

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

### Features

- High attenuation in the mobile frequency range (typically better than -40 dB from 900 MHz to 2 GHz)
- Very low clamping voltage
- Low line capacitance (30 pF max) suitable for high-speed interfaces
- Maximum rise and fall time: 6 ns (10% - 90%)
- Compliant with high speed data rate
- Lead-free Flip Chip package in 400 µm pitch
- Very thin package: 0.6mm thickness

### Benefits

- High efficiency in EMI filtering
- High bandwidth: typically 200 MHz at -3 dB
- 80% space saving versus discrete solution (BOM reduction)
- High reliability offered by monolithic integration
- High reduction of parasitic elements through integration and wafer level packaging

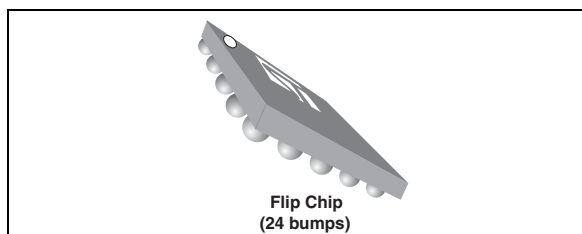
### Complies with the following standards

- IEC61000-4-2 level 4 on inputs and outputs
  - ±15 kV (air discharge)
  - ± 8 kV (contact discharge)

### Applications

Displays and cameras where outstanding EMI filtering in ESD sensitive equipment is required:

- Mobile phones and PDAs
- Personal and home entertainment (portable audio, DVD players, LCD TVs)
- Portable navigation devices
- Digital still cameras
- Portable gaming systems

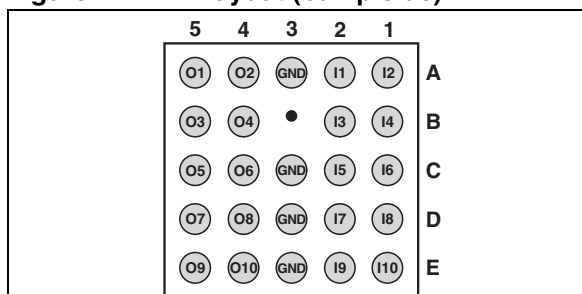


### Description

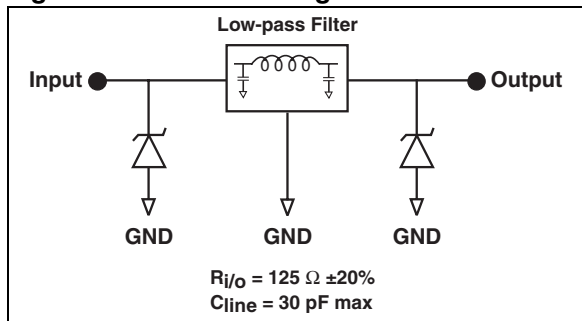
The EMIF10-LCD03F3 is a 10-line highly integrated LC filter designed to suppress EMI/RFI noise in all systems subjected to electromagnetic interference. The EMIF10 Flip Chip packaging means the package size is equal to the die size.

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

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



**Figure 2. Device configuration**



TM: IPAD is a trademark of STMicroelectronics.

# 1 Characteristics

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

Symbol	Parameter	Value	Unit
$V_{PP}$	<b>Input and output pins:</b>		
	ESD discharge IEC 61000-4-2, air discharge	$\pm 15$	kV
	ESD discharge IEC 61000-4-2, contact discharge	$\pm 15$	
$T_j$	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				
$C_{line}$	Line capacitance				
Symbol	Test conditions				
$V_{BR}$	$I_R = 1\text{ mA}$	14			V
$I_{RM}$	$V_{RM} = 3\text{ V per line}$			200	nA
$R_{I/O}$	Tolerance $\pm 20\%$	100	125	150	$\Omega$
$C_{line}$	$V_{line} = 0\text{ V}, V_{OSC} = 30\text{ mV}, F = 1\text{ MHz}$			30	pF

Figure 3. S21 measurement (all GND bumps connected)

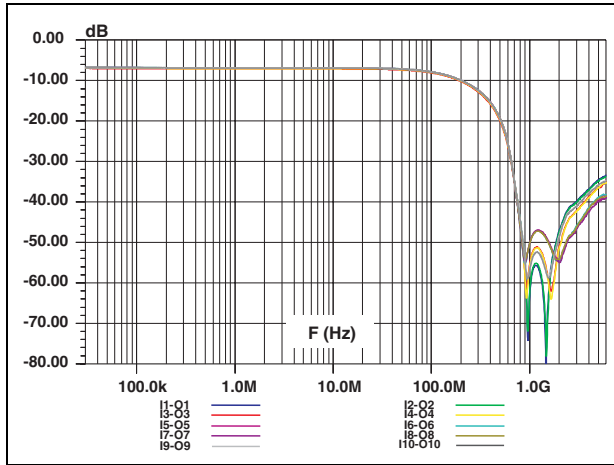


Figure 4. Analog crosstalk measurements (all GND bumps connected)

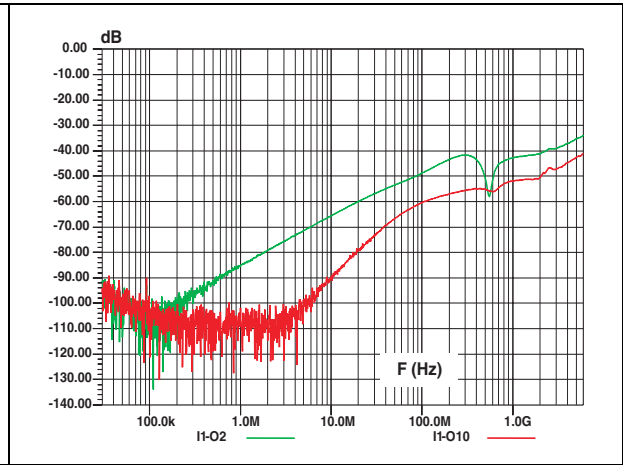


Figure 5. ESD response to IEC 61000-4-2 (+15 kV air discharge) on one line

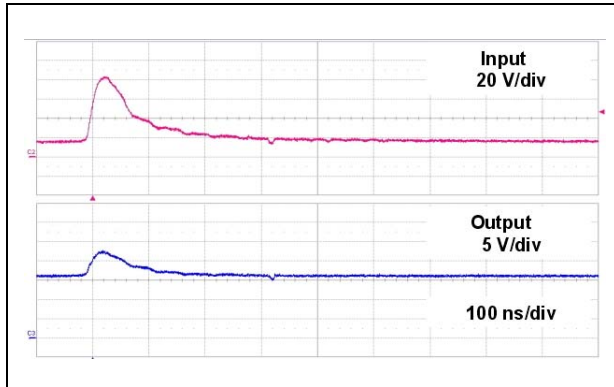


Figure 6. ESD response to IEC 61000-4-2 (-15 kV air discharge) on one line

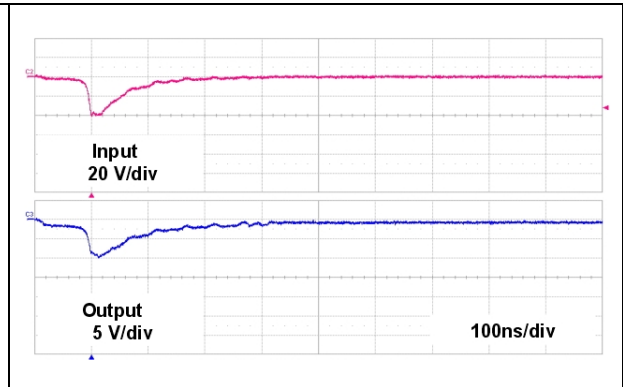


Figure 7. Line capacitance versus applied voltage (typical values)

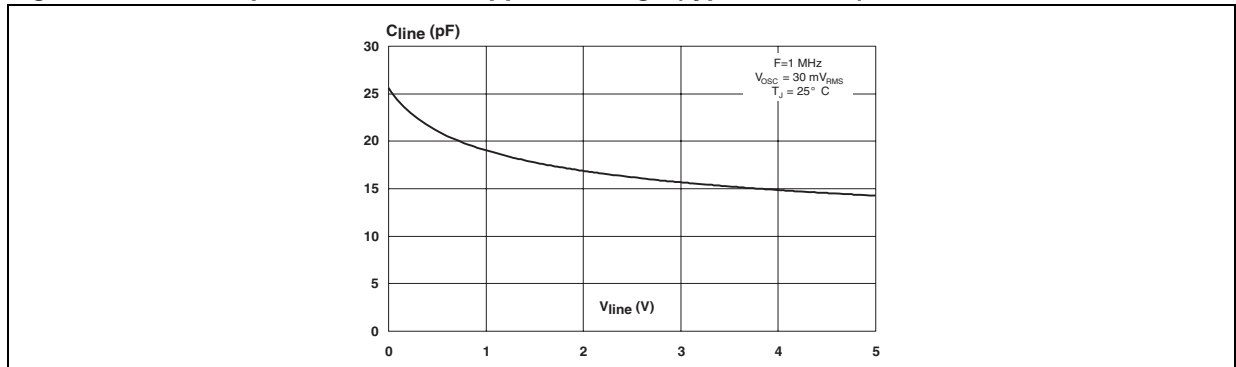


Figure 8. Typical rise and fall time: input voltage

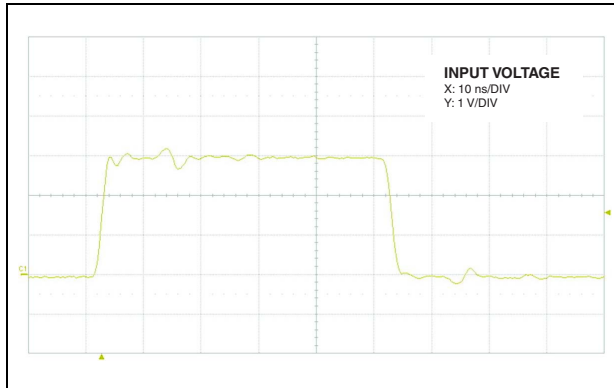
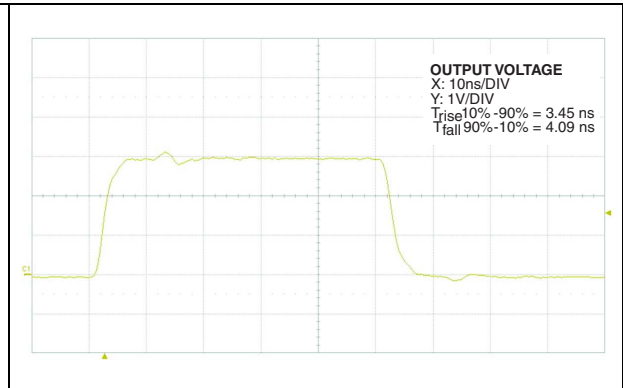
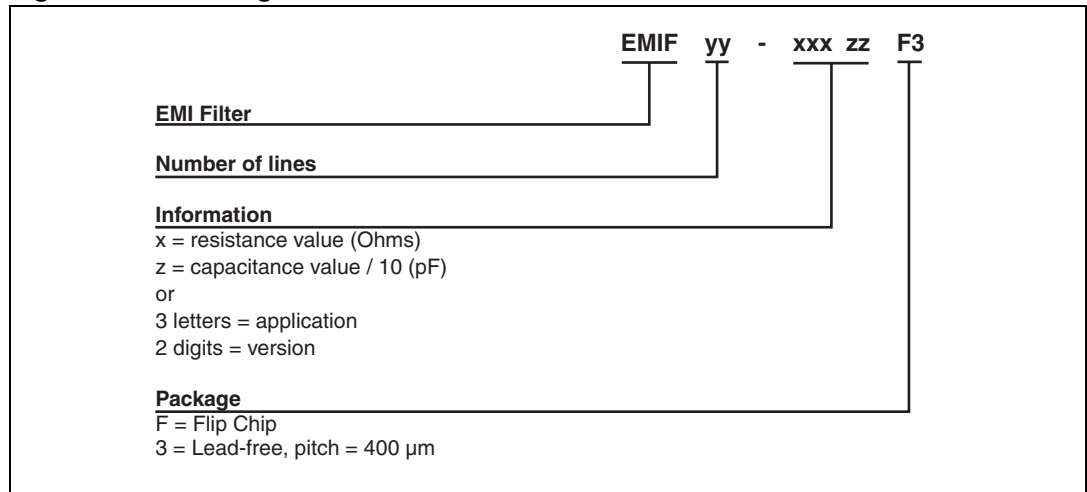


Figure 9. Typical rise and fall time: output voltage



## 2 Ordering information scheme

Figure 10. Ordering information scheme



### 3 Package 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 11. Package dimensions

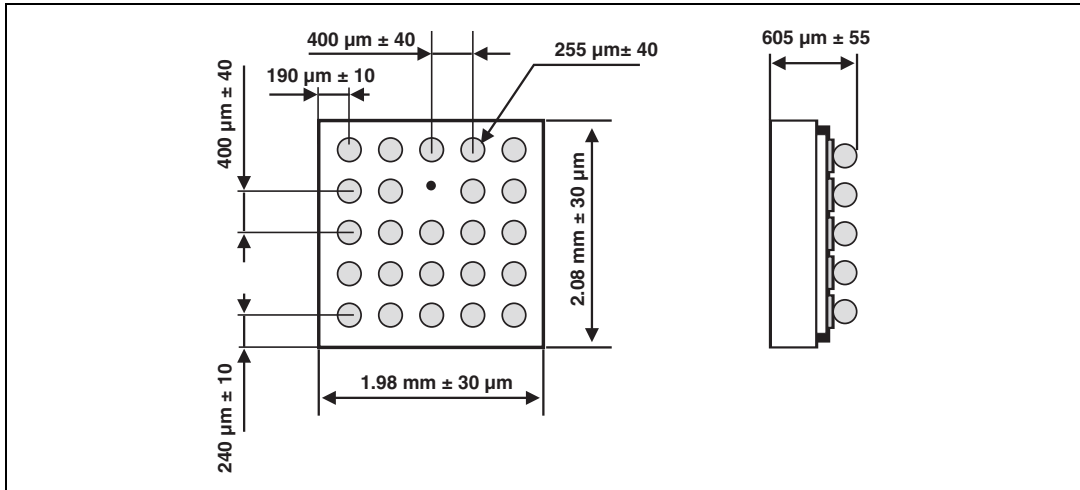


Figure 12. Footprint

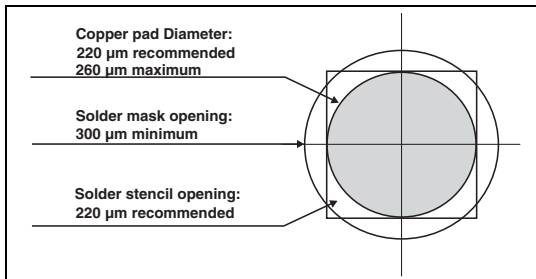


Figure 13. Marking

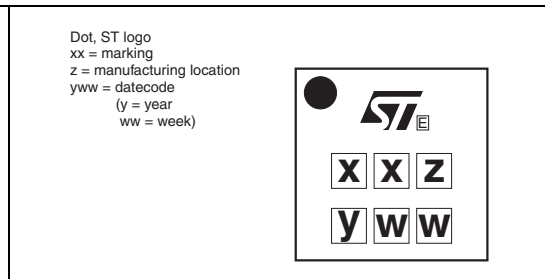
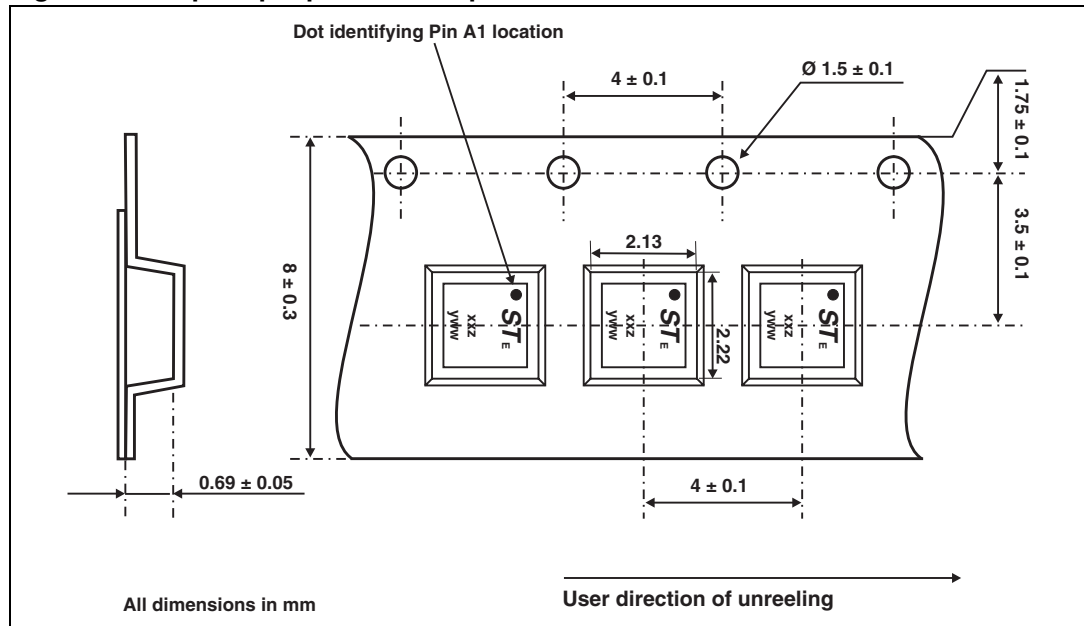


Figure 14. Flip Chip tape and reel specification



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"

## 4 Ordering information

Table 3. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
EMIF10-LCD03F3	HI	Flip Chip	5.3 mg	5000	Tape and reel 7"

## 5 Revision history

Table 4. Document revision history

Date	Revision	Changes
14-Apr-2008	1	Initial release

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