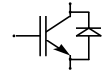


Technische Information / Technical Information

eupec

IGBT-Module
IGBT-Modules

FF 400 R 17 KF6C B2



1700V IGBT Modul mit low loss IGBT der 2. Generation und softer EmCon Diode
1700V IGBT Module with low loss IGBT of 2nd generation and soft EmCon Diode

Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage		V_{CES}	1700	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80\text{ °C}$	$I_{C,nom.}$	400	A
	$T_C = 25\text{ °C}$	I_C	650	A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ ms}, T_C = 80\text{ °C}$	I_{CRM}	800	A
Gesamt-Verlustleistung total power dissipation	$T_C=25\text{ °C}, \text{ Transistor}$	P_{tot}	3,3	kW
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	$t_p = 1\text{ ms}$	I_{FRM}	800	A
Grenzlastintegral der Diode I^2t - value, Diode	$V_R = 0V, t_p = 10ms, T_{vj} = 125\text{ °C}$	I^2t	45	kA^2s
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50\text{ Hz}, t = 1\text{ min.}$	V_{ISOL}	4	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor

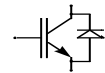
			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$I_C = 400A, V_{GE} = 15V, T_{vj} = 25\text{ °C}$	$V_{CE\text{ sat}}$	-	2,6	3,1	V
	$I_C = 400A, V_{GE} = 15V, T_{vj} = 125\text{ °C}$		-	3,1	3,6	V
Gate-Schwellenspannung gate threshold voltage	$I_C = 30mA, V_{CE} = V_{GE}, T_{vj} = 25\text{ °C}$	$V_{GE(th)}$	4,5	5,5	6,5	V
Gateladung gate charge	$V_{GE} = -15V \dots +15V$	Q_G		4,8		μC
Eingangskapazität input capacitance	$f = 1MHz, T_{vj} = 25\text{ °C}, V_{CE} = 25V, V_{GE} = 0V$	C_{ies}	-	27	-	nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1MHz, T_{vj} = 25\text{ °C}, V_{CE} = 25V, V_{GE} = 0V$	C_{res}		1,3		nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1700V, V_{GE} = 0V, T_{vj} = 25\text{ °C}$	I_{CES}	-	0,01	1	mA
	$V_{CE} = 1700V, V_{GE} = 0V, T_{vj} = 125\text{ °C}$		-	5	40	mA
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25\text{ °C}$	I_{GES}	-	-	400	nA

prepared by: Alfons Wiesenthal

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approved by: Chr. Lübke; 11.08.2000

revision: 2 (Series)

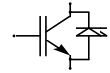


Charakteristische Werte / Characteristic values

Transistor / Transistor			min.	typ.	max.	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = 400A, V_{CE} = 900V$	$t_{d,on}$	-	0,3	-	μs
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 25^\circ C$					
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 125^\circ C$			0,3		μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 400A, V_{CE} = 900V$	t_r	-	0,14	-	μs
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 25^\circ C$					
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 125^\circ C$			0,14		μs
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = 400A, V_{CE} = 900V$	$t_{d,off}$	-	1,1	-	μs
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 25^\circ C$					
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 125^\circ C$			1,1		μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 400A, V_{CE} = 900V$	t_f	-	0,1	-	μs
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 25^\circ C$					
	$V_{GE} = \pm 15V, R_G = 3,6\Omega, T_{vj} = 125^\circ C$			0,11		μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 400A, V_{CE} = 900V, V_{GE} = 15V$ $R_G = 2,7\Omega, T_{vj} = 125^\circ C, L_S = 50nH$	E_{on}	-	180	-	mWs
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 400A, V_{CE} = 900V, V_{GE} = 15V$ $R_G = 3,6\Omega, T_{vj} = 125^\circ C, L_S = 50nH$	E_{off}	-	150	-	mWs
Kurzschlußverhalten SC Data	$t_P \leq 10\mu sec, V_{GE} \leq 15V, R_G = 3,6\Omega$ $T_{vj} \leq 125^\circ C, V_{CC} = 1000V, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	I_{SC}	-	1600	-	A
Modulinduktivität stray inductance module		L_{sCE}	-	20	-	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	pro Zweig / per arm	R_{CC+EE}	-	0,16	-	m Ω

Charakteristische Werte / Characteristic values

Diode / Diode			min.	typ.	max.	
Durchlaßspannung forward voltage	$I_F = 400A, V_{GE} = 0V, T_{vj} = 25^\circ C$	V_F	-	2,1	2,5	V
	$I_F = 400A, V_{GE} = 0V, T_{vj} = 125^\circ C$			2,1	2,5	V
Rückstromspitze peak reverse recovery current	$I_F = 400A, -di_F/dt = 3100A/\mu sec$	I_{RM}	-	300	-	A
	$V_R = 900V, V_{GE} = -10V, T_{vj} = 25^\circ C$			370	-	A
	$V_R = 900V, V_{GE} = -10V, T_{vj} = 125^\circ C$					
Sperrverzögerungsladung recovered charge	$I_F = 400A, -di_F/dt = 3100A/\mu sec$	Q_r	-	80	-	μAs
	$V_R = 900V, V_{GE} = -10V, T_{vj} = 25^\circ C$			145	-	μAs
	$V_R = 900V, V_{GE} = -10V, T_{vj} = 125^\circ C$					
Abschaltenergie pro Puls reverse recovery energy	$I_F = 400A, -di_F/dt = 3100A/\mu sec$	E_{rec}	-	35	-	mWs
	$V_R = 900V, V_{GE} = -10V, T_{vj} = 25^\circ C$			75	-	mWs
	$V_R = 900V, V_{GE} = -10V, T_{vj} = 125^\circ C$					



Thermische Eigenschaften / Thermal properties

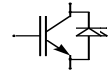
			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,038	K/W
	Diode/Diode, DC		-	-	0,068	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Zweig / per arm pro Modul / per module $d_{Paste} \leq 100\mu m$ / $d_{grease} \leq 100\mu m$	R_{thCK}	-	0,016		K/W
		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

Gehäuse, siehe Anlage case, see appendix					
Innere Isolation internal insulation				AIN	
Kriechstrecke creepage distance				15	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	Nm
				8 - 10	Nm
Gewicht weight		G		1050	g

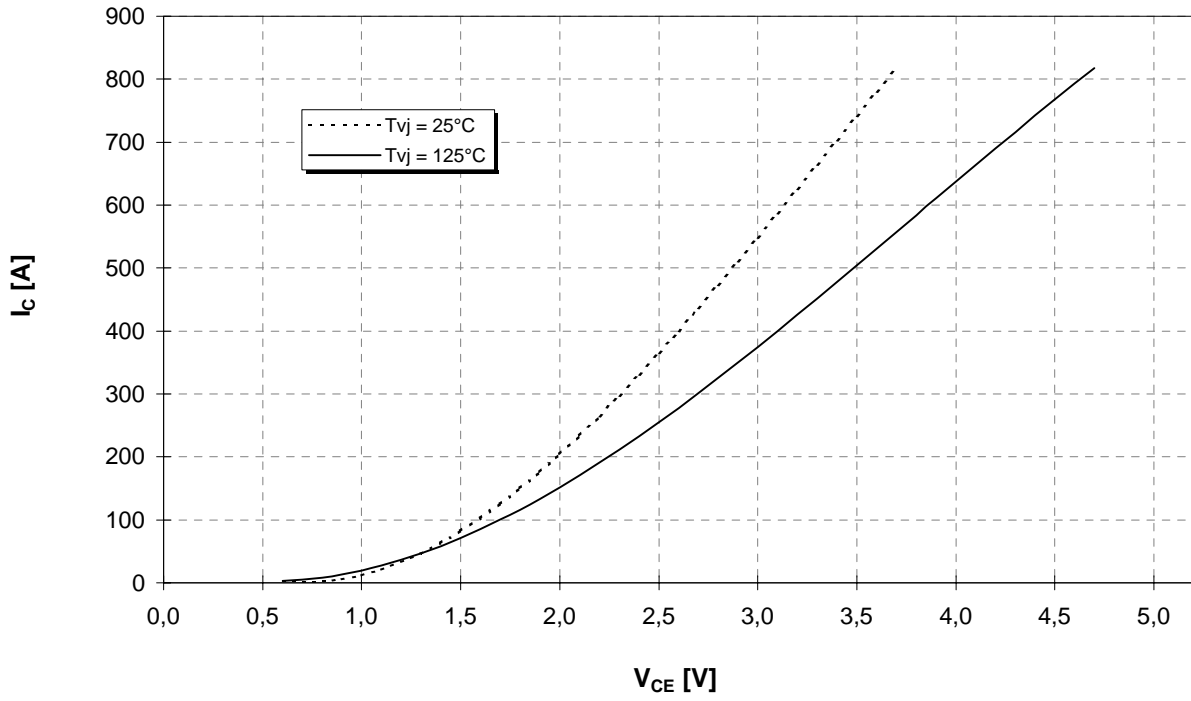
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

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



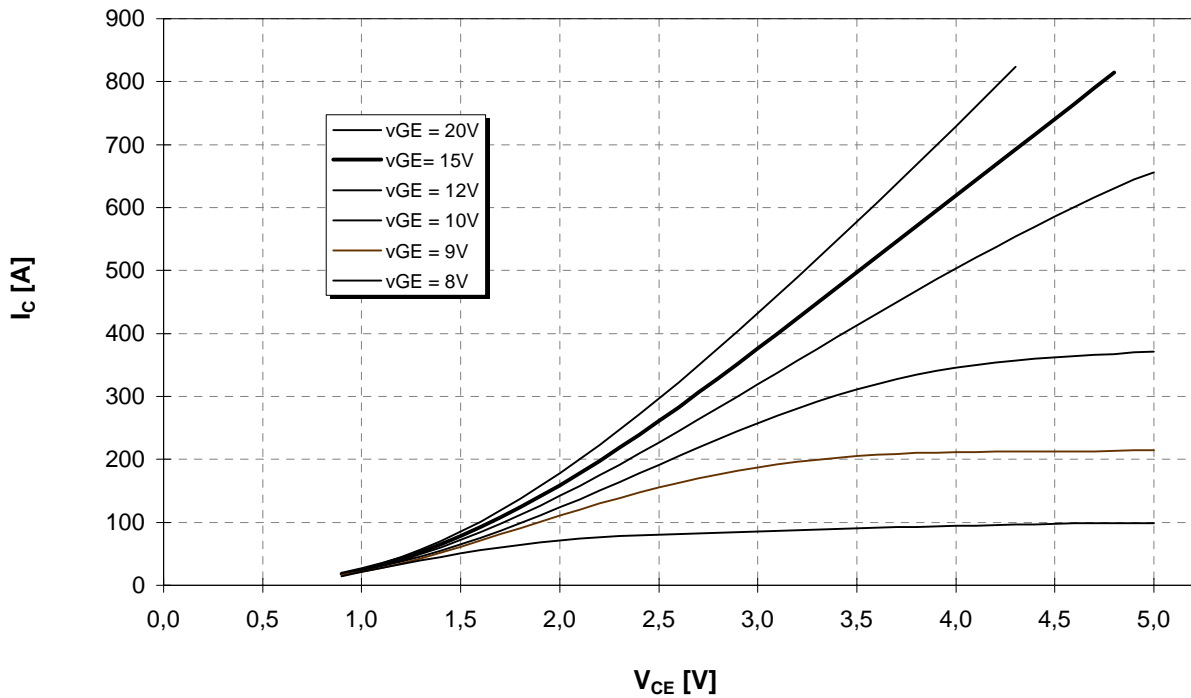
Ausgangskennlinie (typisch)
Output characteristic (typical)

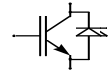
$I_C = f(V_{CE})$
 $V_{GE} = 15V$



Ausgangskennlinienfeld (typisch)
Output characteristic (typical)

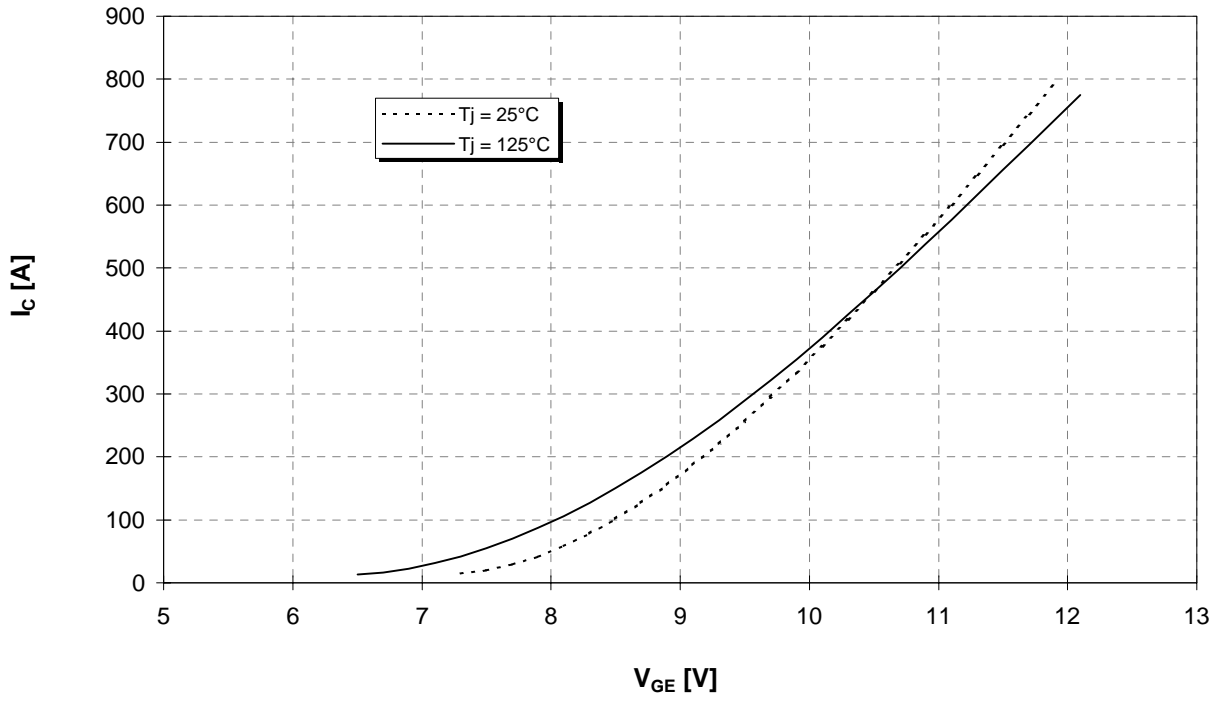
$I_C = f(V_{CE})$
 $T_{vj} = 125°C$





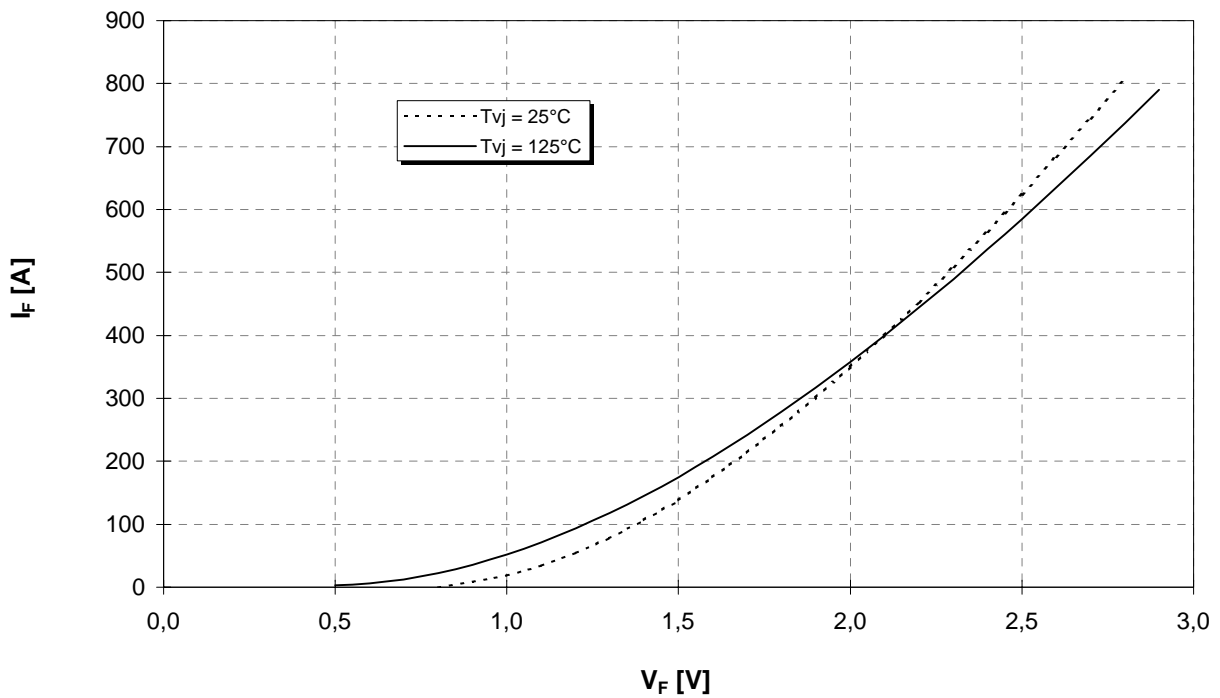
Übertragungscharakteristik (typisch)
Transfer characteristic (typical)

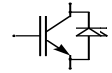
$I_C = f(V_{GE})$
 $V_{CE} = 20V$



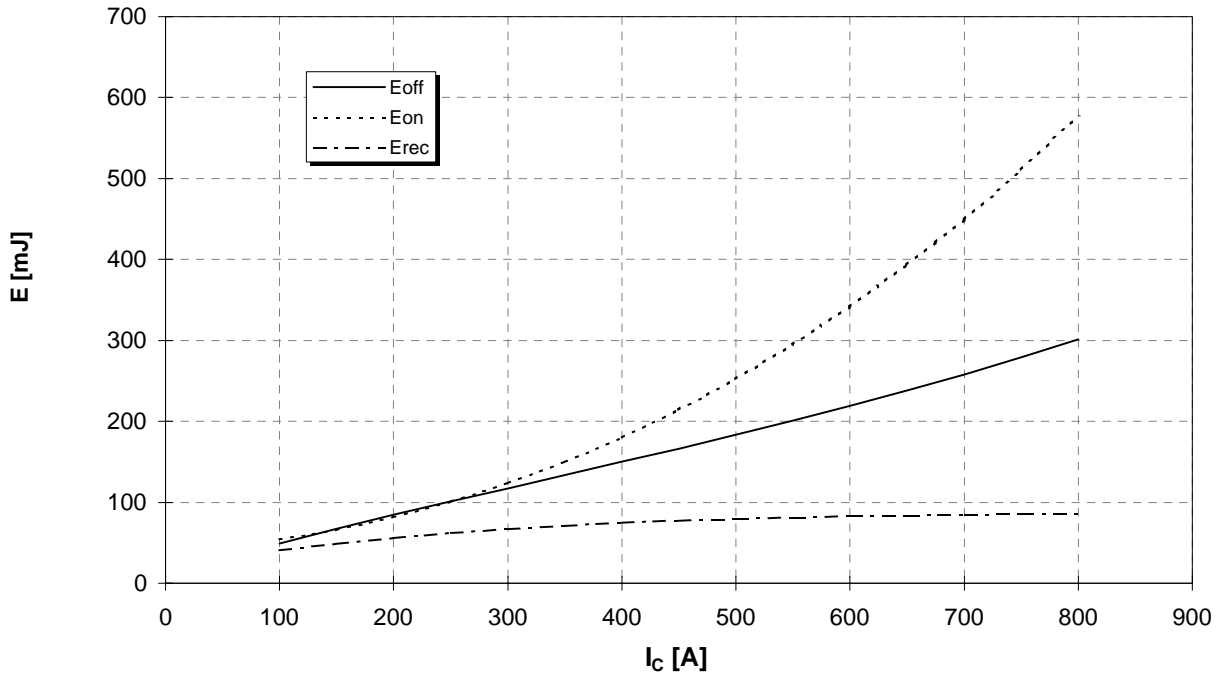
Durchlaßkennlinie der Inversdiode (typisch)
Forward characteristic of inverse diode (typical)

$I_F = f(V_F)$

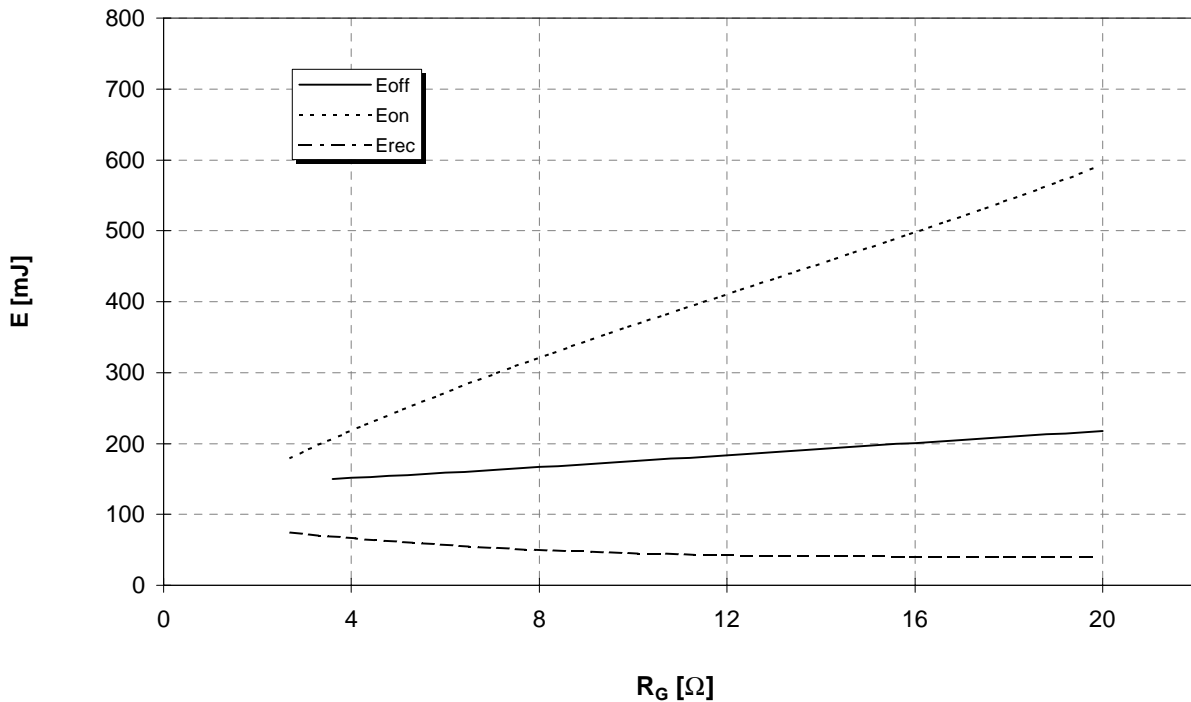




Schaltverluste (typisch) $E_{on} = f(I_C), E_{off} = f(I_C), E_{rec} = f(I_C)$
Switching losses (typical) $R_{gon} = 2,7\Omega; R_{goff} = 3,6\Omega, V_{CE} = 900V, T_j = 125^\circ C$



Schaltverluste (typisch) $E_{on} = f(R_G), E_{off} = f(R_G), E_{rec} = f(R_G)$
Switching losses (typical) $I_C = 400A, V_{CE} = 900V, T_j = 125^\circ C$

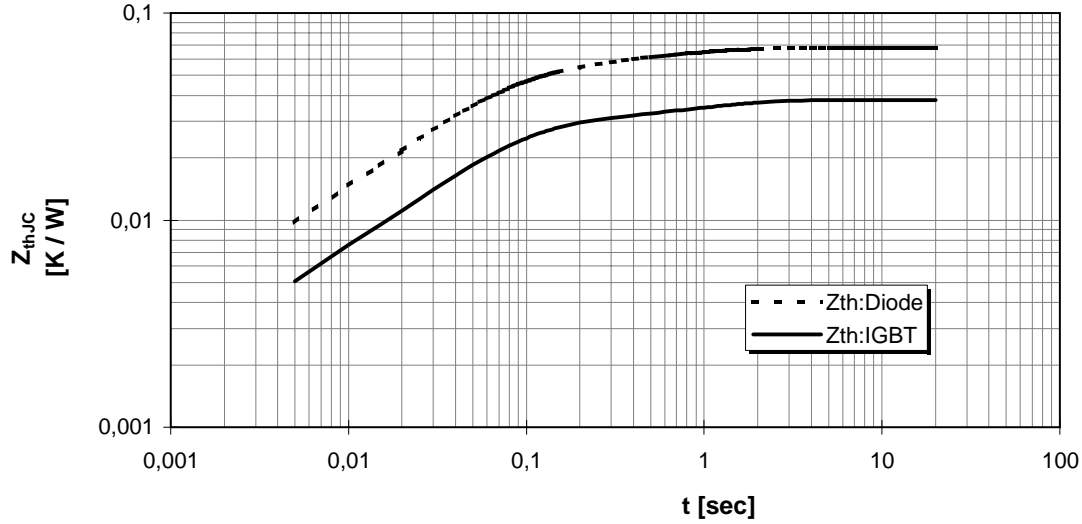




vorläufige Daten
preliminary data

Transienter Wärmewiderstand
Transient thermal impedance

$Z_{thJC} = f(t)$

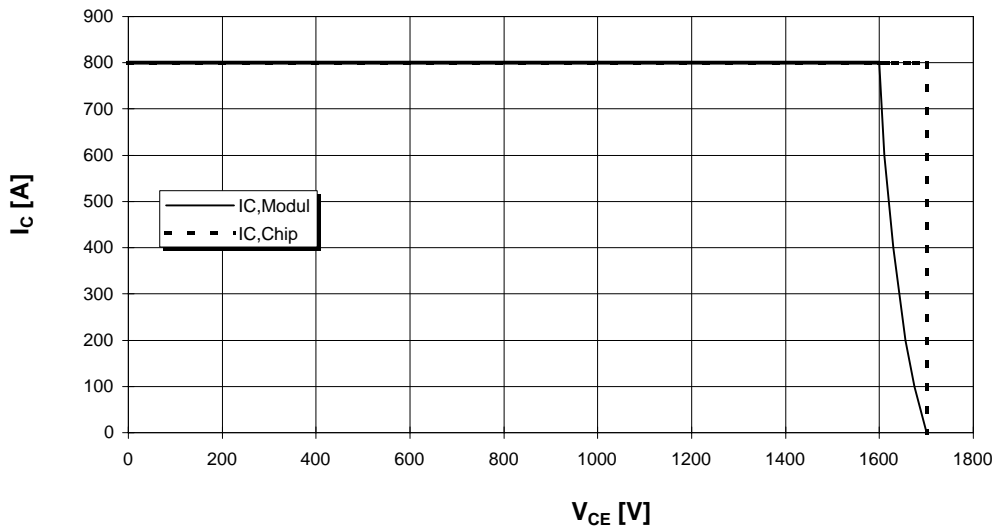


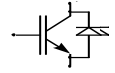
i	1	2	3	4
r_i [K/kW] : IGBT	3,64	17,97	7,6	8,78
τ_i [sec] : IGBT	0,003	0,05	0,1	0,95
r_i [K/kW] : Diode	6,7	36,44	12,44	12,42
τ_i [sec] : Diode	0,003	0,045	0,45	0,75

Sicherer Arbeitsbereich (RBSOA)

Reverse bias safe operation area (RBSOA)

$R_g = 3,6 \text{ Ohm}$, $T_{vj} = 125^\circ\text{C}$





Äußere Abmessungen / external dimensions

