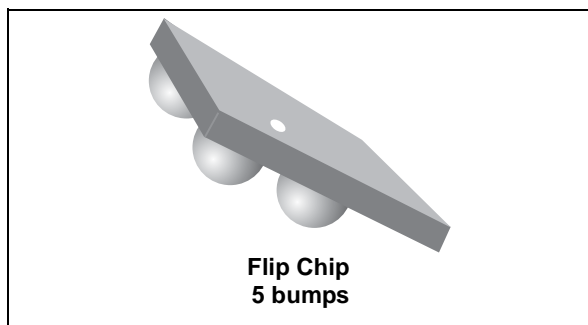


## Dual line IPAD™, common mode filter with ESD protection for high speed serial interface

Datasheet - production data



### 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: <1.1mm<sup>2</sup>
- 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

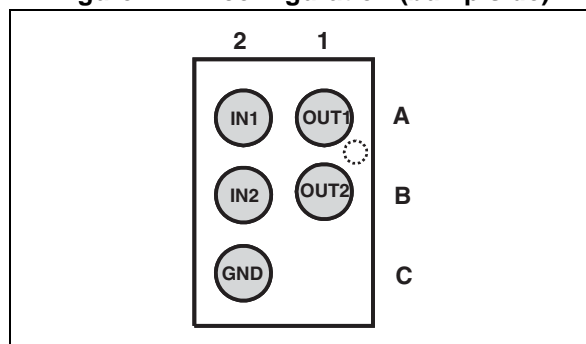
High speed serial interfaces such as USB 2.0, MIPI D-PHY, MDDI and HDMI.

### Description

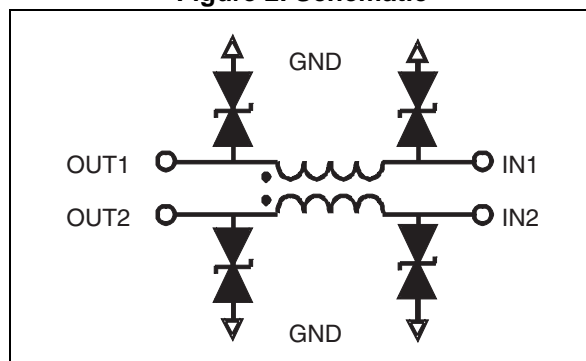
The ECMF02-2BF3 is a highly integrated common mode filter designed to suppress EMI/RFI common mode noise on high speed differential serial buses like MIPI D-PHY, MDDI, USB 2.0 and HDMI.

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

**Figure 1. Pin configuration (bump side)**



**Figure 2. Schematic**



**TM:** IPAD is a trademark of STMicroelectronics.

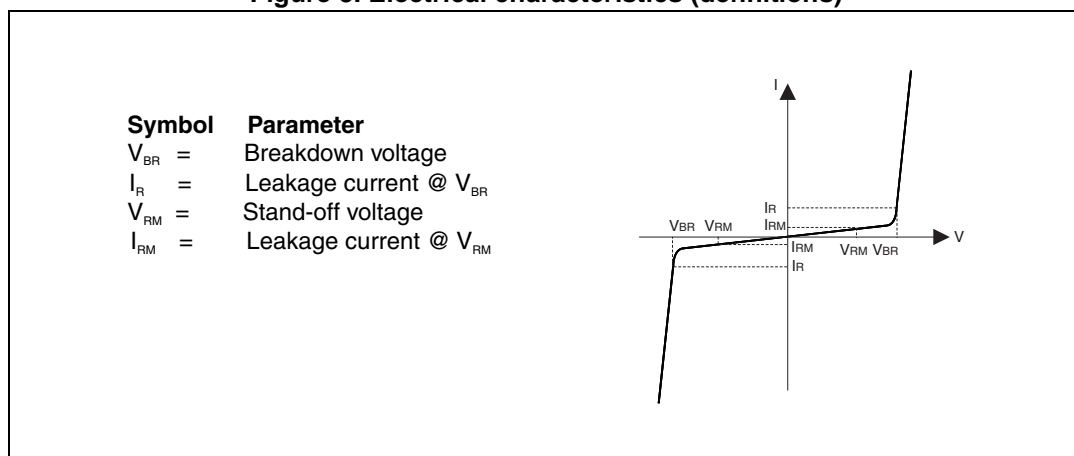
# 1 Characteristics

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

Symbol	Parameter		Value	Unit
$V_{PP}$	Peak pulse voltage <sup>(1)</sup>	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	$\Omega$

## 2 Application schematics

Figure 4. USB2.0 application

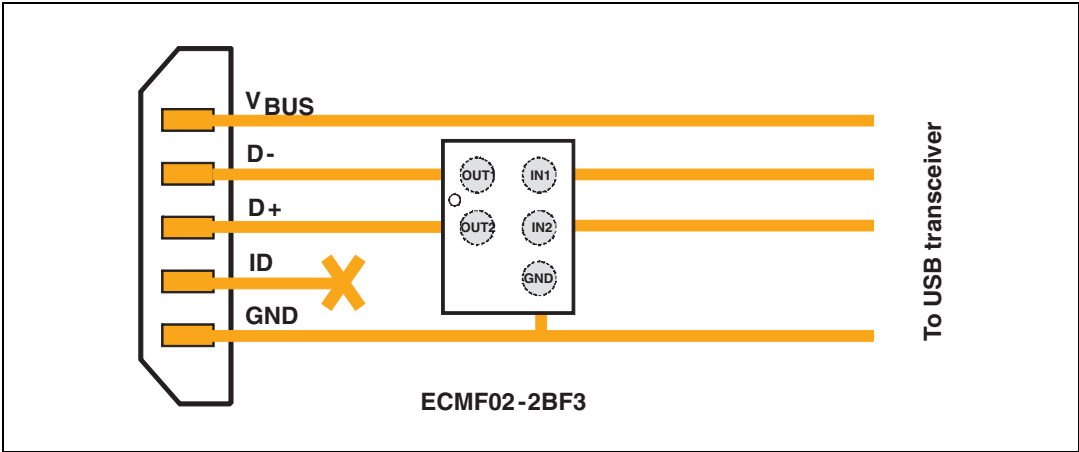
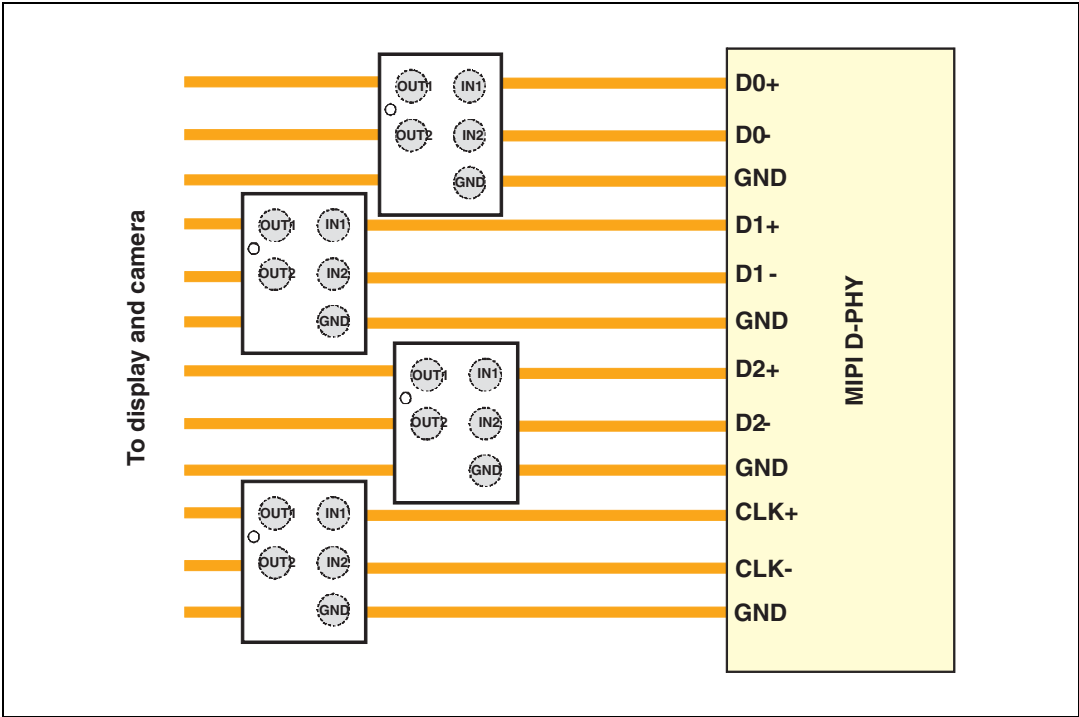


Figure 5. MIPI D-PHY application



### 3 Measurement curves

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

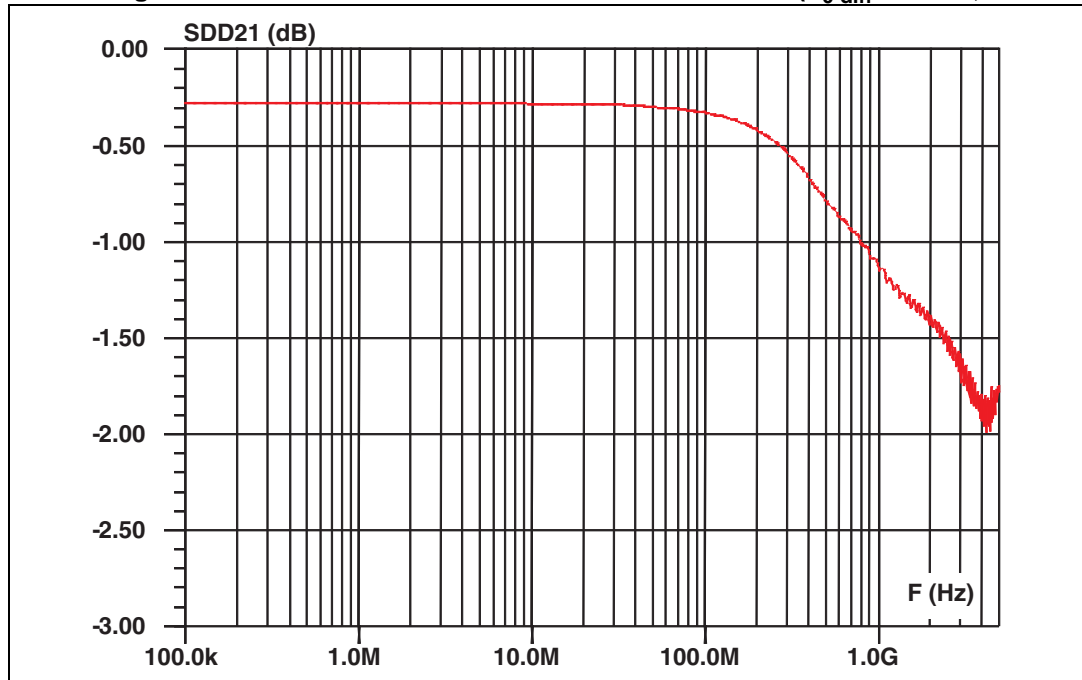


Figure 7. SCC21 common mode attenuation measurement ( $Z_{0\text{ com}} = 50\ \Omega$ )

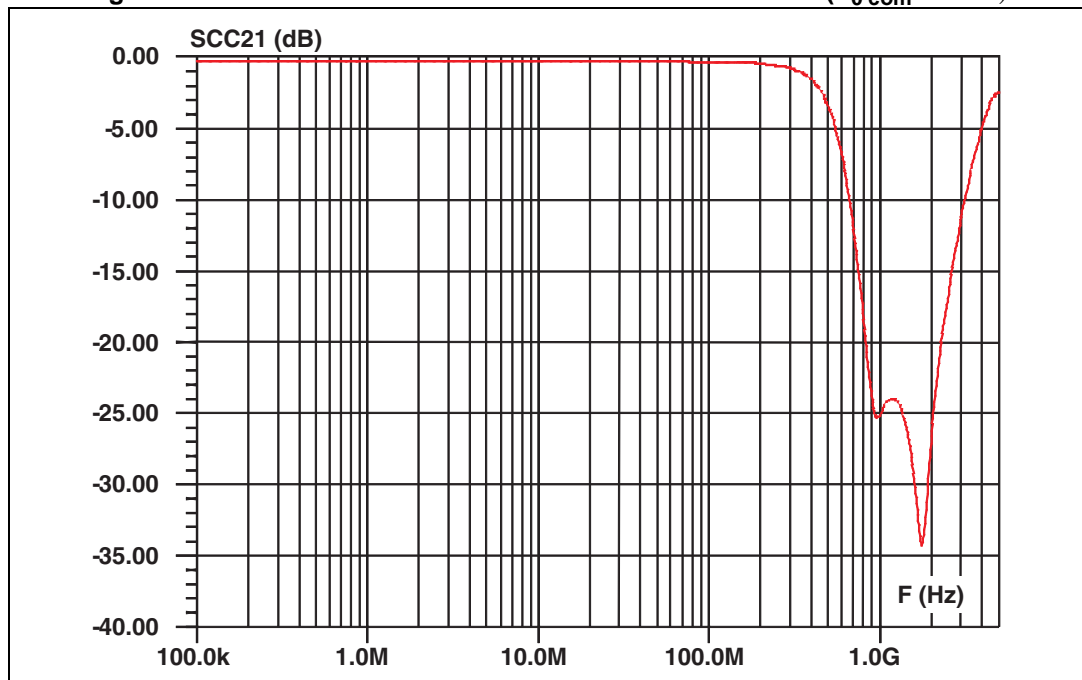


Figure 8. SDD11 and SDD22 differential return loss measurement ( $Z_{0\text{ diff}} = 100\ \Omega$ )

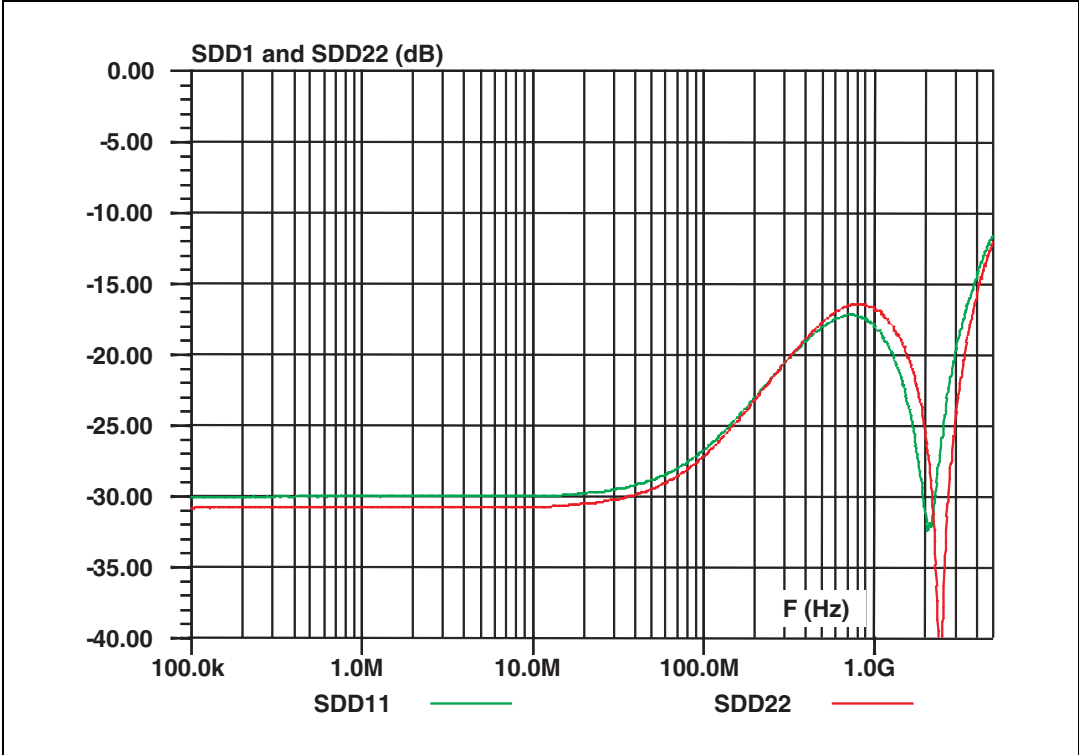


Figure 9. ESD response to IEC 61000-4-2 (+8 kV contact discharge)

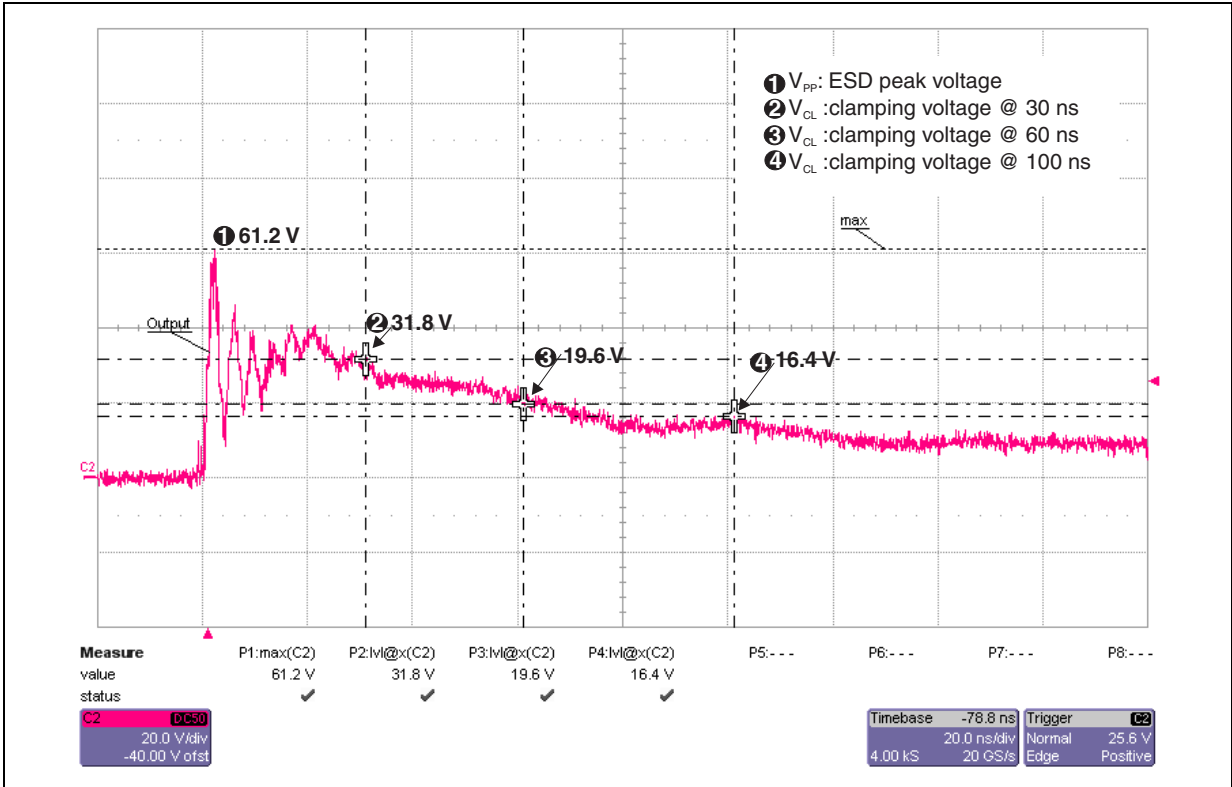
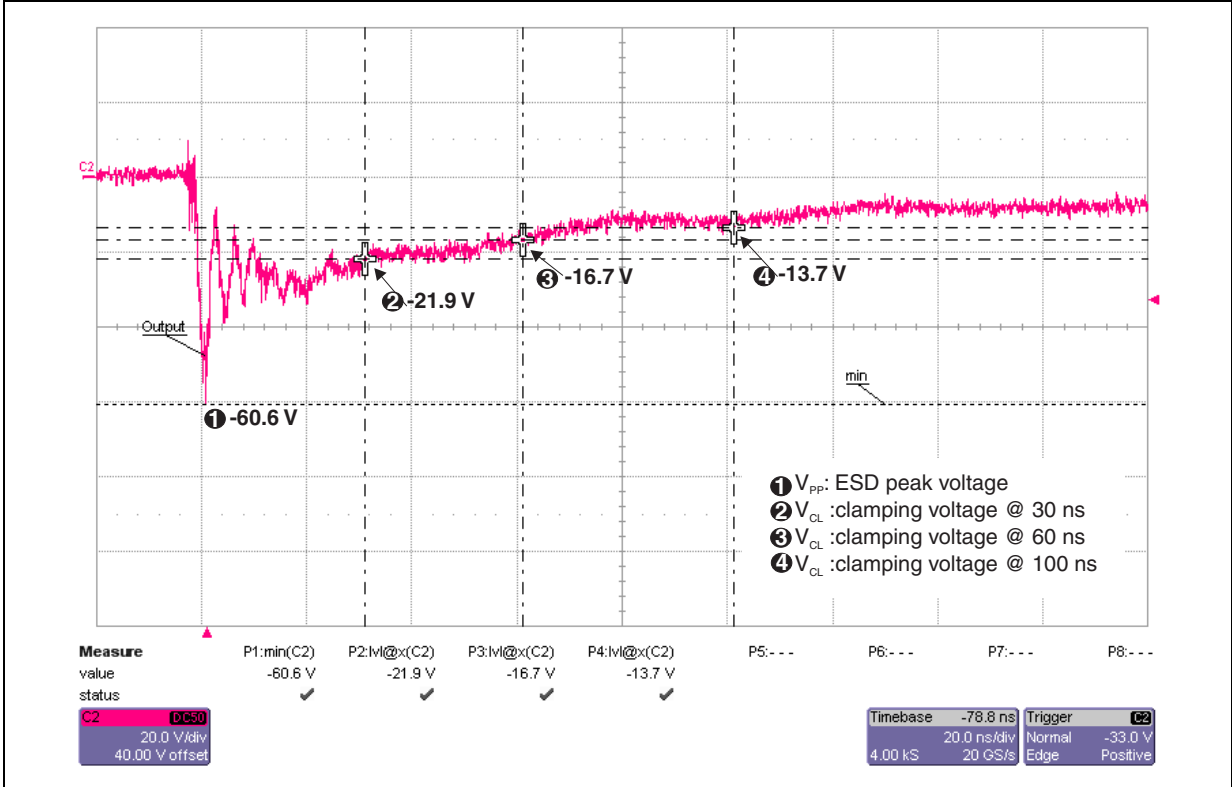


Figure 10. ESD response to IEC 61000-4-2 (-8 kV contact discharge)



## 4 High speed differential standard compliance tests

### 4.1 USB2.0 compliance tests

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

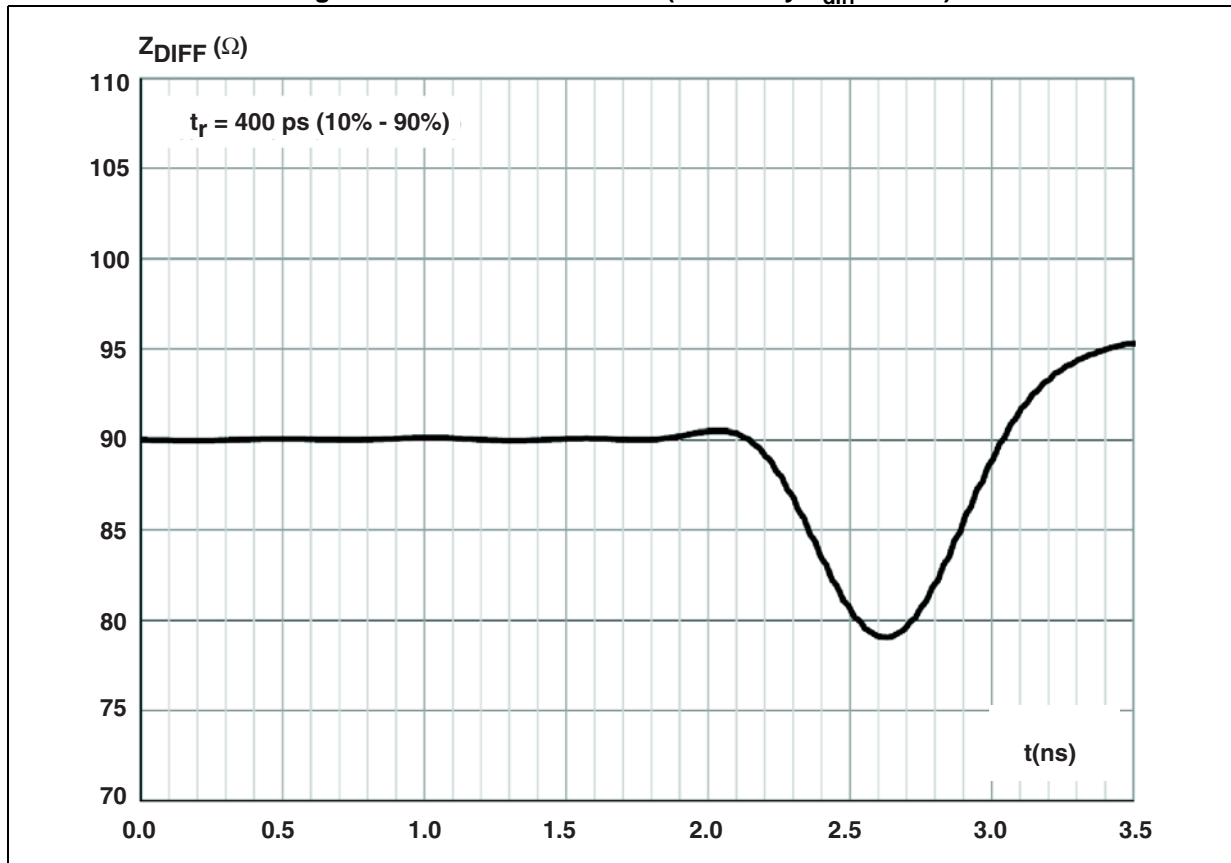
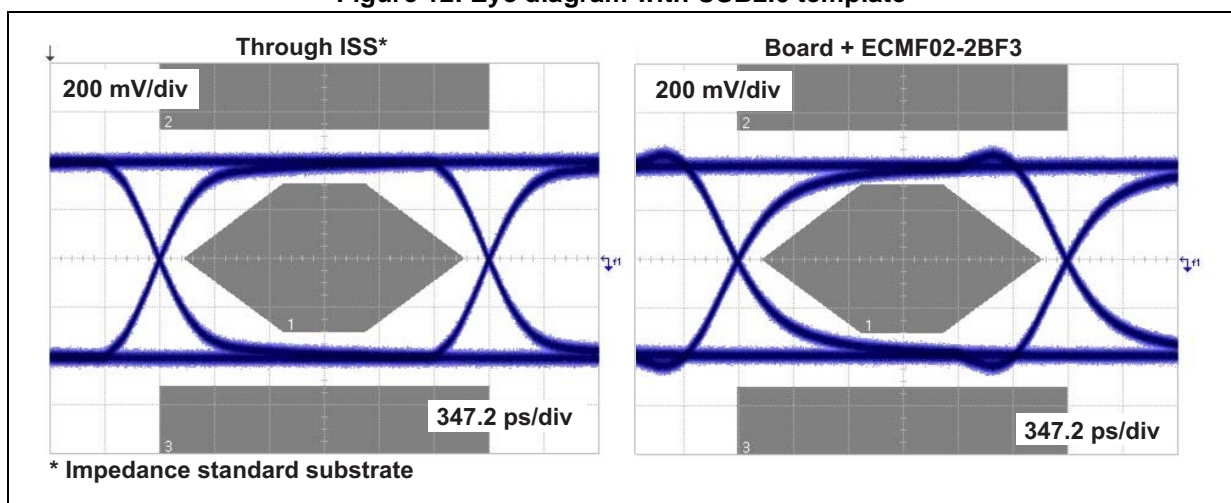
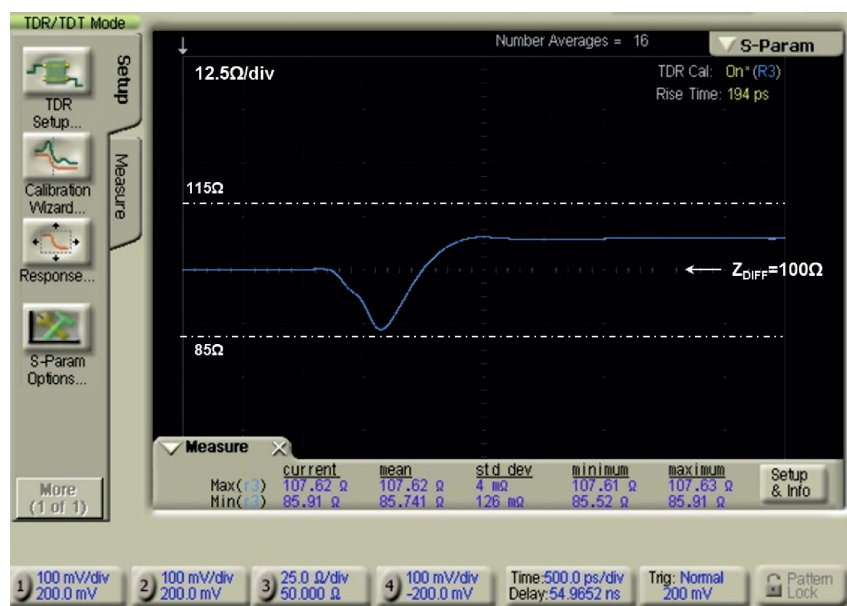


Figure 12. Eye diagram with USB2.0 template



## 4.2 HDMI1.4 compliance tests

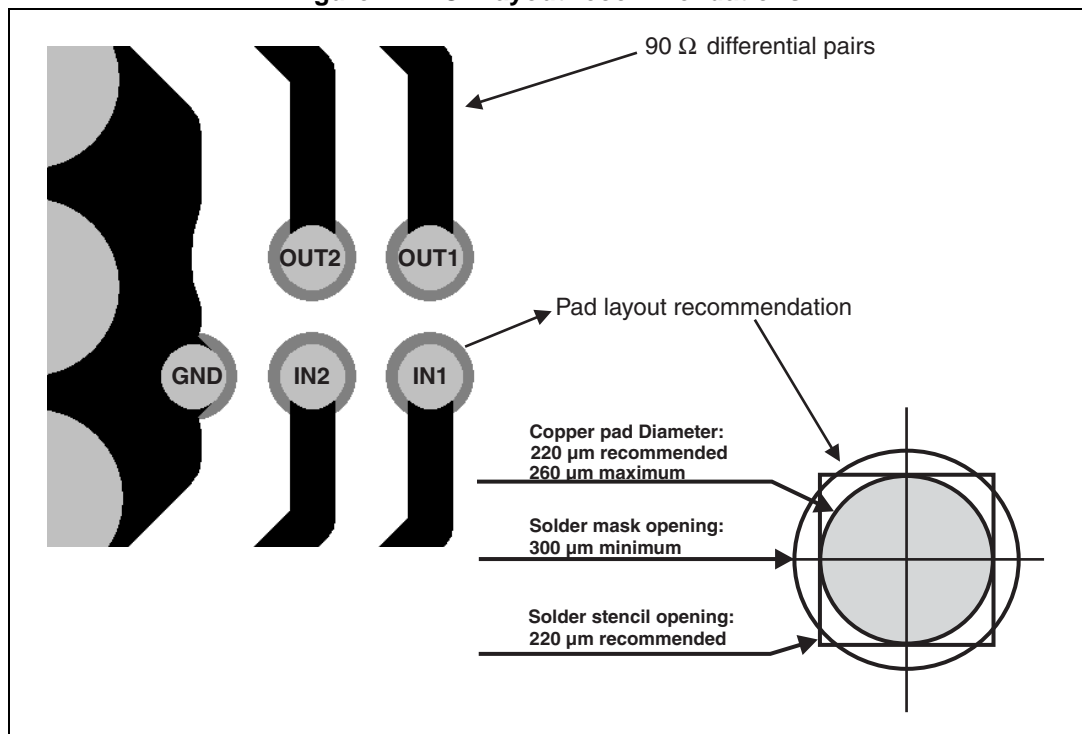
Figure 13. TDR measurement (loaded by  $Z_{\text{diff}} = 100\ \Omega$ ),  $t_r = 194\ \text{ps}$  (10% - 90%)





## 5 PCB layout recommendations

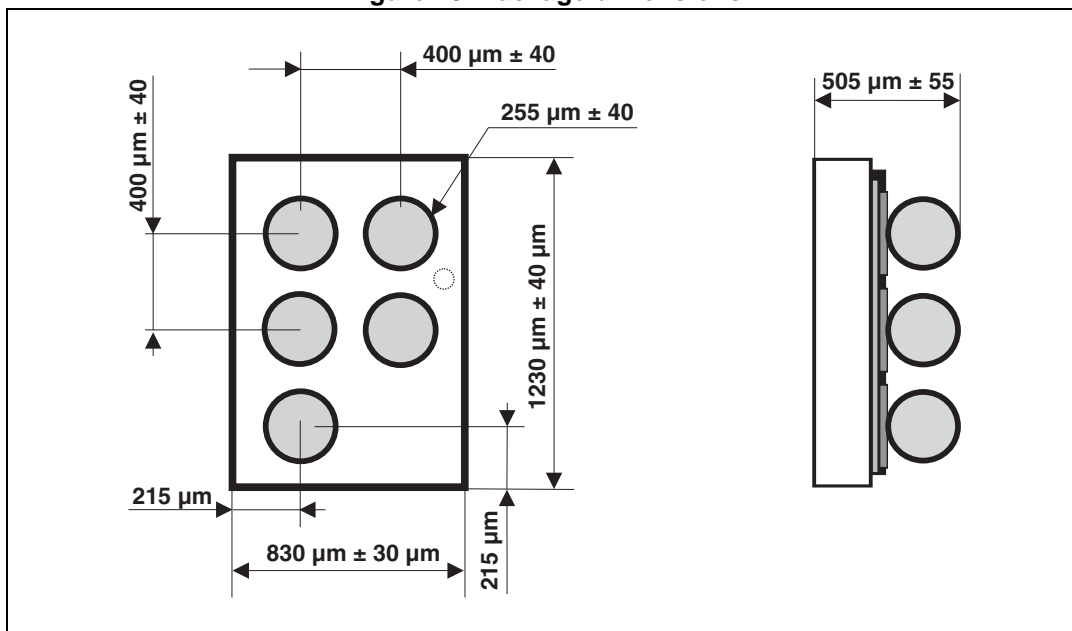
Figure 14. PCB layout recommendations



## 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](http://www.st.com). ECOPACK® is an ST trademark.

**Figure 15. Package dimensions**



**Figure 16. Marking**

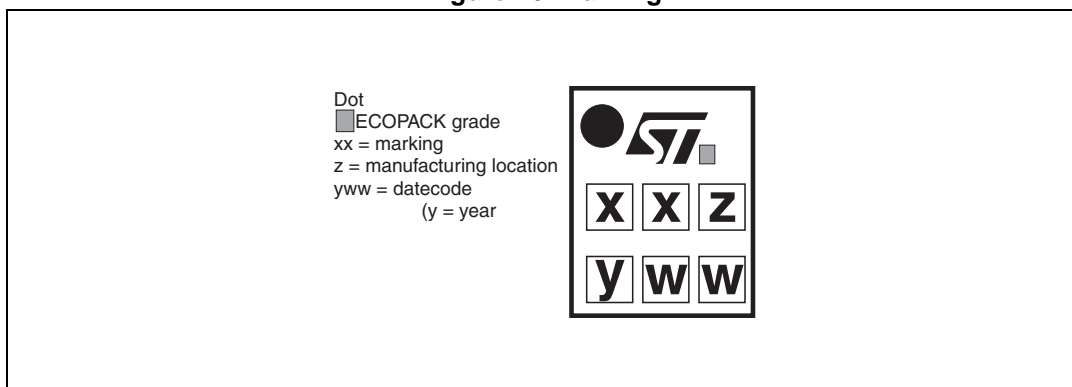
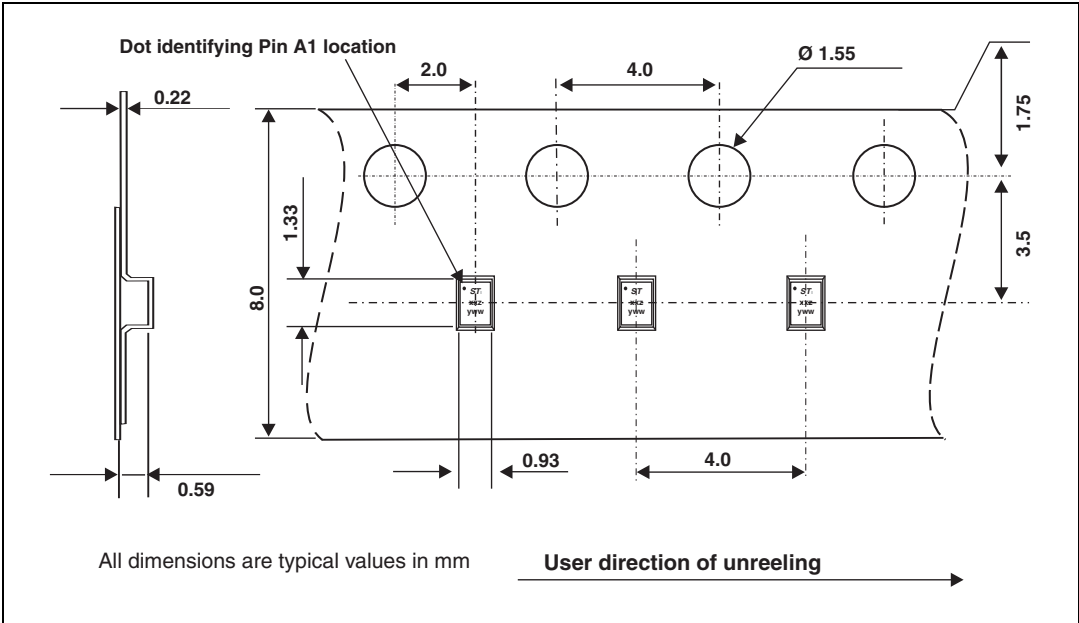


Figure 17. Flip Chip tape and reel specification



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

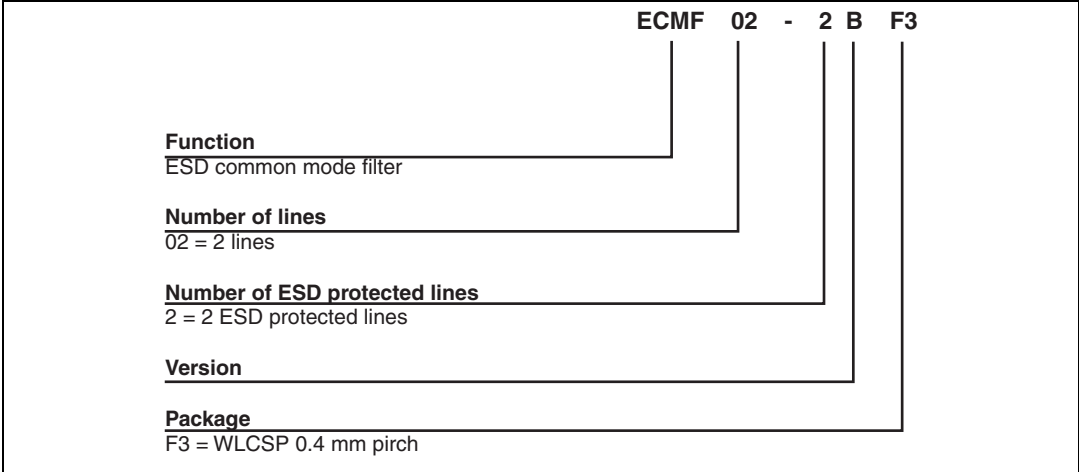


Table 3. Ordering information

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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