vorläufige Daten
preliminary data

Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1700	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}$	$I_{C,nom.}$ I_C	150 240	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ ms}$, $T_C = 80^{\circ}\text{C}$	I_{CRM}	300	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$, Transistor	P_{tot}	1040	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	150	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1\text{ ms}$	I_{FRM}	300	A
Grenzlastintegral der Diode I^2t - value, Diode	$V_R = 0\text{V}$, $t_p = 10\text{ms}$, $T_{vj} = 125^{\circ}\text{C}$	I^2t	t.b.d	$\text{k A}^2\text{s}$
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50\text{ Hz}$, $t = 1\text{ min.}$	V_{ISOL}	3,4	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor

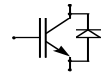
			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$I_C = 150\text{A}$, $V_{GE} = 15\text{V}$, $T_{vj} = 25^{\circ}\text{C}$ $I_C = 150\text{A}$, $V_{GE} = 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{ sat}}$	- -	2,0 2,4	2,45 -	V V
Gate-Schwellenspannung gate threshold voltage	$I_C = 6\text{mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25^{\circ}\text{C}$	$V_{GE(th)}$	5,2	5,8	6,4	V
Gateladung gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$	Q_G	-	1,7	-	μC
Eingangskapazität input capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^{\circ}\text{C}$, $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$	C_{ies}	-	12	-	nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^{\circ}\text{C}$, $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$	C_{res}	-	0,45	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1700\text{V}$, $V_{GE} = 0\text{V}$, $T_{vj} = 25^{\circ}\text{C}$ $V_{CE} = 1700\text{V}$, $V_{GE} = 0\text{V}$, $T_{vj} = 125^{\circ}\text{C}$	I_{CES}	- -	- -	5 -	mA mA
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$, $T_{vj} = 25^{\circ}\text{C}$	I_{GES}	-	-	400	nA

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approved by: Christoph Lübke

revision: 2.0



vorläufige Daten

preliminary data

Charakteristische Werte / Characteristic values

Transistor / Transistor

min. typ. max.

Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = 150A, V_{CE} = 900V$	$t_{d,on}$				
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 25^\circ C$		-	0,20	-	μs
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 125^\circ C$		-	0,22	-	μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 150A, V_{CE} = 900V$	t_r				
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 25^\circ C$		-	0,10	-	μs
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 125^\circ C$		-	0,10	-	μs
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = 150A, V_{CE} = 900V$	$t_{d,off}$				
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 25^\circ C$		-	0,72	-	μs
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 125^\circ C$		-	0,88	-	μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 150A, V_{CE} = 900V$	t_f				
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 25^\circ C$		-	0,10	-	μs
	$V_{GE} = \pm 15V, R_G = 9,1\Omega, T_{vj} = 125^\circ C$		-	0,20	-	μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 150A, V_{CE} = 900V, V_{GE} = \pm 15V$ $R_G = 9,1\Omega, T_{vj} = 125^\circ C, L_\sigma = 80nH$	E_{on}	-	60	-	mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 150A, V_{CE} = 900V, V_{GE} = \pm 15V$ $R_G = 9,1\Omega, T_{vj} = 125^\circ C, L_\sigma = 80nH$	E_{off}	-	50	-	mJ
Kurzschlußverhalten SC Data	$t_p \leq 10\mu sec, V_{GE} \leq 15V$ $T_{vj} \leq 125^\circ C, V_{CC} = 1000V, V_{CEmax} = V_{CES} - L_{\sigma CE} \cdot di/dt$	I_{SC}	-	560	-	A
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	20	-	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	pro Zweig / per arm, $T_C = 25^\circ C$	R_{CC+EE}	-	1,1	-	m Ω

Charakteristische Werte / Characteristic values

Diode / Diode

min. typ. max.

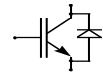
Durchlaßspannung forward voltage	$I_F = 150A, V_{GE} = 0V, T_{vj} = 25^\circ C$	V_F	-	1,8	2,2	V
	$I_F = 150A, V_{GE} = 0V, T_{vj} = 125^\circ C$		-	1,9	t.b.d.	V
Rückstromspitze peak reverse recovery current	$I_F = 150A, -di_F/dt = 2200A/\mu s$	I_{RM}				
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	185	-	A
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	200	-	A
Sperrverzögerungsladung recovered charge	$I_F = 150A, -di_F/dt = 2200A/\mu s$	Q_r				
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	40	-	μC
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	65	-	μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 150A, -di_F/dt = 2200A/\mu s$	E_{rec}				
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 25^\circ C$		-	20	-	mJ
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	35	-	mJ

Technische Information / Technical Information

IGBT-Module
IGBT-Modules

FS 150 R17 KE3 G

eupec



vorläufige Daten
preliminary data

Charakteristische Werte / Characteristic values

NTC - Widerstand / NTC - thermistor

			min.	typ.	max.	
Nennwiderstand rated resistance	$T_C = 25^\circ\text{C}$	R_{25}	-	5	-	k Ω
Abweichung von R_{100} deviation of R_{100}	$T_C = 100^\circ\text{C}; R_{100} = 493\Omega$	$\Delta R/R$	-5	-	5	%
Verlustleistung Power dissipation	$T_C = 25^\circ\text{C}$	P_{25}	-	-	20	mW
B - Wert B - value	$R_2 = R_1 \exp[B(1/T_2 - 1/T_1)]$	$B_{25/50}$	-	3375	-	K

Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,120	K/W
	Diode/Diode, DC	R_{thJC}	-	-	0,210	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{\text{Paste}} = 1 \text{ W/m}^2\text{K} \quad \lambda_{\text{grease}} = 1 \text{ W/m}^2\text{K}$	R_{thCK}	-	0,005	-	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj \text{ max}}$	-	-	150	$^\circ\text{C}$
Betriebstemperatur operation temperature		T_{vjop}	-40	-	125	$^\circ\text{C}$
Lagertemperatur storage temperature		T_{stg}	-40	-	125	$^\circ\text{C}$

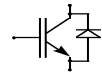
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix					
Innere Isolation internal insulation				Al_2O_3	
Kriechstrecke creepage distance				14	mm
Luftstrecke clearance				10	mm
CTI comperative tracking index				225	
Anzugsdrehmoment f. mech. Befestigung mounting torque	Schraube / screw M5	M	3	-	6 Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Anschlüsse / terminals M6	M	3	-	6 Nm
Gewicht weight		G		916	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.

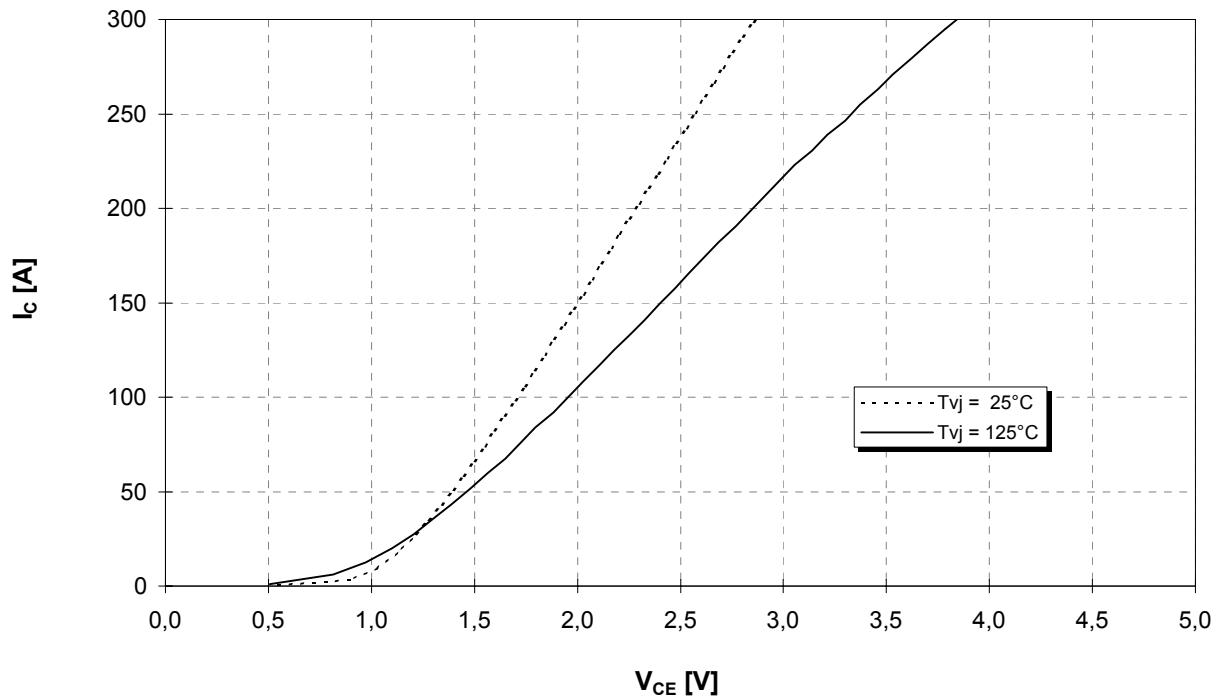


vorläufige Daten
preliminary data

Ausgangskennlinie (typisch)
Output characteristic (typical)

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

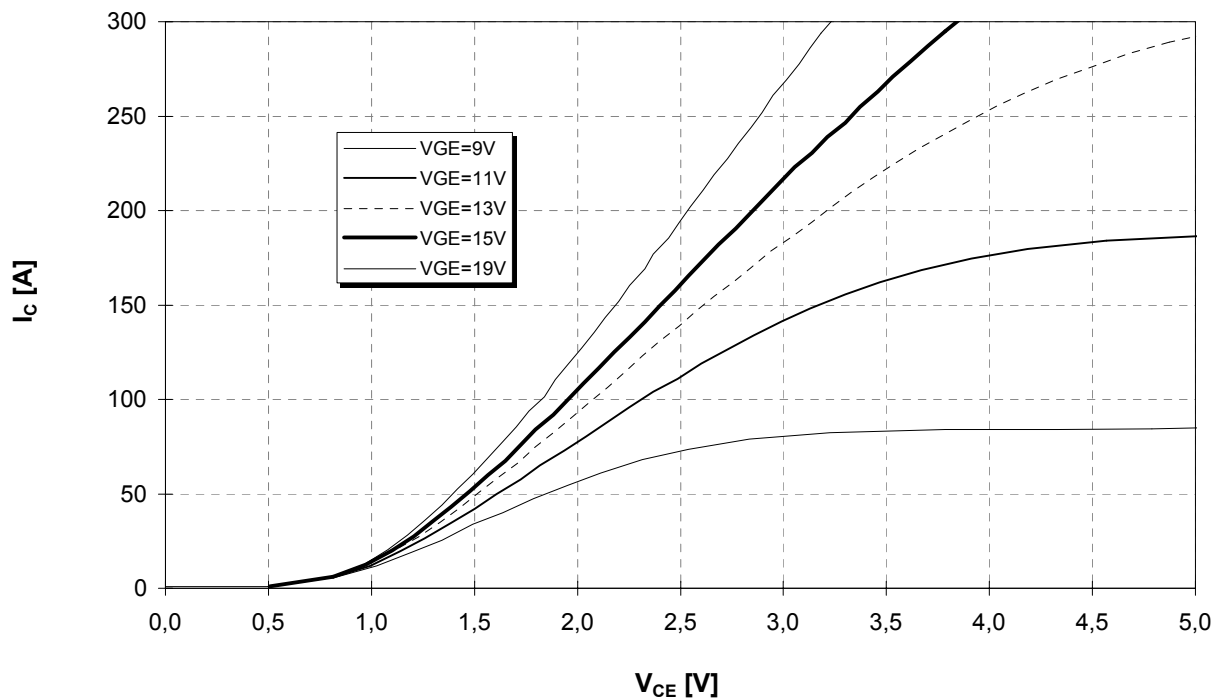
$V_{GE} = 15V$

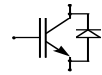


Ausgangskennlinienfeld (typisch)
Output characteristic (typical)

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

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



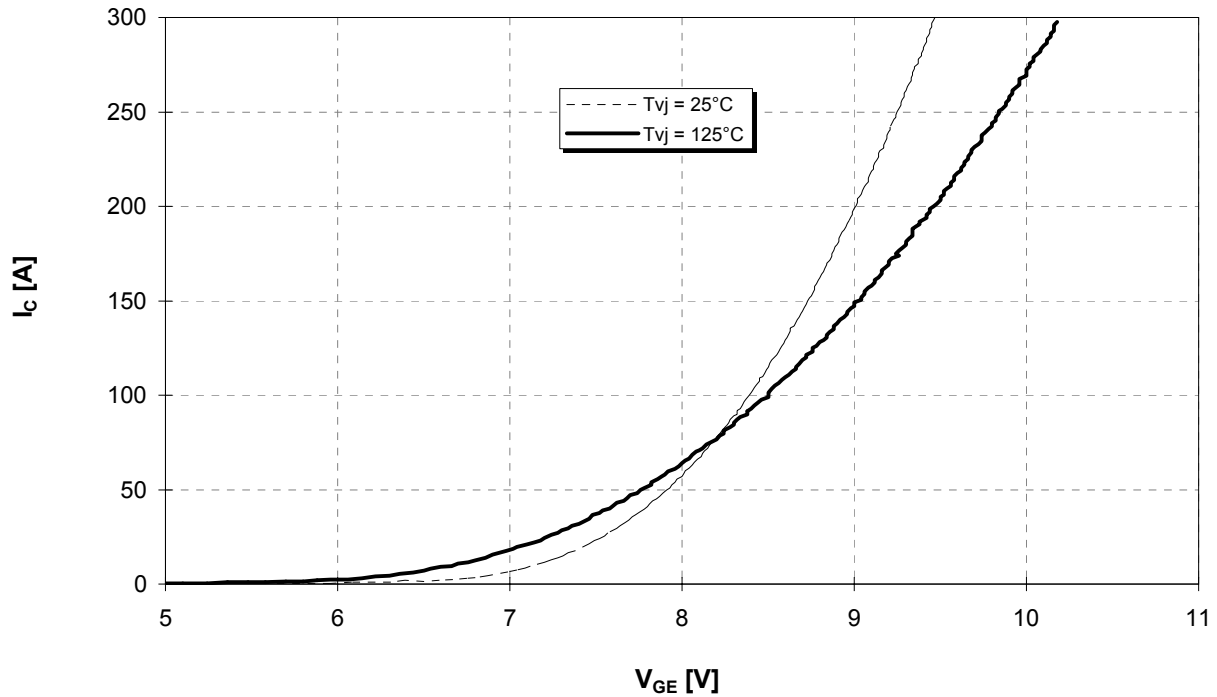


vorläufige Daten
preliminary data

Übertragungscharakteristik (typisch)
Transfer characteristic (typical)

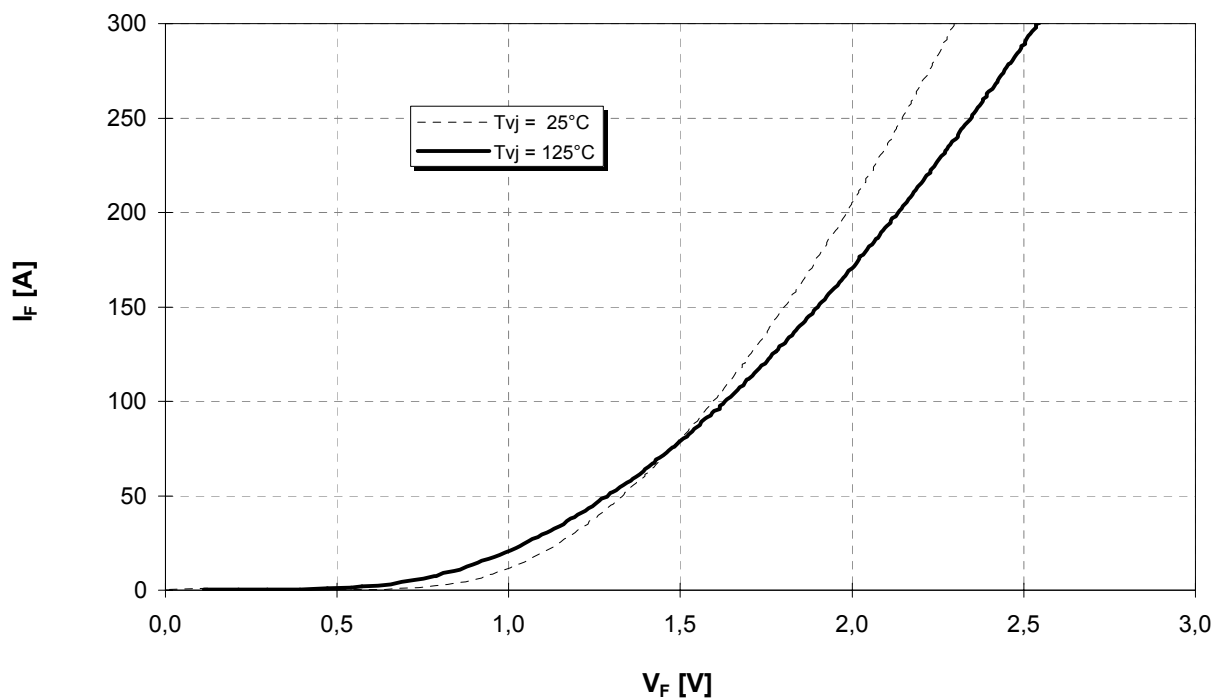
$$I_C = f(V_{GE})$$

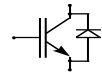
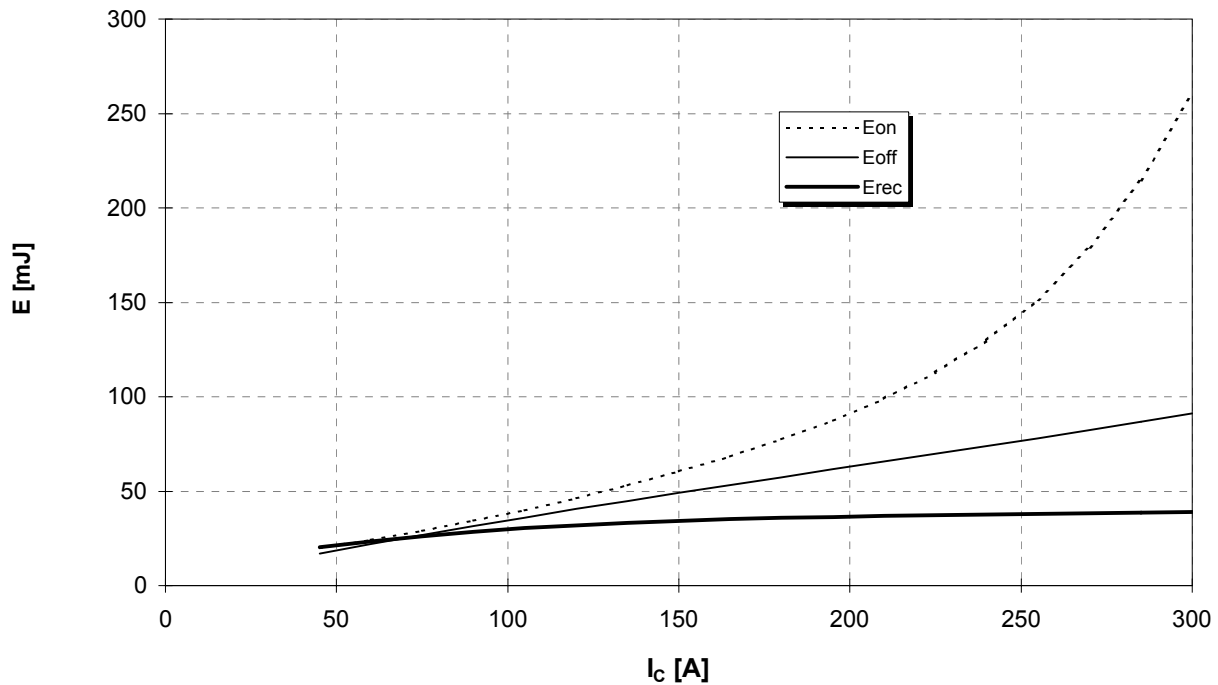
$$V_{CE} = 20V$$



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

$$I_F = f(V_F)$$

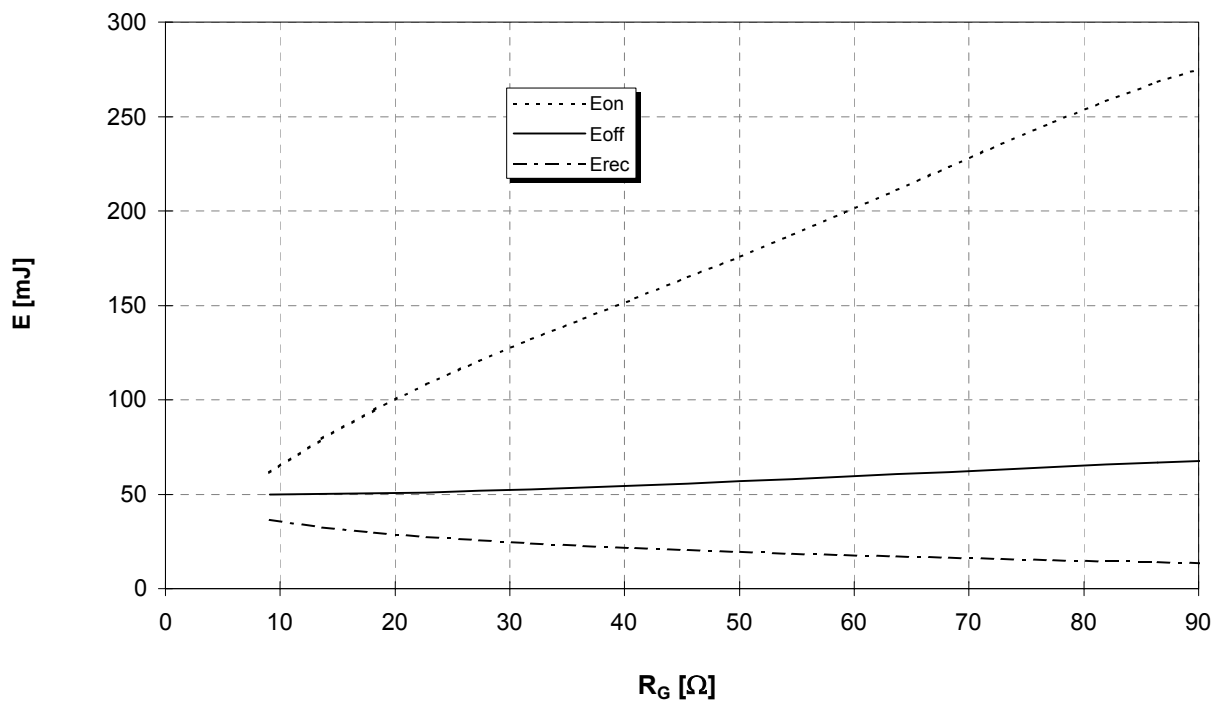


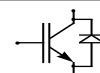
vorläufige Daten
preliminary dataSchaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$ Switching losses (typical) $V_{GE} = \pm 15V$, $R_{Gon} = R_{Goff} = 9,1\Omega$, $V_{CE} = 900V$, $T_{vj} = 125^\circ C$ 

Schaltverluste (typisch)

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

Switching losses (typical)

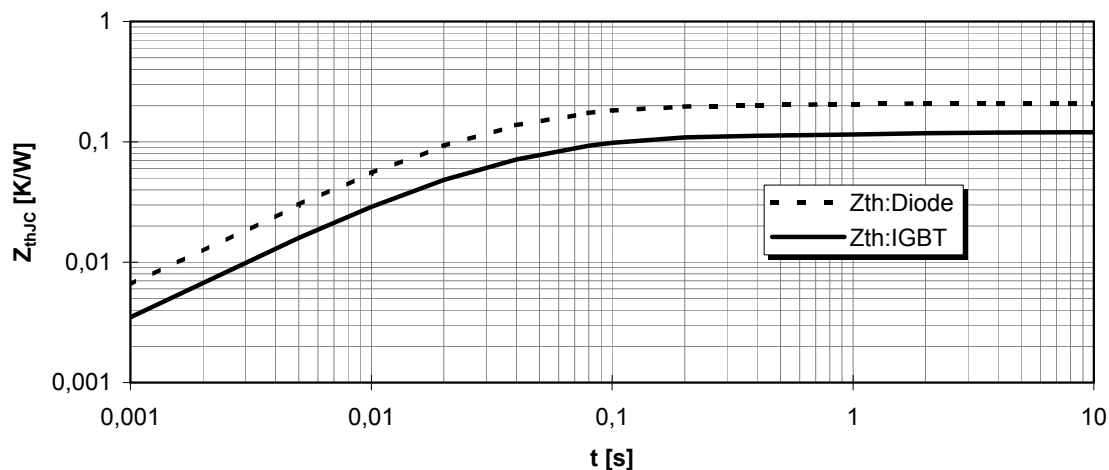
 $V_{GE} = \pm 15V$, $I_C = 150A$, $V_{CE} = 900V$, $T_{vj} = 125^\circ C$ 



vorläufige Daten
preliminary data

Transienter Wärmewiderstand
Transient thermal impedance

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



i		1	2	3	4
r_i [K/kW]	: IGBT	30,54	45,13	34,85	9,479
τ_i [s]	: IGBT	0,01565	0,03977	0,07521	1,443
r_i [K/kW]	: Diode	71,17	78,97	50,01	9,856
τ_i [s]	: Diode	0,02103	0,03011	0,08672	1,1583

Sicherer Arbeitsbereich (RBSOA)

Reverse bias safe operation area (RBSOA)

$$V_{GE} = \pm 15V, R_G = 9,1 \text{ Ohm}, T_J = 125^\circ C$$

