

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

### Features

- EMI symmetrical (I/O) low-pass filter
- High efficiency in EMI filtering
- Lead-free package
- Very low PCB space consuming:  
1.42 mm x 1.42 mm
- Very thin package: 0.65 mm
- High efficiency in ESD suppression
- 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 and  $V_{cc}$  pins:
  - 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)
- MIL STD 883E - Method 3015-6 Class 3

### Applications

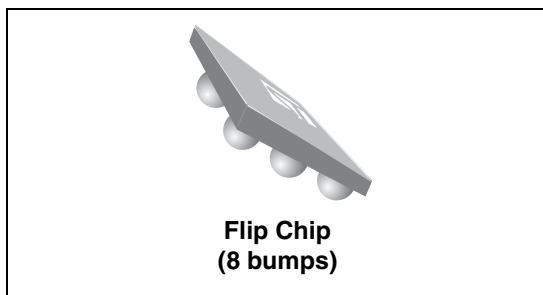
EMI filtering and ESD protection for:

- SIM Interface (Subscriber Identify Module)
- UIM Interface (Universal Identify Module)

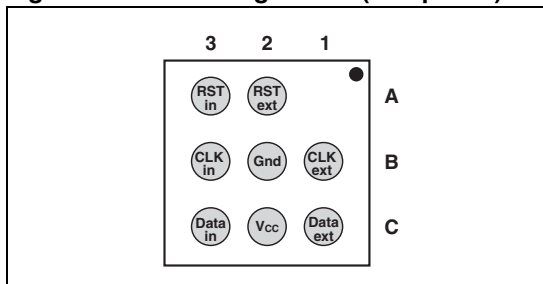
### Description

The EMIF03-SIM02F2 is a highly integrated device designed to suppress EMI/RFI noise in all systems subjected to electromagnetic interference. The EMIF03 Flip Chip packaging means the package size is equal to the die size.

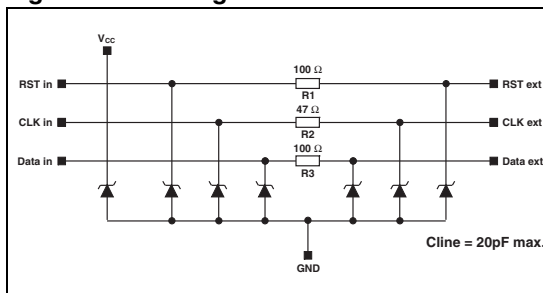
This filter includes an ESD protection circuitry which prevents damage to the application when subjected to ESD surges up 15kV.



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



**Figure 2. Configuration**



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

# 1 Characteristics

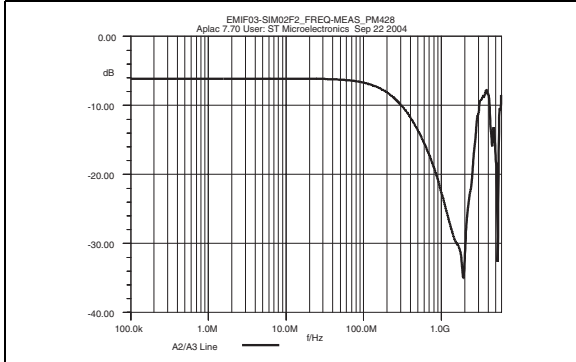
**Table 1. Absolute maximum ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

Symbol	Parameter and test conditions	Value	Unit
$V_{PP}$	<b>Internal pins (A3, B3, C3):</b>		
	ESD discharge IEC61000-4-2, air discharge	2	kV
	ESD discharge IEC61000-4-2, contact discharge	2	
	<b>External pins (A2, B1, C2, C1):</b>		
ESD discharge IEC61000-4-2, air discharge	15		
	ESD discharge IEC61000-4-2, contact discharge	8	
$T_j$	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	$^{\circ}\text{C}$

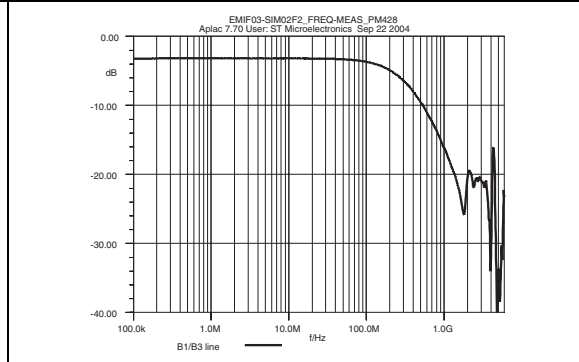
**Table 2. Electrical characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

Symbol	Parameters				
$V_{BR}$	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				
$R_{I/O}$	Series resistance between Input & Output				
$C_{line}$	Input capacitance per line				
Symbol	Test conditions	Min	Typ	Max	Unit
$V_{BR}$	$I_R = 1\text{ mA}$	6		20	V
$I_{RM}$	$V_{RM} = 3\text{ V}$			0.2	$\mu\text{A}$
$R_d$			1.5		$\Omega$
$R_1, R_3$	Tolerance $\pm 20\%$		100		$\Omega$
$R_2$	Tolerance $\pm 20\%$		47		$\Omega$
$C_{line}$	@ 0V			20	pF

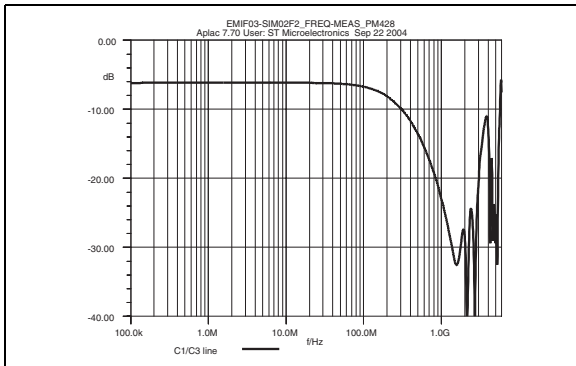
**Figure 3. S21 (dB) attenuation measurement (A2-A3 line)**



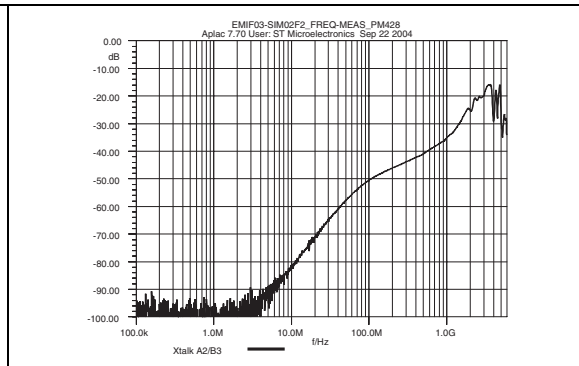
**Figure 4. S21 (dB) attenuation measurement (B1-B3 line)**



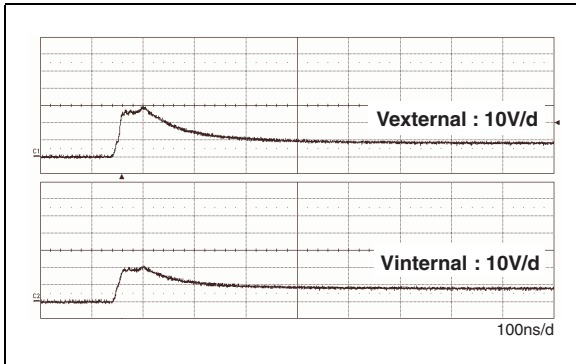
**Figure 5. S21 (dB) attenuation measurement (C1-C3 line)**



**Figure 6. Analog crosstalk measurements**



**Figure 7. Voltages when IEC61000-4-2 (+15 kV air discharge) applied to external pin**



**Figure 8. Voltages when IEC61000-4-2 (-15 kV air discharge) applied to external pin**

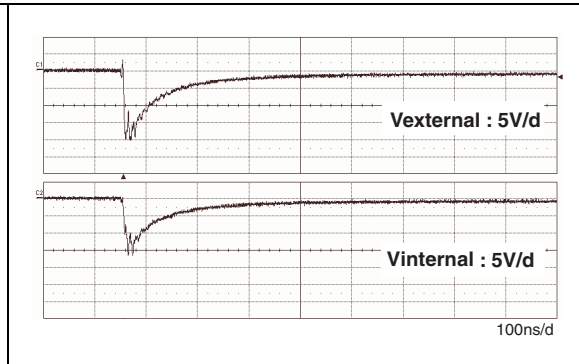
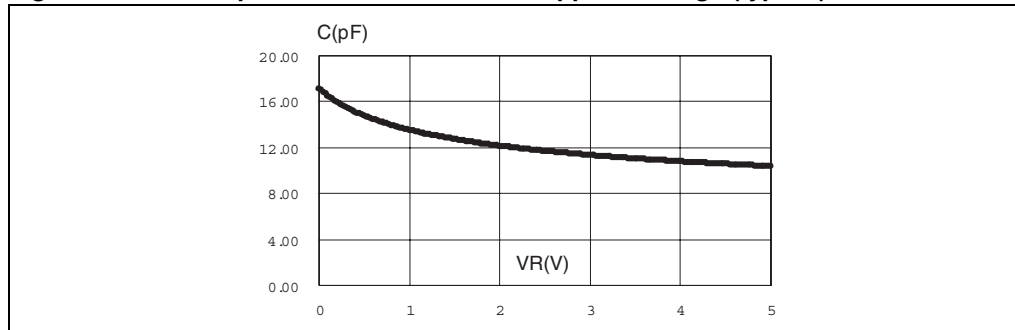


Figure 9. Line capacitance versus reverse applied voltage (typical)



## 2 Application information

Figure 10. Aplac model

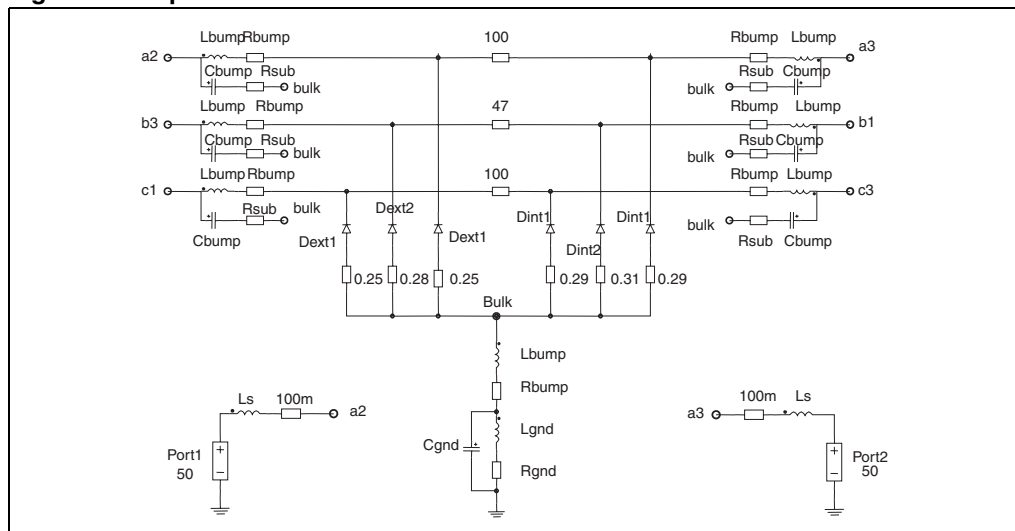
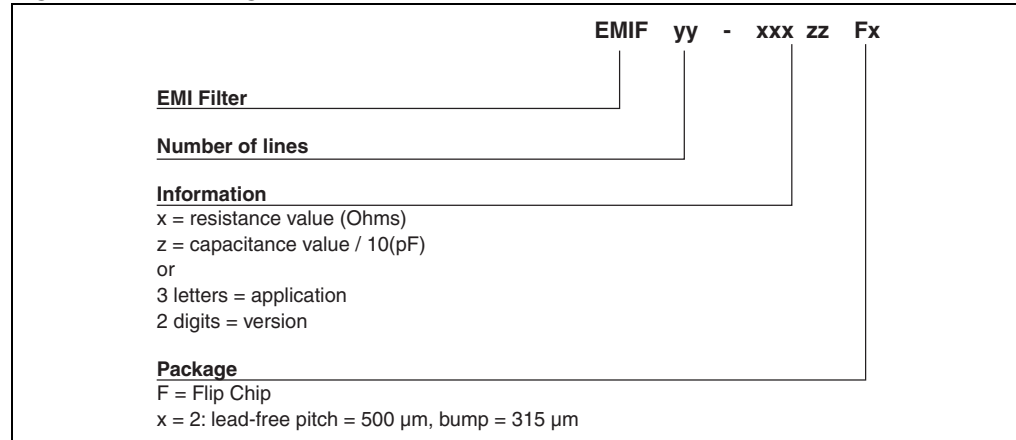


Figure 11. Aplac parameters

Ls 950pH				
Rs 150m	<u>Model Dint1</u>	<u>Model Dext1</u>	<u>Model Dint2</u>	<u>Model Dext2</u>
Cext1 15pF	BV=15	BV=15	BV=15	BV=15
Cint1 4.5pF	CJO=Cint1	CJO=Cext1	CJO=Cint2	CJO=Cext2
Cext2 14pF	IBV=1u	IBV=1u	IBV=1u	IBV=1u
Cint2 4pF	IKF=1000	IKF=1000	IKF=1000	IKF=1000
Rbump 20m	IS=10f	IS=10f	IS=10f	IS=10f
Lbump 50pH	ISR=100p	ISR=100p	ISR=100p	ISR=100p
Cbump 0.15pF	N=1	N=1	N=1	N=1
Rgnd 500m	M=0.3333	M=0.3333	M=0.3333	M=0.3333
Lgnd 50pH	RS=0.001m	RS=0.001m	RS=0.001m	RS=0.001m
Cgnd 0.15pF	VJ=0.6	VJ=0.6	VJ=0.6	VJ=0.6
Rsub 100m	TT=50n	TT=50n	TT=50n	TT=50n

### 3 Ordering information scheme

Figure 12. Ordering information scheme



### 4 Package information

In order to meet environmental requirements, ST offers these devices in ECOPACK<sup>®</sup> 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 13. Package dimensions

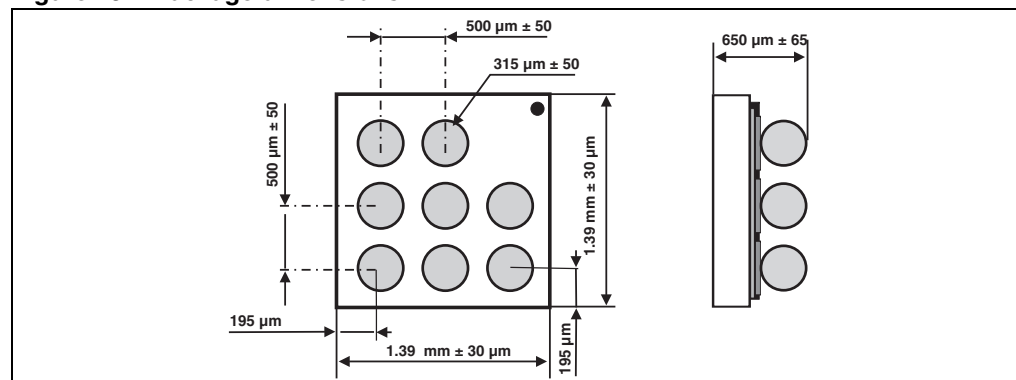


Figure 14. Footprint

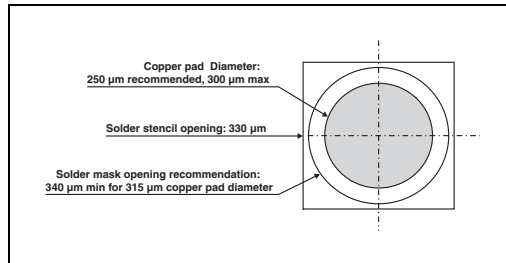


Figure 15. Marking

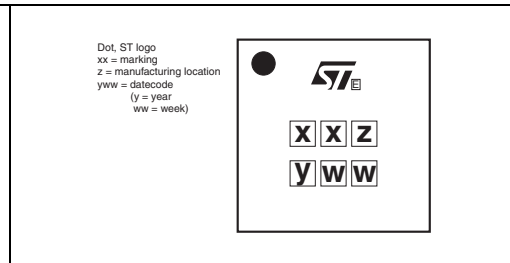
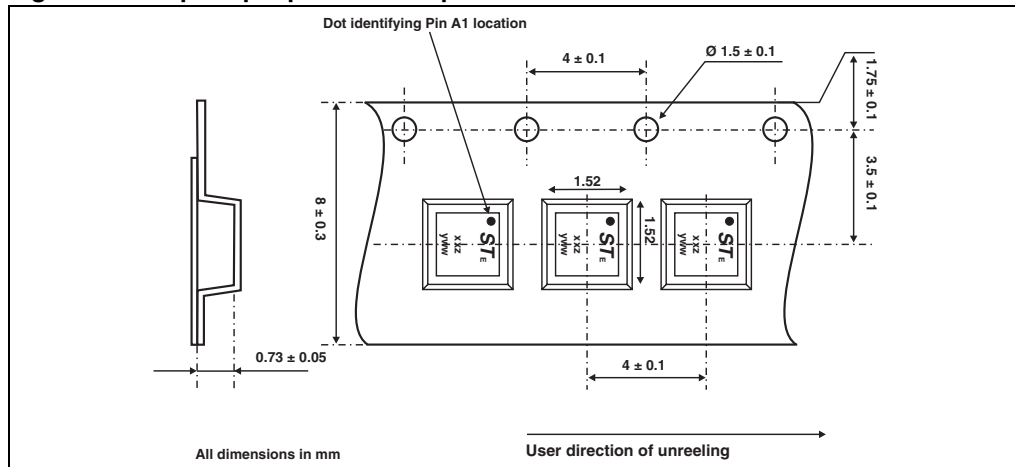


Figure 16. Flip Chip tape and reel specification



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

## 5 Ordering information

Table 3. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
EMIF03-SIM02F2	GJ	Flip Chip	2.65 mg	5000	Tape and reel 7"

## 6 Revision history

**Table 4. Document revision history**

Date	Revision	Changes
08-Oct-2004	1	First issue.
20-Oct-2004	2	Minor layout update.
25-Mar-2005	3	Figure 1 on page 1: pin configuration definitions changed from RST out, CLK out and Data out to RST ext, CLK ext and Data ext.
13-Jun-2005	4	Titles in Figures 7 and 8 changed - No technical data changed
12-Sep-2005	5	“out” changed to “ext” in Figure 2.
24-Apr-2008	6	Updated ECOPACK statement. Updated <a href="#">Figure 12</a> , <a href="#">Figure 13</a> , <a href="#">Figure 14</a> , <a href="#">Figure 15</a> and <a href="#">Figure 16</a> . Reformatted to current standards.

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