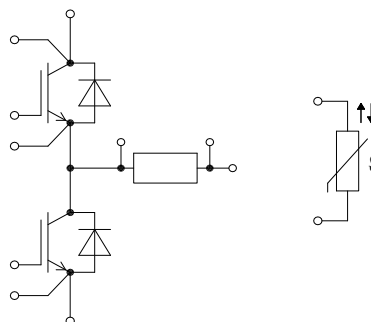


EconoDUAL™3 Modul mit Trench/Feldstopp IGBT4 und Emitter Controlled 4 Diode und PressFIT / NTC / Strommesswiderstand

EconoDUAL™3 module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode and PressFIT / NTC / current sense shunt



Typical Appearance



$V_{CES} = 1200V$

$I_{C\ nom} = 600A / I_{CRM} = 1200A$

Potentielle Anwendungen

- Hochleistungsumrichter
- Motorantriebe
- Servoumrichter
- USV-Systeme
- Windgeneratoren

Potential Applications

- High power converters
- Motor drives
- Servo drives
- UPS systems
- Wind turbines

Elektrische Eigenschaften

- Integrierter Stromsensor
- Niedriges V_{CEsat}
- $T_{vj\ op} = 150^{\circ}C$
- V_{CEsat} mit positivem Temperaturkoeffizienten

Electrical Features

- Integrated current sensor
- Low V_{CEsat}
- $T_{vj\ op} = 150^{\circ}C$
- V_{CEsat} with positive temperature coefficient

Mechanische Eigenschaften

- Hohe Leistungsdichte
- Isolierte Bodenplatte
- PressFIT Verbindungstechnik
- Thermisches Interface Material bereits aufgetragen

Mechanical Features

- High power density
- Isolated base plate
- PressFIT contact technology
- Pre-applied Thermal Interface Material

Module Label Code

Barcode Code 128



DMX - Code



Content of the Code

Content of the Code	Digit
Module Serial Number	1 - 5
Module Material Number	6 - 11
Production Order Number	12 - 19
Datecode (Production Year)	20 - 21
Datecode (Production Week)	22 - 23

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	$T_H = 65^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	$I_{C\text{ nom}}$	600	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	1200	A
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	$I_C = 600\text{ A}, V_{GE} = 15\text{ V}$		1,75	2,10	V	
	$I_C = 600\text{ A}, V_{GE} = 15\text{ V}$		2,00		V	
	$I_C = 600\text{ A}, V_{GE} = 15\text{ V}$		2,05		V	
Gate-Schwellenspannung Gate threshold voltage	$I_C = 23,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	V_{GEth}	5,25	5,80	6,35	V
Gateladung Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$	Q_G	4,40		μC	
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$	R_{Gint}	1,2		Ω	
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}	37,0		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}	2,05		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}		3,0	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	$I_C = 600\text{ A}, V_{CE} = 600\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,16		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,17		μs	
	$R_{Gon} = 1,3\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,17		μs	
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 600\text{ A}, V_{CE} = 600\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,07		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,08		μs	
	$R_{Gon} = 1,3\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,08		μs	
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 600\text{ A}, V_{CE} = 600\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,51		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,52		μs	
	$R_{Goff} = 1,3\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,55		μs	
Fallzeit, induktive Last Fall time, inductive load	$I_C = 600\text{ A}, V_{CE} = 600\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,08		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,17		μs	
	$R_{Goff} = 1,3\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,20		μs	
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 600\text{ A}, V_{CE} = 600\text{ V}, L_S = 35\text{ nH}$	$T_{vj} = 25^{\circ}\text{C}$	34,0		mJ	
	$V_{GE} = \pm 15\text{ V}, di/dt = 7000\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$	$T_{vj} = 125^{\circ}\text{C}$	50,5		mJ	
	$R_{Gon} = 1,3\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	56,5		mJ	
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 600\text{ A}, V_{CE} = 600\text{ V}, L_S = 35\text{ nH}$	$T_{vj} = 25^{\circ}\text{C}$	50,5		mJ	
	$V_{GE} = \pm 15\text{ V}, du/dt = 3300\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$	$T_{vj} = 125^{\circ}\text{C}$	74,0		mJ	
	$R_{Goff} = 1,3\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	83,5		mJ	
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	2300		A	
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT valid with IFX pre-applied thermal interface material	R_{thJH}		0,0722	K/W	
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj\text{ op}}$	-40	150	$^{\circ}\text{C}$	

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	600	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	1200	A
Grenzlastintegral I^2t - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I^2t	29500 27500	A^2s A^2s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 600\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 600\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 600\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_F	1,90 1,90 1,85	2,45	V V V
Rückstromspitze Peak reverse recovery current	$I_F = 600\text{ A}, -di_F/dt = 7000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}	340 415 445		A A A
Sperrverzögerungsladung Recovered charge	$I_F = 600\text{ A}, -di_F/dt = 7000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r	47,5 81,0 96,0		μC μC μC
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 600\text{ A}, -di_F/dt = 7000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}	21,5 37,0 41,5		mJ mJ mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode valid with IFX pre-applied thermal interface material		R_{thJH}		0,120	K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150	$^{\circ}\text{C}$

Strommesswiderstand / Shunt

			min.	typ.	max.	
Nennwiderstand Rated resistance	$T_H = 20^{\circ}\text{C}$		R_{20}	0,26		m Ω
Temperaturkoeffizient Temperature coefficient (tcr)	$20^{\circ}\text{C} - 60^{\circ}\text{C}$			< 30		ppm/K
Belastbarkeit pro Shunt-Widerstand Load capacity per shunt-resistor	$T_H = 80^{\circ}\text{C}$		P		40	W
Betriebstemperatur Shunt-Widerstand Operation temperature shunt-resistor			$T_{tvj\text{ op}}$		200	$^{\circ}\text{C}$
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Shunt-Widerstand / per shunt-resistor valid with IFX pre-applied thermal interface material		R_{thJH}		3,0	K/W

NTC-Widerstand / NTC-Thermistor

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Nennwiderstand Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$		R_{25}	5,00		k Ω
Abweichung von R100 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$		$\Delta R/R$	-5	5	%
Verlustleistung Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$		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	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$		$B_{25/80}$	3411		K
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$		$B_{25/100}$	3433		K

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

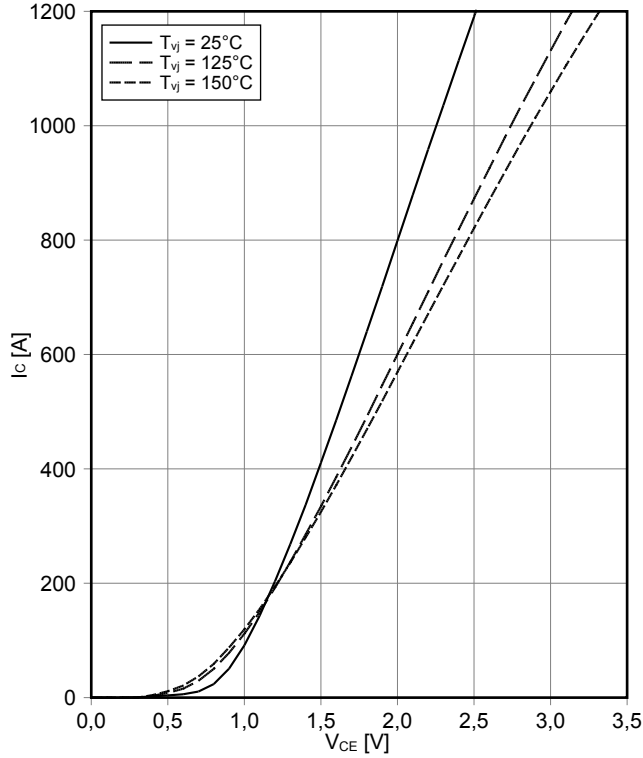
Modul / Module

Isolations-Prüfspannung Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V _{ISOL}	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 ₂ O ₃		
Kriechstrecke Creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		14,5 13,0		mm
Luftstrecke Clearance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		12,5 10,0		mm
Vergleichszahl der Kriechwegbildung Comperative tracking index		CTI	> 200		
			min.	typ.	max.
Modulstreuinduktivität Stray inductance module		L _{SCE}		20	nH
Modulleitungswiderstand, Anschlüsse - Chip Module lead resistance, terminals - chip	T _H = 25°C, pro Schalter / per switch	R _{CC'+EE'}		1,05	mΩ
Lagertemperatur Storage temperature		T _{stg}	-40		125 °C
Höchstzulässige Bodenplattenbetriebstemperatur Maximum baseplate operation temperature		T _{BPmax}			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
Anzugsdrehmoment f. elektr. Anschlüsse Terminal connection torque	Schraube M6 - Montage gem. gültiger Applikationsschrift Screw M6 - Mounting according to valid application note	M	3,0	-	6,0 Nm
Gewicht Weight		G		345	g

Lagerung und Transport von Modulen mit TIM => siehe AN2012-07
Storage and shipment of modules with TIM => see AN2012-07

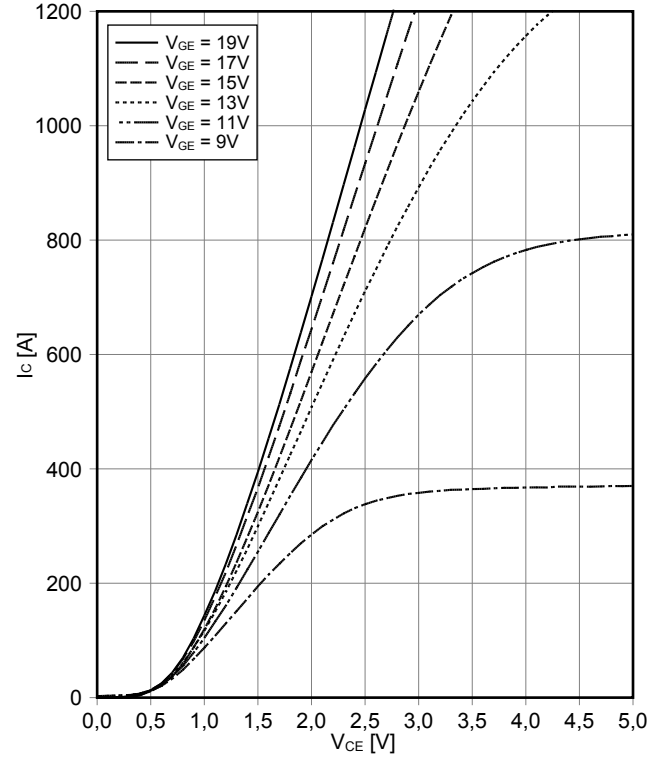
Ausgangskennlinie IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

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



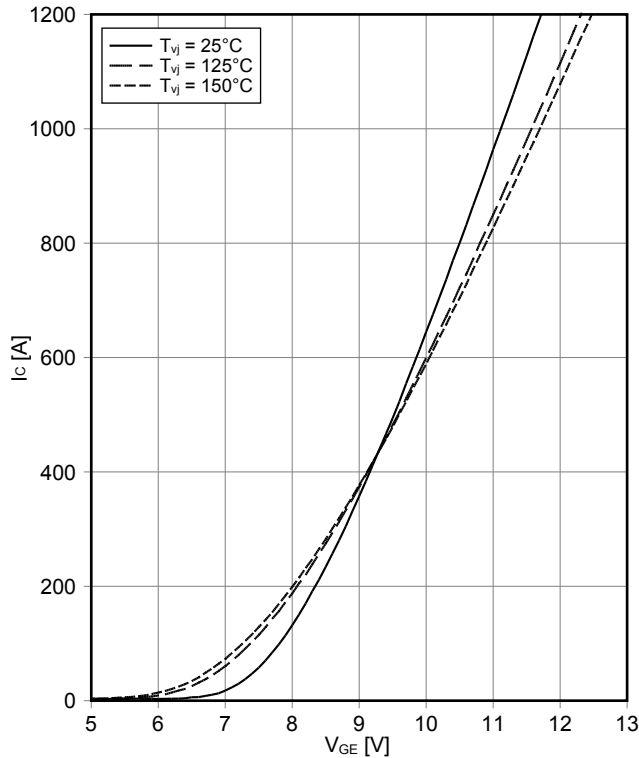
Ausgangskennlinienfeld IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 150^\circ\text{C}$



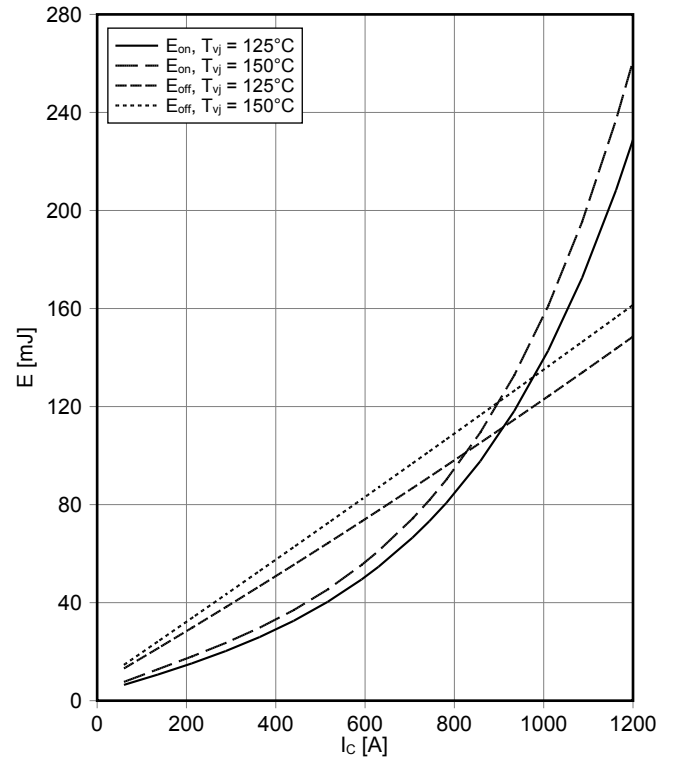
Übertragungscharakteristik IGBT, Wechselrichter (typisch)
transfer characteristic IGBT, Inverter (typical)

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



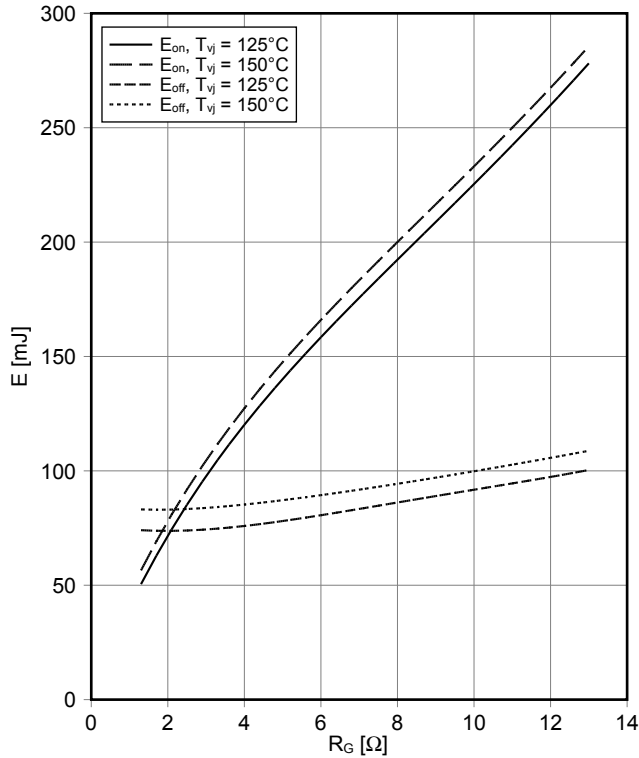
Schaltverluste IGBT, Wechselrichter (typisch)
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.3\ \Omega$, $R_{Goff} = 1.3\ \Omega$, $V_{CE} = 600\text{ V}$



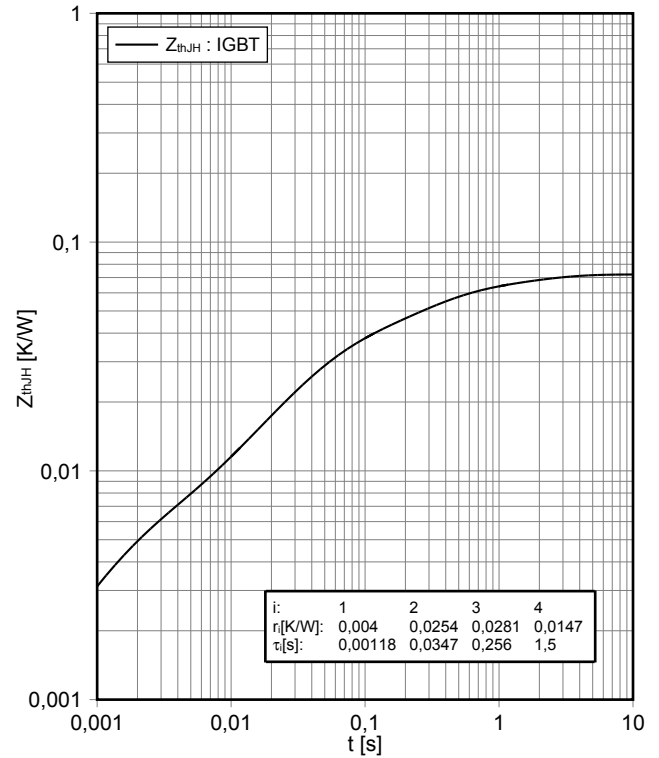
Schaltverluste IGBT, Wechselrichter (typisch)
switching losses IGBT, Inverter (typical)

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



Transienter Wärmewiderstand IGBT, Wechselrichter
transient thermal impedance IGBT, Inverter

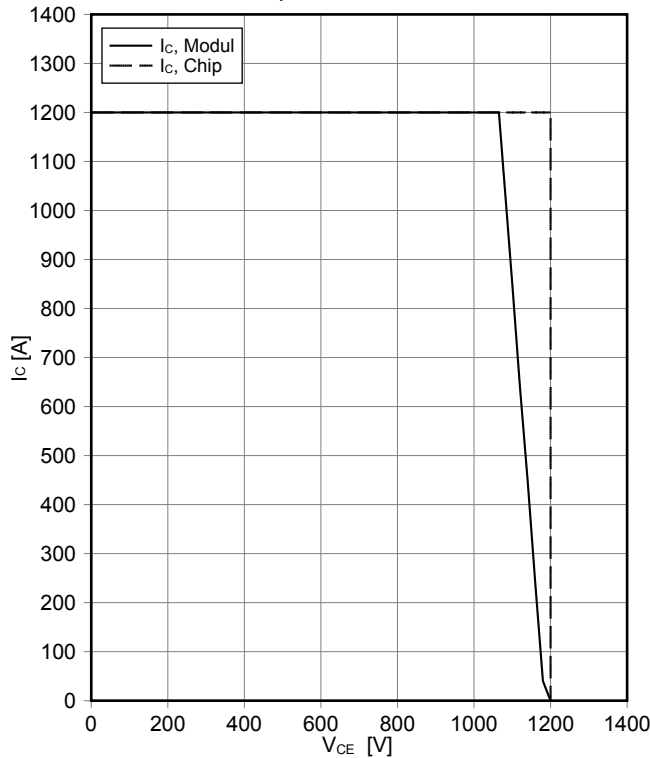
$Z_{thJH} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

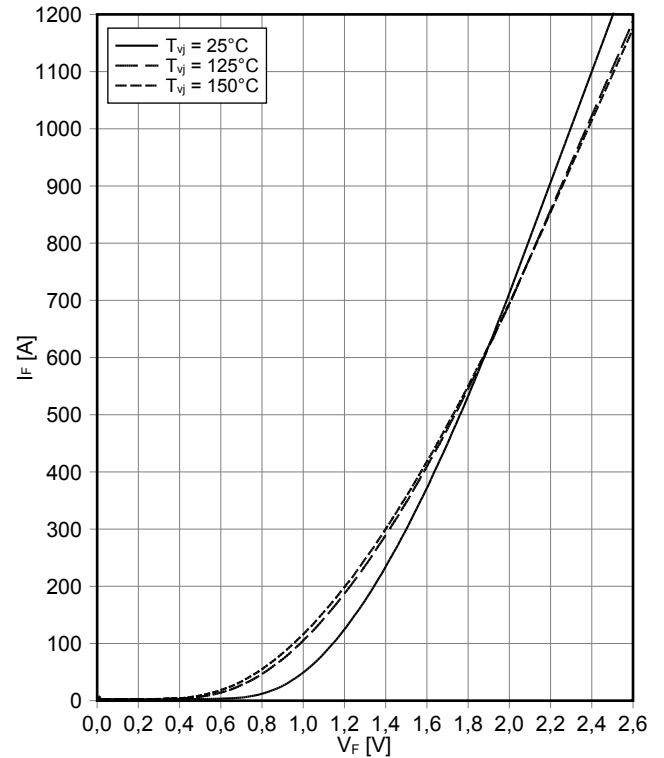
$I_C = f(V_{CE})$

$V_{GE} = \pm 15 \text{ V}, R_{Goff} = 1.3 \Omega, T_{vj} = 150^\circ\text{C}$



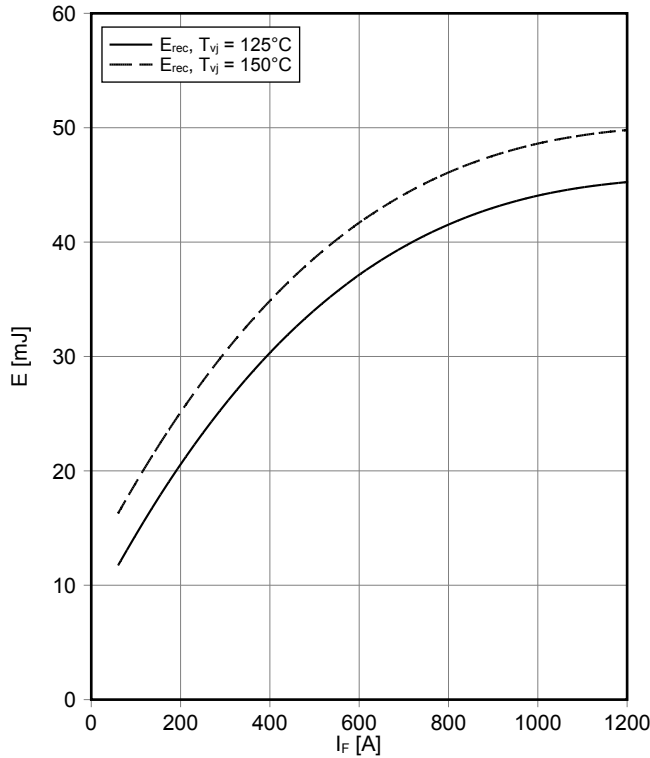
Durchlasskennlinie der Diode, Wechselrichter (typisch)
forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



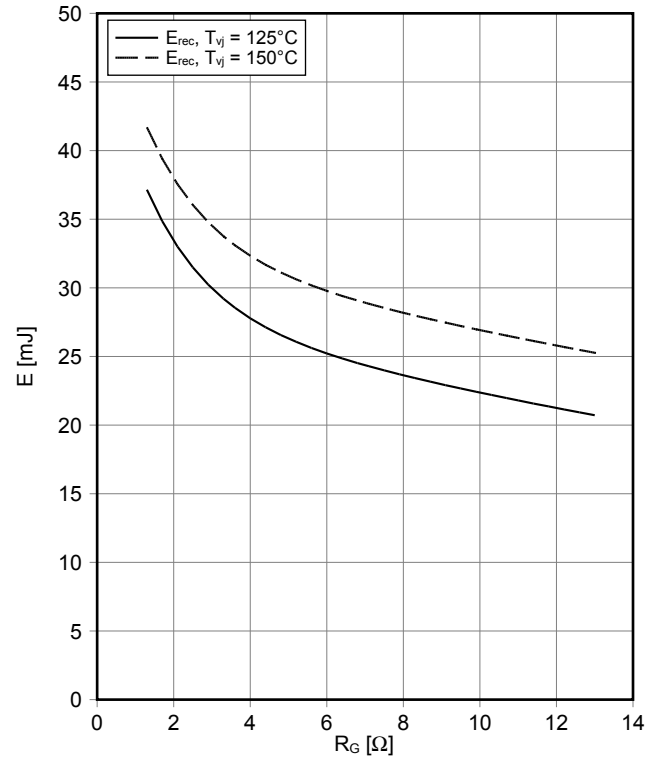
Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.3 \Omega, V_{CE} = 600 V$



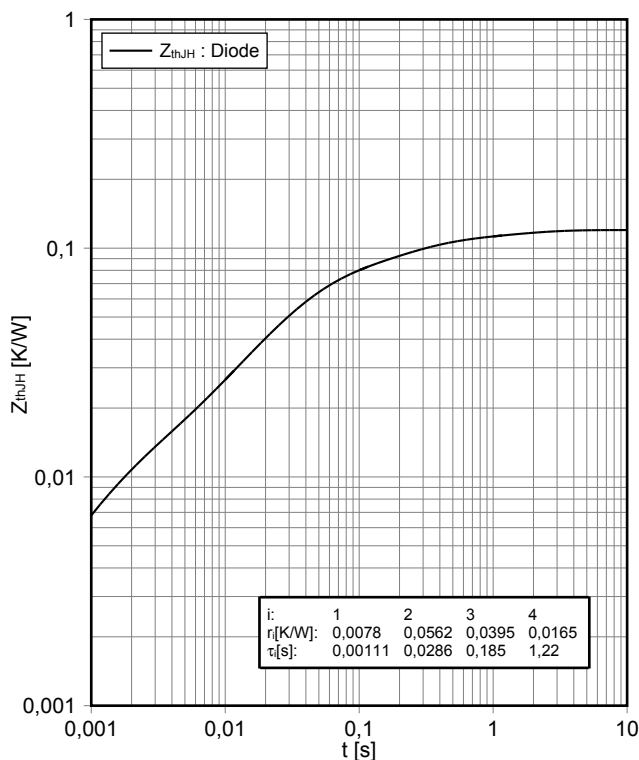
Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)

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



Transienter Wärmewiderstand Diode, Wechselrichter
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$

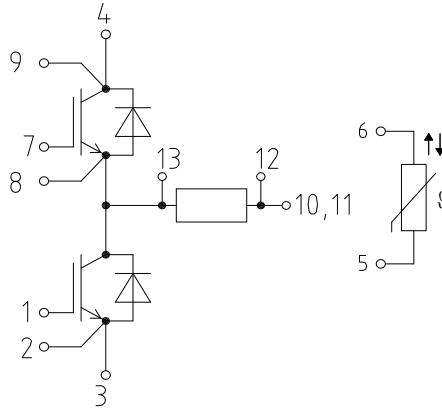


NTC-Widerstand-Temperaturkennlinie (typisch)
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$



Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines

