

**Vorläufige Daten**  
**preliminary data**

**IGBT-Wechselrichter/IGBT-inverter**  
**Höchstzulässige Werte/maximum rated values**

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	1200	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}$	$I_{C\ nom}$ $I_C$	25 40	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_P = 1\ \text{ms}, T_C = 80^{\circ}\text{C}$	$I_{CRM}$	50	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}$	$P_{tot}$	165	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	$I_C = 25\ \text{A}, V_{GE} = 15\ \text{V}, T_{vj} = 25^{\circ}\text{C}$ $I_C = 25\ \text{A}, V_{GE} = 15\ \text{V}, T_{vj} = 125^{\circ}\text{C}$	$V_{CE\ sat}$		1,70 1,90	2,15	V V
Gate-Schwellenspannung gate threshold voltage	$I_C = 1,00\ \text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	$V_{GEth}$	5,0	5,8	6,5	V
Gateladung gate charge	$V_{GE} = -15\ \text{V} \dots +15\ \text{V}$	$Q_G$		0,24		$\mu\text{C}$
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$	$R_{Gint}$		8,0		$\Omega$
Eingangskapazität input capacitance	$f = 1\ \text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$	$C_{ies}$		1,80		nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\ \text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$	$C_{res}$		0,064		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)	$I_C = 25\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, R_{Gon} = 30\ \Omega, T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}, R_{Gon} = 30\ \Omega, T_{vj} = 125^{\circ}\text{C}$	$t_{d\ on}$		0,085 0,09		$\mu\text{s}$ $\mu\text{s}$
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 25\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, R_{Gon} = 30\ \Omega, T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}, R_{Gon} = 30\ \Omega, T_{vj} = 125^{\circ}\text{C}$	$t_r$		0,02 0,03		$\mu\text{s}$ $\mu\text{s}$
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 25\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, R_{Goff} = 30\ \Omega, T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}, R_{Goff} = 30\ \Omega, T_{vj} = 125^{\circ}\text{C}$	$t_{d\ off}$		0,42 0,52		$\mu\text{s}$ $\mu\text{s}$
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 25\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, R_{Goff} = 30\ \Omega, T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}, R_{Goff} = 30\ \Omega, T_{vj} = 125^{\circ}\text{C}$	$t_f$		0,075 0,12		$\mu\text{s}$ $\mu\text{s}$
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 25\ \text{A}, V_{CE} = 600\ \text{V}, L_S = 70\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}, R_{Gon} = 30\ \Omega, T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}, R_{Gon} = 30\ \Omega, T_{vj} = 125^{\circ}\text{C}$	$E_{on}$		1,90 2,50		mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 25\ \text{A}, V_{CE} = 600\ \text{V}, L_S = 70\ \text{nH}$ $V_{GE} = \pm 15\ \text{V}, R_{Goff} = 30\ \Omega, T_{vj} = 25^{\circ}\text{C}$ $V_{GE} = \pm 15\ \text{V}, R_{Goff} = 30\ \Omega, T_{vj} = 125^{\circ}\text{C}$	$E_{off}$		1,90 2,90		mJ mJ
Kurzschlußverhalten SC data	$t_P \leq 10\ \mu\text{s}, V_{GE} \leq 15\ \text{V}$ $T_{vj} \leq 125^{\circ}\text{C}, V_{CC} = 900\ \text{V}, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$I_{SC}$		100		A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT	$R_{thJC}$		0,75	0,85	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{Paste} = 1\ \text{W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\ \text{W}/(\text{m}\cdot\text{K})$	$R_{thCH}$		0,40		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		$I_F$	25	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1 \text{ ms}$	$I_{FRM}$	50	A
Grenzlastintegral $I^2t$ - value	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$	$I^2t$	140	$\text{A}^2\text{s}$

**Charakteristische Werte/characteristic values**

			min.	typ.	max.	
Durchlassspannung forward voltage	$I_F = 25 \text{ A}, V_{GE} = 0 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $I_F = 25 \text{ A}, V_{GE} = 0 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$V_F$		1,65 1,65	2,10	V V
Rückstromspitze peak reverse recovery current	$I_F = 25 \text{ A}, -di_F/dt = 1500 \text{ A}/\mu\text{s}$ $V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$I_{RM}$		47,0 45,0		A A
Sperrverzögerungsladung recovered charge	$I_F = 25 \text{ A}, -di_F/dt = 1500 \text{ A}/\mu\text{s}$ $V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$Q_r$		2,70 4,80		$\mu\text{C}$ $\mu\text{C}$
Abschaltenergie pro Puls reverse recovery energy	$I_F = 25 \text{ A}, -di_F/dt = 1500 \text{ A}/\mu\text{s}$ $V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 25^{\circ}\text{C}$ $V_R = 600 \text{ V}, V_{GE} = -15 \text{ V}, T_{vj} = 125^{\circ}\text{C}$	$E_{rec}$		1,00 1,90		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode	$R_{thJC}$		1,30	1,45	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode $\lambda_{paste} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$	$R_{thCH}$		0,60		K/W

**NTC-Widerstand/NTC-thermistor**

**Charakteristische Werte/characteristic values**

			min.	typ.	max.	
Nennwiderstand rated resistance	$T_C = 25^{\circ}\text{C}$	$R_{25}$		5,00		k $\Omega$
Abweichung von $R_{100}$ deviation of $R_{100}$	$T_C = 100^{\circ}\text{C}, R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
Verlustleistung power dissipation	$T_C = 25^{\circ}\text{C}$	$P_{25}$			20,0	mW
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298, 15\text{K}))]$	$B_{25/50}$		3375		K

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# Technische Information/technical information

IGBT-Module  
IGBT-modules

## FS25R12YT3



### Vorläufige Daten preliminary data

#### Modul/module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min	V <sub>ISO</sub>	2,5		kV
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		13,5 7,50		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		12,0 7,50		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI	> 225		
			min.	typ.	max.
Modulinduktivität stray inductance module		L <sub>sCE</sub>		35	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T <sub>C</sub> = 25°C, pro Zweig / per arm	R <sub>CC'+EE'</sub>		4,00	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
Anpreßkraft für mech. Bef. pro Feder mounting force per clamp		F	40	-	80 N
Gewicht weight		G		36	g

Der Strom im Dauerbetrieb ist auf 25 A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 25 Arms per connector pin.

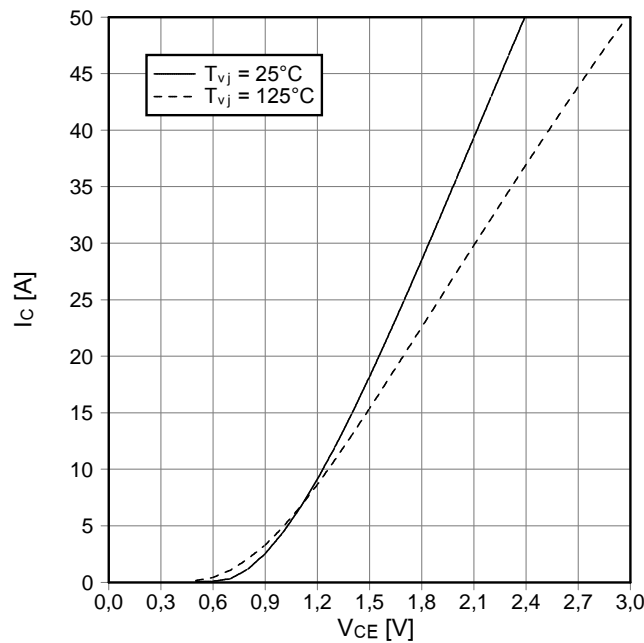
**Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen technischen Erläuterungen.**

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

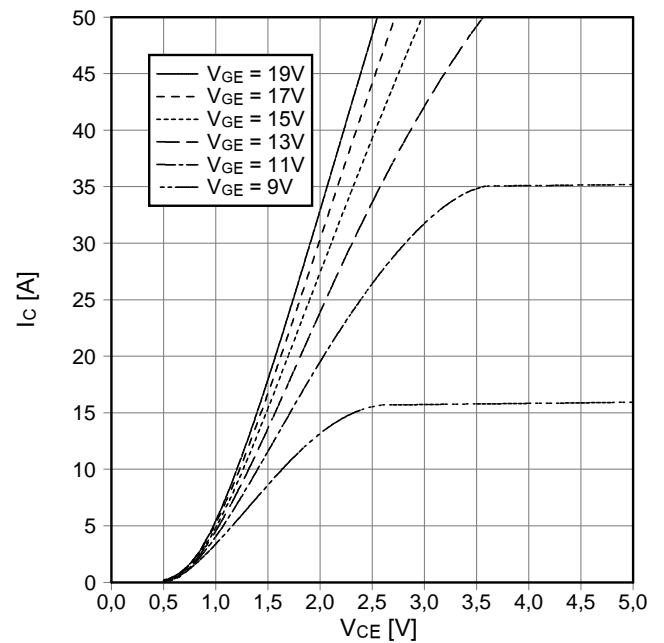
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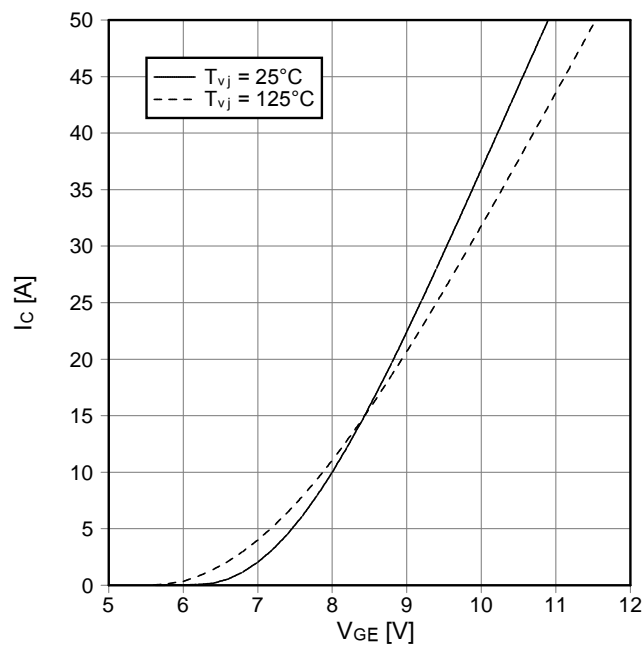
**Ausgangskennlinie IGBT-Wechselr. (typisch)**  
**output characteristic IGBT-inverter (typical)**  
 $I_c = f(V_{CE})$   
 $V_{GE} = 15\text{ V}$



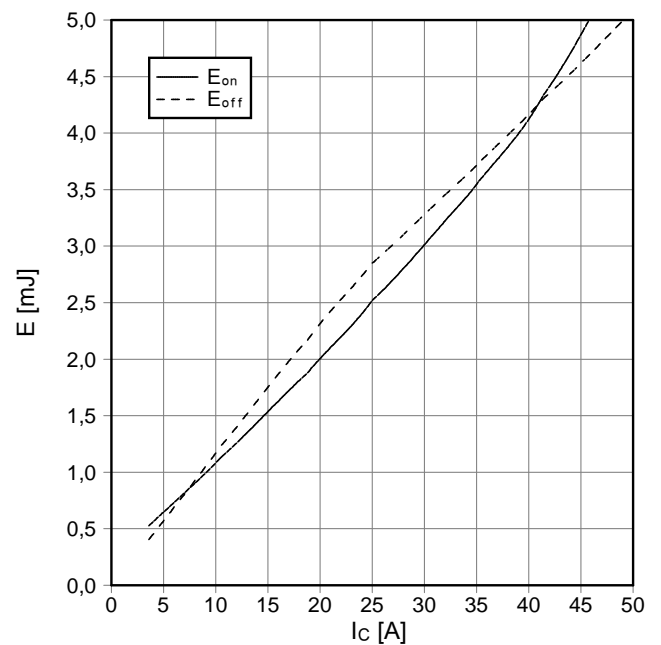
**Ausgangskennlinienfeld IGBT-Wechselr. (typisch)**  
**output characteristic IGBT-inverter (typical)**  
 $I_c = f(V_{CE})$   
 $T_{vj} = 125^\circ\text{C}$



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



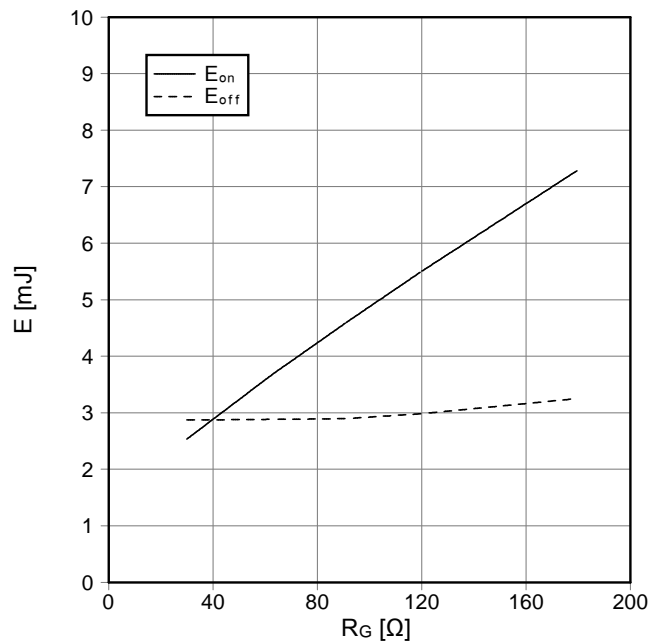
**Schaltverluste IGBT-Wechselr. (typisch)**  
**switching losses IGBT-inverter (typical)**  
 $E_{on} = f(I_c)$ ,  $E_{off} = f(I_c)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 30\ \Omega$ ,  $R_{Goff} = 30\ \Omega$ ,  $V_{CE} = 600\text{ V}$ ,  
 $T_{vj} = 125^\circ\text{C}$



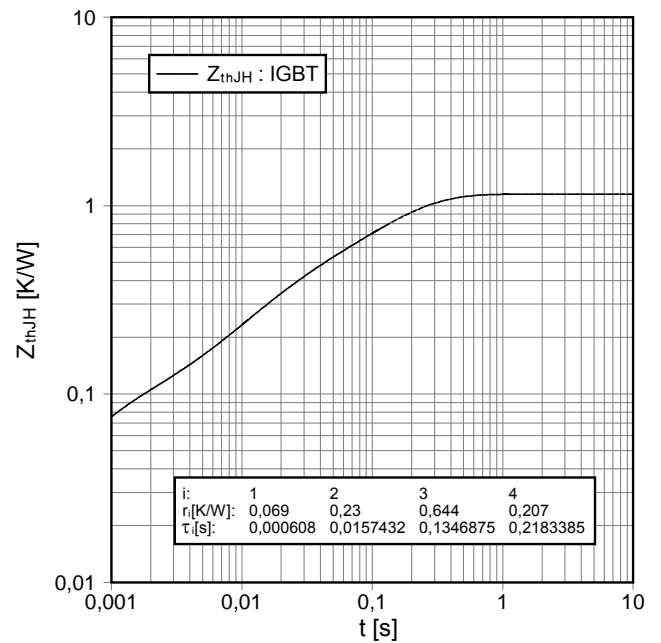
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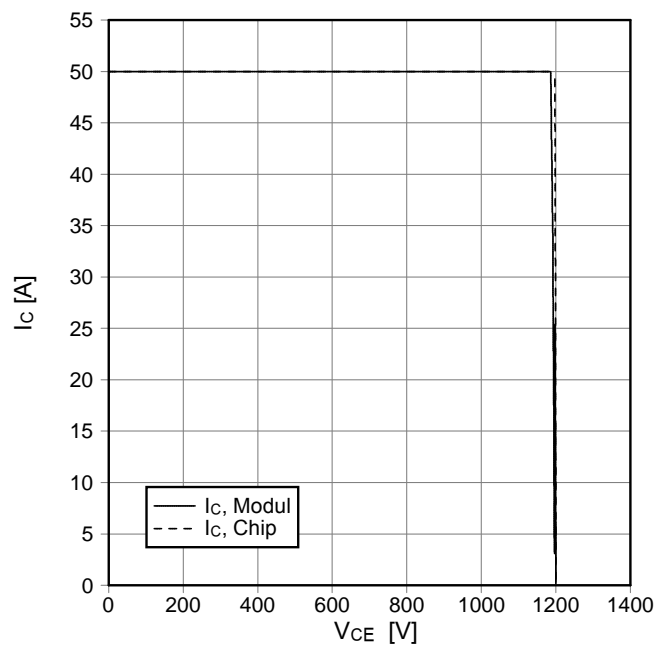
**Schaltverluste IGBT-Wechselr. (typisch)**  
**switching losses IGBT-Inverter (typical)**  
 $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_c = 25\text{ A}$ ,  $V_{CE} = 600\text{ V}$ ,  $T_{vj} = 125^\circ\text{C}$



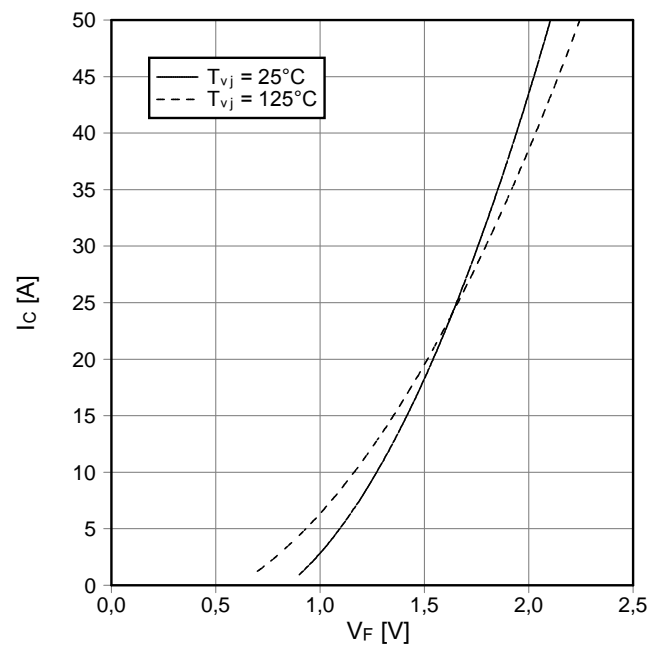
**Transienter Wärmewiderstand IGBT-Wechselr.**  
**transient thermal impedance IGBT-inverter**  
 $Z_{thJH} = f(t)$



**Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)**  
**reverse bias safe operating area IGBT-inv. (RBSOA)**  
 $I_c = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 30\ \Omega$ ,  $T_{vj} = 125^\circ\text{C}$



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

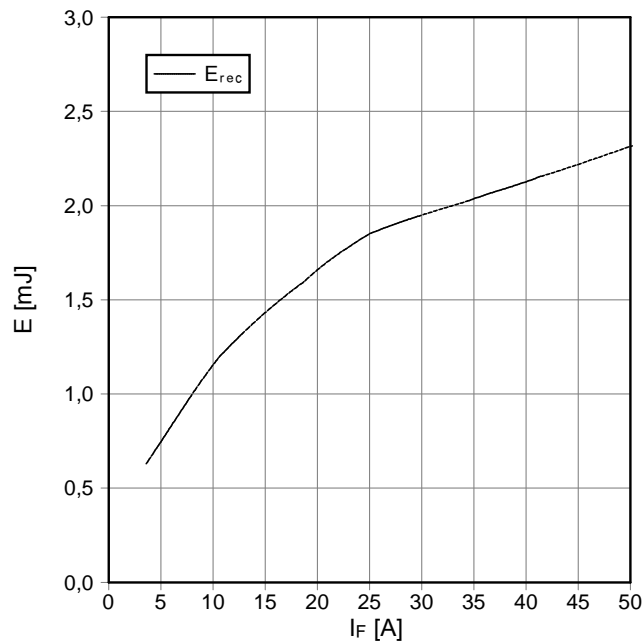


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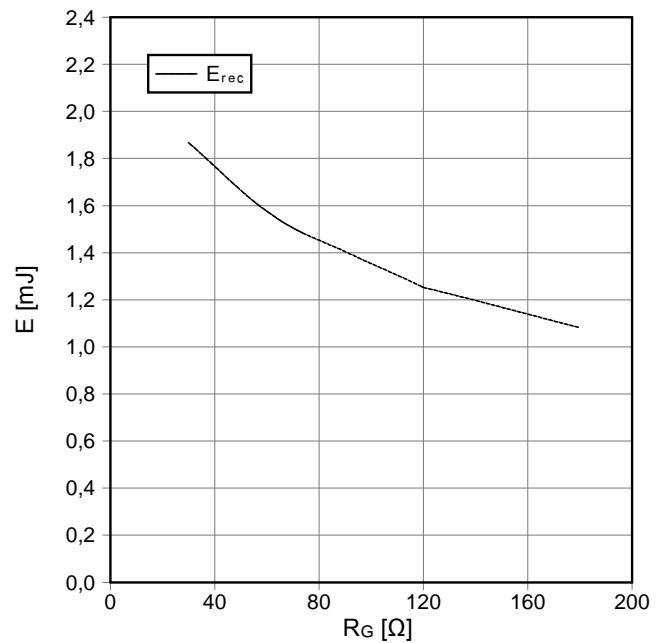
Schaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 30 \Omega$ ,  $V_{CE} = 600 V$ ,  $T_{vj} = 125^\circ C$



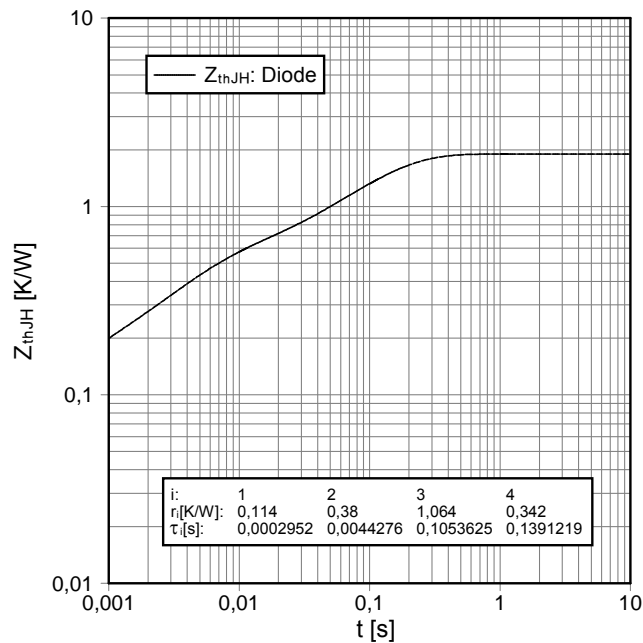
Schaltverluste Diode-Wechselr. (typisch)  
switching losses diode-inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 25 A$ ,  $V_{CE} = 600 V$ ,  $T_{vj} = 125^\circ C$



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

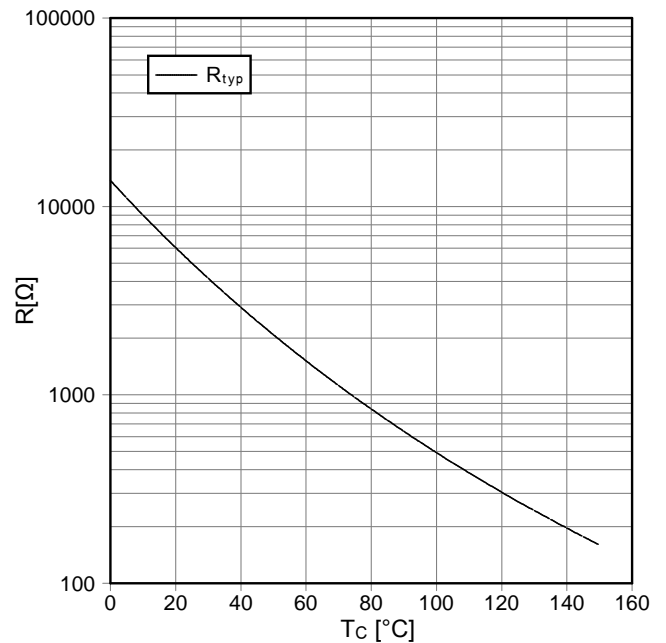
$Z_{thJH} = f(t)$



i:	1	2	3	4
$r_i$ [K/W]:	0,114	0,38	1,064	0,342
$\tau_i$ [s]:	0,0002952	0,0044276	0,1053625	0,1391219

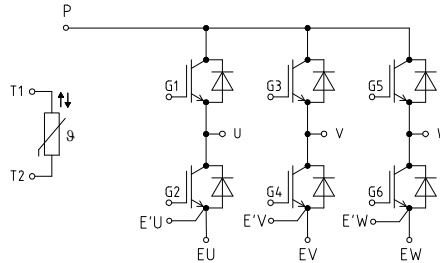
NTC-Temperaturkennlinie (typisch)  
NTC-temperature characteristic (typical)

$R = f(T)$

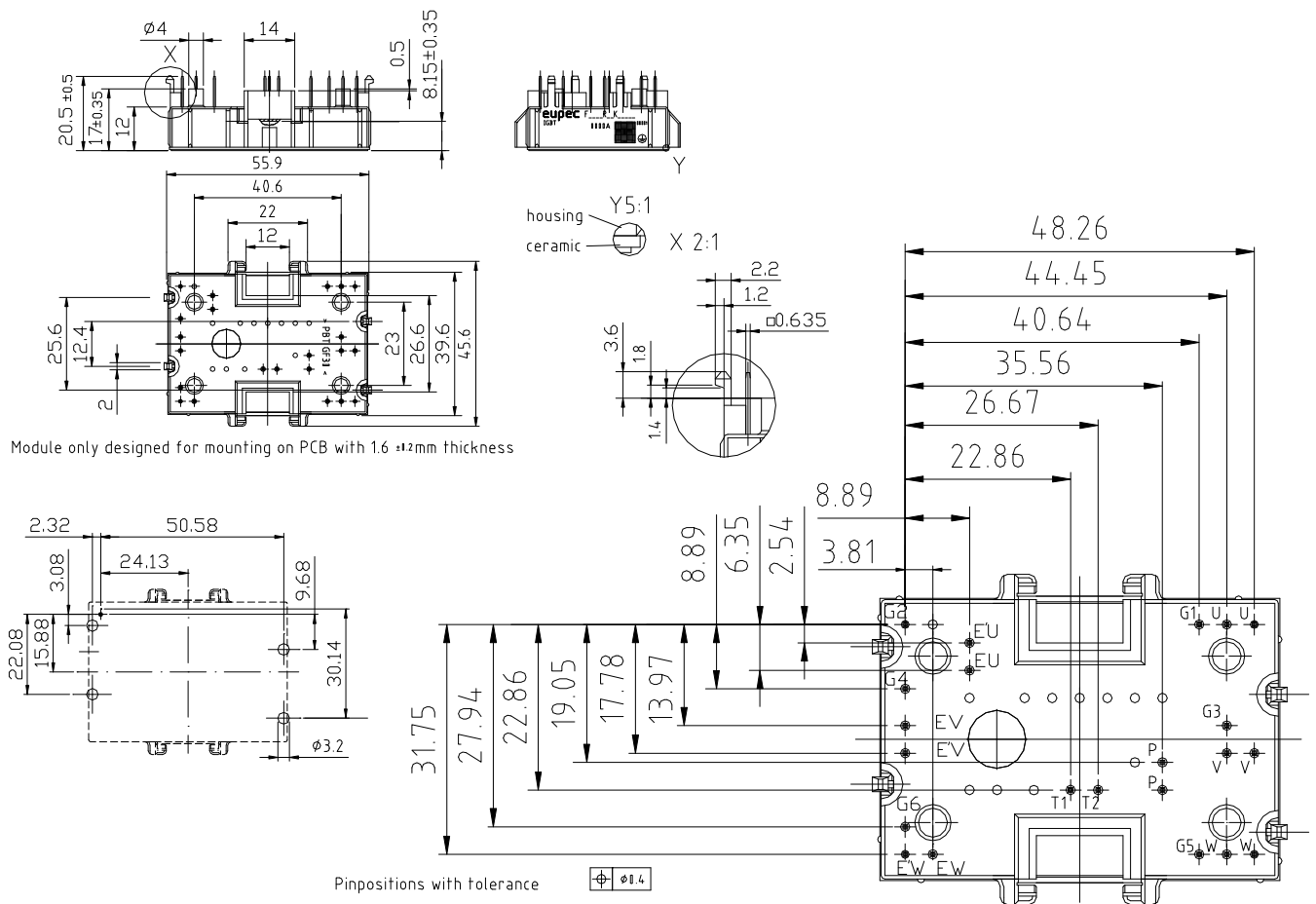


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## Schaltplan/circuit diagram



## Gehäuseabmessungen/package outlines



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