



# EMIF10-LCD01C2

## 10 LINE EMI FILTER AND ESD PROTECTION

IPAD™

### MAIN PRODUCT CHARACTERISTICS:

Where EMI filtering in ESD sensitive equipment is required :

- LCD for Mobile phones
- Computers and printers
- Communication systems
- MCU Boards

### DESCRIPTION

The EMIF10-LCD01C2 is a 10 line highly integrated devices designed to suppress EMI/RFI noise in all systems subjected to electromagnetic interferences. The EMIF10 flip chip packaging means the package size is equal to the die size.

This filter includes an ESD protection circuitry, which prevents the device from destruction when subjected to ESD surges up 15kV.

### BENEFITS

- EMI symmetrical (I/O) low-pass filter
- High efficiency in EMI filtering
- Very low PCB space consuming: < 7mm<sup>2</sup>
- Coating resin on back side
- Very thin package: 0.69 mm
- High efficiency in ESD suppression on input pins (IEC61000-4-2 level 4)
- High reliability offered by monolithic integration
- High reducing of parasitic elements through integration and wafer level packaging.
- Lead free package

### COMPLIES WITH THE FOLLOWING STANDARDS:

#### IEC61000-4-2:

- Level 4 input pins 15kV (air discharge)  
8kV (contact discharge)
- Level 1 output pins 2kV (air discharge)  
2kV (contact discharge)

#### MIL STD 833E - Method 3015-6 Class 3

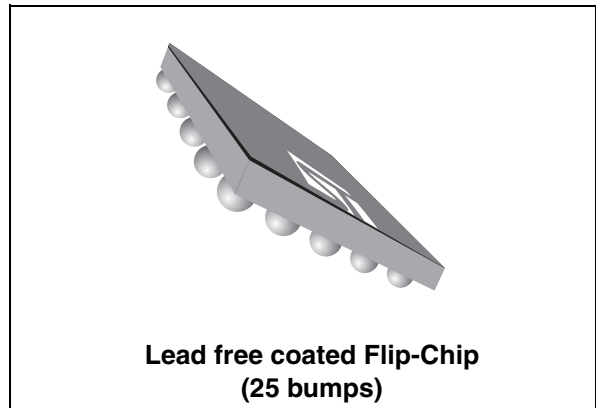


Figure 1: Pin Configuration (bump side)

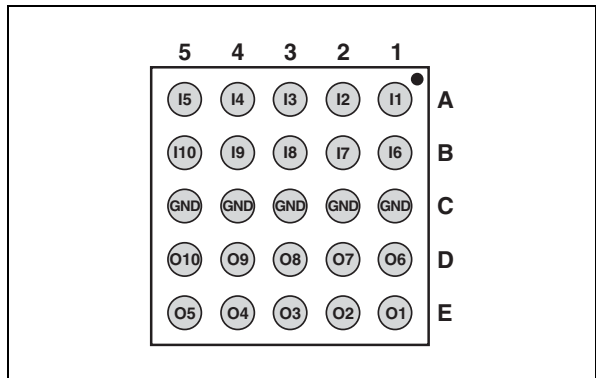


Figure 2: Basic Cell Configuration

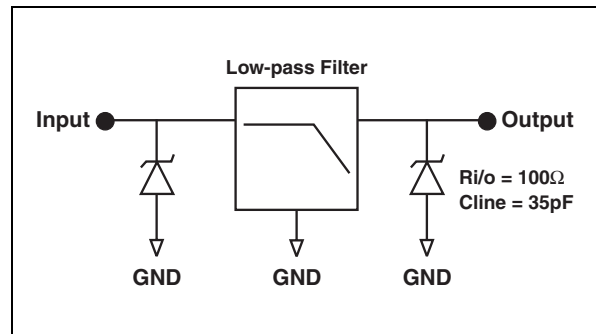


Table 1: Order Code

| Part Number    | Marking |
|----------------|---------|
| EMIF10-LCD01C2 | FL      |

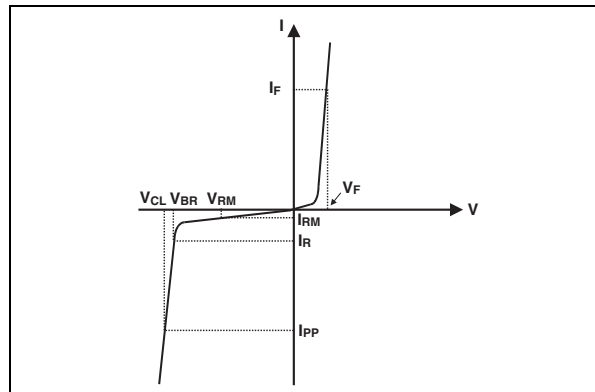
## EMIF10-LCD01C2

**Table 2: Absolute Maximum Ratings** ( $T_{amb} = 25^{\circ}\text{C}$ )

| Symbol    | Parameter                   | Value       | Unit               |
|-----------|-----------------------------|-------------|--------------------|
| $T_j$     | 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 3: Electrical Characteristics** ( $T_{amb} = 25^{\circ}\text{C}$ )

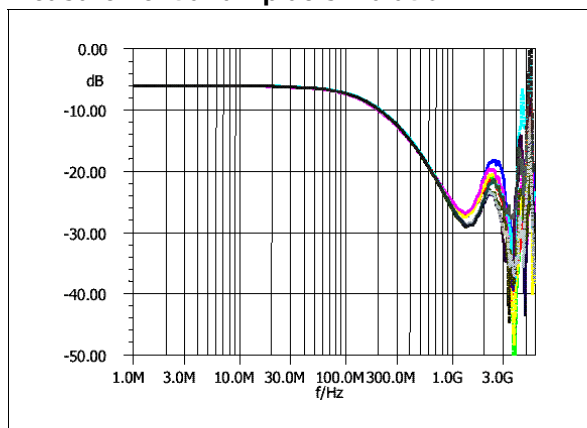
| Symbol    | Parameter                                |
|-----------|--|
| $V_{BR}$  | Breakdown voltage                        |
| $I_{RM}$  | Leakage current @ $V_{RM}$               |
| $V_{RM}$  | Stand-off voltage                        |
| $V_{CL}$  | Clamping voltage                         |
| $R_d$     | Dynamic resistance                       |
| $I_{PP}$  | Peak pulse current                       |
| $R_{I/O}$ | Series resistance between Input & Output |
| Cline     | Input capacitance per line               |



| Symbol    | Test conditions  | Min. | Typ.  | Max. | Unit     |
|-----------|--|------|-------|------|----------|
| $V_{BR}$  | $I_R = 1 \text{ mA}$   | 6    | 8     | 10   | V        |
| $I_{RM}$  | $V_{RM} = 3\text{V}$   |      |       | 500  | nA       |
| $R_{I/O}$ |  | 90   | 100   | 110  | $\Omega$ |
| Cline     | @ 0V bias  |      | 28    | 35   | pF       |
| Rt / Ft   | Induced rise and fall time 10-90% at 26 MHz frequency signal $V = 1.9 \text{ V}$ (Rt / Ft input 1 ns, 50 $\Omega$ impedance generator) |      | 8 (1) |      | ns       |

(1) guaranteed by design

**Figure 3: S21(dB) all lines attenuation measurement and Apalc simulation**



**Figure 4: Analog cross talk measurements**

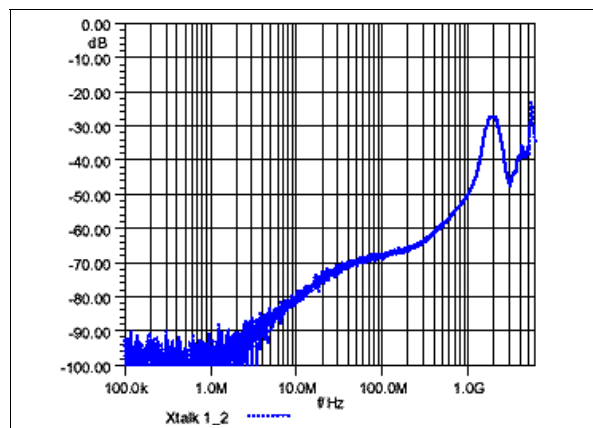


Figure 5: ESD response to IEC61000-4-2 (+15kV air discharge) on one input and on one output

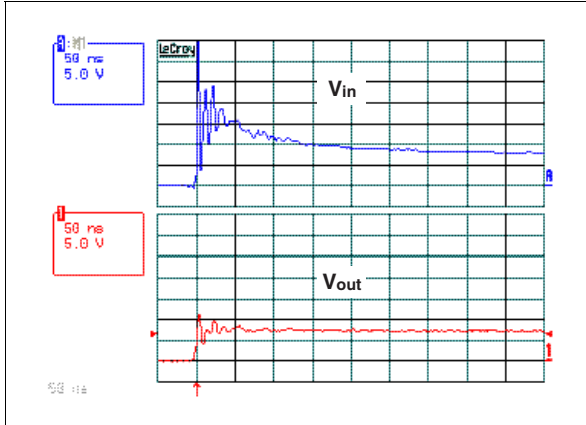


Figure 6: ESD response to IEC61000-4-2 (-15kV air discharge) on one input and on one output

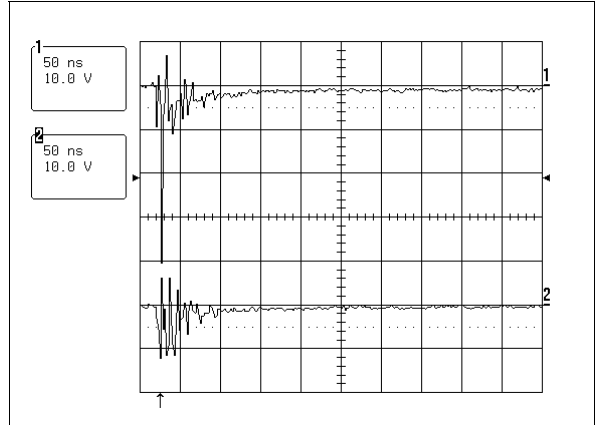


Figure 7: Line capacitance versus applied voltage

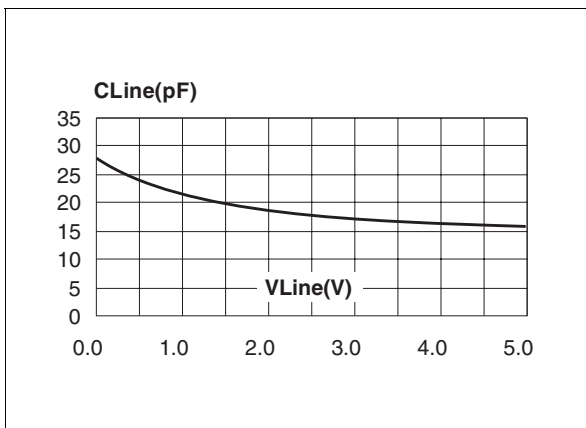


Figure 8: Rise time 10-90% measurements with 1.9V signal at 26 MHz frequency (50Ω generator)

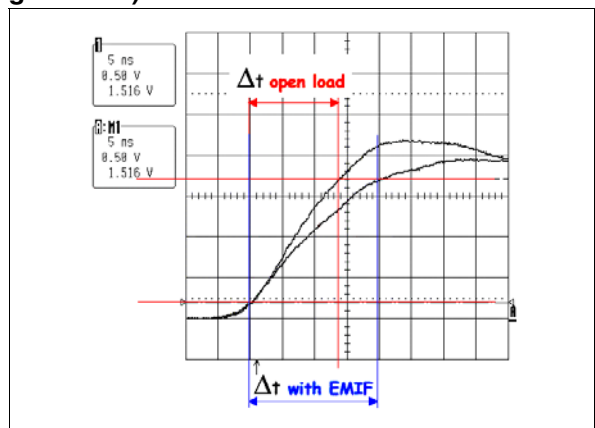


Figure 9: Fall time 10-90% measurements with 1.9V signal at 26 MHz frequency (50Ω generator)

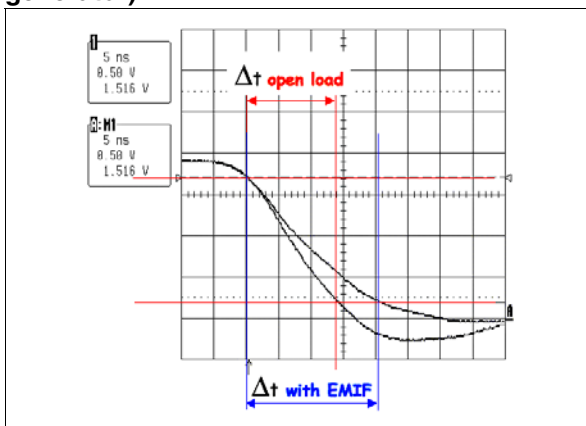


Figure 10: Aplac model

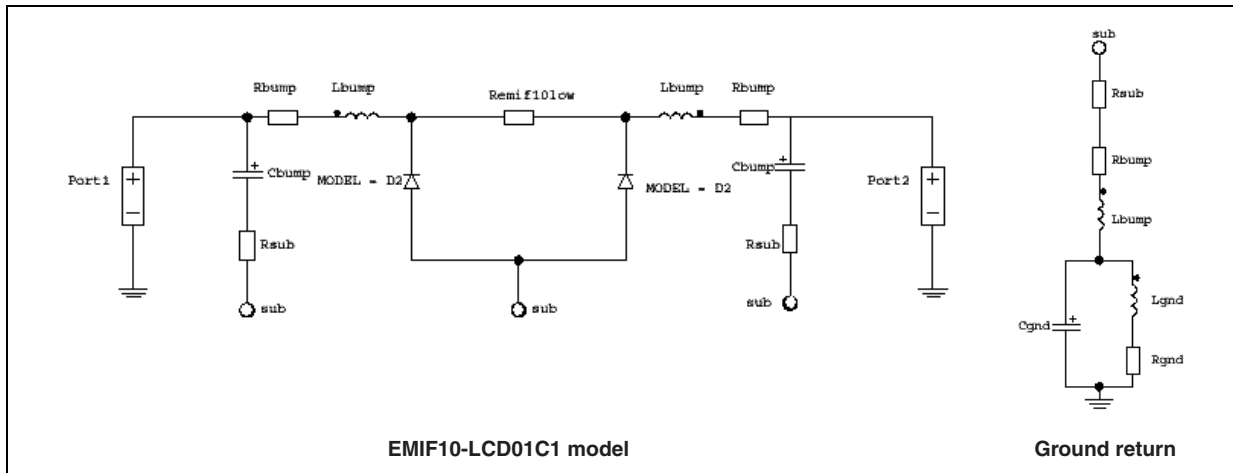


Figure 11: Aplac parameters

|                             |                  |
|-----------------------------|------------------|
| ZRZ structure               |                  |
| aplacvar Remif10low 100     | BV = 7           |
| aplacvar Cemif10flow 17.5pF | CJO = Cemif10low |
| Bumps                       | IBV = 1u         |
| aplacvar Lbump 50pH         | IKF = 1000       |
| aplacvar Rbump 20m          | IS = 10f         |
| aplacvar Cbump 1.5pF        | ISR = 100p       |
| Bulk                        | N = 1            |
| aplacvar Rsub 100m          | M = 0.3333       |
| Gnd connections             | RS = 0.015       |
| aplacvar Rgnd 100m          | VJ = 0.6         |
| aplacvar Lgnd 200pH         | TT = 50n         |
| aplacvar Cgnd 0.15pF        |                  |

Figure 12: Order Code

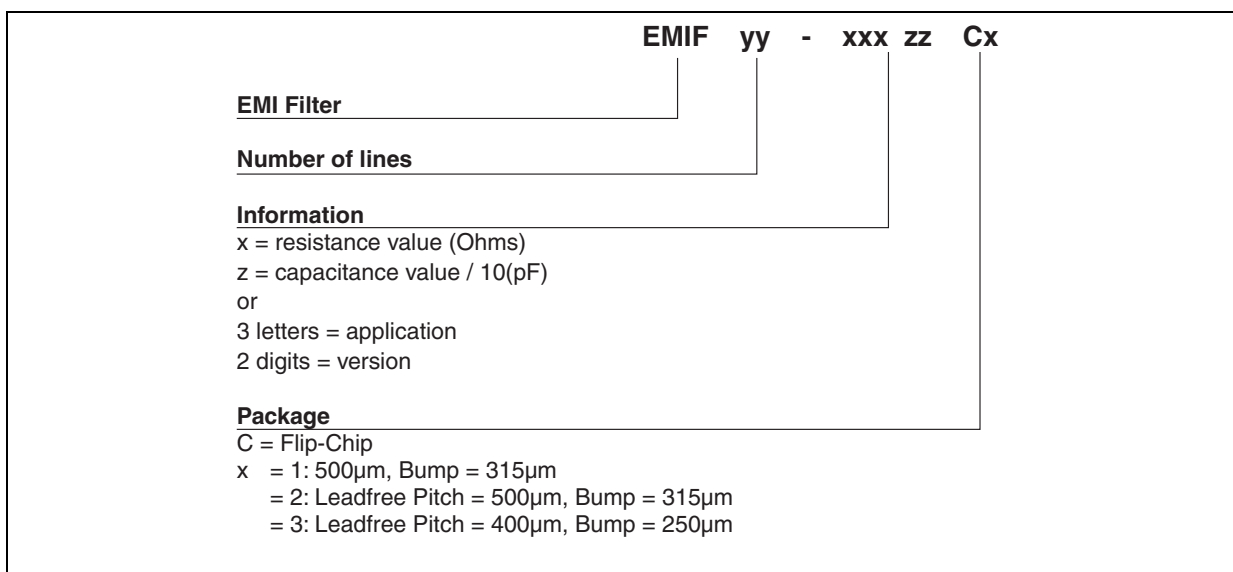


Figure 13: FLIP-CHIP Package Mechanical Data

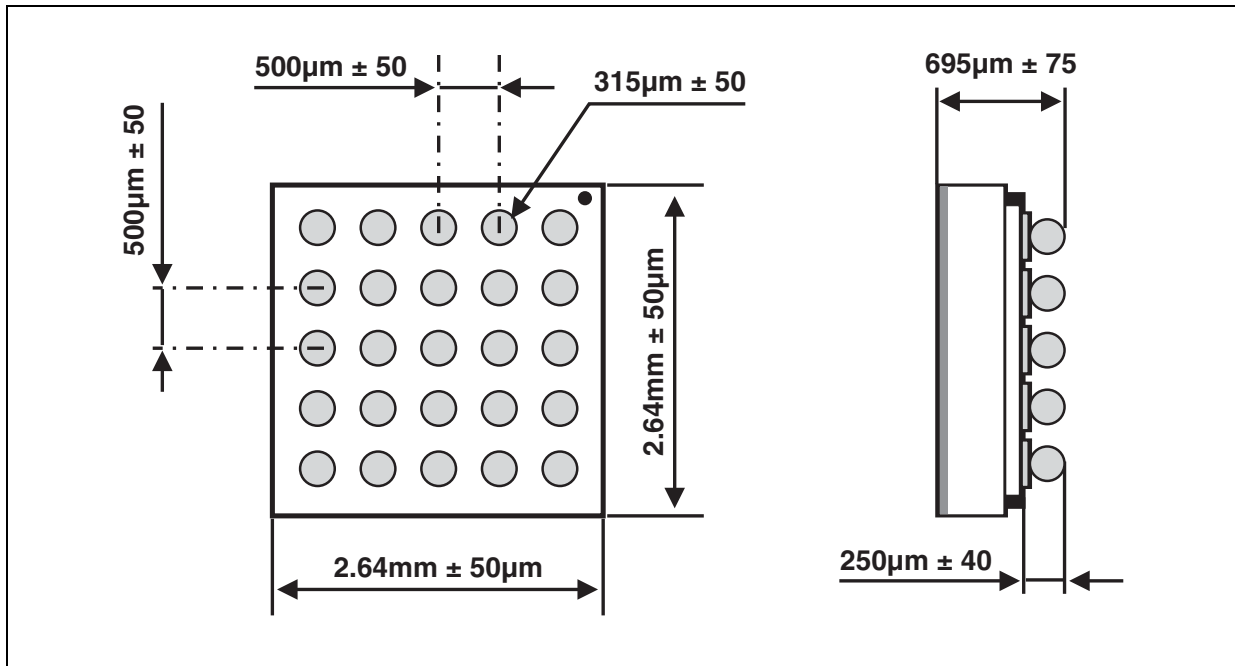


Figure 14: Foot Print Recommendations

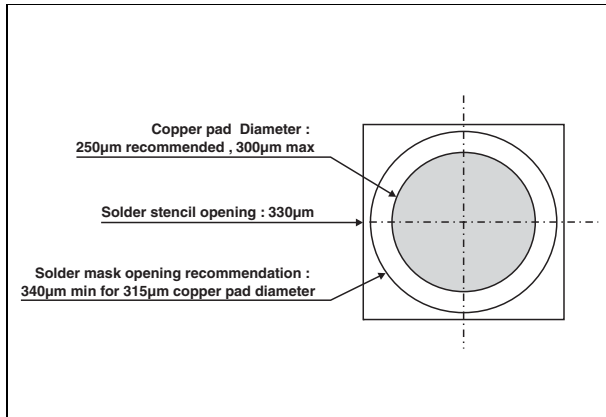


Figure 15: Marking

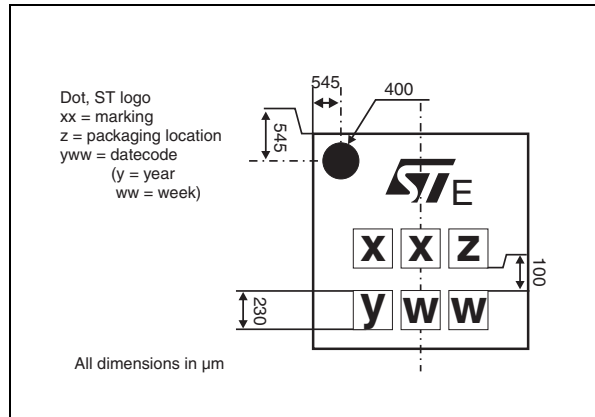
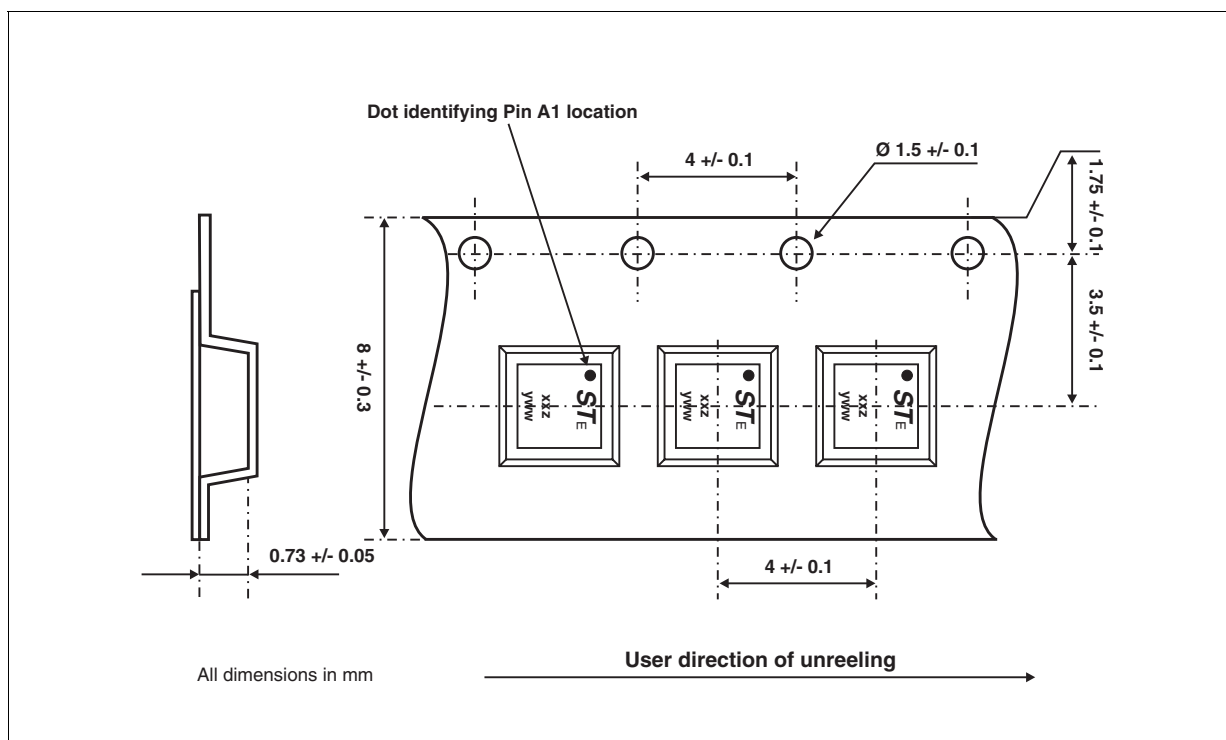


Figure 16: FLIP-CHIP Tape and Reel Specification



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 package and 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).

| Part Number    | Marking | Package   | Weight | Base qty | Delivery mode    |
|----------------|---------|-----------|--------|----------|------------------|
| EMIF10-LCD01C2 | FL      | Flip-Chip | 9.3 mg | 5000     | Tape & reel (7") |

Table 4: Ordering Information

**Note:** Further packing information available in the application notes  
 - AN1235: "Flip-Chip: Package description and recommendations for use"  
 - AN1751: "EMI Filters: Recommendations and measurements"

Table 5: Revision History

| Date        | Revision | Description of Changes |
|-------------|----------|------------------------|
| 12-Aug-2005 | 1        | First issue            |

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