

**Highly insulated module with Trench/Fieldstop IGBT3 and emitter controlled 3 diode****Features**

- Electrical features
  - $V_{CES} = 4500\text{ V}$
  - $I_{C\text{ nom}} = 800\text{ A} / I_{CRM} = 1600\text{ A}$
  - High DC stability
  - High dynamic robustness
  - High short-circuit capability
  - Low  $V_{CE,sat}$
  - Trench IGBT 3
  - $V_{CE,sat}$  with positive temperature coefficient
- Mechanical features
  - ALSiC base plate for increased thermal cycling capability
  - High creepage and clearance distances
  - Isolated base plate
  - Package with CTI > 600
  - Package with enhanced insulation of 10.4 kV AC 60 s

**Potential applications**

- Traction drives
- Motor drives
- Medium-voltage converters
- Chopper applications
- High-power converters

**Product validation**

- Qualified for industrial applications according to the relevant tests of IEC 60747, 60749 and 60068

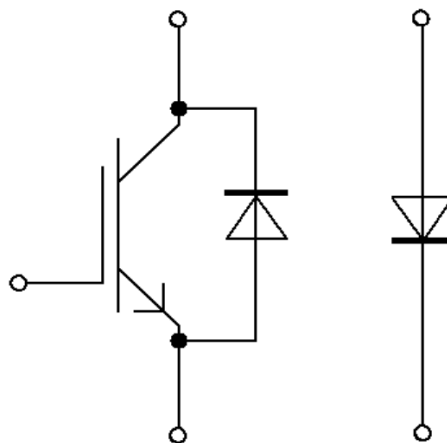
**Description**

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## 1 Package

**Table 1**                      **Insulation coordination**

| Parameter                            | Symbol      | Note or test condition                                 | Values | Unit |
|--------------------------------------|-------------|--------------------------------------------------------|--------|------|
| Isolation test voltage               | $V_{ISOL}$  | RMS, $f = 50 \text{ Hz}$ , $t = 60 \text{ s}$          | 10.4   | kV   |
| Partial discharge extinction voltage | $V_{isol}$  | RMS, $f = 50 \text{ Hz}$ , $Q_{PD} \leq 10 \text{ pC}$ | 3.5    | kV   |
| DC stability                         | $V_{CE(D)}$ | $T_{vj}=25^{\circ}\text{C}$ , 100 Fit                  | 3000   | V    |
| Material of module baseplate         |             |                                                        | AlSiC  |      |
| Internal isolation                   |             | basic insulation (class 1, IEC 61140)                  | AlN    |      |
| Creepage distance                    | $d_{Creep}$ | terminal to heatsink                                   | 64.0   | mm   |
| Creepage distance                    | $d_{Creep}$ | terminal to terminal                                   | 56.0   | mm   |
| Clearance                            | $d_{Clear}$ | terminal to heatsink                                   | 40.0   | mm   |
| Clearance                            | $d_{Clear}$ | terminal to terminal                                   | 26.0   | mm   |
| Comparative tracking index           | $CTI$       |                                                        | >600   |      |

**Table 2**                      **Characteristic values**

| Parameter                                | Symbol               | Note or test condition                         |           | Values |      |      | Unit |
|------------------------------------------|----------------------|------------------------------------------------|-----------|--------|------|------|------|
|                                          |                      |                                                |           | Min.   | Typ. | Max. |      |
| Stray inductance module                  | $L_{\text{sCE}}$     |                                                |           |        | 20   |      | nH   |
| Module lead resistance, terminals - chip | $R_{\text{AA'+CC'}}$ | $T_{\text{C}}=25^{\circ}\text{C}$ , per switch |           |        | 0.18 |      | mΩ   |
| Module lead resistance, terminals - chip | $R_{\text{CC'+EE'}}$ | $T_{\text{C}}=25^{\circ}\text{C}$ , per switch |           |        | 0.18 |      | mΩ   |
| Storage temperature                      | $T_{\text{stg}}$     |                                                |           | -55    |      | 125  | °C   |
| Mounting torque for module mounting      | $M$                  | - Mounting according to valid application note | M6, Screw | 4.25   |      | 5.75 | Nm   |
| Terminal connection torque               | $M$                  | - Mounting according to valid application note | M4, Screw | 1.8    |      | 2.1  | Nm   |
|                                          |                      |                                                | M8, Screw | 8      |      | 10   |      |
| Weight                                   | $G$                  |                                                |           |        | 1400 |      | g    |

*Note:                      The maximum allowed  $dv/dt$  measured between 0,6 and  $1 \times V_{ce}$  is 2400V/ $\mu\text{s}$ .*

## 2 IGBT, Brake-Chopper

**Table 3** Maximum rated values

| Parameter                         | Symbol    | Note or test condition              |                          | Values | Unit |
|-----------------------------------|-----------|-------------------------------------|--------------------------|--------|------|
| Collector-emitter voltage         | $V_{CES}$ |                                     | $T_{vj} = -40\text{ °C}$ | 4500   | V    |
|                                   |           |                                     | $T_{vj} = 25\text{ °C}$  | 4500   |      |
|                                   |           |                                     | $T_{vj} = 125\text{ °C}$ | 4500   |      |
| Continuous DC collector current   | $I_{CDC}$ | $T_{vj\text{ max}} = 125\text{ °C}$ | $T_C = 95\text{ °C}$     | 800    | A    |
| Repetitive peak collector current | $I_{CRM}$ | $t_p = 1\text{ ms}$                 |                          | 1600   | A    |
| Gate-emitter peak voltage         | $V_{GES}$ |                                     |                          | ±20    | V    |

**Table 4** Characteristic values

| Parameter                            | Symbol              | Note or test condition                                                                                   |                          | Values |       |      | Unit |
|--------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------|--------------------------|--------|-------|------|------|
|                                      |                     |                                                                                                          |                          | Min.   | Typ.  | Max. |      |
| Collector-emitter saturation voltage | $V_{CE\text{ sat}}$ | $I_C = 800\text{ A}$ , $V_{GE} = 15\text{ V}$                                                            | $T_{vj} = 25\text{ °C}$  |        | 2.50  | 2.85 | V    |
|                                      |                     |                                                                                                          | $T_{vj} = 125\text{ °C}$ |        | 3.10  | 3.70 |      |
| Gate threshold voltage               | $V_{GEth}$          | $I_C = 70.5\text{ mA}$ , $V_{CE} = V_{GE}$ , $T_{vj} = 25\text{ °C}$                                     |                          | 5.40   | 6     | 6.60 | V    |
| Gate charge                          | $Q_G$               | $V_{CE} = 2800\text{ V}$                                                                                 |                          |        | 26.5  |      | μC   |
| Internal gate resistor               | $R_{Gint}$          | $T_{vj} = 25\text{ °C}$                                                                                  |                          |        | 1.1   |      | Ω    |
| Input capacitance                    | $C_{ies}$           | $f = 1000\text{ kHz}$ , $T_{vj} = 25\text{ °C}$ , $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$         |                          |        | 185   |      | nF   |
| Reverse transfer capacitance         | $C_{res}$           | $f = 1000\text{ kHz}$ , $T_{vj} = 25\text{ °C}$ , $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$         |                          |        | 3.1   |      | nF   |
| Collector-emitter cut-off current    | $I_{CES}$           | $V_{CE} = 4500\text{ V}$ , $V_{GE} = 0\text{ V}$                                                         | $T_{vj} = 25\text{ °C}$  |        |       | 5    | mA   |
| Gate-emitter leakage current         | $I_{GES}$           | $V_{CE} = 0\text{ V}$ , $V_{GE} = 20\text{ V}$ , $T_{vj} = 25\text{ °C}$                                 |                          |        |       | 400  | nA   |
| Turn-on delay time (inductive load)  | $t_{don}$           | $I_C = 800\text{ A}$ , $V_{CE} = 2800\text{ V}$ , $V_{GE} = \pm 15\text{ V}$ , $R_{Gon} = 1\text{ Ω}$    | $T_{vj} = 25\text{ °C}$  |        | 0.580 |      | μs   |
|                                      |                     |                                                                                                          | $T_{vj} = 125\text{ °C}$ |        | 0.600 |      |      |
| Rise time (inductive load)           | $t_r$               | $I_C = 800\text{ A}$ , $V_{CE} = 2800\text{ V}$ , $V_{GE} = \pm 15\text{ V}$ , $R_{Gon} = 1\text{ Ω}$    | $T_{vj} = 25\text{ °C}$  |        | 0.190 |      | μs   |
|                                      |                     |                                                                                                          | $T_{vj} = 125\text{ °C}$ |        | 0.220 |      |      |
| Turn-off delay time (inductive load) | $t_{doff}$          | $I_C = 800\text{ A}$ , $V_{CE} = 2800\text{ V}$ , $V_{GE} = \pm 15\text{ V}$ , $R_{Goff} = 7.5\text{ Ω}$ | $T_{vj} = 25\text{ °C}$  |        | 6.600 |      | μs   |
|                                      |                     |                                                                                                          | $T_{vj} = 125\text{ °C}$ |        | 6.900 |      |      |
| Fall time (inductive load)           | $t_f$               | $I_C = 800\text{ A}$ , $V_{CE} = 2800\text{ V}$ , $V_{GE} = \pm 15\text{ V}$ , $R_{Goff} = 7.5\text{ Ω}$ | $T_{vj} = 25\text{ °C}$  |        | 0.350 |      | μs   |
|                                      |                     |                                                                                                          | $T_{vj} = 125\text{ °C}$ |        | 0.450 |      |      |
| Turn-on time (resistive load)        | $t_{on\_R}$         | $I_C = 500\text{ A}$ , $V_{CE} = 2000\text{ V}$ , $V_{GE} = \pm 15\text{ V}$ , $R_{Gon} = 1\text{ Ω}$    | $T_{vj} = 25\text{ °C}$  | 1.80   |       |      | μs   |

(table continues...)

**Table 4** (continued) Characteristic values

| Parameter                              | Symbol             | Note or test condition                                                                                                                                                                                                         | Values                                                                     |      |      | Unit             |
|----------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------|------|------------------|
|                                        |                    |                                                                                                                                                                                                                                | Min.                                                                       | Typ. | Max. |                  |
| Turn-on energy loss per pulse          | $E_{on}$           | $I_C = 800\text{ A}$ , $V_{CE} = 2800\text{ V}$ ,<br>$L_\sigma = 95\text{ nH}$ , $V_{GE} = \pm 15\text{ V}$ ,<br>$R_{Gon} = 1\text{ }\Omega$ , $di/dt = 3300\text{ A}/\mu\text{s}$ ( $T_{vj} = 125\text{ }^\circ\text{C}$ )    | $T_{vj} = 25\text{ }^\circ\text{C}$                                        | 3100 |      | mJ               |
|                                        |                    |                                                                                                                                                                                                                                | $T_{vj} = 125\text{ }^\circ\text{C}$                                       | 4100 |      |                  |
| Turn-off energy loss per pulse         | $E_{off}$          | $I_C = 800\text{ A}$ , $V_{CE} = 2800\text{ V}$ ,<br>$L_\sigma = 95\text{ nH}$ , $V_{GE} = \pm 15\text{ V}$ ,<br>$R_{Goff} = 7.5\text{ }\Omega$ , $dv/dt = 2000\text{ V}/\mu\text{s}$ ( $T_{vj} = 125\text{ }^\circ\text{C}$ ) | $T_{vj} = 25\text{ }^\circ\text{C}$                                        | 2800 |      | mJ               |
|                                        |                    |                                                                                                                                                                                                                                | $T_{vj} = 125\text{ }^\circ\text{C}$                                       | 3400 |      |                  |
| SC data                                | $I_{SC}$           | $V_{GE} \leq 15\text{ V}$ , $V_{CC} = 2800\text{ V}$ ,<br>$V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$                                                                                                                          | $t_p \leq 10\text{ }\mu\text{s}$ , $T_{vj} \leq 125\text{ }^\circ\text{C}$ | 4600 |      | A                |
| Thermal resistance, junction to case   | $R_{thJC}$         | per IGBT                                                                                                                                                                                                                       |                                                                            |      | 11.1 | K/kW             |
| Thermal resistance, case to heat sink  | $R_{thCH}$         | per IGBT, $\lambda_{grease} = 1\text{ W}/(\text{m}^2\text{K})$                                                                                                                                                                 |                                                                            | 13.5 |      | K/kW             |
| Temperature under switching conditions | $T_{vj\text{ op}}$ |                                                                                                                                                                                                                                | -50                                                                        |      | 125  | $^\circ\text{C}$ |

### 3 Diode, Brake-Chopper

**Table 5** Maximum rated values

| Parameter                       | Symbol             | Note or test condition                                      |                                               | Values | Unit                  |
|---------------------------------|--------------------|-------------------------------------------------------------|-----------------------------------------------|--------|-----------------------|
| Repetitive peak reverse voltage | $V_{\text{RRM}}$   |                                                             | $T_{\text{vj}} = -40\text{ }^{\circ}\text{C}$ | 4500   | V                     |
|                                 |                    |                                                             | $T_{\text{vj}} = 25\text{ }^{\circ}\text{C}$  | 4500   |                       |
|                                 |                    |                                                             | $T_{\text{vj}} = 125\text{ }^{\circ}\text{C}$ | 4500   |                       |
| Continuous DC forward current   | $I_{\text{F}}$     |                                                             |                                               | 800    | A                     |
| Repetitive peak forward current | $I_{\text{FRM}}$   | $t_{\text{p}} = 1\text{ ms}$                                |                                               | 1600   | A                     |
| $I^2t$ - value                  | $I^2t$             | $t_{\text{p}} = 10\text{ ms}$ , $V_{\text{R}} = 0\text{ V}$ | $T_{\text{vj}} = 125\text{ }^{\circ}\text{C}$ | 255    | $\text{kA}^2\text{s}$ |
| Maximum power dissipation       | $P_{\text{RQM}}$   | $T_{\text{vj}} = 125\text{ }^{\circ}\text{C}$               |                                               | 1600   | kW                    |
| Minimum turn-on time            | $t_{\text{onmin}}$ |                                                             |                                               | 10     | $\mu\text{s}$         |

**Table 6** Characteristic values

| Parameter       | Symbol | Note or test condition                       |                                        | Values |      |      | Unit |
|-----------------|--------|----------------------------------------------|----------------------------------------|--------|------|------|------|
|                 |        |                                              |                                        | Min.   | Typ. | Max. |      |
| Forward voltage | $V_F$  | $I_F = 800\text{ A}$ , $V_{GE} = 0\text{ V}$ | $T_{vj} = 25\text{ }^{\circ}\text{C}$  |        | 2.50 | 3.10 | V    |
|                 |        |                                              | $T_{vj} = 125\text{ }^{\circ}\text{C}$ |        | 2.50 | 3.00 |      |

(table continues...)

**Table 6** (continued) Characteristic values

| Parameter                              | Symbol             | Note or test condition                                                                                                                          |                          | Values |      |      | Unit               |
|----------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------|------|------|--------------------|
|                                        |                    |                                                                                                                                                 |                          | Min.   | Typ. | Max. |                    |
| Peak reverse recovery current          | $I_{RM}$           | $V_R = 2800\text{ V}$ , $I_F = 800\text{ A}$ ,<br>$V_{GE} = -15\text{ V}$ , $-di_F/dt = 3300\text{ A}/\mu\text{s}$ ( $T_{vj} = 125\text{ °C}$ ) | $T_{vj} = 25\text{ °C}$  |        | 1000 |      | A                  |
|                                        |                    |                                                                                                                                                 | $T_{vj} = 125\text{ °C}$ |        | 1150 |      |                    |
| Recovered charge                       | $Q_r$              | $V_R = 2800\text{ V}$ , $I_F = 800\text{ A}$ ,<br>$V_{GE} = -15\text{ V}$ , $-di_F/dt = 3300\text{ A}/\mu\text{s}$ ( $T_{vj} = 125\text{ °C}$ ) | $T_{vj} = 25\text{ °C}$  |        | 770  |      | $\mu\text{C}$      |
|                                        |                    |                                                                                                                                                 | $T_{vj} = 125\text{ °C}$ |        | 1400 |      |                    |
| Reverse recovery energy                | $E_{rec}$          | $V_R = 2800\text{ V}$ , $I_F = 800\text{ A}$ ,<br>$V_{GE} = -15\text{ V}$ , $-di_F/dt = 3300\text{ A}/\mu\text{s}$ ( $T_{vj} = 125\text{ °C}$ ) | $T_{vj} = 25\text{ °C}$  |        | 1200 |      | mJ                 |
|                                        |                    |                                                                                                                                                 | $T_{vj} = 125\text{ °C}$ |        | 2400 |      |                    |
| Thermal resistance, junction to case   | $R_{thJC}$         | per diode                                                                                                                                       |                          |        |      | 25.5 | K/kW               |
| Thermal resistance, case to heat sink  | $R_{thCH}$         | per diode, $\lambda_{grease} = 1\text{ W}/(\text{m}^2\text{K})$                                                                                 |                          |        | 21.0 |      | K/kW               |
| Temperature under switching conditions | $T_{vj\text{ op}}$ |                                                                                                                                                 |                          | -50    |      | 125  | $^{\circ}\text{C}$ |

## 4 Diode, Reverse

**Table 7** Maximum rated values

| Parameter                       | Symbol      | Note or test condition                    |                          | Values | Unit                  |
|---------------------------------|-------------|-------------------------------------------|--------------------------|--------|-----------------------|
| Repetitive peak reverse voltage | $V_{RRM}$   |                                           | $T_{vj} = -40\text{ °C}$ | 4500   | V                     |
|                                 |             |                                           | $T_{vj} = 25\text{ °C}$  | 4500   |                       |
|                                 |             |                                           | $T_{vj} = 125\text{ °C}$ | 4500   |                       |
| Continuous DC forward current   | $I_F$       |                                           |                          | 800    | A                     |
| Repetitive peak forward current | $I_{FRM}$   | $t_p = 1\text{ ms}$                       |                          | 1600   | A                     |
| $I^2t$ - value                  | $I^2t$      | $t_p = 10\text{ ms}$ , $V_R = 0\text{ V}$ | $T_{vj} = 125\text{ °C}$ | 255    | $\text{kA}^2\text{s}$ |
| Maximum power dissipation       | $P_{RQM}$   | $T_{vj} = 125\text{ °C}$                  |                          | 1600   | kW                    |
| Minimum turn-on time            | $t_{onmin}$ |                                           |                          | 10     | $\mu\text{s}$         |

**Table 8** Characteristic values

| Parameter       | Symbol | Note or test condition                       |                          | Values |      |      | Unit |
|-----------------|--------|----------------------------------------------|--------------------------|--------|------|------|------|
|                 |        |                                              |                          | Min.   | Typ. | Max. |      |
| Forward voltage | $V_F$  | $I_F = 800\text{ A}$ , $V_{GE} = 0\text{ V}$ | $T_{vj} = 25\text{ °C}$  |        | 2.50 | 3.10 | V    |
|                 |        |                                              | $T_{vj} = 125\text{ °C}$ |        | 2.50 | 3.00 |      |

(table continues...)

**Table 8** (continued) Characteristic values

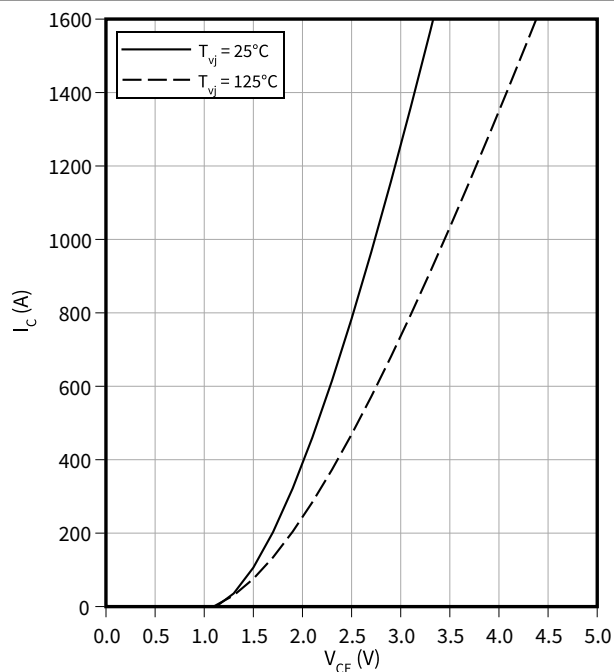
| Parameter                              | Symbol      | Note or test condition                                                                                                                                           |                                       | Values |      |      | Unit             |
|----------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------|------|------|------------------|
|                                        |             |                                                                                                                                                                  |                                       | Min.   | Typ. | Max. |                  |
| Peak reverse recovery current          | $I_{RM}$    | $V_R = 2800 \text{ V}$ , $I_F = 800 \text{ A}$ ,<br>$V_{GE} = -15 \text{ V}$ , $-di_F/dt = 3300 \text{ A}/\mu\text{s}$ ( $T_{vj} = 125 \text{ }^\circ\text{C}$ ) | $T_{vj} = 25 \text{ }^\circ\text{C}$  |        | 1000 |      | A                |
|                                        |             |                                                                                                                                                                  | $T_{vj} = 125 \text{ }^\circ\text{C}$ |        | 1150 |      |                  |
| Recovered charge                       | $Q_r$       | $V_R = 2800 \text{ V}$ , $I_F = 800 \text{ A}$ ,<br>$V_{GE} = -15 \text{ V}$ , $-di_F/dt = 3300 \text{ A}/\mu\text{s}$ ( $T_{vj} = 125 \text{ }^\circ\text{C}$ ) | $T_{vj} = 25 \text{ }^\circ\text{C}$  |        | 770  |      | $\mu\text{C}$    |
|                                        |             |                                                                                                                                                                  | $T_{vj} = 125 \text{ }^\circ\text{C}$ |        | 1400 |      |                  |
| Reverse recovery energy                | $E_{rec}$   | $V_R = 2800 \text{ V}$ , $I_F = 800 \text{ A}$ ,<br>$V_{GE} = -15 \text{ V}$ , $-di_F/dt = 3300 \text{ A}/\mu\text{s}$ ( $T_{vj} = 125 \text{ }^\circ\text{C}$ ) | $T_{vj} = 25 \text{ }^\circ\text{C}$  |        | 1200 |      | mJ               |
|                                        |             |                                                                                                                                                                  | $T_{vj} = 125 \text{ }^\circ\text{C}$ |        | 2400 |      |                  |
| Thermal resistance, junction to case   | $R_{thJC}$  | per diode                                                                                                                                                        |                                       |        |      | 25.5 | K/kW             |
| Thermal resistance, case to heat sink  | $R_{thCH}$  | per diode, $\lambda_{grease} = 1 \text{ W}/(\text{m}^2\text{K})$                                                                                                 |                                       |        | 21.0 |      | K/kW             |
| Temperature under switching conditions | $T_{vj op}$ |                                                                                                                                                                  |                                       | -50    |      | 125  | $^\circ\text{C}$ |

## 5 Characteristics diagrams

### Output characteristic (typical), IGBT, Brake-Chopper

$$I_C = f(V_{CE})$$

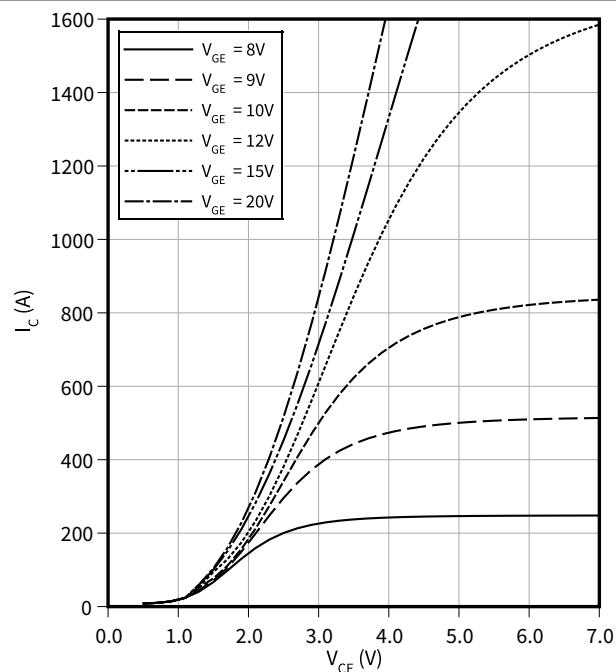
$$V_{GE} = 15 \text{ V}$$



### Output characteristic field (typical), IGBT, Brake-Chopper

$$I_C = f(V_{CE})$$

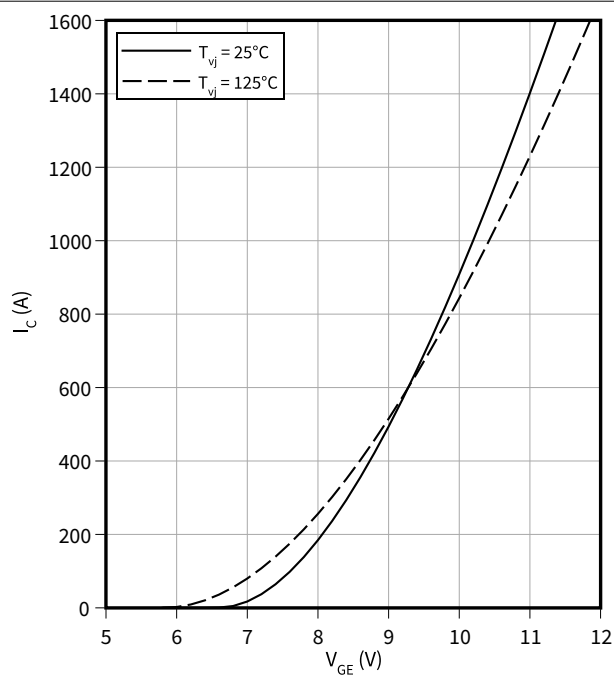
$$T_{vj} = 125^\circ\text{C}$$



### Transfer characteristic (typical), IGBT, Brake-Chopper

$$I_C = f(V_{GE})$$

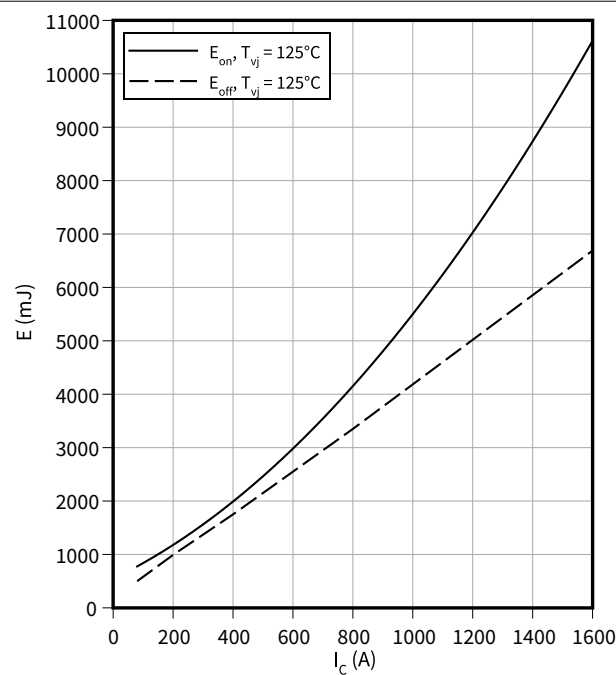
$$V_{CE} = 20 \text{ V}$$



### Switching losses (typical), IGBT, Brake-Chopper

$$E = f(I_C)$$

$$R_{Goff} = 7.5 \Omega, R_{Gon} = 1 \Omega, V_{CE} = 2800 \text{ V}, V_{GE} = \pm 15 \text{ V}$$

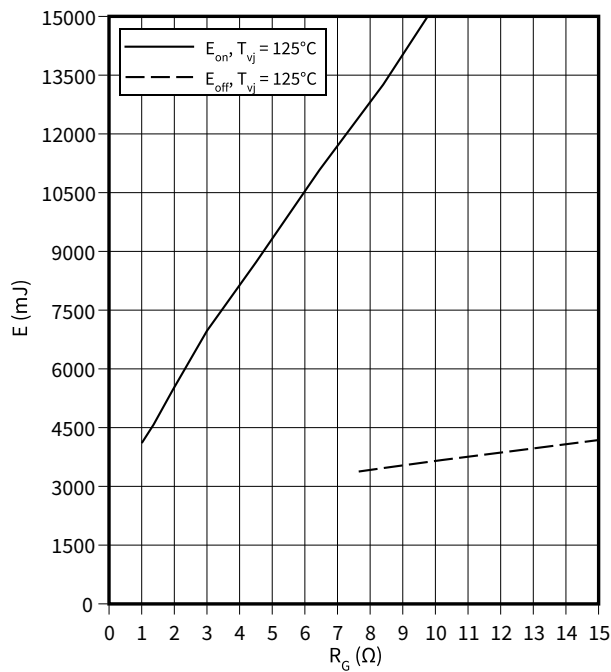


5 Characteristics diagrams

Switching losses (typical), IGBT, Brake-Chopper

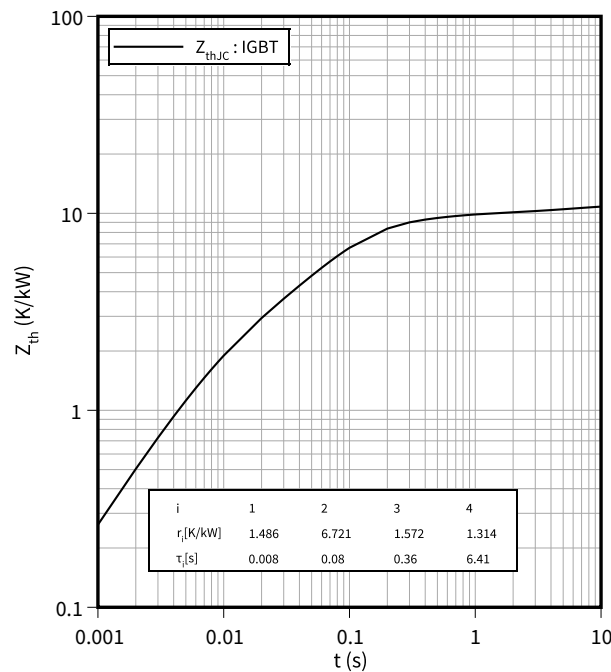
$E = f(R_G)$

$I_C = 800\text{ A}, V_{CE} = 2800\text{ V}, V_{GE} = \pm 15\text{ V}$



Transient thermal impedance, IGBT, Brake-Chopper

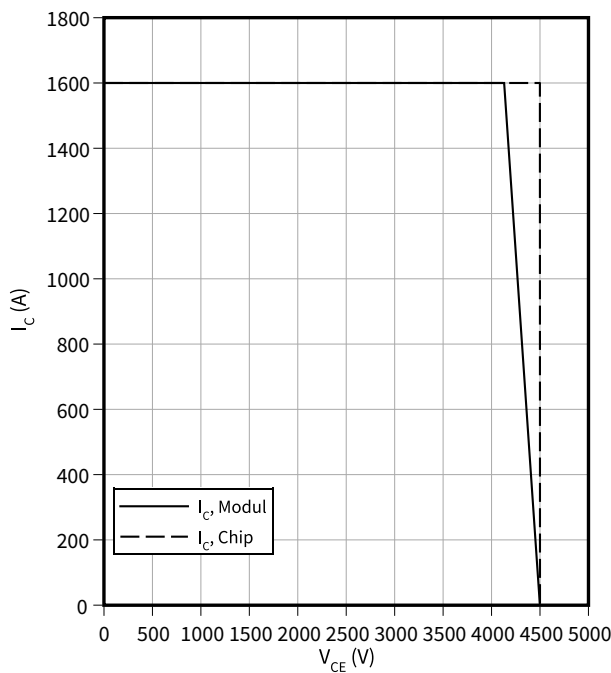
$Z_{th} = f(t)$



Reverse bias safe operating area (RBSOA), IGBT, Brake-Chopper

$I_C = f(V_{CE})$

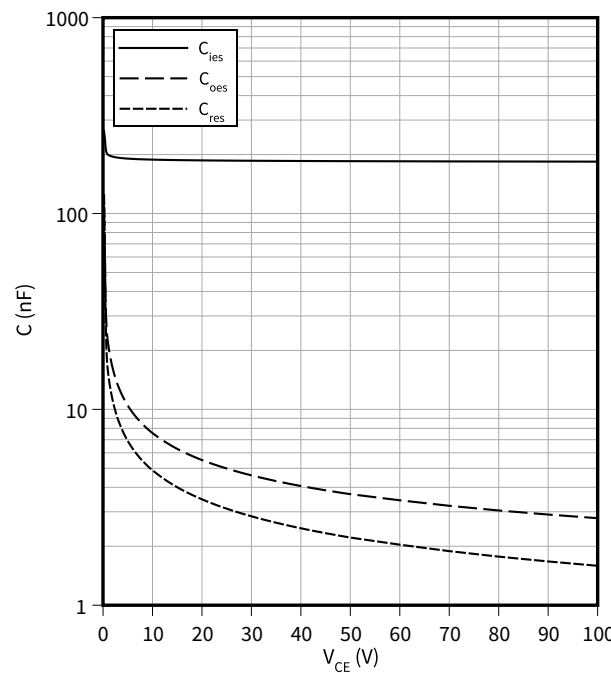
$R_{Goff} = 7.5\ \Omega, V_{GE} = \pm 15\text{ V}, T_{vj} = 125\ ^\circ\text{C}$



Capacity characteristic (typical), IGBT, Brake-Chopper

$C = f(V_{CE})$

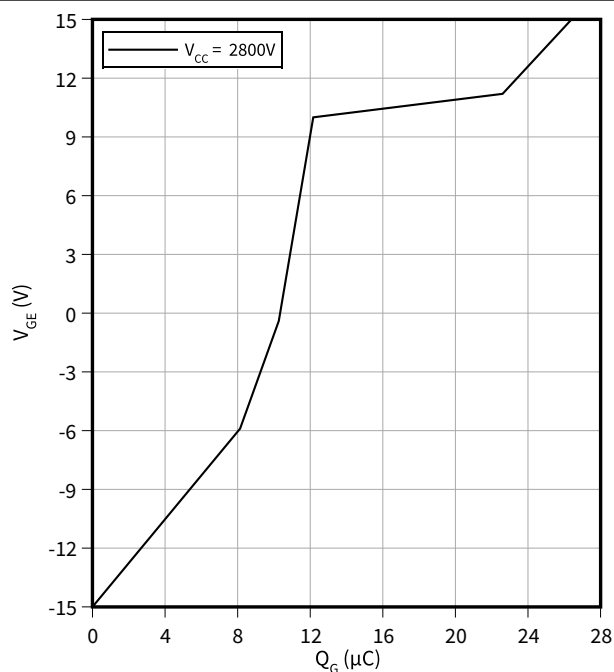
$f = 1000\text{ kHz}, V_{GE} = 0\text{ V}, T_{vj} = 25\ ^\circ\text{C}$



**Gate charge characteristic (typical), IGBT, Brake-Chopper**

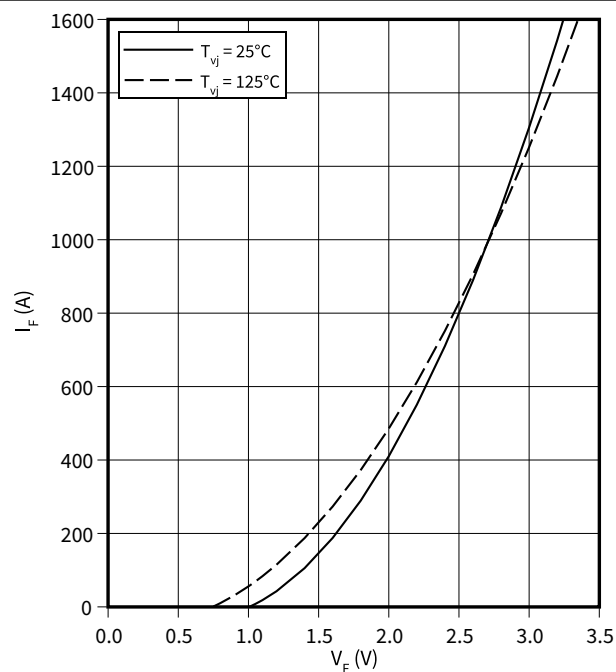
$$V_{GE} = f(Q_G)$$

$I_C = 800 \text{ A}$ ,  $T_{vj} = 25^\circ\text{C}$



**Forward characteristic (typical), Diode, Brake-Chopper**

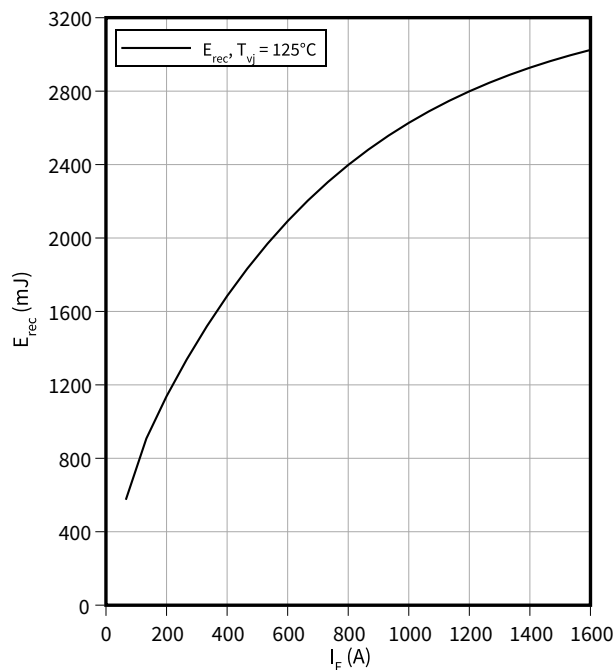
$$I_F = f(V_F)$$



**Switching losses (typical), Diode, Brake-Chopper**

$$E_{rec} = f(I_F)$$

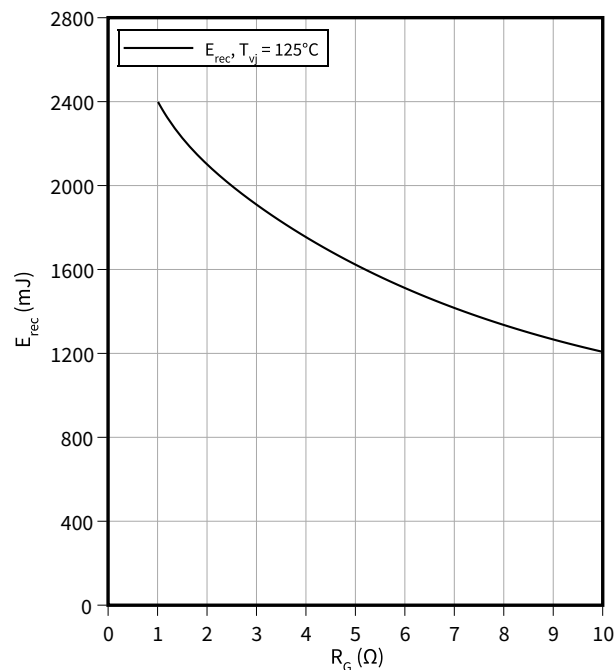
$V_{CE} = 2800 \text{ V}$ ,  $R_{Gon} = R_{Gon}(\text{IGBT})$



**Switching losses (typical), Diode, Brake-Chopper**

$$E_{rec} = f(R_G)$$

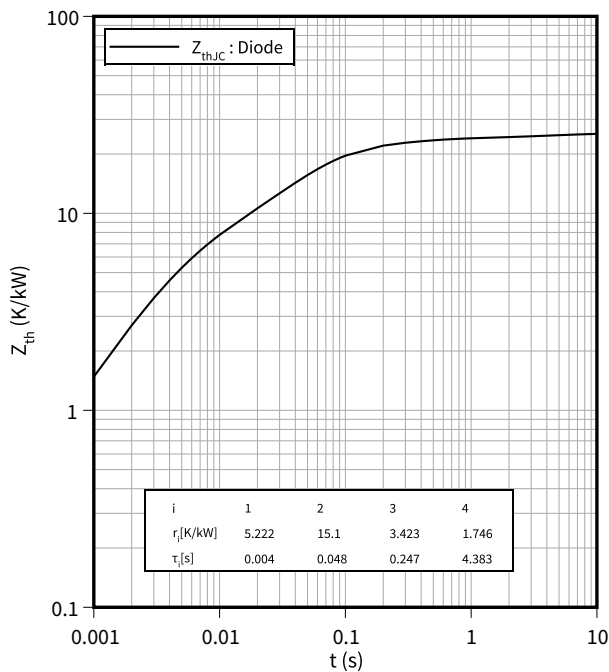
$V_{CE} = 2800 \text{ V}$ ,  $I_F = 800 \text{ A}$



5 Characteristics diagrams

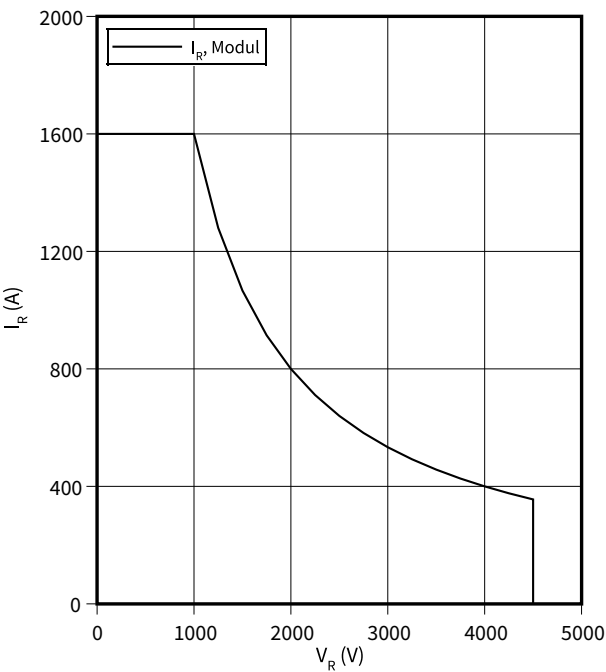
Transient thermal impedance, Diode, Brake-Chopper

$Z_{th} = f(t)$



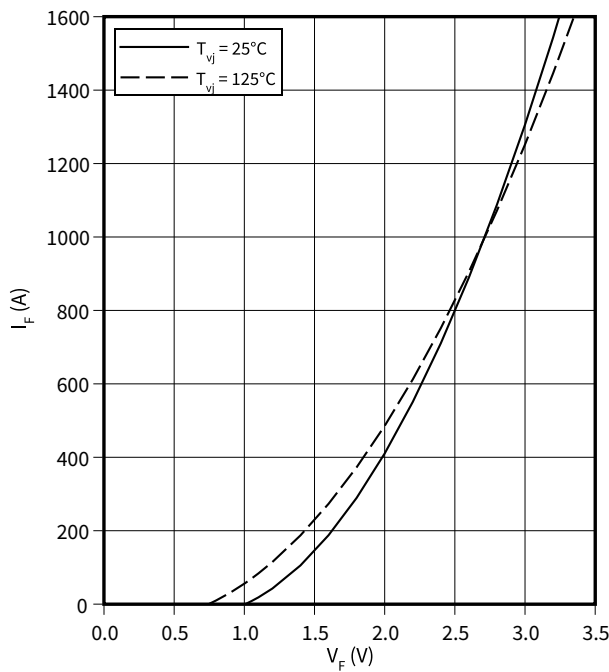
Safe operating area (SOA), Diode, Brake-Chopper

$I_R = f(V_R)$   
 $T_{vj} = 125^\circ\text{C}$



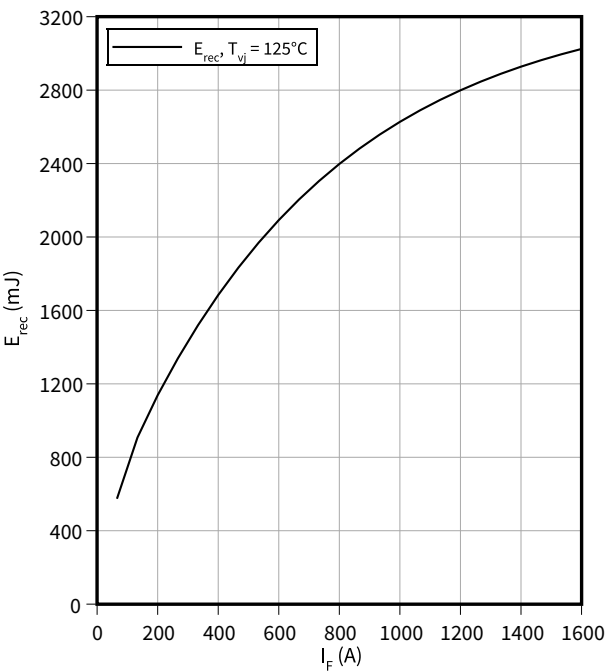
Forward characteristic (typical), Diode, Reverse

$I_F = f(V_F)$



Switching losses (typical), Diode, Reverse

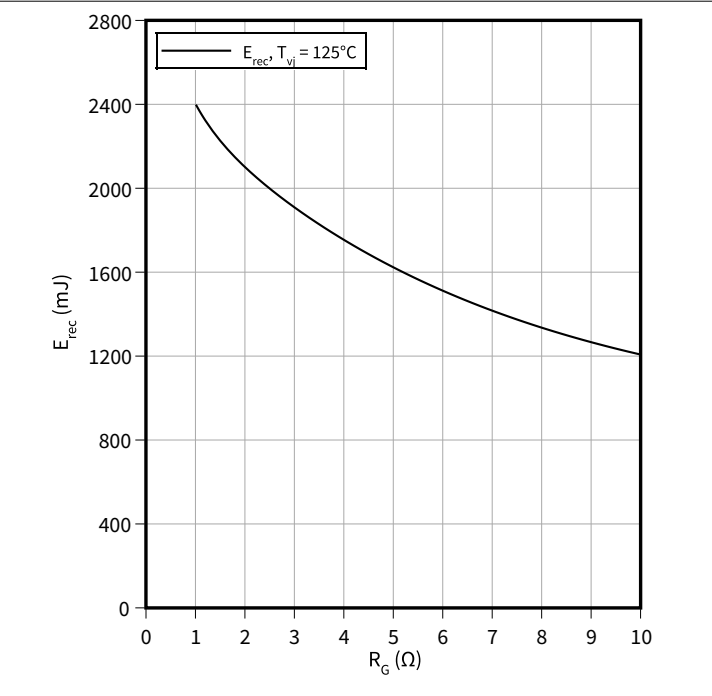
$E_{rec} = f(I_F)$   
 $V_{CE} = 2800\text{ V}, R_{Gon} = R_{Gon}(\text{IGBT})$



5 Characteristics diagrams

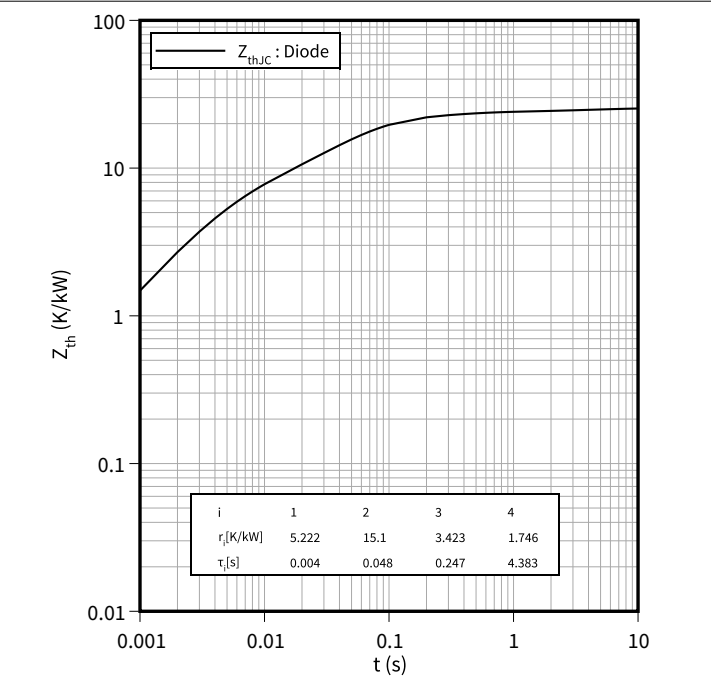
Switching losses (typical), Diode, Reverse

$E_{rec} = f(R_G)$   
 $V_{CE} = 2800\text{ V}, I_F = 800\text{ A}$



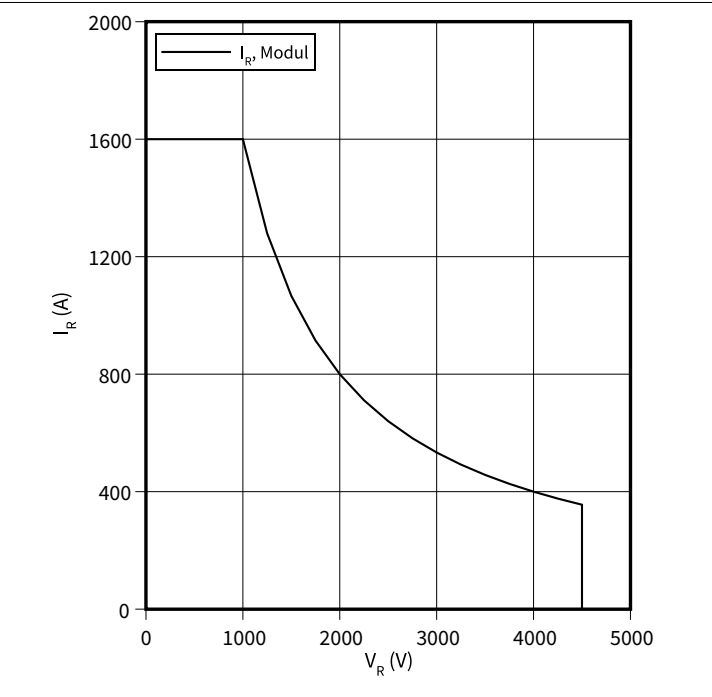
Transient thermal impedance, Diode, Reverse

$Z_{th} = f(t)$

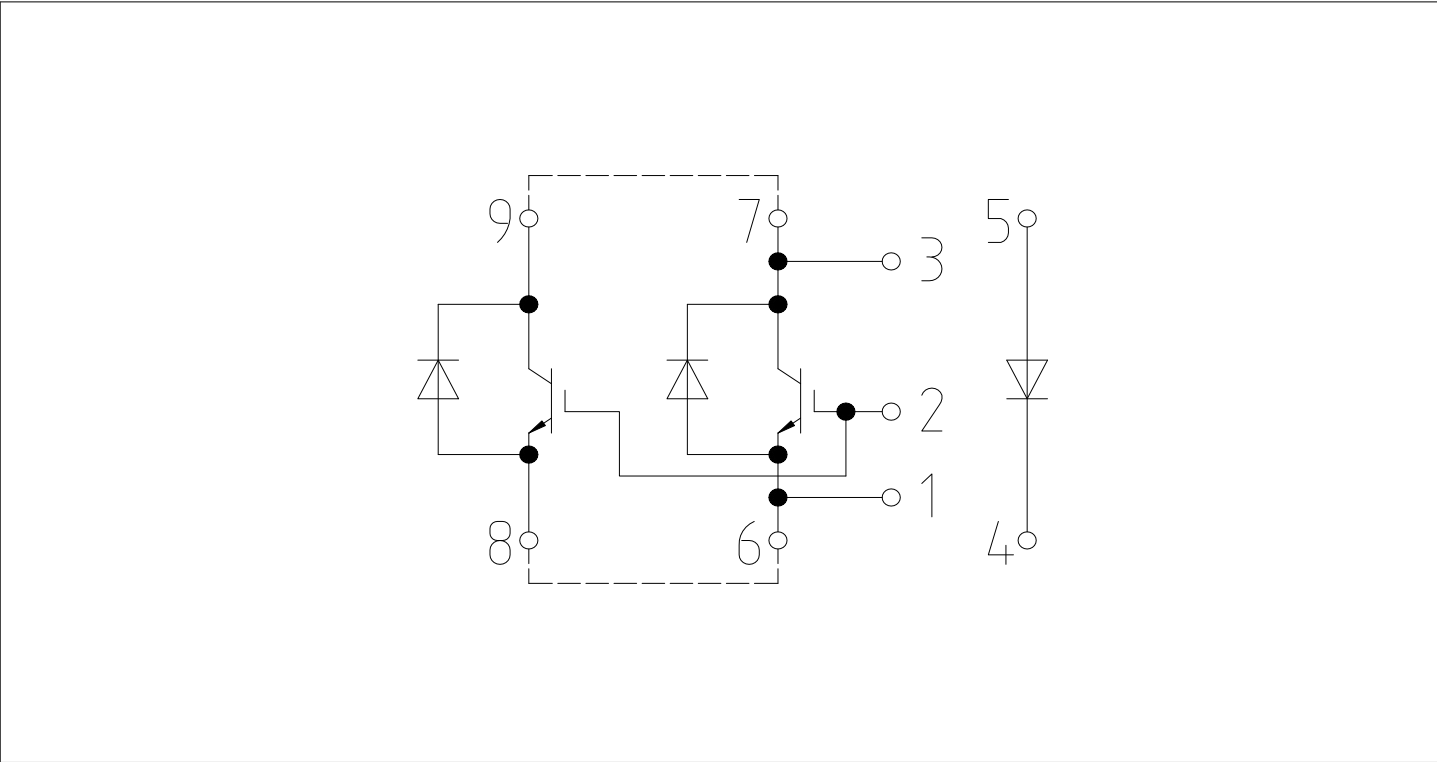


Safe operating area (SOA), Diode, Reverse

$I_R = f(V_R)$   
 $T_{vj} = 125\text{ °C}$



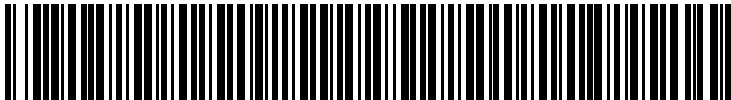
6      **Circuit diagram**



**Figure 1**

### Figure 2

## 8 Module label code

| Module label code |                                                                                                                                                                        |              |                 |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------|
| Code format       | Data Matrix                                                                                                                                                            |              | Barcode Code128 |
| Encoding          | ASCII text                                                                                                                                                             |              | Code Set A      |
| Symbol size       | 16x16                                                                                                                                                                  |              | 23 digits       |
| Standard          | IEC24720 and IEC16022                                                                                                                                                  |              | IEC8859-1       |
| Code content      | <i>Content</i>                                                                                                                                                         | <i>Digit</i> | <i>Example</i>  |
|                   | Module serial number                                                                                                                                                   | 1 – 5        | 71549           |
|                   | Module material number                                                                                                                                                 | 6 - 11       | 142846          |
|                   | Production order number                                                                                                                                                | 12 - 19      | 55054991        |
|                   | Date code (production year)                                                                                                                                            | 20 – 21      | 15              |
|                   | Date code (production week)                                                                                                                                            | 22 – 23      | 30              |
| Example           |   |              |                 |
|                   | <div>71549142846550549911530</div> <div>71549142846550549911530</div>                                                                                                  |              |                 |

**Figure 3**

## Revision history

| Document revision | Date of release | Description of changes                                                                                                                              |
|-------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| V2.0              | 2015-07-08      | Preliminary datasheet                                                                                                                               |
| V3.0              | 2015-09-14      | Final datasheet                                                                                                                                     |
| V3.1              | 2016-08-30      | Final datasheet                                                                                                                                     |
| V3.2              | 2018-01-15      | Final datasheet                                                                                                                                     |
| V3.3              | 2019-08-23      | Final datasheet                                                                                                                                     |
| n/a               | 2020-09-01      | Datasheet migrated to a new system with a new layout and new revision number schema: target or preliminary datasheet = 0.xy; final datasheet = 1.xy |
| 1.10              | 2021-12-23      | Final datasheet                                                                                                                                     |

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