# ESDALCL5-1BM2

## Single-line low capacitance and low leakage current ESD protection

**Datasheet – production data**

## Features

- Single-line low capacitance Transil diode
- Bidirectional ESD protection
- Breakdown voltage $V_{BR}$ = 5.0 V min.
- Low diode capacitance (26 pF typ at 0 V)
- Low leakage current:
  - 10 nA at 3 V
  - 1 nA at 1 V
- Very small PCB area: 0.6 mm²
- ECOPACK®2 compliant components

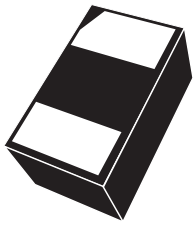
### Complies with the following standards:

- IEC 61000-4-2 level 4 and higher
  - 30 kV (air discharge)
  - 30 kV (contact discharge)
- MIL STD 883G - Method 3015-7: class 3
  - Human body model

## Applications

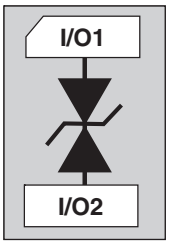
Where transient overvoltage protection in ESD sensitive equipment is required, such as:

- Portable multimedia players and accessories
- Portable healthcare equipment
- Notebooks
- Communication systems
- Cellular phone handsets and accessories



**SOD882**
**ESDALC5-1BM2**

**Figure 1. Functional diagram**




## Description

The ESDALCL5-1BM2 is a bidirectional single-line TVS diode designed to protect data lines or other I/O ports against ESD transients.

This device is ideal for applications where reduced line capacitance and board space saving are required. Its low leakage current makes it suitable for portable equipment.



This is information on a product in full production. www.st.com

# 1 Characteristics

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

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{PP}$ | Peak pulse voltage | IEC 61000-4-2 contact discharge<br>IEC 61000-4-2 air discharge | ±30 | kV |
| $P_{PP}$(1) | Peak pulse power dissipation (8/20 µs) | $T_j$ initial = $T_{amb}$ | 150 | W |
| $I_{PP}$ | Peak pulse current (8/20 µs) | | 9 | A |
| $T_j$ | Junction temperature | | -55 to +150 | °C |
| $T_{stg}$ | Storage temperature range | | -65 to +150 | °C |
| $T_L$ | Maximum lead temperature for soldering during 10 s | | 260 | °C |

1. For a surge greater than the maximum values, the diode will fail in short-circuit.

**Figure 2. Electrical characteristics (definitions)**

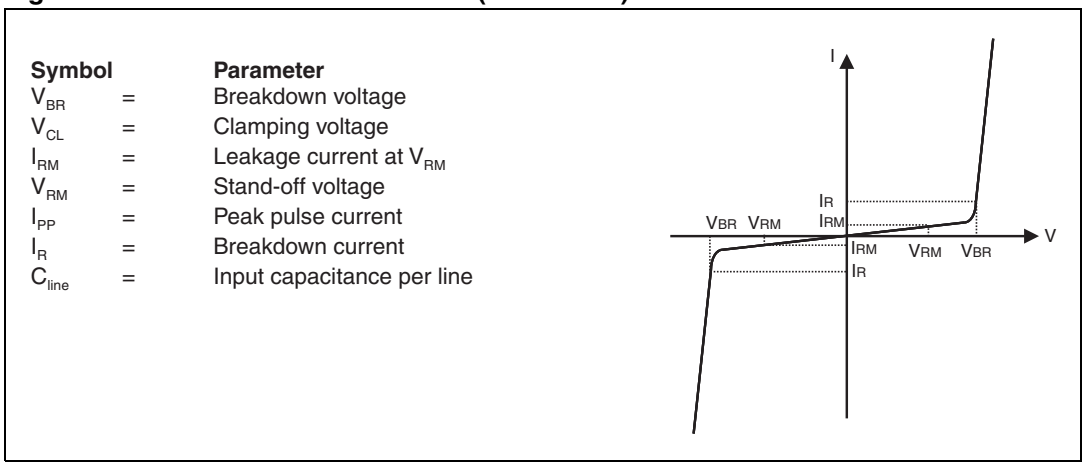



**Table 2. Electrical characteristics (values, $T_{amb}$ = 25 °C)**

| Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $V_{BR}$ | From pin1 to pin2, $I_R$ = 1 mA | 11 | 13 | | V |
| | From pin2 to pin1, $I_R$ = 1 mA | 5 | 8 | | |
| $I_{RM}$ | $V_{RM}$ = 3 V | | | 10 | nA |
| | $V_{RM}$ = 1 V | | | 1 | |
| $R_d$ | Square pulse, $I_{PP}$ = 1 A, $t_p$ = 2.5 µs | | 650 | | mΩ |
| $C_{line}$ | F = 1 MHz, $V_R$ = 0 V | | 26 | 30 | pF |

**Figure 3. Relative variation of peak pulse power versus initial junction temperature**

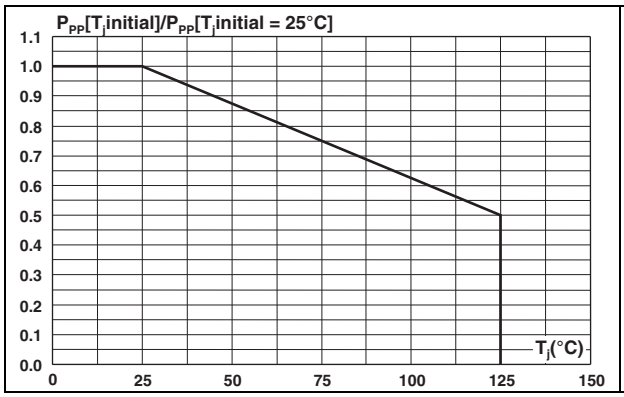



**Figure 4. Leakage current versus junction temperature (typical values, $V_R$ = 1 V)**

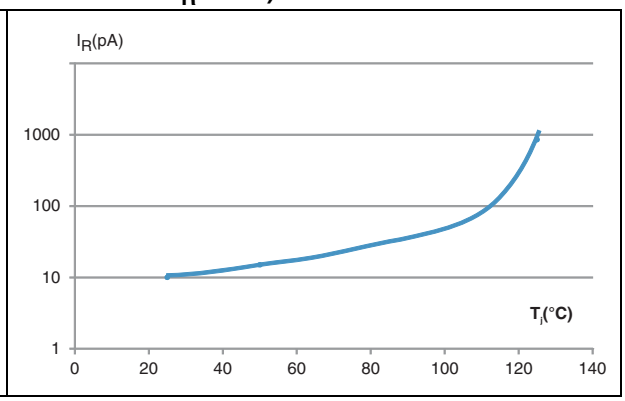



**Figure 5. Leakage current versus reverse applied voltage (typical values)**

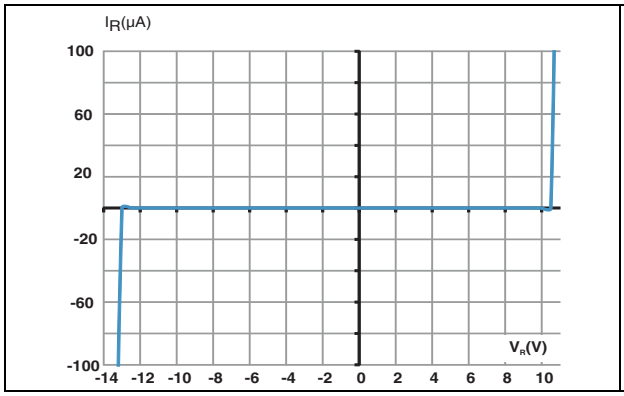



**Figure 6. Peak pulse power versus exponential pulse duration (direct)**

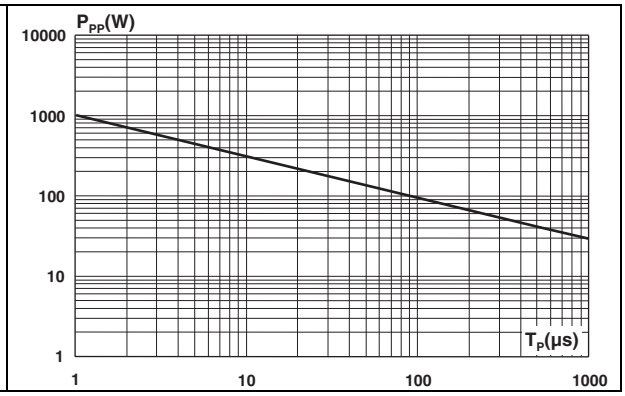



**Figure 7. Peak pulse power versus exponential pulse duration (reverse)**

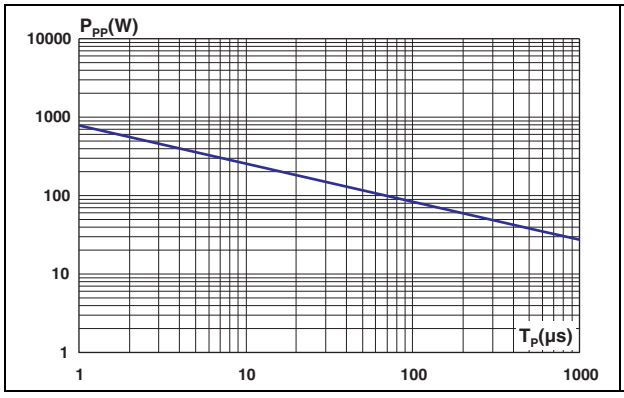



**Figure 8. Clamping voltage versus peak pulse current (typical values, exponential waveform, direct)**

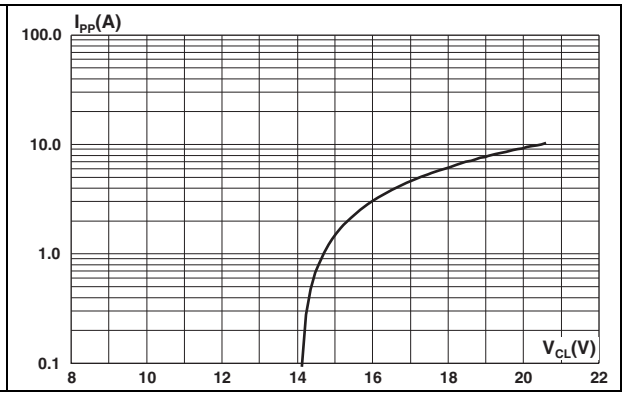


**Figure 9. Clamping voltage versus peak pulse current (typical values, exponential waveform, reverse)**

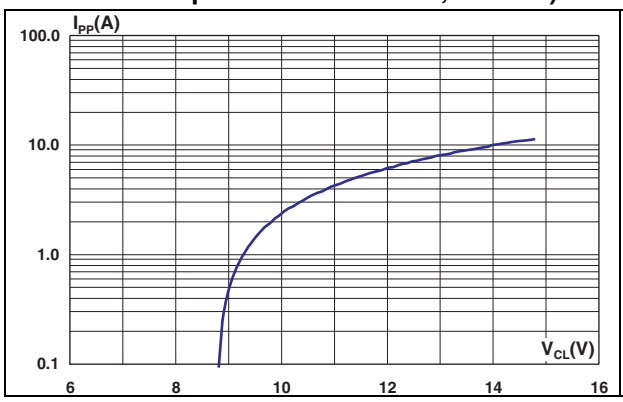



**Figure 10. Junction capacitance versus reverse applied voltage (typical values, direct)**

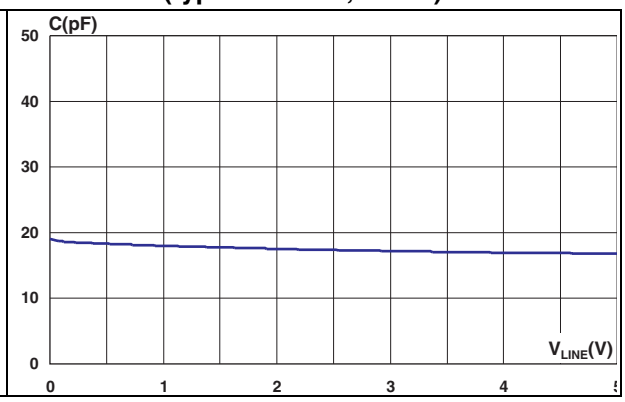



**Figure 11. Junction capacitance versus reverse applied voltage (typical values, reverse)**

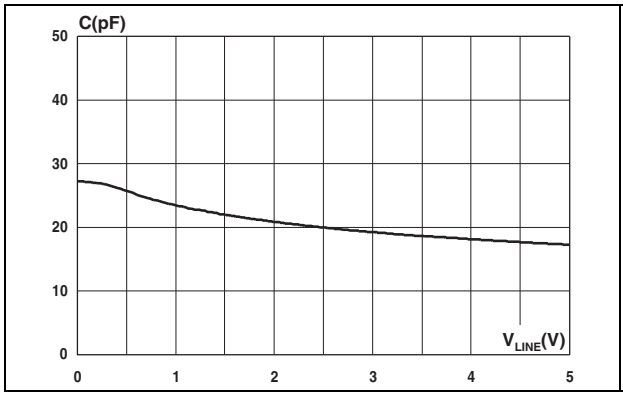



**Figure 12. ESD response to IEC 61000-4-2 (+30 kV contact discharge)**

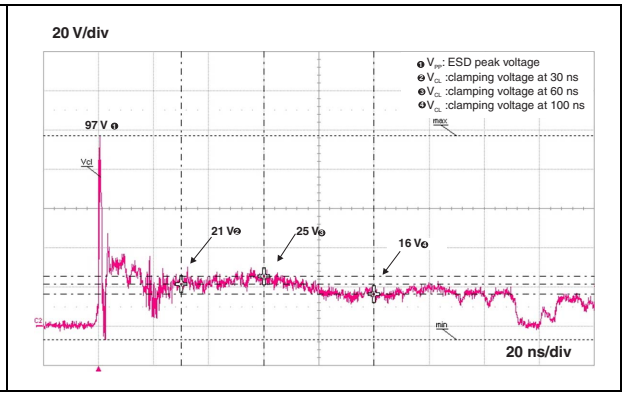



**Figure 13. ESD response to IEC 61000-4-2 (-30 kV contact discharge)**

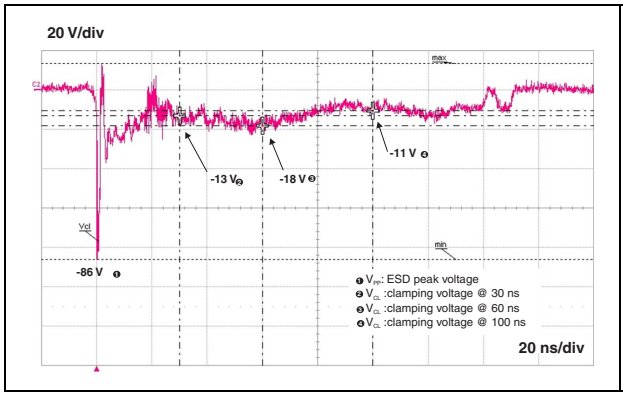
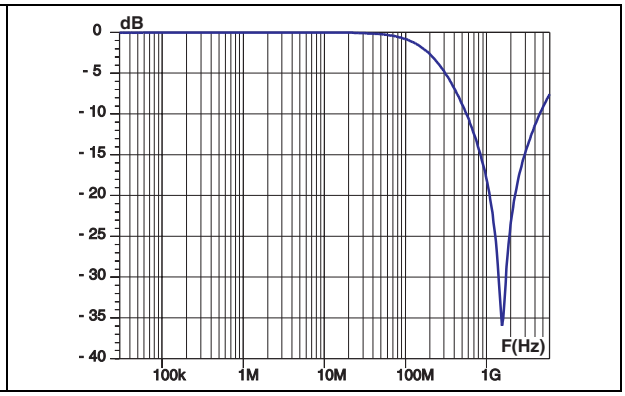
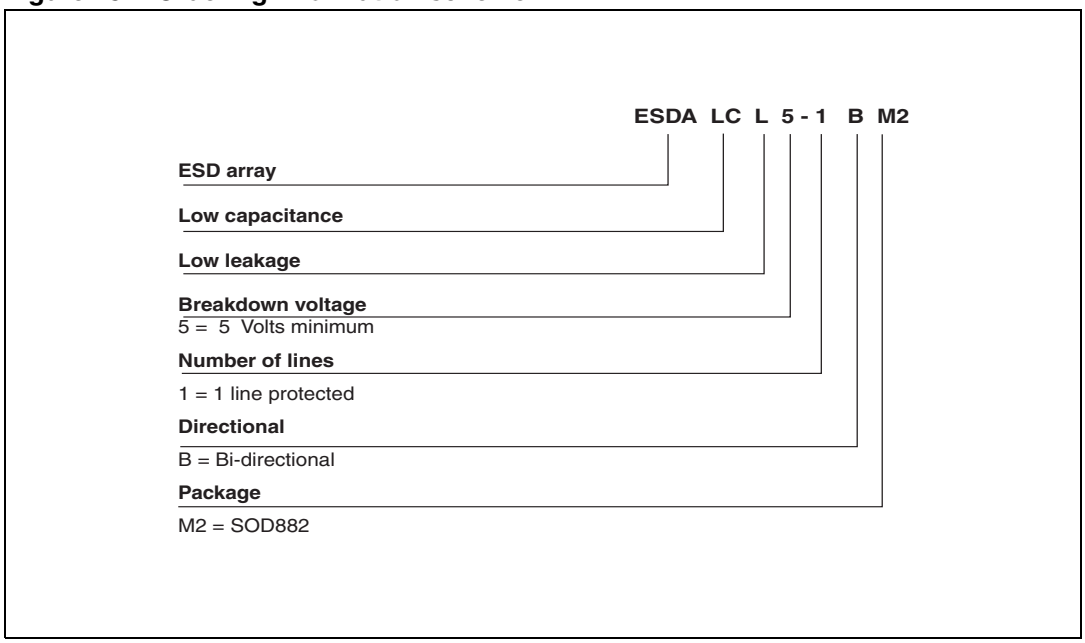



**Figure 14. S21 attenuation measurement result**



# 2 Ordering information scheme

**Figure 15. Ordering information scheme**



# 3 Package information

- Epoxy meets UL94, V0
- Lead-free package

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

**Figure 16. SOD882 dimension definitions**

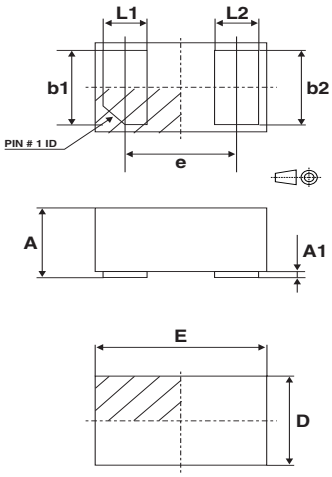



**Table 3. SOD882 dimension values**

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 0.40 | 0.47 | 0.50 | 0.016 | 0.019 | 0.020 |
| A1 | 0.00 | | 0.05 | 0.000 | | 0.002 |
| b1 | 0.45 | 0.50 | 0.55 | 0.018 | 0.020 | 0.022 |
| b2 | 0.45 | 0.50 | 0.55 | 0.018 | 0.020 | 0.022 |
| D | 0.55 | 0.60 | 0.65 | 0.022 | 0.024 | 0.026 |
| E | 0.95 | 1.00 | 1.05 | 0.037 | 0.039 | 0.041 |
| e | 0.60 | 0.65 | 0.70 | 0.024 | 0.026 | 0.028 |
| L1 | 0.20 | 0.25 | 0.30 | 0.008 | 0.010 | 0.012 |
| L2 | 0.20 | 0.25 | 0.30 | 0.008 | 0.010 | 0.012 |

**Figure 17. SOD882 footprint in mm (inches)**

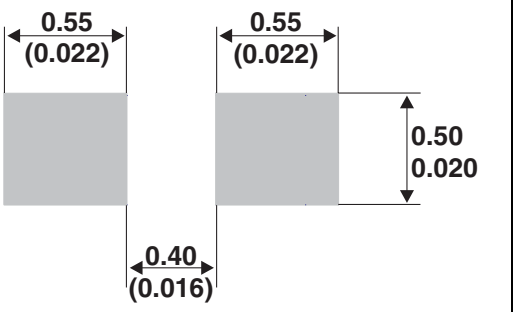
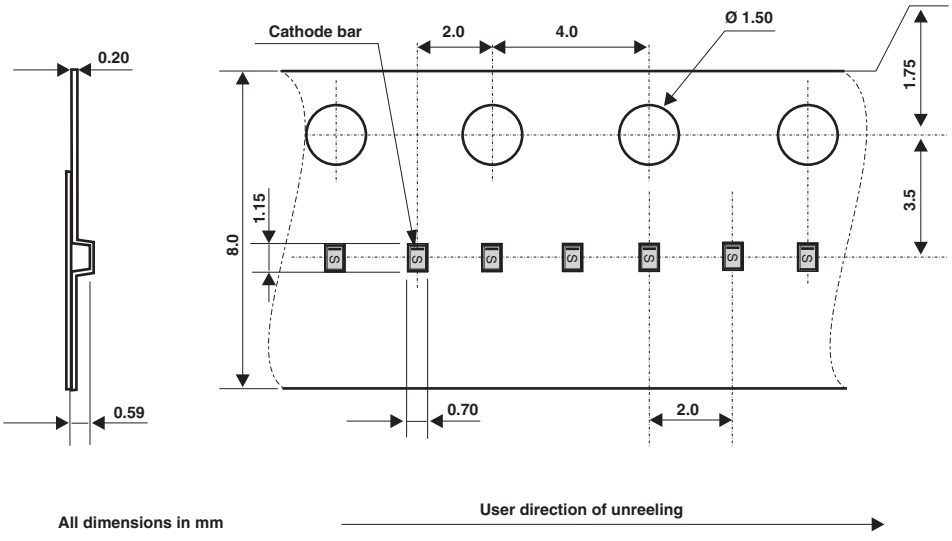



**Figure 18. SOD882 marking**




*Note: Product marking may be rotated by multiples of 90° for assembly plant differentiation. In no case should this product marking be used to orient the component for its placement on a PCB. Only pin 1 mark is to be used for this purpose.*

**Figure 19. SOD882 tape and reel specifications**

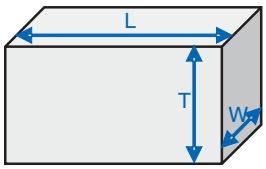


# 4 Recommendations on PCB assembly

## 4.1 Stencil opening design

1. General recommendation on stencil opening design
   a) Stencil opening dimensions: L (Length), W (Width), T (Thickness).

**Figure 20. Stencil opening dimensions**




   b) General design rule

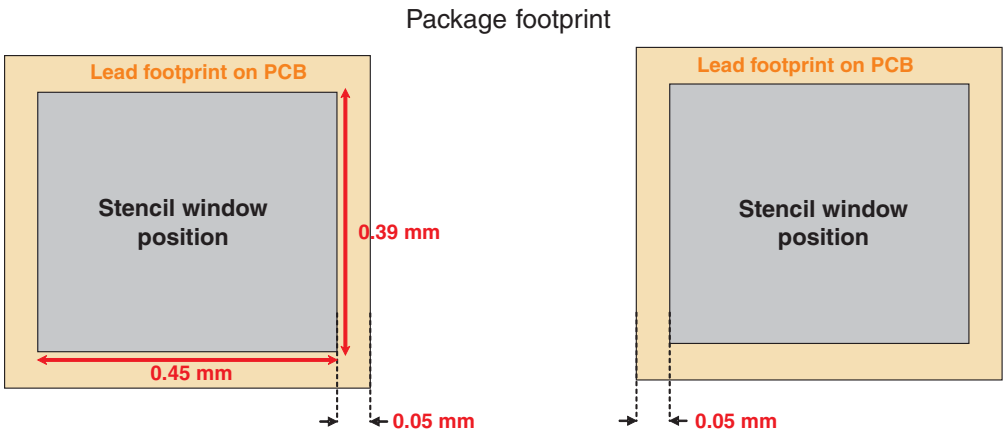
   Stencil thickness (T) = 75 ~ 125 µm

$$\text{Aspect Ratio} = \frac{W}{T} \geq 1.5$$

$$\text{Aspect Area} = \frac{L \times W}{2T(L+W)} \geq 0.66$$

2. Reference design
   a) Stencil opening thickness: 100 µm
   b) Stencil opening for central exposed pad: Opening to footprint ratio is 50%.
   c) Stencil opening for leads: Opening to footprint ratio is 90%.

**Figure 21. Recommended stencil window position**



## 4.2 Solder paste

1. Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
2. “No clean” solder paste is recommended.
3. Offers a high tack force to resist component movement during high speed.
4. Solder paste with fine particles: powder particle size is 20-45 µm.

## 4.3 Placement

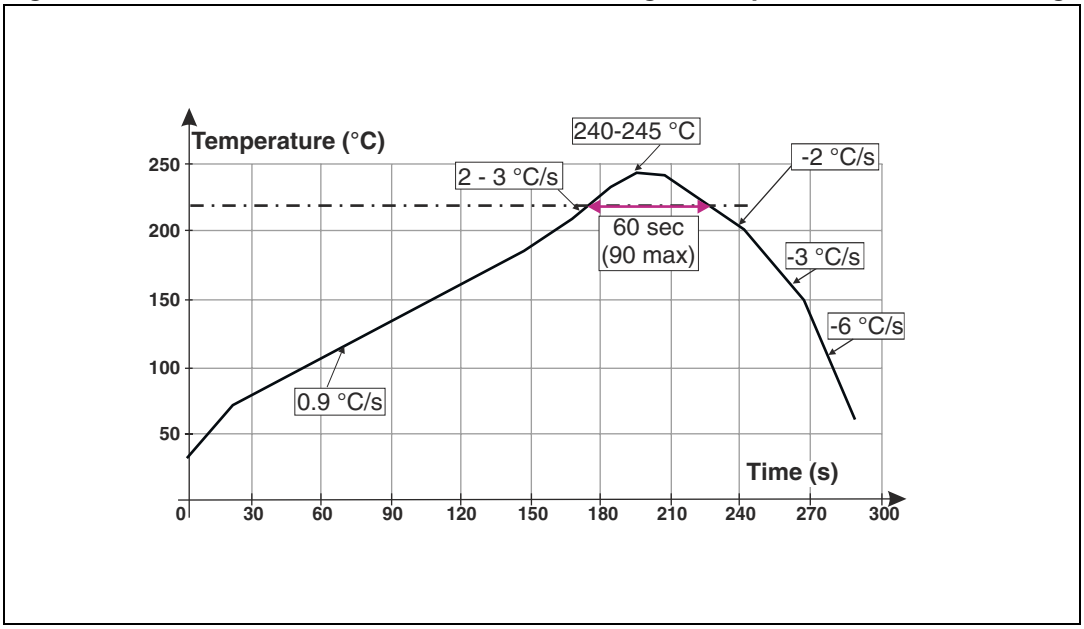
1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering.
3. Standard tolerance of ± 0.05 mm is recommended.
4. 3.5 N placement force is recommended. Too much placement force can lead to squeezed out solder paste and cause solder joints to short. Too low placement force can lead to insufficient contact between package and solder paste that could cause open solder joints or badly centered packages.
5. To improve the package placement accuracy, a bottom side optical control should be performed with a high resolution tool.
6. For assembly, a perfect supporting of the PCB (all the more on flexible PCB) is recommended during solder paste printing, pick and place and reflow soldering by using optimized tools.

## 4.4 PCB design preference

1. To control the solder paste amount, the closed via is recommended instead of open vias.
2. The position of tracks and open vias in the solder area should be well balanced. The symmetrical layout is recommended, in case any tilt phenomena caused by asymmetrical solder paste amount due to the solder flow away.

## 4.5 Reflow profile

**Figure 22. ST ECOPACK® recommended soldering reflow profile for PCB mounting**




*Note: Minimize air convection currents in the reflow oven to avoid component movement.*

# 5 Ordering information

**Table 4. Ordering information**

| Order code | Marking[1] | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| ESDALCL5-1BM2 | S | SOD882 | 0.92 mg | 12,000 | Tape and reel |

1. The marking can be rotated by multiples of 90° to differentiate assembly location

# 6 Revision history

**Table 5. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 31-Oct-2012 | 1 | Initial release. |

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