



Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage		V_{CES}	2500	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80\text{ °C}$	$I_{C,nom.}$	1000	A
	$T_C = 25\text{ °C}$	I_C	1600	A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ ms}, T_C = 80\text{ °C}$	I_{CRM}	2000	A
Gesamt-Verlustleistung total power dissipation	$T_C=25\text{ °C}, \text{ Transistor}$	P_{tot}	10,4	kW
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	1000	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1\text{ ms}$	I_{FRM}	2000	A
Grenzlastintegral der Diode I^2t - value, Diode	$V_R = 0V, t_p = 10\text{ms}, T_{vj} = 125\text{ °C}$	I^2t	400	kA^2s
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50\text{ Hz}, t = 1\text{ min.}$	V_{ISOL}	5	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor		min. typ. max.				
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$I_C = 1000A, V_{GE} = 15V, T_{vj} = 25\text{ °C}$	$V_{CE\text{ sat}}$	-	3,0	3,5	V
	$I_C = 1000A, V_{GE} = 15V, T_{vj} = 125\text{ °C}$		-	3,8	4,3	V
Gate-Schwellenspannung gate threshold voltage	$I_C = 80\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25\text{ °C}$	$V_{GE(th)}$	4,3	5,3	6,3	V
Gateladung gate charge	$V_{GE} = -15V \dots +15V$	Q_G	-	18	-	μC
Eingangskapazität input capacitance	$f = 1\text{MHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25V, V_{GE} = 0V$	C_{ies}	-	95	-	nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\text{MHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25V, V_{GE} = 0V$	C_{res}	-	8	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 2500V, V_{GE} = 0V, T_{vj} = 25\text{ °C}$	I_{CES}	-	-	20	mA
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25\text{ °C}$	I_{GES}	-	-	400	nA

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Technische Information / Technical Information

eupec

IGBT-Module
IGBT-Modules

FZ 1000 R 25 KF1



Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = 1000A, V_{CE} = 1200V$ $V_{GE} = \pm 15V, R_G = 1,3\Omega, C_{GE}=136nF, T_{vj} = 25^\circ C,$	$t_{d,on}$	-	1,4	-	μs
	$V_{GE} = \pm 15V, R_G = 1,3\Omega, C_{GE}=136nF, T_{vj} = 125^\circ C,$		-	1,5	-	μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 1000A, V_{CE} = 1200V$ $V_{GE} = \pm 15V, R_G = 1,3\Omega, C_{GE}=136nF, T_{vj} = 25^\circ C,$	t_r	-	0,25	-	μs
	$V_{GE} = \pm 15V, R_G = 1,3\Omega, C_{GE}=136nF, T_{vj} = 125^\circ C,$		-	0,25	-	μs
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = 1000A, V_{CE} = 1200V$ $V_{GE} = \pm 15V, R_G = 2,7\Omega, C_{GE}=136nF, T_{vj} = 25^\circ C,$	$t_{d,off}$	-	2,2	-	μs
	$V_{GE} = \pm 15V, R_G = 2,7\Omega, C_{GE}=136nF, T_{vj} = 125^\circ C,$		-	2,2	-	μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 1000A, V_{CE} = 1200V$ $V_{GE} = \pm 15V, R_G = 2,7\Omega, C_{GE}=136nF, T_{vj} = 25^\circ C,$	t_f	-	0,2	-	μs
	$V_{GE} = \pm 15V, R_G = 2,7\Omega, C_{GE}=136nF, T_{vj} = 125^\circ C,$		-	0,2	-	μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 1000A, V_{CE} = 1200V, V_{GE} = \pm 15V$ $R_G = 1,3\Omega, C_{GE}=136nF, T_{vj} = 125^\circ C, L_S = 60nH$	E_{on}	-	1400	-	mWs
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 1000A, V_{CE} = 1200V, V_{GE} = \pm 15V$ $R_G = 2,7\Omega, C_{GE}=136nF, T_{vj} = 125^\circ C, L_S = 60nH$	E_{off}	-	1000	-	mWs
Kurzschlußverhalten SC Data	$t_p \leq 10\mu sec, V_{GE} \leq 15V$ $T_{vj} \leq 125^\circ C, V_{CC}=1200V, V_{CEmax}=V_{CES} - L_{sCE} \cdot di/dt$	I_{SC}	-	4000	-	A
Modulinduktivität stray inductance module		L_{sCE}	-	12	-	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip		R_{CC+EE}	-	0,19	-	m Ω

Diode / Diode

			min.	typ.	max.	
Durchlaßspannung forward voltage	$I_F = 1000A, V_{GE} = 0V, T_{vj} = 25^\circ C$	V_F	-	2,3	2,7	V
	$I_F = 1000A, V_{GE} = 0V, T_{vj} = 125^\circ C$		-	2,3	2,7	V
Rückstromspitze peak reverse recovery current	$I_F = 1000A, - di_F/dt = 4000A/\mu s$ $V_R = 1200V, V_{GE} = -10V, T_{vj} = 25^\circ C$	I_{RM}	-	950	-	A
	$V_R = 1200V, V_{GE} = -10V, T_{vj} = 125^\circ C$		-	1000	-	A
Sperrverzögerungsladung recovered charge	$I_F = 1000A, - di_F/dt = 4000A/\mu s$ $V_R = 1200V, V_{GE} = -10V, T_{vj} = 25^\circ C$	Q_r	-	520	-	μAs
	$V_R = 1200V, V_{GE} = -10V, T_{vj} = 125^\circ C$		-	900	-	μAs
Abschaltenergie pro Puls reverse recovery energy	$I_F = 1000A, - di_F/dt = 4000A/\mu s$ $V_R = 1200V, V_{GE} = -10V, T_{vj} = 25^\circ C$	E_{rec}	-	340	-	mWs
	$V_R = 1200V, V_{GE} = -10V, T_{vj} = 125^\circ C$		-	650	-	mWs



Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,012	K/W
	Diode/Diode, DC		-	-	0,024	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per Module $\lambda_{Paste} \leq 1 \text{ W/m}^2\text{K} / \lambda_{grease} \leq 1 \text{ W/m}^2\text{K}$	R_{thCK}	-	0,008	-	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		T_{vj}	-	-	150	°C
Betriebstemperatur Sperrschicht junction operation temperature	Schaltvorgänge IGBT(RBSOA);Diode(SOA) switching operation IGBT(RBSOA);Diode(SOA)	$T_{vj,op}$	-40	-	125	°C
Lagertemperatur storage temperature		T_{stg}	-40	-	125	°C

Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix					
Material Modulbodenplatte material of module baseplate				AISiC	
Innere Isolation internal insulation				AlN	
Kriechstrecke creepage distance				32	mm
Luftstrecke clearance				19,1	mm
CTI comperative tracking index				>400	
Anzugsdrehmoment f. mech. Befestigung mounting torque		M1		5	Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	terminals M4	M2		2	Nm
	terminals M8			8 - 10	Nm
Gewicht weight		G		1000	g

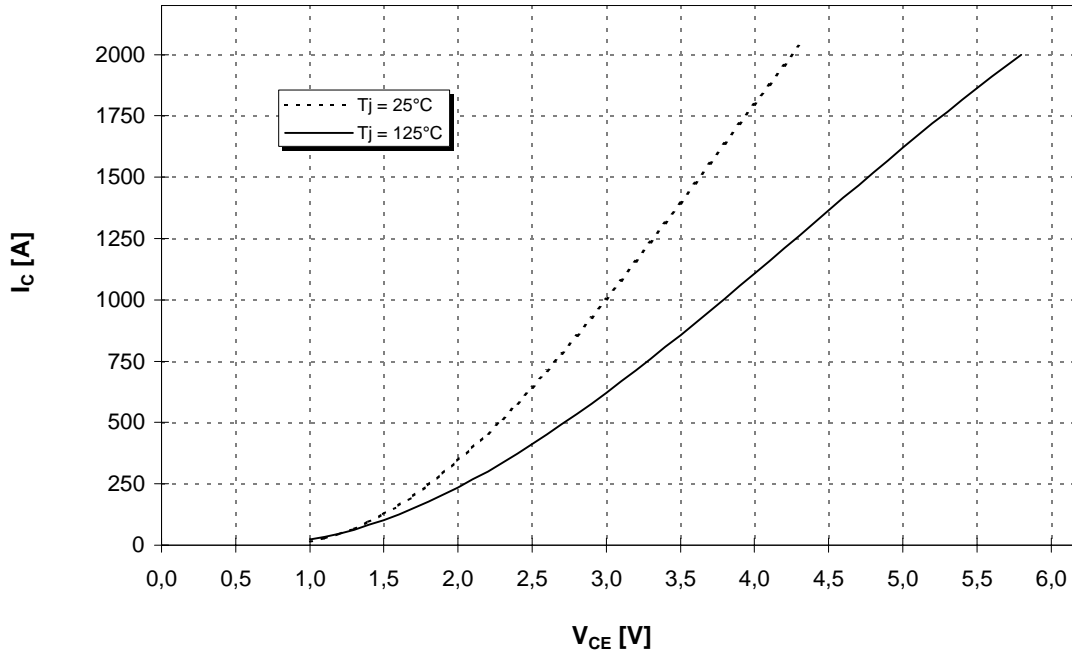
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

This technical information specifies semiconductor devices but promises no characteristics. It is valid in combination with the belonging technical notes.



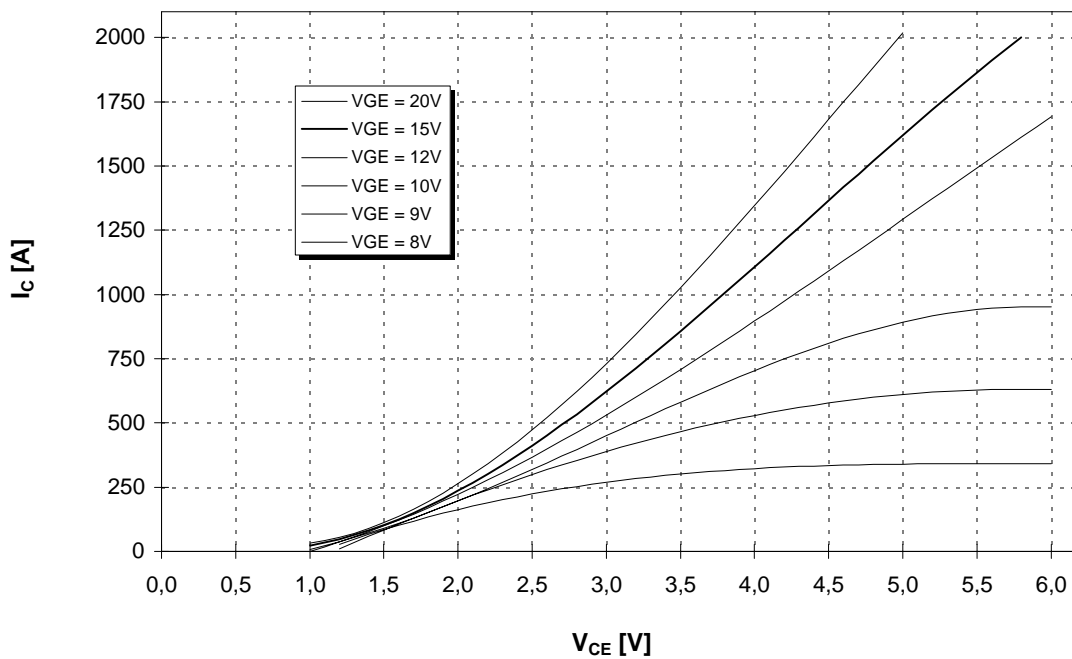
Ausgangskennlinie (typisch)
Output characteristic (typical)

$I_C = f(V_{CE})$
 $V_{GE} = 15V$



Ausgangskennlinienfeld (typisch)
Output characteristic (typical)

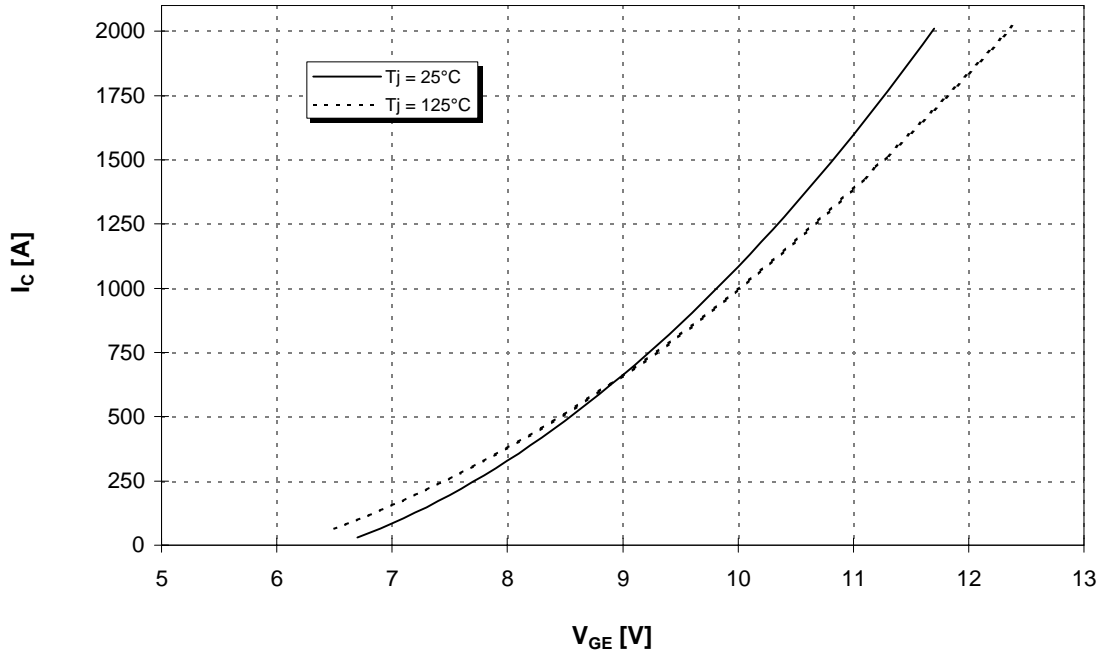
$I_C = f(V_{CE})$
 $T_{vj} = 125^\circ C$





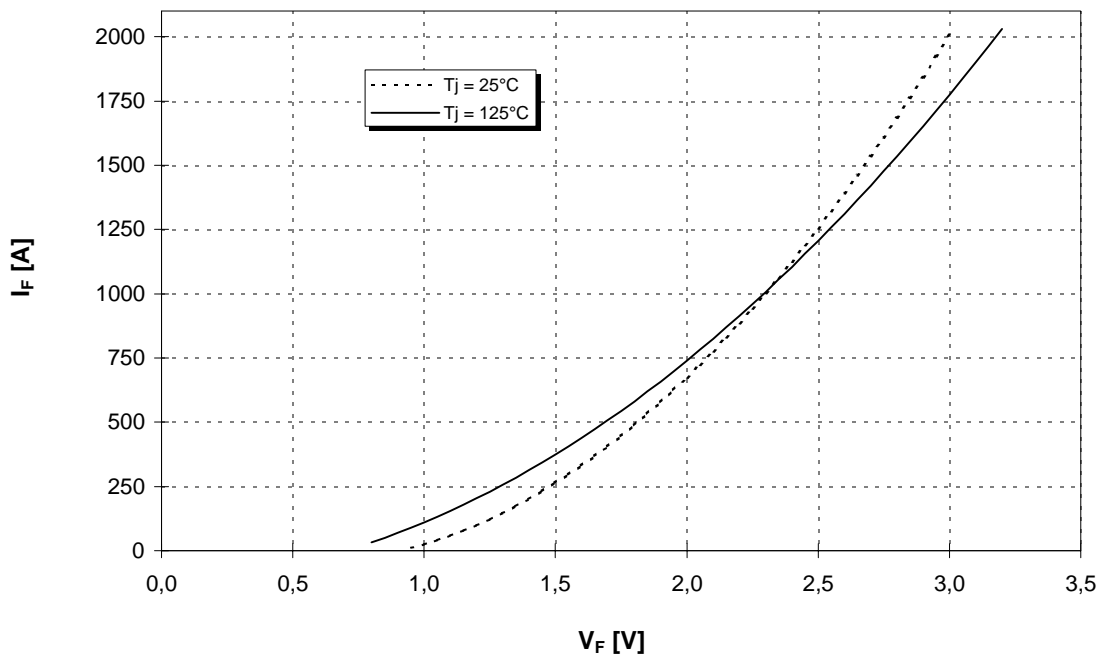
Übertragungscharakteristik (typisch)
Transfer characteristic (typical)

$I_C = f(V_{GE})$
 $V_{CE} = 10V$



Durchlaßkennlinie der Inversdiode (typisch)
Forward characteristic of inverse diode (typical)

$I_F = f(V_F)$

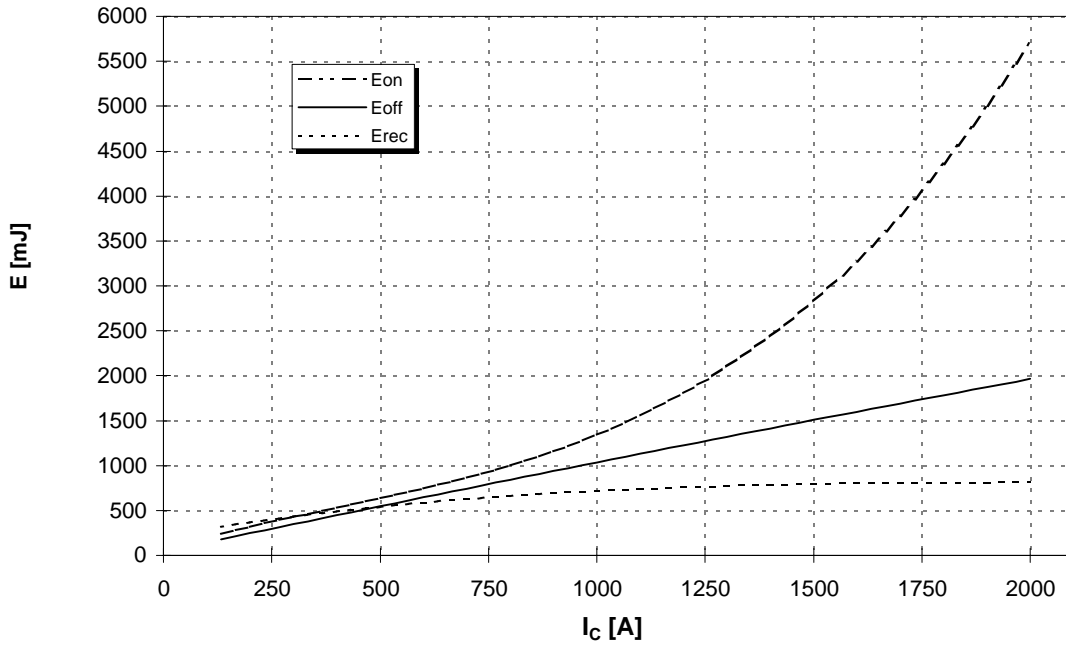




Schaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$

Switching losses (typical)

$R_{gon}=1,3\Omega$, $R_{goff}=2,7\Omega$, $C_{GE}=136nF$, $V_{GE}=\pm 15V$, $V_{CE} = 1200V$, $T_j = 125^\circ C$, $L_S = 60nH$

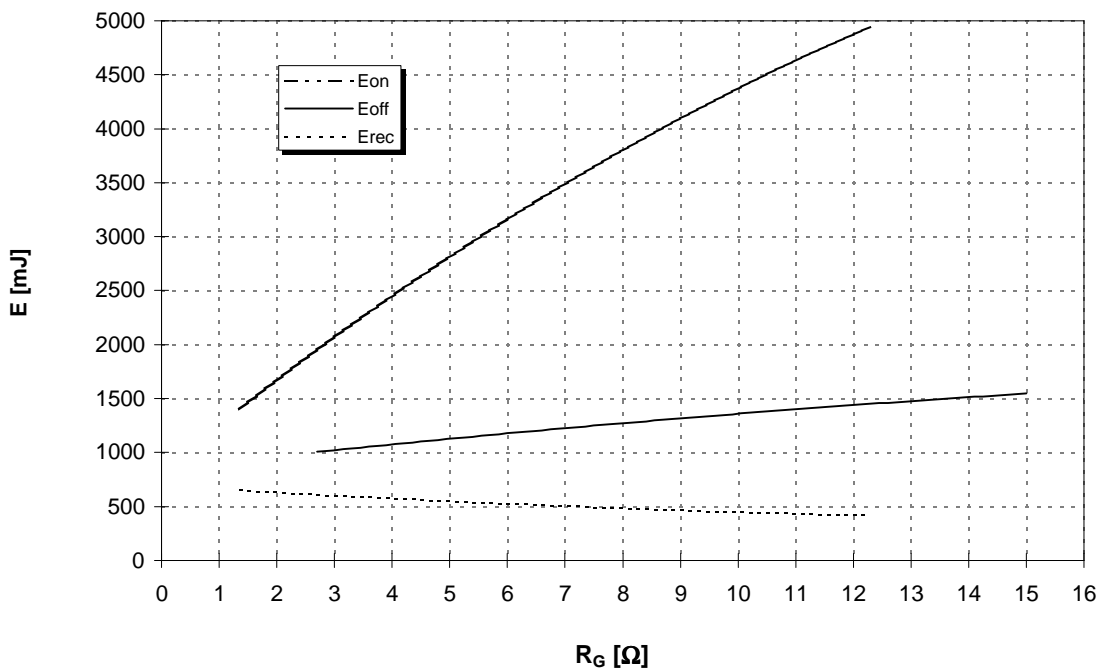


Schaltverluste (typisch)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$

Switching losses (typical)

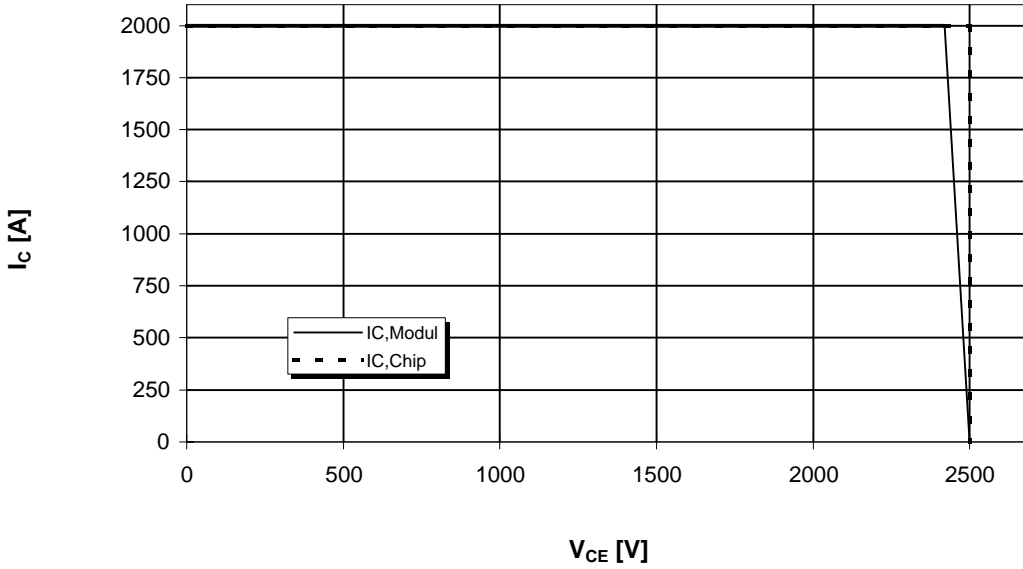
$I_C = 1000A$, $V_{CE} = 1200V$, $V_{GE}=\pm 15V$, $C_{GE} = 136nF$, $T_j = 125^\circ C$, $L_S = 60nH$





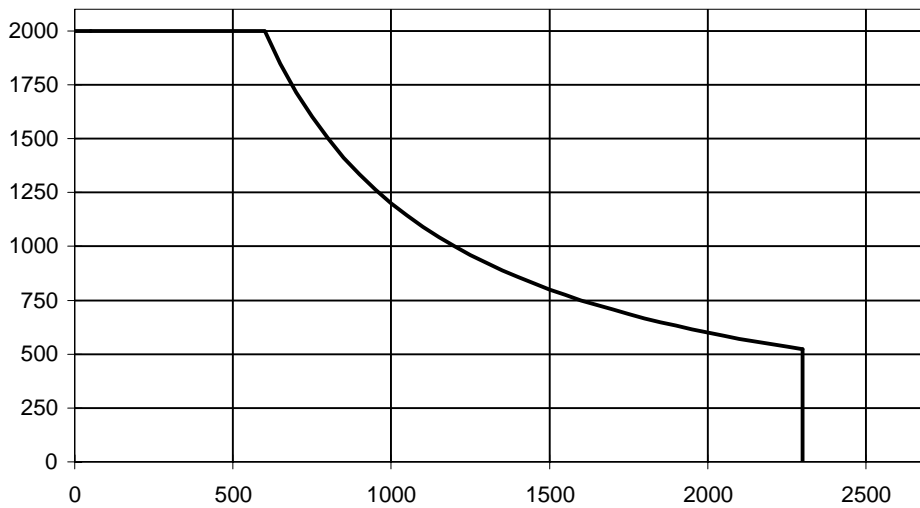
Sicherer Arbeitsbereich (RBSOA)

Reverse bias safe operation area (RBSOA) $R_g = 2,7 \text{ Ohm}$, $C_{GE} = 136\text{nF}$, $T_{vj} = 125^\circ\text{C}$



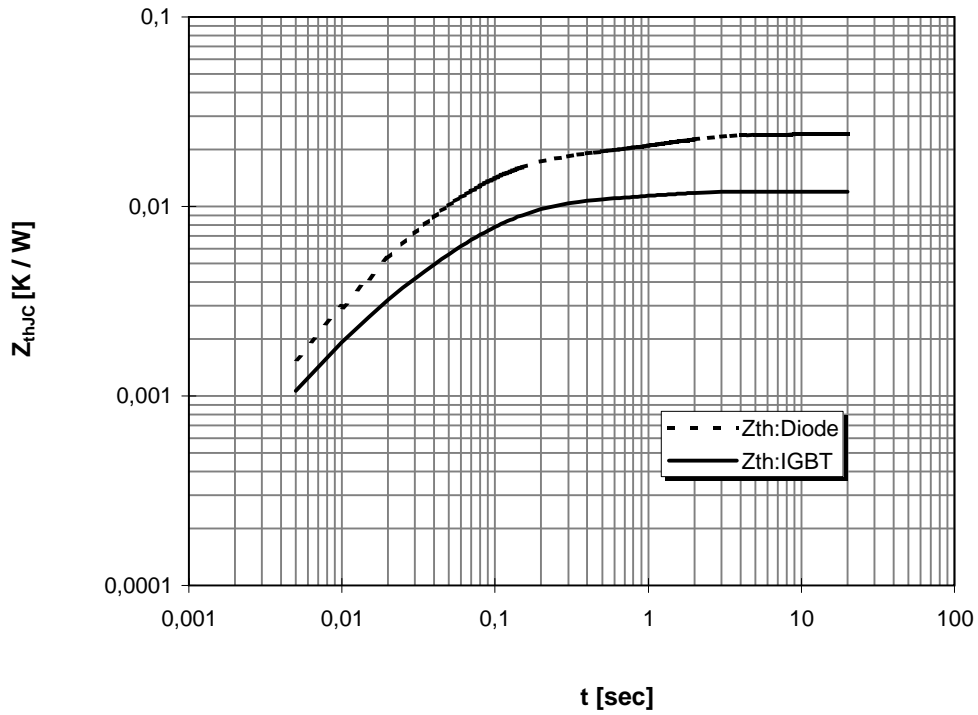
Sicherer Arbeitsbereich Diode (SOA)
safe operation area Diode (SOA)

$T_{vj} = 125^\circ\text{C}$





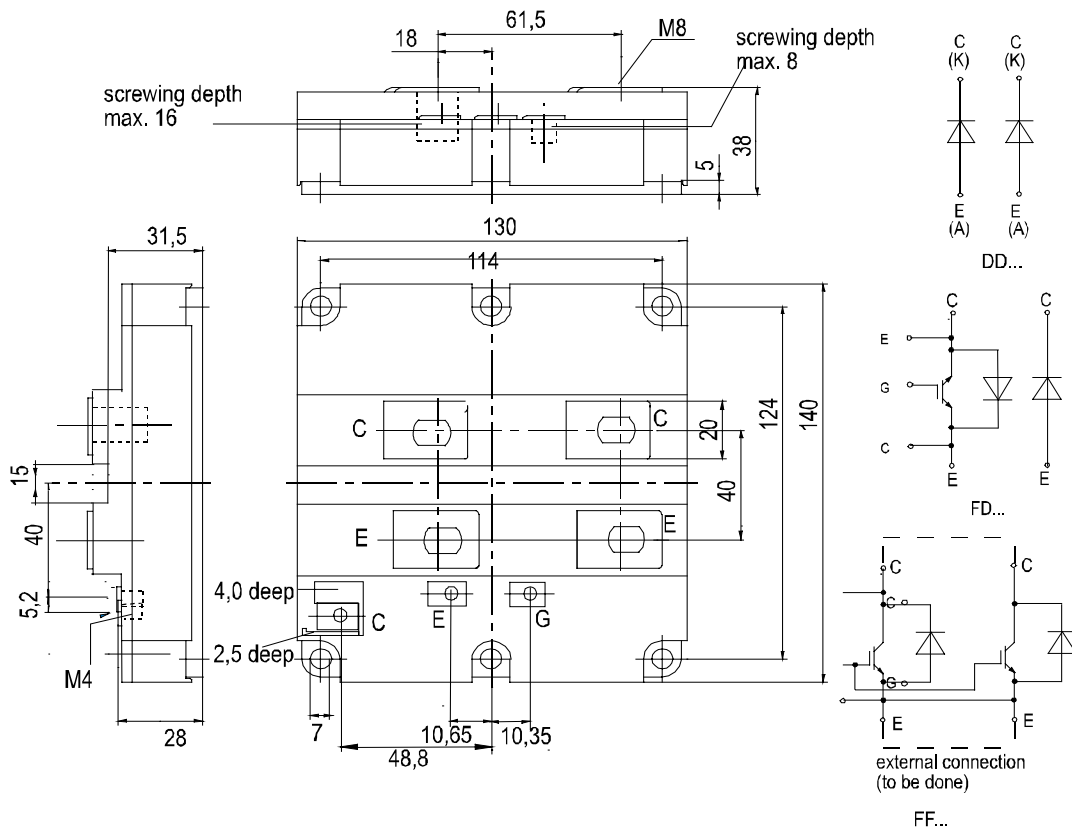
Transienter Wärmewiderstand $Z_{thJC} = f(t)$
Transient thermal impedance



i		1	2	3	4
r_i [K/kW]	: IGBT	1,35	3,3	5,55	1,8
τ_i [sec]	: IGBT	0,011	0,052	0,103	0,95
r_i [K/kW]	: Diode	3,15	7,5	6,75	6,6
τ_i [sec]	: Diode	0,025	0,056	0,1	1,31



Äußere Abmessungen und Schaltbild /
external dimensions and circuit diagram



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