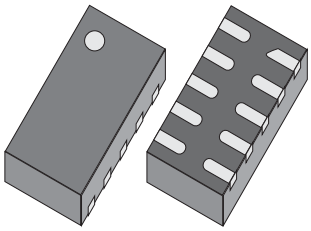
ECMF04-4HSWM10

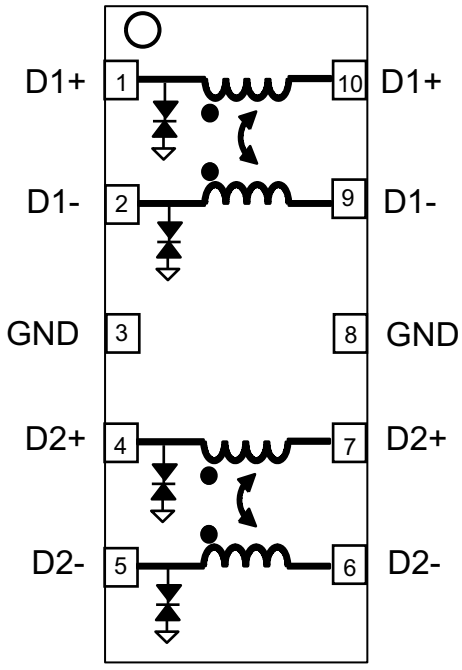
Common-mode filter with ESD protection

Datasheet - production data



µQFN-10L 2.60 x 1.35 mm

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

Table 1. Absolute maximum ratings (T_{amb} = 25 °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)

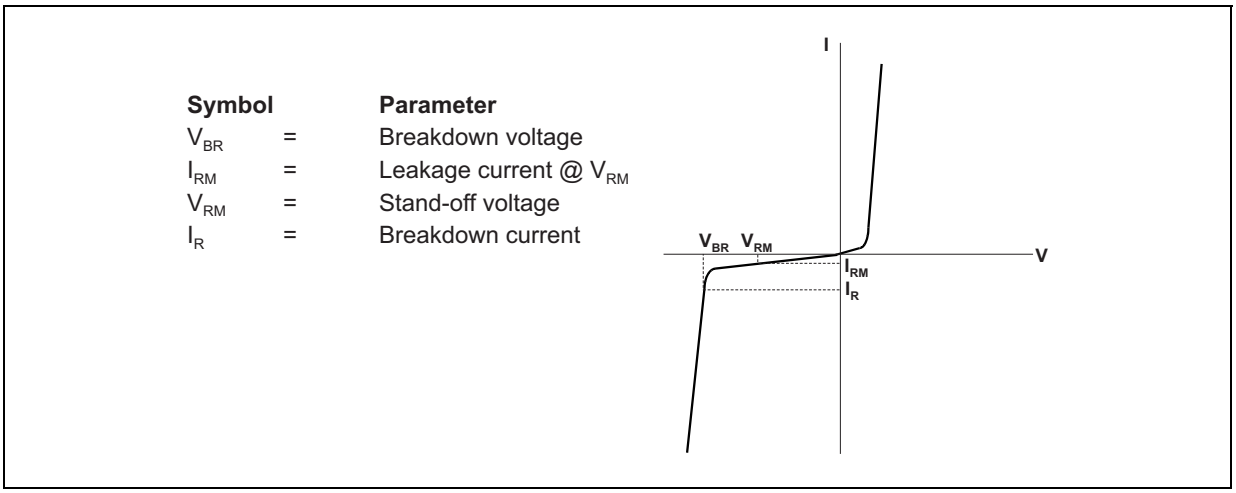


Table 2. Electrical characteristics (T_{amb} = 25 °C)

Symbol	Test conditions	Min.	Typ.	Max.	Unit
V_{BR}	I_R = 1 mA	4.5	5.5		V
I_{RM}	V_{RM} = 3 V per line			100	nA
R_{DC}	DC serial resistance		5		Ω
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 ($Z_{0\ diff}$ = 100 Ω)

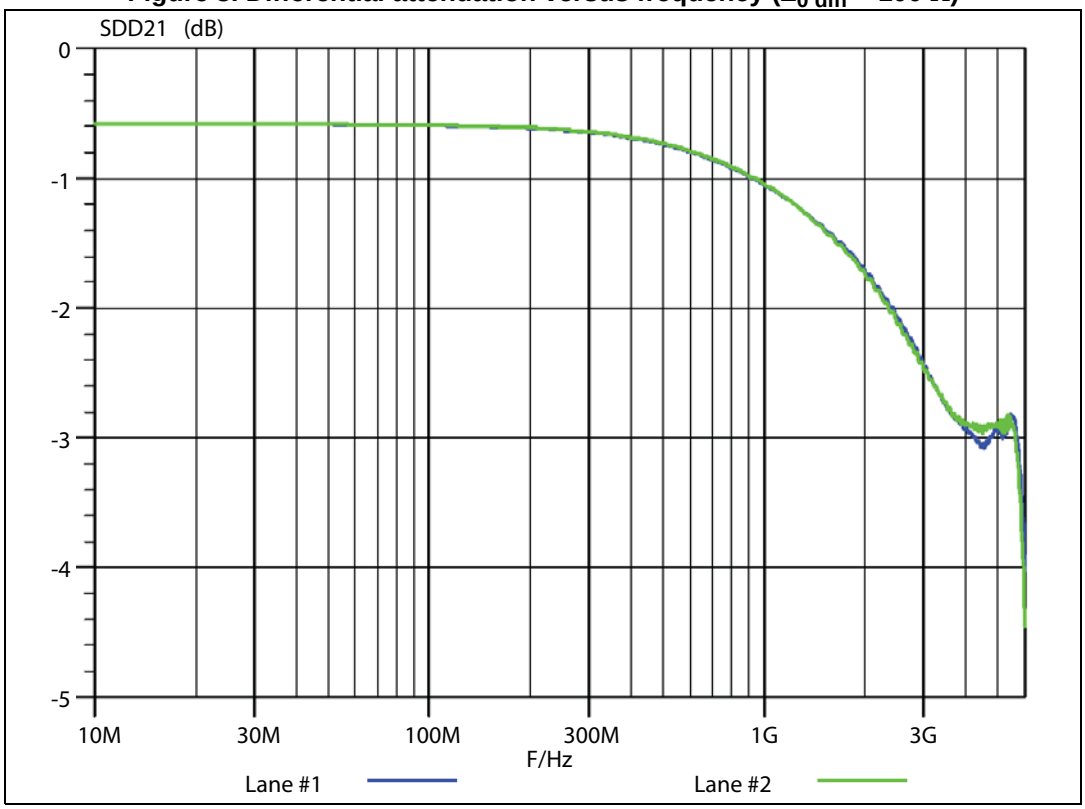


Figure 4. Common mode attenuation versus frequency ($Z_{0\ com}$ = 50 Ω)

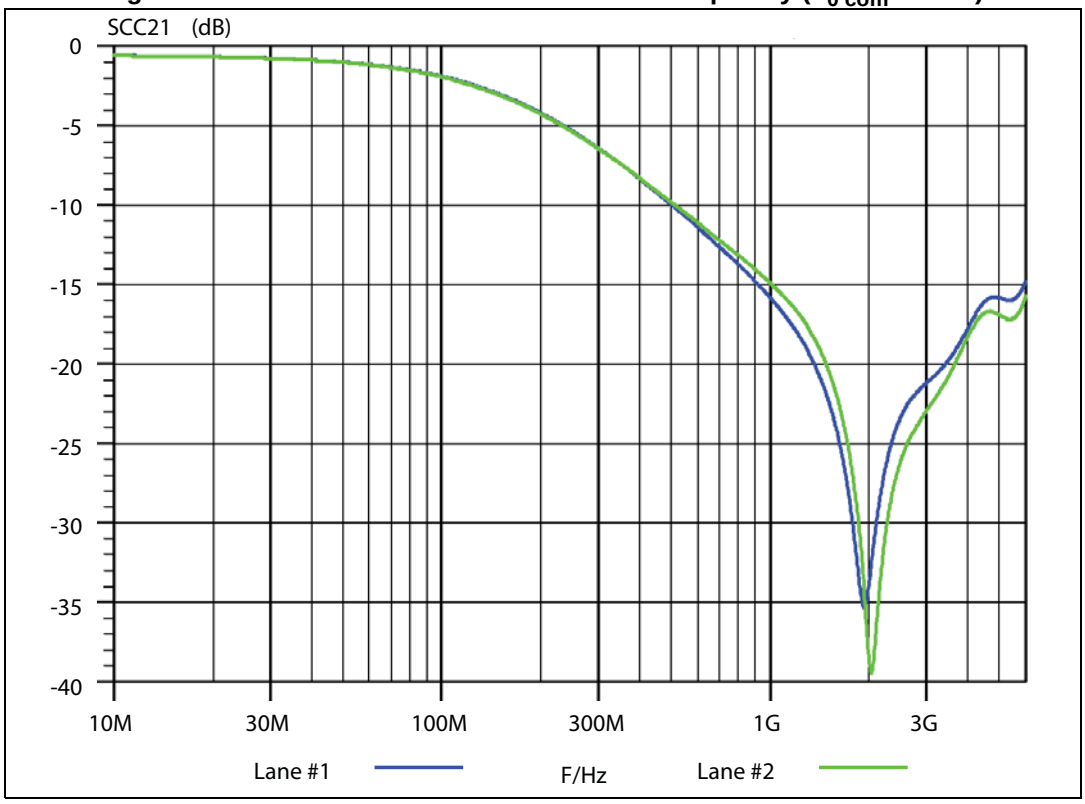


Figure 5. ESD response to IEC61000-4-2 (+8 kV contact discharge)

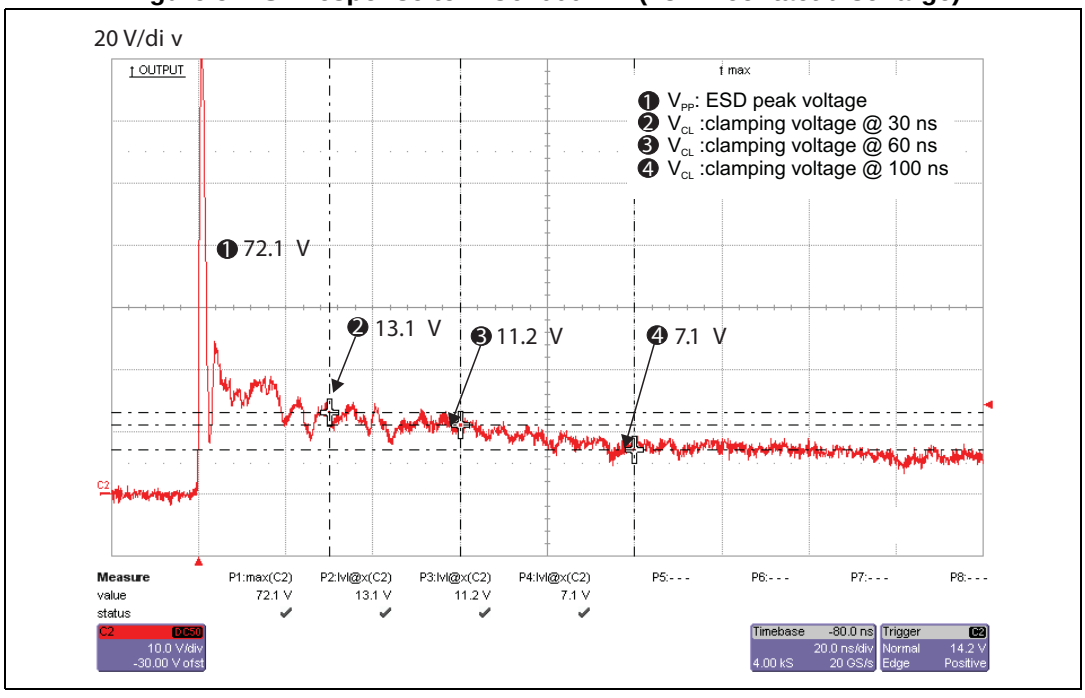


Figure 6. ESD response to IEC61000-4-2 (-8 kV contact discharge)

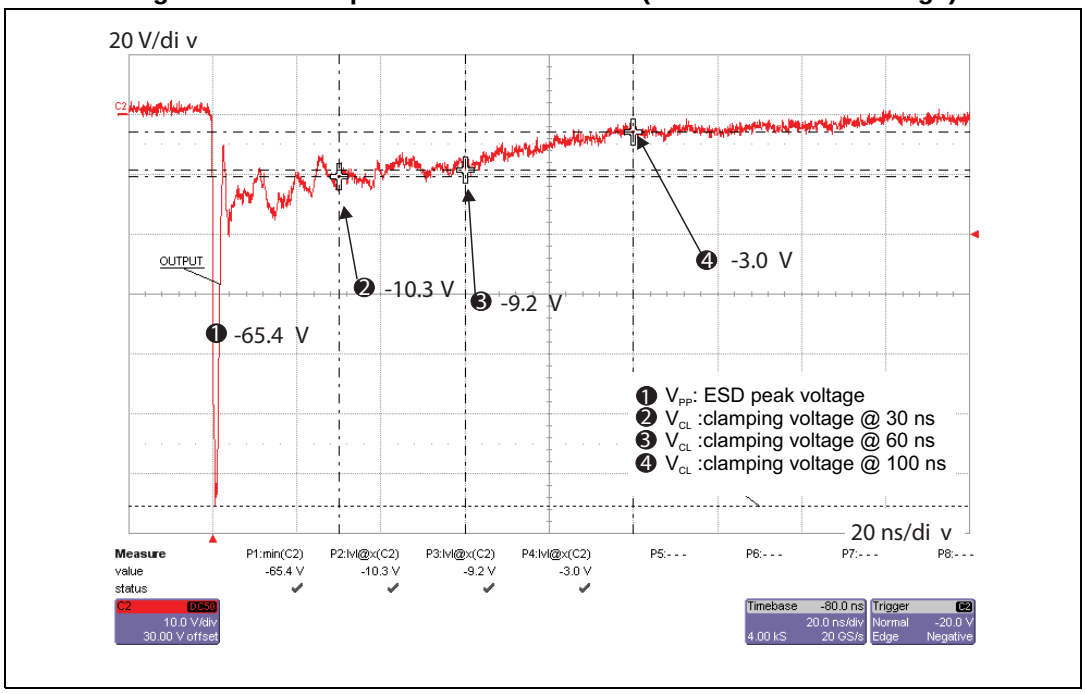


Figure 7. HDMI2.0 5.94 Gbps eye diagram without ECMF04-4HSWM10 (evaluation board with SMA connector)

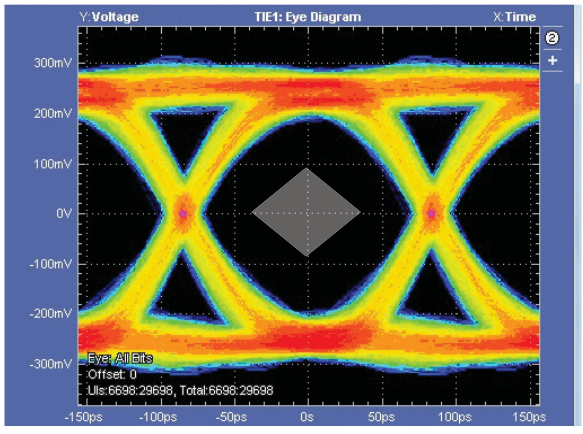


Figure 8. HDMI2.0 5.94 Gbps eye diagram with ECMF04-4HSWM10 (evaluation board with SMA connector)

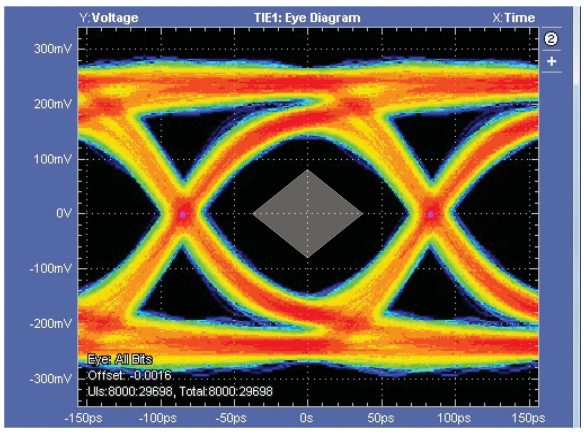


Figure 9. HDMI1.4 3.35 Gbps eye diagram without ECMF04-4HSWM10

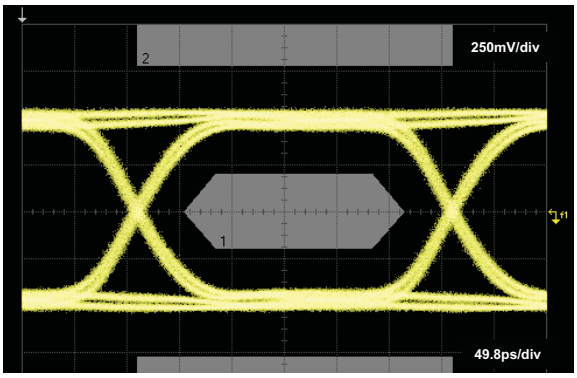


Figure 10. HDMI1.4 3.35 Gbps eye diagram with ECMF04-4HSWM10

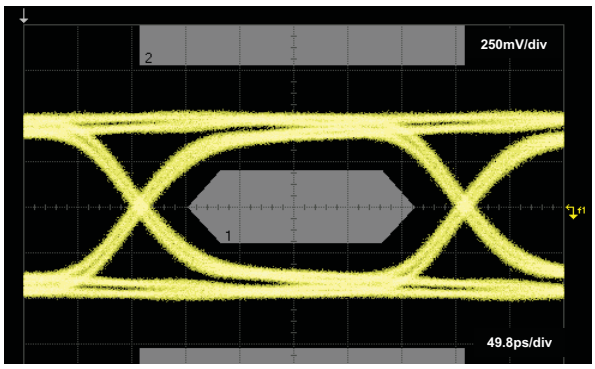
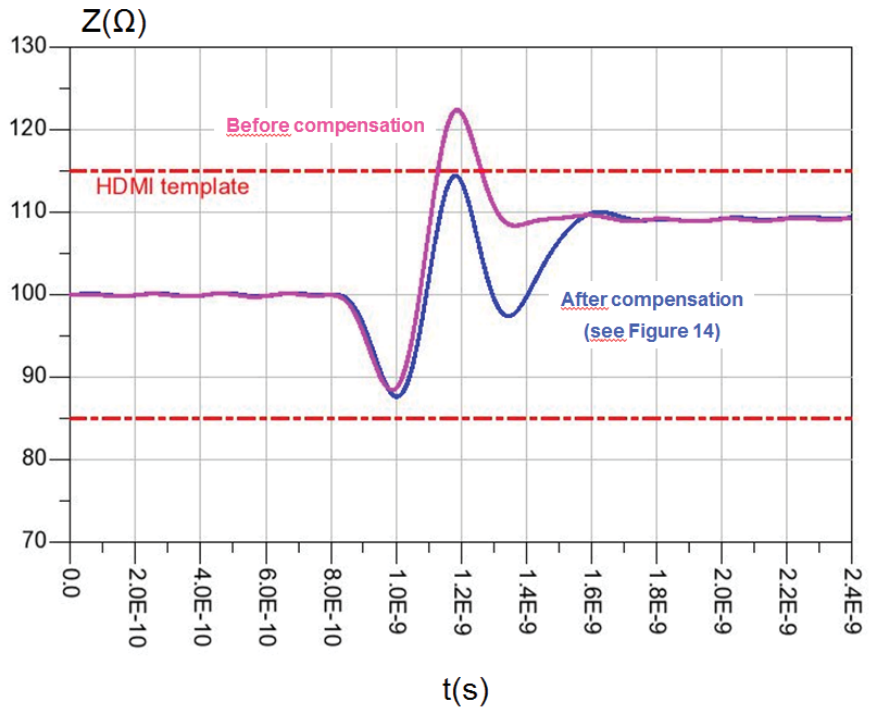


Figure 11. TDR



2 Application information

Figure 12. HDMI schematic

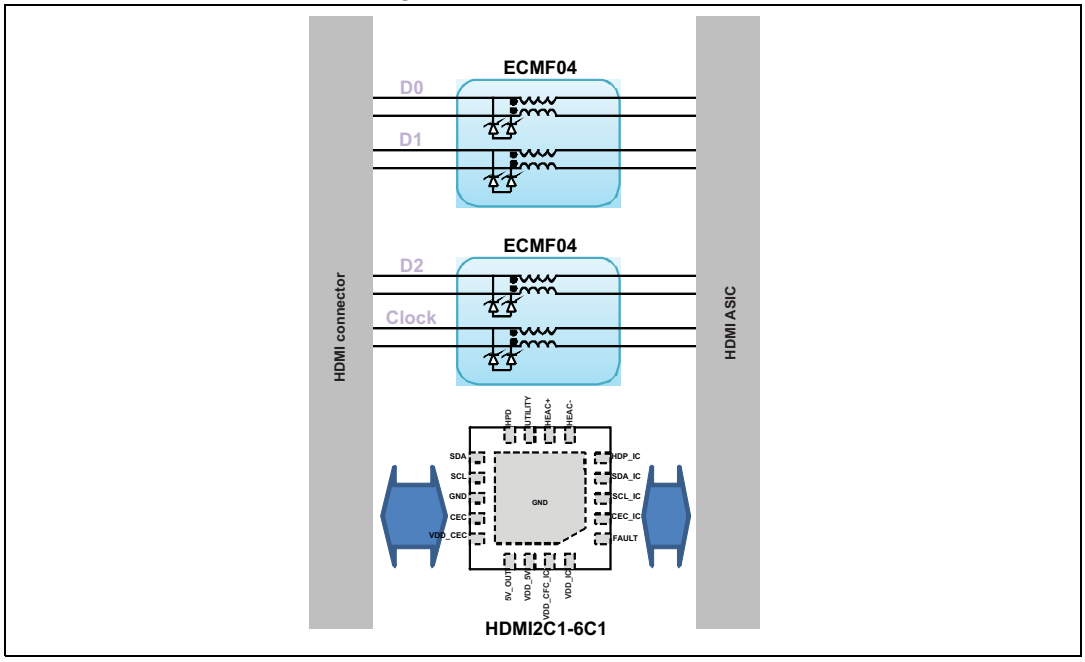
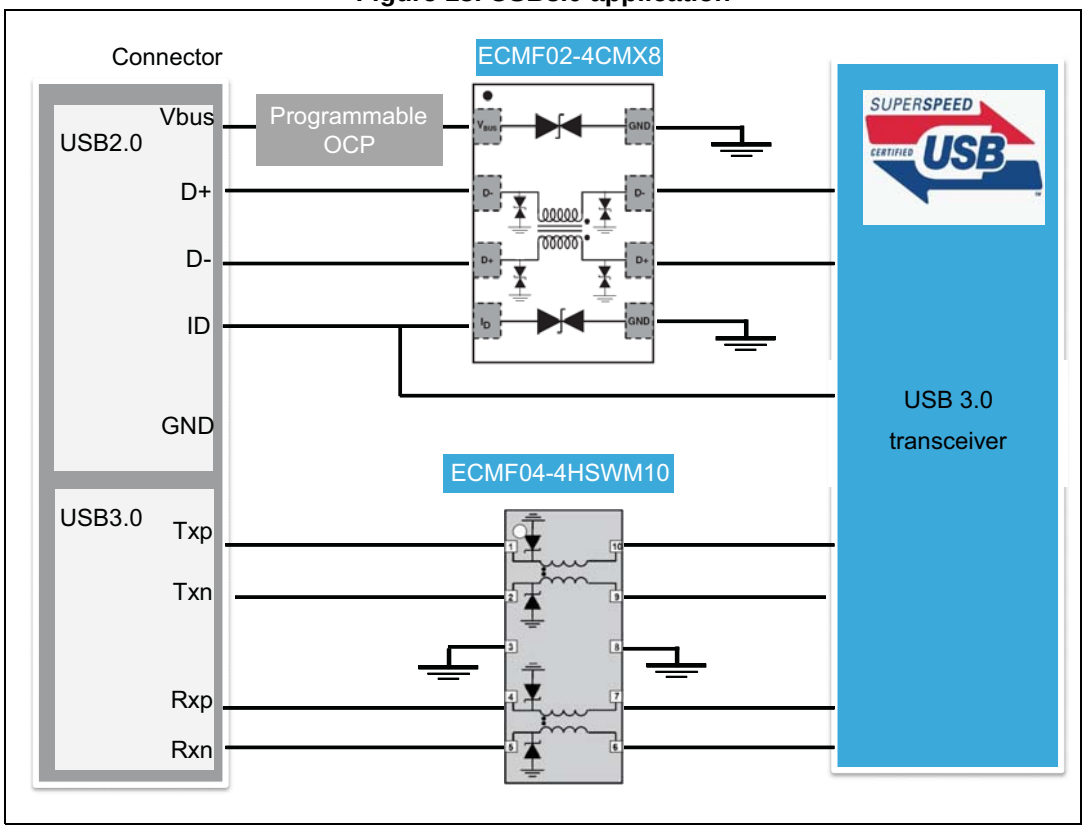


Figure 13. USB3.0 application



3 PCB layout recommendations

Figure 14. PCB layout recommendations

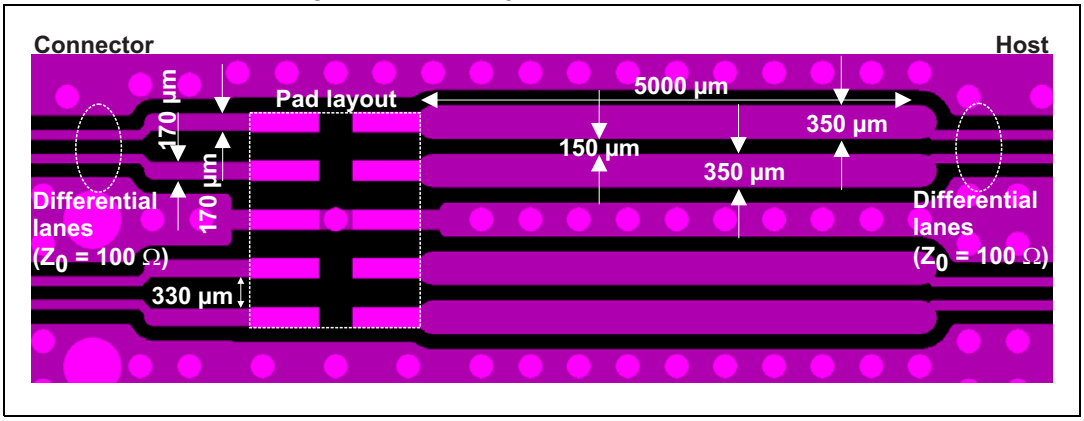
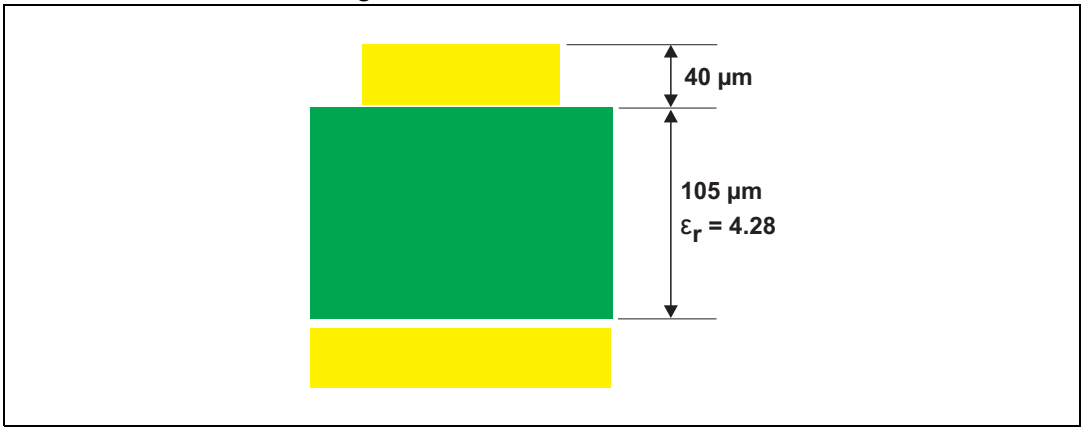


Figure 15. PCB stack dimensions



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.* ECOPACK® is an ST trademark.

Figure 16. µQFN-10L dimension definitions

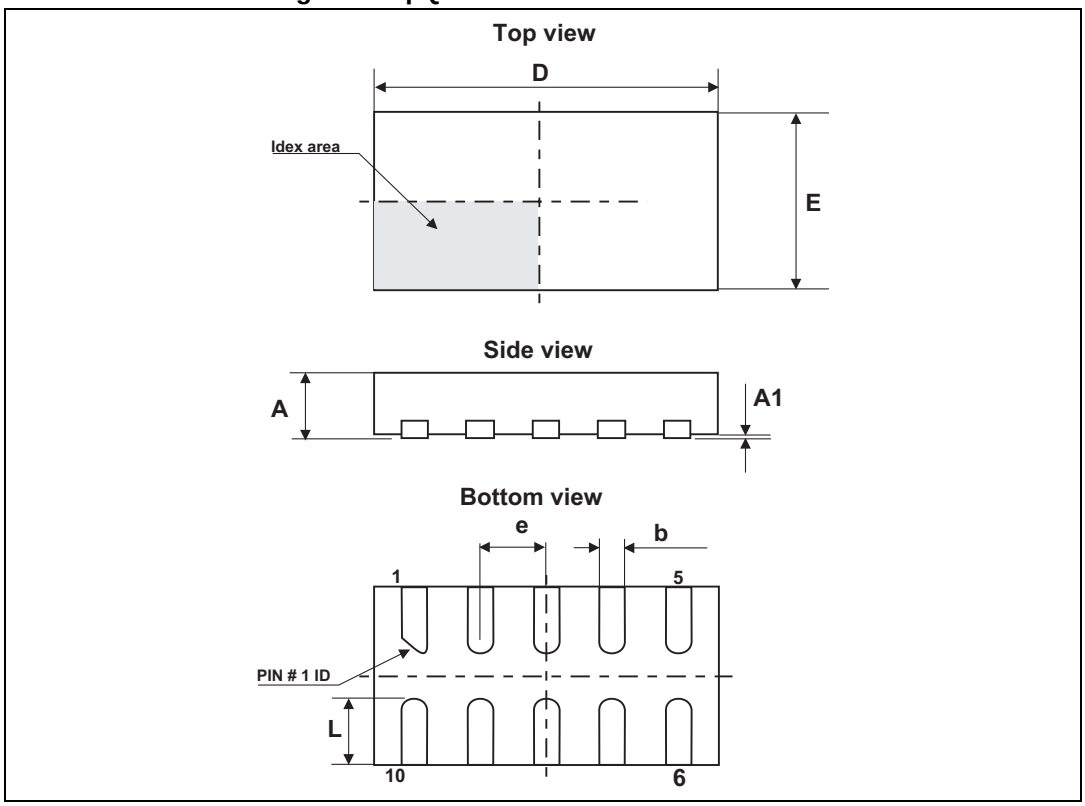


Table 4. µQFN-10L dimension values

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

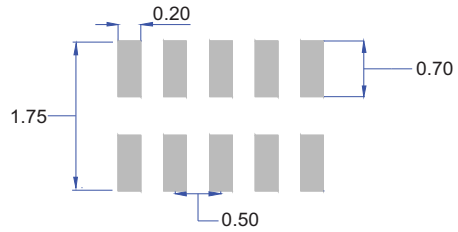
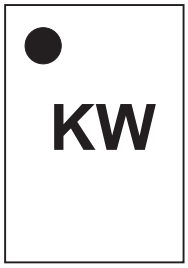
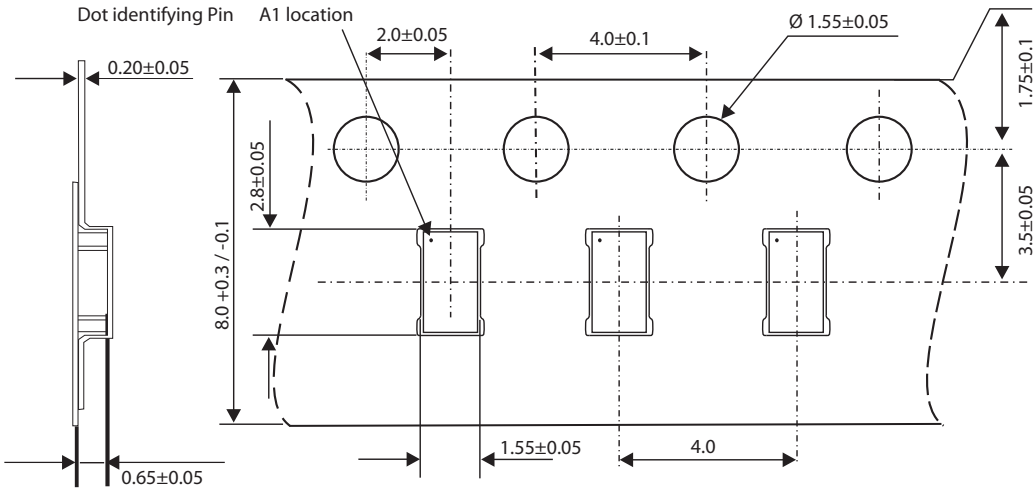


Figure 18. Marking



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

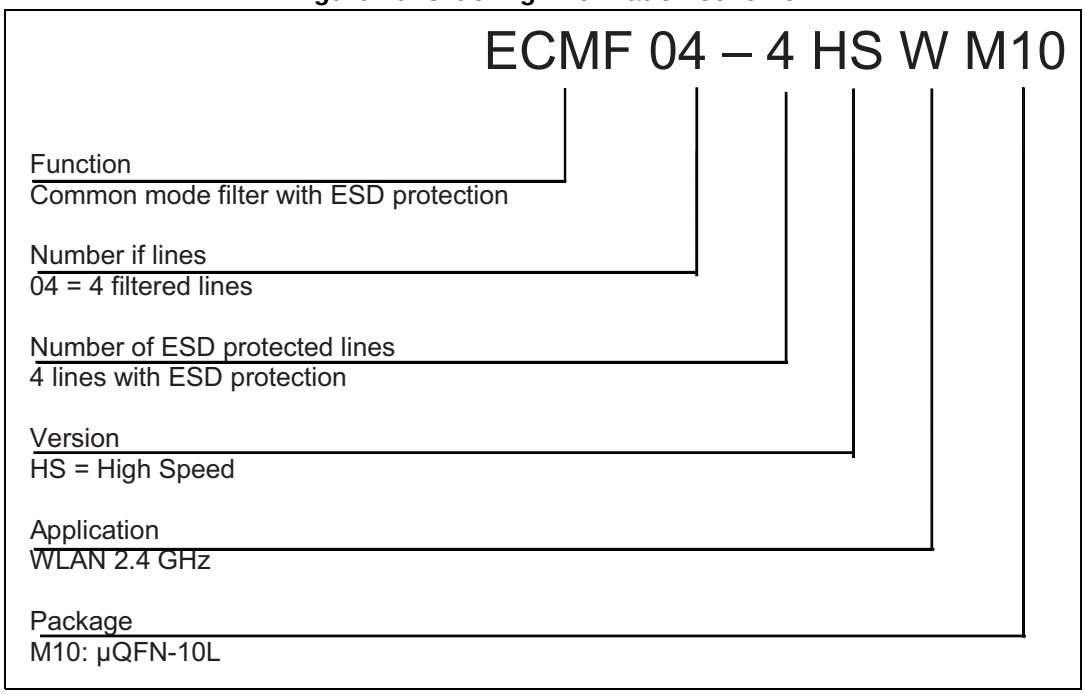


Table 5. Ordering information

Order code	Marking[1]	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 *Table 1*.

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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