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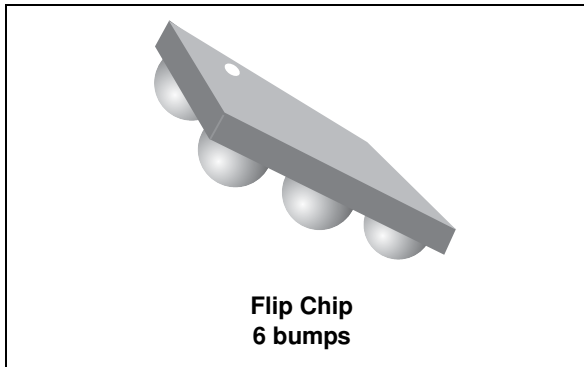
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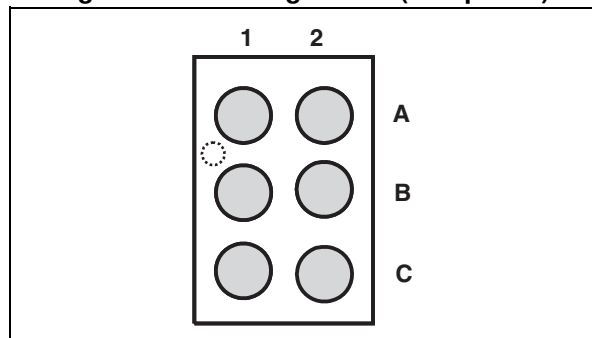


## Common mode filter with ESD protection

Datasheet – production data



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



### Features

- Very large differential bandwidth
- Very low PCB space consumption
- High ESD robustness: IEC 61000-4-2 level 4
- Withstand 1000 ESD strikes
- Lead-free Flip-Chip package
- Small footprint
- Very low profile

### Complies with the following standard:

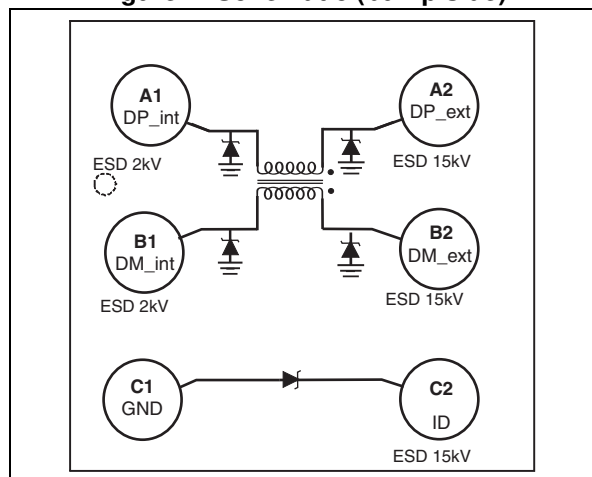
- IEC 61000-4-2 level 4:
  - ±15 kV (air discharge)
  - ±8 kV (contact discharge)

### Applications

Where transient overvoltage protection in ESD sensitive equipment is required such as:

- Mobile phones
- Computers
- Portable navigation devices
- Digital still cameras
- Portable multimedia players

**Figure 2. Schematic (bump side)**



### Description

The ECMF02-3F3 is a highly integrated common mode filter designed to suppress EMI/RFI common mode noise on high speed differential serial buses.

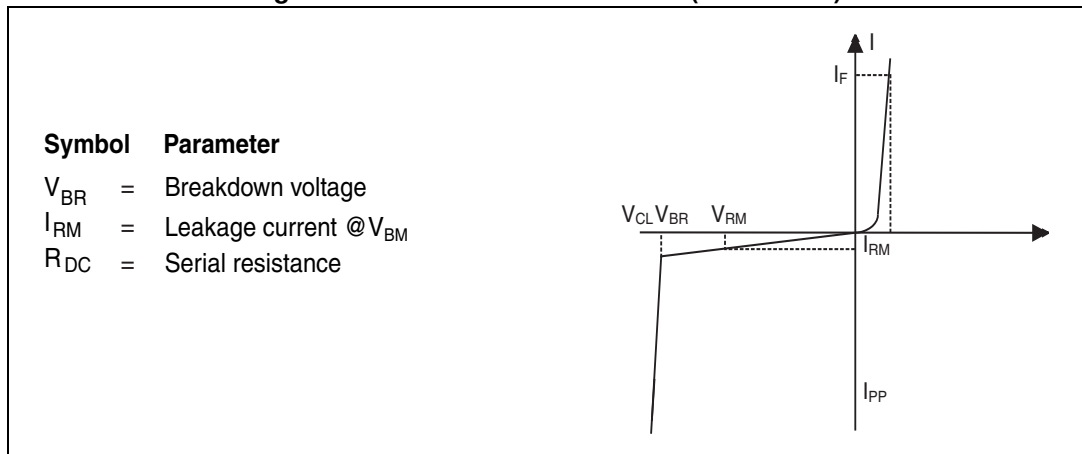
**TM:** IPAD is a trademark of STMicroelectronics.

# 1 Characteristics

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

Symbol	Parameter	Value	Unit
$V_{PP}$	IEC 61000-4-2 (C = 150 pF, R = 330 $\Omega$ )		
	External pins (A2, B2 and C2): level 4		
	Air discharge	15	kV
	Contact discharge	8	
Internal pins (A1, B1): level 1	Air discharge	2	
	Contact discharge	2	
$P_d$	Line resistance power dissipation at 85 $^{\circ}\text{C}$ (top max)	60	mW
$T_j$	Operating temperature range	- 30 to + 85	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature range	- 55 to 150	$^{\circ}\text{C}$

**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	4.5	$\Omega$

Figure 4. SDD21 differential attenuation versus frequency

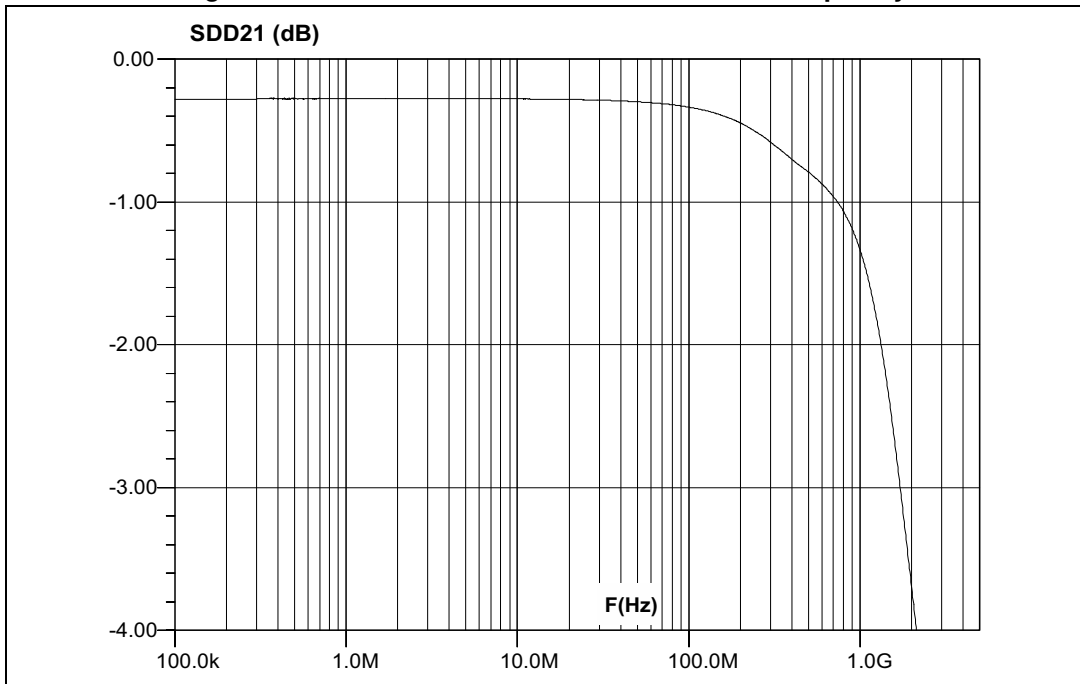


Figure 5. SCC21 common mode attenuation versus frequency (ID pin floating)

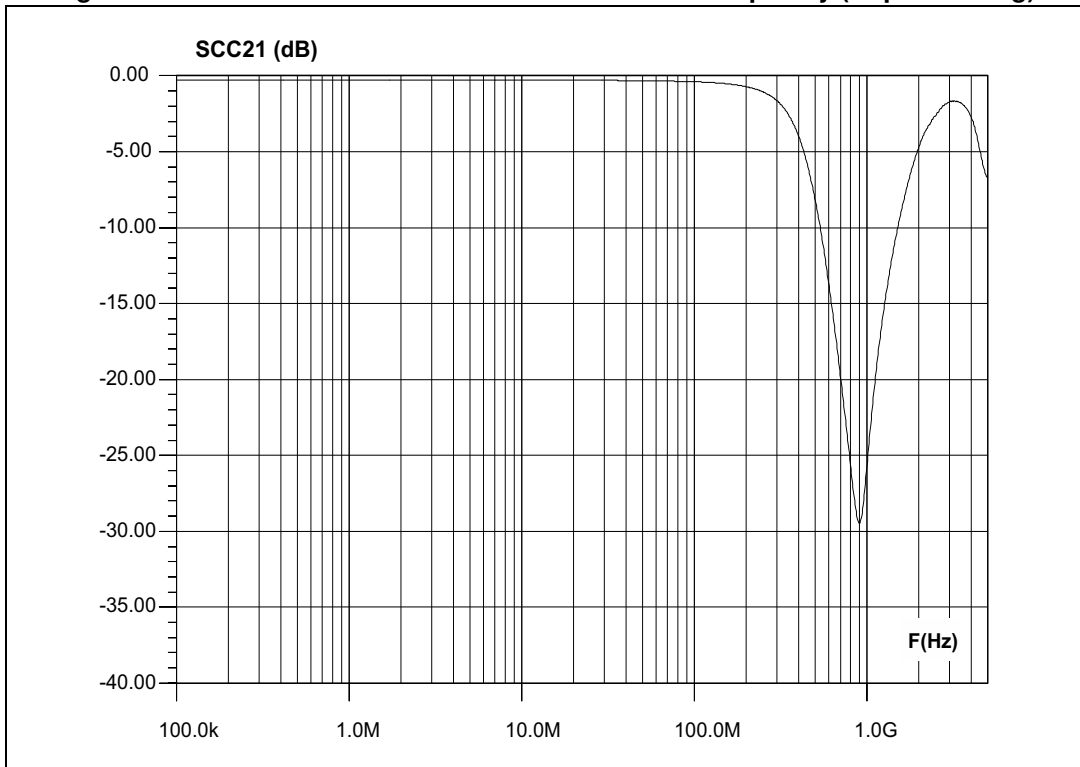




Figure 6. SDD11 / SDD22 differential return loss versus frequency (ID pin floating)

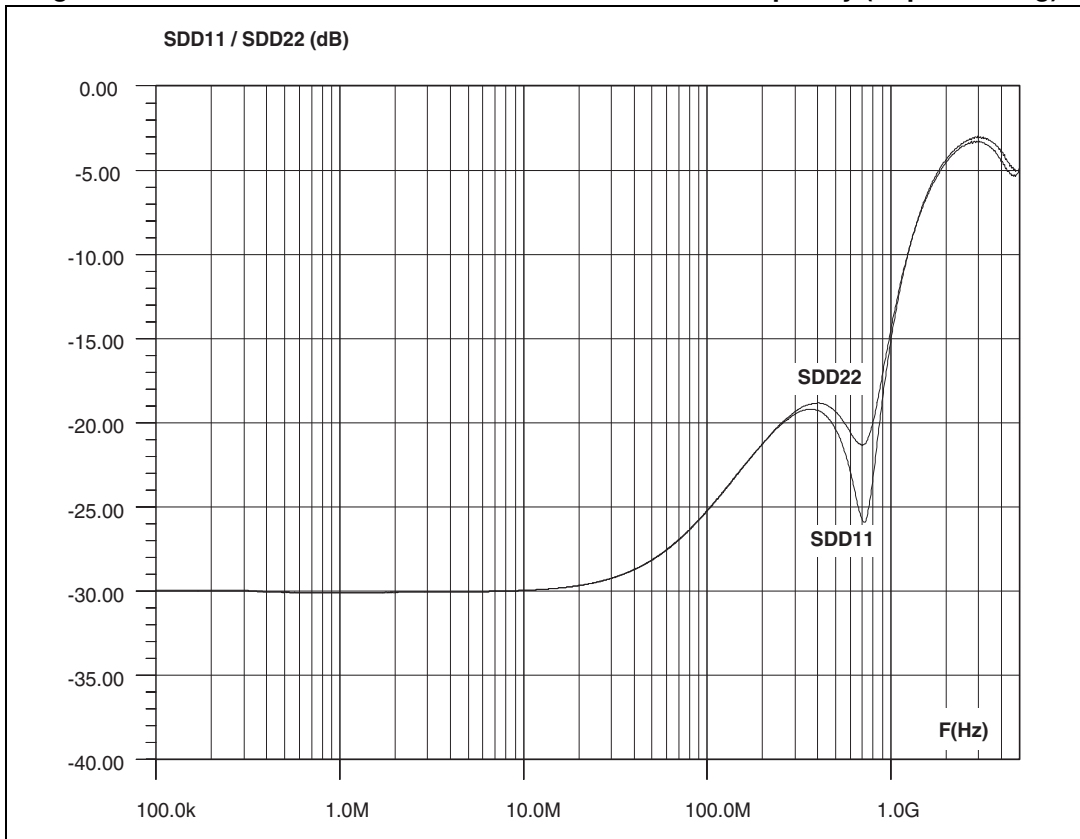


Figure 7. Eye diagram (according to USB 2.0 high speed specification mask1)

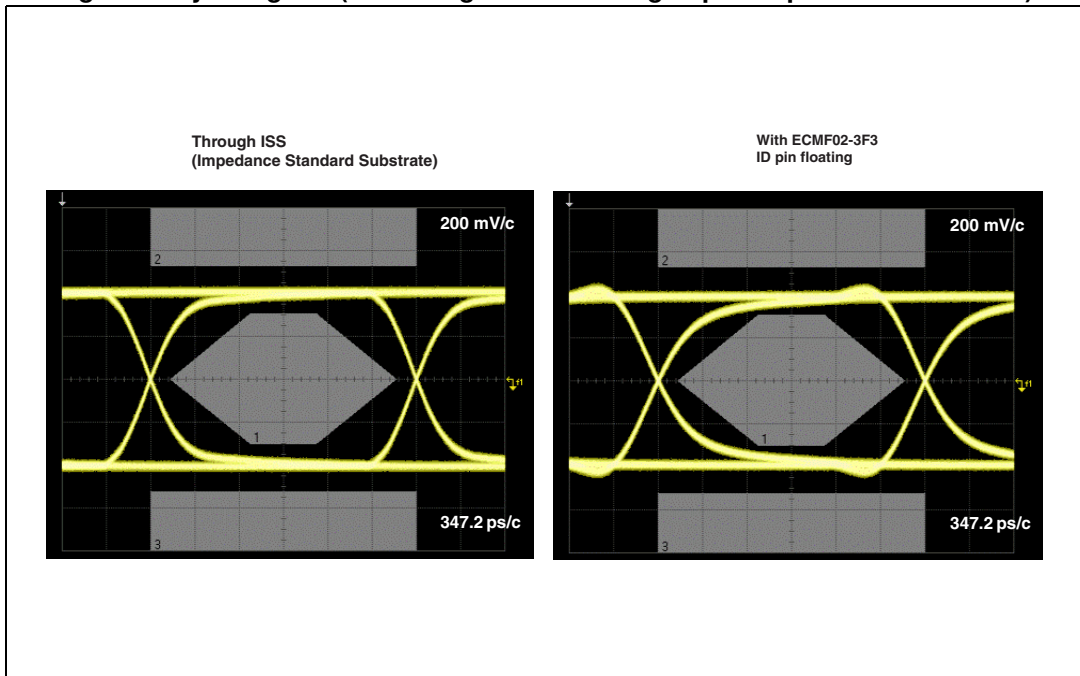


Figure 8. TDR:  $Z_0 \text{ DIFF} = 100 \Omega$ ,  $t_R = 400 \text{ ps}$  (10% - 90%),

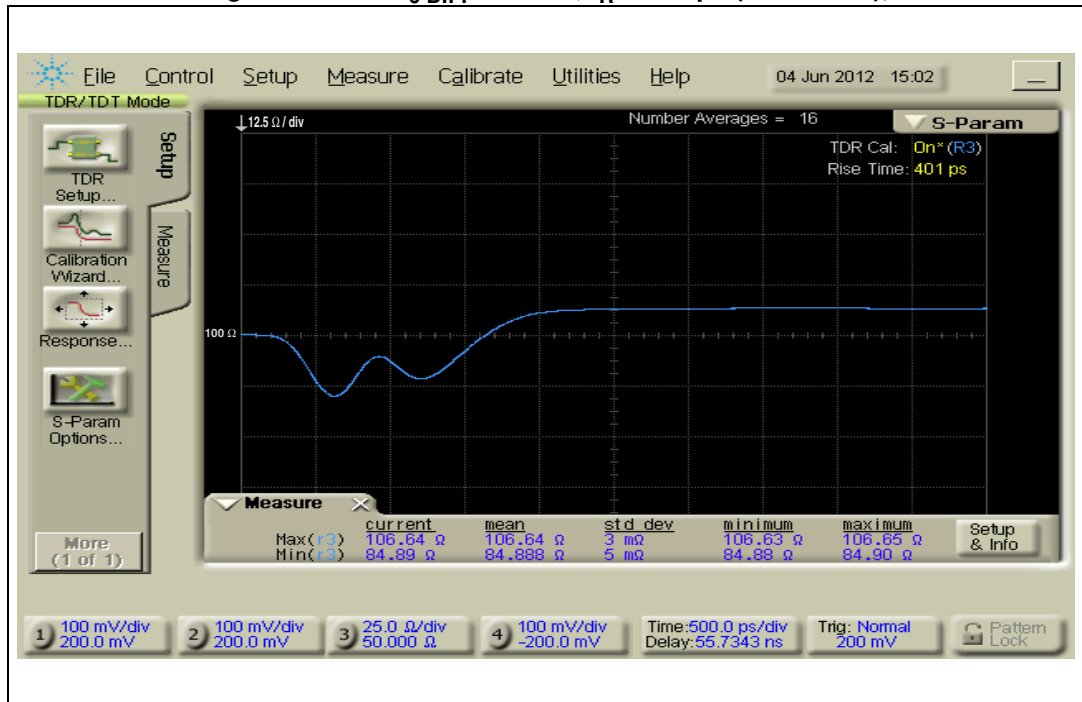


Figure 9. ESD response to IEC 61000-4-2 (+8 kV contact discharge)

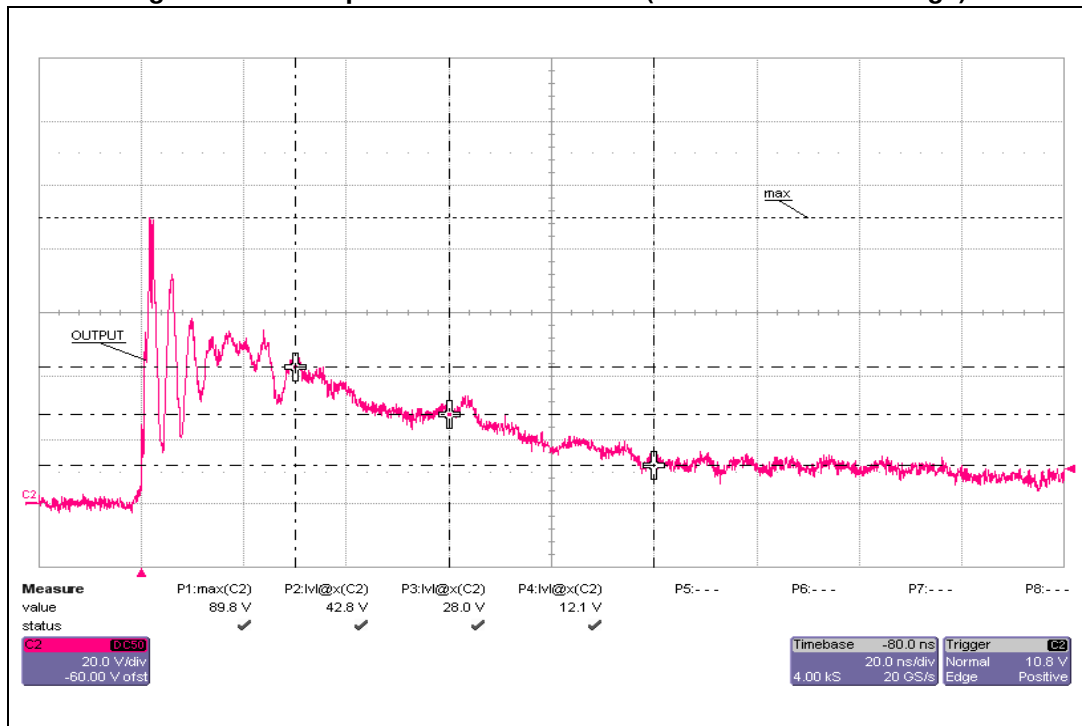
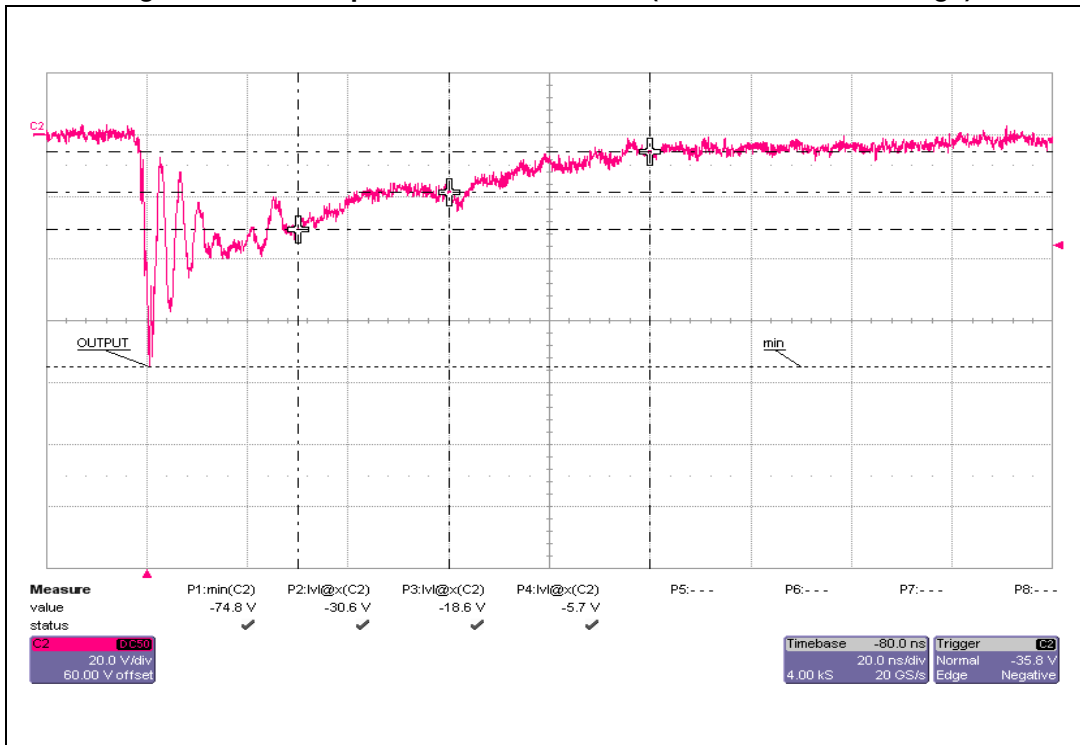
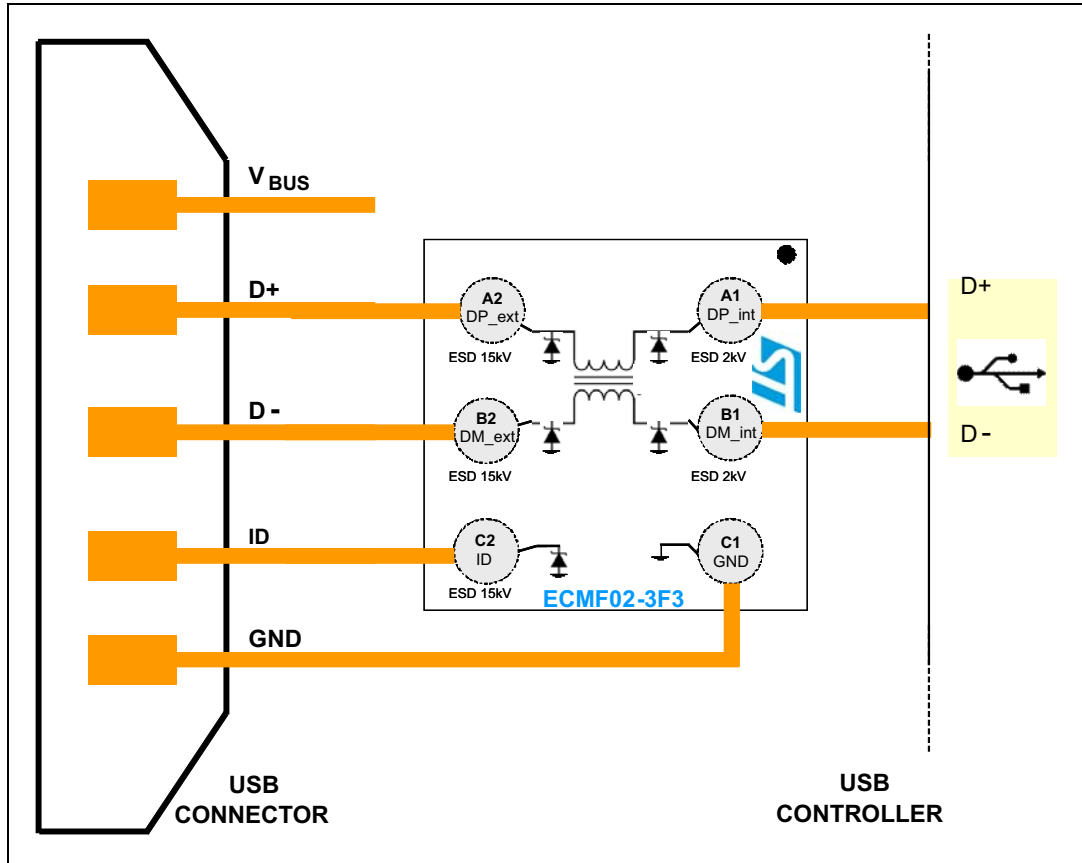


Figure 10. ESD response to IEC 61000-4-2 (- 8 kV contact discharge)



## 2 USB 2.0 application schematic

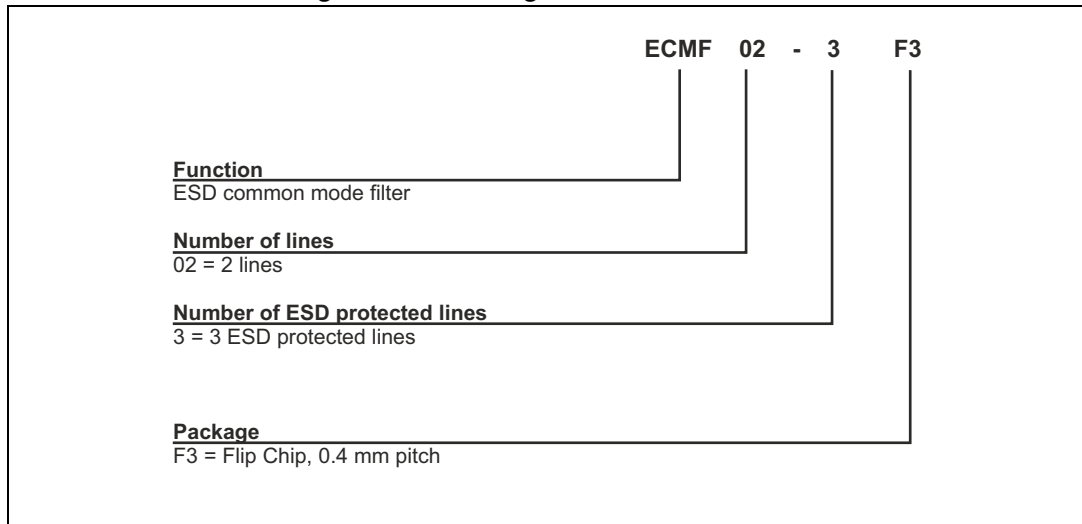
Figure 11. Application schematic





### 3 Ordering information scheme

Figure 12. Ordering information scheme



## 4 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 13. Package dimensions

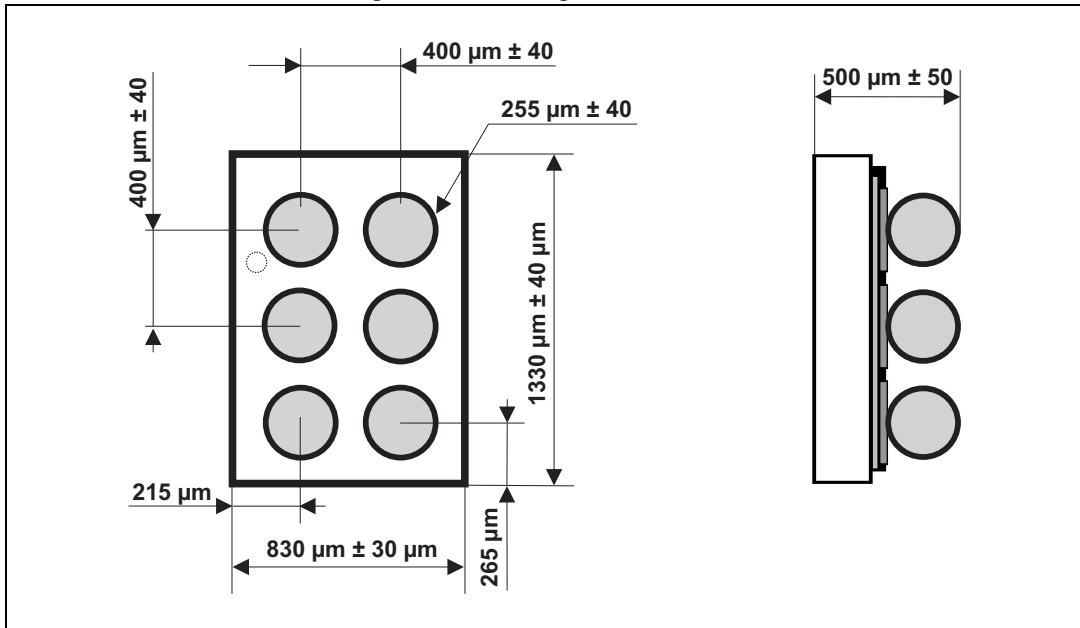


Figure 14. Marking

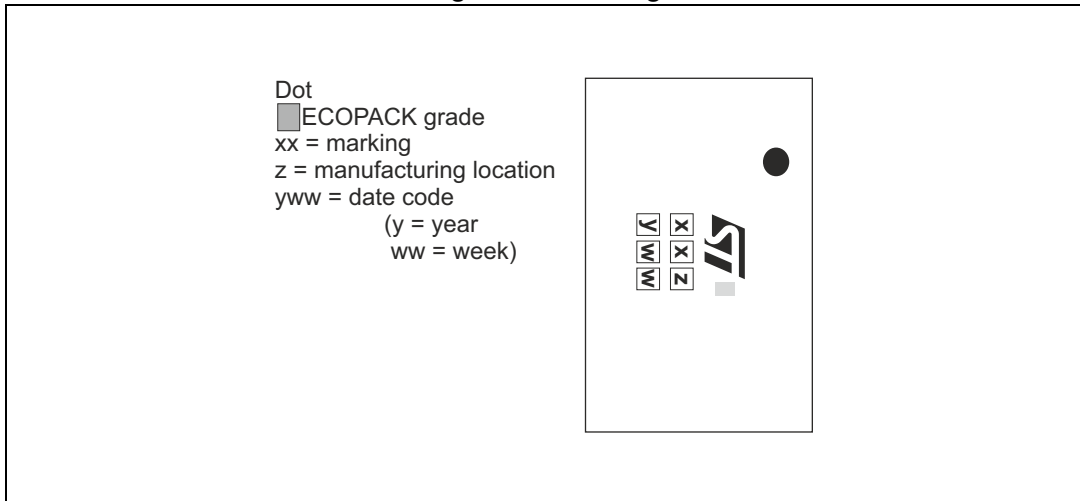


Figure 15. Footprint recommendations

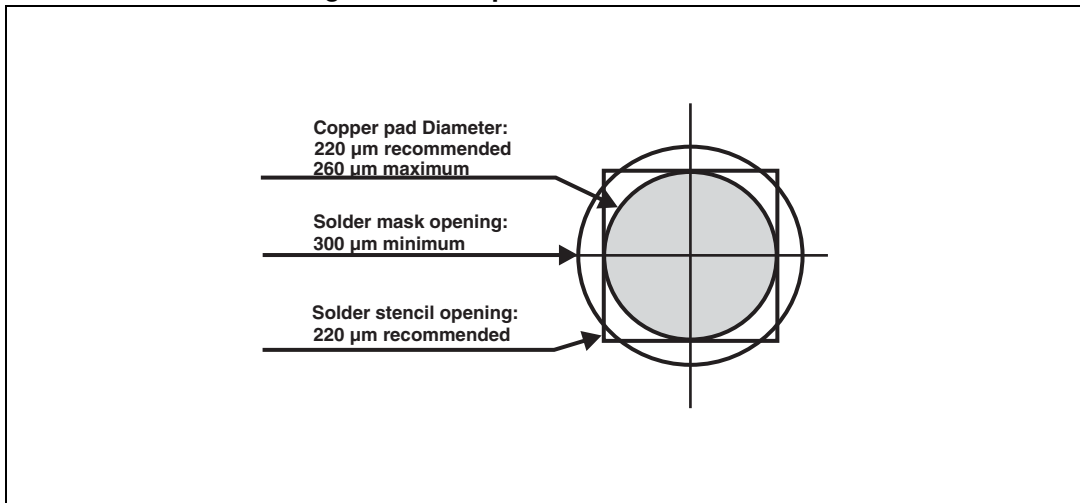
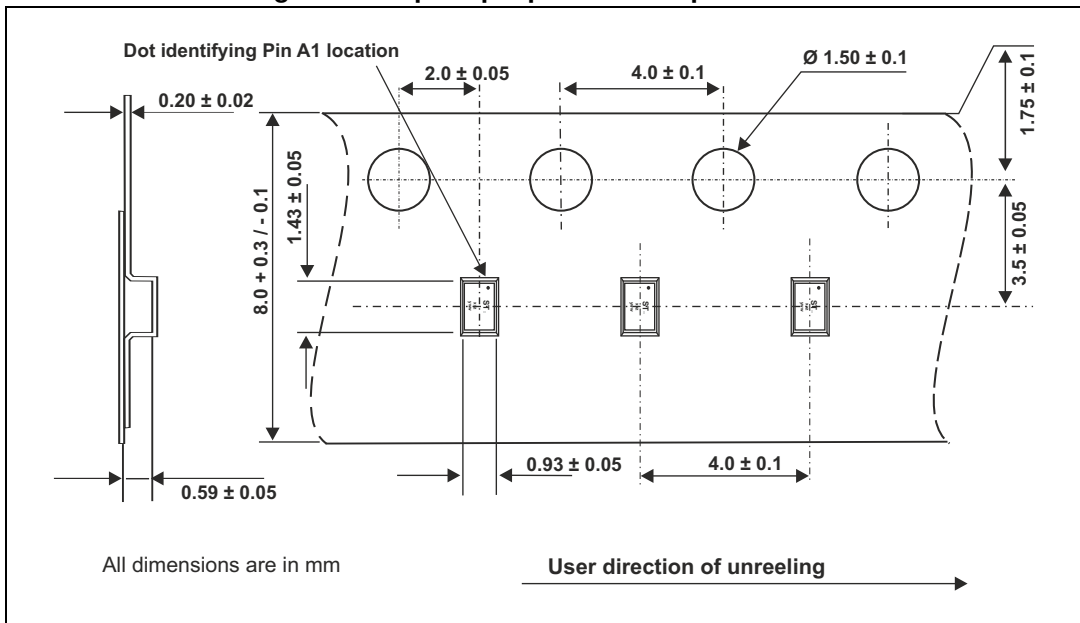


Figure 16. Flip Chip tape and reel specification



Note: More information is available in the application notes:  
 AN2348, "IPAD™ 400  $\mu\text{m}$  Flip Chip: package description and recommendations for use"  
 AN1751, "EMI filters: recommendations and measurements"

## 5 Ordering information

Table 3. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ECMF02-3F3	KH	Flip Chip	1.2 mg	5000	Tape and reel 7"

## 6 Revision history

Table 4. Document revision history

Date	Revision	Changes
19-Nov-2012	1	Initial release.
22-May-2013	2	Moved dot position in <a href="#">Figure 13</a> . Moved arrow in <a href="#">Figure 16</a> to point to pin A1 location.
19-Dec-2013	3	Corrected typographical error in <a href="#">Figure 13</a> .

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