



vorläufige Daten
preliminary data

Höchstzulässige Werte / maximum rated values

Elektrische Eigenschaften / electrical properties

Kollektor Emitter Sperrspannung collector emitter voltage	$T_{vj} = 25\text{ °C}$	V_{CES}	600	V
Kollektor Dauergleichstrom DC collector current	$T_C = 70\text{ °C}$	$I_{C,nom.}$	20	A
	$T_C = 25\text{ °C}$	I_C	26	A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\text{ms}, T_C = 70\text{ °C}$	I_{CRM}	40	A
Gesamt Verlustleistung total power dissipation	$T_C = 25\text{ °C}, \text{ Transistor}$	P_{tot}	89	W
Gate Emitter Spitzenspannung gate emitter peak voltage		V_{GES}	± 20	V
Dauergleichstrom DC forward current		I_F	20	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1\text{ms}$	I_{FRM}	40	A
Grenzlastintegral I^2t value	$V_R = 0\text{V}, t_p = 10\text{ms}, T_{vj} = 125\text{ °C}$	I^2t	73	A^2s
Isolations Prüfspannung insulation test voltage	RMS, $f = 50\text{Hz}, t = 1\text{min}$	V_{ISOL}	2,5	kV

Charakteristische Werte / characteristic values

Transistor Wechselrichter / transistor inverter

			min.	typ.	max.	
Kollektor Emitter Sättigungsspannung collector emitter saturation voltage	$V_{GE} = 15\text{V}, T_{vj} = 25\text{ °C}, I_C = I_{C,nom}$	V_{CESat}	-	1,95	2,55	V
	$V_{GE} = 15\text{V}, T_{vj} = 125\text{ °C}, I_C = I_{C,nom}$		-	2,20	-	V
Gate Schwellenspannung gate threshold voltage	$V_{CE} = V_{GE}, T_{vj} = 25\text{ °C}, I_C = 0,5\text{ mA}$	$V_{GE(th)}$	4,5	5,5	6,5	V
Gateladung gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$	Q_G	-	0,11	-	μC
Eingangskapazität input capacitance	$f = 1\text{MHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$	C_{ies}	-	0,9	-	nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\text{MHz}, T_{vj} = 25\text{ °C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$	C_{res}	-	0,08	-	nF
Kollektor Emitter Reststrom collector emitter cut off current	$V_{CE} = 600\text{ V}, V_{GE} = 0\text{V}, T_{vj} = 25\text{ °C}$	I_{CES}	-	-	5	mA
Gate Emitter Reststrom gate emitter leakage current	$V_{CE} = 0\text{V}, V_{GE} = 20\text{V}, T_{vj} = 25\text{ °C}$	I_{GES}	-	-	400	nA

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Charakteristische Werte / characteristic values

Transistor Wechselrichter / transistor inverter

			min.	typ.	max.	
Einschaltverzögerungszeit (induktive Last) turn on delay time (inductive load)	$I_C = 20 \text{ A}, V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 25^\circ \text{C}$	$t_{d,on}$	-	20	-	ns
	$V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 125^\circ \text{C}$		-	21	-	ns
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 20 \text{ A}, V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 25^\circ \text{C}$	t_r	-	7	-	ns
	$V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 125^\circ \text{C}$		-	8	-	ns
Abschaltverzögerungszeit (induktive Last) turn off delay time (inductive load)	$I_C = 20 \text{ A}, V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 25^\circ \text{C}$	$t_{d,off}$	-	80	-	ns
	$V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 125^\circ \text{C}$		-	110	-	ns
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 20 \text{ A}, V_{CC} = 300 \text{ V}$ $V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 25^\circ \text{C}$	t_f	-	18	-	ns
	$V_{GE} = \pm 15 \text{ V}, R_G = 13 \ \Omega, T_{vj} = 125^\circ \text{C}$		-	25	-	ns
Einschaltverlustenergie pro Puls turn on energy loss per pulse	$I_C = 20 \text{ A}, V_{CC} = 300 \text{ V}$ $R_G = 13 \ \Omega, T_{vj} = 125^\circ \text{C}, L_\sigma = 15 \text{ nH}$	E_{on}	-	0,65	-	mJ
Ausschaltverlustenergie pro Puls turn off energy loss per pulse	$I_C = 20 \text{ A}, V_{CC} = 300 \text{ V}$ $R_G = 13 \ \Omega, T_{vj} = 125^\circ \text{C}, L_\sigma = 15 \text{ nH}$	E_{off}	-	0,45	-	mJ
Kurzschlussverhalten SC data	$t_p \leq 10 \mu\text{sec}, V_{GE} \leq 15 \text{ V}, T_{vj} = 125^\circ \text{C},$ $V_{CC} = 360 \text{ V}, V_{CEmax} = V_{CES} - L_{\sigma CE} \cdot di/dt $	I_{SC}	-	90	-	A
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	25	-	nH
Leitungswiderstand, Anschluss-Chip lead resistance, terminal-chip	$T_c = 25^\circ \text{C}$	$R_{CC/EE}$	-	8	-	m Ω

Charakteristische Werte / characteristic values

Diode Wechselrichter / diode inverter

Durchlassspannung forward voltage	$I_F = 20 \text{ A}, V_{GE} = 0 \text{ V}, T_{vj} = 25^\circ \text{C}$	V_F	-	1,35	1,9	V
	$I_F = 20 \text{ A}, V_{GE} = 0 \text{ V}, T_{vj} = 125^\circ \text{C}$		-	1,30	-	V
Rückstromspitze peak reverse recovery current	$I_F = 20 \text{ A}, -di_F/dt = 2700 \text{ A}/\mu\text{s}$ $V_R = 300 \text{ V}, V_{GE} = -10 \text{ V}, T_{vj} = 25^\circ \text{C}$	I_{RM}	-	51	-	A
	$V_R = 300 \text{ V}, V_{GE} = -10 \text{ V}, T_{vj} = 125^\circ \text{C}$		-	53	-	A
Sperrverzögerungsladung recovered charge	$I_F = 20 \text{ A}, -di_F/dt = 2700 \text{ A}/\mu\text{s}$ $V_R = 300 \text{ V}, V_{GE} = -10 \text{ V}, T_{vj} = 25^\circ \text{C}$	Q_r	-	1,3	-	μC
	$V_R = 300 \text{ V}, V_{GE} = -10 \text{ V}, T_{vj} = 125^\circ \text{C}$		-	2,0	-	μC
Ausschaltenergie pro Puls reverse recovery energy	$I_F = 20 \text{ A}, -di_F/dt = 2700 \text{ A}/\mu\text{s}$ $V_R = 300 \text{ V}, V_{GE} = -10 \text{ V}, T_{vj} = 25^\circ \text{C}$	E_{rec}	-	0,40	-	mJ
	$V_R = 300 \text{ V}, V_{GE} = -10 \text{ V}, T_{vj} = 125^\circ \text{C}$		-	0,55	-	mJ



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Charakteristische Werte / characteristic values

NTC-Widerstand / NTC-thermistor

			min.	typ.	max.	
Nennwiderstand rated resistance	$T_c = 25^\circ\text{C}$	R_{25}	-	5	-	k Ω
Abweichung von R_{100} deviation of R_{100}	$T_c = 100^\circ\text{C}, R_{100} = 493\Omega$	$\Delta R/R$	-5	-	5	%
Verlustleistung power dissipation	$T_c = 25^\circ\text{C}$	P_{25}	-	-	20	mW
B-Wert B-value	$R_2 = R_1 \exp[B(1/T_2 - 1/T_1)]$	$B_{25/50}$	-	3375	-	K

Thermische Eigenschaften / thermal properties

Innerer Wärmewiderstand; DC thermal resistance, junction to case; DC	Transistor Wechselr. / transistor inverter	R_{thJC}	-	-	1,40	K/W
	Diode Wechselrichter / diode inverter		-	-	2,30	K/W
Wärmewiderstand; DC thermal resistance, junction to heatsink; DC	Transistor Wechselr. / transistor inverter	R_{thJH}	-	1,65	-	K/W
	Diode Wechselrichter / diode inverter		-	2,75	-	K/W
	$\lambda_{\text{Paste}} = 1 \text{ W/m}^2\text{K} / \lambda_{\text{grease}} = 1 \text{ W/m}^2\text{K}$					
Übergangs-Wärmewiderstand, DC thermal resistance, case to heatsink, DC	Transistor Wechselr. / transistor inverter	R_{thCH}	-	0,45	-	K/W
	Diode Wechselrichter / diode inverter		-	0,75	-	K/W
	$\lambda_{\text{Paste}} = 1 \text{ W/m}^2\text{K} / \lambda_{\text{grease}} = 1 \text{ W/m}^2\text{K}$					
Höchstzulässige Sperrschichttemp. maximum junction temperature		T_{vjmax}	-	-	150	$^\circ\text{C}$
Betriebstemperatur operation temperature		T_{op}	-40	-	125	$^\circ\text{C}$
Lagertemperatur storage temperature		T_{stg}	-40	-	125	$^\circ\text{C}$

Mechanische Eigenschaften / mechanical properties

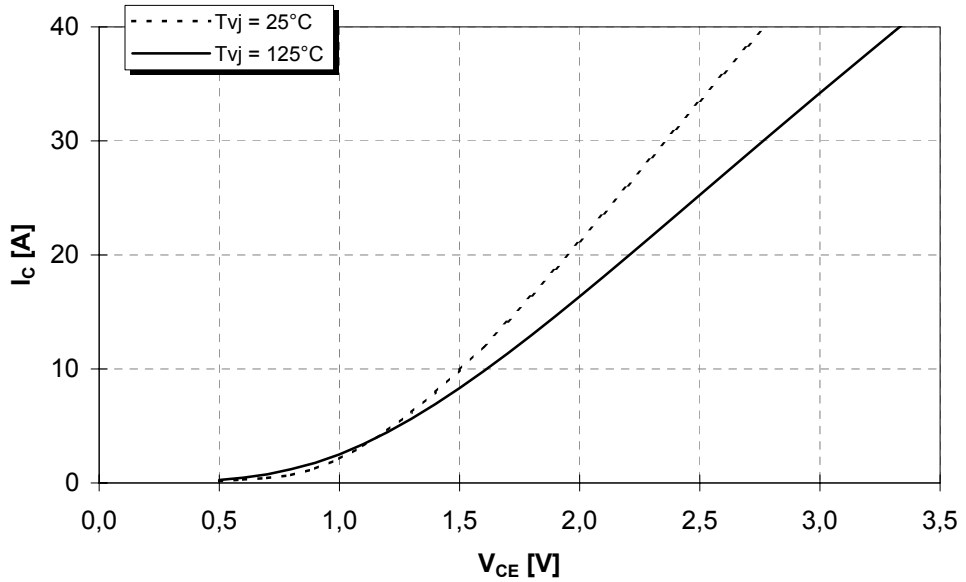
Innere Isolation internal insulation				Al_2O_3	
CTI comperative tracking index				225	
Anpresskraft pro Feder mounting force per clamp		F		20..50	N
Gewicht weight		G		25	g
Kriechstrecke creepage distance	Anschluss - Kühlkörper terminal to heatsink			10,5	mm
	Anschluss - Anschluss terminal to terminal			5	mm
Luftstrecke clearance distance	Anschluss - Kühlkörper terminal to heatsink			9	mm
	Anschluss - Anschluss terminal to terminal			5	mm



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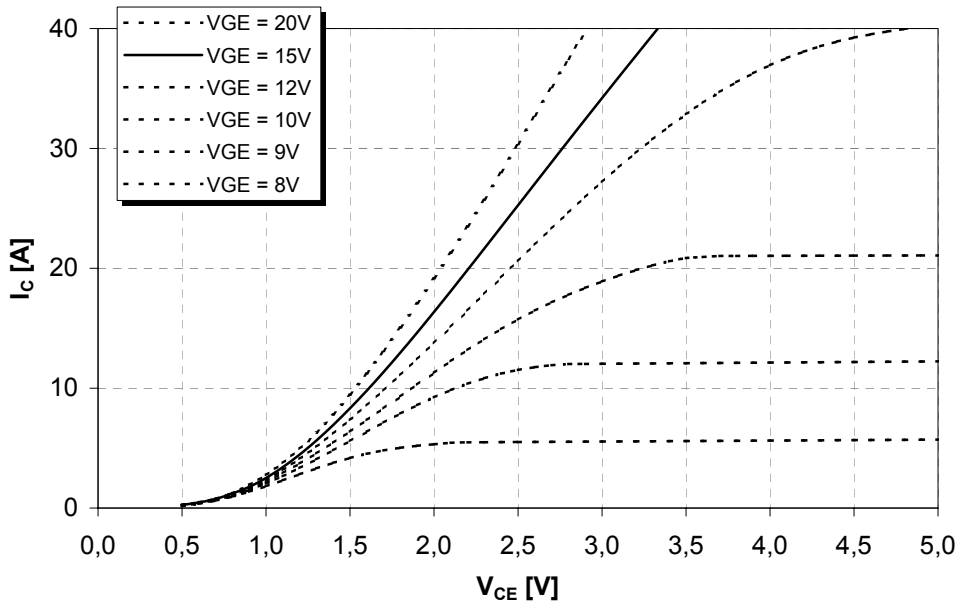
Ausgangskennlinie (typisch)
output characteristic (typical)

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



Ausgangskennlinienfeld (typisch)
output characteristic (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 125°C$

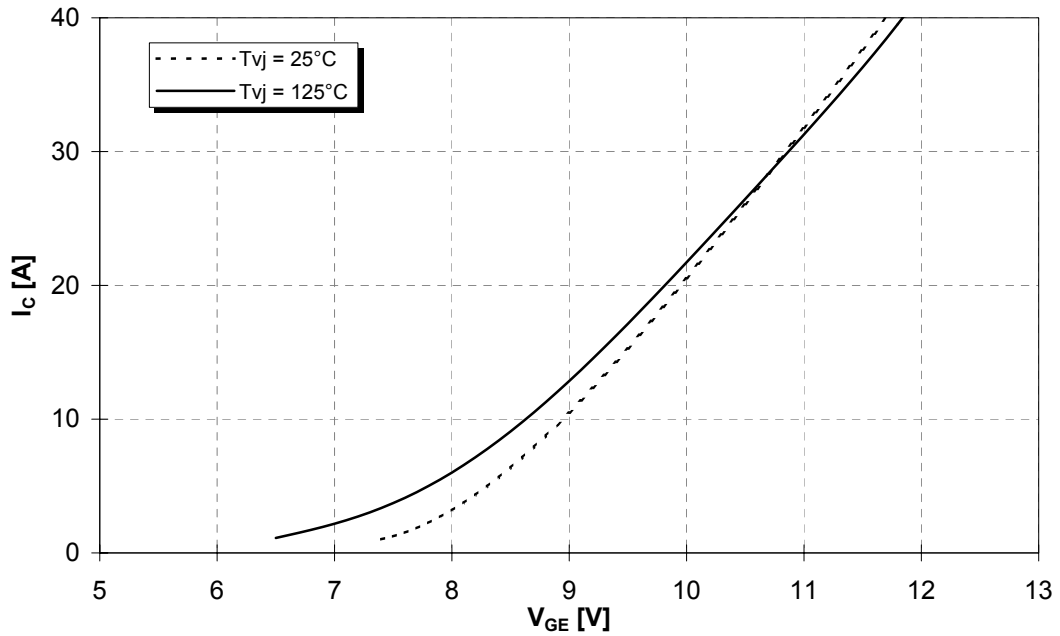




vorläufige Daten
preliminary data

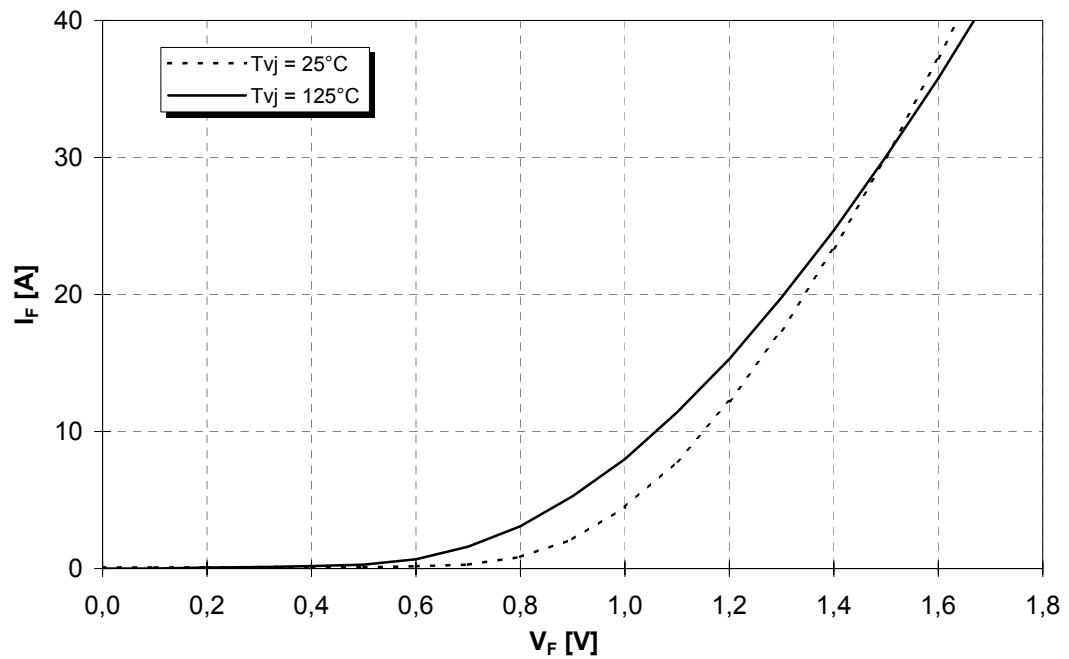
Übertragungscharakteristik (typisch)
transfer characteristic (typical)

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



Durchlasskennlinie der Inversdiode (typisch)
forward characteristic of inverse diode (typical)

$I_F = f(V_F)$

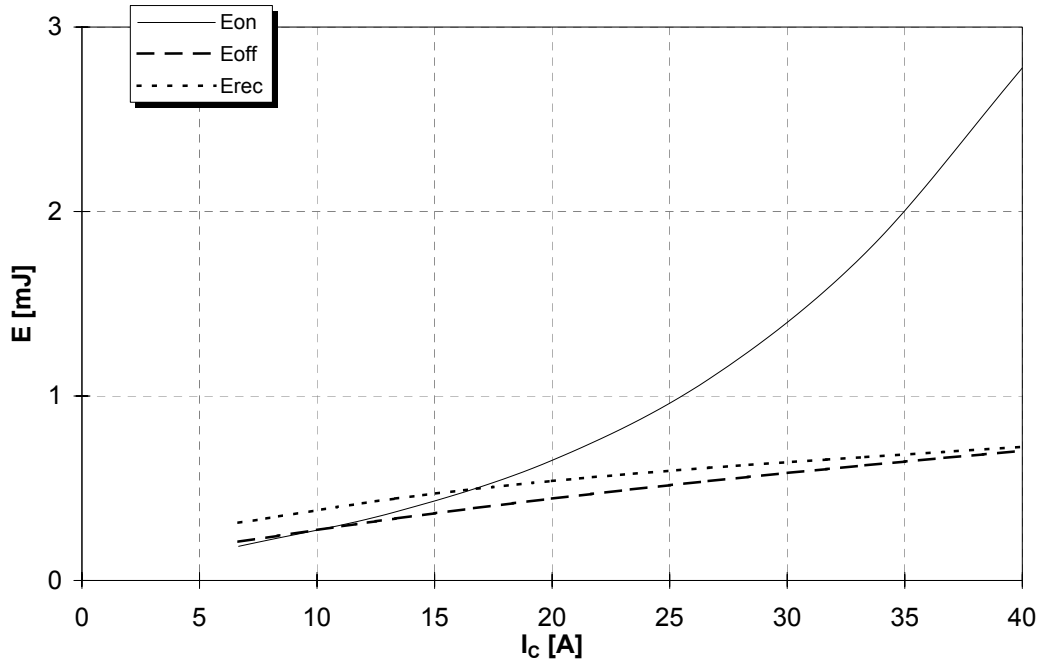




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preliminary data

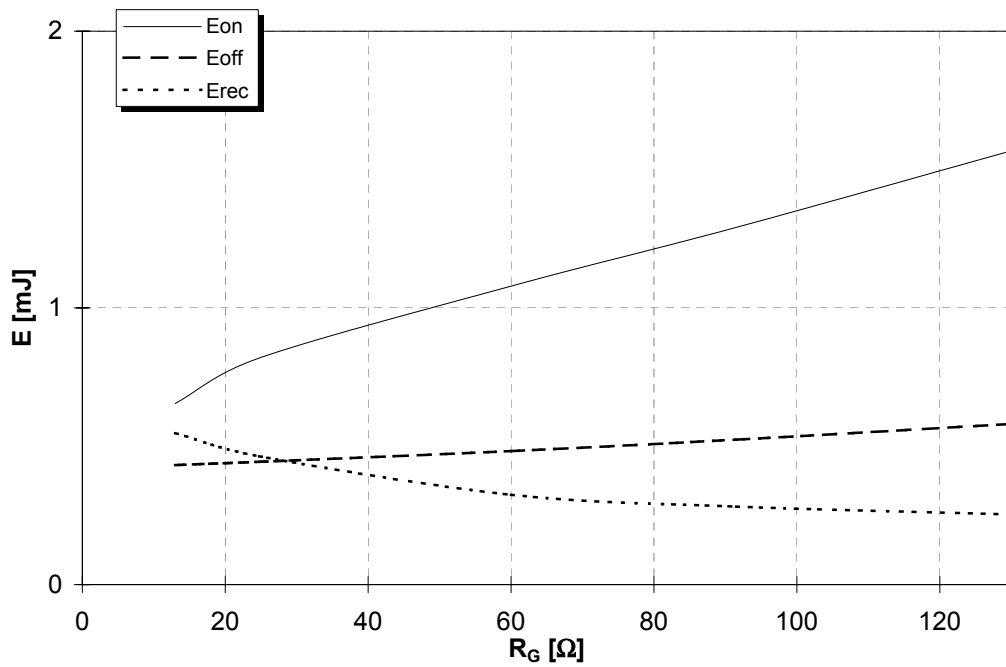
Schaltverluste (typisch)
switching losses (typical)

$E_{on} = f(I_C), E_{off} = f(I_C), E_{rec} = f(I_C)$
 $V_{GE} = \pm 15V, R_{Gon} = R_{Goff} = 13\Omega, V_{CE} = 300V, T_{vj} = 125^\circ C$



Schaltverluste (typisch)
switching losses (typical)

$E_{on} = f(R_G), E_{off} = f(R_G), E_{rec} = f(R_G)$
 $V_{GE} = \pm 15V, I_C = 20A, V_{CE} = 300V, T_{vj} = 125^\circ C$

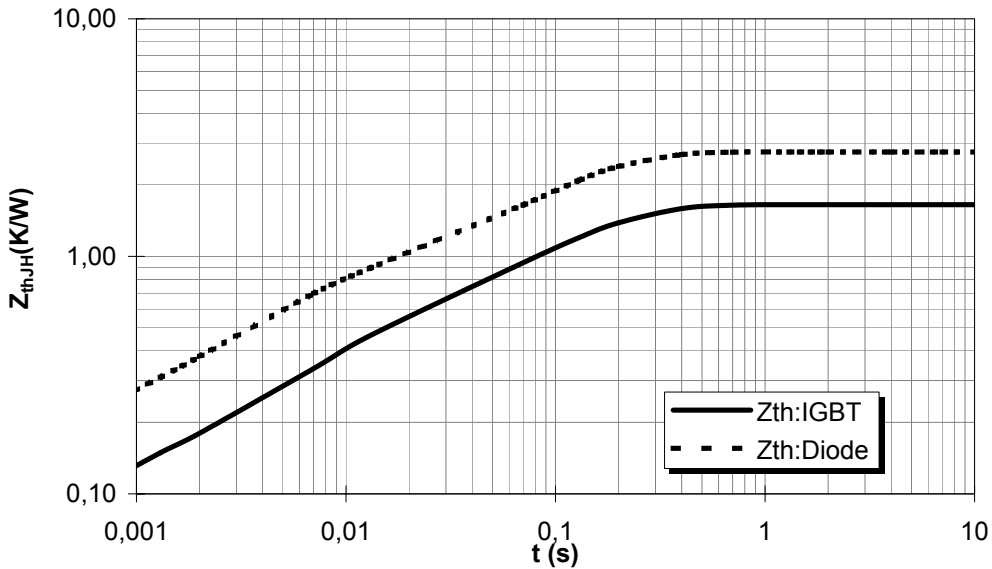




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Transienter Wärmewiderstand
transient thermal impedance

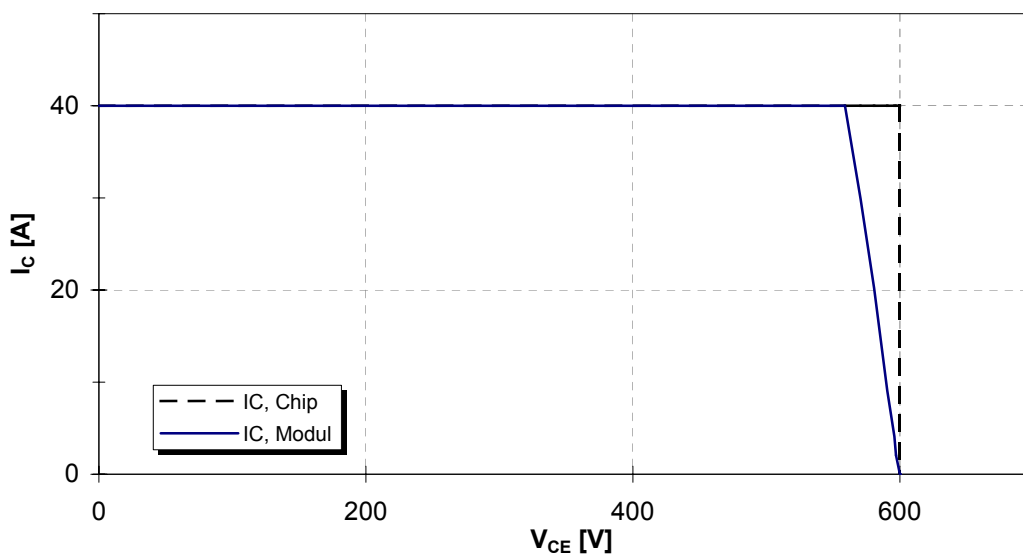
$$Z_{thJH} = f(t)$$



i	1	2	3	4
r_i [K/kW]: IGBT	99,0	330,0	924,0	297,0
τ_i [s]: IGBT	0,00043	0,00942	0,11831	0,17410
r_i [K/kW]: Diode	165,0	550,0	1540,0	495,0
τ_i [s]: Diode	0,00031	0,00508	0,10706	0,14371

Sicherer Arbeitsbereich (RBSOA)
reverse bias safe operation area (RBSOA)

$V_{GE}=15V, T_J=125^\circ C, R_G = 13 \Omega$



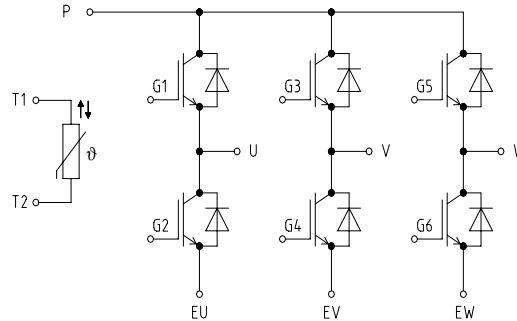
IGBT-Module
IGBT-Modules

FS20R06XL4

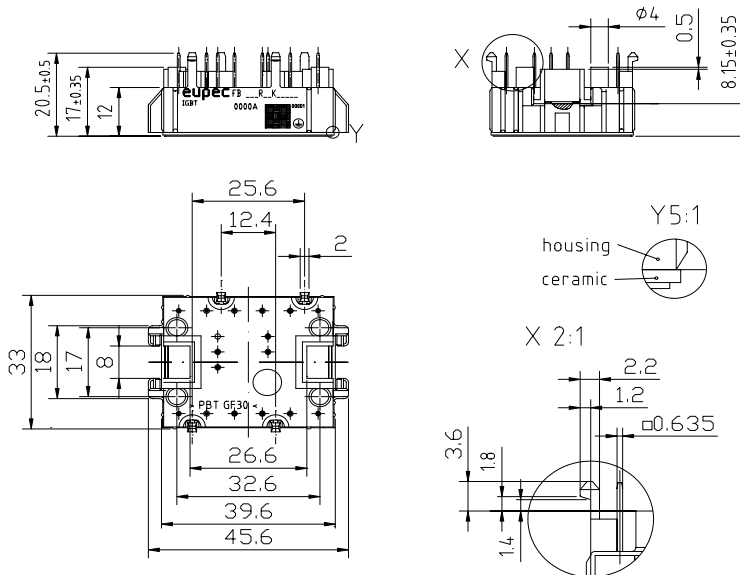


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Schaltbild circuit diagram

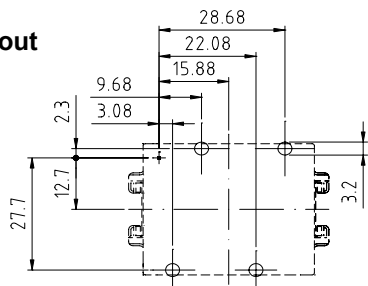


Gehäusemaße package outline

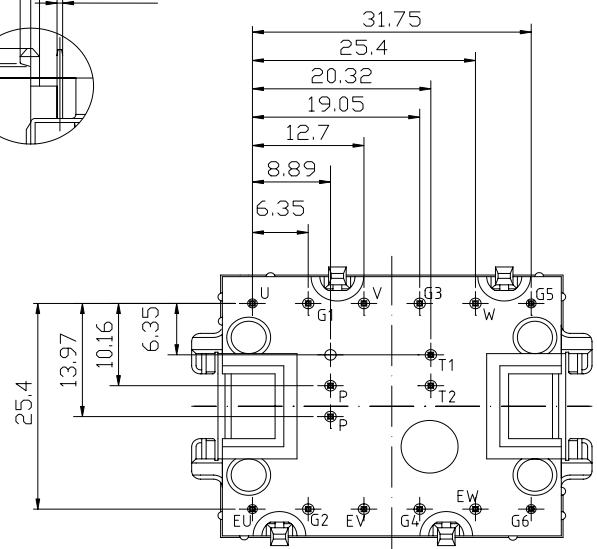


Module only designed for mounting on PCB with 1.6 ± 0.2 mm thickness

Bohrplan drilling layout



Pinpositions with tolerance



Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen technischen Erläuterungen.

This technical information specifies semiconductor devices but promises no characteristics. It is valid with the belonging technical notes.