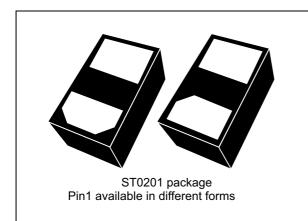
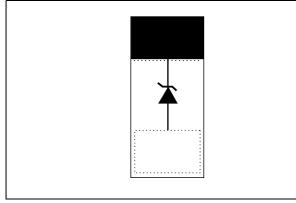


# ESDAXLC5-1U2

# Low clamping, single-line unidirectional ESD protection for high speed interface Datasheet – production data



#### Figure 1. Functional diagram (top view)



### Features

- Unidirectional device
- Low clamping voltage:
  - 10.4 V IEC 61000-4-2, 8 kV contact measured at 30 ns
  - $\,$  13.7 V TLP 16 A  $I_{PP}$
- Very high bandwidth: 11.4 GHz
- 0201 package
- Ultra low PCB area: 0.18 mm<sup>2</sup>
- ECOPACK<sup>®</sup>2 and RoHS compliant component

#### Complies with the following standards:

- IEC 61000-4-2 level 4 (exceed level4)
  - ±30 kV (air discharge)
  - ±16 kV (contact discharge)

# Applications

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

- Smartphones, mobile phone and accessories
- Tablet PCs, netbooks and notebooks
- Portable multimedia devices and accessories
- Digital cameras and camcorders
- · Communication and highly integrated systems

### Description

The ESDAXLC5-1U2 is a unidirectional single line TVS diode designed to protect data lines 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.

This is information on a product in full production.

# 1 Characteristics

Symbol	Parameter	Value	Unit				
V <sub>PP</sub>	Peak pulse voltage: IEC 61000-4-2 contact discharge IEC 61000-4-2 air discharge	±16 ±30	kV				
P <sub>PP</sub>	Peak pulse power (8/20 μs) <sup>(1)</sup>	20	W				
I <sub>PP</sub>	Peak pulse current (8/20 µs) <sup>(1)</sup>	2.2	А				
Тj	Operating junction temperature range	- 55 to +150	°C				
T <sub>stg</sub>	Storage temperature range	- 65 to +150	°C				
ΤL	Maximum lead temperature for soldering during 10 s	260	°C				

Table 1. Absolute	maximum	ratings	$(T_{amb} = 25 ^{\circ}C)$
	maximum	ratings	$\sqrt{amn} = 20$ 0/

1. According to IEC61000-4-5, for a surge greater than the maximum values, the diode will fail in short-circuit.

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

Symb	ol	Parameter	IF	
V <sub>BR</sub>	=	Breakdown voltage	IF T	
$V_{CL}$	=	Clamping voltage		
I <sub>RM</sub>	=	Leakage current @ V <sub>RM</sub>		
$V_{RM}$	=	Stand-off voltage	V <sub>CL</sub> V <sub>BR</sub> V <sub>RM</sub>	¥ <sup>V</sup> F
I <sub>F</sub>	=	Forward current		· • •
I <sub>PP</sub>	=	Peak pulse current	I <sub>R</sub>	•
I <sub>R</sub>	=	Breakdown current		
V <sub>F</sub>	=	Forward voltage drop		
R <sub>d</sub>	=	Dynamic impedance	Slope = 1/R <sub>d</sub>	
αŤ	=	Voltage temperature		

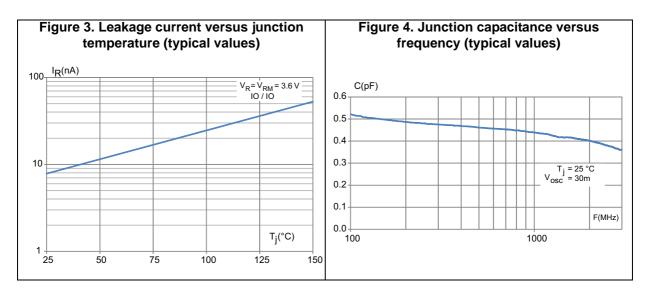


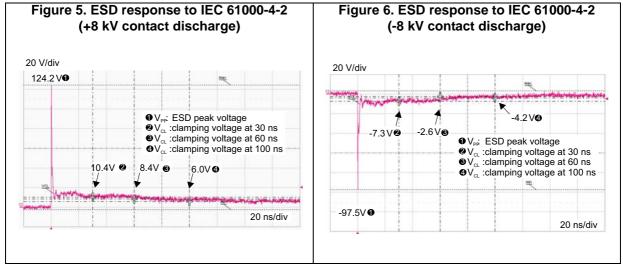
Symbol	Parameter	Test Condition		Min.	Тур.	Max.	Unit
$V_{BR}$	Breakdown voltage	I <sub>R</sub> = 1 mA			6.6		V
V <sub>RM</sub>	Reverse working voltage					3.6	V
I <sub>RM</sub>	Leakage current	V <sub>RM</sub> = 3.6 V			4	100	nA
C <sub>line</sub>	Line capacitance	F = (200 MHz- 3000 MHz	F = (200 MHz- 3000 MHz), V <sub>LINE</sub> = 0 V		0.55	0.7	pF
		I <sub>PP</sub> = 1 A, 8/20 μs			7		V
	Reverse clamping voltage	I <sub>PP</sub> = 2.2 A, 8/20 μs			8		
V <sub>CL</sub>		IEC 61000-4-2, 8 kV contact measured at 30 ns			10.4		
		TLP measurement (pulse duration 100 ns), $I_{PP} = 16 A^{(1)}$			13.7		
R <sub>d</sub>	Dynamic resistance <sup>(1)</sup>	Pulse duration 100 ns <sup>(1)</sup>	Direct		0.39		
			Forward		0.52		Ω
		I <sub>PP</sub> = 1 A, 8/20 μs			2.5		
V <sub>FCL</sub>	Forward clamping voltage	I <sub>PP</sub> = 2.2 A, 8/20 μs			4.0		V
		TLP measurement (pulse duration 100 ns), $I_{PP} = 16 A^{(1)}$			10.4		
$F_{C}$	Cut-off frequency	-3 dB			11.4		GHz

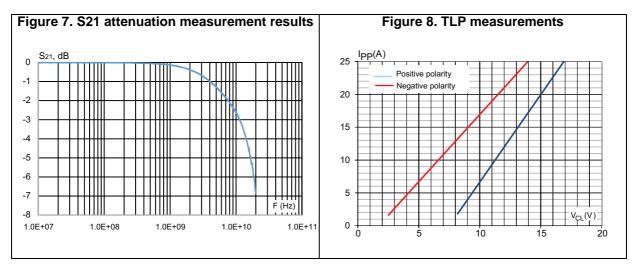
Table 2. Electrical characteristics (values, T<sub>amb</sub> = 25 °C)

1. More information is available in ST application note: AN4022









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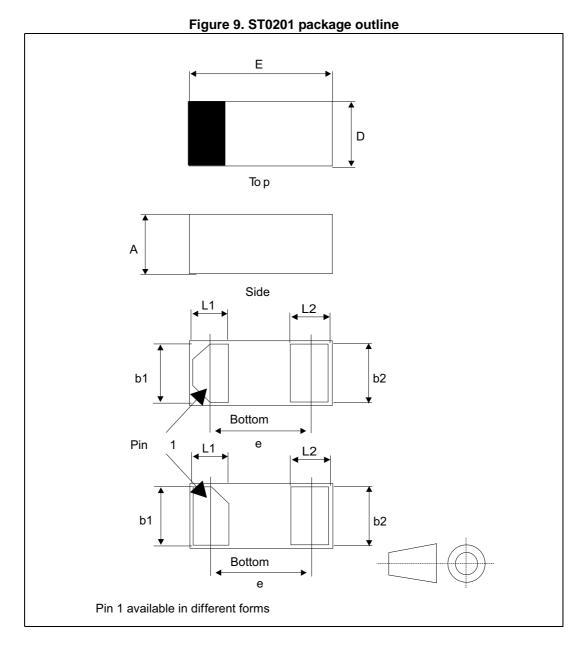


# 2 Package information

- Epoxy meets UL94, V0
- Bar indicates pin 1

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

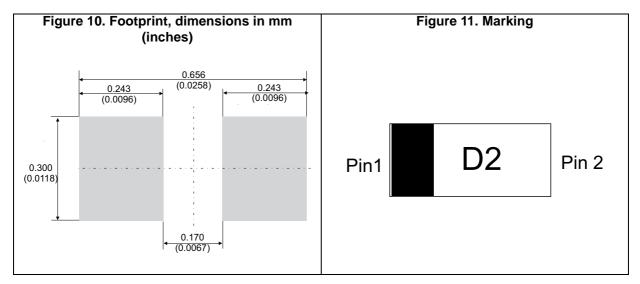
# 2.1 ST0201 package information





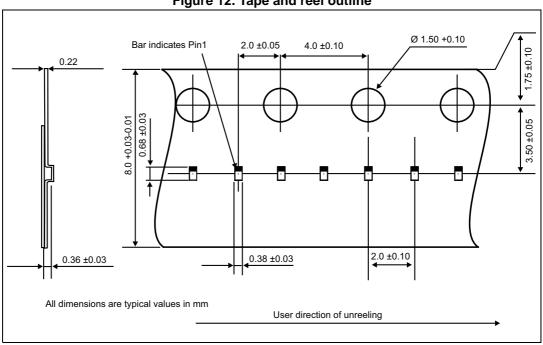
	Dimensions						
Ref.	Millimeters			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
А	0.23	0.28	0.33	0.0091	0.0110	0.0130	
b1	0.20	0.25	0.30	0.0079	0.0098	0.0118	
b2	0.20	0.25	0.30	0.0079	0.0098	0.0118	
D	0.25	0.30	0.35	0.0099	0.0118	0.0138	
Е	0.55	0.60	0.65	0.0217	0.0236	0.0256	
е		0.35			0.0138		
L1	0.13	0.18	0.23	0.0052	0.0071	0.0091	
L2	0.14	0.19	0.24	0.0055	0.0075	0.0095	

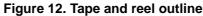




Note: Product marking may be rotated by 180° for assembly plant differentiation. In no case should this product marking be used to orient the component for its placement on a PCB. Only pin 1 mark is to be used for this purpose.







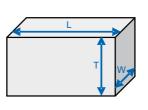


# 3 Recommendation on PCB assembly

### 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

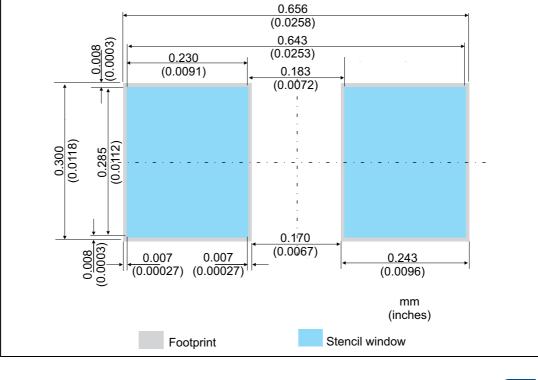
Stencil thickness (T) = 75 ~ 125 µm

Aspect Ratio = 
$$\frac{W}{T} \ge 1.5$$

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

- 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 $\mu m$



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### 3.2 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 displacement during PCB movement.
- 4. Use solder paste with fine particles: Type 4 (powder particle size is 20-45  $\mu$ m).

### 3.3 Placement

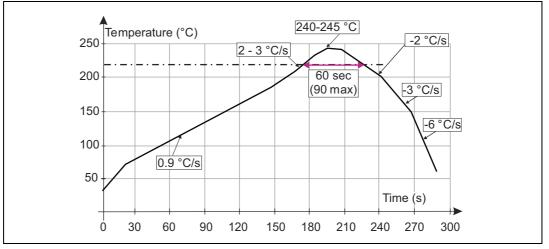
- 1. Manual positioning is not recommended.
- 2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering
- 3. Standard tolerance of ±0.05 mm is recommended.
- 4. 1.0 N placement force is recommended. Too much placement force can lead to squeezed out 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. A symmetrical layout is recommended, to avoid any tilt phenomena caused by asymmetrical solder paste due to 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. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.



# 4 Ordering information

# ESDA XLC 5 - 1 U2 ESD Array Extra low capacitance Breadown voltage 05: 5.5 V Number of lines Package U2 = ST0201

#### Figure 16. Ordering information scheme

#### Table 4. Ordering information

Order code	Marking	Weight	Base qty	Delivery mode
ESDAXLC5-1U2	D2 <sup>(1)</sup>	0.124 mg	15000	Tape and reel

1. The marking can be rotated by 180° to differentiate assembly location

# 5 Revision history

#### Table 5. Document revision history

	Date	Revision	Changes
ĺ	25-Jan-2016	1	Initial release.



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