

Technische Information / Technical Information

IGBT-Module
IGBT-Modules

FS 300 R17 KE3

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vorläufige Daten
preliminary data

Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

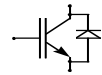
Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1700	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}$	$I_{C,nom.}$ I_C	300 375	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ ms}, T_C = 80^{\circ}\text{C}$	I_{CRM}	600	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$, Transistor	P_{tot}	1660	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V
Dauergleichstrom DC forward current		I_F	300	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1\text{ ms}$	I_{FRM}	600	A
Grenzlastintegral der Diode I^2t - value, Diode	$V_R = 0\text{V}, t_p = 10\text{ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	t.b.d.	$\text{k A}^2\text{s}$
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50\text{ Hz}, t = 1\text{ min.}$	V_{ISOL}	3,4	kV

Charakteristische Werte / Characteristic values

Transistor / Transistor

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$I_C = 300\text{A}, V_{GE} = 15\text{V}, T_{vj} = 25^{\circ}\text{C}$	$V_{CE\text{ sat}}$	-	2,0	2,45	V
	$I_C = 300\text{A}, V_{GE} = 15\text{V}, T_{vj} = 125^{\circ}\text{C}$		-	2,4	t.b.d.	V
Gate-Schwellenspannung gate threshold voltage	$I_C = 12\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	$V_{GE(th)}$	5,2	5,8	6,4	V
Gateladung gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$	Q_G	-	3,4	-	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}	-	25	-	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_{res}	-	0,9	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1700\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$	I_{CES}	-	-	5	mA
	$V_{CE} = 1700\text{V}, V_{GE} = 0\text{V}, T_{vj} = 125^{\circ}\text{C}$		-	-	-	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 / Transistor****min. typ. max.**

Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = 300A, V_{CE} = 900V$	$t_{d,on}$	-	0,25	-	μs
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 25^\circ C$					
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 125^\circ C$					
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 300A, V_{CE} = 900V$	t_r	-	0,10	-	μs
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 25^\circ C$					
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 125^\circ C$					
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = 300A, V_{CE} = 900V$	$t_{d,off}$	-	0,82	-	μs
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 25^\circ C$					
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 125^\circ C$					
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 300A, V_{CE} = 900V$	t_f	-	0,10	-	μs
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 125^\circ C$					
	$V_{GE} = \pm 15V, R_G = 4,7\Omega, T_{vj} = 125^\circ C$					
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 300A, V_{CE} = 900V, V_{GE} = \pm 15V$	E_{on}	-	120	-	mJ
	$R_G = 4,7\Omega, T_{vj} = 125^\circ C, L_\sigma = 80nH$					
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 300A, V_{CE} = 900V, V_{GE} = \pm 15V$	E_{off}	-	100	-	mJ
	$R_G = 4,7\Omega, T_{vj} = 125^\circ C, L_\sigma = 80nH$					
Kurzschlußverhalten SC Data	$t_p \leq 10\mu s, V_{GE} \leq 15V$	I_{SC}	-	1110	-	A
	$T_{vj} \leq 125^\circ C, V_{CC} = 1000V, V_{CEmax} = V_{CES} - L_{\sigma CE} \cdot di/dt$					
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	20	-	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	pro Zweig / per arm, $T_C = 25^\circ C$	R_{CC+EE}	-	1,1	-	m Ω

Charakteristische Werte / Characteristic values**Diode / Diode****min. typ. max.**

Durchlaßspannung forward voltage	$I_F = 300A, V_{GE} = 0V, T_{vj} = 25^\circ C$	V_F	-	1,8	2,2	V
	$I_F = 300A, V_{GE} = 0V, T_{vj} = 125^\circ C$					
Rückstromspitze peak reverse recovery current	$I_F = 300A, -di_F/dt = 3500A/\mu s$	I_{RM}	-	370	-	A
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 25^\circ C$					
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 125^\circ C$					
Sperrverzögerungsladung recovered charge	$I_F = 300A, -di_F/dt = 3500A/\mu s$	Q_r	-	80	-	μC
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 25^\circ C$					
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 125^\circ C$					
Abschaltenergie pro Puls reverse recovery energy	$I_F = 300A, -di_F/dt = 3500A/\mu s$	E_{rec}	-	40	-	mJ
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 25^\circ C$					
	$V_R = 900V, V_{GE} = -15V, T_{vj} = 125^\circ C$					

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Charakteristische Werte / Characteristic values

NTC - Widerstand / NTC - thermistor

			min.	typ.	max.	
Nennwiderstand rated resistance	$T_C = 25^\circ\text{C}$	R_{25}	-	5	-	k Ω
Abweichung von R_{100} deviation of R_{100}	$T_C = 100^\circ\text{C}; R_{100} = 493\Omega$	$\Delta R/R$	-5	-	5	%
Verlustleistung Power dissipation	$T_C = 25^\circ\text{C}$	P_{25}	-	-	20	mW
B - Wert B - value	$R_2 = R_1 \exp[B(1/T_2 - 1/T_1)]$	$B_{25/50}$	-	3375	-	K

Thermische Eigenschaften / Thermal properties

			min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to case	Transistor / transistor, DC	R_{thJC}	-	-	0,075	K/W
	Diode/Diode, DC		-	-	0,130	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{\text{Paste}} = 1 \text{ W/m}^2\text{K} \quad / \quad \lambda_{\text{grease}} = 1 \text{ W/m}^2\text{K}$	R_{thCK}	-	0,005	-	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj \text{ max}}$	-	-	150	$^\circ\text{C}$
Betriebstemperatur operation temperature		T_{vjop}	-40	-	125	$^\circ\text{C}$
Lagertemperatur storage temperature		T_{stg}	-40	-	125	$^\circ\text{C}$

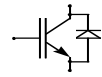
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix					
Innere Isolation internal insulation				Al_2O_3	
Kriechstrecke creepage distance				14	mm
Luftstrecke clearance				10	mm
CTI comperative tracking index				225	
Anzugsdrehmoment f. mech. Befestigung mounting torque	Schraube / screw M5	M	3	-	6 Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Anschlüsse / terminals M6	M	3	-	6 Nm
Gewicht weight		G		916	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.

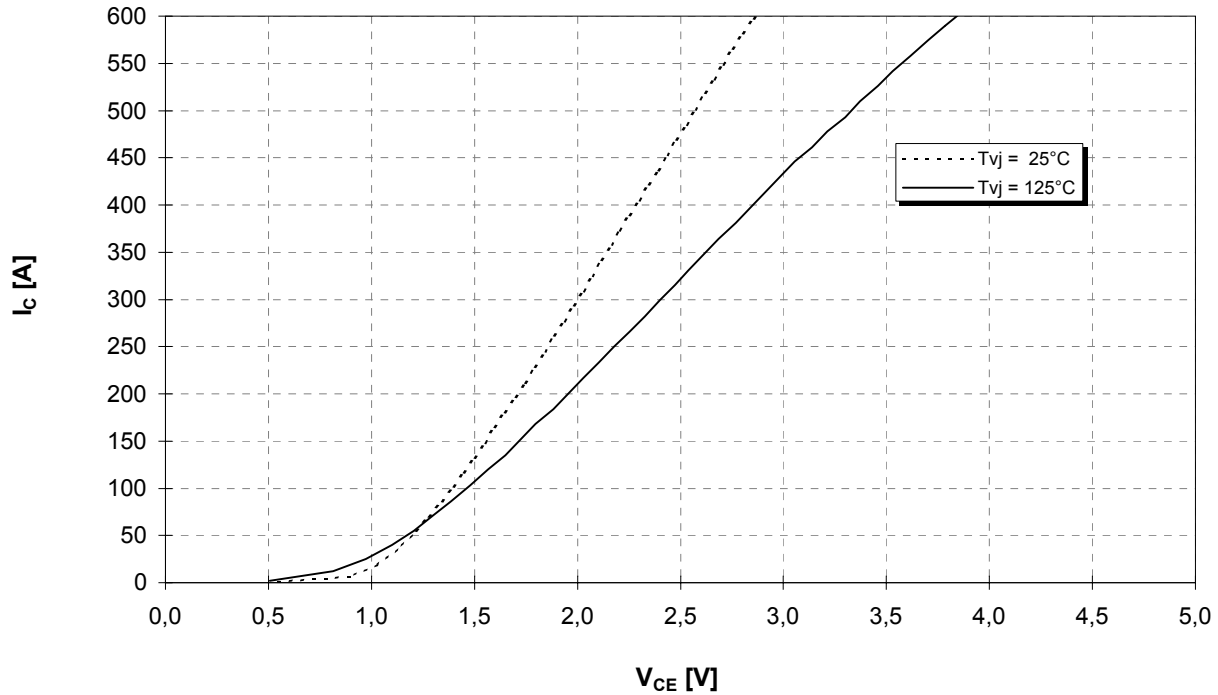


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Ausgangskennlinie (typisch)
Output characteristic (typical)

$$I_c = f(V_{CE})$$

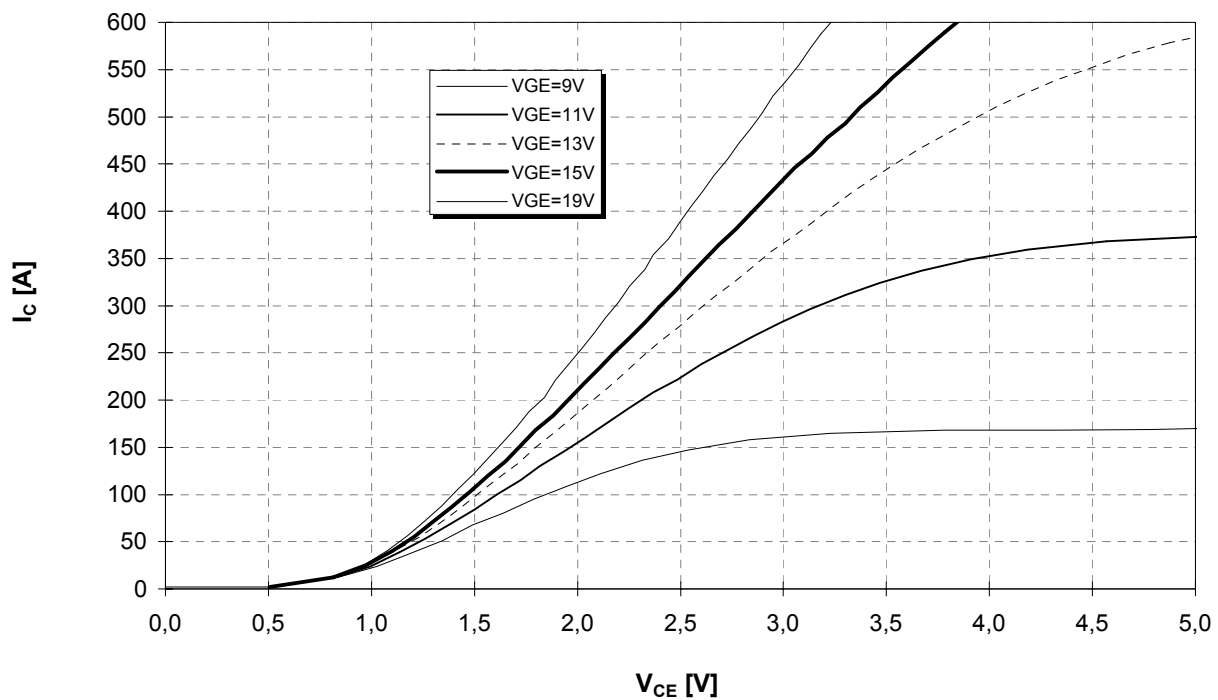
$V_{GE} = 15V$



Ausgangskennlinienfeld (typisch)
Output characteristic (typical)

$$I_c = f(V_{CE})$$

$T_{vj} = 125^{\circ}C$



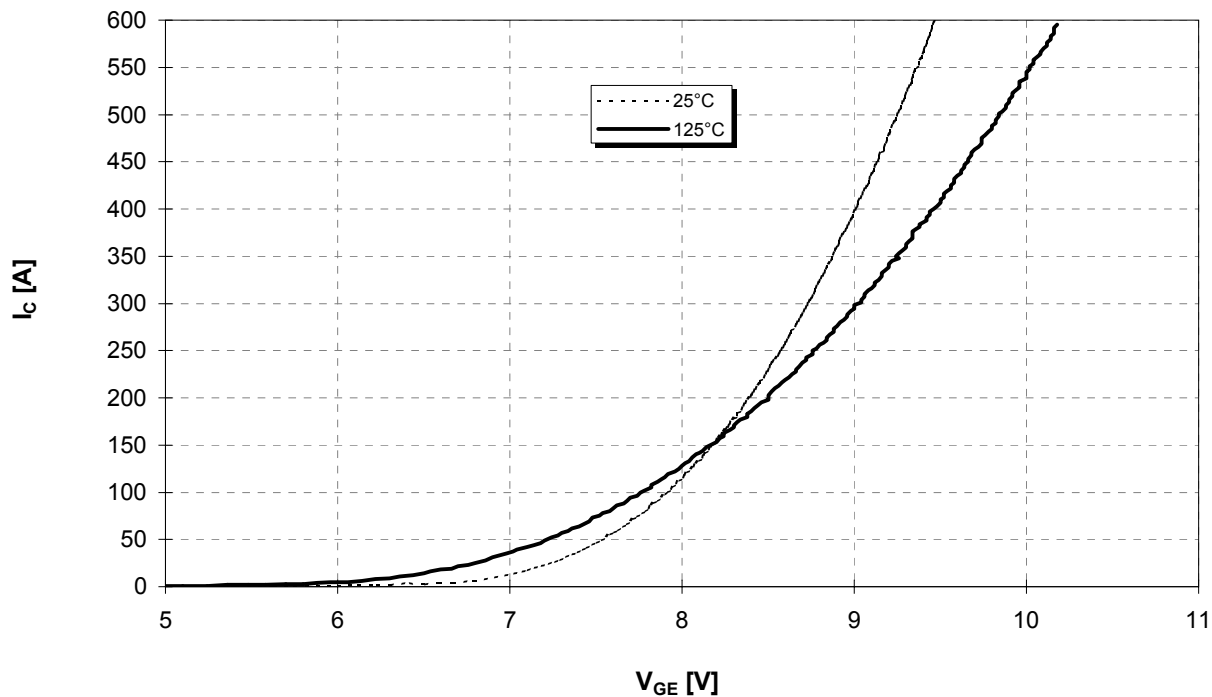


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Übertragungscharakteristik (typisch)
Transfer characteristic (typical)

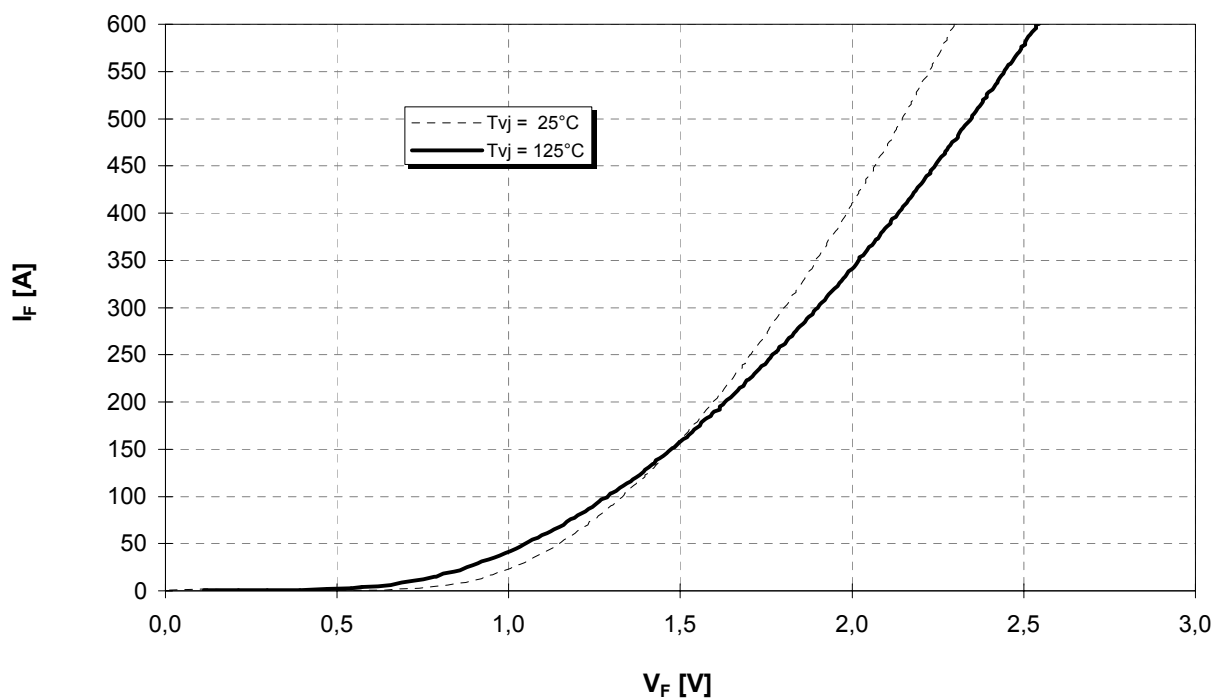
$$I_C = f(V_{GE})$$

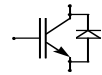
$V_{CE} = 20V$



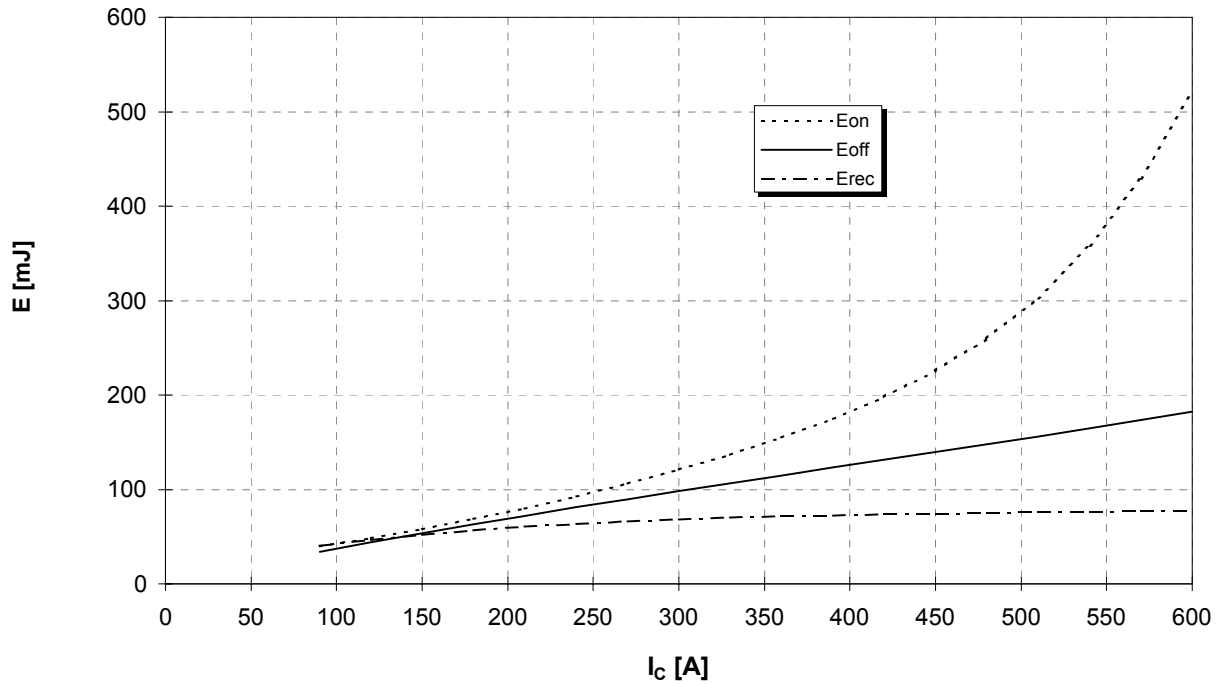
Durchlaßkennlinie der Inversdiode (typisch)
Forward characteristic of inverse diode (typical)

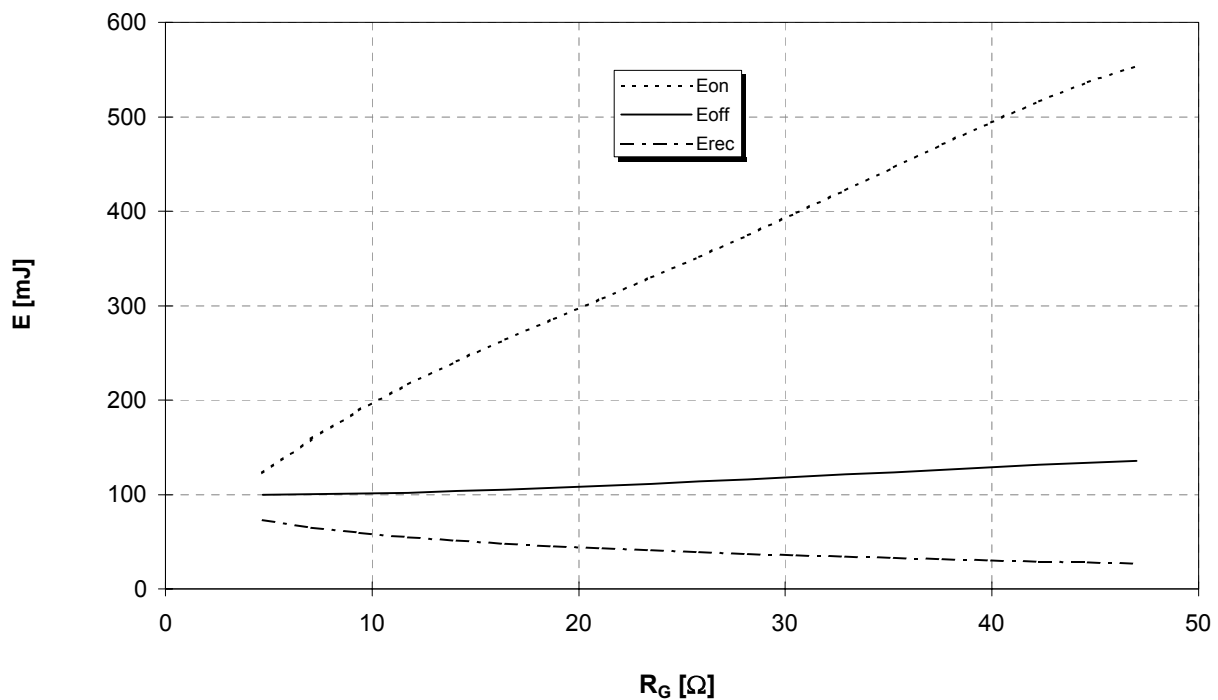
$$I_F = f(V_F)$$




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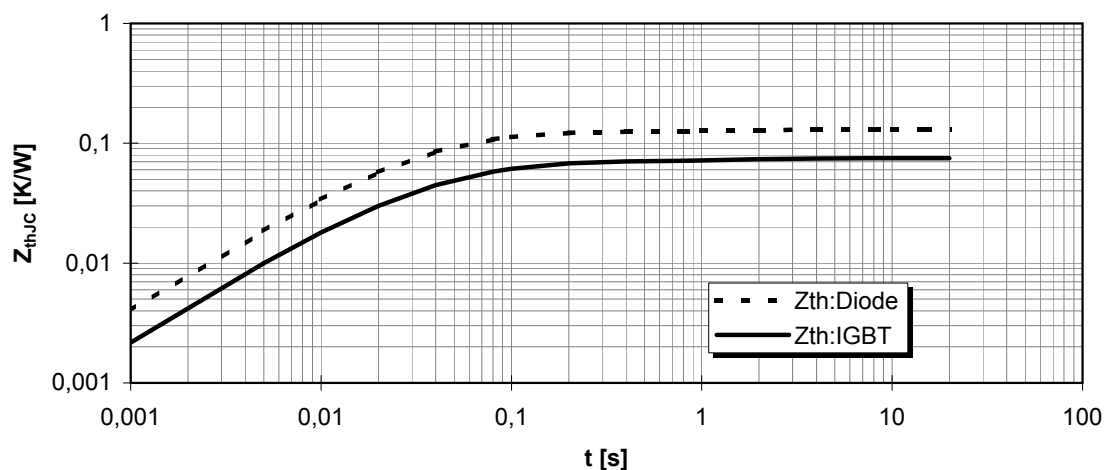
Schaltverluste (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$

Switching losses (typical) $V_{GE} = \pm 15V$, $R_{Gon} = R_{Goff} = 4,7\Omega$, $V_{CE} = 900V$, $T_{vj} = 125^\circ C$

Schaltverluste (typisch)
Switching losses (typical)

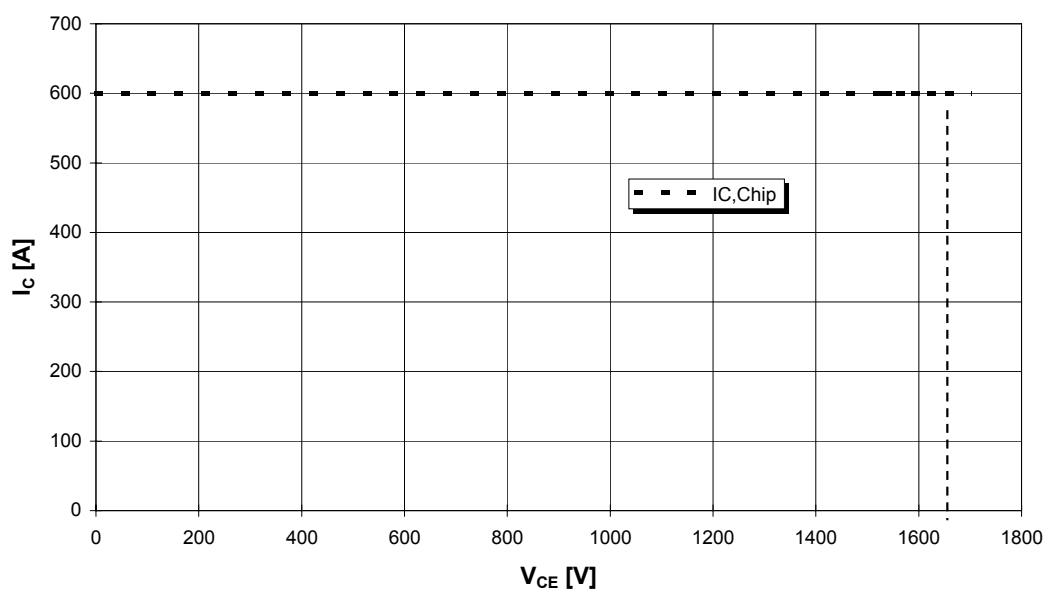
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
 $V_{GE} = \pm 15V$, $I_C = 300A$, $V_{CE} = 900V$, $T_{vj} = 125^\circ C$


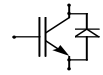
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Transienter Wärmewiderstand
Transient thermal impedance

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

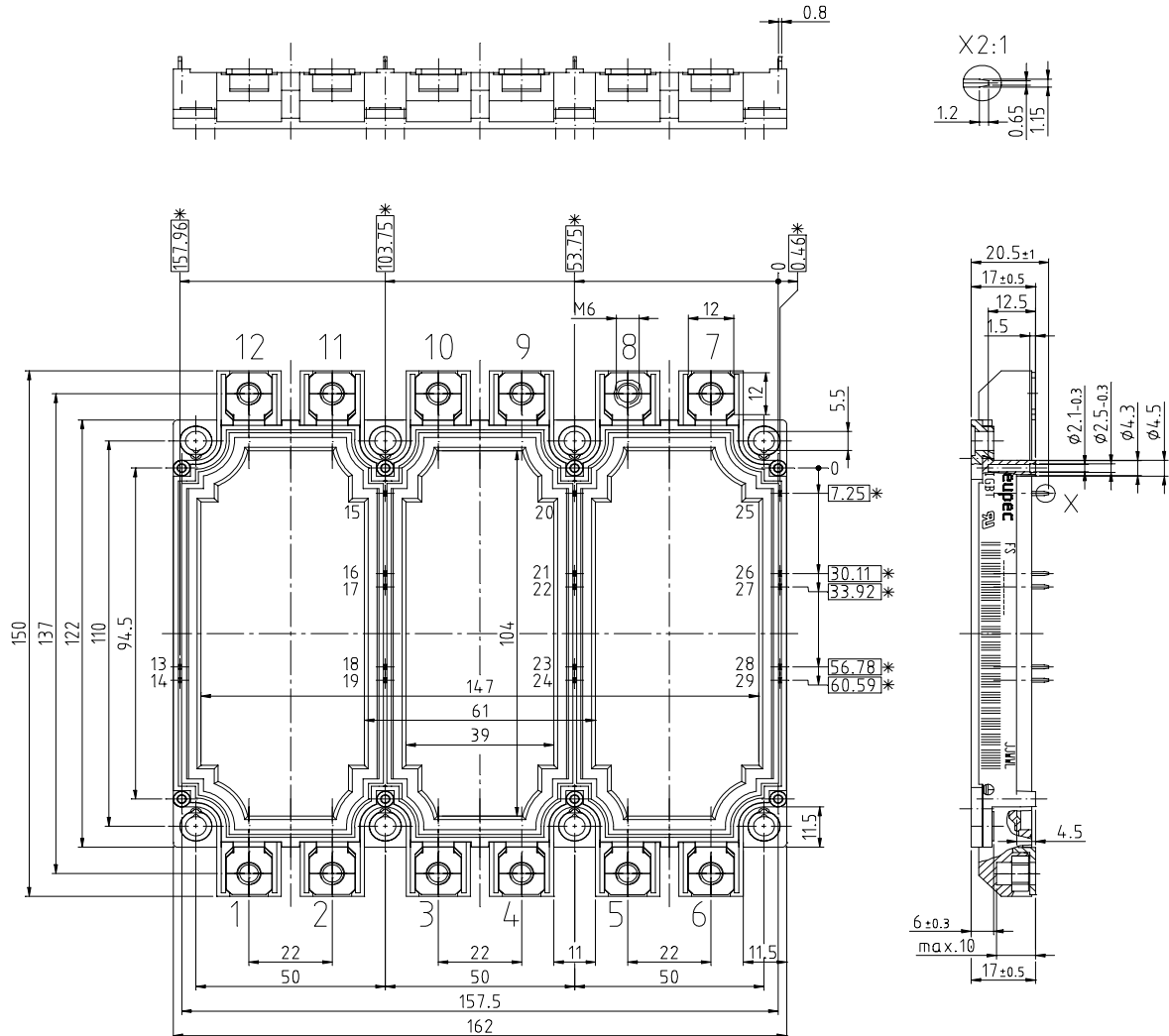


i		1	2	3	4
r_i [K/kW]	: IGBT	19,09	28,21	21,78	5,924
τ_i [s]	: IGBT	0,01565	0,03977	0,07521	1,443
r_i [K/kW]	: Diode	44,06	48,89	30,96	6,1
τ_i [s]	: Diode	0,02103	0,03011	0,08672	1,1583

Sicherer Arbeitsbereich (RBSOA)
Reverse bias safe operation area (RBSOA)
 $V_{GE} = \pm 15V$, $R_G = 4,7 \text{ Ohm}$, $T_{vj} = 125^\circ C$




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* = alle Maße mit einer Toleranz von ± 0.5

