

## 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 60.5	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 $T_{vjmax}$ $T_c = 25^{\circ}\text{C}$ $T_c = 100^{\circ}\text{C}$	$I_F$	57.5 38.5	A
Diode pulsed current, $t_p$ limited by $T_{vjmax}$ <sup>1)</sup>	$I_{Fpuls}$	150.0	A
Gate-emitter voltage Transient Gate-emitter voltage ( $t_p \leq 10\mu\text{s}$ , $D < 0.010$ )	$V_{GE}$	$\pm 20$ $\pm 30$	V
Power dissipation $T_c = 25^{\circ}\text{C}$ Power dissipation $T_c = 100^{\circ}\text{C}$	$P_{tot}$	274.0 137.0	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.	
<b>R<sub>th</sub> Characteristics</b>						
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.55	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	1.00	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

<sup>1)</sup> 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.	
<b>Static Characteristic</b>						
Collector-emitter saturation voltage	$V_{CEsat}$	$V_{GE} = 15.0\text{V}$ , $I_C = 50.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- - -	1.35 1.55 1.65	1.70 - -	V
Diode forward voltage	$V_F$	$V_{GE} = 0\text{V}$ , $I_F = 40.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- - -	1.35 1.55 1.65	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	$I_{CES}$	$V_{CE} = 650\text{V}$ , $V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	- 2000	1300 -	$\mu\text{A}$
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 480\text{V}$ , $V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$	-	-	40	$\mu\text{A}$
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.	
<b>Dynamic Characteristic</b>						
Input capacitance	$C_{ies}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ $f = 250\text{kHz}$	-	2660	-	pF
Output capacitance	$C_{oes}$		-	530	-	
Reverse transfer capacitance	$C_{res}$		-	10	-	
Gate charge	$Q_G$	$V_{CC} = 520\text{V}$ , $I_C = 50.0\text{A}$ , $V_{GE} = 15\text{V}$	-	110.0	-	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	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C}$ ,	-	19	-	ns
Rise time	$t_r$	$V_{CC} = 400\text{V}$ , $I_C = 50.0\text{A}$ , $V_{GE} = 0.0/15.0\text{V}$ ,	-	9	-	ns
Turn-off delay time	$t_{d(off)}$	$R_{G(on)} = 9.0\Omega$ , $R_{G(off)} = 9.0\Omega$ ,	-	140	-	ns
Fall time	$t_f$	$L\sigma = 30\text{nH}$ , $C\sigma = 30\text{pF}$ $L\sigma$ , $C\sigma$ from Fig. E	-	19	-	ns
Turn-on energy	$E_{on}$	Energy losses include "tail" and diode reverse recovery.	-	0.23	-	mJ
Turn-off energy	$E_{off}$		-	0.52	-	mJ
Total switching energy	$E_{ts}$		-	0.75	-	mJ