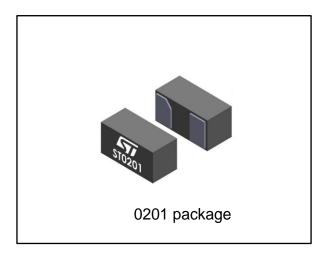
## ESDA5-1F4



# Low clamping single line unidirectional ESD

Datasheet - production data



## **Features**

- Low clamping voltage:
  - -3 V / +9 V (IEC 61000-4-2 contact discharge at 30 ns)
- Unidirectional device
- Low leakage current
- 0201 package
- ECOPACK®2 compliant component

## Complies with the following standards

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

## **Applications**

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

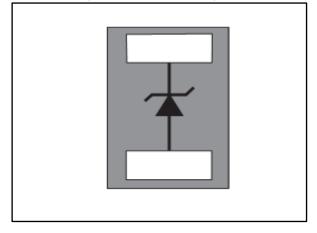
- Smartphones, mobile phones and accessories
- Tablet, PC, netbooks and notebooks
- Portable multimedia devices and accessories
- Digital cameras and camcorders
- Communication and highly integrated systems

## **Description**

The ESDA5-1F4 is a unidirectional 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



Characteristics ESDA5-1F4

# 1 Characteristics

Table 1: Absolute maximum ratings (T<sub>amb</sub> = 25 °C)

Symbol	Pa	Value	Unit		
	Peak pulse voltage	IEC61000-4-2 contact discharge	±30	1.)/	
$V_{pp}$		IEC61000-4-2 air discharge	±30	kV	
Ppp	Peak pulse power (8/20µs)	110	W		
I <sub>pp</sub>	Peak pulse current (8/20µs)	11	Α		
Tj	Operating junction temperate	-55 to +150			
T <sub>stg</sub>	Storage junction temperature	-65 to +150	°C		
T∟	Maximum lead temperature	260			

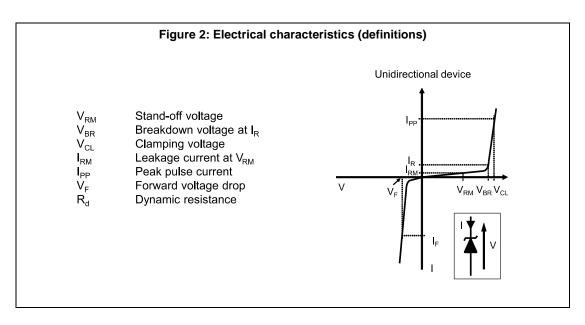


Table 2: Electrical characteristics (T<sub>amb</sub> = 25 °C)

Symbol	Parameter	Test condition	Min.	Тур.	Max.	Unit
V <sub>BR</sub>	Breakdown voltage	I <sub>R</sub> = 1 mA	5.8			٧
$V_{RM}$	Reverse working voltage				5.5	V
I <sub>RM</sub>	Leakage current	V <sub>RM</sub> = 5.5 V			100	nΑ
VcL	Clamping voltage	IEC 61000-4-2, +8 kV contact measured at 30 ns		9.0		>
VCL	Clamping voltage	IEC 61000-4-2, -8 kV contact measured at 30 ns		-3.0		>
В	Dynamic resistance, pulse duration 100 ns <sup>(1)</sup>	Direct		0.17		Ω
R <sub>d</sub>		Forward		0.14		12
CLINE	Line capacitance	$V_{LINE} = 0 \text{ V, F} = 1 \text{ MHz,}$ $V_{OSC} = 30 \text{ mV}$		110		pF

## Notes:

<sup>&</sup>lt;sup>(1)</sup>More information are available in ST application note: AN4022

ESDA5-1F4 Characteristics

# 1.1 Characteristics (curves)

Figure 3: Variation of leakage current versus

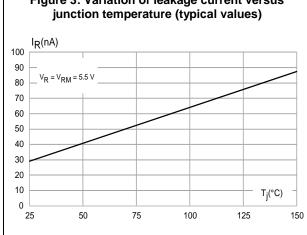


Figure 4: Junction capacitance versus frequency (typical values)

C (pF)

C (pF)

Vosc = 30 mV

VR(V)

VR(V)

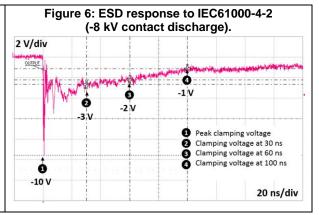
VR(V)

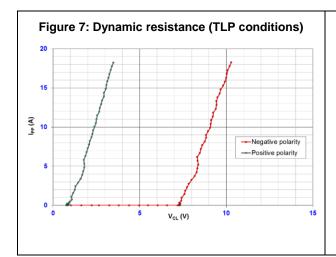
Figure 5: ESD response to IEC61000-4-2
(+8 kV contact discharge)

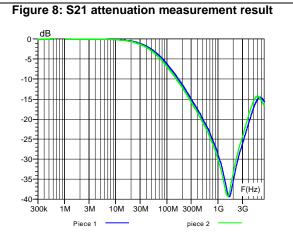
5 V/div

Peak clamping voltage
Clamping voltage at 30 ns
Clamping voltage at 60 ns
Clamping voltage at 100 ns
16 V

9 V
9 V
9 V
8 V
20 ns/div







Package information ESDA5-1F4

### 2 **Package information**

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.

### 0201 package information 2.1

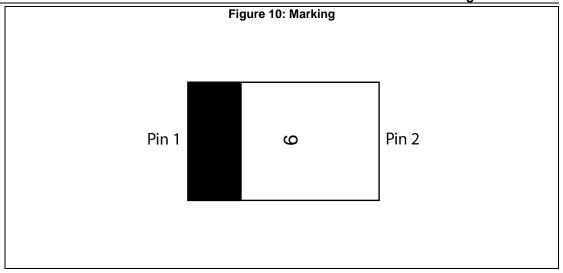
Ε Тор Side D1 ‡fE **Bottom** 

Figure 9: 0201 package outline

Table 3: 0201 package mechanical data

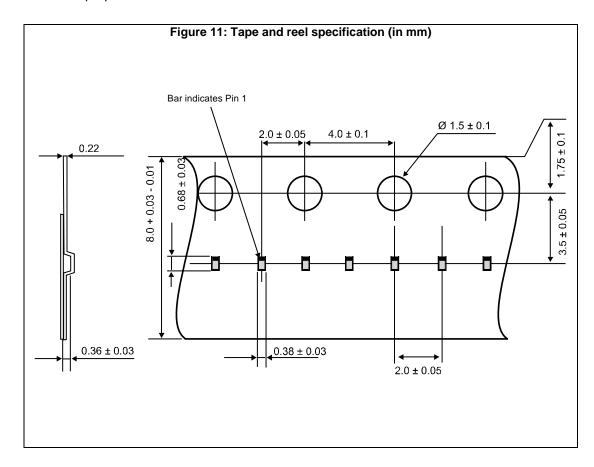
	Dimensions					
Ref.	ef. Millimeters			Inches		
	Min.	Тур.	Max.	Min.	Тур.	Max.
А	0.280	0.300	0.320	0.011	0.0118	0.0126
b	0.125	0.140	0.155	0.0049	0.0055	0.0061
D	0.570	0.600	0.630	0.0224	0.0236	0.0248
D1		0.350			0.0138	
Е	0.270	0.300	0.330	0.0106	0.0118	0.0130
E1	0.175	0.190	0.205	0.0069	0.0075	0.0081
fD	0.110	0.125	0.140	0.0043	0.0049	0.0055
fE	0.040	0.055	0.070	0.0016	0.0022	0.0028

ESDA5-1F4 Package information



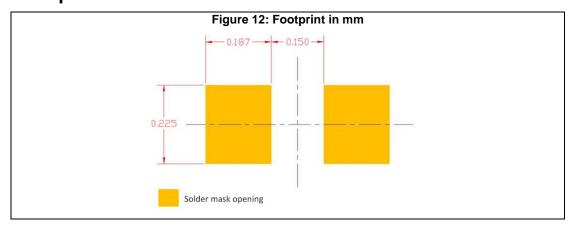


Product marking may be rotated by multiples of 90° for assembly plant differentiation. In no case should this product marking be used to orient the component for its placement on a PCB. Only pin 1 mark is to be used for this purpose.



# 3 Recommendation on PCB assembly

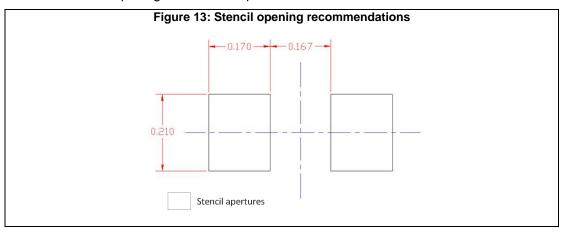
## 3.1 Footprint



1. SMD footprint design is recommended.

## 3.2 Stencil opening design

- 1. Recommended design reference
  - a. Stencil opening thickness: 75 µm / 3 mils



## 3.3 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 20-38 μm.

#### 3.4 **Placement**

- 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.
- 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.
- To improve the package placement accuracy, a bottom side optical control should be 5. 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.

### 3.5 PCB design preference

- To control the solder paste amount, the closed via is recommended instead of open
- 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.

### 3.6 Reflow profile

240-245 °C . Temperature (°C) -2 °C/s 2 - 3 °C/s 200 60 sec (90 max) -3 °C/s 150 -6 °C/s 100 0.9 °C/s 50 Time (s) 30 60 120 150 180 210 240 270 300 90

Figure 14: ST ECOPACK® recommended soldering reflow profile for PCB mounting

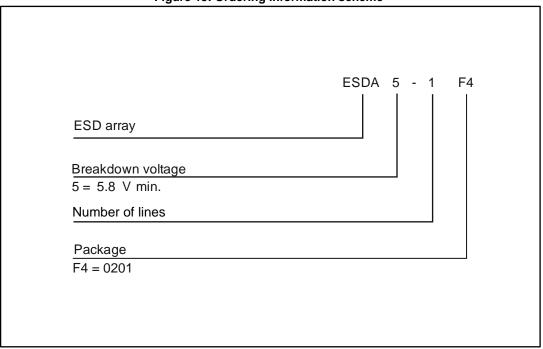


Minimize air convection currents in the reflow oven to avoid component movement. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.

Ordering information ESDA5-1F4

# 4 Ordering information

Figure 15: Ordering information scheme



**Table 4: Ordering information** 

Order code	Marking	Package	Weight	Base qty.	Delivery mode
ESDA5-1F4	6	ST0201	0.116 mg	15000	Tape and reel

# 5 Revision history

**Table 5: Document revision history** 

Date		Revision	Changes
	02-May-2017	1	Initial release.

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