Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage		V_{CES}	1200	V
Kollektor-Dauergleichstrom DC-collector current	T_C = 70°C T_C = 25 °C	$I_{C,nom.}$ I_C	400 510	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms, T_C = 80°C	I_{CRM}	800	A
Gesamt-Verlustleistung total power dissipation	T_C=25°C, Transistor	P_{tot}	2500	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	400	A
Periodischer Spitzenstrom repetitive peak forw. current	t_P = 1 ms	I_{FRM}	800	A
Grenzlastintegral der Diode I^2t - value, Diode	V_R = 0V, t_p = 10ms, T_{Vj} = 125°C	I^2t	65.000	A^2s
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	2.500	V

Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	I_C = 400A, V_{GE} = 15V, Tvj = 25°C I_C = 400A, V_{GE} = 15V, T_{vj} = 125°C	$V_{CE\,sat}$	- -	3,20 3,85	3,70 -	V V
Gate-Schwellenspannung gate threshold voltage	I_C = 16 mA, V_{CE} = V_{GE}, T_{vj} = 25°C	$V_{GE(th)}$	4,5	5,5	6,5	V
Eingangskapazität input capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{ies}	-	26	-	nF
Rückwirkungskapazität reverse transfer capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{res}	-	1,7	-	nF
Gateladung gate charge	V_{GE} = -15V ... + 15V, V_{CE} = 600V	Q_G	-	4,2	-	µC
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 1200V, V_{GE} = 0V, T_{vj} = 25°C	I_{CES}	-	-	5	mA
Gate-Emitter Reststrom gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25°C	I_{GES}	-	-	400	nA

prepared by: A.Schulz	date of publication : 2001-11-29
approved by: M.Hierholzer	revision: 2

Charakteristische Werte / Characteristic values

Transistor / Transistor			min.	typ.	max.	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	I_C = 400 A, V_{CC} = 600V V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 25°C V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 125°C	$t_{d,on}$	- -	100 125	- -	ns ns
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 400 A, V_{CC} = 600V V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 25°C V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 125°C	t_r	- -	90 100	- -	ns ns
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I_C = 400 A, V_{CC} = 600V V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 25°C V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 125°C	$t_{d,off}$	- -	530 590	- -	ns ns
Fallzeit (induktive Last) fall time (inductive load)	I_C = 400 A, V_{CC} = 600V V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 25°C V_{GE} = ±15V, R_G = 2,2 Ω, T_{vj} = 125°C	t_f	- -	60 70	- -	ns ns
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 400 A, V_{CC} = 600V, V_{GE} = 15V R_G = 2,2 Ω, T_{vj} = 125°C, L_S = 85 nH	E_{on}	-	38	-	mWs
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 400 A, V_{CC} = 600V, V_{GE} = 15V R_G = 2,2 Ω, T_{vj} = 125°C, L_S = 85 nH	E_{off}	-	29	-	mWs
Kurzschlußverhalten SC Data	$t_P \leq 10\mu sec$, $V_{GE} \leq 15V$ $T_{Vj} \leq 125°C$, V_{CC}=900 V, $V_{CEmax}=V_{CES}-L_{sCE} \cdot dI/dt$	I_{SC}	-	2600	-	A
Modulinduktivität stray inductance module		L_{sCE}	-	16	-	nH
Modul-Leitungswiderstand, Anschlüsse - Chip lead resistance, terminals - chip		$R_{CC'+EE'}$	-	0,4	-	mΩ

Charakteristische Werte / Characteristic values

Diode / Diode			min.	typ.	max.	
Durchlaßspannung forward voltage	I_F = 400 A, V_{GE} = 0V, T_{vj} = 25°C I_F = 400 A, V_{GE} = 0V, T_{vj} = 125°C	V_F	- -	2,00 1,70	2,40 -	V V
Rückstromspitze peak reverse recovery current	I_F = 400 A, - di_F/dt = 4100 A/µsec V_R = 600V, VGE = -10V, T_{vj} = 25°C V_R = 600V, VGE = -10V, T_{vj} = 125°C	I_{RM}	- -	270 450	- -	A A
Sperrverzögerungsladung recovered charge	I_F = 400 A, - di_F/dt = 4100 A/µsec V_R = 600V, VGE = -10V, T_{vj} = 25°C V_R = 600V, VGE = -10V, T_{vj} = 125°C	Q_r	- -	30 80	- -	µAs µAs
Abschaltenergie pro Puls reverse recovery energy	I_F = 400 A, - di_F/dt = 4100 A/µsec V_R = 600V, VGE = -10V, T_{vj} = 25°C V_R = 600V, VGE = -10V, T_{vj} = 125°C	E_{rec}	- -	16 38	- -	mWs mWs

Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,050	K/W
	Diode/Diode, DC		-	-	0,085	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module λ_{Paste} = 1 W/m*K / λ_{grease} = 1 W/m*K	R_{thCK}	-	0,010	-	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\ max}$	-	-	150	°C
Betriebstemperatur operation temperature		$T_{vj\ op}$	-40	-	125	°C
Lagertemperatur storage temperature		T_{stg}	-40	-	150	°C

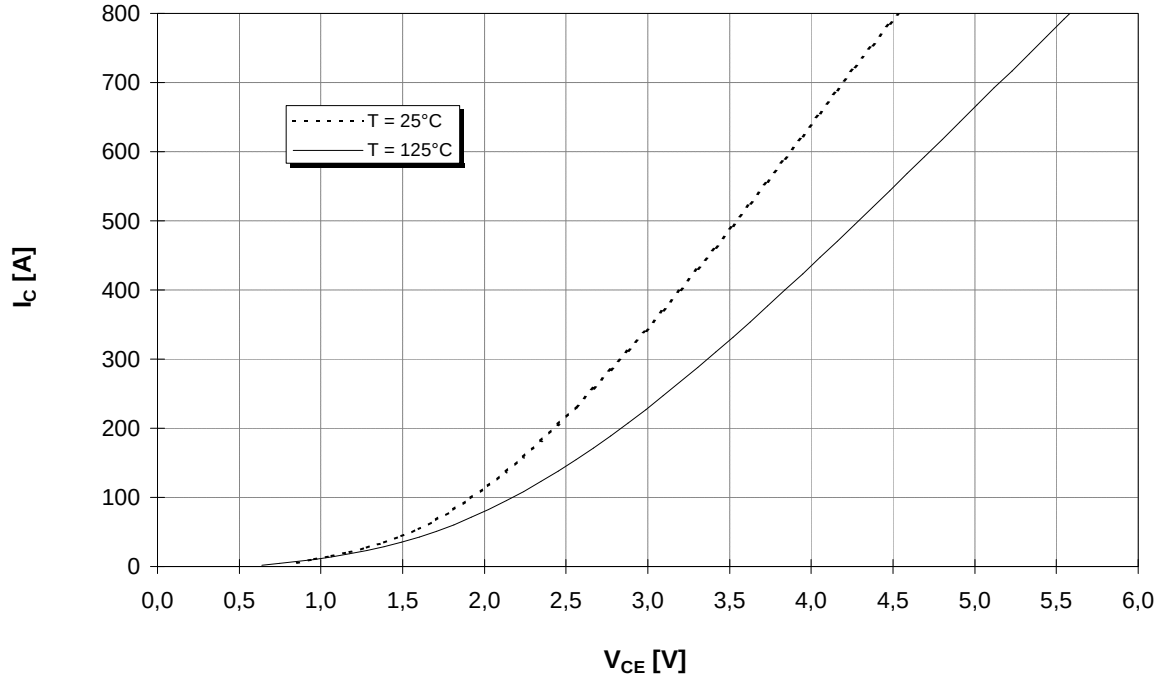
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix					
Material Modulgrundplatte material of module baseplate			Cu		
Innere Isolation internal insulation			Al_2O_3		
Kriechstrecke creepage distance			20		mm
Luftstrecke clearance			11		mm
CTI comperative tracking index			225		
Anzugsdrehmoment f. mech. Befestigung mounting torque	Schraube / screw M5	M1	3,0 - 6,0		Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	terminals M6	M2	2,5 - 5,0		Nm
	terminals M4		1,1 - 2,0		Nm
Gewicht weight		G	300		g

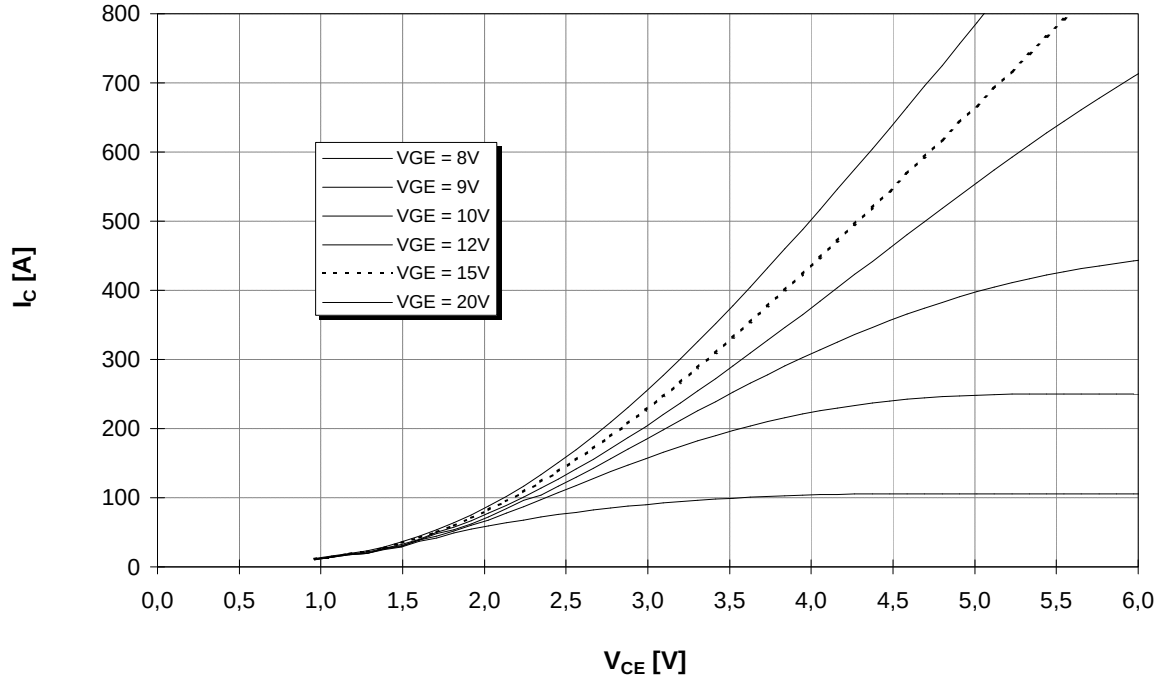
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

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

Ausgangskennlinie (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $V_{GE} = 15V$

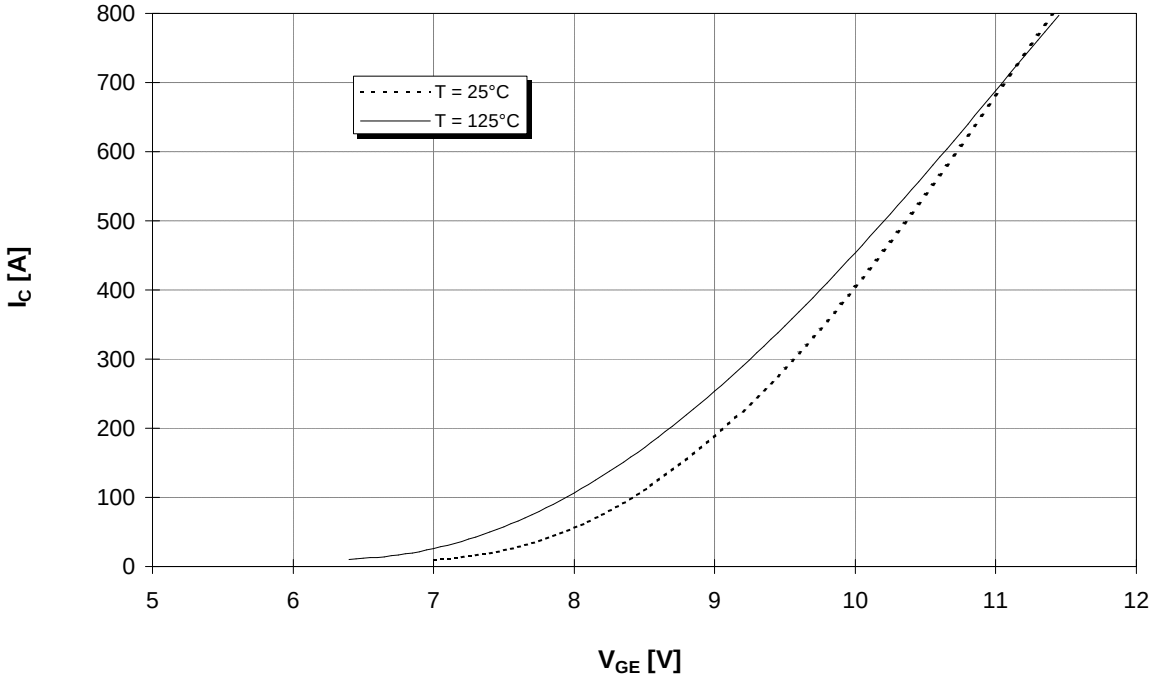


Ausgangskennlinienfeld (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $T_{vj} = 125°C$



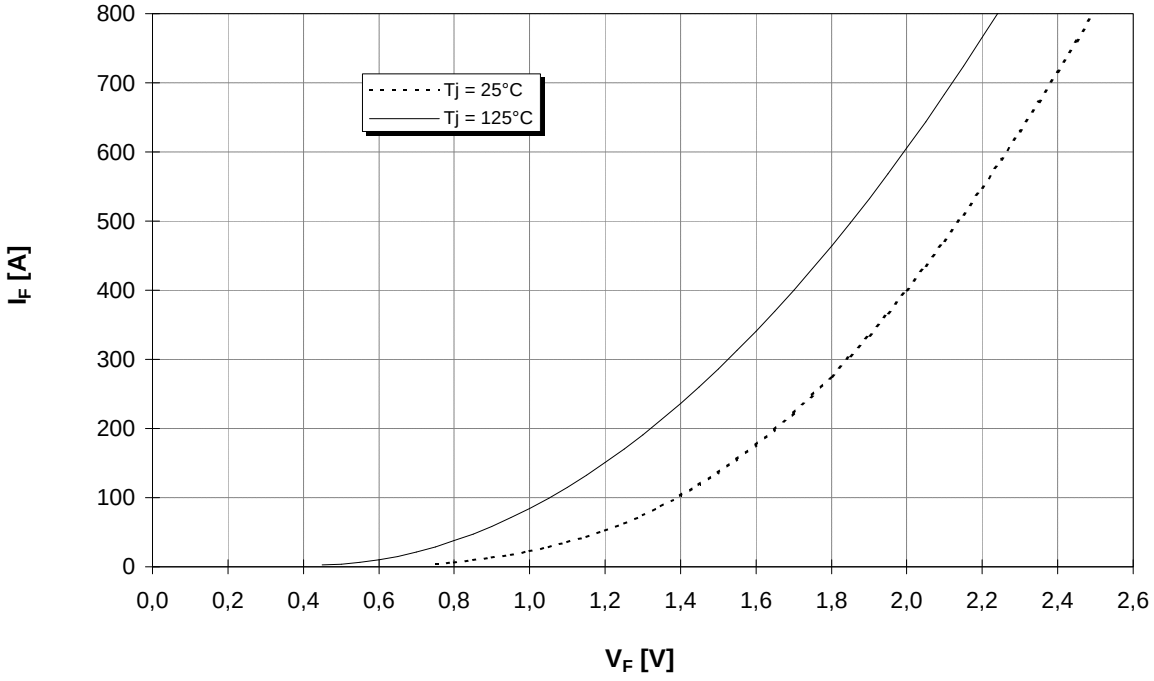
Übertragungscharakteristik (typisch) $I_C = f(V_{GE})$

Transfer characteristic (typical) $V_{CE} = 20V$

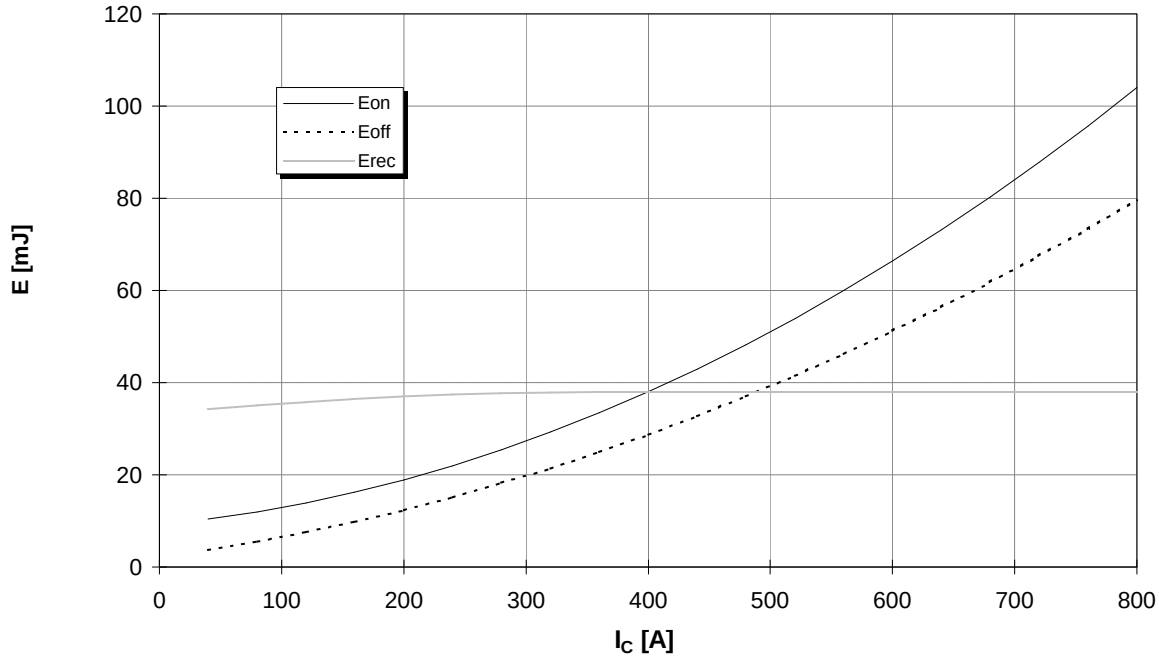


Durchlaßkennlinie der Inversdiode (typisch) $I_F = f(V_F)$

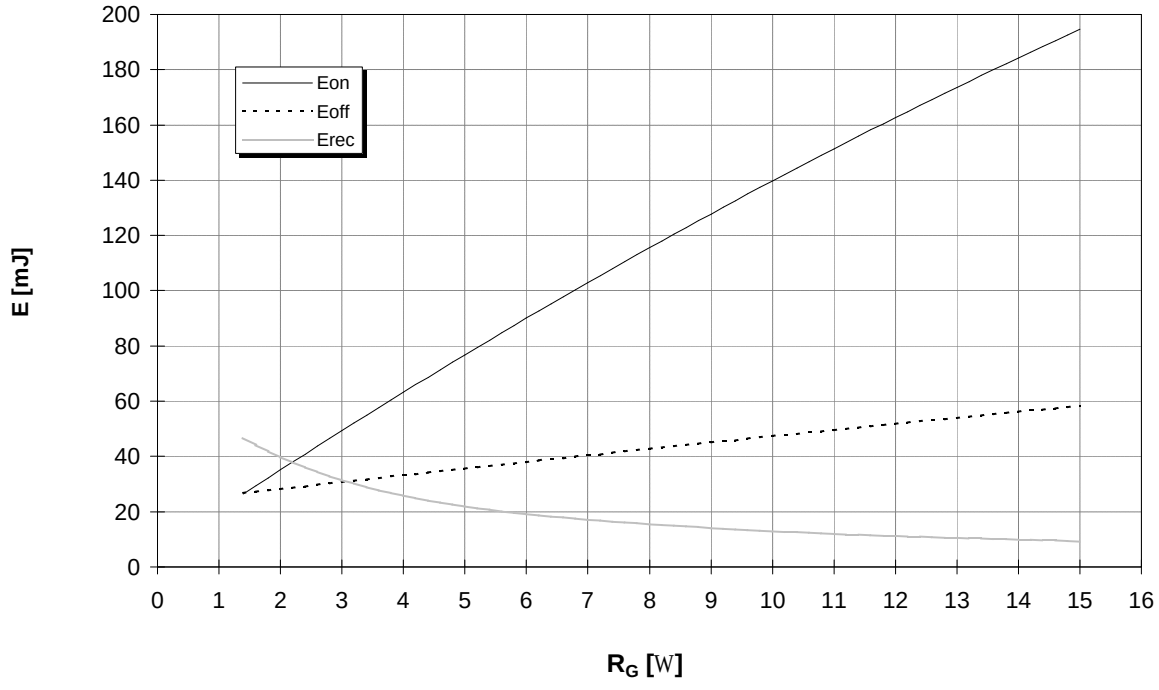
Forward characteristic of inverse diode (typical)



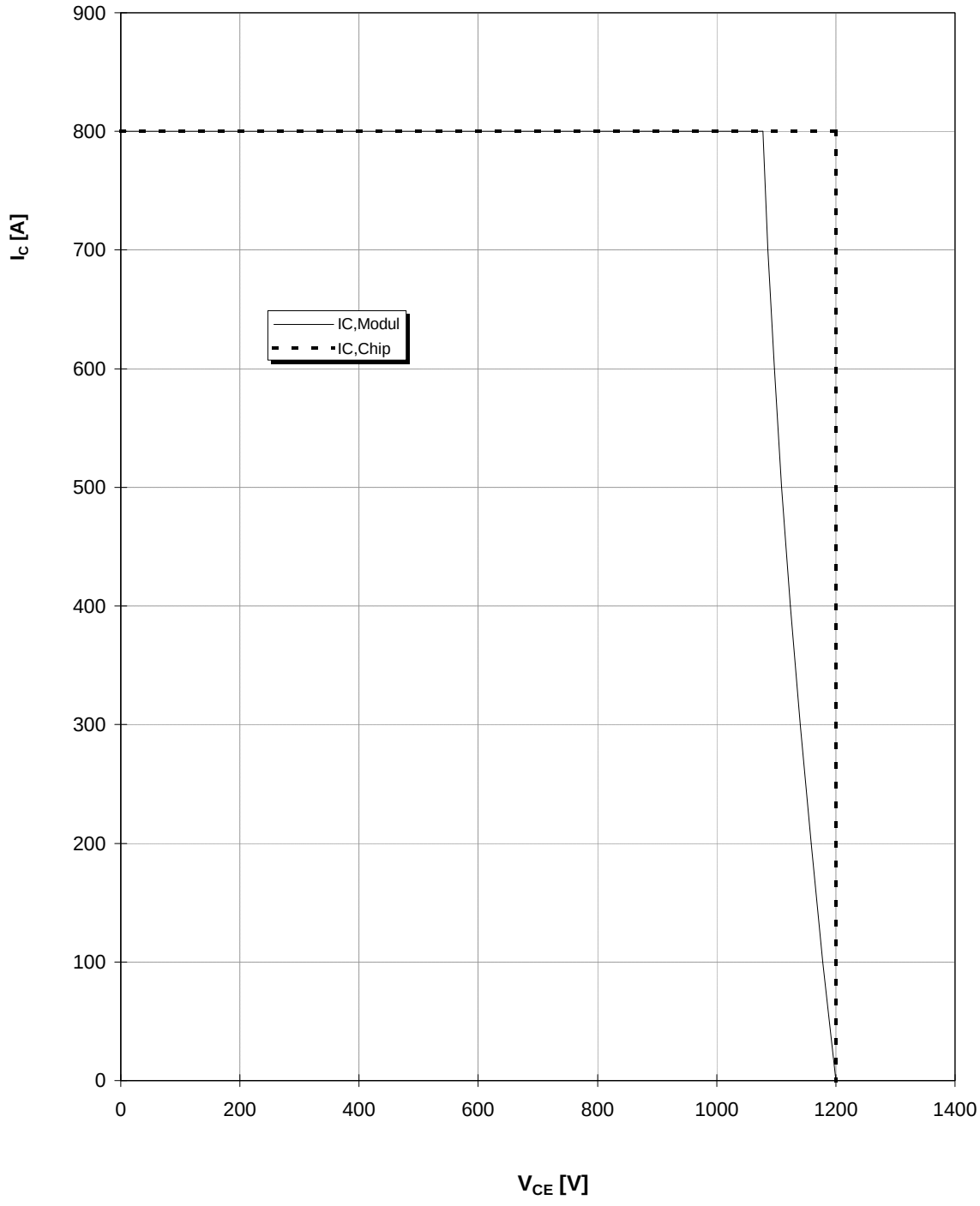
Schaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$
Switching losses (typical) $R_{G,on} = R_{G,off} = 2{,}2\ \Omega$, $V_{CE} = 600V$, $T_j = 125°C$



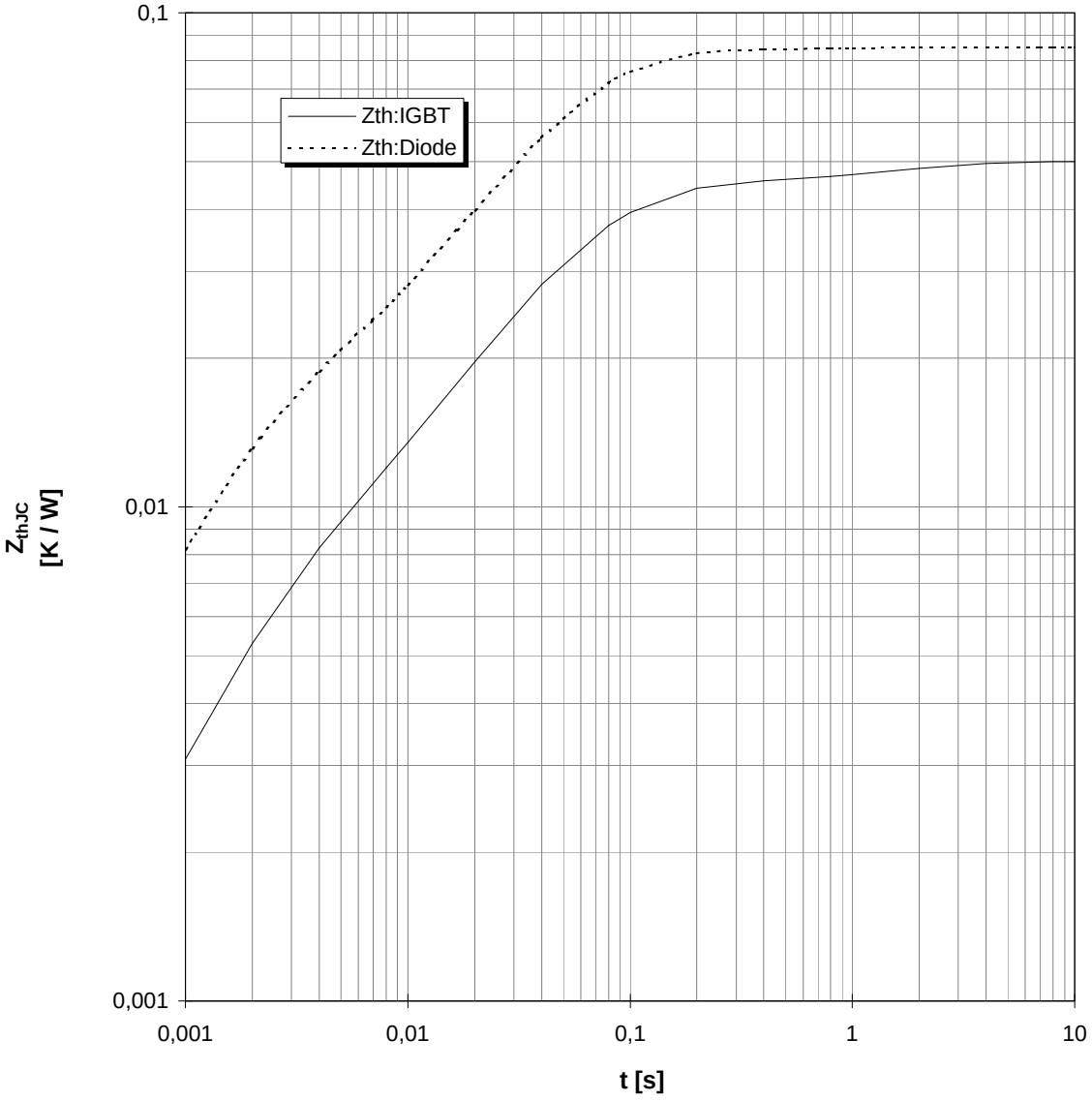
Schaltverluste (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
Switching losses (typical) $I_C = 400\ A$, $V_{CE} = 600V$, $T_j = 125°C$



Sicherer Arbeitsbereich IGBT (RBSOA) $R_{G,off}$ = 2,2 Ω, T_{vj}= 125°C
Reverse bias safe operation area IGBT (RBSOA)



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



i		1	2	3	4
r_i [K/kW]	: IGBT	5,59	16,93	22,06	5,43
τ_i [s]	: IGBT	0,0020	0,0300	0,0660	1,6550
r_i [K/kW]	: Diode	13,15	34,56	35,61	1,68
τ_i [s]	: Diode	0,0015	0,0327	0,0561	0,3872

Gehäusemaße / Schaltbild
Package outline / Circuit diagram