# 2 IGBT,Inverter

## 2.1 Maximum Rated Values

| Parameter | Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector-emitter voltage | $T_{vj}$ = 25°C | $V_{CES}$ | 1200[1] | V |
| Implemented collector current | | $I_{CN}$ | 380 | A |
| Continuous DC collector current | $T_F$ = 100°C, $T_{vj\,max}$ = 175°C | $I_{C\,nom}$ | 250[2] | A |
| Repetitive peak collector current | $t_P$ = 1 ms | $I_{CRM}$ | 760 | A |
| Total power dissipation | $T_F$ = 75°C, $T_{vj\,max}$ = 175°C | $P_{tot}$ | 870[2] | W |
| Gate-emitter peak voltage | | $V_{GES}$ | +/-20 | V |

## 2.2 Characteristic Values

| | | | | min. | typ. | max. | |
|---|---|---|---|---|---|---|---|
| Collector-emitter saturation voltage | $I_C$ = 250 A, $V_{GE}$ = 15 V<br>$I_C$ = 250 A, $V_{GE}$ = 15 V<br>$I_C$ = 250 A, $V_{GE}$ = 15 V<br><br>$I_C$ = 380 A, $V_{GE}$ = 15 V<br>$I_C$ = 380 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C<br><br>$T_{vj}$ = 25°C<br>$T_{vj}$ = 150°C | $V_{CE\,sat}$ | | 1.60<br>1.85<br>1.90<br><br>1,95<br>2,40 | 1.95 | V |
| Gate threshold voltage | $I_C$ = 9.75 mA, $V_{CE}$ = $V_{GE}$ | $T_{vj}$ = 25°C | $V_{GEth}$ | 5.20 | 5.80 | 6.40 | V |
| Gate charge | $V_{GE}$ = -8 V ... 15 V, $V_{CE}$ = 600V | | $Q_G$ | | 1.75 | | µC |
| Internal gate resistor | | $T_{vj}$ = 25°C | $R_{Gint}$ | | 2.5 | | Ω |
| Input capacitance | f = 1 MHz, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25°C | $C_{ies}$ | | 19.0 | | nF |
| Reverse transfer capacitance | f = 1 MHz, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25°C | $C_{res}$ | | 0.81 | | nF |
| Collector-emitter cut-off current | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V | $T_{vj}$ = 25°C | $I_{CES}$ | | | 1.0 | mA |
| Gate-emitter leakage current | $V_{CE}$ = 0 V, $V_{GE}$ = 20 V | $T_{vj}$ = 25°C | $I_{GES}$ | | | 400 | nA |
| Turn-on delay time, inductive load | $I_C$ = 250 A, $V_{CE}$ = 600 V<br>$V_{GE}$ = -8 / +15 V<br>$R_{Gon}$ = 2.2 Ω | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $t_{d\,on}$ | | 0.13<br>0.14<br>0.14 | | µs |
| Rise time, inductive load | $I_C$ = 250 A, $V_{CE}$ = 600 V<br>$V_{GE}$ = -8 / +15 V<br>$R_{Gon}$ = 2.2 Ω | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $t_r$ | | 0.05<br>0.05<br>0.05 | | µs |
| Turn-off delay time, inductive load | $I_C$ = 250 A, $V_{CE}$ = 600 V<br>$V_{GE}$ = -8 / +15 V<br>$R_{Goff}$ = 2.2 Ω | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $t_{d\,off}$ | | 0.47<br>0.57<br>0.60 | | µs |
| Fall time, inductive load | $I_C$ = 250 A, $V_{CE}$ = 600 V<br>$V_{GE}$ = -8 / +15 V<br>$R_{Goff}$ = 2.2 Ω | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $t_f$ | | 0.10<br>0.20<br>0.22 | | µs |
| Turn-on energy loss per pulse | $I_C$ = 250 A, $V_{CE}$ = 600 V, $L_S$ = 20 nH<br>$V_{GE}$ = -8 / +15 V<br>$R_{Gon}$ = 2.2 Ω<br>di/dt ($T_{vj}$ 25°C) = 4000 A/µs<br>di/dt ($T_{vj}$ 150°C) = 3800 A/µs | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $E_{on}$ | | 19.0<br>26.5<br>29.0 | | mJ |
| Turn-off energy loss per pulse | $I_C$ = 250 A, $V_{CE}$ = 600 V, $L_S$ = 20 nH<br>$V_{GE}$ = -8 / +15 V<br>$R_{Goff}$ = 2.2 Ω<br>dv/dt ($T_{vj}$ 25°C) = 3300 V/µs<br>dv/dt ($T_{vj}$ 150°C) = 3000 V/µs | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $E_{off}$ | | 18.5<br>28.0<br>31.0 | | mJ |
| SC data | $V_{GE} \le$ 15 V, $V_{CC}$ = 800 V<br>$V_{CEmax}$ = $V_{CES}$ -$L_{sCE}$ ·di/dt | $t_P \le$ 8 µs, $T_{vj}$ = 25°C<br>$t_P \le$ 6 µs, $T_{vj}$ = 150°C | $I_{SC}$ | | 1500<br>1200 | | A |
| Thermal resistance, junction to cooling fluid | per IGBT; ΔV/Δt = 10 dm³/min, $T_F$ = 75°C | | $R_{thJF}$ | | 0.100[3] | 0.115[3] | K/W |
| Temperature under switching conditions | $t_{op}$ continuous | | $T_{vj\,op}$ | -40 | | 150 | °C |

[1] For applications with applied blocking voltage > 60% of the specified maximum collector-emitter voltage, we recommend to evaluate the impact of the cosmic radiation effect in early design phase. For assessment please contact local Infineon sales office.
[2] Verified by characterization / design not by test.
[3] Cooler design and flow direction according to application note AN-HPDPERF-ASSEMBLY. Cooling fluid 50% water / 50% ethylenglycol.

# 3 Diode, Inverter

## 3.1 Maximum Rated Values

| Parameter | Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Repetitive peak reverse voltage | $T_{vj}$ = 25°C | $V_{RRM}$ | 1200[1] | V |
| Implemented forward current | | $I_{FN}$ | 380 | A |
| Continuous DC forward current | | $I_F$ | 250[2] | A |
| Repetitive peak forward current | $t_P$ = 1 ms | $I_{FRM}$ | 760 | A |
| $I^2t$ - value | $V_R$ = 0 V, $t_P$ = 10 ms, $T_{vj}$ = 125°C<br>$V_R$ = 0 V, $t_P$ = 10 ms, $T_{vj}$ = 150°C | $I^2t$ | 10000<br>8800 | $A^2s$<br>$A^2s$ |

## 3.2 Characteristic Values

| | | | | min. | typ. | max. | |
|---|---|---|---|---|---|---|---|
| Forward voltage | $I_F$ = 250 A, $V_{GE}$ = 0 V<br>$I_F$ = 250 A, $V_{GE}$ = 0 V<br>$I_F$ = 250 A, $V_{GE}$ = 0 V<br><br>$I_F$ = 380 A, $V_{GE}$ = 0 V<br>$I_F$ = 380 A, $V_{GE}$ = 0 V | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C<br><br>$T_{vj}$ = 25°C<br>$T_{vj}$ = 150°C | $V_F$ | | 1.60<br>1.55<br>1.55<br><br>1,85<br>1,80 | 2.00 | V |
| Peak reverse recovery current | $I_F$ = 250 A, - $di_F/dt$ = 3800 A/µs ($T_{vj}$ = 150°C)<br>$V_R$ = 600 V<br>$V_{GE}$ = -8 V | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $I_{RM}$ | | 245<br>300<br>315 | | A |
| Recovered charge | $I_F$ = 250 A, - $di_F/dt$ = 3800 A/µs ($T_{vj}$ = 150°C)<br>$V_R$ = 600 V<br>$V_{GE}$ = -8 V | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $Q_r$ | | 24.0<br>42.5<br>48.0 | | µC |
| Reverse recovery energy | $I_F$ = 250 A, - $di_F/dt$ = 3800 A/µs ($T_{vj}$ = 150°C)<br>$V_R$ = 600 V<br>$V_{GE}$ = -8 V | $T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 150°C | $E_{rec}$ | | 10.0<br>17.5<br>19.5 | | mJ |
| Thermal resistance, junction to cooling fluid | per diode; $\Delta V/\Delta t$ = 10 $dm^3$/min, $T_F$ = 75°C | | $R_{thJF}$ | | 0.140[3] | 0.160[3] | K/W |
| Temperature under switching conditions | $t_{op}$ continuous | | $T_{vj\,op}$ | -40 | | 150 | °C |

# 4 NTC-Thermistor

| Parameter | Conditions | Symbol | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| | | | Value | | | |
| Rated resistance | $T_C$ = 25°C | $R_{25}$ | | 5.00 | | kΩ |
| Deviation of R100 | $T_C$ = 100°C, $R_{100}$ = 493 Ω | ΔR/R | 5 | | 5 | % |
| Power dissipation | $T_C$ = 25°C | $P_{25}$ | | | 20.0 | mW |
| B-value | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\ K))]$ | $B_{25/50}$ | | 3375 | | K |
| B-value | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\ K))]$ | $B_{25/80}$ | | 3411 | | K |
| B-value | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\ K))]$ | $B_{25/100}$ | | 3433 | | K |

Specification according to the valid application note.

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[2] Verified by characterization / design not by test.
[3] Cooler design and flow direction according to application note AN-HPDPERF-ASSEMBLY. Cooling fluid 50% water / 50% ethylenglycol.