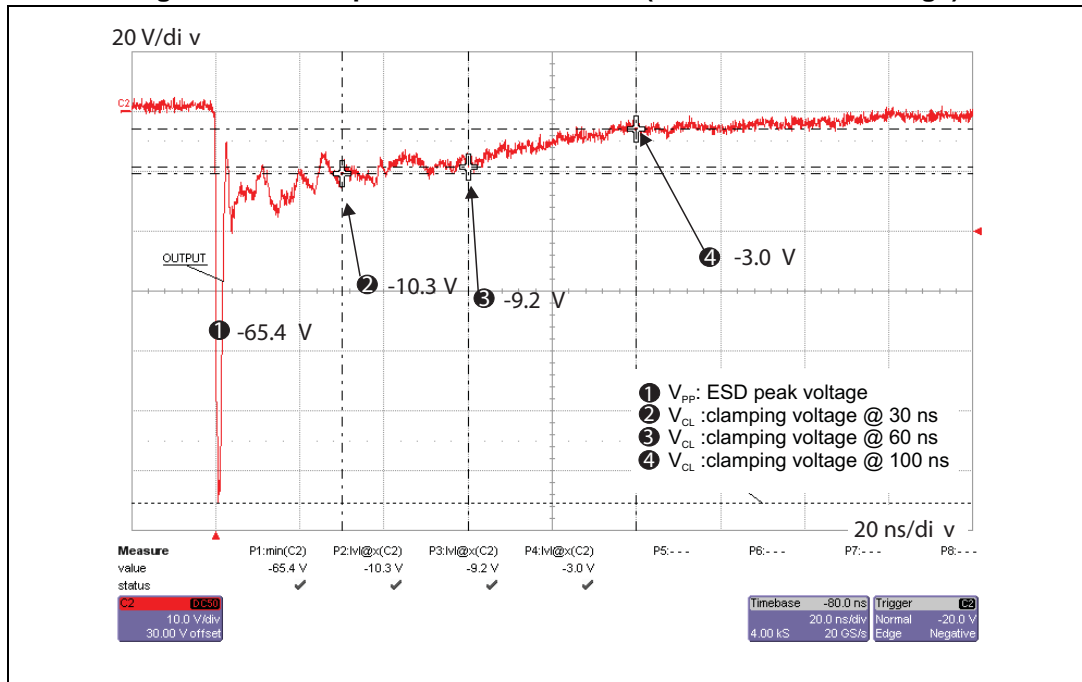


Figure 7. HDMI2.0 5.94 Gbps eye diagram without ECMF04-4HSWM10 (evaluation board with SMA connector)

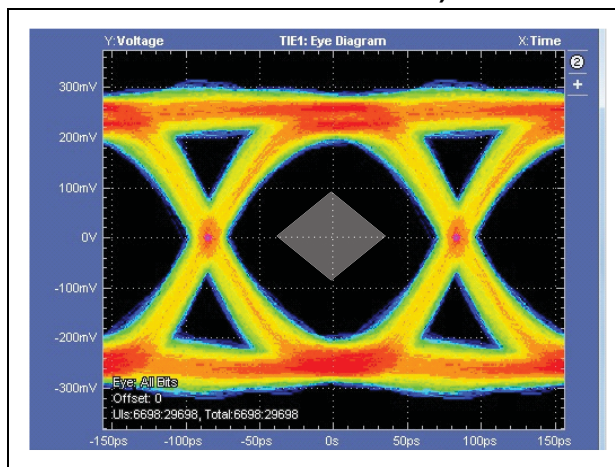


Figure 8. HDMI2.0 5.94 Gbps eye diagram with ECMF04-4HSWM10 (evaluation board with SMA connector)

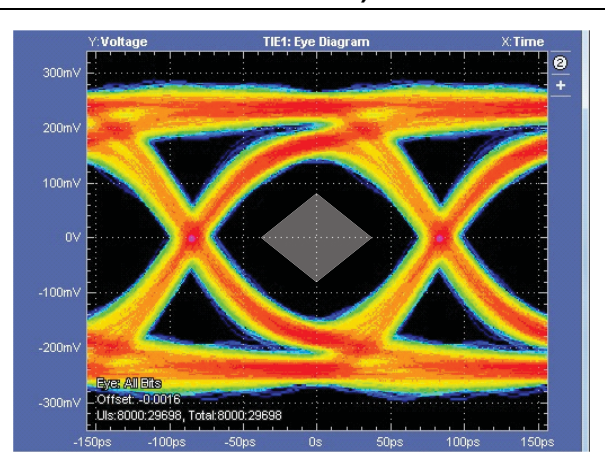


Figure 9. HDMI1.4 3.35 Gbps eye diagram without ECMF04-4HSWM10

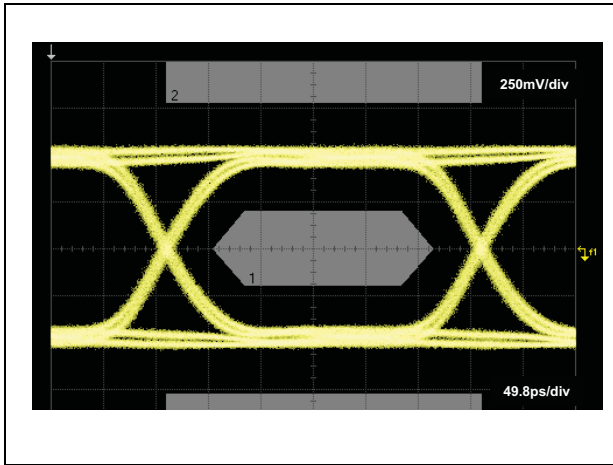


Figure 10. HDMI1.4 3.35 Gbps eye diagram with ECMF04-4HSWM10

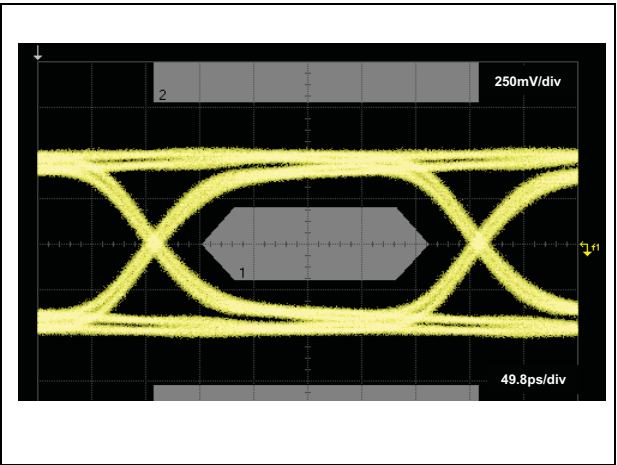
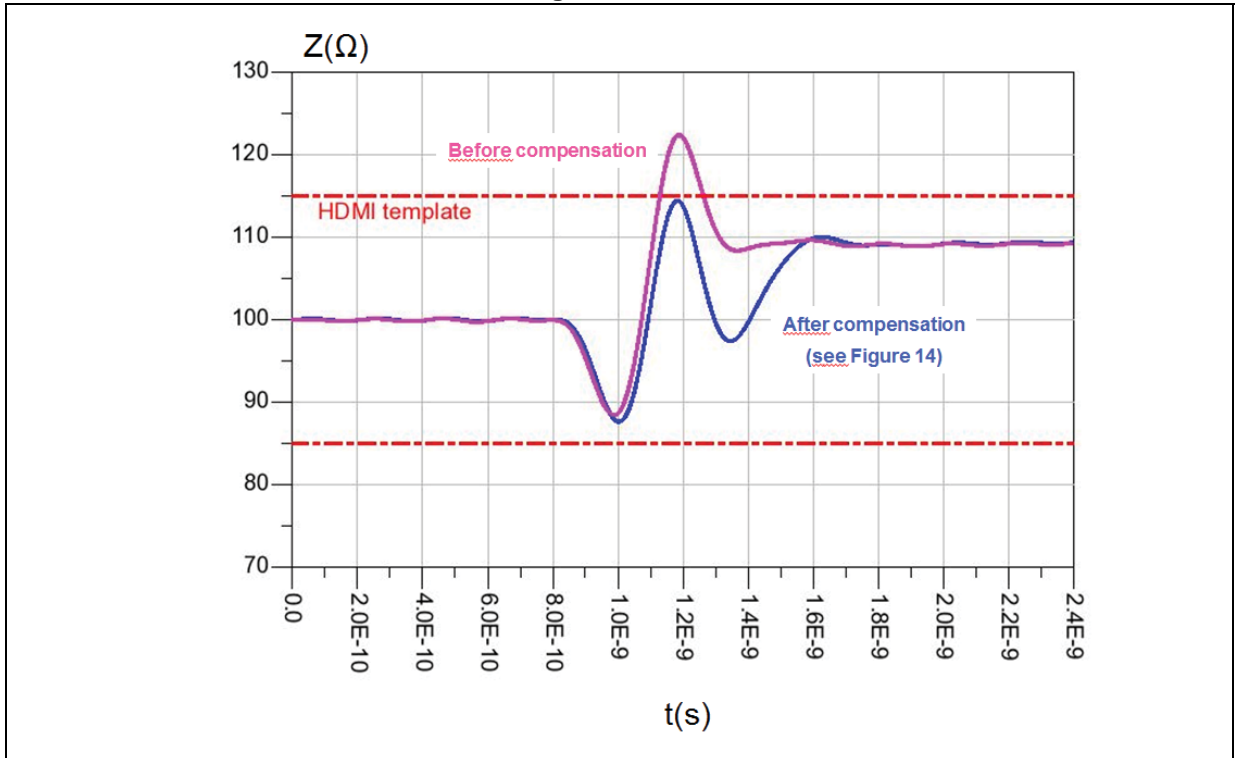


Figure 11. TDR



## 2 Application information

Figure 12. HDMI schematic

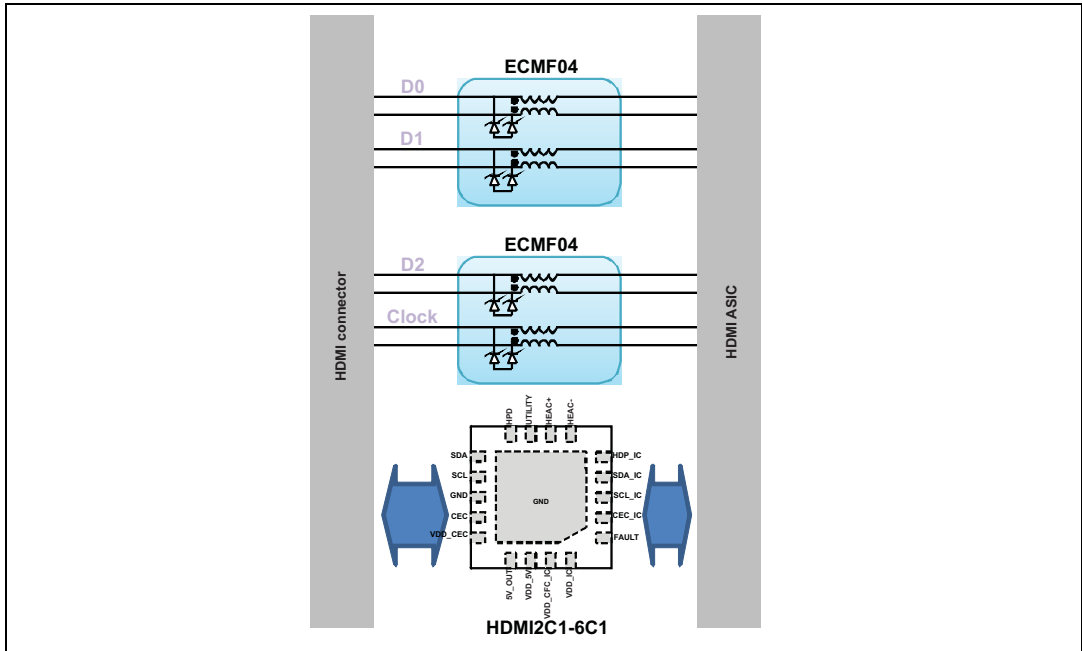
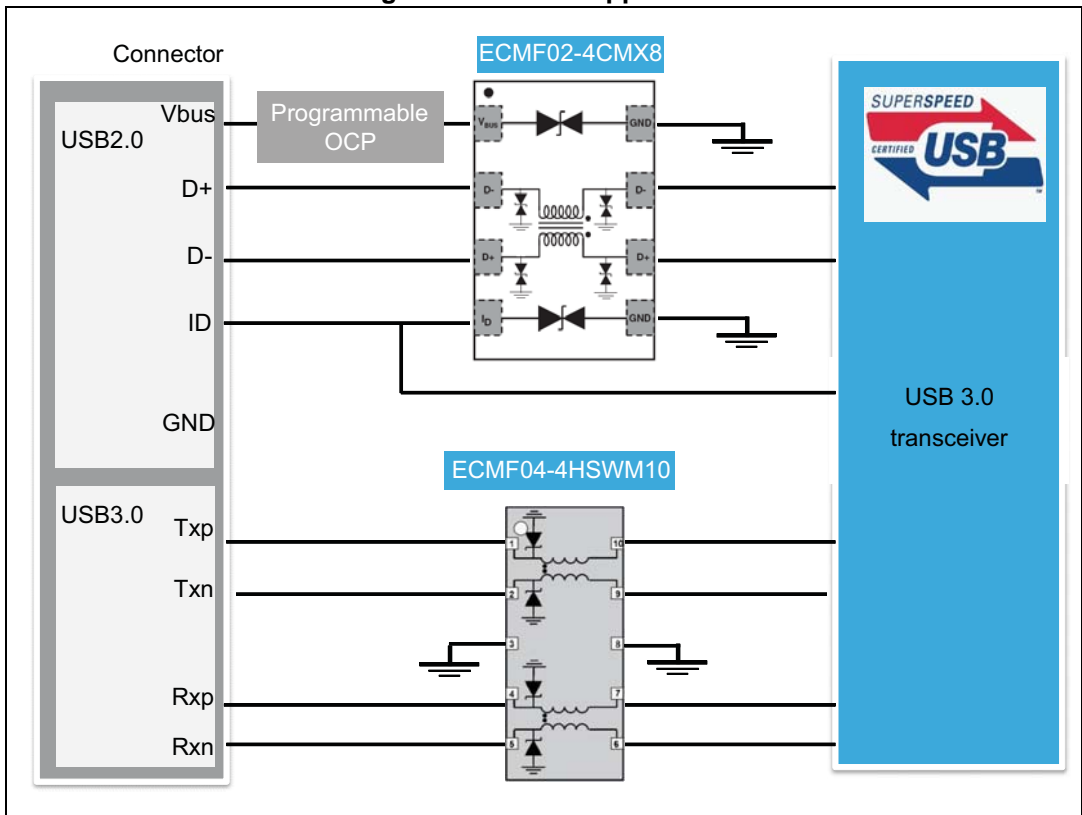


Figure 13. USB3.0 application





### 3 PCB layout recommendations

Figure 14. PCB layout recommendations

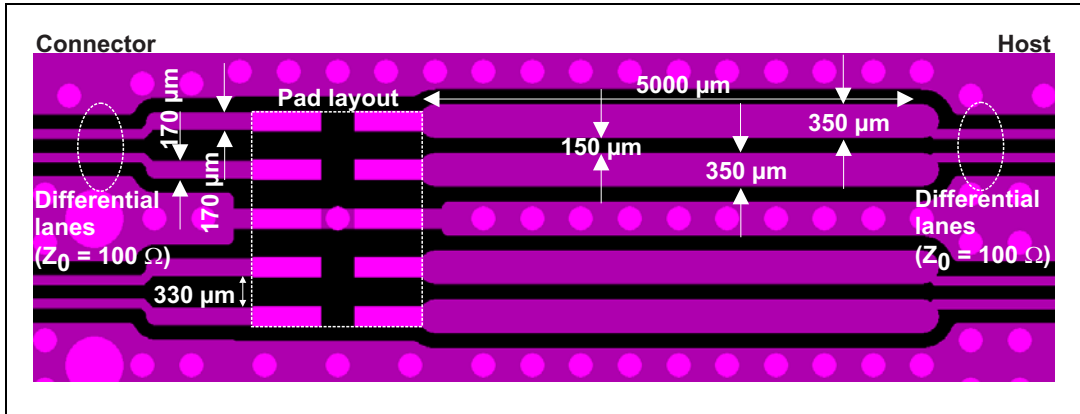
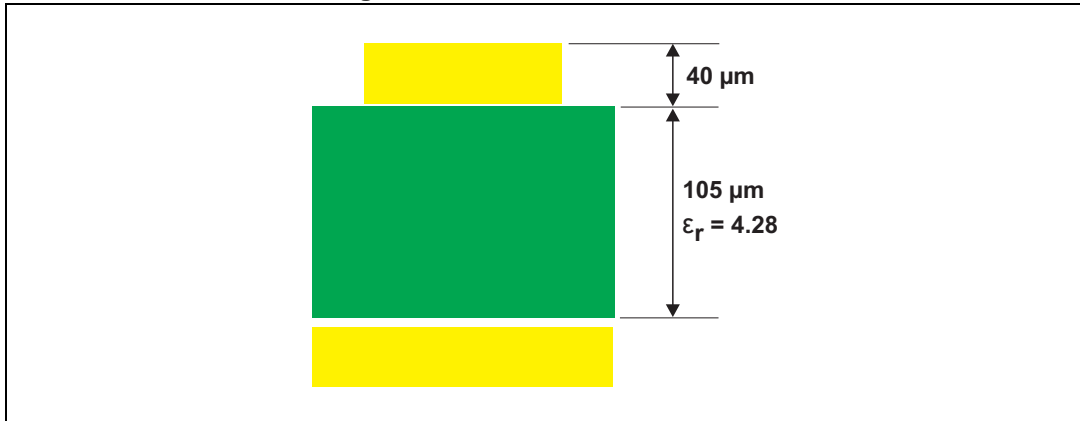


Figure 15. PCB stack dimensions



## 4 Package information

- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

Figure 16.  $\mu$ QFN-10L dimension definitions

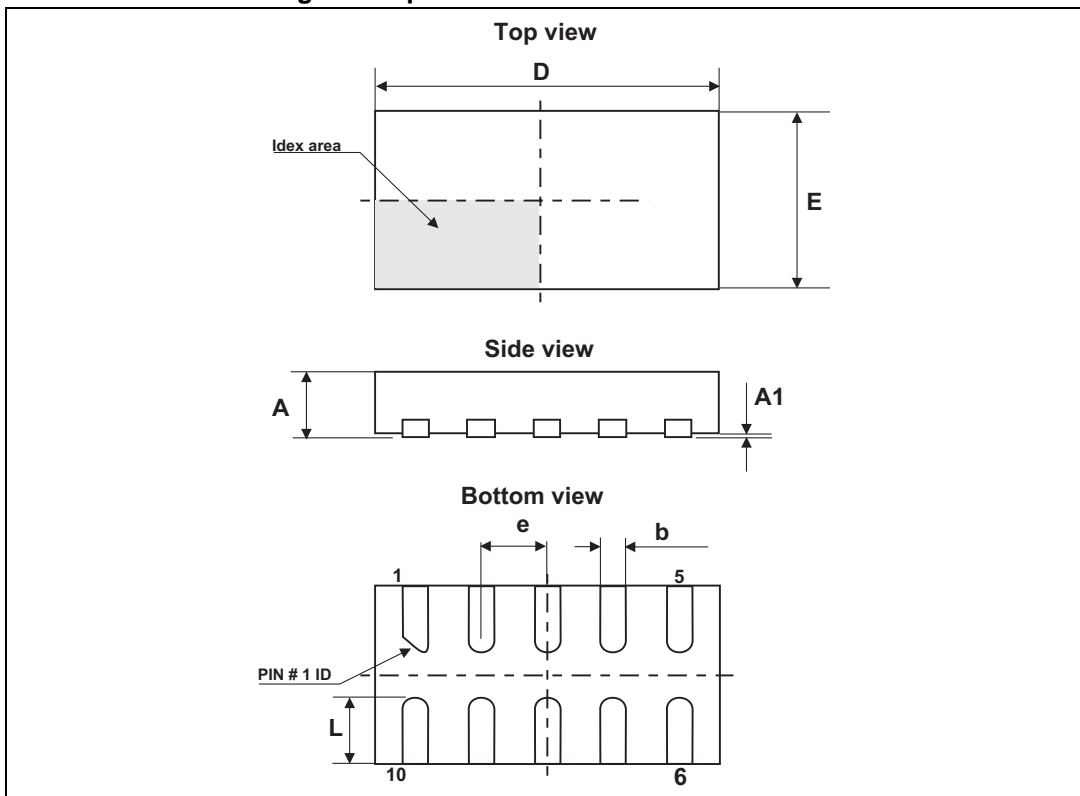


Table 4.  $\mu$ QFN-10L dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.45	0.50	0.55	0.018	0.020	0.022
A1	0.00	0.02	0.05	0.00	0.0008	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
D	2.55	2.60	2.65	0.1	0.102	0.104
E	1.30	1.35	1.40	0.051	0.053	0.055
e		0.50			0.020	
L	0.40	0.50	0.60	0.016	0.020	0.024

Figure 17. Footprint

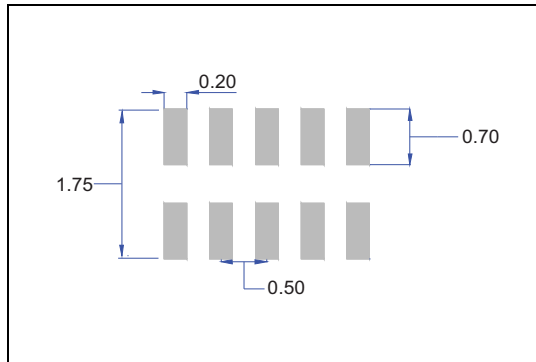
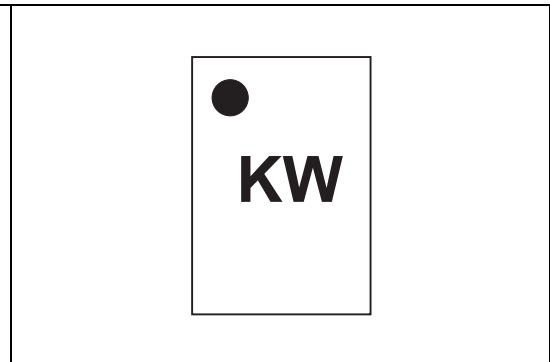
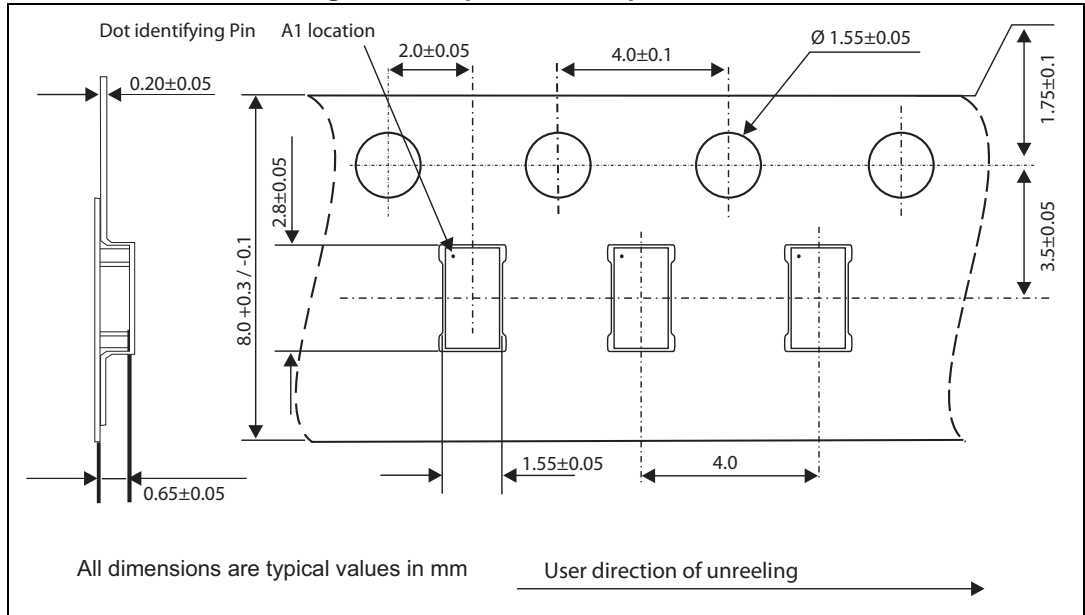


Figure 18. Marking



Note: Product marking may be rotated by multiples of 90° for assembly plant differentiation. In no case should this product marking be used to orient the component for its placement on a PCB. Only pin 1 mark is to be used for this purpose.

Figure 19. Tape and reel specifications



## 5 Ordering information

Figure 20. Ordering information scheme

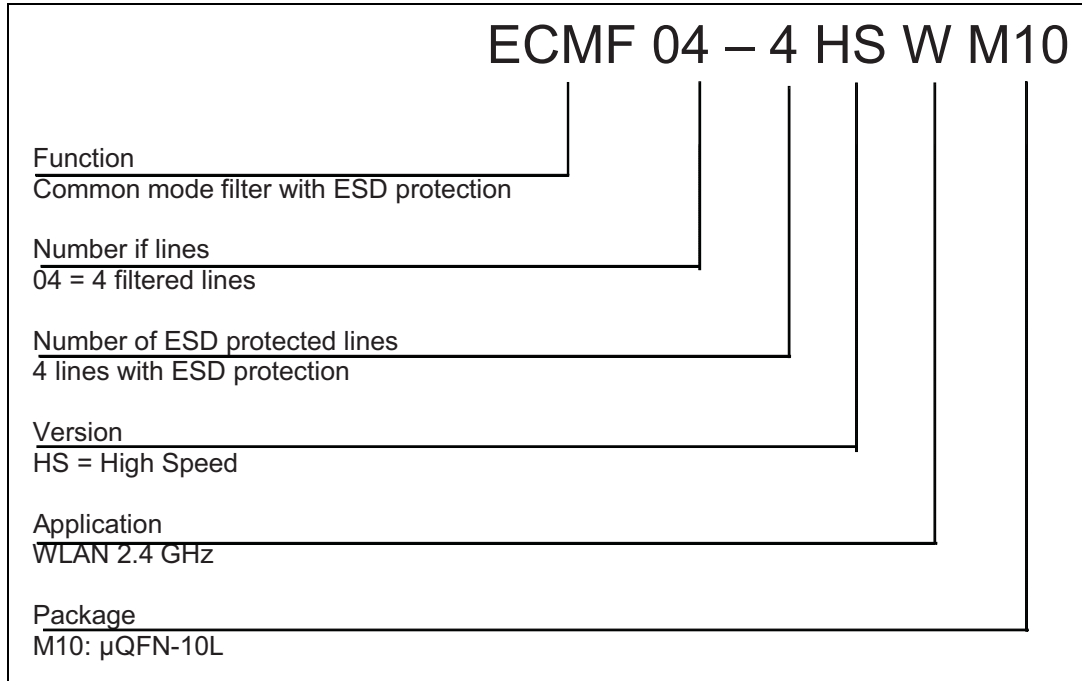


Table 5. Ordering information

Order code	Marking <sup>(1)</sup>	Package	Weight	Base qty	Delivery mode
ECMF04-4HSWM10	KW	μQFN-10L	5.00 mg	3000	Tape and reel

1. The marking can be rotated by multiples of 90° to differentiate assembly location

## 6 Revision history

Table 6. Document revision history

Date	Revision	Changes
10-Jun-2014	1	Initial release.
08-Jan-2018	2	Updated <a href="#">Table 1</a> .

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.