

9-line IPAD™, EMI filter and ESD protection

Features

- 9-line EMI low-pass filter and ESD protection
- High efficiency in EMI filtering
- Lead-free package
- 400 µm pitch
- Very low PCB space occupation: < 4 mm²
- Very thin package: 0.6 mm
- High reliability offered by monolithic integration
- Reduction of parasitic elements thanks to CSP integration

Complies with the following standards

- IEC61000-4-2 level 4 on external pins:
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- IEC61000-4-2 level 2 on internal pins:
 - 2 kV (air discharge)
 - 2 kV (contact discharge)
- MIL STD 883F - Method 3015.7 Class 3

Application

- Secure digital memory card in mobile phones and communication systems

Description

The EMIF09-SD01F3 is a highly integrated array designed to suppress EMI/RFI noise for secure digital memory cards. The EMIF09-SD01F3 is in a Flip Chip package to offer space saving and high RF performance.

This low-pass filter includes ESD protection circuitry, which prevents damage to the protected device when subjected to ESD surges up to 15 kV. This filter also has a low line capacitance to be compatible with high data rate signals.

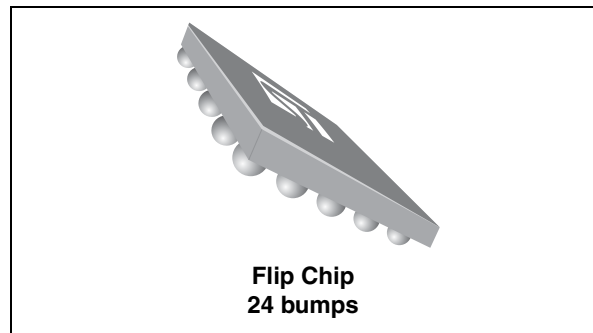
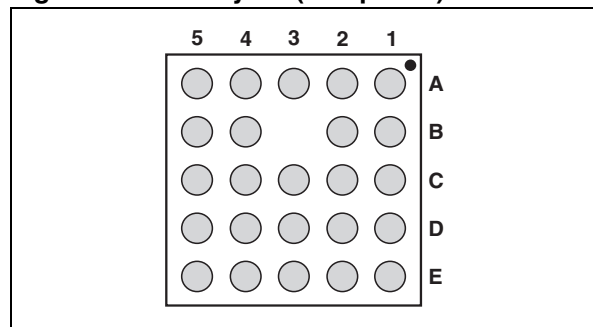


Figure 1. Pin layout (bump side)



TM: IPAD is a trademark of STMicroelectronics.

1 Characteristics

Figure 2. Device configuration

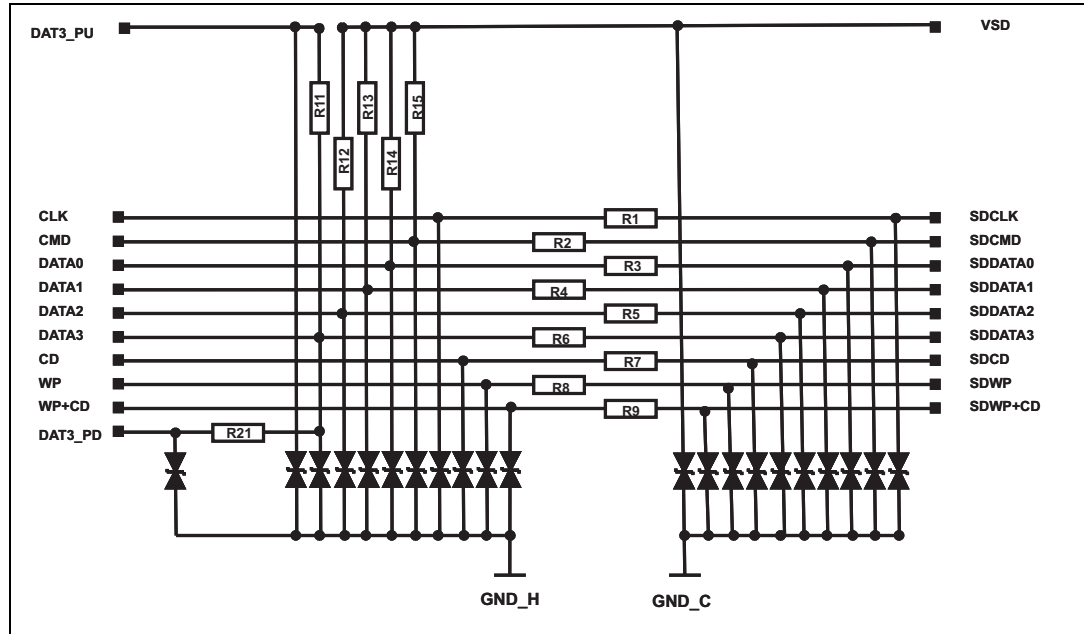


Table 1. Pin-signal attribution

| Pin | Description | Pin | Description | Pin | Description | Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|-----|-------------|-----|-------------|-----|-------------|
| A1 | DATA2 | B1 | CD | C1 | DAT3_PD | D1 | WP+CD | E1 | DATA1 |
| A2 | DATA3 | B2 | CMD | C2 | WP | D2 | CLK | E2 | DATA0 |
| A3 | GND_H | B3 | | C3 | DAT3_PU | D3 | GND_C | E3 | GND_C |
| A4 | SDDATA2 | B4 | SDCD | C4 | SDWP | D4 | SDWP+CD | E4 | SDDATA1 |
| A5 | SDDATA3 | B5 | SDCMD | C5 | VSD | D5 | SDCLK | E5 | SDDATA0 |

Table 2. Absolute ratings (limiting values)

| Symbol | Parameter | Value | Unit |
|--|---|-------------|------|
| V_{PP} | Internal pins (A1, B1, C1, D1, E1, A2, B2, C2, D2, E2, C3) | | |
| | ESD discharge IEC 61000-4-2, air discharge | 2 | kV |
| | ESD discharge IEC 61000-4-2, contact discharge | 2 | |
| | External pins (A4, B4, C4, D4, E4, A5, B5, C5, D5, E5) | | |
| ESD discharge IEC 61000-4-2, air discharge | 15 | | |
| | ESD discharge IEC 61000-4-2, contact discharge | 8 | |
| T_j | Junction temperature | 125 | °C |
| T_{op} | Operating temperature range | -30 to + 85 | °C |
| T_{stg} | Storage temperature range | -55 to 150 | °C |

GND bumps (GND_H and GND_C - A3, D3 and E3) must be connected to ground on the printed circuit board for ESD testing and RF measurements.

Table 3. 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 and output | | | | |
| C_{line} | Input capacitance per line | | | | |
| Symbol | Test conditions | | | | |
| V_{BR} | $I_R = 1\text{ mA}$ | 6 | | 20 | V |
| I_{RM} | $V_{RM} = 5\text{ V per line}$ | | 50 | 200 | nA |
| R1, R2, R3, R4, R5, R6, R7, R8, R9 | Tolerance $\pm 20\%$ | | 40 | | Ω |
| R11, R12, R13, R14 | Tolerance $\pm 30\%$ | | 50 | | k Ω |
| R15 | Tolerance $\pm 30\%$ | | 15 | | k Ω |
| R21 | Tolerance $\pm 30\%$ | | 470 | | k Ω |
| C_{line} | $V_{line} = 0\text{ V}$, $V_{OSC} = 30\text{ mV}$, $F = 1\text{ MHz}$ (under zero light conditions) | | | 20 | pF |

Figure 3. S21(dB) all lines attenuation measurement

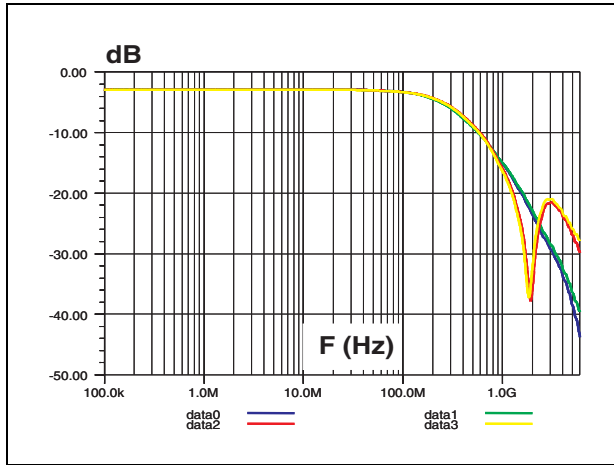


Figure 4. Analog cross talk measurement

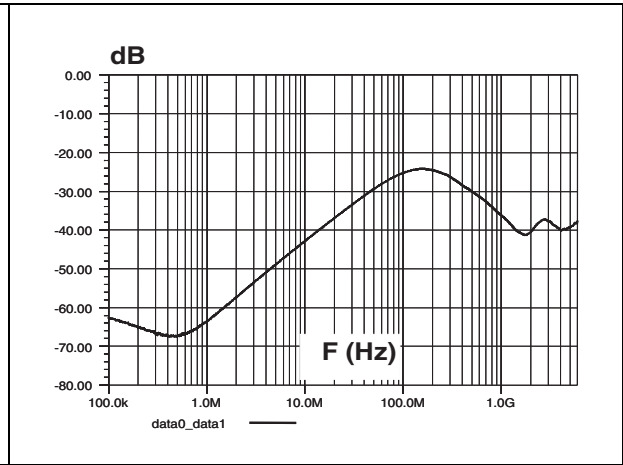


Figure 5. Digital crosstalk measurement

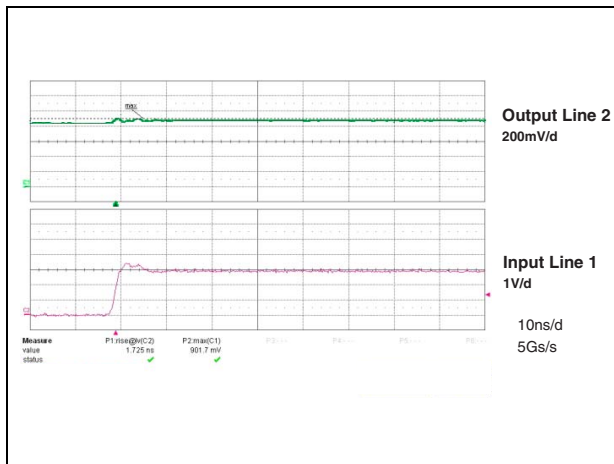


Figure 6. ESD response to IEC 61000-4-2 (+15 kV air discharge) on one input (V_{IN}) and on one output (V_{OUT})

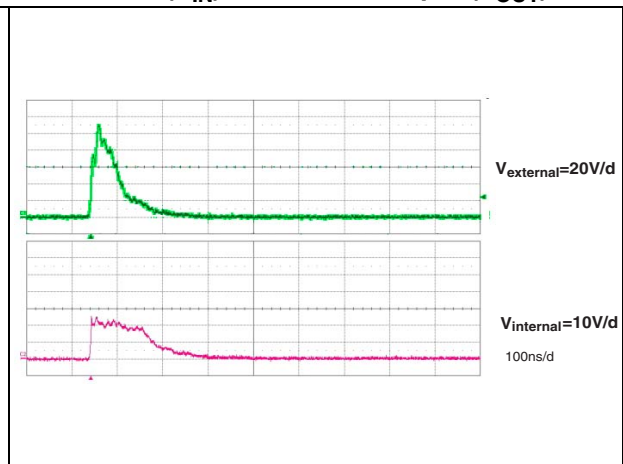


Figure 7. ESD response to IEC 61000-4-2 (-15 kV air discharge) on one input (V_{IN}) and on one output (V_{OUT})

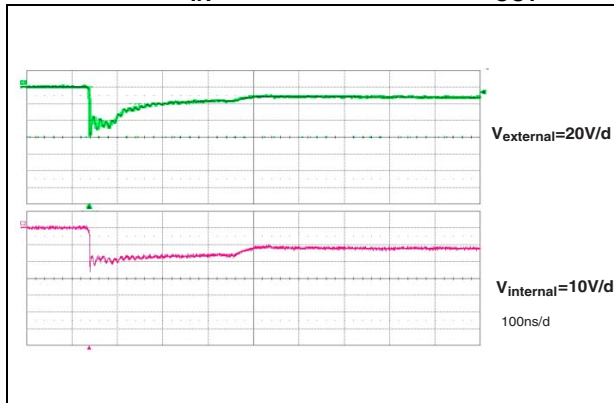
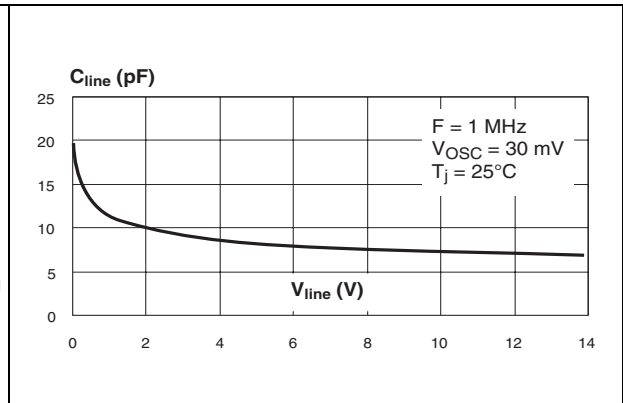


Figure 8. Line capacitance versus applied voltage



2 Application information

Figure 9. Aplac model

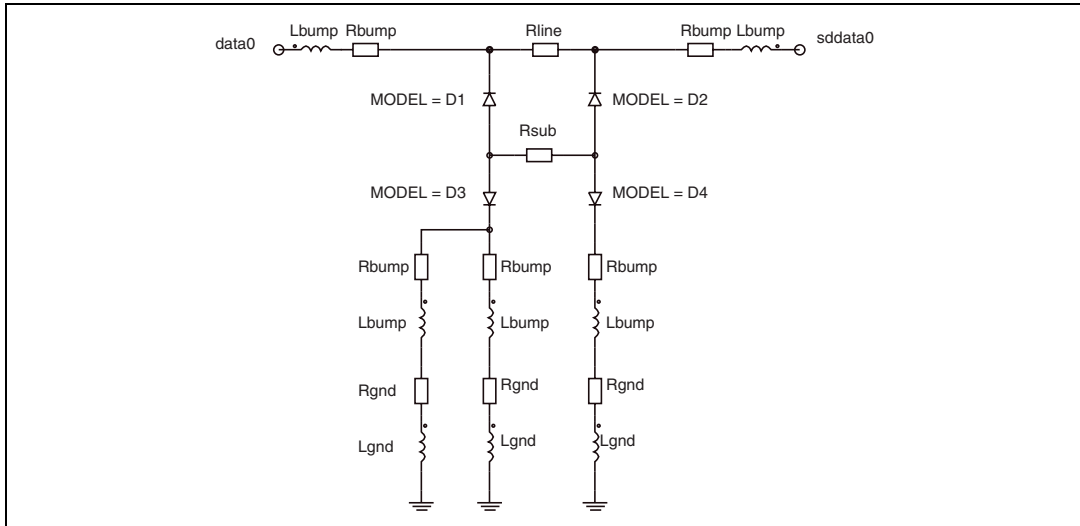
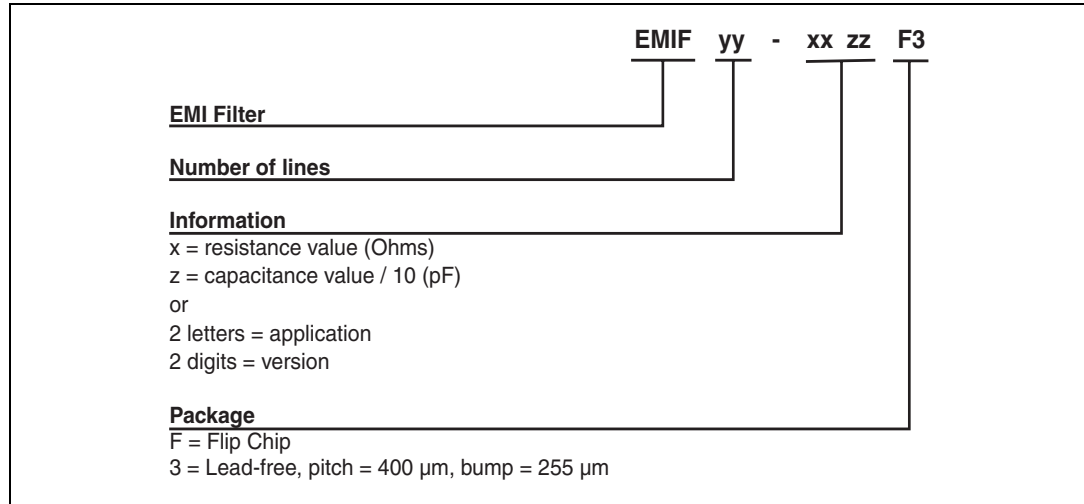


Figure 10. Aplac model variables

| <u>Variables</u> | <u>Diode D1</u> | <u>Diode D2</u> | <u>Diode D3</u> | <u>Diode D4</u> |
|----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <code>aplacvar Rline 40</code> | <code>BV=7</code> | <code>BV=7</code> | <code>BV=7</code> | <code>BV=7</code> |
| <code>aplacvar C_d1 14.5p</code> | <code>IBV=1m</code> | <code>IBV=1m</code> | <code>IBV=1m</code> | <code>IBV=1m</code> |
| <code>aplacvar C_d2 6.5p</code> | <code>CJO=C_d1</code> | <code>CJO=C_d2</code> | <code>CJO=C_d3</code> | <code>CJO=C_d4</code> |
| <code>aplacvar C_d3 303p</code> | <code>M=0.28</code> | <code>M=0.28</code> | <code>M=0.28</code> | <code>M=0.28</code> |
| <code>aplacvar C_d4 14.5p</code> | <code>RS=1.13</code> | <code>RS=0.8</code> | <code>RS=0.37</code> | <code>RS=1.13</code> |
| <code>aplacvar Lbump 43pH</code> | <code>VJ=0.6</code> | <code>VJ=0.6</code> | <code>VJ=0.6</code> | <code>VJ=0.6</code> |
| <code>aplacvar Rbump 17m</code> | <code>TT=100n</code> | <code>TT=100n</code> | <code>TT=100n</code> | <code>TT=100n</code> |
| <code>aplacvar Cbump 150f</code> | | | | |
| <code>aplacvar Lgnd 150pH</code> | | | | |
| <code>aplacvar Rgnd 10m</code> | | | | |
| <code>aplacvar Rsub 5</code> | | | | |

3 Ordering information scheme

Figure 11. 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.

Figure 12. Package dimensions

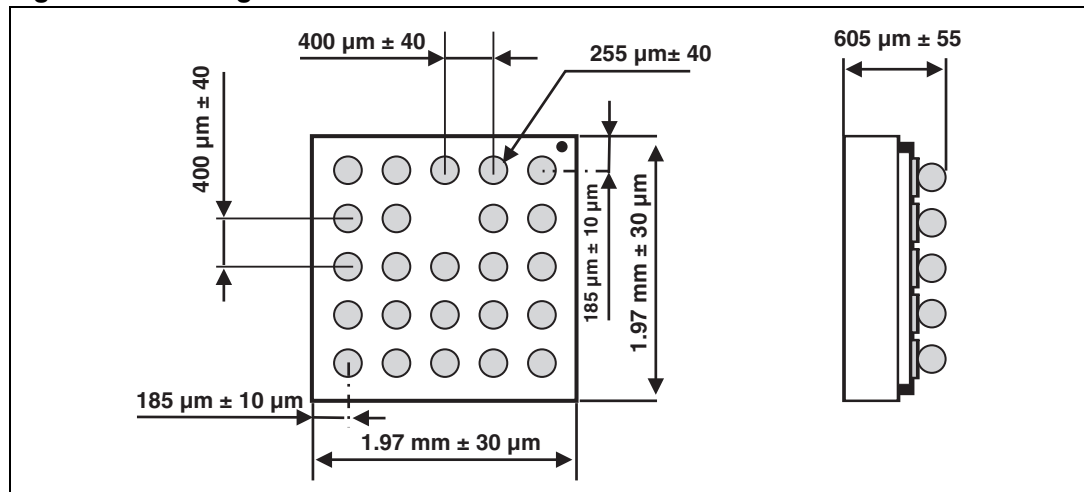


Figure 13. Footprint

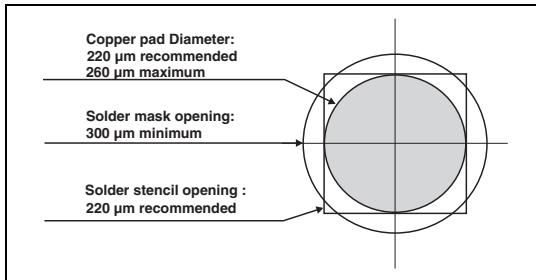


Figure 14. Marking

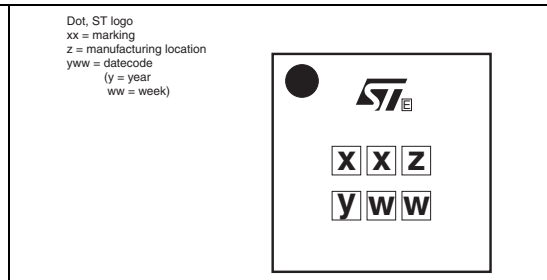
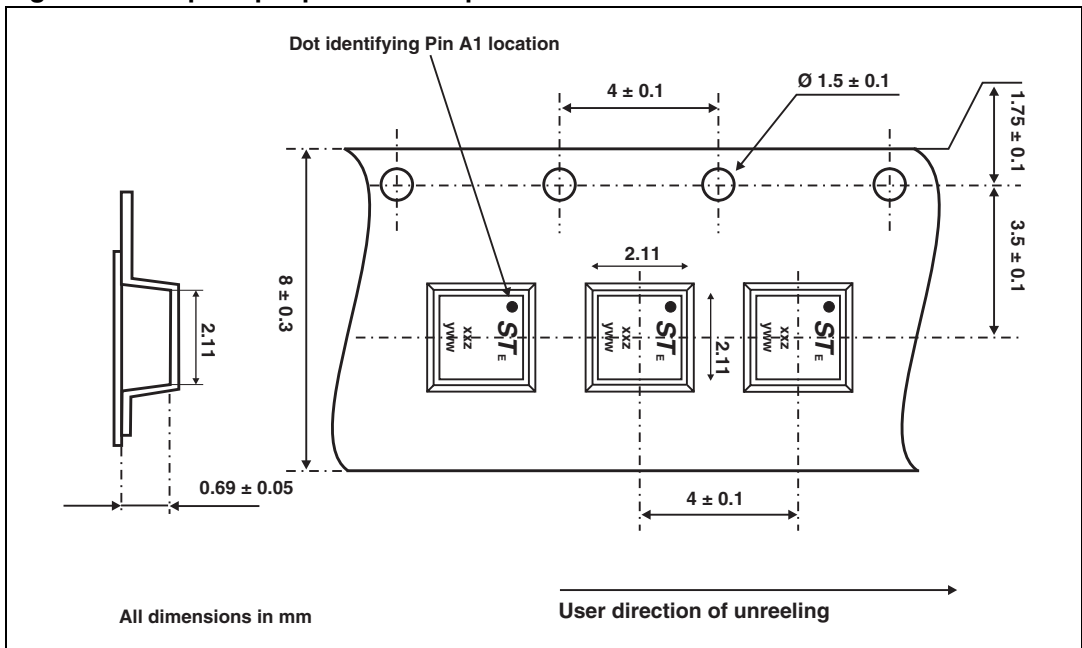


Figure 15. Flip Chip tape and reel specifications



Note:

More information is available in the application note:

AN2348: “STMicroelectronics 400 micro-metre Flip Chip: Package description and recommendation for use”

AN1751: EMI Filters: Recommendations and measurements

5 Ordering information

Table 4. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|---------|-----------|--------|----------|--------------------|
| EMIF09-SD01F3 | GZ | Flip Chip | 5.2 mg | 5000 | Tape and reel (7") |

6 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 19-Oct-2005 | 1 | Initial release. |
| 09-Feb-2006 | 2 | Tape cavity dimensions added in Figure 13. Other graphics improved. |
| 22-Mar-2006 | 3 | Reformatted to current standard. Typical and maximum values updated for I_{RM} in Electrical characteristics, page 3. |
| 28-Apr-2008 | 4 | Updated ECOPACK statement. Updated Figure 11 , Figure 12 and Figure 15 . Reformatted to current standards. |

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