

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

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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	$T_{vj} = 150^{\circ}\text{C}$, $I_F = 20\text{ A}$	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	$T_{vj} = 150^{\circ}\text{C}$, $V_R = 800\text{ V}$	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	$V_{GE} = 15\text{V}$, $T_{vj} = 25^{\circ}\text{C}$, $I_C = 20\text{ A}$ $V_{GE} = 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $I_C = 20\text{ A}$	$V_{CE\text{ sat}}$	-	1,95 2,2	2,55 -	V V	
Gate-Schwellenspannung gate threshold voltage	$V_{CE} = V_{GE}$, $T_{vj} = 25^{\circ}\text{C}$, $I_C = 0,5\text{mA}$	$V_{GE(TO)}$	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}	-	1,1	-	nF	
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{GE} = 0\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $V_{CE} = 600\text{V}$	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)	$I_C = I_{Nenn}$, $V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 25^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$	$t_{d,on}$	-	22 31	-	ns ns	
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = I_{Nenn}$, $V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 25^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$	t_r	-	23 37	-	ns ns	
Abschaltverzögerungszeit (ind. Last) turn off delay time (inductive load)	$I_C = I_{Nenn}$, $V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 25^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$	$t_{d,off}$	-	143 154	-	ns ns	
Fallzeit (induktive Last) fall time (inductive load)	$I_C = I_{Nenn}$, $V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 25^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$	t_f	-	22 38	-	ns ns	
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = I_{Nenn}$, $V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$ $L_S = 80\text{ nH}$	E_{on}	-	0,7	-	mWs	
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = I_{Nenn}$, $V_{CC} = 300\text{ V}$ $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^{\circ}\text{C}$, $R_G = 47\text{ Ohm}$ $L_S = 80\text{ nH}$	E_{off}	-	0,6	-	mWs	
Kurzschlußverhalten SC Data	$t_p \leq 10\mu\text{s}$, $V_{GE} \leq 15\text{V}$, $R_G = 47\text{ Ohm}$ $T_{vj} \leq 125^{\circ}\text{C}$, $V_{CC} = 360\text{ V}$	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

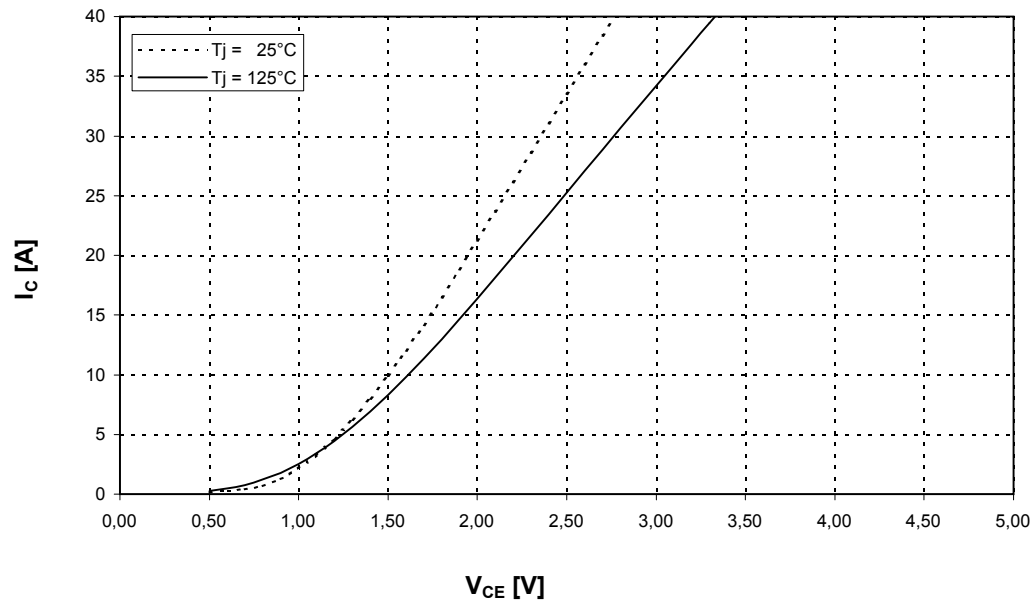
Innere Isolation internal insulation			Al_2O_3	
CTI comperative tracking index			225	
Anpreßkraft f. mech. Befestigung mounting force		F	40...80	N
Gewicht weight		G	36	g
Kontakt - Kühlkörper terminal to heatsink	Kriechstrecke creeping distance		13,5	mm
	Luftstrecke clearance		12	mm
Terminal - Terminal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



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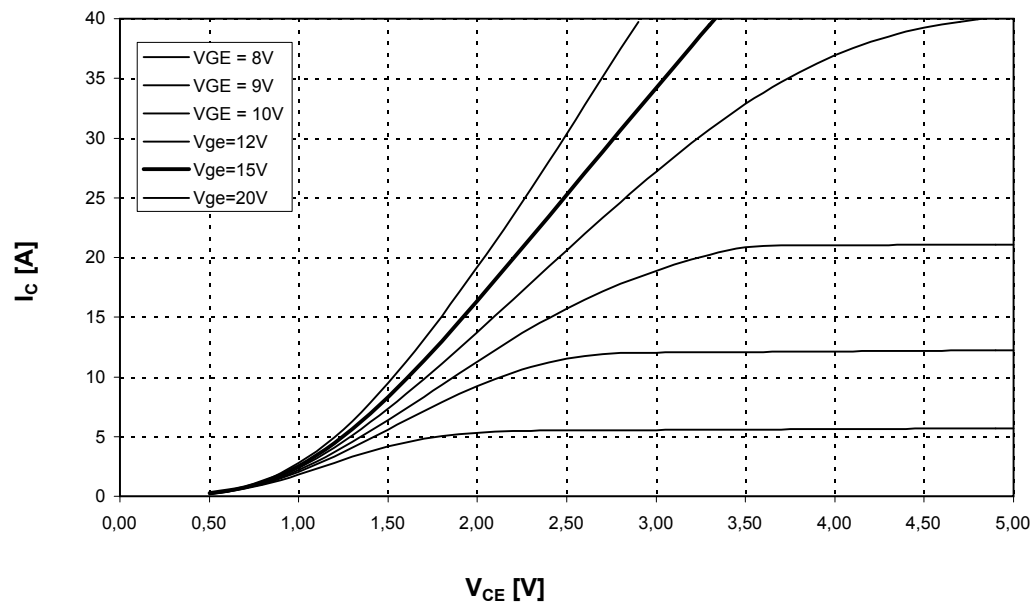
Ausgangskennlinienfeld Wechselr. (typisch)
Output characteristic Inverter (typical)

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



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

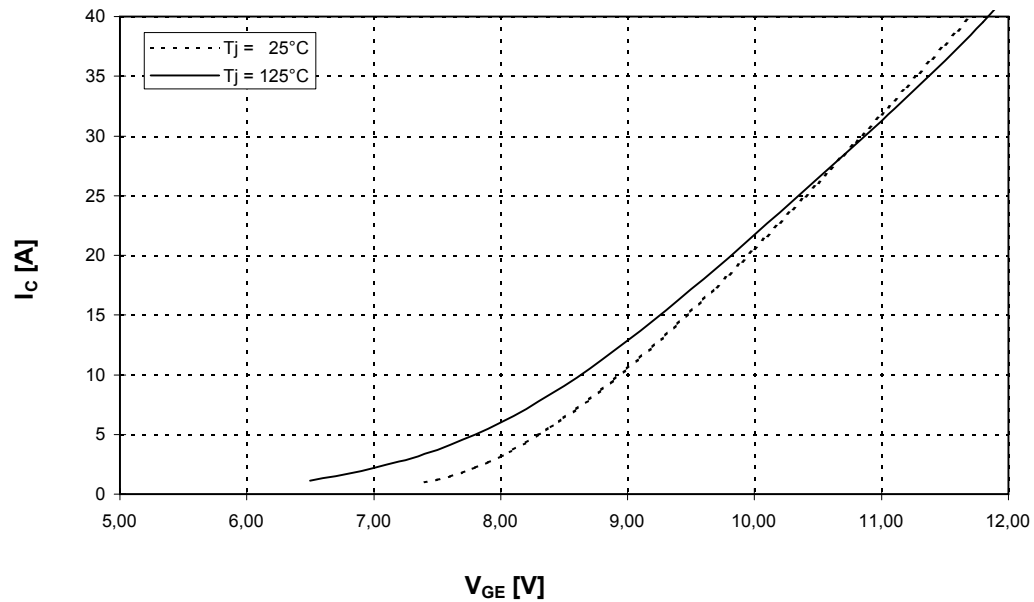
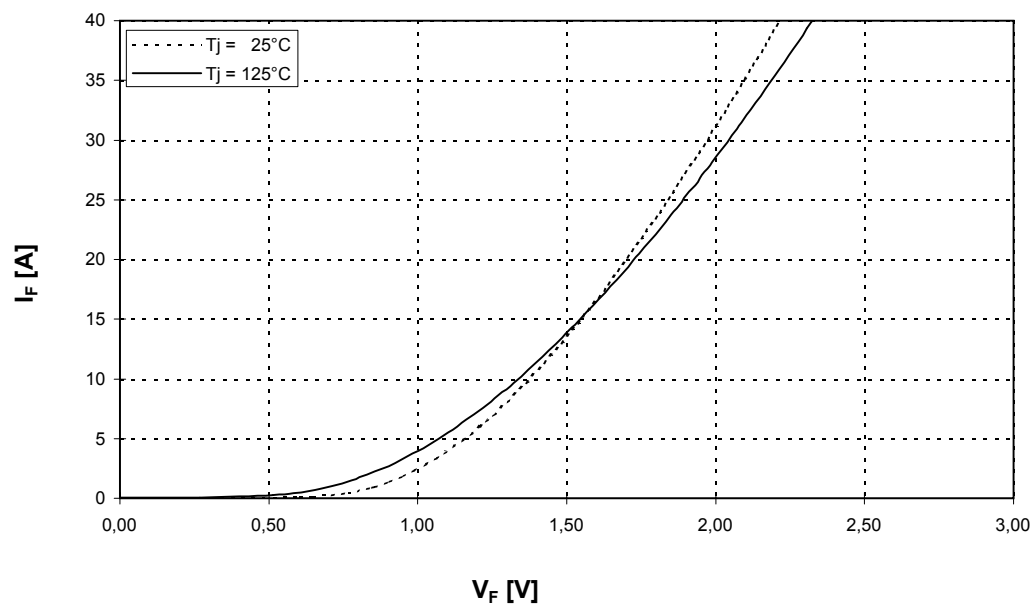
$I_C = f(V_{CE})$
 $T_{vj} = 125^\circ\text{C}$



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

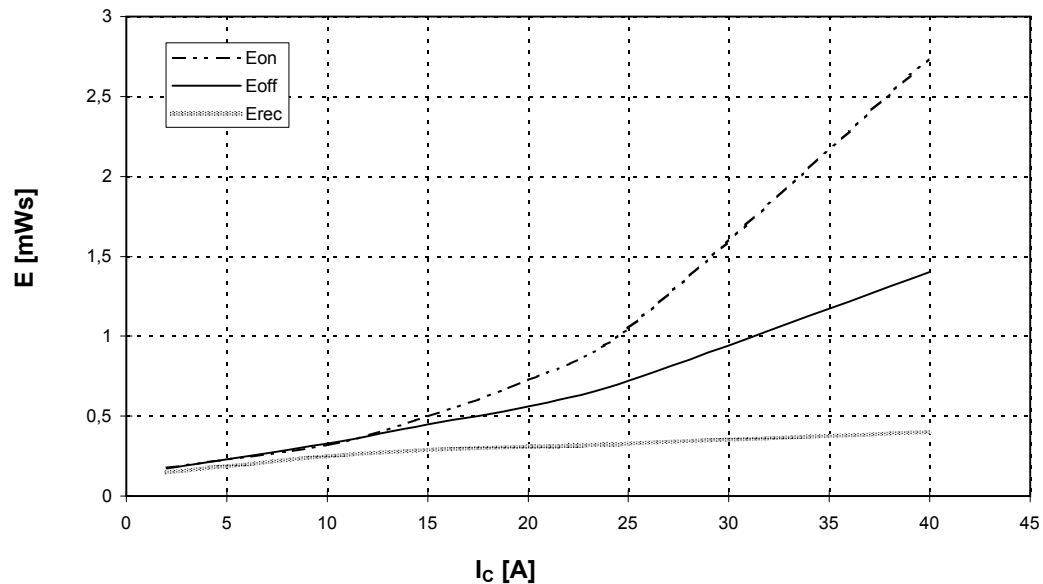
$$I_C = f(V_{GE})$$

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

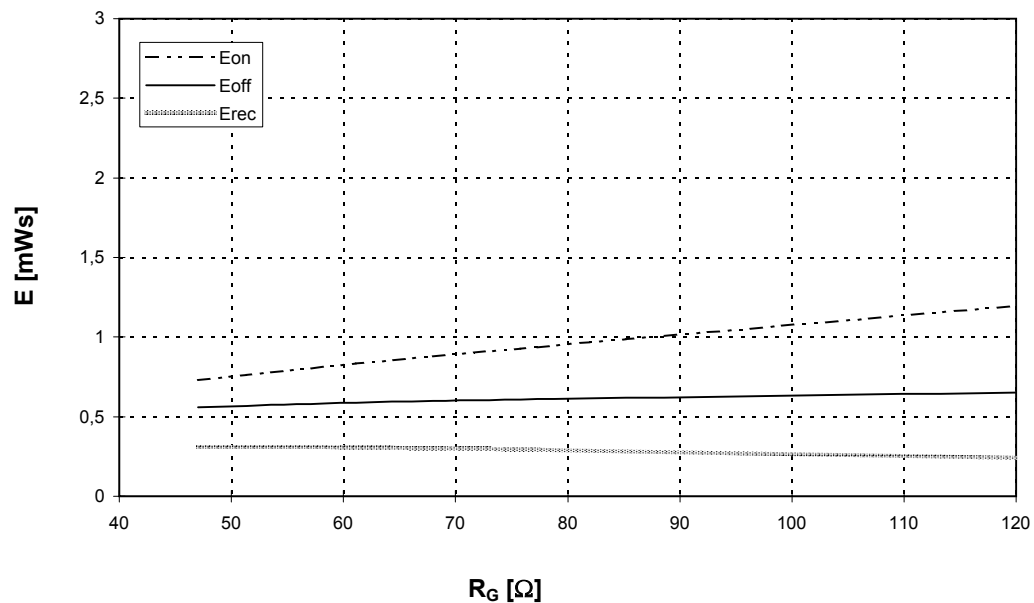
Durchlaßkennlinie der Freilaufdiode Wechselr. (typisch) $I_F = f(V_F)$
Forward characteristic of FWD Inverter (typical)

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

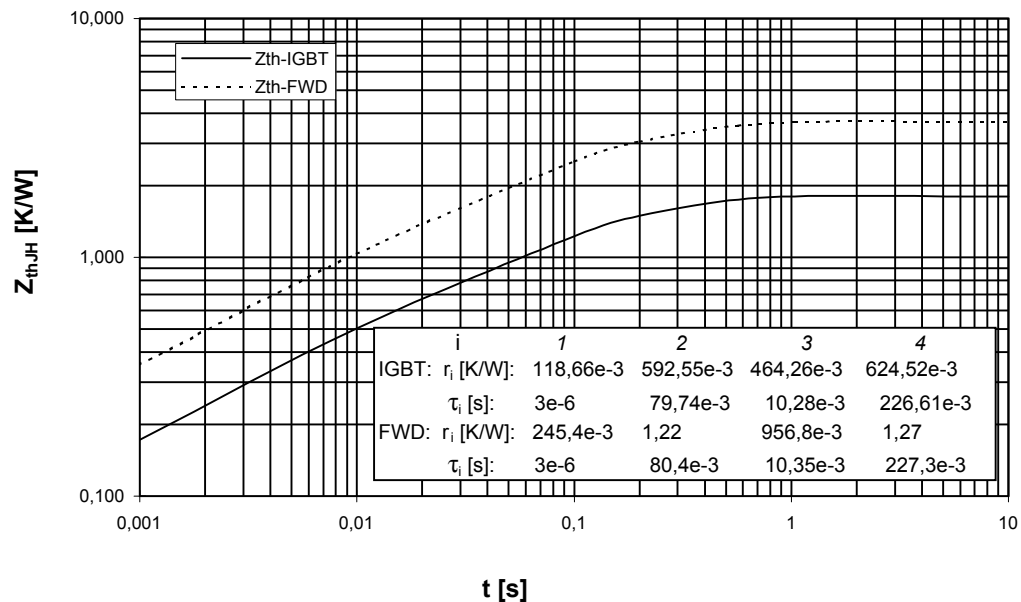


Schaltverluste Wechselr. (typisch) $E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
 Switching losses Inverter (typical) $T_J = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{ V}$, $I_C = I_{nenn}$, $V_{CC} = 300\text{ V}$



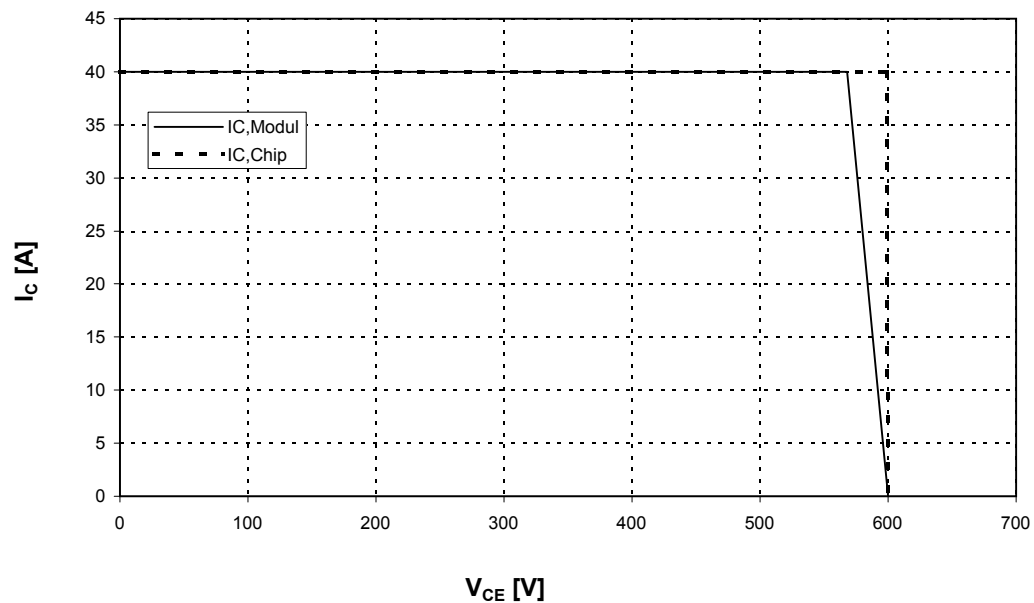
Vorläufig
PreliminaryTransienter Wärmewiderstand Wechslr.
Transient thermal impedance Inverter

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



Sicherer Arbeitsbereich Wechslr. (RBSOA)

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

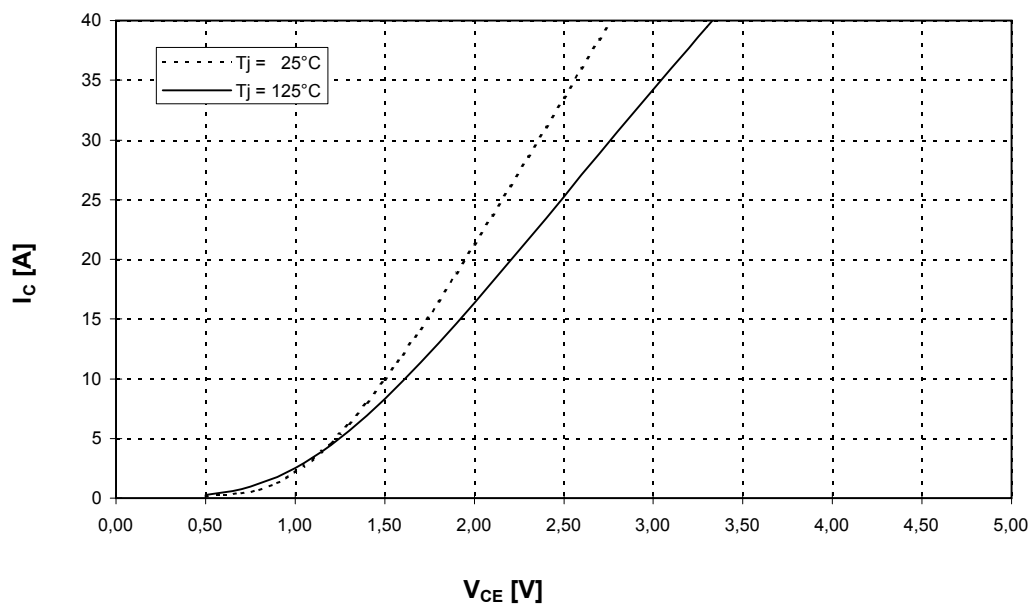
Reverse bias safe operating area Inverter (RBSOA) $T_{vj} = 125^\circ\text{C}$, $V_{GE} = \pm 15\text{V}$, $R_G = 47\text{ Ohm}$ 

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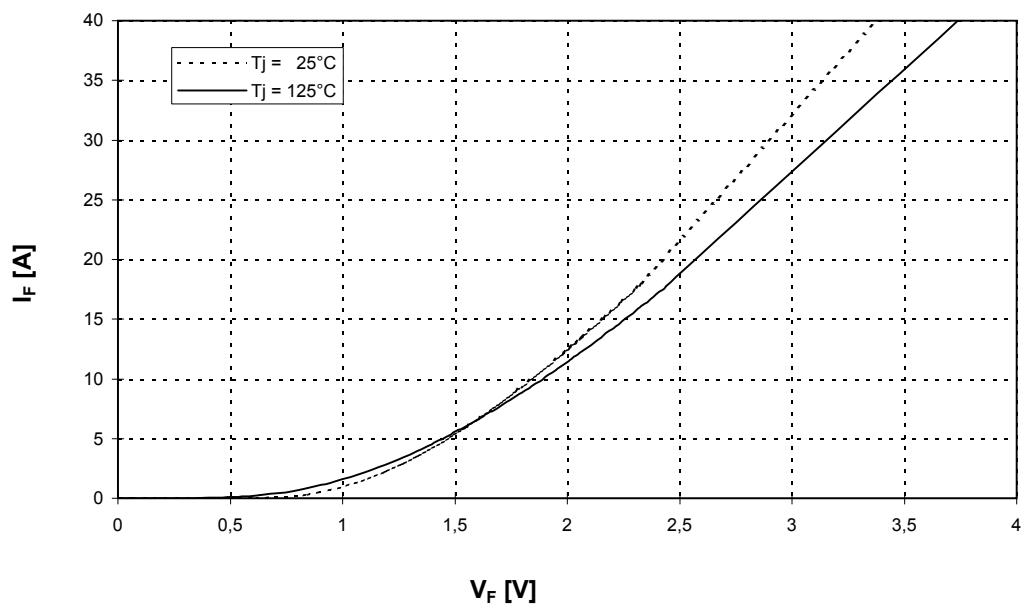
Ausgangskennlinienfeld Brems-Chopper-IGBT (typisch)

 $I_C = f(V_{CE})$

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)

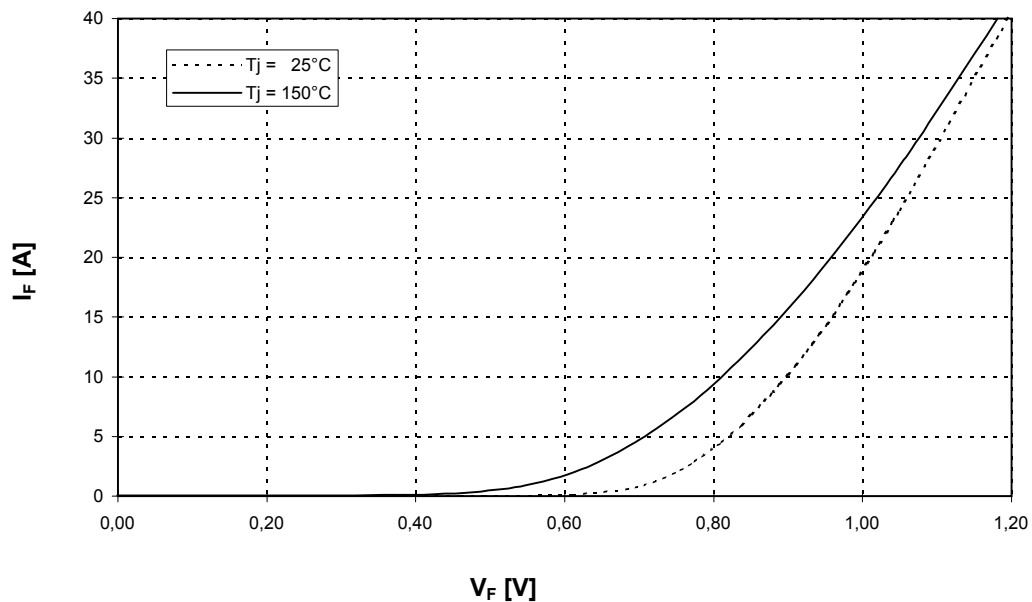




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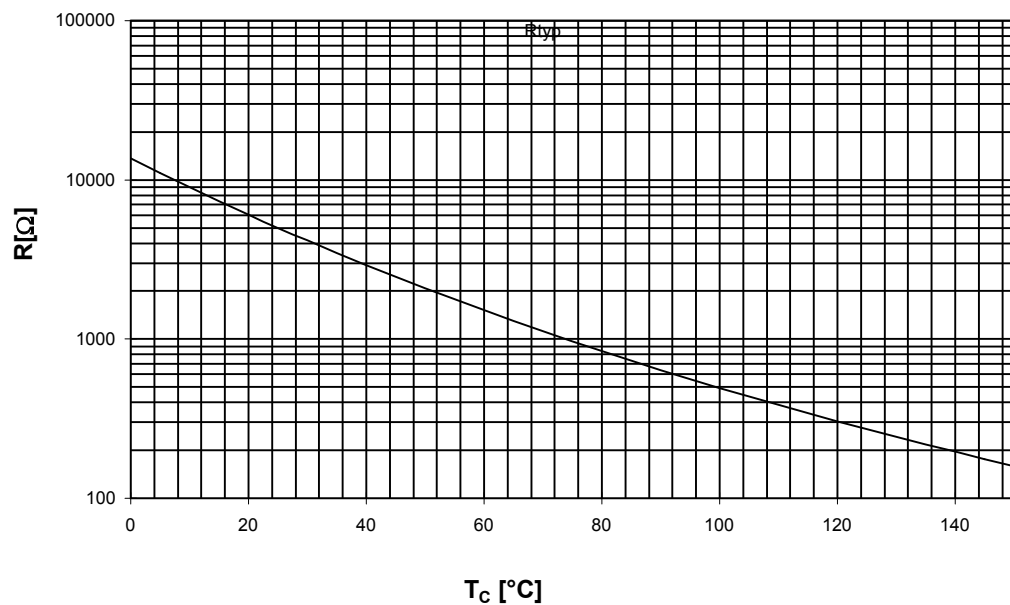
Durchlaßkennlinie der Gleichrichterdiode (typisch)
Forward characteristic of Rectifier Diode (typical)

$$I_F = f(V_F)$$



NTC- Temperaturkennlinie (typisch)
NTC- temperature characteristic (typical)

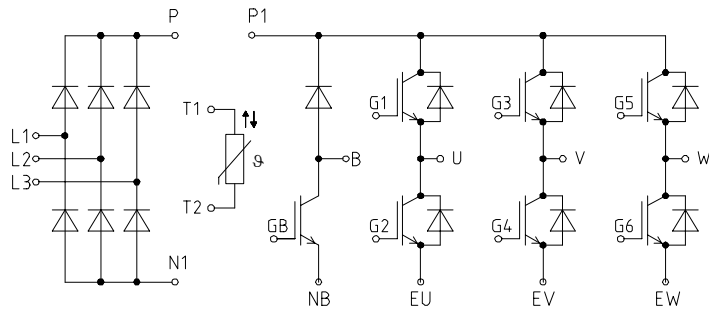
$$R = f(T)$$





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Schaltplan/ Circuit diagram

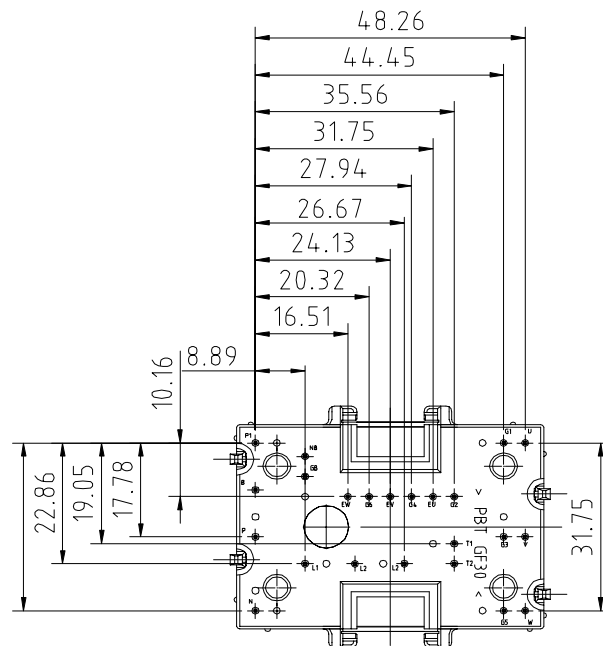
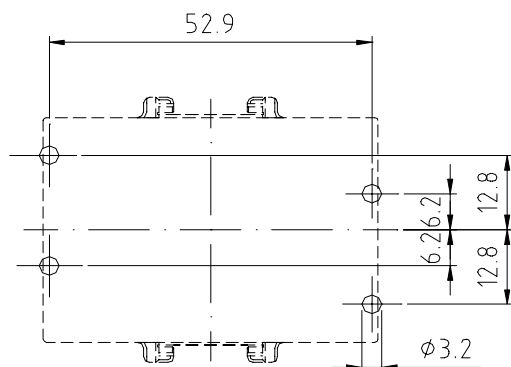


Gehäuseabmessungen/ Package outlines

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

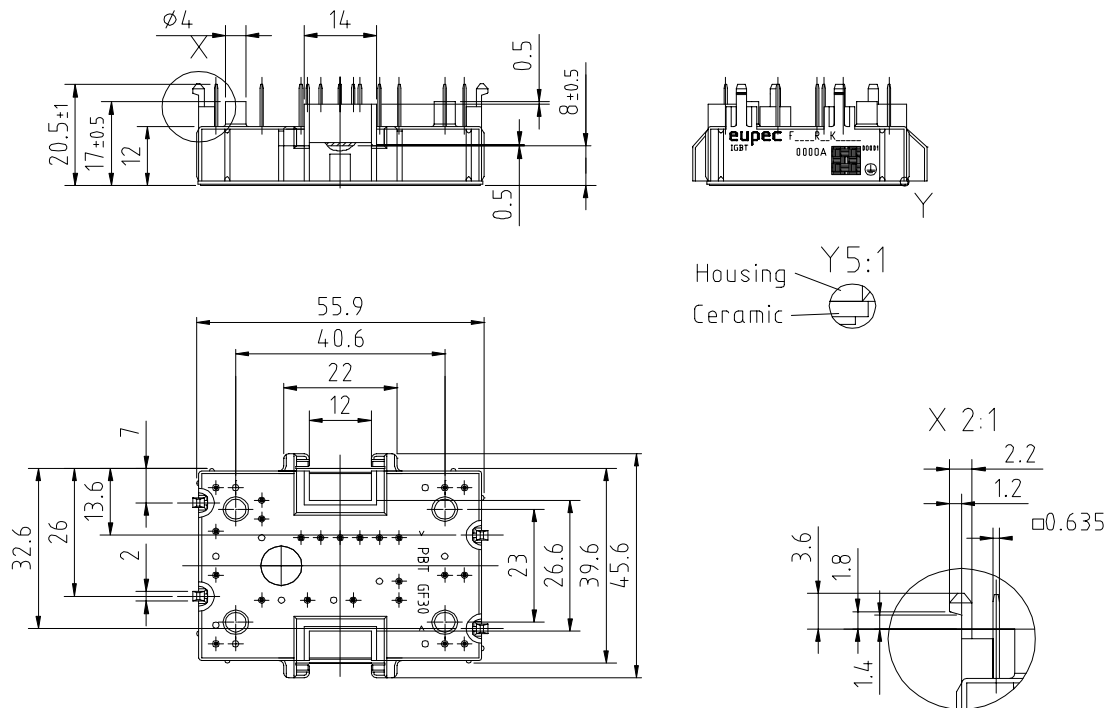
Pinpositions with tolerance ± 0.4

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.

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