Sixth generation, high speed soft switching series

## Maximum Ratings

**For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector-emitter voltage, $T_{vj} \geq 25°C$ | $V_{CE}$ | 1200 | V |
| DC collector current, limited by $T_{vjmax}$<br>$T_c = 25°C$<br>$T_c = 100°C$ | $I_C$ | <br>80.0<br>40.0 | A |
| Pulsed collector current, $t_p$ limited by $T_{vjmax}$ | $I_{Cpuls}$ | 160.0 | A |
| Turn off safe operating area $V_{CE} \leq 1200V$, $T_{vj} \leq 175°C$ | - | 160.0 | A |
| Diode forward current, limited by $T_{vjmax}$<br>$T_c = 25°C$<br>$T_c = 100°C$ | $I_F$ | <br>80.0<br>40.0 | A |
| Diode pulsed current, $t_p$ limited by $T_{vjmax}$ | $I_{Fpuls}$ | 160.0 | A |
| Gate-emitter voltage<br>Transient Gate-emitter voltage ($t_p \leq 0.5\mu s$, $D < 0.001$) | $V_{GE}$ | ±20<br>25 | V |
| Power dissipation $T_c = 25°C$<br>Power dissipation $T_c = 100°C$ | $P_{tot}$ | 500.0<br>250.0 | W |
| Operating junction temperature | $T_{vj}$ | -40...+175 | °C |
| Storage temperature | $T_{stg}$ | -55...+150 | °C |
| Soldering temperature,<br>wave soldering 1.6mm (0.063in.) from case for 10s | | 260 | °C |

## Thermal Resistance

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **$R_{th}$ Characteristics** | | | | | | |
| IGBT thermal resistance,<br>junction - case | $R_{th(j-c)}$ | | - | - | 0.30 | K/W |
| Diode thermal resistance,<br>junction - case | $R_{th(j-c)}$ | | - | - | 0.78 | K/W |
| Thermal resistance<br>junction - ambient | $R_{th(j-a)}$ | | - | - | 40 | K/W |

**Electrical Characteristic, at $T_{vj}$ = 25°C, unless otherwise specified**

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Static Characteristic** | | | | | | |
| Collector-emitter saturation voltage | $V_{CEsat}$ | $V_{GE}$ = 15.0V, $I_C$ = 40.0A<br>$T_{vj}$ = 25°C<br>$T_{vj}$ = 125°C<br>$T_{vj}$ = 175°C | <br>-<br>-<br>- | <br>1.85<br>2.15<br>2.25 | <br>2.15<br>-<br>- | V |
| Diode forward voltage | $V_F$ | $V_{GE}$ = 0V, $I_F$ = 40.0A<br>$T_{vj}$ = 25°C<br>$T_{vj}$ = 175°C | <br>-<br>- | <br>2.20<br>2.25 | <br>2.55<br>- | V |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $I_C$ = 1.90mA, $V_{CE}$ = $V_{GE}$ | 5.1 | 5.7 | 6.3 | V |
| Zero gate voltage collector current | $I_{CES}$ | $V_{CE}$ = 1200V, $V_{GE}$ = 0V<br>$T_{vj}$ = 25°C<br>$T_{vj}$ = 175°C | <br>-<br>- | <br>-<br>1600 | <br>850<br>- | µA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = 20V | - | - | 600 | nA |
| Transconductance | $g_{fs}$ | $V_{CE}$ = 20V, $I_C$ = 40.0A | - | 32.0 | - | S |

**Electrical Characteristic, at $T_{vj}$ = 25°C, unless otherwise specified**

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic Characteristic** | | | | | | |
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | - | 2700 | - | pF |
| Output capacitance | $C_{oes}$ | | - | 185 | - | |
| Reverse transfer capacitance | $C_{res}$ | | - | 120 | - | |
| Gate charge | $Q_G$ | $V_{CC}$ = 960V, $I_C$ = 40.0A,<br>$V_{GE}$ = 15V | - | 285.0 | - | nC |
| Internal emitter inductance measured 5mm (0.197 in.) from case | $L_E$ | | - | 13.0 | - | nH |

**Switching Characteristic, Inductive Load**

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **IGBT Characteristic, at $T_{vj}$ = 25°C** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $T_{vj}$ = 25°C,<br>$V_{CC}$ = 600V, $I_C$ = 40.0A,<br>$V_{GE}$ = 0.0/15.0V,<br>$R_{G(on)}$ = 9.0Ω, $R_{G(off)}$ = 9.0Ω,<br>Lσ = 70nH, Cσ = 67pF<br>Lσ, Cσ from Fig. E<br>Energy losses include “tail” and diode reverse recovery. | - | 27 | - | ns |
| Rise time | $t_r$ | | - | 27 | - | ns |
| Turn-off delay time | $t_{d(off)}$ | | - | 315 | - | ns |
| Fall time | $t_f$ | | - | 27 | - | ns |
| Turn-on energy | $E_{on}$ | | - | 1.45 | - | mJ |
| Turn-off energy | $E_{off}$ | | - | 1.55 | - | mJ |
| Total switching energy | $E_{ts}$ | | - | 3.00 | - | mJ |