

62mm C-Serien Modul mit Trench/Feldstop IGBT3 und EmCon High Efficiency Diode
62mm C-series module with trench/fieldstop IGBT3 and EmCon High Efficiency diode

IGBT-Wechselrichter / IGBT-inverter

Höchstzulässige Werte / maximum rated values

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	$I_{C\ nom}$ I_C	400 580	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\ \text{ms}$	I_{CRM}	800	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	P_{tot}	2000	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	$I_C = 400\ \text{A}, V_{GE} = 15\ \text{V}$ $I_C = 400\ \text{A}, V_{GE} = 15\ \text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\ sat}$	1,70 2,00	2,15	V V	
Gate-Schwellenspannung gate threshold voltage	$I_C = 16,0\ \text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,0	5,8	6,5	V
Gateladung gate charge	$V_{GE} = -15\ \text{V} \dots +15\ \text{V}$		Q_G	3,70			μC
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	1,9			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}	28,0			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}	1,10			nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1200\ \text{V}, V_{GE} = 0\ \text{V}, T_{vj} = 25^{\circ}\text{C}$		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)	$I_C = 400\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 1,8\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ on}$	0,25 0,30			μs μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 400\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 1,8\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,04 0,045			μs μs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 400\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 1,8\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ off}$	0,50 0,60			μs μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 400\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 1,8\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,10 0,16			μs μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 400\ \text{A}, V_{CE} = 600\ \text{V}, L_S = 30\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}, di/dt = 6000\ \text{A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $R_{Gon} = 1,8\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	17,0 25,0			mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 400\ \text{A}, V_{CE} = 600\ \text{V}, L_S = 30\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}, du/dt = 4000\ \text{V}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $R_{Goff} = 1,8\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	42,0 62,0			mJ mJ
Kurzschlussverhalten SC data	$V_{GE} \leq 15\ \text{V}, V_{CC} = 900\ \text{V}$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$ $t_p \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$		I_{SC}	1600			A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}		0,062		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}	0,031			K/W

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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}	1200	V
Dauergleichstrom DC forward current		I_F	400	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1 \text{ ms}$	I_{FRM}	800	A
Grenzlastintegral I^2t - value	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	34000	A^2s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	$I_F = 400 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 400 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	1,65 1,65	2,15	V V
Rückstromspitze peak reverse recovery current	$I_F = 400 \text{ A}, -di_F/dt = 6000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	490 550		A A
Sperrverzögerungsladung recovered charge	$I_F = 400 \text{ A}, -di_F/dt = 6000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	44,0 80,0		μC μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 400 \text{ A}, -di_F/dt = 6000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	19,0 35,0		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}		0,11	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$		R_{thCH}	0,055		K/W

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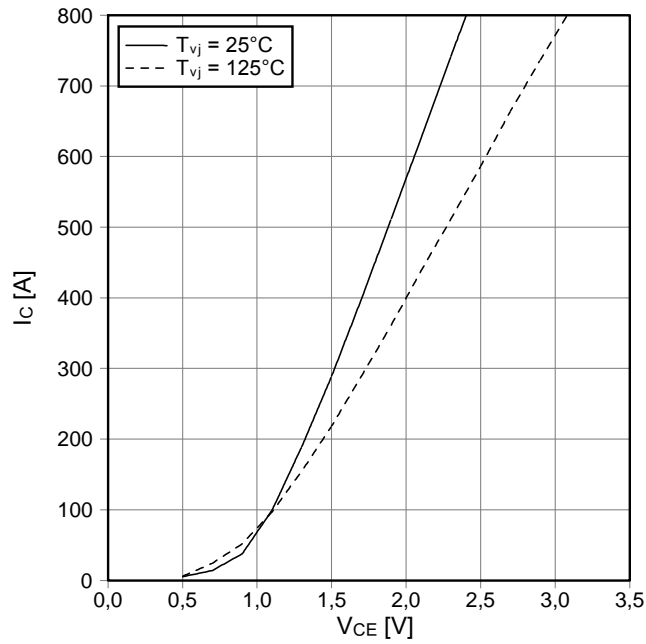
Modul / module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	2,5		kV
Material Modulgrundplatte material of module baseplate			Cu		
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		29,0 23,0		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		23,0 11,0		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI	> 400		
			min.	typ.	max.
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$	R _{thCH}		0,01	K/W
Modulinduktivität stray inductance module		L _{sCE}		20	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T _C = 25°C, pro Schalter / per switch	R _{CC'+EE'}		0,70	mΩ
Höchstzulässige Sperrschichttemperatur maximum junction temperature	Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper	T _{vj max}			150 °C
Temperatur im Schaltbetrieb temperature under switching conditions	Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper	T _{vj op}	-40		125 °C
Lagertemperatur storage temperature		T _{stg}	-40		125 °C
Anzugsdrehmoment f. mech. Befestigung mounting torque	Schraube M6 - Montage gem. gültiger Applikation Note screw M6 - mounting according to valid application note	M	3,00	-	6,00 Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Schraube M6 - Montage gem. gültiger Applikation Note screw M6 - mounting according to valid application note	M	2,5	-	5,0 Nm
Gewicht weight		G		340	g

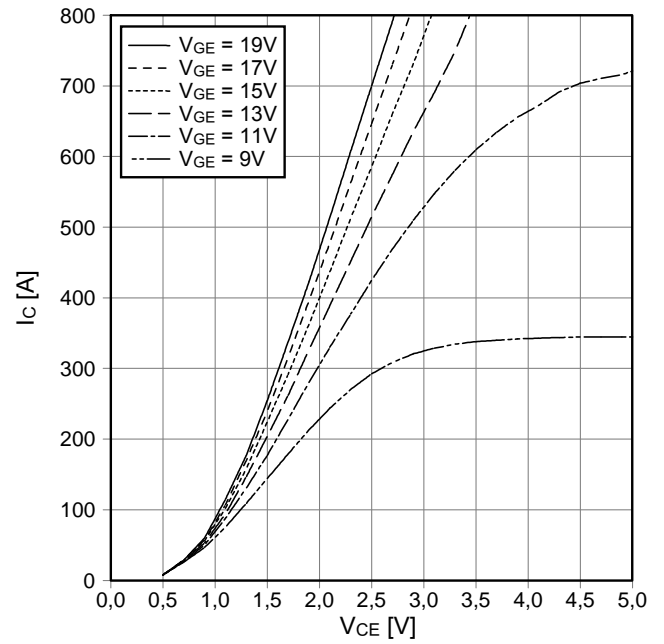
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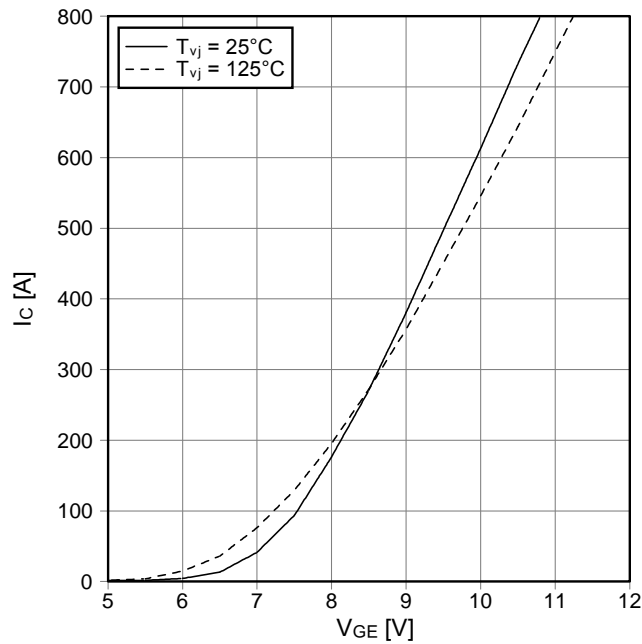
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



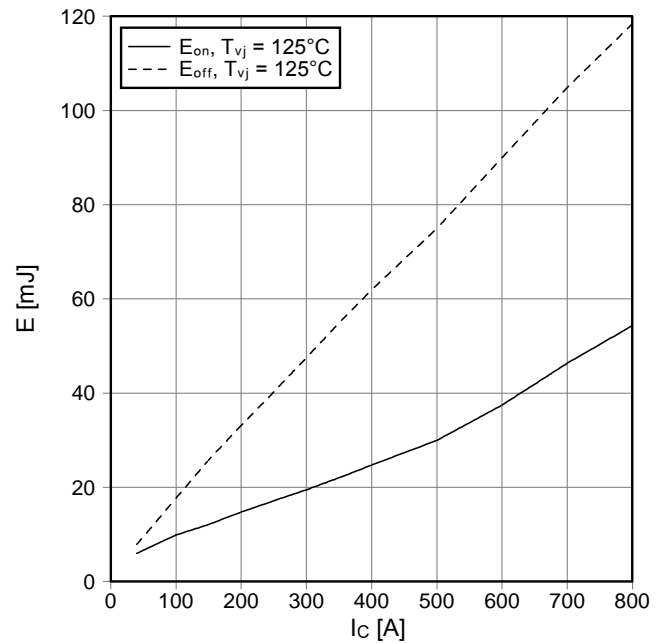
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_C = f(V_{CE})$
 $T_{vj} = 125^\circ\text{C}$



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



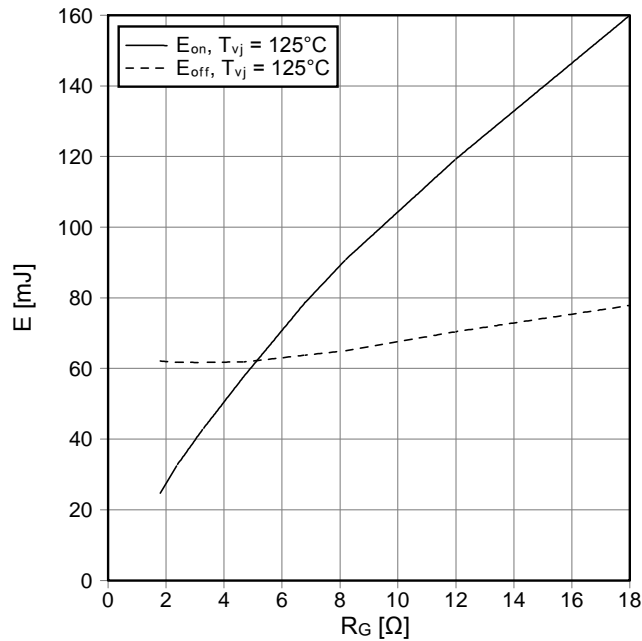
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)
 $E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.8\ \Omega$, $R_{Goff} = 1.8\ \Omega$, $V_{CE} = 600\text{ V}$



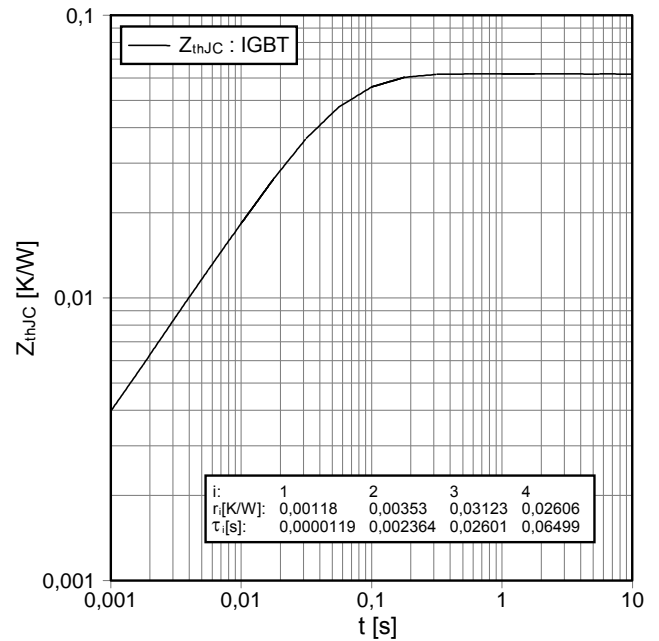
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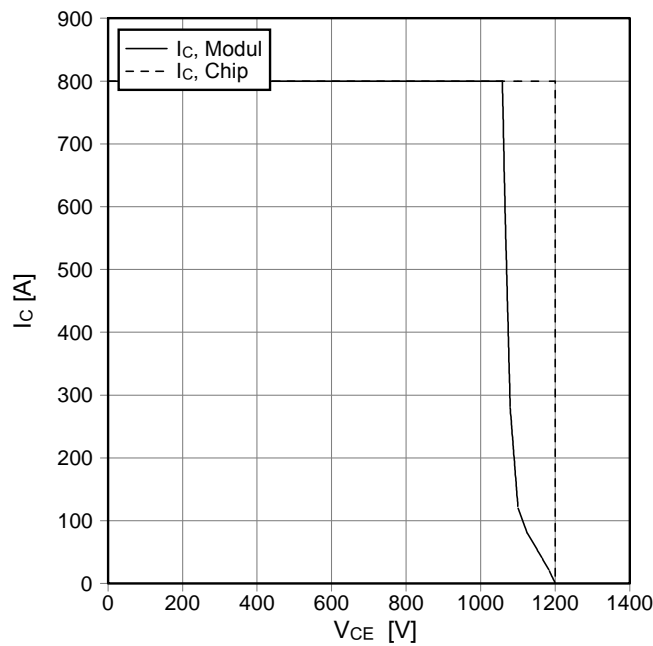
Schaltverluste IGBT-Wechsel. (typisch)
switching losses IGBT-Inverter (typical)
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 400\text{ A}$, $V_{CE} = 600\text{ V}$



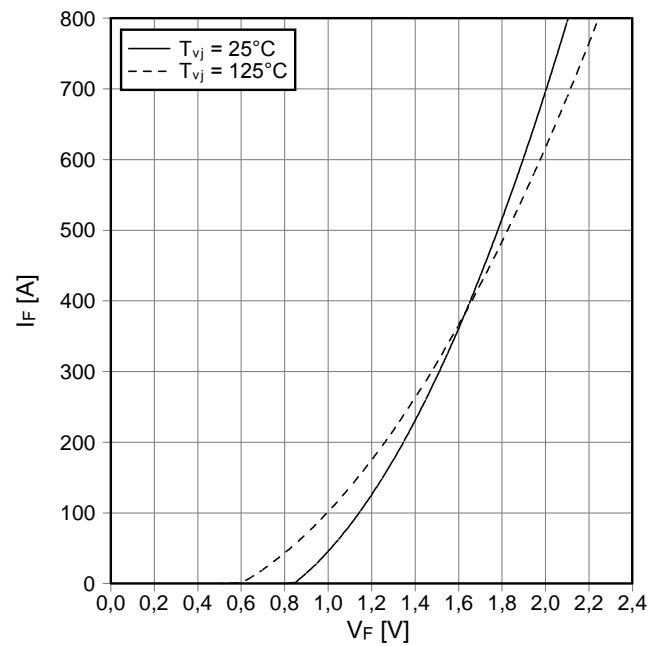
Transienter Wärmewiderstand IGBT-Wechsel.
transient thermal impedance IGBT-inverter
 $Z_{thJC} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 1.8\ \Omega$, $T_{vj} = 125^\circ\text{C}$



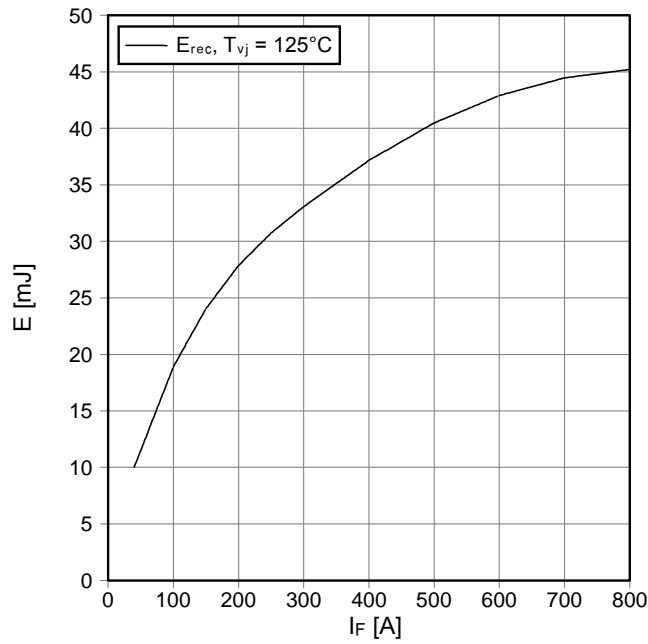
Durchlasskennlinie der Diode-Wechsel. (typisch)
forward characteristic of diode-inverter (typical)
 $I_F = f(V_F)$



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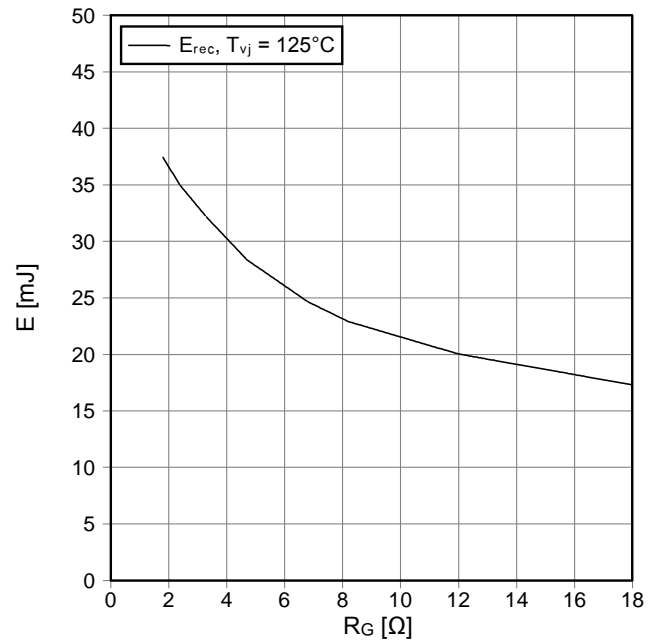
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.8 \Omega, V_{CE} = 600 V$



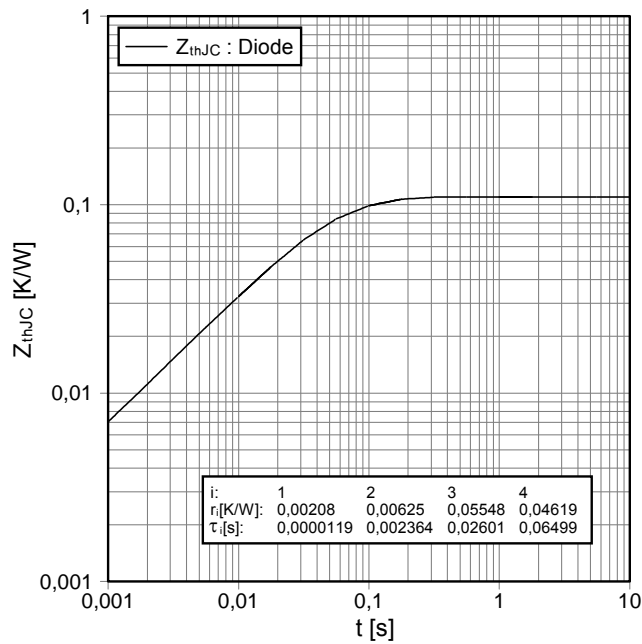
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 400 A, V_{CE} = 600 V$



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

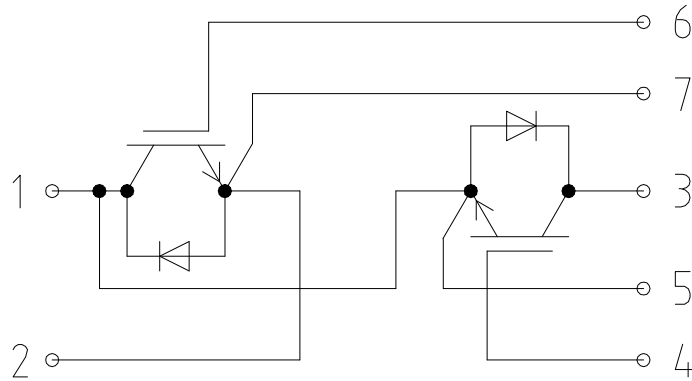
$Z_{thJC} = f(t)$



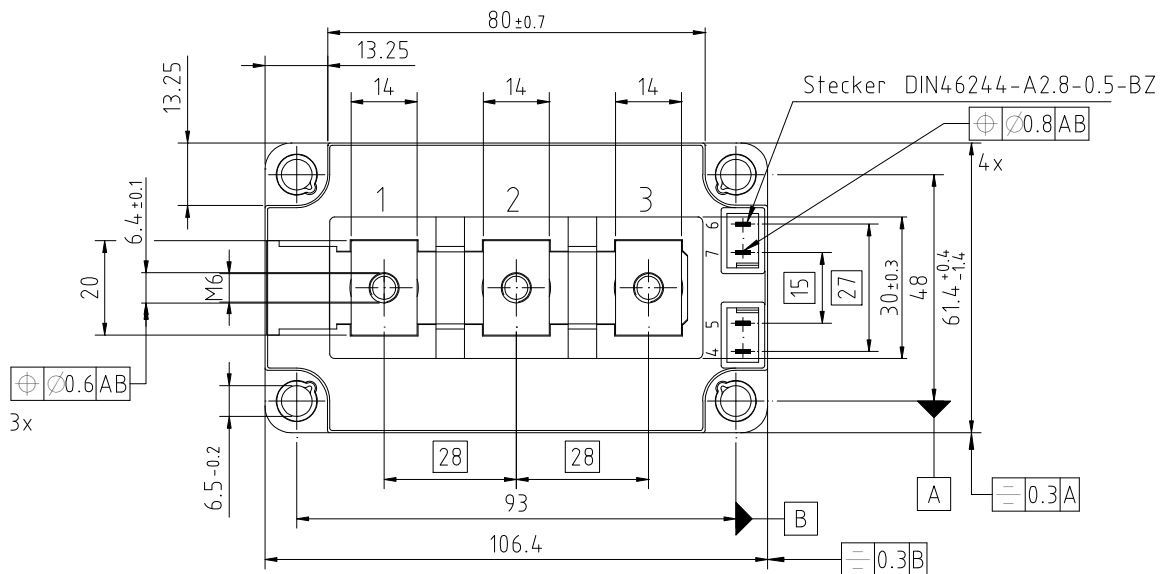
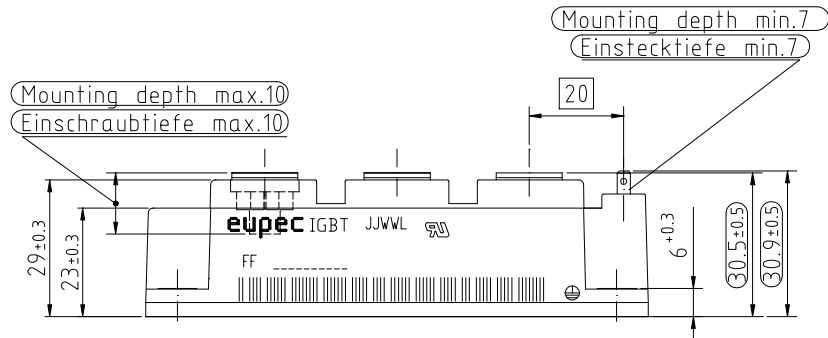
i:	1	2	3	4
r _i [K/W]:	0,00208	0,00625	0,05548	0,04619
τ _i [s]:	0,0000119	0,002364	0,02601	0,06499

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Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



Freimaßtoleranzen
nach ISO2768 mH

General tolerance
ISO2768 mH

Az24

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