



## SEMiX223GD12Vc

### Features

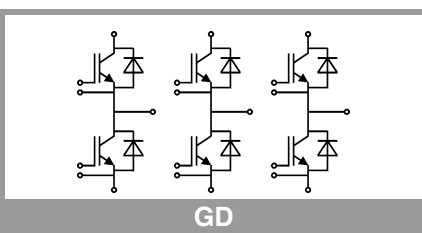
- Homogeneous Si
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability
- UL recognised file no. E63532

### Typical Applications\*

- AC inverter drives
- UPS
- Electronic Welding

### Remarks

- Case temperature limited to  $T_C=125^{\circ}\text{C}$  max.
- Product reliability results are valid for  $T_J=150^{\circ}\text{C}$
- Dynamic values apply to the following combination of resistors:  
 $R_{Gon,main} = 2,9\ \Omega$   
 $R_{Goff,main} = 2,9\ \Omega$   
 $R_{G,X} = 2,2\ \Omega$   
 $R_{E,X} = 0,5\ \Omega$



| Absolute Maximum Ratings |                                                                                |                         |             |      |
|--------------------------|--------------------------------------------------------------------------------|-------------------------|-------------|------|
| Symbol                   | Conditions                                                                     |                         | Values      | Unit |
| IGBT                     |                                                                                |                         |             |      |
| V <sub>CES</sub>         |                                                                                |                         | 1200        | V    |
| I <sub>C</sub>           | T <sub>j</sub> = 175 °C                                                        | T <sub>c</sub> = 25 °C  | 323         | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 246         | A    |
| I <sub>Cnom</sub>        |                                                                                |                         | 225         | A    |
| I <sub>CRM</sub>         | I <sub>CRM</sub> = 3xI <sub>Cnom</sub>                                         |                         | 675         | A    |
| V <sub>GES</sub>         |                                                                                |                         | -20 ... 20  | V    |
| t <sub>psc</sub>         | V <sub>CC</sub> = 600 V<br>V <sub>GE</sub> ≤ 15 V<br>V <sub>CES</sub> ≤ 1200 V | T <sub>j</sub> = 125 °C | 10          | μs   |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |
| Inverse diode            |                                                                                |                         |             |      |
| I <sub>F</sub>           | T <sub>j</sub> = 175 °C                                                        | T <sub>c</sub> = 25 °C  | 263         | A    |
|                          |                                                                                | T <sub>c</sub> = 80 °C  | 197         | A    |
| I <sub>Fnom</sub>        |                                                                                |                         | 225         | A    |
| I <sub>FRM</sub>         | I <sub>FRM</sub> = 3xI <sub>Fnom</sub>                                         |                         | 675         | A    |
| I <sub>FSM</sub>         | t <sub>p</sub> = 10 ms, sin 180°, T <sub>j</sub> = 25 °C                       |                         | 1161        | A    |
| T <sub>j</sub>           |                                                                                |                         | -40 ... 175 | °C   |
| Module                   |                                                                                |                         |             |      |
| I <sub>t(RMS)</sub>      | T <sub>terminal</sub> = 80 °C                                                  |                         | 600         | A    |
| T <sub>stg</sub>         |                                                                                |                         | -40 ... 125 | °C   |
| V <sub>isol</sub>        | AC sinus 50Hz, t = 1 min                                                       |                         | 4000        | V    |

| Characteristics      |                                                          |                         |      |      |      |      |
|----------------------|----------------------------------------------------------|-------------------------|------|------|------|------|
| Symbol               | Conditions                                               |                         | min. | typ. | max. | Unit |
| IGBT                 |                                                          |                         |      |      |      |      |
| V <sub>CE(sat)</sub> | I <sub>C</sub> = 225 A                                   | T <sub>j</sub> = 25 °C  |      | 1.85 | 2.3  | V    |
|                      | V <sub>GE</sub> = 15 V<br>chipelevel                     | T <sub>j</sub> = 150 °C |      | 2.3  | 2.55 | V    |
| V <sub>CE0</sub>     |                                                          | T <sub>j</sub> = 25 °C  |      | 0.94 | 1.04 | V    |
|                      |                                                          | T <sub>j</sub> = 150 °C |      | 0.88 | 0.98 | V    |
| r <sub>CE</sub>      | V <sub>GE</sub> = 15 V                                   | T <sub>j</sub> = 25 °C  |      | 4.0  | 5.6  | mΩ   |
|                      |                                                          | T <sub>j</sub> = 150 °C |      | 6.1  | 7.0  | mΩ   |
| V <sub>GE(th)</sub>  | V <sub>GE</sub> =V <sub>CE</sub> , I <sub>C</sub> = 9 mA |                         | 5.5  | 6    | 6.5  | V    |
| I <sub>CES</sub>     | V <sub>GE</sub> = 0 V                                    | T <sub>j</sub> = 25 °C  |      | 0.1  | 0.3  | mA   |
|                      | V <sub>CE</sub> = 1200 V                                 | T <sub>j</sub> = 150 °C |      |      |      | mA   |
| C <sub>ies</sub>     | V <sub>CE</sub> = 25 V<br>V <sub>GE</sub> = 0 V          | f = 1 MHz               |      | 13.5 |      | nF   |
| C <sub>oes</sub>     |                                                          | f = 1 MHz               |      | 1.33 |      | nF   |
| C <sub>res</sub>     |                                                          | f = 1 MHz               |      | 1.33 |      | nF   |
| Q <sub>G</sub>       | V <sub>GE</sub> = - 8 V...+ 15 V                         |                         |      | 2460 |      | nC   |
| R <sub>Gint</sub>    | T <sub>j</sub> = 25 °C                                   |                         |      | 3.33 |      | Ω    |
| t <sub>d(on)</sub>   | V <sub>CC</sub> = 600 V                                  | T <sub>j</sub> = 150 °C |      | 470  |      | ns   |
| t <sub>r</sub>       | I <sub>C</sub> = 225 A                                   | T <sub>j</sub> = 150 °C |      | 72   |      | ns   |
| E <sub>on</sub>      | V <sub>GE</sub> = ±15 V                                  | T <sub>j</sub> = 150 °C |      | 19.9 |      | mJ   |
| t <sub>d(off)</sub>  | R <sub>G on</sub> = 3.8 Ω                                | T <sub>j</sub> = 150 °C |      | 665  |      | ns   |
| t <sub>f</sub>       | R <sub>G off</sub> = 3.8 Ω                               | T <sub>j</sub> = 150 °C |      | 109  |      | ns   |
|                      | di/dt <sub>on</sub> = 3200 A/μs                          |                         |      |      |      |      |
|                      | di/dt <sub>off</sub> = 2000 A/μs                         |                         |      |      |      |      |
| E <sub>off</sub>     | du/dt <sub>off</sub> = 6600 V/μs                         | T <sub>j</sub> = 150 °C |      | 27.2 |      | mJ   |
| R <sub>th(j-c)</sub> | per IGBT                                                 |                         |      |      | 0.14 | K/W  |



SEMiX® 33c

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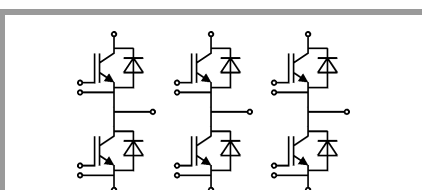
### Typical Applications\*

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### Remarks

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| Characteristics   |                                                                                                                         |                                     |                |      |      |      |
|-------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------|------|------|------|
| Symbol            | Conditions                                                                                                              |                                     | min.           | typ. | max. | Unit |
| Inverse diode     |                                                                                                                         |                                     |                |      |      |      |
| $V_F = V_{EC}$    | $I_F = 225\text{ A}$<br>$V_{GE} = 0\text{ V}$<br>chip                                                                   | $T_j = 25\text{ }^{\circ}\text{C}$  |                | 2.2  | 2.49 | V    |
|                   |                                                                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$ |                | 2.1  | 2.4  | V    |
| $V_{F0}$          |                                                                                                                         | $T_j = 25\text{ }^{\circ}\text{C}$  | 1.1            | 1.3  | 1.5  | V    |
|                   |                                                                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$ | 0.7            | 0.9  | 1.1  | V    |
| $r_F$             |                                                                                                                         | $T_j = 25\text{ }^{\circ}\text{C}$  | 3.6            | 3.9  | 4.4  | mΩ   |
|                   |                                                                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$ | 4.7            | 5.4  | 5.9  | mΩ   |
| $I_{RRM}$         | $I_F = 225\text{ A}$<br>$di/dt_{off} = 3400\text{ A}/\mu\text{s}$<br>$V_{GE} = -15\text{ V}$<br>$V_{CC} = 600\text{ V}$ | $T_j = 150\text{ }^{\circ}\text{C}$ | 210            |      |      | A    |
| $Q_{rr}$          |                                                                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$ | 39.4           |      |      | μC   |
| $E_{rr}$          |                                                                                                                         | $T_j = 150\text{ }^{\circ}\text{C}$ | 16.4           |      |      | mJ   |
| $R_{th(j-c)}$     | per diode                                                                                                               |                                     | 0.23           |      |      | K/W  |
| Module            |                                                                                                                         |                                     |                |      |      |      |
| $L_{CE}$          |                                                                                                                         |                                     | 20             |      |      | nH   |
| $R_{CC'+EE'}$     | res., terminal-chip                                                                                                     | $T_C = 25\text{ }^{\circ}\text{C}$  | 0.7            |      |      | mΩ   |
|                   |                                                                                                                         | $T_C = 125\text{ }^{\circ}\text{C}$ | 1              |      |      | mΩ   |
| $R_{th(c-s)}$     | per module                                                                                                              |                                     | 0.014          |      |      | K/W  |
| $M_s$             | to heat sink (M5)                                                                                                       |                                     | 3              | 5    |      | Nm   |
| $M_t$             |                                                                                                                         | to terminals (M6)                   | 2.5            | 5    |      | Nm   |
|                   |                                                                                                                         |                                     |                |      |      | Nm   |
| w                 |                                                                                                                         |                                     | 900            |      |      | g    |
| Temperatur Sensor |                                                                                                                         |                                     |                |      |      |      |
| $R_{100}$         | $T_C=100^{\circ}\text{C}$ ( $R_{25}=5\text{ k}\Omega$ )                                                                 |                                     | $493 \pm 5\%$  |      |      | Ω    |
| $B_{100/125}$     | $R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$ ; $T[\text{K}]$ ;                                                     |                                     | $3550 \pm 2\%$ |      |      | K    |



GD

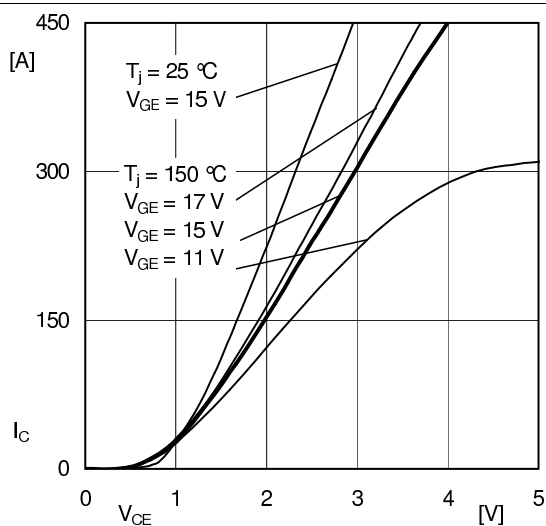


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'}+EE'$

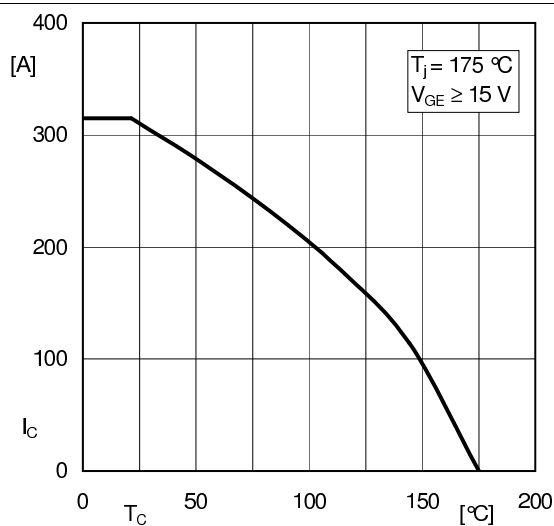


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

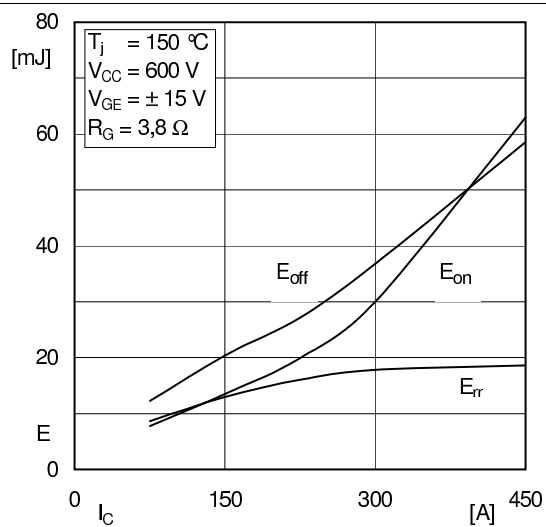


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

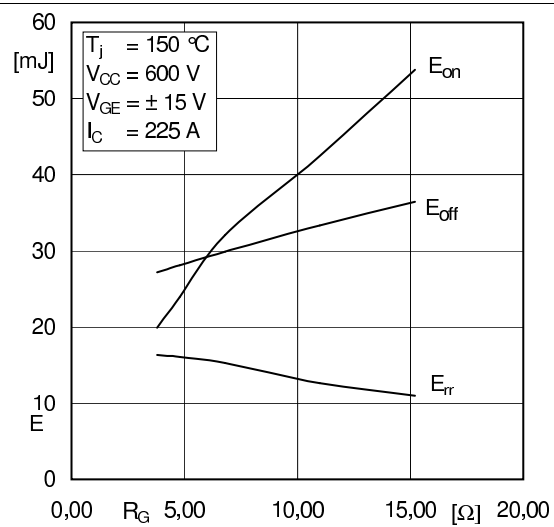


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

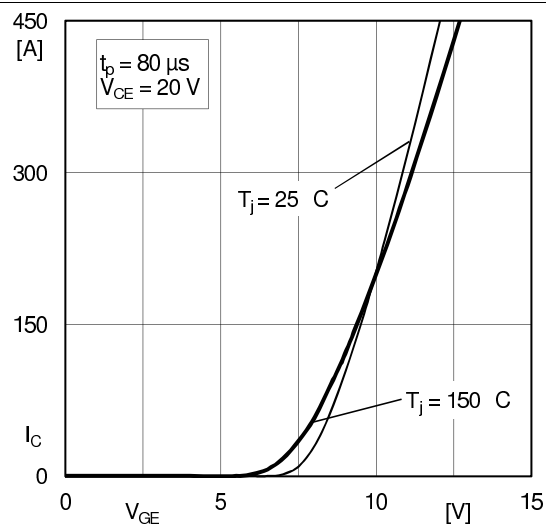


Fig. 5: Typ. transfer characteristic

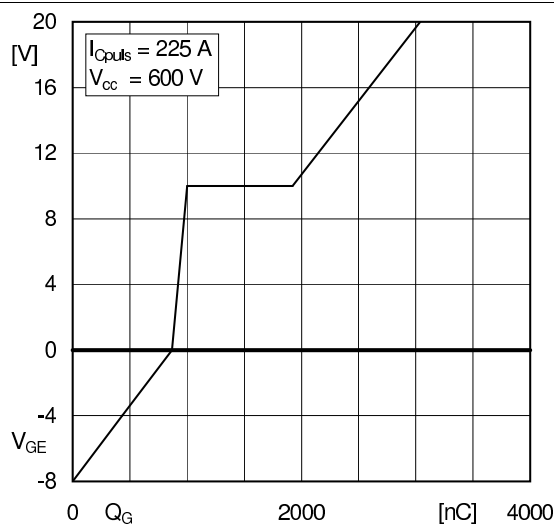


Fig. 6: Typ. gate charge characteristic

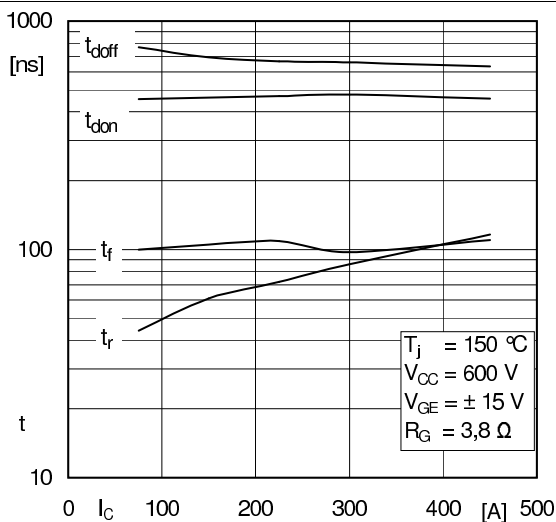


Fig. 7: Typ. switching times vs.  $I_C$

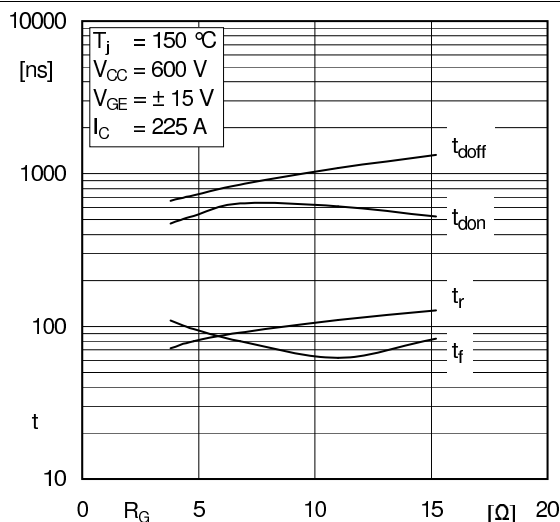


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

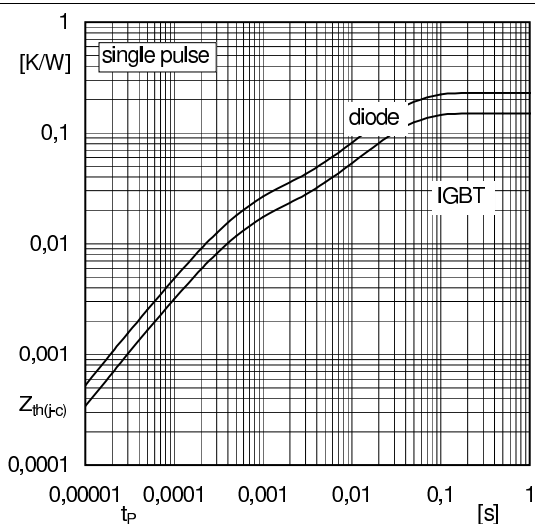


Fig. 9: Typ. transient thermal impedance

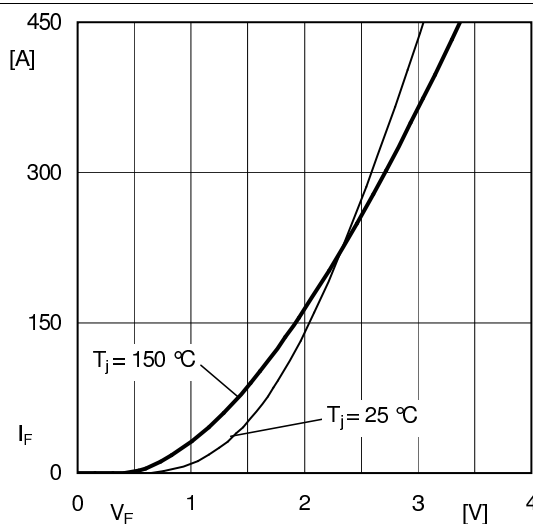


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC'+EE'}$

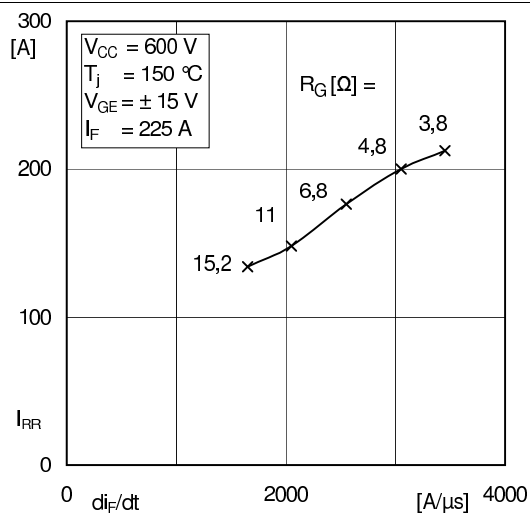


Fig. 11: Typ. CAL diode peak reverse recovery current

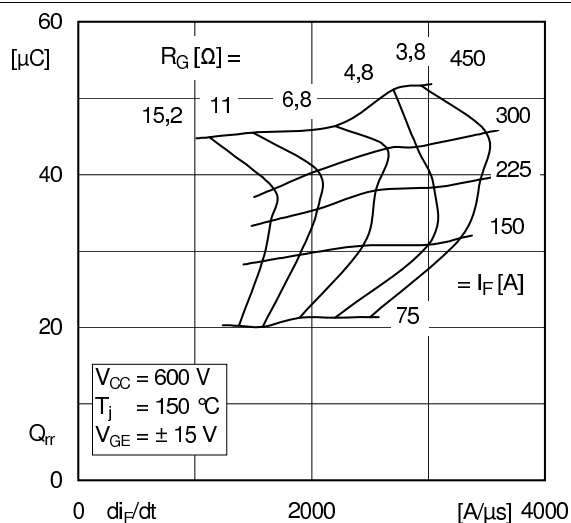
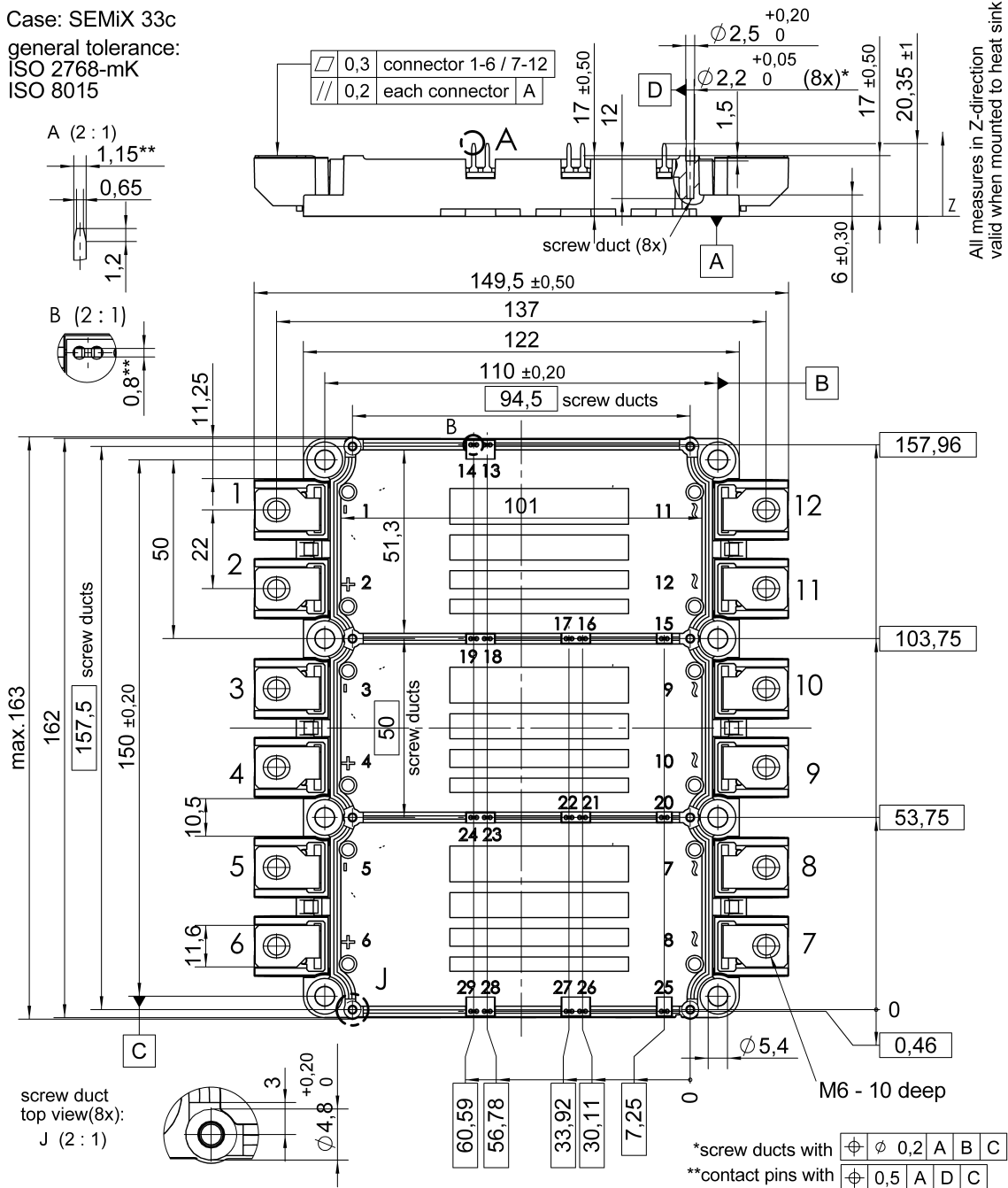


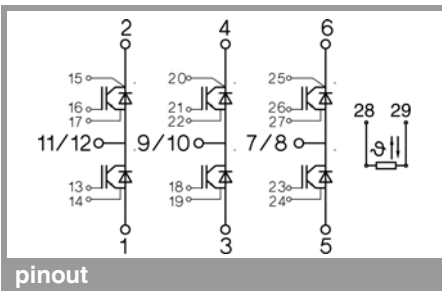
Fig. 12: Typ. CAL diode recovery charge

# SEMiX223GD12Vc

Case: SEMiX 33c  
general tolerance:  
ISO 2768-mK  
ISO 8015



## SEMiX 33c



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 staff.