

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}	29	A
Gleichrichter Ausgang Grenzeffektivstrom maximum RMS current at Rectifier output	$T_C = 80^{\circ}\text{C}$	I_{RMSmax}	36	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}	262 215	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	344 231	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	20 25	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1 \text{ ms}, T_c = 65^{\circ}\text{C}$	I_{CRM}	40	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	P_{tot}	78	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V

Diode Wechselrichter/ Diode Inverter

Dauergleichstrom DC forward current		I_F	20	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1 \text{ ms}$	I_{FRM}	40	A
Grenzlastintegral I^2t - value	$V_R = 0\text{V}, t_p = 10\text{ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	62	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	20 25	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1 \text{ ms}, T_c = 65^{\circ}\text{C}$	I_{CRM}	40	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	P_{tot}	78	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/- 20V	V

Diode Brems-Chopper/ Diode Brake-Chopper

Dauergleichstrom DC forward current		I_F	20	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1 \text{ ms}$	I_{FRM}	40	A

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Technische Information / Technical Information

IGBT-Module
IGBT-Modules

FP20R06KL4

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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	$T_{vj} = 150^{\circ}\text{C}, \quad I_F = 20 \text{ A}$	V_F	-	0,95	-	V	
Schleusenspannung threshold voltage	$T_{vj} = 150^{\circ}\text{C}$	$V_{(TO)}$	-	0,71	-	V	
Ersatzwiderstand slope resistance	$T_{vj} = 150^{\circ}\text{C}$	r_T	-	12	-	mΩ	
Sperrstrom reverse current	$T_{vj} = 150^{\circ}\text{C}, \quad V_R = 800 \text{ V}$	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	$V_{GE} = 15\text{V}, \quad T_{vj} = 25^{\circ}\text{C}, \quad I_C = 20 \text{ A}$ $V_{GE} = 15\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad I_C = 20 \text{ A}$	$V_{CE \text{ sat}}$	-	1,95 2,2	2,55 -	V V	
Gate-Schwellenspannung gate threshold voltage	$V_{CE} = V_{GE}, \quad T_{vj} = 25^{\circ}\text{C}, \quad I_C = 0,5\text{mA}$	$V_{GE(TO)}$	4,5	5,5	6,5	V	
Eingangskapazität input capacitance	$f = 1\text{MHz}, \quad T_{vj} = 25^{\circ}\text{C}$ $V_{CE} = 25 \text{ V}, \quad V_{GE} = 0 \text{ V}$	C_{ies}	-	1,1	-	nF	
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{GE} = 0\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad V_{CE} = 600\text{V}$	I_{CES}	-	5,0	-	mA	
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0\text{V}, \quad V_{GE} = 20\text{V}, \quad T_{vj} = 25^{\circ}\text{C}$	I_{GES}	-	-	400	nA	
Einschaltverzögerungszeit (ind. Last) turn on delay time (inductive load)	$I_C = I_{Nenn}, \quad V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 25^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$	$t_{d,on}$	-	22 31	-	ns ns	
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = I_{Nenn}, \quad V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 25^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$	t_r	-	23 37	-	ns ns	
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = I_{Nenn}, \quad V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 25^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$	$t_{d,off}$	-	143 154	-	ns ns	
Fallzeit (induktive Last) fall time (inductive load)	$I_C = I_{Nenn}, \quad V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 25^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$	t_f	-	22 38	-	ns ns	
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = I_{Nenn}, \quad V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$ $L_S = 80 \text{ nH}$	E_{on}	-	0,7	-	mWs	
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = I_{Nenn}, \quad V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15\text{V}, \quad T_{vj} = 125^{\circ}\text{C}, \quad R_G = 47 \text{ Ohm}$ $L_S = 80 \text{ nH}$	E_{off}	-	0,6	-	mWs	
Kurzschlußverhalten SC Data	$t_P \leq 10\mu\text{s}, \quad V_{GE} \leq 15\text{V}, \quad R_G = 47 \text{ Ohm}$ $T_{vj} \leq 125^{\circ}\text{C}, \quad V_{CC} = 360 \text{ V}$	I_{SC}	-	90	-	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	$T_C = 25^\circ C$	$R_{CC'+EE'}$	-	13	-	mΩ
Diode Wechselrichter/ Diode Inverter						
			min.	typ.	max.	
Durchlaßspannung forward voltage	$V_{GE} = 0V, T_{vj} = 25^\circ C, I_F = 20 A$ $V_{GE} = 0V, T_{vj} = 125^\circ C, I_F = 20 A$	V_F	-	1,7	2,15	V
			-	1,7	-	V
Rückstromspitze peak reverse recovery current	$I_F = I_{Nenn}, -di_F/dt = 1000 A/us$ $V_{GE} = -10V, T_{vj} = 25^\circ C, V_R = 300 V$ $V_{GE} = -10V, T_{vj} = 125^\circ C, V_R = 300 V$	I_{RM}	-	20	-	A
			-	23	-	A
Sperrverzögerungsladung recovered charge	$I_F = I_{Nenn}, -di_F/dt = 1000 A/us$ $V_{GE} = -10V, T_{vj} = 25^\circ C, V_R = 300 V$ $V_{GE} = -10V, T_{vj} = 125^\circ C, V_R = 300 V$	Q_r	-	1	-	μAs
			-	1,7	-	μAs
Abschaltenergie pro Puls reverse recovery energy	$I_F = I_{Nenn}, -di_F/dt = 1000 A/us$ $V_{GE} = -10V, T_{vj} = 25^\circ C, V_R = 300 V$ $V_{GE} = -10V, T_{vj} = 125^\circ C, V_R = 300 V$	E_{rec}	-	0,2	-	mWs
			-	0,35	-	mWs
Transistor Brems-Chopper/ Transistor Brake-Chopper						
			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	$V_{GE} = 15V, T_{vj} = 25^\circ C, I_C = 20,0 A$ $V_{GE} = 15V, T_{vj} = 125^\circ C, I_C = 20,0 A$	$V_{CE sat}$	-	1,95	2,55	V
			-	2,2	-	V
Gate-Schwellenspannung gate threshold voltage	$V_{CE} = V_{GE}, T_{vj} = 25^\circ C, I_C = 0,5mA$	$V_{GE(TO)}$	4,5	5,5	6,5	V
Eingangskapazität input capacitance	$f = 1MHz, T_{vj} = 25^\circ C$ $V_{CE} = 25 V, V_{GE} = 0 V$	C_{ies}	-	1,1	-	nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{GE} = 0V, T_{vj} = 125^\circ C, V_{CE} = 600V$		-	5,0	-	mA
Gate-Emitter Reststrom gate-emitter leakage current	$V_{CE} = 0V, V_{GE} = 20V, T_{vj} = 25^\circ C$	I_{GES}	-	-	400	nA
Diode Brems-Chopper/ Diode Brake-Chopper						
			min.	typ.	max.	
Durchlaßspannung forward voltage	$T_{vj} = 25^\circ C, I_F = 20A$ $T_{vj} = 125^\circ C, I_F = 20A$	V_F	-	2,45	2,9	V
			-	2,55	-	V
NTC-Widerstand/ NTC-Thermistor						
			min.	typ.	max.	
Nennwiderstand rated resistance	$T_C = 25^\circ C$	R_{25}	-	5	-	kΩ
Abweichung von R_{100} deviation of R_{100}	$T_C = 100^\circ C, R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
Verlustleistung power dissipation	$T_C = 25^\circ C$	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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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}	-	2,1	-	K/W
	Trans. Wechsr./ Trans. Inverter $\lambda_{\text{grease}}=1\text{W/m}^2\text{K}$		-	1,8	-	K/W
	Diode Wechsr./ Diode Inverter		-	3,7	-	K/W
	Trans. Bremse/ Trans. Brake		-	1,8	-	K/W
	Diode Bremse/ Diode Brake		-	4,3	-	K/W
Innerer Wärmewiderstand thermal resistance, junction to case	Gleichr. Diode/ Rectif. Diode	R_{thJC}	-	-	2	K/W
	Trans. Wechsr./ Trans. Inverter		-	-	1,6	K/W
	Diode Wechsr./ Diode Inverter		-	-	2,7	K/W
	Trans. Bremse/ Trans. Brake		-	-	1,6	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}	-	0,3	-	K/W
	Trans. Wechsr./ Trans. Inverter $\lambda_{\text{grease}}=1\text{W/m}^2\text{K}$		-	0,4	-	K/W
	Diode Wechsr./ Diode Inverter		-	1,3	-	K/W
	Trans. Bremse/ Trans. Brake		-	0,4	-	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

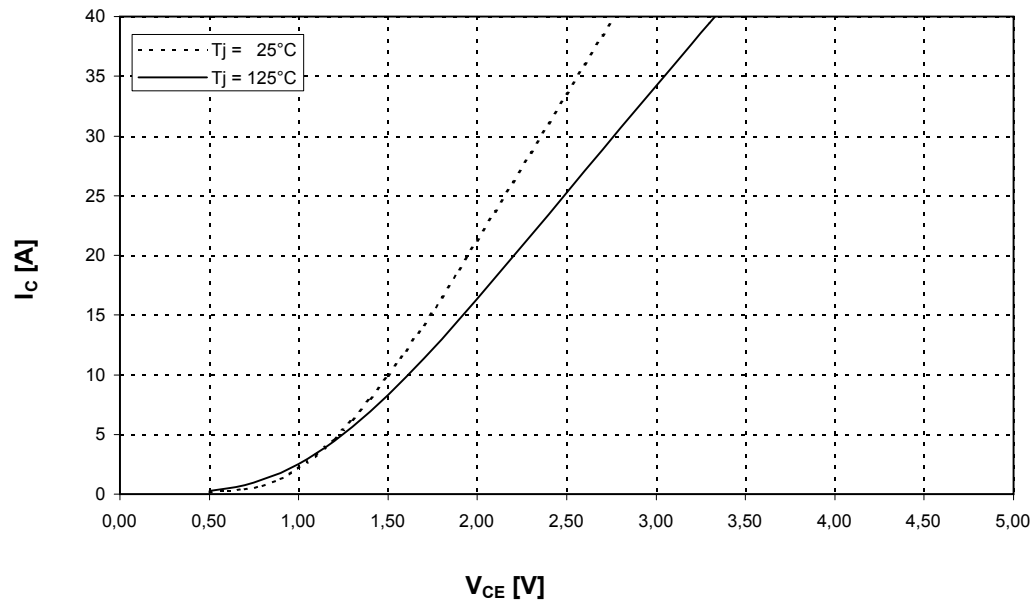
Innere Isolation internal insulation			Al_2O_3	
CTI comperative tracking index			225	
Anpreßkraft f. mech. Befestigung mounting force		F	40...80	N
Gewicht weight		G	36	g
Kontakt - Kühlkörper terminal to heatsink	Kriechstrecke creeping distance		13,5	mm
	Luftstrecke clearance		12	mm
Terminal - Terminal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



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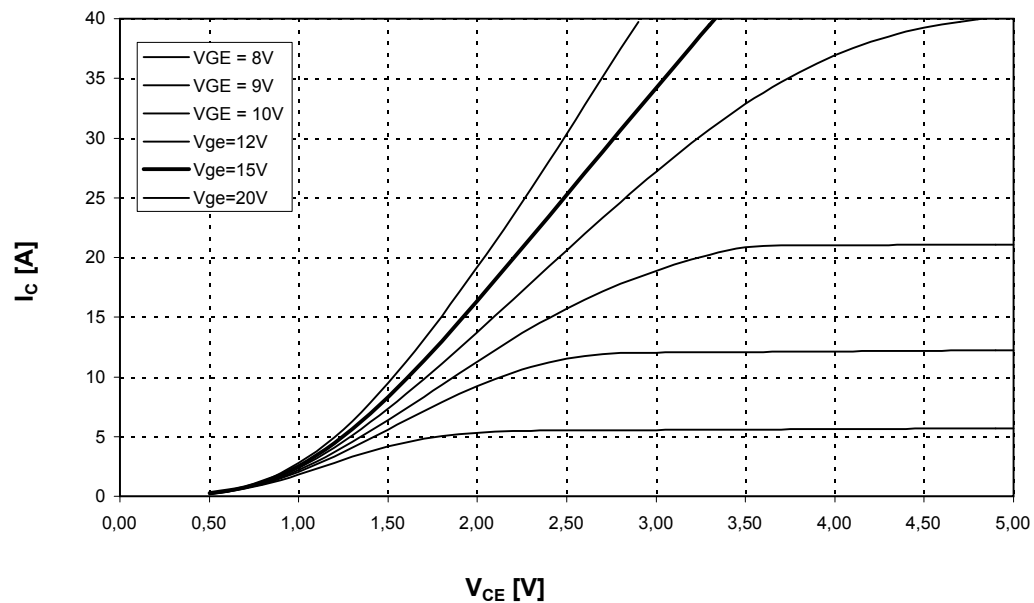
Ausgangskennlinienfeld Wechselr. (typisch)
Output characteristic Inverter (typical)

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



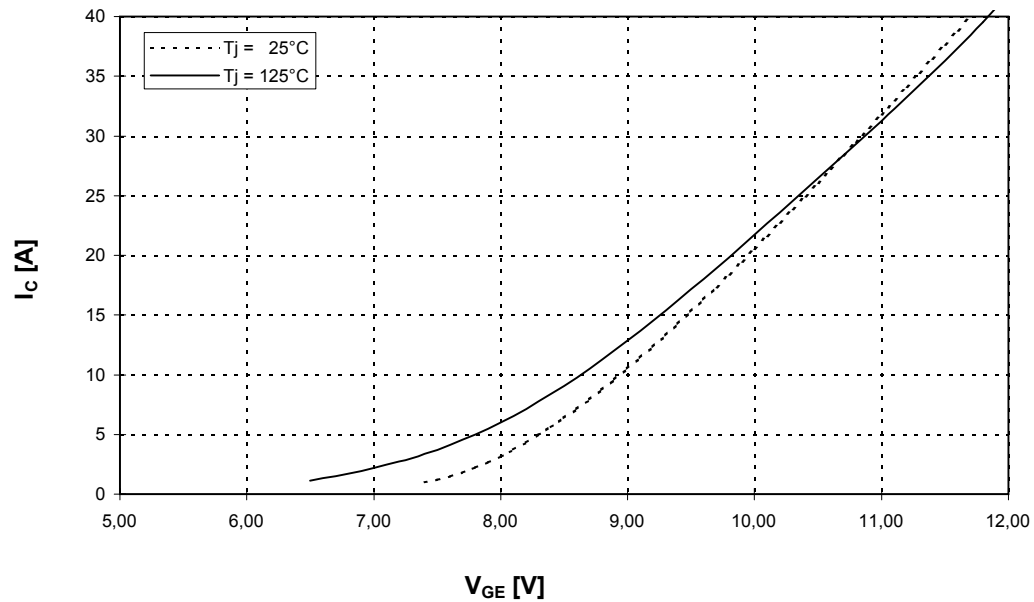
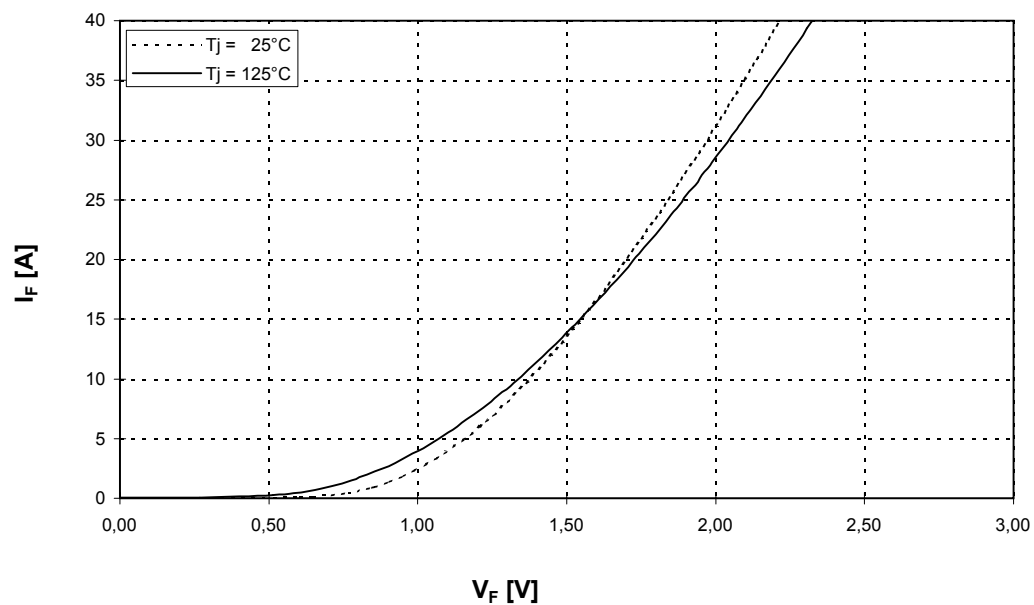
Ausgangskennlinienfeld Wechselr. (typisch)
Output characteristic Inverter (typical)

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



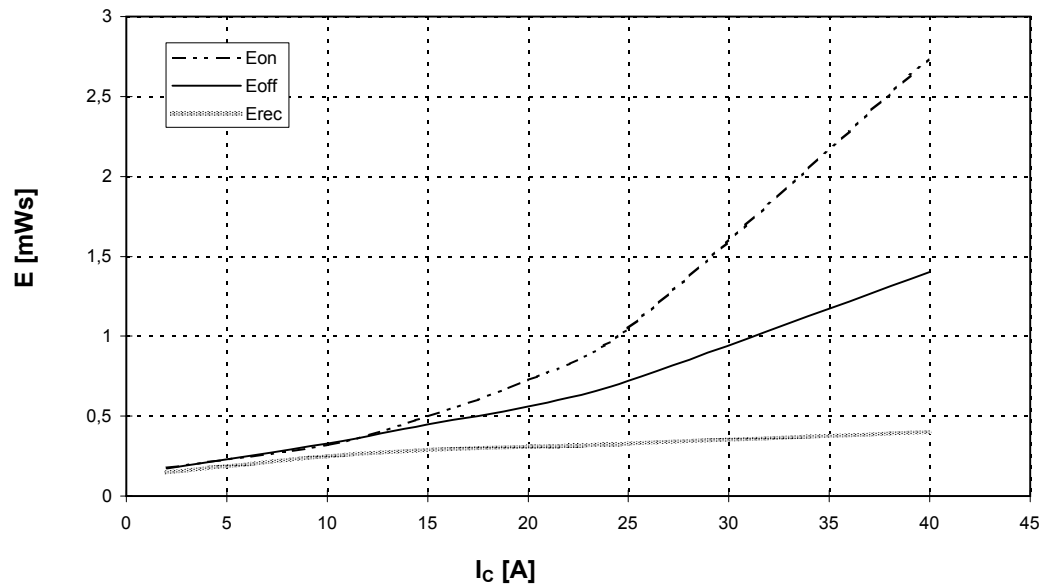
Vorläufig
PreliminaryÜbertragungscharakteristik Wechselr. (typisch)
Transfer characteristic Inverter (typical)

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

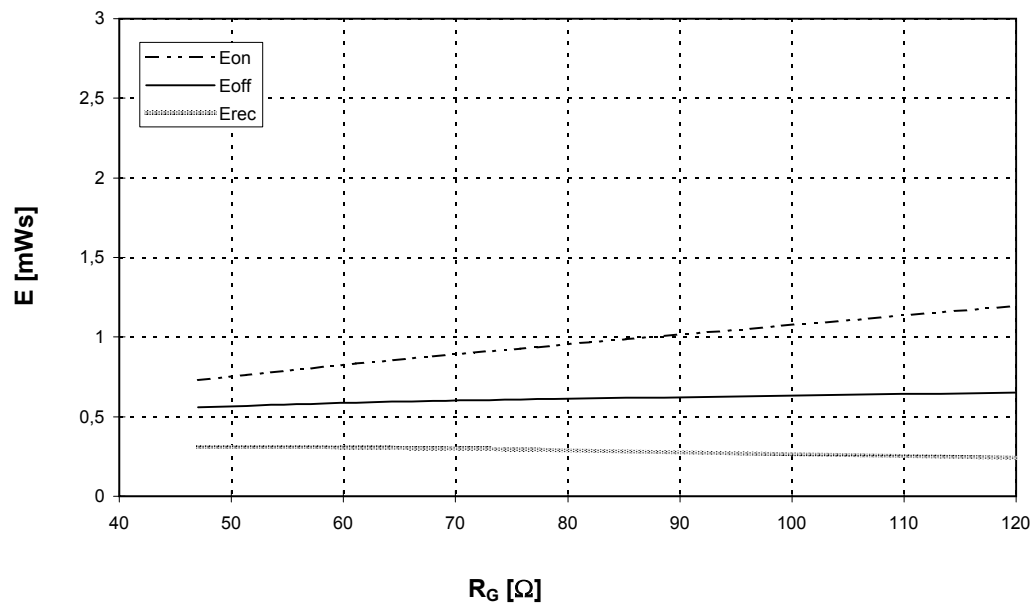
Durchlaßkennlinie der Freilaufdiode Wechselr. (typisch) $I_F = f(V_F)$
Forward characteristic of FWD Inverter (typical)

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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) $T_J = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = R_{Goff} = 47\text{ Ohm}$

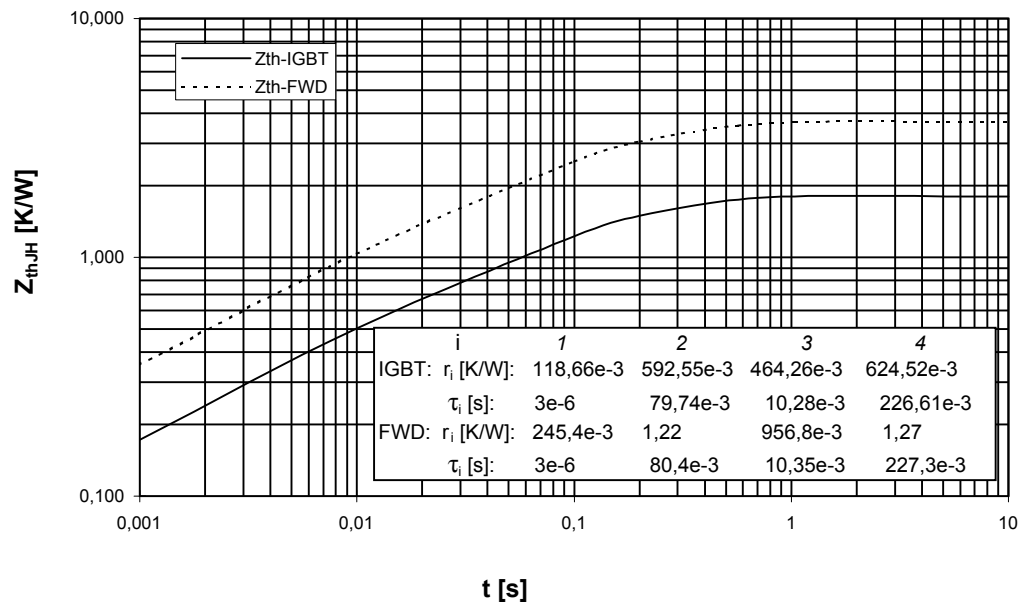


Schaltverluste Wechselr. (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
 Switching losses Inverter (typical) $T_J = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{ V}$, $I_C = I_{nenn}$, $V_{CC} = 300\text{ V}$



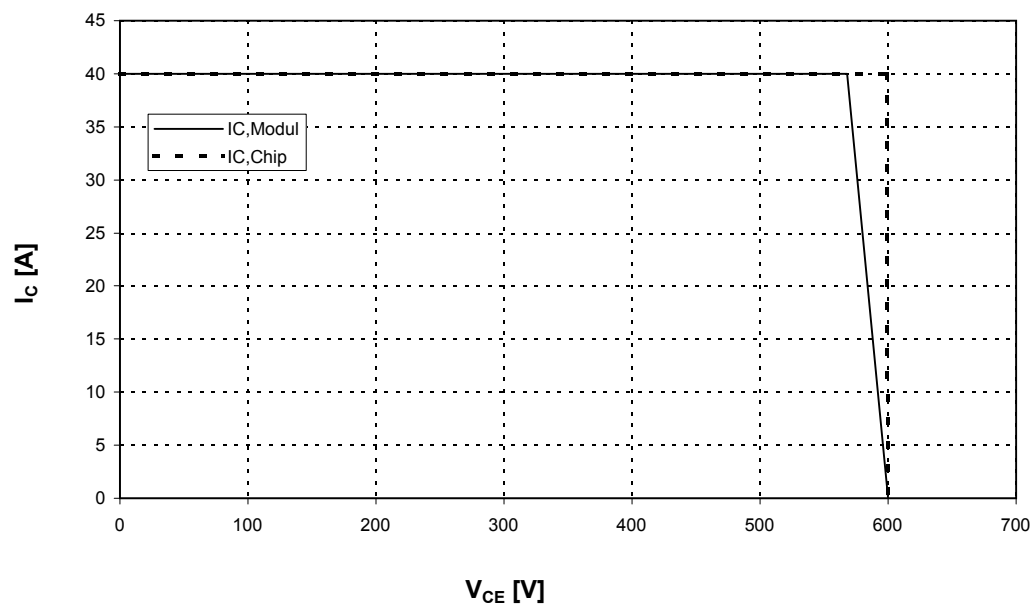
Vorläufig
PreliminaryTransienter Wärmewiderstand Wechslr.
Transient thermal impedance Inverter

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



Sicherer Arbeitsbereich Wechslr. (RBSOA)

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

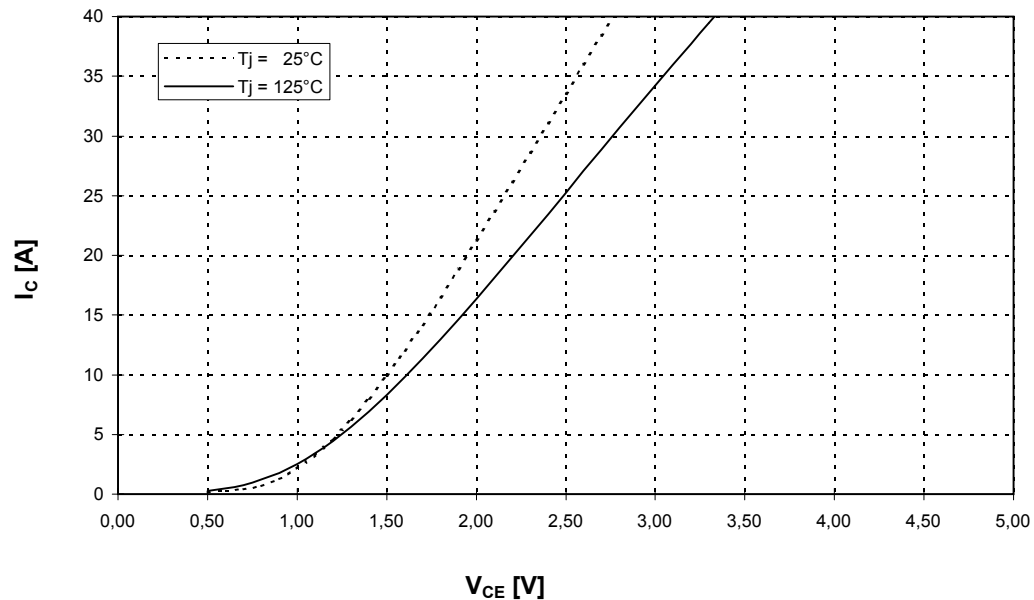
Reverse bias safe operating area Inverter (RBSOA) $T_{vj} = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{V}$, $R_G = 47\ \Omega$ 

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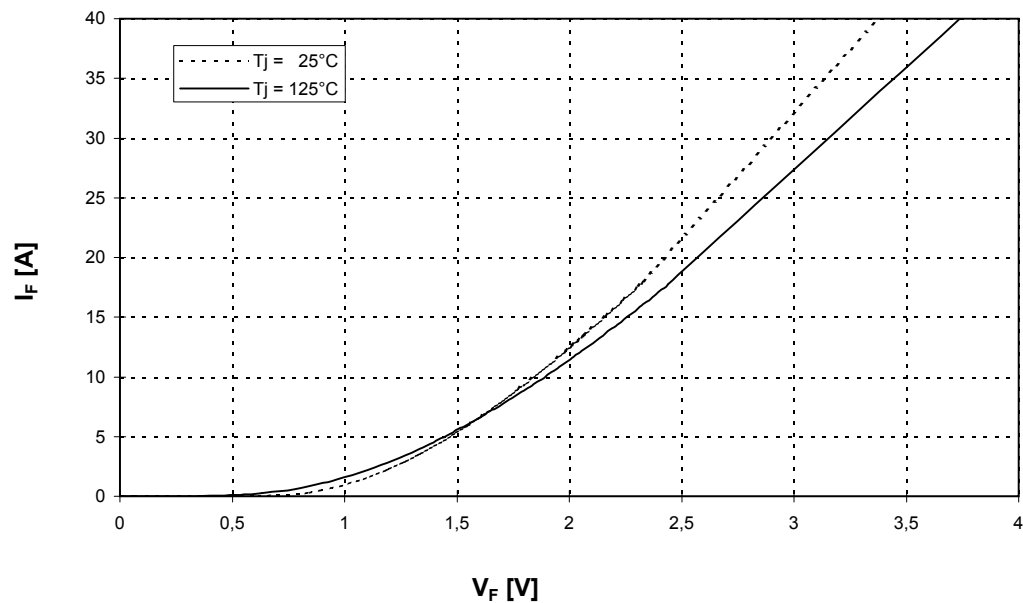
Ausgangskennlinienfeld Brems-Chopper-IGBT (typisch)

 $I_C = f(V_{CE})$

Output characteristic brake-chopper-IGBT (typical)

 $V_{GE} = 15\text{ V}$ Durchlaßkennlinie der Brems-Chopper-Diode (typisch) $I_F = f(V_F)$

Forward characteristic of brake-chopper-FWD (typical)

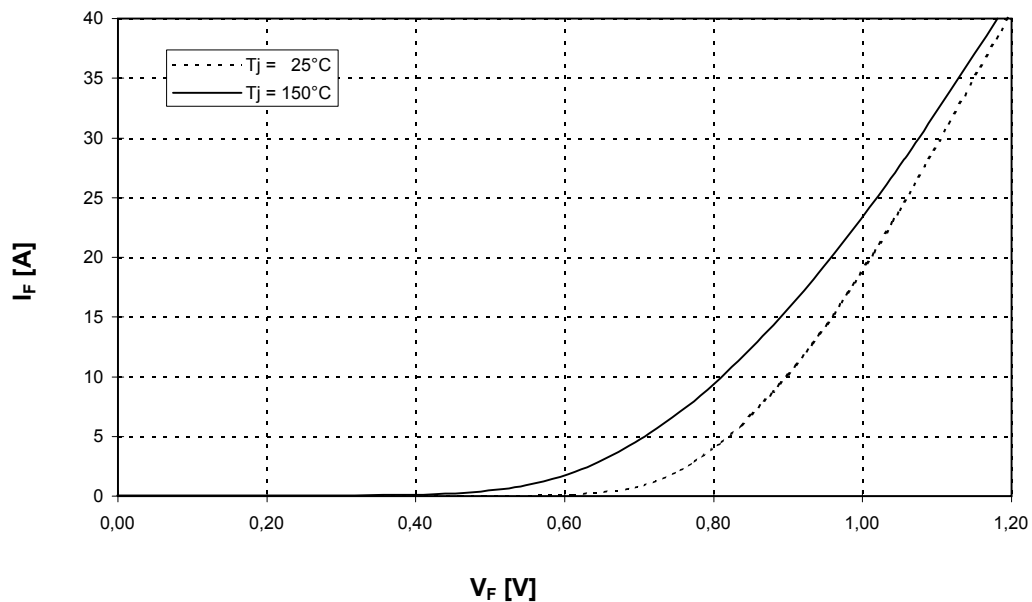




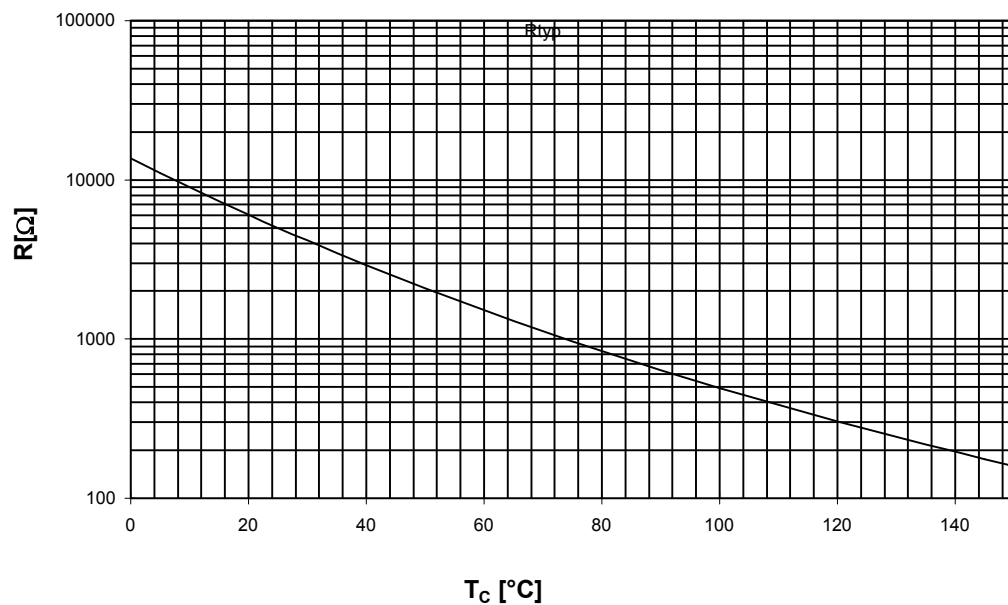
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Durchlaßkennlinie der Gleichrichterdiode (typisch)
Forward characteristic of Rectifier Diode (typical)

$$I_F = f(V_F)$$



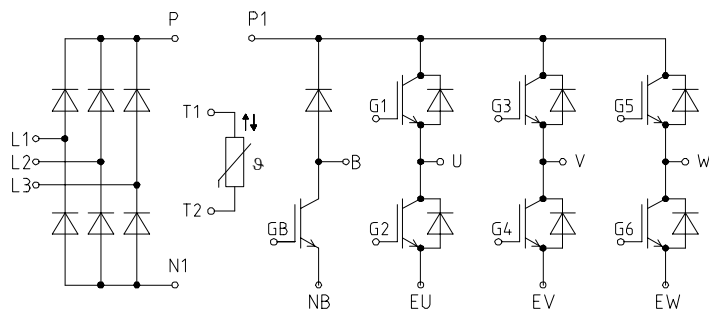
NTC- Temperaturkennlinie (typisch) $R = f(T)$
NTC- temperature characteristic (typical)





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Schaltplan/ Circuit diagram

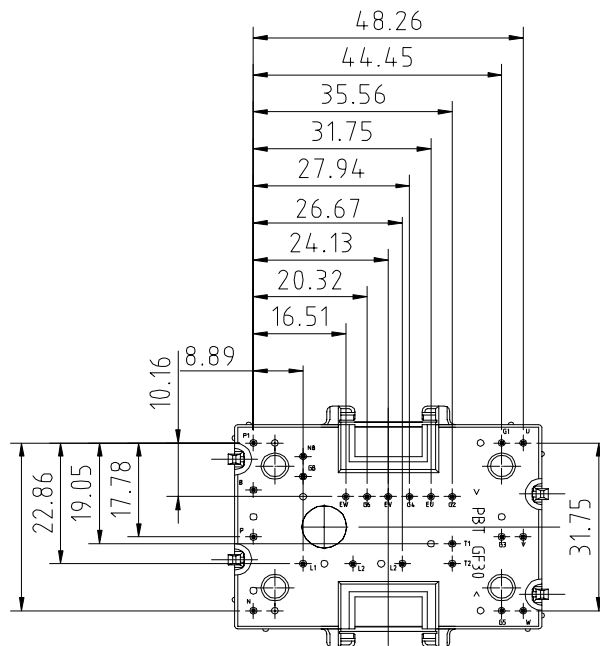
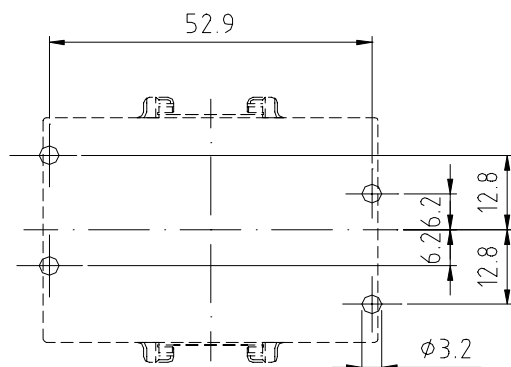


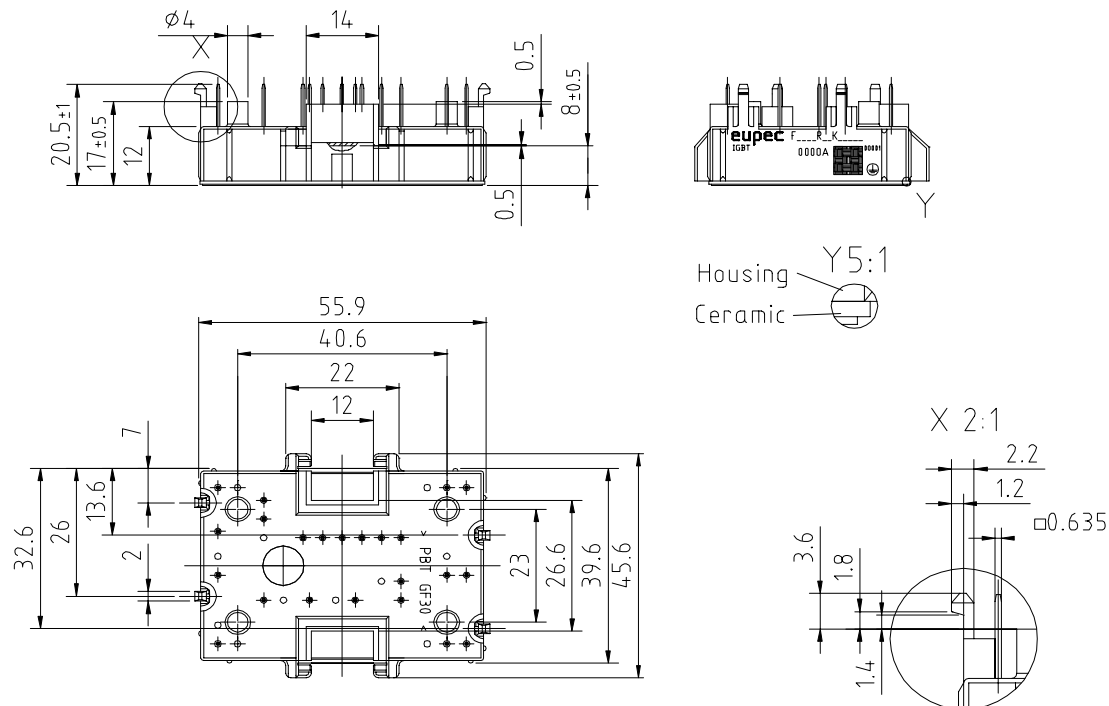
Gehäuseabmessungen/ Package outlines

Modul only designed for mounting on PCB's with 1.6 ± 0.2 mm thickness

Pinpositions with tolerance ± 0.4

Bohrplan /
drilling layout




Gehäuseabmessungen Forts. / Package outlines contd.


Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Diese 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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