

TRENCHSTOP™ IGBT 7

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} $T_c = 25^{\circ}\text{C}$ $T_c = 100^{\circ}\text{C}$	I_C	76.0 49.5	A
Pulsed collector current, t_p limited by $T_{vjmax}^{1)}$	I_{Cpuls}	120.0	A
Turn off safe operating area $V_{CE} \leq 650\text{V}$, $T_{vj} \leq 175^{\circ}\text{C}$, $t_p = 1\mu\text{s}^2)$	-	120.0	A
Diode forward current, limited by T_{vjmax} $T_c = 25^{\circ}\text{C}$ value limited by bondwire $T_c = 100^{\circ}\text{C}$	I_F	72.0 43.5	A
Diode pulsed current, t_p limited by $T_{vjmax}^{1)}$	I_{Fpuls}	120.0	A
Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 10\mu\text{s}$, $D < 0.010$)	V_{GE}	± 20 ± 30	V
Short circuit withstand time $V_{GE} = 15.0\text{V}$, $V_{CC} \leq 400\text{V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ $T_{vj} = 150^{\circ}\text{C}$	t_{SC}	3	μs
Short circuit withstand time $V_{GE} = 15.0\text{V}$, $V_{CC} \leq 330\text{V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ $T_{vj} = 100^{\circ}\text{C}$	t_{SC}	5	μs
Power dissipation $T_c = 25^{\circ}\text{C}$ Power dissipation $T_c = 100^{\circ}\text{C}$	P_{tot}	230.8 115.4	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	$R_{th(j-c)}$		-	-	0.65	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.90	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	K/W

¹⁾ Defined by design. Not subject to production test.

²⁾ Clamped inductive load current test for each device, $I_C=120\text{A}$, $V_{CC}=400\text{V}$, $T_c=25^{\circ}\text{C}$, $V_{GE}=20\text{V}$, $L=80\mu\text{H}$, $R_G=10\Omega$.

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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}	$V_{GE} = 15.0\text{V}$, $I_C = 40.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	1.35	1.65	V
Diode forward voltage	V_F	$V_{GE} = 0\text{V}$, $I_F = 40.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	1.65	2.00	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 0.40\text{mA}$, $V_{CE} = V_{GE}$	4.3	5.0	5.7	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 650\text{V}$, $V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	-	-	40	μA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$	-	-	100	nA
Transconductance	g_{fs}	$V_{CE} = 20\text{V}$, $I_C = 40.0\text{A}$	-	20.5	-	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}	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$ $f = 1000\text{kHz}$	-	2475	-	pF
Output capacitance	C_{oes}		-	77	-	
Reverse transfer capacitance	C_{res}		-	25	-	
Gate charge	Q_G	$V_{CC} = 520\text{V}$, $I_C = 40.0\text{A}$, $V_{GE} = 15\text{V}$	-	235.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH
Short circuit collector current ¹⁾ Max. 1000 short circuits Time between short circuits: $\geq 1.0\text{s}$	$I_{C(SC)}$	$V_{GE} = 15.0\text{V}$, $V_{CC} \leq 400\text{V}$, $t_{SC} \leq 3\mu\text{s}$ $T_{vj} = 150^{\circ}\text{C}$	-	205	-	A

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	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C}$,	-	20	-	ns
Rise time	t_r	$V_{CC} = 400\text{V}$, $I_C = 40.0\text{A}$, $V_{GE} = 0.0/15.0\text{V}$,	-	15	-	ns
Turn-off delay time	$t_{d(off)}$	$R_{G(on)} = 10.0\Omega$, $R_{G(off)} = 10.0\Omega$,	-	310	-	ns
Fall time	t_f	$L\sigma = 32\text{nH}$, $C\sigma = 30\text{pF}$ $L\sigma$, $C\sigma$ from Fig. E	-	13	-	ns
Turn-on energy	E_{on}	Energy losses include "tail" and diode reverse recovery.	-	1.05	-	mJ
Turn-off energy	E_{off}		-	0.59	-	mJ
Total switching energy	E_{ts}		-	1.64	-	mJ

¹⁾ Allowed number of short circuits: <1000; time between short circuits >1s.