

Vorläufig
preliminary**Elektrische Eigenschaften / electrical properties****Höchstzulässige Werte / maximum rated values****Diode Gleichrichter/ diode rectifier**

Periodische Rückw. Spitzensperrspannung repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	800	V
Durchlaßstrom Grenzeffektivwert pro Chip RMS forward current per chip	$T_C = 80^{\circ}\text{C}$	I_{FRMSM}	58	A
Gleichrichter Ausgang Grenzeffektivstrom maximum RMS current at Rectifier output	$T_C = 80^{\circ}\text{C}$	I_{RMSmax}	50	A
Stoßstrom Grenzwert surge forward current	$t_p = 10 \text{ ms}, T_{vj} = 25^{\circ}\text{C}$ $t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I_{FSM}	448 358	A A
Grenzlastintegral I^2t - value	$t_p = 10 \text{ ms}, T_{vj} = 25^{\circ}\text{C}$ $t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I^2t	1000 642	A^2s A^2s

Transistor Wechselrichter/ transistor inverter

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	600	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 65^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}$	$I_{C,nom.}$ I_C	15 19	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1 \text{ ms}, T_C = 65^{\circ}\text{C}$	I_{CRM}	30	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	P_{tot}	60	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V

Diode Wechselrichter/ diode inverter

Dauergleichstrom DC forward current		I_F	15	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1 \text{ ms}$	I_{FRM}	30	A
Grenzlastintegral I^2t - value	$V_R = 0\text{V}, t_p = 10\text{ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	25	A^2s

Transistor Brems-Chopper/ transistor brake-chopper

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	600	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 65^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}$	$I_{C,nom.}$ I_C	15 19	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1 \text{ ms}, T_C = 65^{\circ}\text{C}$	I_{CRM}	30	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	P_{tot}	60	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V

Diode Brems-Chopper/ diode brake-chopper

Dauergleichstrom DC forward current		I_F	15	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1 \text{ ms}$	I_{FRM}	30	A

prepared by: Thomas Passe

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approved by: R. Keggenhoff

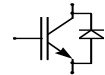
revision: 2.1

Technische Information / technical information

IGBT-Module
IGBT-Modules

FB15R06KL4B1

eupec



**Vorläufig
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Modul Isolation/ module isolation

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min. NTC connected to Baseplate	V_{ISOL}	2,5	kV
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Elektrische Eigenschaften / electrical properties

Charakteristische Werte / characteristic values

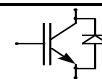
Diode Gleichrichter/ diode rectifier				min.	typ.	max.	
Durchlaßspannung forward voltage	$T_{vj} = 150^{\circ}\text{C},$	$I_F = 15\text{ A}$	V_F	-	0,8	-	V
Schleusenspannung threshold voltage	$T_{vj} = 150^{\circ}\text{C}$		$V_{(TO)}$	-	0,61	-	V
Ersatzwiderstand slope resistance	$T_{vj} = 150^{\circ}\text{C}$		r_T	-	11	-	mΩ
Sperrstrom reverse current	$T_{vj} = 150^{\circ}\text{C},$	$V_R = 800\text{ V}$	I_R	-	5	-	mA
Modul Leitungswiderstand, Anschlüsse-Chip lead resistance, terminals-chip	$T_C = 25^{\circ}\text{C}$		$R_{AA'+CC'}$	-	11	-	mΩ
Transistor Wechselrichter/ transistor inverter				min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$V_{GE} = 15\text{V}, T_{vj} = 25^{\circ}\text{C}, I_C = 15\text{ A}$	$V_{CE\text{ sat}}$	-	1,95	2,55	V	
	$V_{GE} = 15\text{V}, T_{vj} = 125^{\circ}\text{C}, I_C = 15\text{ A}$		-	2,2	-	V	
Gate-Schwellenspannung gate threshold voltage	$V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}, I_C = 0,4\text{mA}$	$V_{GE(TO)}$	4,5	5,5	6,5	V	
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}	-	0,8	-	nF	
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 600\text{V}$	I_{CES}	-	-	5,0	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	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = I_{Nenn}, V_{CC} = 300\text{ V}$	$t_{d,on}$	-	37	-	ns	
	$V_{GE} = \pm 15\text{V}, T_{vj} = 25^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
	$V_{GE} = \pm 15\text{V}, T_{vj} = 125^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = I_{Nenn}, V_{CC} = 300\text{ V}$	t_r	-	37	-	ns	
	$V_{GE} = \pm 15\text{V}, T_{vj} = 25^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
	$V_{GE} = \pm 15\text{V}, T_{vj} = 125^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = I_{Nenn}, V_{CC} = 300\text{ V}$	$t_{d,off}$	-	216	-	ns	
	$V_{GE} = \pm 15\text{V}, T_{vj} = 25^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
	$V_{GE} = \pm 15\text{V}, T_{vj} = 125^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
Fallzeit (induktive Last) fall time (inductive load)	$I_C = I_{Nenn}, V_{CC} = 300\text{ V}$	t_f	-	17	-	ns	
	$V_{GE} = \pm 15\text{V}, T_{vj} = 25^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
	$V_{GE} = \pm 15\text{V}, T_{vj} = 125^{\circ}\text{C}, R_G = 68\text{ Ohm}$						
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = I_{Nenn}, V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}, T_{vj} = 125^{\circ}\text{C}, R_G = 68\text{ Ohm}$ $L_S = 80\text{ nH}$	E_{on}	-	0,6	-	mJ	
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = I_{Nenn}, V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}, T_{vj} = 125^{\circ}\text{C}, R_G = 68\text{ Ohm}$ $L_S = 80\text{ nH}$	E_{off}	-	0,4	-	mJ	
Kurzschlußverhalten SC Data	$t_P \leq 10\mu\text{s}, V_{GE} \leq 15\text{V}, R_G = 68\text{ Ohm}$ $T_{vj} \leq 125^{\circ}\text{C}, V_{CC} = 360\text{ V}$ $dI/dt = 1000\text{ A}/\mu\text{s}$	I_{SC}	-	60	-	A	

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Elektrische Eigenschaften / electrical properties

Charakteristische Werte / characteristic values

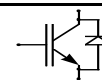
				min.	typ.	max.	
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	-	40	nH	
Modul Leitungswiderstand, Anschlüsse-Chip lead resistance, terminals-chip	$T_C = 25^\circ\text{C}$	$R_{CC'+EE'}$	-	10	-	mΩ	
Diode Wechselrichter/ diode inverter				min.	typ.	max.	
Durchlaßspannung forward voltage	$V_{GE} = 0\text{V}, T_{vj} = 25^\circ\text{C}, I_F = 15\text{A}$ $V_{GE} = 0\text{V}, T_{vj} = 125^\circ\text{C}, I_F = 15\text{A}$	V_F	-	1,75	2,15	V	
Rückstromspitze peak reverse recovery current	$I_F = I_{Nenn}, -di_F/dt = 600\text{A/us}$ $V_{GE} = -10\text{V}, T_{vj} = 25^\circ\text{C}, V_R = 300\text{V}$ $V_{GE} = -10\text{V}, T_{vj} = 125^\circ\text{C}, V_R = 300\text{V}$	I_{RM}	-	13	-	A	
Sperrverzögerungsladung recovered charge	$I_F = I_{Nenn}, -di_F/dt = 600\text{A/us}$ $V_{GE} = -10\text{V}, T_{vj} = 25^\circ\text{C}, V_R = 300\text{V}$ $V_{GE} = -10\text{V}, T_{vj} = 125^\circ\text{C}, V_R = 300\text{V}$	Q_r	-	0,8	-	μAs	
Abschaltenergie pro Puls reverse recovery energy	$I_F = I_{Nenn}, -di_F/dt = 600\text{A/us}$ $V_{GE} = -10\text{V}, T_{vj} = 25^\circ\text{C}, V_R = 300\text{V}$ $V_{GE} = -10\text{V}, T_{vj} = 125^\circ\text{C}, V_R = 300\text{V}$	E_{rec}	-	0,14	-	mJ	
Transistor Brems-Chopper/ transistor brake-chopper				min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$V_{GE} = 15\text{V}, T_{vj} = 25^\circ\text{C}, I_C = 15,0\text{A}$ $V_{GE} = 15\text{V}, T_{vj} = 125^\circ\text{C}, I_C = 15,0\text{A}$	$V_{CE sat}$	-	1,95	2,55	V	
Gate-Schwellenspannung gate threshold voltage	$V_{CE} = V_{GE}, T_{vj} = 25^\circ\text{C}, I_C = 0,4\text{mA}$	$V_{GE(To)}$	4,5	5,5	6,5	V	
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}	-	0,8	-	nF	
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{GE} = 0\text{V}, T_{vj} = 25^\circ\text{C}, V_{CE} = 600\text{V}$		-	-	5,0	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	
Diode Brems-Chopper/ diode brake-chopper				min.	typ.	max.	
Durchlaßspannung forward voltage	$T_{vj} = 25^\circ\text{C}, I_F = 15\text{A}$ $T_{vj} = 125^\circ\text{C}, I_F = 15\text{A}$	V_F	-	2,15	2,6	V	
			-	2,25	-	V	
NTC-Widerstand/ NTC-thermistor				min.	typ.	max.	
Nennwiderstand rated resistance	$T_C = 25^\circ\text{C}$	R_{25}	-	5	-	kΩ	
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	

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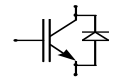
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Thermische Eigenschaften / thermal properties

				min.	typ.	max.	
Innerer Wärmewiderstand thermal resistance, junction to heatsink	Gleichr. Diode/ rectif. diode	$\lambda_{\text{Paste}}=1\text{W/m}^2\text{K}$	R_{thJH}	-	1,1	-	K/W
	Trans. Wechselr./ trans. inverter	$\lambda_{\text{grease}}=1\text{W/m}^2\text{K}$		-	2,4	-	K/W
	Diode Wechselr./ diode inverter			-	4,0	-	K/W
	Trans. Bremse/ trans. brake			-	2,4	-	K/W
	Diode Bremse/ diode brake			-	4,3	-	K/W
Innerer Wärmewiderstand thermal resistance, junction to case	Gleichr. Diode/ rectif. diode		R_{thJC}	-	-	1	K/W
	Trans. Wechselr./ trans. inverter			-	-	2	K/W
	Diode Wechselr./ diode inverter			-	-	2,9	K/W
	Trans. Bremse/ trans. brake			-	-	2	K/W
	Diode Bremse/ diode brake			-	-	3,1	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	Gleichr. Diode/ rectif. diode	$\lambda_{\text{Paste}}=1\text{W/m}^2\text{K}$	R_{thCH}	-	0,2	-	K/W
	Trans. Wechselr./ trans. inverter	$\lambda_{\text{grease}}=1\text{W/m}^2\text{K}$		-	0,6	-	K/W
	Diode Wechselr./ diode inverter			-	1,4	-	K/W
	Trans. Bremse/ trans. brake			-	0,6	-	K/W
	Diode Bremse/ diode brake			-	1,5	-	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

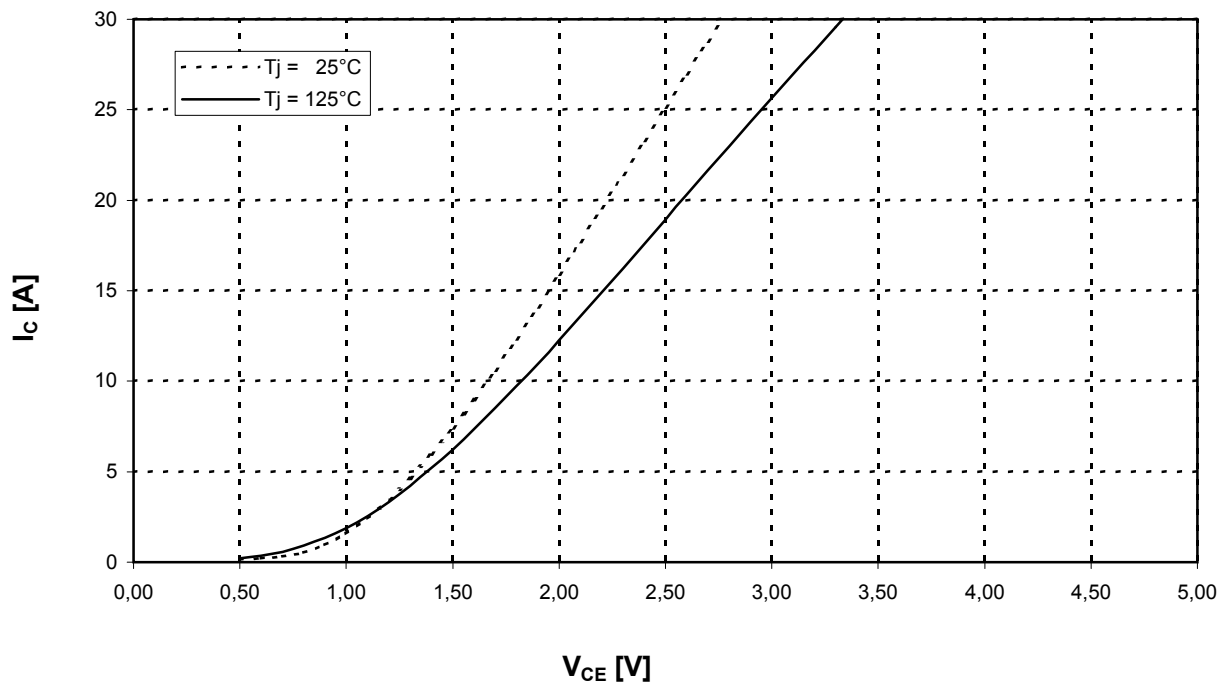
Innere Isolation internal insulation			Al_2O_3	
CTI comperative tracking index			225	
Anpreßkraft f. mech. Befestigung pro Feder mounting force per clamp		F	40...80	N
Gewicht weight		G	36	g
Kontakt - Kühlkörper terminal to heatsink	Kriechstrecke creepage distance		13,5	mm
	Luftstrecke clearance distance		12	mm
Terminal - Terminal terminal to terminal	Kriechstrecke creepage distance		7,5	mm
	Luftstrecke clearance distance		7,5	mm



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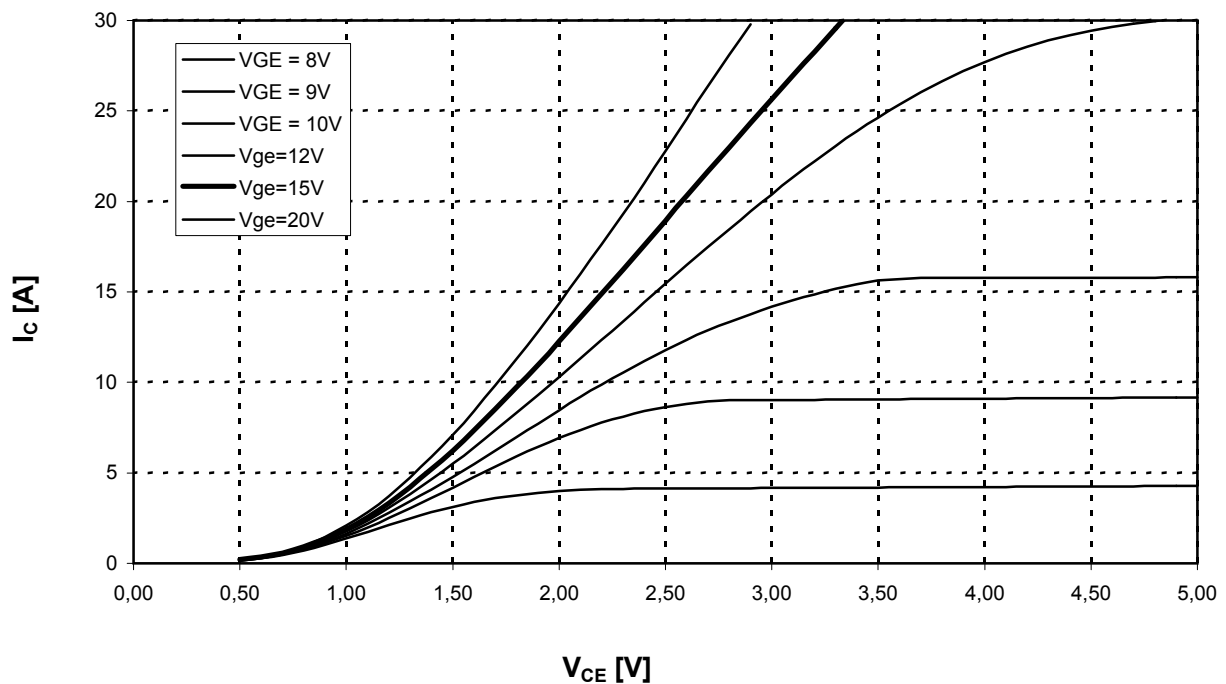
Ausgangskennlinienfeld Wechselr. (typisch)
output characteristic inverter (typical)

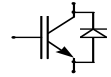
$I_C = f(V_{CE})$
 $V_{GE} = 15 \text{ V}$



Ausgangskennlinienfeld Wechselr. (typisch)
output characteristic inverter (typical)

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

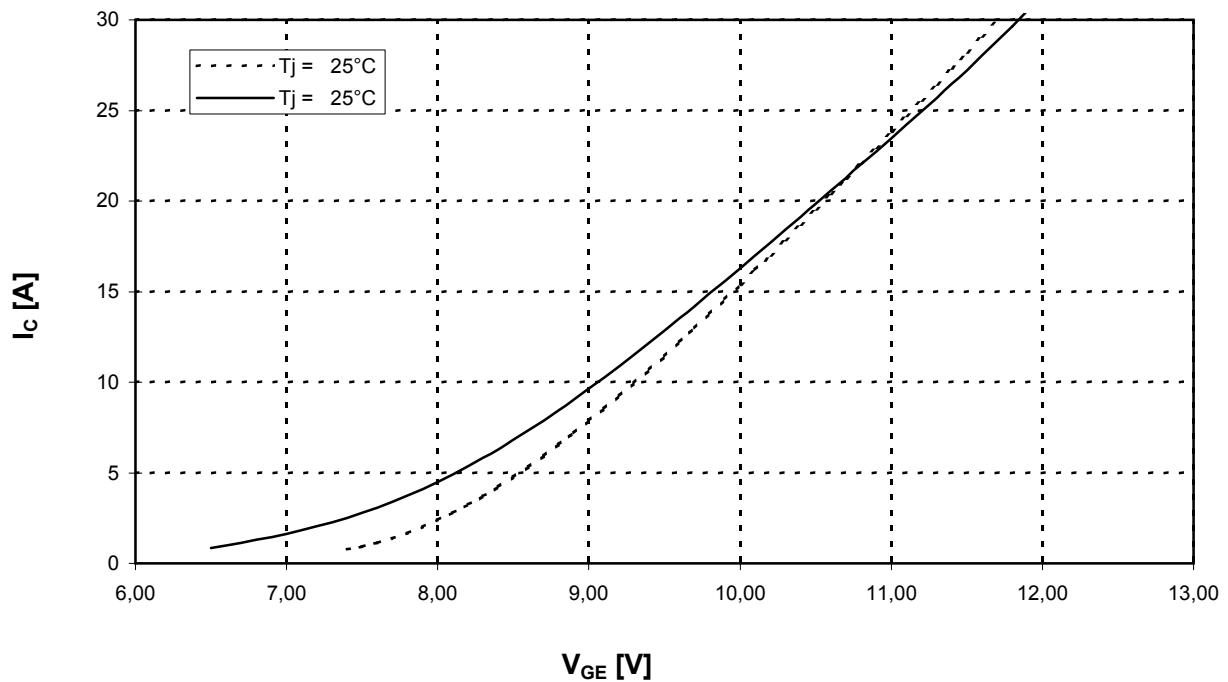


Vorläufig
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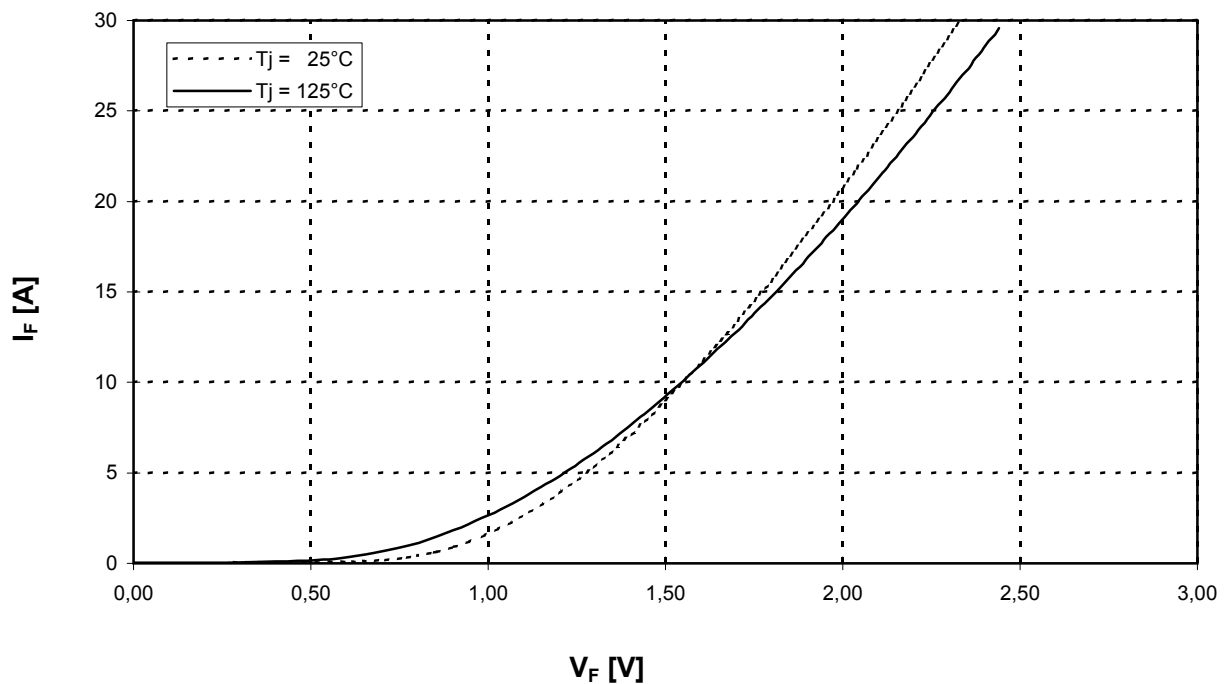
Übertragungscharakteristik Wechselr. (typisch)
transfer characteristic inverter (typical)

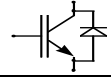
$$I_C = f(V_{GE})$$

$$V_{CE} = 20 \text{ V}$$

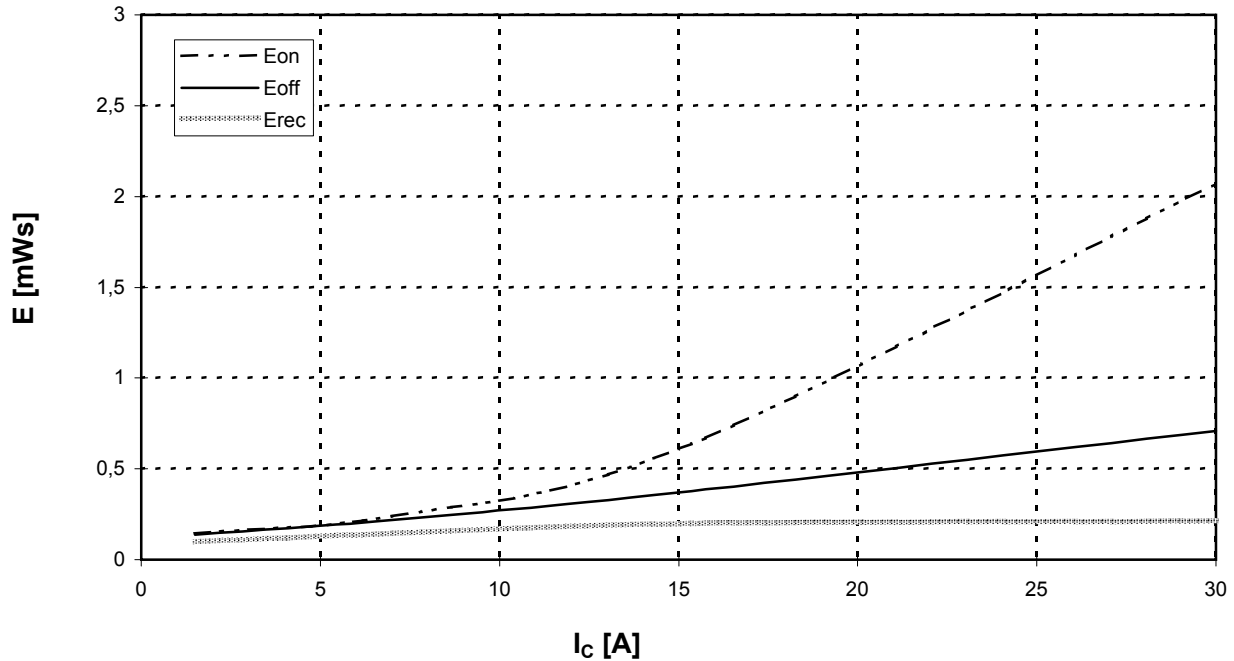


Durchlaßkennlinie der Freilaufdiode Wechselr. (typisch) $I_F = f(V_F)$
forward characteristic of FWD inverter (typical)

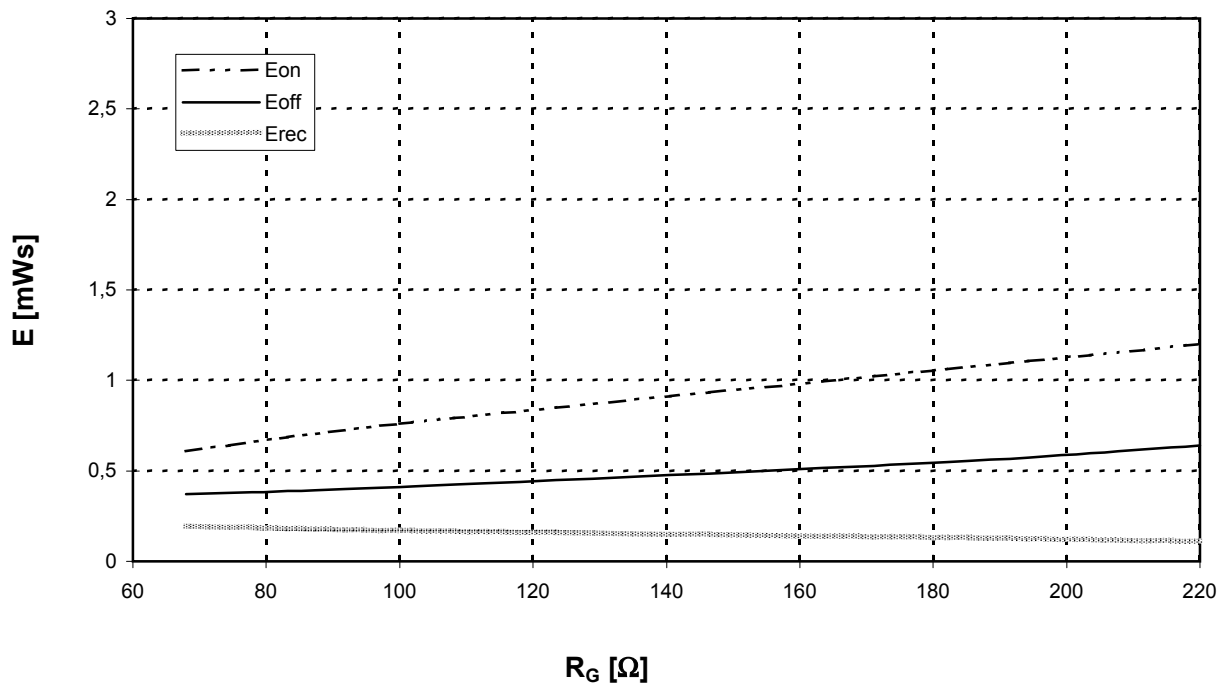


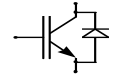
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Schaltverluste Wechselr. (typisch) $E_{on} = f(I_c)$, $E_{off} = f(I_c)$, $E_{rec} = f(I_c)$ $V_{CC} = 300\text{ V}$
 switching losses inverter (typical) $T_j = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = R_{Goff} = 68\text{ Ohm}$



Schaltverluste Wechselr. (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
 switching losses inverter (typical) $T_j = 125^\circ\text{C}$, $V_{GE} = +15\text{ V}$, $I_c = I_{nenn}$, $V_{CC} = 300\text{ V}$

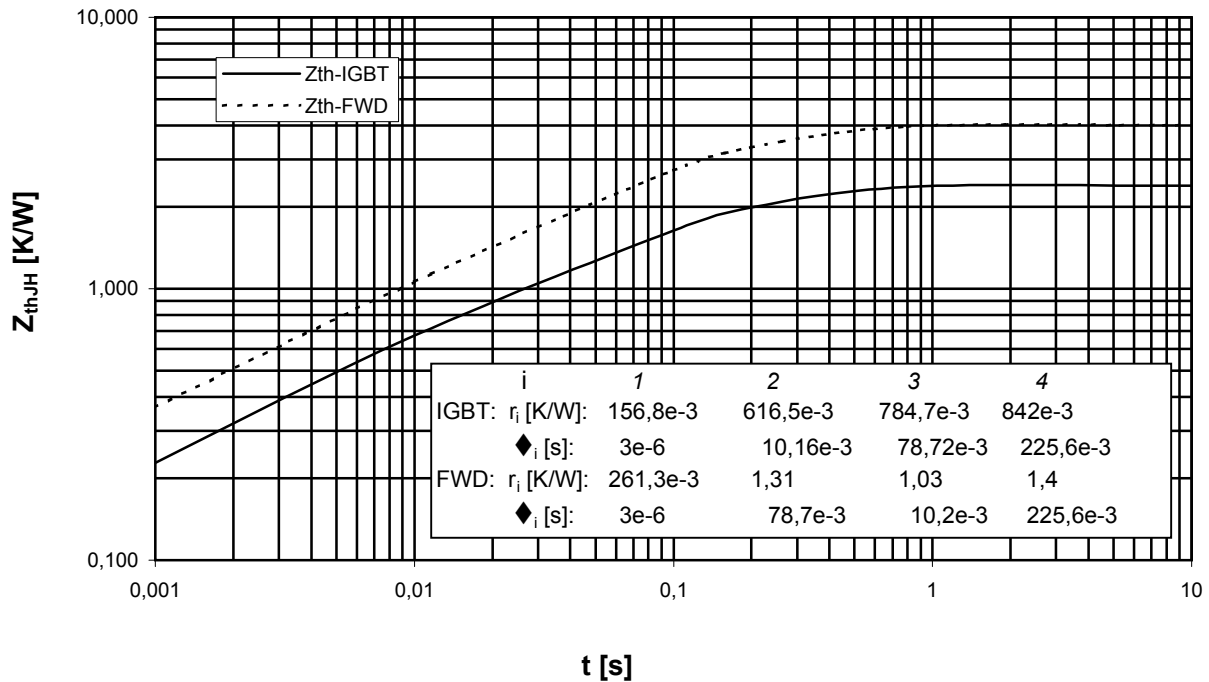




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Transienter Wärmewiderstand Wechselr.
transient thermal impedance inverter

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

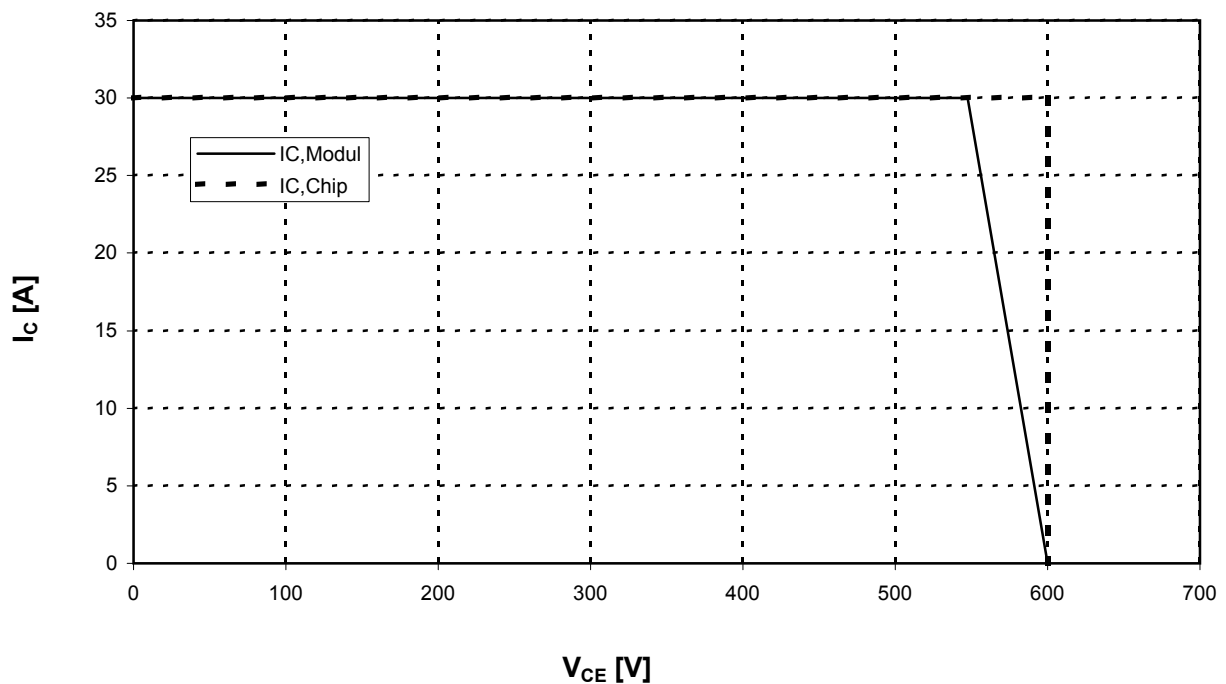


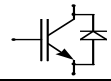
Sicherer Arbeitsbereich Wechselr. (RBSOA)

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

reverse bias safe operating area inverter (RBSOA) $T_{vj} = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{V}$, $R_G =$

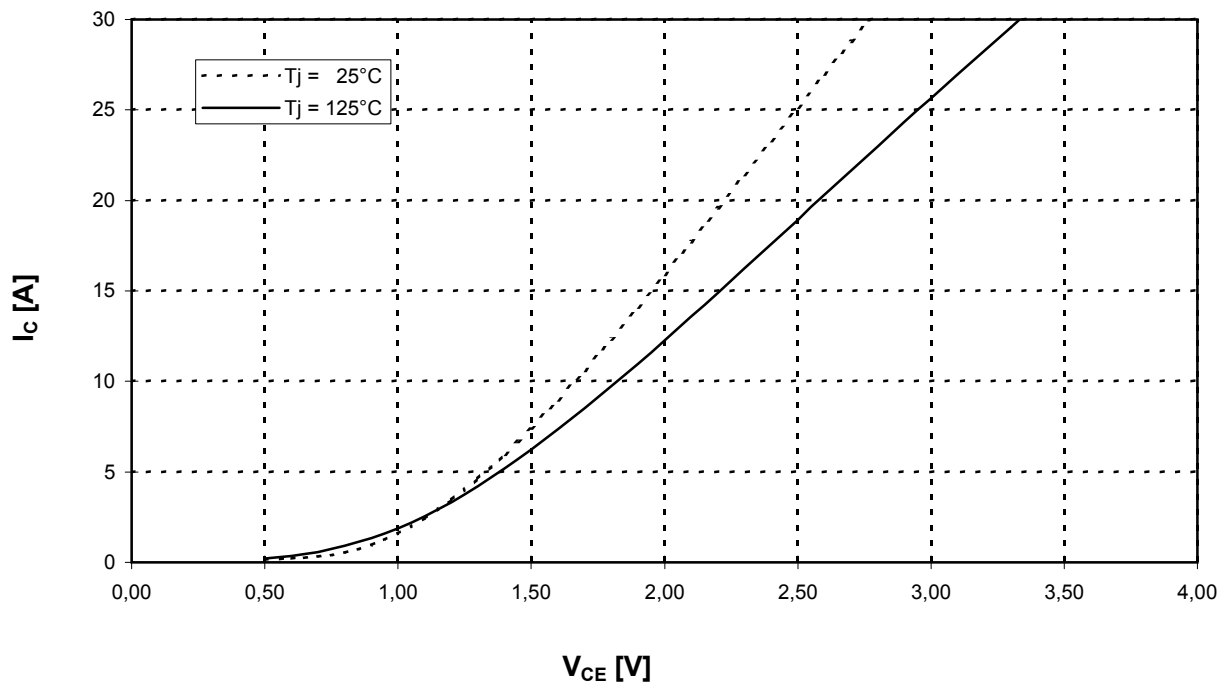
68 Ohm



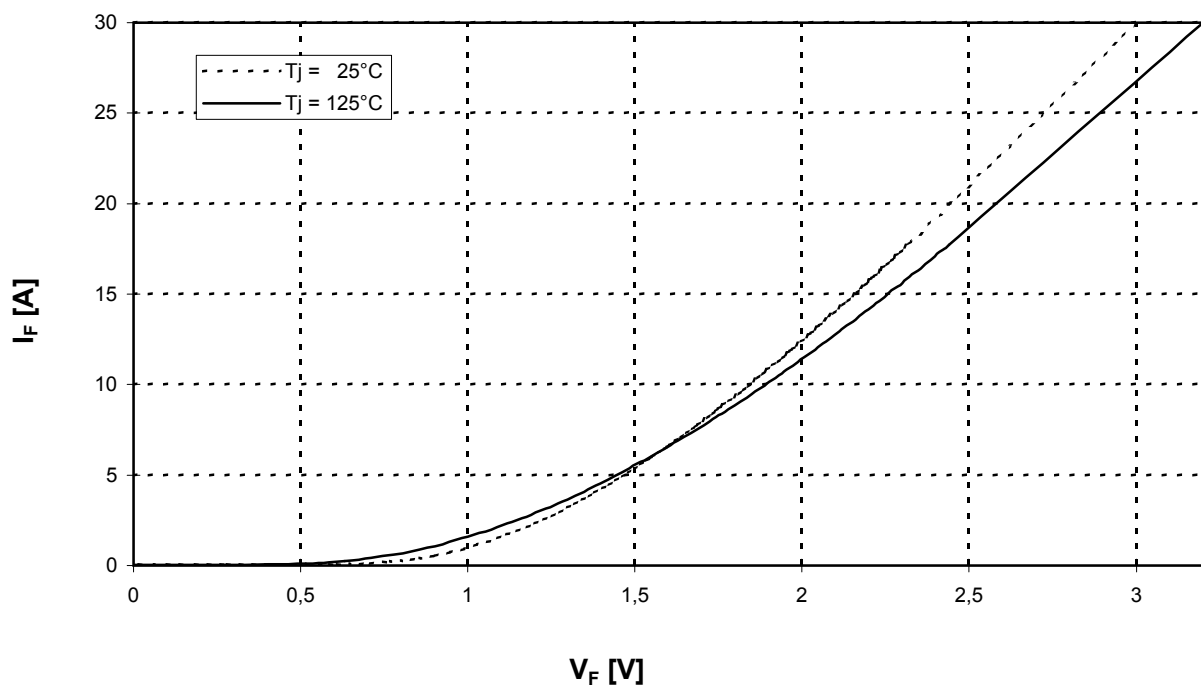
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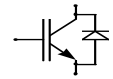
Ausgangskennlinienfeld Brems-Chopper-IGBT (typisch)
output characteristic brake-chopper-IGBT (typical)

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



Durchlaßkennlinie der Brems-Chopper-Diode (typisch) $I_F = f(V_F)$
forward characteristic of brake-chopper-FWD (typical)

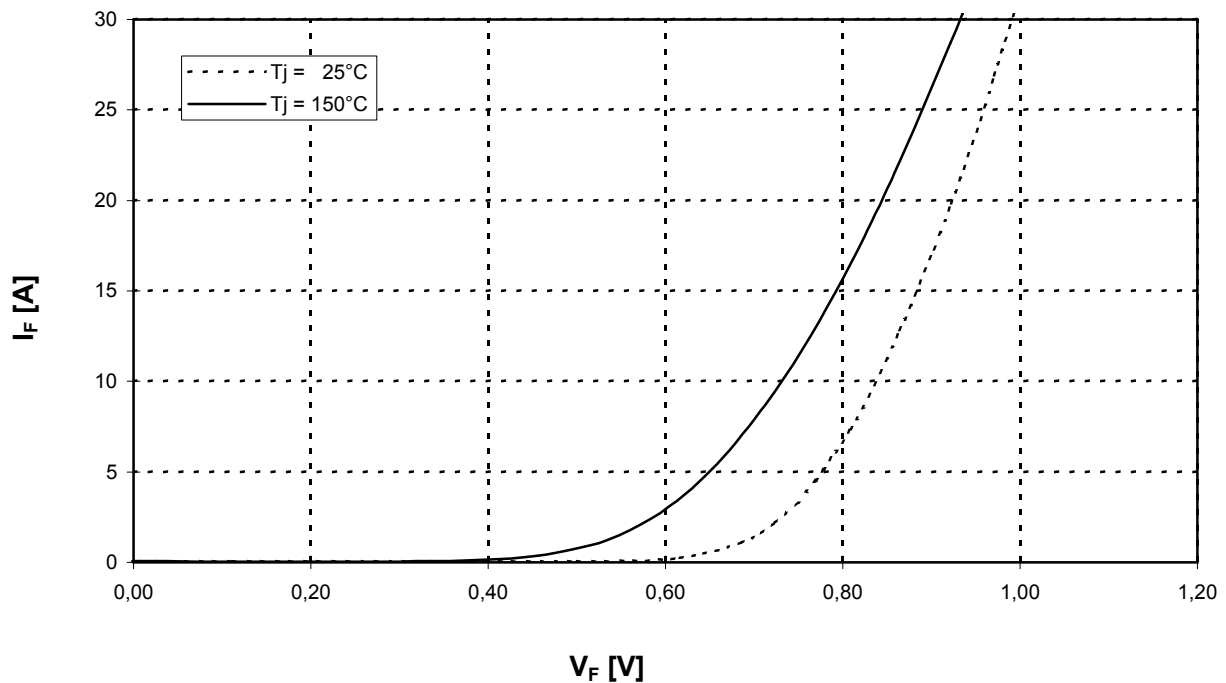




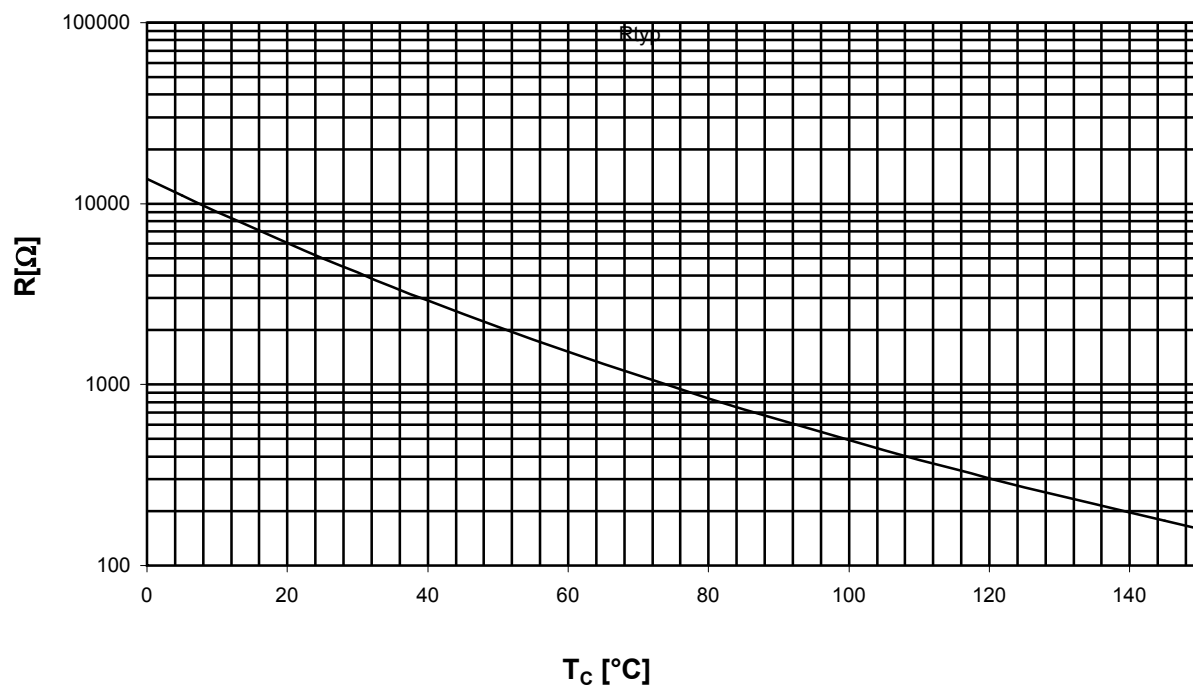
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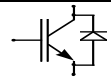
Durchlaßkennlinie der Gleichrichterdiode (typisch)
forward characteristic of rectifier diode (typical)

$$I_F = f(V_F)$$



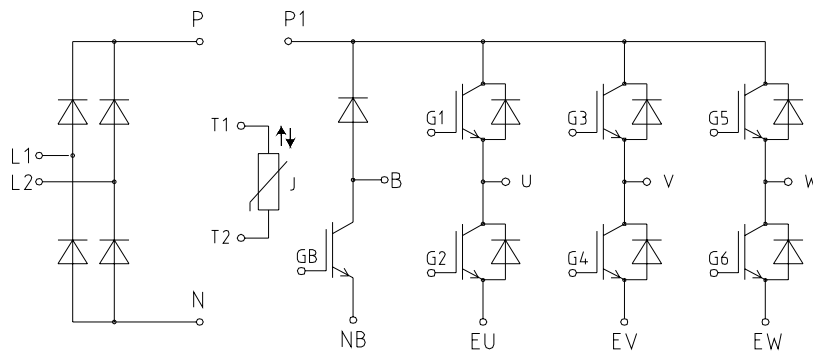
NTC- Temperaturkennlinie (typisch) $R = f(T)$
NTC- temperature characteristic (typical)



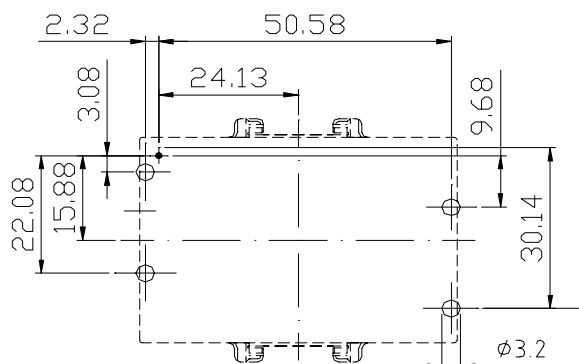
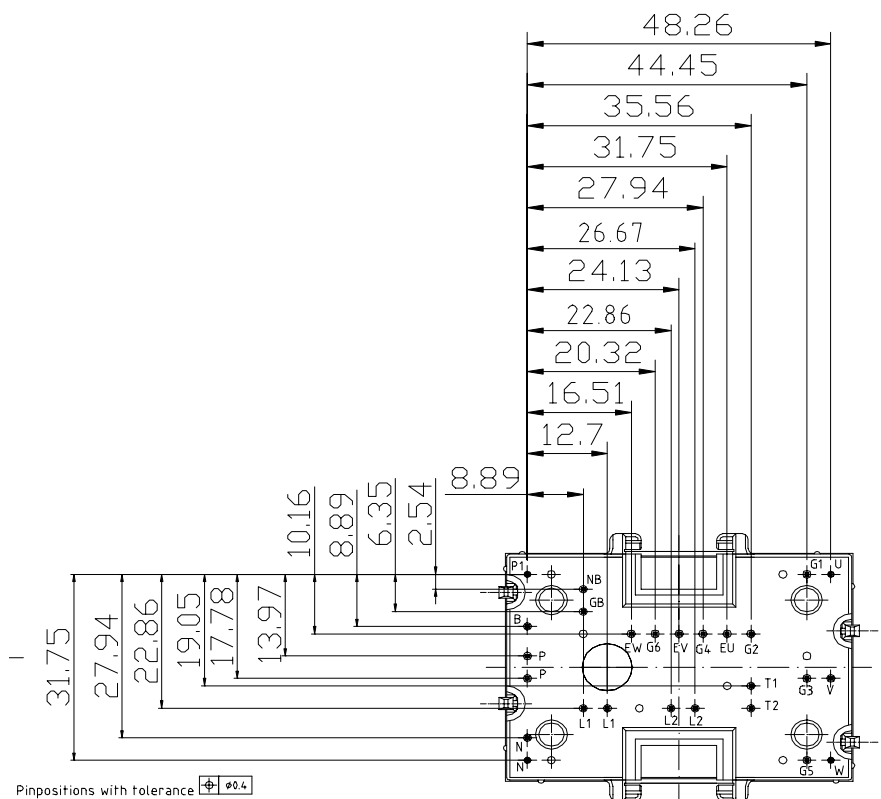


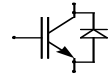
Vorläufig
preliminary

Schaltplan/ circuit diagram

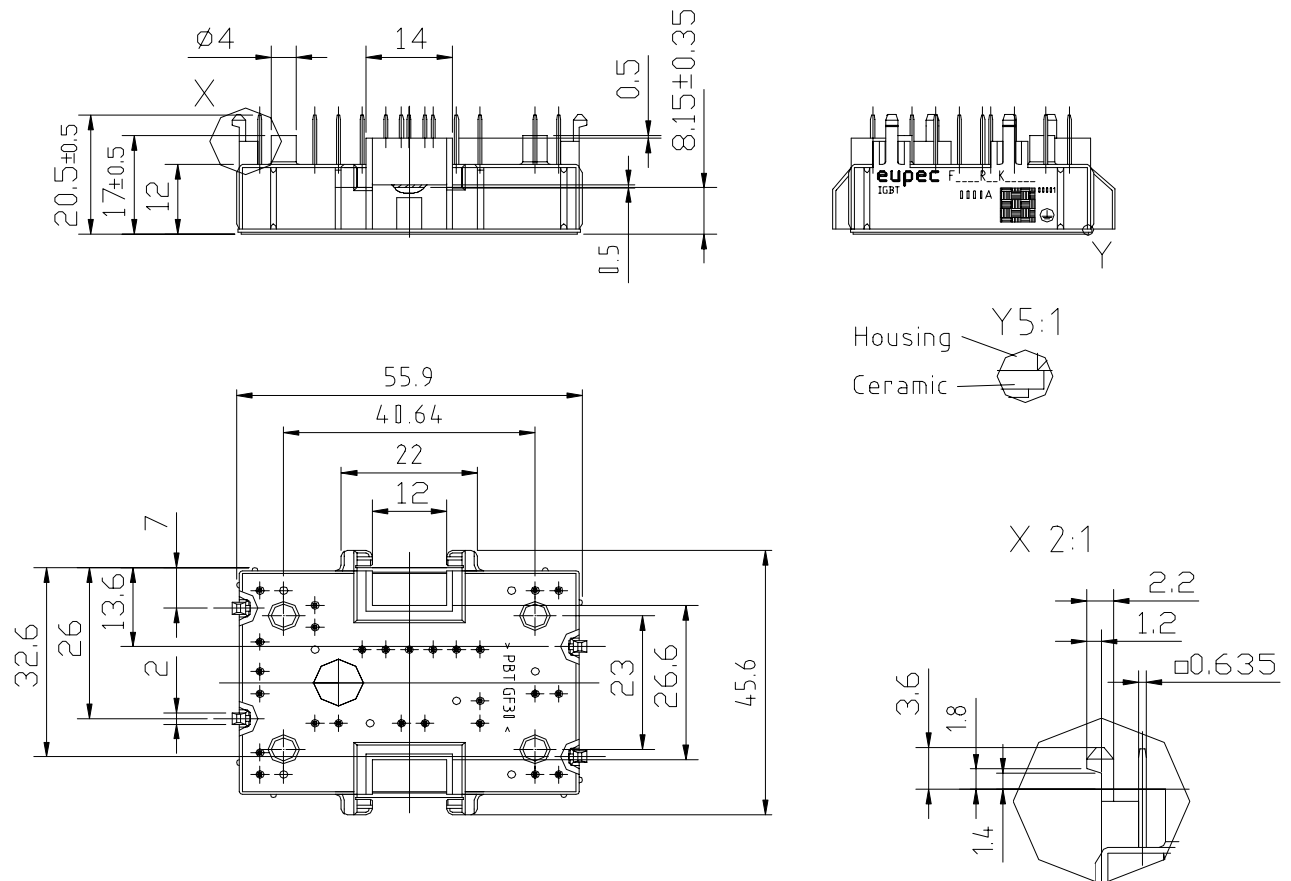


Gehäuseabmessungen/ package outlines

Bohrplan /
drilling layout



Gehäuseabmessungen Forts. / package outlines contd.



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

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