



**SEMITRANS® 2**

## SPT IGBT Module

**SKM 145GB128D**

**SKM 145GAL128D**

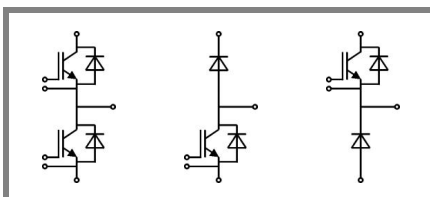
**SKM 145GAR128D**

### Features

- SPT = Soft-Punch-Through technology
- $V_{CEsat}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_c$

### Typical Applications

- AC inverter drives
- UPS
- Electronic welders at  $f_{sw}$  up to 20kHz



**GB**

**GAL**

**GAR**

| Absolute Maximum Ratings |                                                                                                                  |                                         | $T_c = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified |                    |
|--------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------|--------------------|
| Symbol                   | Conditions                                                                                                       |                                         | Values                                                          | Units              |
| IGBT                     |                                                                                                                  |                                         |                                                                 |                    |
| $V_{CES}$                | $T_j = 25\text{ }^{\circ}\text{C}$                                                                               |                                         | 1200                                                            | V                  |
| $I_C$                    | $T_j = 150\text{ }^{\circ}\text{C}$                                                                              | $T_{case} = 25\text{ }^{\circ}\text{C}$ | 190                                                             | A                  |
|                          |                                                                                                                  | $T_{case} = 80\text{ }^{\circ}\text{C}$ | 135                                                             | A                  |
| $I_{CRM}$                | $I_{CRM}=2 \times I_{Cnom}$                                                                                      |                                         | 200                                                             | A                  |
| $V_{GES}$                |                                                                                                                  |                                         | $\pm 20$                                                        | V                  |
| $t_{psc}$                | $V_{CC} = 600\text{ V}; V_{GE} \leq 20\text{ V}; T_j = 125\text{ }^{\circ}\text{C}$<br>$V_{CES} < 1200\text{ V}$ |                                         | 10                                                              | $\mu\text{s}$      |
| Inverse Diode            |                                                                                                                  |                                         |                                                                 |                    |
| $I_F$                    | $T_j = 150\text{ }^{\circ}\text{C}$                                                                              | $T_{case} = 25\text{ }^{\circ}\text{C}$ | 130                                                             | A                  |
|                          |                                                                                                                  | $T_{case} = 80\text{ }^{\circ}\text{C}$ | 90                                                              | A                  |
| $I_{FRM}$                | $I_{FRM}=2 \times I_{Fnom}$                                                                                      |                                         | 200                                                             | A                  |
| $I_{FSM}$                | $t_p = 10\text{ ms}; \sin.$                                                                                      | $T_j = 150\text{ }^{\circ}\text{C}$     | 900                                                             | A                  |
| Freewheeling Diode       |                                                                                                                  |                                         |                                                                 |                    |
| $I_F$                    | $T_j = 150\text{ }^{\circ}\text{C}$                                                                              | $T_{case} = 25\text{ }^{\circ}\text{C}$ | 130                                                             | A                  |
|                          |                                                                                                                  | $T_{case} = 80\text{ }^{\circ}\text{C}$ | 90                                                              | A                  |
| $I_{FRM}$                | $I_{FRM}=2 \times I_{Fnom}$                                                                                      |                                         | 200                                                             | A                  |
| $I_{FSM}$                | $t_p = 10\text{ ms}; \sin.$                                                                                      | $T_j = 150\text{ }^{\circ}\text{C}$     | 900                                                             | A                  |
| Module                   |                                                                                                                  |                                         |                                                                 |                    |
| $I_{t(RMS)}$             |                                                                                                                  |                                         | 200                                                             | A                  |
| $T_{vj}$                 |                                                                                                                  |                                         | - 40...+ 150                                                    | $^{\circ}\text{C}$ |
| $T_{stg}$                |                                                                                                                  |                                         | - 40...+ 125                                                    | $^{\circ}\text{C}$ |
| $V_{isol}$               | AC, 1 min.                                                                                                       |                                         | 4000                                                            | 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> = 4 mA                        |  | 4,5                                                | 5,5  | 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 |  |                                                    | 0,1  | 0,3   | mA    |    |
| V <sub>CE0</sub>     |                                                                                  |  |                                                    | 1    | 1,15  | V     |    |
|                      |                                                                                  |  |                                                    | 0,9  | 1,05  | V     |    |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V                                                           |  |                                                    | 9    | 12    | mΩ    |    |
|                      |                                                                                  |  |                                                    | 12   | 15    | mΩ    |    |
| V <sub>CE(sat)</sub> | I <sub>Cnom</sub> = 100 A, V <sub>GE</sub> = 15 V                                |  |                                                    | 1,9  | 2,35  | V     |    |
|                      |                                                                                  |  |                                                    | 2,1  | 2,55  | V     |    |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25, V <sub>GE</sub> = 0 V      f = 1 MHz                       |  |                                                    |      | 9     | nF    |    |
| C <sub>oes</sub>     |                                                                                  |  |                                                    |      | 1     |       | nF |
| C <sub>res</sub>     |                                                                                  |  |                                                    |      | 1     |       | nF |
| Q <sub>G</sub>       | V <sub>GE</sub> = -8V - +20V                                                     |  |                                                    |      | 1200  | nC    |    |
| R <sub>Gint</sub>    | T <sub>j</sub> = °C                                                              |  |                                                    |      | 4     | Ω     |    |
| t <sub>d(on)</sub>   | R <sub>Gon</sub> = 3 Ω                                                           |  | V <sub>CC</sub> = 600V<br>I <sub>Cnom</sub> = 100A |      | 210   | ns    |    |
| t <sub>r</sub>       |                                                                                  |  |                                                    |      | 40    | ns    |    |
| E <sub>on</sub>      | R <sub>Goff</sub> = 3 Ω                                                          |  | T <sub>j</sub> = 125 °C<br>V <sub>GE</sub> =±15V   |      | 12    | mJ    |    |
| t <sub>d(off)</sub>  |                                                                                  |  |                                                    |      | 430   | ns    |    |
| t <sub>f</sub>       |                                                                                  |  |                                                    |      | 65    | ns    |    |
| E <sub>off</sub>     |                                                                                  |  |                                                    |      | 10    | mJ    |    |
| R <sub>th(j-c)</sub> | per IGBT                                                                         |  |                                                    |      | 0,165 | K/W   |    |



SPT IGBT Module

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Features

- SPT = Soft-Punch-Through technology
- $V_{CEsat}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_c$

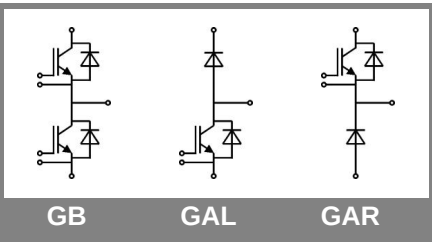
Typical Applications

- AC inverter drives
- UPS
- Electronic welders at  $f_{sw}$  up to 20kHz

| Characteristics                                        |                                                                                                    |                                                                                           |      |                  |      |               |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------|------------------|------|---------------|
| Symbol                                                 | Conditions                                                                                         |                                                                                           | min. | typ.             | max. | Units         |
| Inverse Diode                                          |                                                                                                    |                                                                                           |      |                  |      |               |
| V <sub>F</sub> = V <sub>EC</sub>                       | I <sub>Fnom</sub> = 100 A; V <sub>GE</sub> = 0 V                                                   | T <sub>j</sub> = 25 °C <sub>chiplev.</sub><br>T <sub>j</sub> = 125 °C <sub>chiplev.</sub> |      | 2<br>1,8         | 2,5  | V<br>V        |
| V <sub>F0</sub>                                        |                                                                                                    | T <sub>j</sub> = 25 °C<br>T <sub>j</sub> = 125 °C                                         |      | 1,1              | 1,2  | V<br>V        |
| r <sub>F</sub>                                         |                                                                                                    | T <sub>j</sub> = 25 °C<br>T <sub>j</sub> = 125 °C                                         |      | 9                | 13   | mΩ<br>mΩ      |
| I <sub>RRM</sub><br>Q <sub>rr</sub><br>E <sub>rr</sub> | I <sub>Fnom</sub> = 100 A<br>di/dt = 3500 A/μs<br>V <sub>GE</sub> = -15 V; V <sub>CC</sub> = 600 V | T <sub>j</sub> = 125 °C                                                                   |      | 120<br>18,5<br>7 |      | A<br>μC<br>mJ |
| R <sub>th(j-c)D</sub>                                  | per diode                                                                                          |                                                                                           |      |                  | 0,36 | K/W           |
| Freewheeling Diode                                     |                                                                                                    |                                                                                           |      |                  |      |               |
| V <sub>F</sub> = V <sub>EC</sub>                       | I <sub>Fnom</sub> = 100 A; V <sub>GE</sub> = 0 V                                                   | T <sub>j</sub> = 25 °C <sub>chiplev.</sub><br>T <sub>j</sub> = 125 °C <sub>chiplev.</sub> |      | 2<br>1,8         | 2,5  | V<br>V        |
| V <sub>F0</sub>                                        |                                                                                                    | T <sub>j</sub> = 25 °C                                                                    |      | 1,1              | 1,2  | V             |
| r <sub>F</sub>                                         |                                                                                                    | T <sub>j</sub> = 25 °C                                                                    |      | 9                | 13   | V             |
| I <sub>RRM</sub><br>Q <sub>rr</sub><br>E <sub>rr</sub> | I <sub>Fnom</sub> = 100 A<br>di/dt = 0 A/μs<br>V <sub>GE</sub> = -15 V; V <sub>CC</sub> = 600 V    | T <sub>j</sub> = 125 °C                                                                   |      | 120<br>18,5<br>7 |      | A<br>μC<br>mJ |
| R <sub>th(j-c)FD</sub>                                 | per diode                                                                                          |                                                                                           |      |                  | 0,36 | K/W           |
| Module                                                 |                                                                                                    |                                                                                           |      |                  |      |               |
| L <sub>CE</sub>                                        |                                                                                                    |                                                                                           |      |                  | 30   | nH            |
| R <sub>CC'+EE'</sub>                                   | res., terminal-chip                                                                                | T <sub>case</sub> = 25 °C<br>T <sub>case</sub> = 125 °C                                   |      | 0,75<br>1        |      | mΩ<br>mΩ      |
| R <sub>th(c-s)</sub>                                   | per module                                                                                         |                                                                                           |      |                  | 0,05 | K/W           |
| M <sub>s</sub>                                         | to heat sink M6                                                                                    |                                                                                           | 3    |                  | 5    | Nm            |
| M <sub>t</sub>                                         | to terminals M5                                                                                    |                                                                                           | 2,5  |                  | 5    | Nm            |
| w                                                      |                                                                                                    |                                                                                           |      |                  | 160  | g             |

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

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee expressed or implied is made regarding delivery, performance or suitability.





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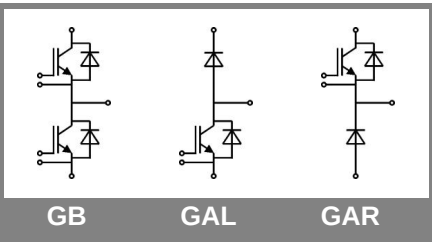
Features

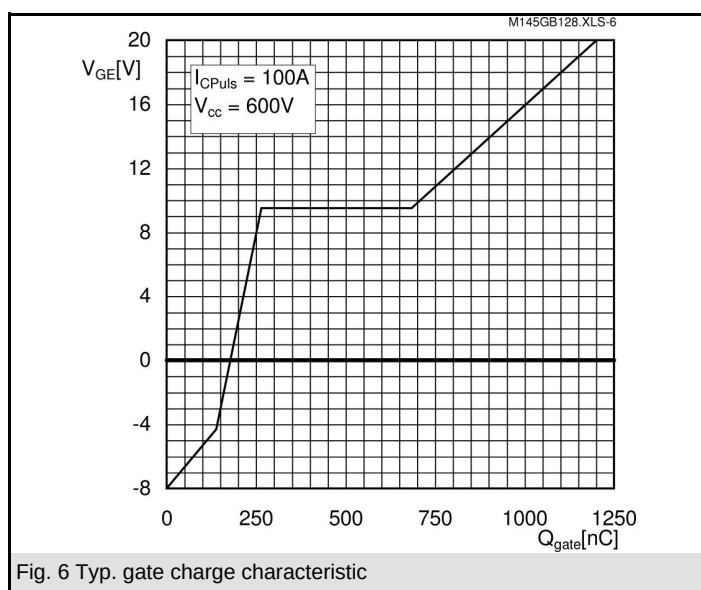
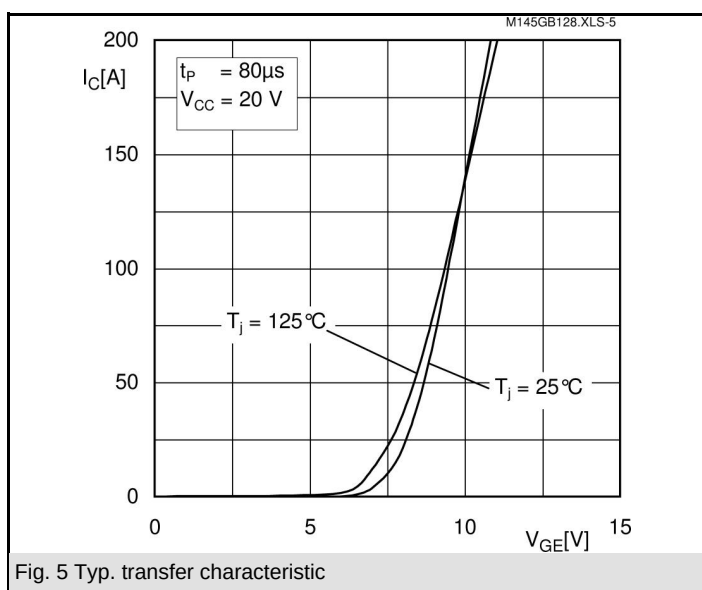
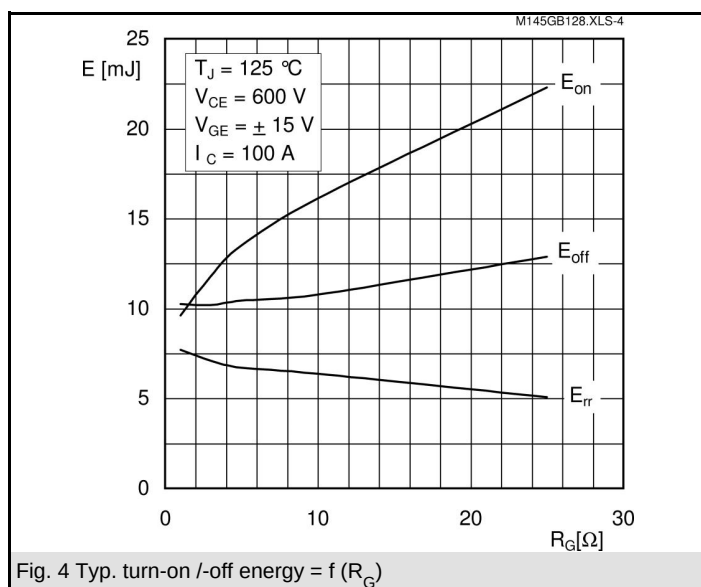
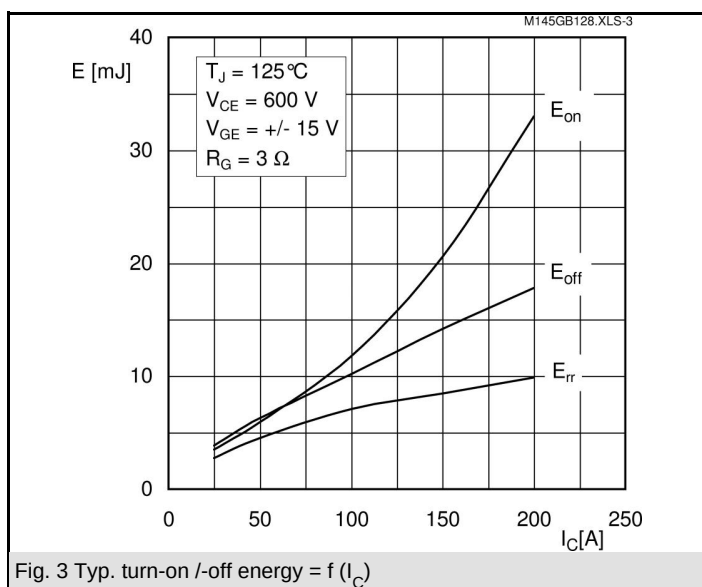
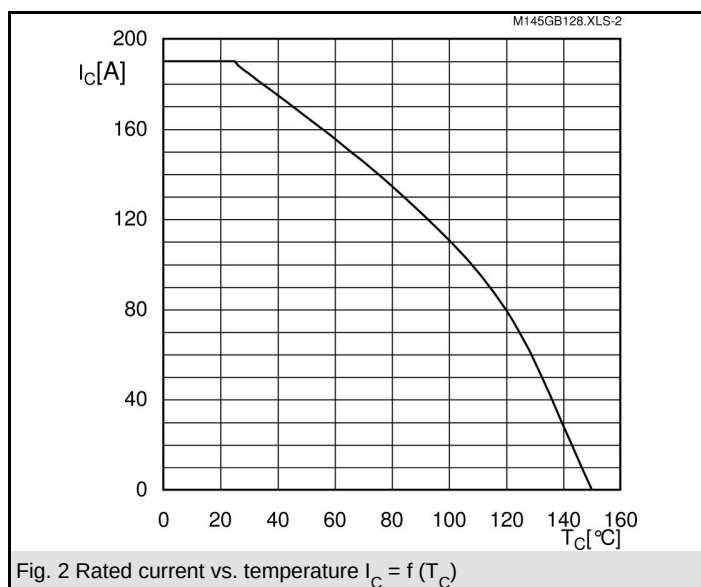
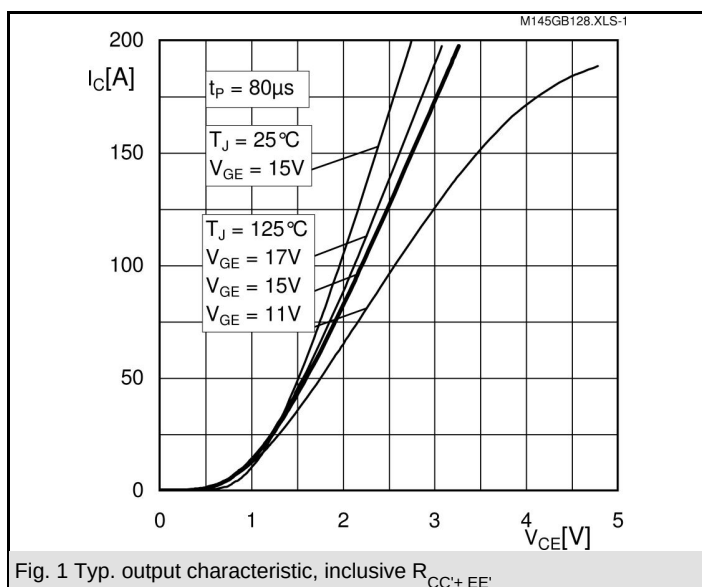
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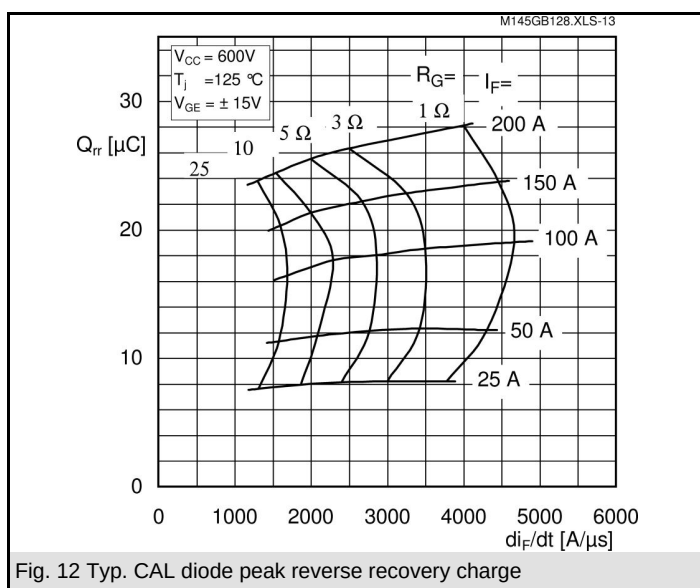
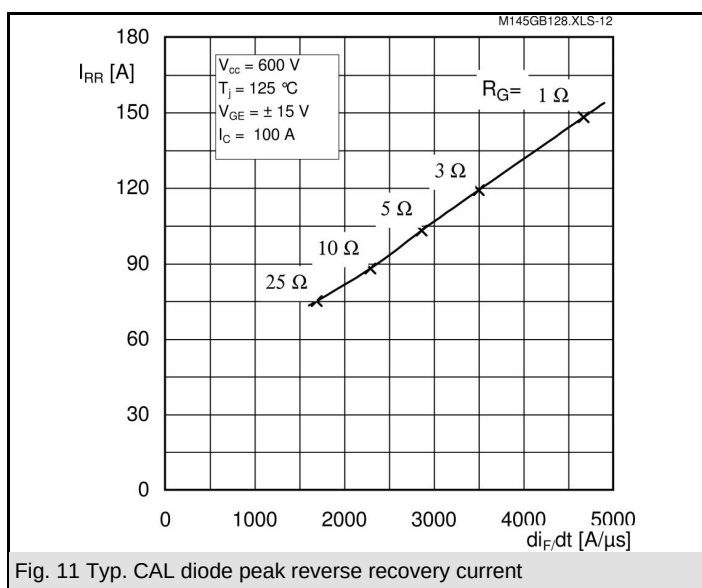
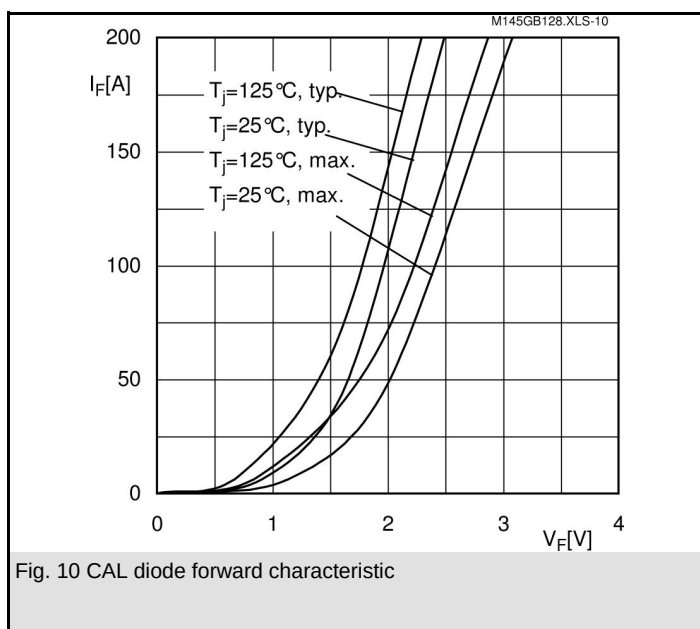
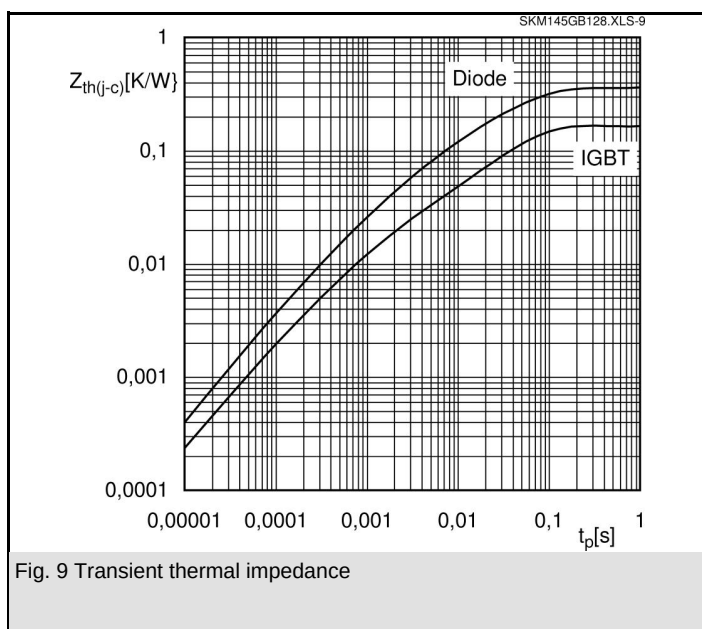
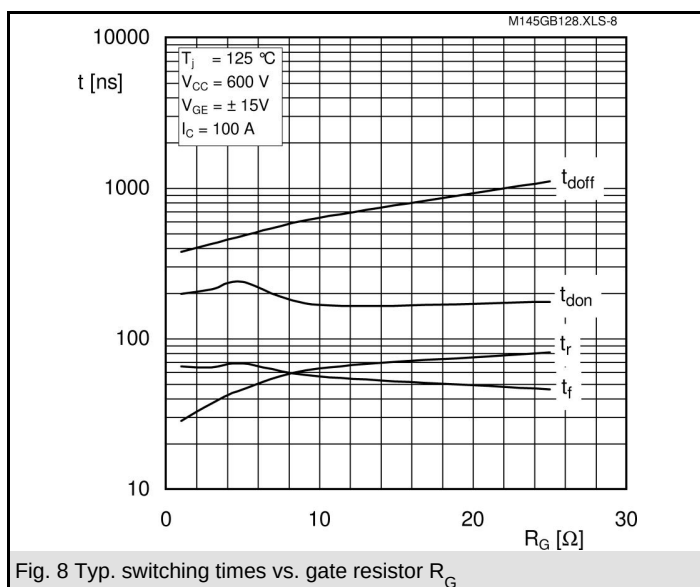
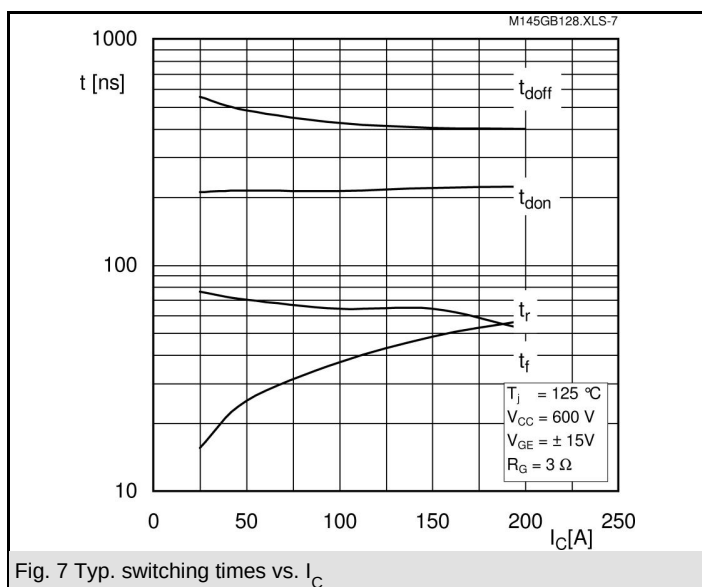
Typical Applications

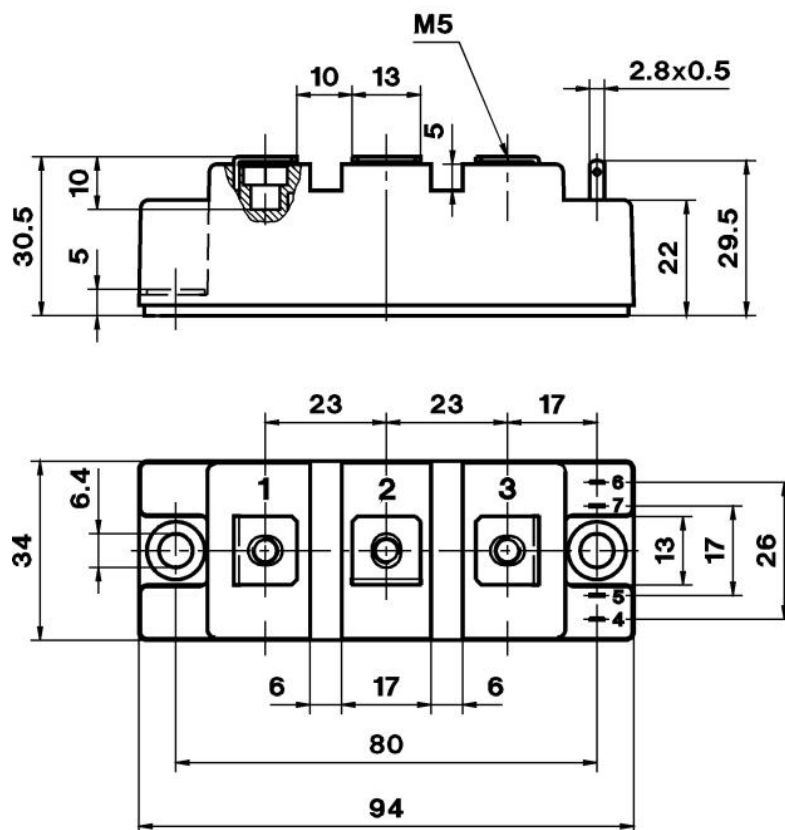
- AC inverter drives
- UPS
- Electronic welders at  $f_{sw}$  up to 20kHz

| $Z_{th}$       |            |        |       |
|----------------|------------|--------|-------|
| Symbol         | Conditions | Values | Units |
| $Z_{th(j-c)I}$ |            |        |       |
| $R_i$          | $i = 1$    | 120    | mk/W  |
| $R_i$          | $i = 2$    | 34     | mk/W  |
| $R_i$          | $i = 3$    | 9      | mk/W  |
| $R_i$          | $i = 4$    | 2      | mk/W  |
| $\tau_{u_i}$   | $i = 1$    | 0,03   | s     |
| $\tau_{u_i}$   | $i = 2$    | 0,1123 | s     |
| $\tau_{u_i}$   | $i = 3$    | 0,0012 | s     |
| $\tau_{u_i}$   | $i = 4$    | 0,0002 | s     |
| $Z_{th(j-c)D}$ |            |        |       |
| $R_i$          | $i = 1$    | 240    | mk/W  |
| $R_i$          | $i = 2$    | 95     | mk/W  |
| $R_i$          | $i = 3$    | 21,5   | mk/W  |
| $R_i$          | $i = 4$    | 3,5    | mk/W  |
| $\tau_{u_i}$   | $i = 1$    | 0,054  | s     |
| $\tau_{u_i}$   | $i = 2$    | 0,0113 | s     |
| $\tau_{u_i}$   | $i = 3$    | 0,0012 | s     |
| $\tau_{u_i}$   | $i = 4$    | 0,005  | s     |

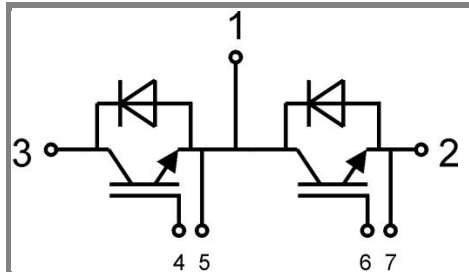




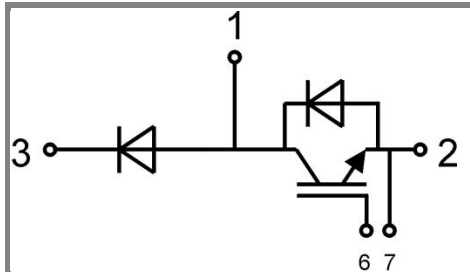




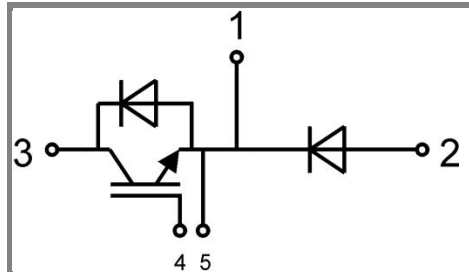
Case D 61, Case D 62, Case D 63



GB Case D 61



GAL Case D 62



GAR Case D 63