

## TRENCHSTOP™ RC-Series for hard switching applications

### 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, $T_{vj} \geq 25^{\circ}\text{C}$	$V_{CE}$	600	V
DC collector current, limited by $T_{vjmax}$ $T_c = 25^{\circ}\text{C}$ $T_c = 100^{\circ}\text{C}$	$I_C$	18.8 12.6	A
Pulsed collector current, $t_p$ limited by $T_{vjmax}$	$I_{Cpuls}$	30.0	A
Turn off safe operating area $V_{CE} \leq 600\text{V}$ , $T_{vj} \leq 175^{\circ}\text{C}$ , $t_p = 1\mu\text{s}$	-	30.0	A
Diode forward current, limited by $T_{vjmax}$ $T_c = 25^{\circ}\text{C}$ $T_c = 100^{\circ}\text{C}$	$I_F$	8.9 4.6	A
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpuls}$	30.0	A
Gate-emitter voltage Transient Gate-emitter voltage ( $t_p \leq 10\mu\text{s}$ , $D < 0.010$ )	$V_{GE}$	$\pm 20$ $\pm 25$	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	$\mu\text{s}$
Power dissipation $T_c = 25^{\circ}\text{C}$ Power dissipation $T_c = 100^{\circ}\text{C}$	$P_{tot}$	79.0 39.5	W
Operating junction temperature	$T_{vj}$	-40...+175	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$	-55...+150	$^{\circ}\text{C}$
Soldering temperature, reflow soldering (MSL1 according to JEDEC J-STA-020)		260	$^{\circ}\text{C}$

### Thermal Resistance

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

#### R<sub>th</sub> Characteristics

IGBT thermal resistance, <sup>1)</sup> junction - case	$R_{th(j-c)}$		-	-	1.90	K/W
Diode thermal resistance, <sup>2)</sup> junction - case	$R_{th(j-c)}$		-	-	6.10	K/W
Thermal resistance, min. footprint junction - ambient	$R_{th(j-a)}$		-	-	75	K/W
Thermal resistance, 6cm <sup>2</sup> Cu on PCB junction - ambient	$R_{th(j-a)}$		-	-	50	K/W

<sup>1)</sup> R<sub>th</sub>/Z<sub>th</sub> based on single cooling pulse. Please be aware that a correct R<sub>th</sub> measurement of the IGBT, is not possible using a thermocouple.

<sup>2)</sup> R<sub>th</sub>/Z<sub>th</sub> based on single cooling pulse. Please be aware that a correct R<sub>th</sub> measurement of the Diode, is not possible using a thermocouple.

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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	$V_{CEsat}$	$V_{GE} = 15.0\text{V}$ , $I_C = 10.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	2.00 2.40	2.30 -	V
Diode forward voltage	$V_F$	$V_{GE} = 0\text{V}$ , $I_F = 10.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	1.90 1.95	2.20 -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 0.11\text{mA}$ , $V_{CE} = V_{GE}$	4.3	5.0	5.7	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 600\text{V}$ , $V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	- -	25 2500	$\mu\text{A}$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\text{V}$ , $V_{GE} = 20\text{V}$	-	-	100	nA
Transconductance	$g_{fs}$	$V_{CE} = 20\text{V}$ , $I_C = 10.0\text{A}$	-	4.5	-	S
Integrated gate resistor	$r_G$			none		$\Omega$

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	$C_{ies}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ $f = 1000\text{kHz}$	-	400	-	$\mu\text{F}$
Output capacitance	$C_{oes}$		-	20	-	
Reverse transfer capacitance	$C_{res}$		-	15	-	
Gate charge	$Q_G$	$V_{CC} = 480\text{V}$ , $I_C = 10.0\text{A}$ , $V_{GE} = 15\text{V}$	-	48.0	-	nC

## 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	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C}$ , $V_{CC} = 400\text{V}$ , $I_C = 10.0\text{A}$ , $V_{GE} = 0.0/15.0\text{V}$ , $R_{G(on)} = 49.0\Omega$ , $R_{G(off)} = 49.0\Omega$ , $L\sigma = 30\text{nH}$ , $C\sigma = 32\text{pF}$ $L\sigma$ , $C\sigma$ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	14	-	ns
Rise time	$t_r$		-	13	-	ns
Turn-off delay time	$t_{d(off)}$		-	250	-	ns
Fall time	$t_f$		-	21	-	ns
Turn-on energy	$E_{on}$		-	0.32	-	mJ
Turn-off energy	$E_{off}$		-	0.17	-	mJ
Total switching energy	$E_{ts}$		-	0.49	-	mJ