

## 3-line IPAD™, EMI filter including ESD protection

### Features

- EMI symmetrical (I/O) low-pass filter
- high efficiency in EMI/ESD protection
- lead-free package
- very thin package
- 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 (on external pins B1 and C1):
  - ±15 kV (air discharge)
  - ±8 kV (contact discharge)
- IEC 61000-4-2 level 1 (on internal pins):
  - ±2 kV (air discharge)
  - ±2 kV (contact discharge)

### Applications

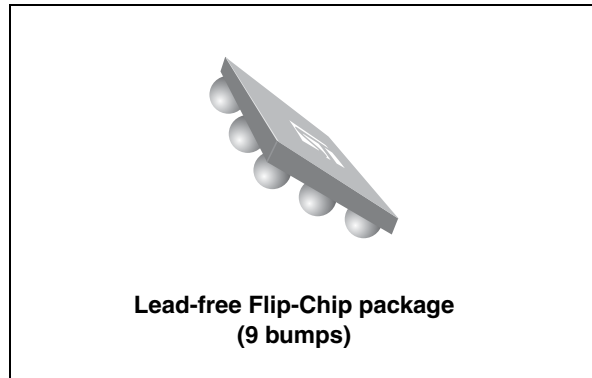
Where EMI filtering in ESD sensitive equipment is required:

- mobile phones and communication systems
- computers, printers and MCU boards

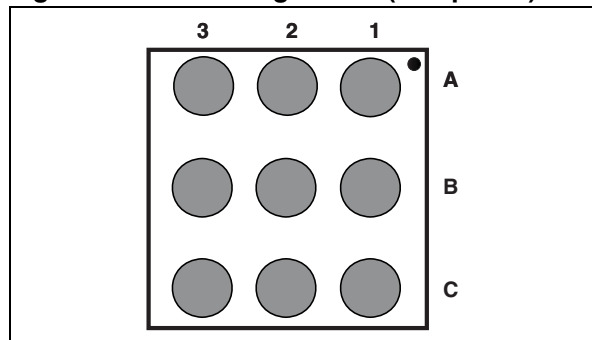
### Description

The EMIF02-USB04F3 chip is a highly integrated audio filter device designed to suppress EMI/RFI noise in all systems subjected to electromagnetic interference.

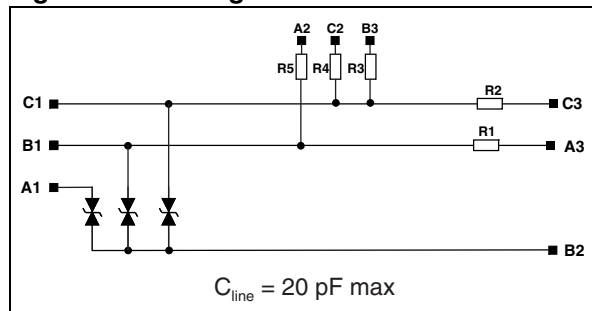
This filter includes ESD protection circuitry, which prevents damage to the protected device when subjected to ESD surges up to 15 kV.



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



**Figure 2. Configuration**



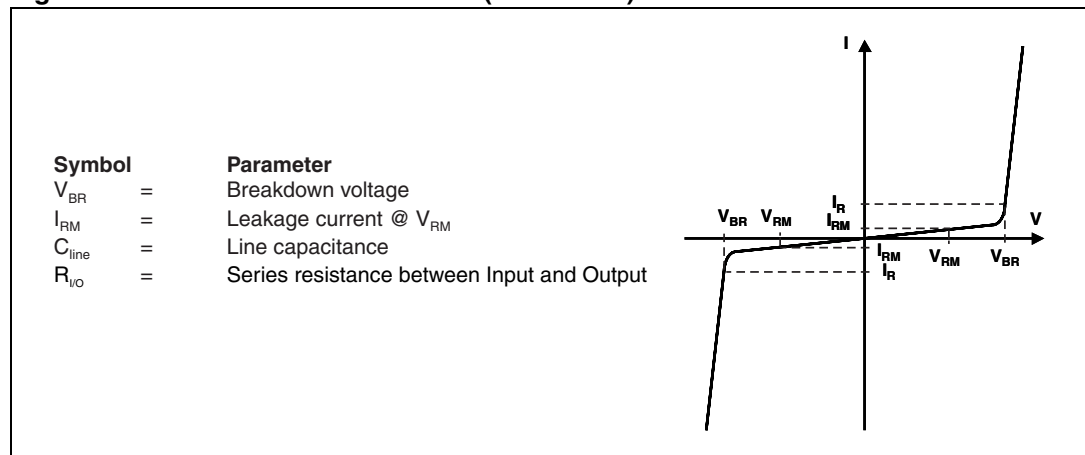
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# 1 Electrical characteristics

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

| Symbol    | Parameter                                                         | Value        | Unit               |
|-----------|-------------------------------------------------------------------|--------------|--------------------|
| $V_{PP}$  | <b>Internal pins (A2, A3, B2, B3, C2, C3):</b>                    |              |                    |
|           | ESD discharge IEC 61000-4-2, level 1, air discharge               | $\pm 2$      | kV                 |
|           | ESD discharge IEC 61000-4-2, level 1, contact discharge           | $\pm 2$      |                    |
|           | <b>External pins (A1, B1, C1):</b>                                |              |                    |
|           | ESD discharge IEC 61000-4-2, level 4, air discharge               | $\pm 15$     |                    |
|           | ESD discharge IEC 61000-4-2, level 4, contact discharge           | $\pm 8$      |                    |
| $P_d$     | Line resistance power dissipation at $70\text{ }^{\circ}\text{C}$ | 60           | mW                 |
| $T_{op}$  | Operating temperature range                                       | - 40 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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

| Symbol     | Test conditions                                                                                                   | Min. | Typ. | Max. | Unit       |
|------------|-------------------------------------------------------------------------------------------------------------------|------|------|------|------------|
| $V_{BR}$   | $I_R = 1\text{ mA}$                                                                                               | 7    |      |      | V          |
| $I_{RM}$   | $V_{RM} = 3\text{ V per line}$                                                                                    |      |      | 100  | nA         |
| $R_1, R_2$ | Tolerance $\pm 5\%$                                                                                               |      | 33   |      | $\Omega$   |
| $R_4, R_5$ | Tolerance $\pm 20\%$                                                                                              |      | 18.5 |      | k $\Omega$ |
| $R_3$      |                                                                                                                   | 1425 | 1490 | 1560 | $\Omega$   |
| $C_{line}$ | $V_{line} = 0\text{ V}$ , $V_{osc} = 30\text{ mV}$ , $F = 1\text{ MHz}$<br>(measured under zero light conditions) |      |      | 20   | pF         |

Figure 4. S21 (dB) attenuation measurement on C3-C1 and A3-B1

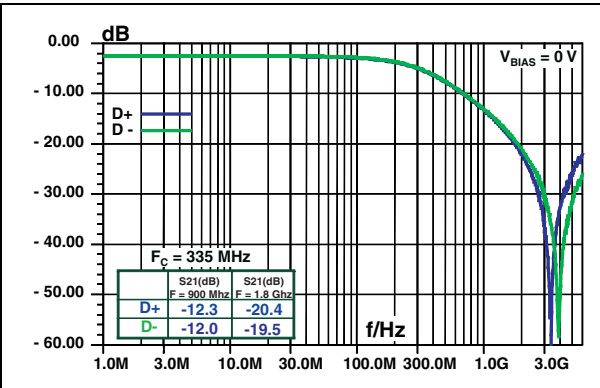


Figure 5. Analog crosstalk measurements on C3 - A1

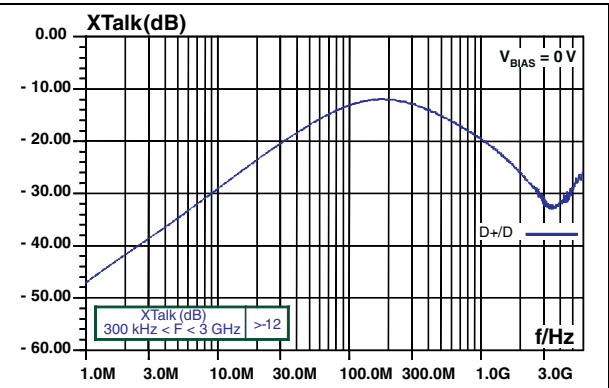


Figure 6. Digital crosstalk measurement on C3-B1 in 50 environment

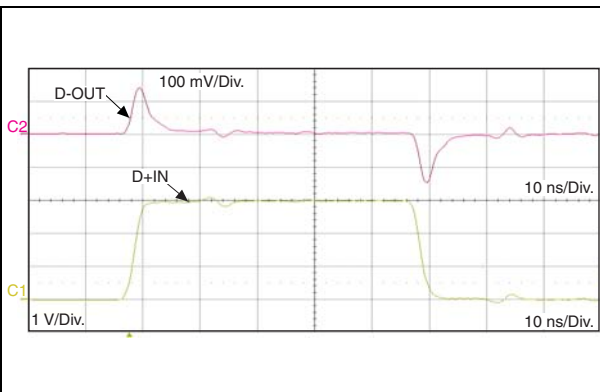


Figure 7. ESD response to IEC 61000-4-2 (+15 kV air discharge) on one input V<sub>(in)</sub> and on one output V<sub>(out)</sub>

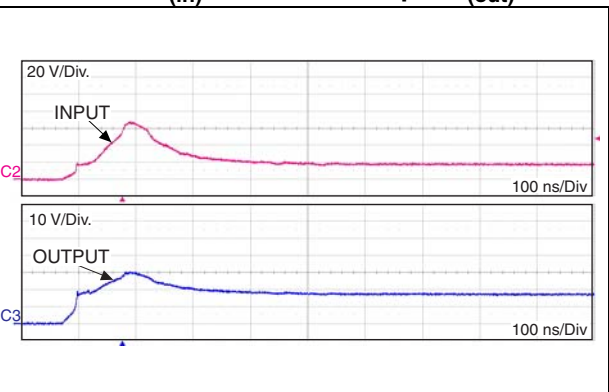


Figure 8. ESD response to IEC 61000-4-2 (-15 kV air discharge) on one input V<sub>(in)</sub> and on one output V<sub>(out)</sub>

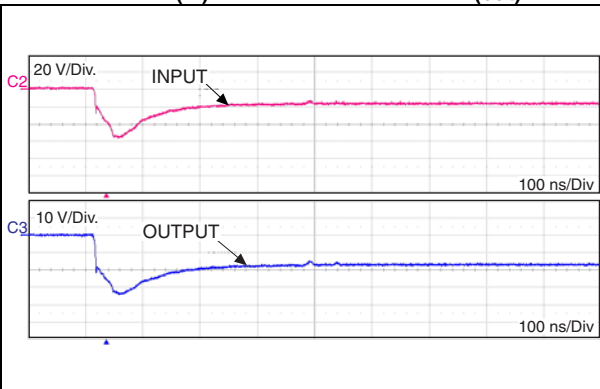
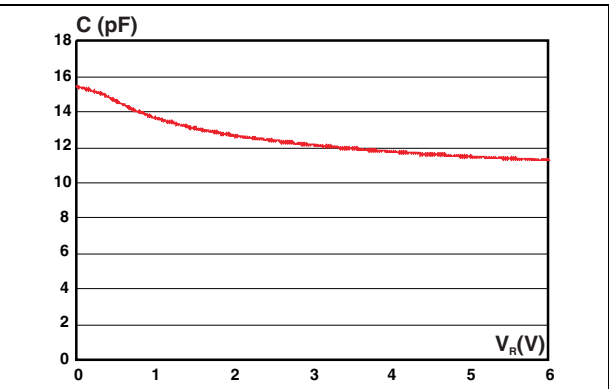
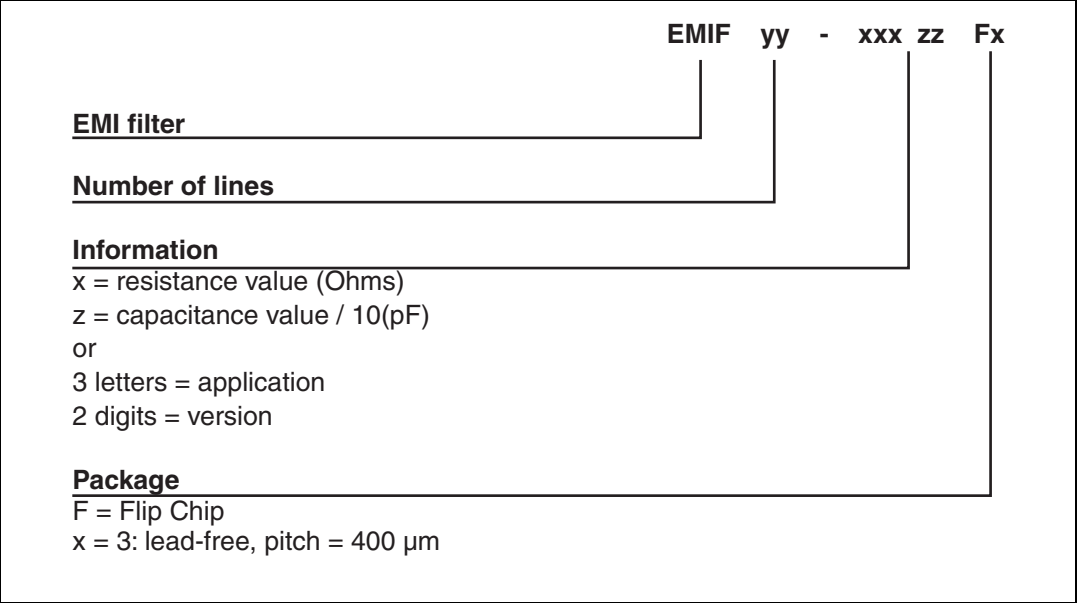


Figure 9. Line capacitance versus applied voltage (typical values, line C1-B2)



## 2 Ordering information scheme

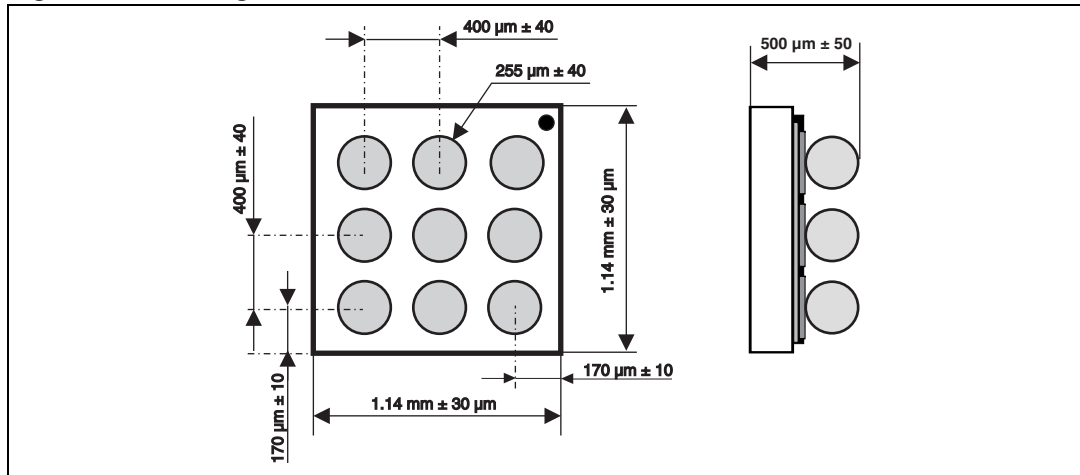
Figure 10. Ordering information scheme



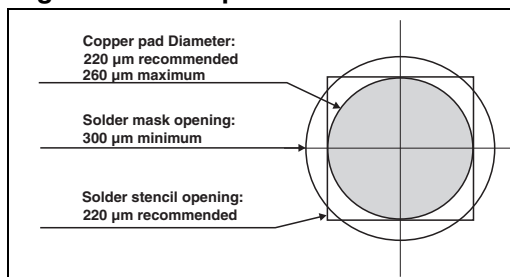
### 3 Package information

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.

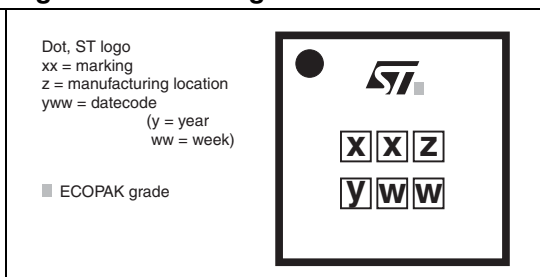
### Figure 11. Package dimensions



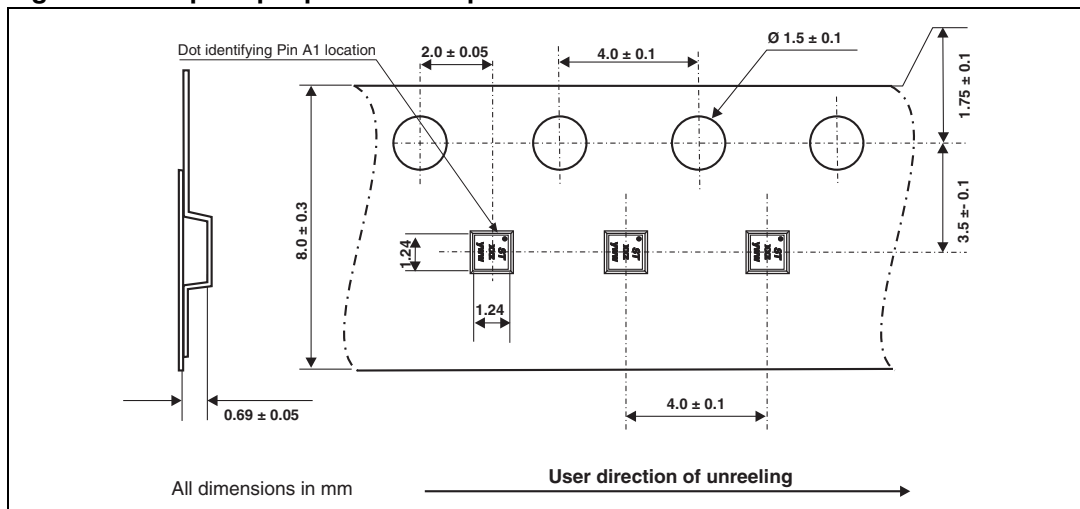
### Figure 12. Footprint



### Figure 13. Marking



**Figure 14. Flip Chip tape and reel specification**



## 4 Ordering information

**Table 3. Ordering information**

| Order code     | Marking | Package   | Weight | Base qty | Delivery mode      |
|----------------|---------|-----------|--------|----------|--------------------|
| EMIF02-USB04F3 | JM      | Flip Chip | 1.4 mg | 5000     | Tape and reel (7") |

Note:

*More information is available in the application notes:*

*AN2348: "STMicroelectronics 400 micro-metre Flip Chip: package description and recommendation for use"*

*AN1751: "EMI filters: recommendations and measurements"*

## 5 Revision history

**Table 4. Document revision history**

| Date        | Revision | Changes      |
|-------------|----------|--------------|
| 21-Oct-2010 | 1        | First issue. |

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