Technische Information / Technical Information

IGBT-Module
IGBT-Modules

FD 800 R 33 KF2

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Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

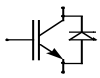
Kollektor-Emitter-Sperrspannung collector-emitter voltage	T_j = 25°C T_j = -25°C	V_{CES}	3300 3300	V V
Kollektor-Dauergleichstrom DC-collector current	T_C = 80°C T_C = 25 °C	$I_{C,nom.}$ I_C	800 1300	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms, T_C = 80°C	I_{CRM}	1600	A
Gesamt-Verlustleistung total power dissipation	T_C=25°C, Transistor	P_{tot}	9,6	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 I2t - value, Diode	V_R = 0V, t_p = 10ms, T_{Vj} = 125°C	I^2t	222.200	A^2s
Spitzenverlustleistung der Diode maximum power dissipation diode	T_j = 125°C	P_{RQM}	800	kW
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	6.000	V
Teilentladungs-Aussetzspannung partial discharge extinction voltage	RMS, f = 50 Hz, $Q_{PD} \leq$ 10 pC (acc. to IEC 1287)	V_{ISOL}	2.600	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	$V_{CE\ sat}$	- -	3,40 4,30	4,25 5,00	V V
Gate-Schwellenspannung gate threshold voltage	I_C = 80 mA, V_{CE} = V_{GE}, T_{vj} = 25°C	$V_{GE(th)}$	4,2	5,1	6,0	V
Eingangskapazität input capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{ies}	-	100	-	nF
Rückwirkungskapazität reverse transfer capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{res}	-	5,4	-	nF
Gateladung gate charge	V_{GE} = -15V ... + 15V, V_{CE} = 1800V	Q_G	-	15	-	µC
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 3300V, V_{GE} = 0V, T_{vj} = 25°C V_{CE} = 3300V, V_{GE} = 0V, T_{vj} = 125°C	I_{CES}	- -	0,1 40	8 100	mA mA
Gate-Emitter Reststrom gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25°C	I_{GES}	-	-	400	nA

prepared by: Jürgen Göttert	date of publication : 08.06.99
approved by: Chr. Lübke; 20.07.99	revision: 2



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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} = 1800V					
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 25°C	$t_{d,on}$	-	370	-	ns
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 125°C		-	350	-	ns
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 800 A, V_{CC} = 1800V					
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 25°C	t_r	-	250	-	ns
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 125°C		-	270	-	ns
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I_C = 800 A, V_{CC} = 1800V					
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 25°C	$t_{d,off}$	-	1550	-	ns
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 125°C		-	1700	-	ns
Fallzeit (induktive Last) fall time (inductive load)	I_C = 800 A, V_{CC} = 1800V					
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 25°C	t_f	-	200	-	ns
	V_{GE} = ±15V, R_G = 1,8 Ω, C_{GE} = 150nF, T_{vj} = 125°C		-	200	-	ns
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 800 A, V_{CC} = 1800V, V_{GE} = 15V					
	R_G = 1,8 Ω, C_{GE} = 150 nF, T_{vj} = 125°C, L_S = 40nH	E_{on}	-	1920	-	mWs
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 800 A, V_{CC} = 1800V, V_{GE} = 15V					
	R_G = 1,8 Ω, C_{GE} = 150 nF, T_{vj} = 125°C, L_S = 40nH	E_{off}	-	1020	-	mWs
Kurzschlußverhalten SC Data	$t_P \leq$ 10µsec, $V_{GE} \leq$ 15V					
	$T_{vj} \leq$125°C, V_{CC}=2500V, V_{CEmax}=V_{CES} -L_{sCE} ·dI/dt	I_{SC}	-	4000	-	A
Modulinduktivität stray inductance module	IGBT (Zweig / arm 1+2 parallel) Diode (Zweig / arm 3)	L_{sCE}	- -	12 25	- -	nH nH
Modul-Leitungswiderstand, Anschlüsse - Chip lead resistance, terminals - chip	T = 25°C, IGBT (Zweig / arm 1+2 parallel) T = 25°C, Diode (Zweig / arm 3)	$R_{CC'+EE'}$	-	0,19 0,34	- -	mΩ 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	-	2,80	3,50	V
	I_F = 800 A, V_{GE} = 0V, T_{vj} = 125°C		-	2,80	3,50	V
Sperrstrom reverse current	V_{CE} = 3300V, T_{vj} = 25°C, Zweig / arm 3	I_R	-	0,01	1,6	mA
	V_{CE} = 3300V, T_{vj} = 125°C, Zweig / arm 3		-	4	20	mA
Rückstromspitze peak reverse recovery current	I_F = 800 A, - di_F/dt = 2500 A/µsec					
	V_R = 1800V, VGE = -10V, T_{vj} = 25°C	I_{RM}	-	650	-	A
	V_R = 1800V, VGE = -10V, T_{vj} = 125°C		-	700	-	A
Sperrverzögerungsladung recovered charge	I_F = 800 A, - di_F/dt = 2500 A/µsec					
	V_R = 1800V, VGE = -10V, T_{vj} = 25°C	Q_r	-	500	-	µAs
	V_R = 1800V, VGE = -10V, T_{vj} = 125°C		-	900	-	µAs
Abschaltenergie pro Puls reverse recovery energy	I_F = 800 A, - di_F/dt = 2500 A/µsec					
	V_R = 1800V, VGE = -10V, T_{vj} = 25°C	E_{rec}	-	490	-	mWs
	V_R = 1800V, VGE = -10V, T_{vj} = 125°C		-	1000	-	mWs

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Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC Diode/Diode, DC, Zweig / arm 1+2 Diode/Diode, DC, Zweig / arm 3	R_{thJC}	- - -	- - -	0,013 0,026 0,026	K/W K/W 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}	-	0,004	-	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

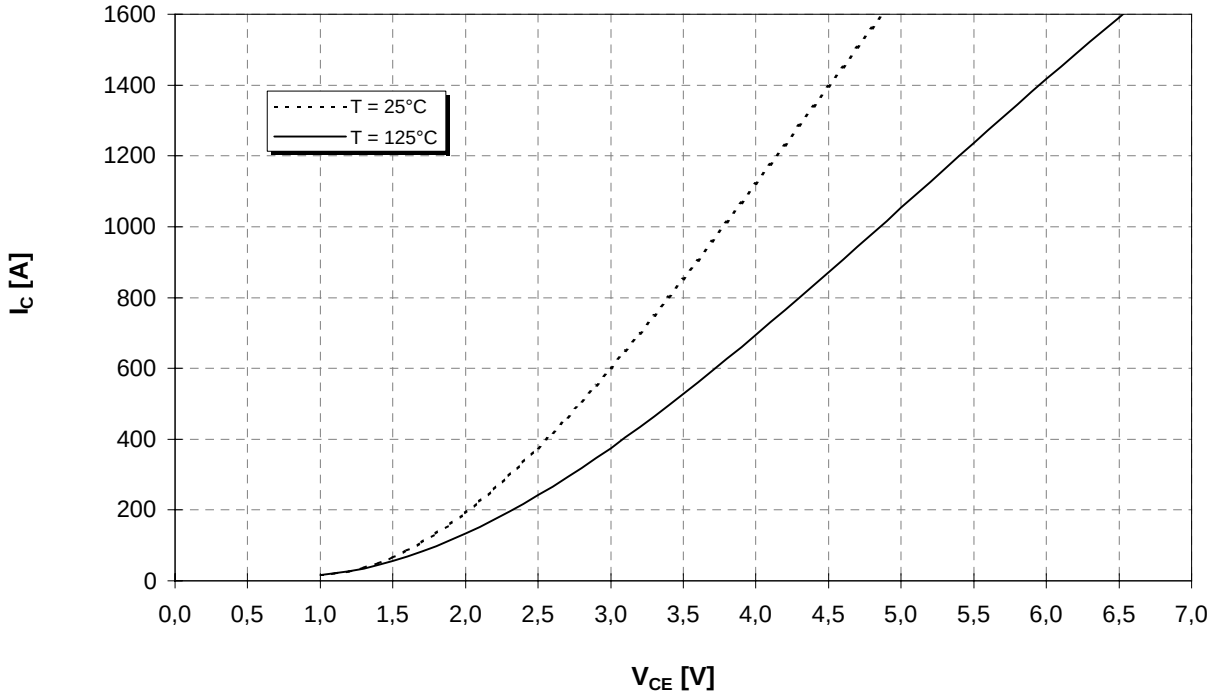
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix				
Material Modulgrundplatte material of module baseplate			AlSiC	
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	5	Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	terminals M4 terminals M8	M2	2 8 .. 10	Nm Nm
Gewicht weight		G	1500	g

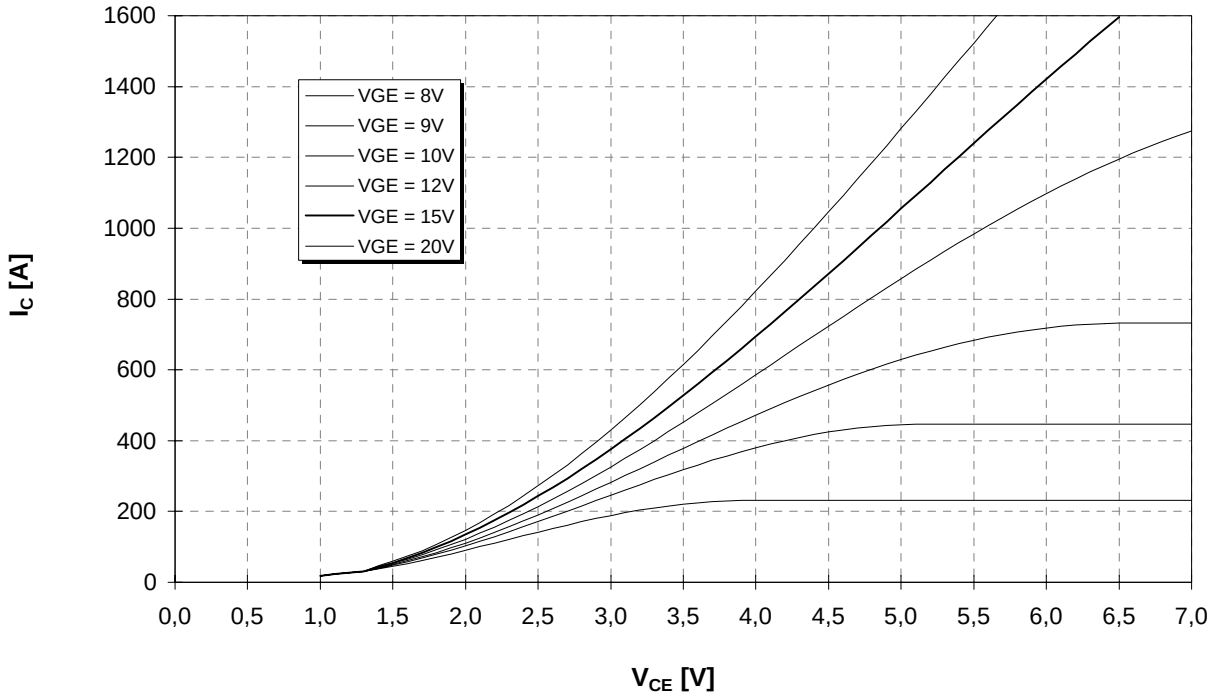
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

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

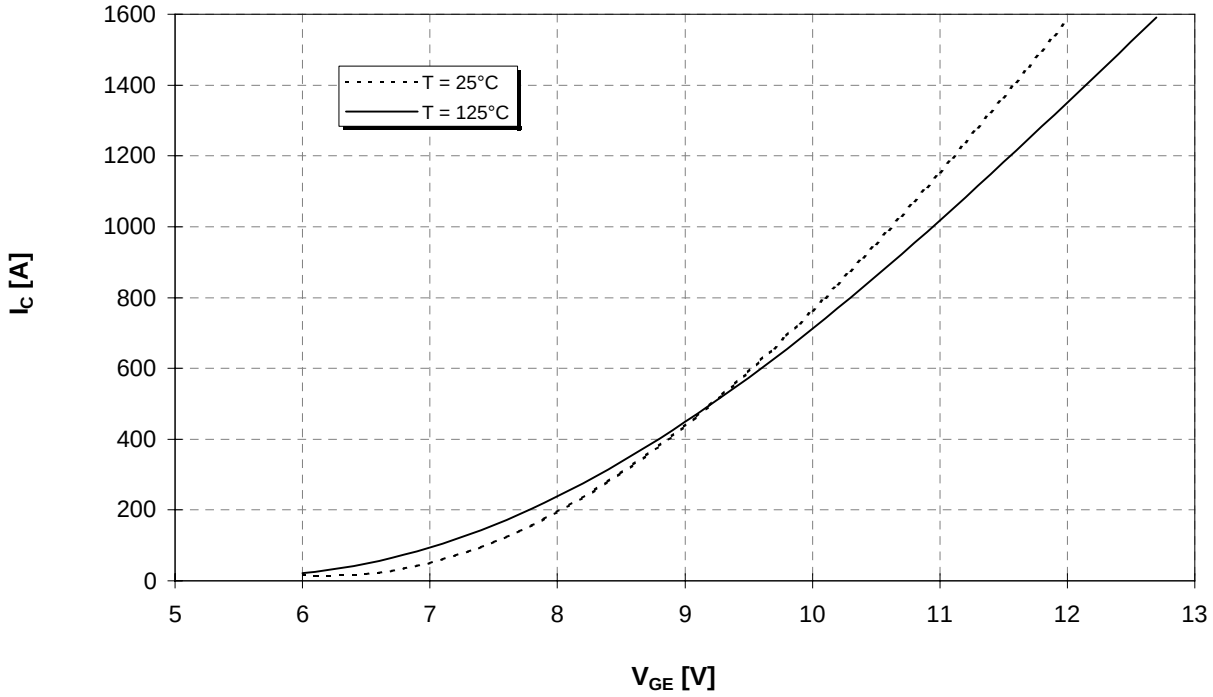
Ausgangskennlinie (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $V_{GE} = 15V$



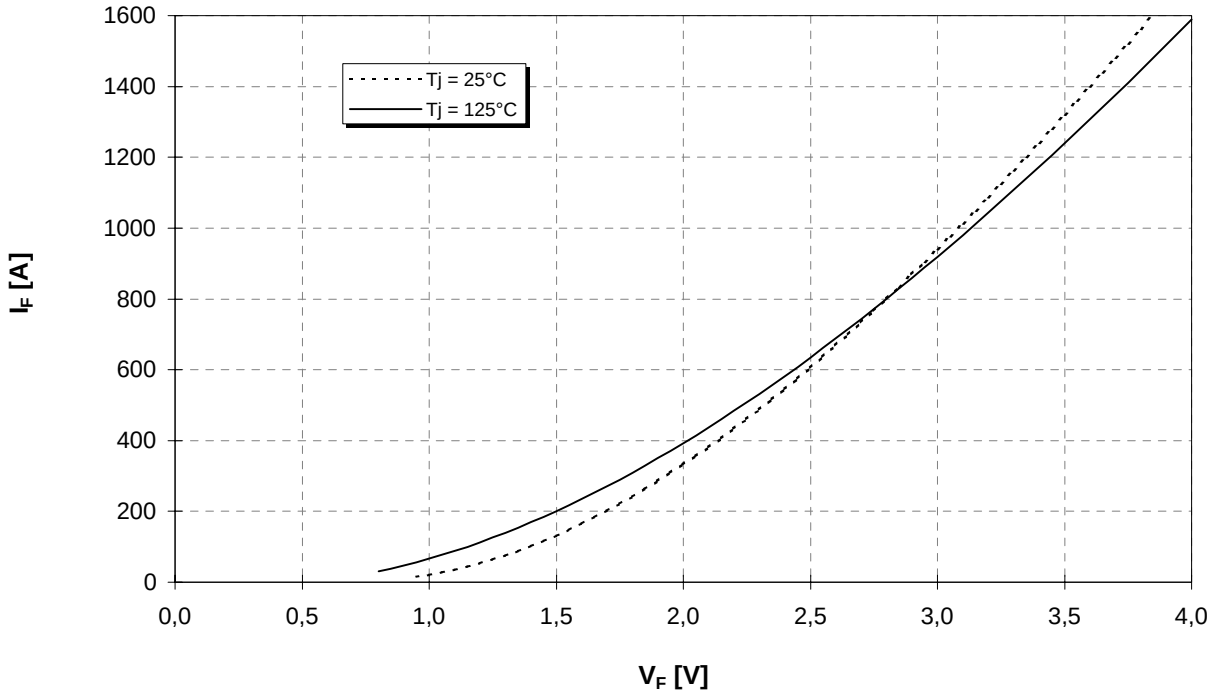
Ausgangskennlinienfeld (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $T_{vj} = 125°C$



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



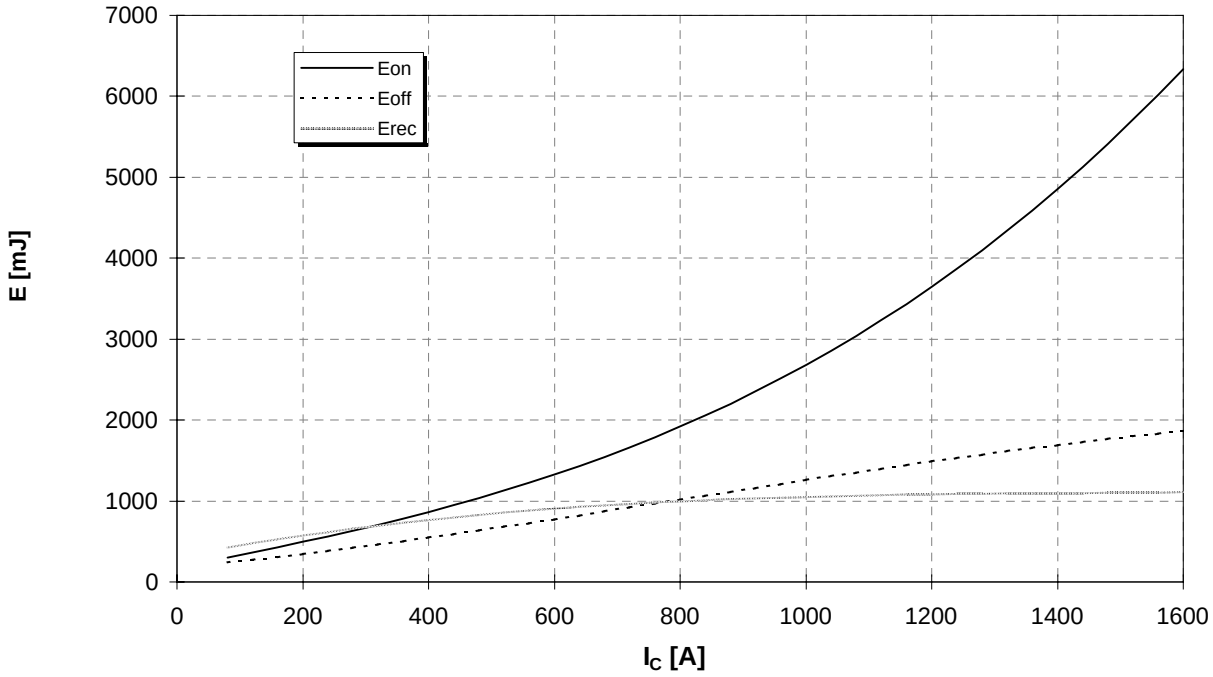
Durchlaßkennlinie der Inversdiode (typisch) $I_F = f(V_F)$
Forward characteristic of inverse diode (typical)



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

Switching losses (typical)

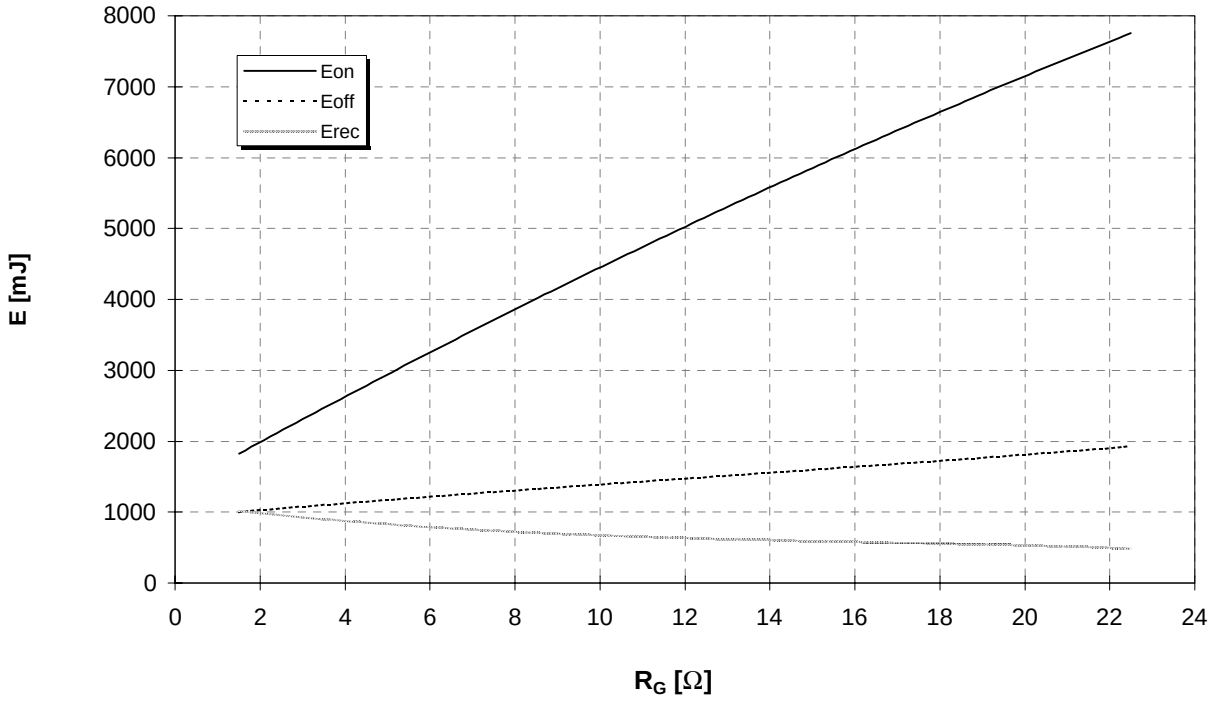
$R_{G,on}$ = 1,8 Ω, $R_{G,off}$ = 1,8 Ω, C_{GE} = 150 nF, V_{CE} = 1800V, T_j = 125°C



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

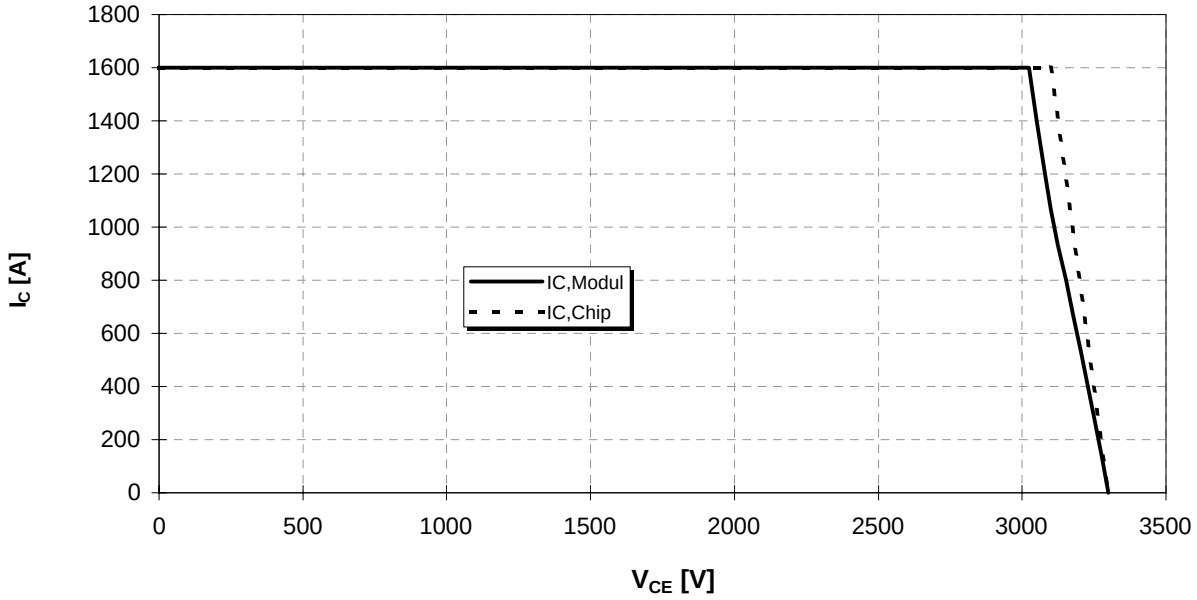
Switching losses (typical)

I_C = 800 A , C_{GE} = 150 nF, V_{CE} = 1800V , T_j = 125°C



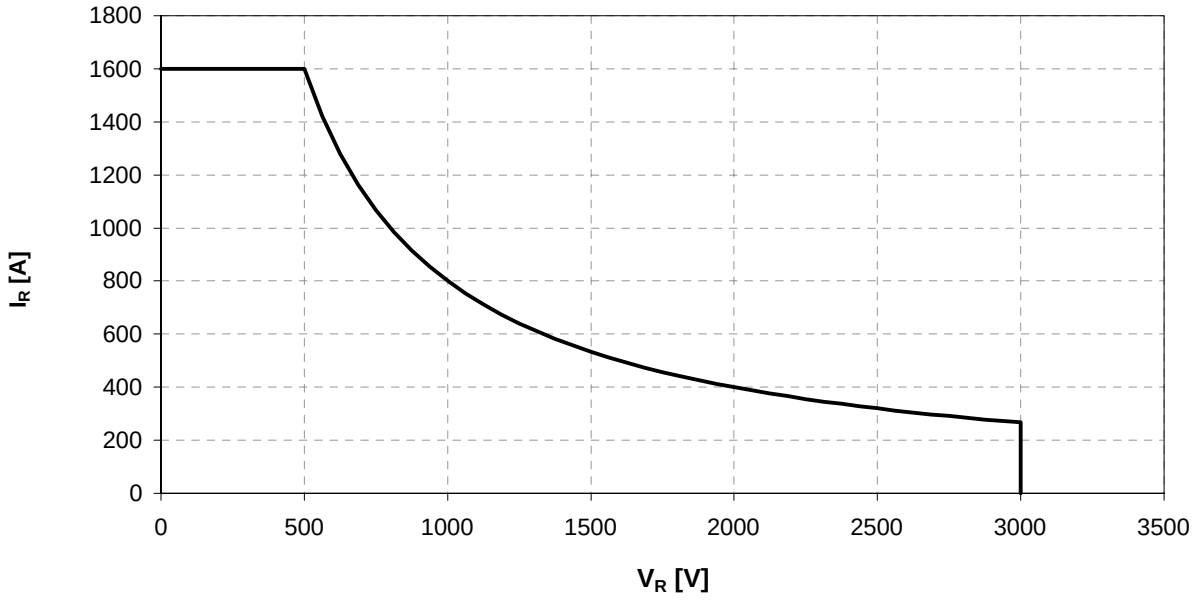
Sicherer Arbeitsbereich IGBT (RBSOA)
Reverse bias safe operation area IGBT (RBSOA)

$R_{G,off}$ = 1,8 Ω, C_{GE} = 150 nF
T_{vj}= 125°C



Sicherer Arbeitsbereich Diode (SOA)
safe operation area Diode (SOA)

T_{vj}= 125°C



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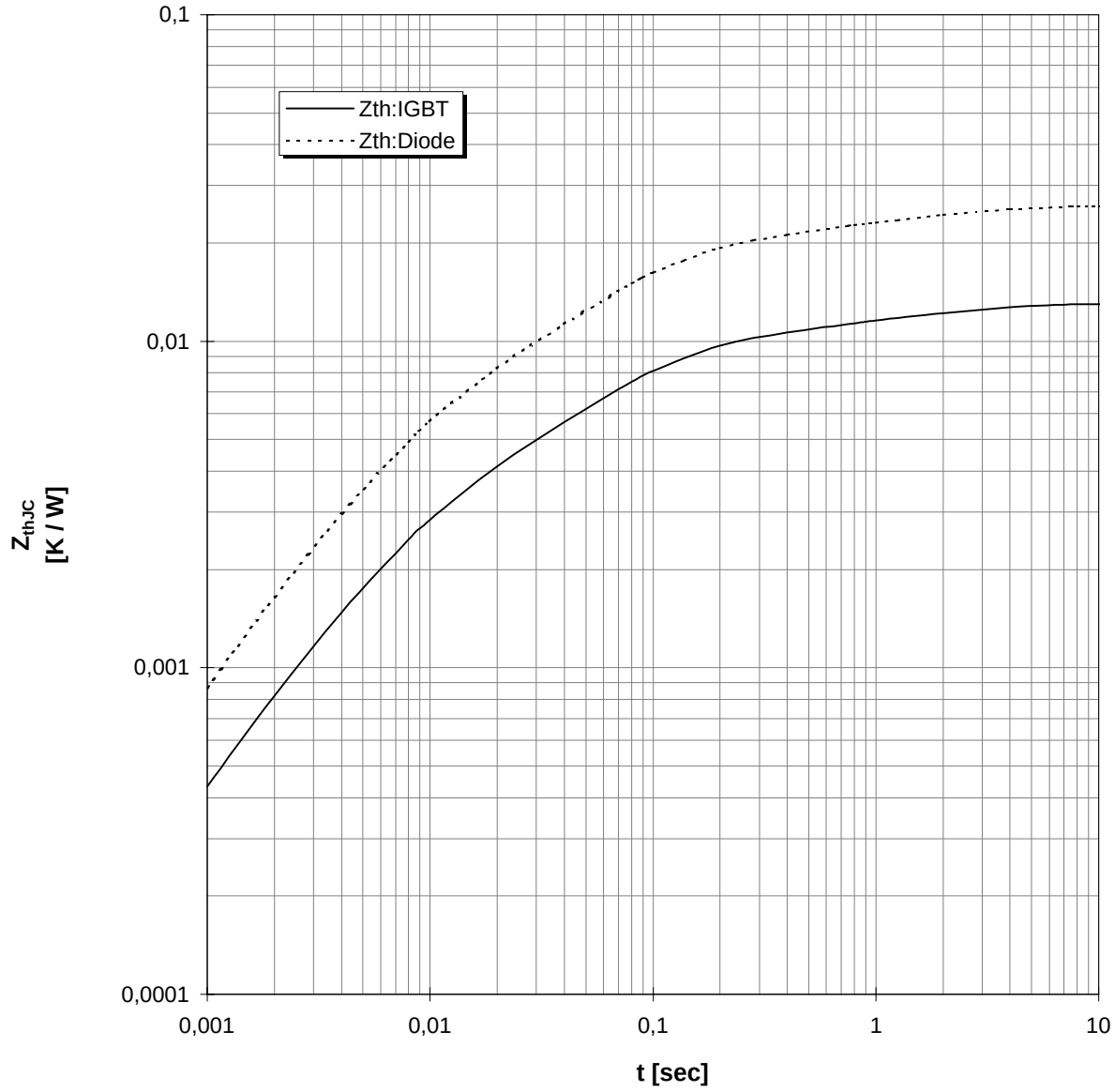
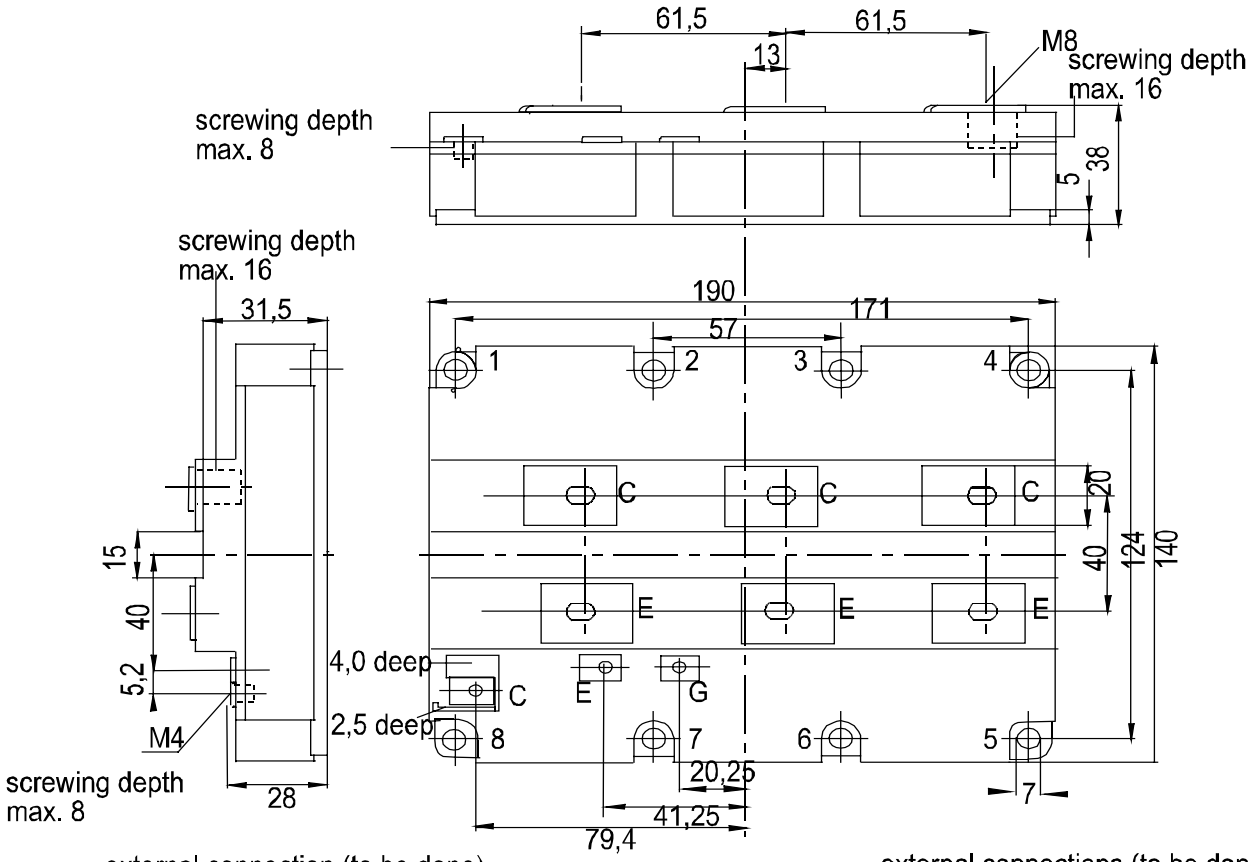
Transienter Wärmewiderstand $Z_{thJC} = f(t)$
Transient thermal impedance

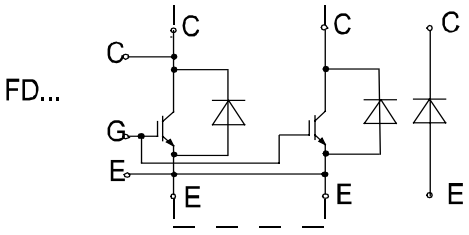


i		1	2	3	4
r_i [K/kW]	: IGBT	2,38	6,49	1,93	2,20
τ_i [sec]	: IGBT	0,0068	0,0642	0,3209	2,0212
r_i [K/kW]	: Diode	4,76	12,98	3,86	4,40
τ_i [sec]	: Diode	0,0068	0,0642	0,3209	2,0212

Gehäusemaße / Schaltbild
Package outline / Circuit diagram



external connection (to be done)



external connections (to be done)