

### Features

- Packaged in lead-free Flip Chip
- Very low resistance: 0.35 Ω
- High attenuation: -45 dB at 900 MHz
- Very low PCB space consumption: 0.89 mm x 1.26 mm
- Very thin package: 0.65 mm
- High efficiency in ESD suppression IEC6 1000-4-2 level 4
- High reliability offered by monolithic integration
- High reduction of parasitic elements through integration and wafer level packaging

### Complies with the following standards

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

### Application

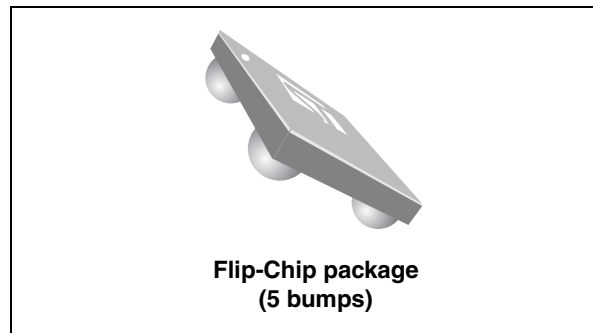
- Mobile phones

### Description

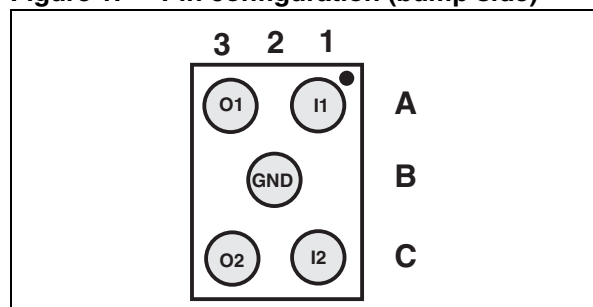
The EMIF02-SPK02F2 chip is a highly integrated device designed to suppress EMI/RFI noise for interface line filtering.

The EMIF02-SPK02F2 flip-chip packaging means the package size is equal to the die size. That's why the EMIF02-SPK02F2 is a very small device.

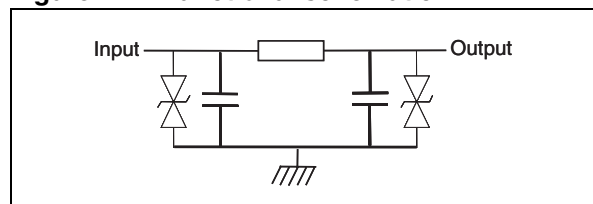
Additionally, this filter includes ESD protection circuitry, which prevents damage to the protected device when subjected to ESD surges up to 30 kV.



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



**Figure 2. Functional schematic**



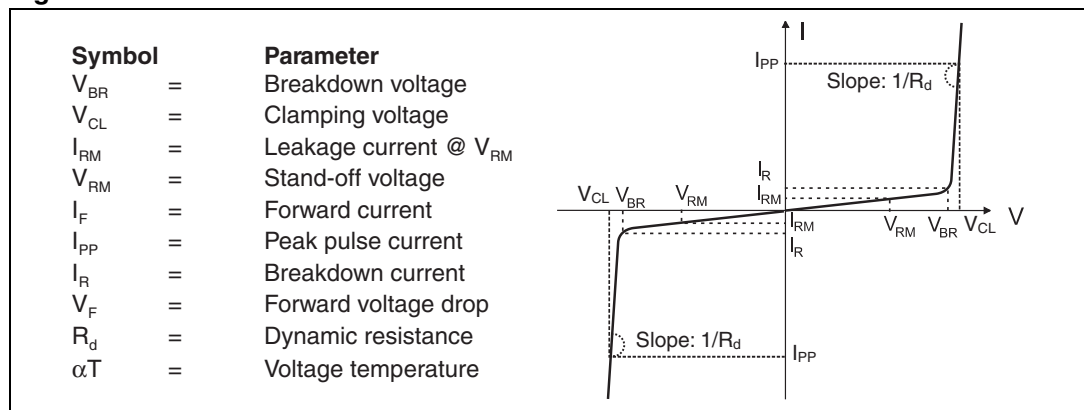
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# 1 Characteristics

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

| Symbol    | Parameter                       | Value        | Unit               |
|-----------|---------------------------------|--------------|--------------------|
| $V_{PP}$  | ESD discharge IEC 61000-4-2     |              |                    |
|           | Air discharge                   | 30           | kV                 |
|           | Contact discharge               | 30           |                    |
| $I_{SPK}$ | Maximum rms current per channel | 350          | mA                 |
| $T_j$     | Junction temperature range      | -30 to 125   | $^{\circ}\text{C}$ |
| $T_{stg}$ | 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        |
| $I_{RM}$   | $V_{RM} = 3\text{ V}$                                   |     |      | 400 | nA       |
| $R_{I/O}$  |   |     | 0.35 | 0.8 | $\Omega$ |
| $C_{LINE}$ | $V_R = 0\text{ V DC}, 1\text{ MHz}$                     | 185 | 250  | 315 | pF       |
| $F_c$      | Cut-off frequency: $Z_{SOURCE} = Z_{LOAD} = 50\ \Omega$ |     | 20   |     | MHz      |

Figure 4. Attenuation measurements versus frequency

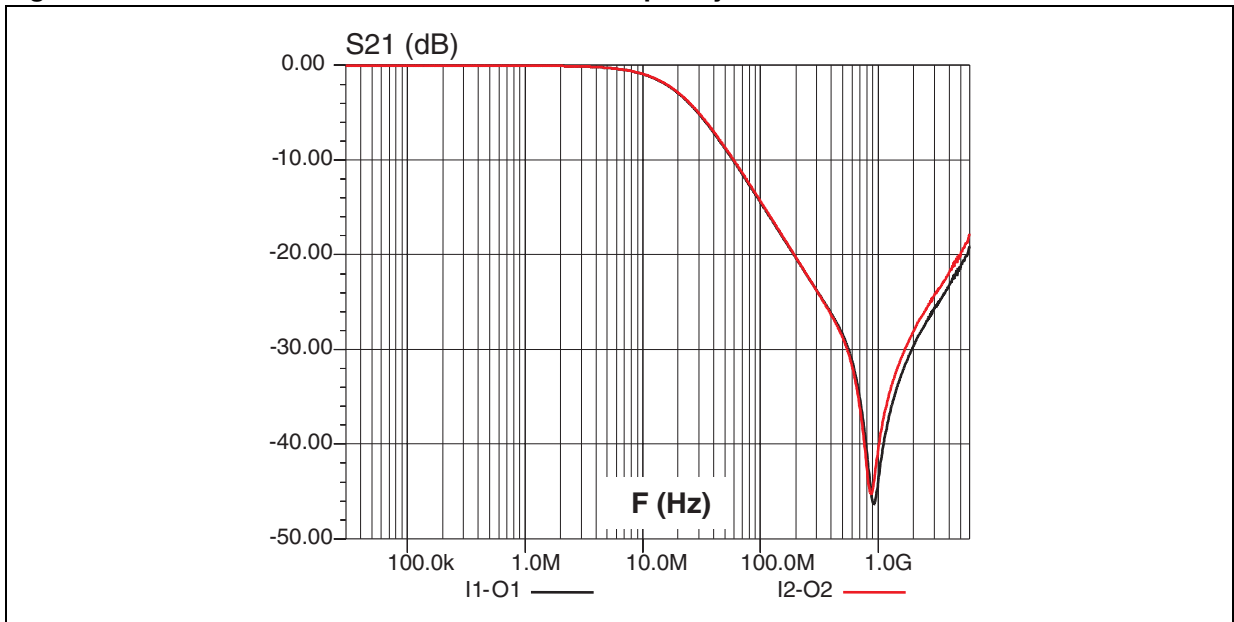


Figure 5. Crosstalk measurements versus frequency

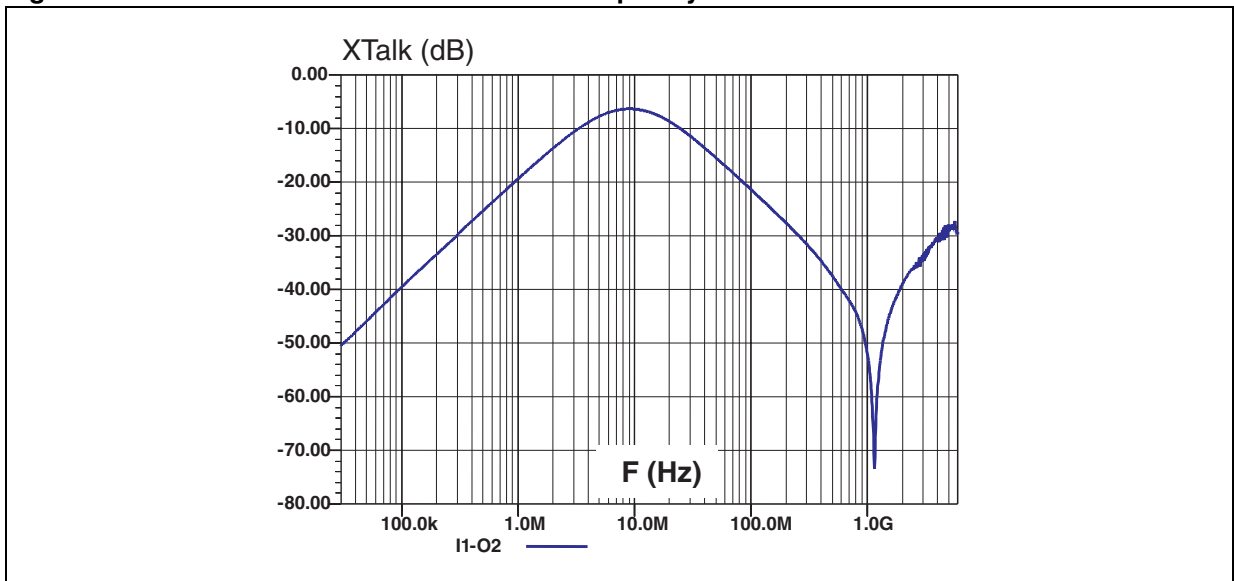


Figure 6. ESD test conditions

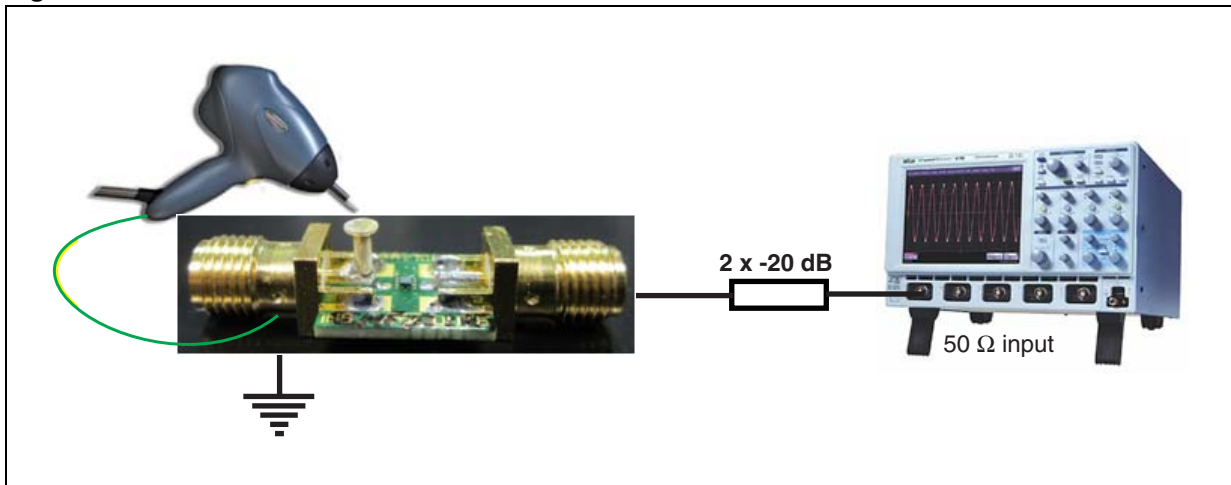
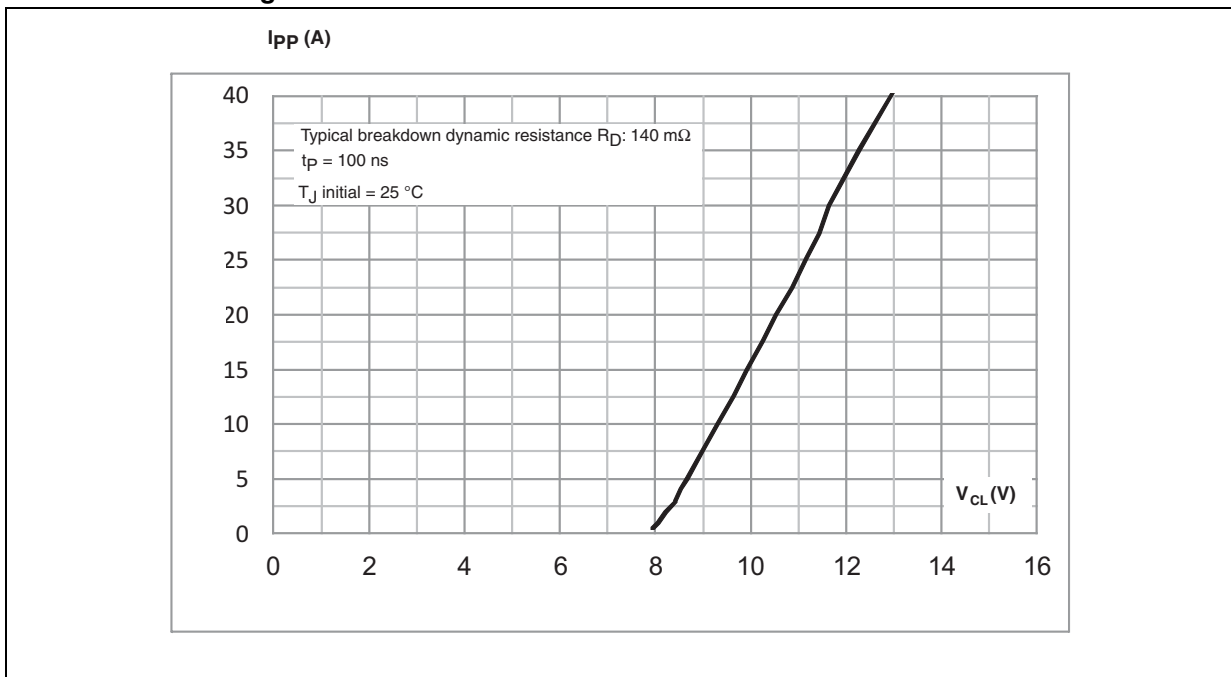


Figure 7. Clamping voltage  $V_{CL}$  versus peak pulse current  $I_{PP}$  for short pulse duration such as ESD surges



Note: For further information on the dynamic characteristic see the STMicroelectronics' application note AN4022, "TVS short pulse  $R_D$  measurement and correlation with TVS clamping voltage during ESD".

Figure 8. Output filter ESD response to IEC 61000-4-2 (+8 kV contact discharge) I1 to O1

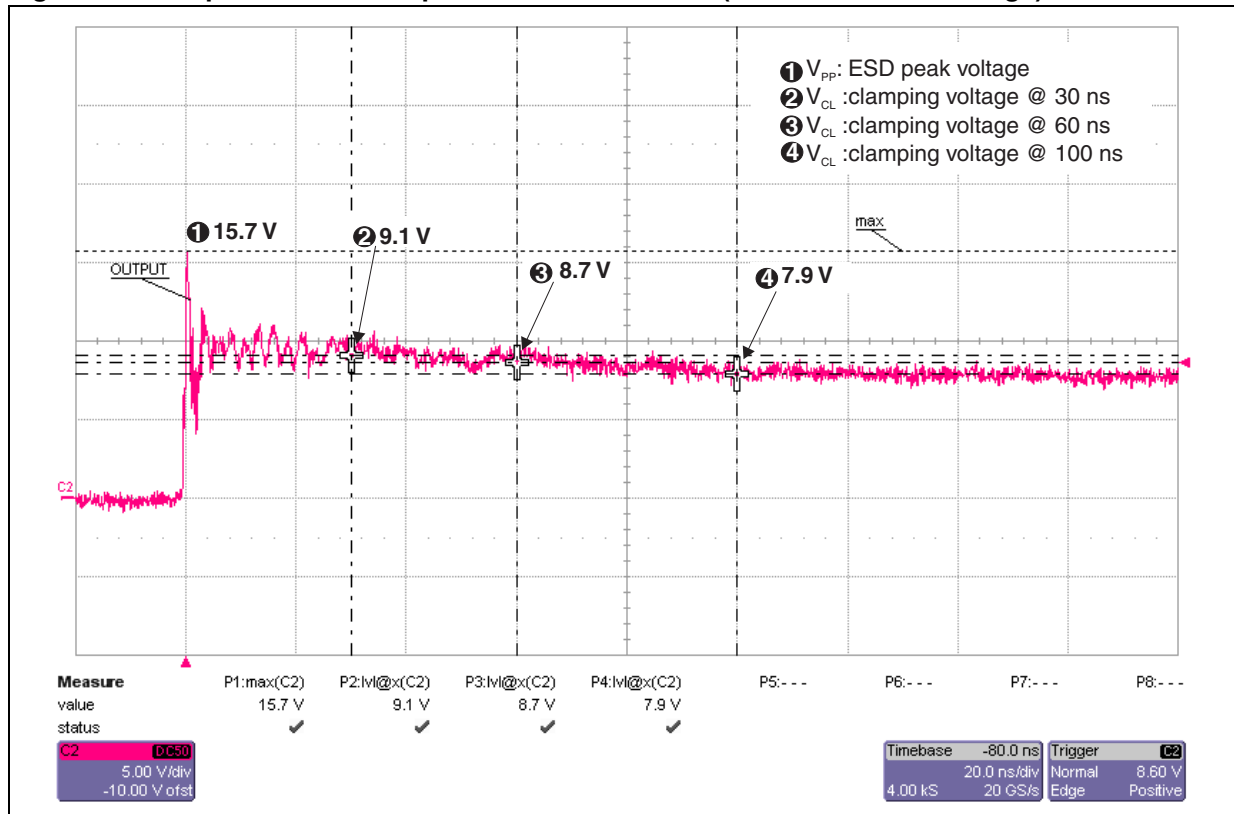


Figure 9. Output filter ESD response to IEC 61000-4-2 (-8 kV contact discharge) I1 to O1

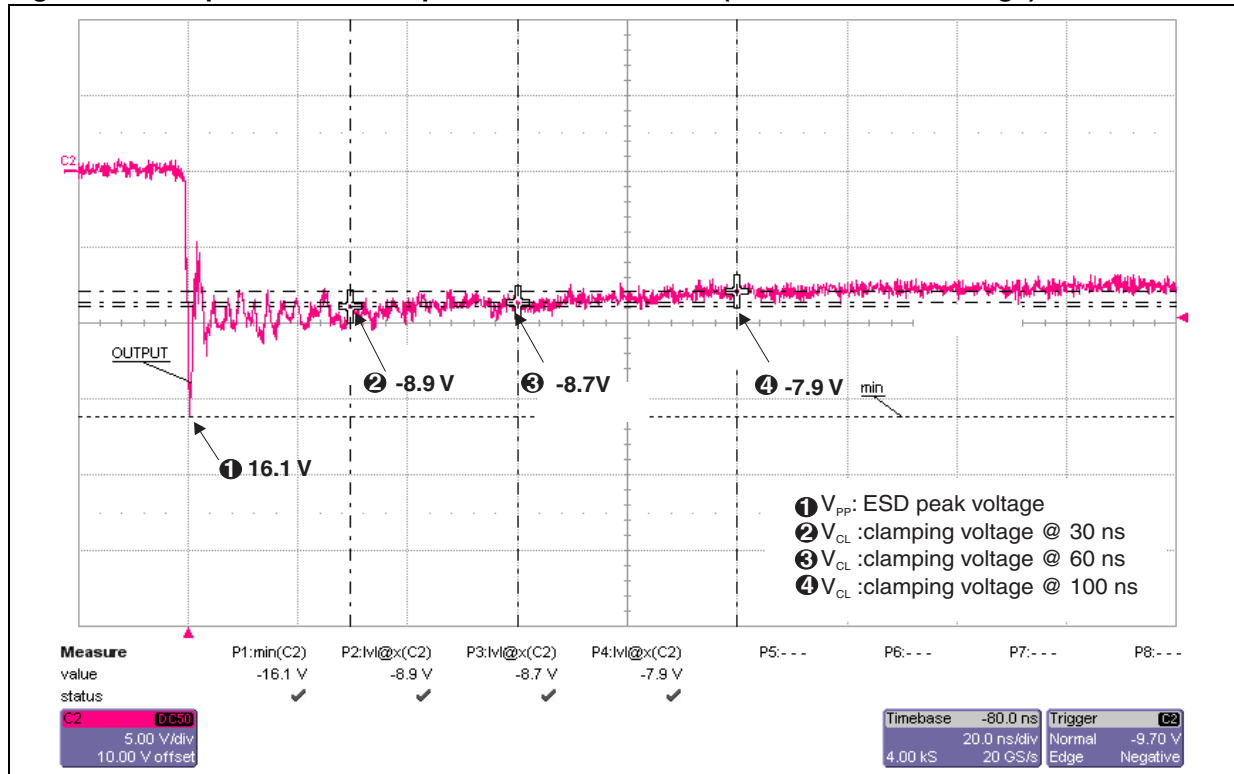


Figure 10. Output filter ESD response to IEC 61000-4-2 (+15 kV contact discharge) I1 to O1

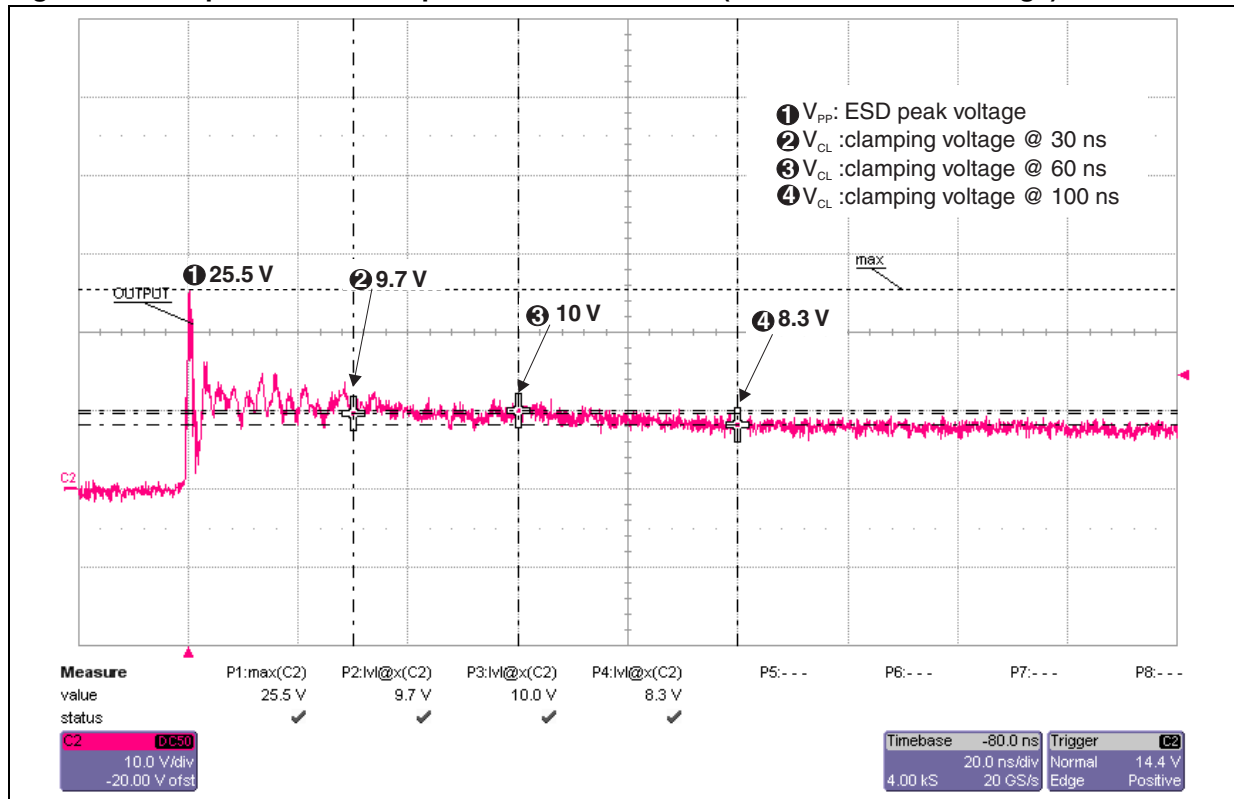


Figure 11. Output filter ESD response to IEC 61000-4-2 (-15 kV contact discharge) I1 to O1

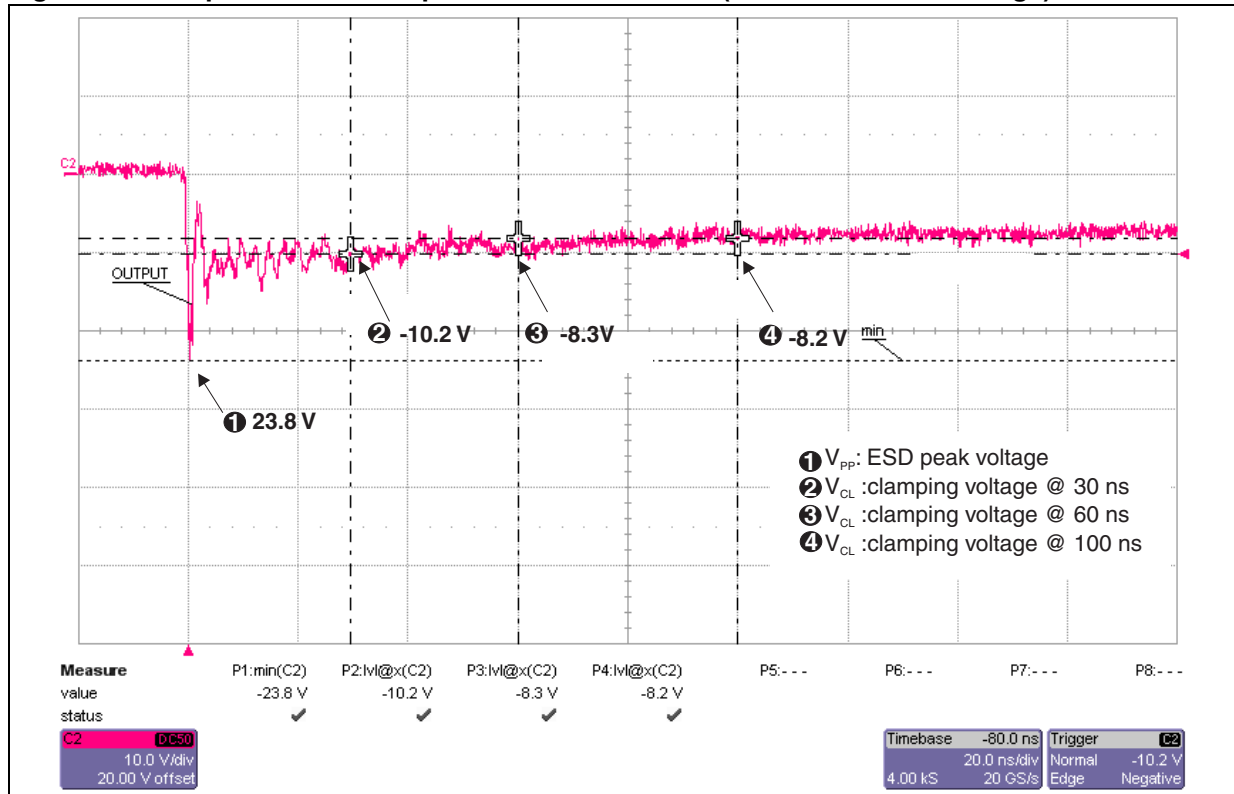


Figure 12. Output filter ESD response to IEC 61000-4-2 (+30 kV contact discharge) I1 to O1

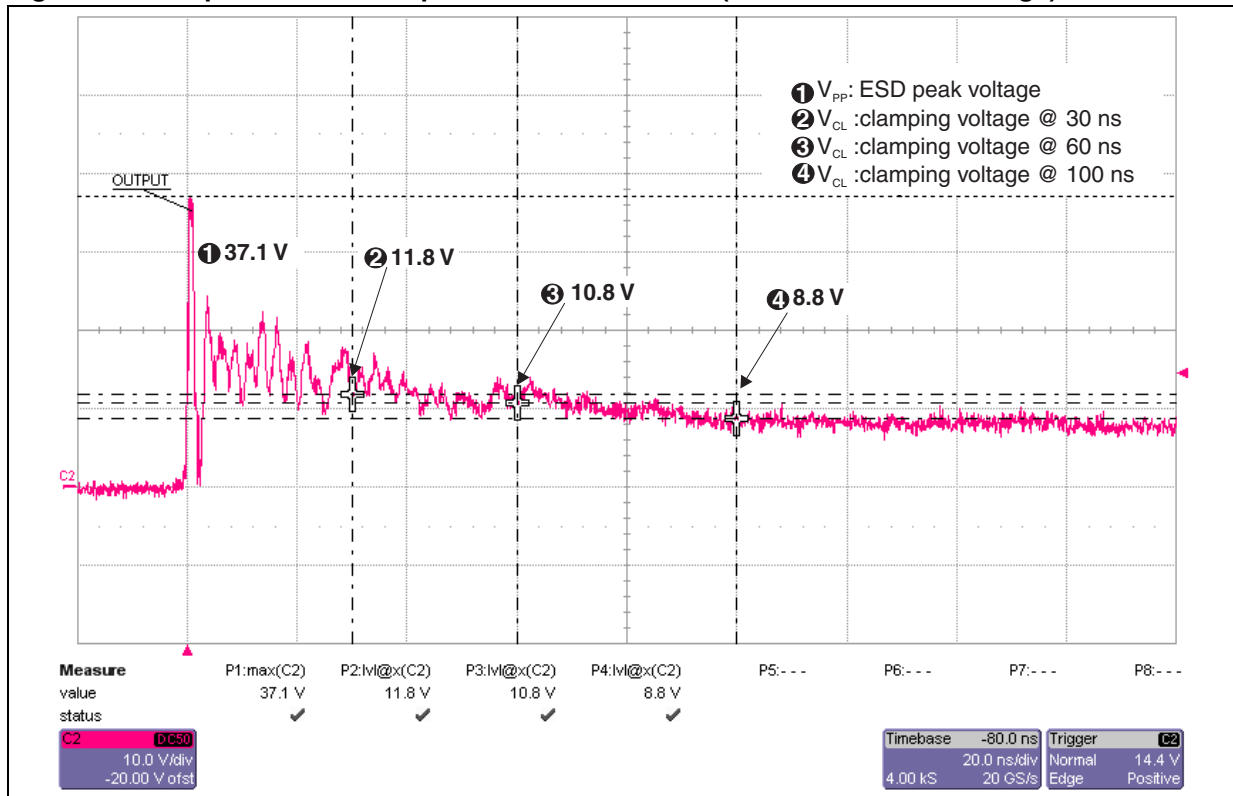
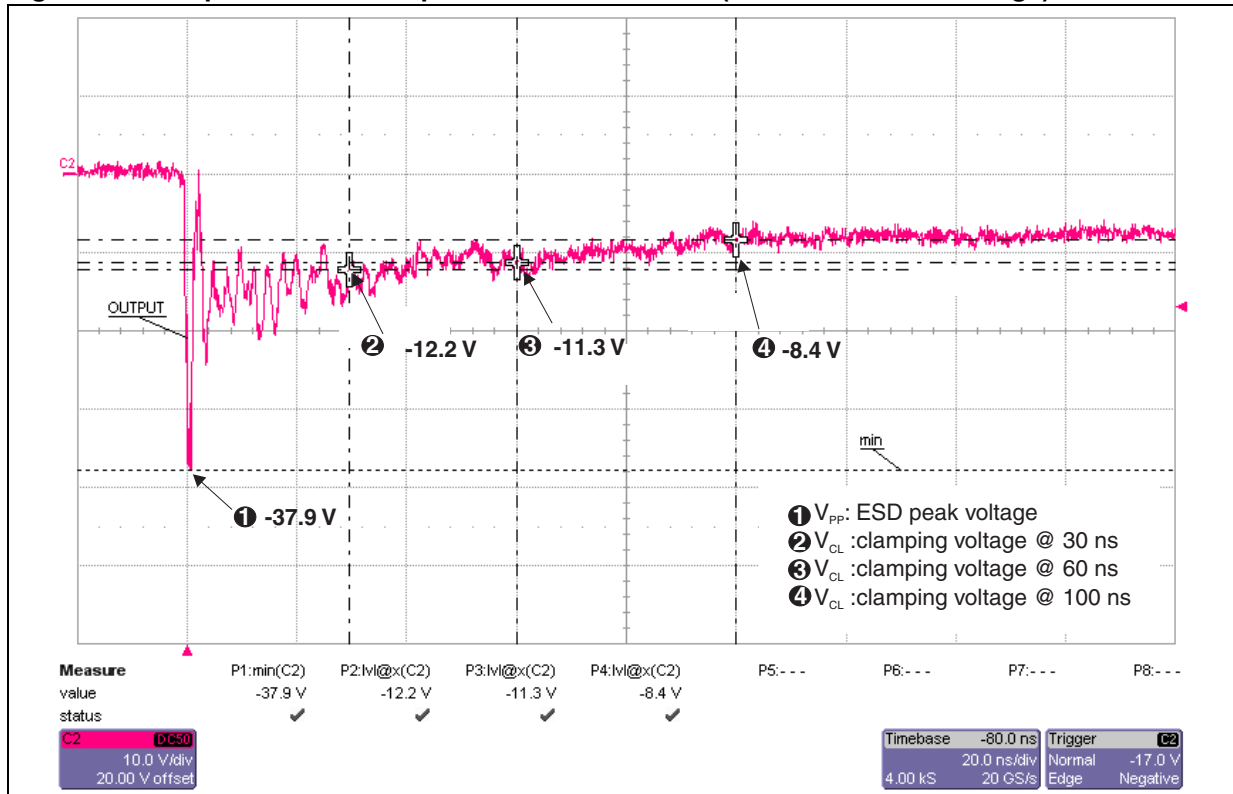
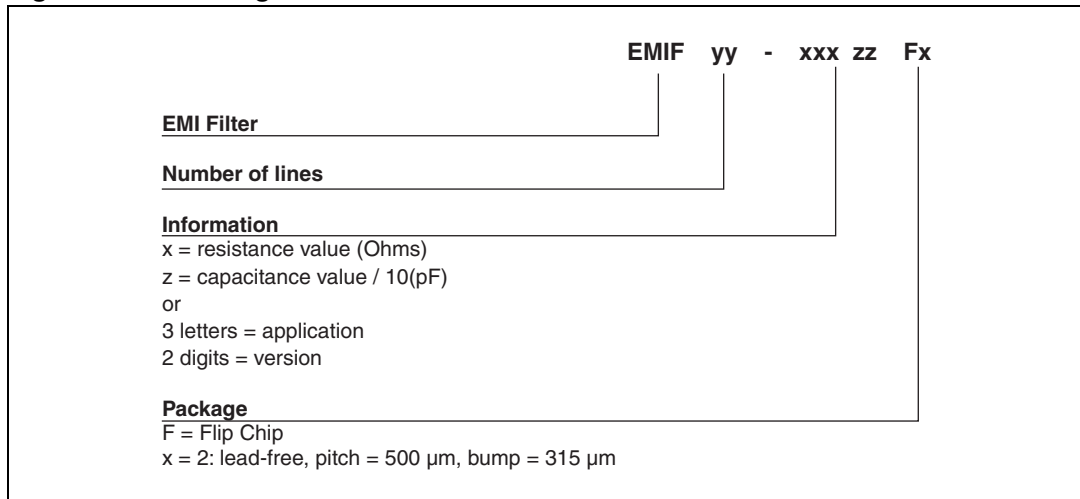


Figure 13. Output filter ESD response to IEC 61000-4-2 (-30 kV contact discharge) I1 to O1



## 2 Ordering information scheme

Figure 14. Ordering information scheme





### 3 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

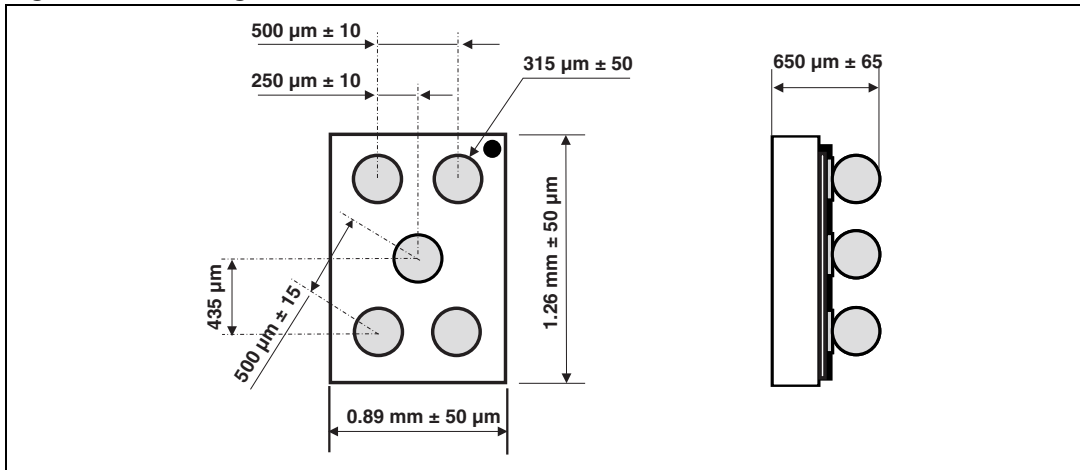


Figure 16. Footprint

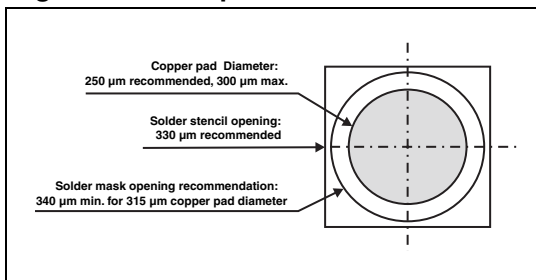


Figure 17. Marking

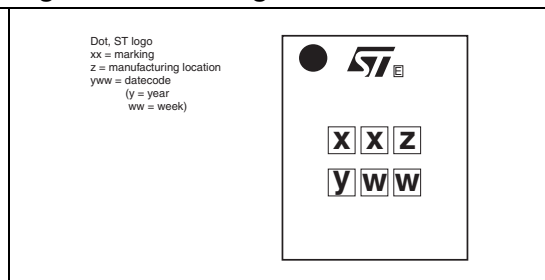
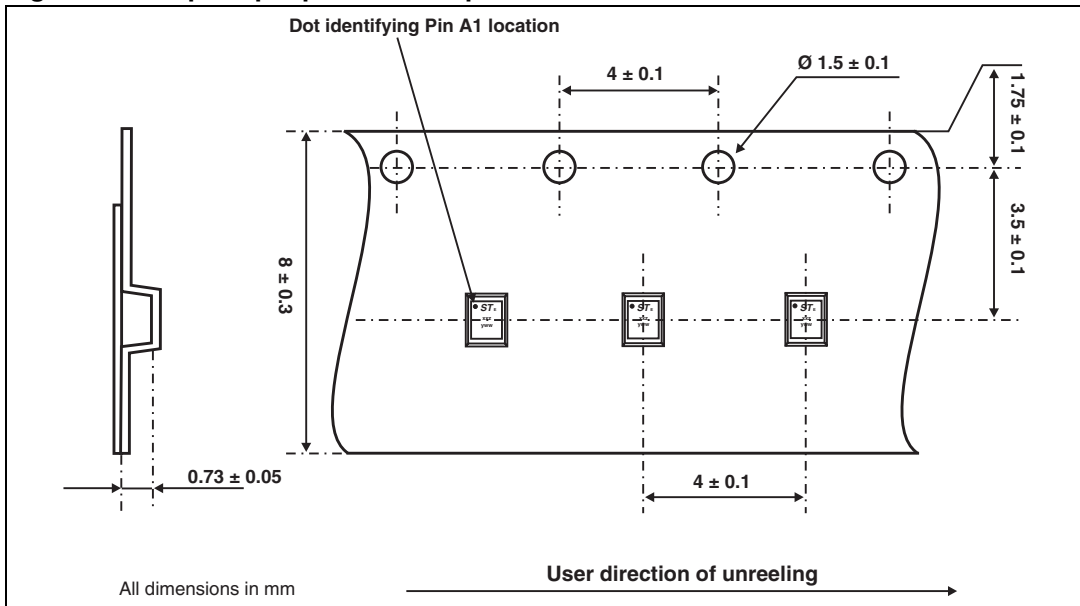


Figure 18. Flip Chip tape and reel specification



Note: More information is available in the application notes:  
 AN1235: "Flip Chip: Package description and recommendations for use"  
 AN1751: "EMI filters: Recommendations and measurements"

## 4 Ordering information

Table 3. Ordering information

| Order code     | Marking | Package   | Weight | Base qty | Delivery mode    |
|----------------|---------|-----------|--------|----------|------------------|
| EMIF02-SPK02F2 | JD      | Flip Chip | 1.8 mg | 5000     | Tape and reel 7" |

## 5 Revision history

Table 4. Document revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| 17-Sep-2008 | 1        | Initial release.  |
| 12-Sep-2011 | 2        | Updated <a href="#">Figure 15</a> and <a href="#">Figure 16</a> .   |
| 3-Apr-2012  | 3        | Updated cover page features and description. Inserted <a href="#">Figure 6</a> to <a href="#">Figure 13</a> . |

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