

## TRENCHSTOP™ RC-Drives Fast Series

## Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_{vj} \geq 25^{\circ}\text{C}$	$V_{CE}$	600	V
DC collector current, limited by $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	$I_C$	20.0 10.0	A
Pulsed collector current, $t_p$ limited by $T_{vjmax}^{1)}$	$I_{Cpuls}$	30.0	A
Turn off safe operating area $V_{CE} \leq 600\text{V}$ , $T_{vj} \leq 175^{\circ}\text{C}$ , $t_p = 1\mu\text{s}^{1)}$	-	30.0	A
Diode forward current, limited by $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	$I_F$	20.0 10.0	A
Diode pulsed current, $t_p$ limited by $T_{vjmax}^{1)}$	$I_{Fpuls}$	30.0	A
Gate-emitter voltage	$V_{GE}$	$\pm 20$	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: $\geq 1.0\text{s}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{SC}$	5	$\mu\text{s}$
Power dissipation $T_C = 25^{\circ}\text{C}$	$P_{tot}$	150.0	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.	
<b>R<sub>th</sub> Characteristics</b>						
IGBT thermal resistance, <sup>2)</sup> junction - case	$R_{th(j-c)}$		-	-	1.00	K/W
Diode thermal resistance, <sup>3)</sup> junction - case	$R_{th(j-c)}$		-	-	2.60	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> Defined by design. Not subject to production test.

<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 IGBT, is not possible using a thermocouple.

<sup>3)</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 breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0\text{V}, I_C = 0.20\text{mA}$	600	-	-	V
Collector-emitter saturation voltage	$V_{CEsat}$	$V_{GE} = 15.0\text{V}, I_C = 10.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	2.20 2.30	2.50 -	V
Diode forward voltage	$V_F$	$V_{GE} = 0\text{V}, I_F = 10.0\text{A}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	2.10 2.00	2.40 -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 0.17\text{mA}, V_{CE} = V_{GE}$	4.3	5.0	5.7	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 600\text{V}, V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	- -	- 440	40 -	$\mu\text{A}$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0\text{V}, V_{GE} = 20\text{V}$	-	-	100	nA
Transconductance <sup>1)</sup>	$g_{fs}$	$V_{CE} = 10\text{V}, I_C = 10.0\text{A}$	-	4.6	-	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	$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$	-	655	-	pF
Output capacitance	$C_{oes}$		-	37	-	
Reverse transfer capacitance	$C_{res}$		-	22	-	
Gate charge	$Q_G$	$V_{CC} = 480\text{V}, I_C = 10.0\text{A},$ $V_{GE} = 15\text{V}$	-	64.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	$L_E$		-	7.0	-	nH
Short circuit collector current Max. 1000 short circuits Time between short circuits: $\geq 1.0\text{s}$	$I_{C(SC)}$	$V_{GE} = 15.0\text{V}, V_{CC} \leq 400\text{V},$ $t_{SC} \leq 5\mu\text{s}$ $T_{vj} = 25^{\circ}\text{C}$	-	74	-	A

## Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>IGBT Characteristic, at <math>T_{vj} = 25^{\circ}\text{C}</math></b>						
Turn-on delay time	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 10.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_{G(on)} = 26.0\Omega, R_{G(off)} = 26.0\Omega,$ $L_{\sigma} = 50\text{nH}, C_{\sigma} = 30\text{pF}$ $L_{\sigma}, C_{\sigma}$ from Fig. E	-	12	-	ns
Rise time	$t_r$		-	15	-	ns
Turn-off delay time	$t_{d(off)}$		-	168	-	ns
Fall time	$t_f$		-	18	-	ns
Turn-on energy	$E_{on}$		-	0.19	-	mJ
Turn-off energy	$E_{off}$		-	0.16	-	mJ
Total switching energy	$E_{ts}$		-	0.35	-	mJ

<sup>1)</sup> Typical value of transconductance determined at  $T_{vj} = 175^{\circ}\text{C}$ .