

## 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: 1.2 mm<sup>2</sup>
- Very thin package: 0.60 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<sub>cc</sub> 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

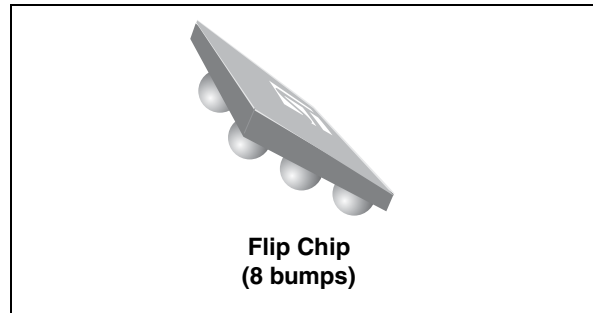
EMI filtering and ESD protection for:

- SIM Interface (subscriber identify module)
- UIM Interface (universal identify module)

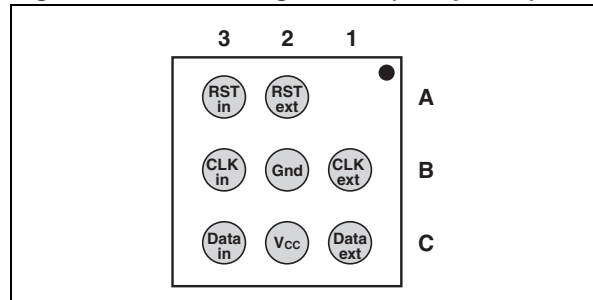
### Description

The EMIF03-SIM02F3 is a highly integrated device designed to suppress EMI / RFI noise in all systems subjected to electromagnetic interferences.

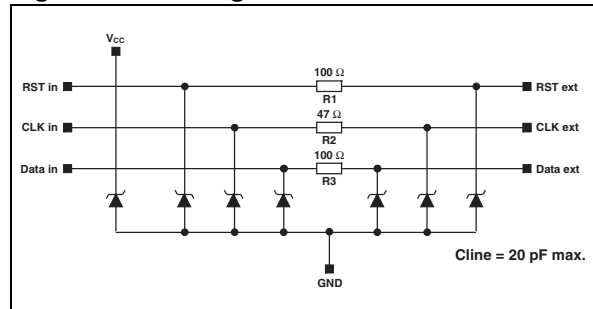
This filter includes an ESD protection circuitry which prevents damage to the application when subjected to ESD surges up to 15 kV.



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



**Figure 2. Configuration**



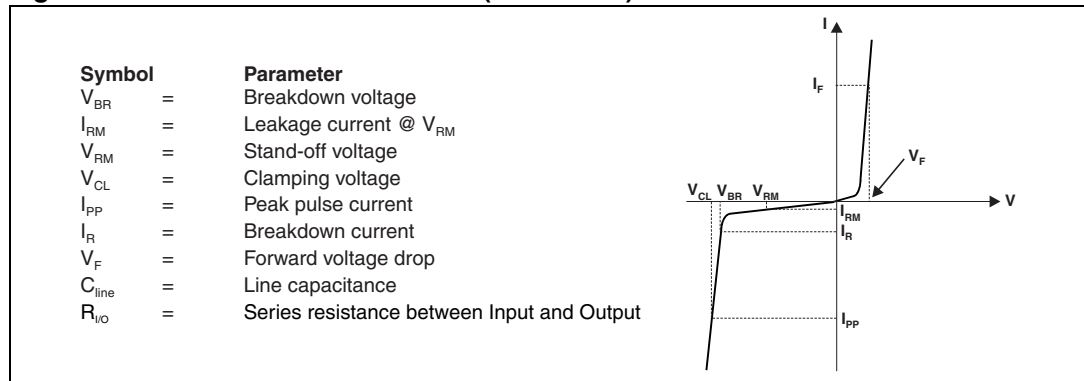
TM: IPAD is a trademark of STMicroelectronics.

# 1 Electrical 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 IEC 61000-4-2, air discharge	2	kV
	ESD discharge IEC 61000-4-2, contact discharge	2	
	<b>External pins (A2, B1, C2, C1):</b>		
	ESD discharge IEC 61000-4-2, air discharge	15	
ESD discharge IEC 61000-4-2, 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	$^{\circ}\text{C}$

**Figure 3. Electrical characteristics (definitions)**



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

Symbol	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR}$	$I_R = 1\text{ mA}$	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	-	$\Omega$
$C_{line}$	$V_{line} = 0\text{ V}, V_{osc} = 30\text{ mV}, F = 1\text{ MHz}$	-	-	20	pF

Figure 4. S21 (dB) attenuation measurement (A2-A3 line)

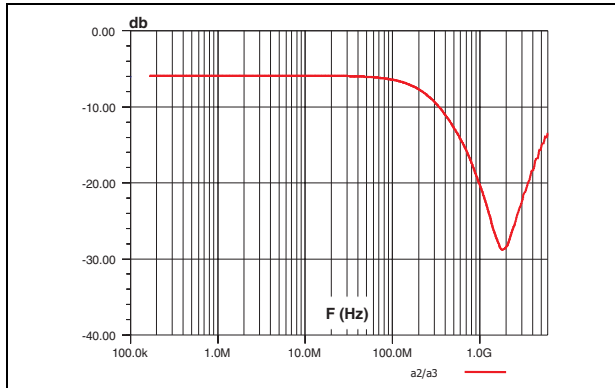


Figure 5. S21 (dB) attenuation measurement (B1-B3 line)

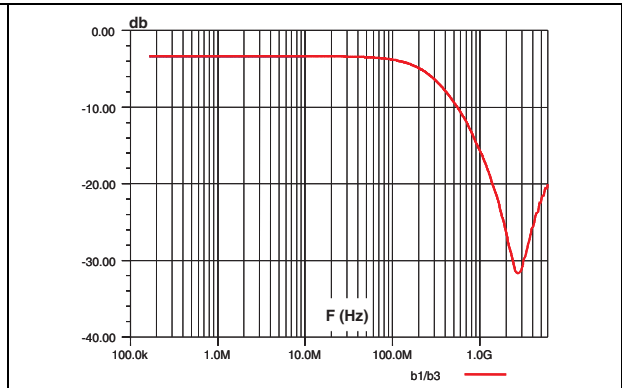


Figure 6. S21 (dB) attenuation measurement (C1-C3 line)

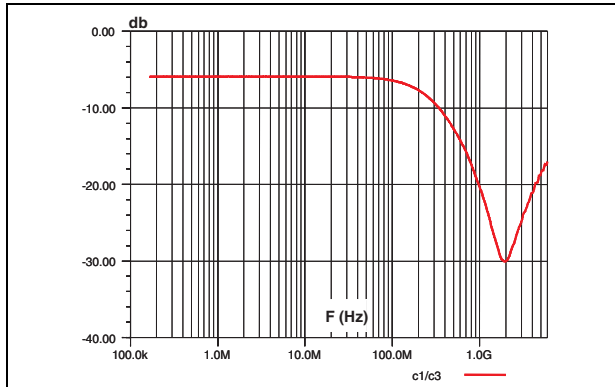


Figure 7. Analog crosstalk measurements

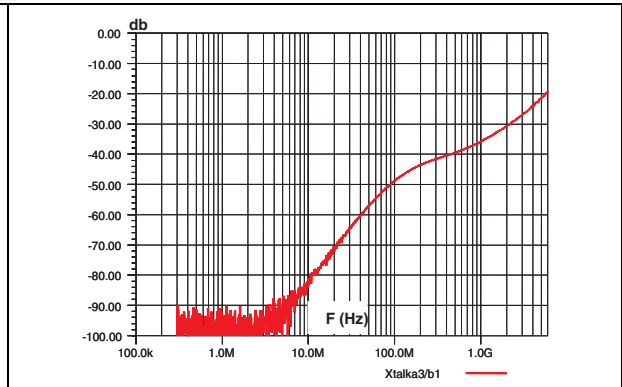


Figure 8. Digital crosstalk measurements

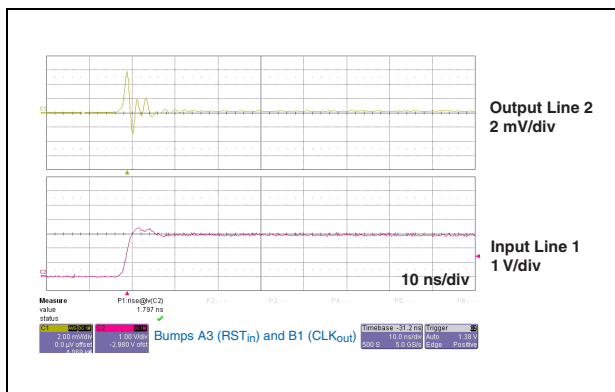
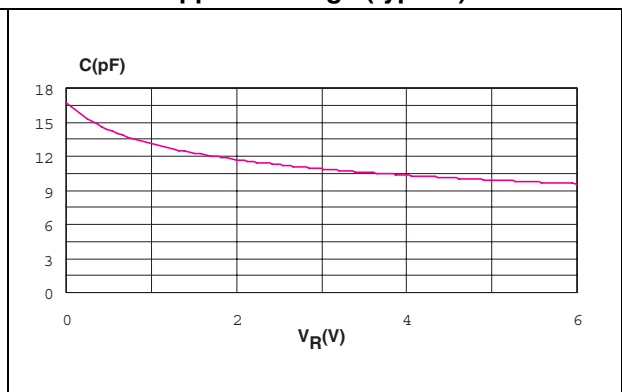


Figure 9. Line capacitance versus reverse applied voltage (typical)



## 2 Aplac model

Figure 10. Aplac model

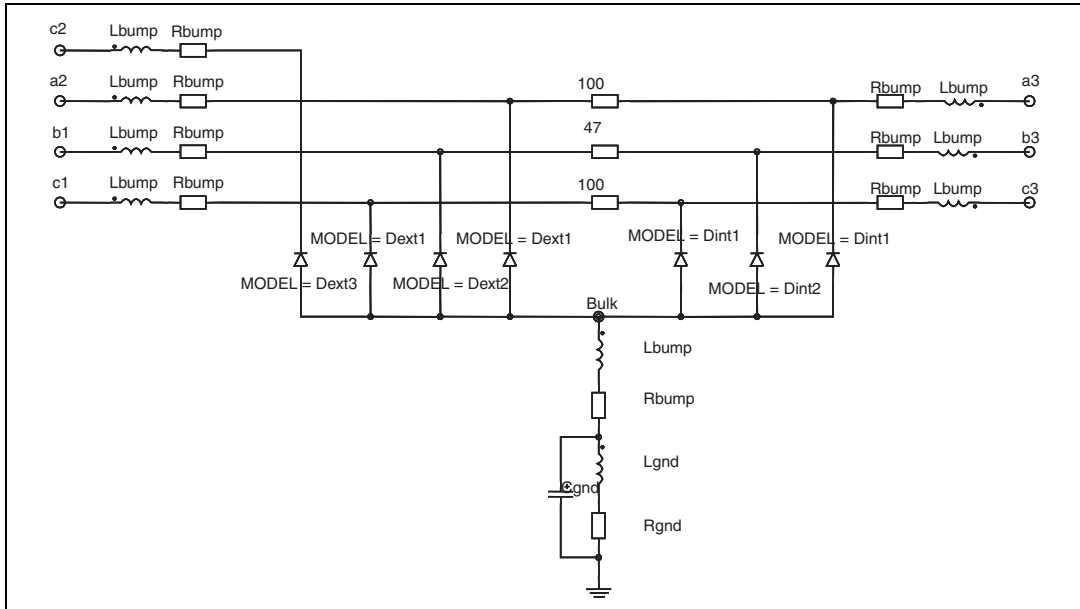


Figure 11. Aplac parameters

aplacvar Ls 950pH					
aplacvar Rs 150m	Dint1	Dext1	Dint2	Dext2	Dext3
aplacvar Cext1 12pF	BV=15	BV=15	BV=15	BV=15	BV=15
aplacvar Cext2 14pF	CJO=Cint1	CJO=Cext1	CJO=Cint2	CJO=Cext2	CJO=Cext3
aplacvar Cext3 18pF	IBV=1u	IBV=1u	IBV=1u	IBV=1u	IBV=1u
aplacvar Cint1 4.5pF	IKF=1000	IKF=1000	IKF=1000	IKF=1000	IKF=1000
aplacvar Cint2 4pF	IS=10f	IS=10f	IS=10f	IS=10f	IS=10f
aplacvar Rbump 17m	ISR=100p	ISR=100p	ISR=100p	ISR=100p	ISR=100p
aplacvar Lbump 43pH	N=1	N=1	N=1	N=1	N=1
aplacvar Rgnd 500m	M=0.3333	M=0.3333	M=0.3333	M=0.3333	M=0.3333
aplacvar Lgnd 50pH	RS=0.29	RS=0.25	RS=0.31	RS=0.28	RS=0.25
aplacvar Cgnd 0.15pF	VJ=0.6	VJ=0.6	VJ=0.6	VJ=0.6	VJ=0.6
aplacvar Rsub 100m	TT=50n	TT=50n	TT=50n	TT=50n	TT=50n

Figure 12. Voltages when IEC 61000-4-2 (+15 kV air discharge) applied to external pin

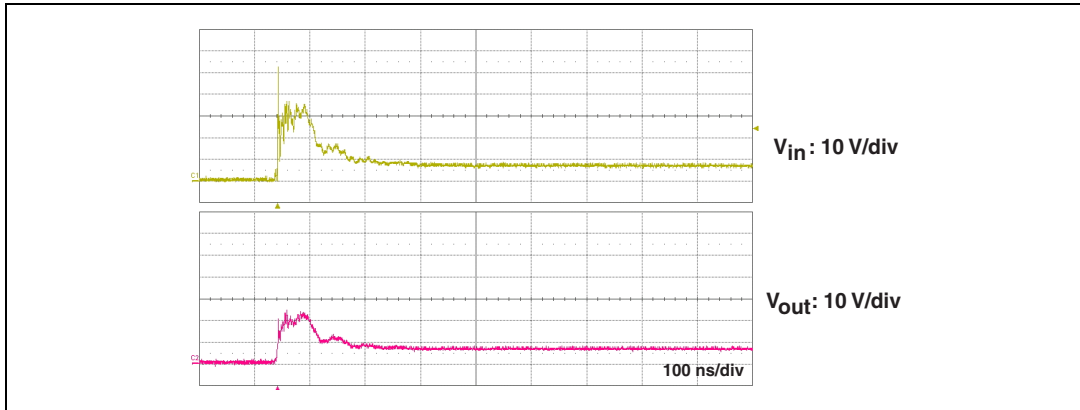
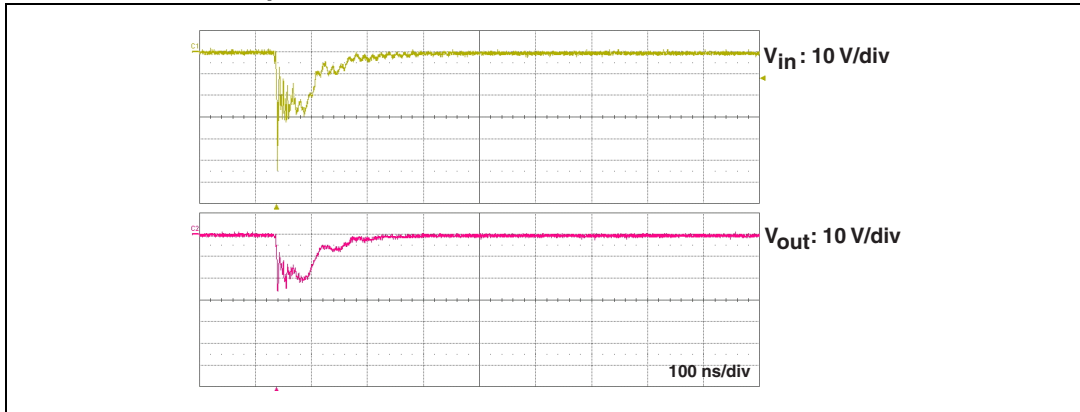
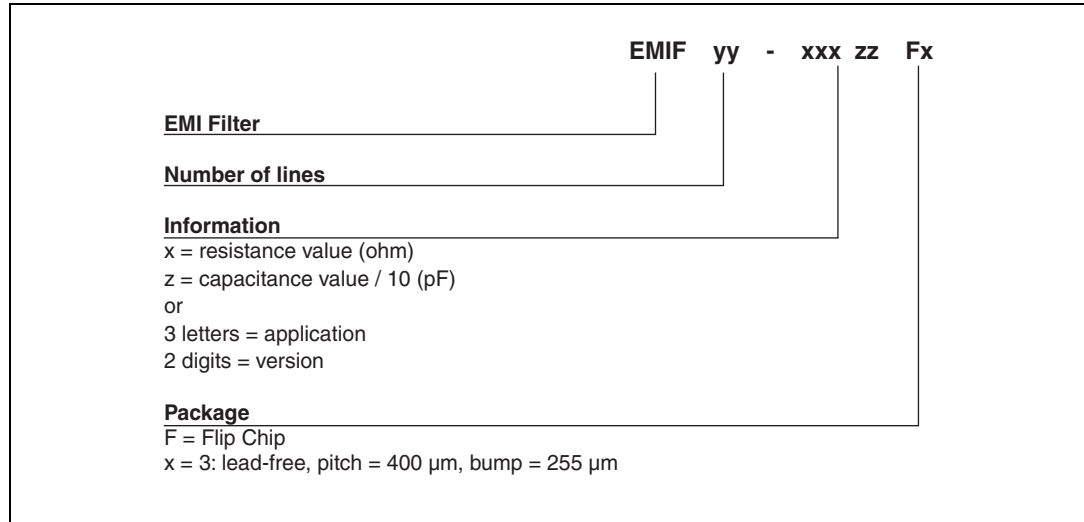


Figure 13. Voltages when IEC 61000-4-2 (- 15 kV air discharge) applied to external pin



### 3 Ordering information scheme

Figure 14. Ordering information scheme



### 4 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

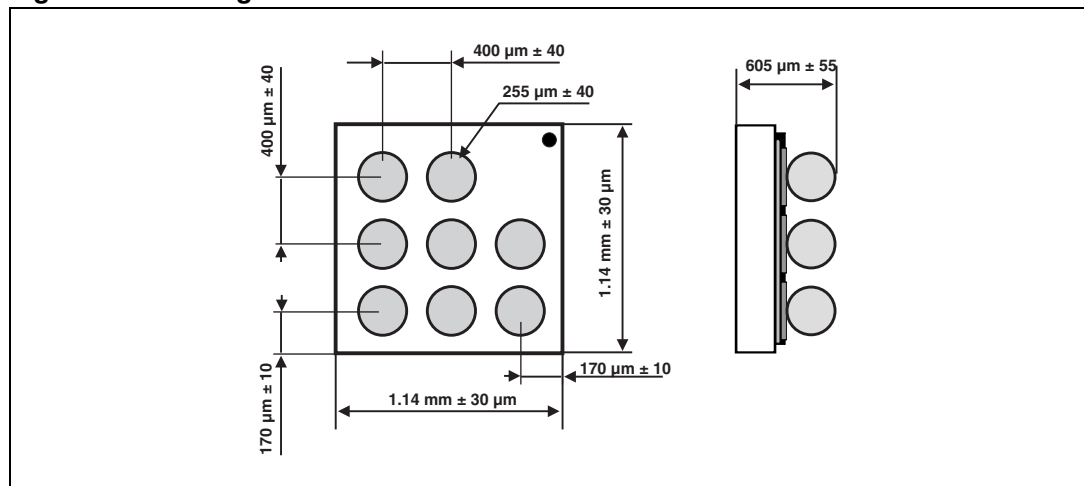


Figure 16. Footprint

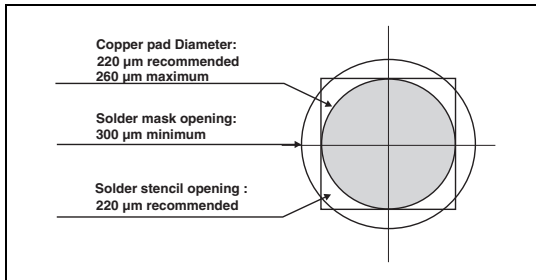


Figure 17. Marking

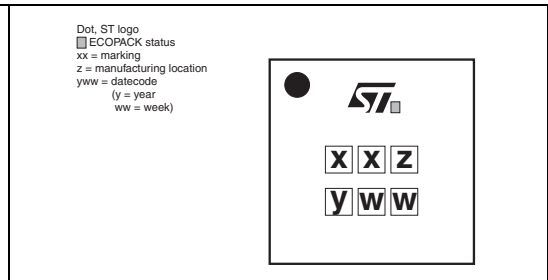
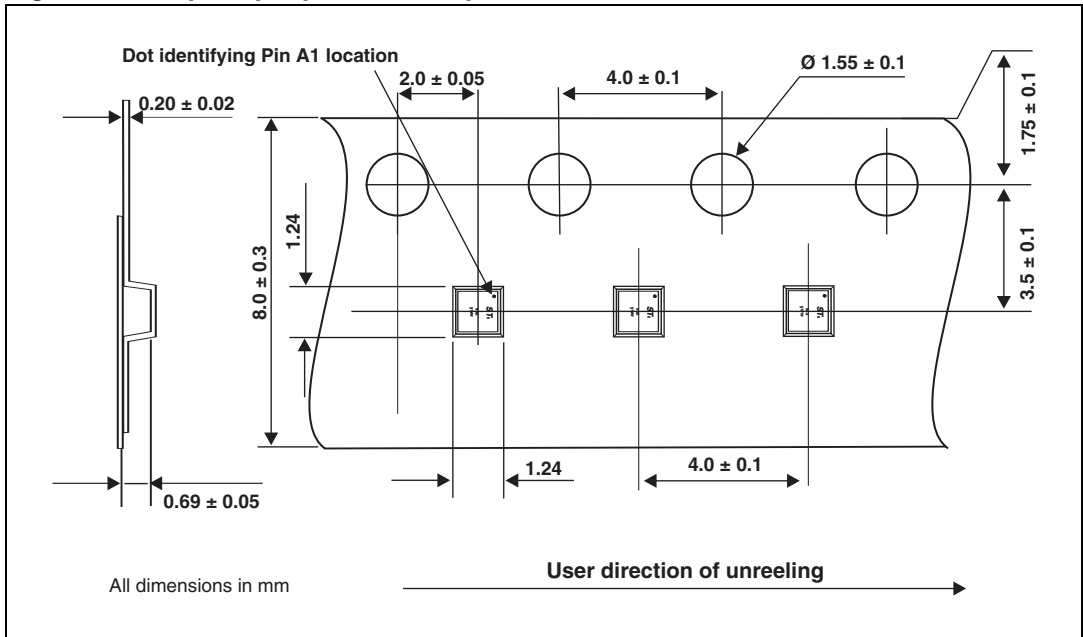


Figure 18. Flip Chip tape and reel specification



## 5 Ordering information

Table 3. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
EMIF03-SIM02F3	HA	Flip Chip	1.74 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"

## 6 Revision history

**Table 4. Document revision history**

<b>Date</b>	<b>Revision</b>	<b>Changes</b>
19-Jul-2005	1	Initial release.
26-Feb-2007	2	Changed out to ext in Configuration diagram on page 1. Added Ecopack statement. Reformatted to current layout standard. Updated Application note AN2348 reference and description.
28-Nov-2007	3	Updated ECOPACK statement. Updated <a href="#">Figure 14</a> , <a href="#">Figure 15</a> , <a href="#">Figure 16</a> and <a href="#">Figure 18</a> . Reformatted to current standards.
09-Feb-2010	4	Updated die dimensions in <a href="#">Figure 15</a> and pocket dimensions in <a href="#">Figure 18</a> .
07-Apr-2010	5	Updated tolerance dimensions in <a href="#">Figure 15: Package dimensions</a> .



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