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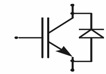
Technische Information / Technical Information

IGBT-Module
IGBT-Modules

FZ 800 R12 KS4



Vorläufige Daten
Preliminary data

Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage		V_{CES}	1200	V
Kollektor-Dauergleichstrom DC-collector current	T_C = 80°C T_C = 25 °C	$I_{C,nom.}$ I_C	800 1200	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms, T_C = 80°C	I_{CRM}	1600	A
Gesamt-Verlustleistung total power dissipation	T_C=25°C, Transistor	P_{tot}	6,9	kW
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	800	A
Periodischer Spitzenstrom repetitive peak forw. current	t_P = 1 ms	I_{FRM}	1600	A
Grenzlastintegral der Diode I^2t - value, Diode	V_R = 0V, t_p = 10ms, T_{vj} = 125°C	I^2t	185.000	A^2s
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	2.500	V

Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	I_C = 800 A, V_{GE} = 15V, Tvj = 25°C I_C = 800 A, V_{GE} = 15V, T_{vj} = 125°C	$V_{CE\ sat}$	- -	3,00 3,60	- -	V V
Gate-Schwellenspannunggate threshold voltage	I_C = 32 mA, V_{CE} = V_{GE}, T_{vj} = 25°C	$V_{GE(th)}$	4,5	5,5	6,5	V
Eingangskapazität input capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{ies}	-	52	-	nF
Rückwirkungskapazität reverse transfer capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{res}	-	t.b.d.	-	nF
Gateladung gate charge	V_{GE} = -15V ... + 15V, V_{CE} = 600V	Q_G	-	8,4	-	µC
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 1200V, V_{GE} = 0V, T_{vj} = 25°C V_{CE} = 1200V, V_{GE} = 0V, T_{vj} = 125°C	I_{CES}	- -	t.b.d. t.b.d.	- -	µA mA
Gate-Emitter Reststrom gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25°C	I_{GES}	-	-	400	nA

prepared by: R. Jörke	date of publication : 2000-06-14
approved by: Jens Thurau	revision: 1

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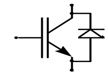

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Charakteristische Werte / Characteristic values

Transistor / Transistor			min.	typ.	max.	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	I_C = 800 A, V_{CC} = 600V					
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 25°C	$t_{d,on}$	-	100	-	ns
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 125°C		-	125	-	ns
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 800 A, V_{CC} = 600V					
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 25°C	t_r	-	90	-	ns
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 125°C		-	100	-	ns
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I_C = 800 A, V_{CC} = 600V					
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 25°C	$t_{d,off}$	-	530	-	ns
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 125°C		-	590	-	ns
Fallzeit (induktive Last) fall time (inductive load)	I_C = 800 A, V_{CC} = 600V					
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 25°C	t_f	-	60	-	ns
	V_{GE} = ±15V, R_G = 1,3 Ω, T_{vj} = 125°C		-	70	-	ns
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 800 A, V_{CC} = 600V, V_{GE} = 15V					
	R_G = 1,3 Ω, T_{vj} = 125°C, L_S = 60nH	E_{on}	-	76	-	mWs
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 800 A, V_{CC} = 600V, V_{GE} = 15V					
	R_G = 1,3 Ω, T_{vj} = 125°C, L_S = 60nH	E_{off}	-	64	-	mWs
Kurzschlußverhalten SC Data	$t_P \le$ 10µsec, $V_{GE} \le$ 15V					
	$T_{Vj} \le$125°C, V_{CC}= 900V, V_{CEmax}=V_{CES} -L_{sCE} ·dI/dt	I_{SC}	-	6000	-	A
Modulinduktivität stray inductance module		L_{sCE}	-	12	-	nH
Modul-Leitungswiderstand, Anschlüsse - Chip lead resistance, terminals - chip		$R_{CC'+EE'}$	-	t.b.d.	-	mΩ

Charakteristische Werte / Characteristic values

Diode / Diode			min.	typ.	max.	
Durchlaßspannung forward voltage	I_F = 800 A, V_{GE} = 0V, T_{vj} = 25°C	V_F	-	2,00	-	V
	I_F = 800 A, V_{GE} = 0V, T_{vj} = 125°C		-	1,70	-	V
Rückstromspitze peak reverse recovery current	I_F = 800 A, - di_F/dt = 8200 A/µsec					
	V_R = 600V, VGE = -10V, T_{vj} = 25°C	I_{RM}	-	540	-	A
	V_R = 600V, VGE = -10V, T_{vj} = 125°C		-	900	-	A
Sperrverzögerungsladung recovered charge	I_F = 800 A, - di_F/dt = 8200 A/µsec					
	V_R = 600V, VGE = -10V, T_{vj} = 25°C	Q_r	-	60	-	µAs
	V_R = 600V, VGE = -10V, T_{vj} = 125°C		-	160	-	µAs
Abschaltenergie pro Puls reverse recovery energy	I_F = 800 A, - di_F/dt = 8200 A/µsec					
	V_R = 600V, VGE = -10V, T_{vj} = 25°C	E_{rec}	-	32	-	mWs
	V_R = 600V, VGE = -10V, T_{vj} = 125°C		-	76	-	mWs

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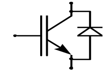


Vorläufige Daten
Preliminary data

Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,018	K/W
	Diode/Diode, DC		-	-	0,027	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	-	150	°C

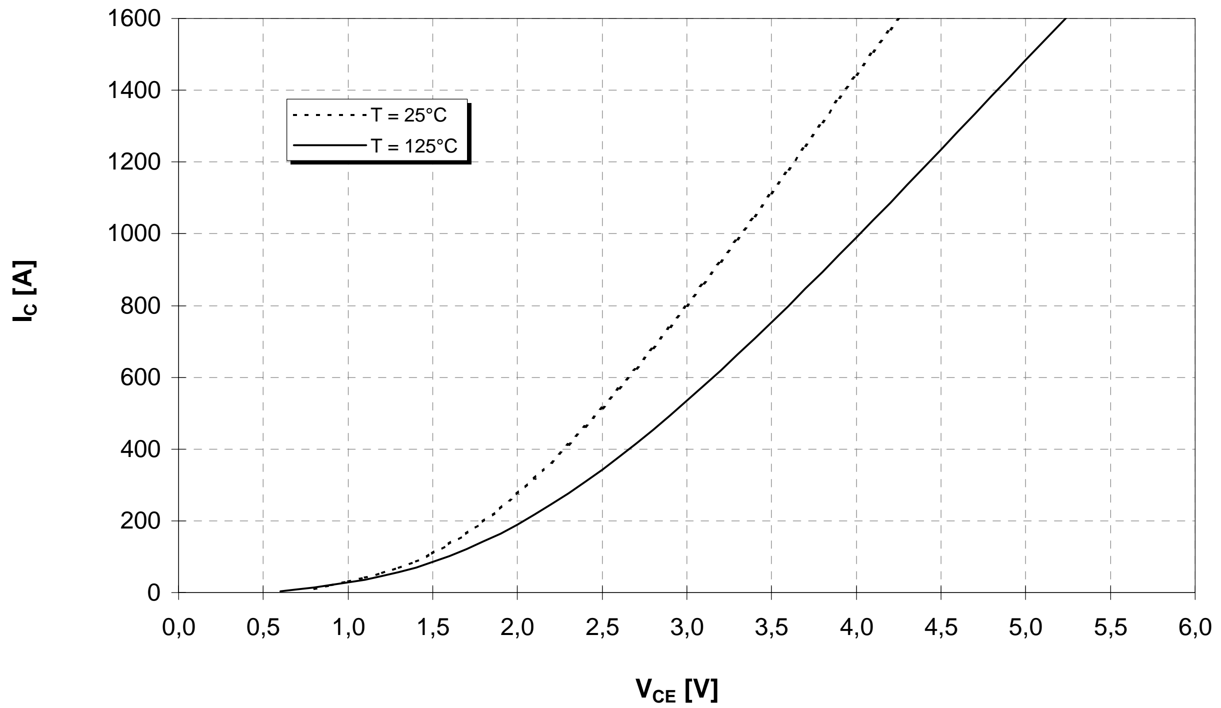
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix						
Material Modulgrundplatte material of module baseplate				Cu		
Innere Isolation internal insulation				AlN		
Kriechstrecke creepage distance				32,2		mm
Luftstrecke clearance				19,1		mm
CTI comperative tracking index				> 400		
Anzugsdrehmoment f. mech. Befestigung mounting torque		M1	4,25		5,75	Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	terminals M4	M2	1,7		2,3	Nm
	terminals M8		8		10,00	Nm
Gewicht weight		G		1000		g

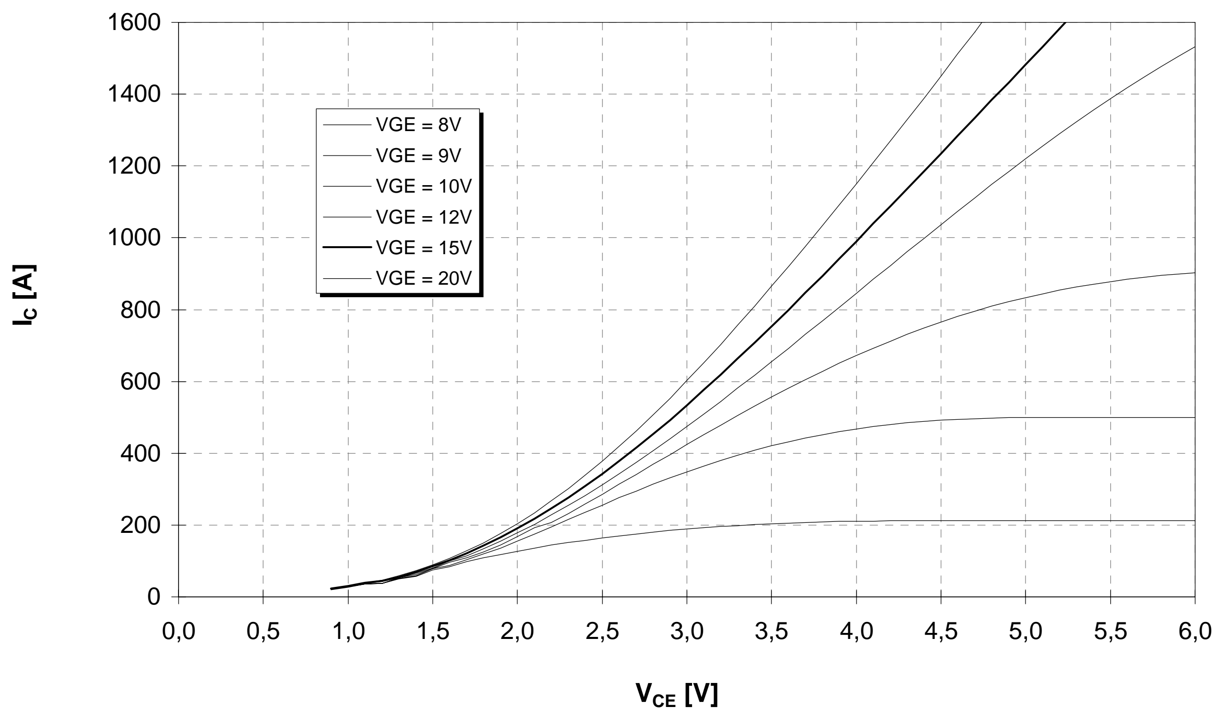
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

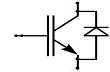
This technical information specifies semiconductor devices but promises no characteristics. It is valid in combination with the belonging technical notes.

Ausgangskennlinie (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $V_{GE} = 15V$



Ausgangskennlinienfeld (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $T_{vj} = 125°C$





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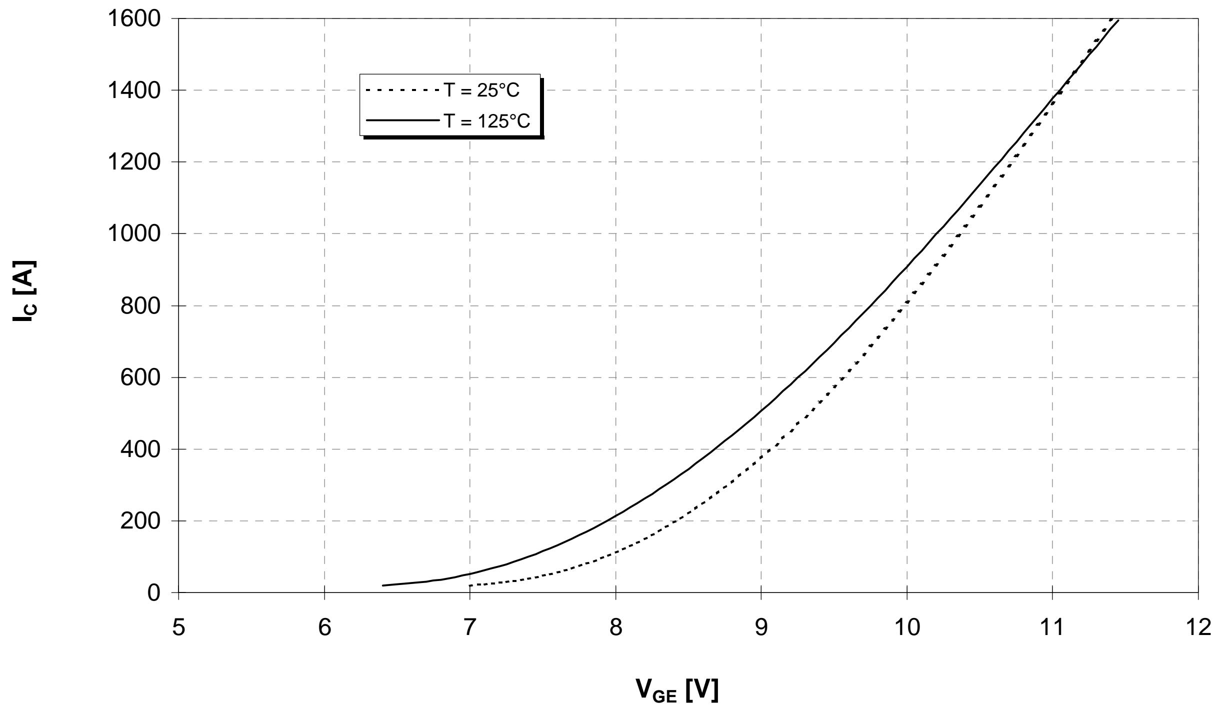
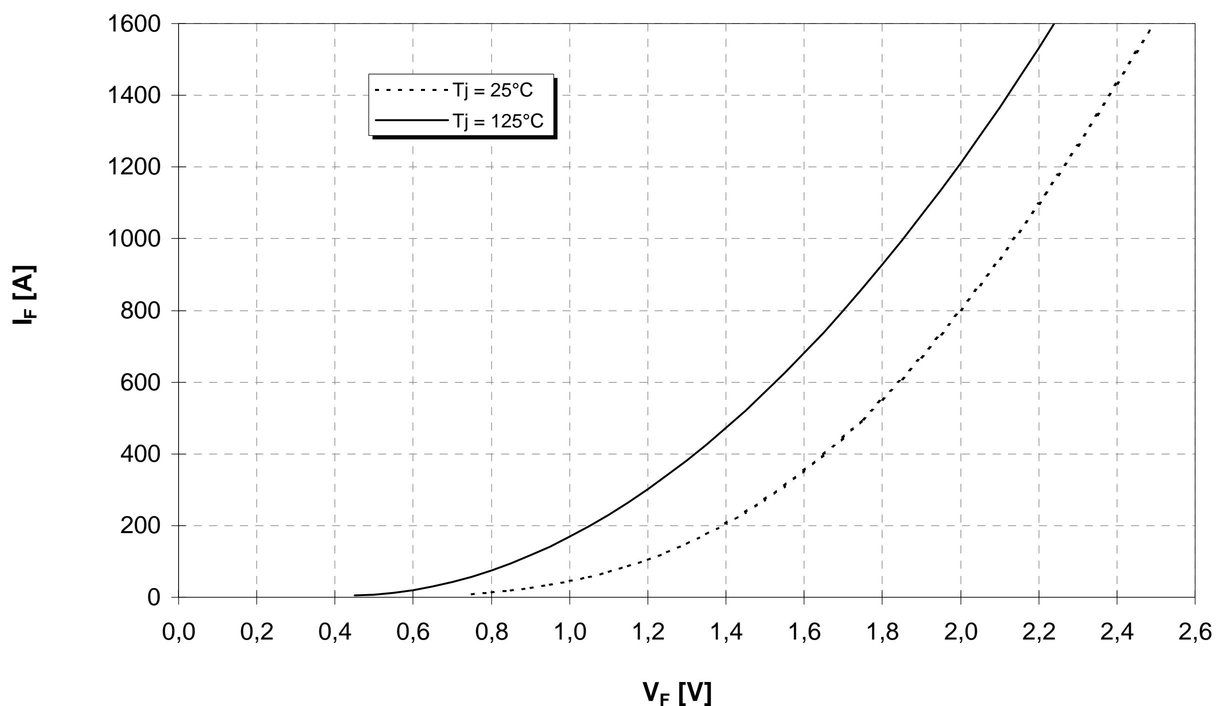
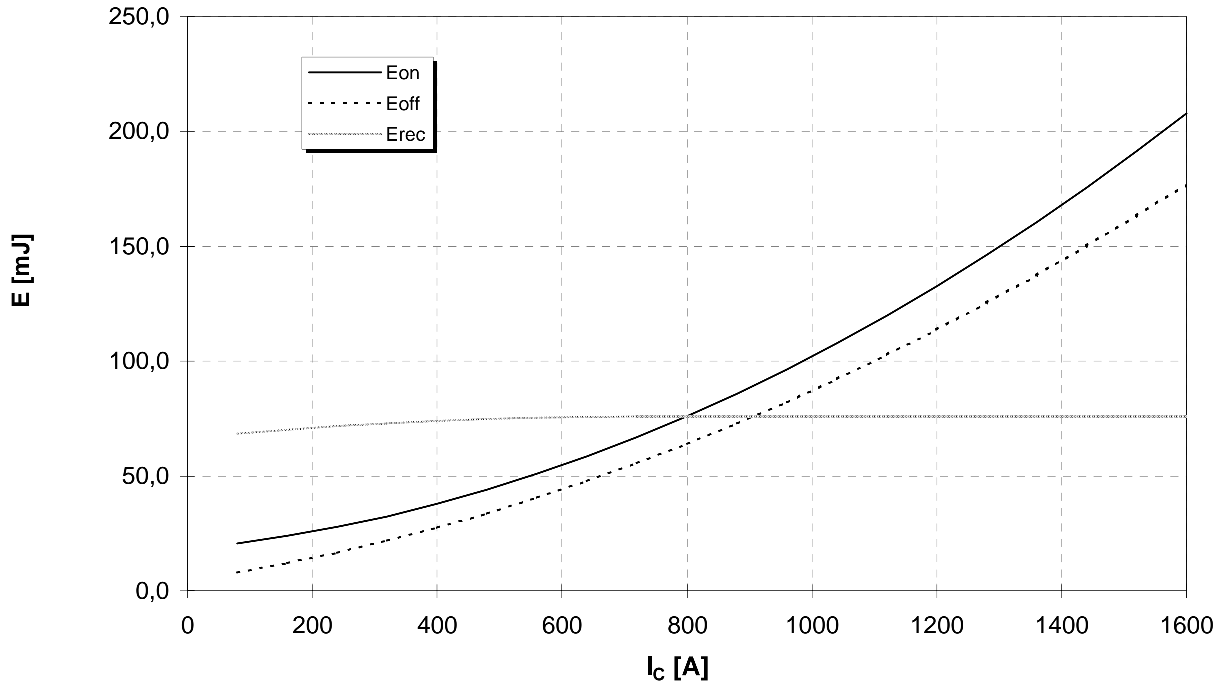
Übertragungscharakteristik (typisch) $I_C = f(V_{GE})$
Transfer characteristic (typical) $V_{CE} = 20V$



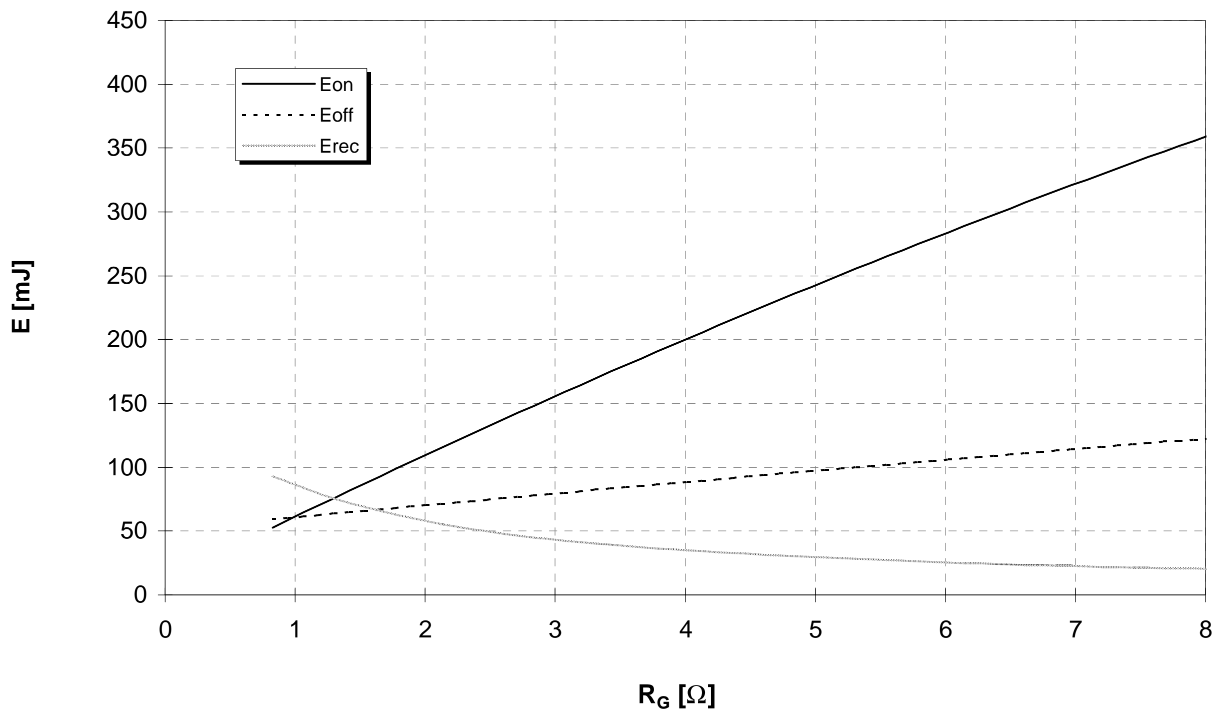
Durchlaßkennlinie der Inversdiode (typisch) $I_F = f(V_F)$
Forward characteristic of inverse diode (typical)

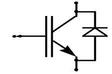


Schaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$
Switching losses (typical) $R_{G,on} = 1{,}3\ \Omega$, $R_{G,off} = 1{,}3\ \Omega$, $V_{CE} = 600V$, $T_j = 125°C$



Schaltverluste (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
Switching losses (typical) $I_C = 800\ A$, $V_{CE} = 600V$, $T_j = 125°C$





Vorläufige Daten
Preliminary data

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

$R_{G,off}$ = 1,3 Ω, T_{vj}= 125°C

I_C [A]

1800
1600
1400
1200
1000
800
600
400
200
0

IC,Modul
IC,Chip

0 200 400 600 800 1000 1200 1400

V_{CE} [V]

Vorläufige Daten
Preliminary data

Transienter Wärmewiderstand
Transient thermal impedance

$Z_{thJC} = f(t)$

Zth:IGBT
Zth:Diode

Z_{thJC} [K / W]

0,1
0,01
0,001
0,0001

0,001
0,01
0,1
1
10

t [sec]

i		1	2	3	4
r_i [K/kW]	: IGBT	3,85	5,68	6,15	2,32
τ_i [sec]	: IGBT	0,0064	0,0493	0,0916	1,5237
r_i [K/kW]	: Diode	5,78	8,52	9,22	3,48
τ_i [sec]	: Diode	0,0064	0,0493	0,0916	1,5237

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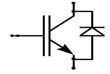

Vorläufige Daten
Preliminary data

Gehäusemaße / Schaltbild
Package outline / Circuit diagram