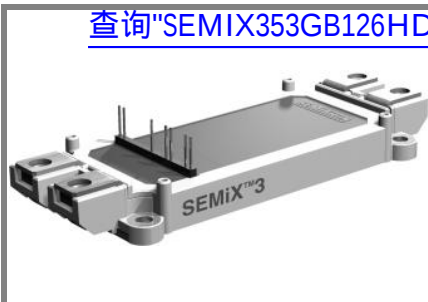


# SEMiX 353GB126HD

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SEMiX® 3

## Trench IGBT Modules

### SEMiX 353GB126HD

Preliminary Data

#### Features

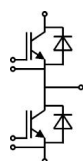
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability

#### Typical Applications

- AC inverter drives
- UPS
- Electronic Welding

#### Remarks

- Case temperatur limited to  $T_C=125^{\circ}\text{C}$  max.
- Not for new design



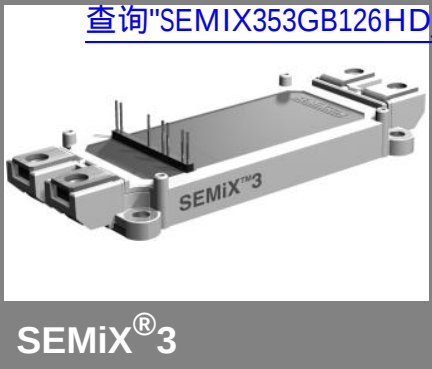
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| Absolute Maximum Ratings |                                                                                                       | T <sub>case</sub> = 25°C, unless otherwise specified |     |       |
|--------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----|-------|
| Symbol                   | Conditions                                                                                            | Values                                               |     | Units |
| IGBT                     |                                                                                                       |                                                      |     |       |
| V <sub>CES</sub>         | T <sub>j</sub> = 25 °C                                                                                | 1200                                                 |     | V     |
| I <sub>C</sub>           | T <sub>j</sub> = 150 °C                                                                               | T <sub>c</sub> = 25 °C                               | 365 | A     |
|                          |                                                                                                       | T <sub>c</sub> = 80 °C                               | 255 | A     |
| I <sub>CRM</sub>         | I <sub>CRM</sub> =2xI <sub>Cnom</sub>                                                                 | 450                                                  |     | A     |
| V <sub>GES</sub>         |                                                                                                       | ± 20                                                 |     | V     |
| t <sub>psc</sub>         | V <sub>CC</sub> = 600 V; V <sub>GE</sub> ≤ 20 V; T <sub>j</sub> = 125 °C<br>V <sub>CES</sub> < 1200 V | 10                                                   |     | µs    |
| Inverse Diode            |                                                                                                       |                                                      |     |       |
| I <sub>F</sub>           | T <sub>j</sub> = 150 °C                                                                               | T <sub>c</sub> = 25 °C                               | 330 | A     |
|                          |                                                                                                       | T <sub>c</sub> = 80 °C                               | 225 | A     |
| I <sub>FRM</sub>         | I <sub>FRM</sub> =2xI <sub>Fnom</sub>                                                                 | 450                                                  |     | A     |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms; sin. T <sub>j</sub> = 25 °C                                                   | 1700                                                 |     | A     |
| Module                   |                                                                                                       |                                                      |     |       |
| I <sub>t(RMS)</sub>      |                                                                                                       | 600                                                  |     | A     |
| T <sub>vj</sub>          |                                                                                                       | - 40 ... + 150                                       |     | °C    |
| T <sub>stg</sub>         |                                                                                                       | - 40 ... + 125                                       |     | °C    |
| V <sub>isol</sub>        | AC, 1 min.                                                                                            | 4000                                                 |     | V     |

| Characteristics                                           |                                                                                                                                                | T <sub>case</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> = 9 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                                                                                              |                                                                               | 1                  | 1,2  | V              |
|                                                           |                                                                                                                                                |                                                                               | 0,9                | 1,1  | V              |
| r <sub>CE</sub>                                           | V <sub>GE</sub> = 15 V      T <sub>j</sub> = 25°C<br>T <sub>j</sub> = 125°C                                                                    |                                                                               | 3,1                | 4,2  | mΩ             |
|                                                           |                                                                                                                                                |                                                                               | 4,9                | 6    | mΩ             |
| V <sub>CE(sat)</sub>                                      | I <sub>Cnom</sub> = 225 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> |                                                                               | 1,7                | 2,1  | V              |
|                                                           |                                                                                                                                                |                                                                               | 2                  | 2,4  | V              |
| C <sub>ies</sub><br>C <sub>oes</sub><br>C <sub>res</sub>  | V <sub>CE</sub> = 25, V <sub>GE</sub> = 0 V      f = 1 MHz                                                                                     |                                                                               | 16<br>0,84<br>0,73 |      | nF<br>nF<br>nF |
| Q <sub>G</sub>                                            | V <sub>GE</sub> = -8 ... +15V                                                                                                                  |                                                                               | 1800               |      | nC             |
| t <sub>d(on)</sub><br>t <sub>r</sub><br>E <sub>on</sub>   | R <sub>Gon</sub> = 2 Ω                                                                                                                         | V <sub>CC</sub> = 600V<br>I <sub>Cnom</sub> = 225A<br>T <sub>j</sub> = 125 °C | 265                |      | ns             |
|                                                           |                                                                                                                                                |                                                                               | 55                 |      | ns             |
|                                                           |                                                                                                                                                |                                                                               | 26,5               |      | mJ             |
| t <sub>d(off)</sub><br>t <sub>f</sub><br>E <sub>off</sub> | R <sub>Goff</sub> = 2 Ω                                                                                                                        |                                                                               | 585                |      | ns             |
|                                                           |                                                                                                                                                |                                                                               |                    | 120  |                |
|                                                           |                                                                                                                                                |                                                                               | 32,5               |      | mJ             |
| R <sub>th(j-c)</sub>                                      | per IGBT                                                                                                                                       |                                                                               |                    | 0,1  | K/W            |

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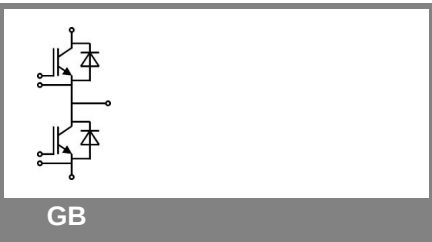
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| Characteristics    |                                                               |                                                |      |          |            |
|--------------------|---------------------------------------------------------------|------------------------------------------------|------|----------|------------|
| Symbol             | Conditions                                                    |                                                | min. | typ.     | max. Units |
| Inverse Diode      |                                                               |                                                |      |          |            |
| $V_F = V_{EC}$     | $I_{Fnom} = 225\text{ A}; V_{GE} = 0\text{ V}$                | $T_j = 25\text{ }^{\circ}\text{C}_{chiplev.}$  |      | 1,6      | 1,8 V      |
|                    |                                                               | $T_j = 125\text{ }^{\circ}\text{C}_{chiplev.}$ |      | 1,6      | 1,8 V      |
| $V_{F0}$           |                                                               | $T_j = 25\text{ }^{\circ}\text{C}$             |      | 1        | 1,1 V      |
|                    |                                                               | $T_j = 125\text{ }^{\circ}\text{C}$            |      | 0,8      | 0,9 V      |
| $r_F$              |                                                               | $T_j = 25\text{ }^{\circ}\text{C}$             |      | 2,7      | 3,1 mΩ     |
|                    |                                                               | $T_j = 125\text{ }^{\circ}\text{C}$            |      | 3,6      | 4 mΩ       |
| $I_{RRM}$          | $I_{Fnom} = 225\text{ A}$                                     | $T_j = 125\text{ }^{\circ}\text{C}$            |      | 330      | A          |
| $Q_{rr}$           | $di/dt = 5600\text{ A}/\mu\text{s}$                           |                                                |      | 69       | μC         |
| $E_{rr}$           | $V_{GE} = -15\text{ V}; V_{CC} = 600\text{ V}$                |                                                |      | 29       | mJ         |
| $R_{th(j-c)D}$     | per diode                                                     |                                                |      | 0,17     | K/W        |
| Module             |                                                               |                                                |      |          |            |
| $L_{CE}$           |                                                               |                                                |      | 20       | nH         |
| $R_{CC'+EE'}$      | res., terminal-chip                                           | $T_{case} = 25\text{ }^{\circ}\text{C}$        |      | 0,7      | mΩ         |
|                    |                                                               | $T_{case} = 125\text{ }^{\circ}\text{C}$       |      | 1        | mΩ         |
| $R_{th(c-s)}$      | per module                                                    |                                                |      | 0,04     | K/W        |
| $M_s$              | to heat sink (M5)                                             |                                                | 3    |          | 5 Nm       |
| $M_t$              | to terminals (M6)                                             |                                                | 2,5  |          | 5 Nm       |
| w                  |                                                               |                                                |      |          | 300 g      |
| Temperature sensor |                                                               |                                                |      |          |            |
| $R_{100}$          | $T_c=100^{\circ}\text{C}$ ( $R_{25}=5\text{ k}\Omega$ )       |                                                |      | 0,493±5% | kΩ         |
| $B_{100/125}$      | $R(T)=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$ ;<br>$T[K]; B$ |                                                |      | 3550±2%  | K          |

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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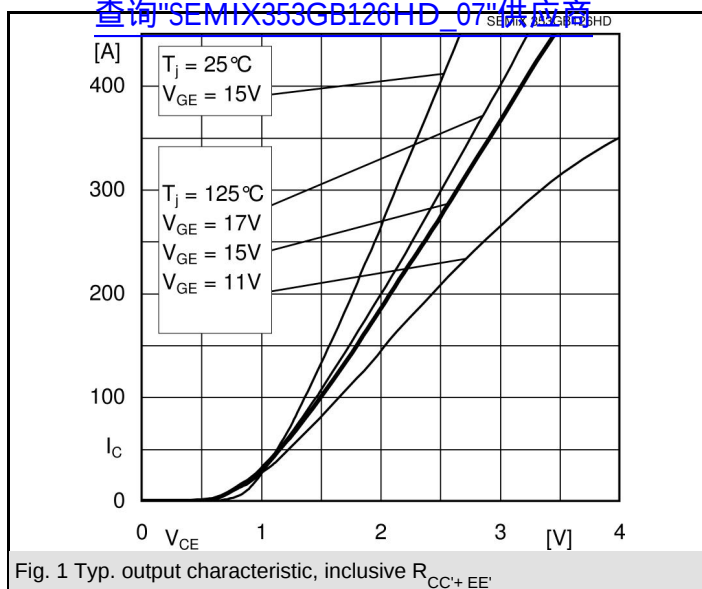


Fig. 1 Typ. output characteristic, inclusive  $R_{CC'+EE'}$

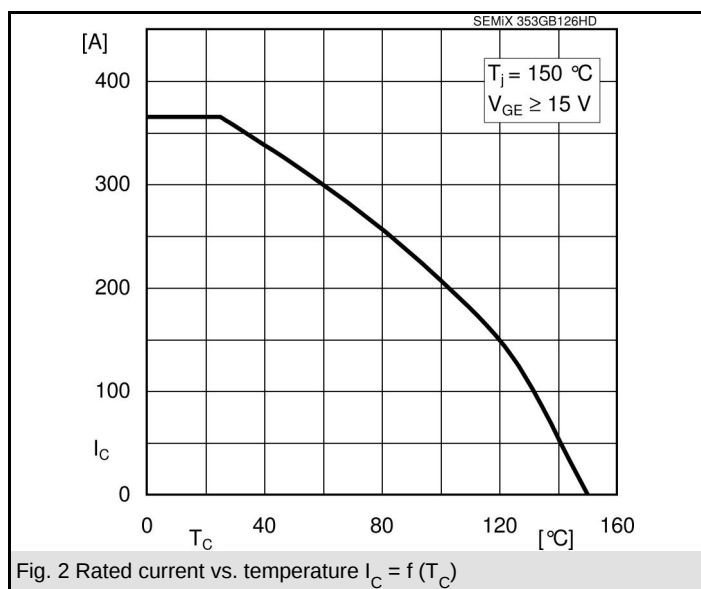


Fig. 2 Rated current vs. temperature  $I_C = f(T_C)$

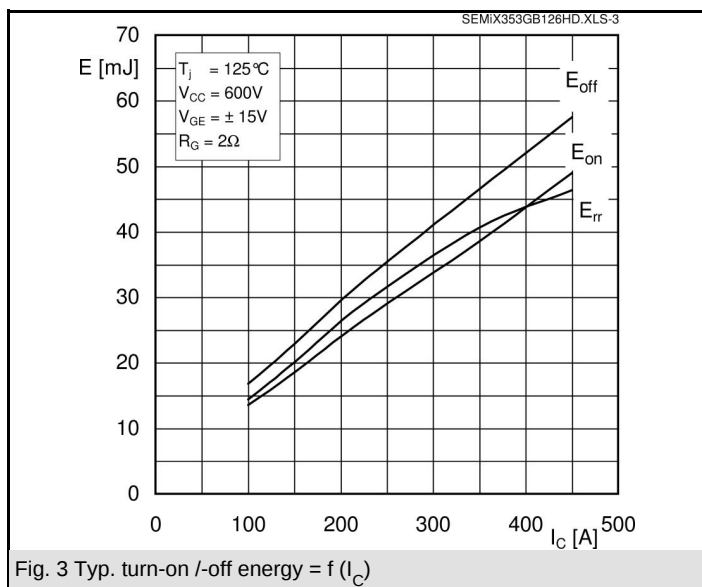


Fig. 3 Typ. turn-on /off energy =  $f(I_C)$

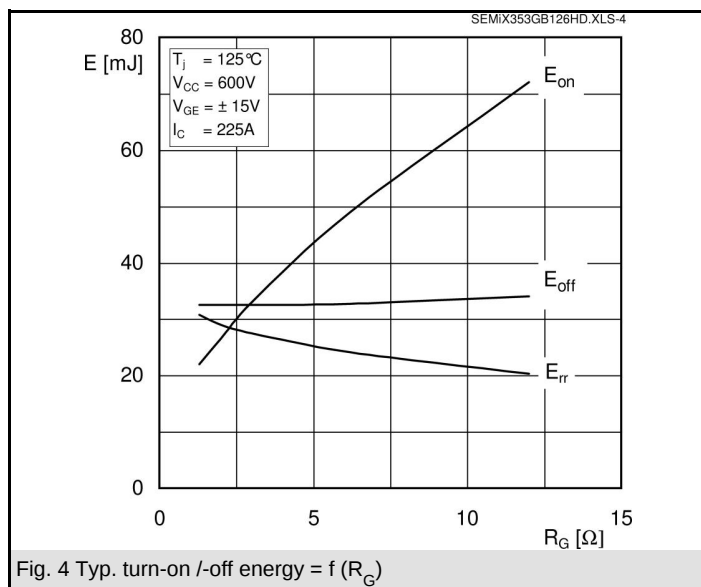


Fig. 4 Typ. turn-on /off energy =  $f(R_G)$

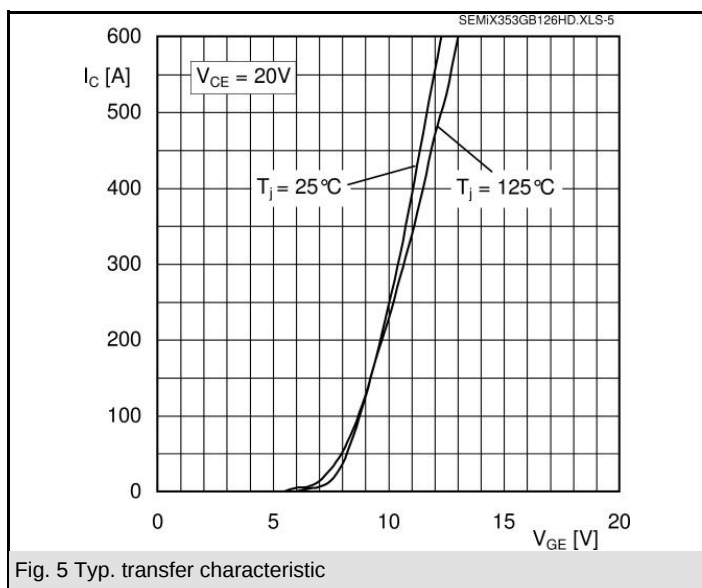


Fig. 5 Typ. transfer characteristic

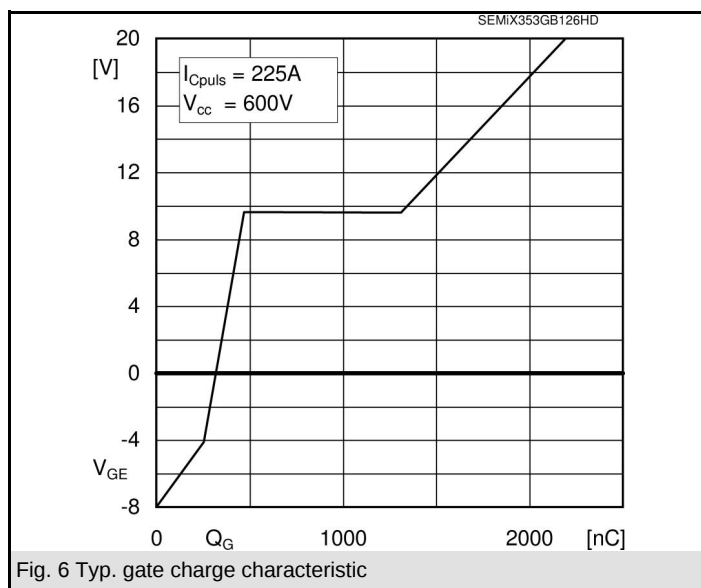
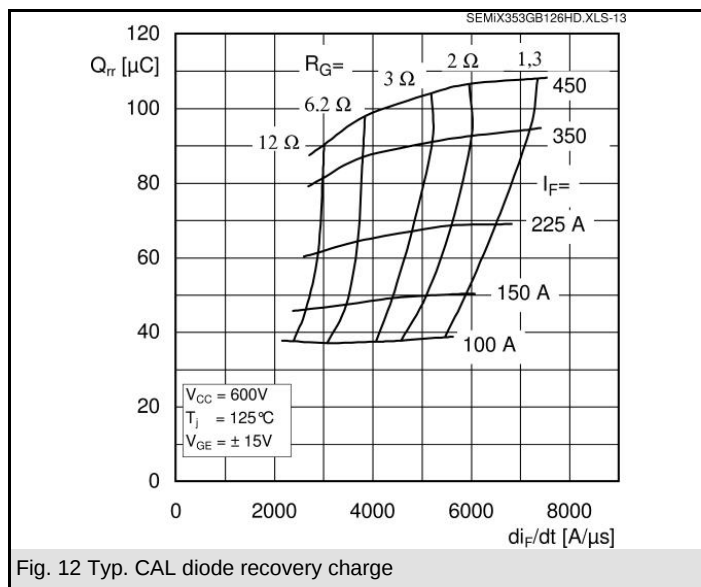
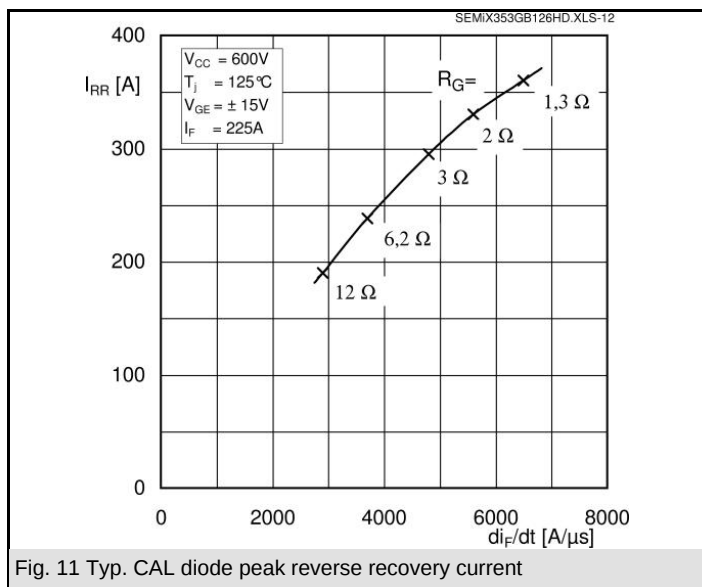
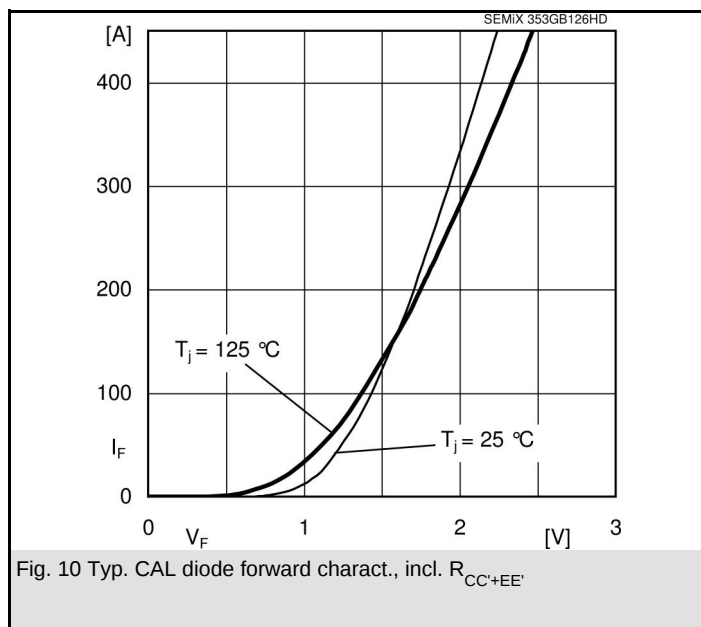
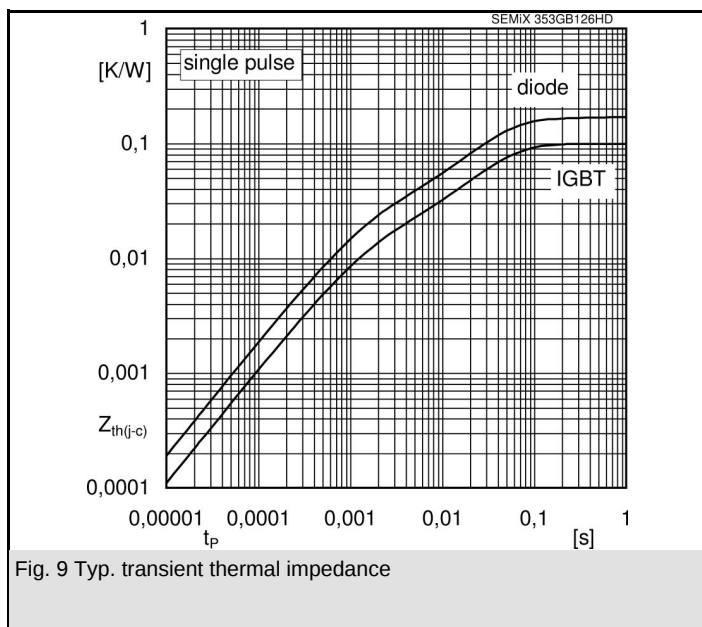
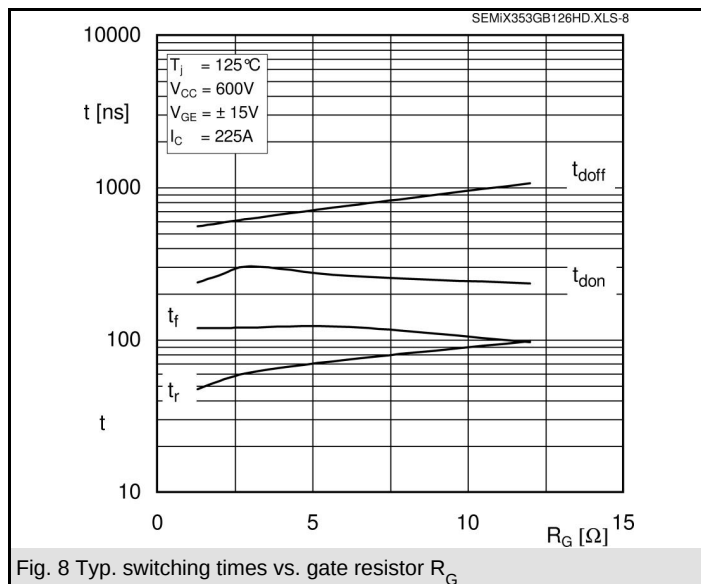
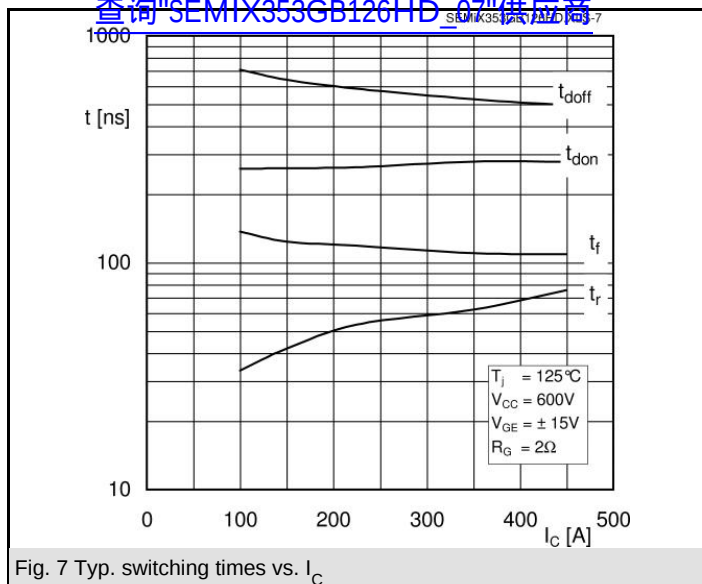
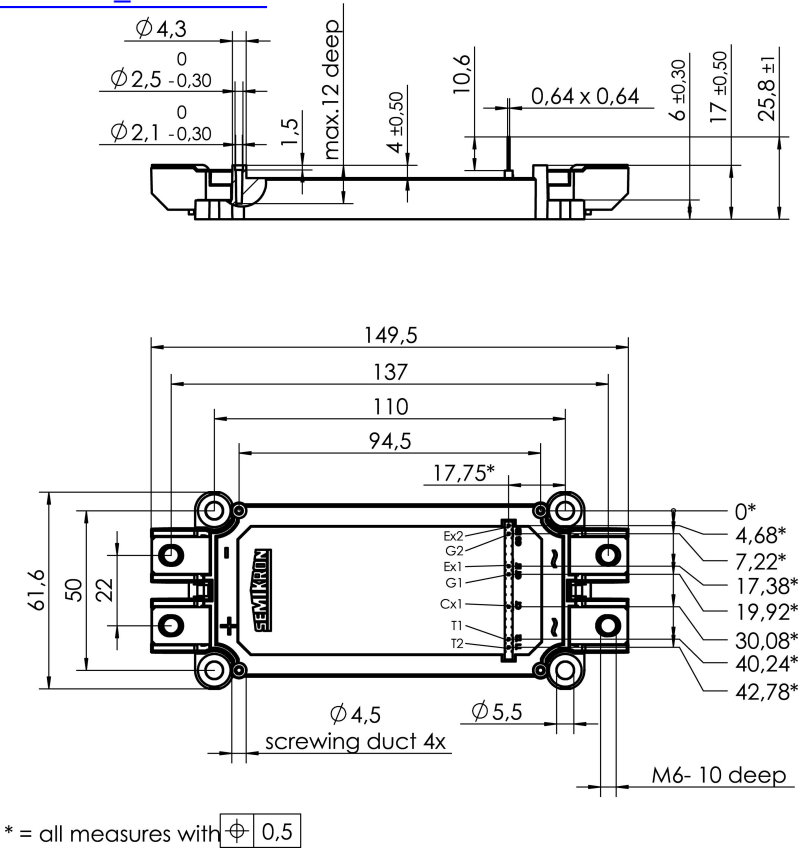


Fig. 6 Typ. gate charge characteristic

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