

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

### Features

- EMI (I/O) low-pass filter
- High efficiency in EMI filtering
- High density capacitor
- Very low PCB space occupation:  
1.92 x 1.42 mm<sup>2</sup>
- Very thin package: 0.65 mm
- High efficiency in ESD suppression on external pins (IEC 61000-4-2 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, on output pins
  - 15 kV (air discharge)
- IEC 61000-4-2 Level 1, on input pins
  - 2 kV (air discharge)

### Applications

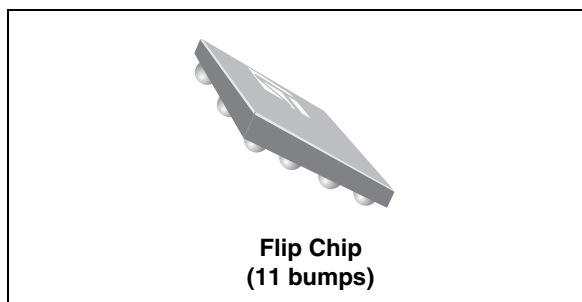
Where EMI filtering in ESD sensitive equipment is required:

- Earpiece and headset for mobile phones
- PDAs
- MP3 players

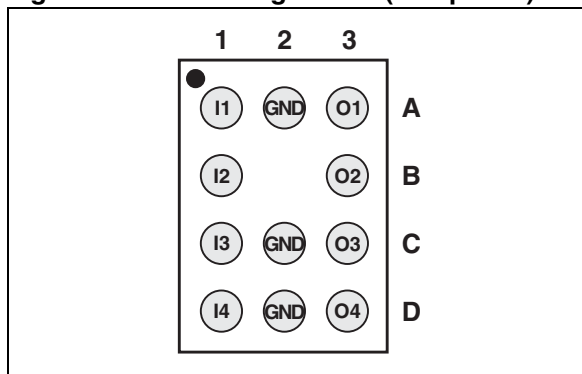
### Description

The **EMIF04-EAR01F2** is a 4-line highly integrated device designed to suppress EMI/RFI noise in all systems subjected to electromagnetic interference. The EMIF04 Flip Chip packaging means the package size is equal to the die size.

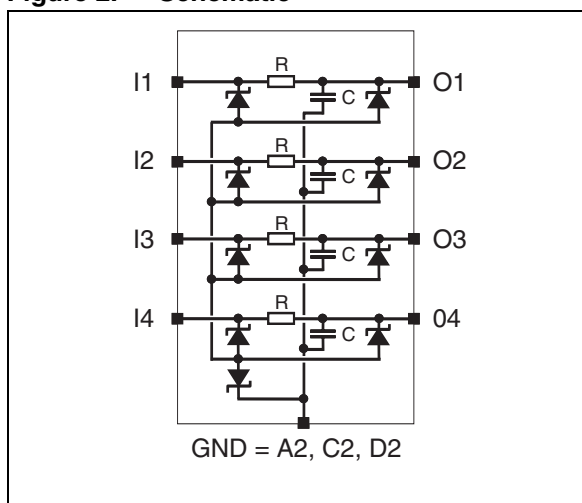
This filter includes ESD protection circuitry, which prevents damage to the application when subjected to ESD surges up to 15 kV.



**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 and test conditions	Value	Unit
$V_{PP}$	Output pins (A3, B3, C3, D3) ESD discharge IEC61000-4-2, air discharge	15	kV
	Input pins (A1, B1, C1, D1) ESD discharge IEC61000-4-2, air discharge	2	
$T_j$	Maximum junction temperature	125	$^{\circ}\text{C}$
$T_{op}$	Operating temperature range	- 40 to + 85	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature range	- 55 to + 150	$^{\circ}\text{C}$

**Table 2. Electrical characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

Symbol	Parameter				
$V_{BR}$	Breakdown voltage				
$I_{RM}$	Leakage current @ $V_{RM}$				
$V_{RM}$	Stand-off voltage				
$V_{CL}$	Clamping voltage				
$R_d$	Dynamic impedance				
$I_{PP}$	Peak pulse current				
$R$	Series resistance between input and output				
$C$	Capacitance				
Symbol	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR}$	$I_R = 1\text{ mA}$	14		18	V
$I_{RM}$	$V_{RM} = 3\text{ V per line}$			500	nA
$R$	Tolerance $\pm 30\%$		10		$\Omega$
$C$	$V_{LINE} = 0\text{ V}$ , $V_{OSC} = 30\text{ mV}$ , $F = 1\text{ MHz}$ Tolerance $\pm 20\%$		5.8		nF

Figure 3. S21 (db) all lines attenuation

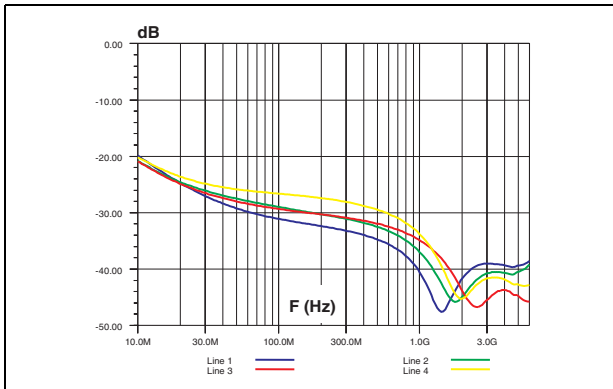


Figure 4. Analog cross talk

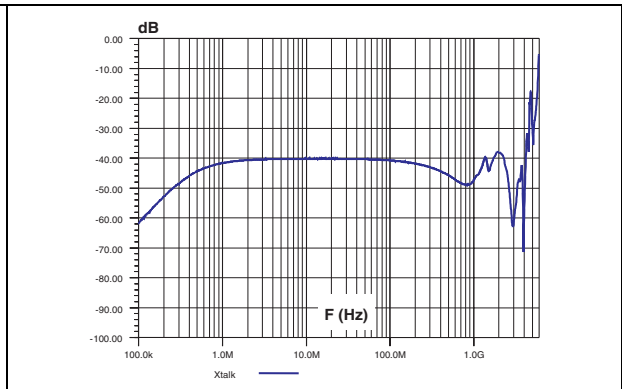


Figure 5. ESD response to IEC 61000-4-2 (+15 kV air discharge) on one output

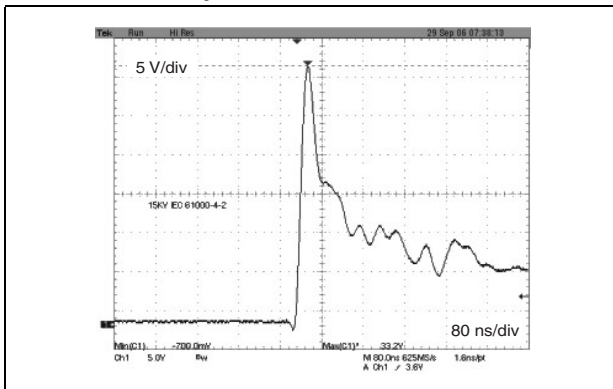


Figure 6. ESD response to IEC 61000-4-2 (-15 kV air discharge) on one output

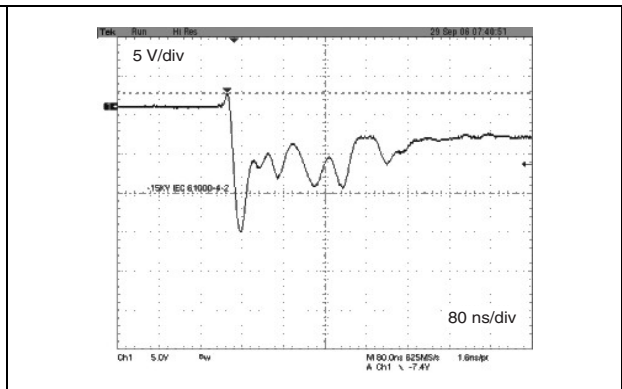
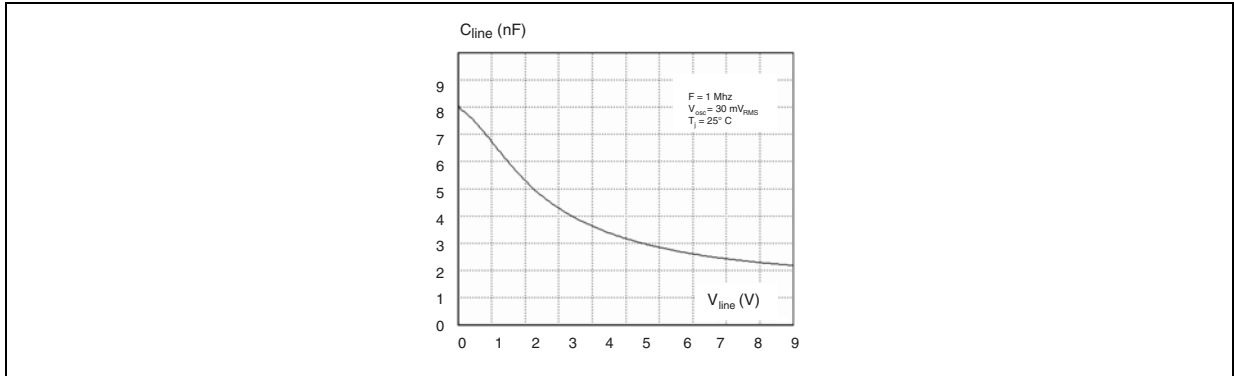
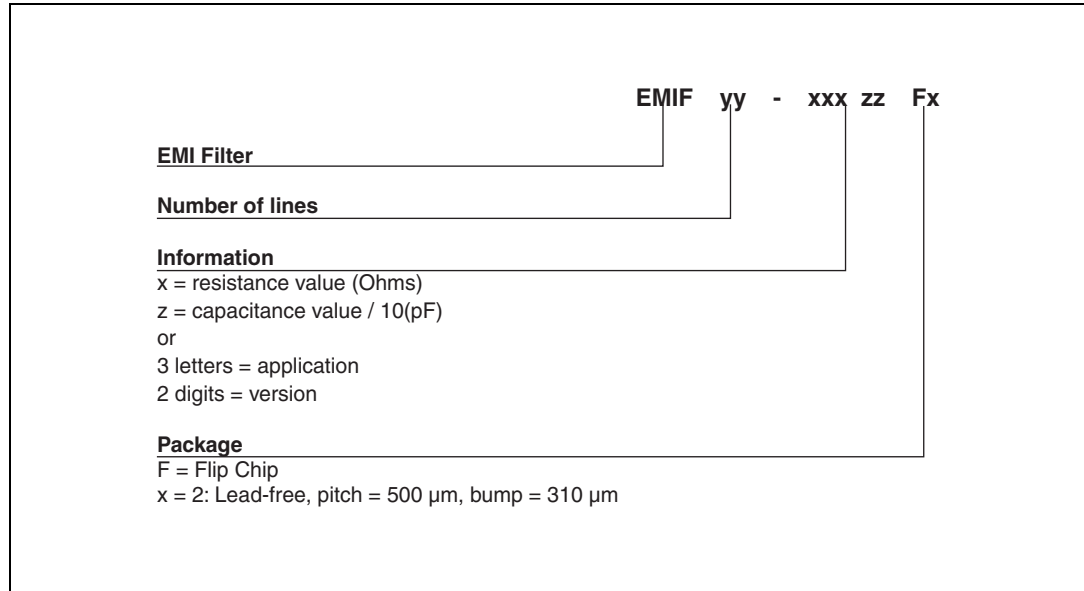


Figure 7. Line capacitance versus reverse applied voltage



## 2 Ordering information scheme

Figure 8. Ordering information scheme



## 3 Packaging information

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at [www.st.com](http://www.st.com).

Figure 9. Flip Chip package dimensions

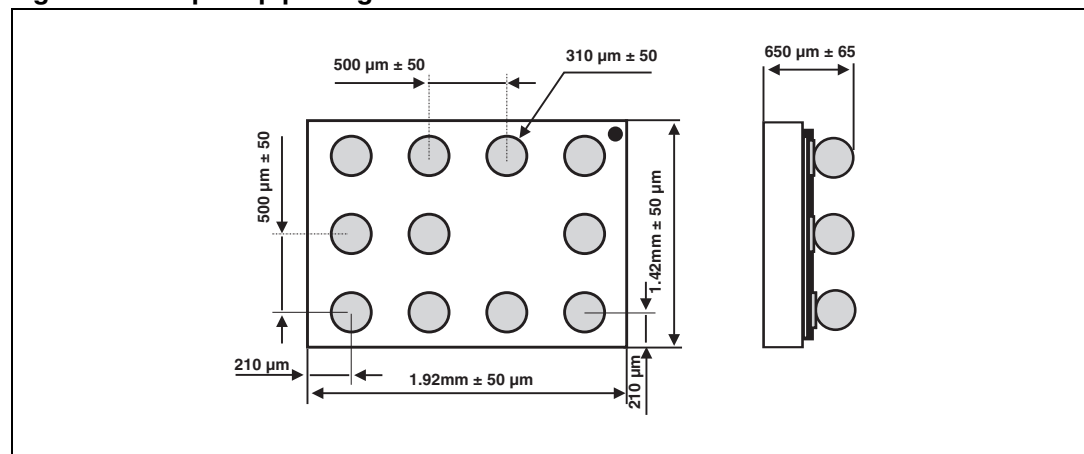


Figure 10. Footprint recommendations

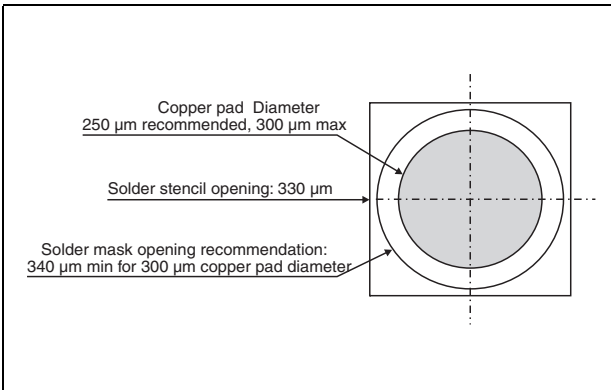


Figure 11. Marking

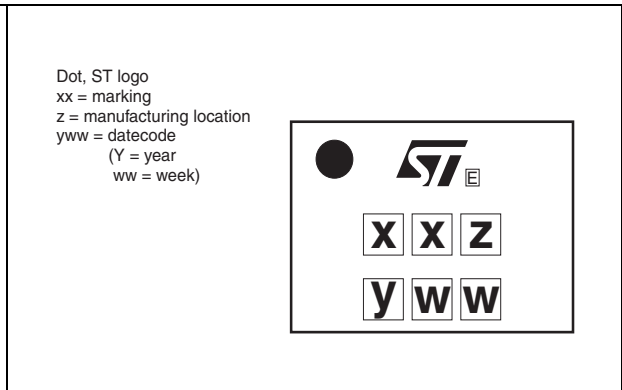
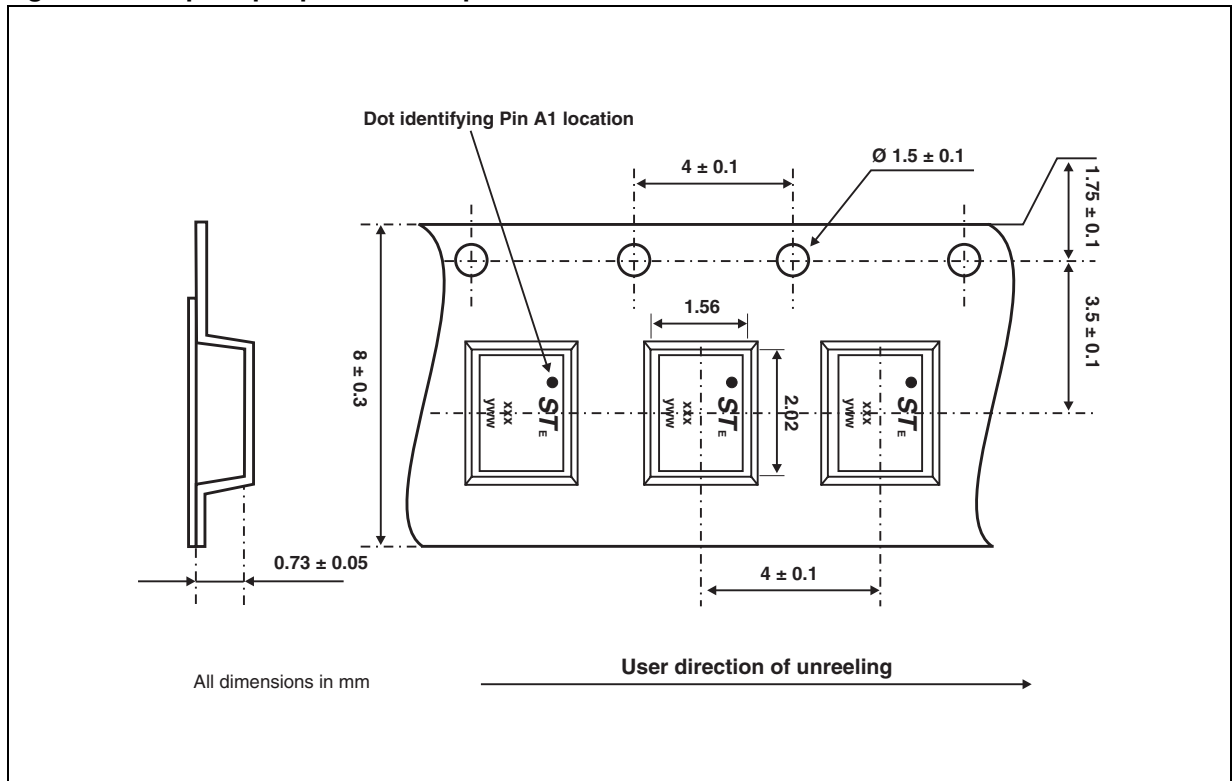


Figure 12. Flip Chip tape and reel specifications



Note: *Note: More information is available in the application note:  
AN2348: "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
EMIF04-EAR01F2	GK	Flip Chip	3.8 mg	5000	Tape and reel 7"

## 5 Revision history

Table 4. Document revision history

Date	Revision	Changes
06-Oct-2006	1	Initial release.
28-Apr-2008	2	Updated ECOPACK statement. Updated figures <a href="#">Figure 9</a> , and <a href="#">Figure 12</a> . Reformatted to current standards.

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