# EMIF02-SPK02F2

## 2-line IPAD™, EMI filter and ESD protection

**Datasheet – production data**

## 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

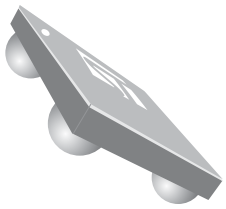
- Mobile phones

## 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 30 kV.



**Flip-Chip package (5 bumps)**

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

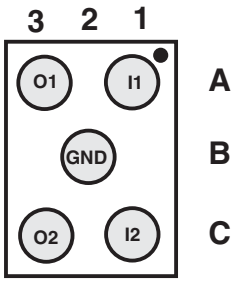
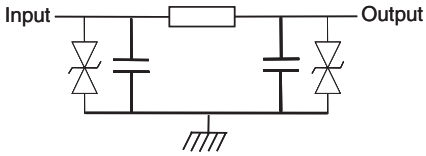



**Figure 2. Functional schematic**




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

# 1 Characteristics

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

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{PP}$ | ESD discharge IEC 61000-4-2<br>Air discharge<br>Contact discharge | <br>30<br>30 | kV |
| $I_{SPK}$ | Maximum rms current per channel | 350 | mA |
| $T_j$ | Junction temperature range | -30 to 125 | °C |
| $T_{stg}$ | Storage temperature range | -55 to + 150 | °C |

**Figure 3. Electrical characteristics - definitions**

| Symbol | | Parameter |
|---|---|---|
| $V_{BR}$ | = | Breakdown voltage |
| $V_{CL}$ | = | Clamping voltage |
| $I_{RM}$ | = | Leakage current @ $V_{RM}$ |
| $V_{RM}$ | = | Stand-off voltage |
| $I_F$ | = | Forward current |
| $I_{PP}$ | = | Peak pulse current |
| $I_R$ | = | Breakdown current |
| $V_F$ | = | Forward voltage drop |
| $R_d$ | = | Dynamic resistance |
| $\alpha T$ | = | Voltage temperature |

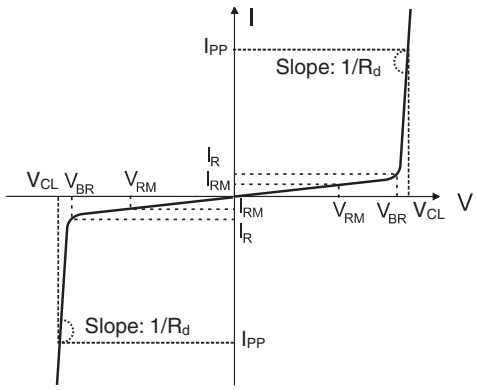



**Table 2. Electrical characteristics - values ($T_{amb}$ = 25 °C)**

| Symbol | Test conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $V_{BR}$ | $I_R$ = 1 mA | 6 | | | V |
| $I_{RM}$ | $V_{RM}$ = 3 V | | | 400 | nA |
| $R_{I/O}$ | | | 0.35 | 0.8 | Ω |
| $C_{LINE}$ | $V_R$ = 0 V DC, 1 MHz | 185 | 250 | 315 | pF |
| $F_c$ | Cut-off frequency: $Z_{SOURCE}$ = $Z_{LOAD}$ = 50 Ω | | 20 | | MHz |

**Figure 4. Attenuation measurements versus frequency**

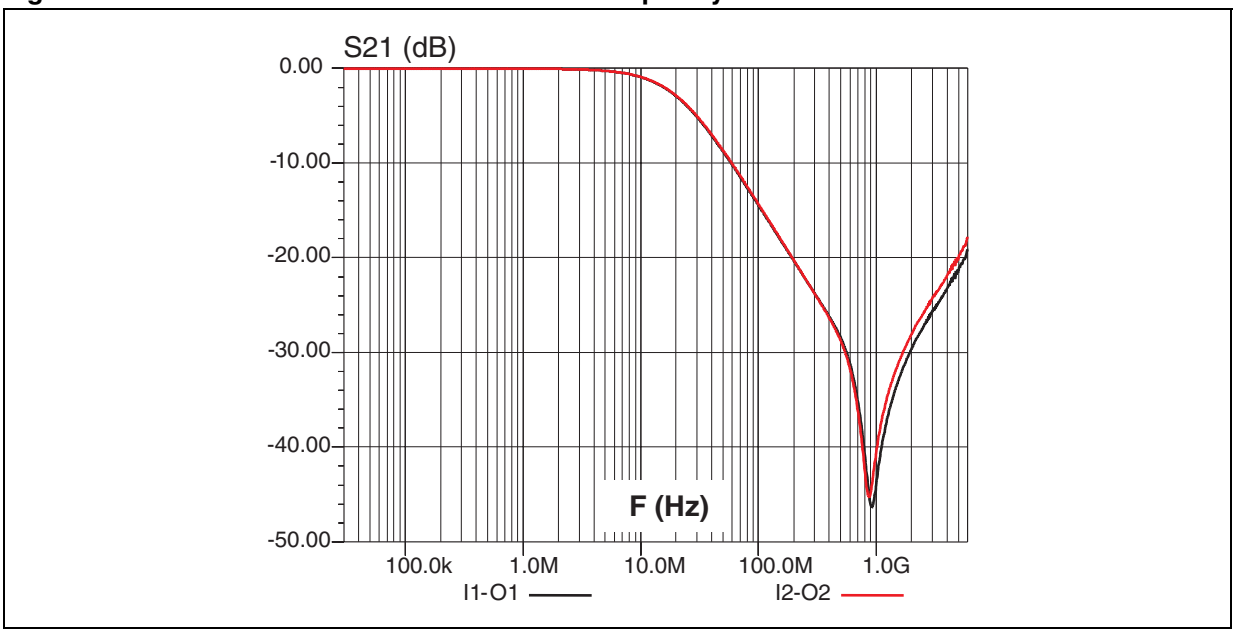



**Figure 5. Crosstalk measurements versus frequency**

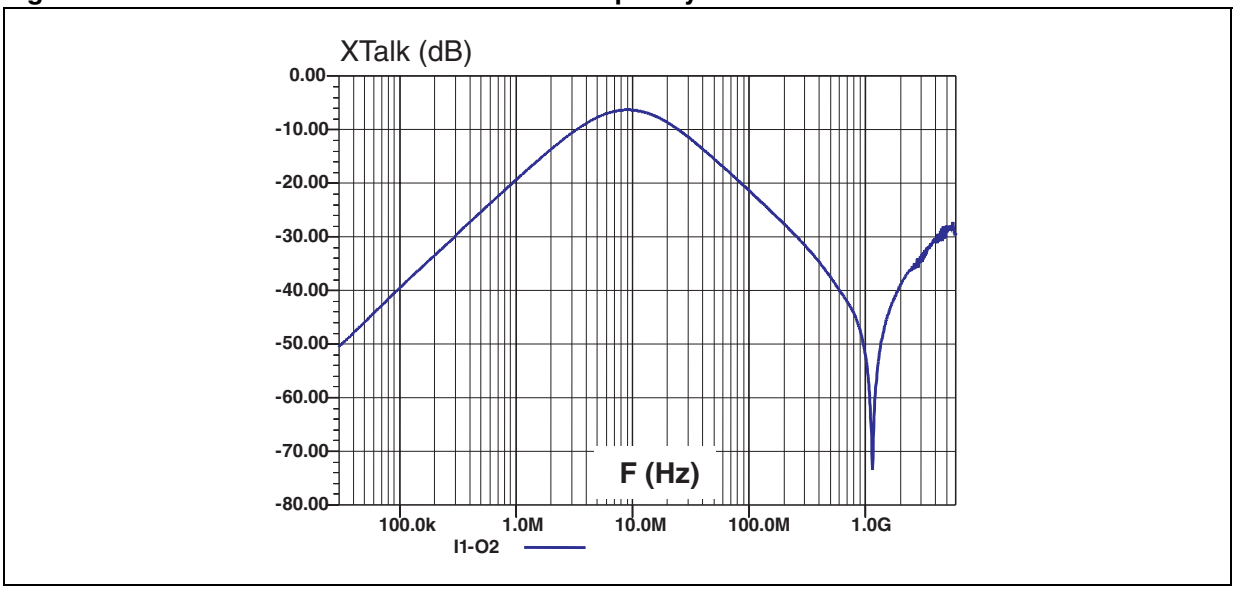


**Figure 6. ESD test conditions**

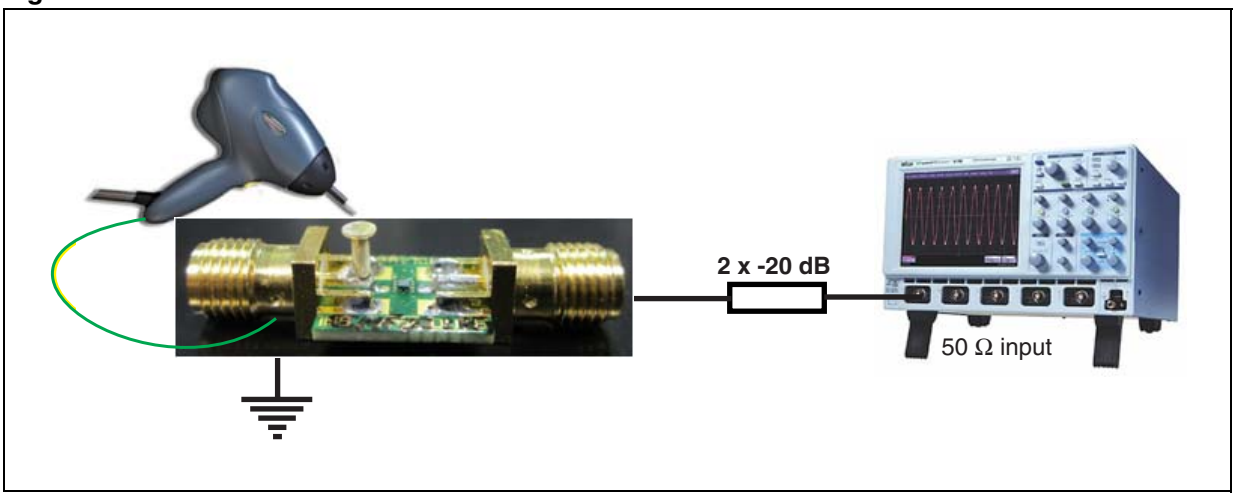
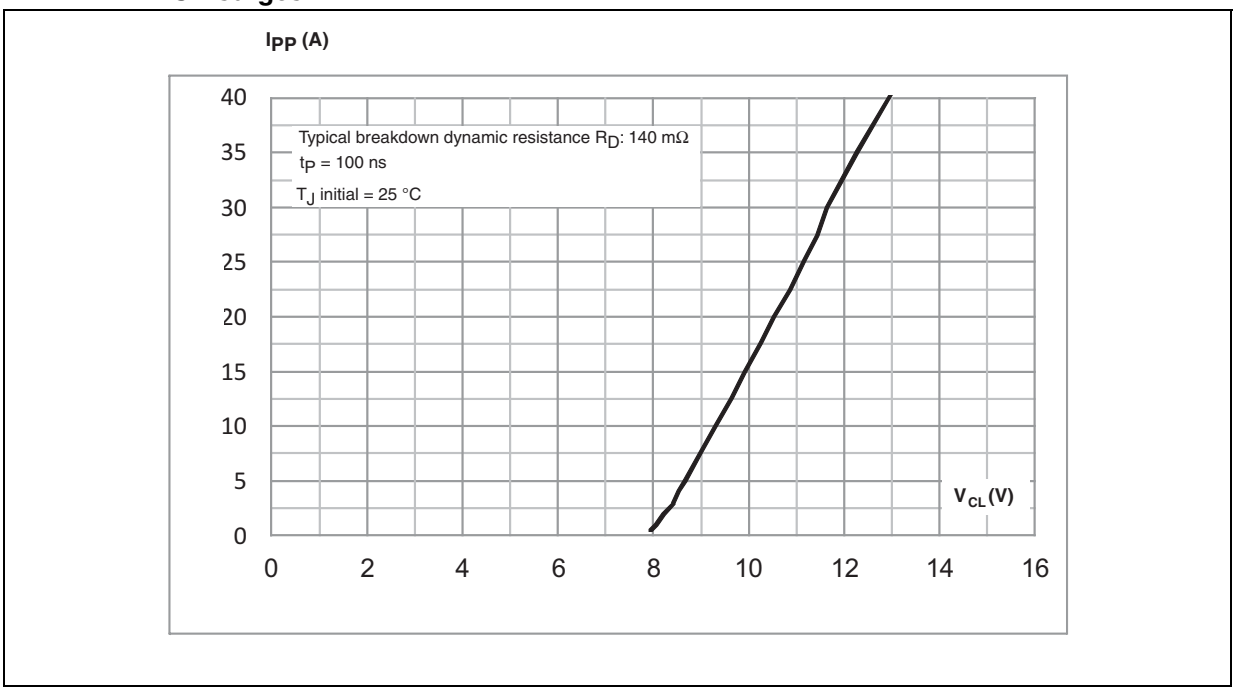



**Figure 7. Clamping voltage $V_{CL}$ versus peak pulse current $I_{PP}$ for short pulse duration such as ESD surges**




*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**

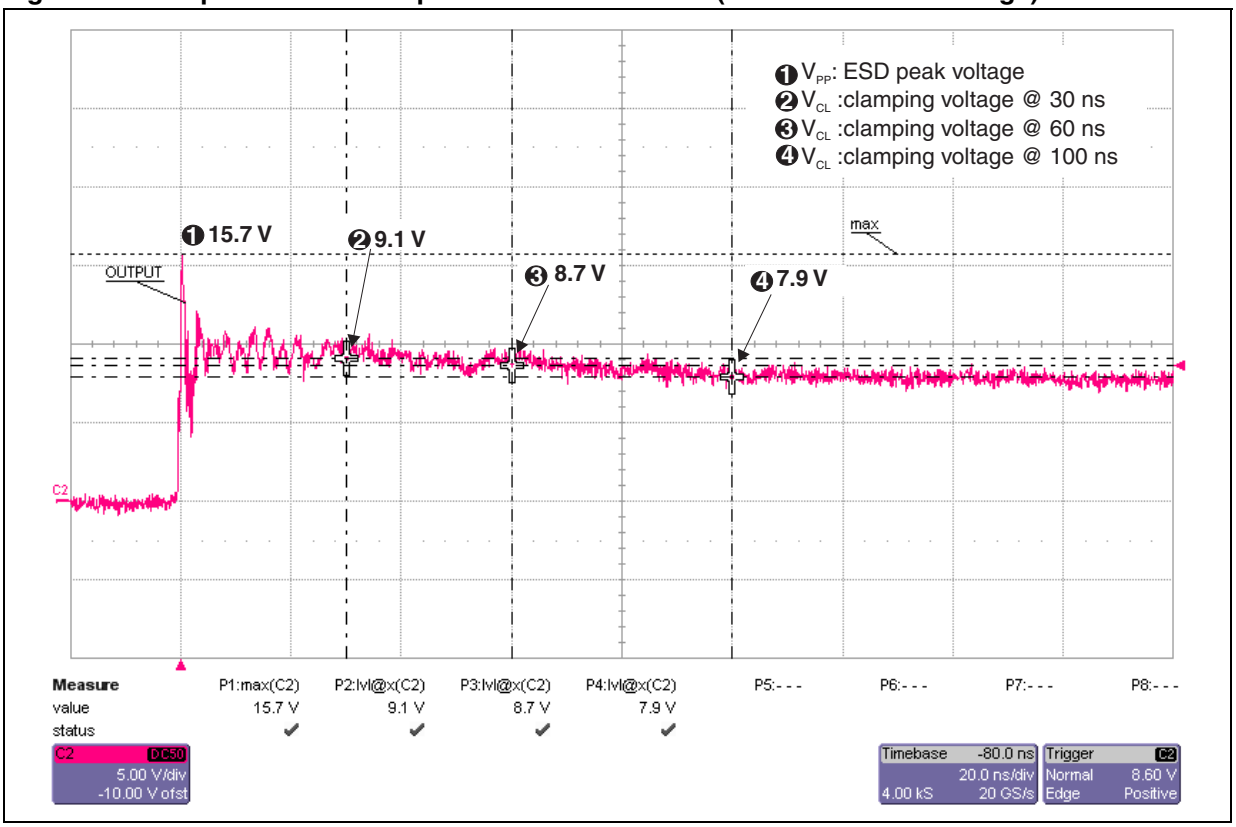



**Figure 9. Output filter ESD response to IEC 61000-4-2 (-8 kV contact discharge) I1 to O1**

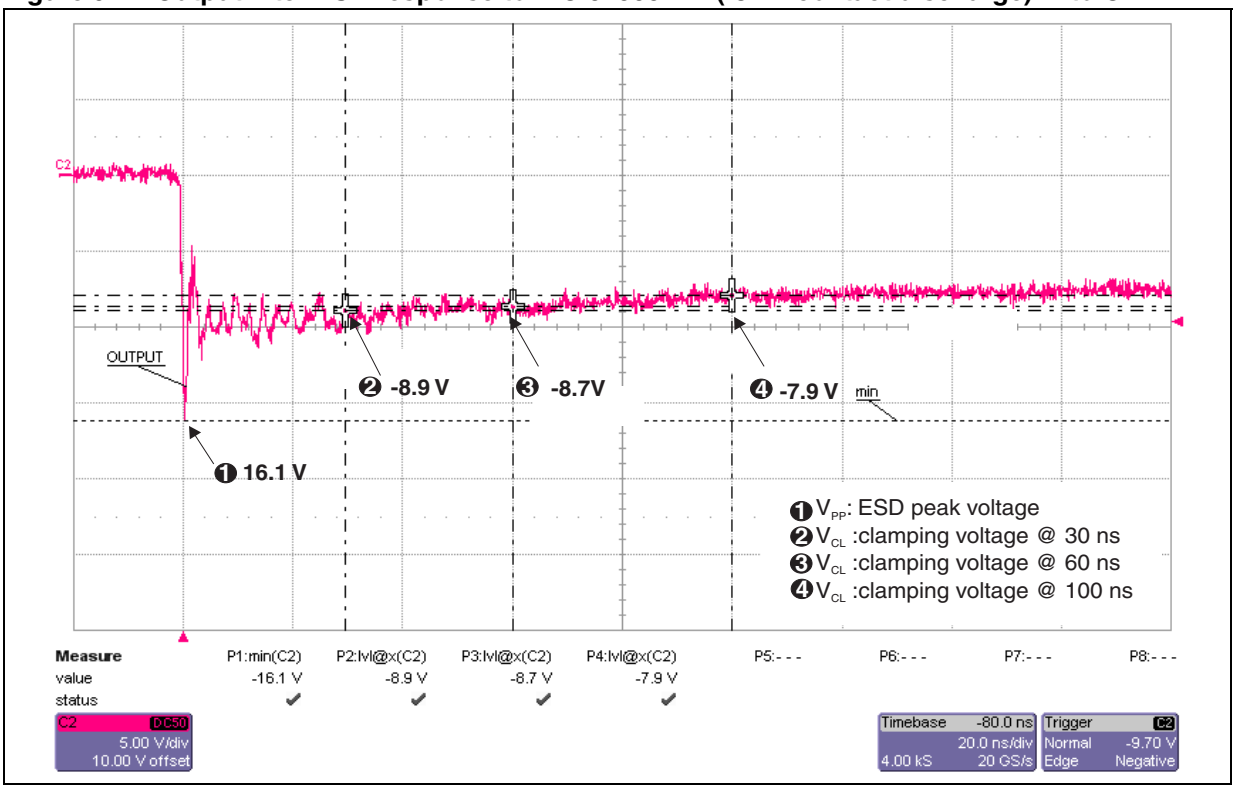


**Figure 10. Output filter ESD response to IEC 61000-4-2 (+15 kV contact discharge) I1 to O1**

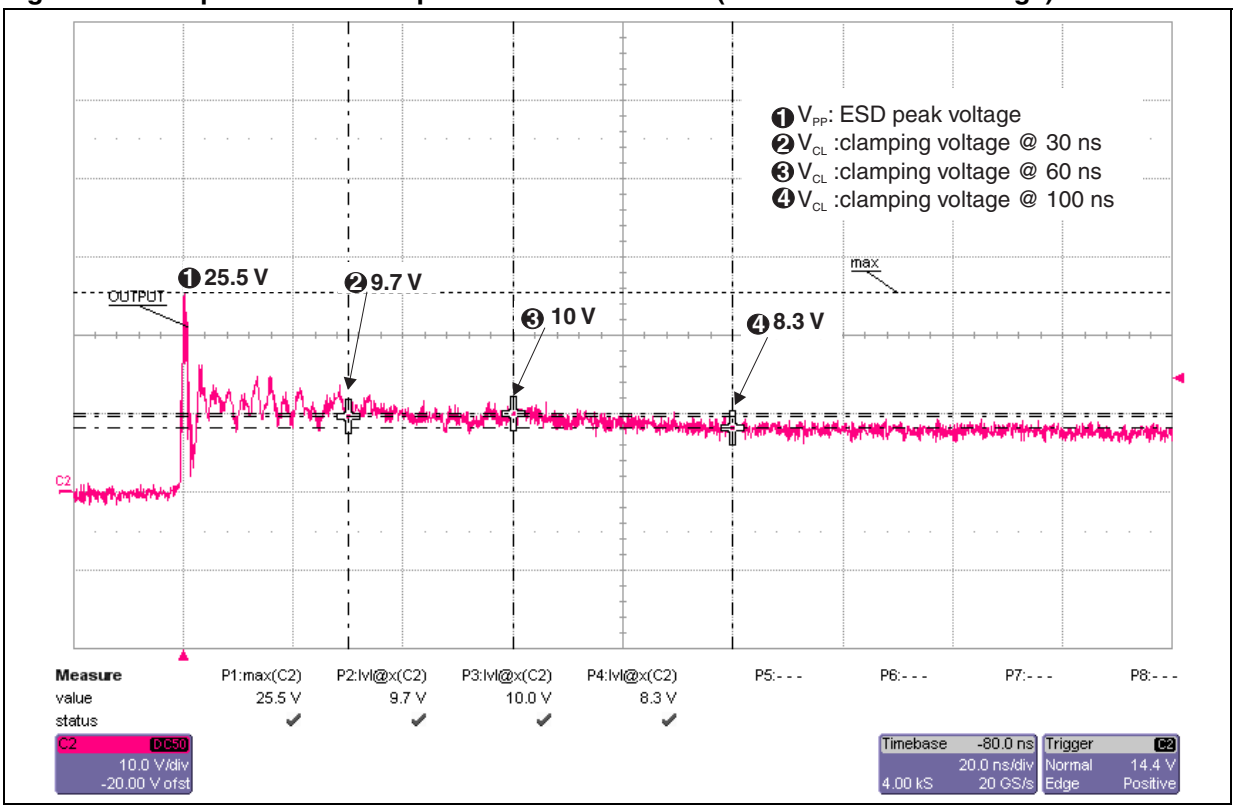



**Figure 11. Output filter ESD response to IEC 61000-4-2 (-15 kV contact discharge) I1 to O1**

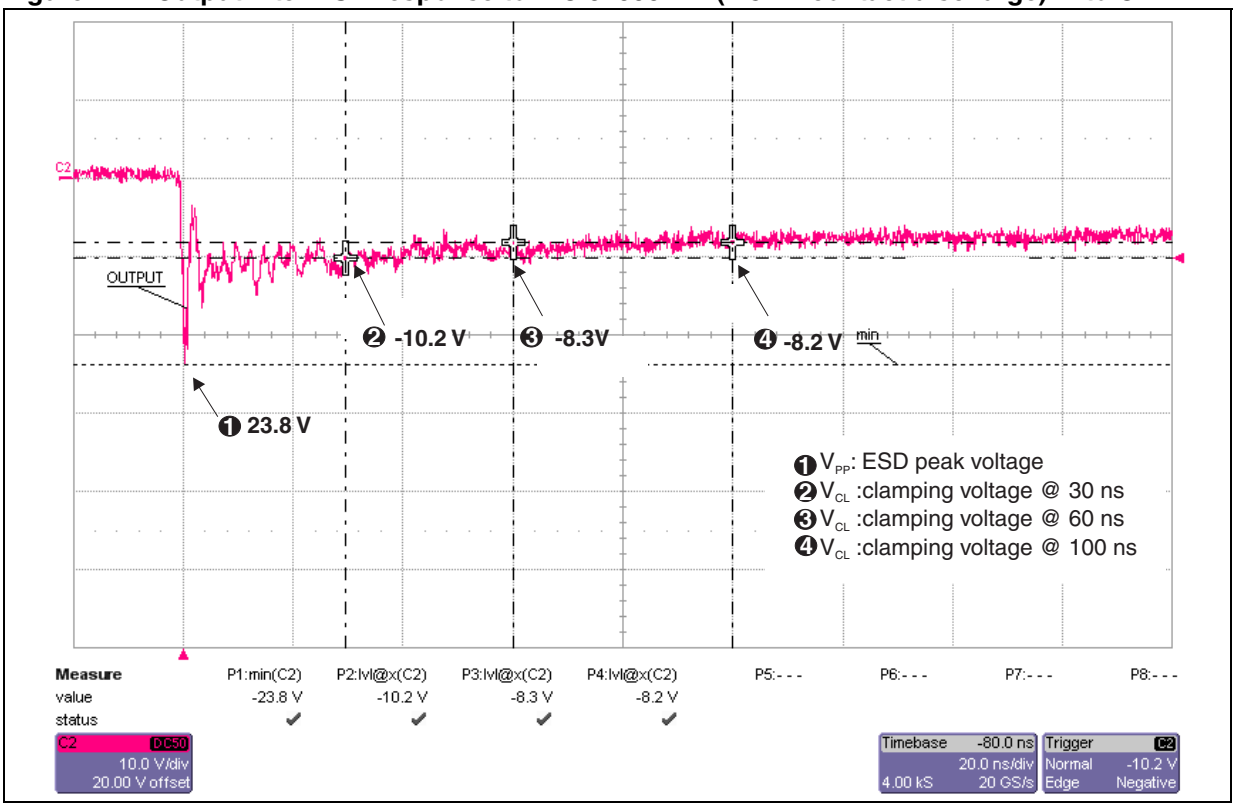


**Figure 12. Output filter ESD response to IEC 61000-4-2 (+30 kV contact discharge) I1 to O1**

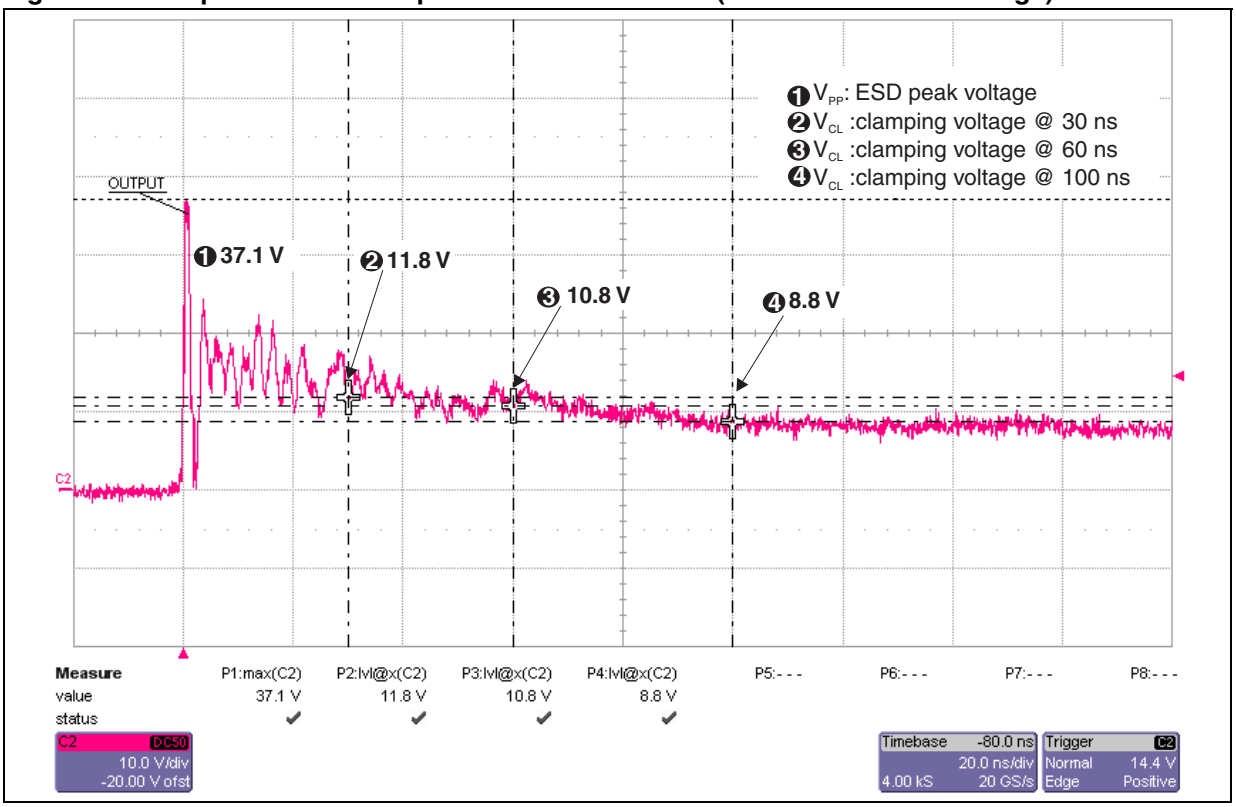
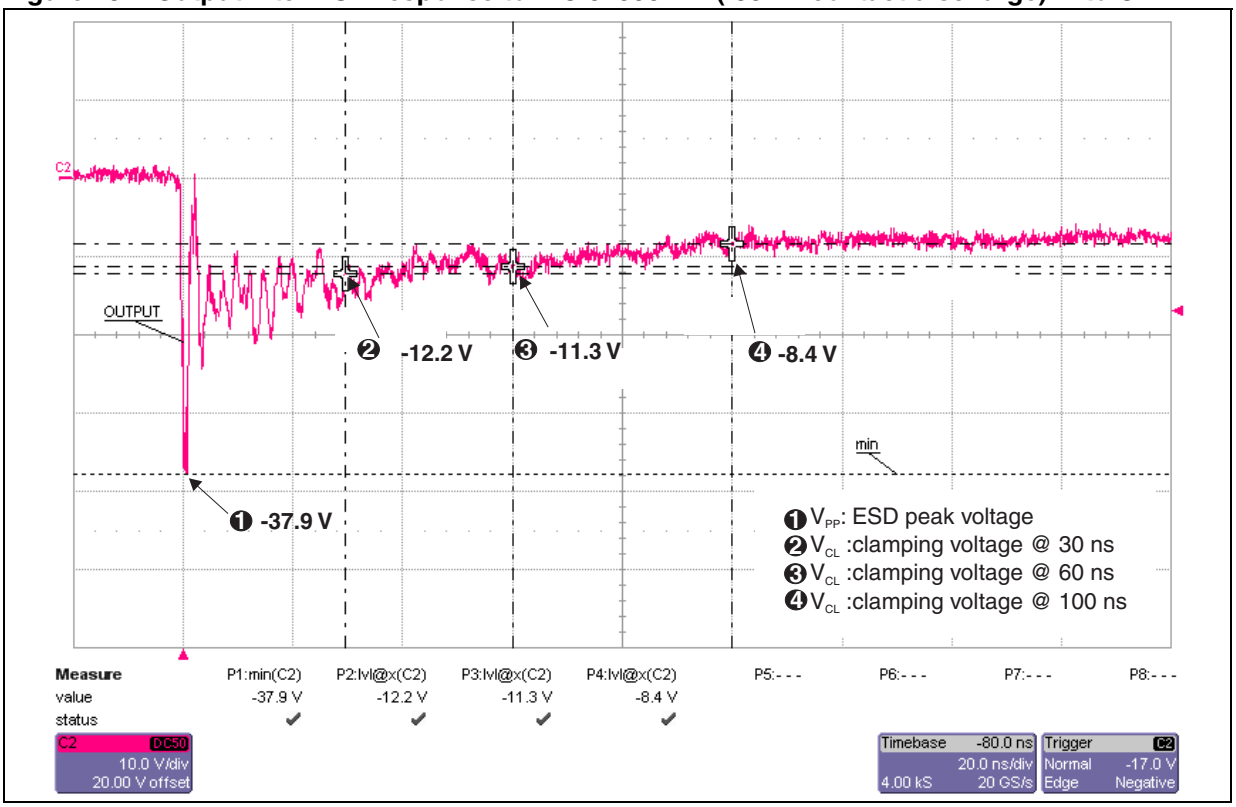
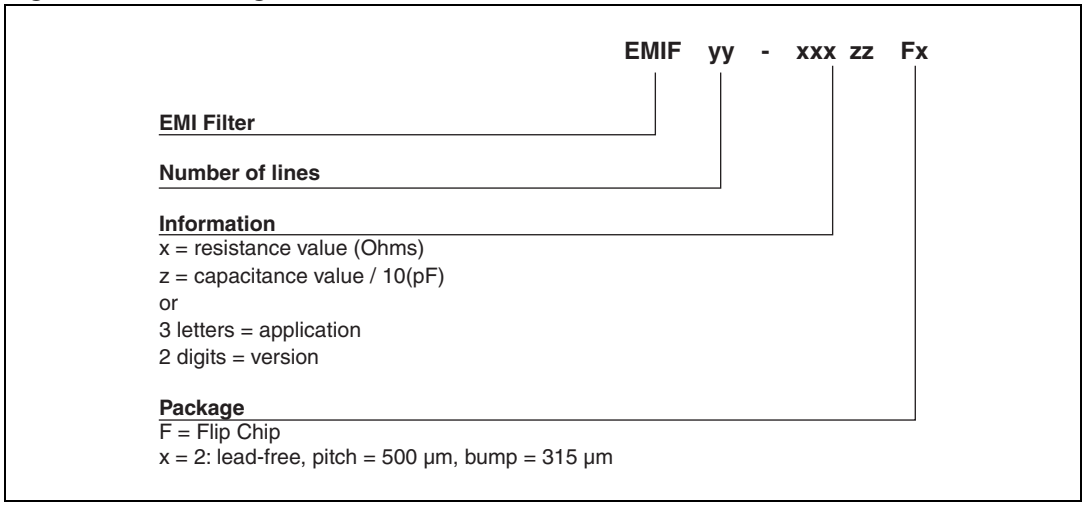



**Figure 13. Output filter ESD response to IEC 61000-4-2 (-30 kV contact discharge) I1 to O1**



# 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. ECOPACK® is an ST trademark.

**Figure 15. Package dimensions**

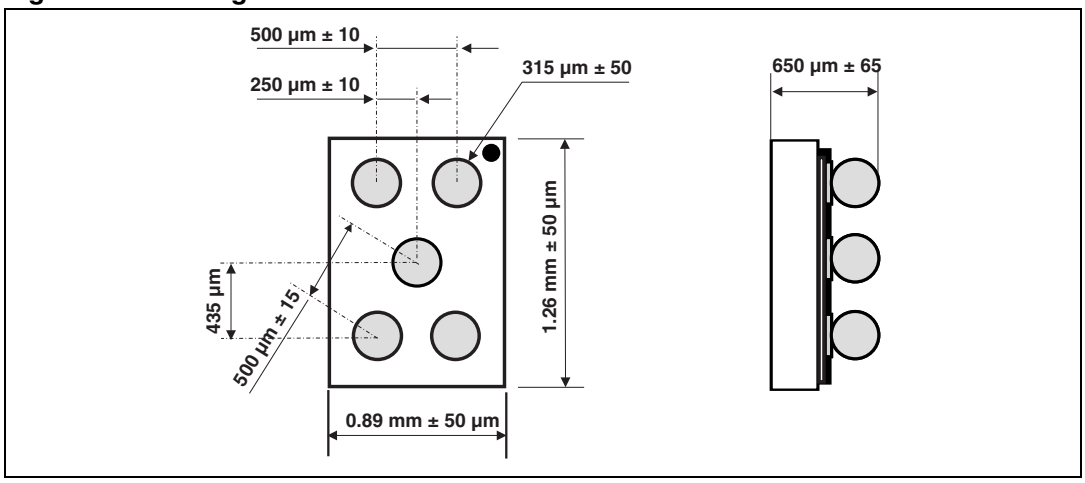



**Figure 16. Footprint**

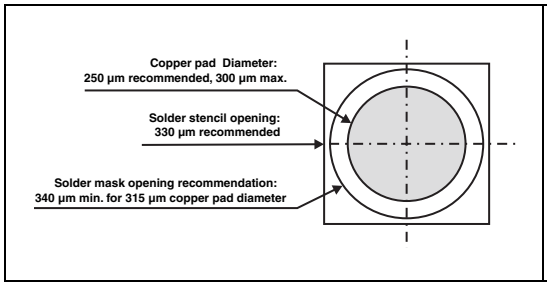



**Figure 17. Marking**

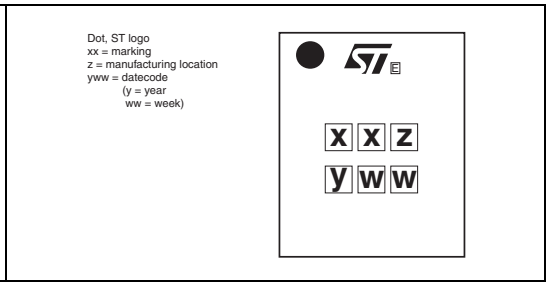
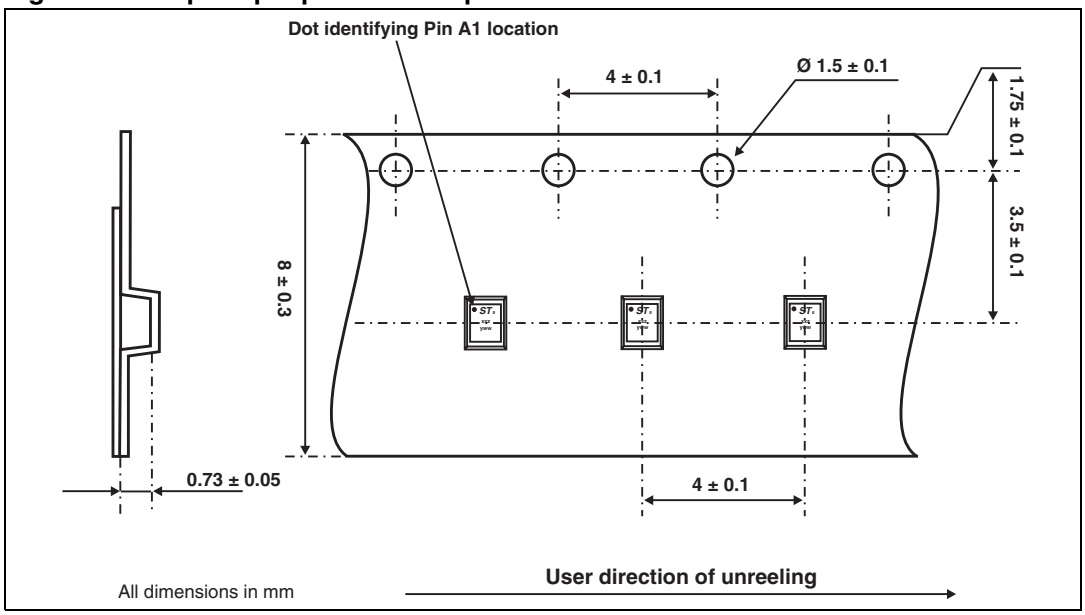


**Figure 18. Flip Chip tape and reel specification**




*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 *Figure 15* and *Figure 16.* |
| 3-Apr-2012 | 3 | Updated cover page features and description.Inserted *Figure 6* to *Figure 13*. |

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