Technische Information / Technical Information

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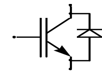

IGBT-Module
IGBT-Modules

FZ 1200 R 17 KF4C

Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage		V_{CES}	1700	V
Kollektor-Dauergleichstrom DC-collector current	T_C = 80 °C	$I_{C,nom.}$	1200	A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms, T_C = 80°C	I_{CRM}	2400	A
Gesamt-Verlustleistung total power dissipation	T_C=25°C, Transistor	P_{tot}	7,8	kW
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	1200	A
Periodischer Spitzenstrom repetitive peak forw. current	tp = 1 ms	I_{FRM}	2400	A
Grenzlastintegral der Diode I^2t - value, Diode	V_R = 0V, t_p = 10ms, T_{Vj} = 125°C	I^2t	380	kA^2s
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	3,4	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	I_C = 1200A, V_{GE} = 15V, T_{vj} = 25°C	$V_{CE\ sat}$		3,5	3,9	V
	I_C = 1200A, V_{GE} = 15V, T_{vj} = 125°C			4,6	5,0	V
Gate-Schwellenspannung gate threshold voltage	I_C = 80mA, V_{CE} = V_{GE}, T_{vj} = 25°C	$V_{GE(th)}$	4,5	5,5	6,5	V
Gateladung gate charge	V_{GE} = -15V ... +15V	Q_G		18		µC
Eingangskapazität input capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{ies}		180		nF
Rückwirkungskapazität reverse transfer capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{res}		4		nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 1700V, V_{GE} = 0V, T_{vj} = 25°C	I_{CES}		0,03	2,5	mA
	V_{CE} = 1700V, V_{GE} = 0V, T_{vj} = 125°C			16	120	mA
Gate-Emitter Reststrom gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25°C	I_{GES}			400	nA

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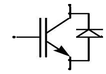
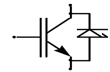


Charakteristische Werte / Characteristic values

Transistor / Transistor			min.	typ.	max.	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	I_C = 1200A, V_{CE} = 900V					
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 25°C	$t_{d,on}$		0,3		µs
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 125°C			0,5		µs
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 1200A, V_{CE} = 900V					
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 25°C	t_r		0,25		µs
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 125°C			0,25		µs
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I_C = 1200A, V_{CE} = 900V					
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 25°C	$t_{d,off}$		1,1		µs
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 125°C			1,3		µs
Fallzeit (induktive Last) fall time (inductive load)	I_C = 1200A, V_{CE} = 900V					
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 25°C	t_f		0,12		µs
	V_{GE} = ±15V, R_G = 1,8Ω, T_{vj} = 125°C			0,13		µs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 1200A, V_{CE} = 900V, V_{GE} = 15V R_G = 1,8Ω, T_{vj} = 125°C, L_S = 70nH	E_{on}		490		mWs
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 1200A, V_{CE} = 900V, V_{GE} = 15V R_G = 1,8Ω, T_{vj} = 125°C, L_S = 70nH	E_{off}		290		mWs
Kurzschlußverhalten SC Data	$t_P \leq$ 10µsec, $V_{GE} \leq$ 15V $T_{Vj} \leq$125°C, V_{CC}=1000V, V_{CEmax}=V_{CES}-L_{sCE} ·dI/dt	I_{SC}		10000		A
Modulinduktivität stray inductance module		L_{sCE}		12		nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip		$R_{CC'+EE'}$		0,08		mΩ

Charakteristische Werte / Characteristic values

Diode / Diode			min.	typ.	max.	
Durchlaßspannung forward voltage	I_F = 1200A, V_{GE} = 0V, T_{vj} = 25°C	V_F		2,1	2,5	V
	I_F = 1200A, V_{GE} = 0V, T_{vj} = 125°C			2,1	2,5	V
Rückstromspitze peak reverse recovery current	I_F = 1200A, - di_F/dt =5000A/µsec					
	V_R = 900V, VGE = -10V, T_{vj} = 25°C	I_{RM}		830		A
	V_R = 900V, VGE = -10V, T_{vj} = 125°C			900		A
Sperrverzögerungsladung recovered charge	I_F = 1200A, - di_F/dt = 5000A/µsec					
	V_R = 900V, VGE = -10V, T_{vj} = 25°C	Q_r		220		µAs
	V_R = 900V, VGE = -10V, T_{vj} = 125°C			400		µAs
Abschaltenergie pro Puls reverse recovery energy	I_F = 1200A, - di_F/dt = 5000A/µsec					
	V_R = 900V, VGE = -10V, T_{vj} = 25°C	E_{rec}		100		mWs
	V_R = 900V, VGE = -10V, T_{vj} = 125°C			190		mWs



Thermische Eigenschaften / Thermal properties

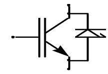
			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC Diode/Diode, DC	R_{thJC}			0,016 0,04	K/W K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module λ_{Paste} = 1 W/m*K / λ_{grease} = 1 W/m*K	R_{thCK}		0,008		K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		T_{vj}			150	°C
Betriebstemperatur operation temperature		T_{op}	-40		125	°C
Lagertemperatur storage temperature		T_{stg}	-40		125	°C

Mechanische Eigenschaften / Mechanical properties

			min.	typ.	max.	
Gehäuse, siehe Anlage case, see appendix						
Innere Isolation internal insulation				Al_2O_3		
Kriechstrecke creepage distance				17		mm
Luftstrecke clearance				10		mm
CTI comperative tracking index				275		
Anzugsdrehmoment f. mech. Befestigung mounting torque		M1			5	Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	terminals M4 terminals M8	M2			2 8 - 10	Nm Nm
Gewicht weight		G		1500		g

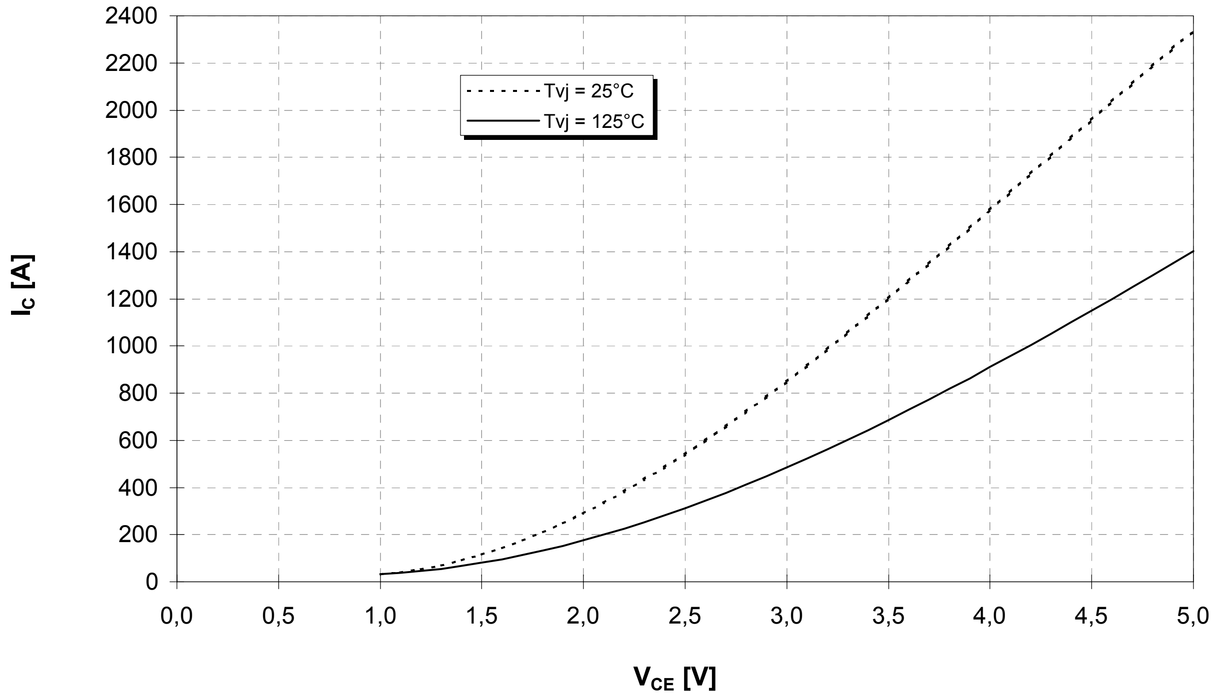
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert.
Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

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



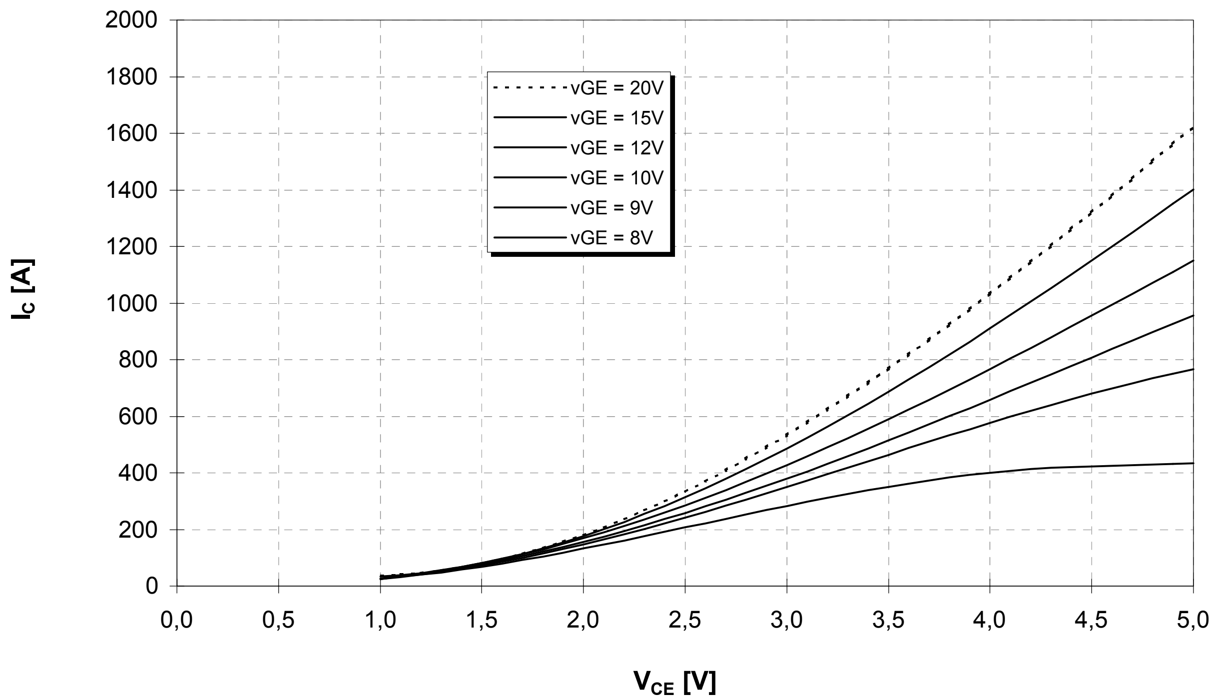
Ausgangskennlinie (typisch)
Output characteristic (typical)

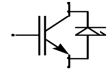
$I_C = f(V_{CE})$
$V_{GE} = 15V$



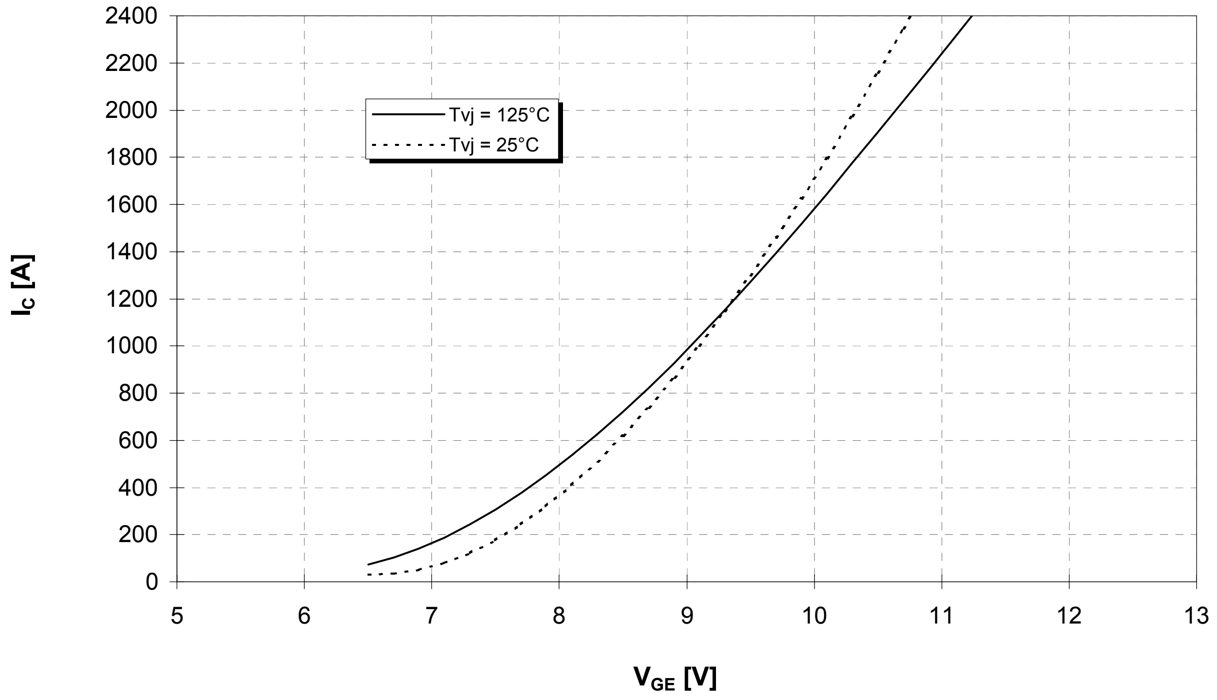
Ausgangskennlinienfeld (typisch)
Output characteristic (typical)

$I_C = f(V_{CE})$
$T_{vj} = 125°C$

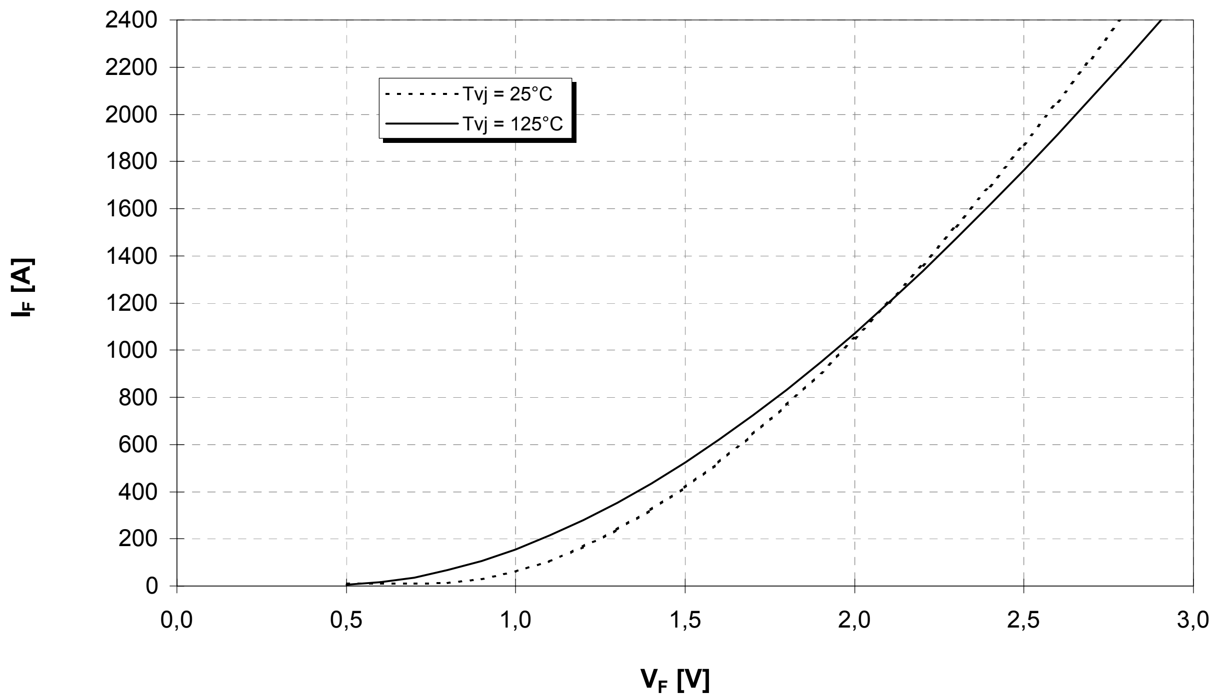


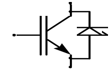


Übertragungscharakteristik (typisch) $I_C = f(V_{GE})$
Transfer characteristic (typical) $V_{CE} = 20V$

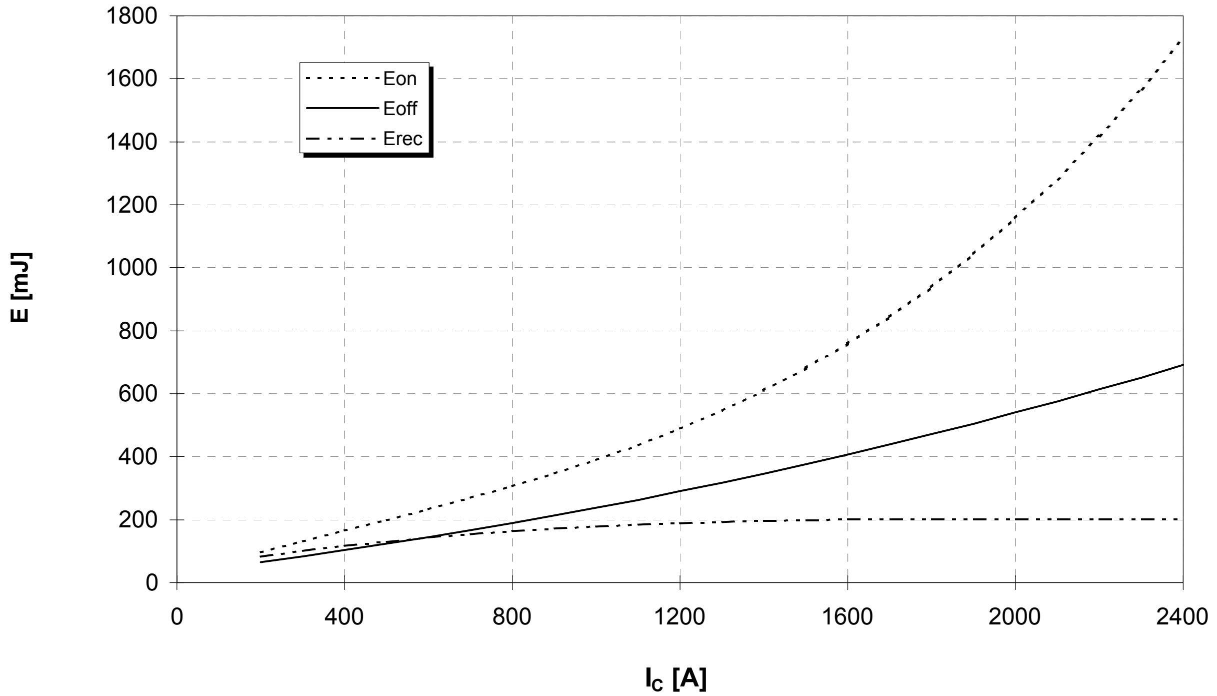


Durchlaßkennlinie der Inversdiode (typisch) $I_F = f(V_F)$
Forward characteristic of inverse diode (typical)

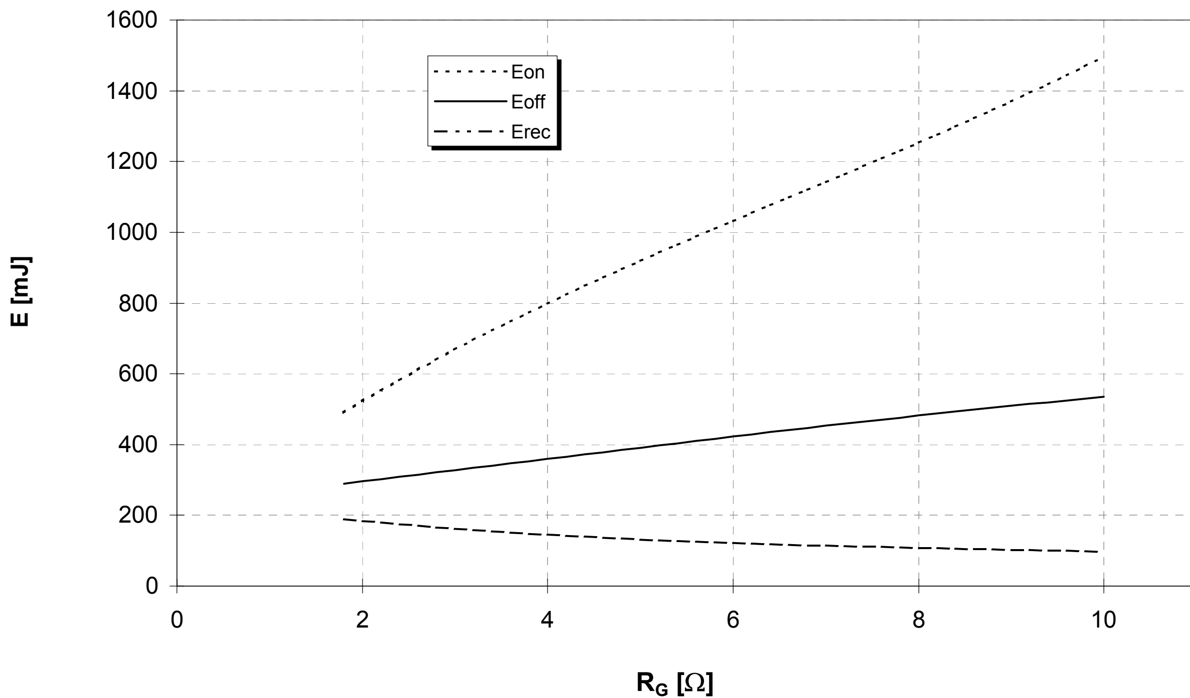


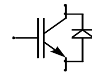


Schaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$
Switching losses (typical) $R_{gon} = R_{goff} = 1{,}8\ \Omega$, $V_{CE} = 900V$, $T_j = 125°C$, $V_{GE} = \pm 15V$

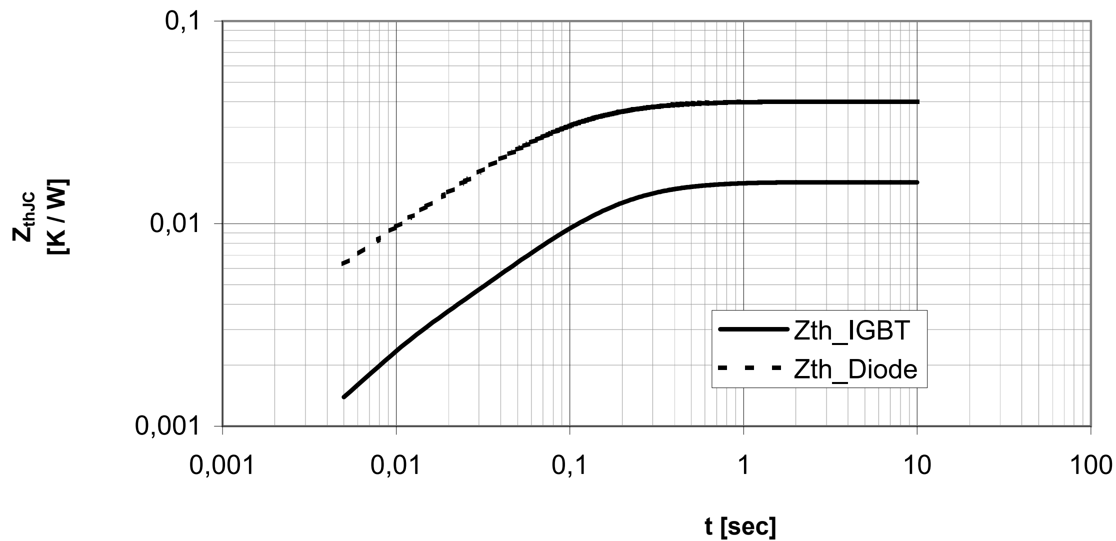


Schaltverluste (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
Switching losses (typical) $I_C = 1200A$, $V_{CE} = 900V$, $T_j = 125°C$, $V_{GE} = \pm 15V$



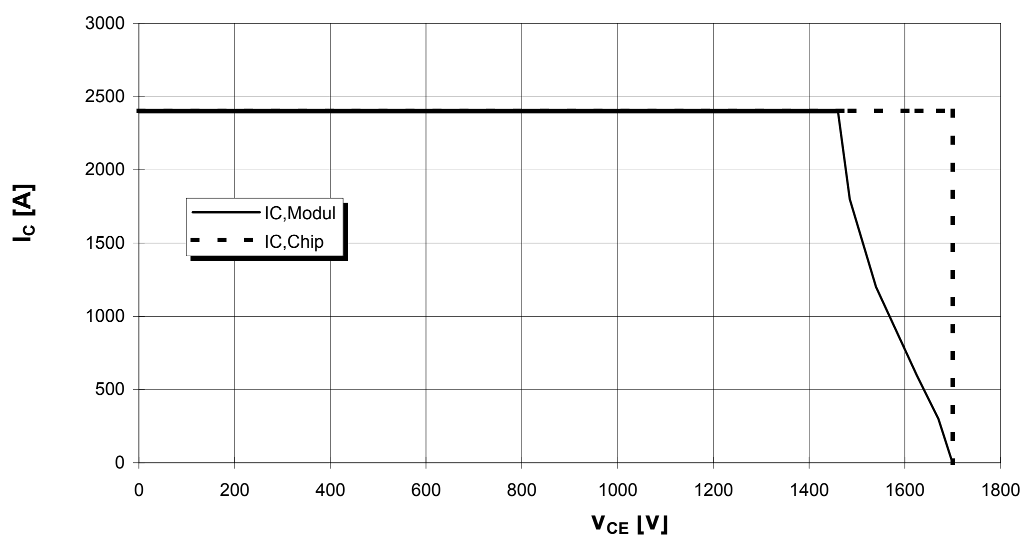


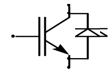
Transienter Wärmewiderstand $Z_{thJC} = f(t)$
Transient thermal impedance



i	1	2	3	4
r_i [K/kW] : IGBT	1,55	5,79	6,28	2,38
τ_i [sec] : IGBT	0,007	0,082	0,135	0,38
r_i [K/kW] : Diode	4,07	13,84	17,56	4,53
τ_i [sec] : Diode	0,003	0,032	0,089	0,316

Sicherer Arbeitsbereich (RBSOA)
Reverse bias safe operation area (RBSOA) R_g = 1,8 Ohm, T_{vj}= 125°C





Äußere Abmessungen / external dimensions