



Höchstzulässige Werte / maximum rated values

Elektrische Eigenschaften / electrical properties

Kollektor Emitter Sperrspannung collector emitter voltage		V_{CES}	1200	V
Kollektor Dauergleichstrom DC collector current	$T_c = 80^\circ\text{C}$ $T_c = 25^\circ\text{C}$	$I_{C, \text{nom}}$ I_C	50 78	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ms}$, $T_c = 80^\circ\text{C}$	I_{CRM}	100	A
Gesamt Verlustleistung total power dissipation	$T_c = 25^\circ\text{C}$	P_{tot}	400	W
Gate Emitter Spitzenspannung gate emitter peak voltage		V_{GES}	+/- 20	V
Dauergleichstrom DC forward current	$T_c = 80^\circ\text{C}$	I_F	50	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1\text{ms}$	I_{FRM}	100	A
Grenzlastintegral I^2t value	$V_R = 0\text{V}$, $t_p = 10\text{ms}$, $T_{vj} = 125^\circ\text{C}$	I^2t	880	A^2s
Isolations Prüfspannung insulation test voltage	RMS, $f = 50\text{Hz}$, $t = 1\text{min}$	V_{ISOL}	2,5	kV

Charakteristische Werte / characteristic values

Transistor Wechselrichter / transistor inverter

			min.	typ.	max.	
Kollektor Emitter Sättigungsspannung collector emitter saturation voltage	$V_{GE} = 15\text{V}$, $T_{vj} = 25^\circ\text{C}$, $I_C = I_{C, \text{nom}}$	V_{CESat}	-	2,5	3	V
	$V_{GE} = 15\text{V}$, $T_{vj} = 125^\circ\text{C}$, $I_C = I_{C, \text{nom}}$		-	3,1	3,7	V
Gate Schwellenspannung gate threshold voltage	$V_{CE} = V_{GE}$, $T_{vj} = 25^\circ\text{C}$, $I_C = 2\text{mA}$	$V_{GE(th)}$	4,5	5,5	6,5	V
Gateladung gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$	Q_G	-	0,54	-	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}	-	3,3	-	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_{fes}	-	0,22	-	nF
Kollektor Emitter Reststrom collector emitter cutt off current	$V_{GE} = 0\text{V}$, $T_{vj} = 25^\circ\text{C}$, $V_{CE} = 1200\text{V}$	I_{CES}	-	-	5	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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Charakteristische Werte / characteristic values

Transistor Wechselrichter / transistor inverter

			min.	typ.	max.	
Einschaltverzögerungszeit (induktive Last) turn on delay time (inductive load)	$I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 25^\circ C$	$t_{d, on}$	-	-	-	ns
	$V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 125^\circ C$		-	44	100	ns
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 25^\circ C$	t_r	-	-	-	ns
	$V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 125^\circ C$		-	56	100	ns
Abschaltverzögerungszeit (induktive Last) turn off delay time (inductive load)	$I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 25^\circ C$	$t_{d, off}$	-	-	-	ns
	$V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 125^\circ C$		-	380	500	ns
Fallzeit (induktive Last) fall time (inductive load)	$I_C = I_{C, nom}, V_{CC} = 600V$ $V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 25^\circ C$	t_f	-	-	-	ns
	$V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 125^\circ C$		-	70	100	ns
Einschaltverlustenergie pro Puls turn on energy loss per pulse	$I_C = I_{C, nom}, V_{CC} = 600V, L_\sigma = 85nH$ $V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 125^\circ C$	E_{on}	-	7,4	-	mJ
Ausschaltverlustenergie pro Puls turn off energy loss per pulse	$I_C = I_{C, nom}, V_{CC} = 600V, L_\sigma = 85nH$ $V_{GE} = \pm 15V, R_G = 22\Omega, T_{vj} = 125^\circ C$	E_{off}	-	4,4	-	mJ
Kurzschlussverhalten SC data	$t_p \leq 10\mu sec, V_{GE} \leq 15V, T_{vj} \leq 125^\circ C$ $V_{CC} = 900V, V_{CEmax} = V_{CES} - L_{\sigma CE} \cdot di/dt$	I_{SC}	-	400	-	A
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	-	-	nH
Leitungswiderstand, Anschluss-Chip lead resistance, terminal-chip	$T_c = 25^\circ C$	$R_{CC/EE}$	-	-	-	mΩ

Charakteristische Werte / characteristic values

Diode Wechselrichter / diode inverter

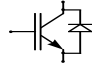
Durchlassspannung forward voltage	$I_F = I_{C, nom}, V_{GE} = 0V, T_{vj} = 25^\circ C$	V_F	-	2,2	2,7	V
	$I_F = I_{C, nom}, V_{GE} = 0V, T_{vj} = 125^\circ C$		-	1,8	-	V
Rückstromspitze peak reverse recovery current	$I_F = I_{C, nom}, -di_F/dt = 530A/\mu s$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$	I_{RM}	-	-	-	A
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	45	-	A
Sperrverzögerungsladung recovered charge	$I_F = I_{C, nom}, -di_F/dt = 530A/\mu s$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$	Q_r	-	3,4	-	μQ
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	8	-	μQ
Ausschaltenergie pro Puls reverse recovery energy	$I_F = I_{C, nom}, -di_F/dt = 530A/\mu s$ $V_R = 600V, V_{GE} = -15V, T_{vj} = 25^\circ C$	E_{rec}	-	-	-	mJ
	$V_R = 600V, V_{GE} = -15V, T_{vj} = 125^\circ C$		-	2,7	-	mJ

Technische Information / technical information

eupec

IGBT-Module
IGBT-Modules

BSM50GX120DN2



Thermische Eigenschaften / thermal properties

Innerer Wärmewiderstand; DC thermal resistance, junction to case; DC	Transistor Wechselr. / transistor inverter	R_{thJC}	-	-	0,3	K/W
	Diode Wechselrichter / diode inverter		-	-	0,6	K/W
Übergangs Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{paste}= 1W/m^*K$ / $\lambda_{grease}= 1W/m^*K$	R_{thCK}	-	0,02	-	K/W
Höchstzulässige Sperrschichttemp. 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, mech. Befestigung mounting torque	Schraube M5 screw M5	M	3	-	6	Nm
Gewicht weight		G			180	g

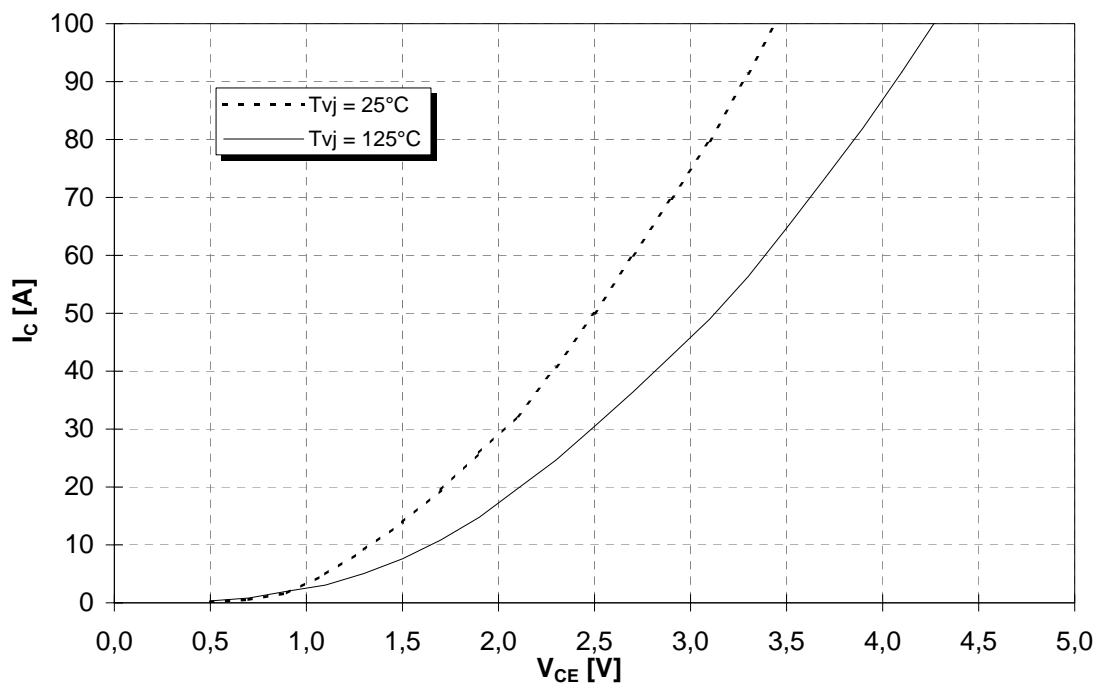
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen technischen Erläuterungen.

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



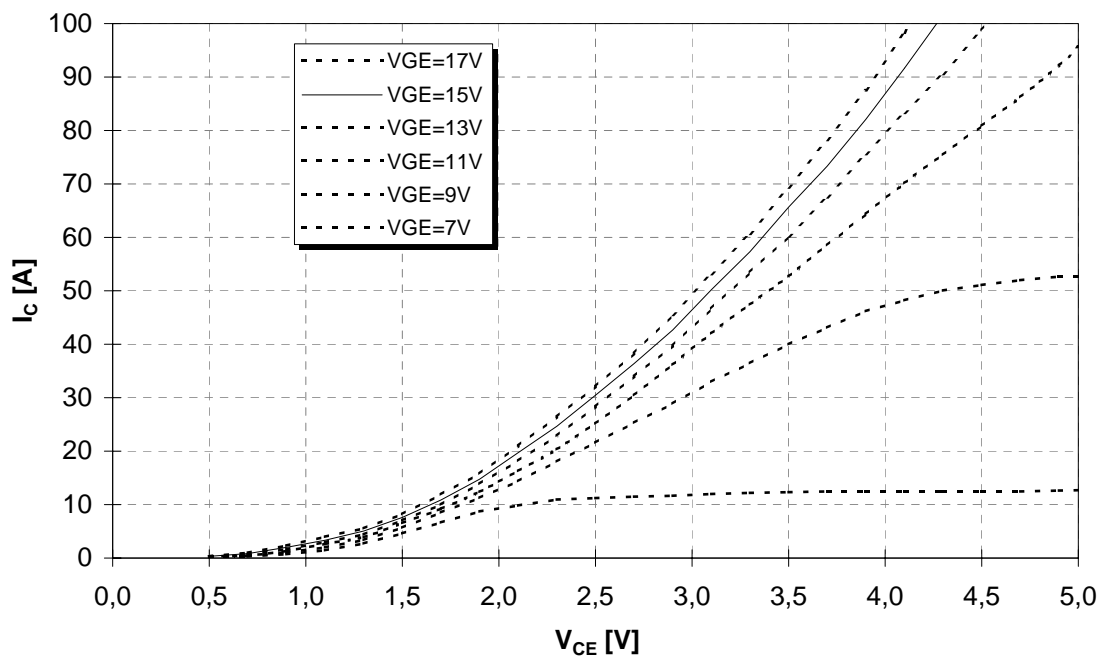
Ausgangskennlinie (typisch)
output characteristic (typical)

$I_C = f(V_{CE})$
 $V_{GE} = 15V$



Ausgangskennlinienfeld (typisch)
output characteristic (typical)

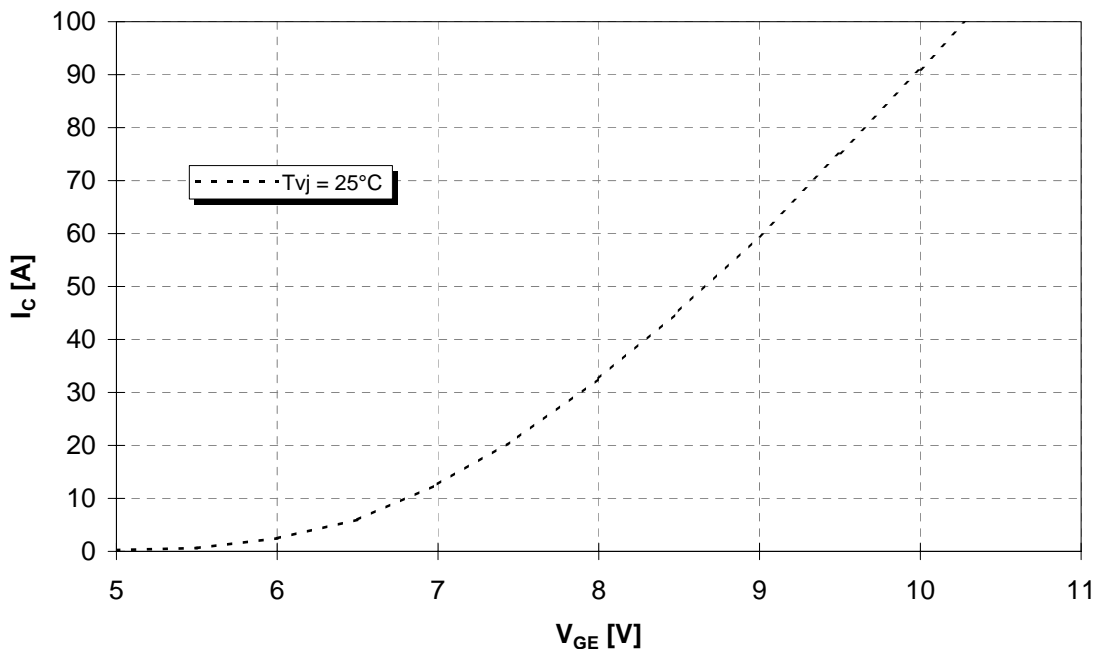
$I_C = f(V_{CE})$
 $T_{vj} = 125^\circ C$





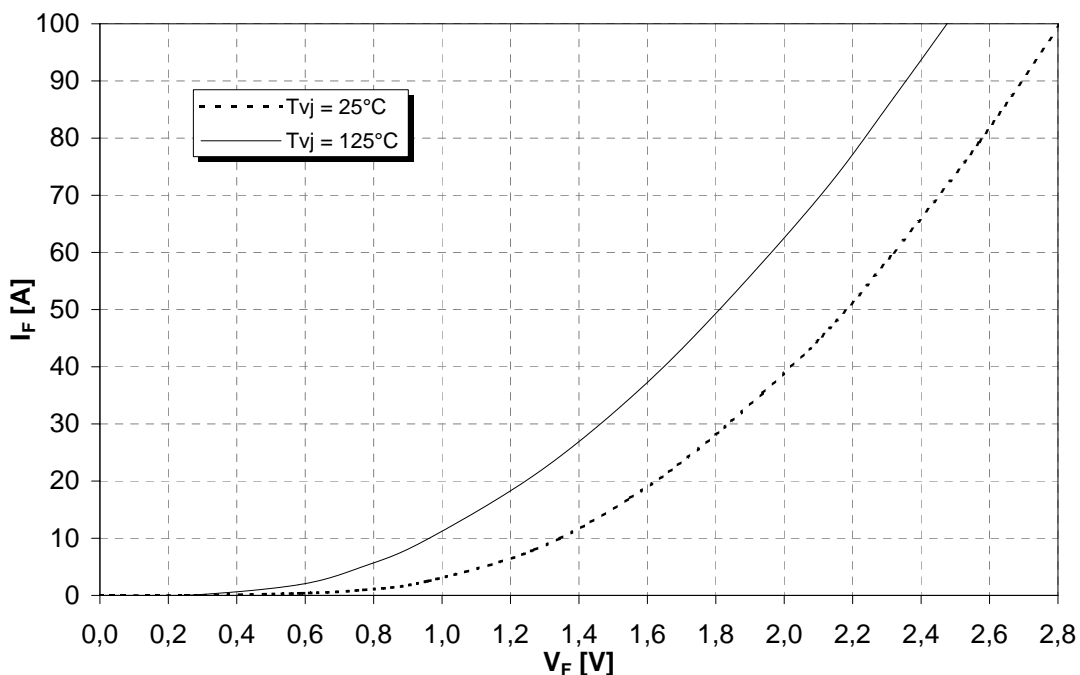
Übertragungscharakteristik (typisch)
transfer characteristic (typical)

$I_C = f(V_{GE})$
 $V_{CE} = 20V$



Durchlasskennlinie der Inversdiode (typisch)
forward characteristic of inverse diode (typical)

$I_F = f(V_F)$

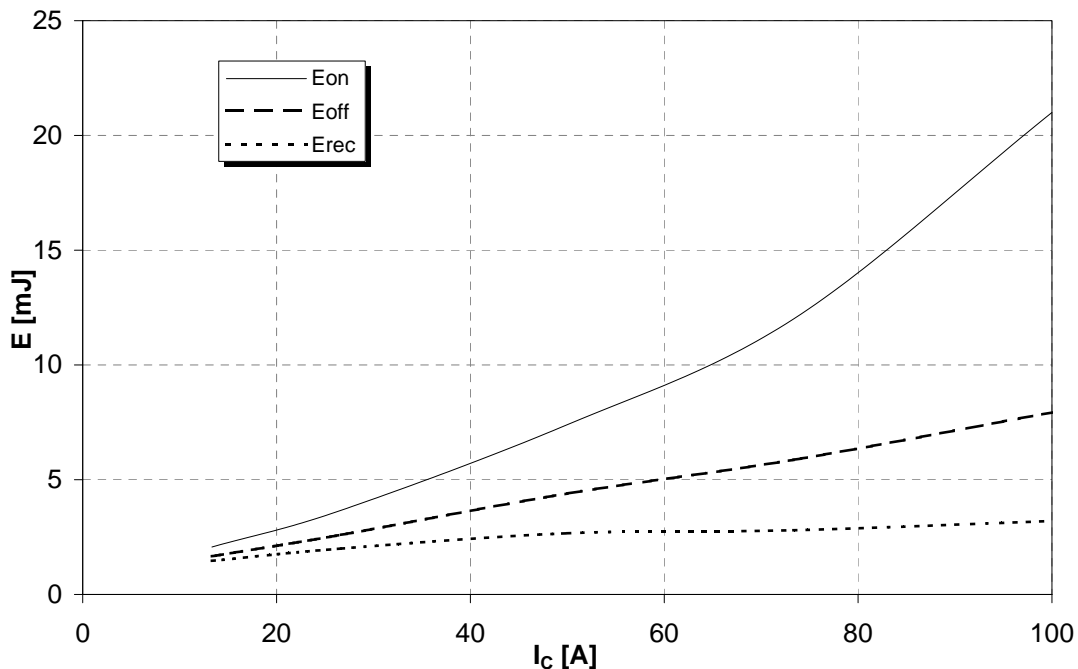




Schaltverluste (typisch)
Switching losses (typical)

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

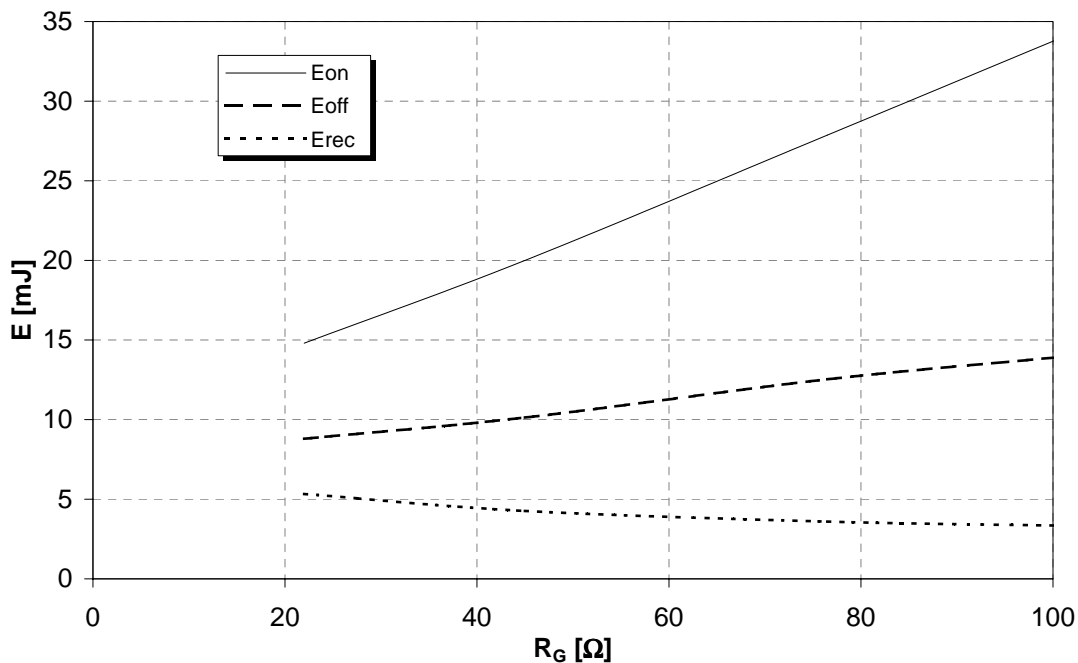
$V_{GE}=15V$, $R_{qon}=R_{qoff}=22\Omega$, $V_{CE}=600V$, $T_i=125^\circ C$

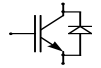


Schaltverluste (typisch)
Switching losses (typical)

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

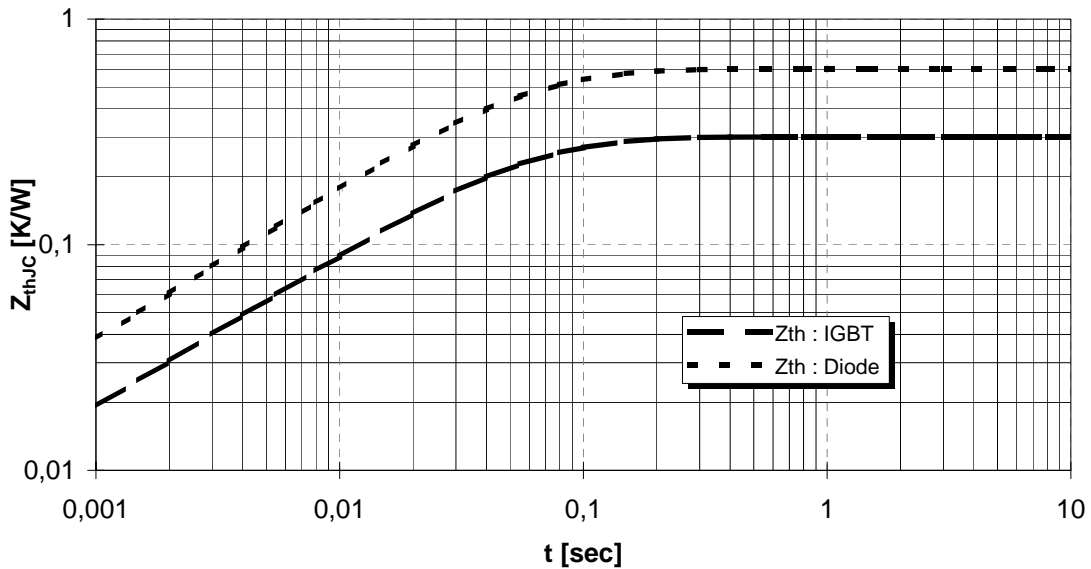
$V_{GE}=15V$, $I_C=50A$, $V_{CE}=600V$, $T_i=125^\circ C$





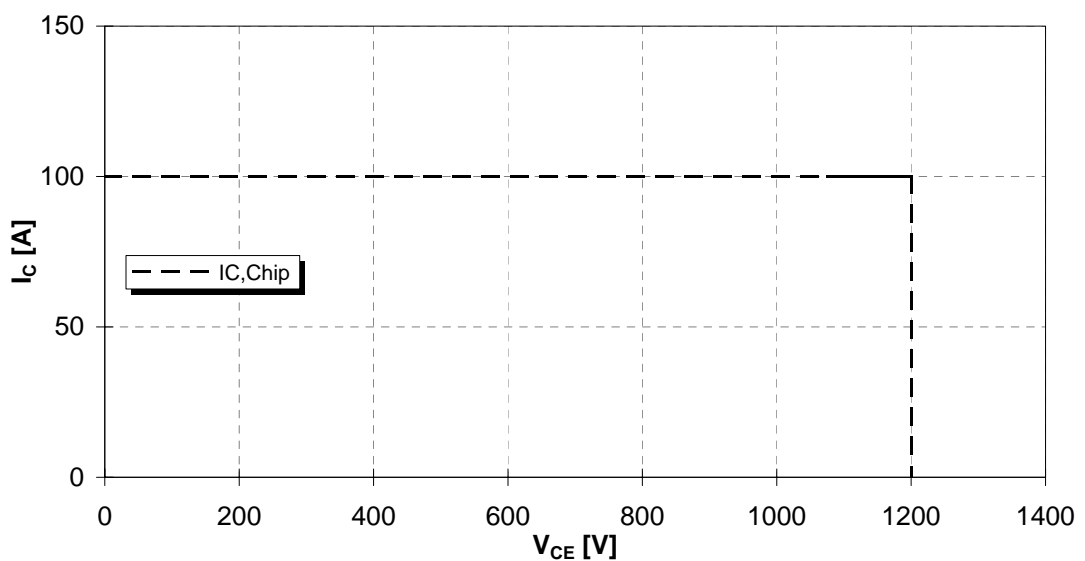
Transienter Wärmewiderstand
Transient thermal impedance

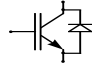
$$Z_{thJC} = f(t)$$



i	1	2	3	4
r_i [K/kW] : IGBT	126,11	151,15	17,04	5,70
τ_i [sec] : IGBT	6,499E-02	2,601E-02	2,364E-03	1,187E-05
r_i [K/kW] : Diode	251,96	302,64	34,08	11,32
τ_i [K/kW] : Diode	6,499E-02	2,601E-02	2,364E-03	1,187E-05

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





Gehäusemaße / Schaltbild Package outline / Circuit diagram

