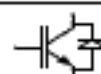


# Technische Information / Technical Information

IGBT-Module  
IGBT-Modules

## BSM 200 GB 60 DLC

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### Höchstzulässige Werte / Maximum rated values

#### Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Spannung collector-emitter voltage		$V_{CES}$	600	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 50^\circ\text{C}$	$I_{C,DM}$	200	A
	$T_C = 25^\circ\text{C}$	$I_C$	230	A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ms}, T_C = 50^\circ\text{C}$	$I_{CRM}$	400	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^\circ\text{C}$ , Transistor	$P_{tot}$	730	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		$V_{GEM}$	$\pm 20\text{V}$	V
Dauergleichstrom DC forward current		$I_F$	200	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1\text{ms}$	$I_{FSM}$	400	A
Grenzlastintegral der Diode $\int I_t$ - value, Diode	$V_{CE} = 0\text{V}, t_p = 10\text{ms}, T_C = 125^\circ\text{C}$	$\int I_t$	4.050	$\text{A}^2\text{s}$
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50\text{Hz}, t = 1\text{min.}$	$V_{ISOI}$	2,5	kV

### Charakteristische Werte / Characteristic values

#### Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$I_C = 200\text{A}, V_{GE} = 15\text{V}, T_C = 25^\circ\text{C}$	$V_{CE(sat)}$	-	1,95	2,45	V
	$I_C = 200\text{A}, V_{GE} = 15\text{V}, T_C = 125^\circ\text{C}$		-	2,20	-	V
Gate-Schwellenspannung gate threshold voltage	$I_C = 4,0\text{mA}, V_{CE} = V_{GE}, T_C = 25^\circ\text{C}$	$V_{GE(th)}$	4,5	5,5	6,5	V
Eingangskapazität input capacitance	$f = 1\text{MHz}, T_C = 25^\circ\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$	$C_{ies}$	-	9	-	nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\text{MHz}, T_C = 25^\circ\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$	$C_{res}$	-	0,8	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 600\text{V}, V_{GE} = 0\text{V}, T_C = 25^\circ\text{C}$	$I_{oss}$	-	1	500	$\mu\text{A}$
	$V_{CE} = 600\text{V}, V_{GE} = 0\text{V}, T_C = 125^\circ\text{C}$		-	1	-	mA
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0\text{V}, V_{GE} = 20\text{V}, T_C = 25^\circ\text{C}$	$I_{oss}$	-	-	400	nA

prepared by: Andreas Vetter

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approved by: Michael Hornkamp

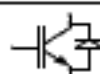
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# Technische Information / Technical Information

IGBT-Module  
IGBT-Modules

## BSM 200 GB 60 DLC

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### Charakteristische Werte / Characteristic values

Transistor / Transistor		min.	typ.	max.		
Einschaltverzögerungszeit (Ind. Last) turn on delay time (Inductive load)	$I_C = 200A, V_{CE} = 300V$ $V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 25^\circ C$	$t_{d(on)}$	-	163	-	ns
	$V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 125^\circ C$		-	180	-	ns
Anstiegszeit (Induktive Last) rise time (Inductive load)	$I_C = 200A, V_{CE} = 300V$ $V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 25^\circ C$	$t_r$	-	43	-	ns
	$V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 125^\circ C$		-	49	-	ns
Abschaltverzögerungszeit (Ind. Last) turn off delay time (Inductive load)	$I_C = 200A, V_{CE} = 300V$ $V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 25^\circ C$	$t_{d(off)}$	-	253	-	ns
	$V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 125^\circ C$		-	285	-	ns
Fallzeit (Induktive Last) fall time (Inductive load)	$I_C = 200A, V_{CE} = 300V$ $V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 25^\circ C$	$t_f$	-	33	-	ns
	$V_{GE} = \pm 15V, R_{GE} = 1,5\Omega, T_{VF} = 125^\circ C$		-	41	-	ns
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 200A, V_{CE} = 300V, V_{GE} = 15V$ $R_{GE} = 1,5\Omega, T_{VF} = 125^\circ C, L_G = 15nH$	$E_{on}$	-	4,6	-	mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 200A, V_{CE} = 300V, V_{GE} = 15V$ $R_{GE} = 1,5\Omega, T_{VF} = 125^\circ C, L_G = 15nH$	$E_{off}$	-	6,3	-	mJ
Kurzschlussverhalten SC Data	$t_p \leq 10\mu sec, V_{GE} \leq 15V$ $T_{VF} \leq 125^\circ C, V_{CE} = 360V, V_{CEmax} = V_{CEs} - I_{Csc} \cdot dt/dt$	$I_{sc}$	-	900	-	A
Modulinduktivität stray inductance module		$L_{GE}$	-	40	-	nH
Modul-Leitungswiderstand, Anschlüsse - Chip lead resistance, terminals - chip	$T_C = 25^\circ C$	$R_{COVGE}$	-	0,9	-	mΩ

### Charakteristische Werte / Characteristic values

Diode / Diode		min.	typ.	max.		
Durchlaßspannung forward voltage	$I_F = 200A, V_{GE} = 0V, T_{VF} = 25^\circ C$	$V_F$	-	1,25	1,6	V
	$I_F = 200A, V_{GE} = 0V, T_{VF} = 125^\circ C$		-	1,20	-	V
Rückstromspitze peak reverse recovery current	$I_F = 200A, -di_F/dt = 4000A/\mu sec$ $V_R = 300V, V_{GE} = -10V, T_{VF} = 25^\circ C$	$I_{RM}$	-	154	-	A
	$V_R = 300V, V_{GE} = -10V, T_{VF} = 125^\circ C$		-	188	-	A
Sperrverzögerungsladung recovered charge	$I_F = 200A, -di_F/dt = 4000A/\mu sec$ $V_R = 300V, V_{GE} = -10V, T_{VF} = 25^\circ C$	$Q_r$	-	12,1	-	μC
	$V_R = 300V, V_{GE} = -10V, T_{VF} = 125^\circ C$		-	19,7	-	μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 200A, -di_F/dt = 4000A/\mu sec$ $V_R = 300V, V_{GE} = -10V, T_{VF} = 25^\circ C$	$E_{rrs}$	-	-	-	mJ
	$V_R = 300V, V_{GE} = -10V, T_{VF} = 125^\circ C$		-	4,1	-	mJ



**Thermische Eigenschaften / Thermal properties**

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	$R_{thJC}$	-	-	0,17	K/W
	Diode / diode, DC		-	-	0,29	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{Paste}= 1W/m^*K$ / $\lambda_{grease}= 1W/m^*K$	$R_{thCK}$	-	0,02	-	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				$Al_2O_3$	
Kriechstrecke creepage insulation				15	mm
Luftstrecke clearance				8,5	mm
CTI comperative tracking index				275	
Anzugsdrehmoment für mech. Befestigung mounting torque	Schraube M6 screw M6	M1	-15	5 +15	Nm %
Gewicht weight		G		180	g

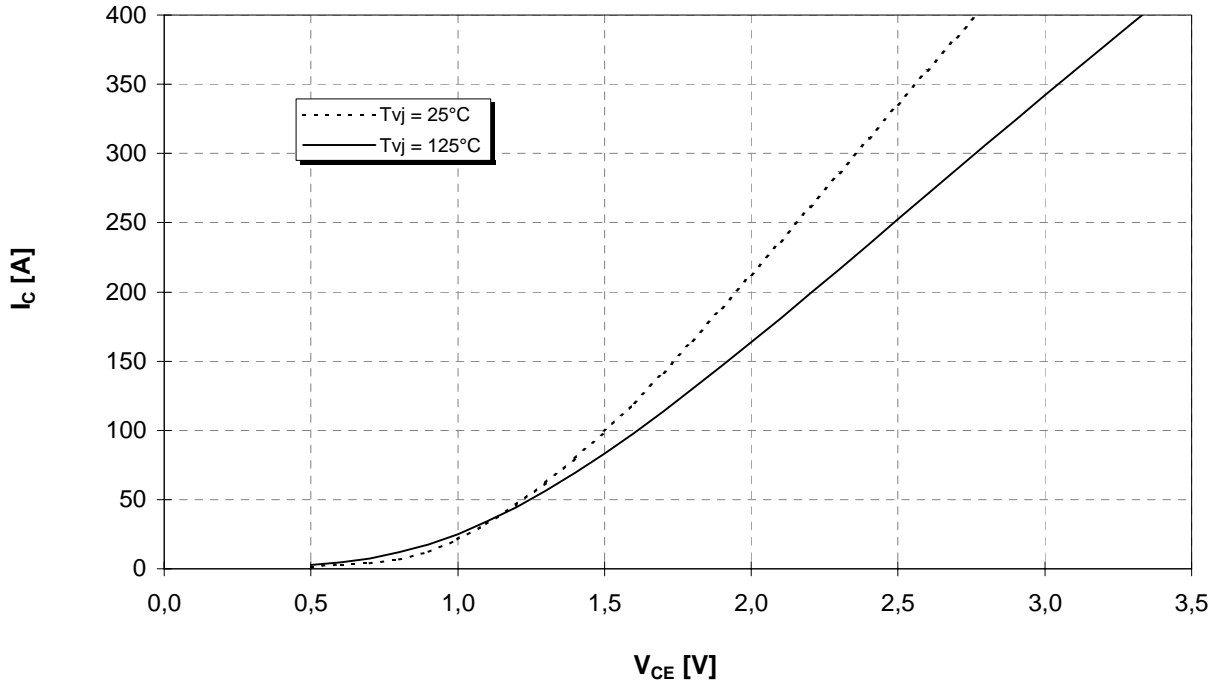
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

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



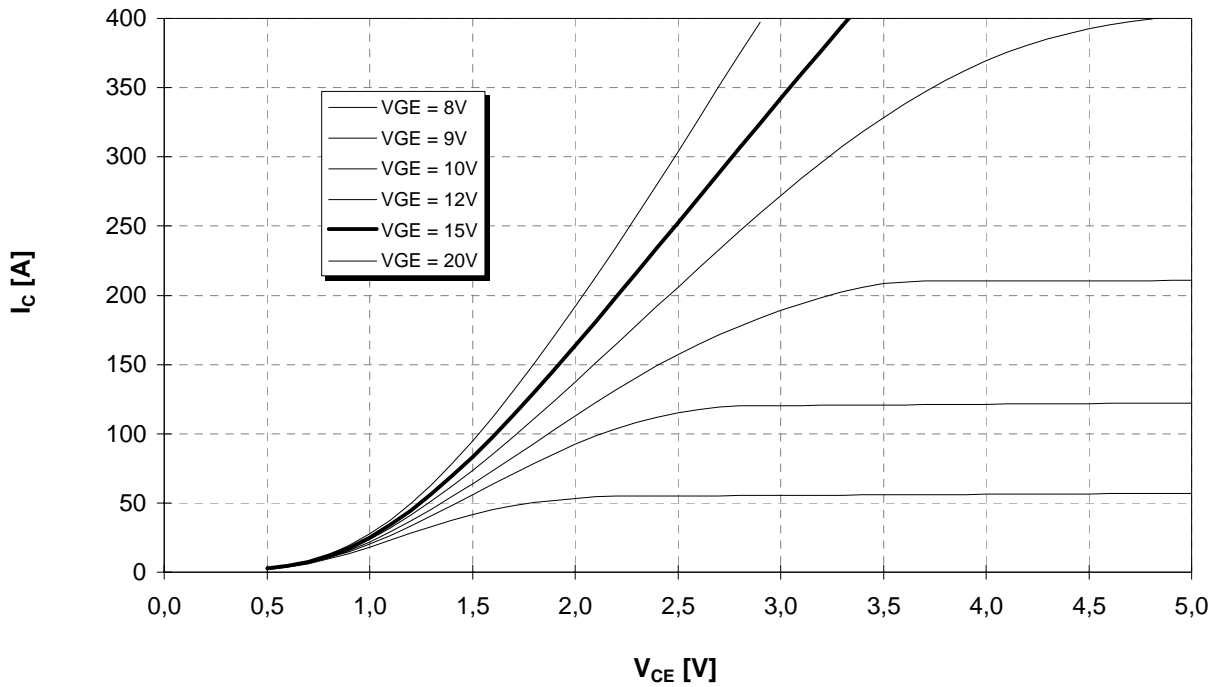
**Ausgangskennlinie (typisch)**  
**Output characteristic (typical)**

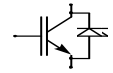
**$I_C = f(V_{CE})$**   
 **$V_{GE} = 15V$**



**Ausgangskennlinienfeld (typisch)**  
**Output characteristic (typical)**

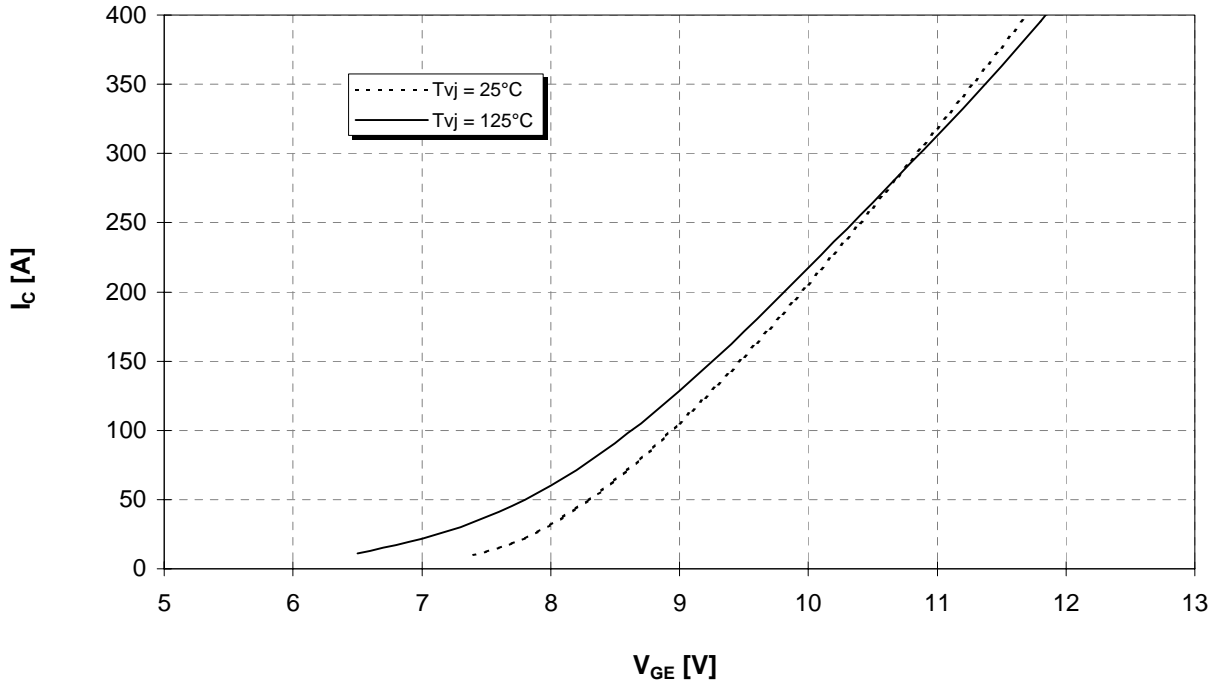
**$I_C = f(V_{CE})$**   
 **$T_{vj} = 125^\circ C$**





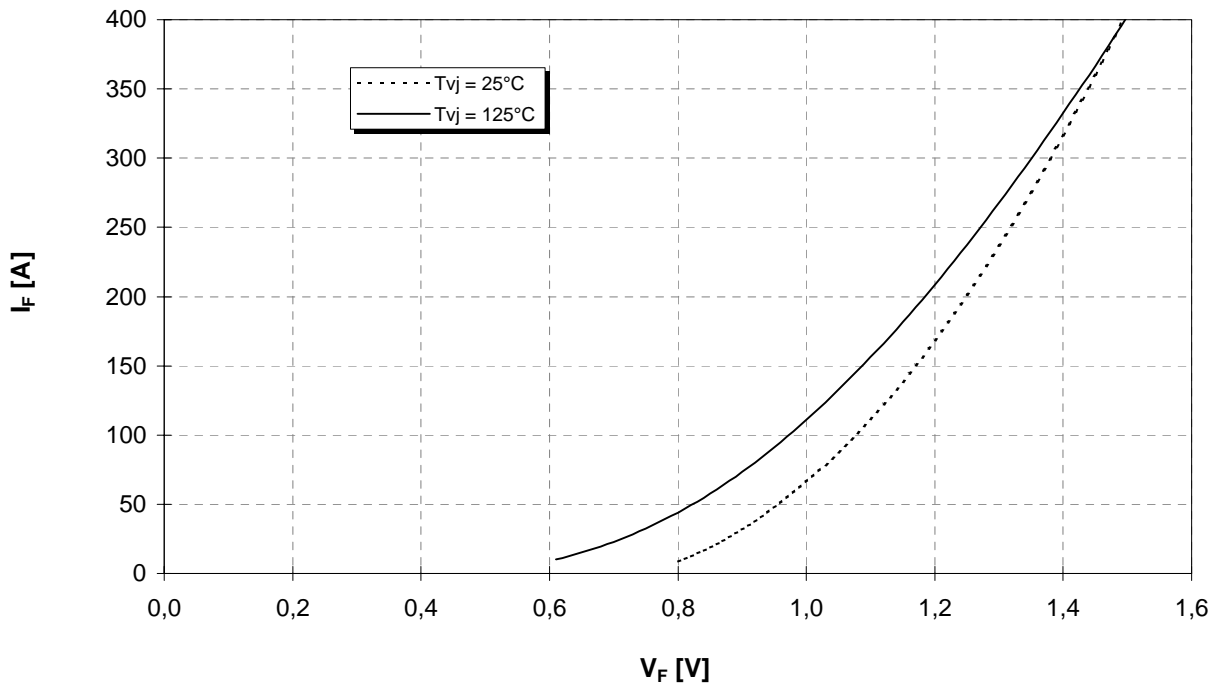
Übertragungscharakteristik (typisch)  
Transfer characteristic (typical)

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



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

$I_F = f(V_F)$

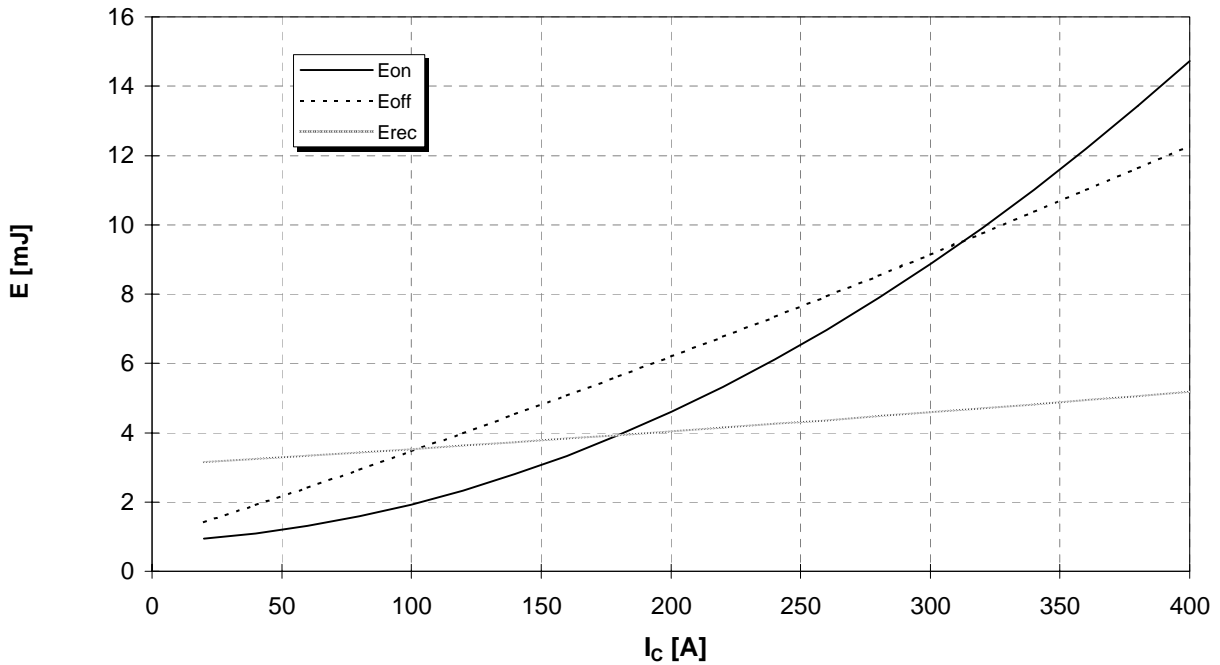




Schaltverluste (typisch)  
Switching losses (typical)

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

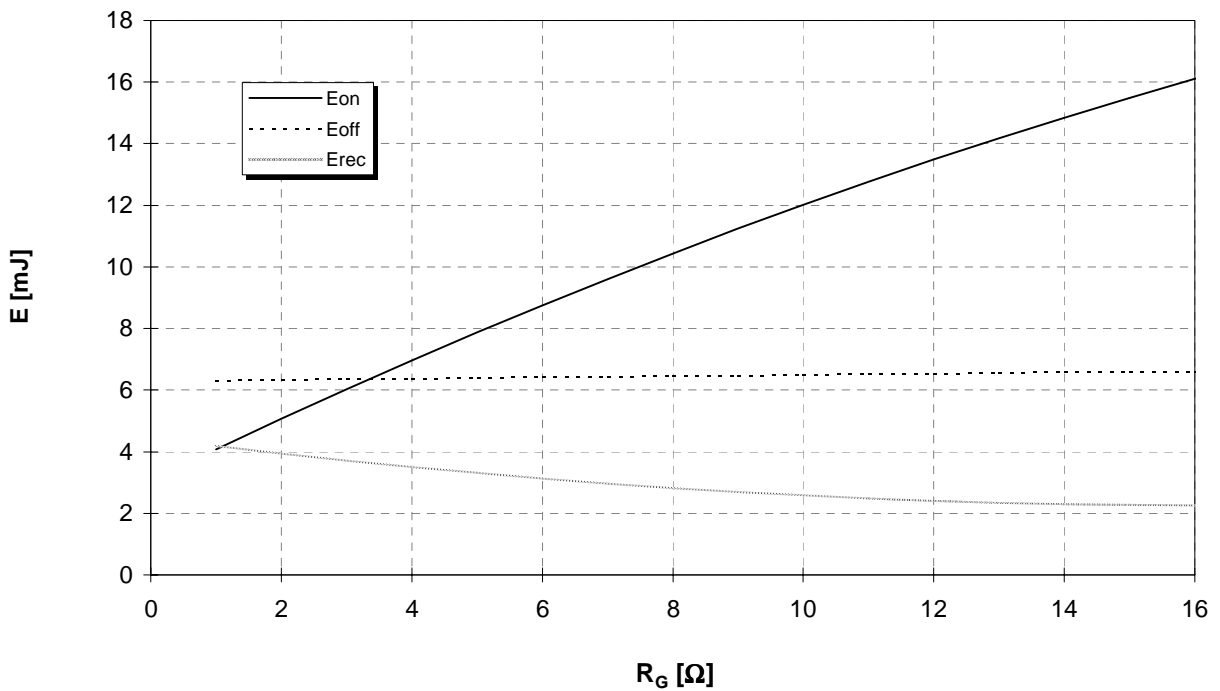
$R_{G,on} = 1,5\Omega, R_{G,off} = 1,5\Omega, V_{CC} = 300V, T_{vj} = 125^\circ C$



Schaltverluste (typisch)  
Switching losses (typical)

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

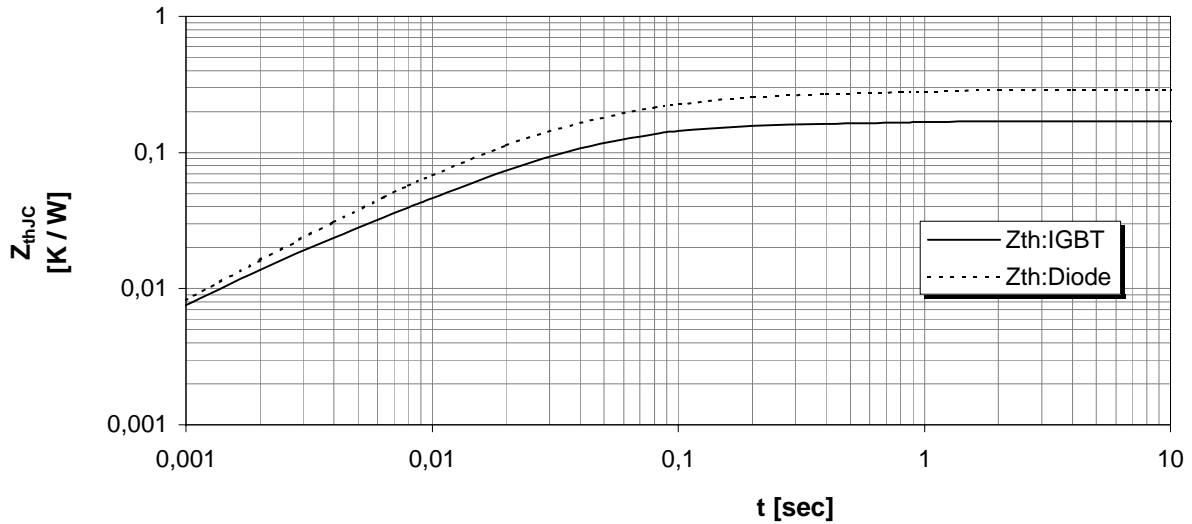
$I_C = 200A, V_{CC} = 300V, T_{vj} = 125^\circ C$





**Transienter Wärmewiderstand**  
**Transient thermal impedance**

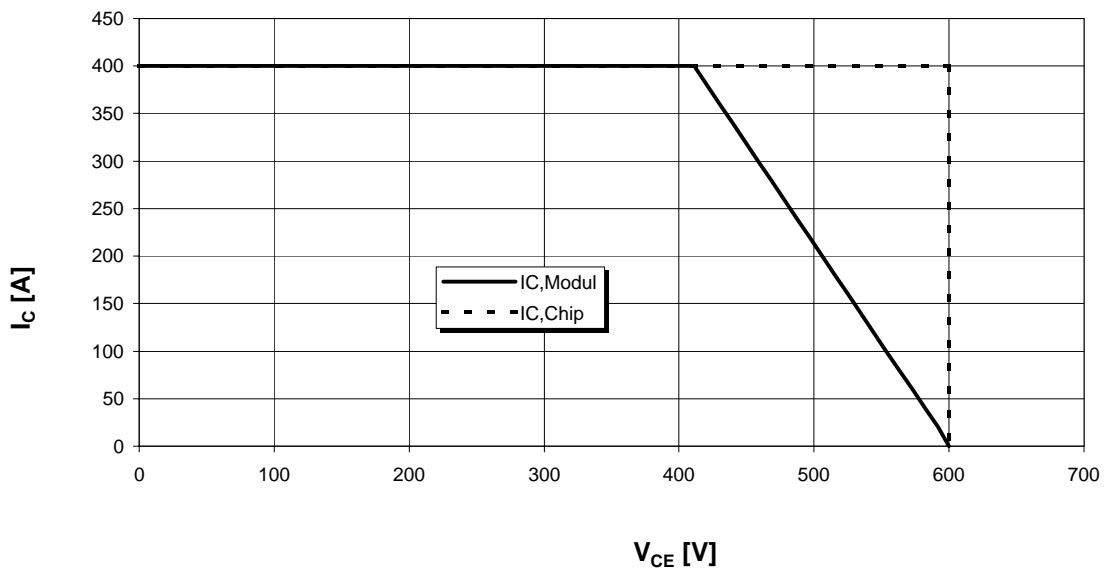
$Z_{thJC} = f(t)$



i	1	2	3	4
$r_i$ [K/kW] : IGBT	7,2	89,1	59,9	13,8
$\tau_i$ [sec] : IGBT	0,0018	0,0240	0,0651	0,6626
$r_i$ [K/kW] : Diode	102,2	98,0	61,6	28,2
$\tau_i$ [sec] : Diode	0,0487	0,0169	0,1069	0,9115

**Sicherer Arbeitsbereich (RBSOA)**  
**Reverse bias safe operation area (RBSOA)**

$V_{GE} = +15V, R_{G,off} = 1,5\Omega, T_V = 125^\circ C$





Gehäusemaße / Schaltbild  
Package outline / Circuit diagram

