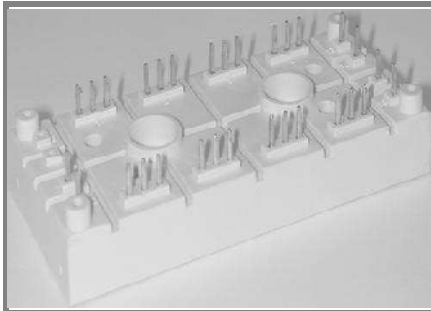




SEMIPONT™ 6

## 3-Phase Bridge Rectifier + IGBT braking chopper

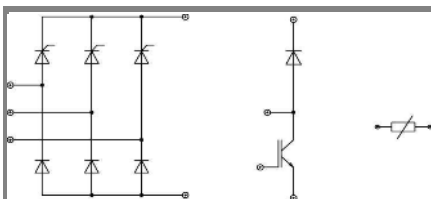
SKDH116/..L140

### Features

- Compact design
- Two screws mounting
- Heat transfer and isolation through direct copper bonded aluminium oxide ceramic (DCB)
- High surge currents
- Up to 1600V reverse voltage
- IGBT Trench4 inside; max  $T_j=175^\circ\text{C}$
- CAL4F inside, max  $T_j=175^\circ\text{C}$
- $I_{CM}/I_{FM} = 3 \times I_{C,nom}/I_{F,nom}$
- Rectifier diode, max  $T_j=150^\circ\text{C}$

### Typical Applications\*

- DC drives
- Controlled filed rectifiers for DC motors
- Controlled battery charger



DH

| $V_{RSM}$<br>V | $V_{RRM}, V_{DRM}$<br>V | $I_D = 110\text{ A}$ (maximum value for continuous operation)<br>( $T_s = 80^\circ\text{C}$ ) |
|----------------|-------------------------|-----------------------------------------------------------------------------------------------|
| 1300           | 1200                    | SKDH116/12-L140                                                                               |
| 1700           | 1600                    | SKDH116/16-L140                                                                               |

| Absolute Maximum Ratings        |                                                            | $T_s = 25^\circ\text{C}$ , unless otherwise specified |                  |
|---------------------------------|------------------------------------------------------------|-------------------------------------------------------|------------------|
| Symbol                          | Conditions                                                 | Values                                                | Units            |
| <b>Bridge - Rectifier</b>       |                                                            |                                                       |                  |
| $I_D$                           | $T_s = 80^\circ\text{C}$ ; inductive load                  | 110                                                   | A                |
| $I_{FSM}/I_{TSM}$               | $t_p = 10\text{ ms}$ ; $\sin 180^\circ$ ; $T_{jmax}$       | 950                                                   | A                |
| $i^2t$                          | $t_p = 10\text{ ms}$ ; $\sin 180^\circ$ ; $T_{jmax}$       | 4500                                                  | A <sup>2</sup> s |
| <b>IGBT - Chopper</b>           |                                                            |                                                       |                  |
| $V_{CES}/V_{GES}$               |                                                            | 1200 / 20                                             | V                |
| $I_C$                           | $T_s = 25\text{ (70)}^\circ\text{C}$                       | 150 (120)                                             | A                |
| $I_{CM}$                        | $t_p = 1\text{ ms}$ ; $T_s = 25\text{ (70)}^\circ\text{C}$ | 520                                                   | A                |
| <b>Freewheeling - CAL Diode</b> |                                                            |                                                       |                  |
| $V_{RRM}$                       |                                                            | 1200                                                  | V                |
| $I_F$                           | $T_s = 25\text{ (70)}^\circ\text{C}$                       | 130 (105)                                             | A                |
| $I_{FM}$                        | $t_p = 1\text{ ms}$ ; $T_s = 25\text{ (70)}^\circ\text{C}$ | 450                                                   | A                |
| $T_{vj}$                        | Diode & IGBT (Thyristor)                                   | - 40 ... + 175 (-40...+ 125)                          | $^\circ\text{C}$ |
| $T_{stg}$                       |                                                            | - 40 ... + 125                                        | $^\circ\text{C}$ |
| $T_{solder}$                    | terminals, 10 s                                            | 260                                                   | $^\circ\text{C}$ |
| $V_{isol}$                      | a.c. (50) Hz, RMS 1 min. / 1 s                             | 3000 / 3600                                           | V                |

| Characteristics                   |                                                                                              | $T_s = 25^\circ\text{C}$ , unless otherwise specified |             |                  |
|-----------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------|------------------|
| Symbol                            | Conditions                                                                                   | min.                                                  | typ.        | max. Units       |
| <b>Diode - Rectifier</b>          |                                                                                              |                                                       |             |                  |
| $V_{TO} / r_t$                    | $T_j = 125^\circ\text{C}$                                                                    |                                                       | 0,8 / 7     | V / mΩ           |
| $R_{th(j-s)}$                     | per diode                                                                                    |                                                       |             | 1 K/W            |
| <b>Thyristor - Rectifier</b>      |                                                                                              |                                                       |             |                  |
| $V_{F(TO)} / r_t$                 | $T_j = 125^\circ\text{C}$                                                                    |                                                       | 1,1 / 6     | V / mΩ           |
| $R_{th(j-s)}$                     | per Thyristor                                                                                |                                                       |             | 0,85 K/W         |
| $I_{GD}$                          | $T_j = 125^\circ\text{C}$ ; d.c.                                                             |                                                       | 5           | mA               |
| $V_{GT} / I_{GT}$                 | $T_j = 25^\circ\text{C}$                                                                     |                                                       |             | 3 / 150 V / mA   |
| $I_H / I_L$                       | $T_j = 25^\circ\text{C}$                                                                     |                                                       | 250 / 600   | mA               |
| $(dv/dt)_{cr}$                    | $T_j = 125^\circ\text{C}$                                                                    |                                                       |             | 1000 V/μs        |
| $(di/dt)_{cr}$                    | $T_j = 125^\circ\text{C}$                                                                    |                                                       |             | 100 A/μs         |
| <b>IGBT - Chopper</b>             |                                                                                              |                                                       |             |                  |
| $V_{CE(sat)}$                     | $I_C = 140\text{ A}$ , $T_j = 25^\circ\text{C}$ ;<br>$V_{GE} = 15\text{ V}$                  |                                                       | 1,85        | 2,1 V            |
| $R_{th(j-s)}$                     | per IGBT                                                                                     |                                                       | 0,38        | K/W              |
| $t_{d(on)} / t_r$                 | valid for all values:<br>$V_{CC} = 600\text{ V}$ ; $V_{GE} = 15\text{ V}$ ;                  |                                                       | 97 / 185    | ns               |
| $t_{d(off)} / t_f$                | $I_C = 140\text{ A}$ ; $T_j = 150^\circ\text{C}$ ;                                           |                                                       | 443 / 82    | ns               |
| $E_{on} + E_{off}$                | $T_j = 150^\circ\text{C}$ ; $R_G = 4\text{ }\Omega$ ;<br>inductive load                      |                                                       | 63,3        | mJ               |
| <b>CAL - Diode - Freewheeling</b> |                                                                                              |                                                       |             |                  |
| $V_{T(TO)} / r_t$                 | $T_j = 150^\circ\text{C}$                                                                    |                                                       | 0,9 / 7,8   | 1,1 / 8,6 V / mΩ |
| $R_{th(j-s)}$                     | per diode                                                                                    |                                                       | 0,56        | K/W              |
| $I_{RRM}$                         | valid for all values:                                                                        |                                                       | 30          | A                |
| $Q_{rr}$                          | $I_F = 140\text{ A}$ ; $V_R = - -600\text{ V}$ ;<br>$di_F/dt = - -1700\text{ A}/\mu\text{s}$ |                                                       | 9           | μC               |
| $E_{off}$                         | $V_{GE} = 0\text{ V}$ ; $T_j = 150^\circ\text{C}$                                            |                                                       | 7,92        | mJ               |
| <b>Temperature Sensor</b>         |                                                                                              |                                                       |             |                  |
| $R_{TS}$                          | $T = 25\text{ (100)}^\circ\text{C}$ ;                                                        |                                                       | 1000 (1670) | Ω                |
| <b>Mechanical data</b>            |                                                                                              |                                                       |             |                  |
| $M_S$                             | mounting Torque                                                                              | 2,55                                                  | 3,45        | Nm               |

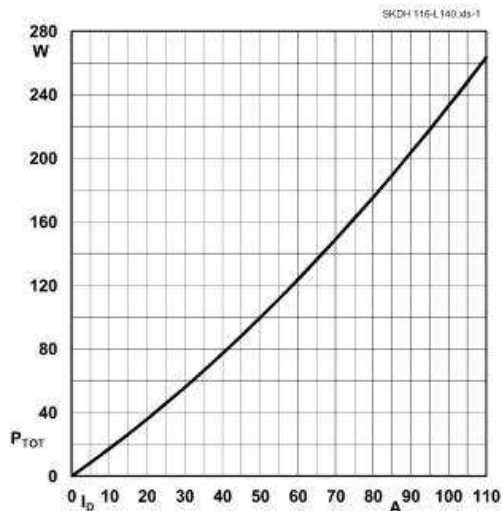


Fig. 1 Power dissipation per module vs. output current

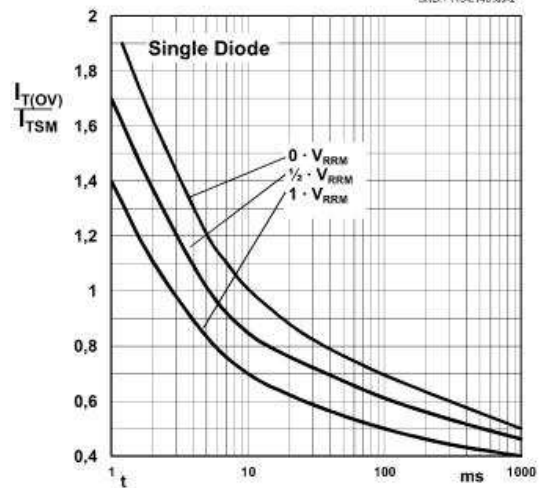


Fig. 2 Surge overload current vs. time

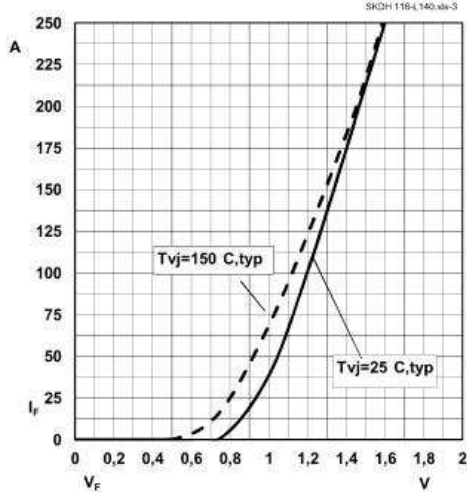


Fig. 3 Forward characteristic of single rectifier diode

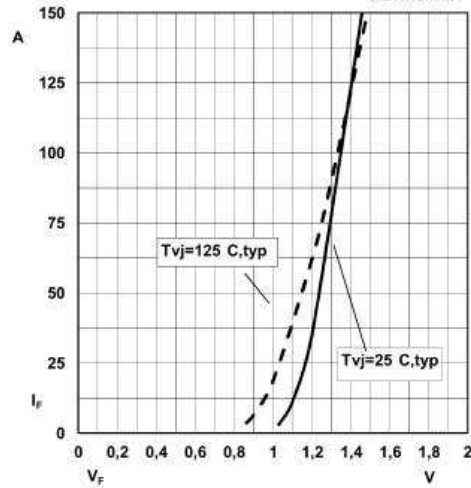


Fig. 4 Forward characteristic of single thyristor

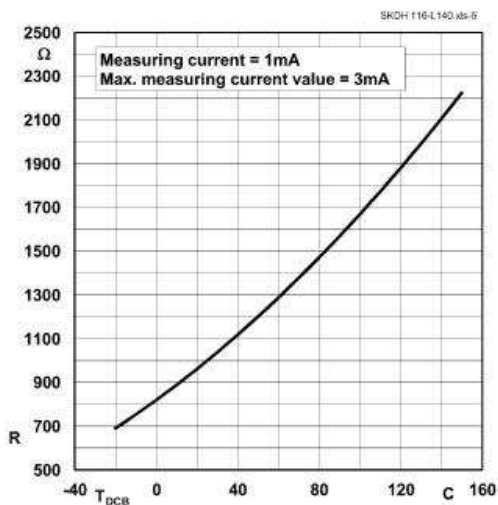


Fig. 5 Temperature sensor characteristic

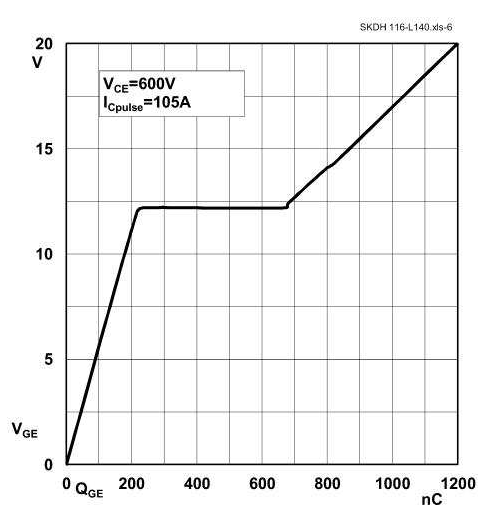


Fig. 6 Typ gate charge characteristic

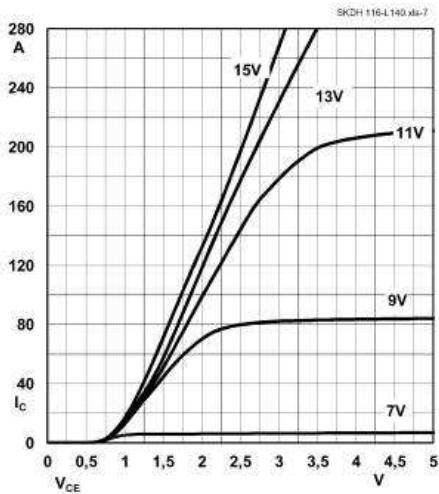
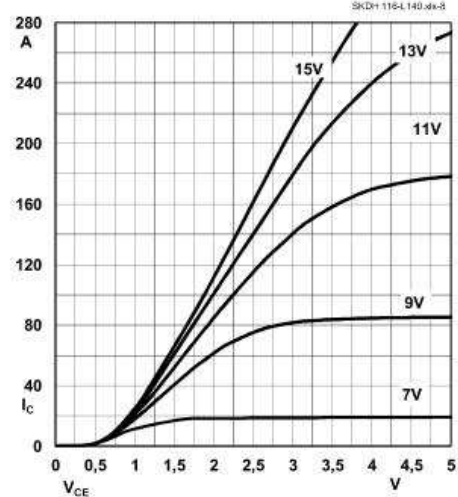
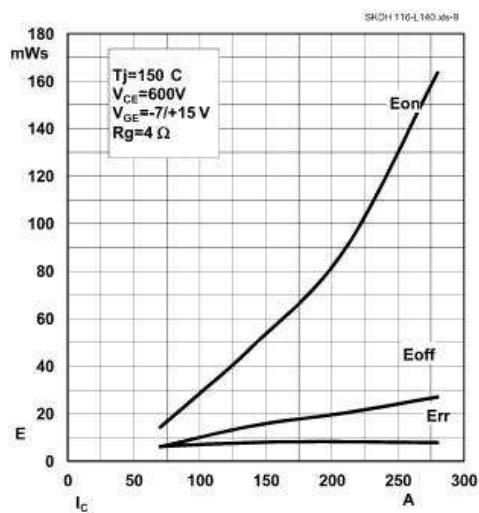
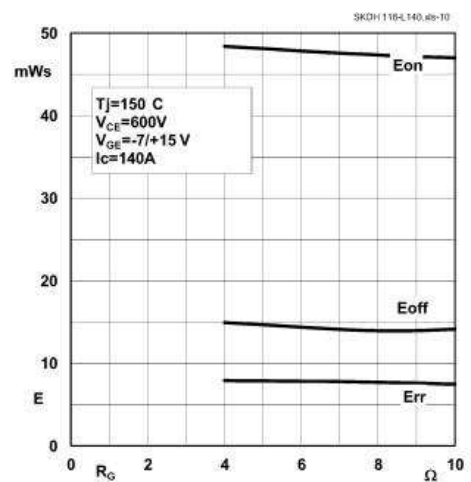
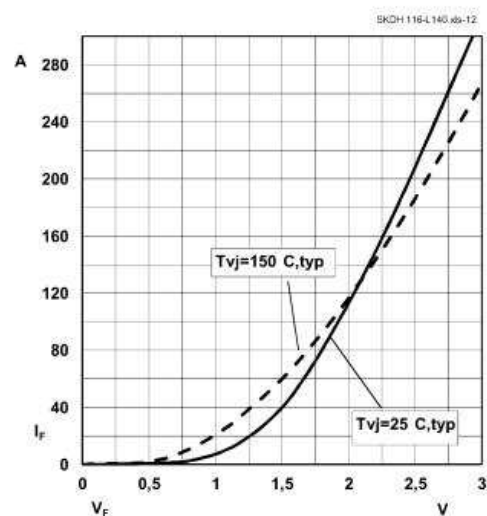
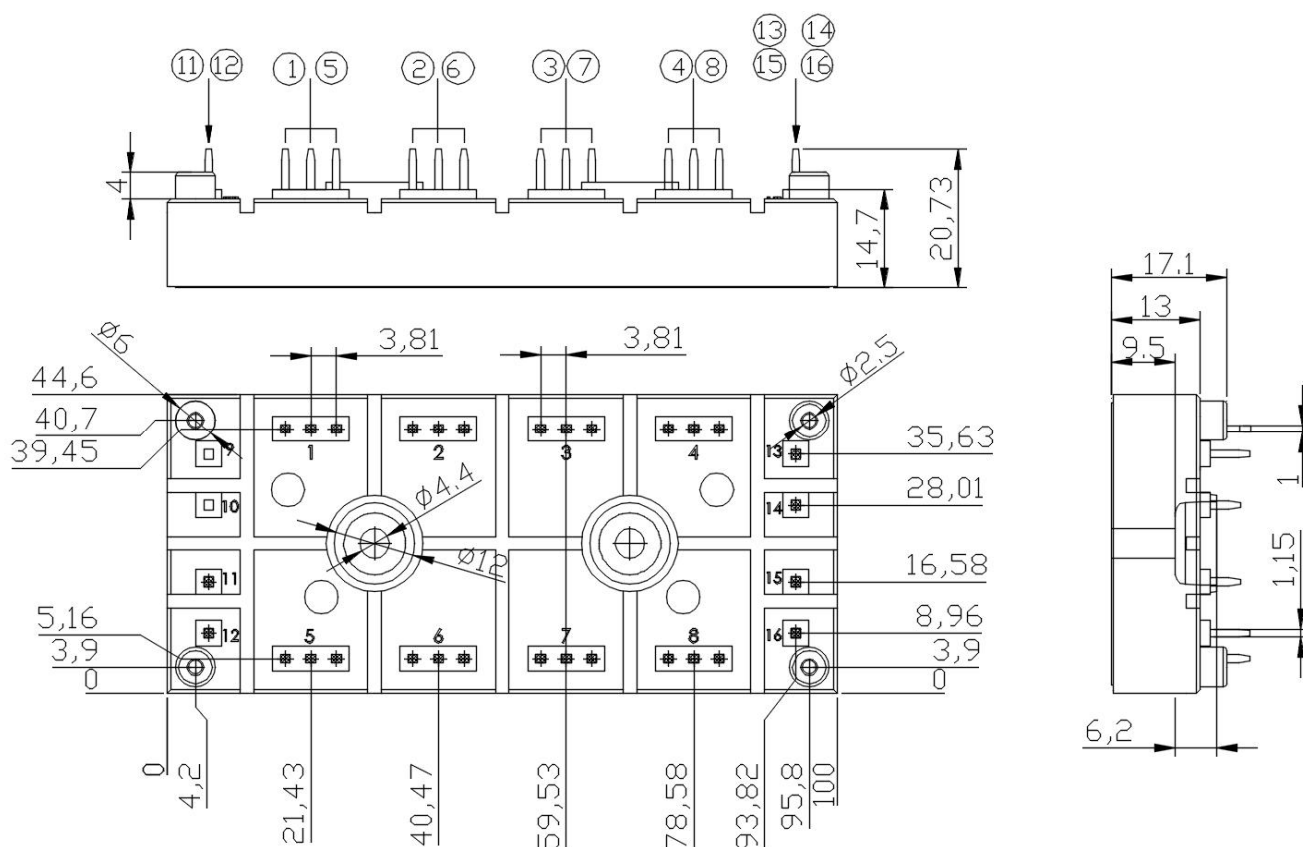
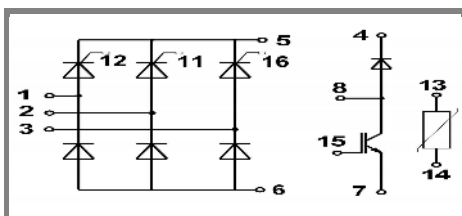
Fig. 7 Output Igbt characteristic  $I_C=f(V_{CE})$   $T_j=25^\circ\text{C}$ Fig. 8 Output Igbt characteristic  $I_C=f(V_{CE})$   $T_j=125^\circ\text{C}$ Fig. 9 Turn-on/-off energy  $=f(I_C)$ Fig. 10 turn-on/-off energy  $=f(R_g)$ 

Fig. 12 Freewheeling diode forward characteristic



Case G 59



Case G 59

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

## \*IMPORTANT INFORMATION AND WARNINGS

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.