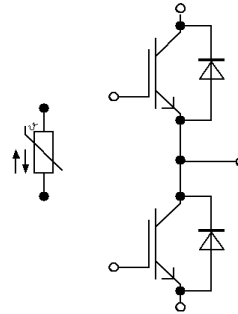
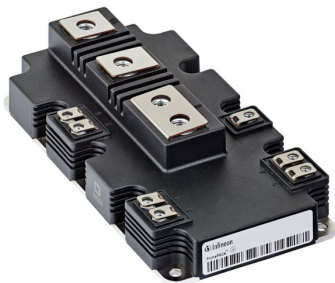


PrimePACK™2 Modul mit Trench/Feldstopp IGBT5, Emitter Controlled 5 Diode und NTC / bereits aufgetragenem Thermal Interface Material

PrimePACK™2 module with Trench/Fieldstop IGBT5, Emitter Controlled 5 diode and NTC / pre-applied Thermal Interface Material



$V_{CES} = 1700V$

$I_{C\ nom} = 1200A / I_{CRM} = 2400A$

Potentielle Anwendungen

- Hochleistungsumrichter
- Motorantriebe
- Traktionsumrichter
- Windgeneratoren

Potential Applications

- High power converters
- Motor drives
- Traction drives
- Wind turbines

Elektrische Eigenschaften

- Erweiterte Sperrschichttemperatur $T_{vj\ op}$
- Hohe Stromdichte
- Niedrige Schaltverluste
- Niedriges V_{CEsat}
- $T_{vj\ op} = 175^{\circ}C$

Electrical Features

- Extended operating temperature $T_{vj\ op}$
- High current density
- Low switching losses
- Low V_{CEsat}
- $T_{vj\ op} = 175^{\circ}C$

Mechanische Eigenschaften

- Gehäuse mit CTI > 400
- Große Luft- und Kriechstrecken
- Hohe Last- und thermische Wechselfestigkeit
- Hohe Leistungsdichte
- Thermisches Interface Material bereits aufgetragen

Mechanical Features

- Package with CTI > 400
- High creepage and clearance distances
- High power and thermal cycling capability
- High power density
- 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}	1700	V
Kollektor-Dauergleichstrom Continuous DC collector current	$T_H = 30^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	I_{CDC}	1200	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	2400	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	$I_C = 1200\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,75 2,15 2,35	2,30 2,75 3,00	V V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 43,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,35	5,80 6,25	V
Gateladung Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 900\text{ V}$		Q_G	6,00		μC
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	1,2		Ω
Eingangskapazität Input capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	68,0		nF
Rückwirkungskapazität Reverse transfer capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}	2,10		nF
Kollektor-Emitter-Reststrom Collector-emitter cut-off current	$V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	I_{CES}		10	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	$I_C = 1200\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,56\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{don}	0,27 0,28 0,29		μs μs μs
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 1200\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,56\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_r	0,15 0,17 0,17		μs μs μs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 1200\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 1,0\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{doff}	0,64 0,71 0,76		μs μs μs
Fallzeit, induktive Last Fall time, inductive load	$I_C = 1200\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 1,0\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_f	0,15 0,20 0,21		μs μs μs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 1200\text{ A}, V_{CE} = 900\text{ V}, L_{\sigma} = 45\text{ nH}$ $di/dt = 6450\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 0,56\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{on}	265 400 485		mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 1200\text{ A}, V_{CE} = 900\text{ V}, L_{\sigma} = 45\text{ nH}$ $du/dt = 2800\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 1,0\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{off}	295 400 470		mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 1000\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$		I_{SC}	4200		A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT valid with IFX pre-applied thermal interface material		R_{thJH}		40,7	K/kW
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{ op}}$	-40	175	$^{\circ}\text{C}$

Diode, Wechselrichter / Diode, Inverter

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1700	V
Dauergleichstrom Continuous DC forward current		I_F	1200	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_p = 1\text{ ms}$	I_{FRM}	2400	A
Grenzlastintegral I^2t - value	$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 175^{\circ}\text{C}$	I^2t	340 275	kA^2s kA^2s
Spitzenverlustleistung Maximum power dissipation	$T_{vj} = 175^{\circ}\text{C}$	P_{RQM}	1200	kW

Charakteristische Werte / Characteristic Values

				min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 1200\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	V_F		1,80	2,20	V
	$I_F = 1200\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$			1,75	2,15	V
	$I_F = 1200\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 175^{\circ}\text{C}$			1,75	2,15	V
Rückstromspitze Peak reverse recovery current	$I_F = 1200\text{ A}, -di_F/dt = 6450\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	I_{RM}		945		A
		$T_{vj} = 125^{\circ}\text{C}$			1100		A
		$T_{vj} = 175^{\circ}\text{C}$			1200		A
Sperrverzögerungsladung Recovered charge	$I_F = 1200\text{ A}, -di_F/dt = 6450\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	Q_r		230		μC
		$T_{vj} = 125^{\circ}\text{C}$			410		μC
		$T_{vj} = 175^{\circ}\text{C}$			540		μC
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 1200\text{ A}, -di_F/dt = 6450\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	E_{rec}		130		mJ
		$T_{vj} = 125^{\circ}\text{C}$			245		mJ
		$T_{vj} = 175^{\circ}\text{C}$			325		mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode valid with IFX pre-applied thermal interface material	R_{thJH}				64,8	K/kW
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj\text{ op}}$	-40			175	$^{\circ}\text{C}$

NTC-Widerstand / NTC-Thermistor

Charakteristische Werte / Characteristic Values

				min.	typ.	max.	
Nennwiderstand Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}			5,00		$\text{k}\Omega$
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.

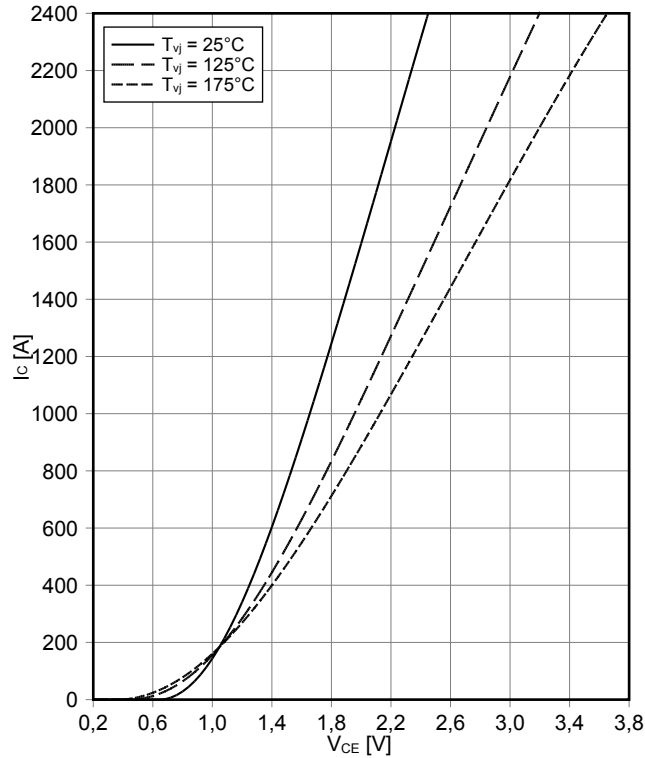
Modul / Module

Isolations-Prüfspannung Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	4,0		kV
Material Modulgrundplatte Material of module baseplate			Cu		
Kriechstrecke Creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		33,0 33,0		mm
Luftstrecke Clearance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		19,0 19,0		mm
Vergleichszahl der Kriechwegbildung Comperative tracking index		CTI	> 400		
			min.	typ.	max.
Modulstreuintuktivität Stray inductance module		L _{sCE}		18	nH
Modulleitungswiderstand, Anschlüsse - Chip Module lead resistance, terminals - chip	T _H = 25°C, pro Schalter / per switch	R _{CC'+EE'} R _{AA'+CC'}		0,30 0,22	mΩ
Lagertemperatur Storage temperature		T _{stg}	-40		150 °C
Höchstzulässige Bodenplattenbetriebstemperatur Maximum baseplate operation temperature		T _{BPmax}			150 °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 M4 - Montage gem. gültiger Applikationsschrift Screw M4 - Mounting according to valid application note Schraube M8 - Montage gem. gültiger Applikationsschrift Screw M8 - Mounting according to valid application note	M	1,8 8,0	- -	2,1 10 Nm
Gewicht Weight		G		825	g

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

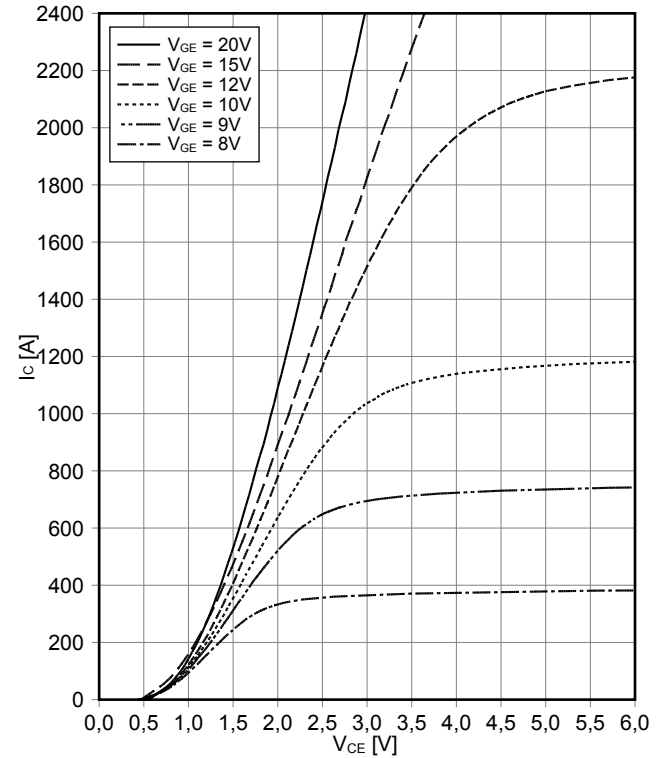
Ausgangskennlinie IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

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



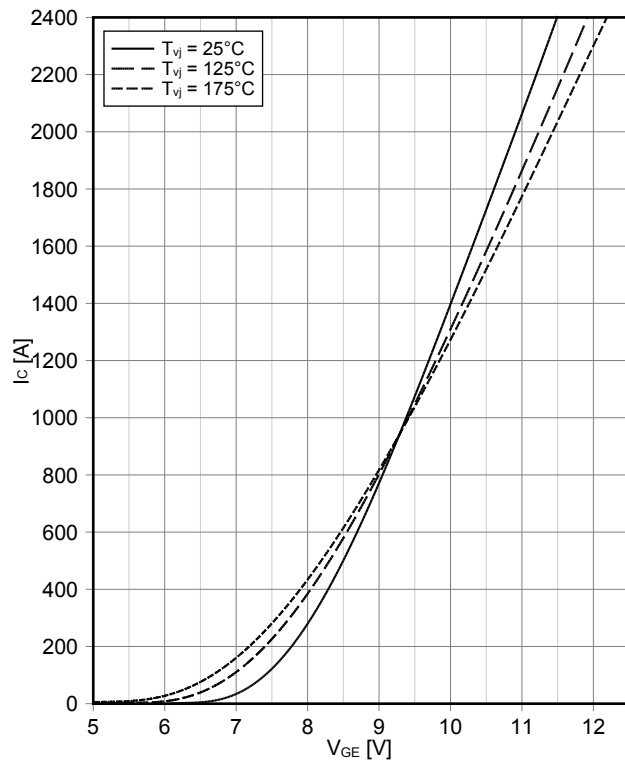
Ausgangskennlinienfeld IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 175^\circ\text{C}$



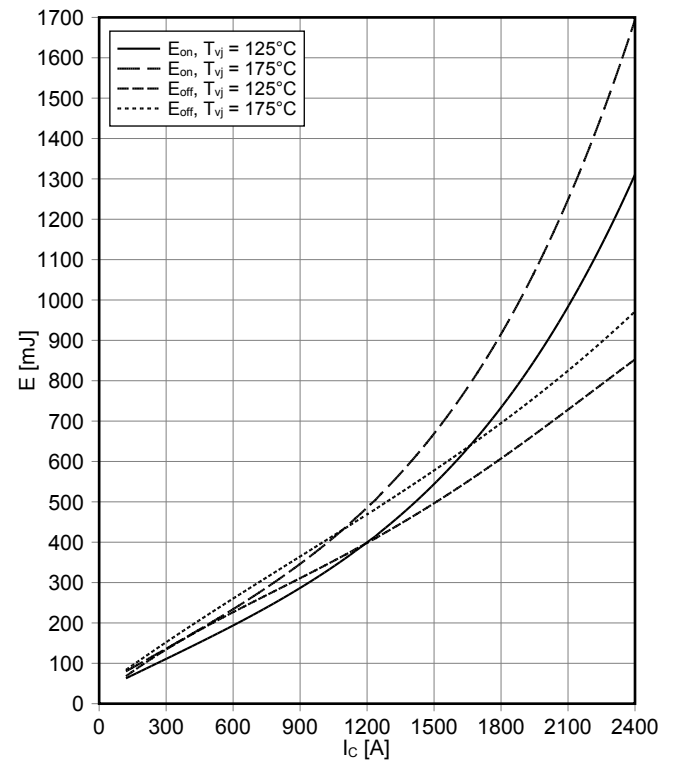
Übertragungscharakteristik IGBT, Wechselrichter (typisch)
transfer characteristic IGBT, Inverter (typical)

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



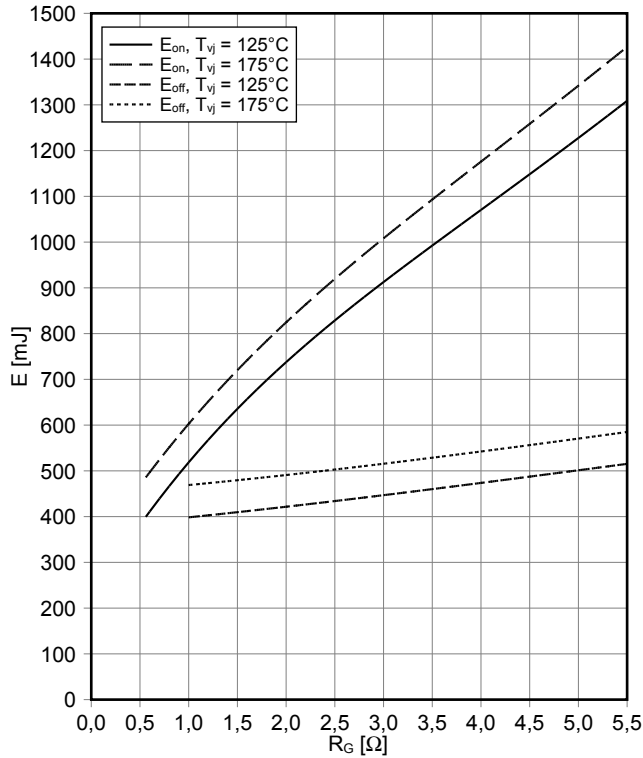
Schaltverluste IGBT, Wechselrichter (typisch)
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.56\ \Omega$, $R_{Goff} = 1\ \Omega$, $V_{CE} = 900\text{ V}$



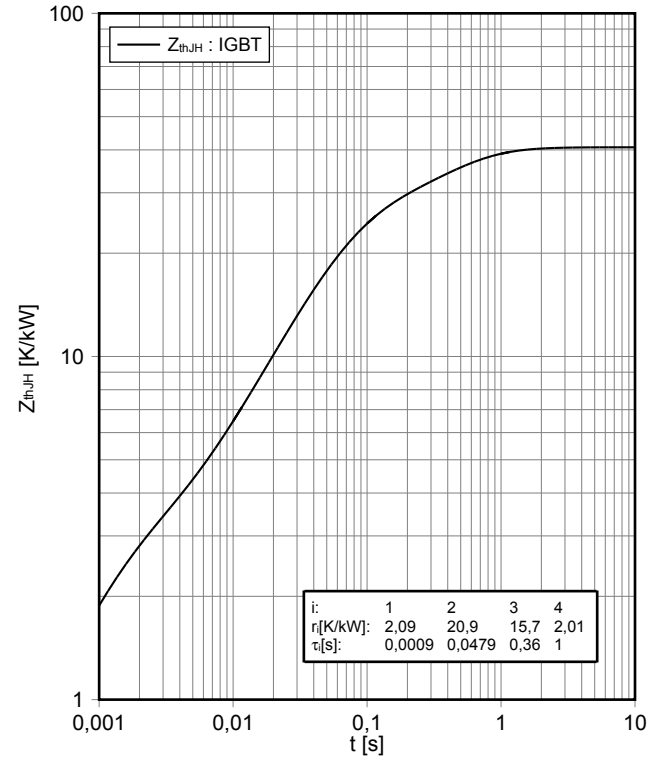
Schaltverluste IGBT, Wechselrichter (typisch)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 1200\text{ A}$, $V_{CE} = 900\text{ V}$



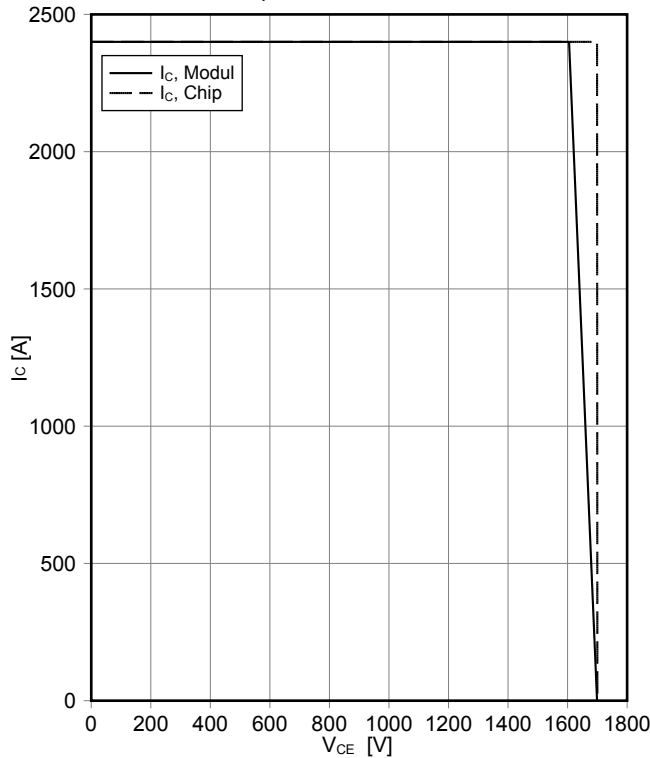
Transienter Wärmewiderstand IGBT, Wechselrichter
transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



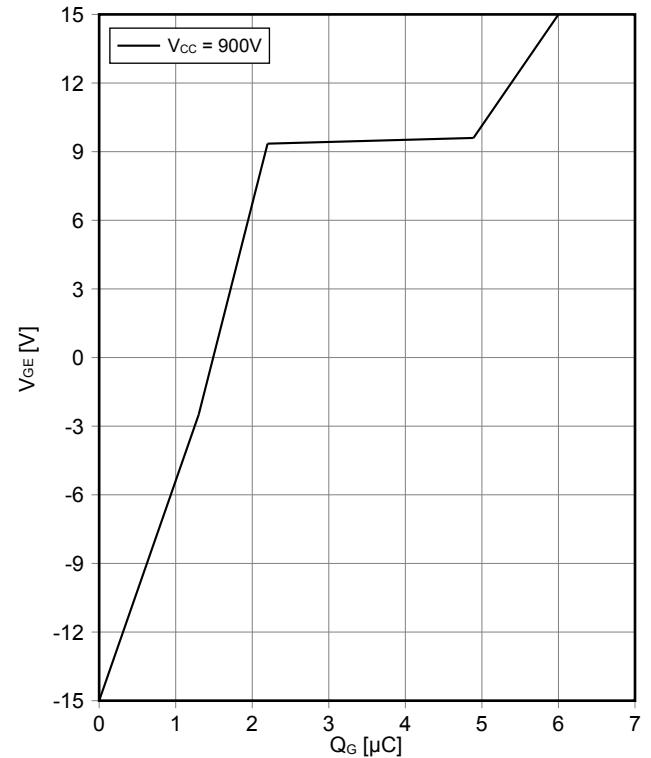
Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 1\ \Omega$, $T_{vj} = 175^\circ\text{C}$

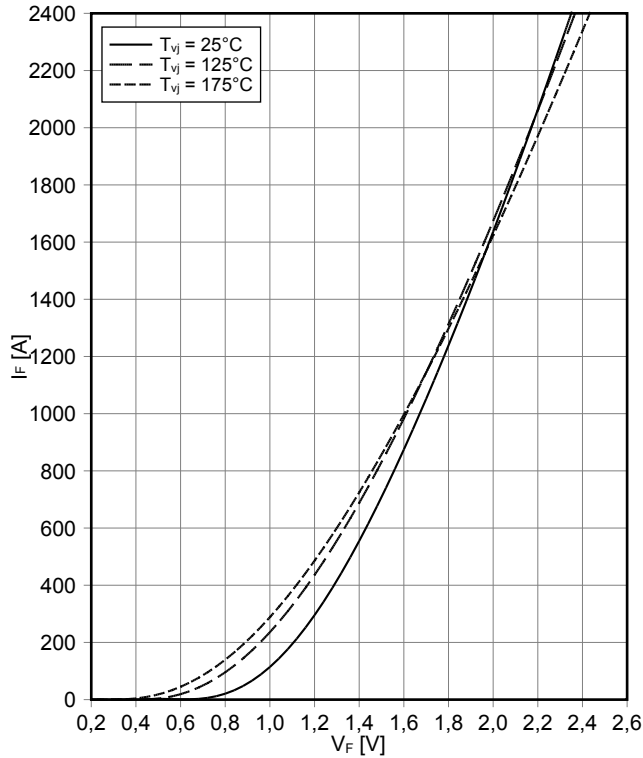


Gateladungs Charakteristik IGBT, Wechselrichter (typisch)
gate charge characteristic IGBT, Inverter (typical)

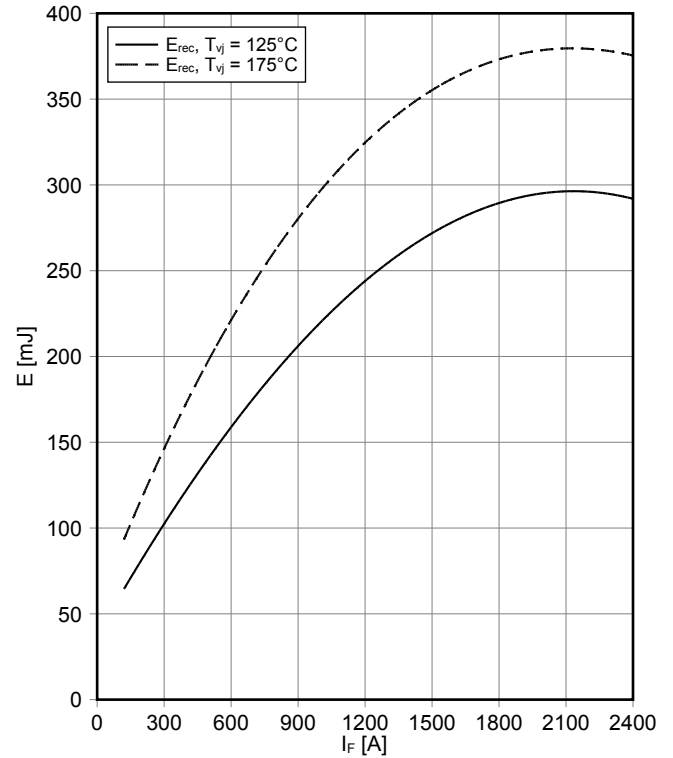
$V_{GE} = f(Q_G)$
 $I_C = 1200\text{ A}$, $T_{vj} = 25^\circ\text{C}$



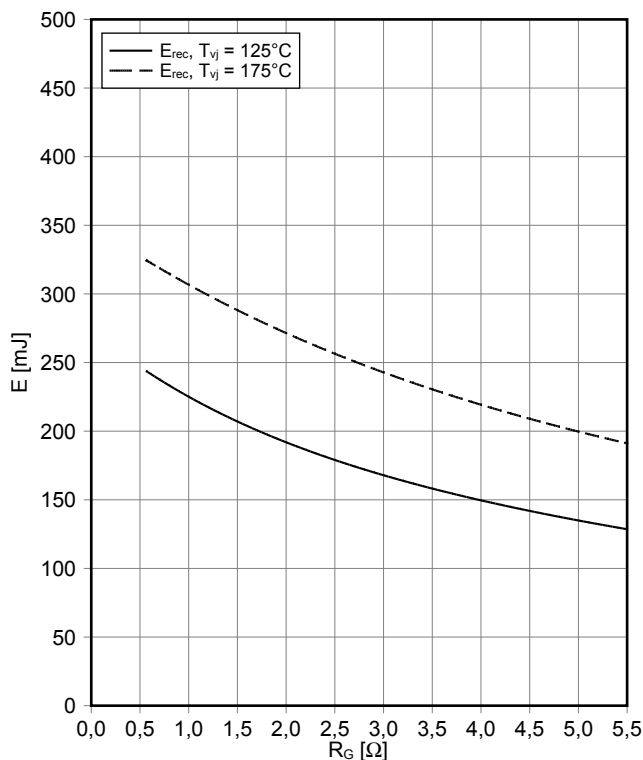
Durchlasskennlinie der Diode, Wechselrichter (typisch)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



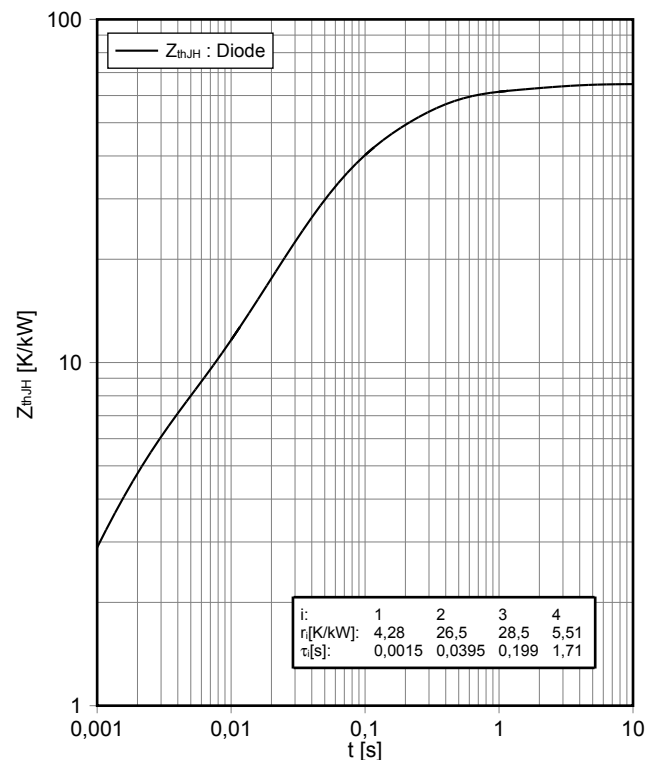
Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 0.56 \Omega, V_{CE} = 900 \text{ V}$



Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 1200 \text{ A}, V_{CE} = 900 \text{ V}$

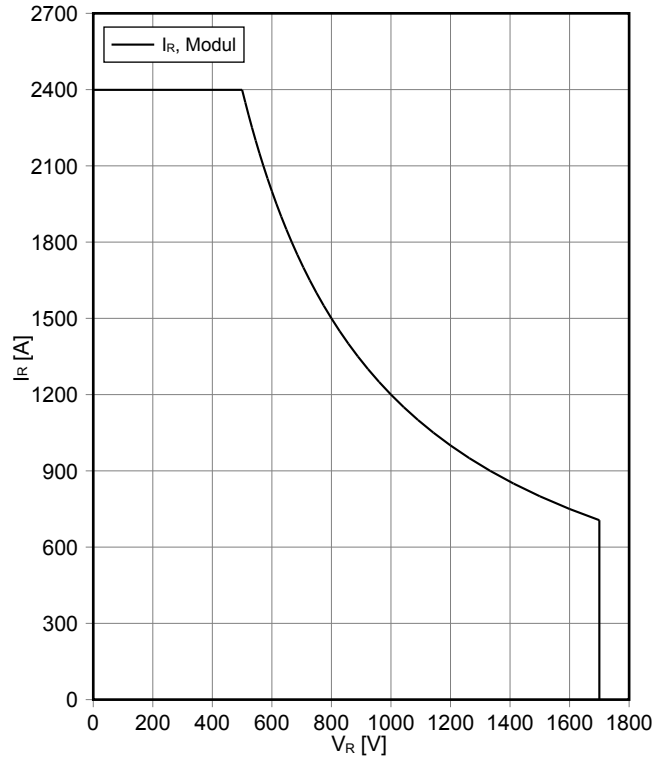


Transienter Wärmewiderstand Diode, Wechselrichter
transient thermal impedance Diode, Inverter
 $Z_{thJH} = f(t)$



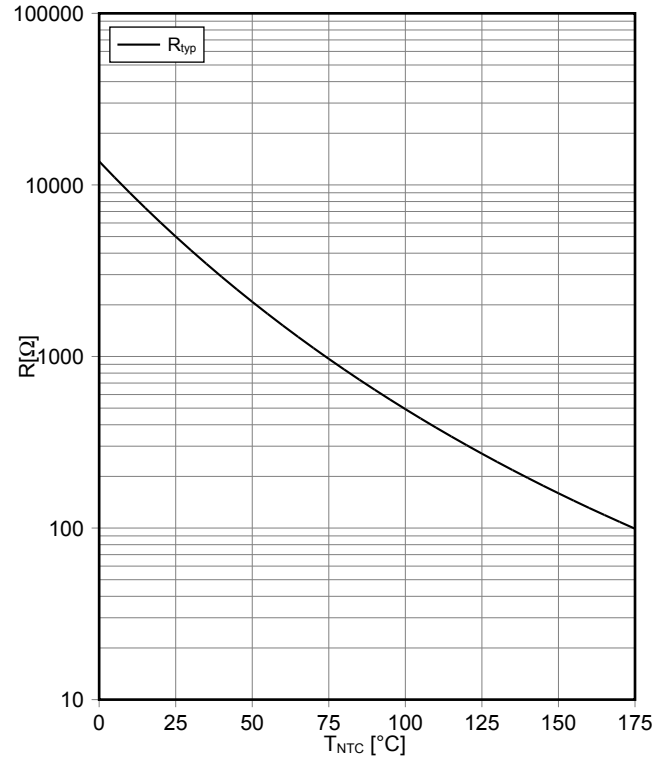
Sicherer Arbeitsbereich Diode, Wechselrichter (SOA)
safe operation area Diode, Inverter (SOA)

$I_R = f(V_R)$
 $T_{vj} = 175^\circ\text{C}$

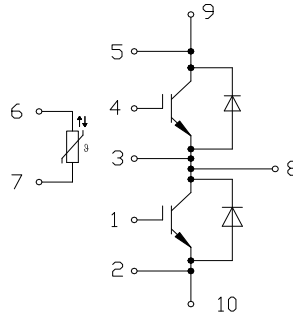


NTC-Widerstand-Temperaturkennlinie (typisch)
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$



Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines

