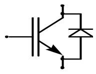
Technische Information / Technical Information

eupec

IGBT-Module
IGBT-Modules

BSM 50 GD 60 DLC E3226



Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung collector-emitter voltage		V_{CES}	600	V
Kollektor-Dauergleichstrom DC-collector current	T_C= 80°C T_C= 25°C	$I_{C,nom.}$ I_C	50 70	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P= 1ms, T_C= 80°C	I_{CRM}	100	A
Gesamt-Verlustleistung total power dissipation	T_C= 25°C, Transistor	P_{tot}	250	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	50	A
Periodischer Spitzenstrom repetitive peak forw. current	t_P= 1ms	I_{FRM}	100	A
Grenzlastintegral der Diode I^2t - value, Diode	V_R= 0V, t_p= 10ms, T_{Vj}= 125°C	I^2t	760	A^2s
Isolations-Prüfspannung insulation test voltage	RMS, f= 50Hz, t= 1min.	V_{ISOL}	2,5	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	I_C= 50A, V_{GE}= 15V, T_{vj}= 25°C I_C= 50A, V_{GE}= 15V, T_{vj}= 125°C	$V_{CE\ sat}$	- -	1,95 2,20	2,45 -	V V
Gate-Schwellenspannung gate threshold voltage	I_C= 1mA, 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}	-	2,2	-	nF
Rückwirkungskapazität reverse transfer capacitance	f= 1MHz, T_{vj}= 25°C, V_{CE}= 25V, V_{GE}= 0V	C_{res}	-	0,2	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE}= 600V, V_{GE}= 0V, T_{vj}= 25°C V_{CE}= 600V, V_{GE}= 0V, T_{vj}= 125°C	I_{CES}	- -	1 1	500 -	µA 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= 50A, V_{CC}= 300V					
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 25°C	$t_{d,on}$	-	40	-	ns
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 125°C		-	42	-	ns
Anstiegszeit (induktive Last) rise time (inductive load)	I_C= 50A, V_{CC}= 300V					
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 25°C	t_r	-	9	-	ns
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 125°C		-	10	-	ns
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I_C= 50A, V_{CC}= 300V					
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 25°C	$t_{d,off}$	-	120	-	ns
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 125°C		-	130	-	ns
Fallzeit (induktive Last) fall time (inductive load)	I_C= 50A, V_{CC}= 300V					
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 25°C	t_f	-	12	-	ns
	V_{GE}= ±15V, R_G= 2,7Ω, T_{vj}= 125°C		-	21	-	ns
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C= 50A, V_{CC}= 300V, V_{GE}= 15V R_G= 2,7Ω, T_{vj}= 125°C, L_σ= 15nH	E_{on}	-	0,5	-	mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C= 50A, V_{CC}= 300V, V_{GE}= 15V R_G= 2,7Ω, T_{vj}= 125°C, L_σ= 15nH	E_{off}	-	1,0	-	mJ
Kurzschlußverhalten SC Data	$t_P \le 10$µsec, $V_{GE} \le 15$V $T_{Vj} \le 125$°C, V_{CC}=360V, $V_{CEmax}=V_{CES} - L_{\sigma CE} \cdot dI/dt$	I_{SC}	-	225	-	A
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	60	-	nH
Modul-Leitungswiderstand, Anschlüsse - Chip lead resistance, terminals - chip	T_C= 25°C	$R_{CC'+EE'}$	-	8,0	-	mΩ

Charakteristische Werte / Characteristic values

Diode / Diode			min.	typ.	max.	
Durchlaßspannung forward voltage	I_F= 50A, V_{GE}= 0V, T_{vj}= 25°C	V_F	-	1,25	1,6	V
	I_F= 50A, V_{GE}= 0V, T_{vj}= 125°C		-	1,20	-	V
Rückstromspitze peak reverse recovery current	I_F= 50A, -di_F/dt= 2900A/µsec					
	V_R= 300V, V_{GE}= -10V, T_{vj}= 25°C	I_{RM}	-	88	-	A
	V_R= 300V, V_{GE}= -10V, T_{vj}= 125°C		-	88	-	A
Sperrverzögerungsladung recoverred charge	I_F= 50A, -di_F/dt= 2900A/µsec					
	V_R= 300V, V_{GE}= -10V, T_{vj}= 25°C	Q_r	-	3,4	-	µC
	V_R= 300V, V_{GE}= -10V, T_{vj}= 125°C		-	5,6	-	µC
Abschaltenergie pro Puls reverse recovery energy	I_F= 50A, -di_F/dt= 2900A/µsec					
	V_R= 300V, V_{GE}= -10V, T_{vj}= 25°C	E_{rec}	-	-	-	mJ
	V_R= 300V, V_{GE}= -10V, T_{vj}= 125°C		-	1,5	-	mJ

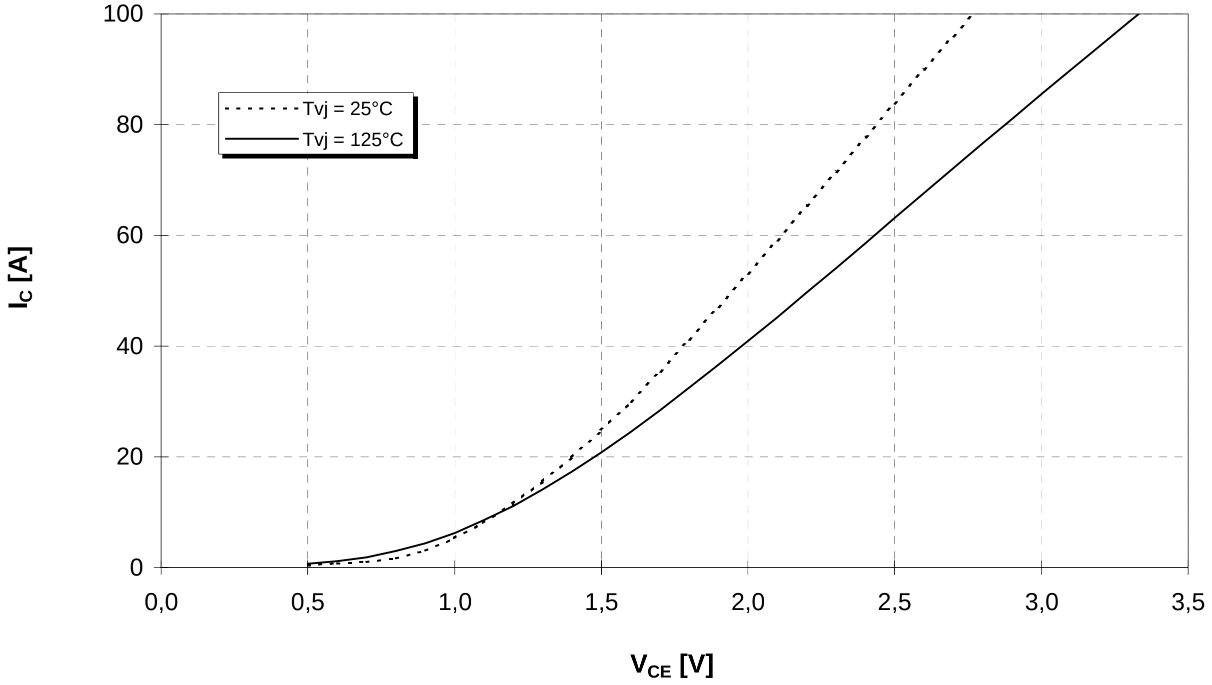
Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,50	K/W
	Diode / diode, DC		-	-	0,80	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module λ_{Paste}= 1W/m*K / λ_{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

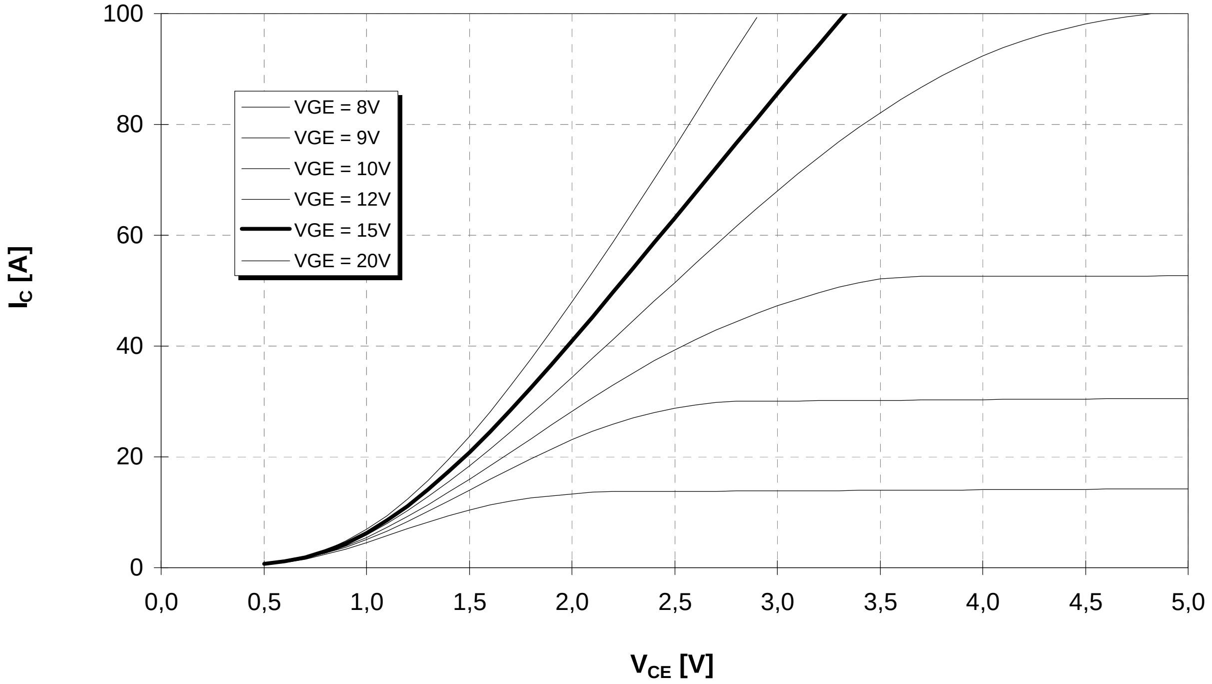
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix						
Innere Isolation internal insulation				Al_2O_3		
CTI comperative tracking index				225		
Anzugsdrehmoment f. mech. Befestigung mounting torque		M	-15	4	+15	Nm %
Gewicht weight		G		180		g

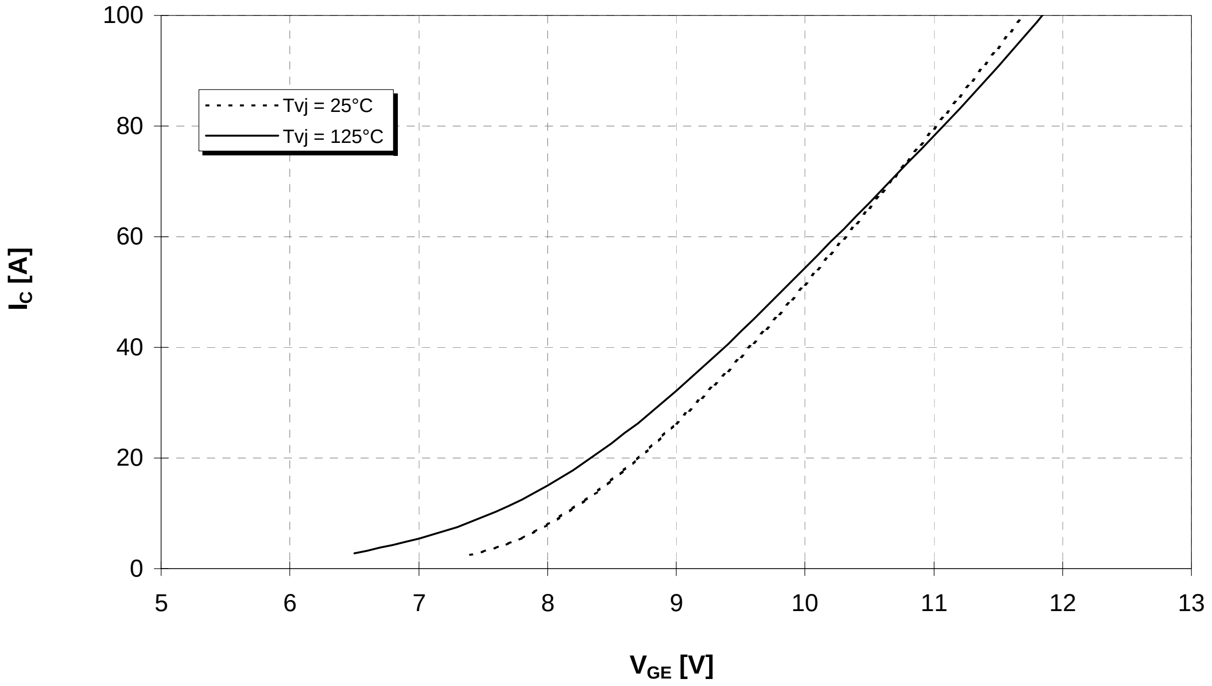
Ausgangskennlinie (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $V_{GE} = 15V$



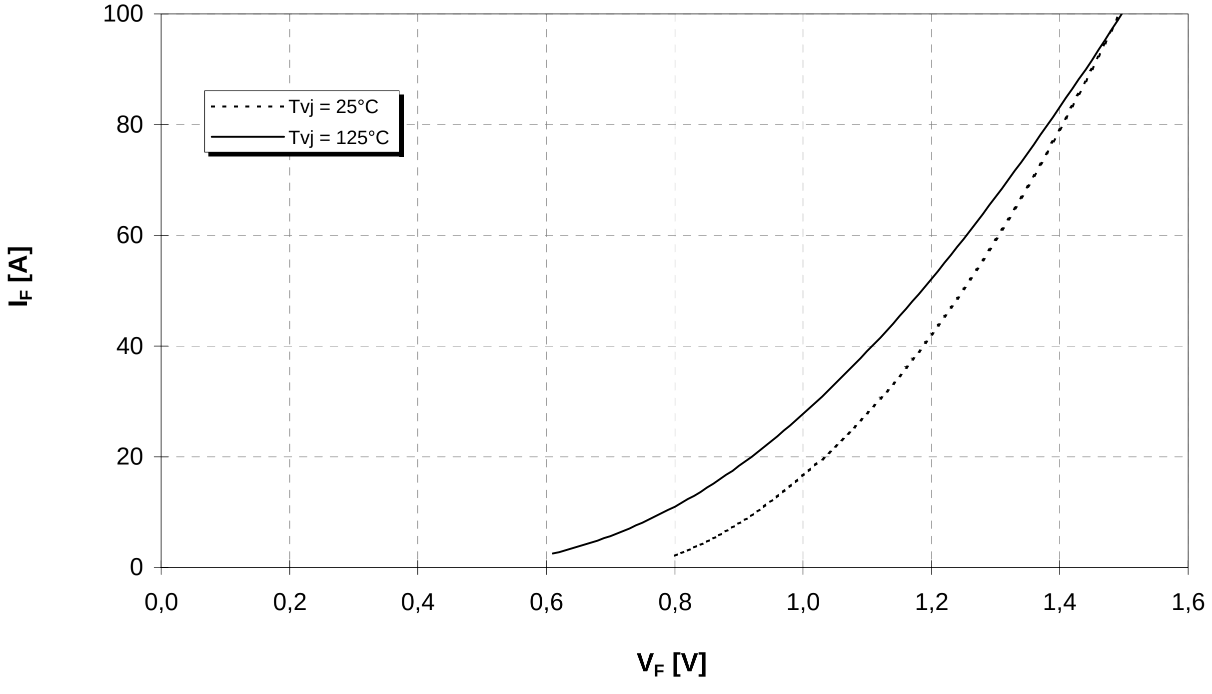
Ausgangskennlinienfeld (typisch) $I_C = f(V_{CE})$
Output characteristic (typical) $T_{vj} = 125°C$



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



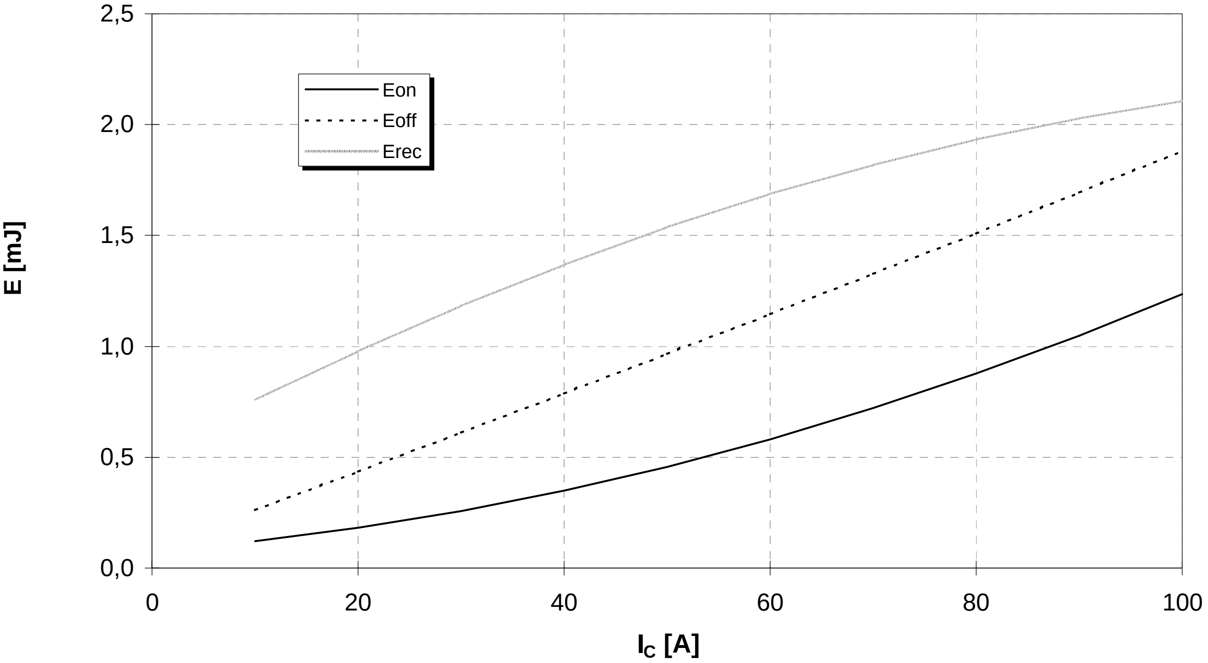
Durchlaßkennlinie der Inversdiode (typisch) **$I_F = f(V_F)$**
Forward characteristic of inverse diode (typical)



Schaltverluste (typisch)
Switching losses (typical)

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

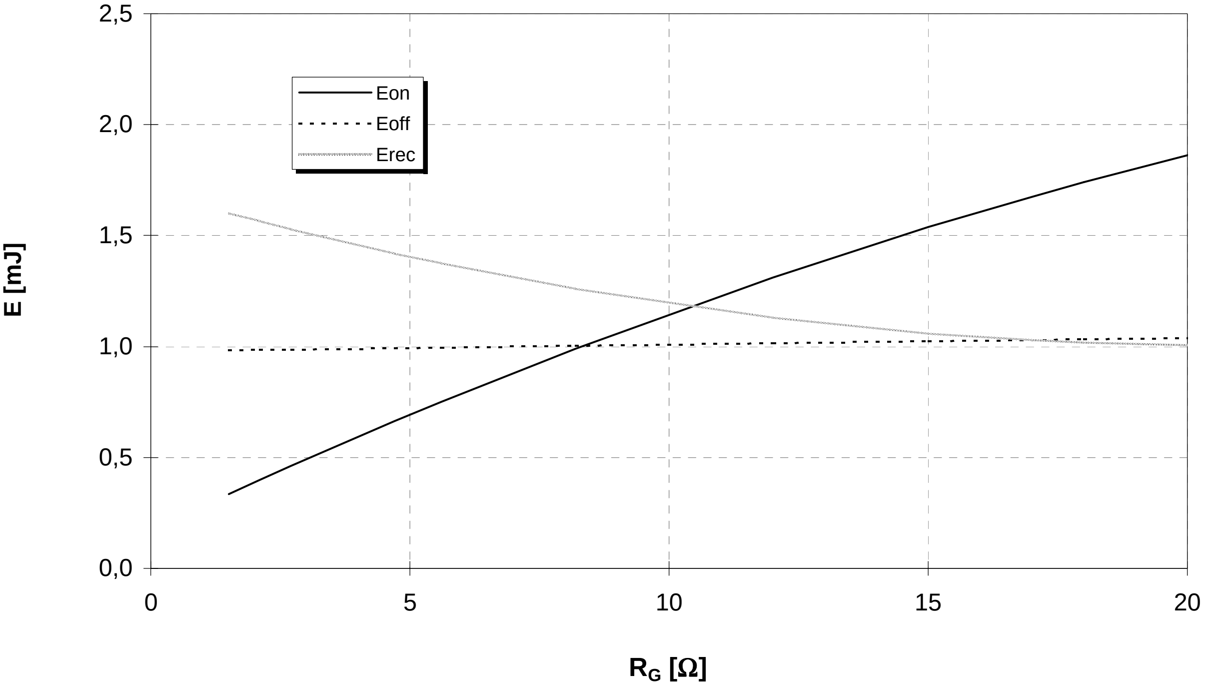
$R_{G,on} = 2{,}7\Omega$, $R_{G,off} = 2{,}7\Omega$, $V_{CC} = 300V$, $T_{vj} = 125°C$



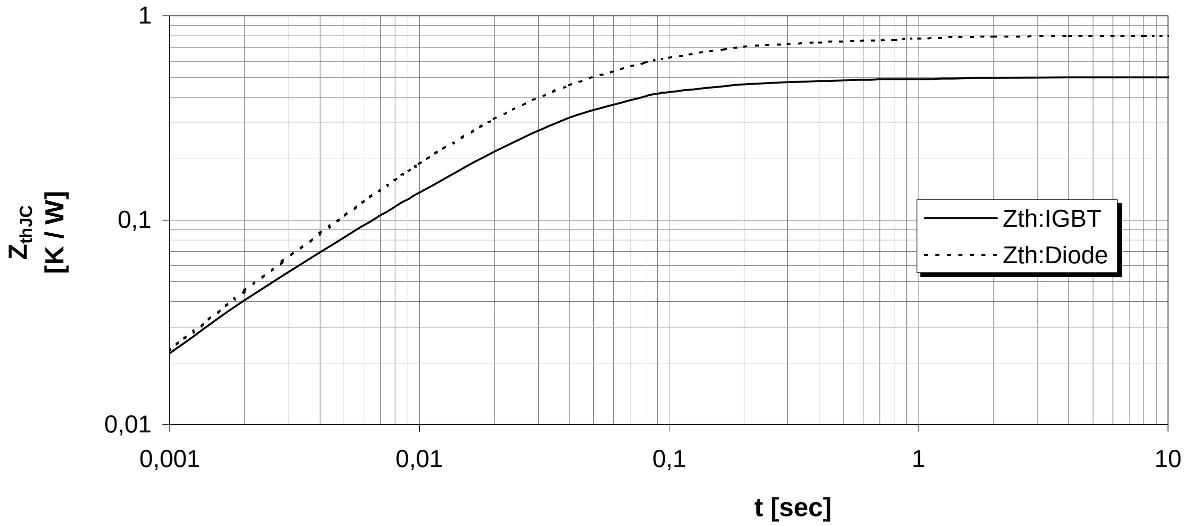
Schaltverluste (typisch)
Switching losses (typical)

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

$I_C = 50A$, $V_{CE} = 300V$, $T_{vj} = 125°C$

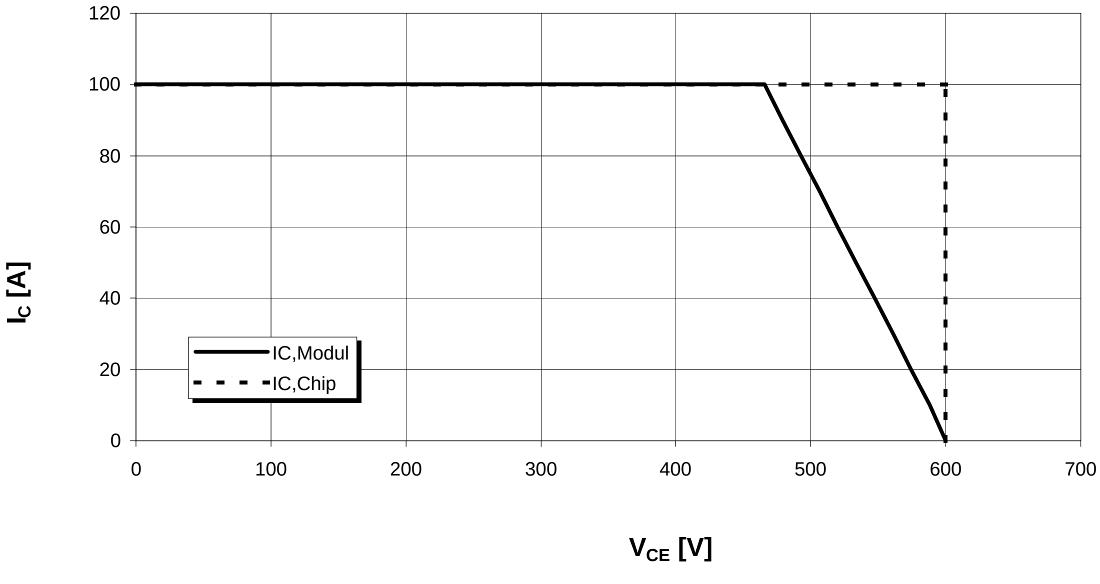


Transienter Wärmewiderstand $Z_{thJC} = f(t)$
Transient thermal impedance



i		1	2	3	4
r_i [K/kW]	: IGBT	21,2	262,0	176,2	40,6
τ_i [sec]	: IGBT	0,0018	0,0240	0,0651	0,6626
r_i [K/kW]	: Diode	281,9	270,4	169,8	77,9
τ_i [sec]	: Diode	0,0487	0,0169	0,1069	0,9115

Sicherer Arbeitsbereich (RBSOA)
Reverse bias safe operation area (RBSOA) $R_{G,off}$= 2,7Ω, T_{vj}= 125°C



Gehäusemaße / Schaltbild
Package outline / Circuit diagram