1. General description

Unidirectional Transient Voltage Suppressor (TVS) in a very small leadless DSN1608-2 (SOD964) package.

2. Features and benefits

- Average measured peak pulse current: $I_{PPM} = 43.5$ A (8/20 µs pulse)
- Rated peak pulse current: $I_{PPM} = 37$ A (8/20 µs pulse)
- Rated peak pulse power: $P_{PPM} = 200$ W (10/1000 µs pulse)
- Dynamic resistance $R_{dyn} = 0.17$ Ω
- Very low package height: 0.29 mm

3. Applications

- Power supply protection
- Power management
- Industrial application

4. Quick reference data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{PPM}$</td>
<td>rated peak pulse current</td>
<td>$t_p = 8/20$ µs</td>
<td>[1] [2]</td>
<td>-</td>
<td>-</td>
<td>37 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$t_p = 10/1000$ µs</td>
<td>[3] [2]</td>
<td>-</td>
<td>-</td>
<td>5.3 A</td>
</tr>
<tr>
<td>$V_{RWM}$</td>
<td>reverse standoff voltage</td>
<td>$T_{amb} = 25$ °C</td>
<td>-</td>
<td>-</td>
<td>22</td>
<td>V</td>
</tr>
</tbody>
</table>

[1] In accordance with IEC 61000-4-5 (8/20 µs current waveform).
5. Pinning information

Table 2. Pinning information

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>K</td>
<td>cathode</td>
<td></td>
<td>1[2] - 2</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td>1[2] sym035</td>
<td></td>
</tr>
</tbody>
</table>

6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTVS22VZ1USK</td>
<td>DSN1608-2</td>
<td>leadless very small package; 2 terminals; body 1.6 x 0.8 x 0.29 mm</td>
<td>SOD964</td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTVS22VZ1USK</td>
<td>Y2</td>
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</table>

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_{PPM}</td>
<td>rated peak pulse power</td>
<td>( t_p = 8/20 , \mu \text{s} )</td>
<td>[1]</td>
<td>-</td>
<td>1900 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( t_p = 10/1000 , \mu \text{s} )</td>
<td>[2]</td>
<td>-</td>
<td>200 W</td>
</tr>
<tr>
<td>I_{PPM}</td>
<td>rated peak pulse current</td>
<td>( t_p = 8/20 , \mu \text{s} )</td>
<td>[1]</td>
<td>37</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( t_p = 10/1000 , \mu \text{s} )</td>
<td>[2]</td>
<td>-</td>
<td>5.3 A</td>
</tr>
<tr>
<td>T_j</td>
<td>junction temperature</td>
<td>-</td>
<td>-</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{amb}</td>
<td>ambient temperature</td>
<td>-40</td>
<td>-</td>
<td>125</td>
<td>°C</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td>-65</td>
<td>-</td>
<td>150</td>
<td>°C</td>
</tr>
</tbody>
</table>

**ESD maximum ratings**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>IEC Standard</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{ESD}</td>
<td>electrostatic discharge voltage</td>
<td>IEC 61000-4-2; contact discharge</td>
<td>[4]</td>
<td>30</td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2; air discharge</td>
<td>[4]</td>
<td>30</td>
<td>kV</td>
</tr>
</tbody>
</table>

[1] In accordance with IEC 61000-4-5 (8/20 µs current waveform).
Device stressed with ten non-repetitive ESD pulses.

Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5

Fig. 2. 10/1000 µs pulse waveform according to IEC 61643-321

Fig. 3. ESD pulse waveform according to IEC 61000-4-2
9. Characteristics

Table 6. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{\text{RWM}}$</td>
<td>reverse standoff voltage</td>
<td>$T_{\text{amb}} = 25 , ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>22</td>
<td>V</td>
</tr>
<tr>
<td>$V_{\text{BR}}$</td>
<td>breakdown voltage</td>
<td>$I_R = 10 , \text{mA}; \ T_{\text{amb}} = 25 , ^\circ \text{C}$</td>
<td>[1]</td>
<td>24.4</td>
<td>25.7</td>
<td>26.9</td>
</tr>
<tr>
<td>$I_{\text{RM}}$</td>
<td>reverse leakage current</td>
<td>$V_R = 22 , \text{V}; \ T_{\text{amb}} = 25 , ^\circ \text{C}$</td>
<td>[1]</td>
<td>-</td>
<td>0.1</td>
<td>200</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 , \text{MHz}; \ V_R = 0 , \text{V}; \ T_{\text{amb}} = 25 , ^\circ \text{C}$</td>
<td>-</td>
<td>247</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{\text{CL}}$</td>
<td>clamping voltage</td>
<td>$I_{\text{PPM}} = 37 , \text{A}; \ t_p = 8/20 , \mu\text{s}; \ T_{\text{amb}} = 25 , ^\circ \text{C}$</td>
<td>[2]</td>
<td>[1]</td>
<td>43.5</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{\text{PPM}} = 5.3 , \text{A}; \ t_p = 10/1000 , \mu\text{s}; \ T_{\text{amb}} = 25 , ^\circ \text{C}$</td>
<td>[3]</td>
<td>[1]</td>
<td>33</td>
<td>39.5</td>
</tr>
<tr>
<td>$R_{\text{dyn}}$</td>
<td>dynamic resistance</td>
<td>$I_R = 10 , \text{A}; \ T_{\text{amb}} = 25 , ^\circ \text{C}$</td>
<td>[4]</td>
<td>-</td>
<td>0.17</td>
<td>-</td>
</tr>
</tbody>
</table>

[2] In accordance with IEC 61000-4-5 (8/20 µs current waveform).
[4] Non-repetitive current pulse, Transmission Line Pulse (TLP) $t_p = 100 \, \text{ns}$; square pulse; ANSI / ESD STM5.5.1-2008.

Fig. 4. V-I characteristics for a unidirectional TVS protection diode

Fig. 5. Dynamic resistance with positive clamping voltage

$t_p = 100 \, \text{ns}$; Transmission Line Pulse (TLP)
**Transient voltage suppressor in DSN1608-2 for mobile applications**

---

**Fig. 6.** Dynamic resistance with negative clamping voltage

\[
\begin{align*}
V_{CL} & \quad I_{pp} \\
0 & \quad 0 \\
-8 & \quad -20 \\
-16 & \quad -40 \\
-24 & \quad -60 \\
-32 & \quad -80 \\
\end{align*}
\]

\[R_{dyn} = 0.07 \, \Omega\]

\[t_p = 100 \, \text{ns}; \text{ Transmission Line Pulse (TLP)}\]

---

**Fig. 7.** Positive clamping voltage (8/20 \(\mu\)s pulse); typical values

\[
\begin{align*}
V_{CL} & \quad I_{pp} \\
0 & \quad 0 \\
40 & \quad 20 \\
30 & \quad 10 \\
20 & \quad 5 \\
10 & \quad 2 \\
0 & \quad 1 \\
\end{align*}
\]

\[t_p = 8/20 \, \mu\text{s}; \text{ according to IEC 61000-4-5}\]

---

**Fig. 8.** Negative clamping voltage (8/20 \(\mu\)s pulse); typical values

\[
\begin{align*}
V_{CL} & \quad I_{pp} \\
-14 & \quad 0 \\
-12 & \quad 10 \\
-10 & \quad 20 \\
-8 & \quad 30 \\
-6 & \quad 40 \\
-4 & \quad 50 \\
-2 & \quad 60 \\
0 & \quad 70 \\
\end{align*}
\]

\[t_p = 8/20 \, \mu\text{s}; \text{ according to IEC 61000-4-5}\]

---

**Fig. 9.** Rated peak pulse power as a function of square pulse duration; typical values

\[
\begin{align*}
P_{ppM} & \quad t_p \\
10^4 & \quad 10 \, \text{to} \, 10^4 \\
10^3 & \quad \text{10}^3 \, \text{to} \, \text{10}^4 \\
10^2 & \quad \text{10}^2 \, \text{to} \, \text{10}^3 \\
10 & \quad \text{10}^3 \, \text{to} \, \text{10}^4 \\
\end{align*}
\]
**Fig. 10.** Relative variation of reverse leakage current as a function of ambient temperature; typical values

**Fig. 11.** ESD clamping test setup and waveforms
Fig. 12. Clamped +8 kV pulse waveform (IEC61000-4-2 network)

Fig. 13. Clamped -8 kV pulse waveform (IEC61000-4-2 network)
10. Package outline

DSN1608-2, leadless very small package; 2 terminals; body 1.6 x 0.8 x 0.29 mm

<table>
<thead>
<tr>
<th>Outline version</th>
<th>References</th>
<th>European projection</th>
<th>Issue date</th>
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<td>SOD964</td>
<td>IEC</td>
<td>JEDEC</td>
<td>JEITA</td>
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<td></td>
<td>sod964_po</td>
<td>15-08-13</td>
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<td>16-01-03</td>
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</table>

Fig. 14. Package outline DSN1608-2 (SOD964)
11. Soldering

Fig. 15. Reflow soldering footprint for DSN1608-2 (SOD964)
12. Revision history

Table 7. Revision history

<table>
<thead>
<tr>
<th>Data sheet ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<tr>
<td>PTVS22VZ1USK v.1</td>
<td>20170525</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
13. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>[short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term "short data sheet" is explained in section "Definitions".
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