

## Common mode filter with ESD protection for high speed serial interface

Datasheet - production data

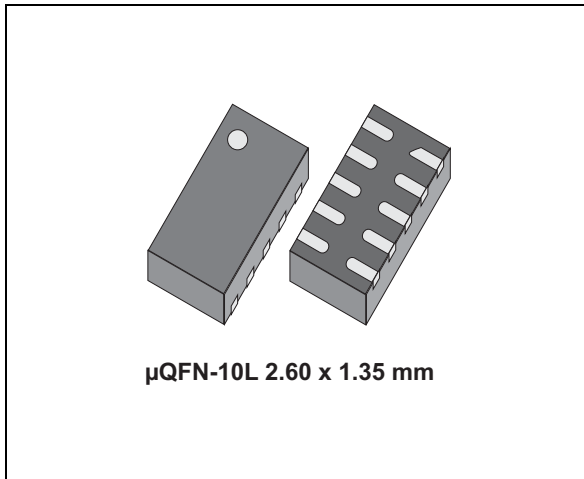
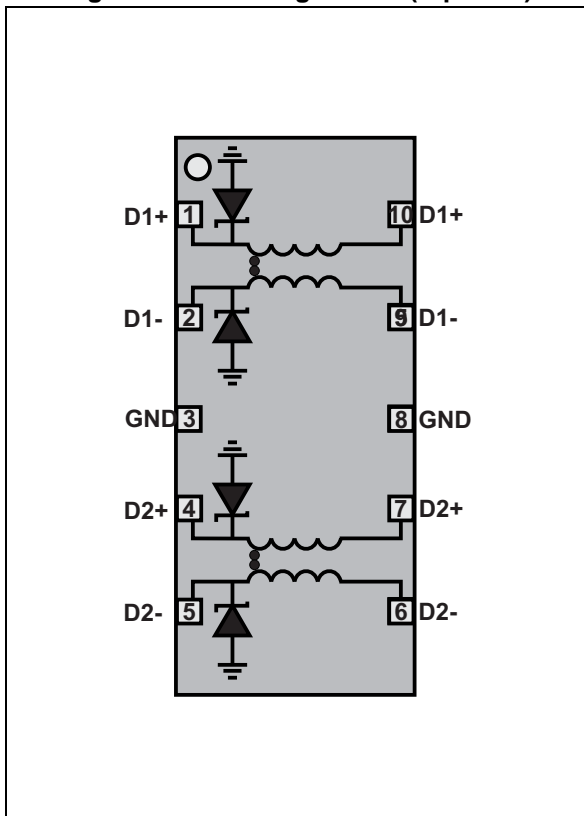


Figure 1. Pin configuration (top view)



### Features

- Very large differential bandwidth to comply with HDMI Full HD, MIPI, USB2.0, USB3.0, Display Port and other high speed serial interfaces
- Provides -20 dB attenuation at 700 MHz in LTE bands
- High common mode attenuation:- 25 dB between 800 MHz - 900 MHz
- 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

- Mobile phones
- Notebook, laptop
- Portable devices
- PND

### Description

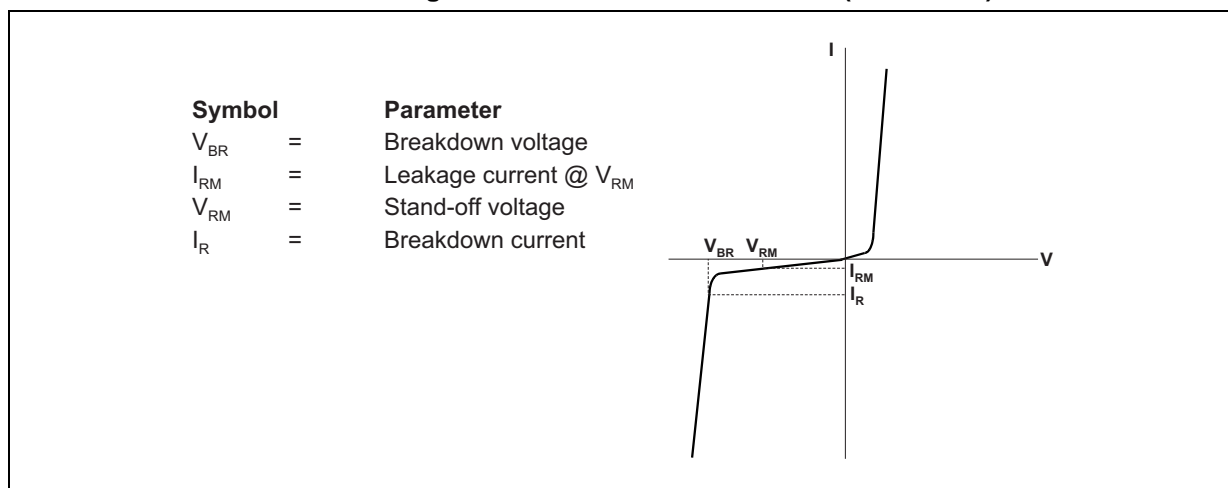
This device is a highly integrated common mode filter designed to suppress EMI/RFI common mode noise on high speed differential serial buses like HDMI Full HD, MIPI, Display Port and other high speed serial interfaces. The device has a very large differential bandwidth to comply with these standards. The device can protect and filter 2 differential lanes.

# 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)	8	kV
		Air discharge (connector side)	16	
$I_{DC}$	Maximum DC current		100	mA
$T_{op}$	Operating temperature range		-40 to +85	°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
$V_{BR}$	$I_R = 1\text{ mA}$	6			V
$I_{RM}$	$V_{RM} = 3\text{ V per line}$			100	nA
$R_{DC}$	DC serial resistance		5		$\Omega$

**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 ( $Z_{0\text{ diff}} = 100 \Omega$ )

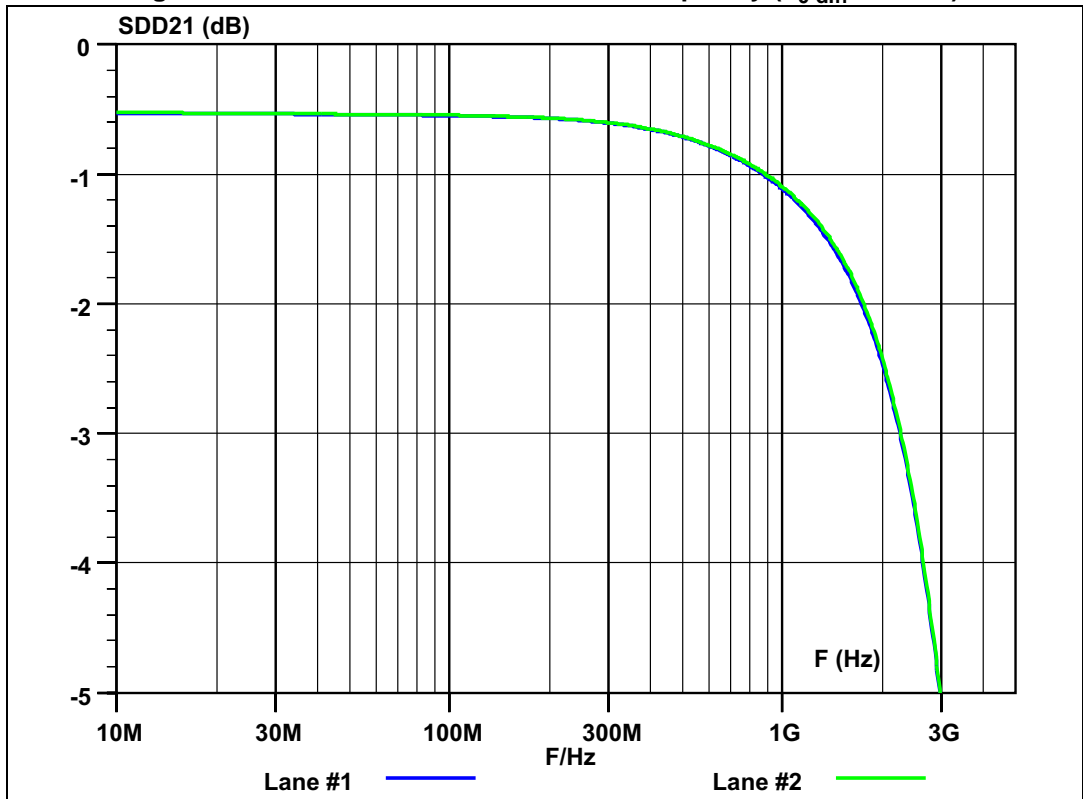


Figure 4. Common mode attenuation versus frequency ( $Z_{0\text{ com}} = 50 \Omega$ )

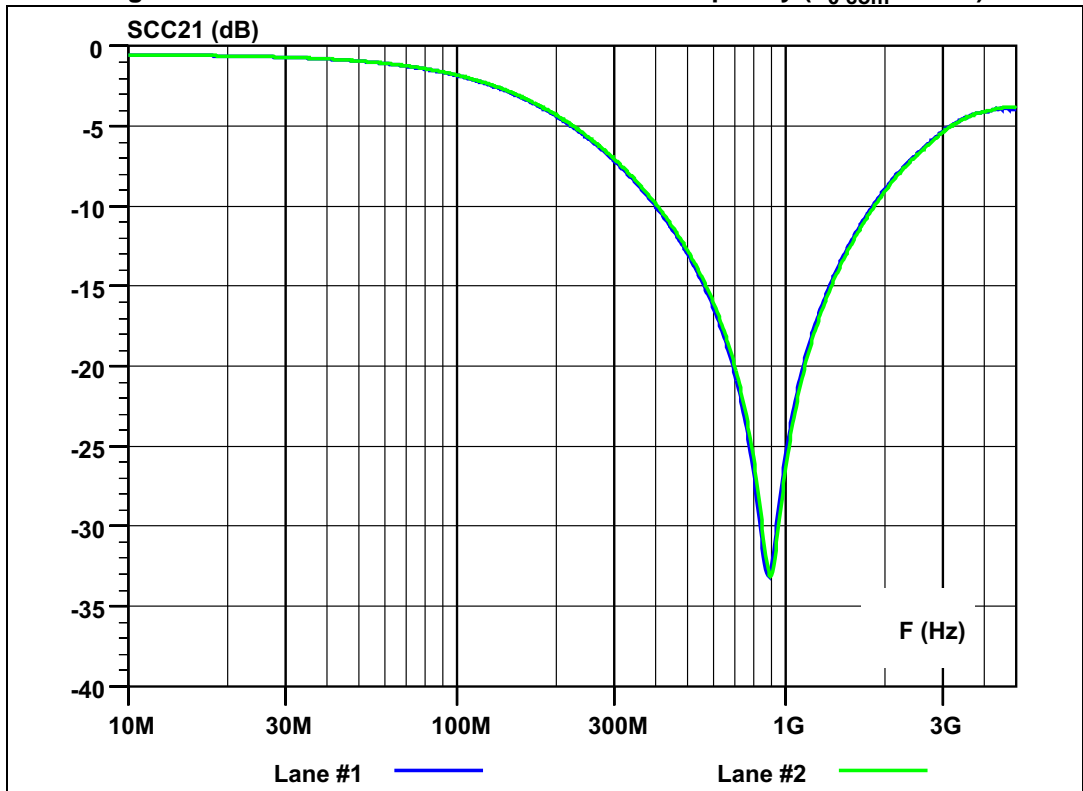


Figure 5. ESD response to IEC61000-4-2 (+8 kV contact discharge)

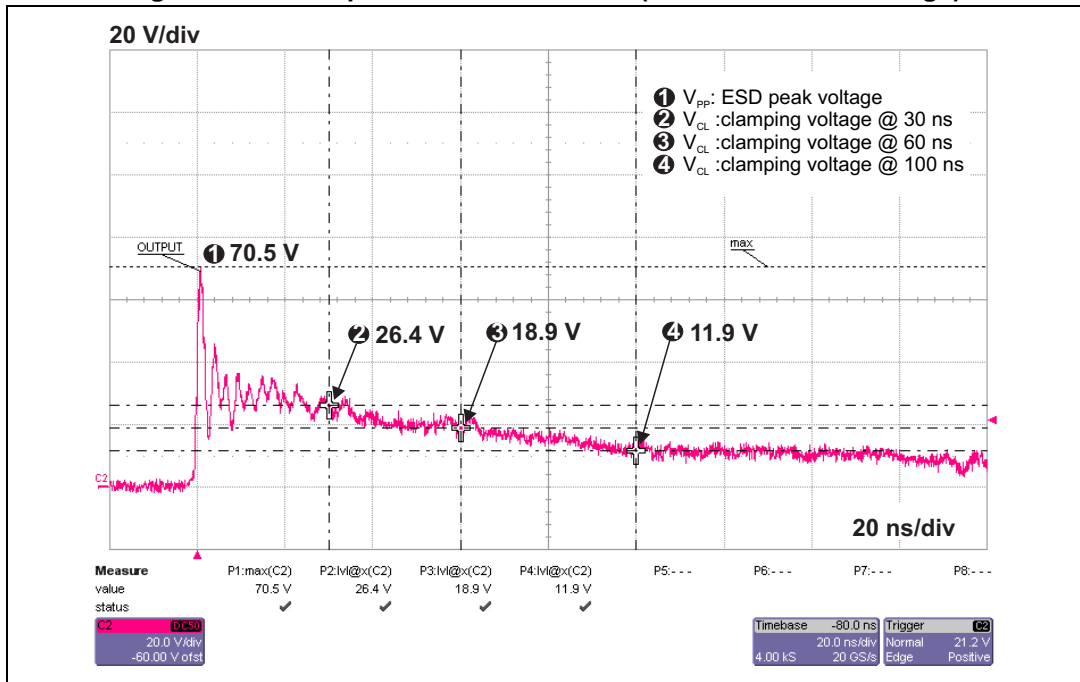


Figure 6. ESD response to IEC61000-4-2 (-8 kV contact discharge)

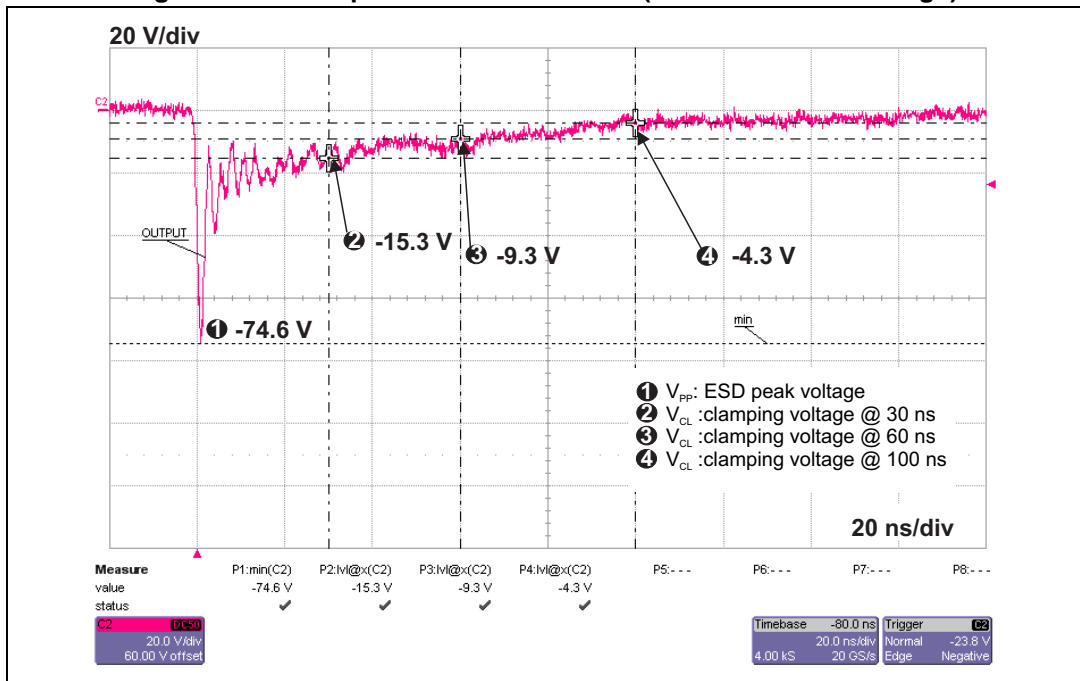


Figure 7. USB2.0 480 Mbps eye diagram without device

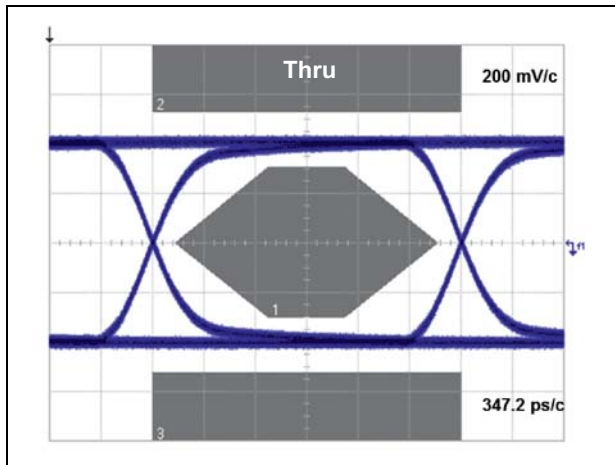


Figure 8. USB2.0 480 Mbps eye diagram with device

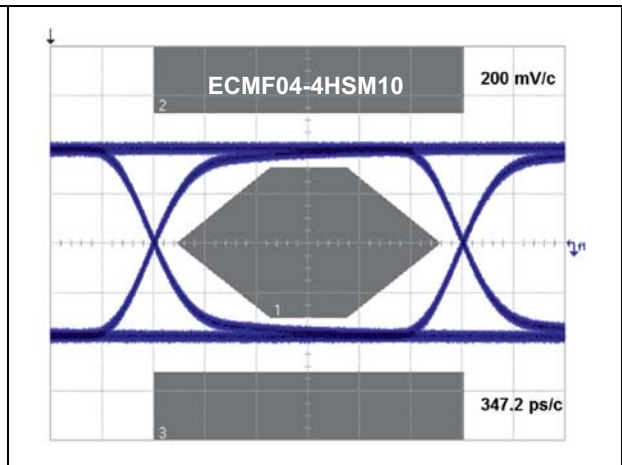


Figure 9. USB3.0 5 Gbps eye diagram without device

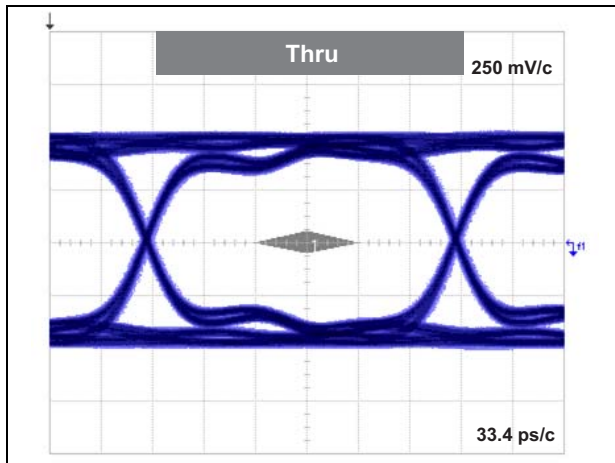


Figure 10. USB3.0 5 Gbps eye diagram with device

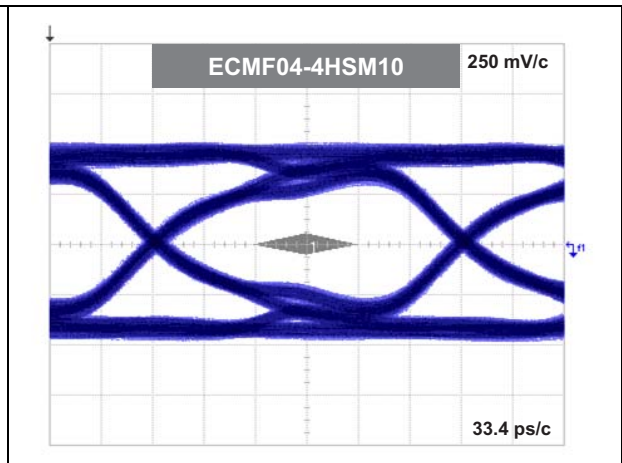


Figure 11. HDMI 3.35 Gbps eye diagram without device

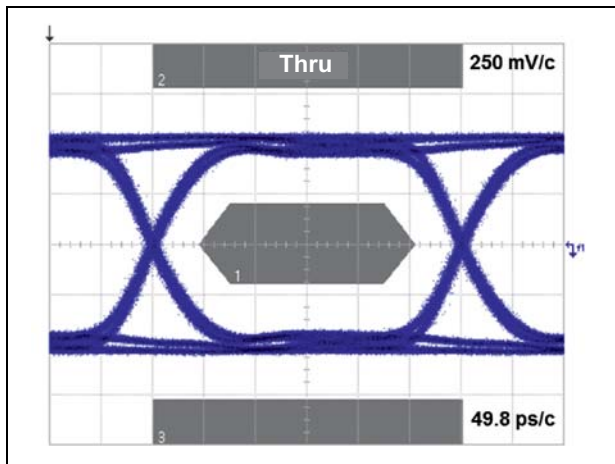


Figure 12. HDMI 3.35 Gbps eye diagram with device

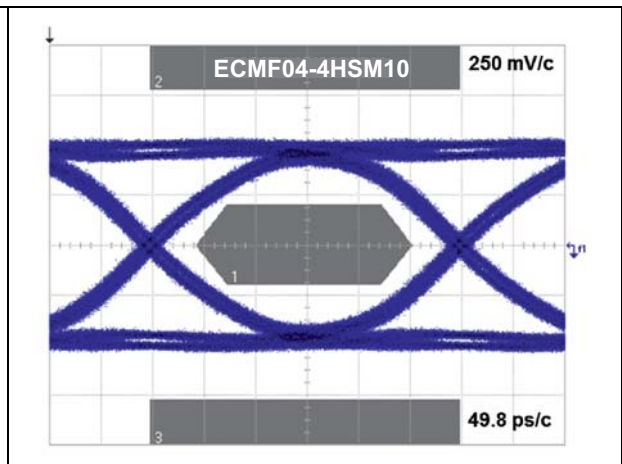
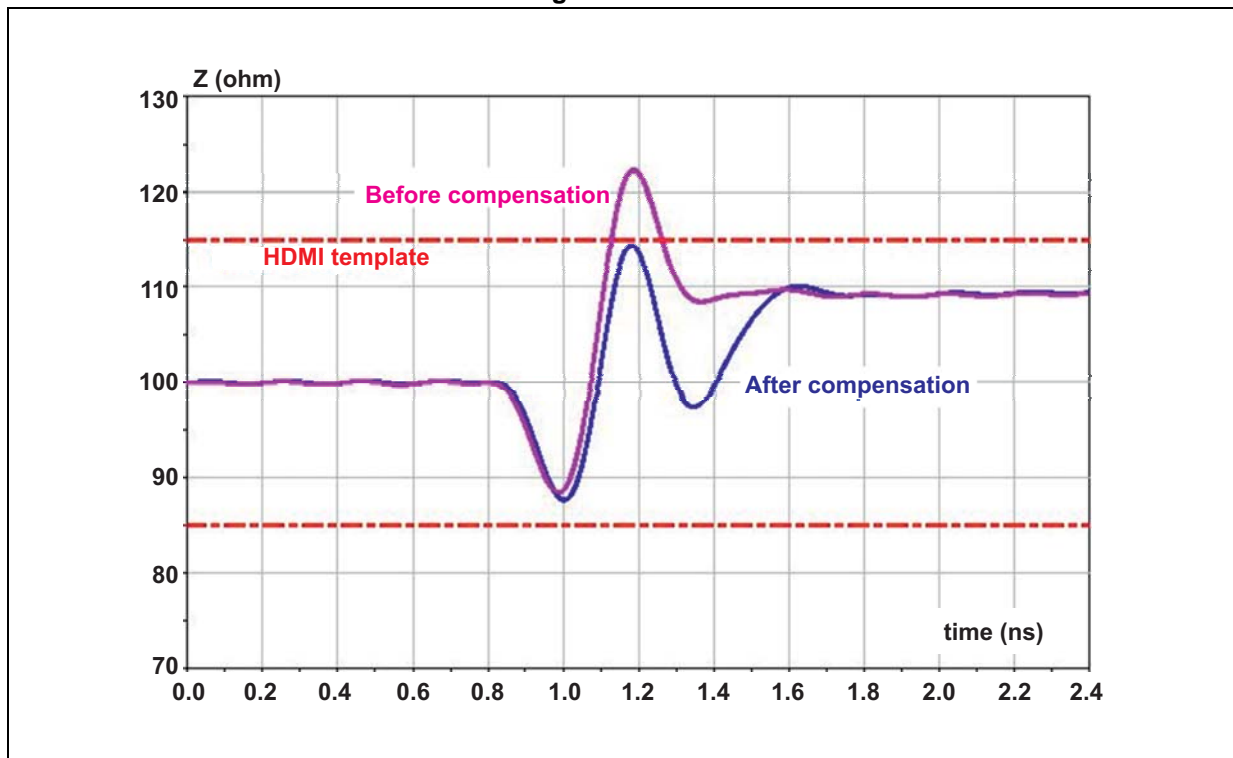
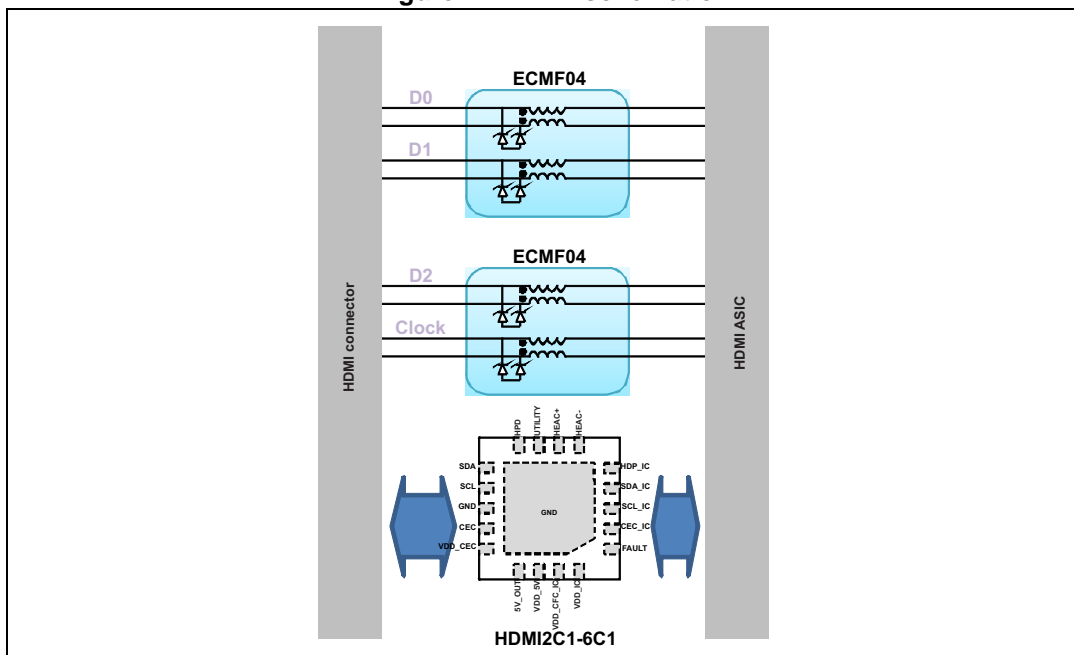


Figure 13. TDR



## 2 Application information

Figure 14. HDMI schematic



### 3 PCB layout recommendations

Figure 15. PCB layout recommendations

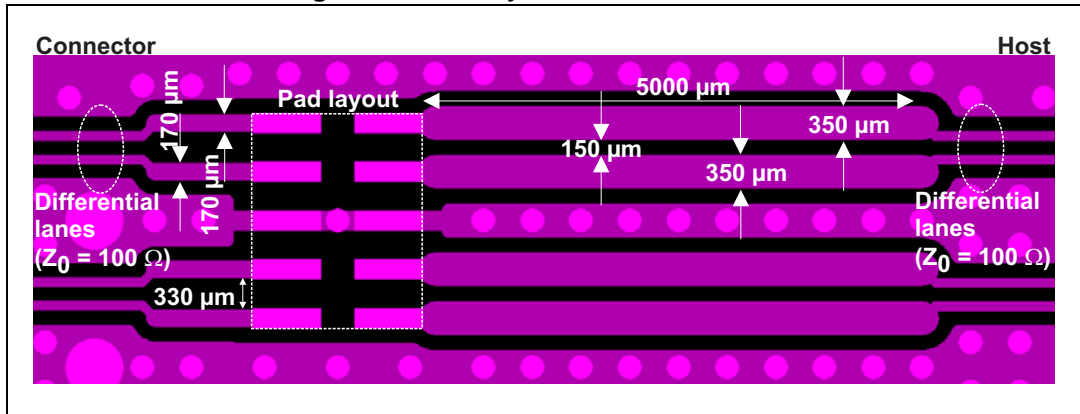
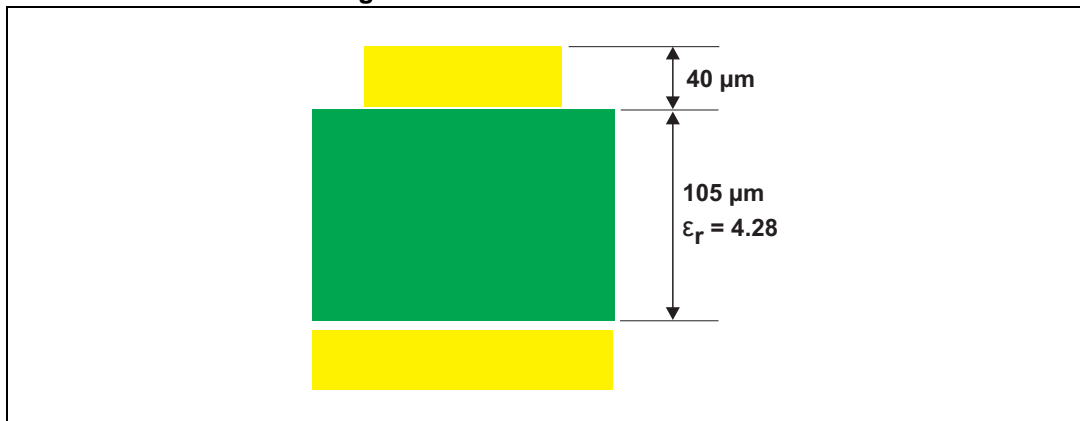


Figure 16. PCB stack dimensions





## 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<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 17.  $\mu$ QFN-10L dimension definitions

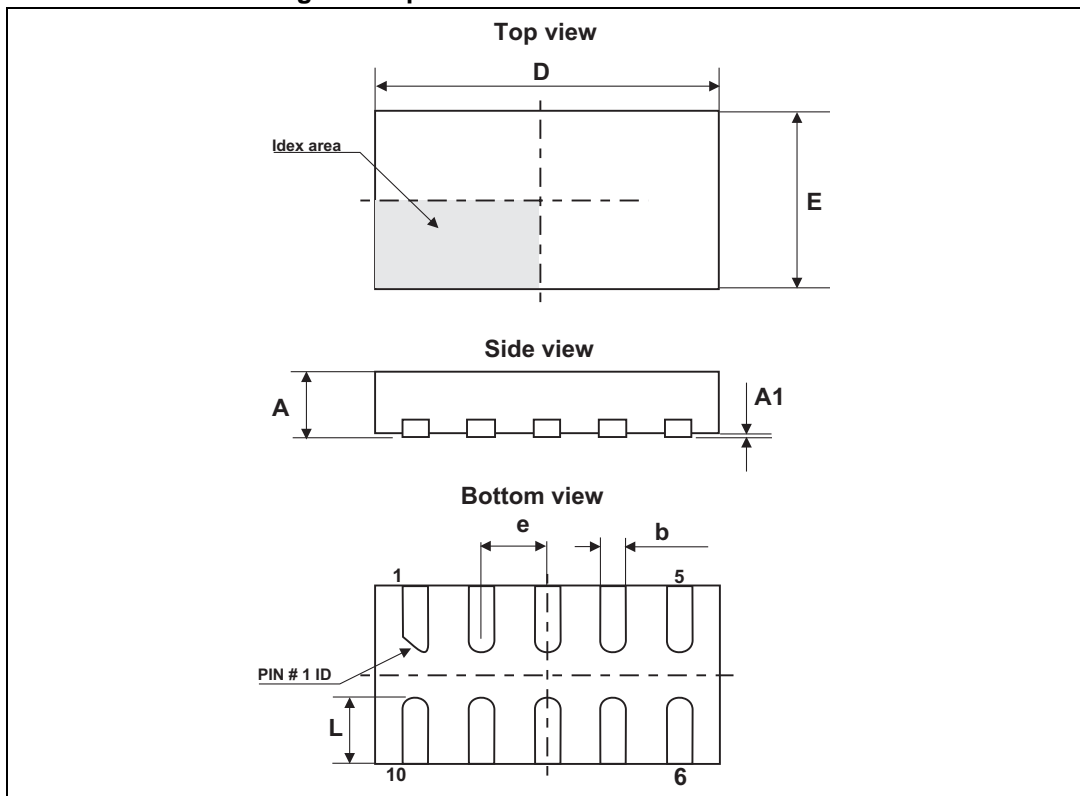


Table 4.  $\mu$ QFN-10L dimension values

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 18. Footprint

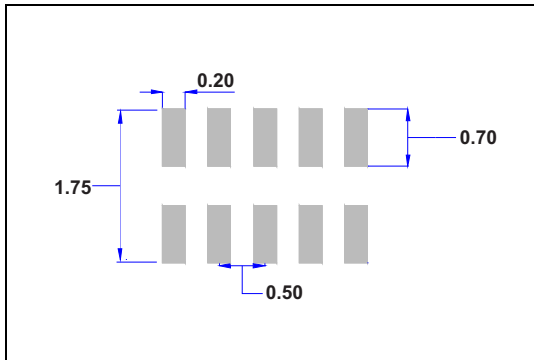
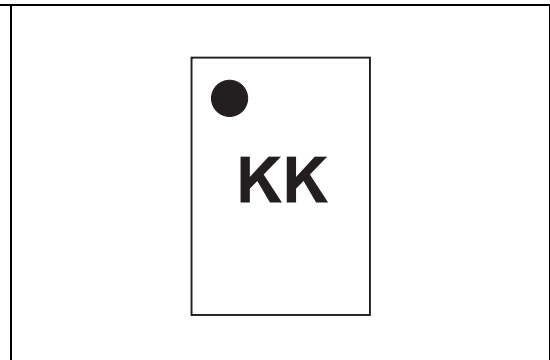
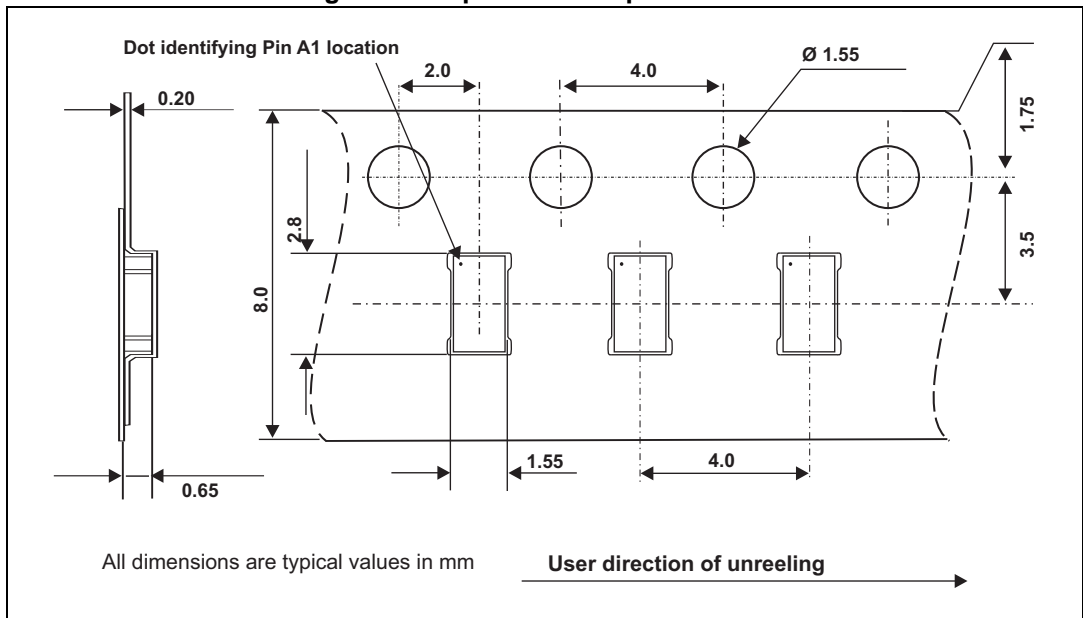


Figure 19. Marking



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 20. Tape and reel specifications



## 5 Ordering information

Figure 21. Ordering information scheme

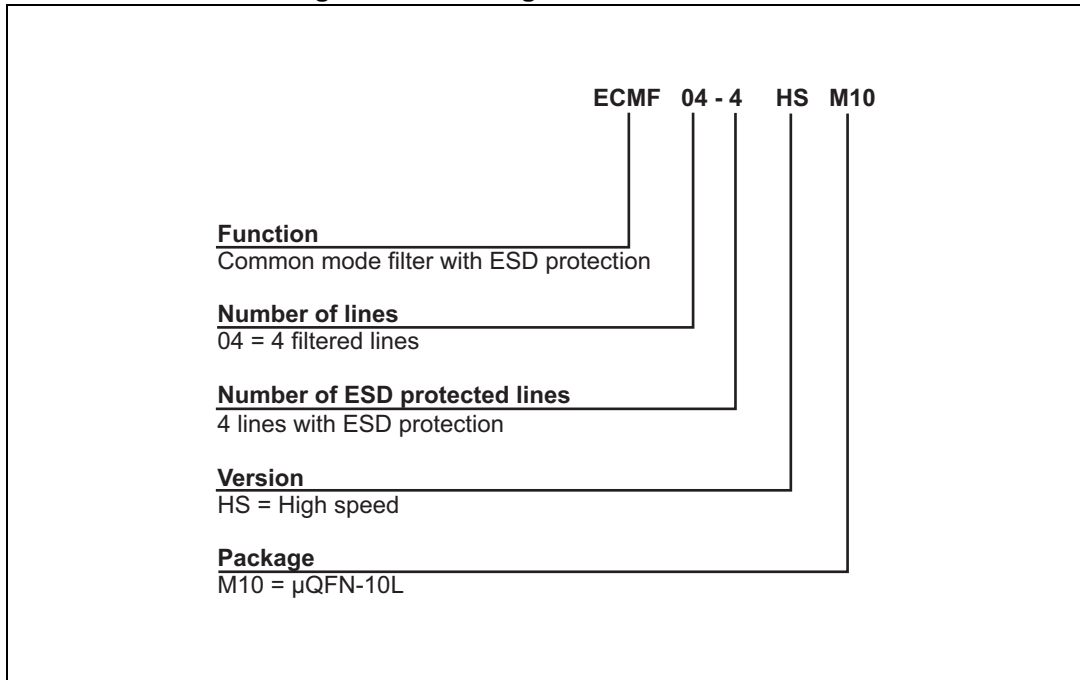


Table 5. Ordering information

Order code	Marking <sup>(1)</sup>	Package	Weight	Base qty	Delivery mode
ECMF04-4HSM10	KK	$\mu$ QFN-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
03-Oct-2013	1	Initial release.

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