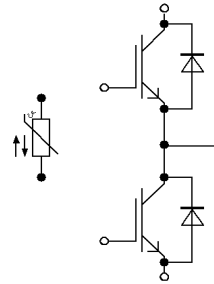
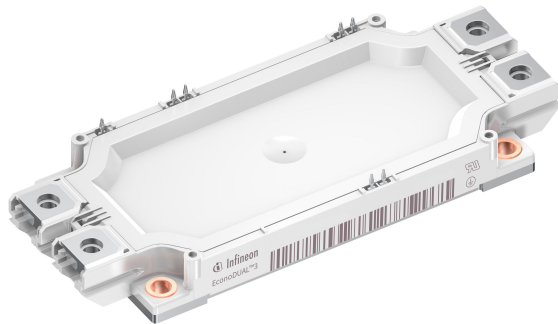


EconoDUAL™3 Modul mit TRENCHSTOP™ IGBT7 und Emitter Controlled 7 Diode und NTC
 EconoDUAL™3 module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and NTC



$V_{CES} = 1200V$
 $I_{C\ nom} = 900A / I_{CRM} = 1800A$

Potentielle Anwendungen

- Hochleistungsumrichter
- Hybrid-Nutzfahrzeuge
- Motorantriebe
- Servoumrichter
- USV-Systeme

Potential Applications

- High power converters
- Commercial Agriculture Vehicles
- Motor drives
- Servo drives
- UPS systems

Elektrische Eigenschaften

- Integrierter Temperatursensor
- Trenchstop™ IGBT7
- V_{CESat} mit positivem Temperaturkoeffizienten

Electrical Features

- Integrated temperature sensor
- Trenchstop™ IGBT7
- V_{CESat} with positive temperature coefficient

Mechanische Eigenschaften

- Hohe Leistungsdichte
- Isolierte Bodenplatte
- PressFIT Verbindungstechnik
- Standardgehäuse

Mechanical Features

- High power density
- Isolated base plate
- PressFIT contact technology
- Standard housing

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	$T_C = 90^{\circ}\text{C}, T_{vj\text{max}} = 175^{\circ}\text{C}$	I_{CDC}	900	A
Grenzeffektivstrom der Modul DC-Kontakte Maximum RMS module DC-terminal current	$T_{\text{Terminal}} \leq 90^{\circ}\text{C}, T_C = 90^{\circ}\text{C}$ $T_{\text{Terminal}} \leq 105^{\circ}\text{C}, T_C = 90^{\circ}\text{C}$	I_{TRMS}	580 565	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_p = 1\text{ ms}$	I_{CRM}	1800	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	$I_C = 900\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,50 1,65 1,75	1,80 V V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 18,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GETH}	5,15 5,80	6,45 V
Gateladung Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		Q_G	14,3	μC
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,5	Ω
Eingangskapazität Input capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	122	nF
Rückwirkungskapazität Reverse transfer capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}	0,72	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}		0,1 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}		100 nA
Einschaltverzögerungszeit, induktive Last Turn-on delay time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{don}	0,41 0,46 0,49	μs μs μs
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_r	0,10 0,11 0,12	μs μs μs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{doff}	0,55 0,63 0,69	μs μs μs
Fallzeit, induktive Last Fall time, inductive load	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_f	0,11 0,23 0,33	μs μs μs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 25\text{ nH}$ $di/dt = 6200\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{on}	89,0 138 170	mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 900\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 25\text{ nH}$ $du/dt = 3000\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{off}	89,0 130 158	mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_p \leq 8\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ $t_p \leq 6\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$	I_{SC}	3200 3000	A A
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro IGBT / per IGBT		R_{thJC}		0,0452 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}		0,0269 K/W
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	900	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	1800	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	35000 30000	A^2s A^2s

Charakteristische Werte / Characteristic Values

		min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 900\text{ A}, V_{GE} = 0\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$		1,80	2,05	V
	$I_F = 900\text{ A}, V_{GE} = 0\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$		1,70		V
	$I_F = 900\text{ A}, V_{GE} = 0\text{ V}$ $T_{vj} = 175^{\circ}\text{C}$		1,65		V
Rückstromspitze Peak reverse recovery current	$I_F = 900\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $T_{vj} = 25^{\circ}\text{C}$		389		A
	$V_R = 600\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$		511		A
	$V_{GE} = -15\text{ V}$ $T_{vj} = 175^{\circ}\text{C}$		578		A
Sperrverzögerungsladung Recovered charge	$I_F = 900\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $T_{vj} = 25^{\circ}\text{C}$		65,0		μC
	$V_R = 600\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$		127		μC
	$V_{GE} = -15\text{ V}$ $T_{vj} = 175^{\circ}\text{C}$		171		μC
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 900\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $T_{vj} = 25^{\circ}\text{C}$		29,0		mJ
	$V_R = 600\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$		52,0		mJ
	$V_{GE} = -15\text{ V}$ $T_{vj} = 175^{\circ}\text{C}$		68,0		mJ
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro Diode / per diode	R_{thJC}		0,0868	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}		0,0342	K/W
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

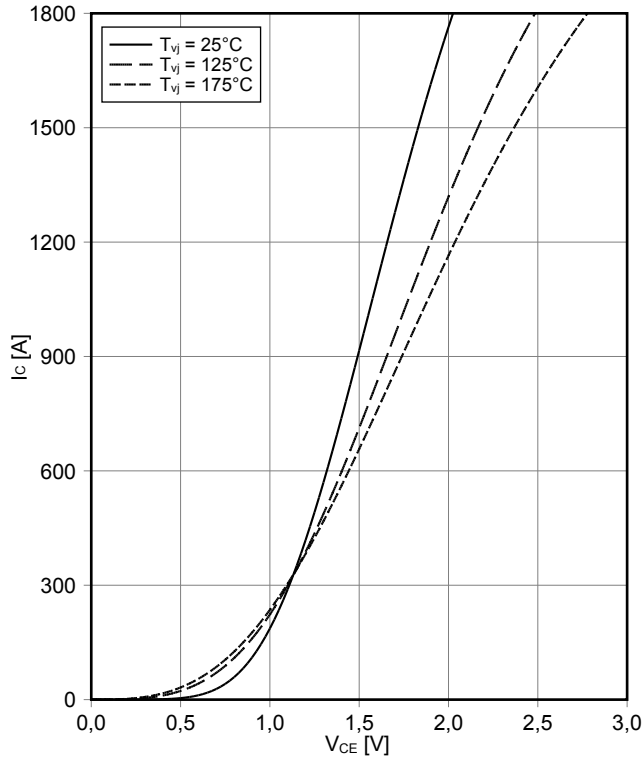
Isolations-Prüfspannung Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V _{ISOL}	3,4		kV
Material Modulgrundplatte Material of module baseplate			Cu		
Innere Isolation Internal isolation	Basisisolierung (Schutzklasse 1, EN61140) basic insulation (class 1, IEC 61140)		Al ₂ O ₃		
Kriechstrecke Creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		15,0 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		
Relativer Temperaturindex (elektr.) RTI Elec.	Gehäuse housing	RTI	140		°C
			min.	typ.	max.
Modulstreuinduktivität Stray inductance module		L _{sCE}		20	nH
Modulleitungswiderstand, Anschlüsse - Chip Module lead resistance, terminals - chip	T _c = 25°C, pro Schalter / per switch	R _{CC+EE'}		0,80	mΩ
Lagertemperatur Storage temperature		T _{stg}	-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
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

T_{vjop} > 150 °C ist nur im Überlastbetrieb zulässig. Detaillierte Angaben sind AN 2018-14 zu entnehmen.

T_{vjop} > 150 °C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

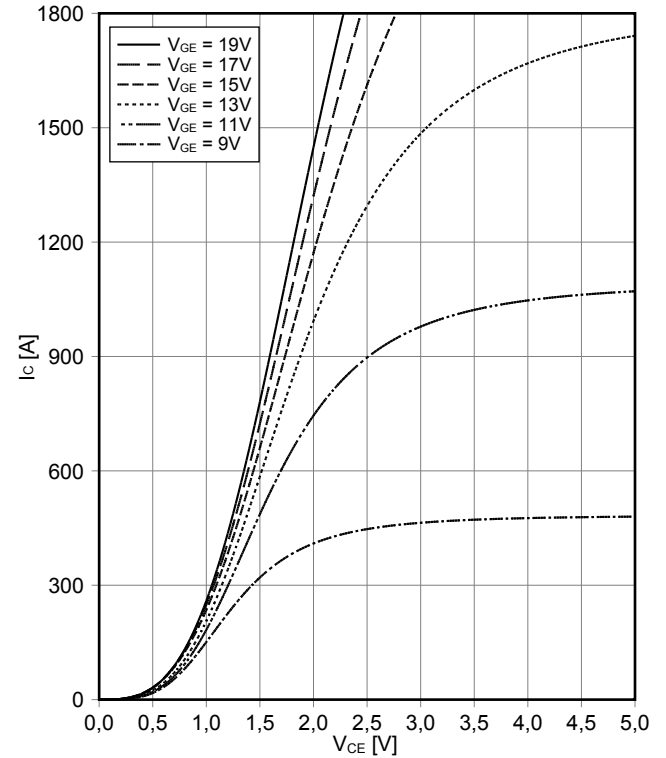
Ausgangskennlinie IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

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



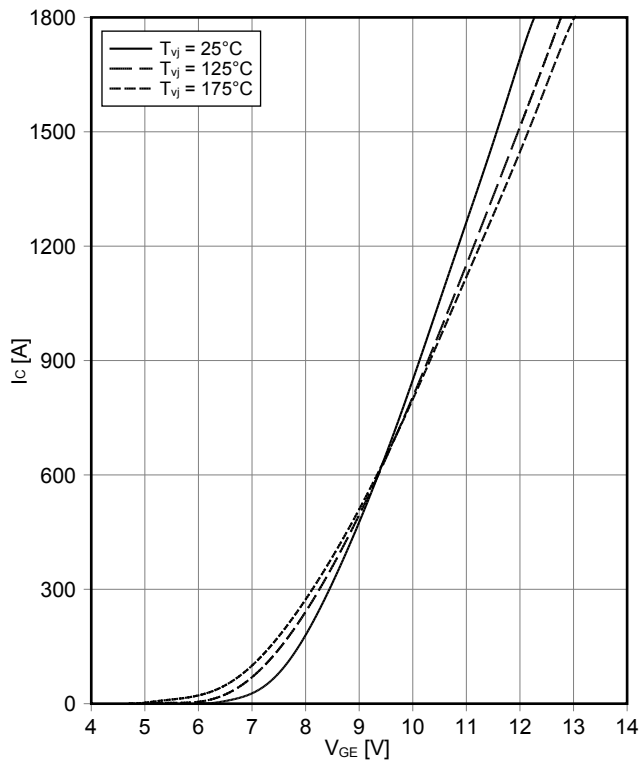
Ausgangskennlinienfeld IGBT, Wechselrichter (typisch)
output characteristic IGBT, Inverter (typical)

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



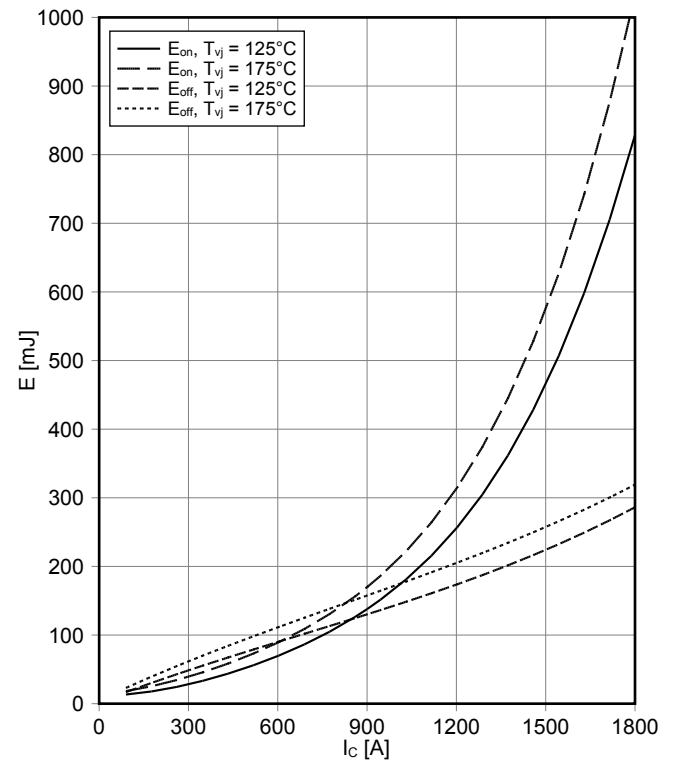
Übertragungscharakteristik IGBT, Wechselrichter (typisch)
transfer characteristic IGBT, Inverter (typical)

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



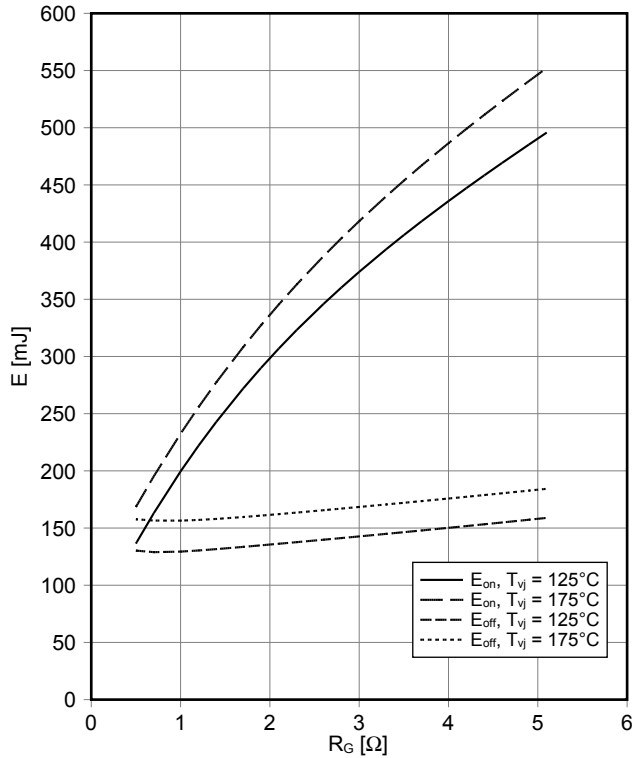
Schaltverluste IGBT, Wechselrichter (typisch)
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.51\ \Omega$, $R_{Goff} = 0.51\ \Omega$, $V_{CE} = 600\text{ V}$



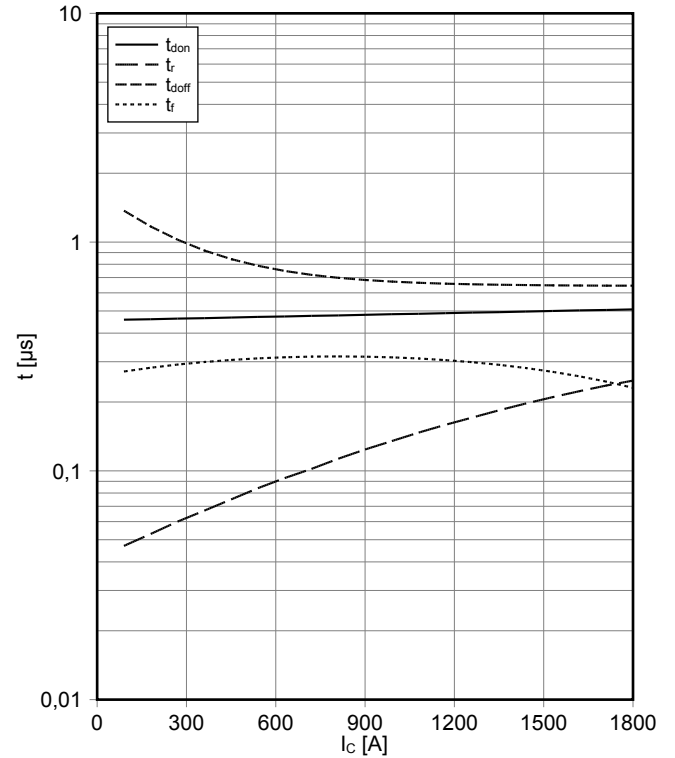
Schaltverluste IGBT, Wechselrichter (typisch)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_c = 900\text{ A}, V_{CE} = 600\text{ V}$



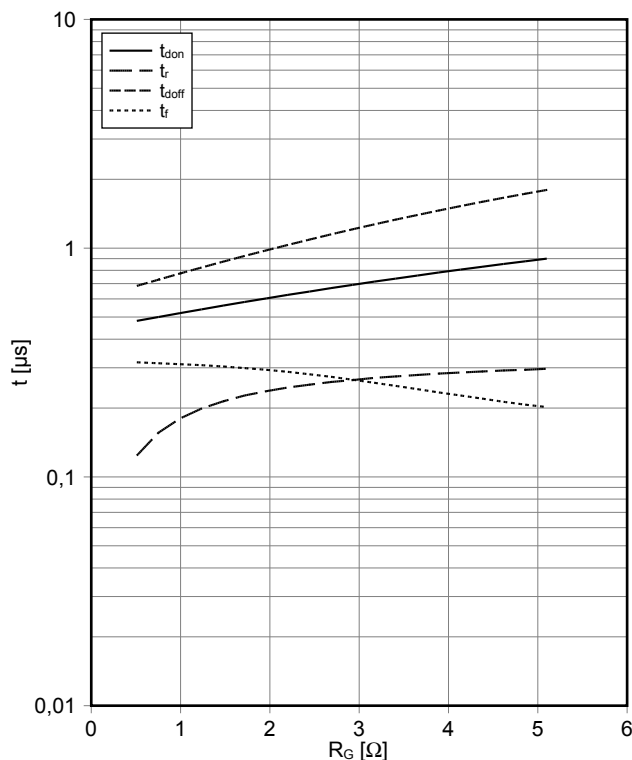
Schaltzeiten IGBT, Wechselrichter (typisch)
switching times IGBT, Inverter (typical)

$t_{don} = f(I_c), t_r = f(I_c), t_{doff} = f(I_c), t_f = f(I_c)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 0.51\ \Omega, R_{Goff} = 0.51\ \Omega, V_{CE} = 600\text{ V}$



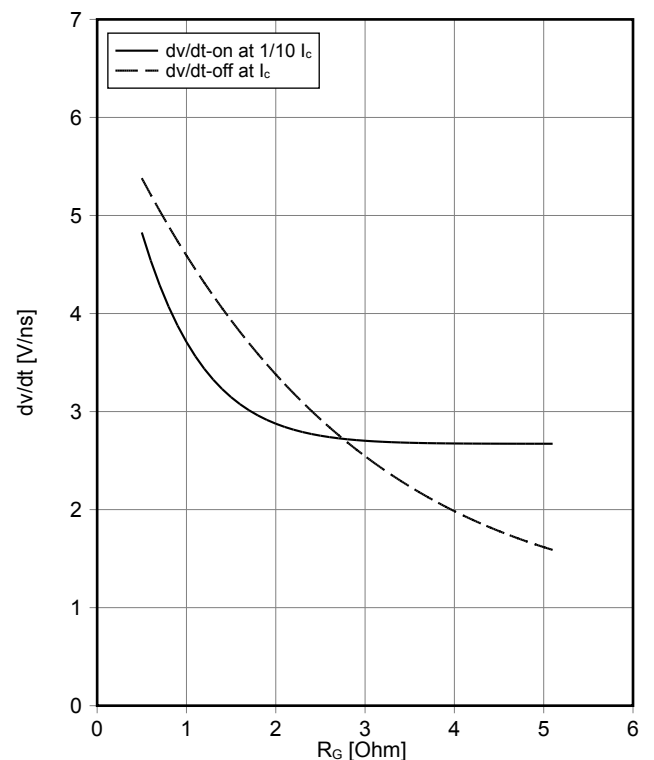
Schaltzeiten IGBT, Wechselrichter (typisch)
switching times IGBT, Inverter (typical)

$t_{don} = f(R_G), t_r = f(R_G), t_{doff} = f(R_G), t_f = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_c = 900\text{ A}, V_{CE} = 600\text{ V}$

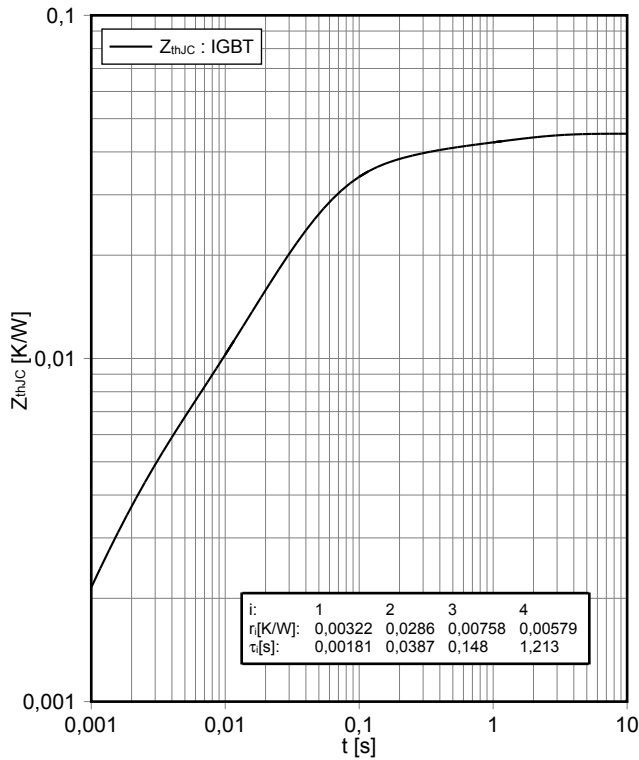


dv/dt IGBT, Wechselrichter (typisch)
dv/dt IGBT, Inverter (typical)

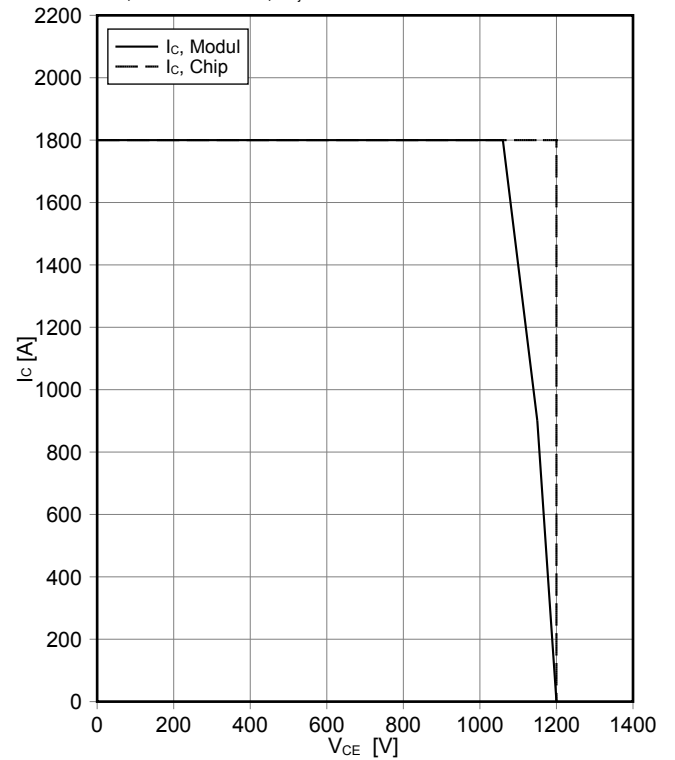
$dv/dt = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_c = 900\text{ A}, V_{CE} = 600\text{ V}, T_{vj} = 25^\circ\text{C}$



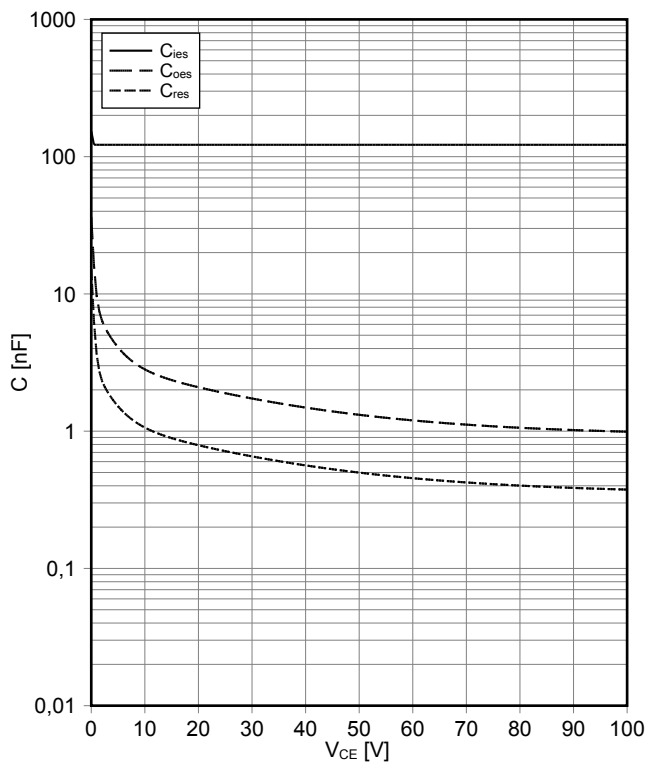
Transienter Wärmewiderstand IGBT, Wechselrichter
transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$



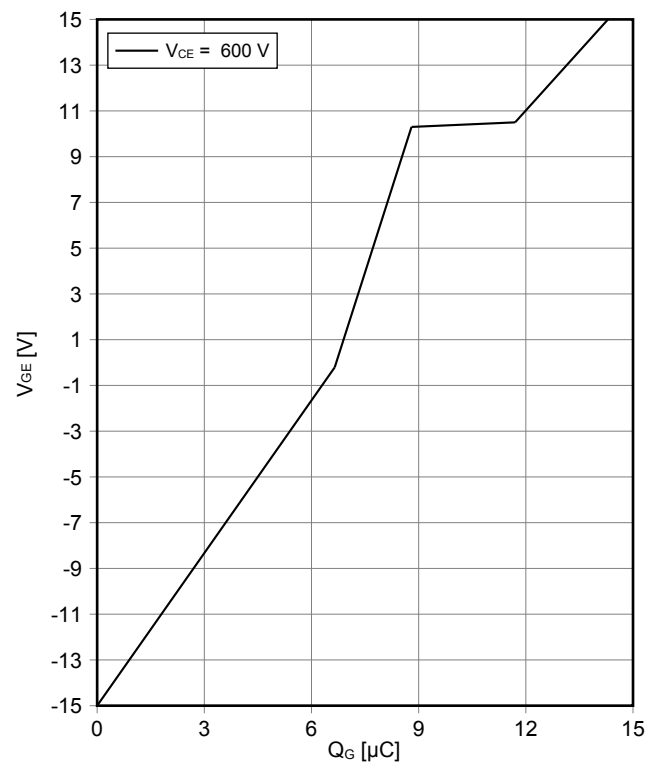
Sicherer Rückwärts-Arbeitsbereich IGBT, Wechselrichter (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 0.51\ \Omega$, $T_{vj} = 175^\circ\text{C}$



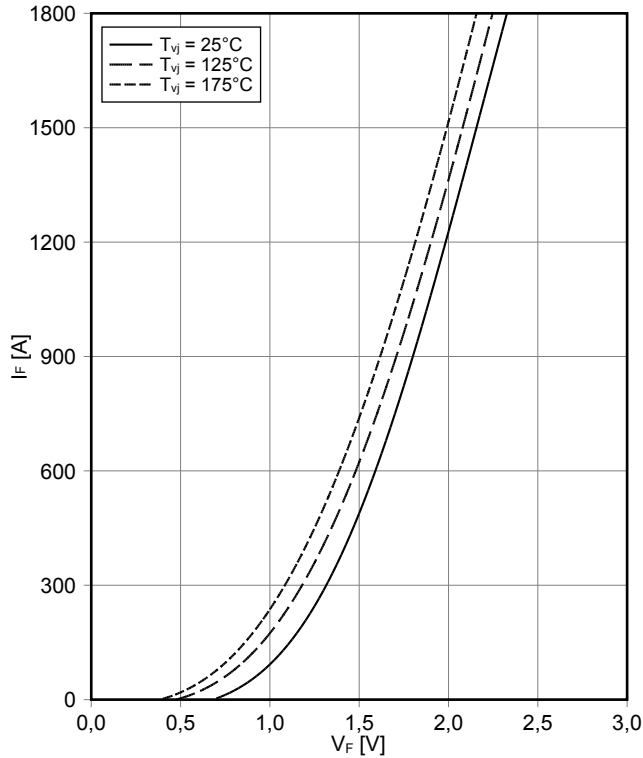
Kapazitäts Charakteristik IGBT, Wechselrichter (typisch)
capacity characteristic IGBT, Inverter (typical)
 $C = f(V_{CE})$
 $V_{GE} = 0\text{ V}$, $T_{vj} = 25^\circ\text{C}$, $f = 100\text{kHz}$



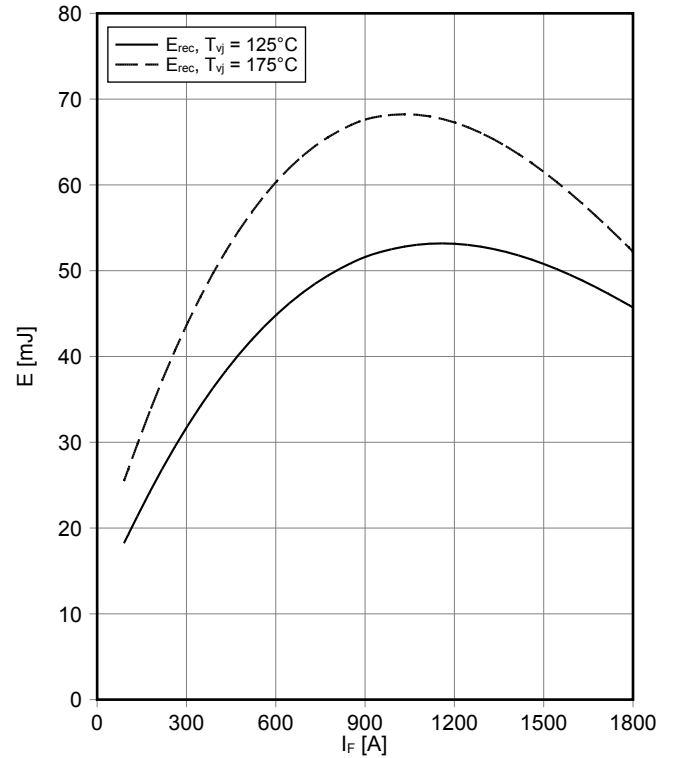
Gateladungs Charakteristik IGBT, Wechselrichter (typisch)
gate charge characteristic IGBT, Inverter (typical)
 $V_{GE} = f(Q_G)$
 $I_C = 900\text{ A}$, $T_{vj} = 25^\circ\text{C}$



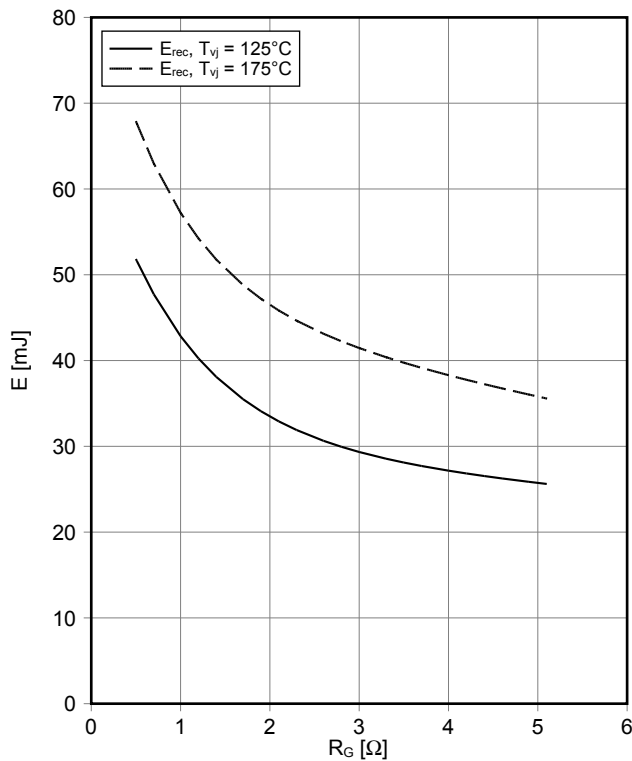
Durchlasskennlinie der Diode, Wechselrichter (typisch)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



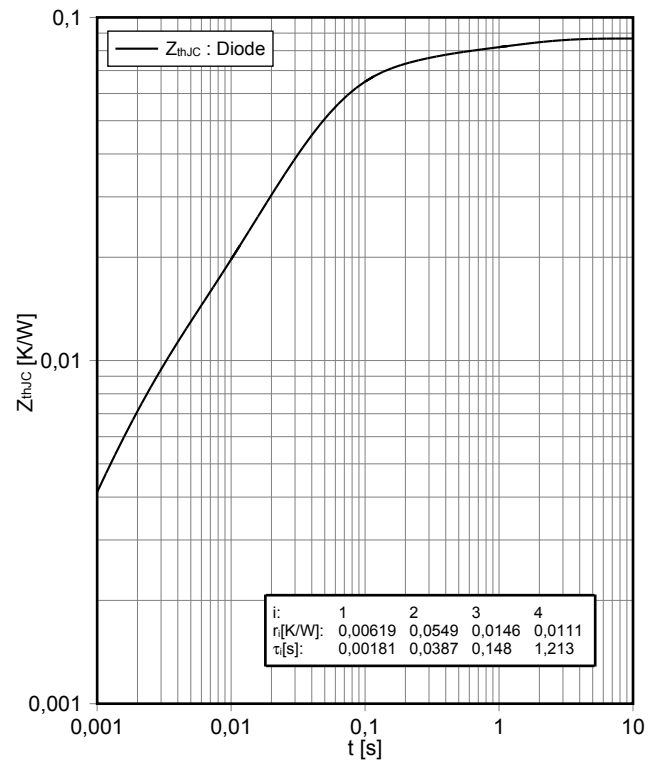
Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 0.51 \Omega, V_{CE} = 600 \text{ V}$



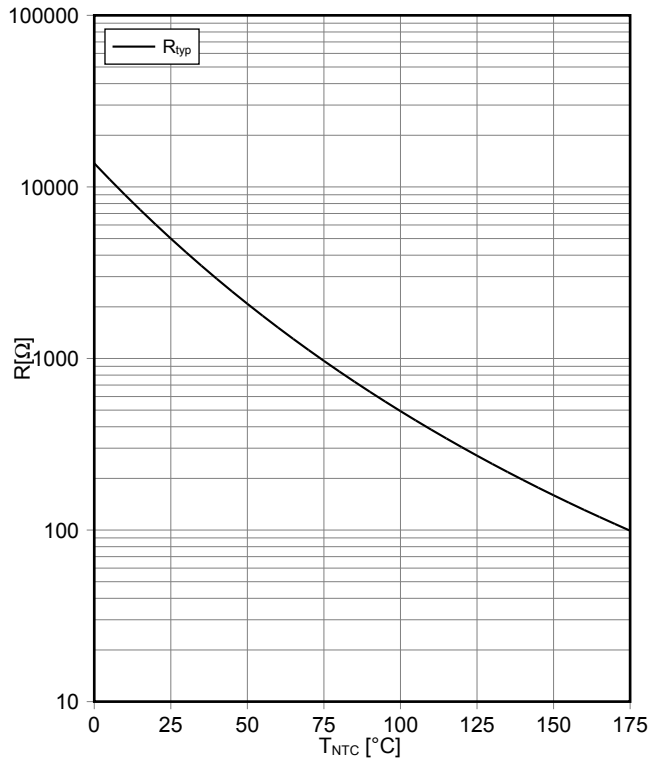
Schaltverluste Diode, Wechselrichter (typisch)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 900 \text{ A}, V_{CE} = 600 \text{ V}$



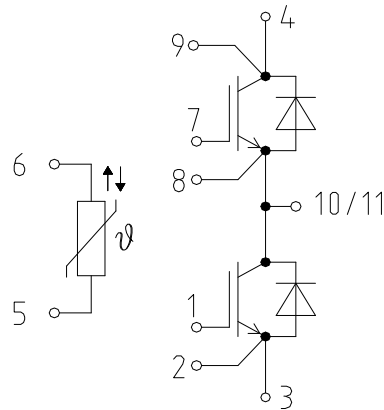
Transienter Wärmewiderstand Diode, Wechselrichter
transient thermal impedance Diode, Inverter
 $Z_{thJC} = f(t)$



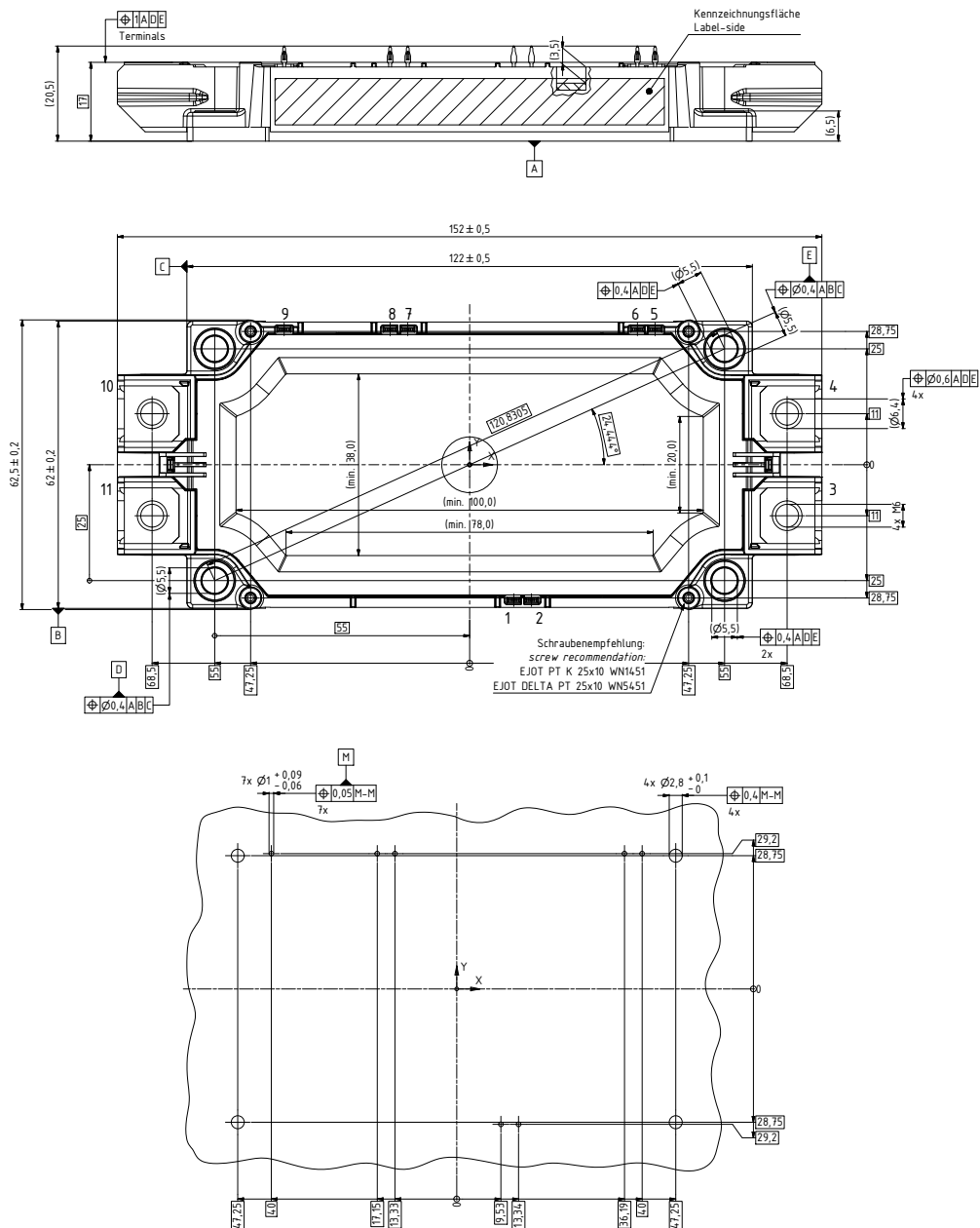
NTC-Widerstand-Temperaturkennlinie (typisch)
NTC-Thermistor-temperature characteristic (typical)
 $R = f(T_{NTC})$



Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines



- PCB: Durchmesser des metallisierten Loches
- PCB: diameter of plated hole