Technische Information / Technical Information

IGBT-Module
IGBT-Modules

FZ 600 R 65 KF1

eupec



Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage	T_{vj}=125°C T_{vj}=25°C T_{vj}=-40°C	V_{CES}	6500 6300 5800	V
Kollektor-Dauergleichstrom DC-collector current	T_C = 80 °C T_C = 25 °C	$I_{C,nom.}$ I_C	600 1200	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms, T_C = 80°C	I_{CRM}	1200	A
Gesamt-Verlustleistung total power dissipation	T_C=25°C, Transistor	P_{tot}	11,4	kW
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	600	A
Periodischer Spitzenstrom repetitive peak forw. current	t_P = 1 ms	I_{FRM}	1200	A
Grenzlastintegral der Diode I^2t - value, Diode	V_R = 0V, t_p = 10ms, T_{Vj} = 125°C	I^2t	165	k A^2s
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}	10,2	kV
Teilentladungs Aussetzspannung partial discharge extinction voltage	RMS, f = 50 Hz, Q_{PD} typ. 10pC (acc. To IEC 1287)	V_{ISOL}	5,1	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	I_C = 600A, V_{GE} = 15V, T_{vj} = 25°C I_C = 600A, V_{GE} = 15V, T_{vj} = 125°C	$V_{CE\ sat}$	- -	4,3 5,3	4,9 5,9	V V
Gate-Schwellenspannung gate threshold voltage	I_C = 100mA, V_{CE} = V_{GE}, T_{vj} = 25°C	$V_{GE(th)}$	6,4	7,0	8,1	V
Gateladung gate charge	V_{GE} = -15V ... +15V	Q_G	-	8,4	-	µC
Eingangskapazität input capacitance	f = 1MHz,T_{vj} = 25°C,V_{CE} = 25V, V_{GE} = 0V	C_{ies}	-	84	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 6300V, V_{GE} = 0V, T_{vj} = 25°C V_{CE} = 6500V, V_{GE} = 0V, T_{vj} = 125°C	I_{CES}	-	0,6 60	-	mA mA
Gate-Emitter Reststrom gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25°C	I_{GES}	-	-	400	nA

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Charakteristische Werte / Characteristic values

Transistor / Transistor			**min.**	**typ.**	**max.**	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	I_C = 600A, V_{CE} = 3600V					
	V_{GE} = ±15V, R_{Gon} = 4,3Ω, C_{GE}=68nF, T_{vj} = 25°C,	$t_{d,on}$	-	0,75	-	µs
	V_{GE} = ±15V, R_{Gon} = 4,3Ω, C_{GE}=68nF, T_{vj} = 125°C,		-	0,72	-	µs
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 600A, V_{CE} = 3600V					
	V_{GE} = ±15V, R_{Gon} = 4,3Ω, C_{GE}=68nF, T_{vj} = 25°C,	t_r	-	0,37	-	µs
	V_{GE} = ±15V, R_{Gon} = 4,3Ω, C_{GE}=68nF, T_{vj} = 125°C,		-	0,40	-	µs
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I_C = 600A, V_{CE} = 3600V					
	V_{GE} = ±15V, R_{Goff} = 25Ω, C_{GE}=68nF, T_{vj} = 25°C,	$t_{d,off}$	-	5,50	-	µs
	V_{GE} = ±15V, R_{Goff} = 25Ω, C_{GE}=68nF, T_{vj} = 125°C,		-	6,00	-	µs
Fallzeit (induktive Last) fall time (inductive load)	I_C = 600A, V_{CE} = 3600V					
	V_{GE} = ±15V, R_{Goff} = 25Ω, C_{GE}=68nF, T_{vj} = 25°C,	t_f	-	0,40	-	µs
	V_{GE} = ±15V, R_{Goff} = 25Ω, C_{GE}=68nF, T_{vj} = 125°C,		-	0,50	-	µs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 600A, V_{CE} = 3600V, V_{GE} = ±15V					
	R_{Gon} = 4,3Ω, C_{GE}=68nF, T_{vj} = 125°C , L_σ = 280nH	E_{on}	-	5900	-	mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 600A, V_{CE} = 3600V, V_{GE} = ±15V					
	R_{Goff} = 25Ω, C_{GE}=68nF, T_{vj} = 125°C , L_σ = 280nH	E_{off}	-	3500	-	mJ
Kurzschlußverhalten SC Data	$t_P \leq$ 10µsec, $V_{GE} \leq$ 15V, acc to appl.note 2002/05					
	$T_{vj} \leq$125°C, V_{CC}=4400V, V_{CEmax}=V_{CES} -$L_{\sigma CE}$ ·di/dt	I_{SC}	-	3000	-	A
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	18	-	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip		$R_{CC'+EE'}$	-	0,12	-	mΩ

Diode / Diode			**min.**	**typ.**	**max.**	
Durchlaßspannung forward voltage	I_F = 600A, V_{GE} = 0V, T_{vj} = 25°C	V_F	3,0	3,8	4,6	V
	I_F = 600A, V_{GE} = 0V, T_{vj} = 125°C			3,9	4,7	V
Rückstromspitze peak reverse recovery current	I_F = 600A, - di_F/dt = 2000A/µs					
	V_R = 3600V, V_{GE} = -10V, T_{vj} = 25°C	I_{RM}	-	800	-	A
	V_R = 3600V, V_{GE} = -10V, T_{vj} = 125°C		-	1000	-	A
Sperrverzögerungsladung recovered charge	I_F = 600A, - di_F/dt = 2000A/µs					
	V_R = 3600V, V_{GE} = -10V, T_{vj} = 25°C	Q_r	-	550	-	µC
	V_R = 3600V, V_{GE} = -10V, T_{vj} = 125°C		-	1050	-	µC
Abschaltenergie pro Puls reverse recovery energy	I_F = 600A, - di_F/dt = 2000A/µs					
	V_R = 3600V, V_{GE} = -10V, T_{vj} = 25°C	E_{rec}	-	660	-	mJ
	V_R = 3600V, V_{GE} = -10V, T_{vj} = 125°C		-	1600	-	mJ



Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,011	K/W
	Diode/Diode, DC		-	-	0,021	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per Module $\lambda_{Paste} \leq 1$ W/m*K / $\lambda_{grease} \leq 1$ W/m*K	R_{thCK}	-	0,006	-	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj, max}$	-	-	150	°C
Betriebstemperatur Sperrschicht junction operation temperature	Schaltvorgänge IGBT(RBSOA);Diode(SOA) switching operation IGBT(RBSOA);Diode(SOA)	$T_{vj,op}$	-40	-	125	°C
Lagertemperatur storage temperature		T_{stg}	-40	-	125	°C

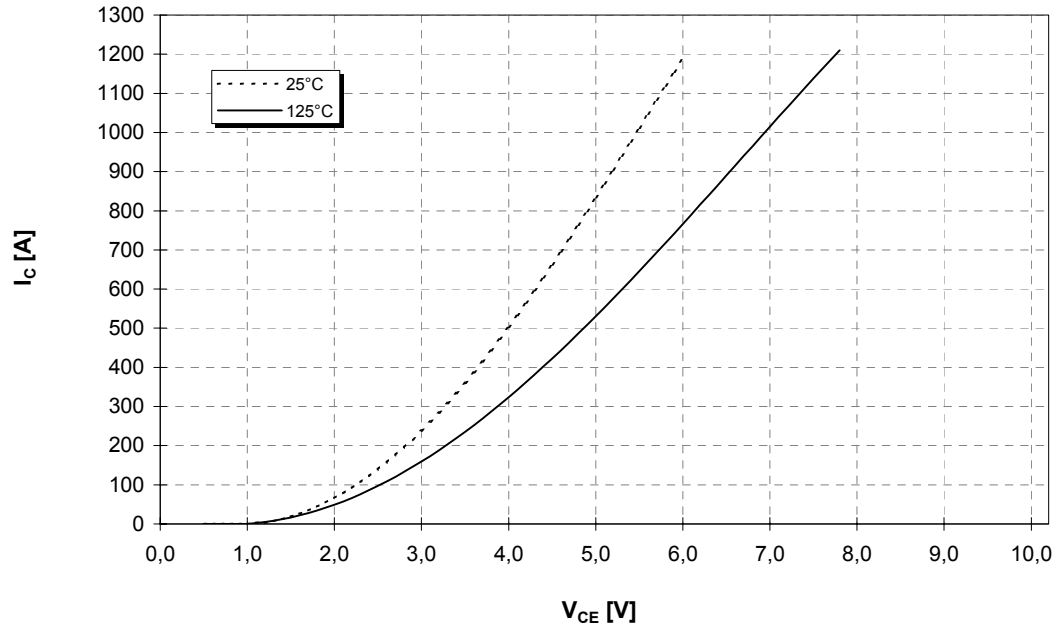
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix						
Innere Isolation internal insulation				AlN		
Kriechstrecke creepage distance				56		mm
Luftstrecke clearance				26		mm
CTI comperative tracking index				>600		
Anzugsdrehmoment f. mech. Befestigung mounting torque	Schraube /screw M6	M			5	Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Anschlüsse / terminals M4	M			2	Nm
	Anschlüsse / terminals M8				8 - 10	Nm
Gewicht weight		G		1400		g

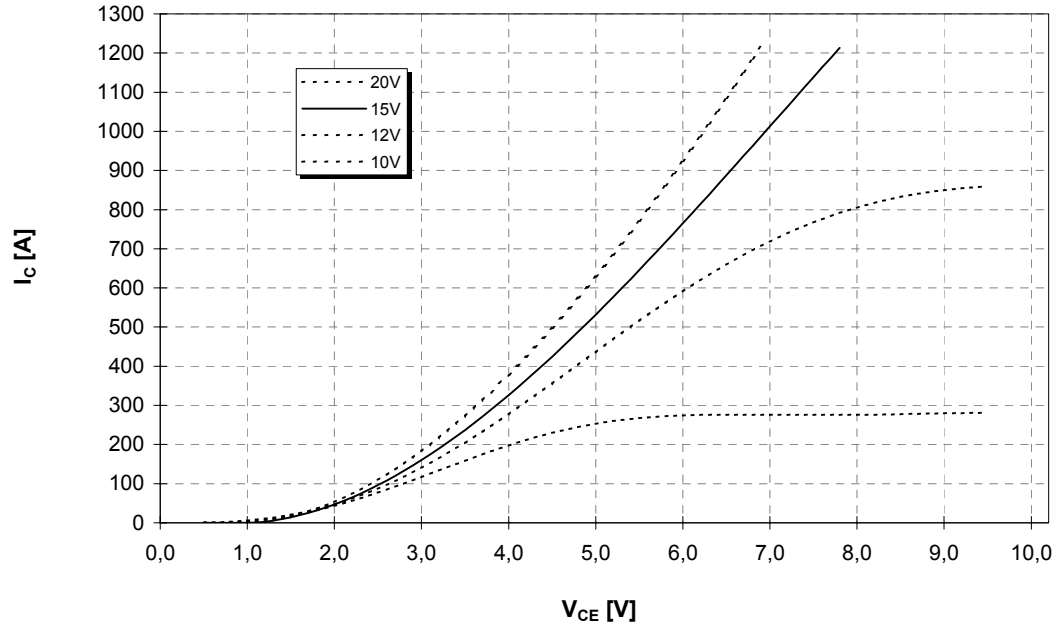
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen.

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

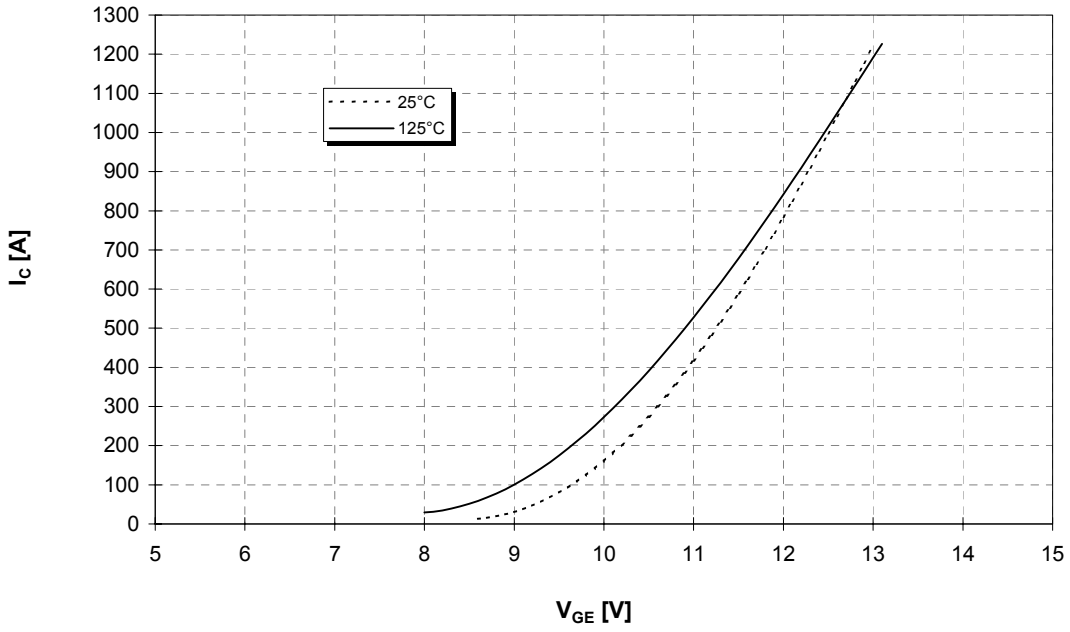
Ausgangskennlinie (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $V_{GE} = 15V$



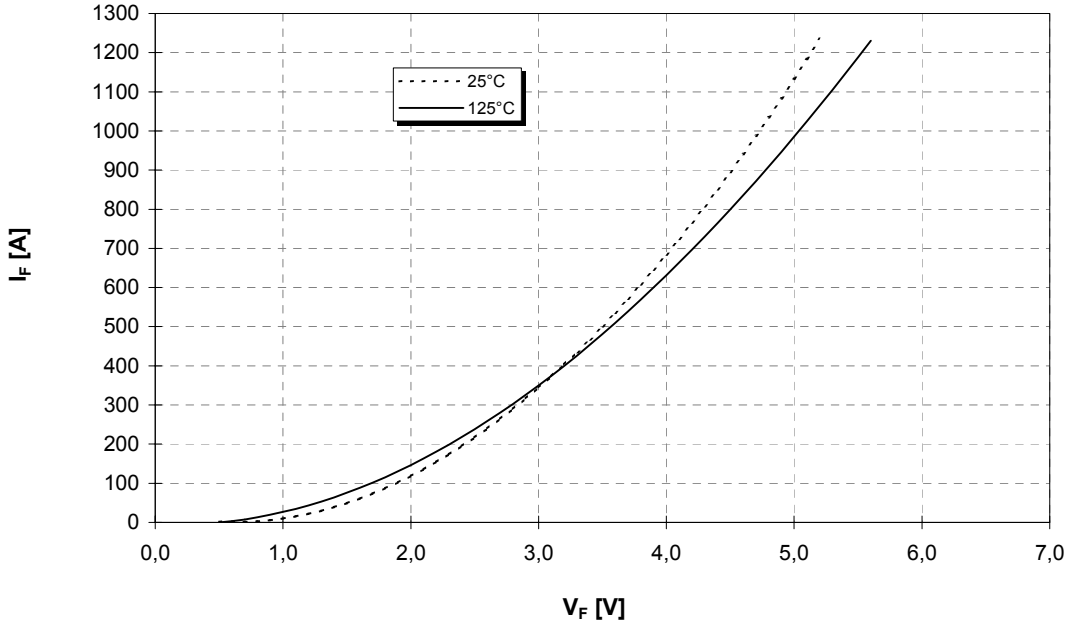
Ausgangskennlinienfeld (typisch) $I_C = f(V_{CE}), V_{GE} = <$ see inset $>$
Output characteristic (typical) $T_{vj} = 125°C$



Übertragungscharakteristik (typisch) $I_C = f(V_{GE})$
Transfer characteristic (typical) $V_{CE} = 10V$

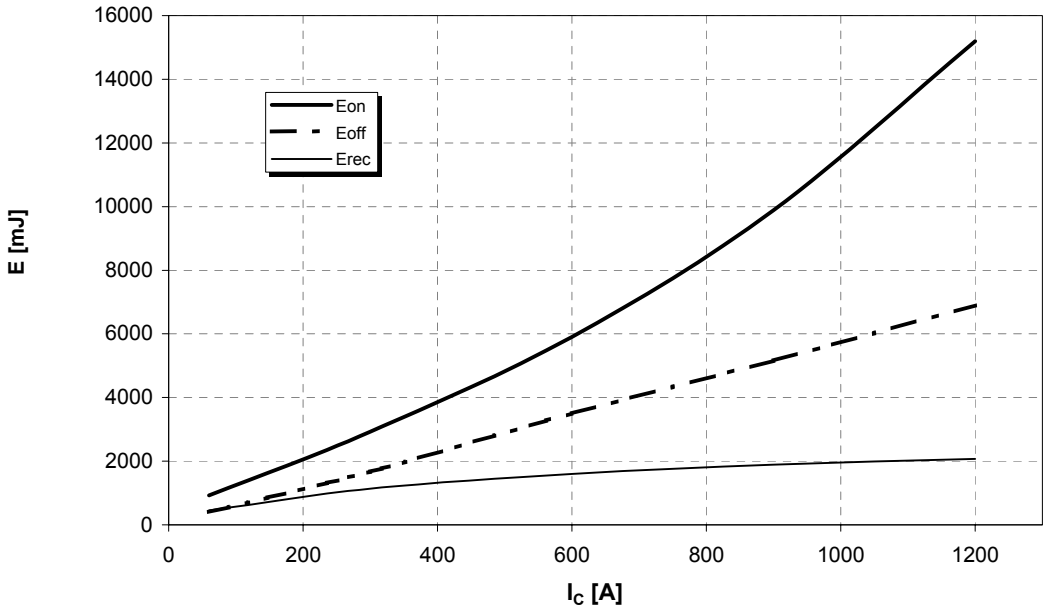


Durchlaßkennlinie der Inversdiode (typisch) $I_F = f(V_F)$
Forward characteristic of inverse diode (typical)



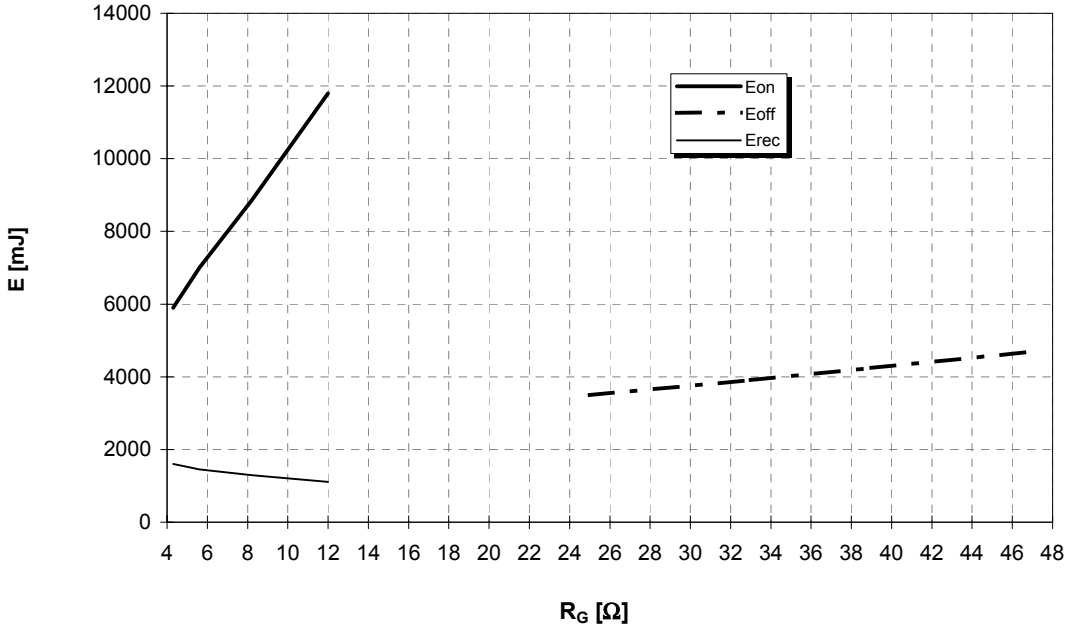
Schaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$

Switching losses (typical) R_{Gon}=4,3Ω, R_{Goff}=25Ω, C_{GE} = 68nF, V_{GE}=±15V, V_{CE} = 3600V, T_{vj} = 125°C,

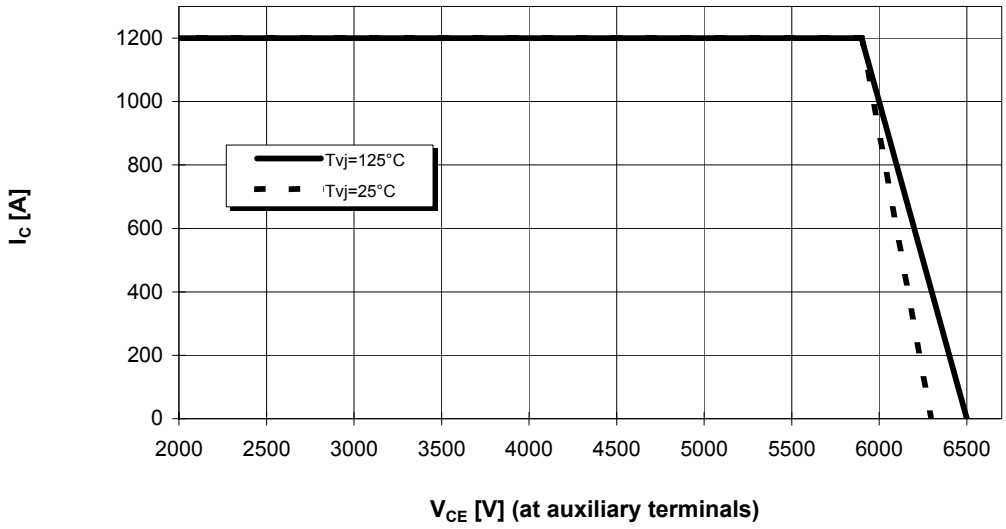


Schaltverluste (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$

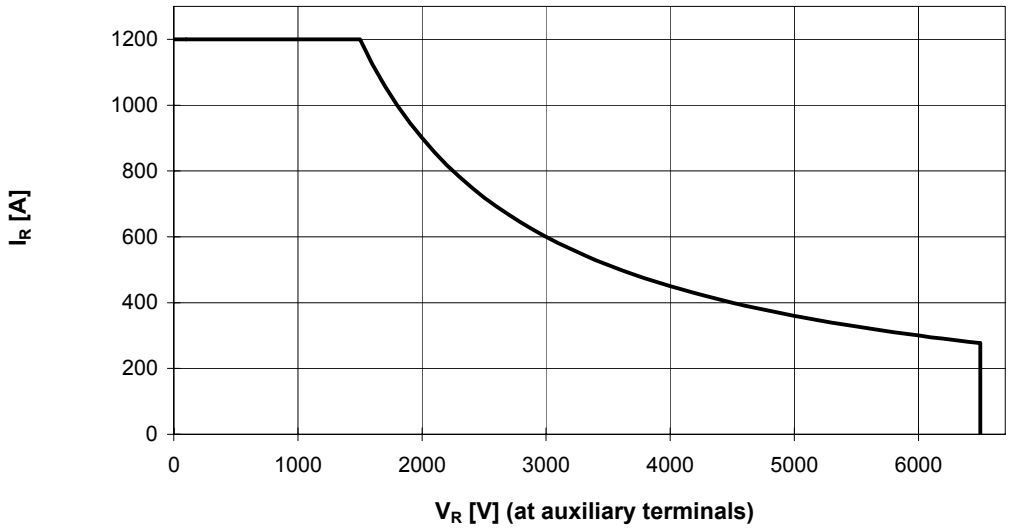
Switching losses (typical) I_C = 600A , V_{CE} = 3600V , V_{GE}=±15V, C_{GE}=68nF , T_{vj} = 125°C



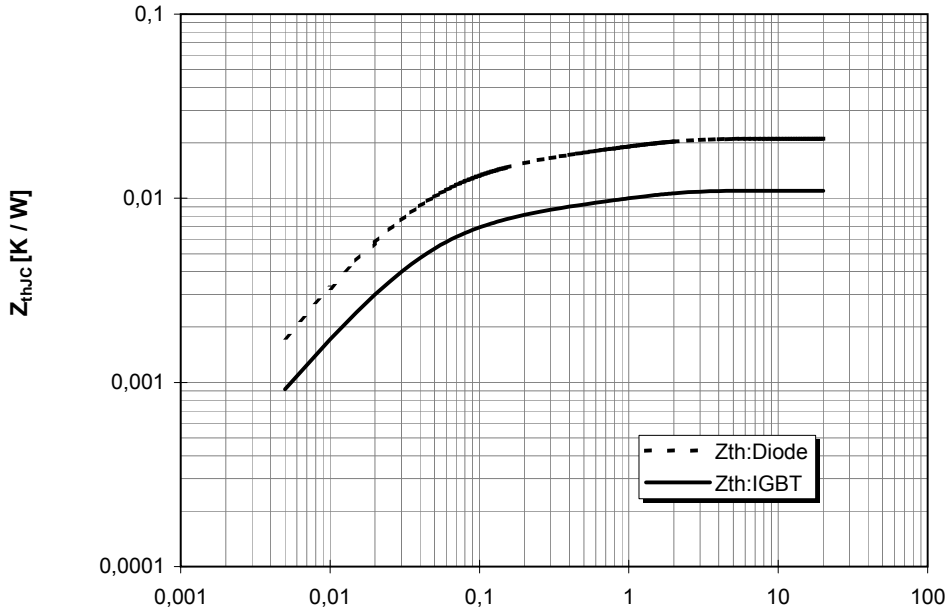
Sicherer Arbeitsbereich (RBSOA)
Reverse bias safe operation area (RBSOA) $R_{G,off}$ = 25Ω, C_{GE}=68nF, V_{GE}=±15V, T_{vj}= <see inset>, V_{CC} <=4400V



Sicherer Arbeitsbereich Diode (SOA)
safe operation area Diode (SOA) P_{max} = 1800kW ; T_{vj}= 125°C

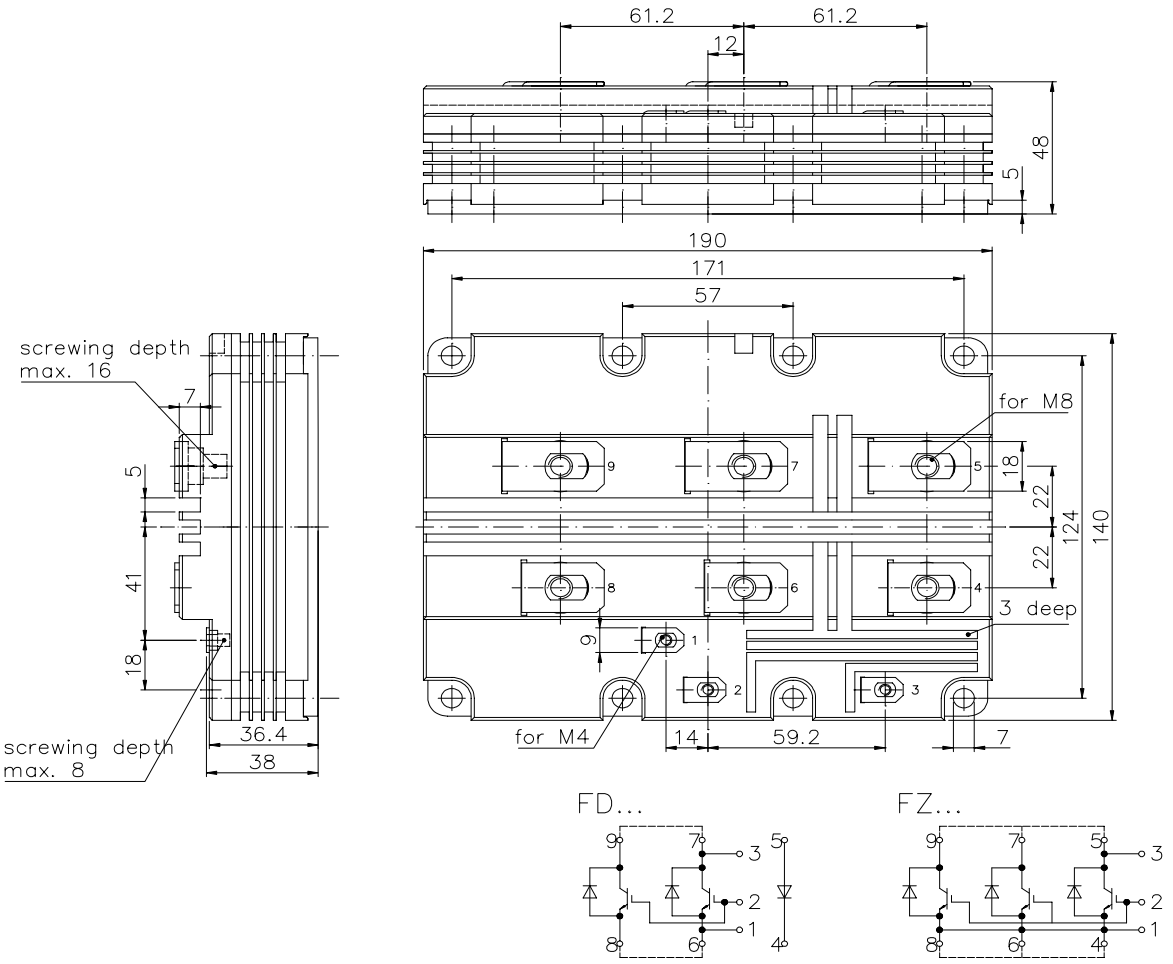


Transienter Wärmewiderstand $Z_{thJC} = f(t)$
Transient thermal impedance



i		1	2	3	4
r_i [K/kW]	: IGBT	4,95	2,75	0,66	2,64
τ_i [s]	: IGBT	0,030	0,10	0,30	1,0
r_i [K/kW]	: Diode	9,45	5,25	1,26	5,04
τ_i [s]	: Diode	0,030	0,10	0,30	1,0

Äußere Abmessungen /
extenal dimensions



Anschlüsse / Terminals	1	Hilfsemitter / auxiliary emitter
	2	Gate / gate
	3	Hilfskollektor / auxiliary collector
	4,6,8,	Emitter / emitter
	5,7,9	Kollektor / collector

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