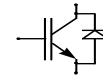


Technische Information / technical information

IGBT-Module
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**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}	23	A
Gleichrichter Ausgang Grenzeffektivstrom maximum RMS current at Rectifier output	$T_C = 80^{\circ}\text{C}$	I_{RMSmax}	25	A
Stoßstrom Grenzwert surge forward current	$t_p = 10 \text{ ms}, T_{vj} = 25^{\circ}\text{C}$	I_{FSM}	197	A
	$t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$		158	A
Grenzlastintegral I^2t - value	$t_p = 10 \text{ ms}, T_{vj} = 25^{\circ}\text{C}$	I^2t	194	A^2s
	$t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$		125	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	$T_C = 80^{\circ}\text{C}$	$I_{C,nom.}$	10	A
	$T_C = 25^{\circ}\text{C}$	I_C	15	A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1 \text{ ms}, T_C = 80^{\circ}\text{C}$	I_{CRM}	20	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	P_{tot}	55	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V

Diode Wechselrichter / diode inverter

Dauergleichstrom DC forward current		I_F	10	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1 \text{ ms}$	I_{FRM}	20	A
Grenzlastintegral I^2t - value	$V_R = 0\text{V}, t_p = 10\text{ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	12	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	$T_C = 80^{\circ}\text{C}$	$I_{C,nom.}$	10	A
	$T_C = 25^{\circ}\text{C}$	I_C	15	A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1 \text{ ms}, T_C = 80^{\circ}\text{C}$	I_{CRM}	20	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	P_{tot}	55	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V

Diode Brems-Chopper / diode brake-chopper

Dauergleichstrom DC forward current		I_F	10	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1 \text{ ms}$	I_{FRM}	20	A

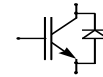
prepared by: Thomas Passe	date of publication: 2003-03-26
approved by: R. Keggenhoff	revision: 2.1

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**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°C, I _F = 10 A	V _F	-	0,9	-	V
Schleusenspannung threshold voltage	T _{vj} = 150°C	V _(TO)	-	0,67	-	V
Ersatzwiderstand slope resistance	T _{vj} = 150°C	r _T	-	21	-	mΩ
Sperrstrom reverse current	T _{vj} = 150°C, V _R = 800 V	I _R	-	5	-	mA
Modul Leitungswiderstand, Anschlüsse-Chip lead resistance, terminals-chip	T _C = 25°C	R _{AA+CC'}	-	11	-	mΩ

Transistor Wechselrichter / transistor inverter

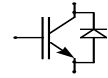
			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	V _{GE} = 15V, T _{vj} = 25°C, I _C = 10 A	V _{CE sat}	-	1,95	2,55	V
	V _{GE} = 15V, T _{vj} = 125°C, I _C = 10 A		-	2,2	-	V
Gate-Schwellenspannung gate threshold voltage	V _{CE} = V _{GE} , T _{vj} = 25°C, I _C = 0,35mA	V _{GE(TO)}	4,5	5,5	6,5	V
Eingangskapazität input capacitance	f = 1MHz, T _{vj} = 25°C V _{CE} = 25 V, V _{GE} = 0 V	C _{ies}	-	0,8	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V _{GE} = 0V, T _{vj} = 25°C, V _{CE} = 600V	I _{CES}	-	-	5,0	mA
Gate-Emitter Reststrom gate-emitter leakage current	V _{CE} = 0V, V _{GE} = 20V, T _{vj} = 25°C	I _{GES}	-	-	400	nA
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	I _C = I _{Nenn} , V _{CC} = 300 V	t _{d,on}	-	32	-	ns
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 82 Ohm					
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 82 Ohm					
Anstiegszeit (induktive Last) rise time (inductive load)	I _C = I _{Nenn} , V _{CC} = 300 V	t _r	-	26	-	ns
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 82 Ohm					
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 82 Ohm					
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I _C = I _{Nenn} , V _{CC} = 300 V	t _{d,off}	-	234	-	ns
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 82 Ohm					
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 82 Ohm					
Fallzeit (induktive Last) fall time (inductive load)	I _C = I _{Nenn} , V _{CC} = 300 V	t _f	-	10	-	ns
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 82 Ohm					
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 82 Ohm					
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I _C = I _{Nenn} , V _{CC} = 300 V V _{GE} = ±15V, T _{vj} = 125°C, R _G = 82 Ohm L _S = 80 nH	E _{on}	-	0,36	-	mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I _C = I _{Nenn} , V _{CC} = 300 V V _{GE} = ±15V, T _{vj} = 125°C, R _G = 82 Ohm L _S = 80 nH	E _{off}	-	0,44	-	mJ
Kurzschlußverhalten SC Data	t _p ≤ 10μs, V _{GE} ≤ 15V, R _G = 82 Ohm T _{vj} ≤ 125°C, V _{CC} = 360 V di/dt = 400 A/μs	I _{SC}	-	40	-	A

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**Vorläufig
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Elektrische Eigenschaften / electrical properties

Charakteristische Werte / characteristic values

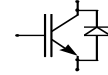
				min.	typ.	max.	
Modulinduktivität stray inductance module		L_{GCE}	-	-	40	nH	
Modul Leitungswiderstand, Anschlüsse-Chip lead resistance, terminals-chip	$T_C = 25^\circ\text{C}$	$R_{\text{CC}'+\text{EE}'}$	-	10	-	m Ω	
Diode Wechselrichter / diode inverter				min.	typ.	max.	
Durchlaßspannung forward voltage	$V_{\text{GE}} = 0\text{V}, T_{\text{vj}} = 25^\circ\text{C}, I_{\text{F}} = 10\text{A}$ $V_{\text{GE}} = 0\text{V}, T_{\text{vj}} = 125^\circ\text{C}, I_{\text{F}} = 10\text{A}$	V_{F}	-	1,85	2,25	V	
Rückstromspitze peak reverse recovery current	$I_{\text{F}} = I_{\text{Nenn}}, -di_{\text{F}}/dt = 600\text{A/us}$ $V_{\text{GE}} = -10\text{V}, T_{\text{vj}} = 25^\circ\text{C}, V_{\text{R}} = 300\text{V}$ $V_{\text{GE}} = -10\text{V}, T_{\text{vj}} = 125^\circ\text{C}, V_{\text{R}} = 300\text{V}$	I_{RM}	-	11	-	A	
Sperrverzögerungsladung recovered charge	$I_{\text{F}} = I_{\text{Nenn}}, -di_{\text{F}}/dt = 600\text{A/us}$ $V_{\text{GE}} = -10\text{V}, T_{\text{vj}} = 25^\circ\text{C}, V_{\text{R}} = 300\text{V}$ $V_{\text{GE}} = -10\text{V}, T_{\text{vj}} = 125^\circ\text{C}, V_{\text{R}} = 300\text{V}$	Q_{r}	-	0,35	-	μAs	
Abschaltenergie pro Puls reverse recovery energy	$I_{\text{F}} = I_{\text{Nenn}}, -di_{\text{F}}/dt = 600\text{A/us}$ $V_{\text{GE}} = -10\text{V}, T_{\text{vj}} = 25^\circ\text{C}, V_{\text{R}} = 300\text{V}$ $V_{\text{GE}} = -10\text{V}, T_{\text{vj}} = 125^\circ\text{C}, V_{\text{R}} = 300\text{V}$	E_{rec}	-	0,05	-	mJ	
Transistor Brems-Chopper / transistor brake-chopper				min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$V_{\text{GE}} = 15\text{V}, T_{\text{vj}} = 25^\circ\text{C}, I_{\text{C}} = 10,0\text{A}$ $V_{\text{GE}} = 15\text{V}, T_{\text{vj}} = 125^\circ\text{C}, I_{\text{C}} = 10,0\text{A}$	$V_{\text{CE sat}}$	-	1,95	2,55	V	
Gate-Schwellenspannung gate threshold voltage	$V_{\text{CE}} = V_{\text{GE}}, T_{\text{vj}} = 25^\circ\text{C}, I_{\text{C}} = 0,35\text{mA}$	$V_{\text{GE(TO)}}$	4,5	5,5	6,5	V	
Eingangskapazität input capacitance	$f = 1\text{MHz}, T_{\text{vj}} = 25^\circ\text{C}$ $V_{\text{CE}} = 25\text{V}, V_{\text{GE}} = 0\text{V}$	C_{ies}	-	0,8	-	nF	
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{\text{GE}} = 0\text{V}, T_{\text{vj}} = 25^\circ\text{C}, V_{\text{CE}} = 600\text{V}$		-	-	5,0	mA	
Gate-Emitter Reststrom gate-emitter leakage current	$V_{\text{CE}} = 0\text{V}, V_{\text{GE}} = 20\text{V}, T_{\text{vj}} = 25^\circ\text{C}$	I_{GES}	-	-	400	nA	
Diode Brems-Chopper / diode brake-chopper				min.	typ.	max.	
Durchlaßspannung forward voltage	$T_{\text{vj}} = 25^\circ\text{C}, I_{\text{F}} = 10,0\text{A}$ $T_{\text{vj}} = 125^\circ\text{C}, I_{\text{F}} = 10,0\text{A}$	V_{F}	-	1,85	2,25	V	
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	

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IGBT-Module
IGBT-Modules

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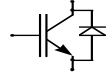
**Vorläufig
preliminary**

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}	-	2,6	-	K/W
	Trans. Wechselr./ trans. inverter $\lambda_{\text{grease}}=1\text{W/m}^2\text{K}$		-	2,8	-	K/W
	Diode Wechselr./ diode inverter		-	4,3	-	K/W
	Trans. Bremse/ trans. brake		-	2,8	-	K/W
	Diode Bremse/ diode brake		-	4,3	-	K/W
Innerer Wärmewiderstand thermal resistance, junction to case	Gleichr. Diode/ rectif. diode	R_{thJC}	-	-	2,4	K/W
	Trans. Wechselr./ trans.inverter		-	-	2,2	K/W
	Diode Wechselr./ diode inverter		-	-	3,1	K/W
	Trans. Bremse/ trans. brake		-	-	2,2	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}	-	0,4	-	K/W
	Trans. Wechselr./ trans. inverter $\lambda_{\text{grease}}=1\text{W/m}^2\text{K}$		-	0,8	-	K/W
	Diode Wechselr./ diode inverter		-	1,5	-	K/W
	Trans. Bremse/ trans. brake		-	0,8	-	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

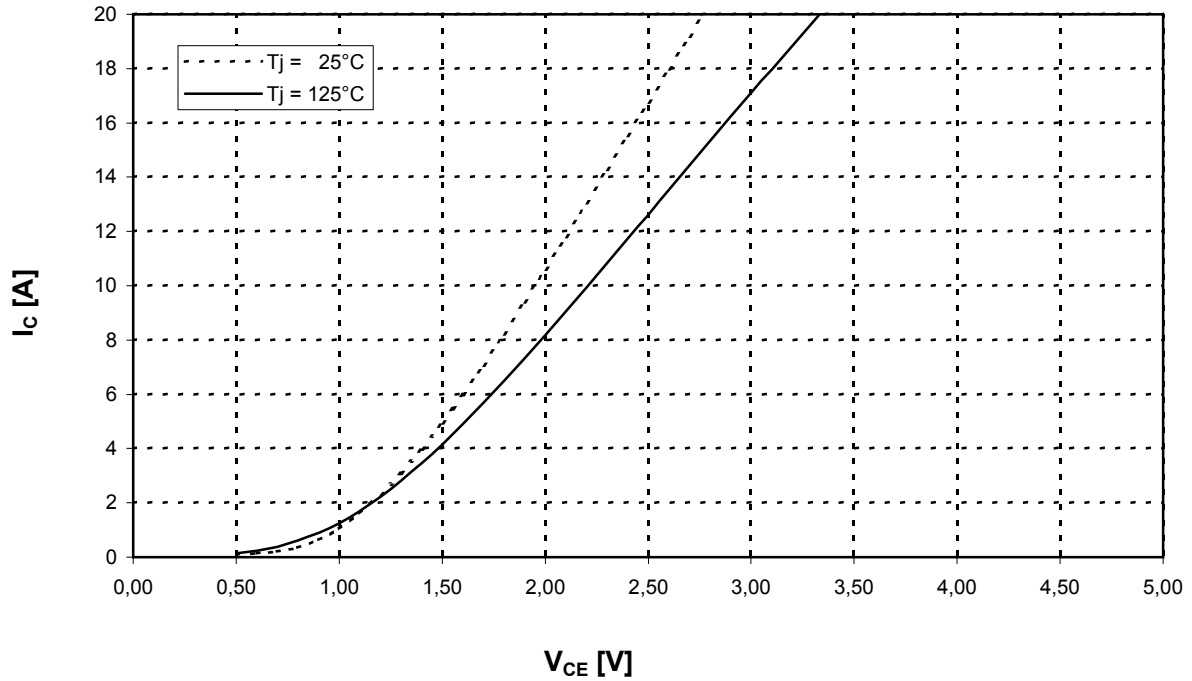
Mechanische Eigenschaften / mechanical properties

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

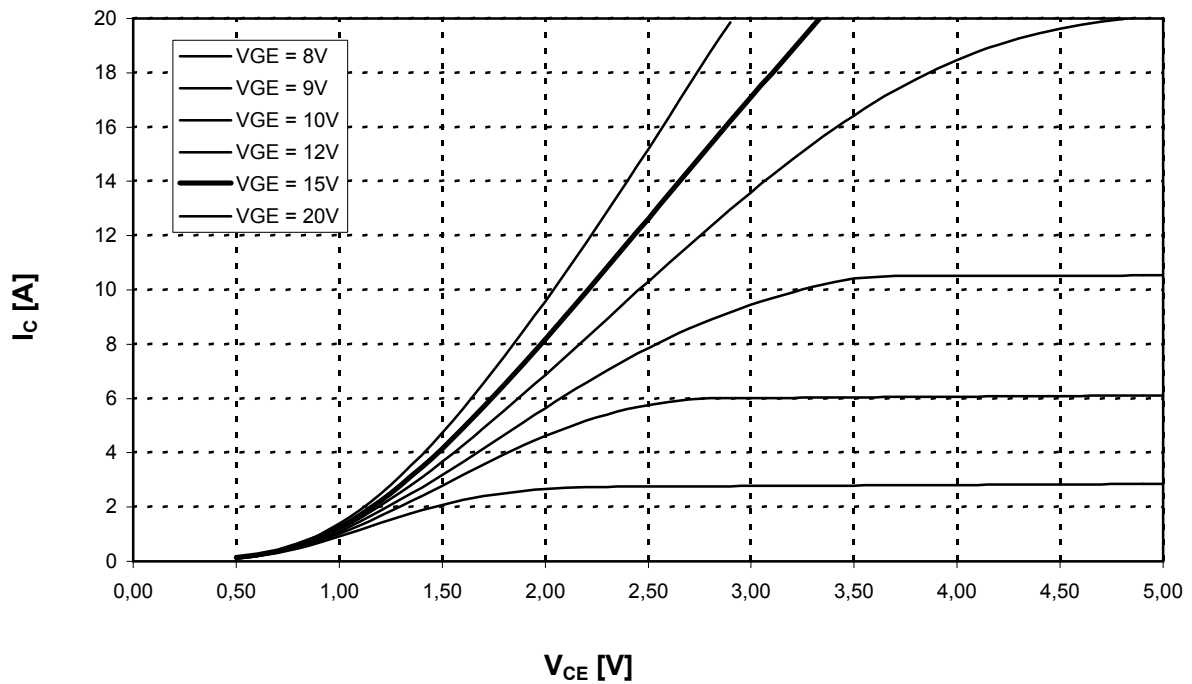


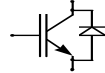
Vorläufig
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Ausgangskennlinienfeld Wechselr. (typisch) $I_C = f(V_{CE})$
output characteristic inverter (typical) $V_{GE} = 15\text{ V}$



Ausgangskennlinienfeld Wechselr. (typisch) $I_C = f(V_{CE})$
output characteristic inverter (typical) $T_{vj} = 125^\circ\text{C}$





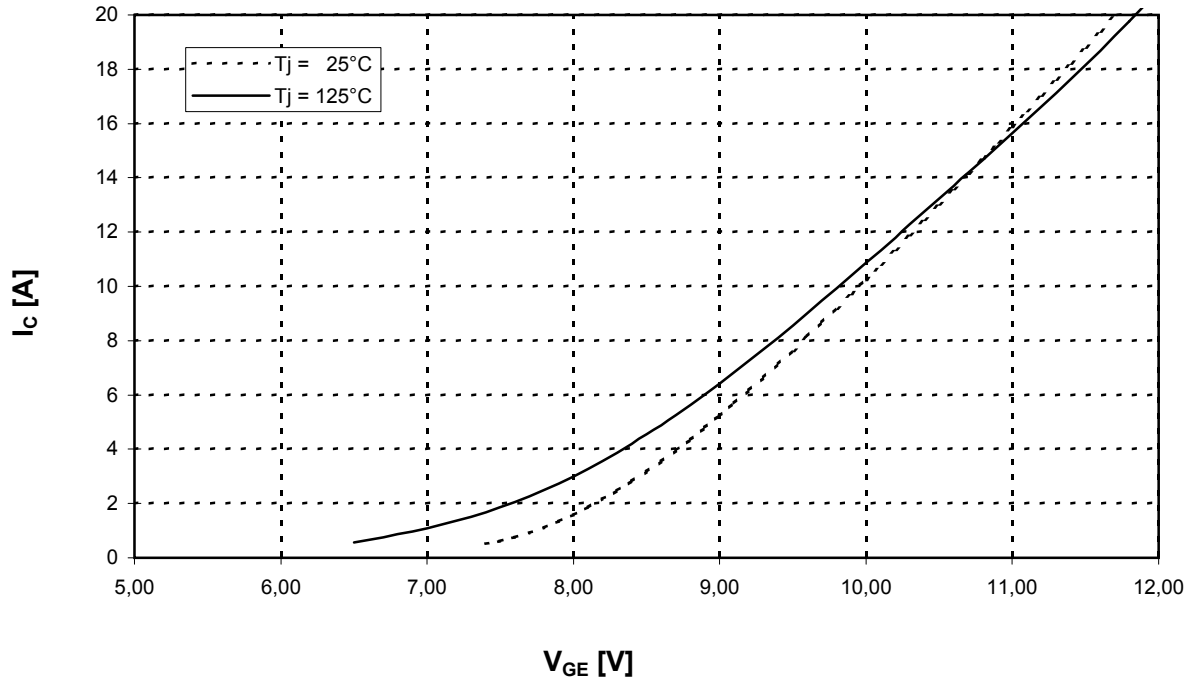
Vorläufig
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Übertragungscharakteristik Wechselr. (typisch)

$I_C = f(V_{GE})$

transfer characteristic inverter (typical)

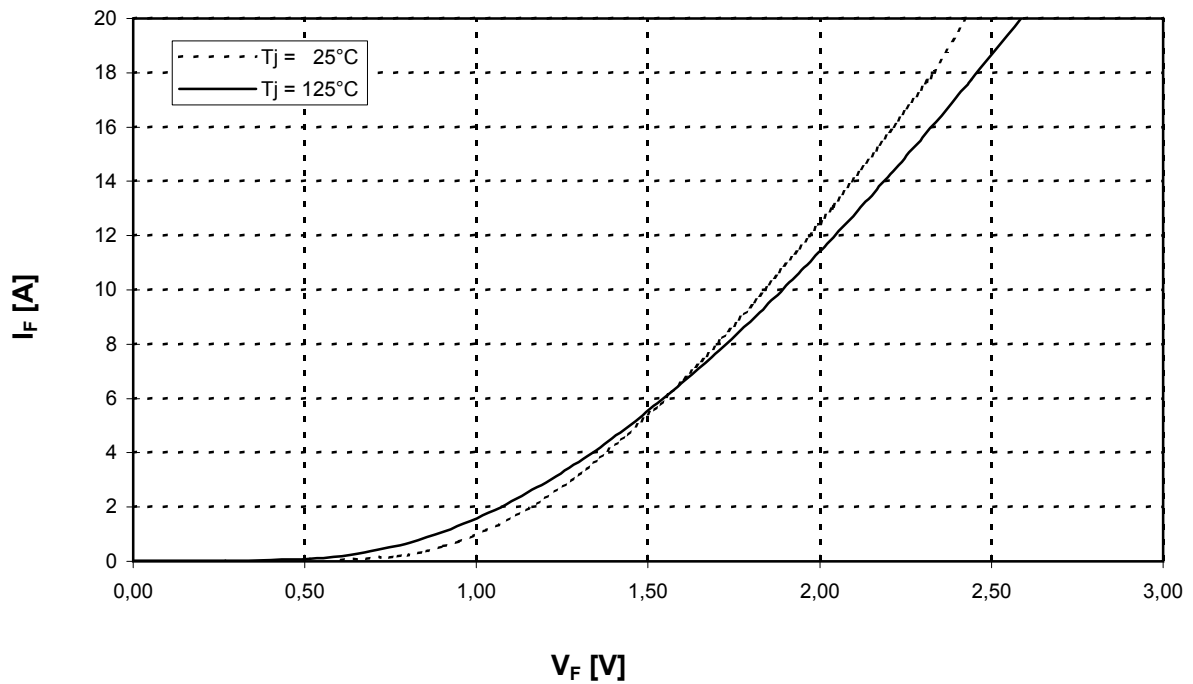
$V_{CE} = 20\text{ V}$

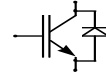


Durchlaßkennlinie der Freilaufdiode Wechselr. (typisch)

$I_F = f(V_F)$

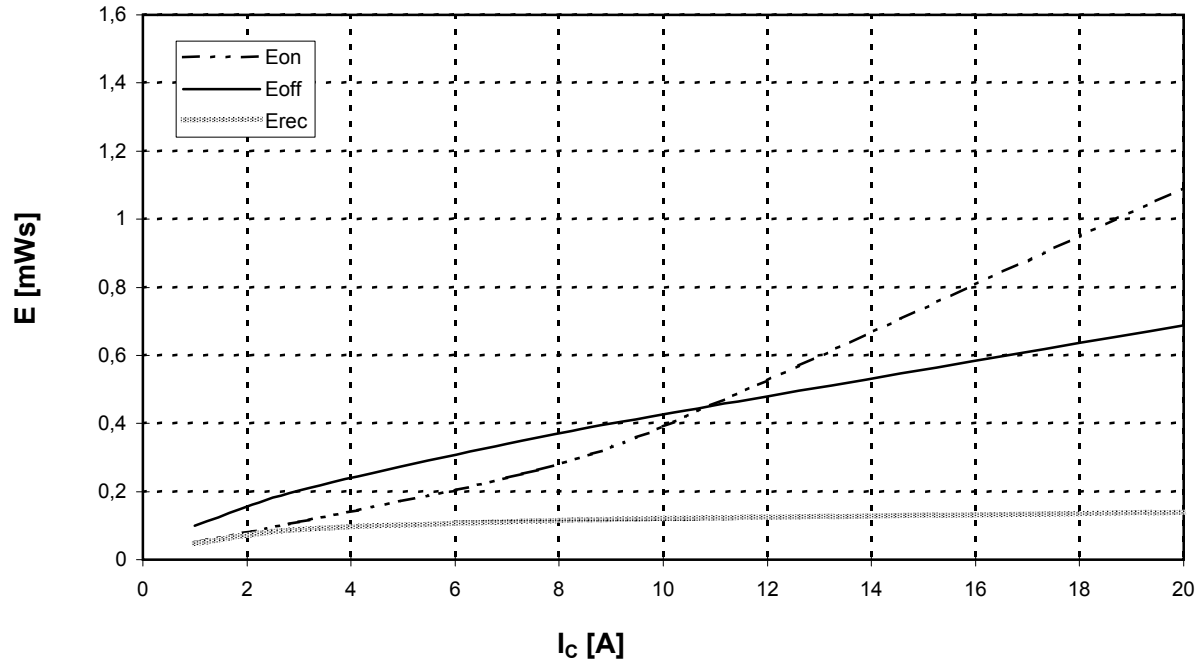
forward characteristic of FWD inverter (typical)



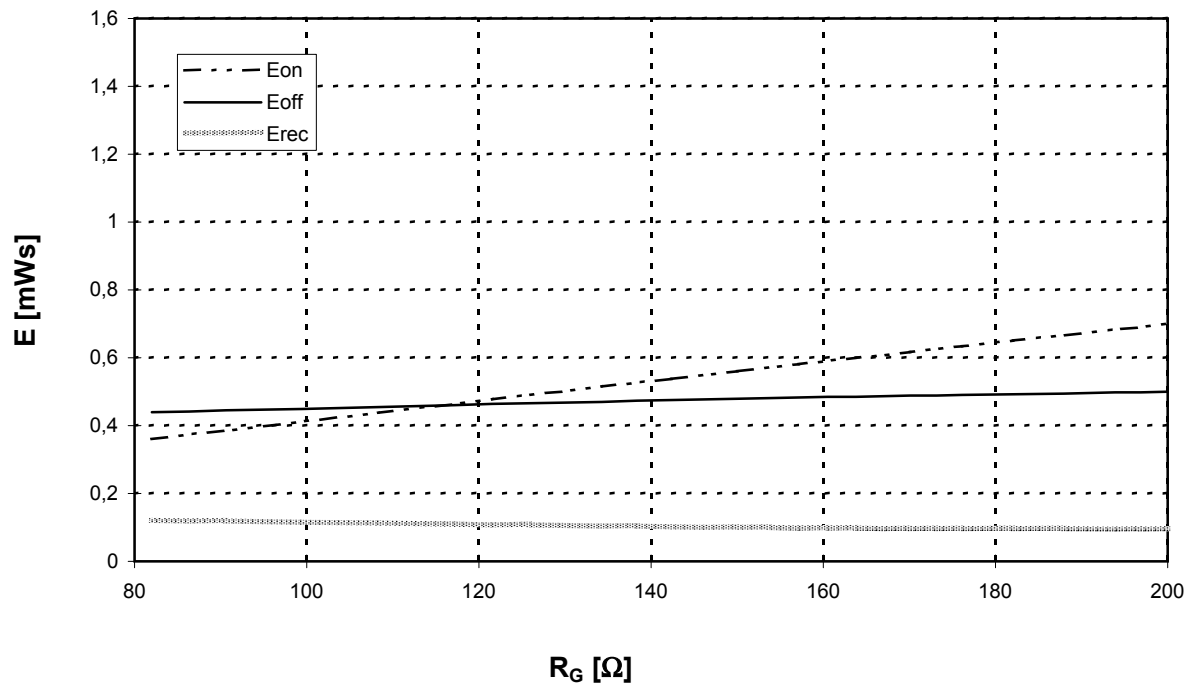


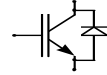
Vorläufig
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Schaltverluste Wechselr. (typisch) $E_{on} = f(I_c)$, $E_{off} = f(I_c)$, $E_{rec} = f(I_c)$ $V_{CC} = 300\text{ V}$
 switching losses inverter (typical) $T_j = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = R_{Goff} = 82\text{ Ohm}$



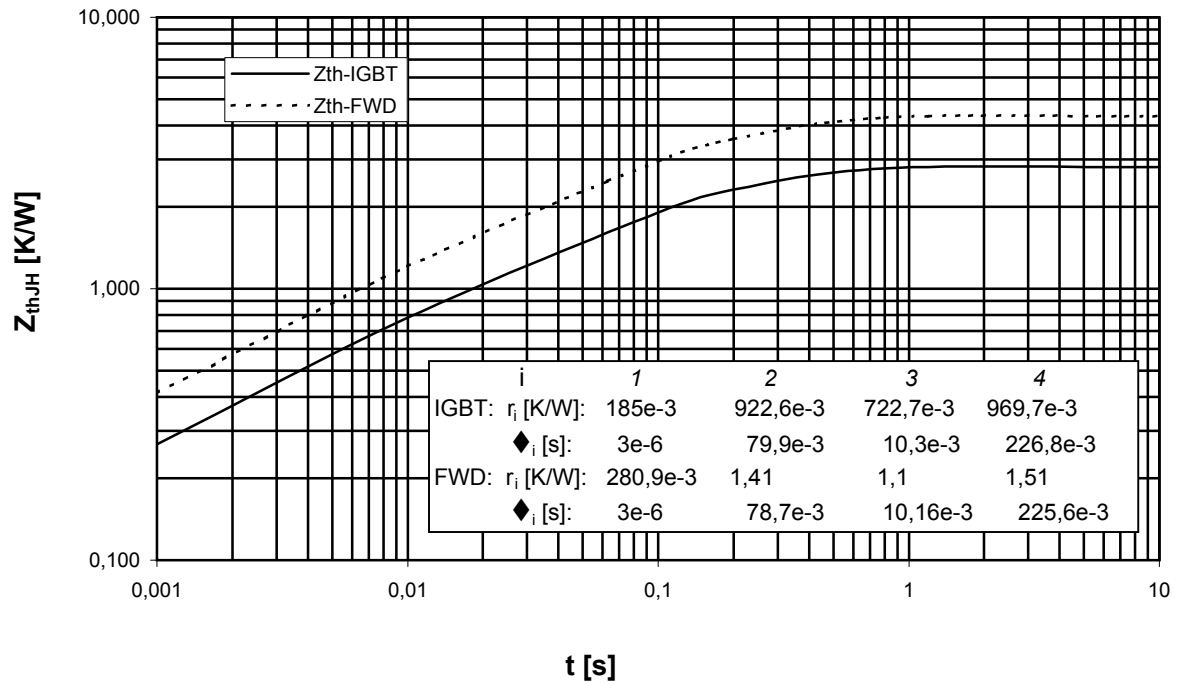
Schaltverluste Wechselr. (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
 switching losses inverter (typical) $T_j = 125^\circ\text{C}$, $V_{GE} = +15\text{ V}$, $I_c = I_{nenn}$, $V_{CC} = 300\text{ V}$



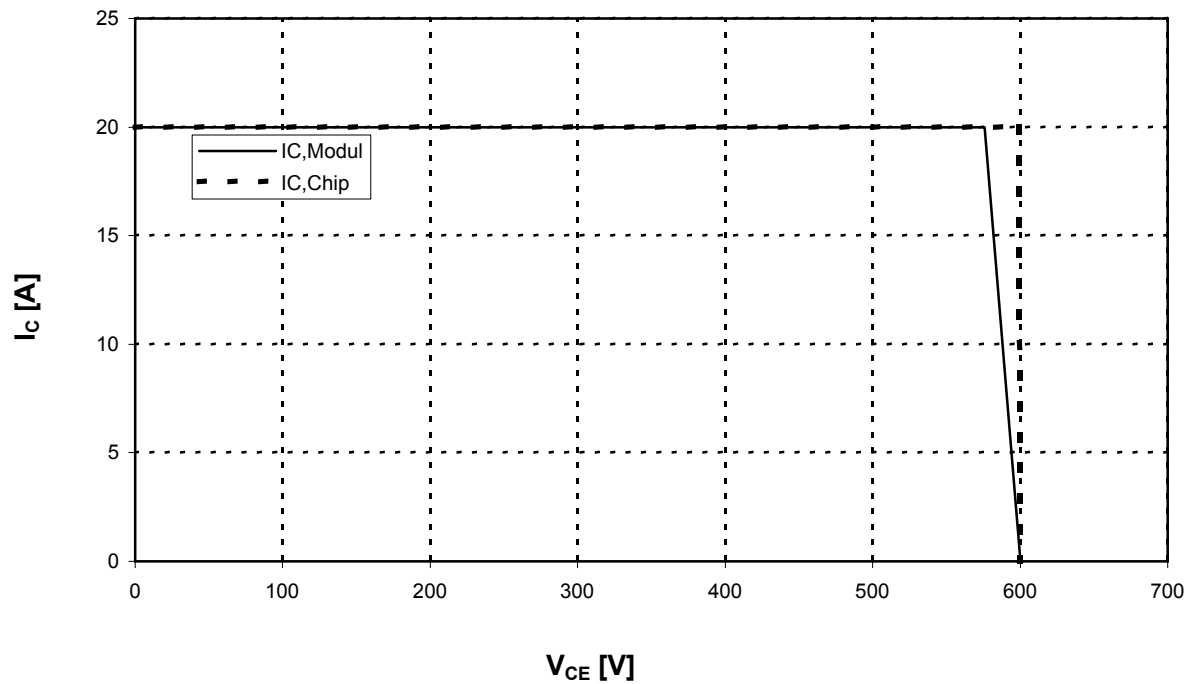


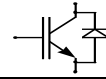
Vorläufig
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Transienter Wärmewiderstand Wechsele
transient thermal impedance inverter $Z_{thJH} = f(t)$



Sicherer Arbeitsbereich Wechsele (RBSOA) $I_C = f(V_{CE})$
reverse bias safe operating area inverter (RBSOA) $T_{vj} = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{V}$, $R_G = 82 \text{ Ohm}$

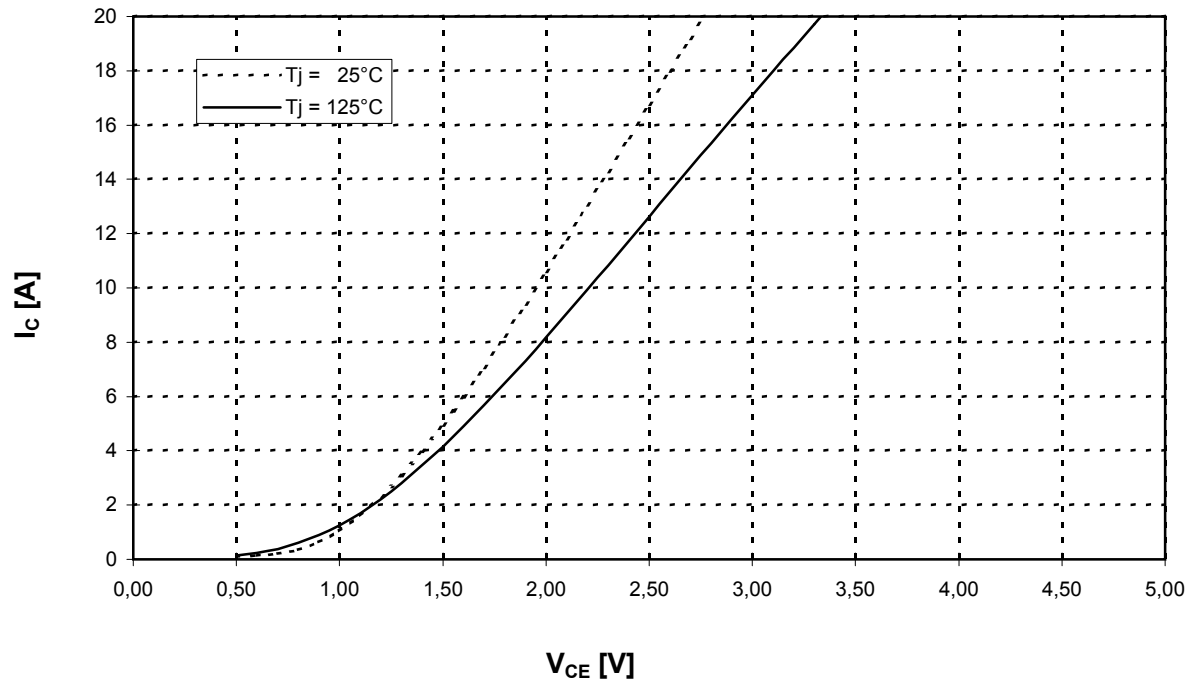




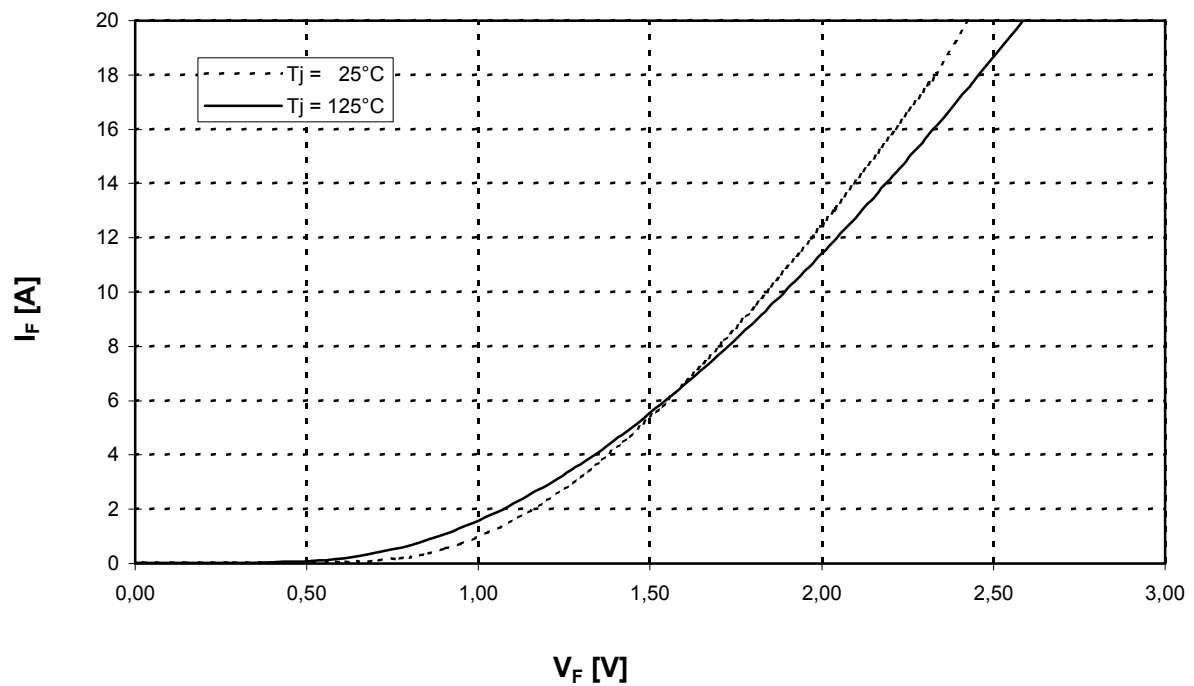
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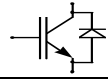
Ausgangskennlinienfeld Brems-Chopper-IGBT (typisch)
output characteristic brake-chopper-IGBT (typical)

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



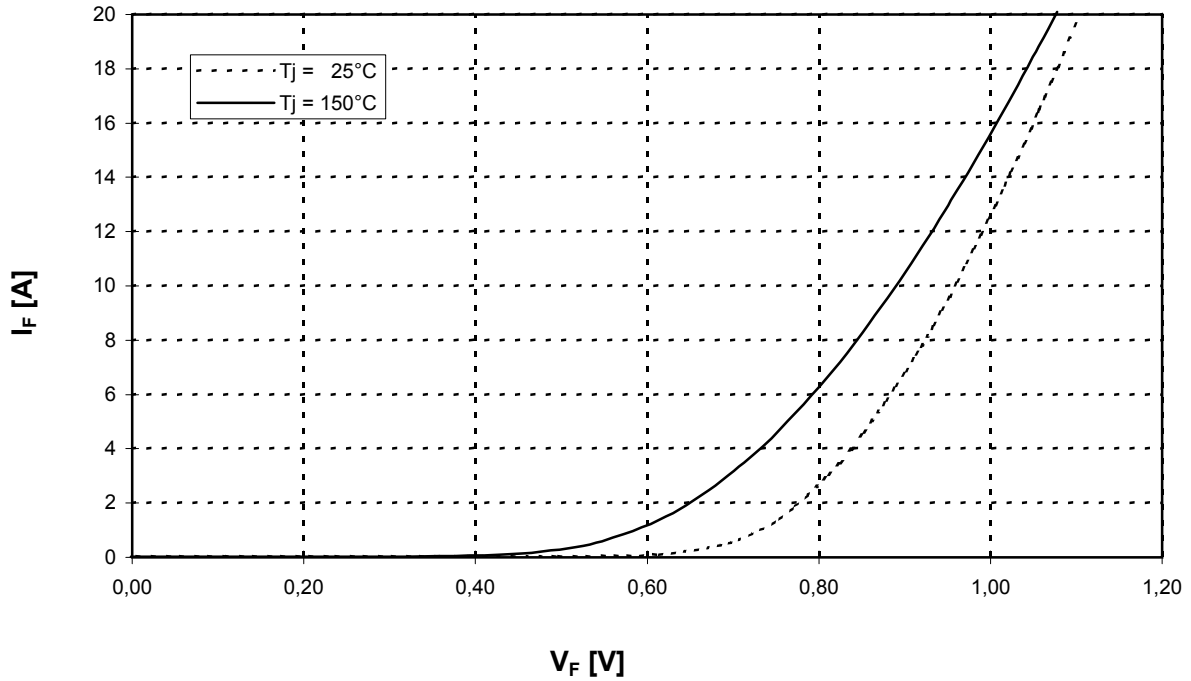
Durchlaßkennlinie der Brems-Chopper-Diode (typisch) $I_F = f(V_F)$
forward characteristic of brake-chopper-FWD (typical)



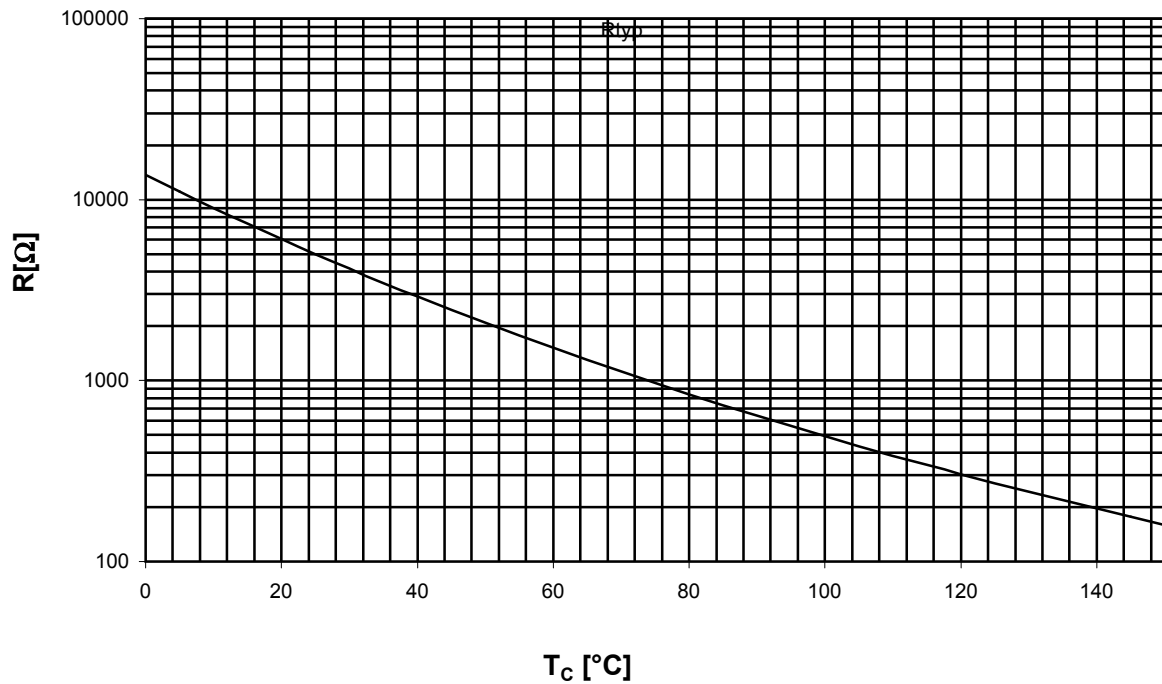


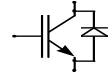
Vorläufig
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Durchlaßkennlinie der Gleichrichterdiode (typisch) $I_F = f(V_F)$
forward characteristic of rectifier diode (typical)



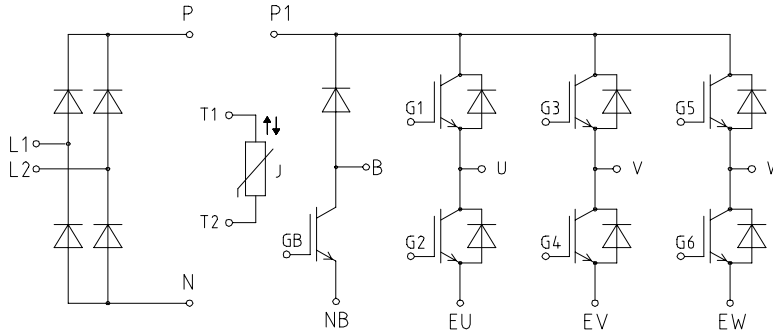
NTC- Temperaturkennlinie (typisch) $R = f(T)$
NTC- temperature characteristic (typical)



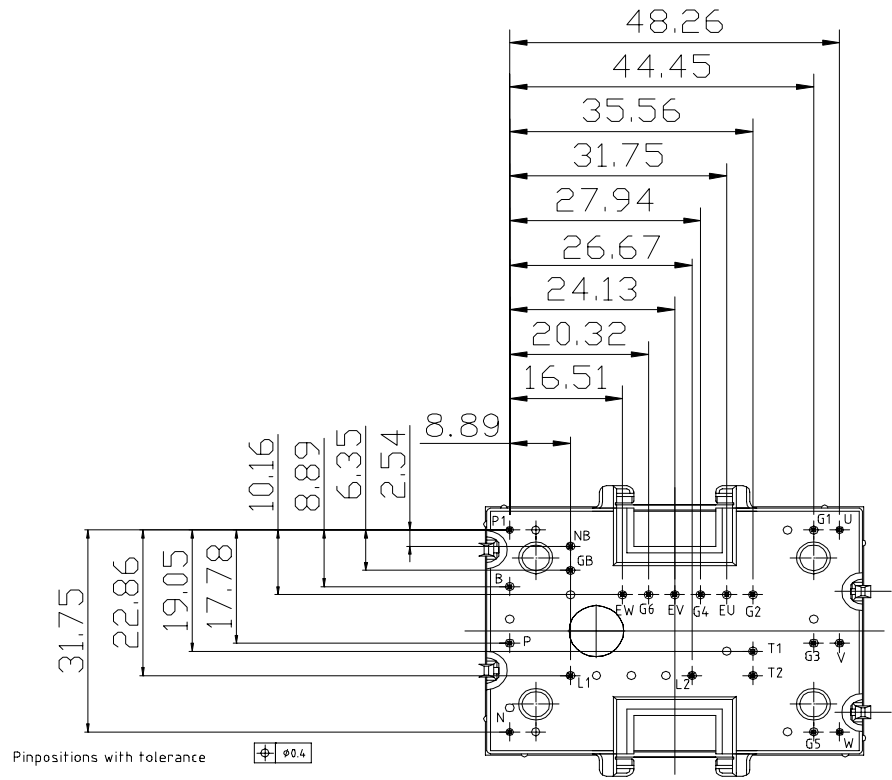


Vorläufig
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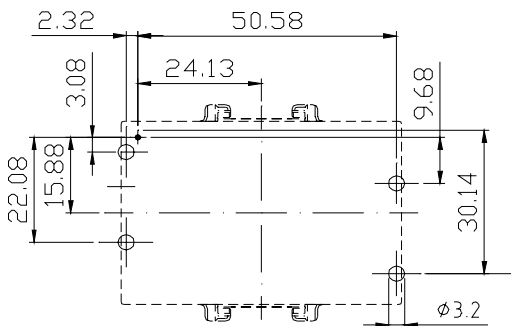
Schaltplan/ circuit diagram

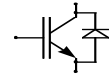


Gehäuseabmessungen/ package outlines

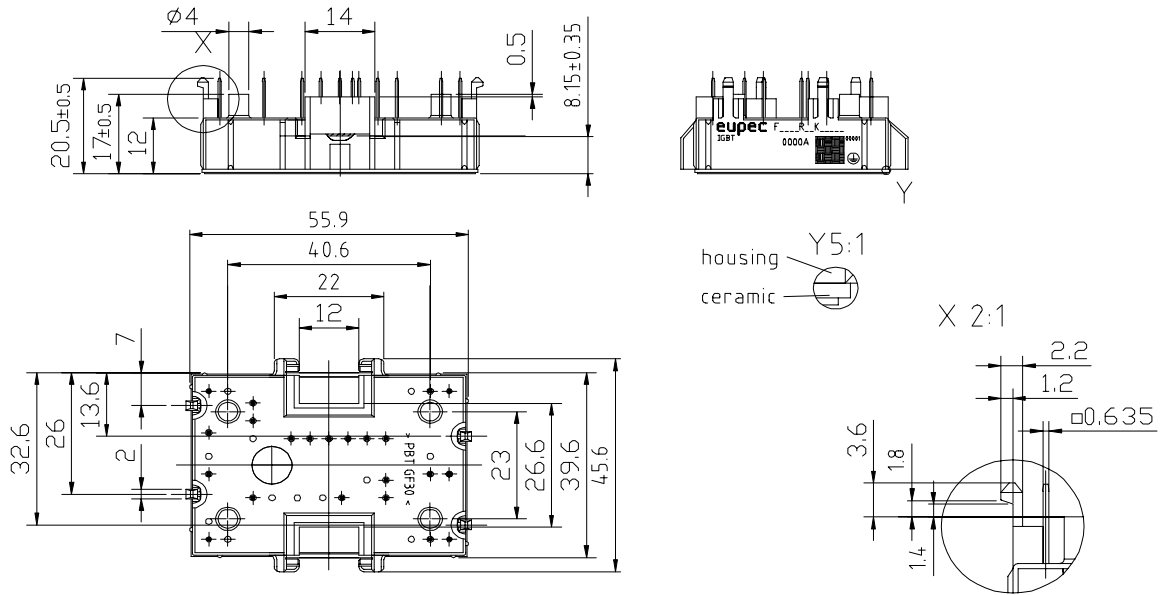


Bohrplan /
drilling layout





Gehäuseabmessungen Forts. / package outlines contd.



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