

62mm C-Serien Modul mit low loss IGBT2 und EmCon Diode
62mm C-series module with low loss IGBT2 and EmCon 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	$T_C = 80^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	$I_{C\text{ nom}}$ I_C	400 625	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}	2500	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	$I_C = 400\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 400\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{ sat}}$	2,10 2,40	2,60 2,90	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}	4,5	5,5	6,5 V
Gateladung gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		Q_G	4,20		μC
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	1,3		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}	26,0		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}	1,70		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)	$I_C = 400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 2,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{ on}}$	0,11 0,12		μs μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 2,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,06 0,07		μs μs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 2,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{ off}}$	0,55 0,57		μs μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 2,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,07 0,08		μs μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}, L_S = 90\text{ nH}$ $R_{Gon} = 2,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	38,0		mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}, L_S = 90\text{ nH}$ $R_{Goff} = 2,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	51,0		mJ mJ
Kurzschlußverhalten SC data	$t_P \leq 10\ \mu\text{s}, V_{GE} \leq 15\text{ V}$ $T_{vj} = 125^{\circ}\text{C}, V_{CC} = 900\text{ V}, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$		I_{SC}	2400		A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}		0,05	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) \quad / \quad \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		R_{thCH}	0,016		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	27500	A ² s

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		1,80 1,70	2,30 2,20	V V
Rückstromspitze peak reverse recovery current	$I_F = 400\text{ A}$, - $di_F/dt = 4100\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}		325 430		A A
Sperrverzögerungsladung recovered charge	$I_F = 400\text{ A}$, - $di_F/dt = 4100\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r		41,0 80,0		μC μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 400\text{ A}$, - $di_F/dt = 4100\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}		16,0 33,0		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}			0,09	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}		0,028		K/W

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		20,0		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		11,0		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI	> 425		
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{\text{Paste}} = 1 \text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1 \text{ W/(m}\cdot\text{K)}$	R _{thCH}	min.	typ.	max.
Modulinduktivität stray inductance module		L _{sCE}		0,01	K/W
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T _C = 25°C, pro Schalter / per switch	R _{CC'+EE'}		0,50	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 / screw M6	M	3,00	-	6,00 Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Schraube / screw M4 Schraube / screw M6	M	1,1 2,5	- -	2,0 5,0 Nm
Gewicht weight		G		340	g

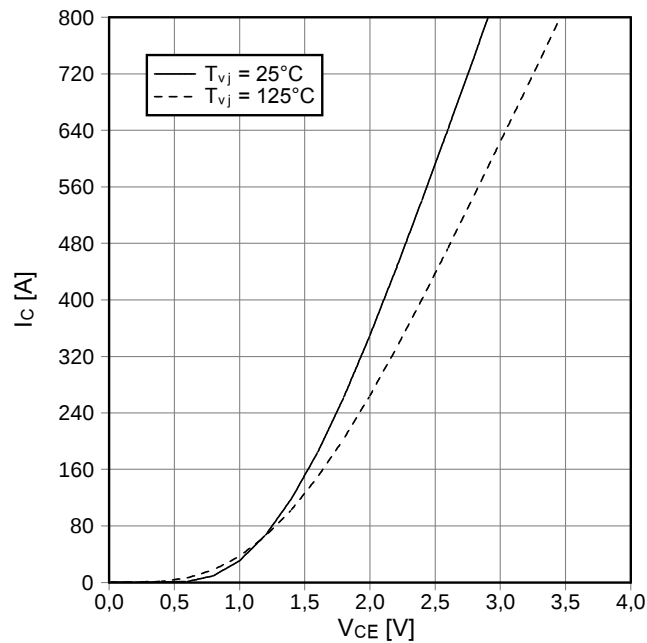
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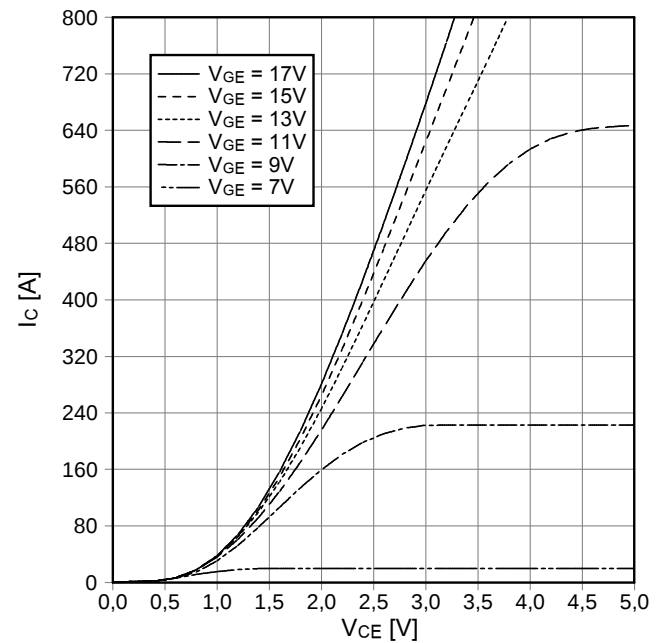
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)

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



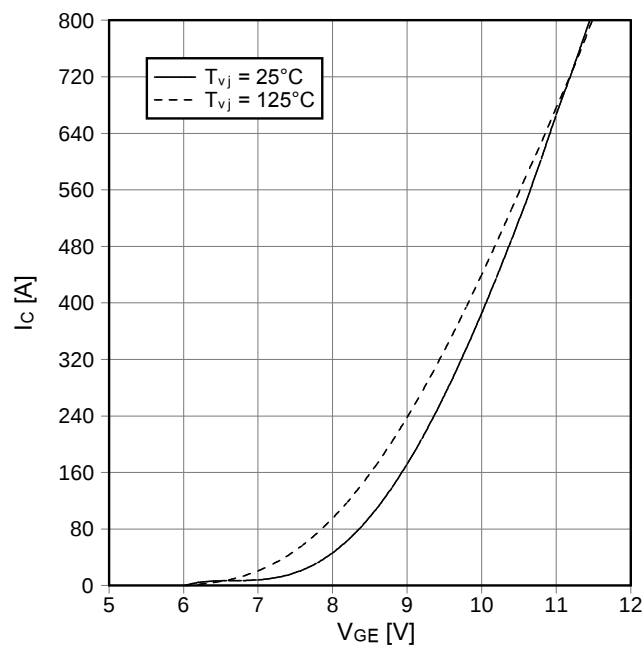
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)

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



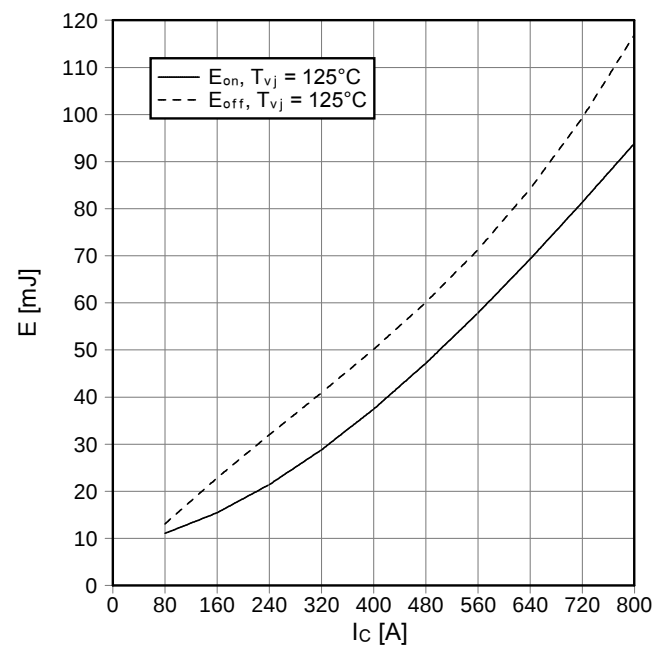
Übertragungscharakteristik IGBT-Wechselr. (typisch)
transfer characteristic IGBT-inverter (typical)

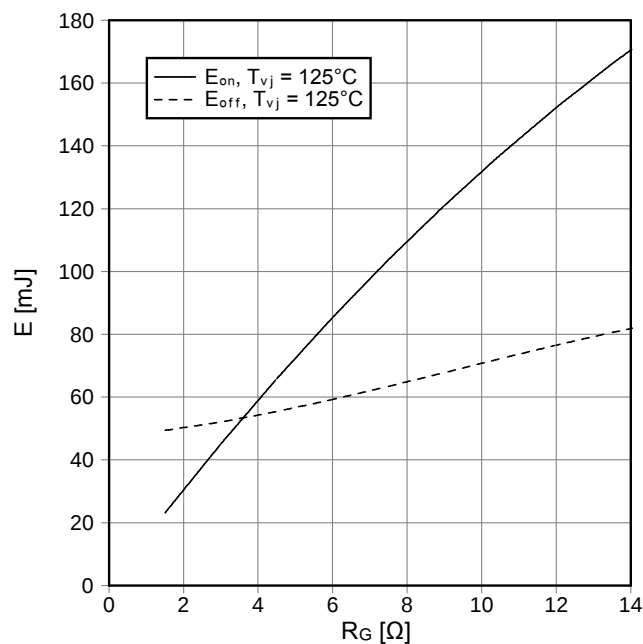
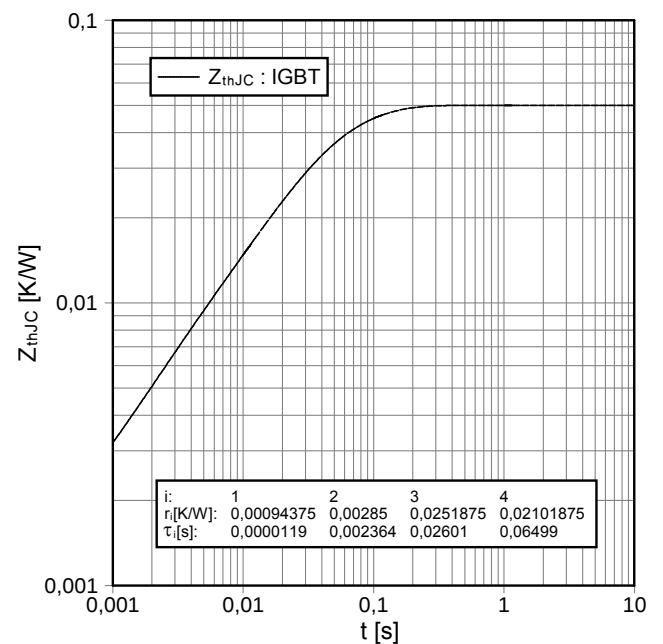
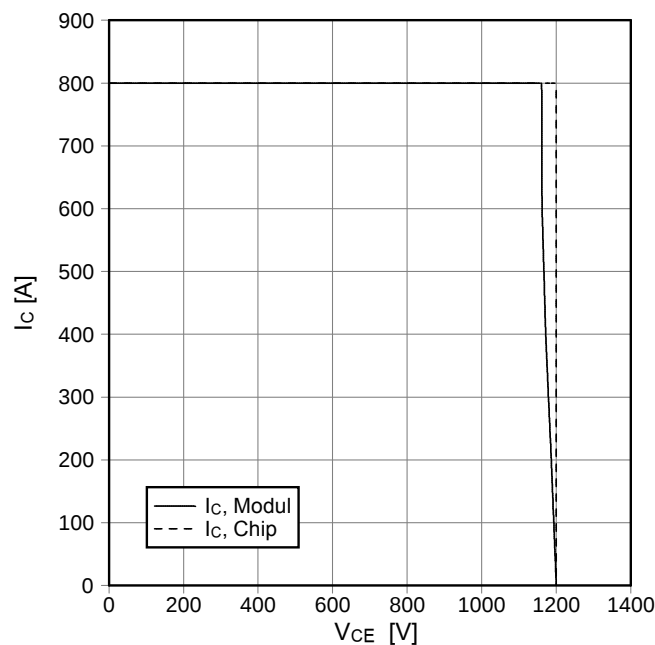
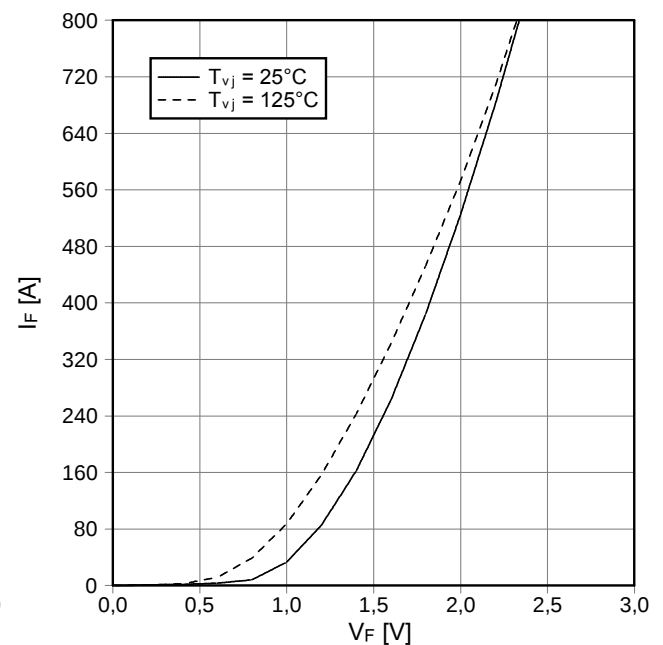
$I_C = f(V_{GE})$
 $V_{CE} = 20 \text{ V}$

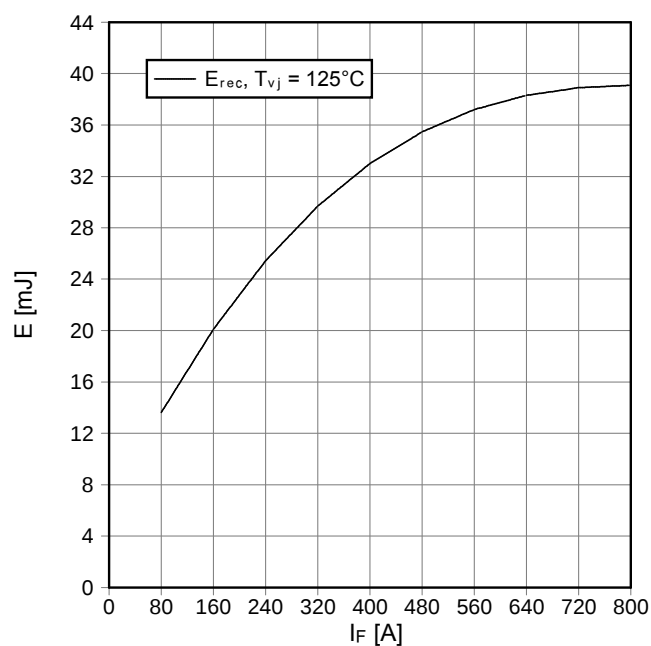
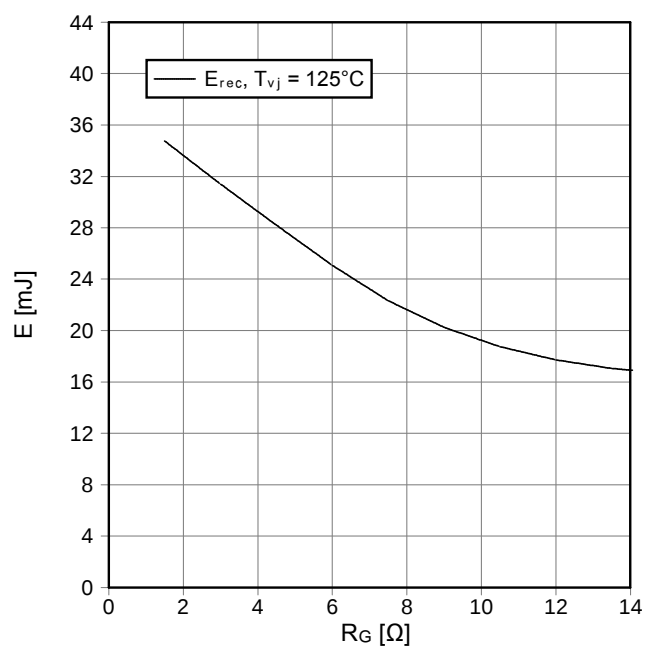
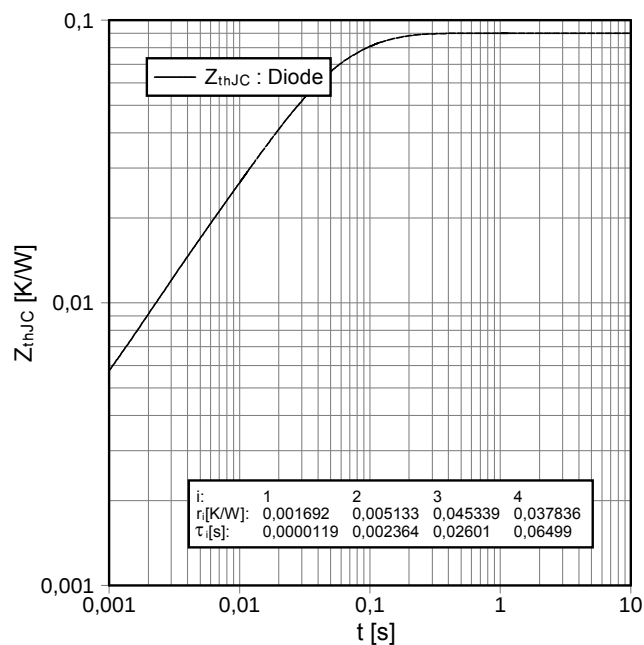


Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 2,2 \Omega$, $R_{Goff} = 2,2 \Omega$, $V_{CE} = 600 \text{ V}$

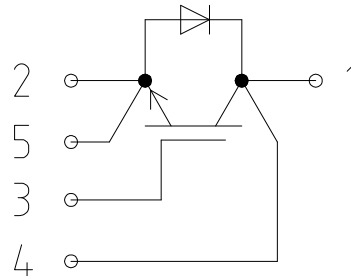


Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-Inverter (typical)
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 400 \text{ A}$, $V_{CE} = 600 \text{ V}$

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

Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 2,2 \Omega$, $T_{vj} = 125^\circ\text{C}$

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


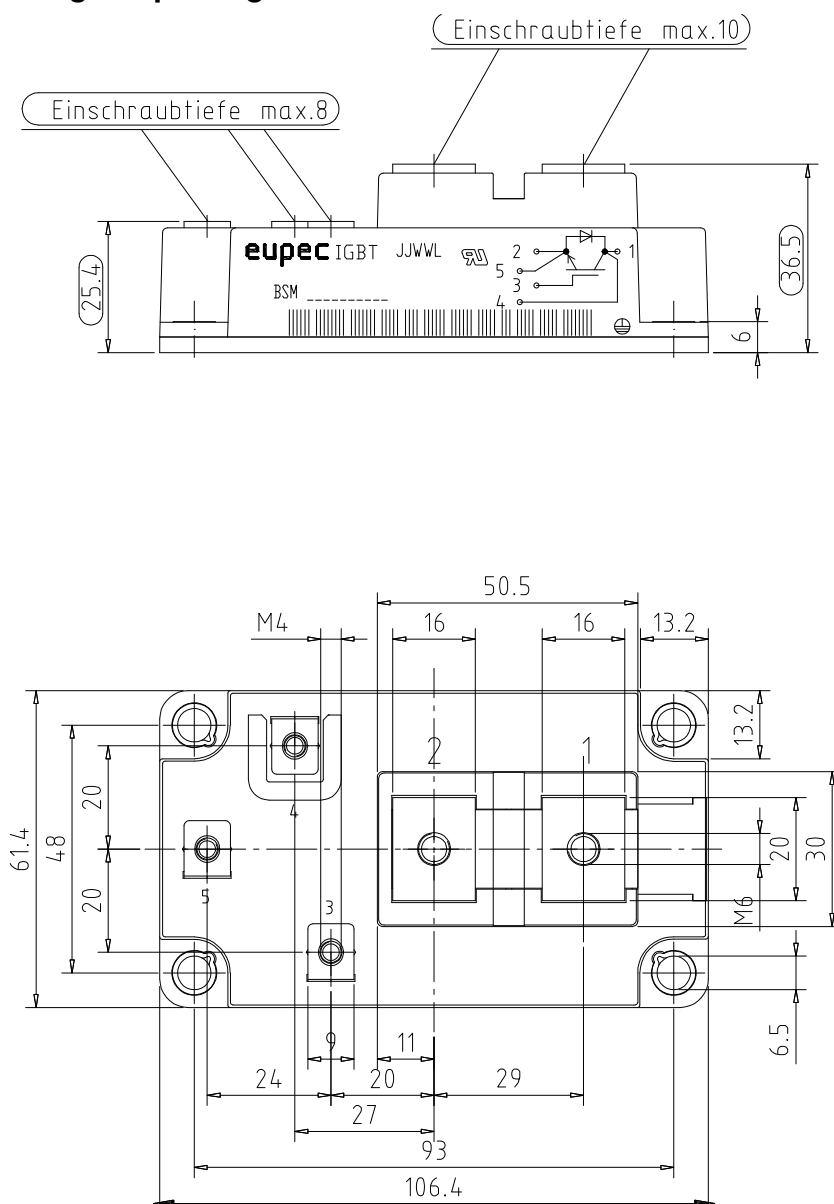
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 2,2 \Omega$, $V_{CE} = 600 V$

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]:	0,001692	0,005133	0,045339	0,037836
τ _i [s]:	0,0000119	0,002364	0,02601	0,06499

Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



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