TVS Diodes
Transient Voltage Suppressor Diodes

ESD5V0S1U-02V
Uni-directional ESD / Transient Protection Diode

Data Sheet
Revision 1.1, 2012-05-31
Final
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Revision History: Rev. 1.0, 2011-02-21

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<td>Table 3 updated</td>
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1 Uni-directional ESD / Transient Protection Diode

1.1 Features

• ESD / transient protection according to:
  – IEC61000-4-2 (ESD): ±25 kV (air) 20 kV (contact)
  – IEC61000-4-4 (EFT): 50 A / 2.5 kV (5/50 ns)
  – IEC61000-4-5 (surge): 5.5 A / 66 W (8/20 μs)
• Uni-directional, working voltage: $V_{RWM} = 5 \text{ V}$
• Ultra low clamping voltage, protects against both positive and negative ESD strikes
• Ultra low dynamic resistance: $R_{DYN}$ down to 0.2 $\Omega$
• Very fast response time
• Pb-free (RoHS compliant) and halogen free package

1.2 Application Examples

• Notebooks, computers and consumer electronics
• Industrial applications, white goods, portable instrumentation
• Mobile communication

2 Product Description

Table 1 Ordering information

<table>
<thead>
<tr>
<th>Type</th>
<th>Package</th>
<th>Configuration</th>
<th>Marking code</th>
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<tr>
<td>ESD5V0S1U-02V</td>
<td>SC79</td>
<td>1 line, uni-directional</td>
<td>U</td>
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Figure 1 Pin configuration and schematic diagram
3 Characteristics

Table 2  Maximum Rating at $T_A = 25 \, ^\circ C$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
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<tr>
<td></td>
<td></td>
<td>Min.</td>
<td>Typ.</td>
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<tr>
<td>ESD air discharge$^1$</td>
<td>$V_{ESD}$</td>
<td>-25</td>
<td>–</td>
</tr>
<tr>
<td>ESD contact discharge$^1$</td>
<td>$V_{ESD}$</td>
<td>-20</td>
<td>–</td>
</tr>
<tr>
<td>Peak pulse current ($t_p = 8/20 , \mu s$)$^2$</td>
<td>$I_{PP}$</td>
<td>-5.5</td>
<td>–</td>
</tr>
<tr>
<td>Peak pulse power ($t_p = 8/20 , \mu s$)$^2$</td>
<td>$P_{pk}$</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>$T_{OP}$</td>
<td>-55</td>
<td>–</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td>-65</td>
<td>–</td>
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</tbody>
</table>

1) $V_{ESD}$ according to IEC61000-4-2
2) $I_{pp}$ according to IEC61000-4-5

3.1 Electrical Characteristics at $T_A = 25 \, ^\circ C$, unless otherwise specified

![Diode_Characteristic_Curve_Uni-directional.vsd](image-url)

Figure 2  Definitions of electrical characteristics

Table 3  DC characteristics at $T_A = 25 \, ^\circ C$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note / Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse working voltage</td>
<td>$V_{RWM}$</td>
<td>–</td>
<td>–</td>
<td>5</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>$V_{BR}$</td>
<td>5.7</td>
<td>6.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Reverse current</td>
<td>$I_R$</td>
<td>–</td>
<td>–</td>
<td>0.1</td>
</tr>
</tbody>
</table>
### Characteristics

#### Table 4  RF characteristics at $T_A = 25 \, ^\circ\text{C}$, unless otherwise specified

<table>
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<th>Values</th>
<th>Unit</th>
<th>Note / Test Condition</th>
</tr>
</thead>
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<td>Diode capacitance</td>
<td>$C_L$</td>
<td>–</td>
<td>35</td>
<td>40 pF $V_R = 0 , \text{V}, f = 1 , \text{MHz}$</td>
</tr>
<tr>
<td>Diode capacitance</td>
<td>$C_L$</td>
<td>–</td>
<td>20</td>
<td>– pF $V_R = 2.5 , \text{V}, f = 1 , \text{MHz}$</td>
</tr>
</tbody>
</table>

#### Table 5  ESD characteristics at $T_A = 25 \, ^\circ\text{C}$, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
<th>Unit</th>
<th>Note / Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clamping voltage</td>
<td>$V_{CL}$</td>
<td>–</td>
<td>7.6</td>
<td>– V $I_{pp} = 5 , \text{A}, t_p = 30 , \text{ns}, \text{pin } 1-2$</td>
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<tr>
<td>Clamping voltage</td>
<td>$V_{CL}$</td>
<td>–</td>
<td>10.5</td>
<td>– V $I_{pp} = 16 , \text{A}, t_p = 30 , \text{ns}, \text{pin } 1-2$</td>
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<tr>
<td>Clamping voltage</td>
<td>$V_{CL}$</td>
<td>–</td>
<td>14.5</td>
<td>– V $I_{pp} = 30 , \text{A}, t_p = 30 , \text{ns}, \text{pin } 1-2$</td>
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<tr>
<td>Forward clamping</td>
<td>$V_{FC}$</td>
<td>–</td>
<td>2</td>
<td>– V $I_{pp} = 5 , \text{A}, t_p = 30 , \text{ns}, \text{pin } 2-1$</td>
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<tr>
<td>Forward clamping</td>
<td>$V_{FC}$</td>
<td>–</td>
<td>4.3</td>
<td>– V $I_{pp} = 16 , \text{A}, t_p = 30 , \text{ns}, \text{pin } 2-1$</td>
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<td>Forward clamping</td>
<td>$V_{FC}$</td>
<td>–</td>
<td>7.3</td>
<td>– V $I_{pp} = 30 , \text{A}, t_p = 30 , \text{ns}, \text{pin } 2-1$</td>
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<tr>
<td>Dynamic resistance</td>
<td>$R_{DYN}$</td>
<td>–</td>
<td>0.2</td>
<td>– $\Omega$ $f_p = 30 , \text{ns}, \text{pin } 1-2$</td>
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<tr>
<td>Dynamic resistance</td>
<td>$R_{DYN}$</td>
<td>–</td>
<td>0.3</td>
<td>– $\Omega$ $f_p = 30 , \text{ns}, \text{pin } 1-2$</td>
</tr>
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</table>

1)According TLP tests. Please refer to Application Note AN-210 [1]
3.2 Typical Performance characteristics at $T_A = 25 \, ^\circ\text{C}$, unless otherwise specified

**Figure 3** Capacitance characteristics: $C_L = f(V_R)$ - $f = 1 \, \text{MHz}$

**Figure 4** Reverse characteristics: $I_R = f(T_A)$ - $V_R = 3.3 \, \text{V}$
Figure 5  Forward TLP characteristics (Pin 2 to 1)

Figure 6  Reverse TLP characteristics (Pin 1 to 2)
The protection diode should be placed very close to the location where the ESD can occur to keep loops and inductances as small as possible.
5 Ordering information scheme (examples)

Figure 8 Ordering Information Scheme

ESD 0P1 RF - XX YY

- **Package**
  - XX = Pin number (i.e.: 02 = 2 pins; 03 = 3 pins)
  - YY = Package family:
    - LS = TSSLP
    - LRH = TSLP

- For **Radio Frequency** Applications

- **Line Capacitance** $C_L$ in pF: (i.e.: 0P1 = 0.1pF)

ESD 5V3 Un U - XX YY

- **Package or Application**
  - XX = Pin number (i.e.: 02 = 2 pins; 03 = 3 pins)
  - YY = Package family:
    - LS = TSSLP
    - LRH = TSLP
    - S = SOT363
    - U = SC74

- XX = Application family:
  - LC = Low Clamp
  - HDMI

- **Uni- / Bi-directional or Rail to Rail protection**

- **Number of protected lines** (i.e.: 1 = 1 line; 4 = 4 lines)

- **Capacitance**: Standard (>10pF), Low (<10pF), Ultra-low (<1pF)

- **Maximum working voltage** $V_{RWM}$ in V: (i.e.: 5V3 = 5.3V)
6 Package Information

6.1 SC79 Package

**Figure 9** SC79: Package outline (dimension in mm)

**Figure 10** SC79: Footprint (dimension in mm)

**Figure 11** SC79: Packing (dimension in mm)

**Figure 12** SC79: Marking (example)
## 7 Date Code Marking for SC79

### one digit (SCD80, SC79, SC75) CES-Code

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*Figure 13* Date Code marking for SC79 packages
References

Terminology

CES  Character Encoding Scheme
CL   Line capacitance
EFT  Electrical Fast Transient
ESD  Electrostatic Discharge
I_{pp}  Peak pulse current
I_{R}  Reverse current
RoHs Restriction of Hazardous Substance Directive
T_{A}  Ambient Temperature
T_{OP} Operation temperature
T_{p}  Pulse duration
T_{stg} Storage temperature
V_{CL} Reverse clamping voltage
V_{ESD} Electrostatic discharge voltage
V_{FC} Forward Clamping Voltage
V_{R}  Reverse voltage
V_{RWM} Reverse working voltage maximum
V_{BR} Breakdown voltage
R_{DYN} Dynamic resistance