

IGBT-Wechselrichter / IGBT-inverter

Vorläufige Daten / preliminary data

Höchstzulässige Werte / maximum rated values

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	600	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 65^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$	$I_{C\ nom}$ I_C	30 37	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\ \text{ms}$	I_{CRM}	60	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$	P_{tot}	100	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	$I_C = 30\ \text{A}, V_{GE} = 15\ \text{V}$ $I_C = 30\ \text{A}, V_{GE} = 15\ \text{V}$ $I_C = 30\ \text{A}, V_{GE} = 15\ \text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\ sat}$	1,55 1,70 1,80	2,00	V V V	
Gate-Schwellenspannung gate threshold voltage	$I_C = 0,30\ \text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	4,9	5,8	6,5	V
Gateladung gate charge	$V_{GE} = -15\ \text{V} \dots +15\ \text{V}$		Q_G	0,30			μC
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,0			Ω
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}	1,65			nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\ \text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$		C_{res}	0,051			nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 600\ \text{V}, V_{GE} = 0\ \text{V}, T_{vj} = 25^{\circ}\text{C}$		I_{CES}			1,0	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)	$I_C = 30\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\ on}$	0,02 0,02 0,02			μs μs μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 30\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,016 0,021 0,022			μs μs μs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 30\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\ off}$	0,14 0,16 0,18			μs μs μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 30\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,045 0,06 0,065			μs μs μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 30\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, L_s = 45\ \text{nH}$ $R_{Gon} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	0,50 0,65 0,75			mJ mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 30\ \text{A}, V_{CE} = 300\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, L_s = 45\ \text{nH}$ $R_{Goff} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	0,60 0,75 0,80			mJ mJ mJ
Kurzschlussverhalten SC data	$V_{GE} \leq 15\ \text{V}, V_{CC} = 360\ \text{V}$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 8\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$ $t_p \leq 6\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	210 150			A A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}	1,35	1,50		K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{Paste} = 1\ \text{W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\ \text{W}/(\text{m}\cdot\text{K})$		R_{thCH}	0,65			K/W

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Vorläufige Daten
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Diode-Wechselrichter / diode-inverter

Höchstzulässige Werte / maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	600	V
Dauergleichstrom DC forward current		I_F	30	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1\text{ ms}$	I_{FRM}	60	A
Grenzlastintegral I^2t - value	$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I^2t	90,0 82,0	A^2s A^2s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	$I_F = 30\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 30\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 30\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_F	1,60 1,55 1,50	2,05	V V V
Rückstromspitze peak reverse recovery current	$I_F = 30\text{ A}, -di_F/dt = 2100\text{ A}/\mu\text{s}$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}	44,0 49,0 50,0		A A A
Sperrverzögerungsladung recovered charge	$I_F = 30\text{ A}, -di_F/dt = 2100\text{ A}/\mu\text{s}$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r	1,20 2,20 2,50		μC μC μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 30\text{ A}, -di_F/dt = 2100\text{ A}/\mu\text{s}$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}	0,32 0,55 0,65		mJ mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}	1,95	2,15	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		R_{thCH}	0,80		K/W

NTC-Widerstand / NTC-thermistor

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Nennwiderstand rated resistance	$T_C = 25^{\circ}\text{C}$		R_{25}	5,00		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}		20,0	mW
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$		$B_{25/50}$	3375		K

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Modul / module

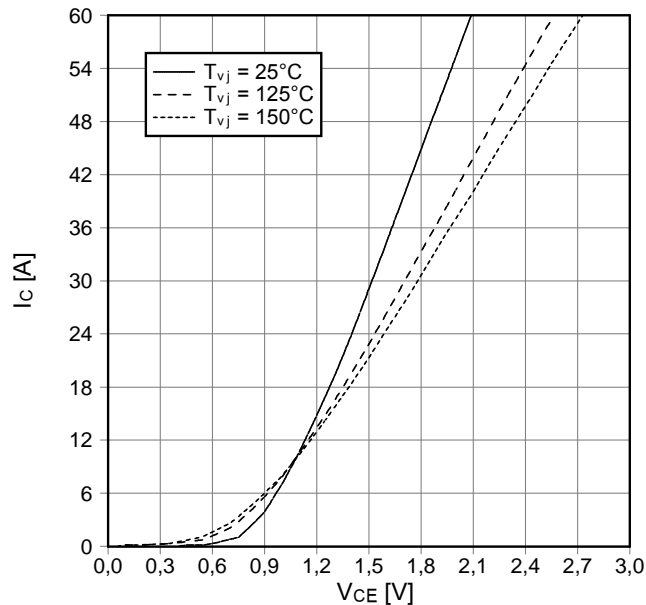
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISO}	2,5		kV
Material für innere Isolation material for internal insulation			Al ₂ O ₃		
Kriechstrecke creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		10,5 9,0		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		5,0 5,0		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI	> 225		
			min.	typ.	max.
Modulinduktivität stray inductance module		L _{sCE}		25	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T _C = 25°C, pro Schalter / per switch	R _{CC'+EE'}		8,00	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 mounting force per clamp		F	20	-	50 N
Gewicht weight		G		25	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.

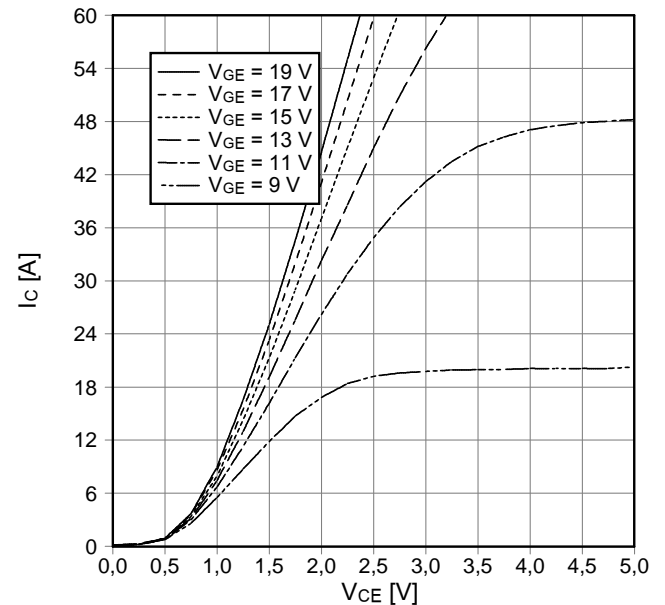
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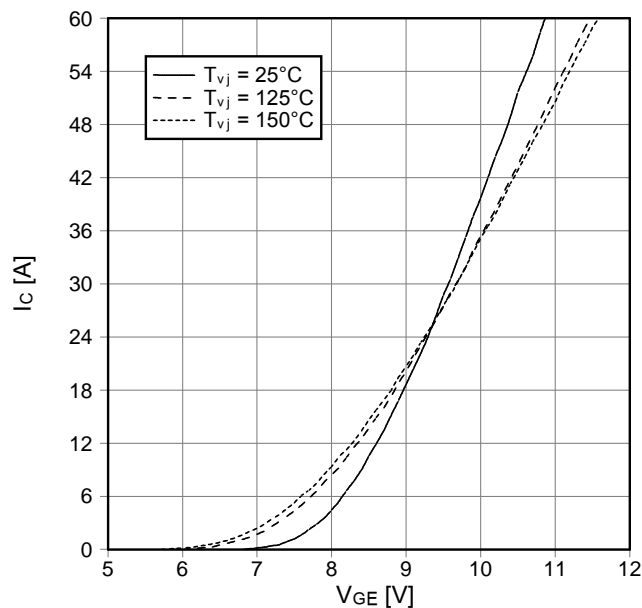
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



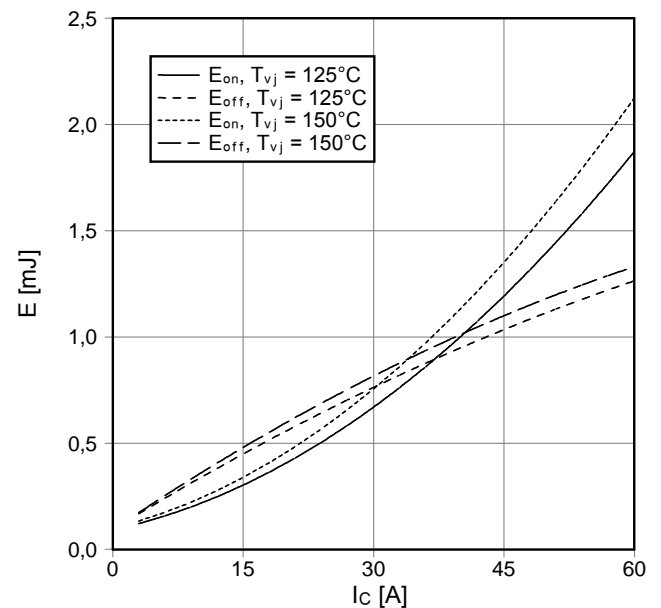
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_C = f(V_{CE})$
 $T_{vj} = 150^\circ\text{C}$



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



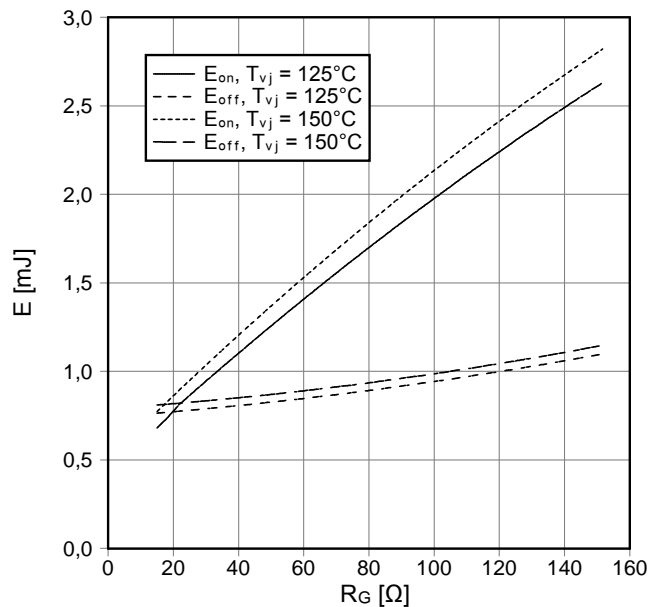
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)
 $E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 15\ \Omega$, $R_{Goff} = 15\ \Omega$, $V_{CE} = 300\text{ V}$



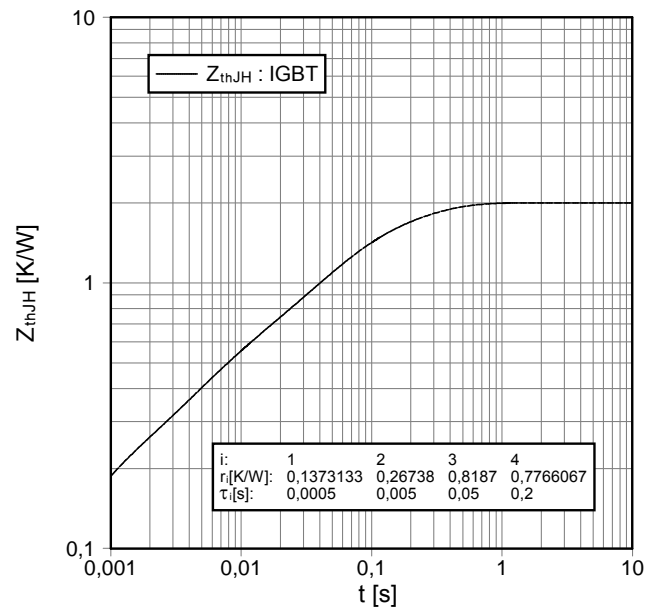
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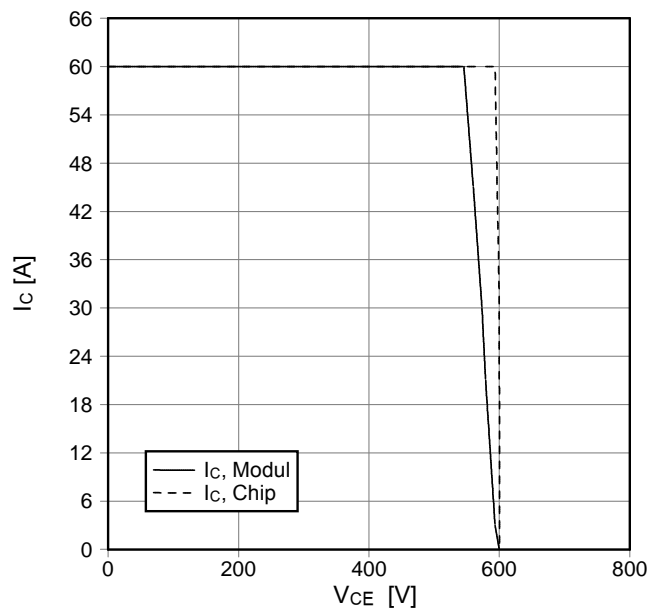
Schaltverluste IGBT-Wechsel. (typisch)
switching losses IGBT-inverter (typical)
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_c = 30\text{ A}$, $V_{CE} = 300\text{ V}$



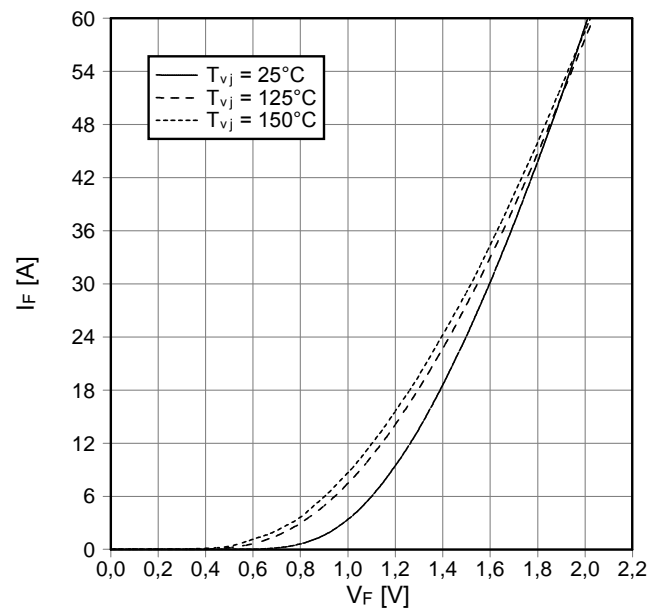
Transienter Wärmewiderstand IGBT-Wechsel.
transient thermal impedance IGBT-inverter
 $Z_{thJH} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
 $I_c = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 15\ \Omega$, $T_{vj} = 150^\circ\text{C}$



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

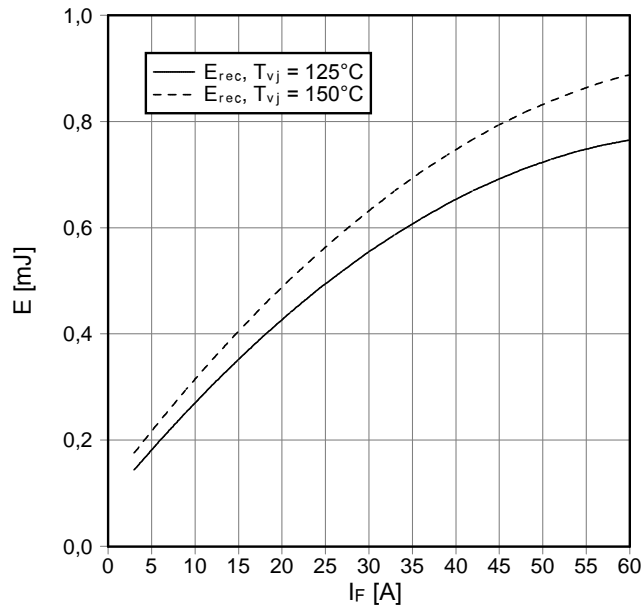


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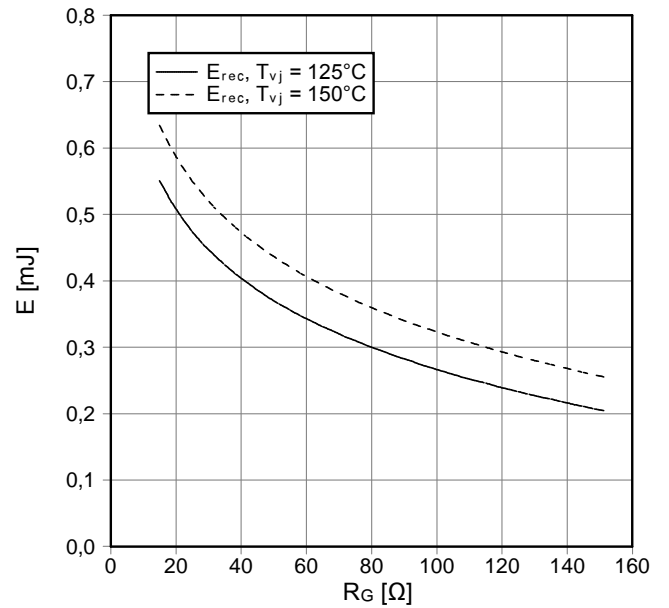
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 15 \Omega, V_{CE} = 300 V$



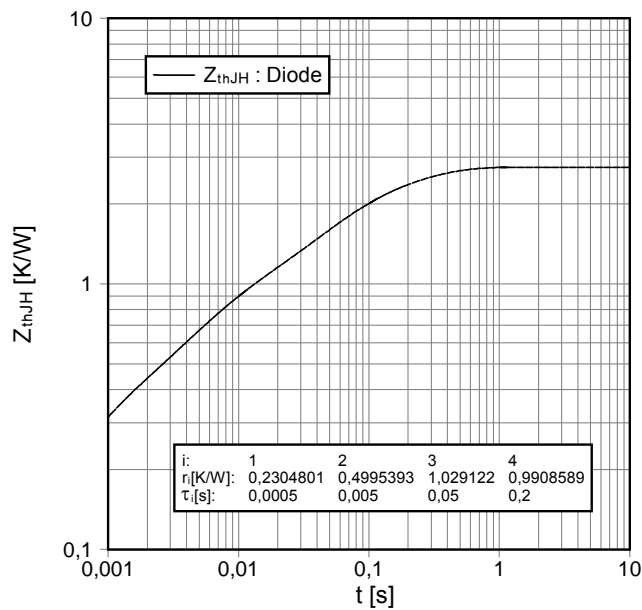
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 30 A, V_{CE} = 300 V$



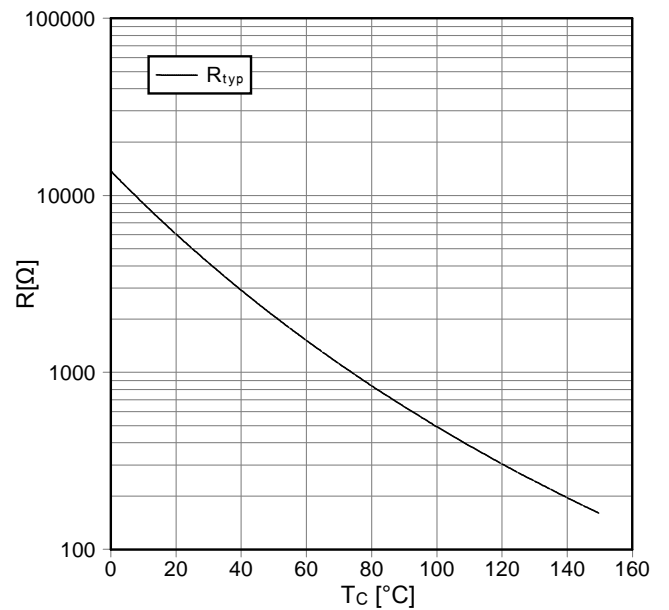
Transienter Wärmewiderstand Diode-Wechselr.
transient thermal impedance diode-inverter

$Z_{thJH} = f(t)$



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

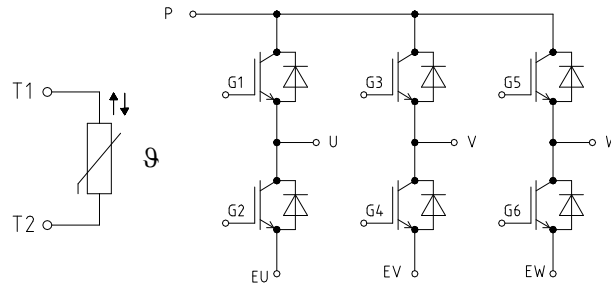
$R = f(T)$



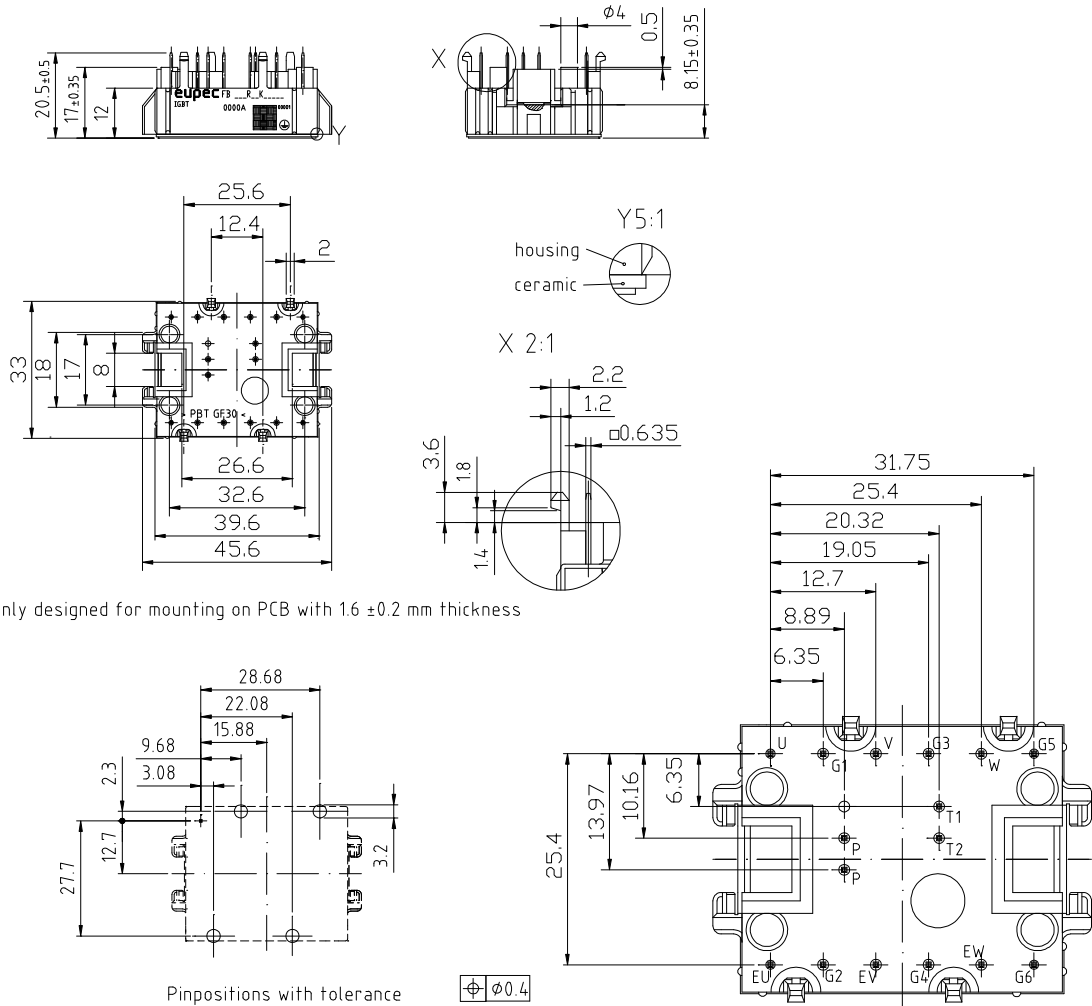
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Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



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