Vincotech

final data sheet

flow **PHASE 0 1200V/ 50A**

V23990-P567-F10-01-14

Maximum Ratings / Höchstzulässige Werte

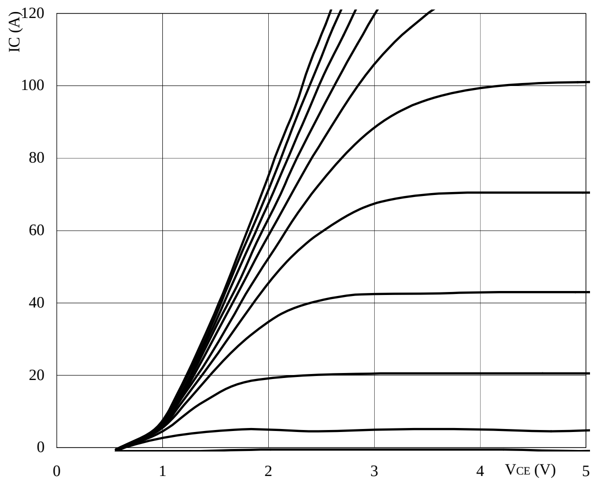
Parameter	Condition		Symbol	Datasheet values max.	Unit
Transistor Inverter **Transistor Wechselrichter**					
Collector-emitter break down voltage Kollektor-Emitter-Sperrspannung			V_{CE}	1200	V
DC collector current Kollektor-Dauergleichstrom	T_j=150°C	T_h=80°C, T_c=80°C	I_C	44 57	A
Repetitive peak collector current Periodischer Kollektorspitzenstrom	t_p=1ms	T_h=80°C	I_{cpuls}	88	A
Power dissipation per IGBT Verlustleistung pro IGBT	T_j=150°C	T_h=80°C T_c=80°C	P_{tot}	85 129	W
Gate-emitter peak voltage Gate-Emitter-Spitzenspannung			V_{GE}	±20	V
SC withstand time Kurzschlußverhalten	Tj≤125°C V_{CC}=900V	V_{GE}=15V	t_{SC}	10	us
Diode Inverter **Diode Wechselrichter**					
DC forward current Dauergleichstrom	T_j=150°C	T_h=80°C, T_c=80°C	I_F	41 54	A
Repetitive peak forward current Periodischer Spitzenstrom	t_p=1ms	T_h=80°C	I_{FRM}	81 109	A
Power dissipation per Diode Verlustleistung pro Diode	T_j=150°C	T_h=80°C T_c=80°C	P_{tot}	62 93	W
Thermal properties **Thermische Eigenschaften**					
max. Chip temperature max. Chiptemperatur			T_{jmax}	150	°C
Storage temperature Lagertemperatur			T_{stg}	-40…+125	°C
Operation temperature Betriebstemperatur			T_{op}	-40…+125	°C
Insulation properties **Modulisolation**					
Insulation voltage Isolationsspannung		t=1min	V_{is}	4000	Vdc
Creepage distance Kriechstrecke				min 12,7	mm
Clearance Luftstrecke				min 12,7	mm

Characteristic values/ Charakteristische Werte

Description	Symbol	Conditions					Datasheet values			Unit
		T(C°)	Other conditions (Rgon-Rgoff)	VGE(V) VGS(V)	VR(V) VCE(V) VDS(V)	IC(A) IF(A) Id(A)	Min	Typ	Max	
Transistor Inverter, inductive load **Transistor Wechselrichter**										
Gate emitter threshold voltage	$V_{GE(th)}$	Tj=25°C	VCE=VGE			0,002	5	5,8	6,5	V
Gate-Schwellenspannung		Tj=150°C								
Collector-emitter saturation voltage	$V_{CE(sat)}$	Tj=25°C		15		50		1,75	2,2	V
Kollektor-Emitter Sättigungsspannung		Tj=125°C						2		
Collector-emitter cut-off	I_{CES}	Tj=25°C		0	1200				0,4	mA
Kollektor-Emitter Reststrom		Tj=125°C								
Gate-emitter leakage current	I_{GES}	Tj=25°C		30	0				700	nA
Gate-Emitter Reststrom		Tj=150°C								
Integrated Gate resistor	R_{gint}							4		Ohm
Integrirter Gate Widerstand										
Turn-on delay time	$t_{d(on)}$	Tj=25°C	Rgoff=18 Ohm							ns
Einschaltverzögerungszeit		Tj=125°C	Rgon=18 Ohm	±15	600	50		75		
Rise time	t_r	Tj=25°C	Rgoff=18 Ohm							ns
Anstiegszeit		Tj=125°C	Rgon=18 Ohm	±15	600	50		25		
Turn-off delay time	$t_{d(off)}$	Tj=25°C	Rgoff=18 Ohm							ns
Abschaltverzögerungszeit		Tj=125°C	Rgon=18 Ohm	±15	600	50		465		
Fall time	t_f	Tj=25°C	Rgoff=18 Ohm							ns
Fallzeit		Tj=125°C	Rgon=18 Ohm	±15	600	50		217		
Turn-on energy loss per pulse	E_{on}	Tj=25°C	Rgoff=18 Ohm							mWs
Einschaltverlustenergie pro Puls		Tj=125°C	Rgon=18 Ohm	±15	600	50		6,2		
Turn-off energy loss per pulse	E_{off}	Tj=25°C	Rgoff=18 Ohm							mWs
Abschaltverlustenergie pro Puls		Tj=125°C	Rgon=18 Ohm	±15	600	50		5,5		
Input capacitance	C_{ies}	Tj=25°C	f=1MHz	0	25			3,7		nF
Eingangskapazität		Tj=125°C								
Output capacitance	C_{oss}	Tj=25°C	f=1MHz	0	25			0,8		nF
Ausgangskapazität		Tj=125°C								
Reverse transfer capacitance	C_{rss}	Tj=25°C	f=1MHz	0	25			0,7		nF
Rückwirkungskapazität		Tj=125°C								
Gate charge	Q_{Gate}	Tj=25°C						470		nC
Gate Ladung		Tj=125°C								
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}		Thermal grease thickness≤50um					0,82		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehause pro Chip	R_{thJC}		Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,54		K/W
Coupled thermal resistance inverter diode-transistor Gekoppelte Wärmewiderstand Wechselrichter Diode-Transistor	R_{thJH}		Thermal grease thickness≤50um					0,08		K/W
Coupled thermal resistance inverter transistor-transistor Gekoppelte Wärmewiderstand Wechselrichter Transistor-Transistor	R_{thJH}		Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,06		K/W
Diode Inverter **Diode Wechselrichter**										
Diode forward voltage	V_F	Tj=25°C				50		1,55	2,3	V
Durchlaßspannung		Tj=125°C						1,6		
Peak reverse recovery current	I_{RM}	Tj=25°C	Rgon=18 Ohm							A
Rückstromspitze		Tj=125°C	di0/dt = 2250 A/us	0	600	50		89		
Reverse recovery time	t_{rr}	Tj=25°C	Rgon=18 Ohm							ns
Sperreverzögerungszeit		Tj=125°C	di0/dt = 2250 A/us	0	600	50		506		
Reverse recovered charge	Q_{rr}	Tj=25°C	Rgon=18 Ohm							uC
Sperrverzögerungsladung		Tj=125°C	di0/dt = 2250 A/us	0	600	50		12,7		
Reverse recovered energy	Erec	Tj=25°C	Rgon=18 Ohm							mWs
Sperrverzögerungsenergie		Tj=125°C	di0/dt = 2250 A/us	0	600	50		5		
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}		Thermal grease thickness≤50um					1,14		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehause pro Chip	R_{thJC}		Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,75		K/W
Coupled thermal resistance inverter transistor-diode Gekoppelte Wärmewiderstand Wechselrichter Transistor-Diode	R_{thJH}		Thermal grease thickness≤50um					0,06		K/W
Coupled thermal resistance inverter diode-diode Gekoppelte Wärmewiderstand Wechselrichter Diode-Diode	R_{thJH}		Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,05		K/W

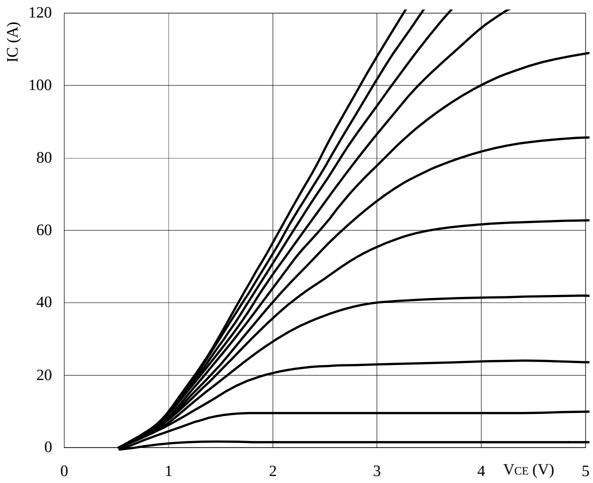
Output inverter

Figure 1. Typical output characteristics
Output inverter IGBT
Ic= f(VCE)



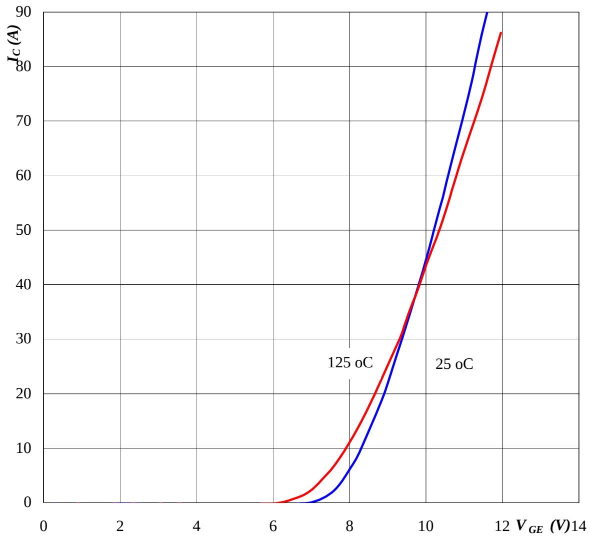
parameter: tp = 250 us Tj = 25 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

Figure 2. Typical output characteristics
Output inverter IGBT
Ic= f(VCE)



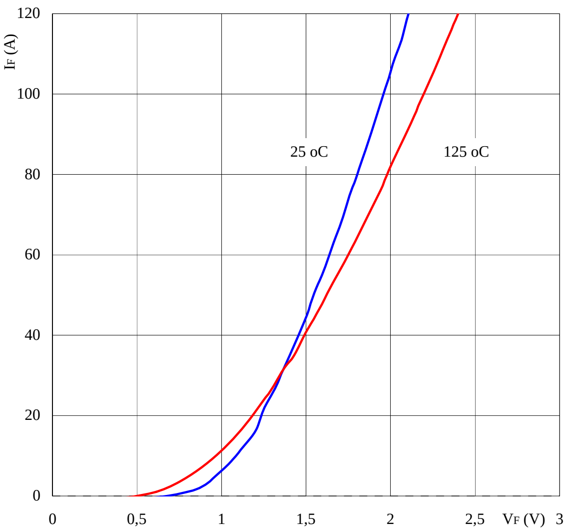
parameter: tp = 250 us Tj = 125 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

Figure 3. Typical transfer characteristics
Output inverter IGBT
Ic= f(VGE)



parameter: tp = 250 us VCE = 10 V

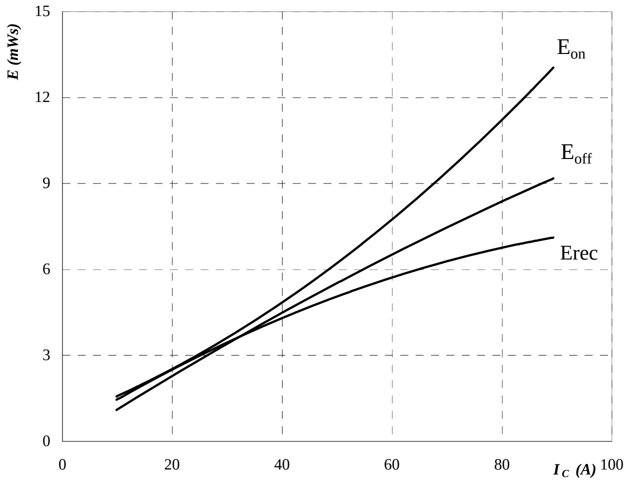
Figure 4. Typical diode forward current as a function of forward voltage
Output inverter FRED IF=f(VF)



parameter: tp = 250 us

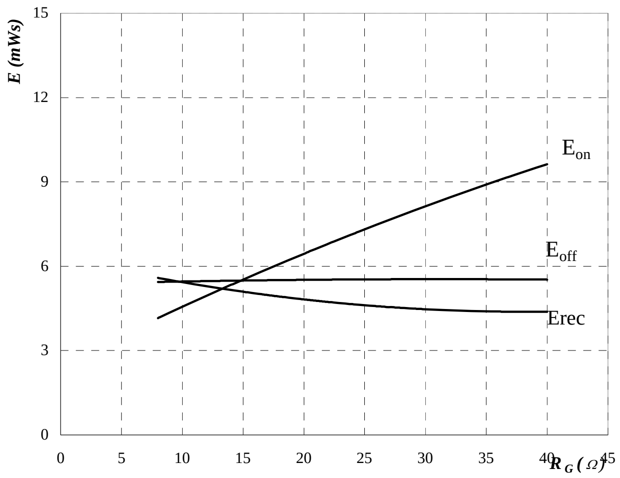
Output inverter

Figure 5. Typical switching energy losses as a function of collector current
Output inverter IGBT
E = f (Ic)



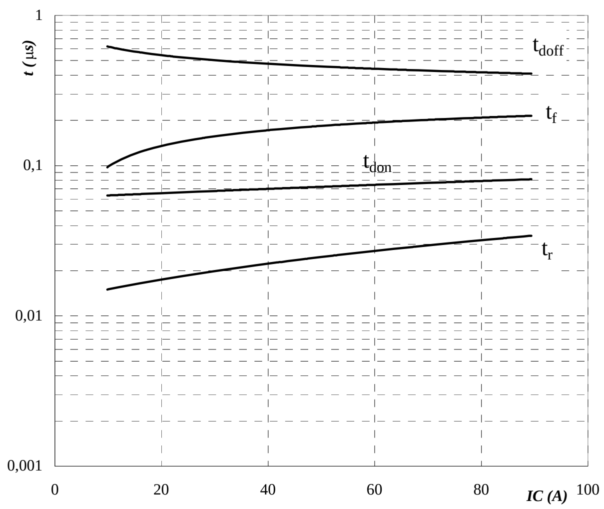
inductive load, Tj = 125 °C
VCE = 600 V
VGE= ±15 V
Rgon= 18 Ω
Rgoff= 18 Ω

Figure 6. Typical switching energy losses as a function of gate resistor
Output inverter IGBT
E = f (RG)



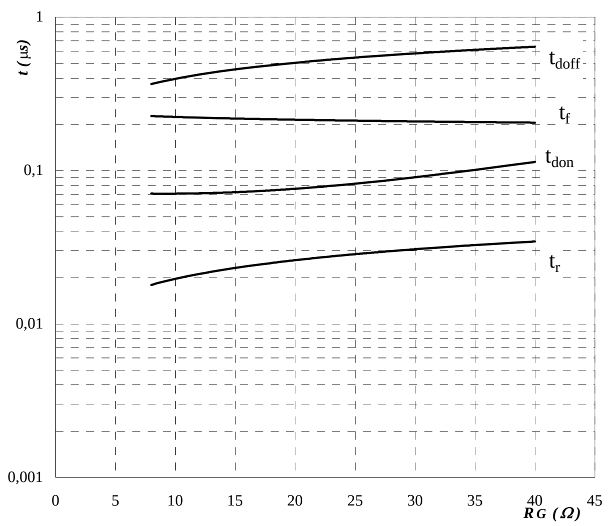
inductive load, Tj = 125 °C
VCE = 600 V
VGE= ±15 V
Ic = 50 A

Figure 7. Typical switching times as a function of collector current
Output inverter IGBT
t = f (Ic)



inductive load, Tj = 125 °C
VCE = 600 V
VGE= ±15 V
Rgon= 18 Ω
Rgoff= 18 Ω

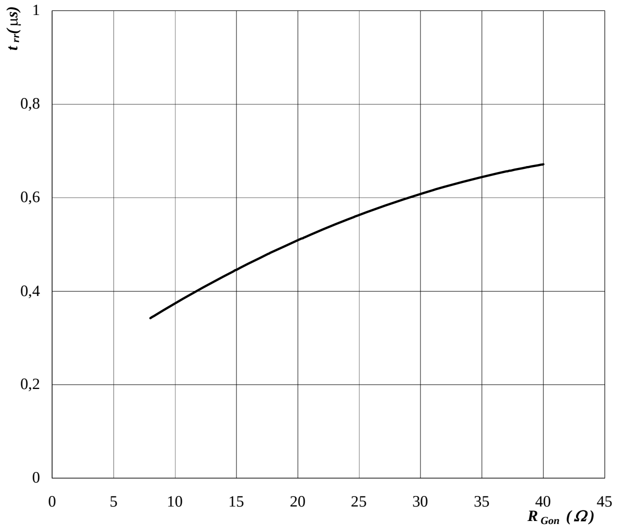
Figure 8. Typical switching times as a function of gate resistor
Output inverter IGBT
t = f (RG)



inductive load, Tj = 125 °C
VCE = 600 V
VGE= ±15 V
Ic = 50 A

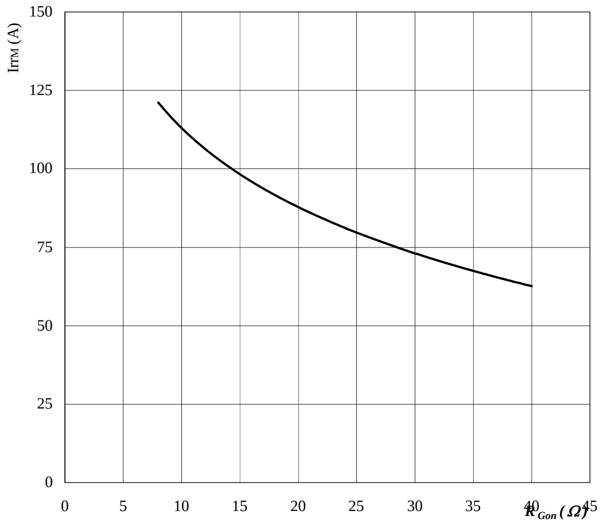
Output inverter

Figure 9. **Typical reverse recovery time as a function of IGBT turn on gate resistor**
Output inverter FRED diode
t_{rr} = f (Rgon)



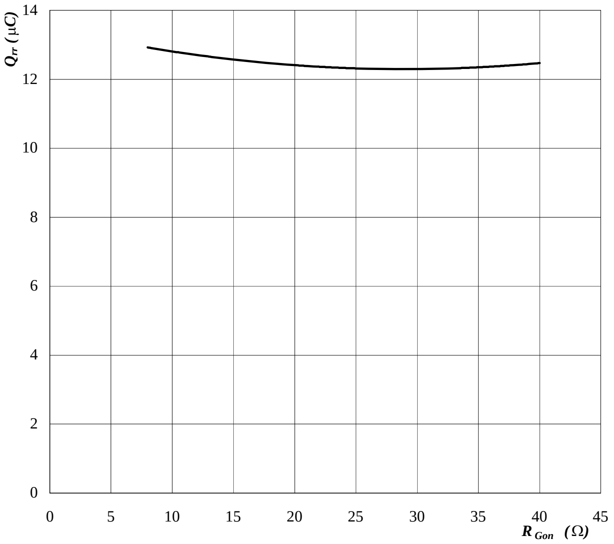
Tj =	125	°C
V_R =	600	V
I_F=	50	A

Figure 10. **Typical reverse recovery current as a function of IGBT turn on gate resistor**
Output inverter FRED diode
I_{RRM} = f (Rgon)



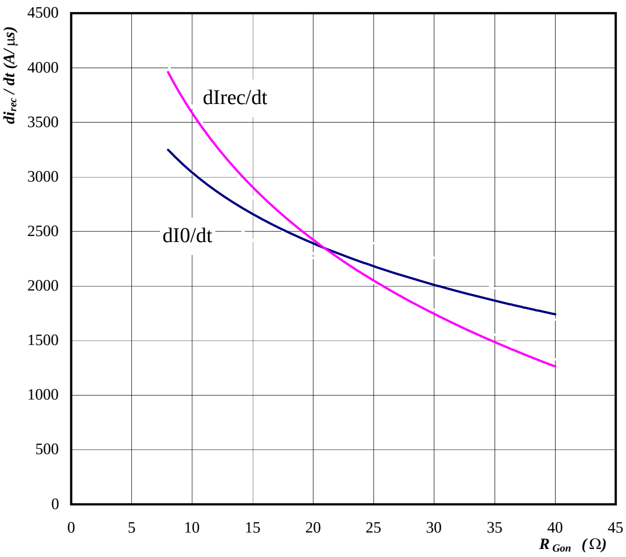
Tj =	125	°C
V_R =	600	V
I_F=	50	A

Figure 11. **Typical reverse recovery charge as a function of IGBT turn on gate resistor**
Output inverter FRED diode
Q_{rr} = f (Rgon)



Tj =	125	°C
V_R =	600	V
I_F=	50	A

Figure 12. **Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor**
Output inverter FRED diode
dI0/dt,dIrec/dt= f (Rgon)

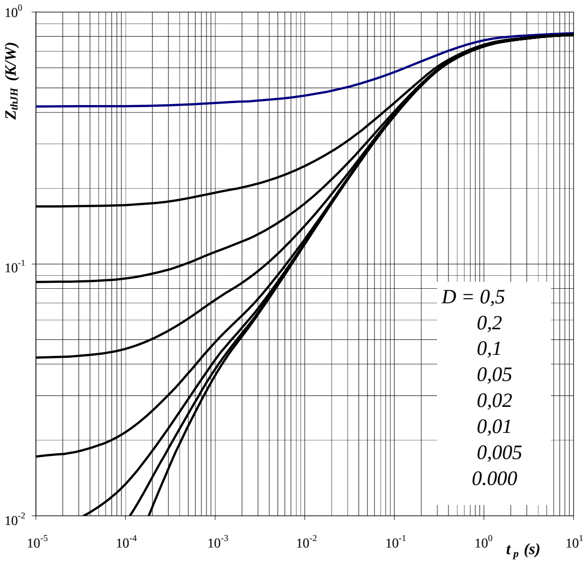


Tj =	125	°C
V_R =	600	V
I_F=	50	A

Output inverter

Figure 13. IGBT transient thermal impedance as a function of pulse width

ZthJH = f(tp)



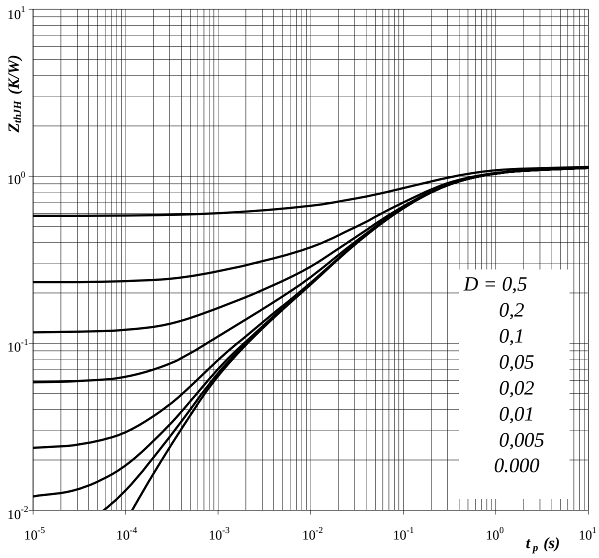
Parameter: D = tp / T RthJH= 0,82 K/W

IGBT thermal model values

R (C/W)	Tau (s)
0,05	1,6E+01
0,12	1,4E+00
0,43	2,2E-01
0,15	4,5E-02
0,06	8,0E-03

Figure 14. FRED transient thermal impedance as a function of pulse width

ZthJH = f(tp)



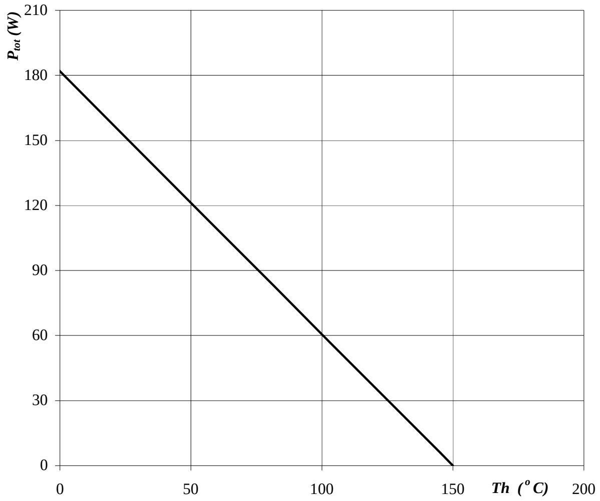
Parameter: D = tp / T RthJH= 1,14 K/W

FRED thermal model values

R (C/W)	Tau (s)
0,06	2,4E+01
0,11	1,8E+00
0,41	2,6E-01
0,36	6,6E-02
0,15	1,2E-02

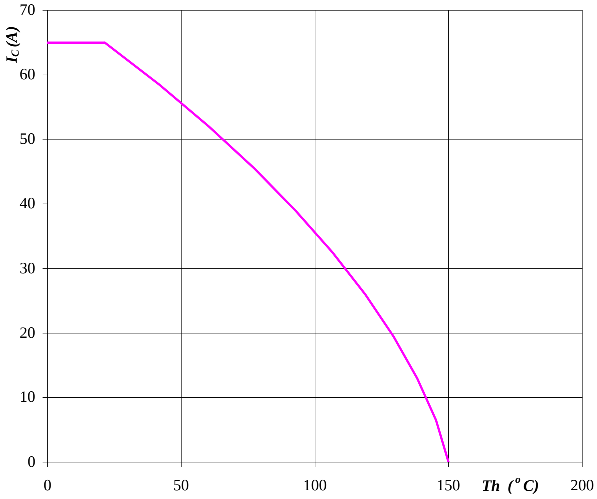
Output inverter

Figure 15. Power dissipation as a function of heatsink temperature
Output inverter IGBT
P_{tot} = f (Th)



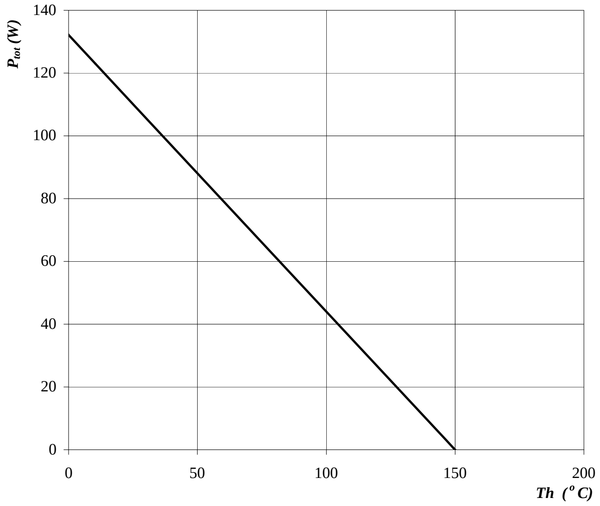
parameter: Tj = 150°C

Figure 16. Collector current as a function of heatsink temperature
Output inverter IGBT
I_C = f (Th)



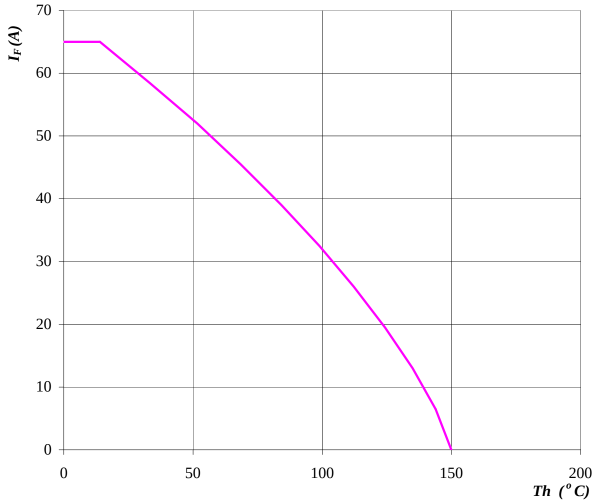
parameter: Tj = 150°C
V_{GE}= 15 V

Figure 17. Power dissipation as a function of heatsink temperature
Output inverter FRED
P_{tot} = f (Th)



parameter: Tj = 150°C

Figure 18. Forward current as a function of heatsink temperature
Output inverter FRED
I_F = f (Th)



parameter: Tj = 150°C