Thyristor High Voltage, Phase Control SCR, 100 A

**FEATURES**
- Designed and qualified according to JEDEC®-JESD 47
- 150 °C maximum operating junction temperature
- Material categorization:
  for definitions of compliance please see www.vishay.com/doc?99912

**APPLICATIONS**
Typical usage is in input rectification crowbar (soft start) and AC switch motor control, UPS, welding, and battery charge.

**DESCRIPTION**
The VS-100TPS12L high voltage series of silicon controlled rectifiers are specifically designed for medium power switching, and phase control applications. The glass passivation technology used, has reliable operation up to 150 °C junction temperature.

**MECHANICAL DATA**
Case: TO-247AD 3L
Molding compound meets UL 94 V-0 flammability rating
Terminals: matte tin plated leads, solderable per J-STD-002

**PRIMARY CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Values</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT(AV)</td>
<td></td>
<td></td>
<td>100 A</td>
<td></td>
</tr>
<tr>
<td>VDRM/VRRM</td>
<td></td>
<td></td>
<td>1200 V</td>
<td></td>
</tr>
<tr>
<td>VT (typ.)</td>
<td></td>
<td></td>
<td>1.17 V</td>
<td></td>
</tr>
<tr>
<td>IG</td>
<td></td>
<td></td>
<td>100 mA</td>
<td></td>
</tr>
<tr>
<td>TJ</td>
<td></td>
<td>-40 °C to +150 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Package</td>
<td></td>
<td></td>
<td>TO-247AD 3L</td>
<td></td>
</tr>
<tr>
<td>Circuit configuration</td>
<td></td>
<td></td>
<td>Single SCR</td>
<td></td>
</tr>
</tbody>
</table>

**MAJOR RATINGS AND CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Values</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak repetitive reverse voltage</td>
<td>VRRM/VDRM</td>
<td>1200 °C, typical</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>On-state voltage</td>
<td>VT</td>
<td>100 A, TJ = 125 °C</td>
<td>1.17 V</td>
<td></td>
</tr>
<tr>
<td>Average rectified forward current</td>
<td>I(TAV)</td>
<td>100 A</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Maximum continuous RMS on-state current</td>
<td>IRMS</td>
<td>157 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-repetitive peak surge current</td>
<td>ITSM</td>
<td>TJ = 150 °C, 10 ms sine</td>
<td>935</td>
<td></td>
</tr>
<tr>
<td>Maximum rate of rise</td>
<td>dV/dt</td>
<td>1000 V/μs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum operating junction and storage range</td>
<td>Tj, TStg</td>
<td>-40 to +150 °C</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

**VOLTAGE RATINGS**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>VRRM/VDRM, Maximum Repetitive Peak and Off-State Voltage</th>
<th>VRSM+ Maximum Non-Repetitive Peak Reverse Voltage</th>
<th>TYP. IRRM/IDRM AT 150 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS-100TPS12L-M3</td>
<td>1200</td>
<td>1300</td>
<td>28</td>
</tr>
</tbody>
</table>
## ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum average on-state current</td>
<td>IT(AV)</td>
<td>TC = 103 °C, 180° conduction half sine wave</td>
<td>-</td>
<td>100</td>
<td>A</td>
</tr>
<tr>
<td>Maximum continuous RMS on-state current</td>
<td>IRMS</td>
<td></td>
<td>-</td>
<td>157</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>as AC switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak, one-cycle non-repetitive surge current</td>
<td>ITSM</td>
<td>10 ms sine pulse, rated VRRM applied, Initial TJ = TJ maximum</td>
<td>-</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 ms sine pulse, no voltage reapplied</td>
<td>-</td>
<td>935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 ms sine pulse, rated VRRM applied, t = 0.1 ms to 10 ms, no voltage reapplied</td>
<td>-</td>
<td>3090</td>
<td>A^2s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>t = 0.1 ms to 10 ms, no voltage reapplied, TJ = 150 °C</td>
<td>-</td>
<td>4370</td>
<td>A^2/s</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>VT</td>
<td>100 A, TJ = 25 °C</td>
<td>1.22</td>
<td>1.37</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>190 A, TJ = 25 °C</td>
<td>1.45</td>
<td>1.61</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 A, TJ = 125 °C</td>
<td>1.17</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>190 A, TJ = 125 °C</td>
<td>1.47</td>
<td>1.60</td>
<td></td>
</tr>
<tr>
<td>Low level value of threshold voltage</td>
<td>VTO1</td>
<td>TJ = 150 °C</td>
<td>-</td>
<td>0.82</td>
<td>V</td>
</tr>
<tr>
<td>High level value of threshold voltage</td>
<td>VTO2</td>
<td></td>
<td>-</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>Low level value of on-state slope resistance</td>
<td>r1</td>
<td>TJ = 150 °C</td>
<td>-</td>
<td>3.80</td>
<td>mΩ</td>
</tr>
<tr>
<td>High level value of on-state slope resistance</td>
<td>r2</td>
<td>TJ = 150 °C</td>
<td>-</td>
<td>3.50</td>
<td></td>
</tr>
<tr>
<td>Rate of rise of turned-on current</td>
<td>dI/dt</td>
<td>TJ = 150 °C, Vr &lt; 800 V, Ir = 100 A, Igt = 200 mA, t &lt; 100 ns, repetitive</td>
<td>-</td>
<td>200</td>
<td>A/μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 150 °C, Vr &lt; 1000 V, Ir = 100 A, Igt = 200 mA, t &lt; 100 ns, non repetitive</td>
<td>-</td>
<td>500</td>
<td>A/μs</td>
</tr>
<tr>
<td>Holding current</td>
<td>IH</td>
<td>Anode supply = 6 V, resistive load, TJ = 25 °C</td>
<td>-</td>
<td>300</td>
<td>mA</td>
</tr>
<tr>
<td>Latching current</td>
<td>IL</td>
<td></td>
<td>-</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Reverse and direct leakage current</td>
<td>IRRM/IDRM</td>
<td>TJ = 25 °C</td>
<td>30</td>
<td>100</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 125 °C</td>
<td>10</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 150 °C</td>
<td>28</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Rate of rise of off-state voltage</td>
<td>dV/dt</td>
<td>TJ = TJ maximum, linear to 80 % VDRM, Rg-k = open</td>
<td>-</td>
<td>1000</td>
<td>V/μs</td>
</tr>
</tbody>
</table>

## TRIGGERING

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak gate power</td>
<td>PG</td>
<td>10 ms sine pulse, no voltage reapplied</td>
<td>-</td>
<td>10</td>
<td>W</td>
</tr>
<tr>
<td>Average gate power</td>
<td>PGM</td>
<td></td>
<td>-</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Peak gate current</td>
<td>PG</td>
<td></td>
<td>-</td>
<td>2.5</td>
<td>A</td>
</tr>
<tr>
<td>Peak negative gate voltage</td>
<td>-VGM</td>
<td></td>
<td>-</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Required DC gate voltage to trigger</td>
<td>VG</td>
<td>TJ = -40 °C, Anode supply = 6 V resistive load</td>
<td>1.2</td>
<td>1.7</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 25 °C, Anode supply = 6 V resistive load</td>
<td>1.0</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 125 °C, Anode supply = 6 V resistive load</td>
<td>0.7</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 150 °C, Anode supply = 6 V resistive load</td>
<td>0.6</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Required DC gate to trigger</td>
<td>IG</td>
<td>TJ = -40 °C, Anode supply = 6 V resistive load</td>
<td>80</td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 25 °C, Anode supply = 6 V resistive load</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 125 °C, Anode supply = 6 V resistive load</td>
<td>25</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TJ = 150 °C, Anode supply = 6 V resistive load</td>
<td>17</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>DC gate voltage not to trigger</td>
<td>VGD</td>
<td>TJ = 150 °C, VDRM = 80 % rated value</td>
<td>-</td>
<td>0.20</td>
<td>V</td>
</tr>
<tr>
<td>DC gate current not to trigger</td>
<td>IGD</td>
<td></td>
<td>-</td>
<td>3.0</td>
<td>mA</td>
</tr>
</tbody>
</table>

## SWITCHING

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn-on time</td>
<td>tO</td>
<td>Ir = 100 A, VD = 50 % VDRM, Igt = 300 mA, TJ = 25 °C</td>
<td>1.8</td>
<td>-</td>
<td>μs</td>
</tr>
<tr>
<td>Turn-off time</td>
<td>tO</td>
<td>Ir = 100 A, VD = 80 % VDRM, dV/dt = 20 V/μs, tP = 200 μs</td>
<td>135</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

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For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

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**THERMAL AND MECHANICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum operating junction and storage temperature range</td>
<td>$T_J, T_{Stg}$</td>
<td>-40</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Maximum thermal resistance, junction to case</td>
<td>$R_{thJC}$</td>
<td>-</td>
<td>0.25</td>
<td>°C/W</td>
<td></td>
</tr>
<tr>
<td>Maximum thermal resistance, junction to ambient</td>
<td>$R_{thJA}$</td>
<td>-</td>
<td>40</td>
<td>°C/W</td>
<td></td>
</tr>
<tr>
<td>Typical thermal resistance, case to heatsink</td>
<td>$R_{thCS}$</td>
<td>Mounting surface, smooth, and greased</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approximate weight</td>
<td></td>
<td></td>
<td>6</td>
<td>g</td>
<td></td>
</tr>
<tr>
<td>Mounting torque</td>
<td></td>
<td>minimum</td>
<td>6 (5)</td>
<td>kgf · cm (lbf · in)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>maximum</td>
<td>12 (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marking device</td>
<td></td>
<td>Case style TO-247AD 3L</td>
<td>100TPS12L</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 1 - Current Rating Characteristics**

**Fig. 2 - Current Rating Characteristics**

**Fig. 3 - On-State Power Loss Characteristics**

**Fig. 4 - On-State Power Loss Characteristic**
Fig. 5 - Maximum Non-Repetitive Surge Current

Fig. 6 - Maximum Non-Repetitive Surge Current

Fig. 7 - On-State Voltage Drop Characteristics

Fig. 8 - Thermal Impedance $Z_{thJC}$ Characteristics
## ORDERING INFORMATION TABLE

<table>
<thead>
<tr>
<th>Device code</th>
<th>VS-</th>
<th>100</th>
<th>T</th>
<th>P</th>
<th>S</th>
<th>12</th>
<th>L</th>
<th>-M3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

1. Vishay Semiconductors product
2. Current code (100 = 100 A)
3. Circuit configuration:
   - T = thyristor
4. P = TO-247 package
5. Type of silicon:
   - S = standard recovery rectifier
6. Voltage code (12 = 1200 V)
7. Package L = long lead
8. -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

## ORDERING INFORMATION (example)

<table>
<thead>
<tr>
<th>PREFERRED P/N</th>
<th>QUANTITY PER TUBE</th>
<th>MINIMUM ORDER QUANTITY</th>
<th>PACKAGING DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS-100TPS12L-M3</td>
<td>25</td>
<td>500</td>
<td>Antistatic plastic tubes</td>
</tr>
</tbody>
</table>

## LINKS TO RELATED DOCUMENTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
</table>
### TO-247AD 3L

**DIMENSIONS** in millimeters and inches

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>MILLIMETERS</th>
<th>INCHES</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.65 - 5.31</td>
<td>0.183 - 0.209</td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>2.21 - 2.59</td>
<td>0.087 - 0.102</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>1.50 - 2.49</td>
<td>0.059 - 0.098</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>0.99 - 1.40</td>
<td>0.039 - 0.055</td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td>0.99 - 1.35</td>
<td>0.039 - 0.053</td>
<td></td>
</tr>
<tr>
<td>b2</td>
<td>1.65 - 2.39</td>
<td>0.065 - 0.094</td>
<td></td>
</tr>
<tr>
<td>b3</td>
<td>1.65 - 2.34</td>
<td>0.065 - 0.092</td>
<td></td>
</tr>
<tr>
<td>b4</td>
<td>2.59 - 3.43</td>
<td>0.102 - 0.135</td>
<td></td>
</tr>
<tr>
<td>b5</td>
<td>2.59 - 3.38</td>
<td>0.102 - 0.133</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>0.38 - 0.89</td>
<td>0.015 - 0.035</td>
<td></td>
</tr>
<tr>
<td>c1</td>
<td>0.38 - 0.84</td>
<td>0.015 - 0.033</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>19.71 - 20.70</td>
<td>0.776 - 0.815</td>
<td>3</td>
</tr>
<tr>
<td>D1</td>
<td>13.08 - 13.88</td>
<td>0.515 - 0.548</td>
<td>4</td>
</tr>
</tbody>
</table>

**Panel Dimensions**

- **pins:** 3
- **body:** 20.7 x 1.6 x 5.1
- **plating:** 12.7 x 1.6
- **thermal pad:** 15.87 x 15.87

**Notes**

1. Dimensioning and tolerancing per ASME Y14.5M-1994
2. Contour of slot optional
3. Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
4. Thermal pad contour optional with dimensions D1 and E1
5. Lead finish uncontrolled in L1
6. Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
7. Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4
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