

**IGBT, Brems-Chopper / IGBT, Brake-Chopper**  
**Höchstzulässige Werte / Maximum Rated Values**

|                                                                          |                                                                                                                                          |                            |          |        |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------|--------|
| Kollektor-Emitter-Sperrspannung<br>Collector-emitter voltage             | $T_{vj} = 80^{\circ}\text{C}$                                                                                                            | $V_{CES}$                  | 1200     | V      |
| Kollektor-Dauergleichstrom<br>Continuous DC collector current            | $T_C = 80^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$ | $I_{C\text{nom}}$<br>$I_C$ | 10<br>18 | A<br>A |
| Periodischer Kollektor-Spitzenstrom<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                                                                                      | $I_{CRM}$                  | 20       | A      |
| Gesamt-Verlustleistung<br>Total power dissipation                        | $T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150$                                                                                       | $P_{\text{tot}}$           | 83,5     | W      |
| Gate-Emitter-Spitzenspannung<br>Gate-emitter peak voltage                |                                                                                                                                          | $V_{GES}$                  | +/-20    | V      |

**Charakteristische Werte / Characteristic Values**

|                                                                                 |                                                                                                                                                     |                                                                 | min.               | typ.         | max. |                                |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------|--------------|------|--------------------------------|
| Kollektor-Emitter-Sättigungsspannung<br>Collector-emitter saturation voltage    | $I_C = 10\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$                                                              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,85<br>2,25 | 2,45 | V<br>V                         |
| Gate-Schwellenspannung<br>Gate threshold voltage                                | $I_C = 0,30\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                |                                                                 | $V_{G\text{eth}}$  | 5,0          | 5,8  | 6,5 V                          |
| Gateladung<br>Gate charge                                                       | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                          |                                                                 | $Q_G$              | 0,10         |      | $\mu\text{C}$                  |
| Interner Gatewiderstand<br>Internal gate resistor                               | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                       |                                                                 | $R_{G\text{int}}$  | 0,0          |      | $\Omega$                       |
| Eingangskapazität<br>Input capacitance                                          | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                          |                                                                 | $C_{\text{ies}}$   | 0,60         |      | nF                             |
| Rückwirkungskapazität<br>Reverse transfer capacitance                           | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                          |                                                                 | $C_{\text{res}}$   | 0,026        |      | nF                             |
| Kollektor-Emitter-Reststrom<br>Collector-emitter cut-off current                | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                          |                                                                 | $I_{CES}$          |              | 1,0  | mA                             |
| Gate-Emitter-Reststrom<br>Gate-emitter leakage current                          | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                            |                                                                 | $I_{GES}$          |              | 100  | nA                             |
| Einschaltverzögerungszeit, induktive Last<br>Turn-on delay time, inductive load | $I_C = 10\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{on}} = 100\ \Omega$                                          | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{d\text{on}}$   | 0,09<br>0,09 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| Anstiegszeit, induktive Last<br>Rise time, inductive load                       | $I_C = 10\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{on}} = 100\ \Omega$                                          | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_r$              | 0,03<br>0,05 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| Abschaltverzögerungszeit, induktive Last<br>Turn-off delay time, inductive load | $I_C = 10\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{off}} = 100\ \Omega$                                         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{d\text{off}}$  | 0,42<br>0,52 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| Fallzeit, induktive Last<br>Fall time, inductive load                           | $I_C = 10\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{off}} = 100\ \Omega$                                         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_f$              | 0,07<br>0,09 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| Einschaltverlustenergie pro Puls<br>Turn-on energy loss per pulse               | $I_C = 10\text{ A}, V_{CE} = 600\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{on}} = 100\ \Omega$                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{\text{on}}$    | 1,00<br>1,40 |      | mJ<br>mJ                       |
| Abschaltverlustenergie pro Puls<br>Turn-off energy loss per pulse               | $I_C = 10\text{ A}, V_{CE} = 600\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{off}} = 100\ \Omega$                 | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{\text{off}}$   | 0,90<br>1,20 |      | mJ<br>mJ                       |
| Kurzschlußverhalten<br>SC data                                                  | $V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$<br>$V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$                                              | $t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$        | $I_{SC}$           | 40           |      | A                              |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro IGBT / per IGBT                                                                                                                                 |                                                                 | $R_{\text{thJC}}$  |              | 1,50 | K/W                            |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro IGBT / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                 | $R_{\text{thCH}}$  | 0,485        |      | K/W                            |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                                     |                                                                 | $T_{vj\text{op}}$  | -40          | 125  | $^{\circ}\text{C}$             |

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## Diode, Brems-Chopper / Diode, Brake-Chopper

### Höchstzulässige Werte / Maximum Rated Values

|                                                                     |                                                                      |           |      |                      |
|---------------------------------------------------------------------|----------------------------------------------------------------------|-----------|------|----------------------|
| Periodische Spitzensperrspannung<br>Repetitive peak reverse voltage | $T_{vj} = 80^{\circ}\text{C}$                                        | $V_{RRM}$ | 1200 | V                    |
| Dauergleichstrom<br>Continuous DC forward current                   |                                                                      | $I_F$     | 10   | A                    |
| Periodischer Spitzenstrom<br>Repetitive peak forward current        | $t_P = 1\text{ ms}$                                                  | $I_{FRM}$ | 20   | A                    |
| Grenzlastintegral<br>$I^2t$ - value                                 | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 20,0 | $\text{A}^2\text{s}$ |

### Charakteristische Werte / Characteristic Values

|                                                                                 |                                                                                                                                         |                                                                 | min.               | typ.         | max. |                                |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------|--------------|------|--------------------------------|
| Durchlassspannung<br>Forward voltage                                            | $I_F = 10\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 10\text{ A}, V_{GE} = 0\text{ V}$                                                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_F$              | 1,80<br>1,85 | 2,25 | V<br>V                         |
| Rückstromspitze<br>Peak reverse recovery current                                | $I_F = 10\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$                           | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $I_{RM}$           | 14,0<br>15,0 |      | A<br>A                         |
| Sperrverzögerungsladung<br>Recovered charge                                     | $I_F = 10\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$                           | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $Q_r$              | 1,00<br>1,80 |      | $\mu\text{C}$<br>$\mu\text{C}$ |
| Abschaltenergie pro Puls<br>Reverse recovery energy                             | $I_F = 10\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$                           | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{rec}$          | 0,26<br>0,56 |      | mJ<br>mJ                       |
| Wärmewiderstand, Chip bis Gehäuse<br>Thermal resistance, junction to case       | pro Diode / per diode                                                                                                                   |                                                                 | $R_{thJC}$         |              | 2,30 | K/W                            |
| Wärmewiderstand, Gehäuse bis Kühlkörper<br>Thermal resistance, case to heatsink | pro Diode / per diode<br>$\lambda_{paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                 | $R_{thCH}$         | 0,74         |      | K/W                            |
| Temperatur im Schaltbetrieb<br>Temperature under switching conditions           |                                                                                                                                         |                                                                 | $T_{vj\text{ op}}$ | -40          | 125  | $^{\circ}\text{C}$             |

### NTC-Widerstand / NTC-Thermistor

#### Charakteristische Werte / Characteristic Values

|                                          |                                                               |  | min.         | typ.   | max. |                  |
|------------------------------------------|---------------------------------------------------------------|--|--------------|--------|------|------------------|
| Nennwiderstand<br>Rated resistance       | $T_C = 25^{\circ}\text{C}$                                    |  | $R_{25}$     | 5,00   |      | $\text{k}\Omega$ |
| Abweichung von R100<br>Deviation of R100 | $T_C = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$            |  | $\Delta R/R$ | -5     | 5    | %                |
| Verlustleistung<br>Power dissipation     | $T_C = 25^{\circ}\text{C}$                                    |  | $P_{25}$     |        | 20,0 | mW               |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$  |  | $B_{25/50}$  | 3375   |      | K                |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$  |  | $B_{25/80}$  | t.b.d. |      | K                |
| B-Wert<br>B-value                        | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ |  | $B_{25/100}$ | t.b.d. |      | K                |

Angaben gemäß gültiger Application Note.  
Specification according to the valid application note.

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