

Hybrid CoolSiC™ IGBT

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, $T_{vj} \geq 25^{\circ}\text{C}$ | V_{CE} | 650 | V |
| DC collector current, limited by T_{vjmax} $T_c = 25^{\circ}\text{C}$ value limited by bondwire $T_c = 100^{\circ}\text{C}$ | I_C | 80.0 56.0 | A |
| Pulsed collector current, t_p limited by T_{vjmax} | I_{Cpuls} | 200.0 | A |
| Turn off safe operating area $V_{CE} \leq 650\text{V}$, $T_{vj} \leq 175^{\circ}\text{C}$, $t_p = 1\mu\text{s}$ | - | 200.0 | A |
| Diode forward current, limited by T_{vjmax} $T_c = 25^{\circ}\text{C}$ $T_c = 100^{\circ}\text{C}$ | I_F | 33.7 22.8 | A |
| Diode pulsed current, t_p limited by T_{vjmax} ¹⁾ | I_{Fpuls} | 75.0 | A |
| Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 10\mu\text{s}$, $D < 0.010$) | V_{GE} | ± 20 ± 30 | V |
| Power dissipation $T_c = 25^{\circ}\text{C}$ Power dissipation $T_c = 100^{\circ}\text{C}$ | P_{tot} | 305.0 152.5 | W |
| Operating junction temperature | T_{vj} | -40...+175 | $^{\circ}\text{C}$ |
| Storage temperature | T_{stg} | -55...+150 | $^{\circ}\text{C}$ |
| Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s | | 260 | $^{\circ}\text{C}$ |
| Mounting torque, M3 screw Maximum of mounting processes: 3 | M | 0.6 | Nm |

Thermal Resistance

| Parameter | Symbol | Conditions | Value | | | Unit |
|--|---------------|------------|-------|------|------|------|
| | | | min. | typ. | max. | |
| R_{th} Characteristics | | | | | | |
| IGBT thermal resistance, junction - case | $R_{th(j-c)}$ | | - | - | 0.50 | K/W |
| Diode thermal resistance, junction - case | $R_{th(j-c)}$ | | - | - | 1.50 | K/W |
| Thermal resistance junction - ambient | $R_{th(j-a)}$ | | - | - | 40 | K/W |

¹⁾ Pulse current level depends on T_{vj} of diode chip, see also Fig. "Maximum pulse current as a function of junction temperature"

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Electrical Characteristic, at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Value | | | Unit |
|--------------------------------------|--------------|---|-------|------|------|---------------|
| | | | min. | typ. | max. | |
| Static Characteristic | | | | | | |
| Collector-emitter saturation voltage | V_{CEsat} | $V_{GE} = 15.0\text{V}$, $I_C = 50.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | - | 1.65 | 2.10 | V |
| Diode forward voltage | V_F | $V_{GE} = 0\text{V}$, $I_F = 20.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | - | 1.35 | 1.50 | V |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $I_C = 0.50\text{mA}$, $V_{CE} = V_{GE}$ | 3.2 | 4.0 | 4.8 | V |
| Zero gate voltage collector current | I_{CES} | $V_{CE} = 650\text{V}$, $V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | - | - | 700 | μA |
| Zero gate voltage collector current | I_{CES} | $V_{CE} = 480\text{V}$, $V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ | - | - | 25 | μA |
| Gate-emitter leakage current | I_{GES} | $V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$ | - | - | 100 | nA |
| Transconductance | g_{fs} | $V_{CE} = 20\text{V}$, $I_C = 50.0\text{A}$ | - | 62.0 | - | S |

Electrical Characteristic, at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Value | | | Unit |
|--|-----------|--|-------|-------|------|------|
| | | | min. | typ. | max. | |
| Dynamic Characteristic | | | | | | |
| Input capacitance | C_{ies} | $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$ $f = 250\text{kHz}$ | - | 2660 | - | pF |
| Output capacitance | C_{oes} | | - | 320 | - | |
| Reverse transfer capacitance | C_{res} | | - | 10 | - | |
| Gate charge | Q_G | $V_{CC} = 520\text{V}$, $I_C = 50.0\text{A}$, $V_{GE} = 15\text{V}$ | - | 120.0 | - | 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 $T_{vj} = 25^{\circ}\text{C}$

| | | | | | | |
|------------------------|--------------|--|---|------|---|----|
| Turn-on delay time | $t_{d(on)}$ | $T_{vj} = 25^{\circ}\text{C}$, | - | 22 | - | ns |
| Rise time | t_r | $V_{CC} = 400\text{V}$, $I_C = 25.0\text{A}$, $V_{GE} = 0.0/15.0\text{V}$, | - | 7 | - | ns |
| Turn-off delay time | $t_{d(off)}$ | $R_{G(on)} = 12.0\Omega$, $R_{G(off)} = 12.0\Omega$, | - | 180 | - | ns |
| Fall time | t_f | $L\sigma = 30\text{nH}$, $C\sigma = 30\text{pF}$ $L\sigma$, $C\sigma$ from Fig. E | - | 18 | - | ns |
| Turn-on energy | E_{on} | Energy losses include "tail" and diode reverse recovery. | - | 0.23 | - | mJ |
| Turn-off energy | E_{off} | | - | 0.18 | - | mJ |
| Total switching energy | E_{ts} | | - | 0.41 | - | mJ |