

## Technische Information/technical information

IGBT-Module  
IGBT-modules

FF800R17KE3

eupec

Vorläufige Daten  
preliminary data

## IGBT-Wechselrichter/IGBT-inverter

## Höchstzulässige Werte/maximum rated values

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	1700	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}$	$I_{C\ nom}$ $I_C$	800 1150	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_P = 1\ \text{ms}$ , $T_C = 80^{\circ}\text{C}$	$I_{CRM}$	1600	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	$P_{tot}$	4,45	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	$I_C = 800\ \text{A}$ , $V_{GE} = 15\ \text{V}$ , $T_{vj} = 25^{\circ}\text{C}$ $I_C = 800\ \text{A}$ , $V_{GE} = 15\ \text{V}$ , $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\ sat}$		2,00 2,40	2,45	V V
Gate-Schwellenspannung gate threshold voltage	$I_C = 32,0\ \text{mA}$ , $V_{CE} = V_{GE}$ , $T_{vj} = 25^{\circ}\text{C}$	$V_{GEth}$	5,2	5,8	6,4	V
Gateladung gate charge	$V_{GE} = -15\ \text{V} \dots +15\ \text{V}$	$Q_G$		9,00		$\mu\text{C}$
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$	$R_{Gint}$		1,9		$\Omega$
Eingangskapazität input capacitance	$f = 1\ \text{MHz}$ , $T_{vj} = 25^{\circ}\text{C}$ , $V_{CE} = 25\ \text{V}$ , $V_{GE} = 0\ \text{V}$	$C_{ies}$		75,0		nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\ \text{MHz}$ , $T_{vj} = 25^{\circ}\text{C}$ , $V_{CE} = 25\ \text{V}$ , $V_{GE} = 0\ \text{V}$	$C_{res}$		2,30		nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1700\ \text{V}$ , $V_{GE} = 0\ \text{V}$ , $T_{vj} = 25^{\circ}\text{C}$	$I_{CES}$			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)	$I_C = 800\ \text{A}$ , $V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Gon} = 1,8\ \Omega$ , $T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Gon} = 1,8\ \Omega$ , $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ on}$		0,45 0,50		$\mu\text{s}$ $\mu\text{s}$
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 800\ \text{A}$ , $V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Gon} = 1,8\ \Omega$ , $T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Gon} = 1,8\ \Omega$ , $T_{vj} = 125^{\circ}\text{C}$	$t_r$		0,14 0,15		$\mu\text{s}$ $\mu\text{s}$
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 800\ \text{A}$ , $V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Goff} = 2,2\ \Omega$ , $T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Goff} = 2,2\ \Omega$ , $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ off}$		1,20 1,40		$\mu\text{s}$ $\mu\text{s}$
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 800\ \text{A}$ , $V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Goff} = 2,2\ \Omega$ , $T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Goff} = 2,2\ \Omega$ , $T_{vj} = 125^{\circ}\text{C}$	$t_f$		0,14 0,25		$\mu\text{s}$ $\mu\text{s}$
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 800\ \text{A}$ , $V_{CE} = 900\ \text{V}$ , $L_S = 50\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Gon} = 1,8\ \Omega$ , $T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Gon} = 1,8\ \Omega$ , $T_{vj} = 125^{\circ}\text{C}$	$E_{on}$		160 240		mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 800\ \text{A}$ , $V_{CE} = 900\ \text{V}$ , $L_S = 50\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Goff} = 2,2\ \Omega$ , $T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}$ , $R_{Goff} = 2,2\ \Omega$ , $T_{vj} = 125^{\circ}\text{C}$	$E_{off}$		210 280		mJ mJ
Kurzschlußverhalten SC data	$t_P \leq 10\ \mu\text{s}$ , $V_{GE} \leq 15\ \text{V}$ $T_{vj} \leq 125^{\circ}\text{C}$ , $V_{CC} = 1000\ \text{V}$ , $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$I_{SC}$		3100		A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT	$R_{thJC}$			28,0	K/kW
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{Paste} = 1\ \text{W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\ \text{W}/(\text{m}\cdot\text{K})$	$R_{thCH}$		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	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	1700	V
Dauergleichstrom DC forward current		$I_F$	800	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1 \text{ ms}$	$I_{FRM}$	1600	A
Grenzlastintegral $I^2t$ - value	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$	$I^2t$	105	$\text{kA}^2\text{s}$

#### Charakteristische Werte/characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	$I_F = 800 \text{ A}, V_{GE} = 0 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $I_F = 800 \text{ A}, V_{GE} = 0 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$V_F$		1,80 1,90	2,20	V V
Rückstromspitze peak reverse recovery current	$I_F = 800 \text{ A}, -di_F/dt = 4800 \text{ A}/\mu\text{s}$ $V_R = 900 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $V_R = 900 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$I_{RM}$		765 910		A A
Sperrverzögerungsladung recovered charge	$I_F = 800 \text{ A}, -di_F/dt = 4800 \text{ A}/\mu\text{s}$ $V_R = 900 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $V_R = 900 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$Q_r$		195 340		$\mu\text{C}$ $\mu\text{C}$
Abschaltenergie pro Puls reverse recovery energy	$I_F = 800 \text{ A}, -di_F/dt = 4800 \text{ A}/\mu\text{s}$ $V_R = 900 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $V_R = 900 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$E_{rec}$		125 225		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode	$R_{thJC}$			64,0	K/kW
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode $\lambda_{paste} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$	$R_{thCH}$		39,0		K/kW

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### Modul/module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V <sub>ISO</sub>	3,4		kV	
Material Modulgrundplatte material of module baseplate			Cu			
Material für innere Isolation material for internal insulation			Al <sub>2</sub> O <sub>3</sub>			
Kriechstrecke creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		32,0 32,0		mm	
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		19,0 19,0		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 <sub>thCH</sub>		6,00		K/kW
Modulinduktivität stray inductance module		L <sub>sCE</sub>		20		nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T <sub>C</sub> = 25°C, pro Zweig / per arm	R <sub>CC'+EE'</sub>		0,37		mΩ
Höchstzulässige Sperrschichttemperatur maximum junction temperature		T <sub>vj max</sub>			150	°C
Temperatur im Schaltbetrieb temperature under switching conditions		T <sub>vj op</sub>	-40		125	°C
Lagertemperatur storage temperature		T <sub>stg</sub>	-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.**

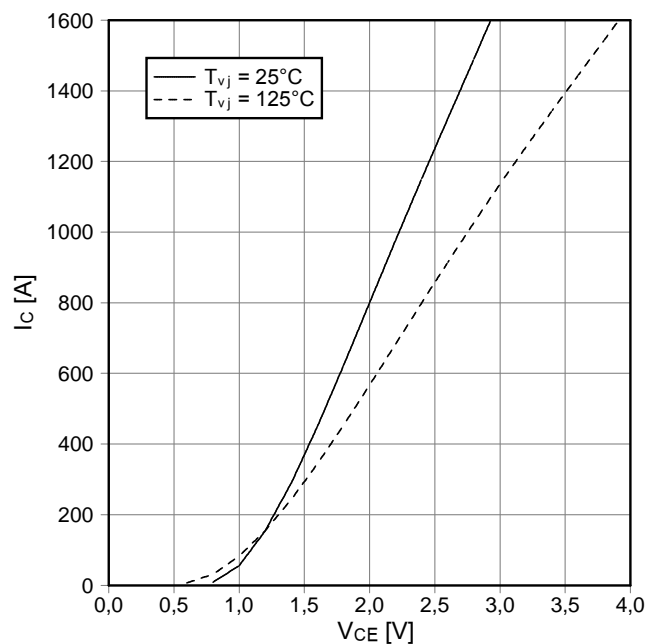
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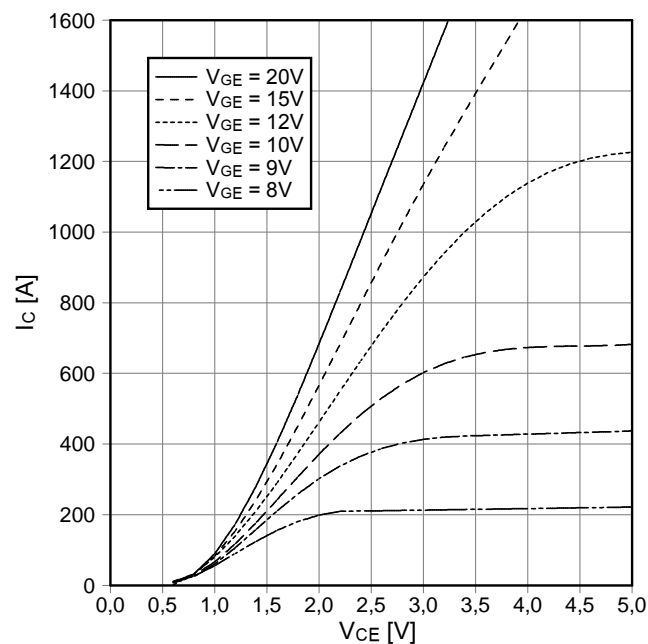
Ausgangskennlinie IGBT-Wechselr. (typisch)  
output characteristic IGBT-inverter (typical)

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



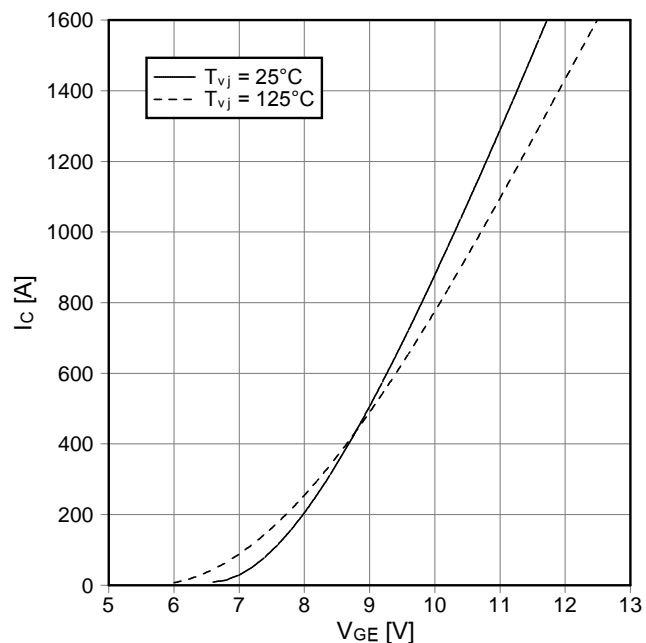
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)  
output characteristic IGBT-inverter (typical)

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



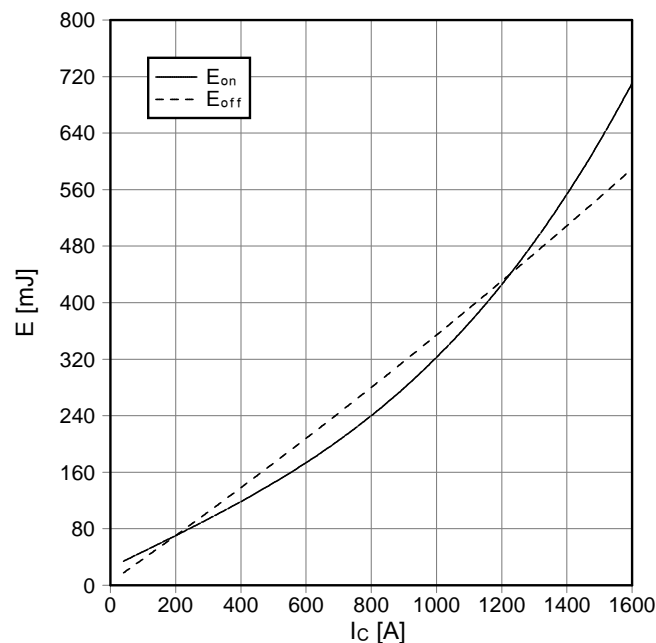
Übertragungscharakteristik IGBT-Wechselr. (typisch)  
transfer characteristic IGBT-inverter (typical)

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



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

$E_{on} = f(I_c)$ ,  $E_{off} = f(I_c)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 1,8\ \Omega$ ,  $R_{Goff} = 2,2\ \Omega$ ,  $V_{CE} = 900\text{ V}$ ,  
 $T_{vj} = 125^\circ\text{C}$

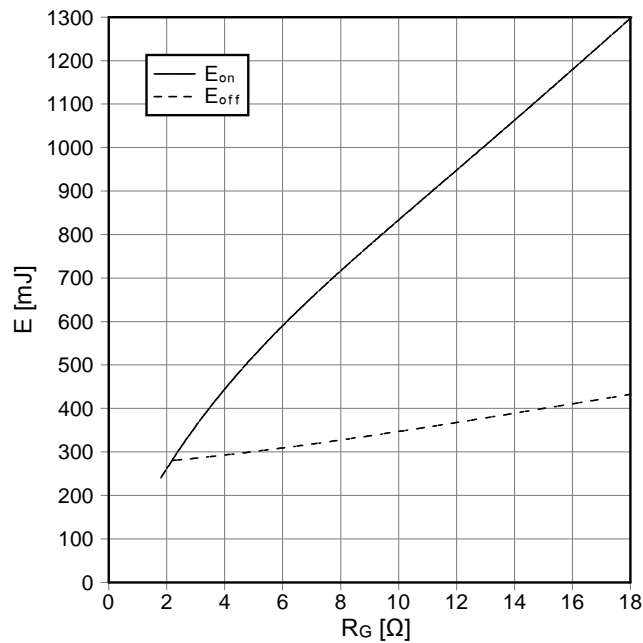


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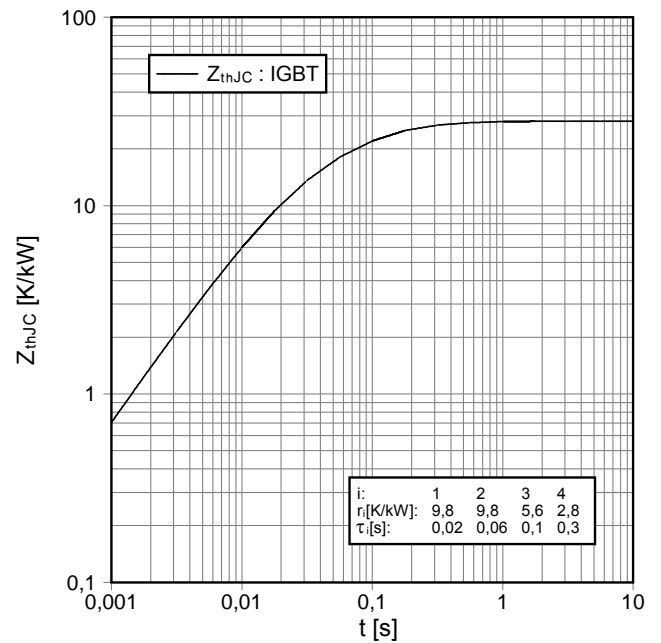


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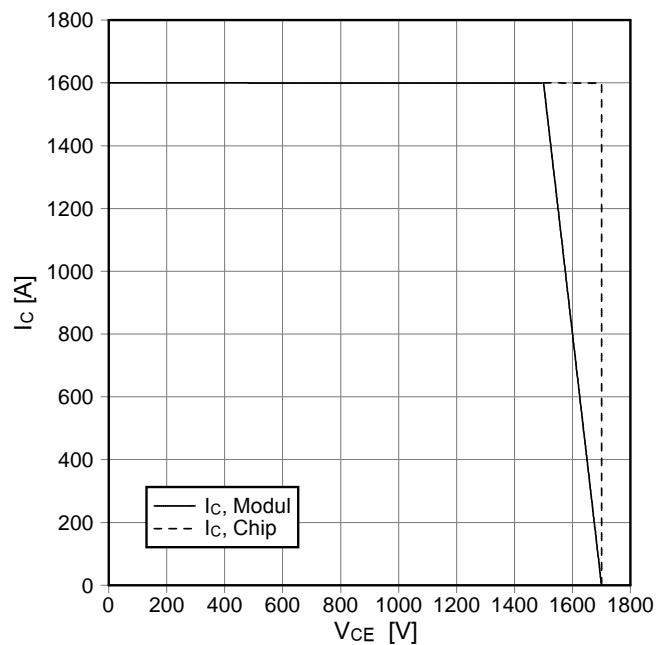
Schaltverluste IGBT-Wechselr. (typisch)  
switching losses IGBT-Inverter (typical)  
 $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 800\text{ A}$ ,  $V_{CE} = 900\text{ V}$ ,  $T_{vj} = 125^\circ\text{C}$



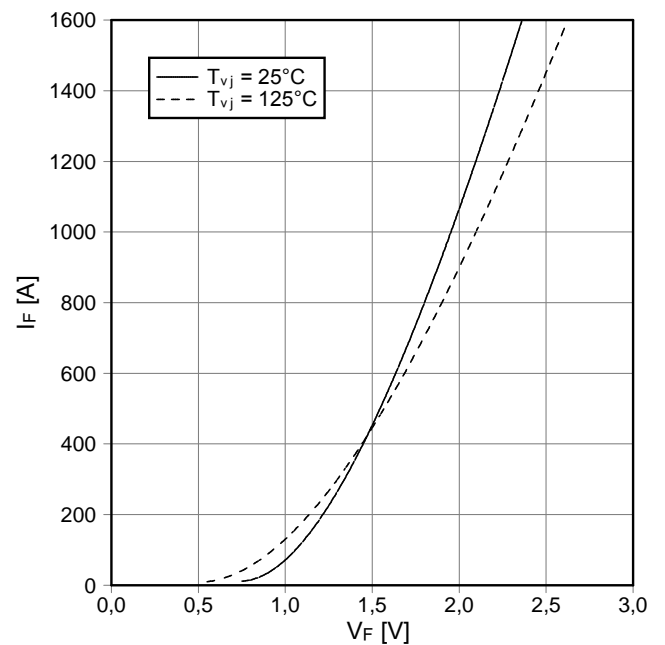
Transienter Wärmewiderstand IGBT-Wechselr.  
transient thermal impedance IGBT-inverter  
 $Z_{thJC} = f(t)$



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)  
 $I_F = f(V_F)$

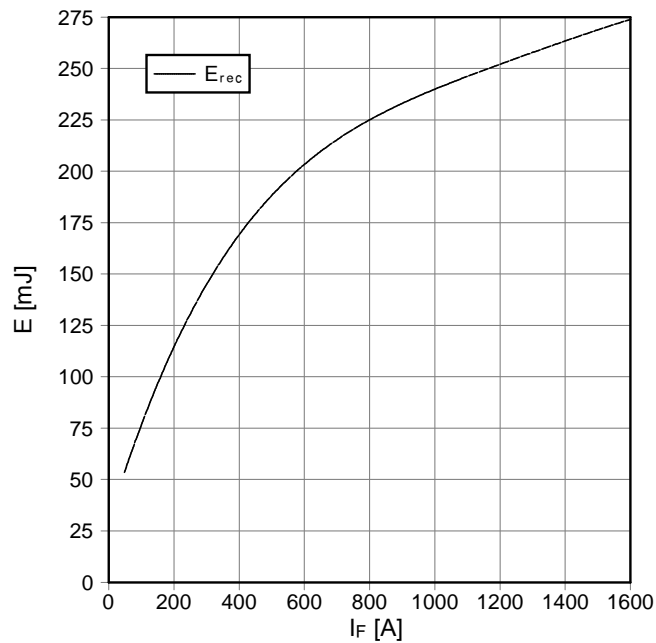




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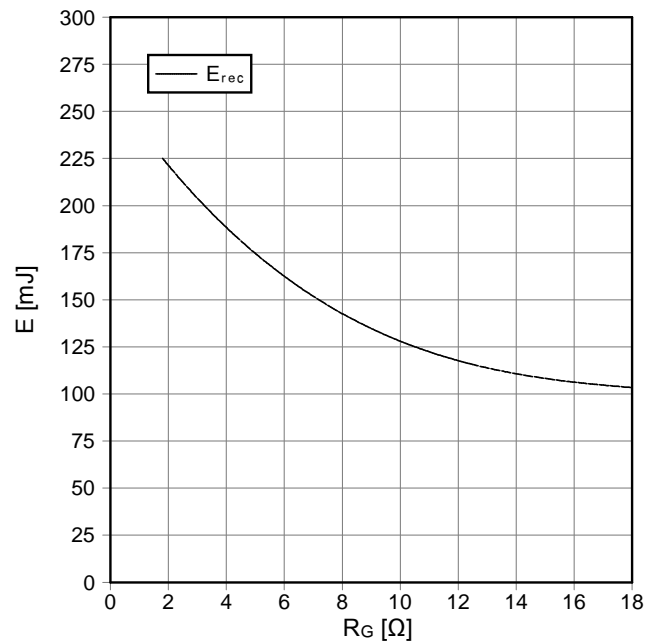
Schaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 1,8 \Omega$ ,  $V_{CE} = 900 V$ ,  $T_{vj} = 125^\circ C$



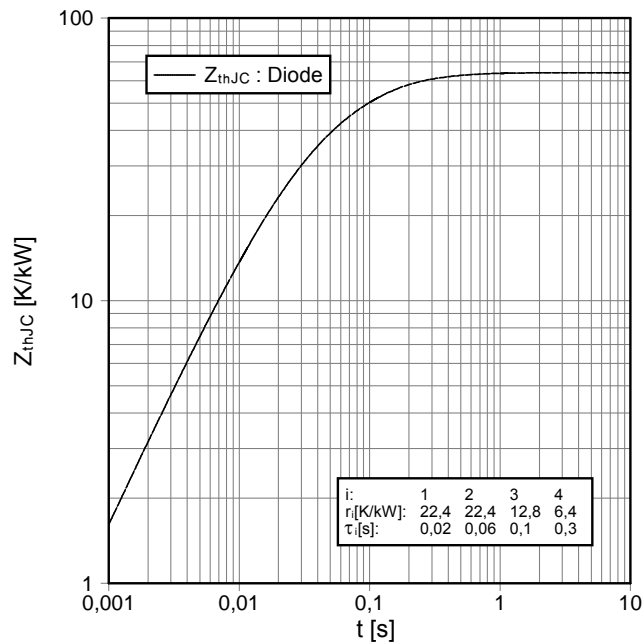
Schaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 800 A$ ,  $V_{CE} = 900 V$ ,  $T_{vj} = 125^\circ C$



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

$Z_{thJC} = f(t)$



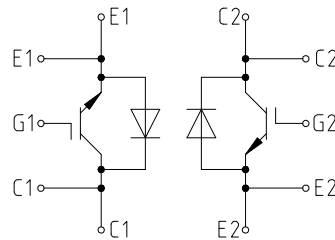
i:	1	2	3	4
r <sub>i</sub> [K/kW]:	22,4	22,4	12,8	6,4
τ <sub>i</sub> [s]:	0,02	0,06	0,1	0,3

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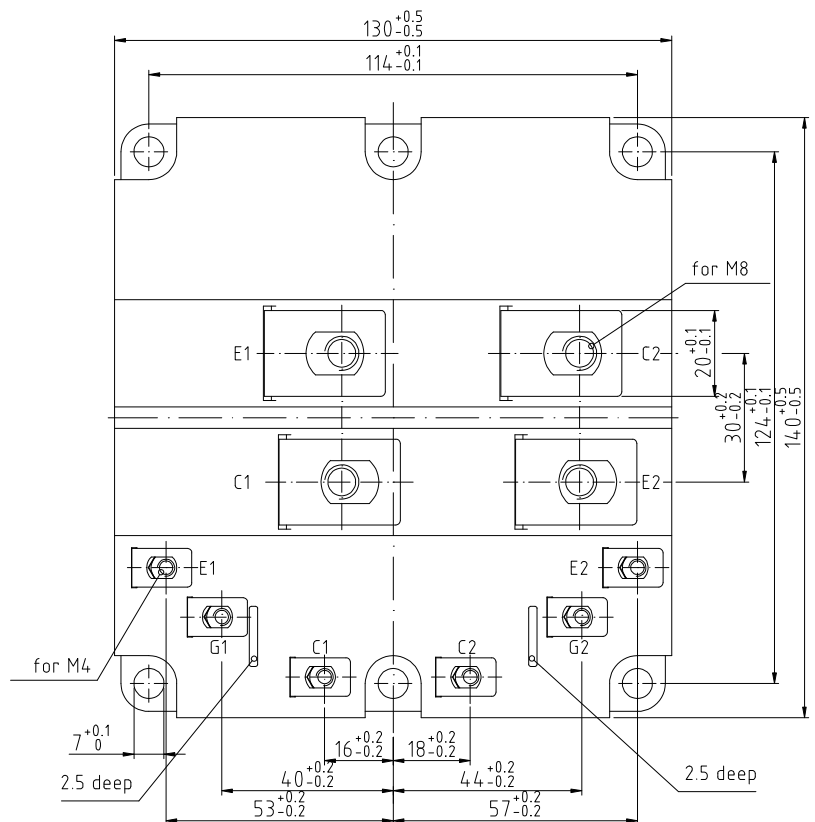
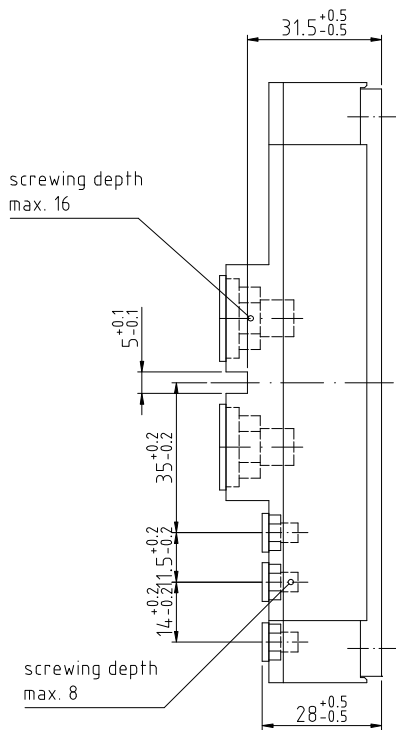
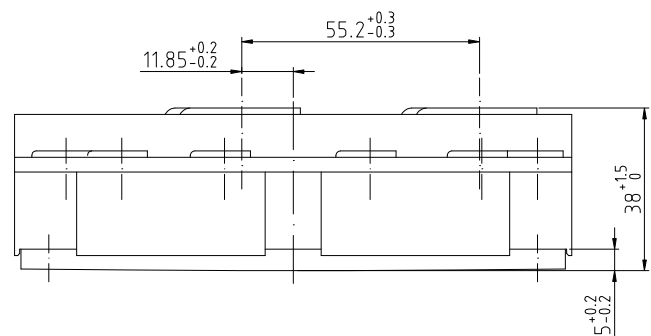


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Schaltplan/circuit diagram



Gehäuseabmessungen/package outlines



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