Technische Information / technical information

IGBT-Module
IGBT-modules

BSM400GA120DLC

power electronics in motion
eupec

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°C	V_{CES}	1200	V
Kollektor-Dauergleichstrom DC-collector current	T_C = 80°C, T_{vj} = 150°C T_C = 25°C, T_{vj} = 150°C	$I_{C\ nom}$ I_C	400 625	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms	I_{CRM}	800	A
Gesamt-Verlustleistung total power dissipation	T_C = 25°C, T_{vj} = 150°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 A, V_{GE} = 15 V I_C = 400 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C	$V_{CE\ sat}$	2,10 2,40	2,60 2,90	V V
Gate-Schwellenspannung gate threshold voltage	I_C = 16,0 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	4,5	5,5	6,5	V
Gateladung gate charge	V_{GE} = -15 V ... +15 V		Q_G		4,20		µC
Interner Gatewiderstand internal gate resistor	T_{vj} = 25°C		R_{Gint}		1,3		Ω
Eingangskapazität input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		26,0		nF
Rückwirkungskapazität reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		1,70		nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			5,0	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 = 400 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 2,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\ on}$		0,11 0,12		µs µs
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 400 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Gon} = 2,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_r		0,06 0,07		µs µs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	I_C = 400 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 2,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\ off}$		0,55 0,57		µs µs
Fallzeit (induktive Last) fall time (inductive load)	I_C = 400 A, V_{CE} = 600 V V_{GE} = ±15 V R_{Goff} = 2,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_f		0,07 0,08		µs µs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 400 A, V_{CE} = 600 V V_{GE} = ±15 V, L_S = 90 nH R_{Gon} = 2,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{on}		38,0		mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 400 A, V_{CE} = 600 V V_{GE} = ±15 V, L_S = 90 nH R_{Goff} = 2,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{off}		51,0		mJ mJ
Kurzschlußverhalten SC data	t_P ≤ 10 µs, V_{GE} ≤ 15 V T_{vj} = 125°C, V_{CC} = 900 V, V_{CEmax} = V_{CES} -L_{sCE} ·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 λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,016		K/W

prepared by: Mark Münzer	date of publication: 2004-7-5
approved by: Wilhelm Rusche	revision: 3.2

Diode-Wechselrichter / diode-inverter

Höchstzulässige Werte / maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Dauergleichstrom DC forward current		I_F	400	A
Periodischer Spitzenstrom repetitive peak forward current	t_P = 1 ms	I_{FRM}	800	A
Grenzlastintegral I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C	I²t	27500	A²s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	I_F = 400 A, V_{GE} = 0 V I_F = 400 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C	V_F		1,80 1,70	2,30 2,20	V V
Rückstromspitze peak reverse recovery current	I_F = 400 A, - di_F/dt = 4100 A/µs V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	I_{RM}		325 430		A A
Sperrverzögerungsladung recovered charge	I_F = 400 A, - di_F/dt = 4100 A/µs V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	Q_r		41,0 80,0		µC µC
Abschaltenergie pro Puls reverse recovery energy	I_F = 400 A, - di_F/dt = 4100 A/µs V_R = 600 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°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 λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		0,028		K/W

Modul / module

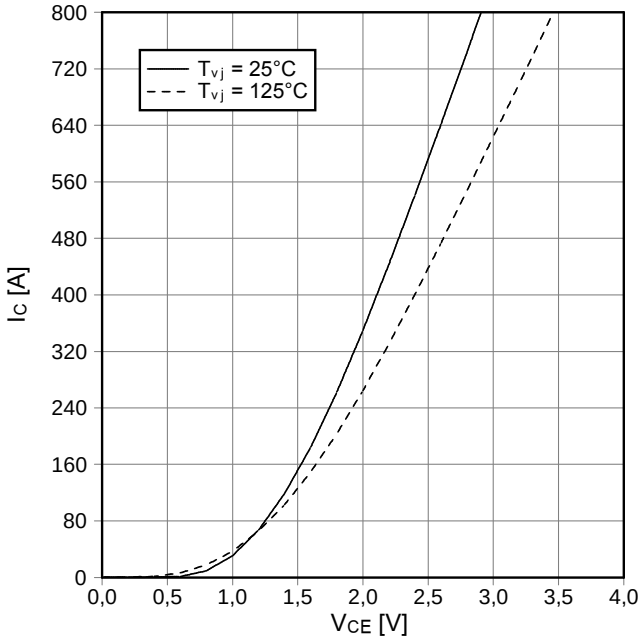
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		2,5		kV
Material Modulgrundplatte material of module baseplate				Cu		
Material für innere Isolation material for internal insulation				Al_2O_3		
Kriechstrecke creepage distance	Kontakt - Kühlkörper / terminal to heatsink 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		
			min.	typ.	max.	
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,01		K/W
Modulinduktivität stray inductance module		L_{sCE}		16		nH
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 Nm
Gewicht weight		G		340		g

Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen technischen Erläuterungen.

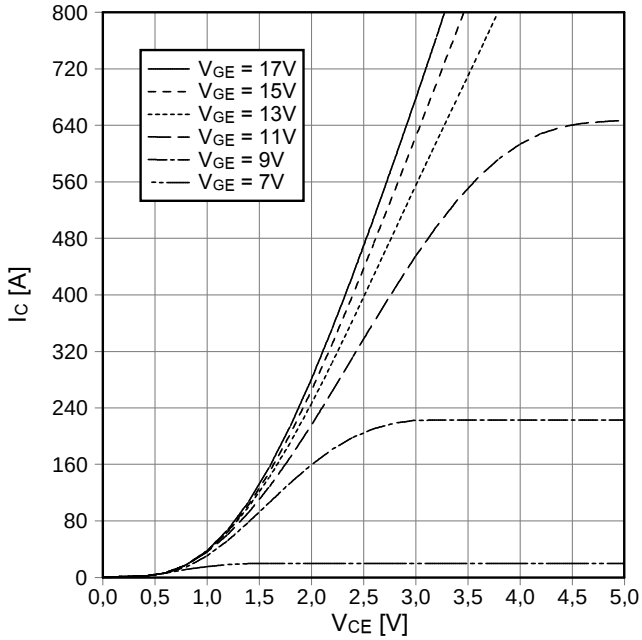
This technical information specifies semiconductor devices but guarantees no characteristics. It is valid with the appropriate technical explanations.

prepared by: Mark Münzer	date of publication: 2004-7-5
approved by: Wilhelm Rusche	revision: 3.2

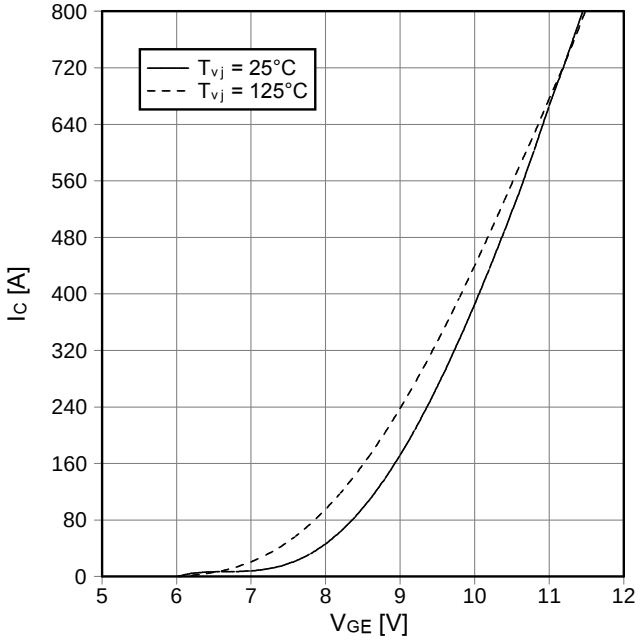
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



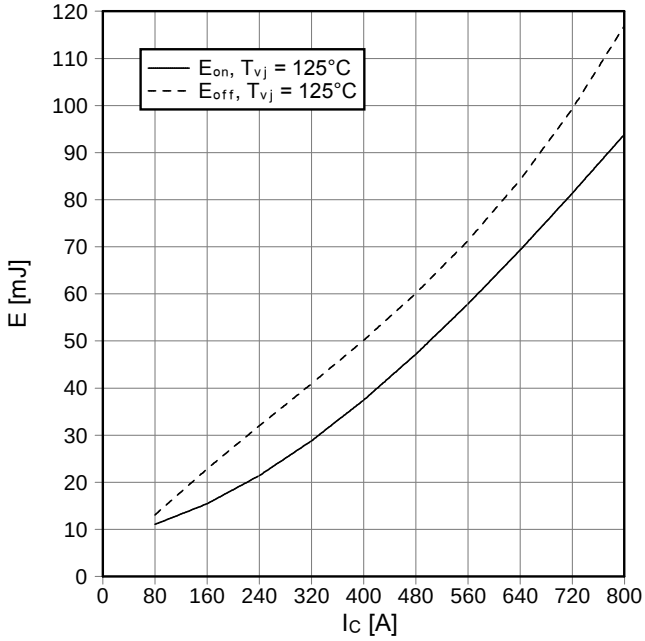
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
$I_C = f(V_{CE})$
T_{vj} = 125°C



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

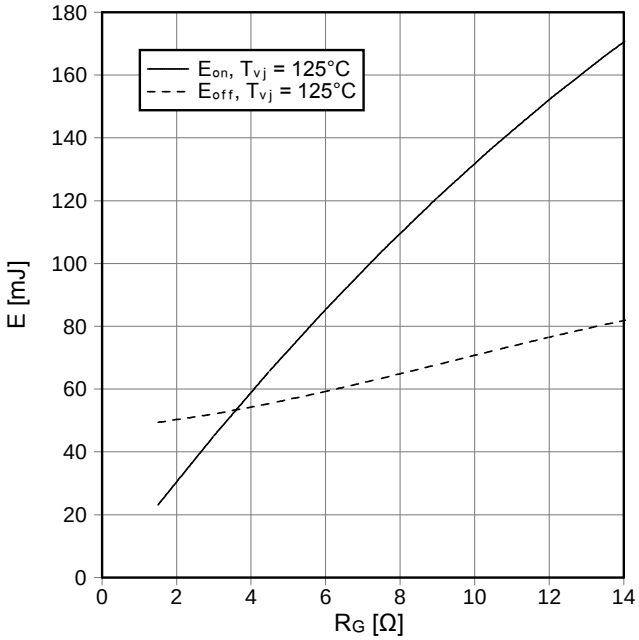


Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 2,2 Ω, R_{Goff} = 2,2 Ω, V_{CE} = 600 V

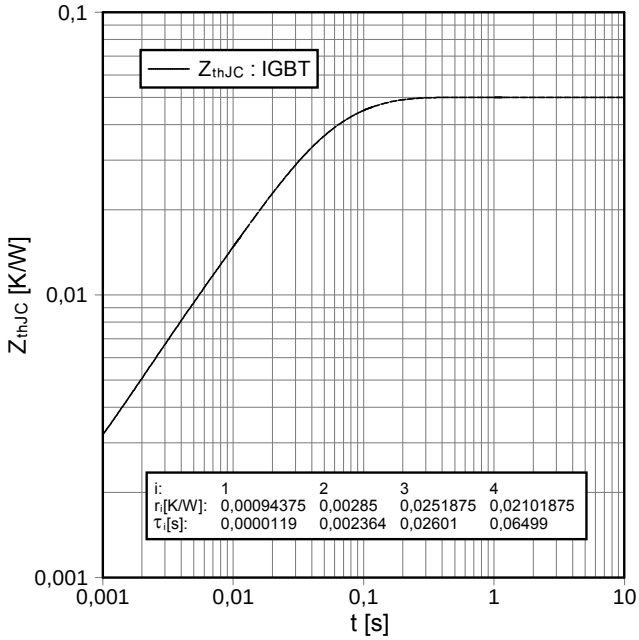


prepared by: Mark Münzer	date of publication: 2004-7-5
approved by: Wilhelm Rusche	revision: 3.2

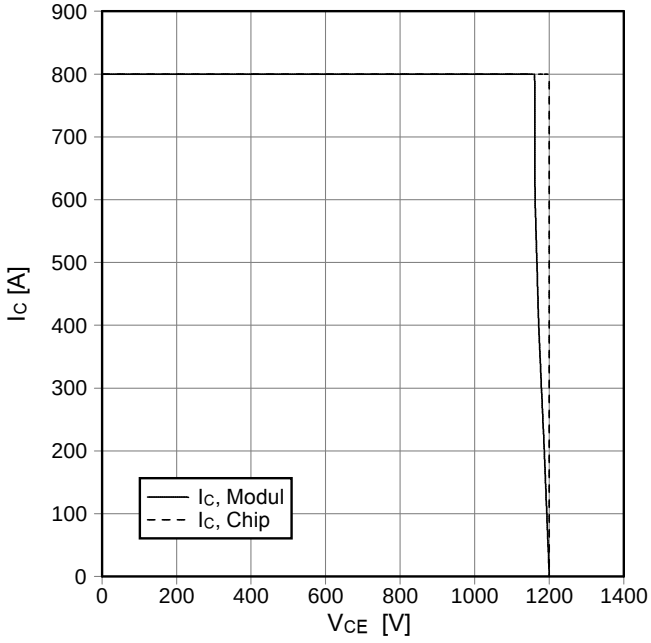
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 400$ A, $V_{CE} = 600$ V



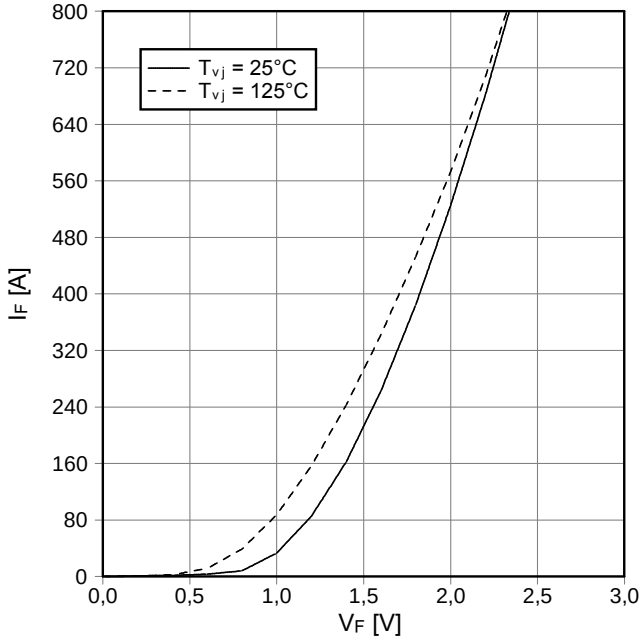
Transienter Wärmewiderstand IGBT-Wechselr.
transient thermal impedance IGBT-inverter
$Z_{thJC} = f(t)$



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

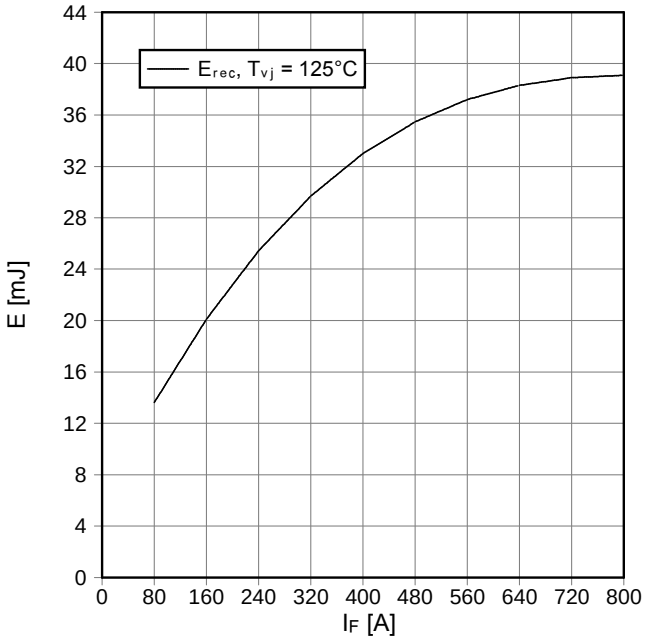


Durchlaßkennlinie der Diode-Wechselr. (typisch)
forward characteristic of diode-inverter (typical)
$I_F = f(V_F)$

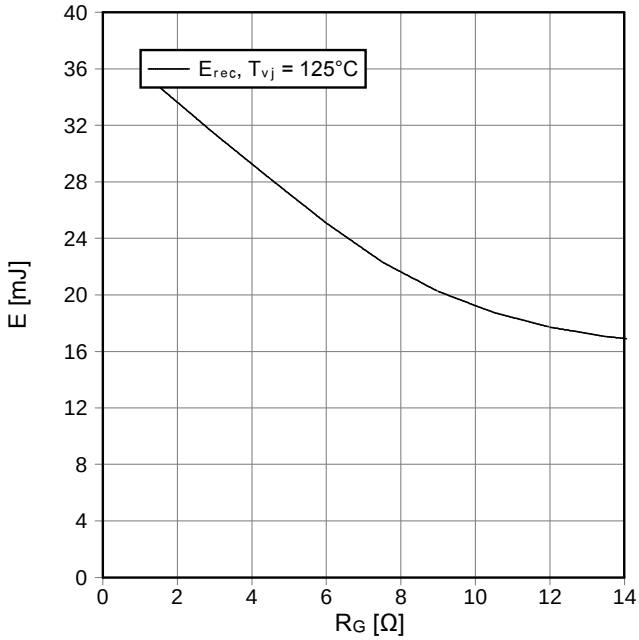


prepared by: Mark Münzer	date of publication: 2004-7-5
approved by: Wilhelm Rusche	revision: 3.2

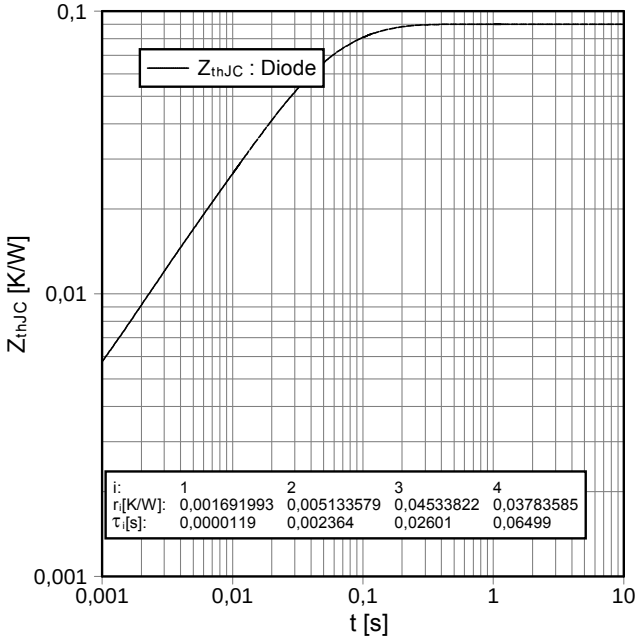
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 2{,}2\ \Omega$, $V_{CE} = 600$ V



Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 400$ A, $V_{CE} = 600$ V

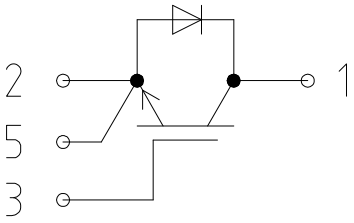


Transienter Wärmewiderstand Diode-Wechselr.
transient thermal impedance diode-inverter
$Z_{thJC} = f(t)$

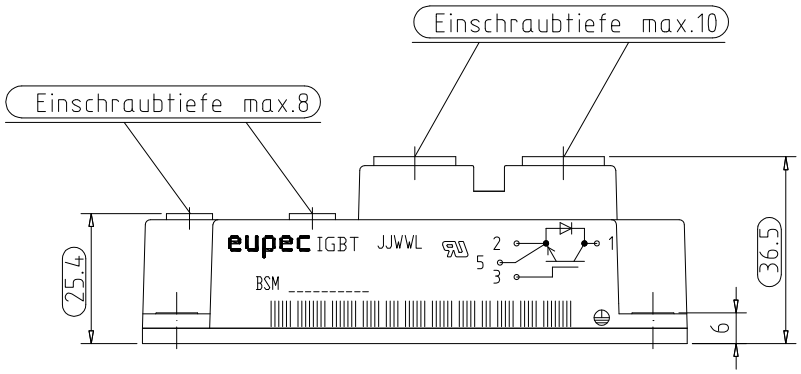


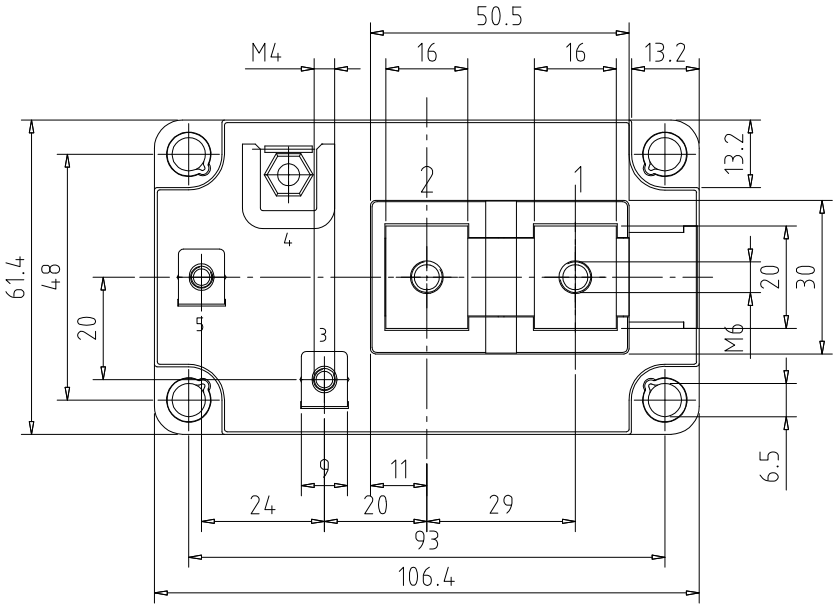
prepared by: Mark Münzer	date of publication: 2004-7-5
approved by: Wilhelm Rusche	revision: 3.2

Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines





prepared by: Mark Münzer	date of publication: 2004-7-5
approved by: Wilhelm Rusche	revision: 3.2

Terms & Conditions of Usage

Attention
The present product data is exclusively subscribed to technically experienced staff. This Data Sheet is describing the specification of the products for which a warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its specifications. Changes to the Data Sheet are reserved.

You and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application. Should you require product information in excess of the data given in the Data Sheet, please contact your local Sales Office via "www.eupec.com / sales & contact".

Warning
Due to technical requirements the products may contain dangerous substances. For information on the types in question please contact your local Sales Office via "www.eupec.com / sales & contact".