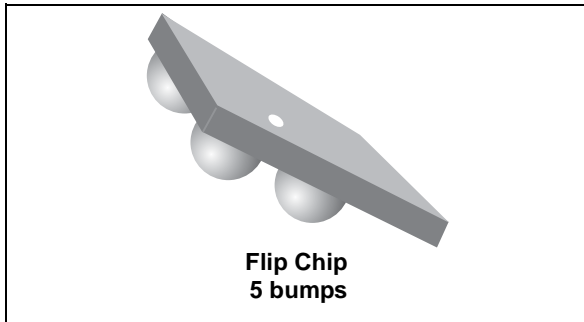


Dual line IPAD™, common mode filter with ESD protection for high speed serial interface

Datasheet - production data



Description

The ECMF02-2BF3 is a highly integrated common mode filter designed to suppress EMI/RFI common mode noise on high speed differential serial buses like MIPI D-PHY, MDDI, USB 2.0 and HDMI.

The ECMF02-2BF3 can protect and filter one differential lane.

Features

- Very large differential bandwidth above 5 GHz
- High common mode attenuation:
 - - 23 dB at 900 MHz.
- High common mode attenuation:
 - - 20 dB between 800 MHz and 2.2 GHz.
- Very low PCB space consumption: <math><1.1\text{mm}^2</math>
- Thin package: 0.50 mm max. after reflow
- Lead-free package
- High reduction of parasitic elements through integration

Complies with the following standard:

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

Application

High speed serial interfaces such as USB 2.0, MIPI D-PHY, MDDI and HDMI.

Figure 1. Pin configuration (bump side)

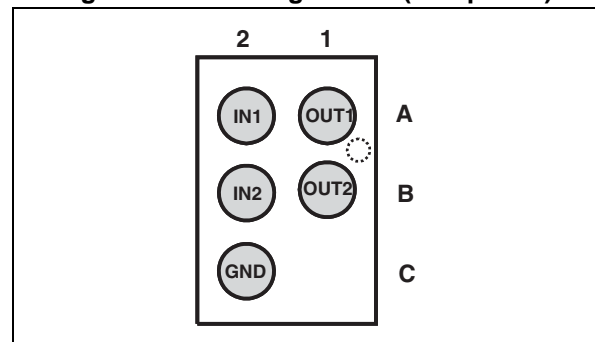
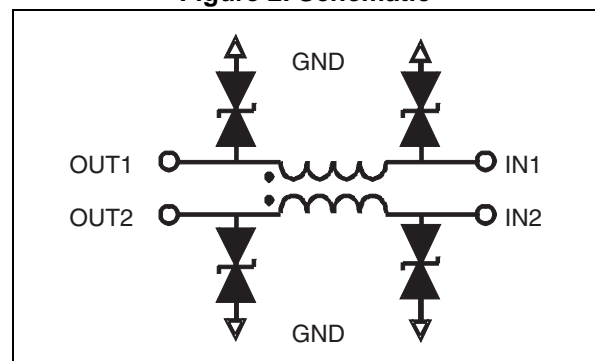


Figure 2. Schematic



TM: IPAD is a trademark of STMicroelectronics.

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage ⁽¹⁾	IEC 61000-4-2 contact discharge	10	kV
		IEC 61000-4-2 air discharge	20	
T_j	Maximum junction temperature		125	$^{\circ}\text{C}$
T_{op}	Operating temperature range		- 30 to + 85	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		- 55 to 150	$^{\circ}\text{C}$

1. Measurements done on IEC 61000-4-2 test bench. For further details see Application note AN3353.

Figure 3. Electrical characteristics (definitions)

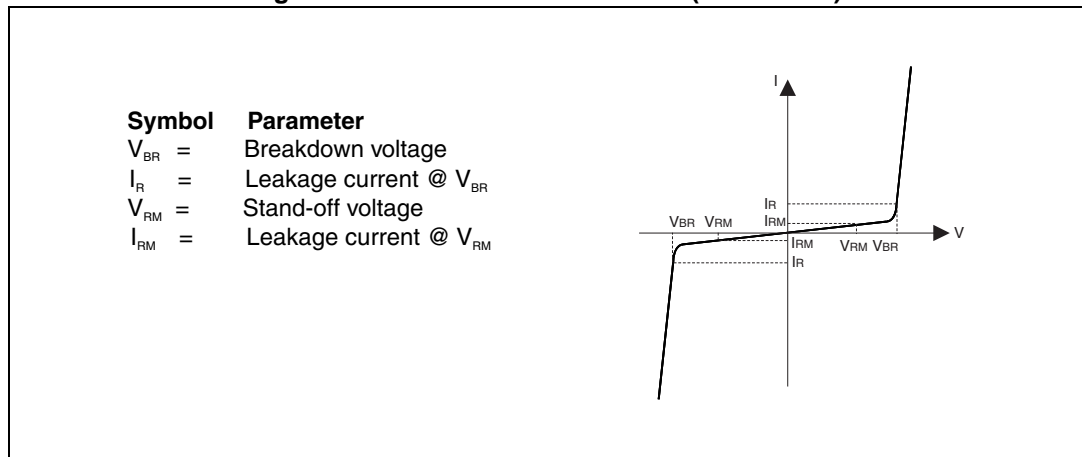


Table 2. Electrical characteristics (values, $T_{amb} = 25\text{ }^{\circ}\text{C}$)

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		3	4	Ω

2 Application schematics

Figure 4. USB2.0 application

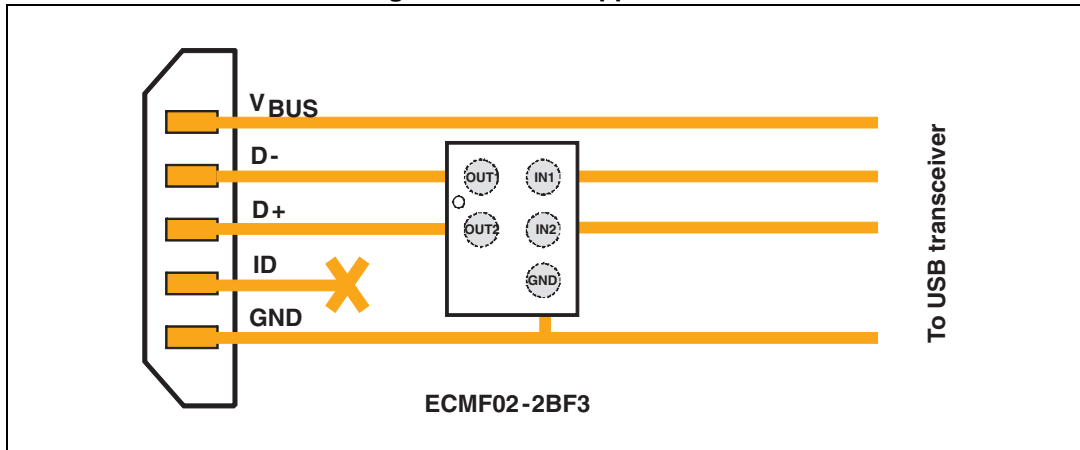
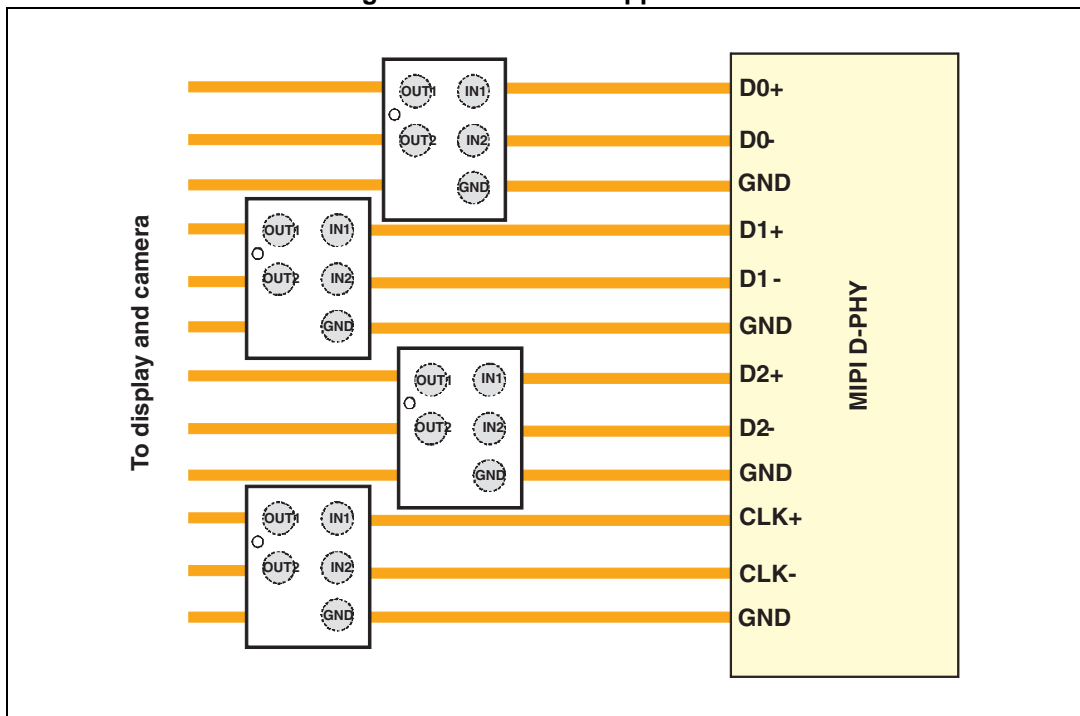


Figure 5. MIPI D-PHY application



3 Measurement curves

Figure 6. SDD21 differential attenuation measurement ($Z_{0\text{ diff}} = 100 \Omega$)

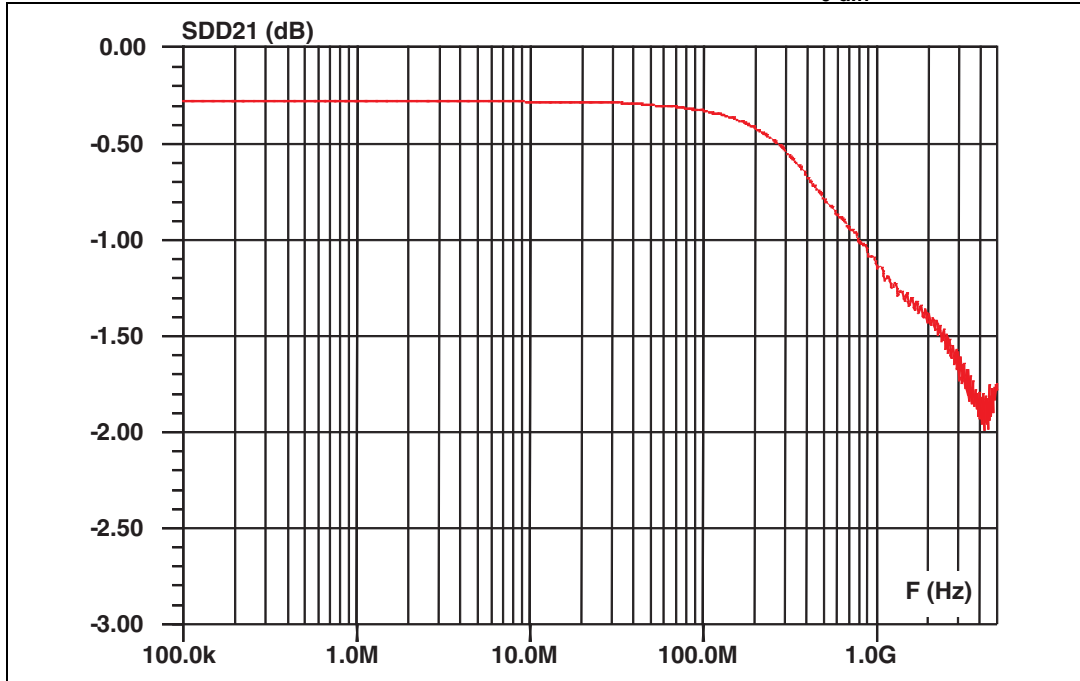


Figure 7. SCC21 common mode attenuation measurement ($Z_{0\text{ com}} = 50 \Omega$)

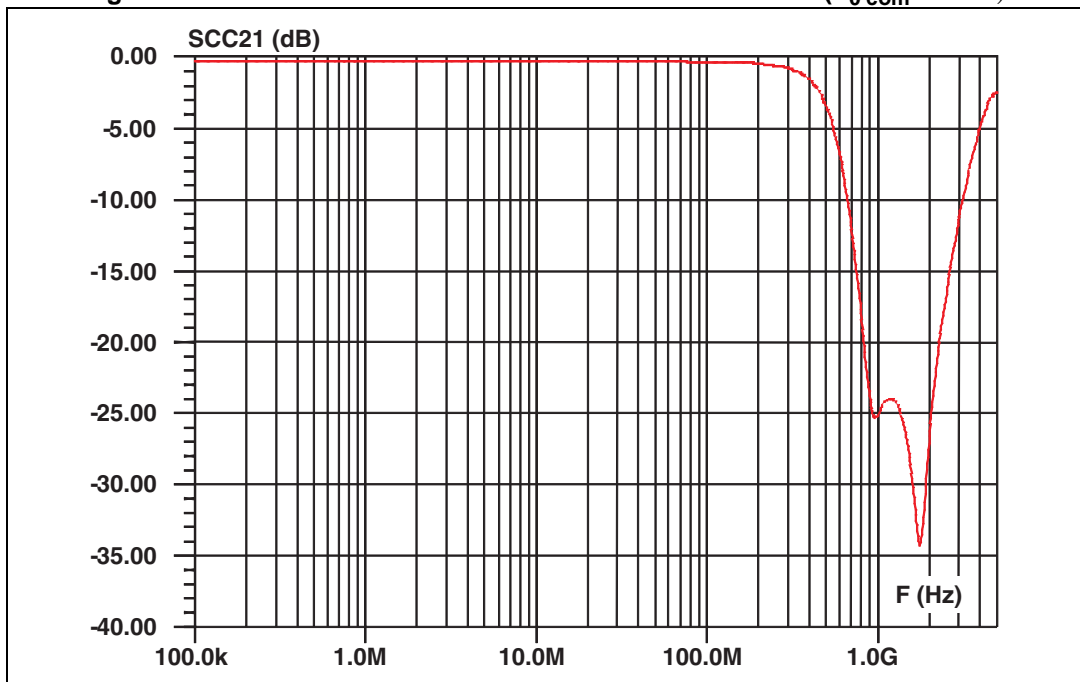


Figure 8. SDD11 and SDD22 differential return loss measurement ($Z_{0 \text{ diff}} = 100 \Omega$)

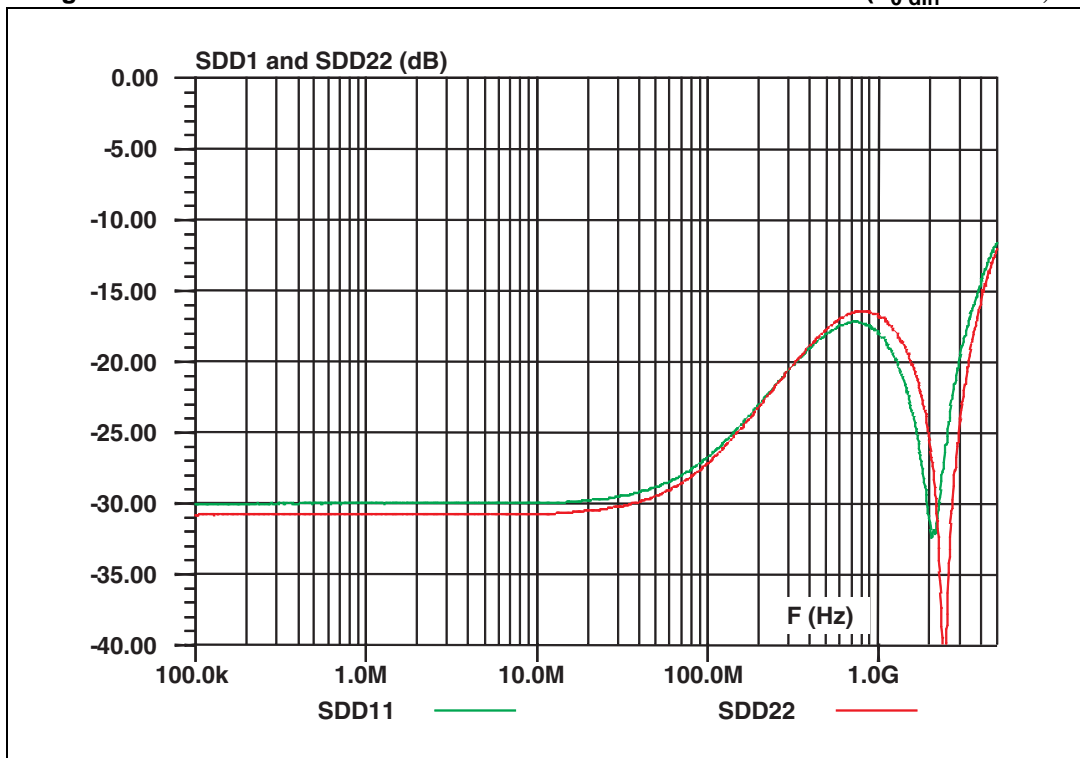


Figure 9. ESD response to IEC 61000-4-2 (+8 kV contact discharge)

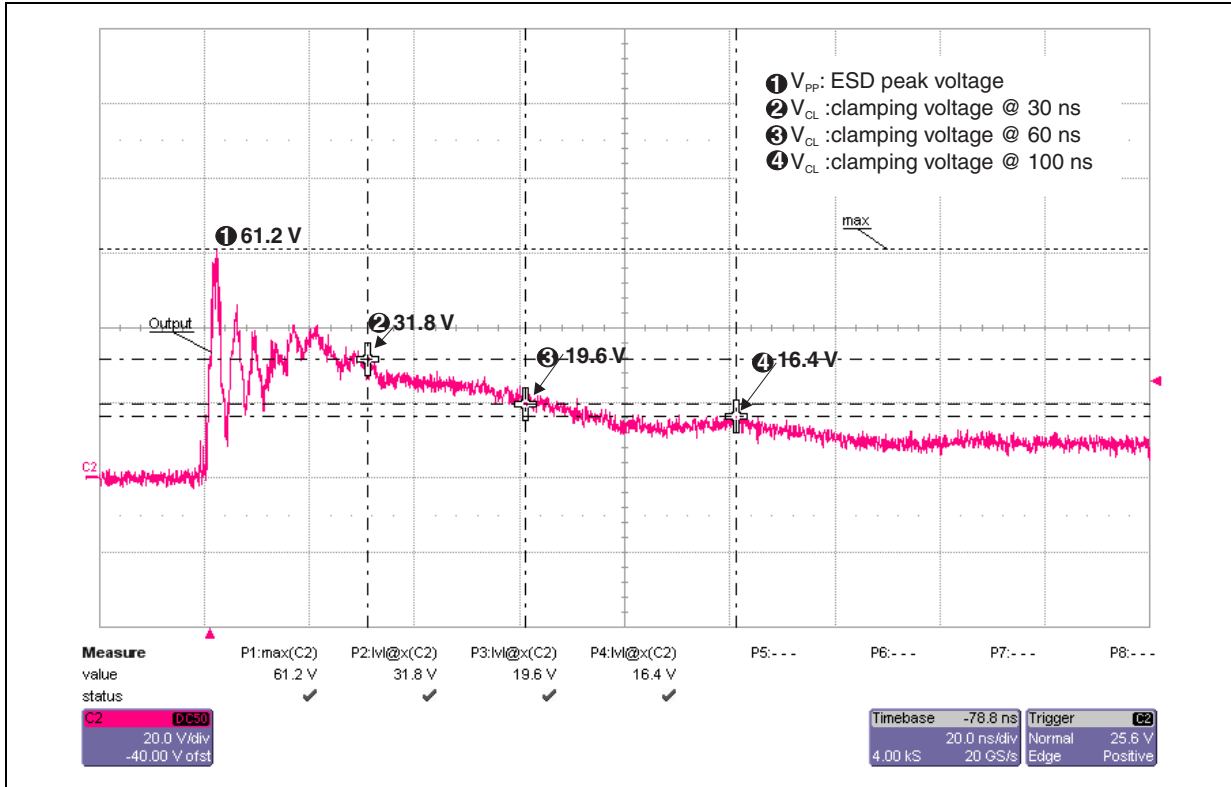
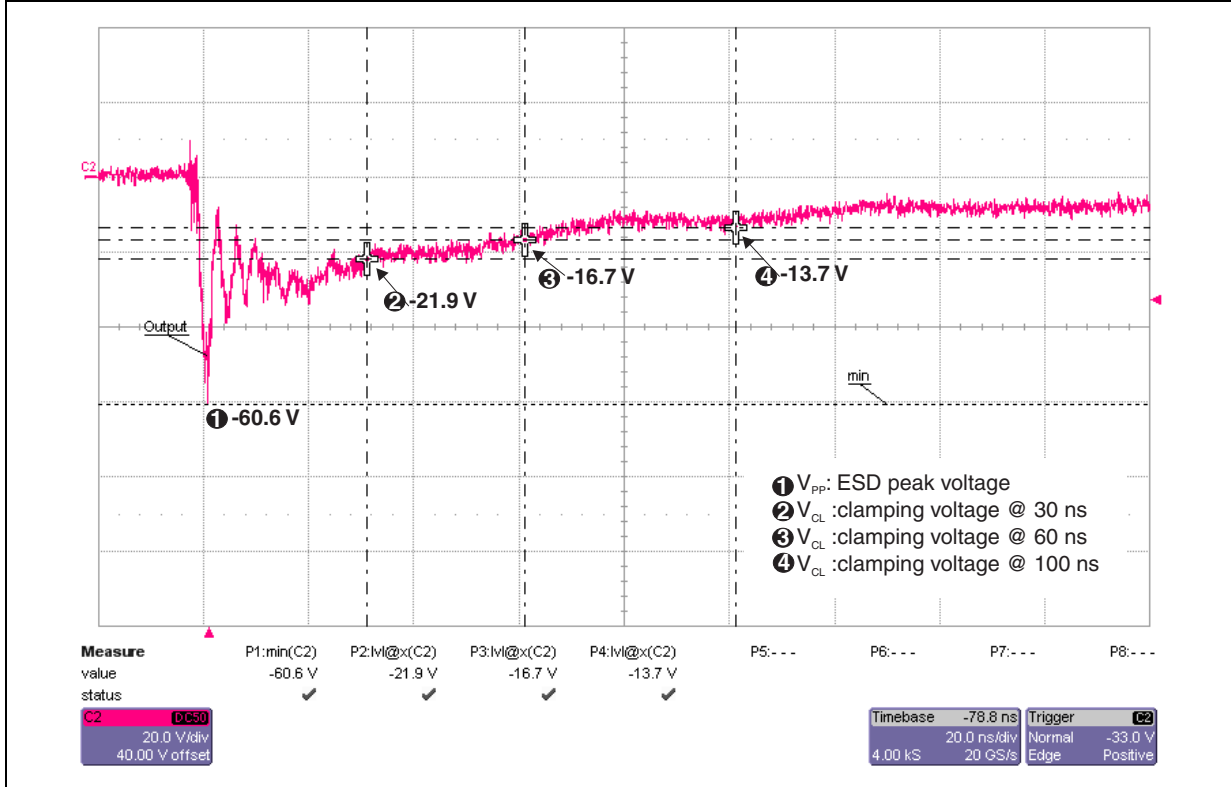


Figure 10. ESD response to IEC 61000-4-2 (-8 kV contact discharge)



4 High speed differential standard compliance tests

4.1 USB2.0 compliance tests

Figure 11. TDR measurement (loaded by $Z_{diff} = 90 \Omega$)

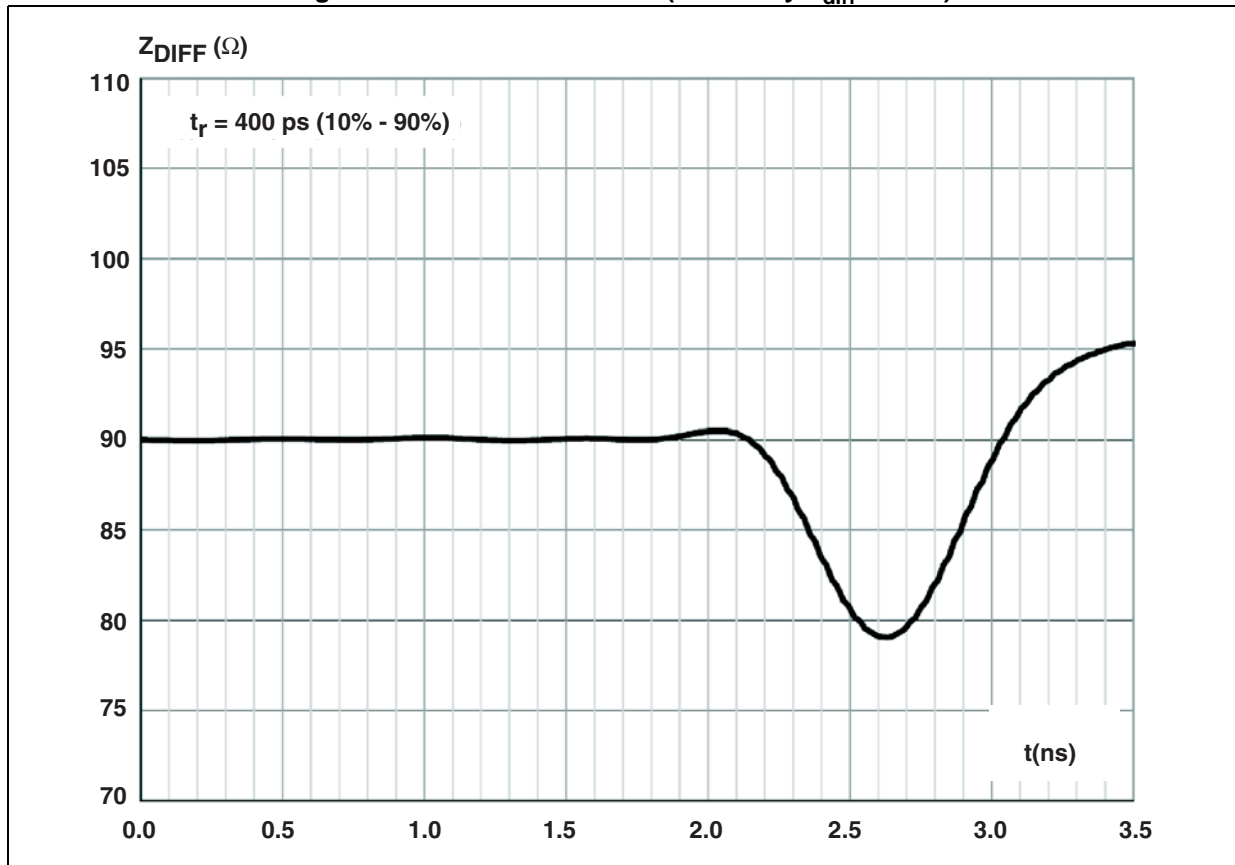
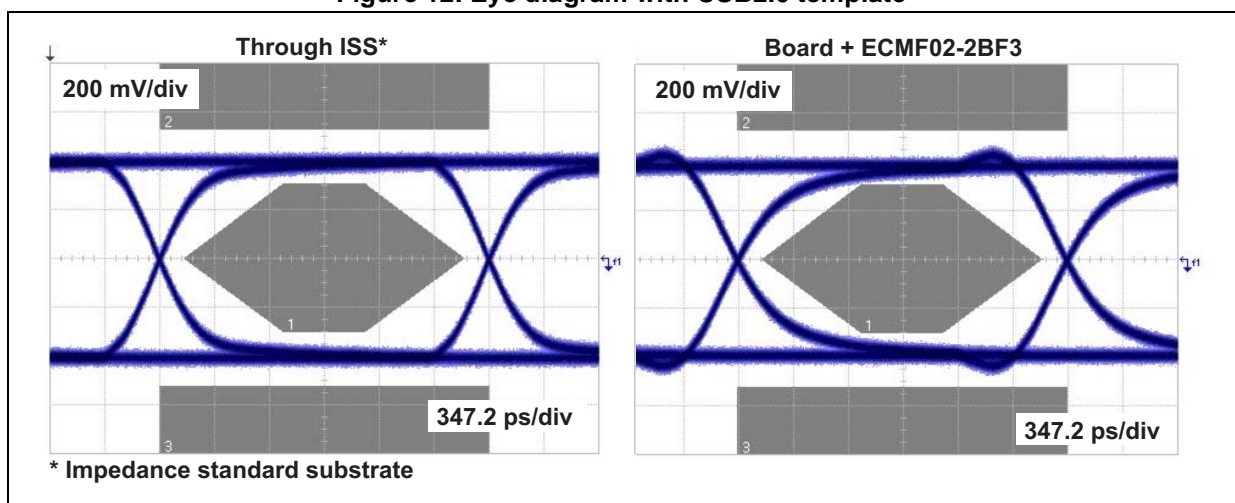
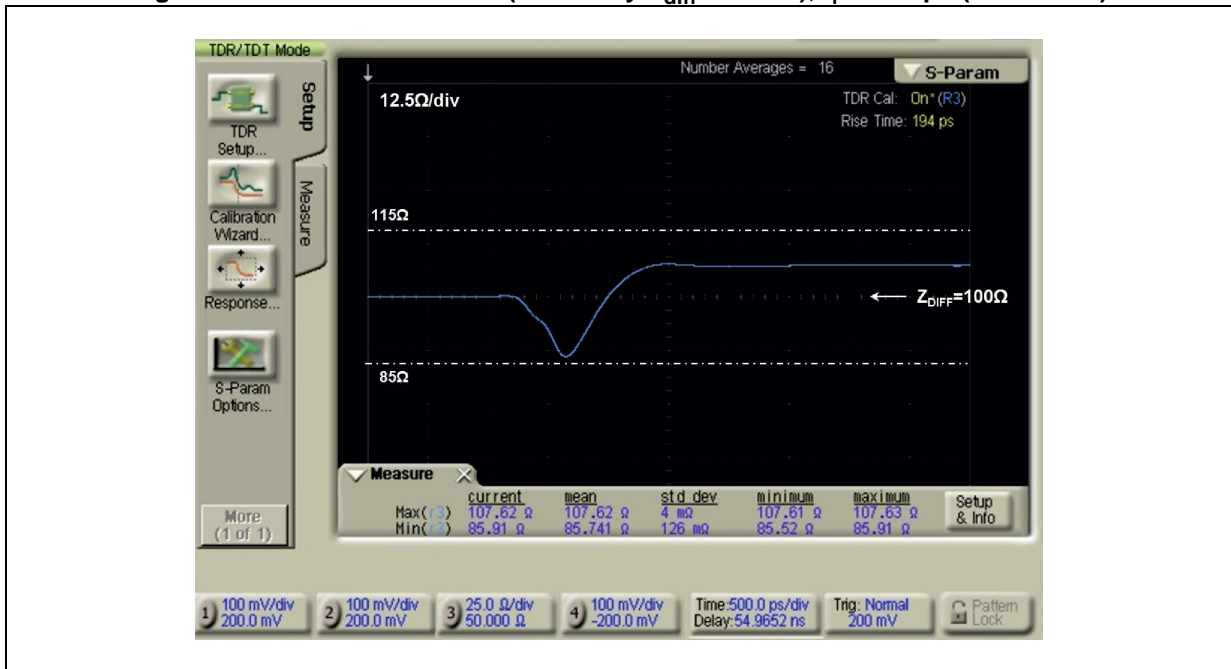


Figure 12. Eye diagram with USB2.0 template



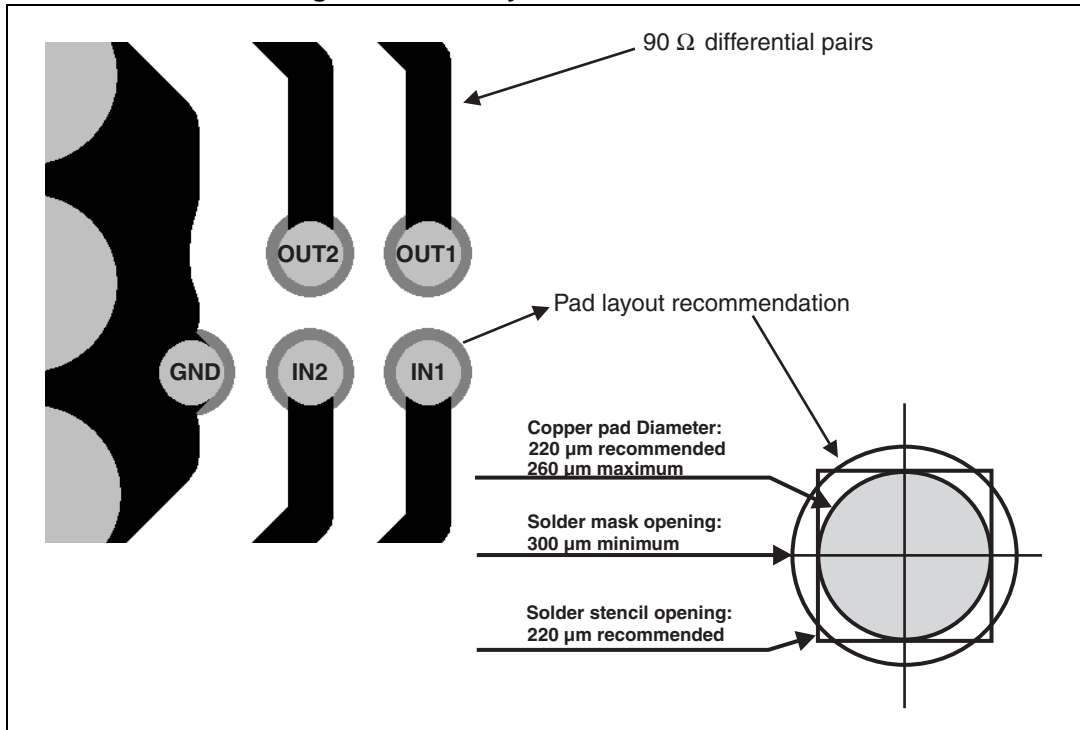
4.2 HDMI1.4 compliance tests

Figure 13. TDR measurement (loaded by $Z_{diff} = 100 \Omega$), $t_r = 194$ ps (10% - 90%)



5 PCB layout recommendations

Figure 14. PCB layout recommendations



6 Package information

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 15. Package dimensions

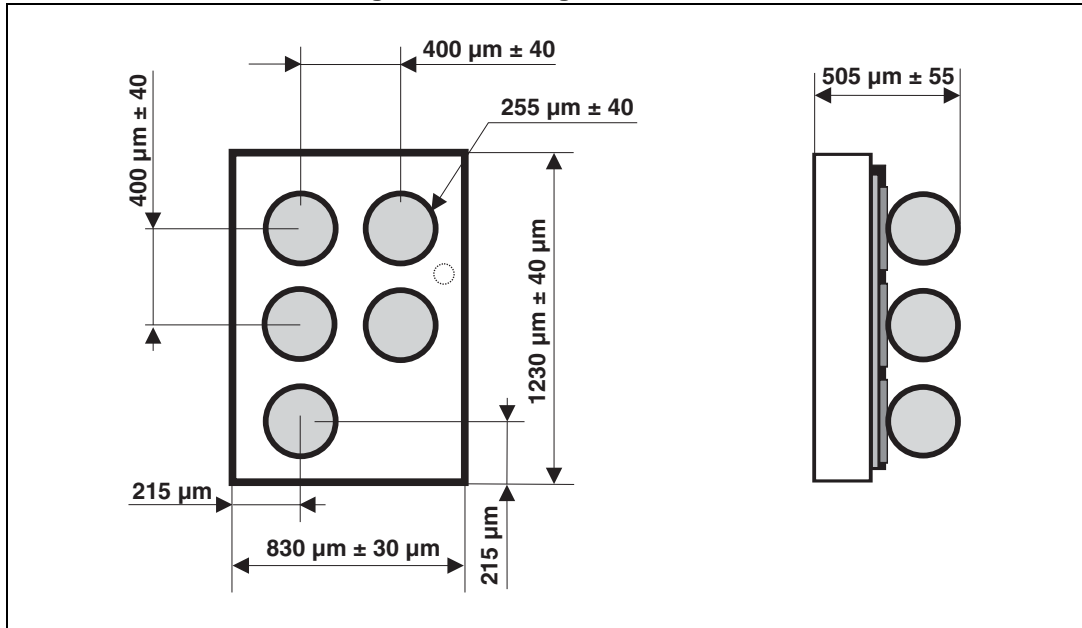


Figure 16. Marking

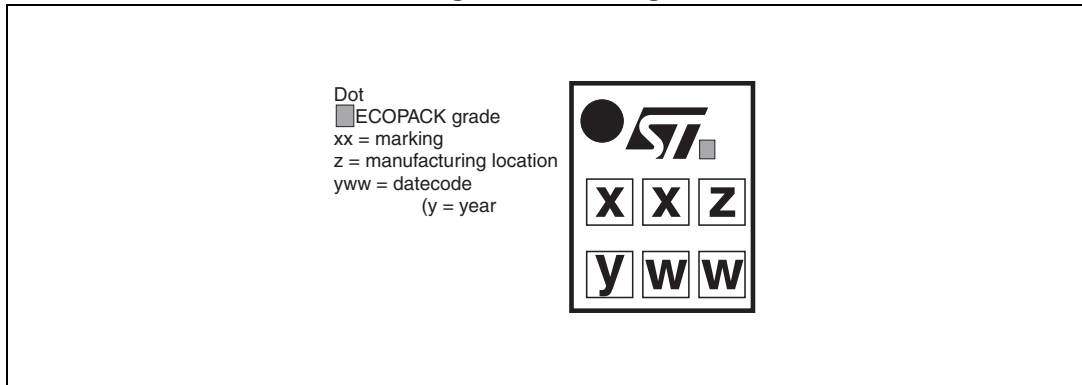
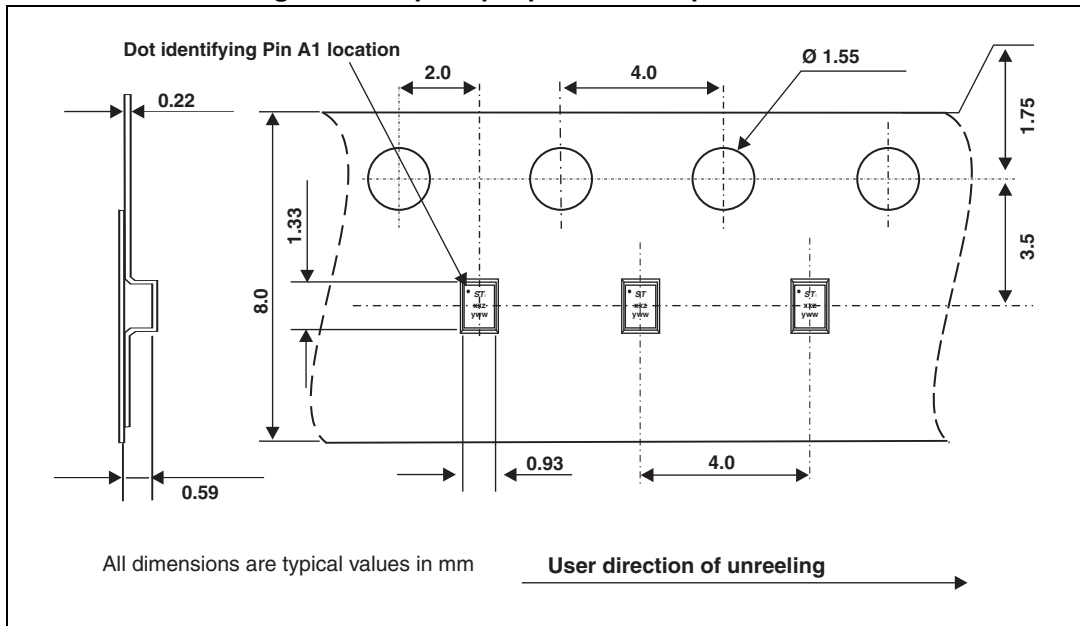


Figure 17. Flip Chip tape and reel specification



Note: More information is available in the application notes:
 AN2348, "IPAD™ 400 µm Flip Chip: package description and recommendations for use"
 AN1751, "EMI filters: recommendations and measurements"

7 Ordering information

Figure 18. Ordering information scheme

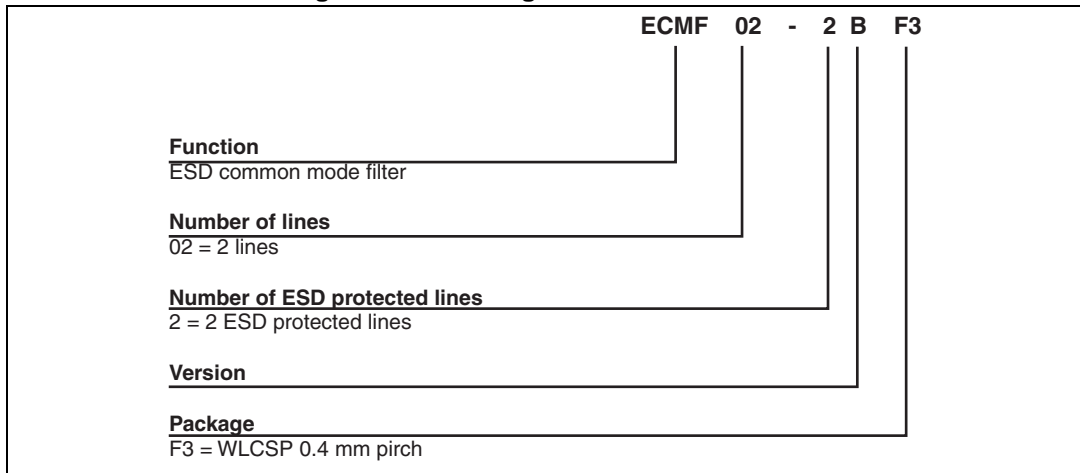


Table 3. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ECMF02-2BF3	KE	Flip Chip	1.15 mg	5000	Tape and reel 7"

8 Revision history

Table 4. Document revision history

Date	Revision	Changes
09-Feb-2012	1	Initial release.
07-Mar-2014	2	Updated <i>Figure 13</i> .

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