

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

### Features

- 6-line low-pass-filter
- High efficiency in EMI filtering
- Very low PCB space occupation: < 4.4 mm<sup>2</sup>
- Lead-free package
- Very thin package: 0.65 mm
- High efficiency in ESD suppression
- High reliability offered by monolithic integration
- High reducing of parasitic elements through integration and wafer level packaging

### Complies with the following standards

- IEC 61000-4-2 level 4 on external pins
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- MIL STD 883E - Method 3015-6 Class 3

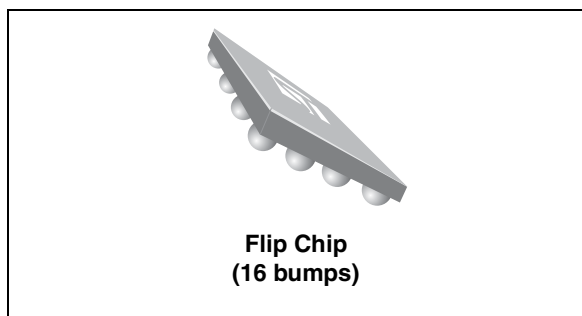
### Applications

- High speed MultiMediaCard

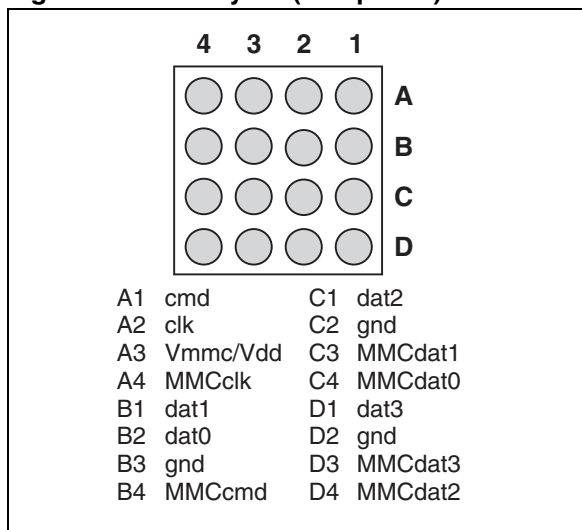
### Description

The EMIF06-HMC01F2 is a highly integrated array designed to suppress EMI / RFI noise for high speed MultiMediaCard port filtering. The EMIF06-HMC01F2 Flip Chip packaging means the package size is equal to the die size.

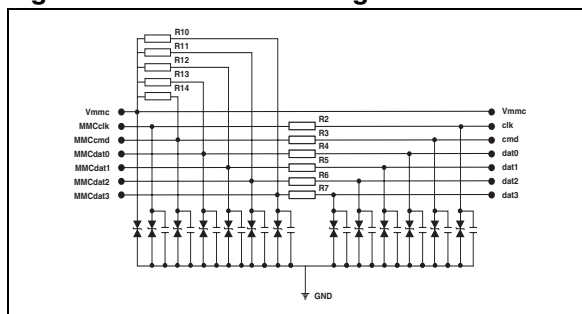
Additionally, this filter includes ESD protection circuitry which prevents damage to the application when subjected to ESD surges up to 15 kV.



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



**Figure 2. Basic cell configuration**



TM: IPAD is a trademark of STMicroelectronics.

# 1 Characteristics

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

| Symbol                                    | Parameter and test conditions                      | Value      | Unit |
|---|--|------------|------|
| $V_{PP}$                                  | <b>Internal pins (A4, B4, C3, C4, D3, D4):</b>     |            |      |
|   | ESD discharge IEC61000-4-2, air discharge          | 2          | kV   |
|   | ESD discharge IEC61000-4-2, contact discharge      | 2          |      |
|   | <b>External pins (A1, A2, A3, B1, B2, C1, D1):</b> |            |      |
| ESD discharge IEC61000-4-2, air discharge | 15   |            |      |
|   | ESD discharge IEC61000-4-2, contact discharge      | 8          |      |
| $T_j$                                     | Maximum junction temperature                       | 125        | °C   |
| $T_{op}$                                  | Operating temperature range                        | -40 to +85 | °C   |
| $T_{stg}$                                 | Storage temperature range                          | -55 to 150 | °C   |

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

| Symbol                           | Parameters                 |            |     |     |     |            |
|----------------------------------|----------------------------|------------|-----|-----|-----|------------|
| $V_{BR}$                         | Breakdown voltage          |            |     |     |     |            |
| $I_{RM}$                         | Leakage current @ $V_{RM}$ |            |     |     |     |            |
| $V_{RM}$                         | Stand-off voltage          |            |     |     |     |            |
| $C_{line}$                       | Input capacitance per line |            |     |     |     |            |
|                                  |                            |            |     |     |     |            |
| Symbol                           | Test conditions            | Tolernace  | Min | Typ | Max | Unit       |
| $V_{BR}$                         | $I_R = 1\text{ mA}$        |            | 14  |     |     | V          |
| $I_{RM}$                         | $V_{RM} = 3V$              |            |     |     | 0.1 | $\mu A$    |
| $C_{line}$                       | @ 0V                       |            |     |     | 20  | pF         |
| $R_2, R_3, R_4, R_5, R_6, R_7$   | $I = 50\text{ mA}$         | $\pm 20\%$ |     | 50  |     | $\Omega$   |
| $R_{10}, R_{11}, R_{12}, R_{13}$ | $I = 50\text{ }\mu A$      | $\pm 30\%$ |     | 75  |     | k $\Omega$ |
| $R_{14}$                         | $I = 200\text{ }\mu A$     | $\pm 30\%$ |     | 7   |     | k $\Omega$ |

Figure 3. S21 (dB) attenuation measurement

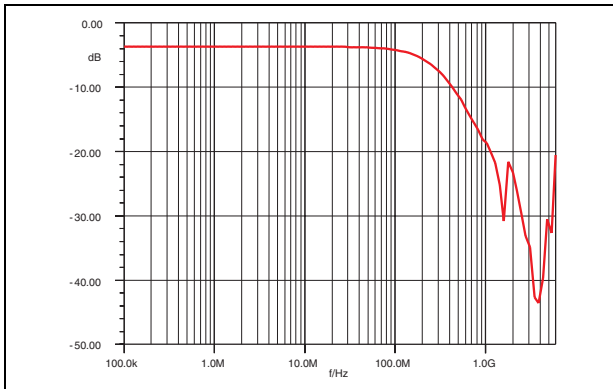


Figure 4. Analog crosstalk measurement

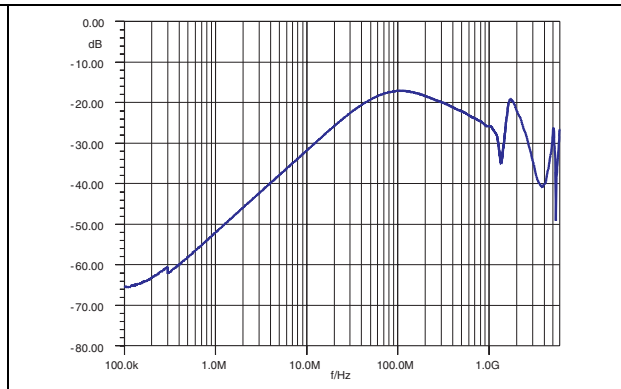


Figure 5. ESD response to IEC 61000-4-2 (+15kV air discharge) on one input (V<sub>in</sub>) and on one output (V<sub>out</sub>)

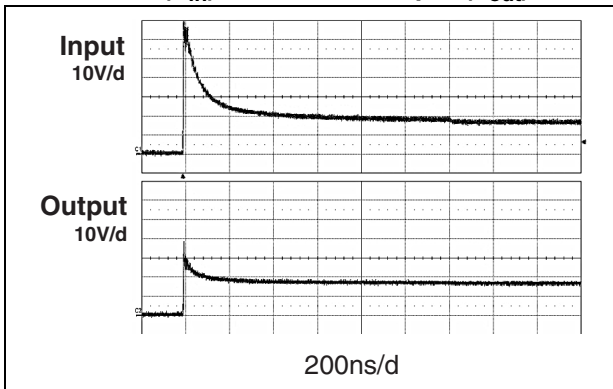


Figure 6. ESD response to IEC 61000-4-2 (-15kV air discharge) on one input (V<sub>in</sub>) and on one output (V<sub>out</sub>)

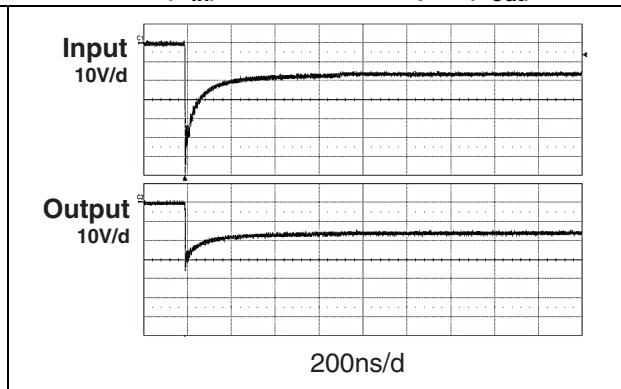
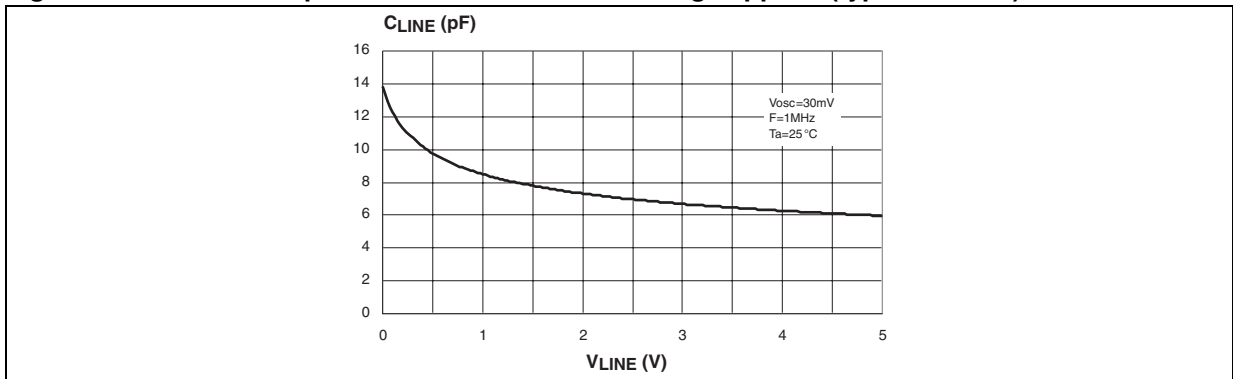


Figure 7. Junction capacitance versus reverse voltage applied (typical values)



## 2 Application information

Figure 8. Aplac model device structure

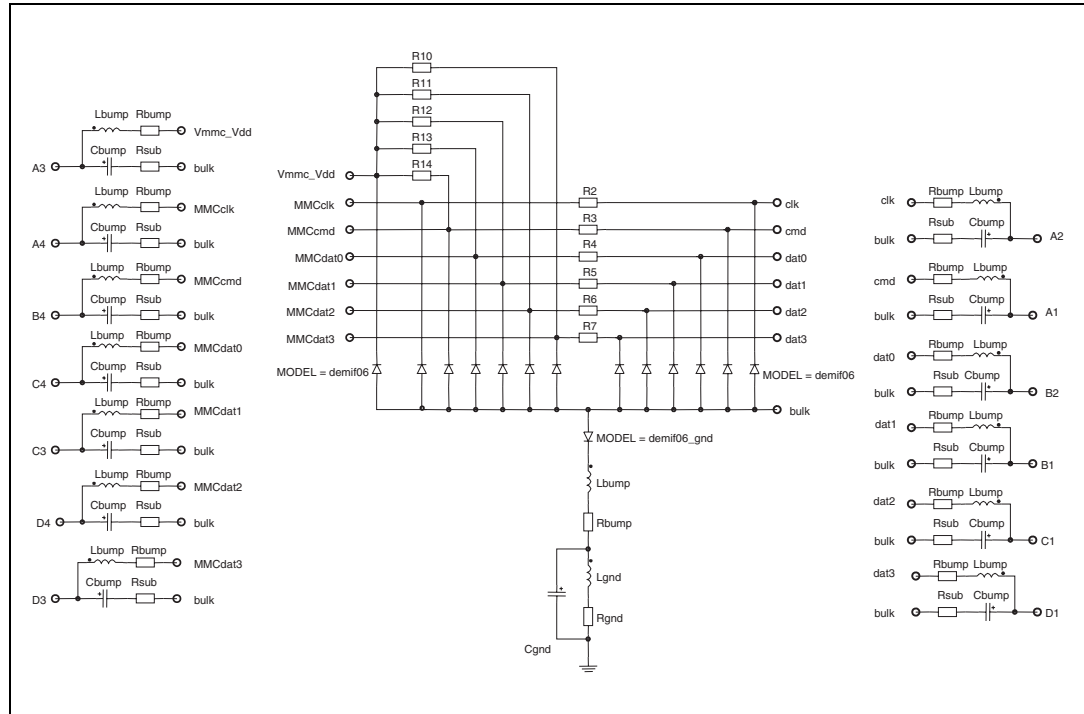
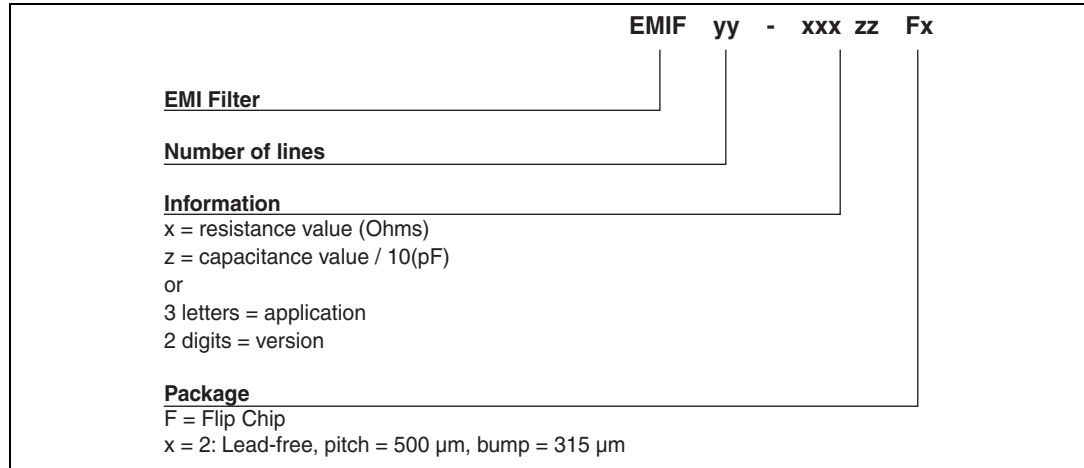


Figure 9. Aplac parameters

| Variables | Variables    | demif06_gnd | demif06 |
|-----------|--------------|-------------|---------|
| R2 50     | Cz 11pF      | BV=14       | BV=14   |
| R3 50     | Cz_gnd 45pF  | IBV=1m      | IBV=1m  |
| R4 50     | RS_gnd 480m  | CJO=Cz_gnd  | CJO=Cz  |
| R5 50     | Ls 950pH     | M=0.31      | M=0.31  |
| R6 50     | Rs 150m      | RS=RS_gnd   | RS=1    |
| R7 50     | Rbump 100m   | VJ=0.6      | VJ=0.6  |
| R10 75k   | Lbump 50pH   | TT=100n     | TT=100n |
| R11 75k   | Cbump 0.15pF |             |         |
| R12 75k   | Lgnd 50pH    |             |         |
| R13 75k   | Rgnd 100m    |             |         |
| R14 7k    | Cgnd 0.15pF  |             |         |
| Rsub 100m |              |             |         |

### 3 Ordering information scheme

Figure 10. Ordering information scheme



### 4 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

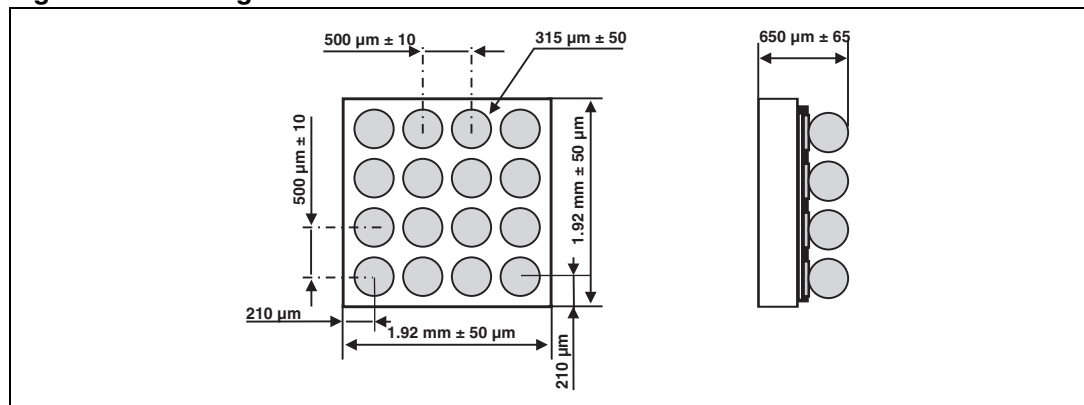


Figure 12. Footprint

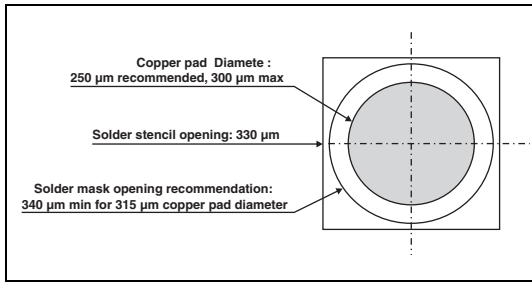


Figure 13. Marking

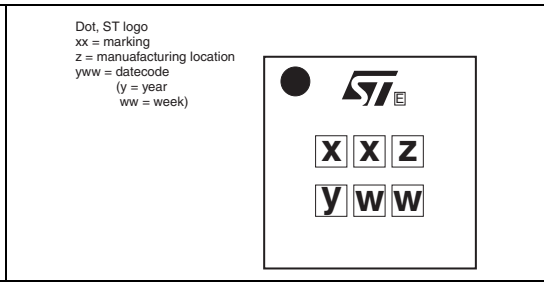
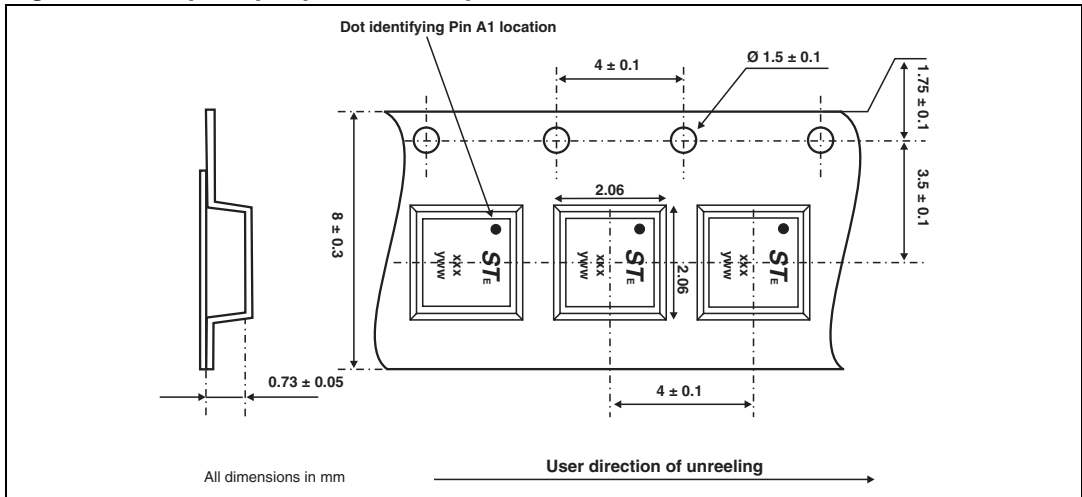


Figure 14. Flip Chip tape and reel specification



Note: More information is available in the application notes:  
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    |
|----------------|---------|-----------|--------|----------|------------------|
| EMIF06-HMC01F2 | GH      | Flip Chip | 5.3 mg | 5000     | Tape and reel 7" |

## 6 Revision history

Table 4. Document revision history

| Date        | Revision | Changes  |
|-------------|----------|--|
| 25-Jan-2005 | 1        | Initial release.   |
| 28-Apr-2008 | 2        | Updated ECOPACK statement. Updated <a href="#">Figure 10</a> , <a href="#">Figure 11</a> , <a href="#">Figure 12</a> , <a href="#">Figure 13</a> and <a href="#">Figure 14</a> . Reformatted to current standards. |

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