

# EMIF06-USD04F3

Datasheet - production data

## 6-line low capacitance IPAD<sup>™</sup> for micro-SD card with EMI filtering and ESD protection



### Features

- EMI low-pass filter
- ESD protection ±8 kV (IEC 61000-4-2)
- Integrated pull up resistors to prevent bus floating when no card is connected
- 208 MHz clock frequency compatible with SDR104 mode (SD3.0)
- Lead-free package

### **Benefits**

- Low power consumption
- Easy layout thanks to smart pin-out configuration
- Very low PCB space consumption
- High reliability offered by monolithic integration
- Reduction of parasitic elements thanks to CSP integration

### Complies with the following standards:

- IEC 61000-4-2 level 4:
  - ±15 kV (air discharge)
  - ±8 kV (contact discharge)

### Description

The EMIF06-USD04F3 is a highly integrated device based on IPAD technology offering two functions: ESD protection to comply with IEC standard, and EMI filtering to reject mobile phone frequencies.

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



### TM: IPAD is a trademark of STMicroelectronics

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This is information on a product in full production.

# 1 Characteristics

| Symbol           | Parameter   | Value             | Unit |
|------------------|---|-------------------|------|
| Vpp              | ESD discharge IEC 61000-4-2, level 4<br>(on pins Vcc, SDclk, SDcmd, SDdat0, SDdat1, SDdat2, SDdat3<br>Air discharge, external pins<br>Contact discharge, external pins<br>ESD discharge IEC 61000-4-2, level 1<br>(on pins dat0, dat1, clk, cmd,dat3, dat2)<br>Air discharge, internal pins<br>Contact discharge, internal pins | 15<br>8<br>2<br>2 | kV   |
| Тj               | Maximum junction temperature  | 125               | °C   |
| T <sub>op</sub>  | Operating temperature range   | - 30 to + 85      | °C   |
| T <sub>stg</sub> | Storage temperature range   | - 55 to + 150     | °C   |

| Table 1. | Absolute | maximum | ratings | $(T_{amb} = 2)$ | 5 °C) |
|----------|----------|---------|---------|-----------------|-------|
|----------|----------|---------|---------|-----------------|-------|

Figure 2. EMIF06-USD04F3 Schematic



### Table 2. Pin configuration

| Pin | Signal          | Pin | Signal |
|-----|-----------------|-----|--------|
| A1  | dat0            | C1  | Cmd    |
| A2  | dat1            |     |        |
| A3  | SDdat1          | C3  | GND    |
| A4  | SDdat0          | C4  | SDcmd  |
| B1  | clk             | D1  | dat3   |
| B2  | V <sub>cc</sub> | D2  | dat2   |
| B3  | GND             | D3  | SDdat2 |
| B4  | SDclk           | D4  | SDdat3 |

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| Symbol                    | Parameter                   | Test conditions                                 | Min. | Тур. | Max. | Unit |
|---------------------------|-----------------------------|---|------|------|------|------|
| V <sub>BR</sub>           | Breakdown voltage           | I <sub>R</sub> = 1 mA                           | 14   |      | 20   | V    |
| I <sub>RM</sub>           | Leakage current at $V_{RM}$ | $V_{RM} = 3 V$                                  |      |      | 100  | nA   |
| R1, R2, R3,<br>R4, R5, R6 | Serial resistance           | Tolerance ±10%, matching ±2%                    |      | 40   |      | Ω    |
| R9, R10, R11,<br>R12      | Pull-up resistance          | Tolerance ±10%, matching ±2%                    |      | 50   |      | kΩ   |
| R13                       | Pull-up resistance on cmd   | Tolerance ±10%                                  |      | 15   |      | kΩ   |
|                           |                             | $V = 0 V, F = 10 MHz, V_{OSC} = 30 mV$          |      | 10   | 12   |      |
| C <sub>line</sub>         | Data line capacitance       | V = 1.8 V, F = 10 MHz, V <sub>OSC</sub> = 30 mV |      | 7.5  | 10   | pF   |
|                           |                             | V = 2.9 V, F = 10 MHz, V <sub>OSC</sub> = 30 mV |      |      | 9    |      |

Table 3. Electrical characteristics (values, T<sub>amb</sub> = 25 °C)

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







Figure 5. Analog crosstalk versus frequency





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Figure 8. Line capacitance versus frequency and bias voltage (typical values)





### 2 Package information

- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: *www.st.com.* ECOPACK<sup>®</sup> is an ST trademark.





Copper pad Diameter: 220 µm recommended 260 µm maximum Solder mask opening: 300 µm minimum Solder stencil opening: 220 µm recommended Solder stencil

Figure 11. Marking

Figure 10. Footprint





Figure 12. Tape and reel specification



## **3** Ordering information

|                     | [    |   |  |
|---------------------|------|---|--|
| EMI filter          |      |   |  |
|                     |      |   |  |
| Number of lines     | <br> | J |  |
| Application         |      |   |  |
| USD = Micro SD card |      |   |  |
| Version             |      |   |  |
| 04 = Design version |      |   |  |
| Package             |      |   |  |

Figure 13. Ordering information scheme

#### Table 4. Ordering information

| Order code     | Marking | Package   | Weight | Base qty | Delivery mode    |
|----------------|---------|-----------|--------|----------|------------------|
| EMIF06-USD04F3 | JZ      | Flip Chip | 2.6 mg | 5000     | Tape and reel 7" |

Note:More information is available in the STmicroelectronics Application notes:AN2348: "Flip Chip: Package description and recommendations for use"AN1751: "EMI Filters: Recommendations and measurements"AN4541: "EMI Filters for SD3.0 card: High speed SD card protection and filtering devices"

## 4 Revision history

| Date        | Revision | Changes  |  |  |  |
|-------------|----------|--|--|--|--|
| 09-May-2012 | 1        | First issue.   |  |  |  |
| 27-Jun-2012 | 2        | Added tolerances in <i>Figure 12</i> .                             |  |  |  |
| 30-Jun-2014 | 3        | Updated Figure 4, Figure 5 and breakdown voltage value in Table 3. |  |  |  |
| 06-Jan-2015 | 4        | Added mention for new AN4541.                                      |  |  |  |

Table 5. Document revision history



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