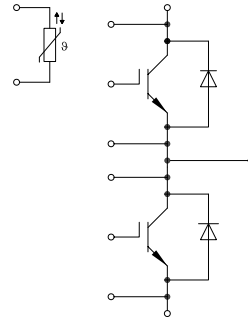


PrimePACK™3+ B-Serien Modul mit Trench/Feldstopp IGBT5, Emitter Controlled 5 Diode und NTC
 PrimePACK™3+ B-series module with Trench/Fieldstop IGBT5, Emitter Controlled 5 diode and NTC



$V_{CES} = 1200V$
 $I_{C\ nom} = 1800A / I_{CRM} = 3600A$

Potentielle Anwendungen

- Hochleistungsumrichter
- Motorantriebe
- Solar Anwendungen
- USV-Systeme

Potential Applications

- High power converters
- Motor drives
- Solar applications
- UPS systems

Elektrische Eigenschaften

- Erweiterte Sperrschichttemperatur $T_{vj\ op}$
- Hohe Kurzschlussrobustheit
- Sehr große Robustheit
- $T_{vj\ op} = 175^{\circ}C$
- Trench IGBT 5

Electrical Features

- Extended operating temperature $T_{vj\ op}$
- High short-circuit capability
- Unbeatable robustness
- $T_{vj\ op} = 175^{\circ}C$
- Trench IGBT 5

Mechanische Eigenschaften

- Gehäuse mit CTI > 400
- Große Luft- und Kriechstrecken
- Hohe Last- und thermische Wechselfestigkeit
- Hohe Leistungsdichte

Mechanical Features

- Package with CTI > 400
- High creepage and clearance distances
- High power and thermal cycling capability
- High power density

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	$T_C = 95^{\circ}\text{C}, T_{vj\text{max}} = 175^{\circ}\text{C}$	I_{CDC}	1800	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	3600	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	$I_C = 1800\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,70 2,00 2,15	2,15 2,45 2,60	V V V	
Gate-Schwellenspannung Gate threshold voltage	$I_C = 49,2\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,25	5,80	6,35	V
Gateladung Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		Q_G	8,65			μC
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,5			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}	98,5			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}	3,90			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	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{don}	0,24 0,29 0,31			μs μs μs
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_r	0,19 0,20 0,20			μs μs μs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{doff}	0,57 0,63 0,66			μs μs μs
Fallzeit, induktive Last Fall time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_f	0,10 0,12 0,14			μs μs μs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 30\text{ nH}$ $di/dt = 8150\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{on}	130 195 235			mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 30\text{ nH}$ $du/dt = 2350\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{off}	210 260 290			mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$		I_{SC}	6800			A
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro IGBT / per IGBT		R_{thJC}			17,3	K/kW
Wärmewiderstand, Gehäuse bis Kühlkörper 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}			11,4	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}	1200	V
Dauergleichstrom Continuous DC forward current		I_F	1800	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	3600	A
Grenzlastintegral I^2t - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	760	kA^2s
	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 175^{\circ}\text{C}$		720	kA^2s

Charakteristische Werte / Characteristic Values

		min. typ. max.				
Durchlassspannung Forward voltage	$I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$		1,90	2,35	V
	$I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	V_F	1,75	2,20	V
	$I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		1,70	2,15	V
Rückstromspitze Peak reverse recovery current	$I_F = 1800\text{ A}, -di_F/dt = 8700\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	I_{RM}		810	A
	$V_R = 600\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		1150	A	
	$V_{GE} = -15\text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		1300	A	
Sperrverzögerungsladung Recovered charge	$I_F = 1800\text{ A}, -di_F/dt = 8700\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	Q_r		175	μC
	$V_R = 600\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		330	μC	
	$V_{GE} = -15\text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		435	μC	
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 1800\text{ A}, -di_F/dt = 8700\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$	E_{rec}		79,0	mJ
	$V_R = 600\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		145	mJ	
	$V_{GE} = -15\text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		190	mJ	
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro Diode / per diode	R_{thJC}			28,3	K/kW
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}		13,2		K/kW
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj op}$	-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

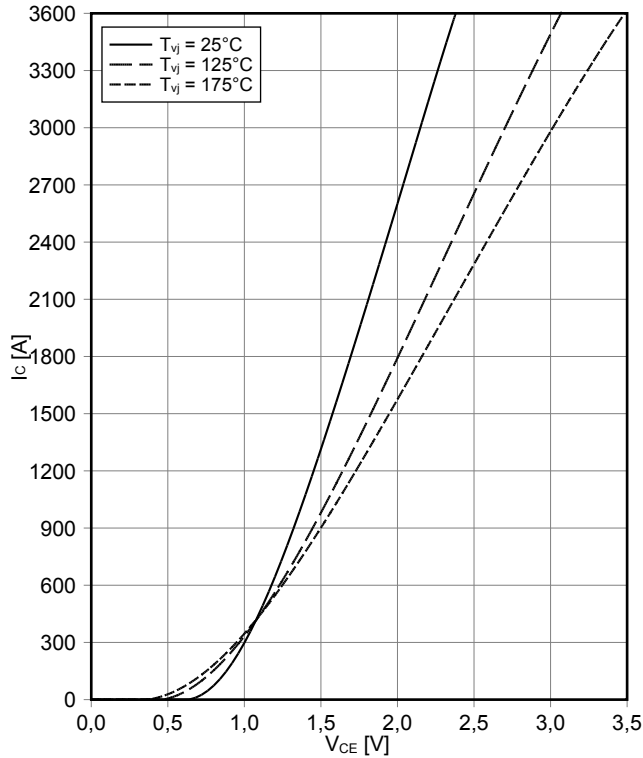
Angaben gemäß gültiger Application Note.
Specification according to the valid application note.

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		
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		36,0 28,0		mm
Luftstrecke Clearance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		21,0 19,0		mm
Vergleichszahl der Kriechwegbildung Comperative tracking index		CTI	> 400		
			min.	typ.	max.
Modulstreuinduktivität Stray inductance module		L _{SCE}		10	nH
Modulleitungswiderstand, Anschlüsse - Chip Module lead resistance, terminals - chip	T _C = 25°C, pro Schalter / per switch	R _{CC'+EE'} R _{AA'+CC'}		0,10 0,09	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 Schraube M8 - Montage gem. gültiger Applikationsschrift Screw M4 - Mounting according to valid application note Screw M8 - Mounting according to valid application note	M	1,8 8,0	- -	2,1 10 Nm
Gewicht Weight		G		1400	g

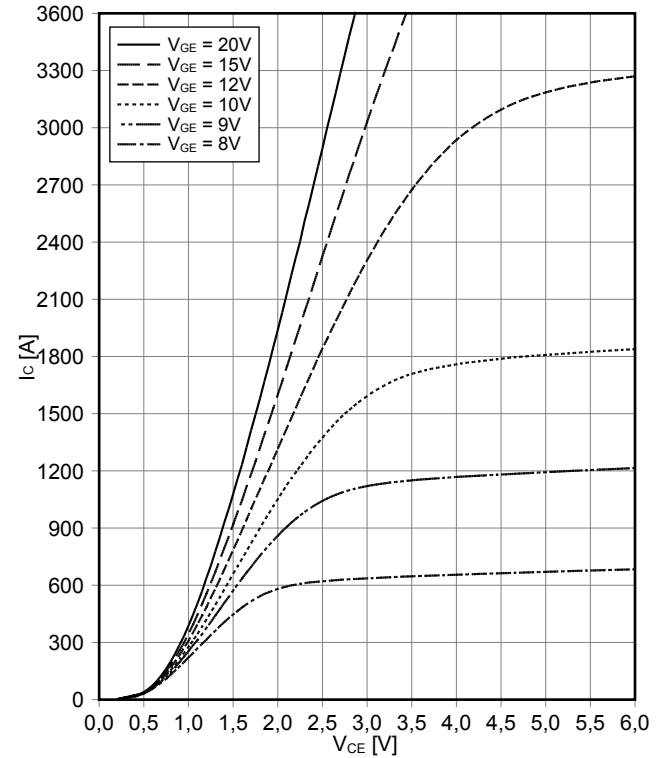
Ausgangskennlinie IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

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



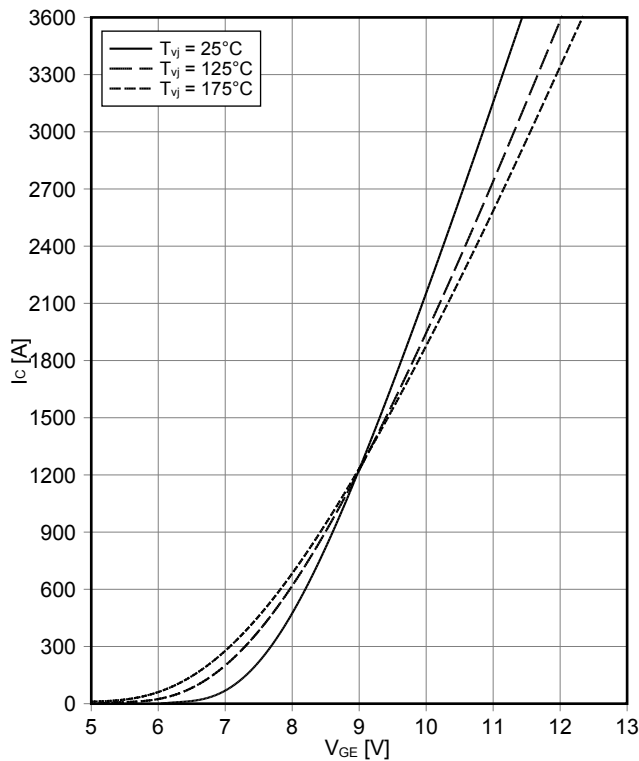
Ausgangskennlinienfeld IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

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



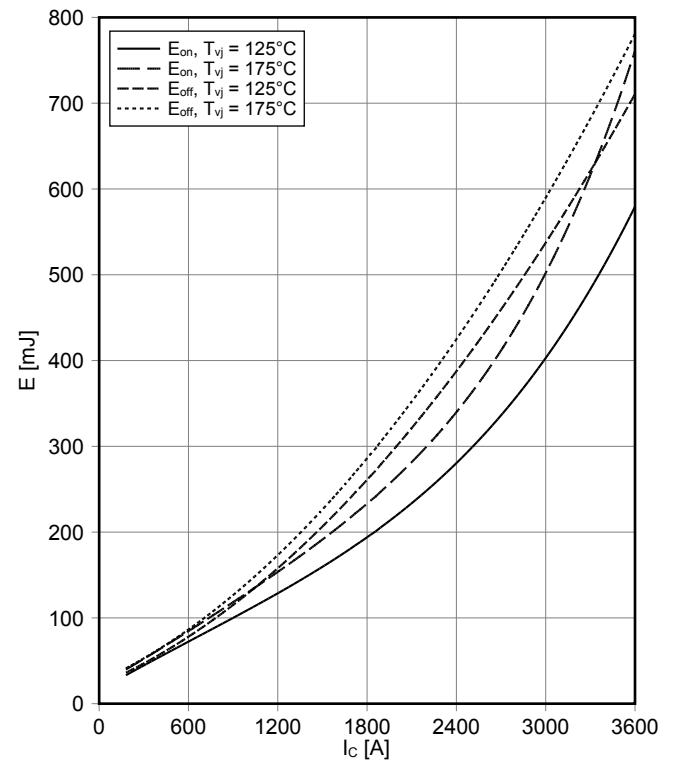
Übertragungscharakteristik IGBT, Wechselrichter (typisch)
transfer characteristic IGBT, Inverter (typical)

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



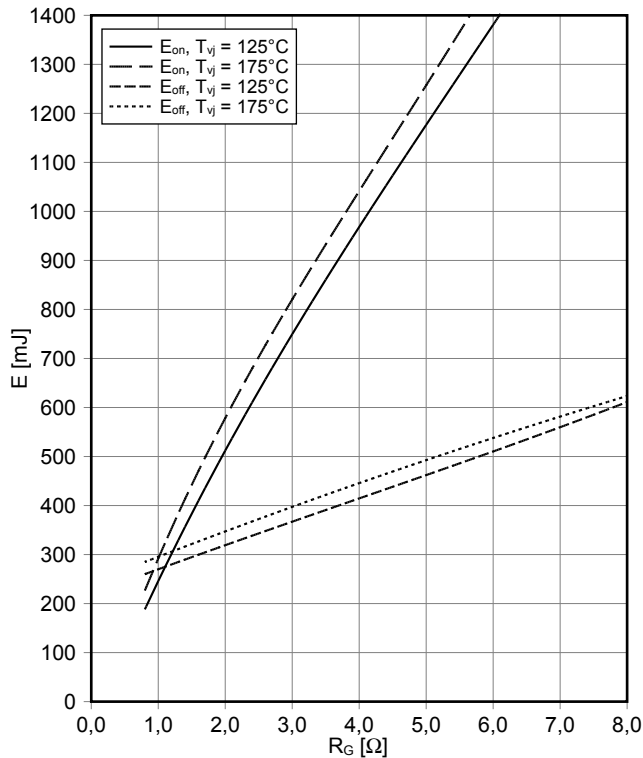
Schaltverluste IGBT, Wechselrichter (typisch)
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.82\ \Omega$, $R_{Goff} = 0.82\ \Omega$, $V_{CE} = 600\text{ V}$



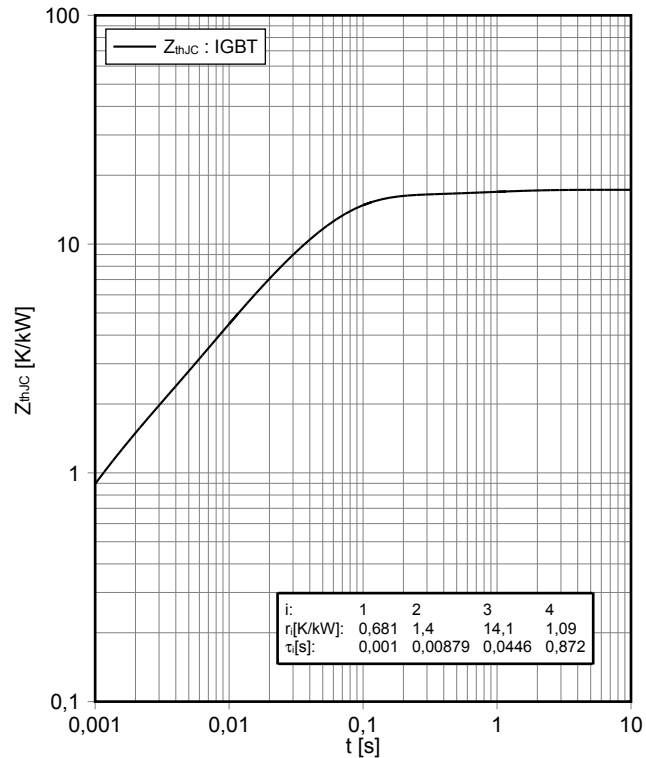
Schaltverluste IGBT, Wechselrichter (typisch) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 1800 \text{ A}$, $V_{CE} = 600 \text{ V}$



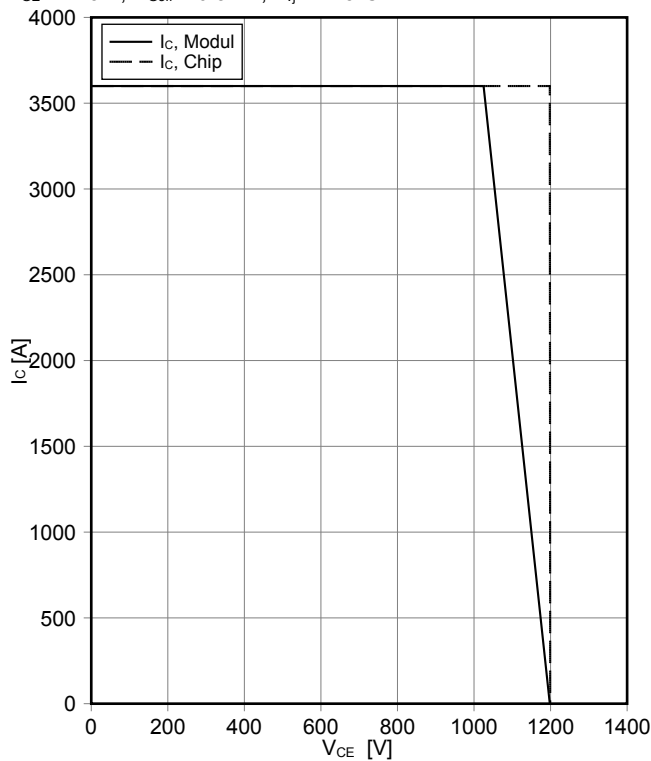
Transienter Wärmewiderstand IGBT, Wechselrichter transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



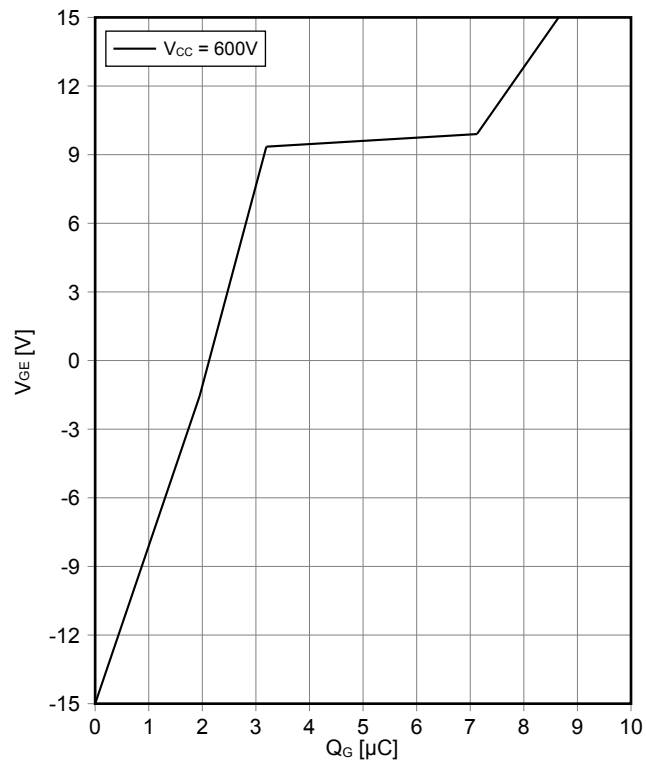
Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter (RBSOA) reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 0.82 \Omega$, $T_{vj} = 175^\circ\text{C}$

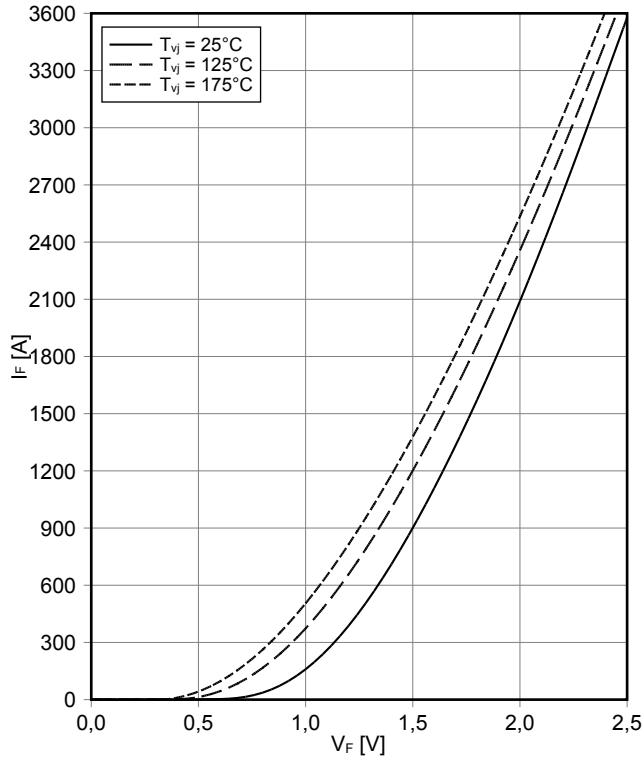


Gateladungs Charakteristik IGBT, Wechselrichter (typisch) gate charge characteristic IGBT, Inverter (typical)

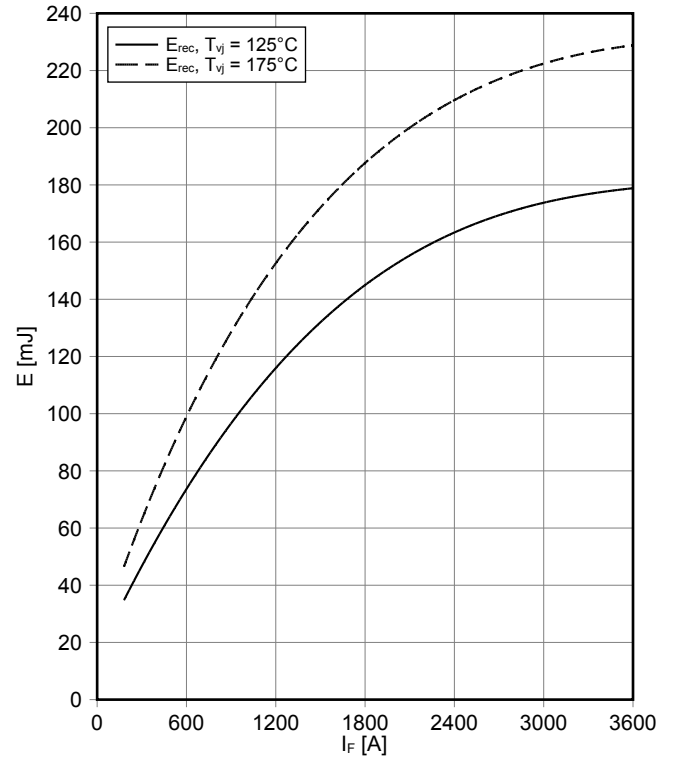
$V_{GE} = f(Q_G)$
 $I_C = 1800 \text{ A}$, $T_{vj} = 25^\circ\text{C}$



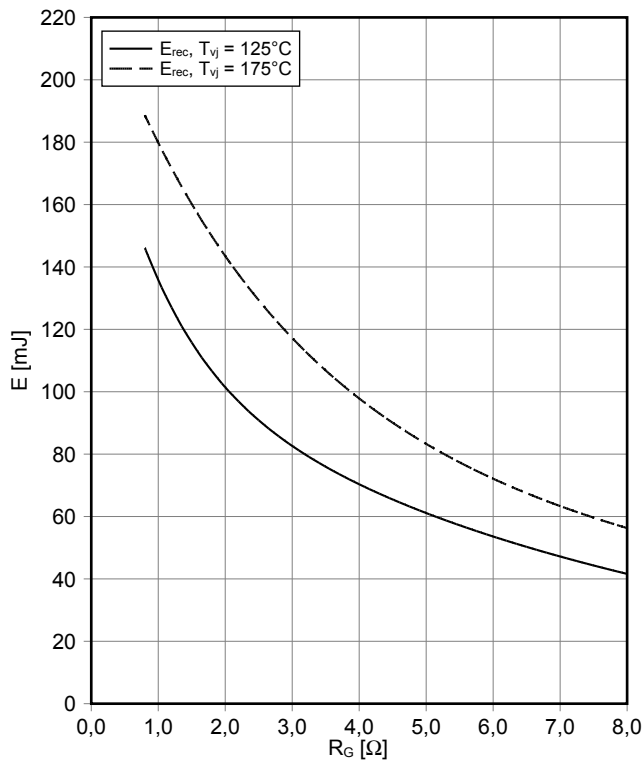
Durchlasskennlinie der Diode, Wechselrichter (typisch)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



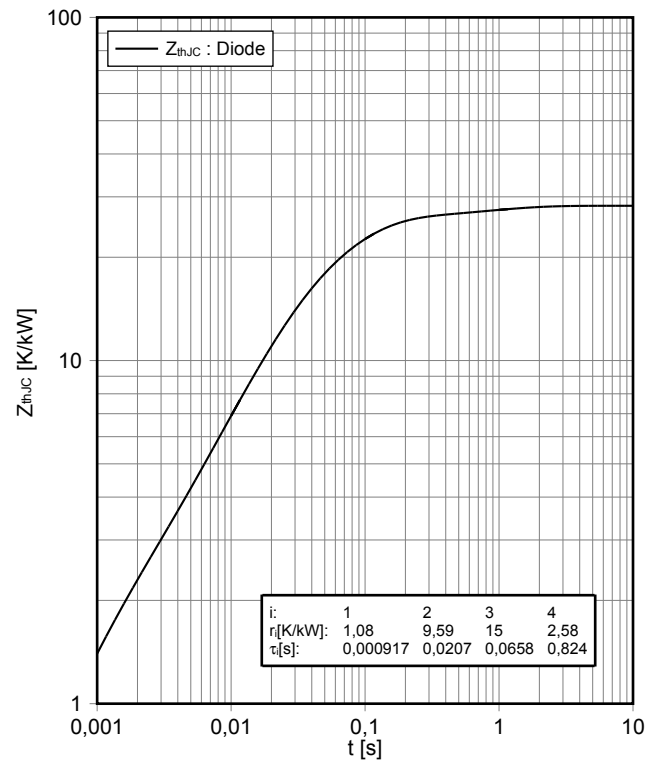
Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 0.82 \Omega, V_{CE} = 600 \text{ V}$



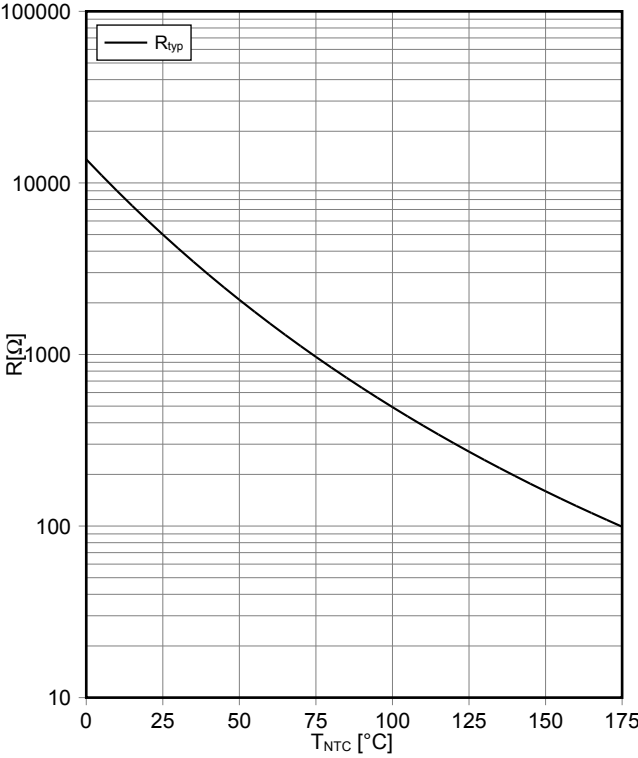
Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 1800 \text{ A}, V_{CE} = 600 \text{ V}$



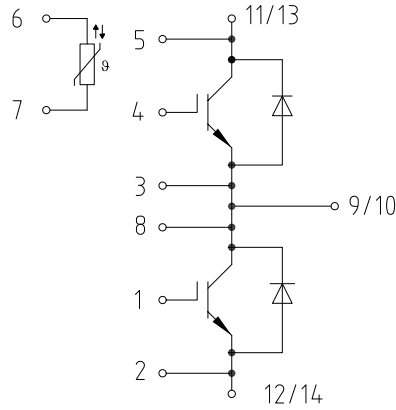
Transienter Wärmewiderstand Diode, Wechselrichter
transient thermal impedance Diode, Inverter
 $Z_{thJC} = f(t)$



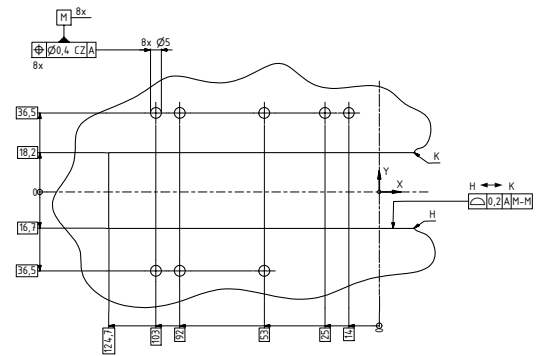
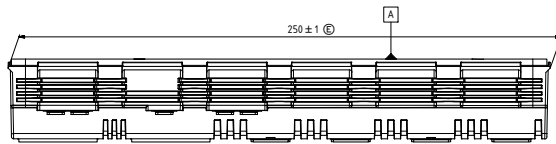
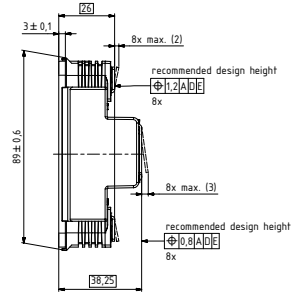
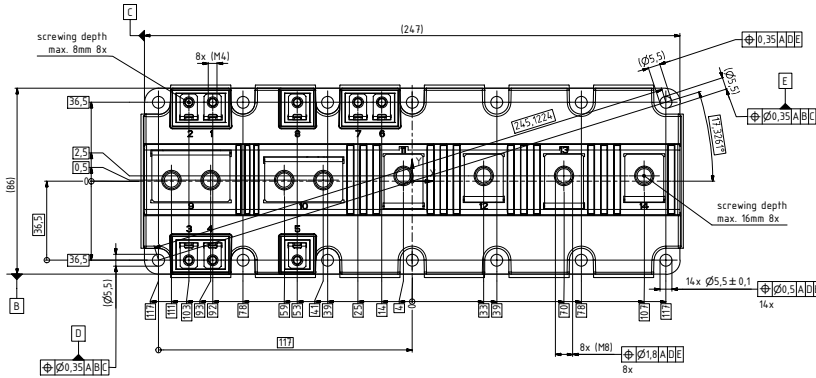
NTC-Widerstand-Temperaturkennlinie (typisch)
NTC-Thermistor-temperature characteristic (typical)
 $R = f(T)$



Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines



Dimension in mounted condition ISO 10579

Terminal heights measurement at the end of bending radius