

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}	96	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	$t_p = 1 \text{ ms}, T_C = 80^{\circ}\text{C}$	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

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Technische Information / Technical Information				eupec			
IGBT-Module IGBT-Modules		FB15R06KL4					
Vorläufig Preliminary							
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			
Elektrische Eigenschaften / Electrical properties							
Charakteristische Werte / Characteristic values							
Diode Gleichrichter/ Diode Rectifier				min.	typ.	max.	
Durchlaßspannung forward voltage	T _{vj} = 150°C, I _F = 15 A	V _F	-	0,8	-	V	
Schleusenspannung threshold voltage	T _{vj} = 150°C	V _(TO)	-	0,61	-	V	
Ersatzwiderstand slope resistance	T _{vj} = 150°C	r _T	-	11	-	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}	-	4	-	mΩ	
Transistor Wechselrichter/ Transistor Inverter				min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	V _{GE} = 15V, T _{vj} = 25°C, I _C = 15 A	V _{CE sat}	-	1,95	2,55	V	
	V _{GE} = 15V, T _{vj} = 125°C, I _C = 15 A		-	2,2	-	V	
Gate-Schwellenspannung gate threshold voltage	V _{CE} = V _{GE} , T _{vj} = 25°C, I _C = 0,4mA	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} = 125°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}	-	37	-	ns	
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 68 Ohm						
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 68 Ohm						
Anstiegszeit (induktive Last) rise time (inductive load)	I _C = I _{Nenn} , V _{CC} = 300 V	t _r	-	37	-	ns	
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 68 Ohm						
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 68 Ohm						
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	I _C = I _{Nenn} , V _{CC} = 300 V	t _{d,off}	-	216	-	ns	
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 68 Ohm						
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 68 Ohm						
Fallzeit (induktive Last) fall time (inductive load)	I _C = I _{Nenn} , V _{CC} = 300 V	t _f	-	17	-	ns	
	V _{GE} = ±15V, T _{vj} = 25°C, R _G = 68 Ohm						
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 68 Ohm						
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I _C = I _{Nenn} , V _{CC} = 300 V	E _{on}	-	0,6	-	mWs	
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 68 Ohm						
	L _S = 80 nH						
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I _C = I _{Nenn} , V _{CC} = 300 V	E _{off}	-	0,4	-	mWs	
	V _{GE} = ±15V, T _{vj} = 125°C, R _G = 68 Ohm						
	L _S = 80 nH						
Kurzschlußverhalten SC Data	t _p ≤ 10μs, V _{GE} ≤ 15V, R _G = 68 Ohm T _{vj} ≤ 125°C, V _{CC} = 360 V	I _{SC}	-	60	-	A	

Technische Information / Technical Information

IGBT-Module
IGBT-Modules

FB15R06KL4

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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	$V_{GE} = 0V, T_{vj} = 25^\circ C, I_F = 15 A$ $V_{GE} = 0V, T_{vj} = 125^\circ C, I_F = 15 A$	V_F	-	1,75 1,8	2,15 -	V V
Rückstromspitze peak reverse recovery current	$I_F = I_{Nenn}, -di_F/dt = 600 A/us$ $V_{GE} = -10V, T_{vj} = 25^\circ C, V_R = 300 V$ $V_{GE} = -10V, T_{vj} = 125^\circ C, V_R = 300 V$	I_{RM}	-	13 14	- -	A A
Sperrverzögerungsladung recovered charge	$I_F = I_{Nenn}, -di_F/dt = 600 A/us$ $V_{GE} = -10V, T_{vj} = 25^\circ C, V_R = 300 V$ $V_{GE} = -10V, T_{vj} = 125^\circ C, V_R = 300 V$	Q_r	-	0,7 1,2	- -	μAs μAs
Abschaltenergie pro Puls reverse recovery energy	$I_F = I_{Nenn}, -di_F/dt = 600 A/us$ $V_{GE} = -10V, T_{vj} = 25^\circ C, V_R = 300 V$ $V_{GE} = -10V, T_{vj} = 125^\circ C, V_R = 300 V$	E_{rec}	-	0,14 0,24	- -	mWs mWs
NTC-Widerstand/ NTC-Thermistor			min.	typ.	max.	
Nennwiderstand	$T_C = 25^\circ C$	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 $\lambda_{paste}=1W/m^2K$	R_{thJH}	-	1,1	-	K/W
	Trans. Wechsr./ Trans. Inverter $\lambda_{grease}=1W/m^2K$		-	2,4	-	K/W
	Diode Wechsr./ Diode Inverter		-	4,0	-	K/W
Innerer Wärmewiderstand thermal resistance, junction to case	Gleichr. Diode/ Rectif. Diode	R_{thJC}	-	-	1	K/W
	Trans. Wechsr./ Trans. Inverter		-	-	2	K/W
	Diode Wechsr./ Diode Inverter		-	-	2,9	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	Gleichr. Diode/ Rectif. Diode $\lambda_{paste}=1W/m^2K$	R_{thCH}	-	0,2	-	K/W
	Trans. Wechsr./ Trans. Inverter $\lambda_{grease}=1W/m^2K$		-	0,6	-	K/W
	Diode Wechsr./ Diode Inverter		-	1,4	-	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

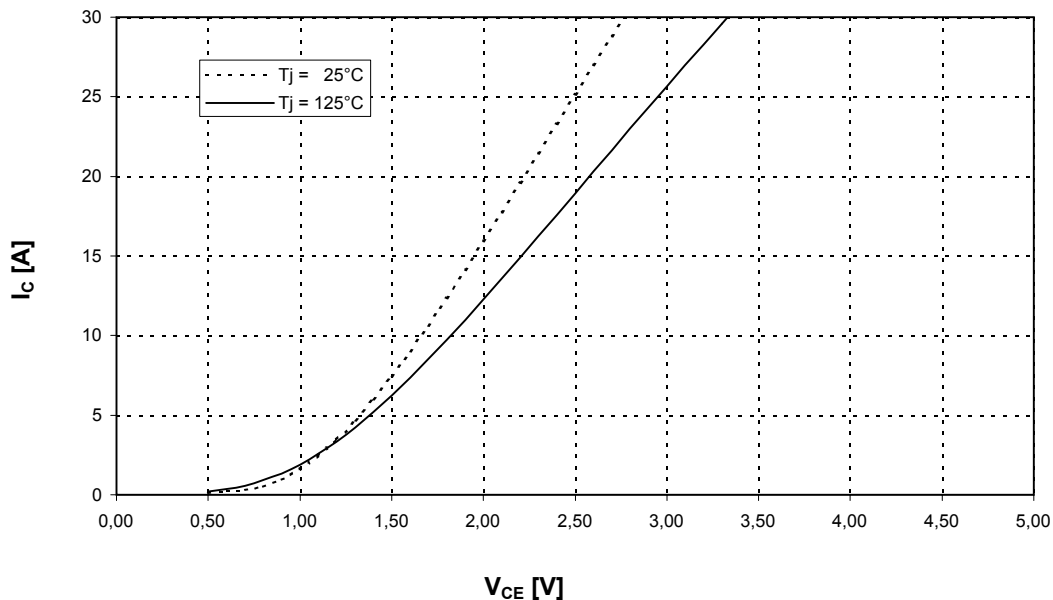
Innere Isolation internal insulation			Al_2O_3	
CTI comperative tracking index			225	
Anpreßkraft f. mech. Befestigung pro Feder mounting force per clamp		F	40...80	N
Gewicht weight		G	36	g
Kontakt - Kühlkörper terminal to heatsink	Kriechstrecke creeping distance		13,5	mm
	Luftstrecke clearance		12	mm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



Vorläufig
Preliminary

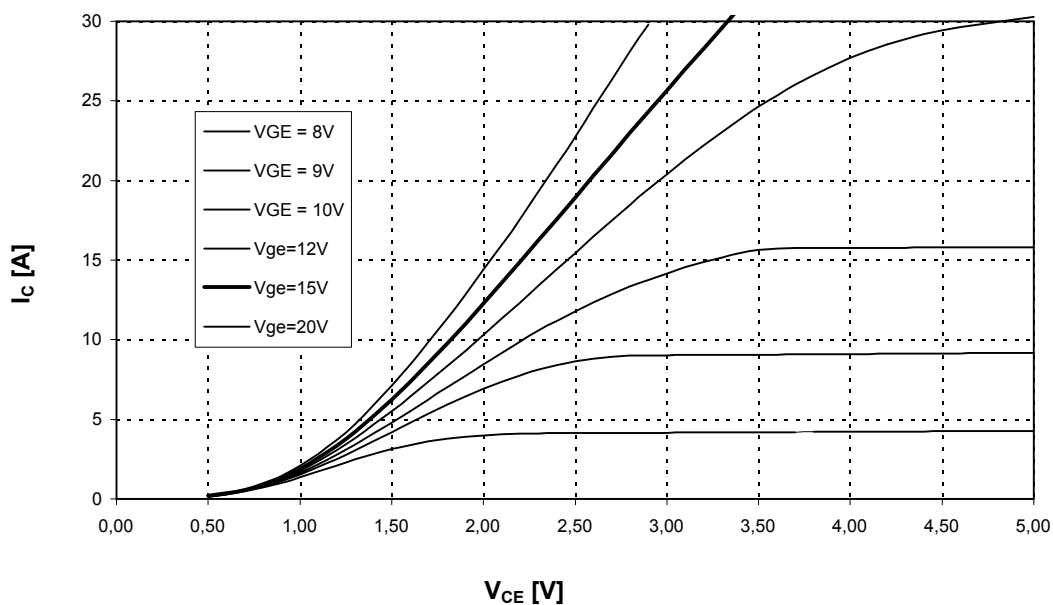
Ausgangskennlinienfeld Wechselr. (typisch)
Output characteristic Inverter (typical)

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



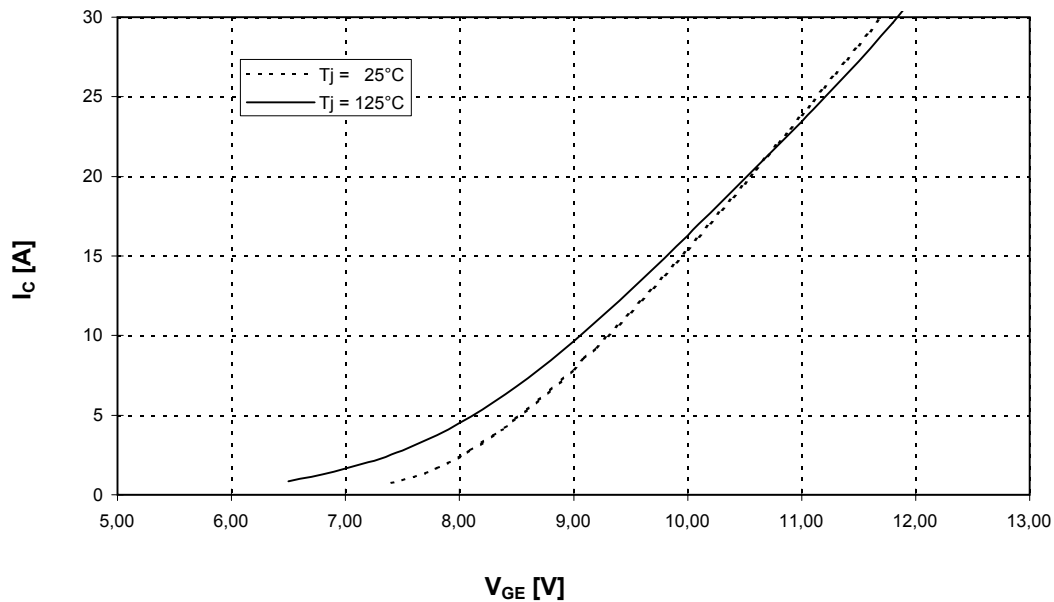
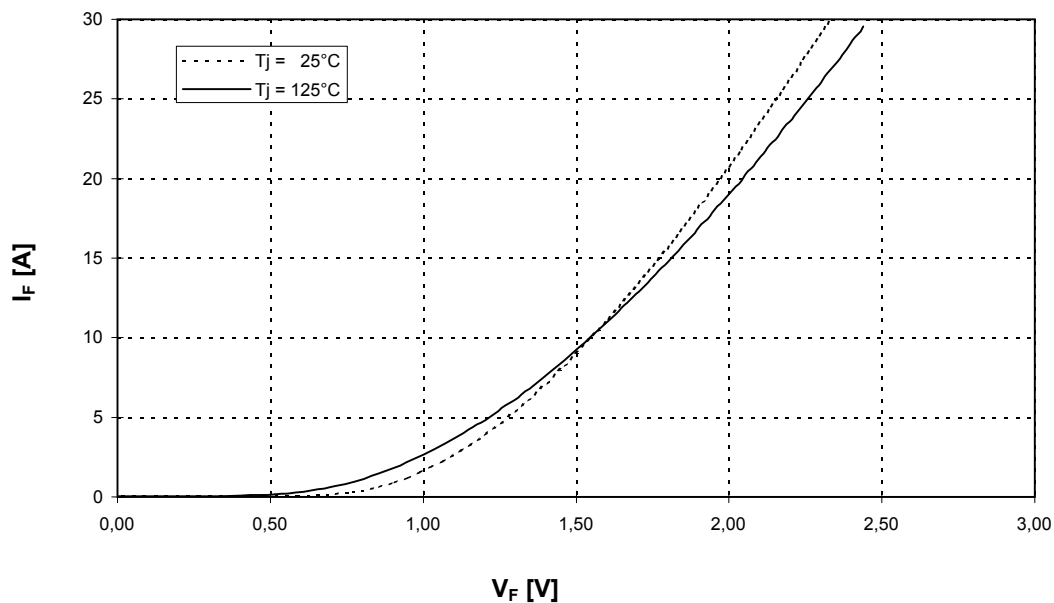
Ausgangskennlinienfeld Wechselr. (typisch)
Output characteristic Inverter (typical)

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



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

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

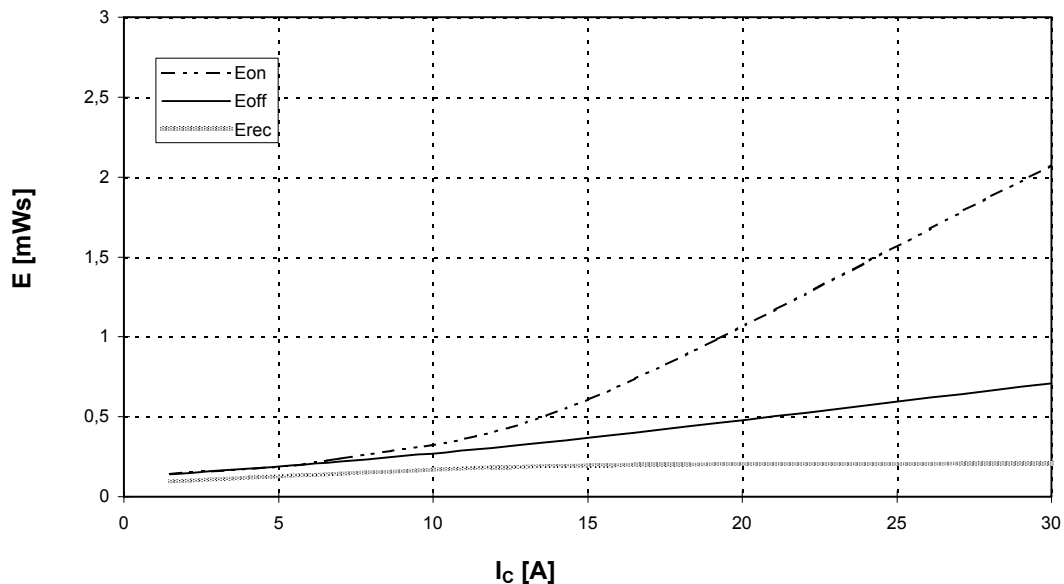
Durchlaßkennlinie der Freilaufdiode Wechselr. (typisch) $I_F = f(V_F)$
Forward characteristic of FWD Inverter (typical)



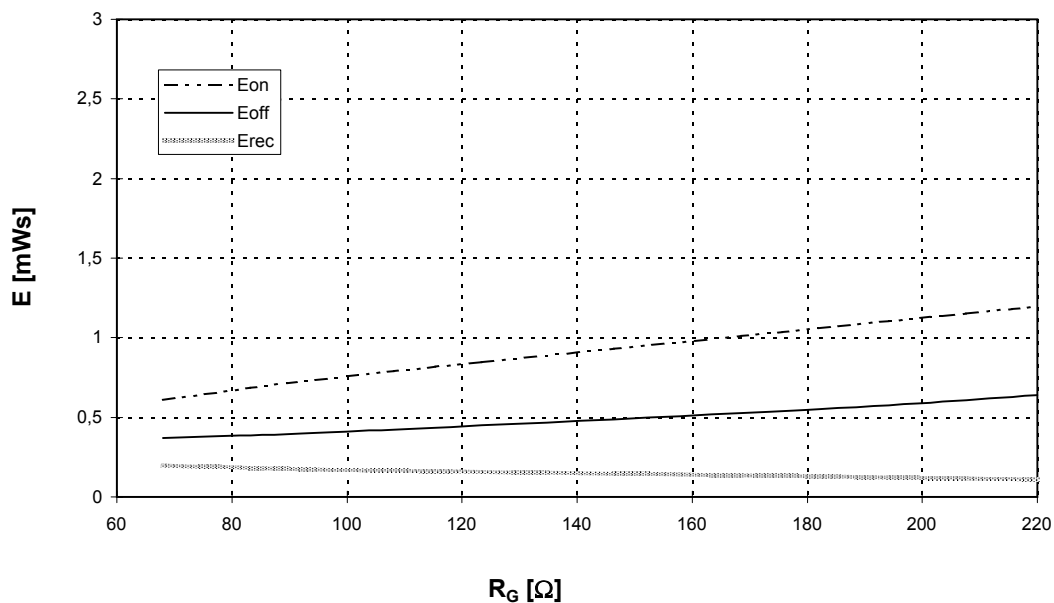
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Schaltverluste Wechselr. (typisch) $E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$ $V_{CC} = 300\text{ V}$
Switching losses Inverter (typical) $T_j = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = R_{Goff} = 68\text{ Ohm}$

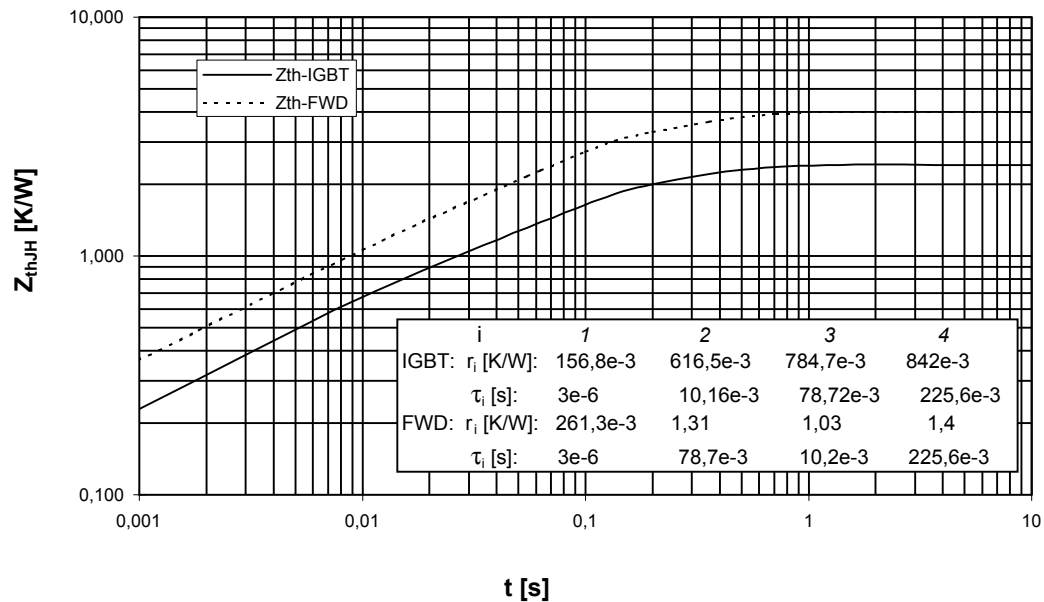


Schaltverluste Wechselr. (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
Switching losses Inverter (typical) $T_j = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{ V}$, $I_C = I_{nenn}$, $V_{CC} = 300\text{ V}$



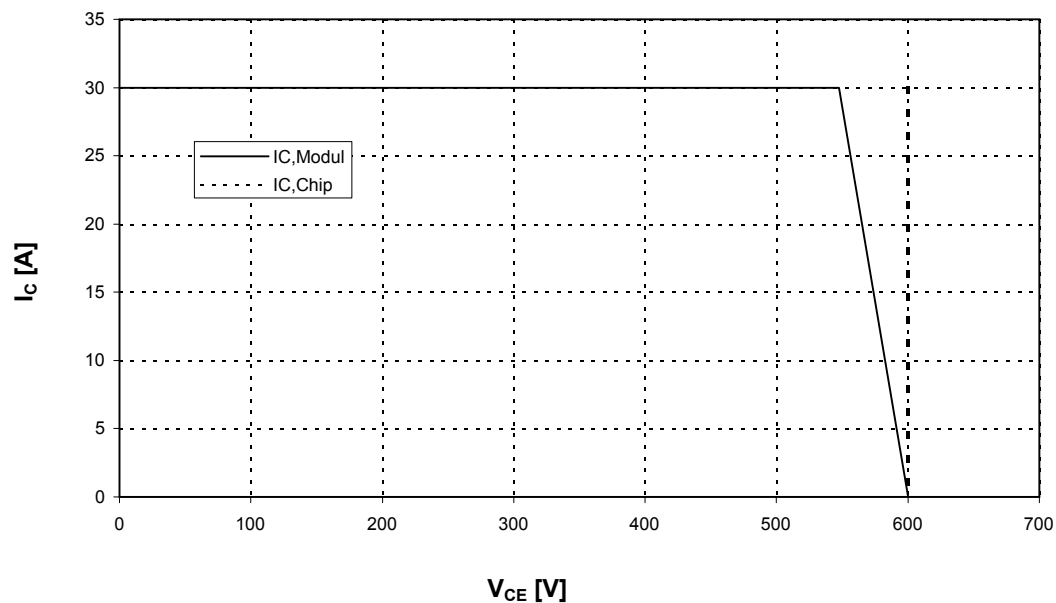
Vorläufig
PreliminaryTransienter Wärmewiderstand Wechselr.
Transient thermal impedance Inverter

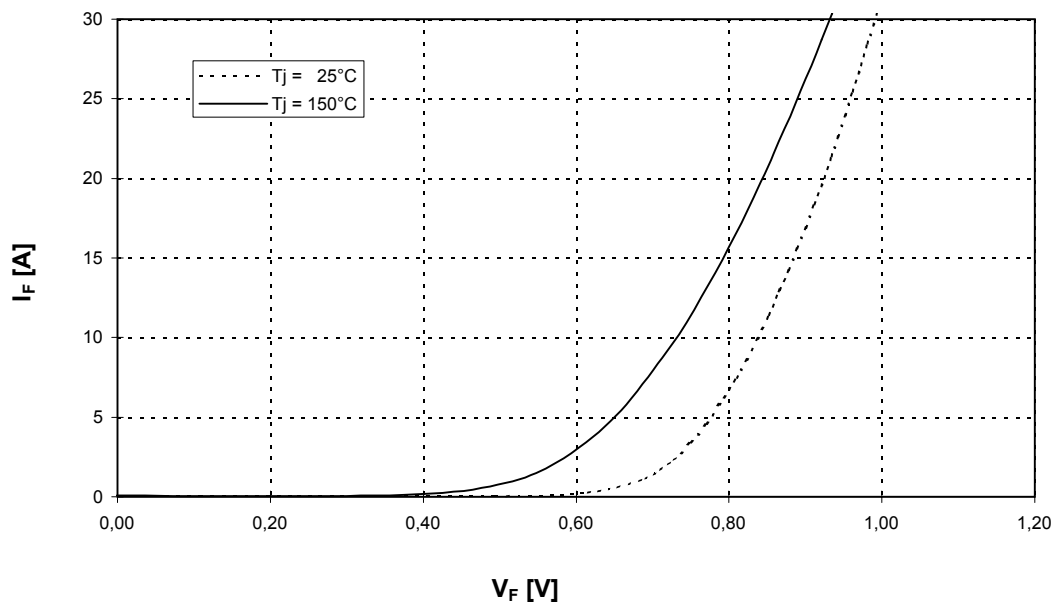
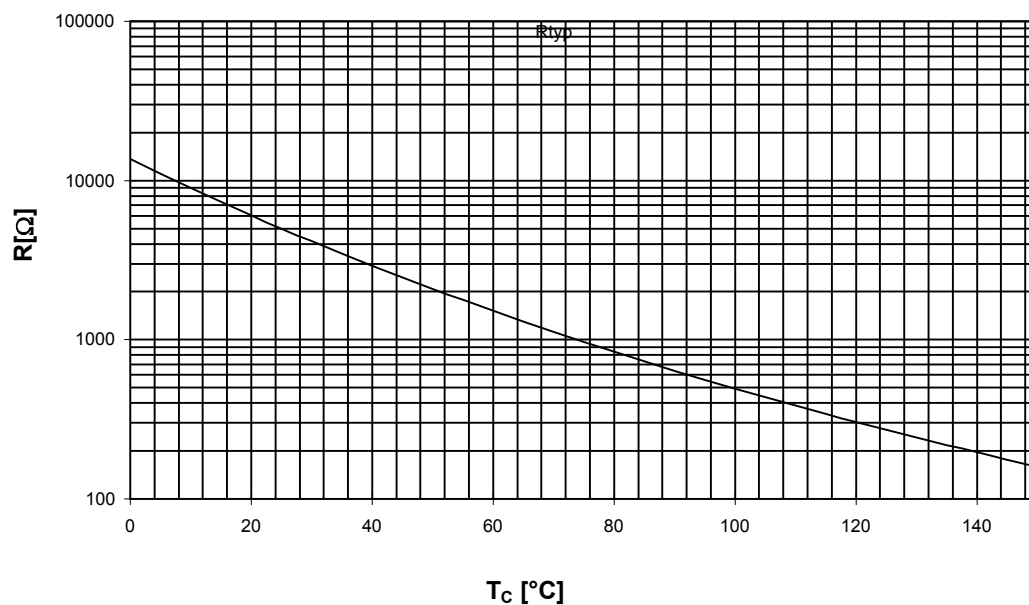
$$Z_{thJH} = f(t)$$

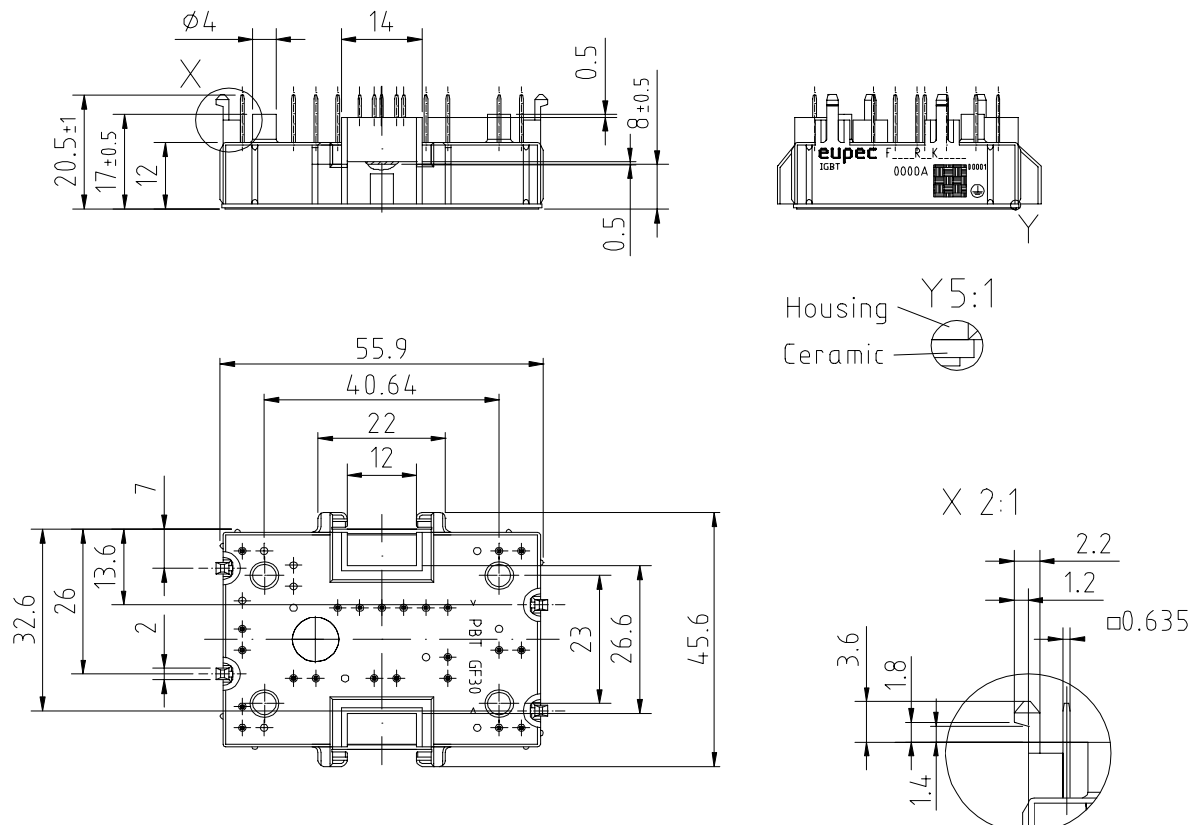


Sicherer Arbeitsbereich Wechselr. (RBSOA)

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

Reverse bias safe operating area Inverter (RBSOA) $T_{vj} = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{V}$, $R_G = 68 \text{ Ohm}$ 

Vorläufig
Preliminary**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)


Gehäuseabmessungen Forts. / Package outlines contd.


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