IGBT-Wechselrichter / IGBT-inverter

Vorläufige Daten / preliminary data

Höchstzulässige Werte / maximum rated values

Kollektor-Emitter-Sperrspannung collector-emitter voltage	T_{vj} = 25°C	V_{CES}	600	V
Kollektor-Dauergleichstrom DC-collector current	T_C = 80°C, T_{vj} = 175°C T_C = 25°C, T_{vj} = 175°C	$I_{C\ nom}$ I_C	15 22	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms	I_{CRM}	30	A
Gesamt-Verlustleistung total power dissipation	T_C = 25°C, T_{vj} = 175°C	P_{tot}	71,5	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/-20	V

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	I_C = 15 A, V_{GE} = 15 V I_C = 15 A, V_{GE} = 15 V I_C = 15 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\ sat}$	1,55 1,70 1,80	2,00	V V V
Gate-Schwellenspannung gate threshold voltage	I_C = 0,20 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	4,9	5,8	6,5	V
Gateladung gate charge	V_{GE} = -15 V ... +15 V		Q_G		0,15		µC
Interner Gatewiderstand internal gate resistor	T_{vj} = 25°C		R_{Gint}		0,0		Ω
Eingangskapazität input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		0,83		nF
Rückwirkungskapazität reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,026		nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 600 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			1,0	mA
Gate-Emitter Reststrom gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			400	nA
Einschaltverzögerungszeit (ind. Last) turn-on delay time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Gon} = 22 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\ on}$		0,014 0,014 0,014		µs µs µs
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Gon} = 22 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,011 0,015 0,015		µs µs µs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Goff} = 22 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\ off}$		0,11 0,13 0,14		µs µs µs
Fallzeit (induktive Last) fall time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Goff} = 22 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,085 0,11 0,12		µs µs µs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 15 A, V_{CE} = 300 V, L_S = 50 nH V_{GE} = ±15 V, di/dt = 1600 A/µs (T_{vj}=150°C) R_{Gon} = 22 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		0,25 0,32 0,36		mJ mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 15 A, V_{CE} = 300 V, L_S = 50 nH V_{GE} = ±15 V, du/dt = 4100 V/µs (T_{vj}=150°C) R_{Goff} = 22 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		0,34 0,44 0,46		mJ mJ mJ
Kurzschlussverhalten SC data	V_{GE} ≤ 15 V, V_{CC} = 360 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	t_P ≤ 8 µs, T_{vj} = 25°C t_P ≤ 6 µs, T_{vj} = 150°C	I_{SC}		100 75		A A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}		1,90	2,10	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,80		K/W

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Vorläufige Daten
preliminary data

Diode-Wechselrichter / diode-inverter

Höchstzulässige Werte / maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	600		V
Dauergleichstrom DC forward current		I_F	15		A
Periodischer Spitzenstrom repetitive peak forward current	t_P = 1 ms	I_{FRM}	30		A
Grenzlastintegral I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 150°C	I²t	22,5 20,5		A²s A²s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	I_F = 15 A, V_{GE} = 0 V I_F = 15 A, V_{GE} = 0 V I_F = 15 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		1,60 1,55 1,50	2,00	V V V
Rückstromspitze peak reverse recovery current	I_F = 15 A, - di_F/dt = 1600 A/µs (T_{vj}=150°C) V_R = 300 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		23,0 25,0 26,0		A A A
Sperrverzögerungsladung recovered charge	I_F = 15 A, - di_F/dt = 1600 A/µs (T_{vj}=150°C) V_R = 300 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		0,80 1,40 1,70		µC µC µC
Abschaltenergie pro Puls reverse recovery energy	I_F = 15 A, - di_F/dt = 1600 A/µs (T_{vj}=150°C) V_R = 300 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		0,16 0,28 0,37		mJ mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}		2,90	3,20	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,95		K/W

Vorläufige Daten
preliminary data

Diode-Gleichrichter / diode-rectifier

Höchstzulässige Werte / maximum rated values

Periodische Rückw. Spitzensperrspannung repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1600	V
Durchlassstrom Grenzeffektivwert pro Dio. forward current RMS maximum per diode	T_C = 80°C	I_{FRMSM}	25	A
Gleichrichter Ausgang Grenzeffektivstrom maximum RMS current at Rectifier output	T_C = 80°C	I_{RMSM}	25	A
Stoßstrom Grenzwert surge forward current	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I_{FSM}	300 245	A A
Grenzlastintegral I²t - value	t_p = 10 ms, T_{vj} = 25°C t_p = 10 ms, T_{vj} = 150°C	I²t	450 300	A²s A²s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	T_{vj} = 150°C, I_F = 15 A	V_F		0,85		V
Sperrstrom reverse current	T_{vj} = 150°C, V_R = 1600 V	I_R		2,00		mA
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode	R_{thJC}		1,30	1,45	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,55		K/W

Vorläufige Daten
preliminary data

IGBT-Brems-Chopper / IGBT-brake-chopper

Höchstzulässige Werte / maximum rated values

Kollektor-Emitter-Sperrspannung collector-emitter voltage	T_{vj} = 25°C	V_{CES}	600	V
Kollektor-Dauergleichstrom DC-collector current	T_C = 80°C, T_{vj} = 175°C T_C = 25°C, T_{vj} = 175°C	I_{Cnom} I_C	15 22	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms	I_{CRM}	30	A
Gesamt-Verlustleistung total power dissipation	T_C = 25°C, T_{vj} = 175°C	P_{tot}	71,5	W
Gate-Emitter-Spitzenspannung gate-emitter peak voltage		V_{GES}	+/-20	V

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Kollektor-Emitter Sättigungsspannung collector-emitter saturation voltage	I_C = 15 A, V_{GE} = 15 V I_C = 15 A, V_{GE} = 15 V I_C = 15 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\ sat}$	1,55 1,70 1,80	2,00	V V V
Gate-Schwellenspannung gate threshold voltage	I_C = 0,20 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	4,9	5,8	6,5	V
Gateladung gate charge	V_{GE} = -15 V ... +15 V		Q_G		0,15		µC
Interner Gatewiderstand internal gate resistor	T_{vj} = 25°C		R_{Gint}		0,00		Ω
Eingangskapazität input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		0,83		nF
Rückwirkungskapazität reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,026		nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 600 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			1,0	mA
Gate-Emitter Reststrom gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			400	nA
Einschaltverzögerungszeit (ind. Last) turn-on delay time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Gon} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\ on}$		0,018 0,018 0,018		µs µs µs
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Gon} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,015 0,02 0,021		µs µs µs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Goff} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\ off}$		0,13 0,16 0,18		µs µs µs
Fallzeit (induktive Last) fall time (inductive load)	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Goff} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,085 0,11 0,12		µs µs µs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Gon} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		0,29 0,37 0,39		mJ mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 15 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Goff} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		0,34 0,44 0,46		mJ mJ mJ
Kurzschlussverhalten SC data	V_{GE} ≤ 15 V, V_{CC} = 360 V V_{CEmax} = V_{CES} -L_{sCE} · di/dt	t_P ≤ 8 µs, T_{vj} = 25°C t_P ≤ 6 µs, T_{vj} = 150°C	I_{SC}		100 75		A A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}		1,90	2,10	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,80		K/W

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Vorläufige Daten
preliminary data

Diode-Brems-Chopper / Diode-brake-chopper

Höchstzulässige Werte / maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	600		V
Dauergleichstrom DC forward current		I_F	10		A
Periodischer Spitzenstrom repetitive peak forw. current	t_p = 1 ms	I_{FRM}	20		A
Grenzlastintegral I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 150°C	I²t	12,5 9,50		A²s A²s

Charakteristische Werte / characteristic values

				min.	typ.	max.	
Durchlassspannung forward voltage	I_F = 10 A, V_{GE} = 0 V I_F = 10 A, V_{GE} = 0 V I_F = 10 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		1,60 1,55 1,50	2,00	V V V
Rückstromspitze peak reverse recovery current	I_F = 10 A, - di_F/dt = 1500 A/µs (T_{vj}=150°C) V_R = 300 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		18,0 19,0 21,0		A A A
Sperrverzögerungsladung recovered charge	I_F = 10 A, - di_F/dt = 1500 A/µs (T_{vj}=150°C) V_R = 300 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		0,50 0,85 1,10		µC µC µC
Abschaltenergie pro Puls reverse recovery energy	I_F = 10 A, - di_F/dt = 1500 A/µs (T_{vj}=150°C) V_R = 300 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		0,11 0,20 0,26		mJ mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}		3,40	3,80	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		1,10		K/W

NTC-Widerstand / NTC-thermistor

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Nennwiderstand rated resistance	T_C = 25°C	R_{25}		5,00		kΩ
Abweichung von R_{100} deviation of R_{100}	T_C = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
Verlustleistung power dissipation	T_C = 25°C	P_{25}			20,0	mW
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/50}$		3375		K

Vorläufige Daten
preliminary data

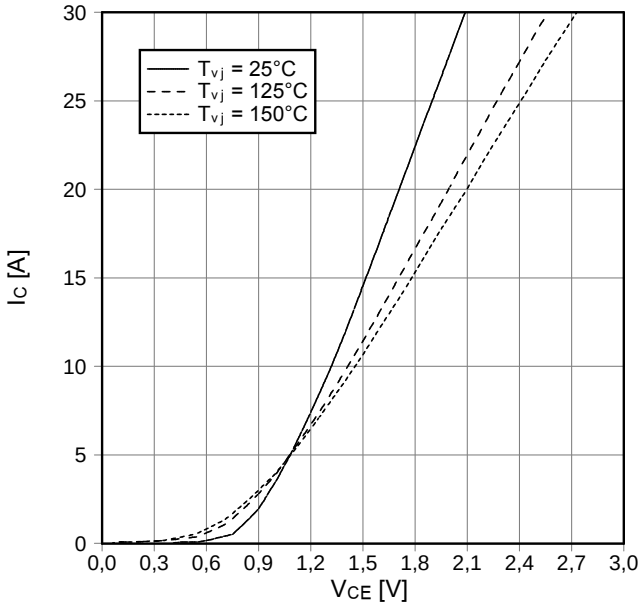
Modul / module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		2,5		kV
Material für innere Isolation material for internal insulation				Al_2O_3		
Kriechstrecke creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal			13,5 7,5		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal			12,0 7,5		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI		> 225		
			min.	typ.	max.	
Modulinduktivität stray inductance module		L_{sCE}		40		nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T_C = 25°C, pro Schalter / per switch	$R_{CC'+EE'}$ $R_{AA'+CC'}$		10,0 11,0		mΩ
Höchstzulässige Sperrschichttemperatur maximum junction temperature	Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper	$T_{vj\ max}$			175	°C
Temperatur im Schaltbetrieb temperature under switching conditions	Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper	$T_{vj\ op}$	-40		150	°C
Lagertemperatur storage temperature		T_{stg}	-40		125	°C
Anpresskraft für mech. Bef. pro Feder mountig force per clamp		F	40	-	80	N
Gewicht weight		G		36		g

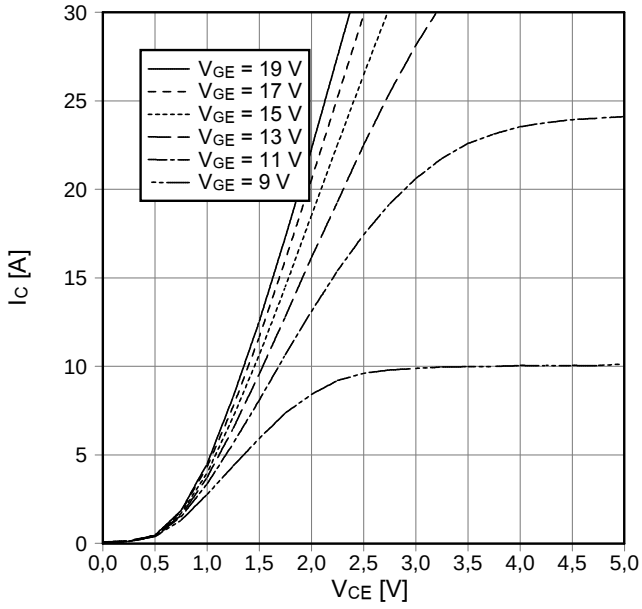
Der Strom im Dauerbetrieb ist auf 25 A effektiv pro Anschlusspin begrenzt
The current under continuous operation is limited to 25 A rms per connector pin

Vorläufige Daten
preliminary data

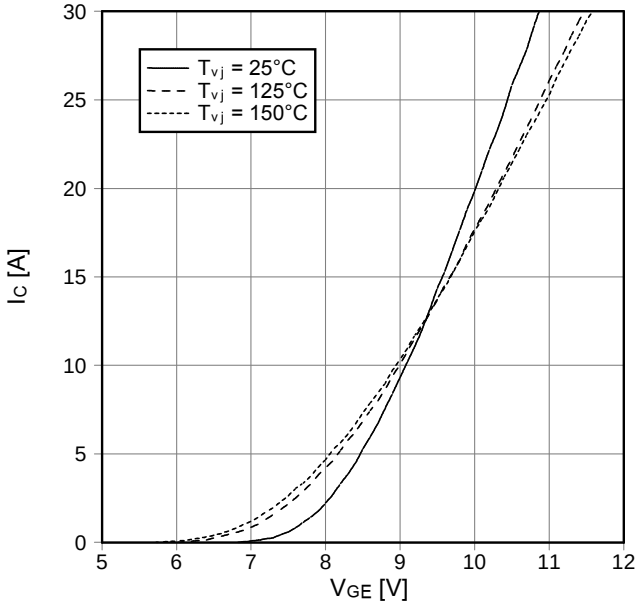
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



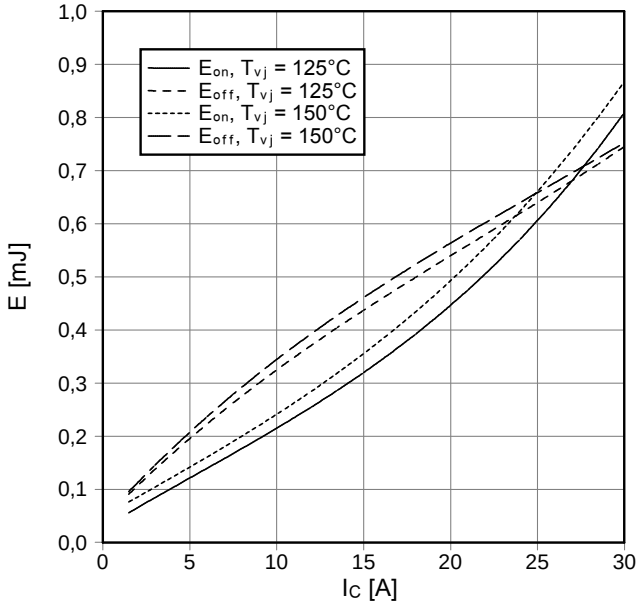
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
$I_C = f(V_{CE})$
T_{vj} = 150°C



Übertragungscharakteristik IGBT-Wechselr. (typisch)
transfer characteristic IGBT-inverter (typical)
$I_C = f(V_{GE})$
V_{CE} = 20 V



Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 22 Ω, R_{Goff} = 22 Ω, V_{CE} = 300 V



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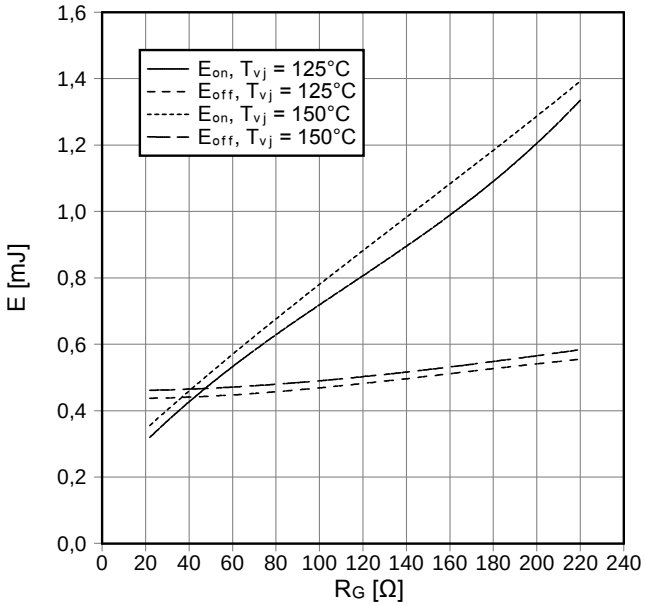
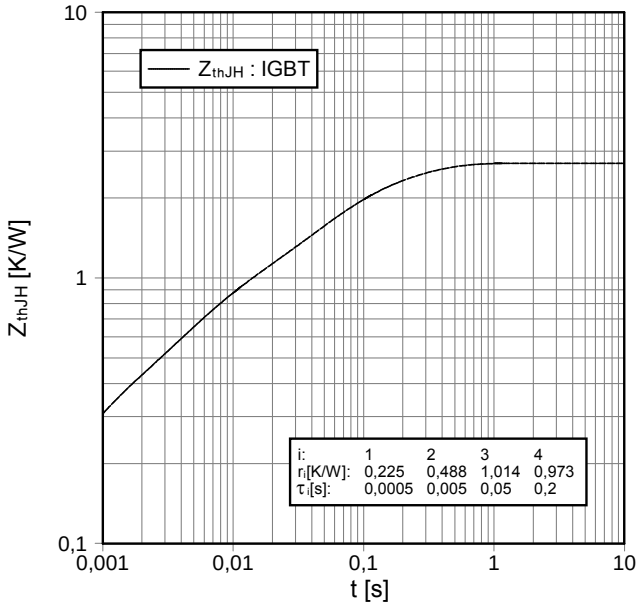
Vorläufige Daten
preliminary data

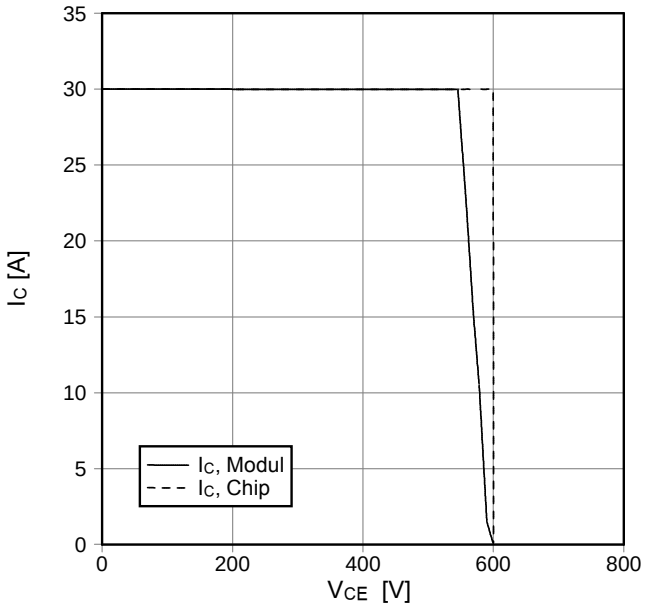
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = ±15 V, I_C = 15 A, V_{CE} = 300 V



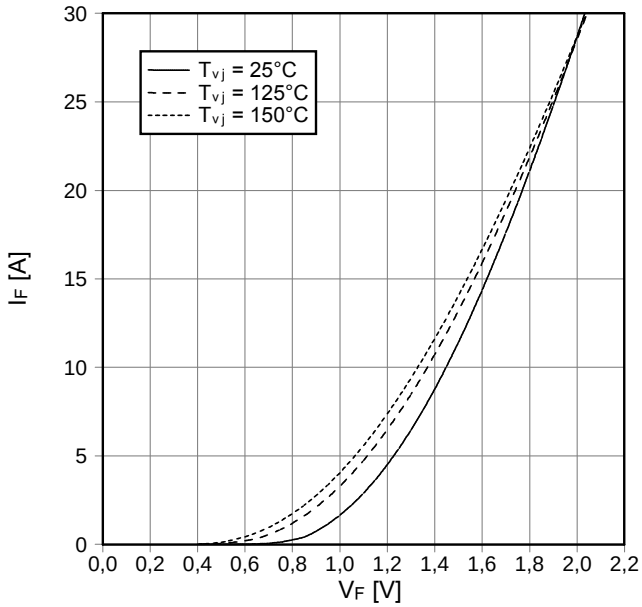
Transienter Wärmewiderstand IGBT-Wechselr.
transient thermal impedance IGBT-inverter
$Z_{thJH} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
$I_C = f(V_{CE})$
V_{GE} = ±15 V, R_{Goff} = 22 Ω, T_{vj} = 150°C



Durchlasskennlinie der Diode-Wechselr. (typisch)
forward characteristic of diode-inverter (typical)
$I_F = f(V_F)$



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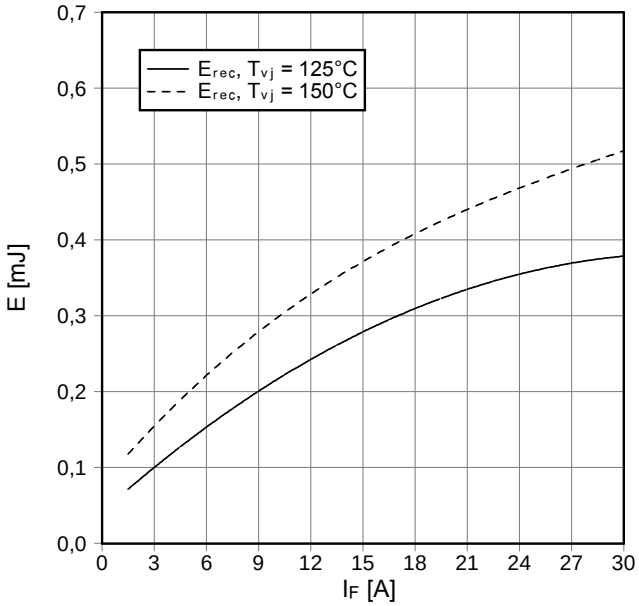
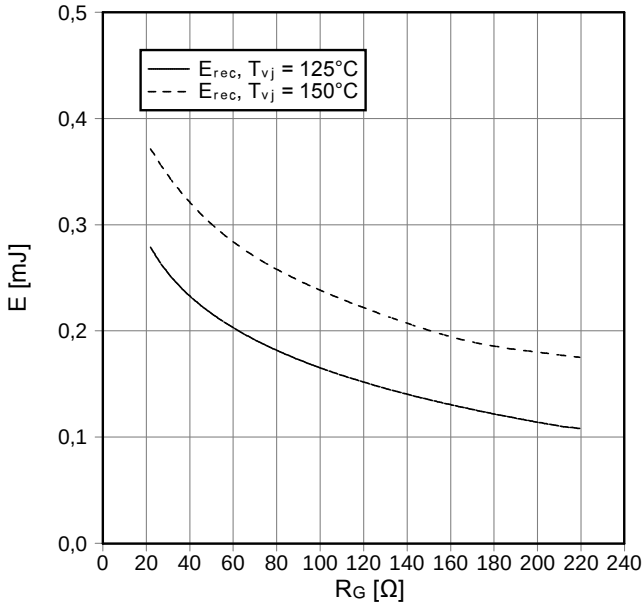
Vorläufige Daten
preliminary data

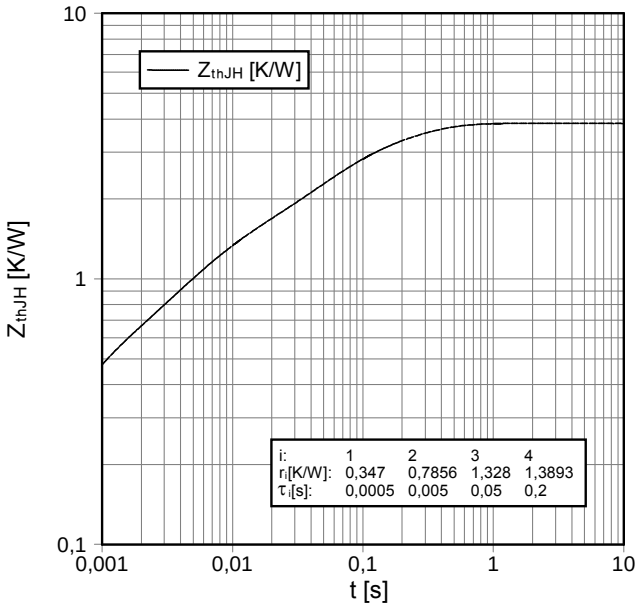
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)
E_{rec} = f (I_F)
R_{Gon} = 22 Ω, V_{CE} = 300 V



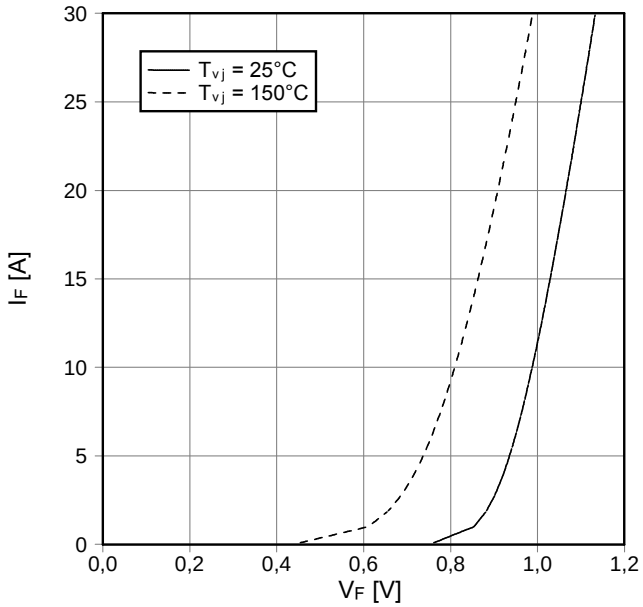
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)
E_{rec} = f (R_G)
I_F = 15 A, V_{CE} = 300 V



Transienter Wärmewiderstand Diode-Wechselr.
transient thermal impedance diode-inverter
Z_{thJH} = f (t)



Durchlasskennlinie der Diode-Gleichrichter (typisch)
forward characteristic of diode-rectifier (typical)
I_F = f (V_F)



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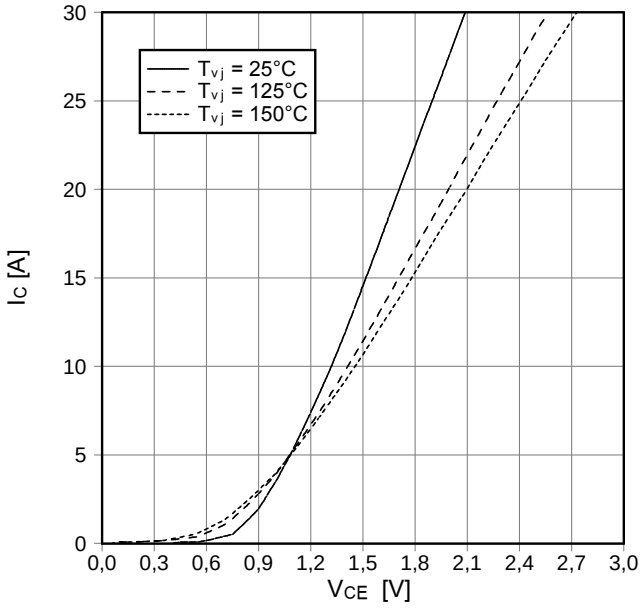
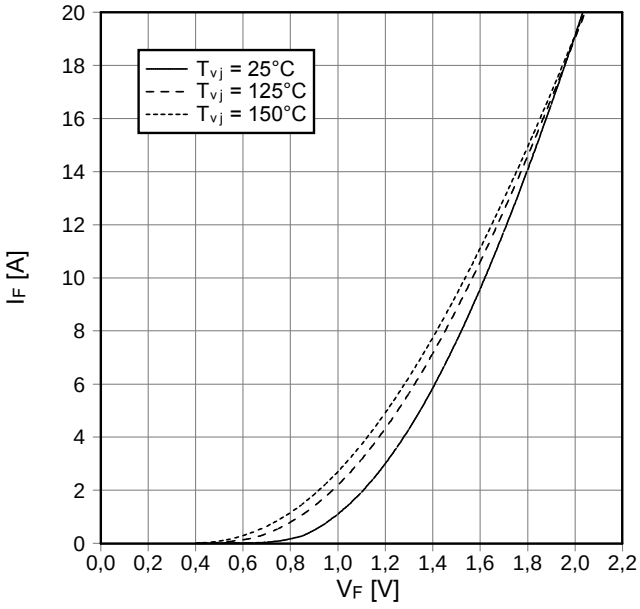
Vorläufige Daten
preliminary data

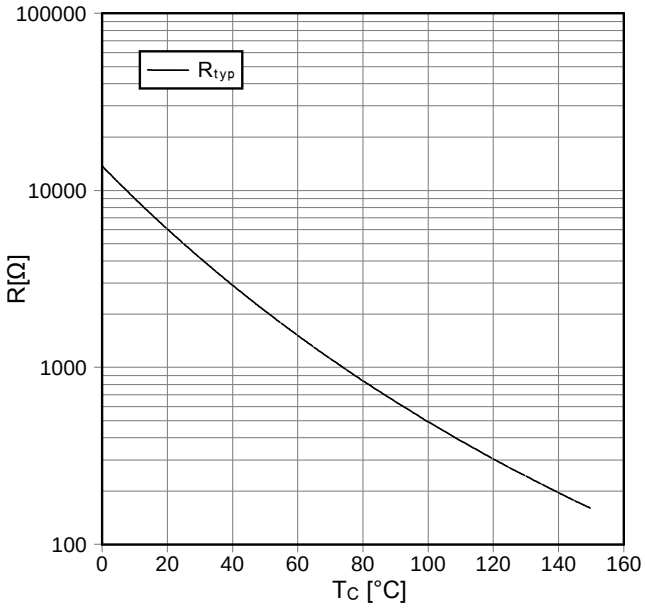
Ausgangskennlinie IGBT-Brems-Copper (typisch)
output characteristic IGBT-brake-chopper (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



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



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



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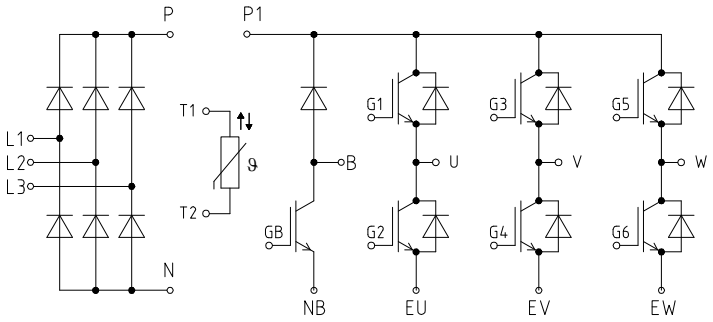
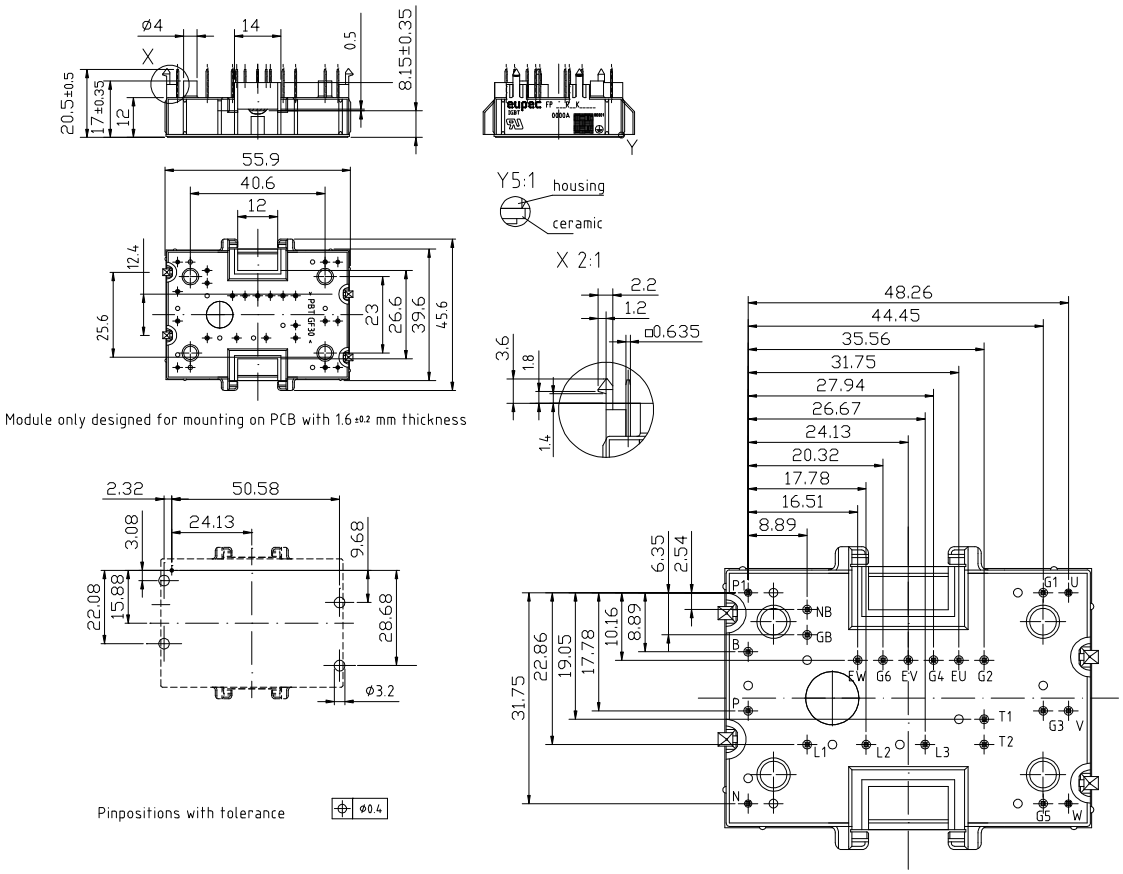
preliminary data

Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



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