



EconoPACK™3 Modul mit schnellem Trench/Feldstop IGBT3 und High Efficiency Diode  
EconoPACK™3 with fast trench/fieldstop IGBT3 and Emitter Controlled High Efficiency diode

**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 Continuous DC collector current	$T_C = 80^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$ $I_C$	100 140	A A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_P = 1\text{ ms}$	$I_{CRM}$	200	A
Gesamt-Verlustleistung Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150$	$P_{tot}$	480	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	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,70 1,90	2,15	V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 4,00\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	5,0	5,8	6,5 V
Gateladung Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		$Q_G$	0,90		$\mu\text{C}$
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	7,5		$\Omega$
Eingangskapazität Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	7,10		nF
Rückwirkungskapazität Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	0,30		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, induktive Last Turn-on delay time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{on}}$	0,26 0,29		$\mu\text{s}$ $\mu\text{s}$
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_r$	0,03 0,05		$\mu\text{s}$ $\mu\text{s}$
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{off}}$	0,42 0,52		$\mu\text{s}$ $\mu\text{s}$
Fallzeit, induktive Last Fall time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_f$	0,07 0,09		$\mu\text{s}$ $\mu\text{s}$
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}, L_S = 70\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$E_{on}$	10,0		mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}, L_S = 70\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$E_{off}$	10,0		mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$	$I_{SC}$	400		A
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro IGBT / per IGBT		$R_{thJC}$		0,26	K/W
Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,09		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{op}}$	-40	125	$^{\circ}\text{C}$

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**Vorläufige Daten  
Preliminary Data**

**Diode, Wechselrichter / Diode, Inverter**

**Höchstzulässige Werte / Maximum Rated Values**

Periodische Spitzensperrspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	1200	V
Dauergleichstrom Continuous DC forward current		$I_F$	100	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_P = 1\text{ ms}$	$I_{FRM}$	200	A
Grenzlastintegral $I^2t$ - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$	$I^2t$	1950	$\text{A}^2\text{s}$

**Charakteristische Werte / Characteristic Values**

			min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 100\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 100\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_F$	1,65 1,65	2,15	V V
Rückstromspitze Peak reverse recovery current	$I_F = 100\text{ A}, -di_F/dt = 2600\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$I_{RM}$	120 140		A A
Sperrverzögerungsladung Recovered charge	$I_F = 100\text{ A}, -di_F/dt = 2600\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$Q_r$	10,0 20,0		$\mu\text{C}$ $\mu\text{C}$
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 100\text{ A}, -di_F/dt = 2600\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$E_{rec}$	5,00 9,00		mJ mJ
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro Diode / per diode		$R_{thJC}$		0,48	K/W
Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink	pro Diode / per diode $\lambda_{paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,14		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{ op}}$	-40	125	$^{\circ}\text{C}$

**NTC-Widerstand / NTC-Thermistor**

**Charakteristische Werte / Characteristic Values**

			min.	typ.	max.	
Nennwiderstand Rated resistance	$T_C = 25^{\circ}\text{C}$		$R_{25}$	5,00		$\text{k}\Omega$
Abweichung von R100 Deviation of R100	$T_C = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$		$\Delta R/R$	-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
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$		$B_{25/80}$	t.b.d.		K
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$		$B_{25/100}$	t.b.d.		K

Angaben gemäß gültiger Application Note.  
Specification according to the valid application note.

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**Modul / Module**

Isolations-Prüfspannung Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V <sub>ISOL</sub>	2,5		kV
Material Modulgrundplatte Material of module baseplate			Cu		
Innere Isolation Internal isolation	Basisisolierung (Schutzklasse 1, EN61140) basic insulation (class 1, IEC 61140)		Al <sub>2</sub> O <sub>3</sub>		
Kriechstrecke Creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		10,0		mm
Luftstrecke Clearance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		7,5		mm
Vergleichszahl der Kriechwegbildung Comperative tracking index		CTI	> 225		
			min.	typ.	max.
Wärmewiderstand, Gehäuse bis Kühlkörper 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 <sub>thCH</sub>	0,009		K/W
Modulstreuintuktivität Stray inductance module		L <sub>sCE</sub>	21		nH
Modulleitungswiderstand, Anschlüsse - Chip Module lead resistance, terminals - chip	T <sub>c</sub> = 25°C, pro Schalter / per switch	R <sub>CC+EE'</sub>	1,80		mΩ
Lagertemperatur Storage temperature		T <sub>stg</sub>	-40	125	°C
Anzugsdrehmoment f. Modulmontage Mounting torque for modul mounting	Schraube M5 - Montage gem. gültiger Applikationsschrift Screw M5 - Mounting according to valid application note	M	3,00	-	6,00 Nm
Gewicht Weight		G	300		g

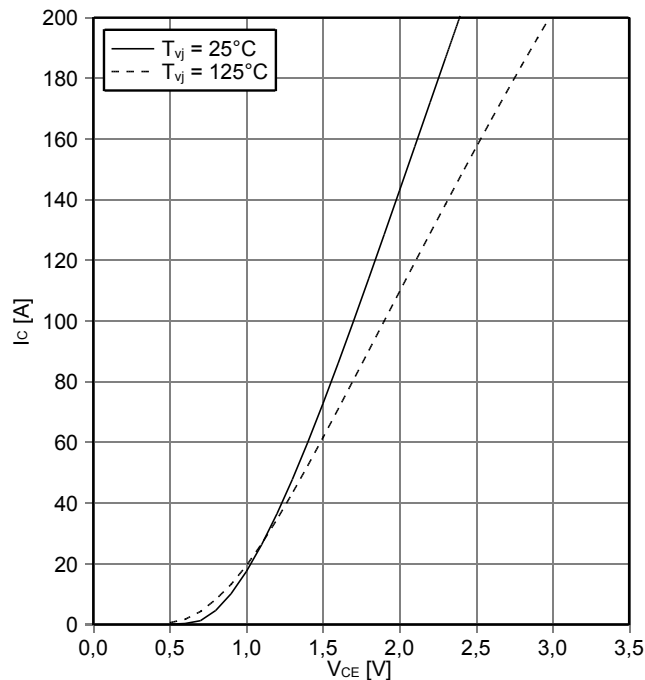
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**Preliminary Data**

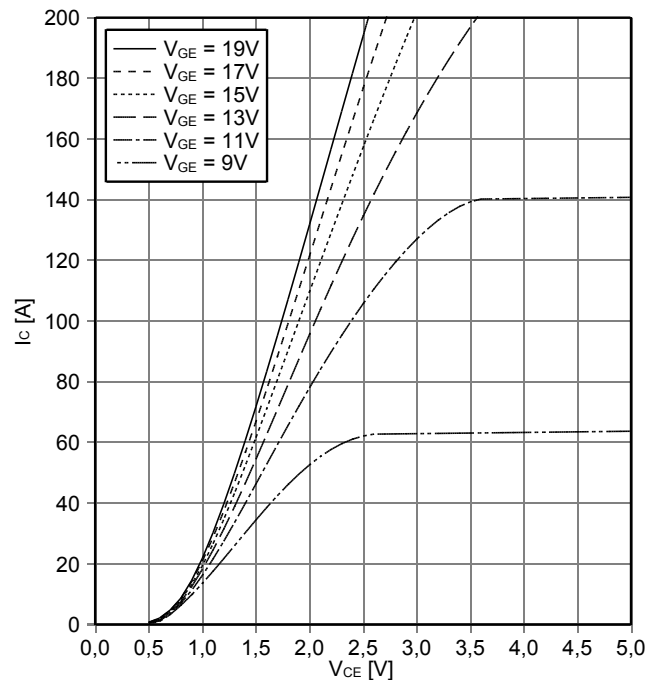
**Ausgangskennlinie IGBT, Wechselrichter (typisch)**  
**output characteristic IGBT, Inverter (typical)**

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



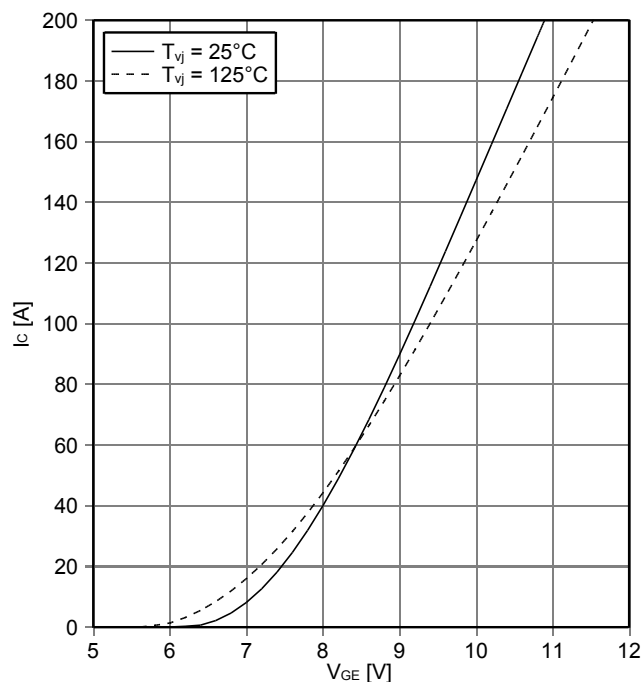
**Ausgangskennlinienfeld IGBT, Wechselrichter (typisch)**  
**output characteristic IGBT, Inverter (typical)**

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



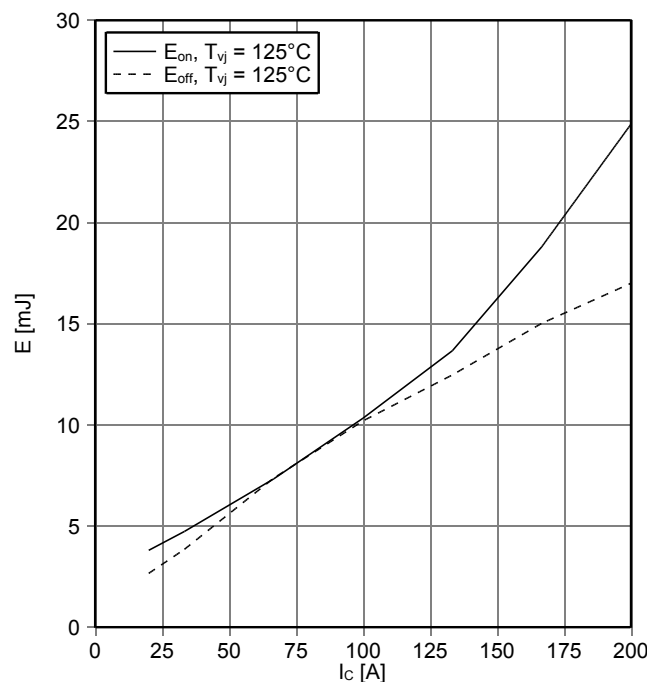
**Übertragungscharakteristik IGBT, Wechselrichter (typisch)**  
**transfer characteristic IGBT, Inverter (typical)**

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



**Schaltverluste IGBT, Wechselrichter (typisch)**  
**switching losses IGBT, Inverter (typical)**

$E_{on} = f(I_C), E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 3.9\ \Omega, R_{Goff} = 3.9\ \Omega, V_{CE} = 600\text{ V}$



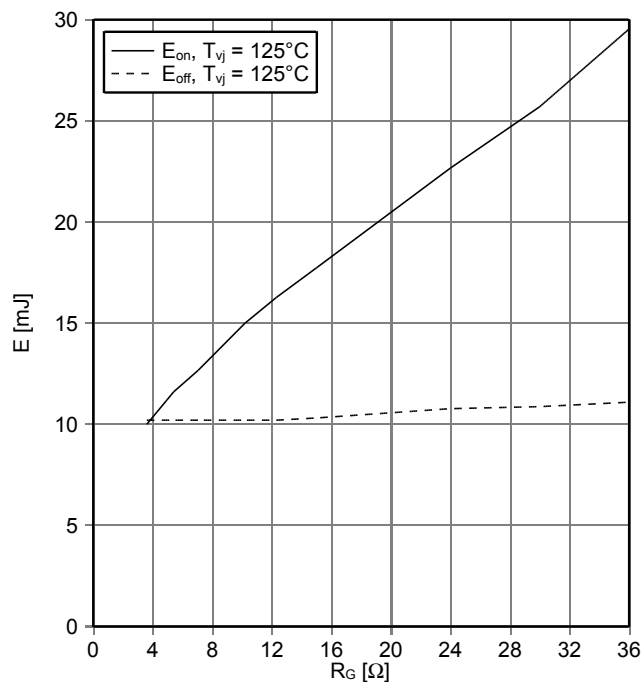
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Preliminary Data

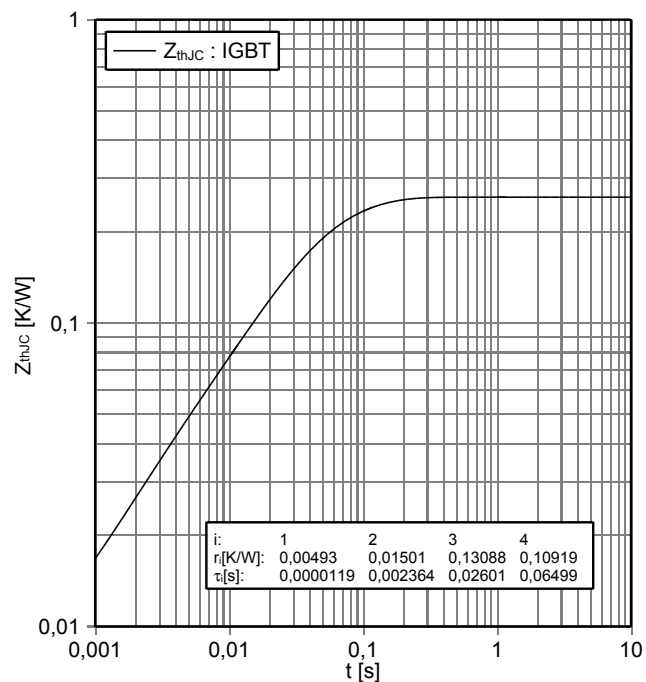
Schaltverluste IGBT, Wechselrichter (typisch)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 100\text{ A}, V_{CE} = 600\text{ V}$



Transienter Wärmewiderstand IGBT, Wechselrichter  
transient thermal impedance IGBT, Inverter

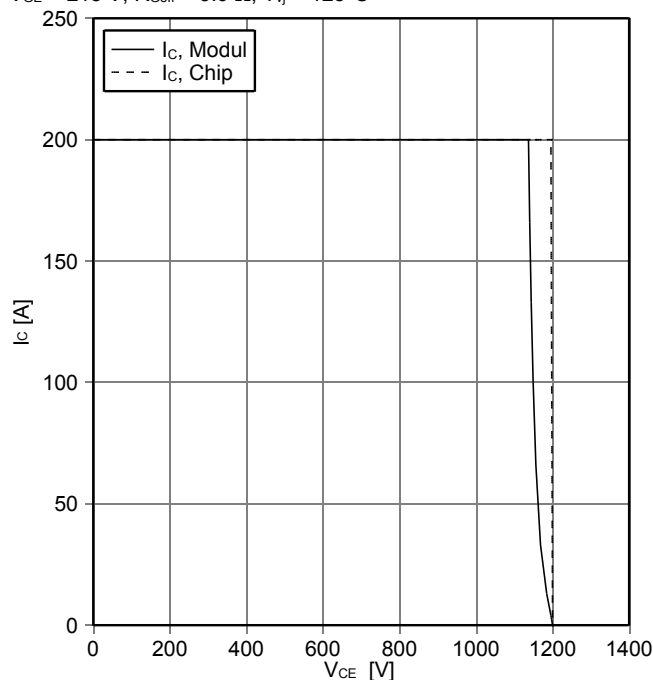
$Z_{thJC} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter  
(RBSOA)

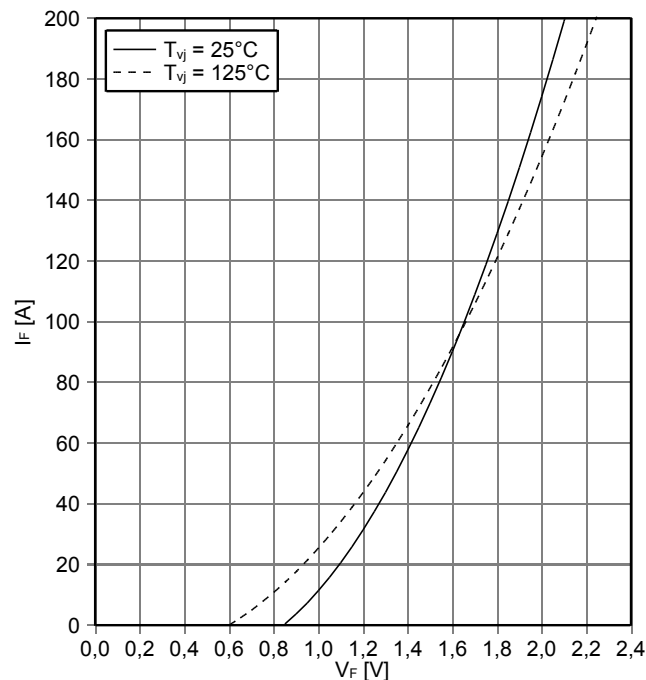
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 3.9\ \Omega, T_{vj} = 125^\circ\text{C}$



Durchlasskennlinie der Diode, Wechselrichter (typisch)  
forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



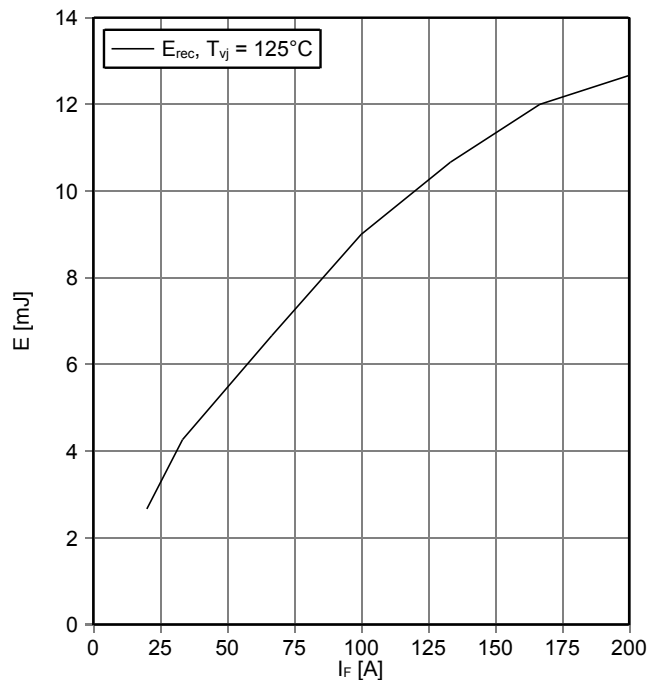
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## Vorläufige Daten Preliminary Data

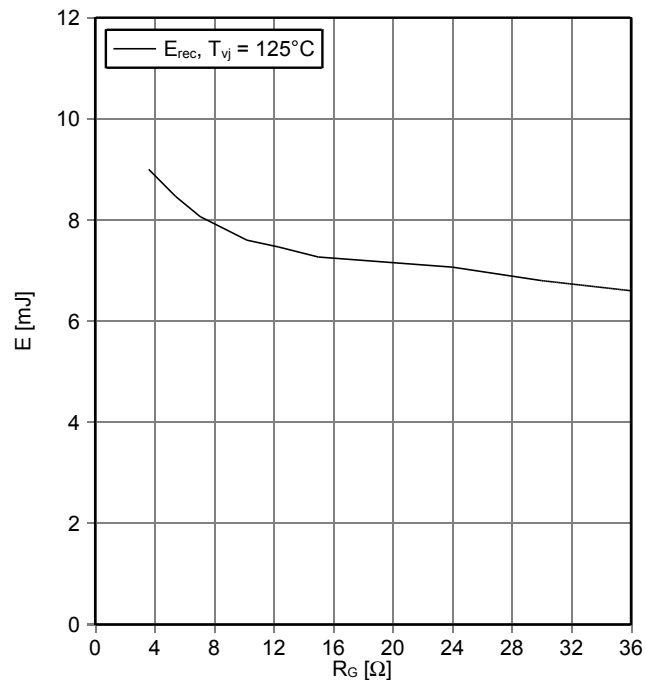
### Schaltverluste Diode, Wechselrichter (typisch) switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 3.9 \Omega, V_{CE} = 600 V$



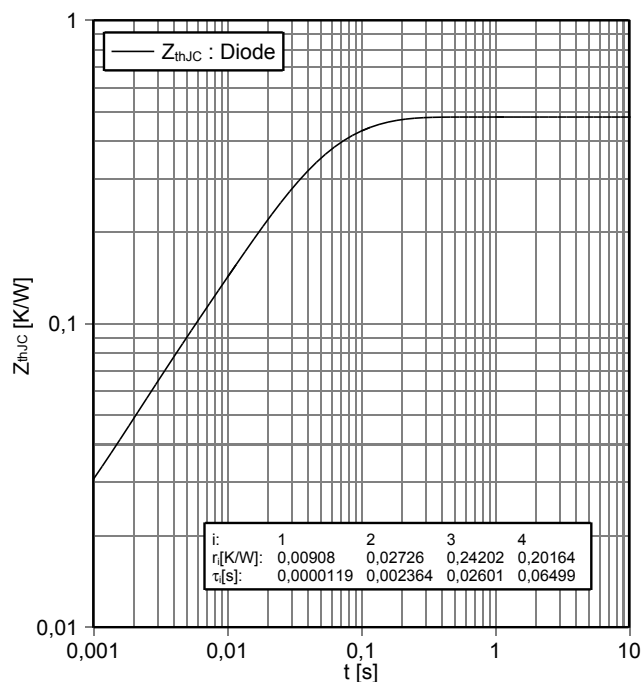
### Schaltverluste Diode, Wechselrichter (typisch) switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 100 A, V_{CE} = 600 V$



### Transienter Wärmewiderstand Diode, Wechselrichter transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$

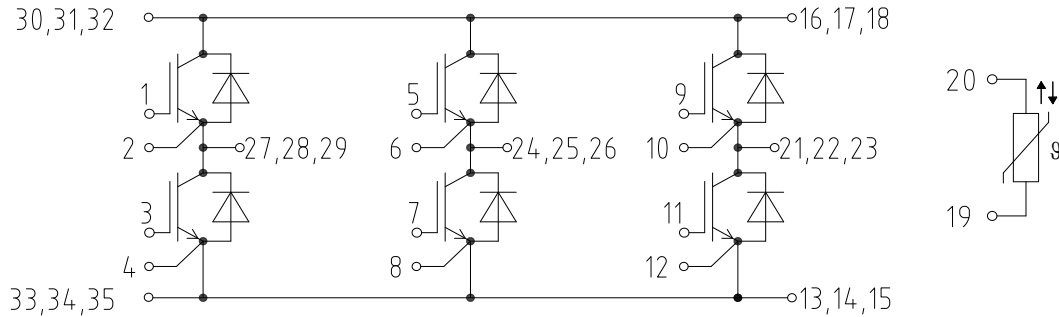


i:	1	2	3	4
r[K/W]:	0,00908	0,02726	0,24202	0,20164
τ[s]:	0,0000119	0,002364	0,02601	0,06499

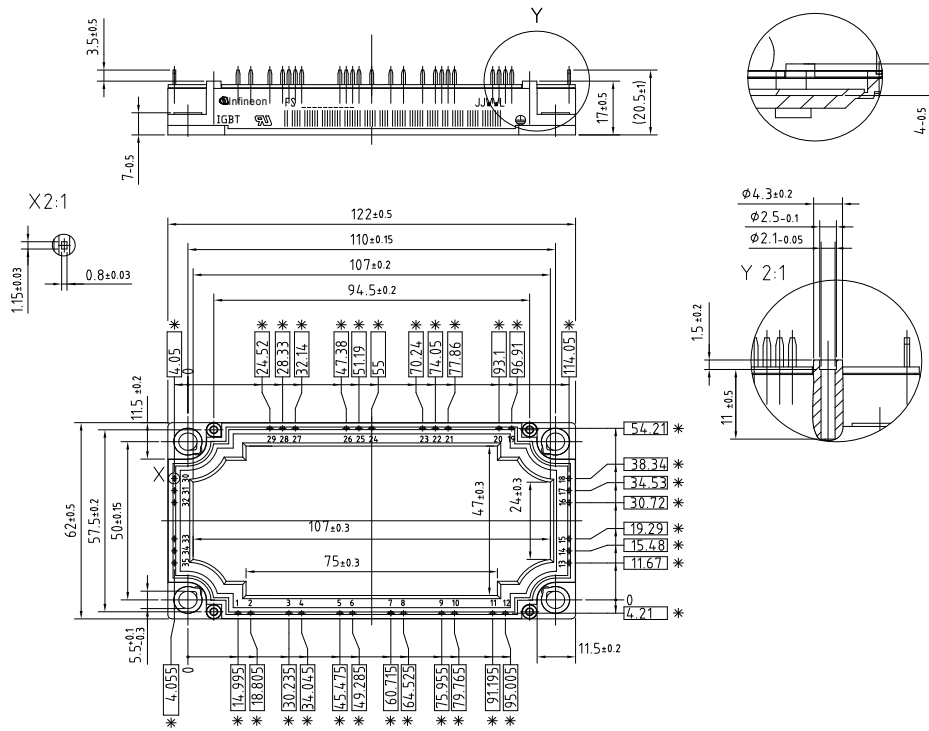
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**Vorläufige Daten**  
**Preliminary Data**

### Schaltplan / circuit\_diagram\_headline



### Gehäuseabmessungen / package outlines



\* = alle Maße mit einer Toleranz von  $\pm 0.5$   
\* = all dimensions with tolerance of  $\pm 0.5$

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