SKM 100GB176D

Trench IGBT Modules

SKM 100GB176D

Features
- Homogeneous Si
- Trench = Trenchgate technology
- \( V_{CE(sat)} \) with positive temperature coefficient
- High short circuit capability, self limiting to 6 \( I_C \)

Typical Applications*
- AC inverter drives mains 575 - 750 V AC
- Public transport (auxiliary syst.)

Absolute Maximum Ratings

\( V_{case} = 25^\circ C, \) unless otherwise specified

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGBT</td>
<td>( V_{CES} )  ( T_j = 25^\circ C )  ( I_C )  ( T_J = 150^\circ C )  ( T_c = 25^\circ C )  ( T_c = 80^\circ C )</td>
<td>125</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>( I_{CRM} )  ( I_{CRM} = 2xI_{Cron} )</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>( V_{GSS} )  ( \pm 20 )</td>
<td>10</td>
<td>( \mu s )</td>
</tr>
<tr>
<td></td>
<td>( I_{psc} )  ( V_{CC} = 1200 ) ( V_{GE} \leq 20 ) ( V )  ( T_j = 125 ) ( T_c = 75^\circ C )  ( T_c &lt; 1700 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inverse Diode</td>
<td>( I_F )  ( T_j = 150^\circ C )  ( T_c = 25^\circ C )</td>
<td>100</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>( I_{IRM} )  ( I_{IRM} = 2xI_{Vnom} )</td>
<td>70</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>( I_{FSM} )  ( I_F = 10 ) ms, sin.  ( T_j = 150^\circ C )</td>
<td>720</td>
<td>A</td>
</tr>
<tr>
<td>Module</td>
<td>( I_{(RMS)} )</td>
<td>200</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>( T_{(j)} )</td>
<td>- 40 ... +150</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td>( T_{stg} )</td>
<td>- 40 ... +125</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td>( V_{isol} )  ( AC, 1 ) min.</td>
<td>4000</td>
<td></td>
</tr>
</tbody>
</table>

Characteristics

\( V_{case} = 25^\circ C, \) unless otherwise specified

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Conditions</th>
<th>min.</th>
<th>typ.</th>
<th>max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGBT</td>
<td>( V_{GE} = V_{CE}, I_C = 3 ) mA ( T_j = 25^\circ C )</td>
<td>5.2</td>
<td>5.8</td>
<td>6.4</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>( I_{CEN} )  ( V_{GE} = 0 ) ( V ) ( V_{CE} = V_{CES} ) ( T_j = 25^\circ C )</td>
<td>3</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>( V_{CE} )  ( T_j = 25^\circ C )  ( T_j = 125^\circ C )</td>
<td>1</td>
<td>1.2</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>( r_{CE} )  ( V_{GE} = 15 ) V</td>
<td>13</td>
<td>16.7</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td></td>
<td>( V_{CE(sat)} )  ( I_{Cron} = 75 ) A ( V_{GE} = 15 ) V ( T_j = 25^\circ C )  ( T_j = 125^\circ C )</td>
<td>2</td>
<td>2.45</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>( C_{ies} )  ( V_{GE} = 25 ) ( V_{GE} = 0 ) V ( f = 1 ) MHz</td>
<td>5.7</td>
<td></td>
<td></td>
<td>nF</td>
</tr>
<tr>
<td></td>
<td>( C_{oes} )  ( V_{GE} = 25 ) ( V_{GE} = 0 ) V ( f = 1 ) MHz</td>
<td>0.28</td>
<td></td>
<td></td>
<td>nF</td>
</tr>
<tr>
<td></td>
<td>( C_{res} )  ( V_{GE} = 25 ) ( V_{GE} = 0 ) V ( f = 1 ) MHz</td>
<td>0.22</td>
<td></td>
<td></td>
<td>nF</td>
</tr>
<tr>
<td></td>
<td>( Q_G )  ( V_{GE} = -8 ) ( V (+15 ) V</td>
<td>620</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td>( R_{Gm} )  ( T_j = 25^\circ C )</td>
<td>8.5</td>
<td></td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td>( t_{q(on)} ) ( R_{Gm} = 4.2 ) Ω ( V_{CC} = 1200 ) V</td>
<td>280</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>( E_{on} )  ( R_{Gm} = 1680 ) A/µs</td>
<td>40</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>( t_{q(2ff)} ) ( R_{Gm} = 4.2 ) Ω ( V_{CC} = -15 ) V</td>
<td>44</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td></td>
<td>( E_{off} )  ( R_{Gm} = 4.90 ) A/µs</td>
<td>680</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>( R_{h(j-c)} ) per IGBT</td>
<td>28.5</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
</tbody>
</table>

*Typical Applications: AC inverter drives mains 575 - 750 V AC; Public transport (auxiliary syst.)

GB
SKM 100GB176D

Trench IGBT Modules

SKM 100GB176D

Features
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x $I_C$

Typical Applications*
- AC inverter drives mains 575 - 750 V AC
- Public transport (auxiliary syst.

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX.

* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our personal.

### Characteristics

#### Inverse Diode

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Conditions</th>
<th>min.</th>
<th>typ.</th>
<th>max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_F = V_{EC}$</td>
<td>$I_{Fron} = 75 A; V_{GE} = 0 V$</td>
<td>1,6</td>
<td>1,9</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{FD}$</td>
<td>$T_J = 25 ^\circ C$</td>
<td>1,1</td>
<td>1,3</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$T_J = 125 ^\circ C$</td>
<td>0,9</td>
<td>1,1</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$r_P$</td>
<td>$T_J = 25 ^\circ C$</td>
<td>6,7</td>
<td>8</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td></td>
<td>$T_J = 125 ^\circ C$</td>
<td>9,3</td>
<td>11</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td>$I_{TERM}$</td>
<td>$I_F = 75 A$</td>
<td>78,5</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>$T_F = 125 ^\circ C$</td>
<td></td>
<td></td>
<td></td>
<td>µC</td>
</tr>
<tr>
<td>$Q_{tr}$</td>
<td>$di/dt = 1650 A/\mu s$</td>
<td>29,6</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>$E_{tr}$</td>
<td>$V_{GE} = -15V ; V_{CC} = 1200 V$</td>
<td>21,4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{th(j&lt;id)}$</td>
<td>per diode</td>
<td>0,45</td>
<td></td>
<td></td>
<td>kW</td>
</tr>
</tbody>
</table>

#### Module

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Conditions</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_{CE}$</td>
<td>res., terminal-chip</td>
<td>30</td>
<td>mH</td>
</tr>
<tr>
<td>$R_{CC\cdot EE}$</td>
<td></td>
<td>0,75</td>
<td>mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>mΩ</td>
</tr>
<tr>
<td>$R_{th(j&lt;id)}$</td>
<td>per module</td>
<td>0,05</td>
<td>kW</td>
</tr>
<tr>
<td>$M_s$</td>
<td>to heat sink M6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>$M_l$</td>
<td>to terminals M5</td>
<td>2,5</td>
<td>5</td>
</tr>
<tr>
<td>$w$</td>
<td></td>
<td>160</td>
<td>g</td>
</tr>
</tbody>
</table>
SKM 100GB176D

Trench IGBT Modules

SKM 100GB176D

Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 $I_C$

Typical Applications*

- AC inverter drives mains 575 - 750 V AC
- Public transport (auxiliary syst.

<table>
<thead>
<tr>
<th>$Z_{th}$ Symbol</th>
<th>Conditions</th>
<th>Values</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Z_{th(j-c)}$</td>
<td>$R_i$</td>
<td>1</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>$i = 1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_i$</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>$i = 2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_i$</td>
<td>3</td>
<td>16.5</td>
</tr>
<tr>
<td></td>
<td>$i = 3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$R_i$</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>$i = 4$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\tau u_i$</td>
<td>1</td>
<td>0.1056</td>
</tr>
<tr>
<td></td>
<td>$\tau u_i$</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td>$\tau u_i$</td>
<td>3</td>
<td>0.0011</td>
</tr>
<tr>
<td></td>
<td>$\tau u_i$</td>
<td>4</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

| $Z_{th(j-c)}D$ | $R_i$ | 1 | 270 | mk/W |
|                | $i = 1$ |       |       |       |
|                | $R_i$ | 2 | 139 | mk/W |
|                | $i = 2$ |       |       |       |
|                | $R_i$ | 3 | 37 | mk/W |
|                | $i = 3$ |       |       |       |
|                | $R_i$ | 4 | 4 | mk/W |
|                | $i = 4$ |       |       |       |
|                | $\tau u_i$ | 1 | 0.0475 | s |
|                | $\tau u_i$ | 2 | 0.0104 | s |
|                | $\tau u_i$ | 3 | 0.0011 | s |
|                | $\tau u_i$ | 4 | 0.0003 | s |
Fig. 1 Typ. output characteristic, inclusive $R_{CC} + EE'$

Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

Fig. 3 Typ. turn-on /-off energy $= f(I_C)$

Fig. 4 Typ. turn-on /-off energy $= f(R_G)$

Fig. 5 Typ. transfer characteristic

Fig. 6 Typ. gate charge characteristic