

## Dual low capacitance Transil™ array for ESD protection

### Features

- 2 unidirectional, low capacitance Transil diodes
- Better than IEC 61000-4-2 standard (ESD protection: 11 kV contact discharge)
- Breakdown voltage  $V_{BR} = 6.1 \text{ V min}$
- Low diode capacitance (11 pF typ at 0 V)
- Low leakage current  $< 0.5 \mu\text{A}$
- Very small PCB area:  $0.6 \text{ mm}^2$
- RoHS compliant

### Benefits

- High ESD protection level
- High integration
- Suitable for high density boards

### Complies with the following standards

- IEC61000-4-2 level 4:
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- MIL STD 883G-Method 3015-7: class 3B:
  - HBM (human body model)

### Applications

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

- Computers
- Printers
- Communication systems
- Cellular phone handsets and accessories
- Video equipment

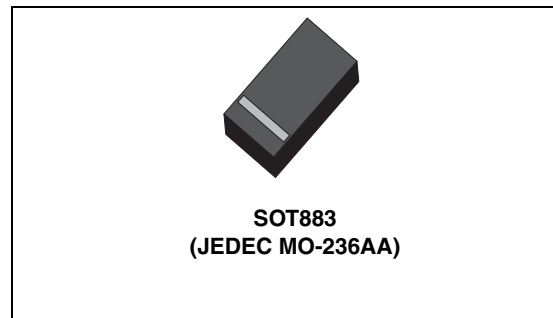
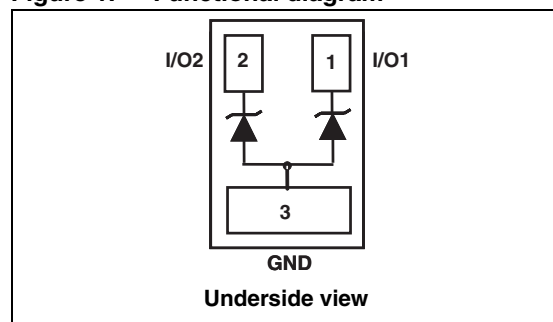


Figure 1. Functional diagram



### Description

The ESDALC6V1M3 is a monolithic array designed to protect 1 line or 2 lines against ESD transients.

The device is ideal for applications where both reduced line capacitance and board space saving are required.

**TM:** Transil is a trademark of STMicroelectronics

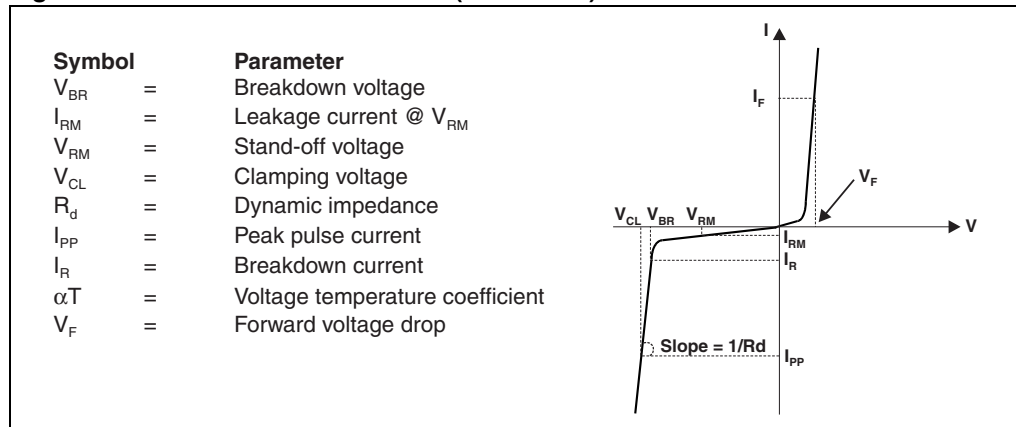
# 1 Characteristics

**Table 1. Absolute ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

Symbol	Parameter		Value	Unit
$V_{PP}$	Peak pulse voltage	IEC 61000-4-2 air discharge IEC 61000-4-2 contact discharge	$\pm 15$ $\pm 11$	kV
$P_{PP}$	Peak pulse power dissipation (8/20 $\mu\text{s}$ ) <sup>(1)</sup>	$T_j$ initial = $T_{amb}$	30	W
$I_{pp}$	Repetitive peak pulse current (8/20 $\mu\text{s}$ )		3	A
$T_j$	Operating junction temperature range		-40 + 125	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature range		-55 + 150	$^{\circ}\text{C}$
$T_L$	Maximum lead temperature for soldering during 10 s		260	$^{\circ}\text{C}$

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

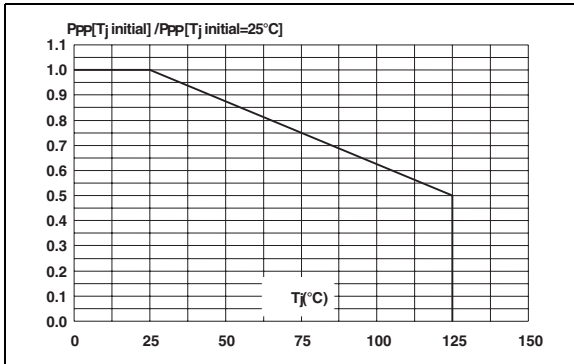
**Figure 2. Electrical characteristics (definitions)**



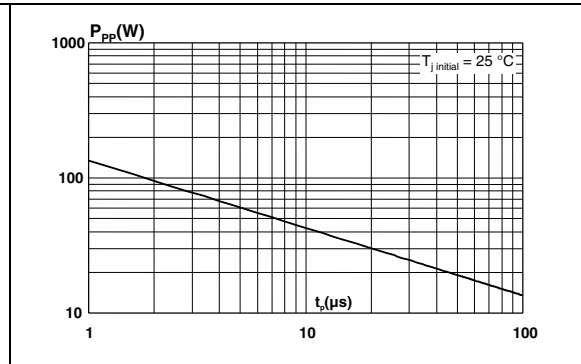
**Table 2. Electrical characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

Symbol	Test condition	Min.	Typ.	Max.	Unit
$V_{BR}$	$I_R = 1\text{ mA}$	6.1		7.2	V
$I_{RM}$	$V_{RM} = 5\text{ V}$			0.5	$\mu\text{A}$
$\alpha T$	$I_R = 1\text{ mA}$			4.2	$10^{-4}/^{\circ}\text{C}$
C	$V_R = 0\text{ V}$ , $F = 1\text{ MHz}$ , $V_{OSC} = 30\text{ mV}$		11		pF

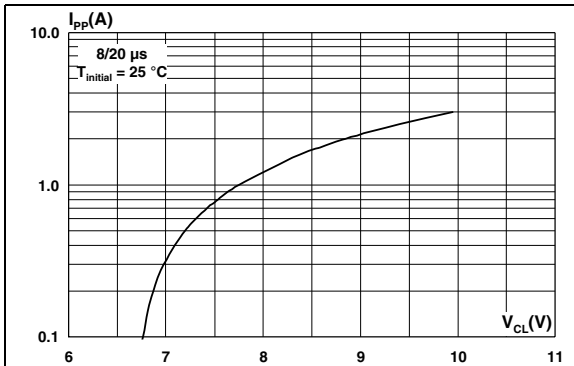
**Figure 3. Relative variation of peak pulse power versus initial junction temperature**



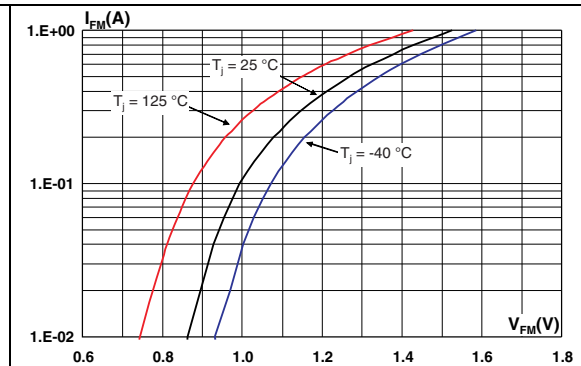
**Figure 4. Peak pulse power versus exponential pulse duration**



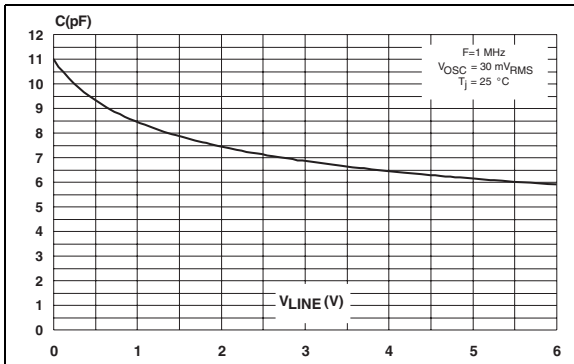
**Figure 5. Clamping voltage versus peak pulse current (typical values)**



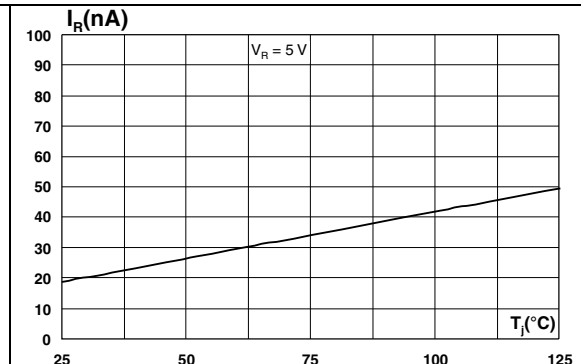
**Figure 6. Forward voltage drop versus peak forward current (typical values)**



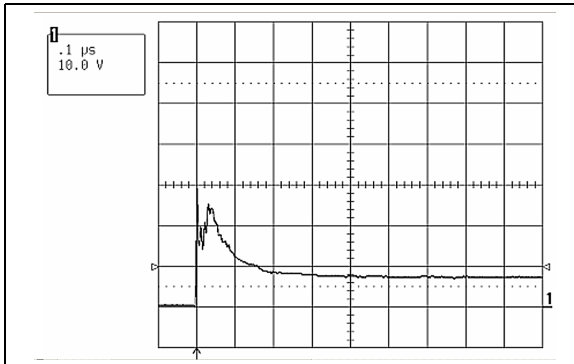
**Figure 7. Junction capacitance versus reverse voltage applied (typical values)**



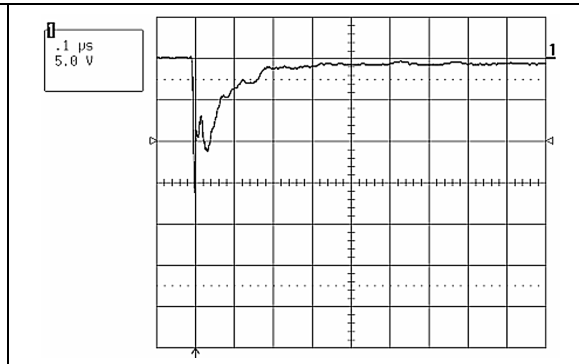
**Figure 8. Variation of leakage current versus junction temperature (typical values)**



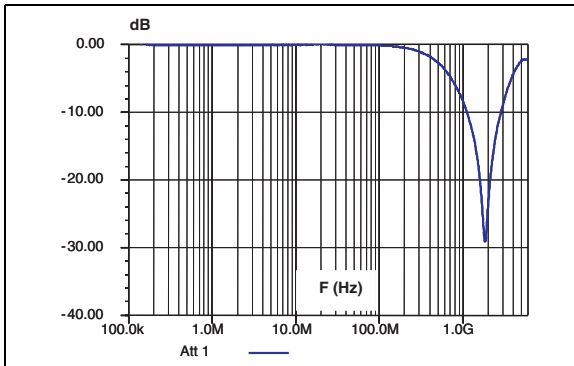
**Figure 9. ESD response to IEC61000-4-2 (+15 kV air discharge) on each channel**



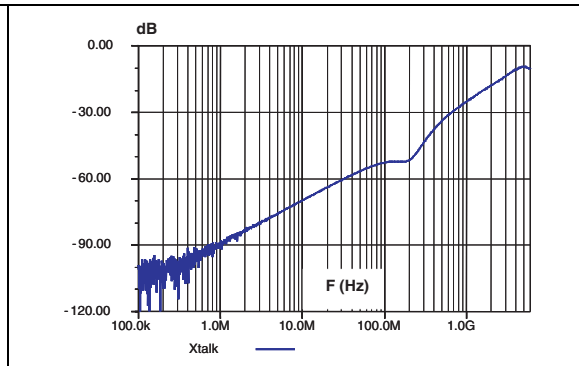
**Figure 10. ESD response to IEC61000-4-2 (-15 kV air discharge) on each channel**



**Figure 11. S21 attenuation measurement results of each channel**

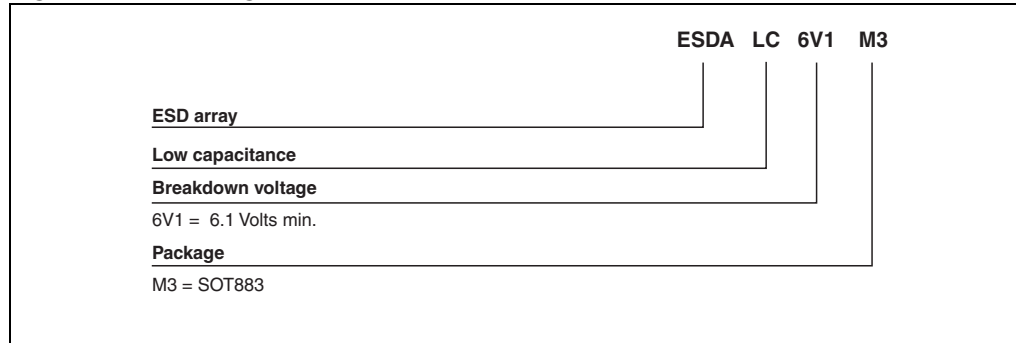


**Figure 12. Analog crosstalk measurements between channels**



## 2 Ordering information

Figure 13. Ordering information scheme



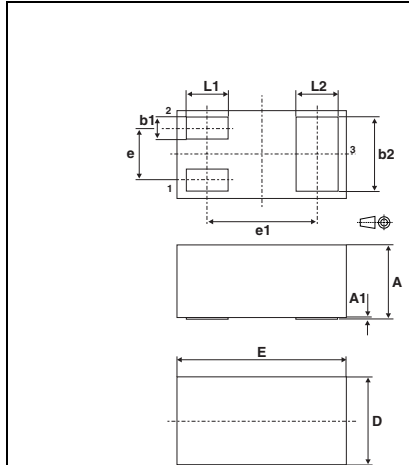
### 3 Package information

- Epoxy meets UL94, V0
- Lead-free packages

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](http://www.st.com). ECOPACK® is an ST trademark.

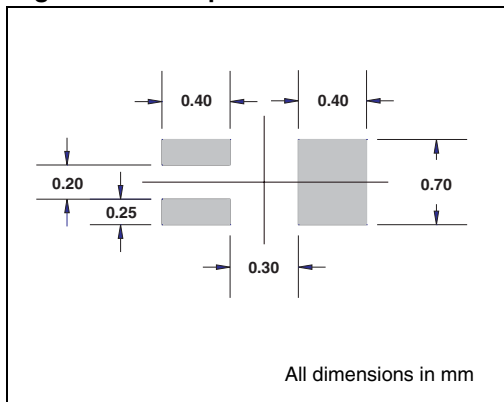
**Table 3. SOT883 dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.40		0.50	0.016		0.02
A1	0.00		0.05	0.00		0.002
b1	0.10	0.15	0.20	0.004	0.006	0.007
b2	0.45	0.50	0.55	0.018	0.020	0.021
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	0.30	0.35	0.40	0.012	0.014	0.015
e1	0.60	0.65	0.70	0.024	0.026	0.027
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



*Note: Product marking may be rotated by 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 14. Footprint**



**Figure 15. Marking**

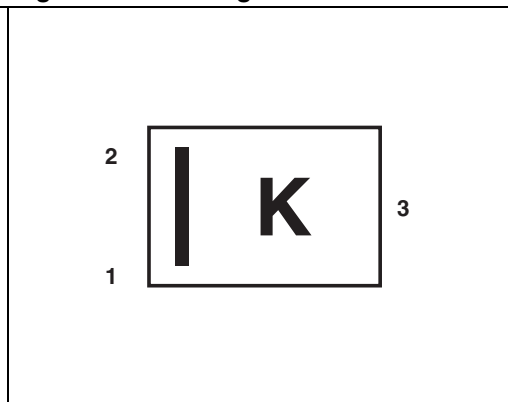
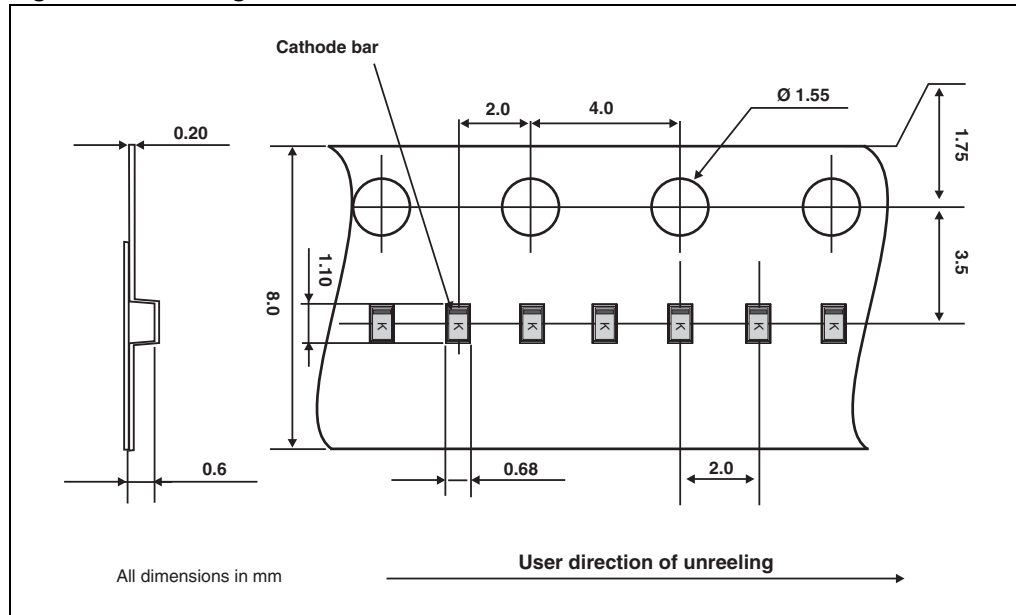


Figure 16. Packing information

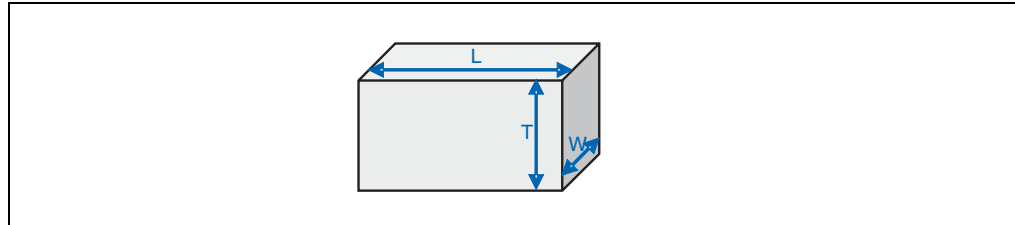


## 4 Recommendation on PCB assembly

### 4.1 Stencil opening design

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

**Figure 17. Stencil opening dimensions**



- b) General design rule
 

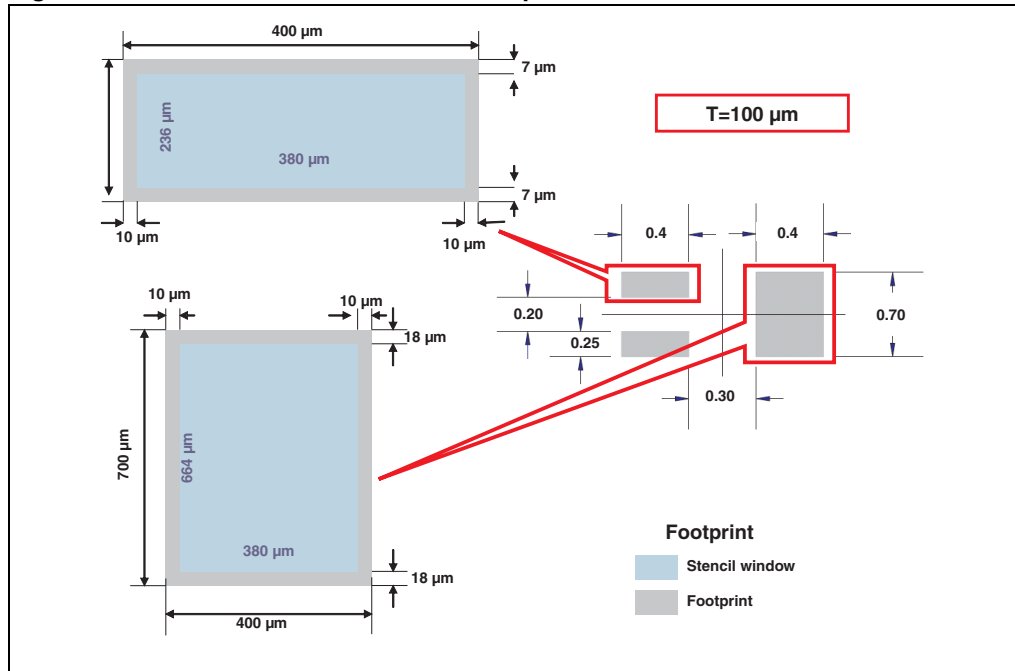
Stencil thickness (T) = 75 ~ 125 μm

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

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

2. Reference design
  - a) Stencil opening thickness: 100 μm
  - b) Stencil opening for leads: Opening to footprint ratio 90%.

**Figure 18. 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  $\mu\text{m}$ .

## 4.3 Placement

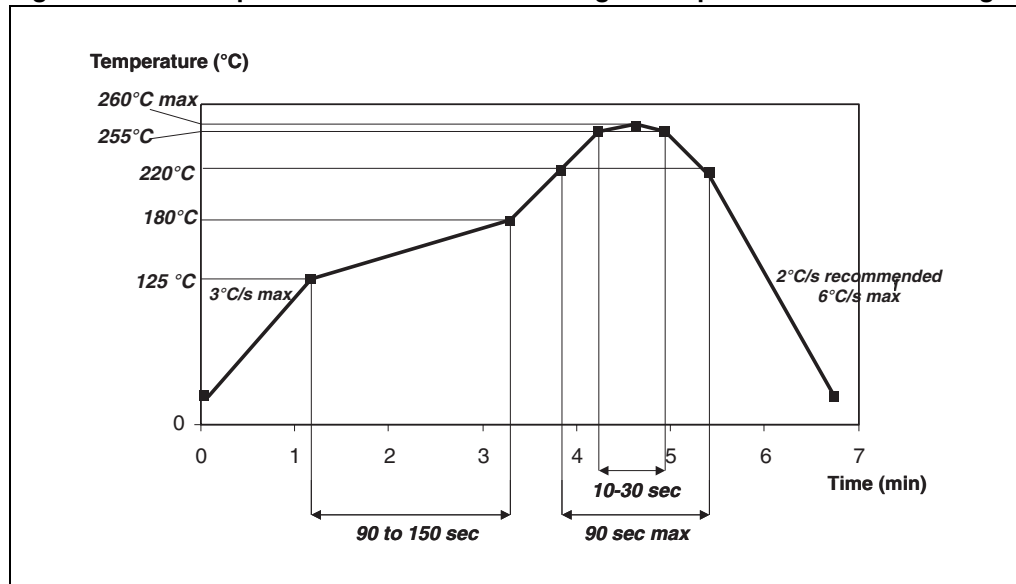
1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering.
3. Standard tolerance of  $\pm 0.05$  mm is recommended.
4. 3.5 N placement force is recommended. Too much placement force can lead to squeezed out 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 19. 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	Package	Weight	Base qty	Delivery mode
ESDALC6V1M3	K <sup>(1)</sup>	SOT883	0.86 mg	12000	Tape and reel

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

## 6 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
04-Aug-2005	1	Initial release.
23-May-2006	2	Reformatted to current standards. Added soldering reflow profile diagram.
16-Jun-2006	3	Updated tape and reel illustration (Figure 14).
18-Feb-2007	4	Reformatted to current standards. Added notes on marking rotation. Updated tape and reel illustration - <a href="#">Figure 16</a> . Added <a href="#">Section 4: Recommendation on PCB assembly</a> . Updated footprint in <a href="#">Figure 14</a> .
26-Oct-2010	5	General revision on: figures (order and values), values and descriptions on the tables.

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