



EMIF02-USB02F2

2-line IPAD™, EMI filter with ESD protection

Features

- 2-line low-pass filter + ESD protection
- High efficiency in EMI filtering
- Lead-free package
- Very low PCB space occupation < 3.2 mm²
- Very thin package: 0.65 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
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- MIL STD 883E - Method 3015-6 Class 3

Application

EMI filtering and ESD protection for USB port.

Description

The EMIF02-USB02F2 is a highly integrated array designed to suppress EMI / RFI noise for a USB port. The EMIF02-USB02F2 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.

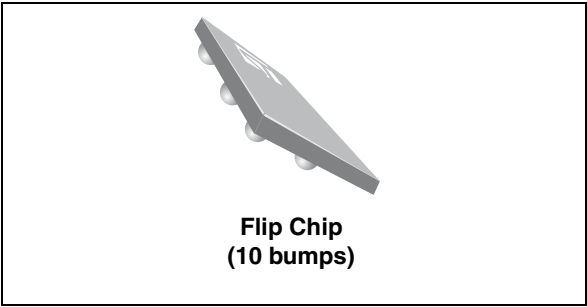


Figure 1. Pin layout (bump side)

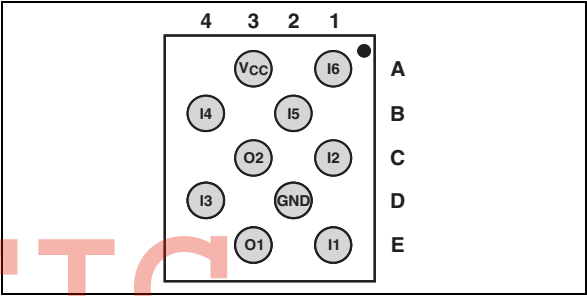
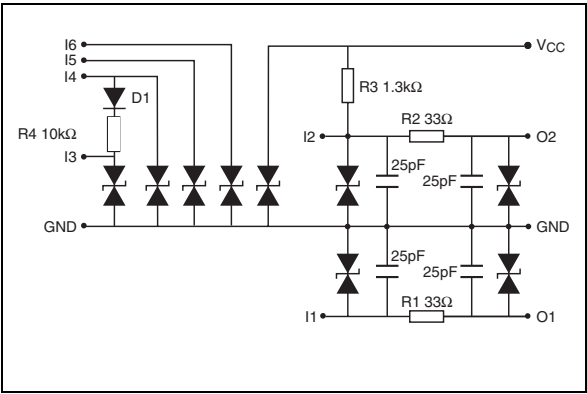


Figure 2. Basic cell configuration



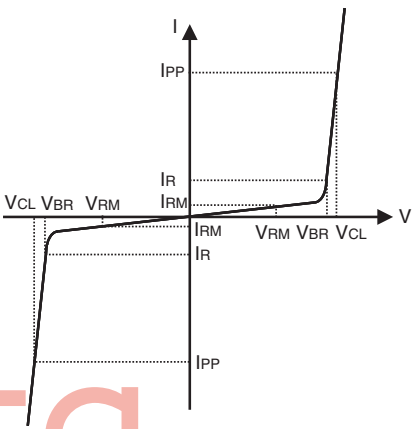
1 Characteristics

Table 1. Absolute ratings (T_{amb} = 25 °C)

| Symbol | Parameter and test conditions | Value | Unit |
|------------------|--|---------------|------|
| V _{PP} | ESD discharge IEC 61000-4-2, air discharge | 15 | kV |
| | ESD discharge IEC 61000-4-2, contact discharge | 8 | |
| T _j | 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 °C)

| Symbol | Parameter |
|-------------------|--|
| 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 | Min. | Typ. | Max. | Unit |
|--------------------------------|-----------------------|------|------|------|------|
| V _{BR} | I _R = 1 mA | 6 | | | V |
| I _{RM} | V _{RM} = 3V | | 0.1 | 0.5 | μA |
| C _{line} | @ 0V | | | 50 | pF |
| R ₁ ,R ₂ | Tolerance ± 5% | | 33 | | Ω |
| R ₃ | Tolerance ± 5% | | 1.3 | | kΩ |
| R ₄ | Tolerance ± 5% | | 10 | | kΩ |
| V _F | @ 1 mA (D1 diode) | | 1 | | V |

Figure 3. Attenuation measurement

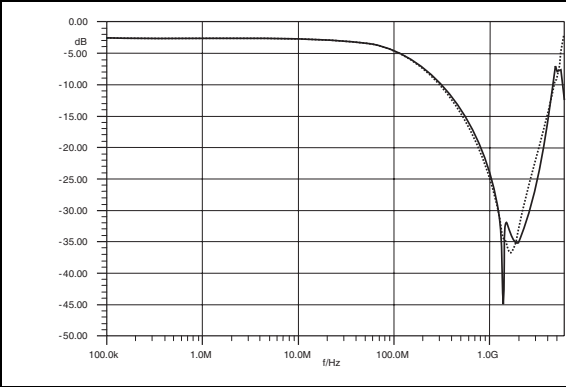


Figure 4. Analog crosstalk measurement (I1- O2)

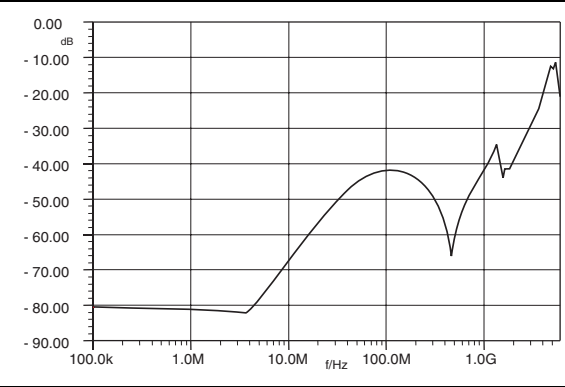


Figure 5. ESD response to IEC 61000-4-2 (+15kV contact discharge)

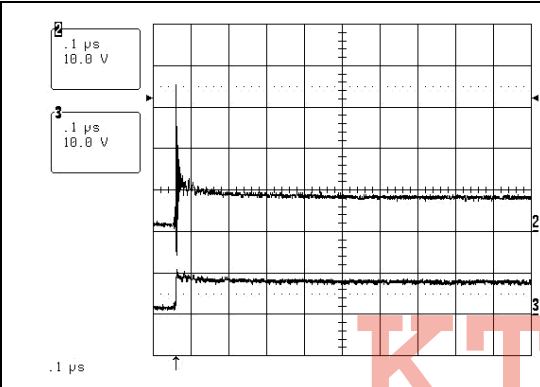
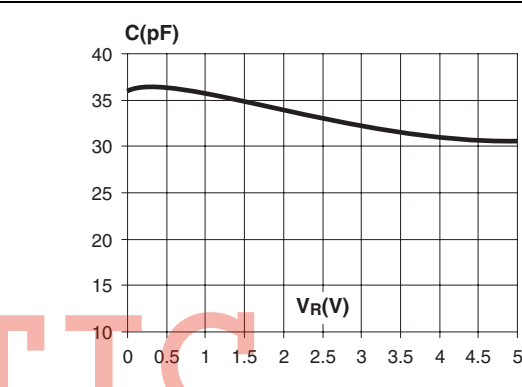


Figure 6. Line capacitance versus reverse applied voltage



2 Application information

Figure 7. Aplac model of D+ & D- cells

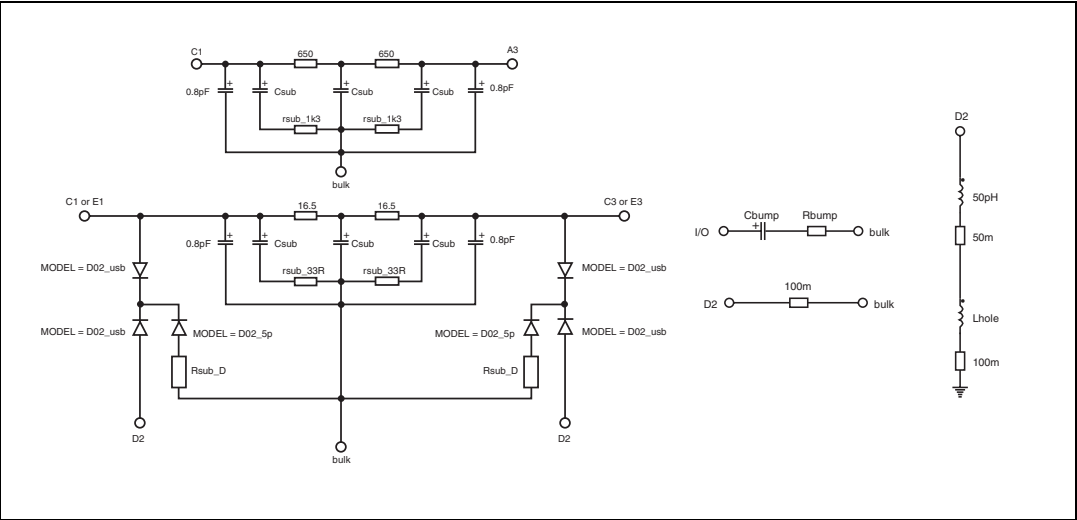
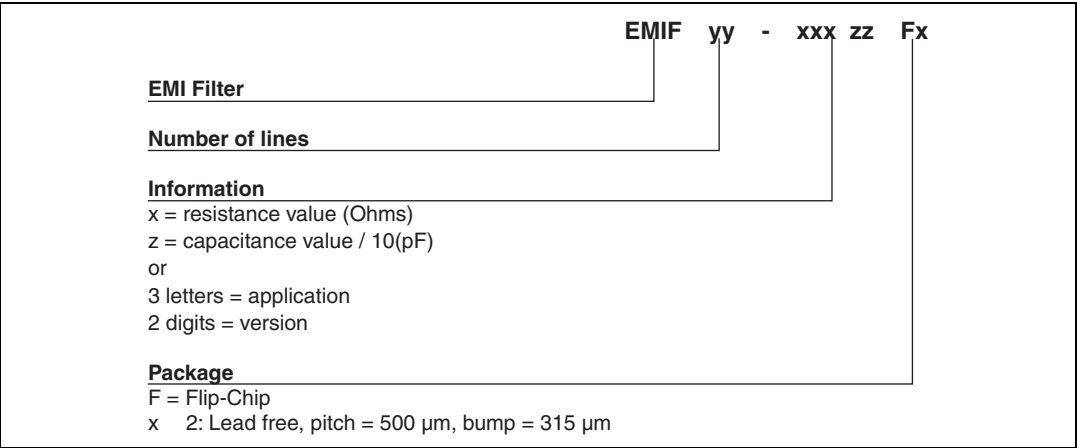


Figure 8. Aplac model parameters

| | | |
|-----------------|----------------------|---------------------|
| Cz 17pF opt | D02_usb diodes model | D02_5p diodes model |
| Ls 0.4nH | + BV = 7 | + BV = 100 |
| Rs 0.1 | + IBV = 1m | + IBV = 1m |
| Rsub_D 10 | + CJO = Cz | + CJO = 5p |
| Csub 0.3pF | + M = 0.3333 | + M = 0.3333 |
| Rsub_33R 16 | + RS = 2 | + RS = 2 |
| Rsub_1k3 18 | + VJ = 0.6 | + VJ = 0.6 |
| lhole 170pH opt | + TT = 100n | + TT = 100n |
| Cbump 1.2pF opt | | |
| Rbump 350 | | |

3 Ordering information scheme

Figure 9. 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 10. Flip Chip package dimensions

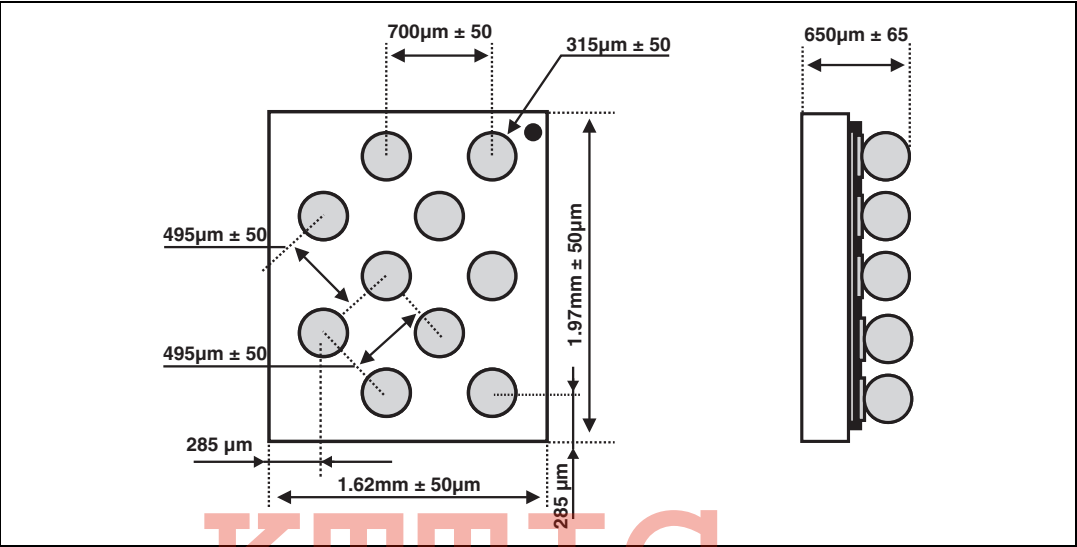
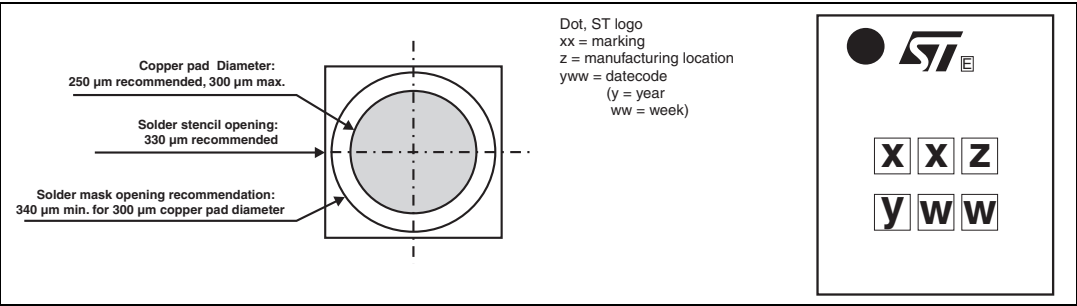


Figure 11. Footprint recommendations Figure 12. Marking



[illegible]

AN1751: "EMI Filters: Recommendations and measurements"

Table 3. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|----------------|---------|-----------|---------|----------|------------------|
| EMIF02-USB02F2 | FG | Flip Chip | 4.25 mg | 5000 | Tape and reel 7" |

Table 4. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 14-Dec-2004 | 1 | First issue |
| 28-Apr-2008 | 2 | Updated ECOPACK statement. Updated Figure 9 , Figure 10 , Figure 12 , and Figure 13 . Reformatted to current standards. |

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