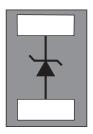


Low clamping single line unidirectional ESD



ST0201 package



Product status link

ESD051-1F4

Features

- · Low clamping voltage:
 - -3 V / +9 V (IEC 61000-4-2 contact discharge at 30 ns)
- · Unidirectional diode
- Low leakage current
- ST0201 package
- Complies with the following standards: IEC 61000-4-2 level 4 (exceeds level 4)
 - ±30 kV (air discharge)
 - ±30 kV (contact discharge)

Application

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 ESD051-1F4 is a unidirectional single line TVS diode designed to protect the power line against EOS and ESD transients.

The device is ideal for applications where board space saving is required.



1 Characteristics

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

| Symbol | | Value | Unit | |
|------------------|--------------------------------------|---------------------------------|------------|----|
| V | Dook pulse veltage | IEC 61000-4-2 contact discharge | ±30 | kV |
| V _{pp} | Peak pulse voltage | IEC 61000-4-2 air discharge | ±30 | KV |
| P _{pp} | Peak pulse power (8/20 μs) | | 110 | W |
| I _{pp} | Peak pulse current (8/20 µs) | | 11 | Α |
| T _{op} | Operating junction temperature range | | -55 to 150 | |
| T _{stg} | Storage junction temperature range | | -65 to 150 | °C |
| TL | Maximum lead temperatu | 260 | | |

Figure 1. Electrical characteristics (definitions)

 $\begin{array}{lll} V_{RM} & Stand\text{-off voltage} \\ V_{BR} & Breakdown voltage \text{ at } I_R \\ V_{CL} & Clamping \text{ voltage} \\ I_{RM} & Leakage \text{ current at } V_{RM} \\ I_{PP} & Peak \text{ pulse current} \\ V_F & Forward \text{ voltage drop} \\ R_d & Dynamic \text{ resistance} \end{array}$

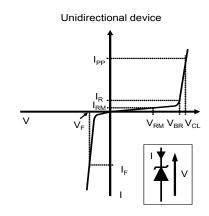


Table 2. Electrical characteristics (values) (T_{amb} = 25° C)

| Symbol | Parameter | Test condition | Min. | Тур. | Max. | Unit |
|-------------------|---------------------------|---|------|------|------|------|
| V _{RM} | Reverse working voltage | | | | 5.5 | V |
| V _{BR} | Breakdown voltage | I _R = 1 mA | 5.8 | | | V |
| I _{RM} | Leakage current | V _{RM} = 5.5 V | | | 100 | nA |
| V _{CL} | Clamping voltage | IEC 61000-4-2, +8 kV contact measured at 30 ns IEC 61000-4-2, -8 kV contact measured at 30 ns | | 9.0 | | V |
| | Dynamic resistance, pulse | Direct | | 0.17 | | Ω |
| R _D | duration 100 ns | Forward | | 0.14 | | Ω |
| C _{LINE} | Line capacitance | V _{LINE} = 0 V, F = 1 MHz, V _{OSC} = 30 mV | | 110 | | pF |

^{1.} More information are available in ST application note: AN4022

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40

30 20

10

0 _ 25

50

1.1 Characteristics (curves)

Figure 2. Variation of leakage current versus junction temperature

I_R(nA)

100
90
80
V_R=V_{RM}= 5.5 V

75

100

T_i(°C)

150

125

C (pF)

140

120

100

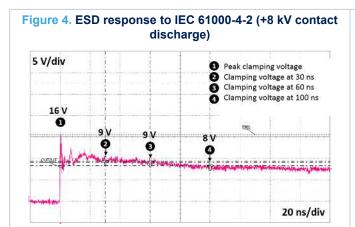
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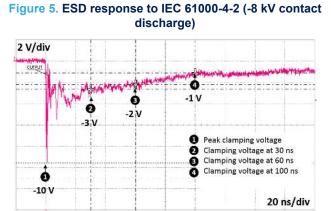
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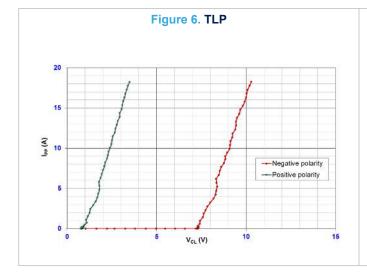
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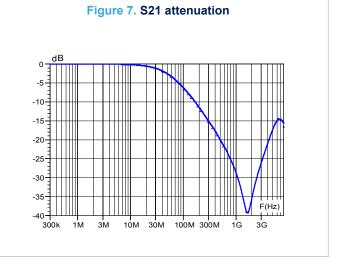
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0 1 2 3 4 5









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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.

ST0201 package information 2.1

Figure 8. ST0201 package outline

Side D1 Bottom

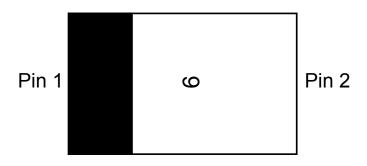
Table 3. ST0201 package mechanical data

| | | Dimensions | | | | | | |
|------|-------------|------------|-------|--------|--------|--------|--|--|
| Ref. | Millimeters | | | | Inches | hes | | |
| | 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 | 0.560 | 0.580 | 0.600 | 0.0220 | 0.0228 | 0.0236 | | |
| D1 | | 0.350 | | | 0.0138 | | | |
| E | 0.260 | 0.280 | 0.300 | 0.0102 | 0.0110 | 0.0119 | | |
| E1 | 0.175 | 0.190 | 0.205 | 0.0069 | 0.0075 | 0.0081 | | |
| fD | 0.030 | 0.045 | 0.060 | 0.0011 | 0.0017 | 0.0024 | | |
| fE | 0.030 | 0.045 | 0.060 | 0.0011 | 0.0017 | 0.0024 | | |

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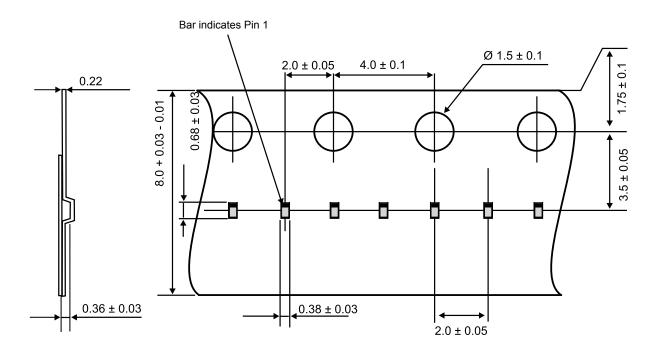


Figure 9. Marking



Note: Marking can be rotated by 90° or 180° to differentiate assembly location.

Figure 10. Tape and reel specification

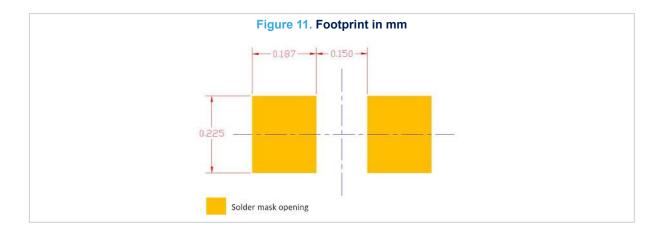


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3 Recommendation on PCB assembly

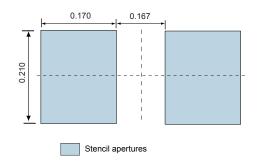
3.1 Footprint



3.2 Stencil opening design

- 1. Recommended design reference
 - a. Stencil opening dimensions: 75 μm

Figure 12. Stencil opening recommendations



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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. Use solder paste with fine particles: powder particle size 20-38 μm.

3.4 Placement

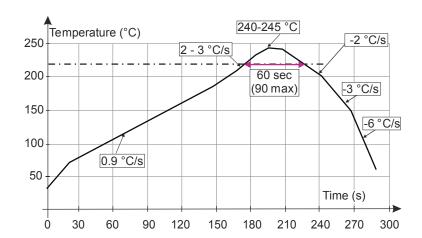
- 1. Manual positioning is not recommended.
- 2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering
- 3. Standard tolerance of ±0.05 mm is recommended.
- 4. 1.0 N placement force is recommended. Too much placement force can lead to squeezed out 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.
- To improve the package placement accuracy, a bottom side optical control should be performed with a high resolution tool.
- 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

- 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.

3.6 Reflow profile

Figure 13. 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.

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4 Ordering information

Figure 14. Ordering information scheme

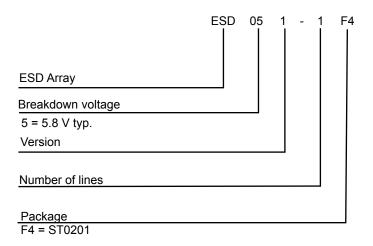


Table 4. Ordering information

| Order code | Marking | Weight | Base qty. | Delivery mode |
|------------|---------|---------|-----------|---------------|
| ESD051-1F4 | 6 | 0.12 mg | 15000 | Tape and reel |

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Revision history

Table 5. Document revision history

| Date | Revision | Changes | |
|-------------|----------|--|--|
| 11-Jun-2018 | 1 | First issue. | |
| 02-Jul-2018 | 2 | Updated Table 3. ST0201 package mechanical data. | |

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