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STMicroelectronics
ESDALC14-1BF4

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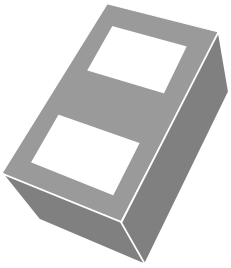
ESDALC14-1BF4

Low clamping and low capacitance bidirectional single line ESD protection

Datasheet - production data



0201 package

Features

- Low clamping voltage: V_{CL} = 18 V
- Bidirectional device
- Low leakage current
- 0201 package
- Ultra low PCB area: 0.18 mm^2
- ECOPACK®2 compliant component

Complies with the following standards

- IEC 61000-4-2:
  - ±15 kV (air discharge)
  - ±8 kV (contact discharge)

Applications

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

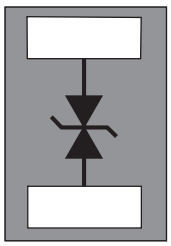
- Smartphones, mobile phones and accessories
- Tablet, PC, netbooks and notebooks
- Portable multimedia devices and accessories
- Digital cameras and camcorders
- Communication and highly integrated systems

Description

The ESDALC14-1BF4 is a bidirectional single line TVS diode designed to protect the data line or other I/O ports against ESD transients.

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

Figure 1. Functional diagram



1 Characteristics

Table 1. Absolute maximum ratings

Symbol	Parameter		Value	Unit
V_{PP} (1)	Peak pulse voltage	IEC 61000-4-2 contact discharge IEC 61000-4-2 air discharge	25 30	kV
P_{PP}(1)	Peak pulse power (8/20 µs)		100	W
I_{PP}(1)	Peak pulse current (8/20 µs)		5	A
T_j	Operating junction temperature range		-40 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)

Symbol		Parameter
V_{BR}	=	Breakdown voltage
V_{RM}	=	Stand-off voltage
V_{CL}	=	Clamping voltage
I_{RM}	=	Leakage current @ V_{RM}
I_{PP}	=	Peak pulse current
R_d	=	Dynamic impedance
αT	=	Voltage temperature coefficient
C	=	Parasitic capacitance

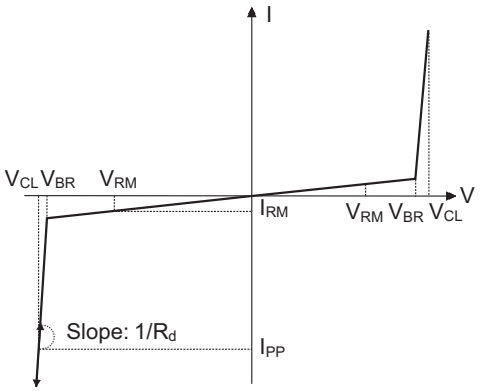


Table 2. Electrical characteristics (values, T_{amb} = 25 °C)

Symbol	Test conditions	Value			Unit
		Min.	Typ.	Max.	
V_{BR}	I_R = 1 mA	13			V
I_{RM}	V_{RM} = 12 V			100	nA
VCL	8 kV contact discharge after 30 ns IEC 61000-4-2		18		
C_{LINE}	V_{LINE}= 0 V, F = 1 MHz, V_{OSC} = 30 mV		22	25	pF

Figure 3. Leakage current versus junction temperature (typical values)

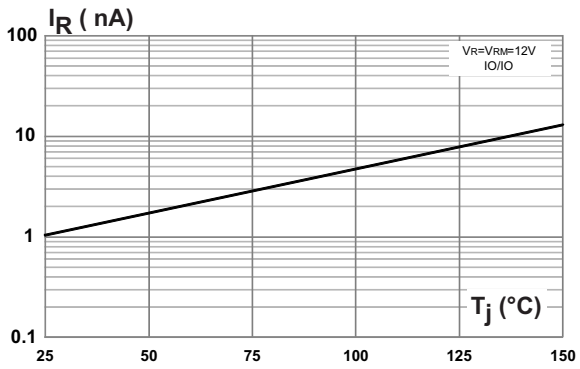


Figure 4. Junction capacitance versus applied voltage (typical values)

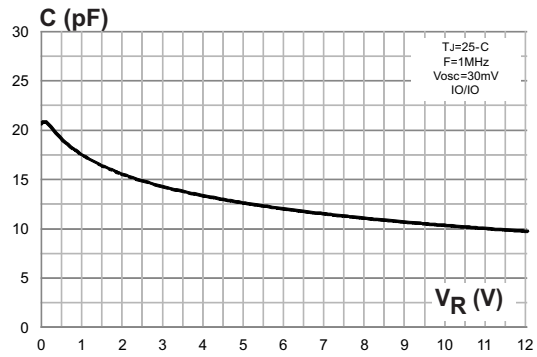


Figure 5. Dynamic resistance

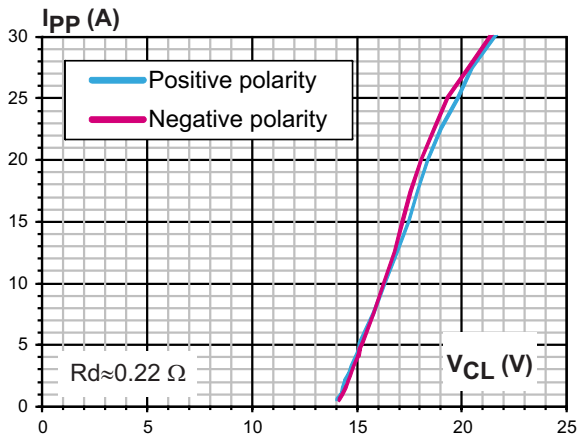


Figure 6. Attenuation measurement result

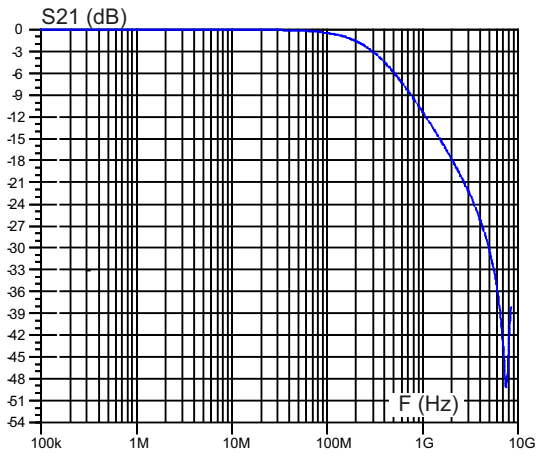


Figure 7. ESD response to IEC 61000-4-2 (+8 kV contact discharge)

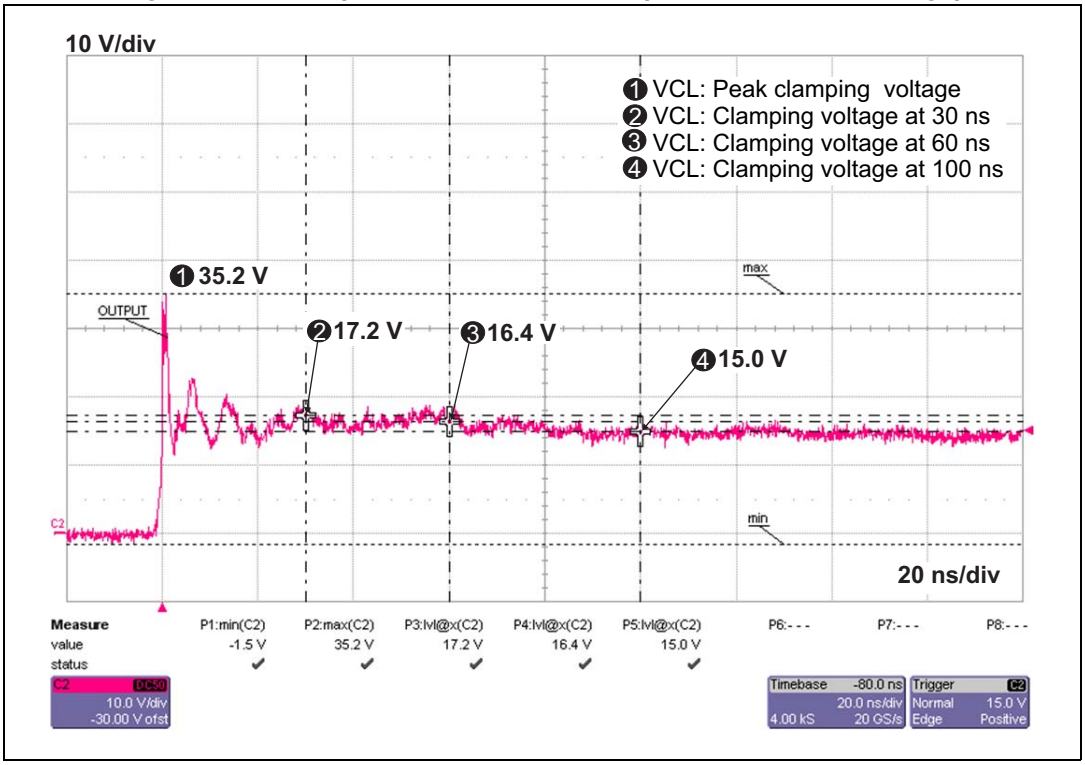
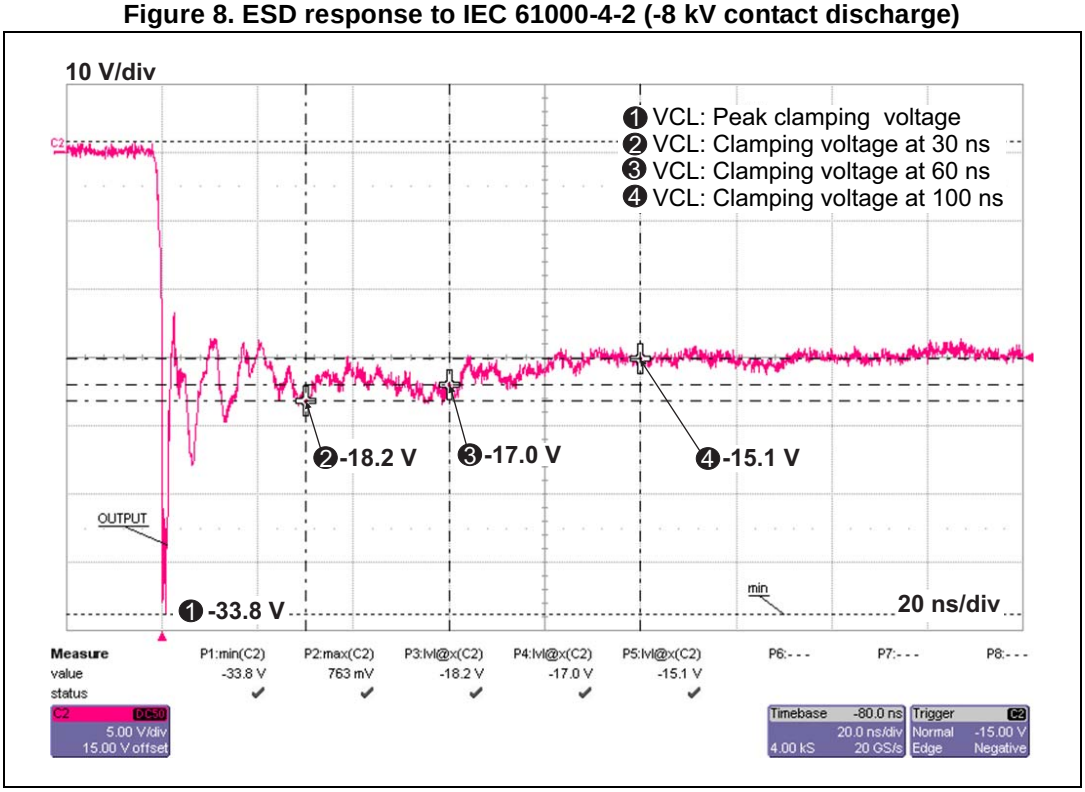


Figure 8. ESD response to IEC 61000-4-2 (-8 kV contact discharge)



2 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.

2.1 0201 package information

Figure 9. 0201 package outline

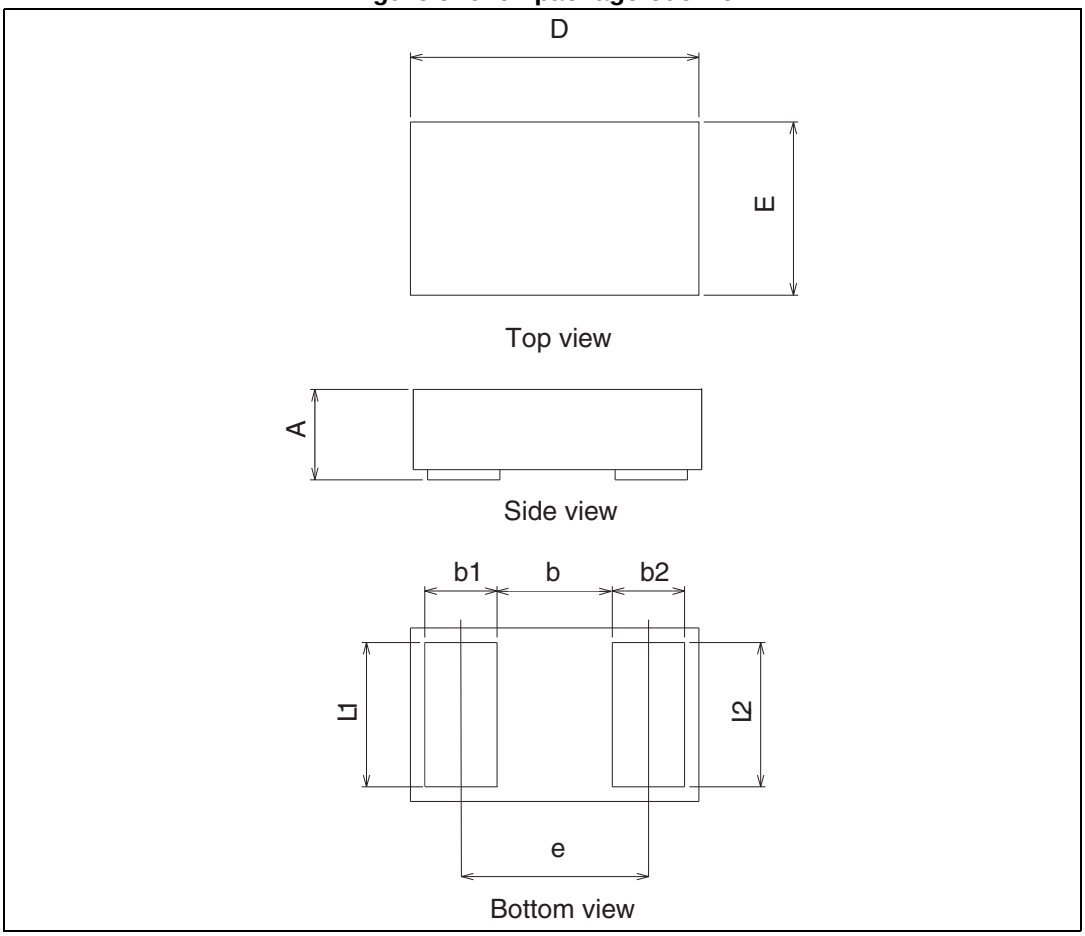


Table 3. 0201 package dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.28	0.30	0.32	0.0110	0.0118	0.0126
b	0.19	0.21	0.23	0.0075	0.0082	0.0091
b1	0.125	0.14	0.155	0.0049	0.0055	0.0061
b2	0.125	0.14	0.155	0.0049	0.0055	0.0061
D	0.57	0.60	0.63	0.0224	0.0236	0.0257
e	0.33	0.35	0.37	0.0130	0.0138	0.0146
E	0.27	0.30	0.33	0.0106	0.0118	0.0130
L1	0.175	0.19	0.205	0.0069	0.0075	0.0081
L2	0.175	0.19	0.205	0.0069	0.0075	0.0081

Figure 10. Footprint in mm (inches)

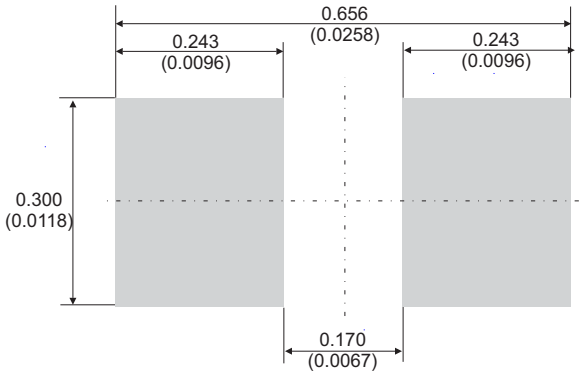
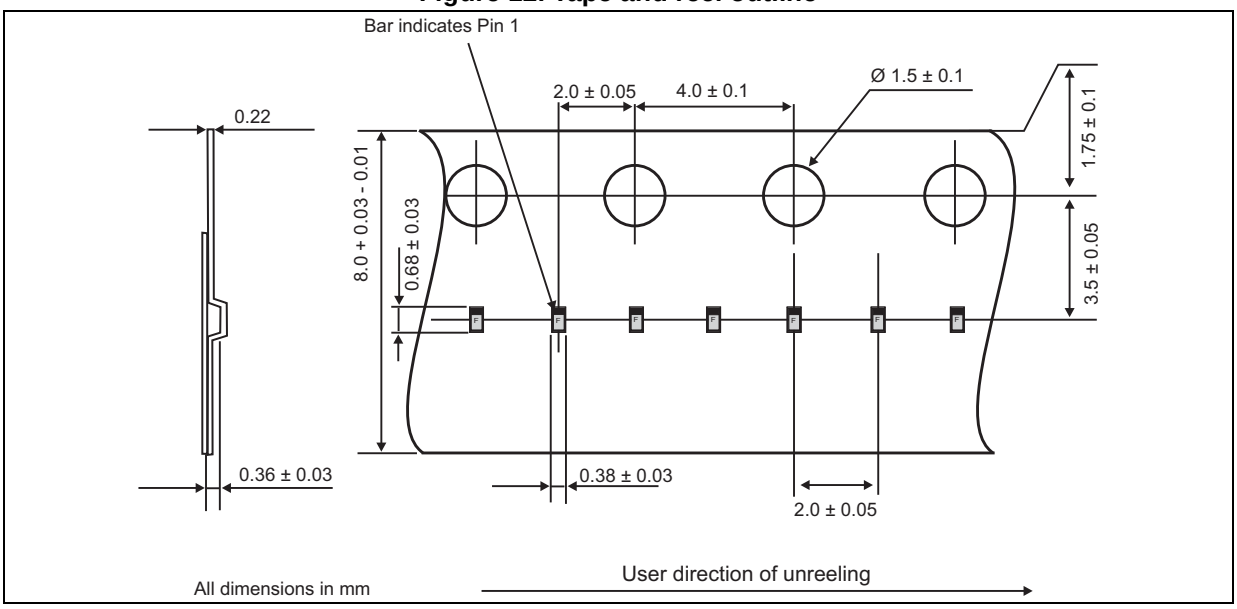


Figure 11. Marking

Note: The marking codes can be rotated by 90° or 180° to differentiate assembly location.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.

2.2 Packing information

Figure 12. Tape and reel outline

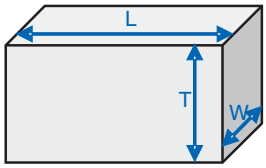


3 Recommendation on PCB assembly

3.1 Stencil opening design

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

Figure 13. Stencil opening dimensions



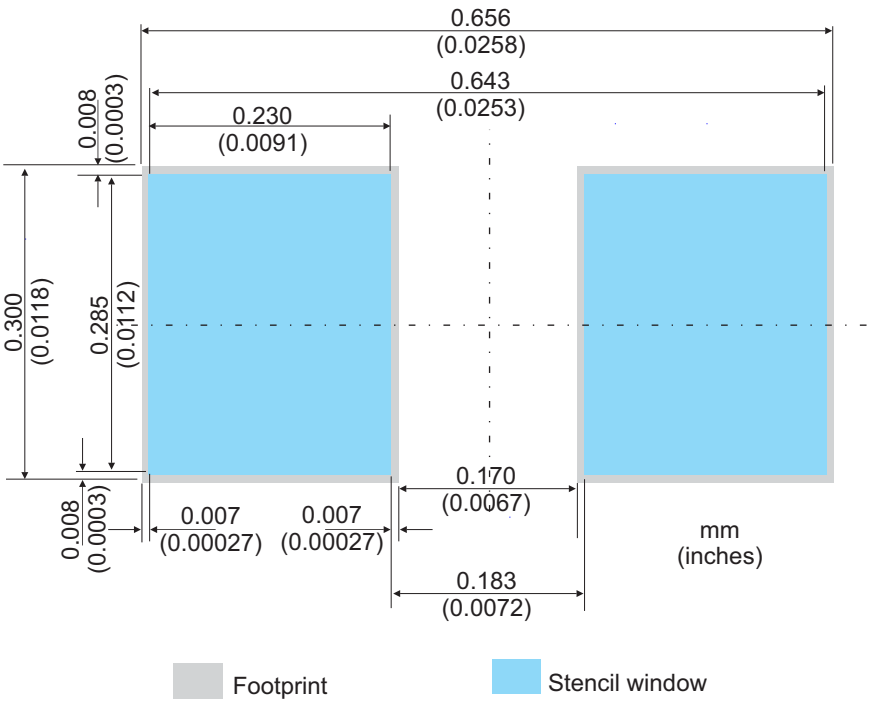
   b) General design rule
   Stencil thickness (T) = 75 ~ 125 µm

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

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

2. Recommended stencil window
   a) Stencil opening thickness: 80 µm
   b) Other dimensions: see *Figure 14*

Figure 14. Recommended stencil window position, stencil opening thickness: 80 µm



3.2 Solder paste

1. Use halide-free flux, qualification ROL0 according to ANSI/J-STD-004.
2. “No clean” solder paste recommended.
3. Offers a high tack force to resist component displacement during PCB movement.
4. Use solder paste with fine particles: Type 4 (powder particle size 20-48 µm per IPC J STD-005).

3.3 Placement

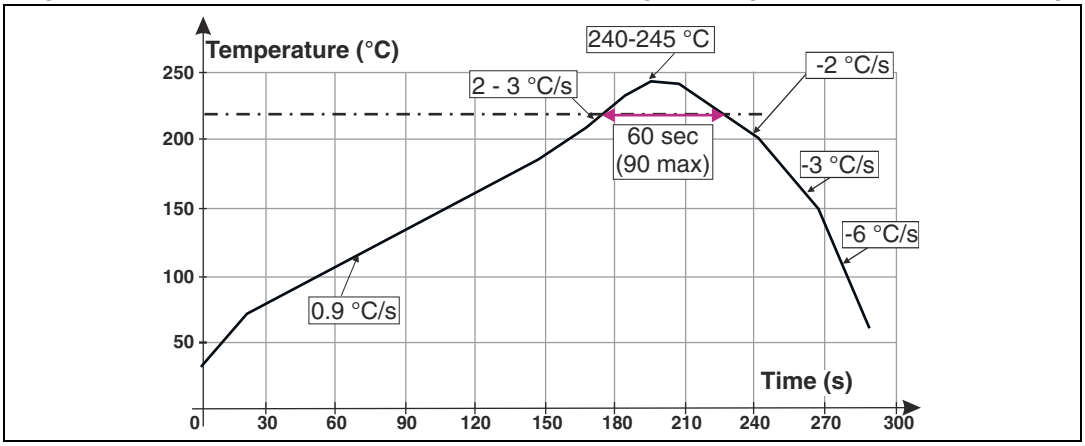
1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering.
3. Standard tolerance of ± 0.05 mm is recommended.
4. 1.0 N placement force is recommended. Too much placement force can lead to squeezed out solder 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.

3.4 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.

3.5 Reflow profile

Figure 15. ST ECOPACK® recommended soldering reflow profile for PCB mounting



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

4 Ordering information

Figure 16. ordering information scheme

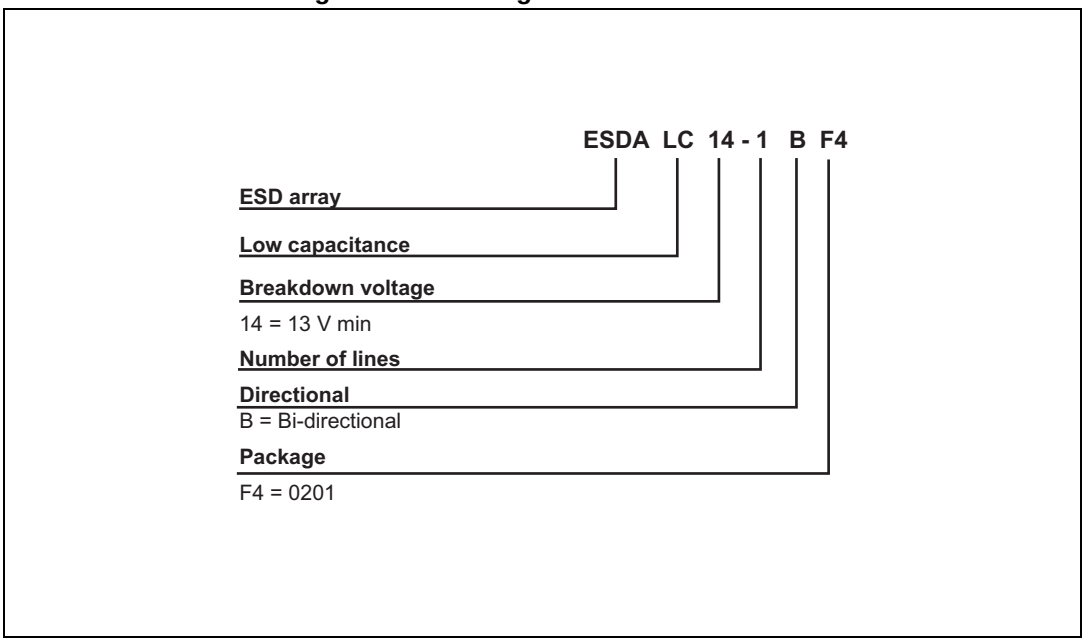


Table 4. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ESDALC14-1BF4	F(1)	0201	0.116 mg	15000	Tape and reel

1. The marking codes can be rotated by 90 °C or 180 °C to differentiate assembly location

5 Revision history

Table 5. Document revision history

Date	Revision	Changes
11-Oct-2013	1	First issue
03-Sep-2015	2	Updated *Table 2*.

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