

**Höchstzulässige Werte / Maximum rated values****Elektrische Eigenschaften / Electrical properties**

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^\circ \text{C}$	V_{CES}	1200	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^\circ \text{C}$ $T_C = 25^\circ \text{C}$	$I_{C,nom.}$ I_C	100 205	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1 \text{ ms}$, $T_C = 80^\circ \text{C}$	I_{CRM}	200	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^\circ \text{C}$, Transistor	P_{tot}	830	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	100	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1 \text{ ms}$	I_{FRM}	200	A
Grenzlastintegral der Diode I^2t - value, Diode	$V_R = 0V$, $t_p = 10\text{ms}$, $T_{vj} = 125^\circ \text{C}$	I^2t	1,71	$\text{k A}^2\text{s}$
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min.}$	V_{ISOL}	2,5	kV

Charakteristische Werte / Characteristic values**Transistor / Transistor**

min. typ. max.

Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$I_C = 100A$, $V_{GE} = 15V$, $T_{vj} = 25^\circ \text{C}$	$V_{CE sat}$	-	2,1	2,6	V
	$I_C = 100A$, $V_{GE} = 15V$, $T_{vj} = 125^\circ \text{C}$		-	2,4	2,9	V
Gate-Schwellenspannung gate threshold voltage	$I_C = 4mA$, $V_{CE} = V_{GE}$, $T_{vj} = 25^\circ \text{C}$	$V_{GE(th)}$	4,5	5,5	6,5	V
Gateladung gate charge	$V_{GE} = -15V \dots +15V$	Q_G	-	1,1	-	μC
Eingangskapazität input capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^\circ \text{C}$, $V_{CE} = 25V$, $V_{GE} = 0V$	C_{ies}	-	6,5	-	nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^\circ \text{C}$, $V_{CE} = 25V$, $V_{GE} = 0V$	C_{res}	-	0,5	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1200V$, $V_{GE} = 0V$, $T_{vj} = 25^\circ \text{C}$	I_{CES}	-	-	5	mA
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0V$, $V_{GE} = 20V$, $T_{vj} = 25^\circ \text{C}$	I_{GES}	-	-	400	nA

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date of publication: 2003-01-23

approved by: SM TM; Wilhelm Rusche

revision: 3.0

Technische Information / Technical Information

IGBT-Module
IGBT-Modules

BSM100GAL120DLC K

eupec



Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = 100A, V_{CE} = 600V$	$t_{d,on}$				
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$		-	0,06	-	μs
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$		-	0,06	-	μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 100A, V_{CE} = 600V$	t_r				
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$		-	0,05	-	μs
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$		-	0,05	-	μs
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = 100A, V_{CE} = 600V$	$t_{d,off}$				
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$		-	0,35	-	μs
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$		-	0,40	-	μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 100A, V_{CE} = 600V$	t_f				
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 25^\circ C$		-	0,06	-	μs
	$V_{GE} = \pm 15V, R_G = 5,6\Omega, T_{vj} = 125^\circ C$		-	0,08	-	μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 100A, V_{CE} = 600V, V_{GE} = \pm 15V$ $R_G = 5,6\Omega, T_{vj} = 125^\circ C, L_\sigma = 60nH$	E_{on}	-	10	-	mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 100A, V_{CE} = 600V, V_{GE} = \pm 15V$ $R_G = 5,6\Omega, T_{vj} = 125^\circ C, L_\sigma = 60nH$	E_{off}	-	12	-	mJ
Kurzschlußverhalten SC Data	$t_p \leq 10\mu s, V_{GE} \leq 15V, R_G = 5,6\Omega$ $T_{vj} \leq 125^\circ C, V_{CC} = 900V, V_{CEmax} = V_{CES} - L_{\sigma CE} \cdot di/dt$	I_{SC}	-	650	-	A
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	40	-	nH
Modul Leitungswiderstand, Anschlüsse – Chip module lead resistance, terminals – chip	$T_C = 25^\circ C$	R_{CC+EE}	-	0,85	-	m Ω

Charakteristische Werte / Characteristic values

Inversdiode / free-wheel diode

			min.	typ.	max.	
Durchlaßspannung forward voltage	$I_F = 100A, V_{GE} = 0V, T_{vj} = 25^\circ C$	V_F	-	1,8	2,3	V
	$I_F = 100A, V_{GE} = 0V, T_{vj} = 125^\circ C$		-	1,7	2,2	V
Rückstromspitze peak reverse recovery current	$I_F = 100A, -di_F/dt = 2700A/\mu s$	I_{RM}				
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	125	-	A
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	155	-	A
Sperrverzögerungsladung recovered charge	$I_F = 100A, -di_F/dt = 2700A/\mu s$	Q_r				
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	12	-	μC
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	22	-	μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 100A, -di_F/dt = 2700A/\mu s$	E_{rec}				
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	4	-	mJ
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	9	-	mJ

Chopperdiode / chopper diode

			min.	typ.	max.	
Durchlaßspannung forward voltage	$I_F = 150A, V_{GE} = 0V, T_{vj} = 25^\circ C$	V_F	-	1,8	2,3	V
	$I_F = 150A, V_{GE} = 0V, T_{vj} = 125^\circ C$		-	1,7	2,2	V
Rückstromspitze peak reverse recovery current	$I_F = 150A, -di_F/dt = 3100A/\mu s$	I_{RM}				
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	180	-	A
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	220	-	A
Sperrverzögerungsladung recovered charge	$I_F = 150A, -di_F/dt = 3100A/\mu s$	Q_r				
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	17	-	μC
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	32	-	μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 150A, -di_F/dt = 3100A/\mu s$	E_{rec}				
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	4	-	mJ
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	10	-	mJ

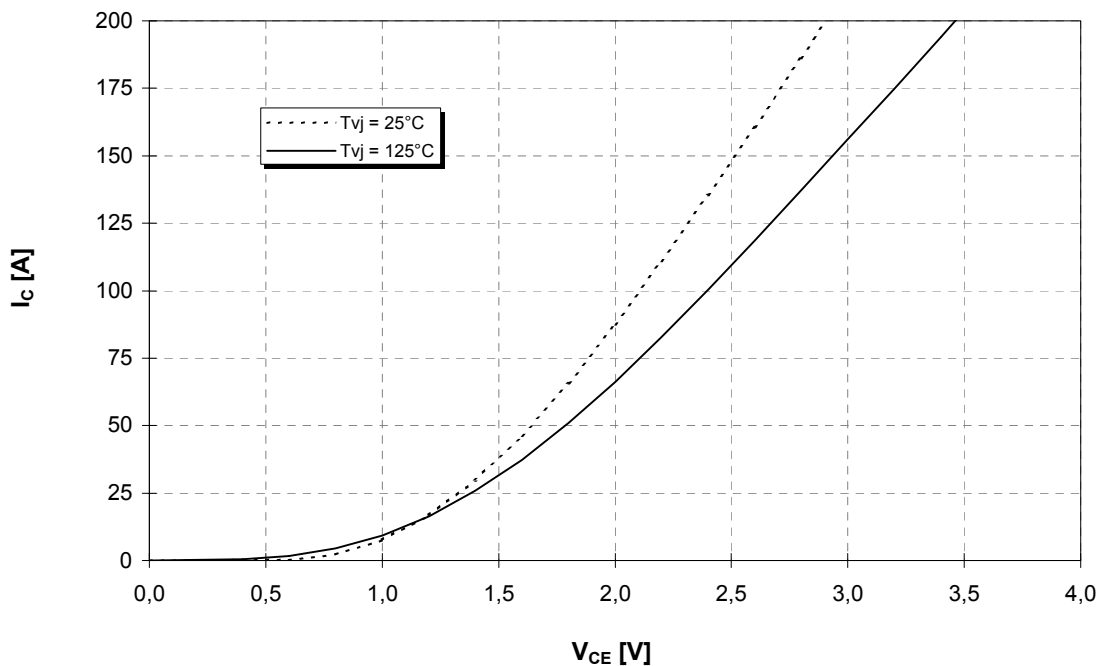
Technische Information / Technical Information			eupec			
IGBT-Module IGBT-Modules		BSM100GAL120DLC K				
Thermische Eigenschaften / Thermal properties						
			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor Wechelnr. / transistor inverter	R_{thJC}	-	-	0,15	K/W
	Inversdiode / free wheel diode		-	-	0,30	K/W
	Chopper Diode / chopper diode		-	-	0,25	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{Flüssig} = 1 \text{ W/m} \cdot \text{K}$ / $\lambda_{grease} = 1 \text{ W/m} \cdot \text{K}$	R_{thCK}	-	0,05	-	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj \text{ max}}$	-	-	150	°C
Betriebstemperatur operation temperature		$T_{vj \text{ op}}$	-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				Al_2O_3		
Kriechstrecke creepage distance				20		mm
Luftstrecke clearance distance				11		mm
CTI comperative tracking index				275		
Anzugsdrehmoment f. mech. Befestigung mounting torque	Schraube / screw M6	M	3,0	-	6,0	Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Anschlüsse / terminals M5	M	2,5	-	5,0	Nm
Gewicht weight		G		250		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)

$$I_C = f(V_{CE})$$

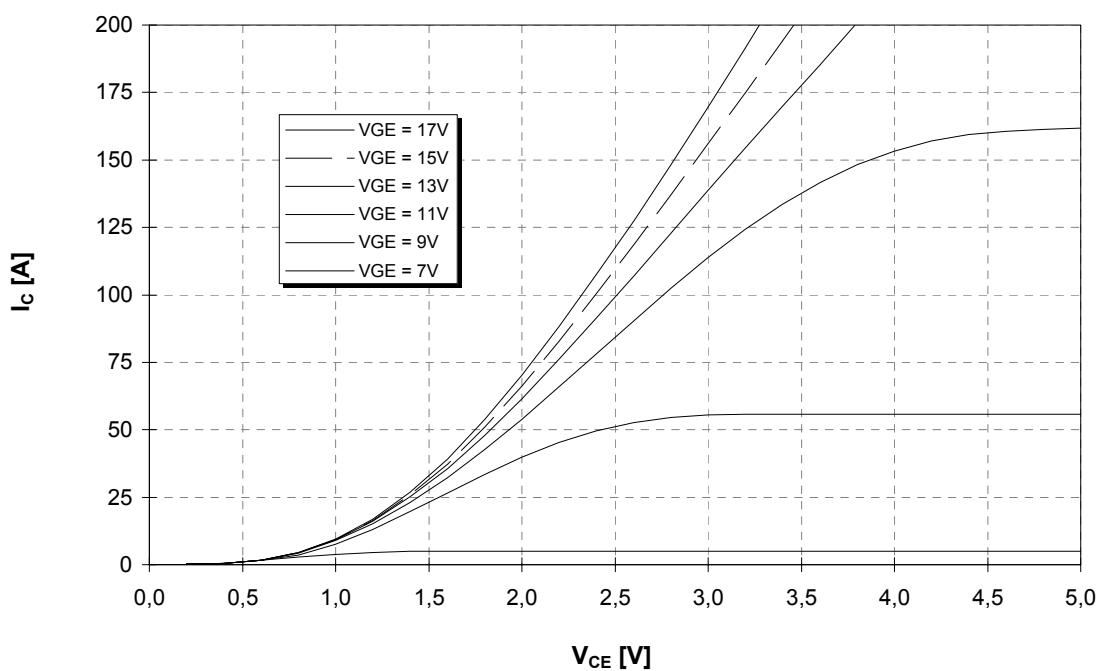
$$V_{GE} = 15V$$



Ausgangskennlinienfeld (typisch)
Output characteristic (typical)

$$I_C = f(V_{CE})$$

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

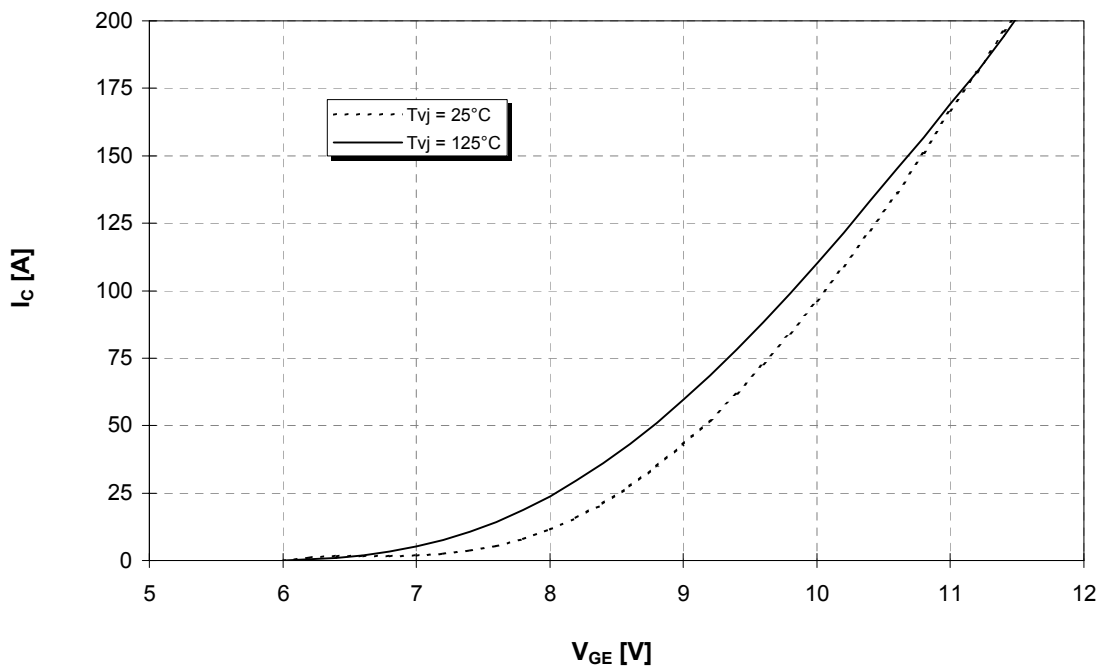




Übertragungscharakteristik (typisch)
Transfer characteristic (typical)

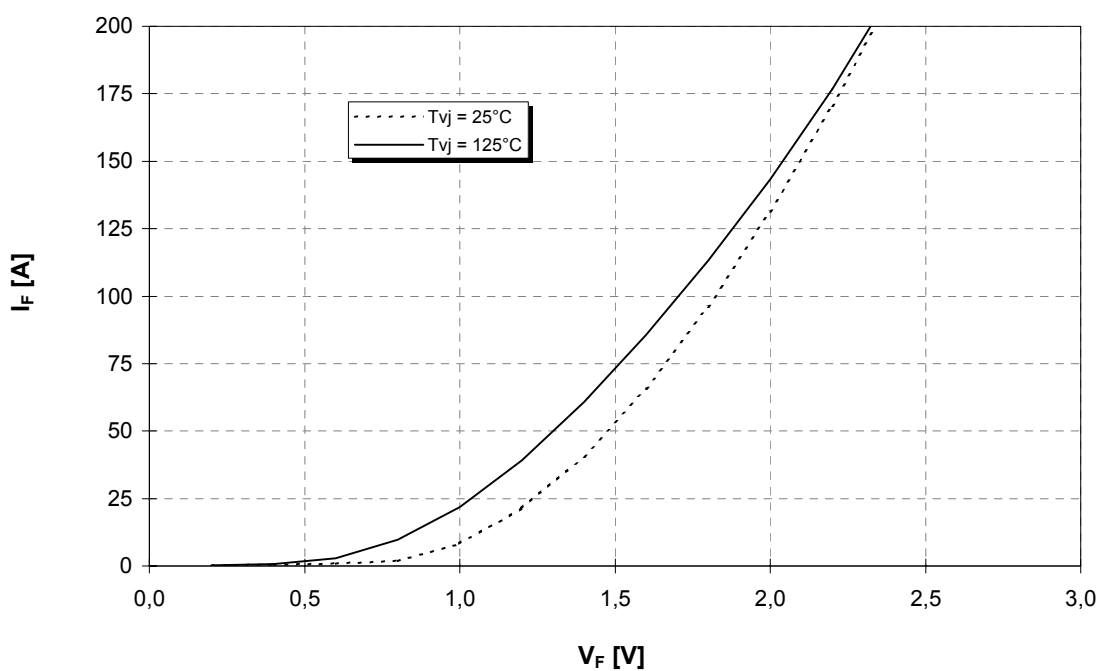
$$I_C = f(V_{GE})$$

$V_{CE} = 20V$



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

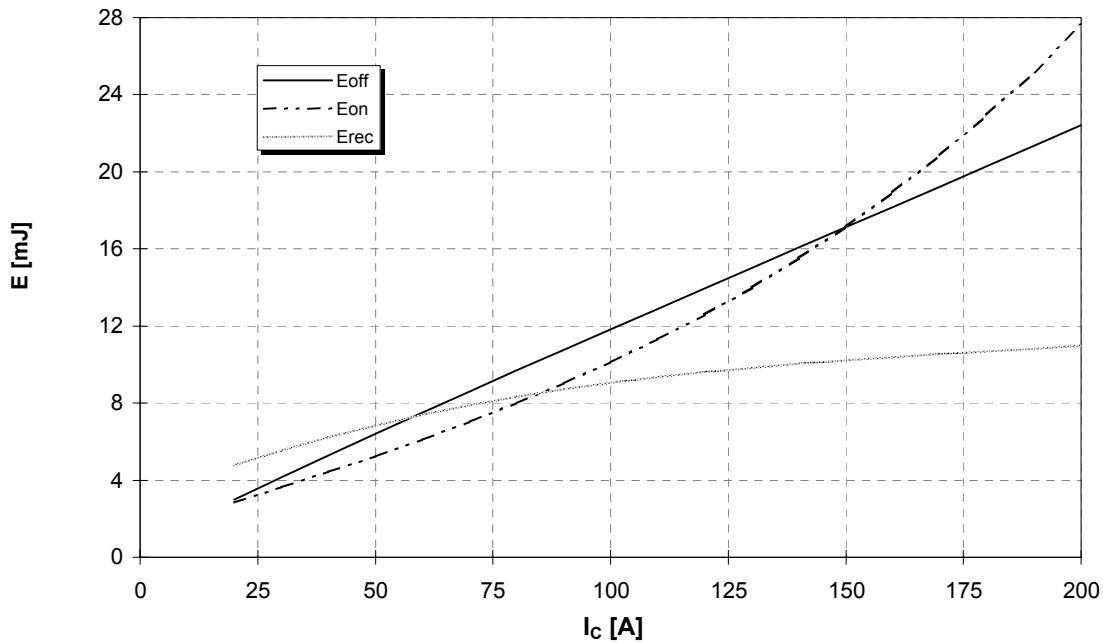
$$I_F = f(V_F)$$





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

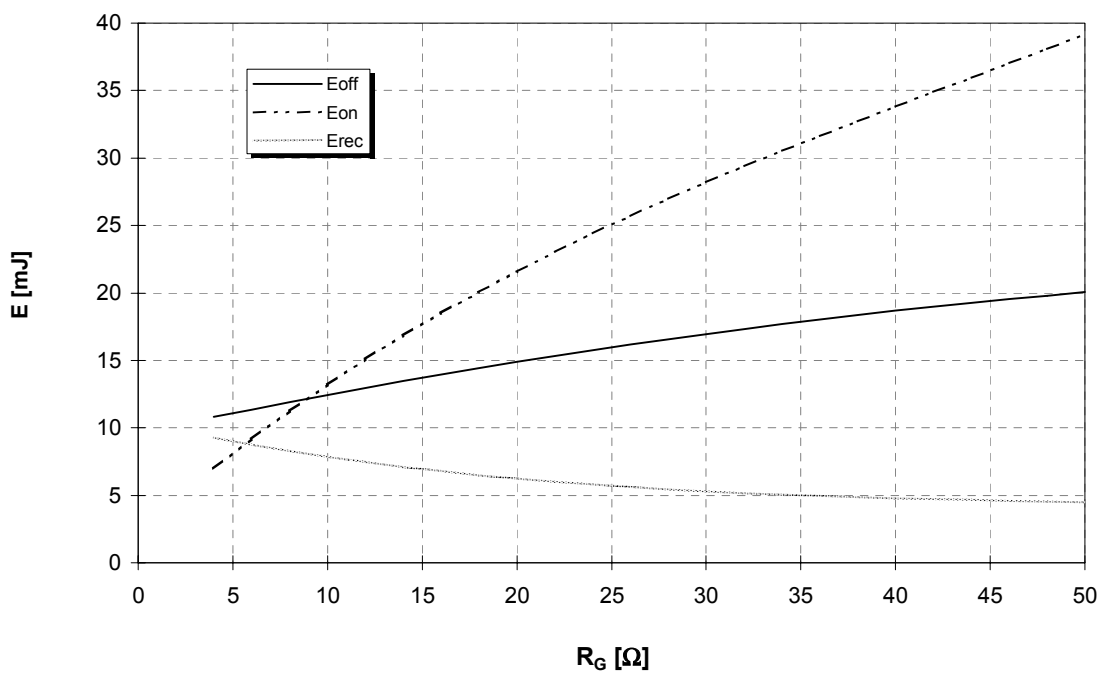
Switching losses (typical) $V_{GE} = \pm 15V$, $R_G = 5,6 \Omega$, $V_{CE} = 600V$, $T_{vj} = 125^\circ C$



Schaltverluste (typisch)
Switching losses (typical)

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

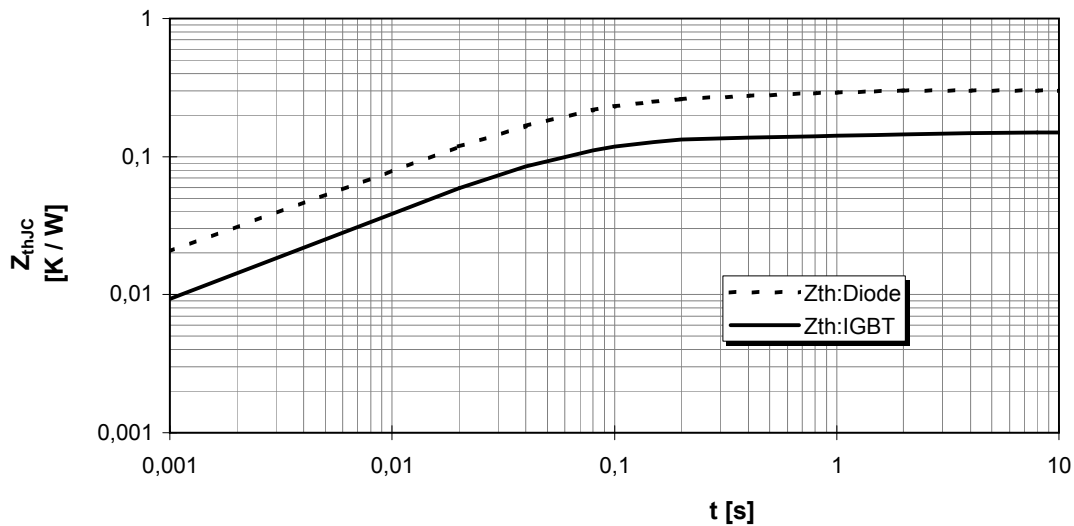
$V_{GE} = \pm 15V$, $I_C = 100A$, $V_{CE} = 600V$, $T_{vj} = 125^\circ C$





Transienter Wärmewiderstand Transient thermal impedance

$$Z_{thJC} = f(t)$$



i	1	2	3	4
r_i [K/kW] : IGBT	16,78	50,78	66,16	16,28
τ_i [s] : IGBT	0,002	0,03	0,066	1,655
r_i [K/kW] : Diode	39,26	103,98	113,45	43,31
τ_i [s] : Diode	0,002	0,03	0,072	0,682

Sicherer Arbeitsbereich (RBSOA)

Reverse bias safe operation area (RBSOA)

$$V_{GE} = 15V, R_G = 5,6 \Omega, T_{vj} = 125^\circ C$$

