Technische Information / technical information

IGBT-Module
IGBT-modules

FD1200R17KE3-K

power electronics in motion
eupec

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}	1700	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	1200 1600	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_P = 1 ms	I_{CRM}	2400	A
Gesamt-Verlustleistung total power dissipation	T_C = 25°C, T_{vj} = 150°C	P_{tot}	5,95	kW
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 = 1200 A, V_{GE} = 15 V I_C = 1200 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C	$V_{CE\ sat}$		2,00 2,40	2,45	V V
Gate-Schwellenspannung gate threshold voltage	I_C = 48,0 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	5,2	5,8	6,4	V
Gateladung gate charge	V_{GE} = -15 V ... +15 V		Q_G		14,0		µC
Interner Gatewiderstand internal gate resistor	T_{vj} = 25°C		R_{Gint}		1,6		Ω
Eingangskapazität input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		110		nF
Rückwirkungskapazität reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		3,50		nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	V_{CE} = 1700 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 = 1200 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Gon} = 1,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\ on}$		0,74 0,80		µs µs
Anstiegszeit (induktive Last) rise time (inductive load)	I_C = 1200 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Gon} = 1,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_r		0,20 0,25		µs µs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	I_C = 1200 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Goff} = 1,5 Ω	T_{vj} = 25°C T_{vj} = 125°C	$t_{d\ off}$		1,45 1,80		µs µs
Fallzeit (induktive Last) fall time (inductive load)	I_C = 1200 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Goff} = 1,5 Ω	T_{vj} = 25°C T_{vj} = 125°C	t_f		0,18 0,30		µs µs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	I_C = 1200 A, V_{CE} = 900 V V_{GE} = ±15 V, L_S = 50 nH R_{Gon} = 1,2 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{on}		240 350		mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	I_C = 1200 A, V_{CE} = 900 V V_{GE} = ±15 V, L_S = 50 nH R_{Goff} = 1,5 Ω	T_{vj} = 25°C T_{vj} = 125°C	E_{off}		305 445		mJ mJ
Kurzschlußverhalten SC data	t_P ≤ 10 µs, V_{GE} ≤ 15 V T_{vj} = 125°C, V_{CC} = 1000 V, V_{CEmax} = V_{CES} $-L_{sCE} \cdot di/dt$		I_{SC}		4800		A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}			21,0	K/kW
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}		17,0		K/kW

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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}	1700	V
Dauergleichstrom DC forward current		I_F	1200	A
Periodischer Spitzenstrom repetitive peak forward current	t_P = 1 ms	I_{FRM}	2400	A
Grenzlastintegral I^2t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C	I^2t	240	kA²s

Charakteristische Werte / characteristic values

				min.	typ.	max.	
Durchlassspannung forward voltage	I_F = 1200 A, V_{GE} = 0 V I_F = 1200 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C	V_F		1,80 1,90	2,20	V V
Rückstromspitze peak reverse recovery current	I_F = 1200 A, - di_F/dt = 7000 A/µs V_R = 900 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	I_{RM}		1150 1250		A A
Sperrverzögerungsladung recovered charge	I_F = 1200 A, - di_F/dt = 7000 A/µs V_R = 900 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	Q_r		305 510		µC µC
Abschaltenergie pro Puls reverse recovery energy	I_F = 1200 A, - di_F/dt = 7000 A/µs V_R = 900 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C	E_{rec}		190 340		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}			48,0	K/kW
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}		39,0		K/kW

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Modul / module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		3,4		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			32,2 32,2		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal			19,1 19,1		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI		> 400		
			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}		6,00		K/kW
Modulinduktivität stray inductance module		L_{sCE}		25		nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T_C = 25°C, pro Schalter / per switch	$R_{CC'+EE'}$ $R_{AA'+CC'}$		0,37 0,37		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	4,25	-	5,75	Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Schraube / screw M4 Schraube / screw M8	M	1,8 8,0	- -	2,1 10	Nm Nm
Gewicht weight		G		1500		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.

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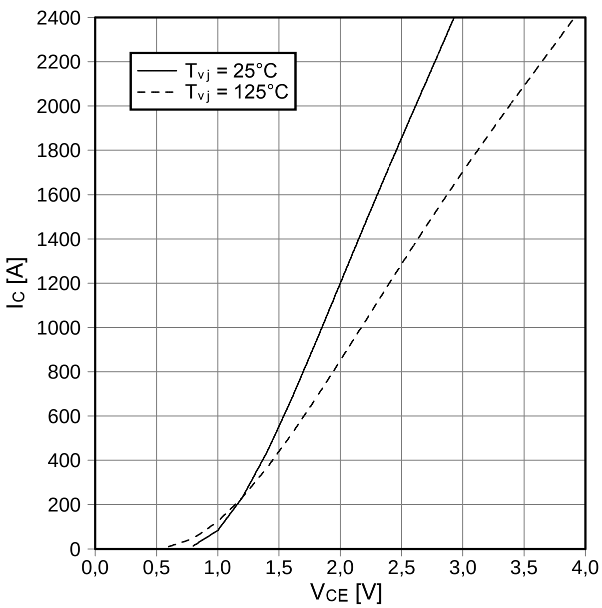
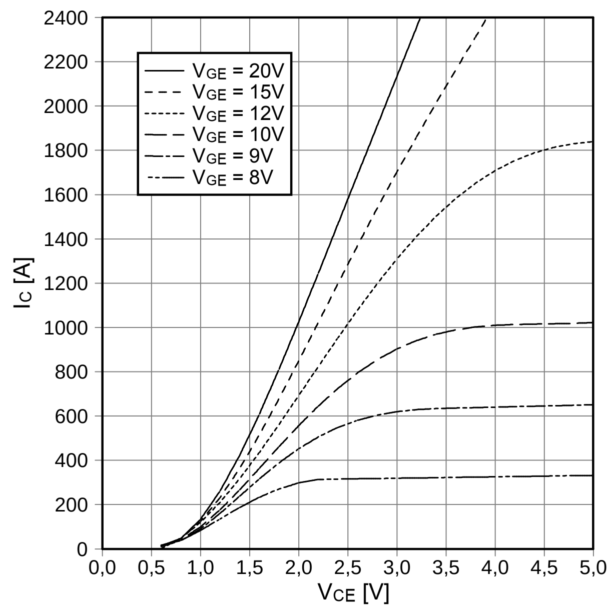
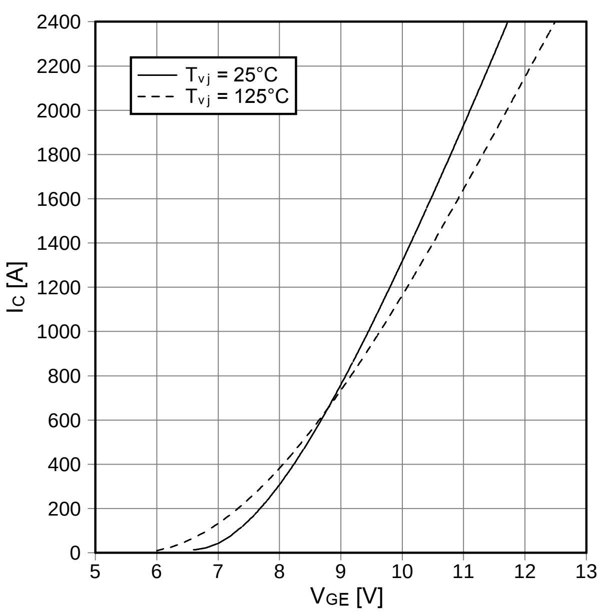
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
I_C = f (V_{CE})
V_{GE} = 15 V



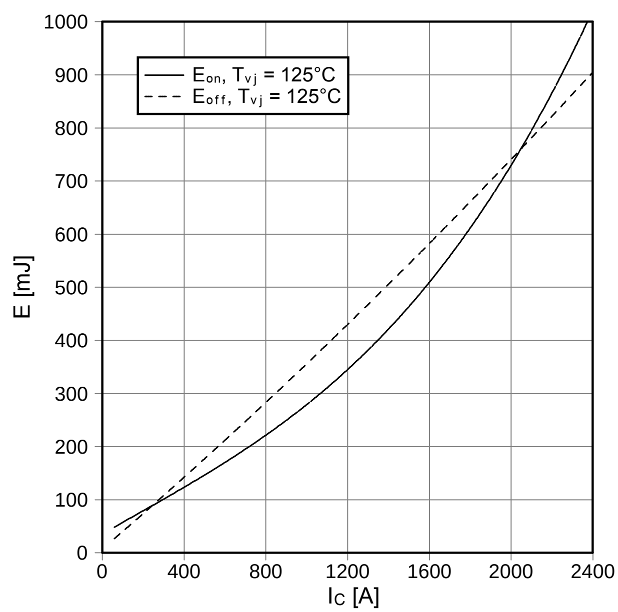
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
I_C = f (V_{CE})
T_{vj} = 125°C



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} = 1,2 Ω, R_{Goff} = 1,5 Ω, V_{CE} = 900 V



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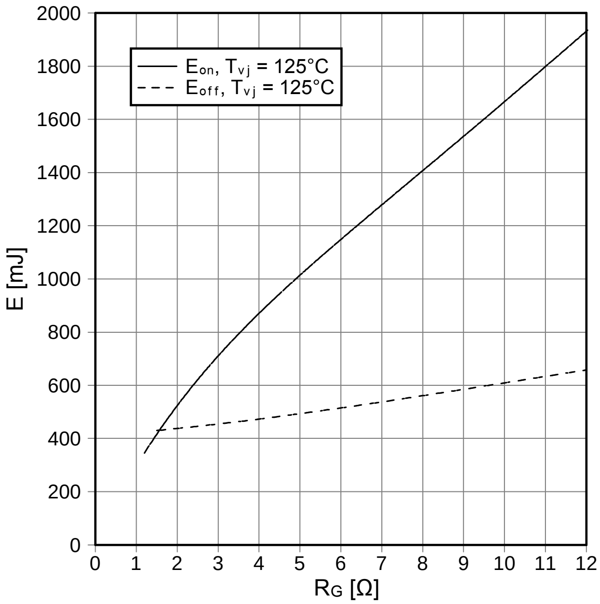
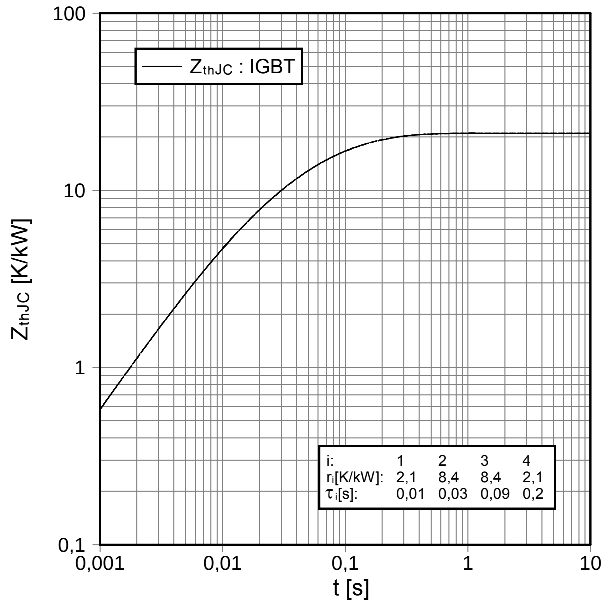
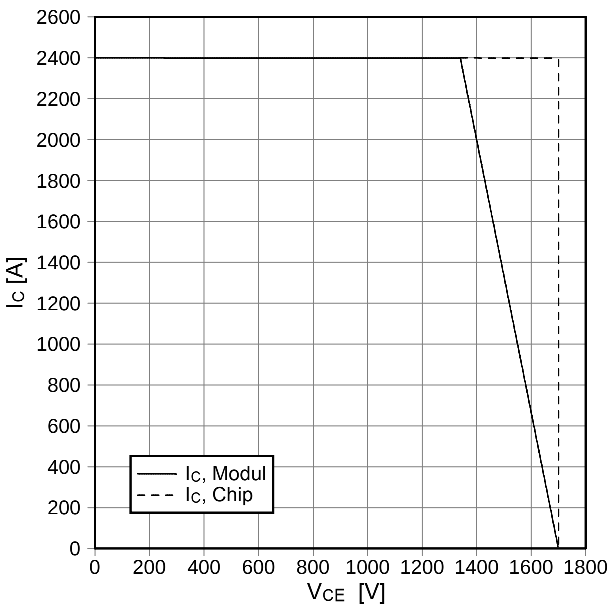
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 1200$ A, $V_{CE} = 900$ V



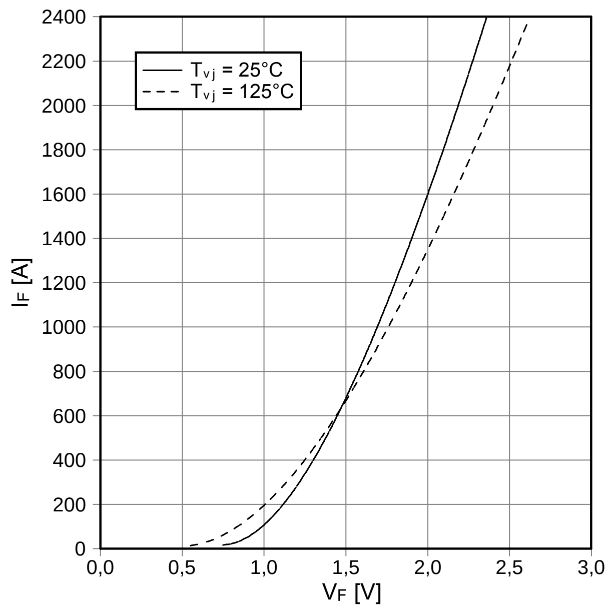
Transienter Wärmewiderstand IGBT-Wechselr.
transient thermal impedance IGBT-inverter
$Z_{thJC} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = \pm 15$ V, $R_{Goff} = 1{,}5\ \Omega$, $T_{vj} = 125$°C



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



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Vorläufige Daten
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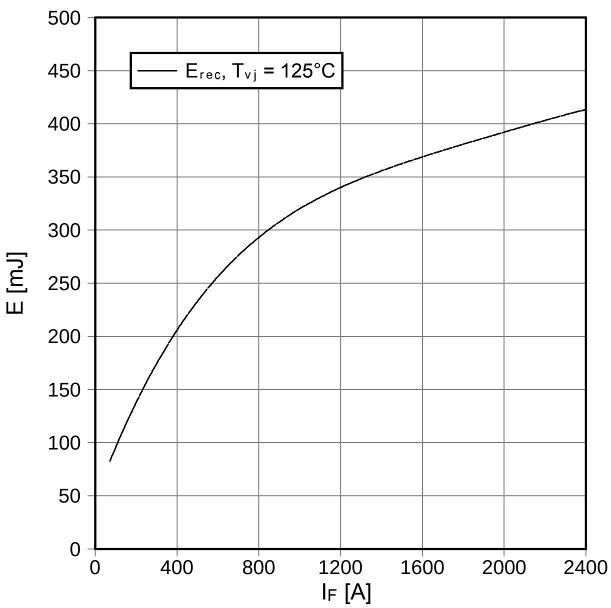
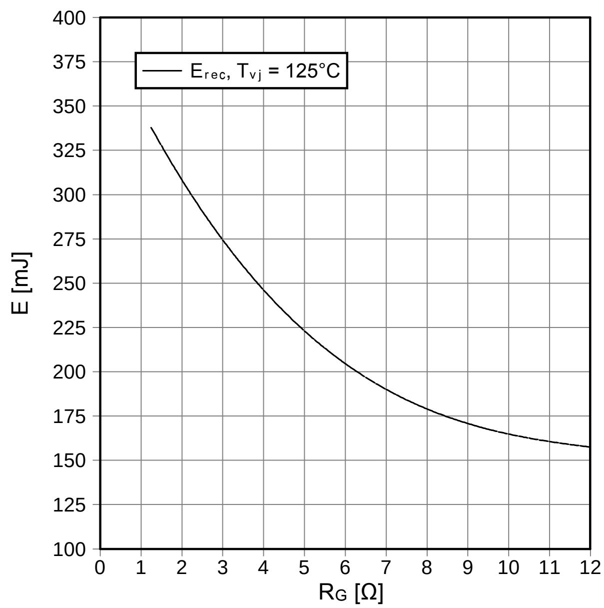
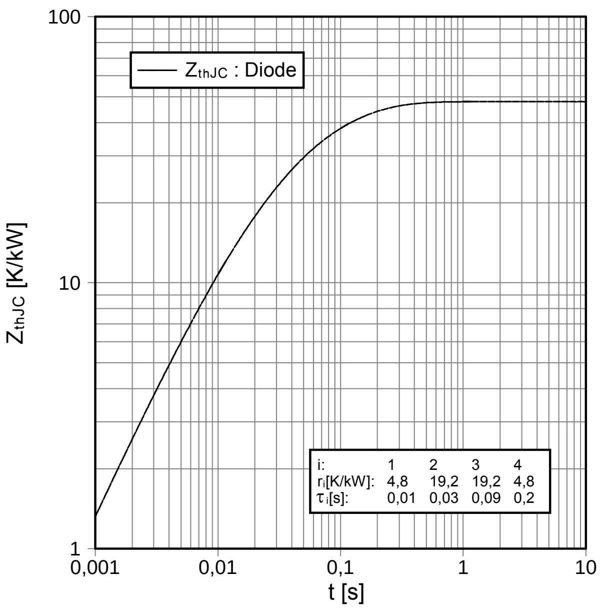
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)
E_{rec} = f (I_F)
R_{Gon} = 1,2 Ω, V_{CE} = 900 V



Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)
E_{rec} = f (R_G)
I_F = 1200 A, V_{CE} = 900 V



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



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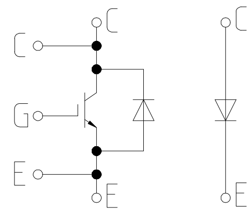
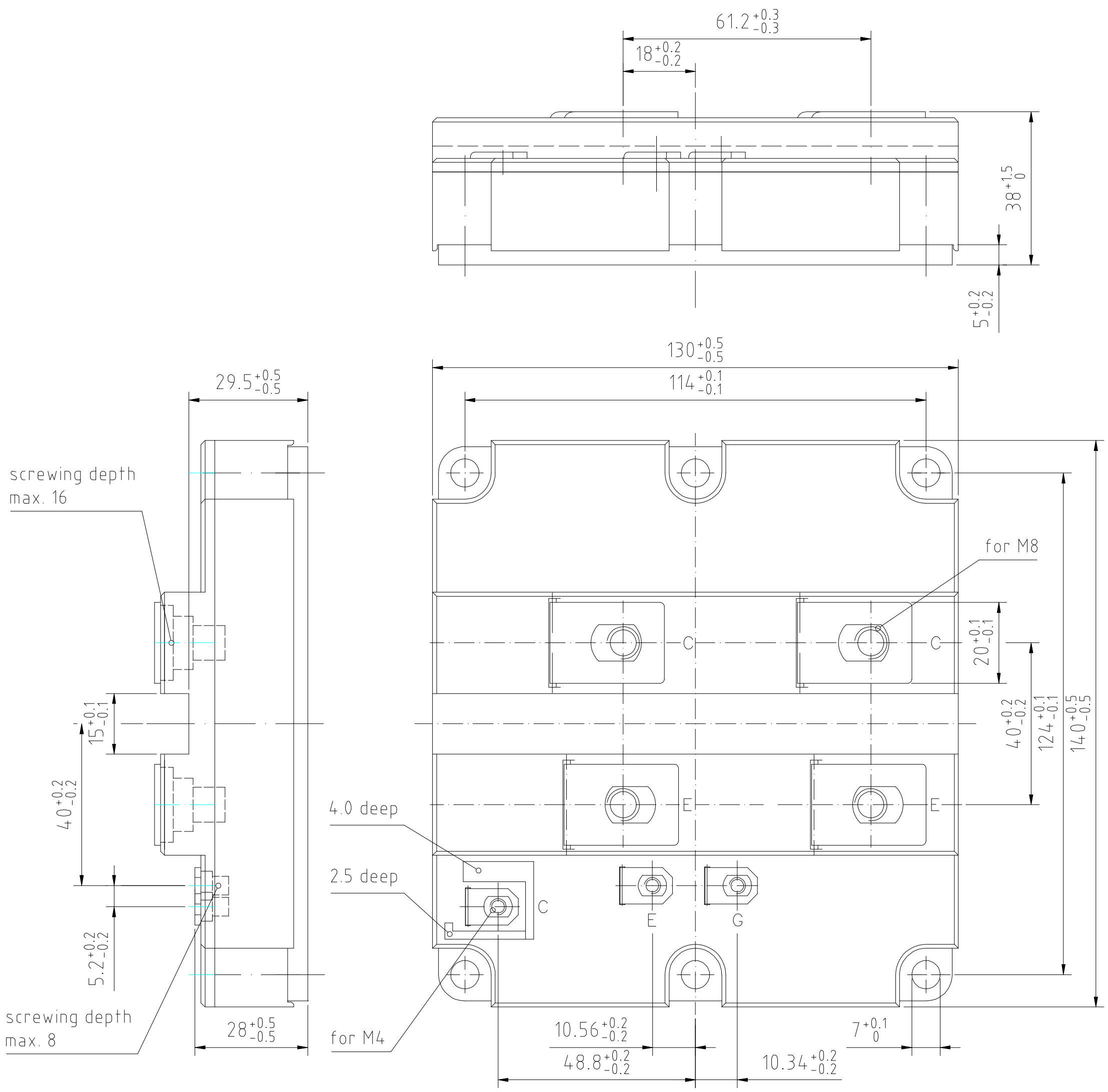
Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



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