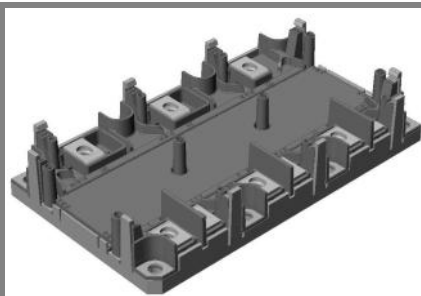


# SKiM455GD12T4D1



SKiM<sup>®</sup> 5

## Trench IGBT modules

SKiM455GD12T4D1

Preliminary Data

### Features

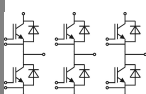
- IGBT 4 = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability

### Typical Applications\*

- High Reliability AC inverter drives
- UPS

### Remarks

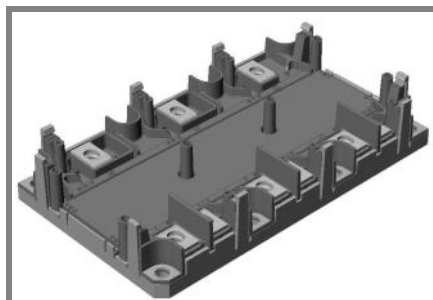
- Case temperature limited to  $T_c = 125^\circ\text{C}$  max
- $T_{j,max}$  of the diode is limited to  $150^\circ\text{C}$



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| Absolute Maximum Ratings |                                                                                                       |                               | T <sub>c</sub> = 25 °C, unless otherwise specified |       |
|--------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------|-------|
| Symbol                   | Conditions                                                                                            |                               | Values                                             | Units |
| IGBT                     |                                                                                                       |                               |                                                    |       |
| V <sub>CES</sub>         | T <sub>j</sub> = °C                                                                                   |                               | 1200                                               | V     |
| I <sub>C</sub>           | T <sub>j</sub> = 150 °C                                                                               | T <sub>heatsink</sub> = 25 °C | 400                                                | A     |
|                          |                                                                                                       | T <sub>heatsink</sub> = 70 °C | 305                                                | A     |
| I <sub>CRM</sub>         | I <sub>CRM</sub> = 3xI <sub>CNOM</sub>                                                                |                               | 1350                                               | A     |
| V <sub>GES</sub>         |                                                                                                       |                               | ± 20                                               | V     |
| t <sub>psc</sub>         | V <sub>CC</sub> = 800 V; V <sub>GE</sub> ≤ 15 V; T <sub>j</sub> = 150 °C<br>V <sub>CES</sub> < 1200 V |                               | 10                                                 | µs    |
| Inverse Diode            |                                                                                                       |                               |                                                    |       |
| I <sub>F</sub>           | T <sub>j</sub> = 150 °C                                                                               | T <sub>heatsink</sub> = 25 °C | 295                                                | A     |
|                          |                                                                                                       | T <sub>heatsink</sub> = 70 °C | 215                                                | A     |
| I <sub>FRM</sub>         | I <sub>FRM</sub> = 2 x I <sub>FNOM</sub>                                                              |                               | 600                                                | A     |
| Module                   |                                                                                                       |                               |                                                    |       |
| I <sub>t(RMS)</sub>      |                                                                                                       |                               |                                                    | A     |
| T <sub>vj</sub>          |                                                                                                       |                               | -40 ... +150                                       | °C    |
| T <sub>stg</sub>         |                                                                                                       |                               | -40 ... +125                                       | °C    |
| V <sub>isol</sub>        | AC, 1 min.                                                                                            |                               | 2500                                               | V     |

| Characteristics      |                                                                                                                                                |  | T <sub>c</sub> = 25 °C, unless otherwise specified |      |      |       |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------|------|------|-------|
| Symbol               | Conditions                                                                                                                                     |  | min.                                               | typ. | max. | Units |
| IGBT                 |                                                                                                                                                |  |                                                    |      |      |       |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 18 mA                                                                                     |  | 5                                                  | 5,8  | 6,5  | V     |
| I <sub>CES</sub>     | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = V <sub>CES</sub> T <sub>j</sub> = 25 °C                                                               |  |                                                    |      | 0,3  | mA    |
| V <sub>CE0</sub>     | T <sub>j</sub> = 25 °C<br>T <sub>j</sub> = 125 °C                                                                                              |  |                                                    | 0,8  | 0,9  | V     |
|                      |                                                                                                                                                |  |                                                    | 0,7  | 0,8  | V     |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V      T <sub>j</sub> = 25°C<br>T <sub>j</sub> = 125°C                                                                    |  |                                                    | 2,2  | 2,4  | mΩ    |
|                      |                                                                                                                                                |  |                                                    | 3,1  | 3,3  | mΩ    |
| V <sub>CE(sat)</sub> | I <sub>Cnom</sub> = 450 A, V <sub>GE</sub> = 15 V      T <sub>j</sub> = 25°C <sub>chiplev.</sub><br>T <sub>j</sub> = 125°C <sub>chiplev.</sub> |  |                                                    | 1,8  | 2    | V     |
|                      |                                                                                                                                                |  |                                                    | 2,1  | 2,3  | V     |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25, V <sub>GE</sub> = 0 V      f = 1 MHz                                                                                     |  |                                                    | 27,9 |      | nF    |
| C <sub>oes</sub>     |                                                                                                                                                |  |                                                    | 1,7  |      | nF    |
| C <sub>res</sub>     |                                                                                                                                                |  |                                                    | 1,5  |      | nF    |
| Q <sub>G</sub>       | V <sub>GE</sub> = -8V/+15V                                                                                                                     |  |                                                    | 2600 |      | nC    |
| R <sub>Gint</sub>    | T <sub>j</sub> = 25 °C                                                                                                                         |  |                                                    | 1,7  |      | Ω     |
| t <sub>d(on)</sub>   | R <sub>Gon</sub> = 1 Ω      V <sub>CC</sub> = 600V<br>di/dt = 8200 A/μs      I <sub>C</sub> = 450A                                             |  |                                                    | 265  |      | ns    |
| t <sub>r</sub>       |                                                                                                                                                |  |                                                    | 60   |      | ns    |
| E <sub>on</sub>      |                                                                                                                                                |  |                                                    | 34   |      | mJ    |
| t <sub>d(off)</sub>  | R <sub>Goff</sub> = 1 Ω      T <sub>j</sub> = 125 °C<br>di/dt = 5300 A/μs      V <sub>GE</sub> = ± 15V                                         |  |                                                    | 470  |      | ns    |
| t <sub>f</sub>       |                                                                                                                                                |  |                                                    | 65   |      | ns    |
| E <sub>off</sub>     |                                                                                                                                                |  |                                                    | 40   |      | mJ    |
| R <sub>th(j-s)</sub> | per IGBT                                                                                                                                       |  |                                                    | 0,14 |      | K/W   |



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## Trench IGBT modules

**SKiM455GD12T4D1**

Preliminary Data

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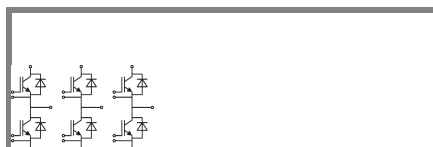
### Remarks

- Case temperature limited to  $T_c = 125^\circ\text{C}$  max
- $T_{j,max}$  of the diode is limited to  $150^\circ\text{C}$

| Characteristics           |                                                |      |          |      |       |
|---------------------------|------------------------------------------------|------|----------|------|-------|
| Symbol                    | Conditions                                     | min. | typ.     | max. | Units |
| <b>Inverse Diode</b>      |                                                |      |          |      |       |
| $V_F = V_{EC}$            | $I_{Fnom} = 450\text{ A}; V_{GE} = 0\text{ V}$ |      |          |      |       |
|                           | $T_j = 25^\circ\text{C}_{chiplev.}$            |      | 2,3      | 2,8  | V     |
|                           | $T_j = 125^\circ\text{C}_{chiplev.}$           |      | 2,2      | 2,7  | V     |
| $V_{F0}$                  |                                                |      |          |      |       |
|                           | $T_j = 25^\circ\text{C}$                       |      | 1,2      | 1,6  | V     |
|                           | $T_j = 125^\circ\text{C}$                      |      | 0,9      | 1,3  | V     |
| $r_F$                     |                                                |      |          |      |       |
|                           | $T_j = 25^\circ\text{C}$                       |      | 2,3      | 2,7  | mΩ    |
|                           | $T_j = 125^\circ\text{C}$                      |      | 2,8      | 3,1  | mΩ    |
| $I_{RRM}$                 | $I_F = 450\text{ A}$                           |      | 500      |      | A     |
| $Q_{rr}$                  | $di/dt = 9000\text{ A}/\mu\text{s}$            |      | 64,5     |      | μC    |
| $E_{rr}$                  | $V_{GE} = -15\text{ V}$                        |      | 27,8     |      | mJ    |
| $R_{th(j-s)}$             | per diode                                      |      | 0,19     |      | K/W   |
| <b>Module</b>             |                                                |      |          |      |       |
| $L_{CE}$                  |                                                |      |          | 20   | nH    |
| $R_{CC'+EE'}$             | res., terminal-chip                            |      |          |      |       |
|                           | $T_{case} = 25^\circ\text{C}$                  |      | 0,9      |      | mΩ    |
|                           | $T_{case} = 125^\circ\text{C}$                 |      | 1,1      |      | mΩ    |
| $M_s$                     | to heat sink M5                                |      |          |      | Nm    |
| $M_t$                     | to terminals M6                                | 4    |          | 5    | Nm    |
| w                         |                                                |      |          | 460  | g     |
| <b>Temperature sensor</b> |                                                |      |          |      |       |
| $R_{TS}$                  | $T = 25\text{ (100)}^\circ\text{C}$            |      | 1 (1,67) |      | kΩ    |
| Tolerance                 | $T = 25\text{ (100)}^\circ\text{C}$            |      | 3 (2)    |      | %     |

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.



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