Maximum Ratings / Höchstzulässige Werte

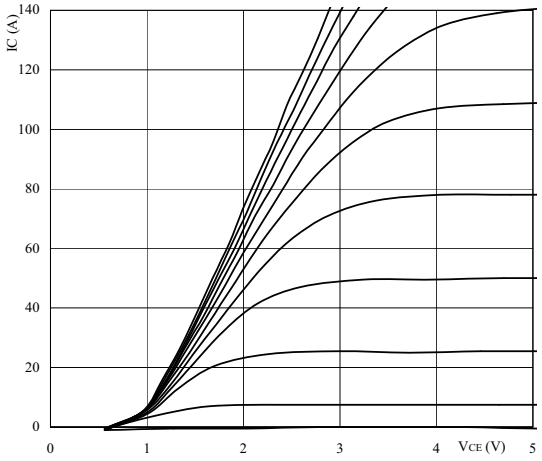
Parameter	Condition		Symbol	Datasheet values	Unit
				max.	
Transistor Inverter **Transistor Wechselrichter**					
Collector-emitter break down voltage Kollektor-Emitter-Sperrspannung			V_{CE}	1200	V
DC collector current Kollektor-Dauergleichstrom	T_j=150°C	T_h=80°C, T_c=80°C	I_C	38 50 limited by bond	A
Repetitive peak collector current Periodischer Kollektorspitzenstrom	t_p=1ms	T_h=80°C	I_{cpuls}	76	A
Power dissipation per IGBT Verlustleistung pro IGBT	T_j=150°C	T_h=80°C T_c=80°C	P_{tot}	68 102	W
Gate-emitter peak voltage Gate-Emitter-Spitzenspannung			V_{GE}	±20	V
SC withstand time Kurzschlußverhalten	Tj≤125°C	V_{GE}=15V	t_{SC} V_{CC}	10 900	us V
Diode Inverter **Diode Wechselrichter**					
DC forward current Dauergleichstrom	T_j=150°C	T_h=80°C, T_c=80°C	I_F	26 35,5	A
Repetitive peak forward current Periodischer Spitzenstrom	t_p=1ms	T_h=80°C	I_{FRM}	52	A
Power dissipation per Diode Verlustleistung pro Diode	T_j=150°C	T_h=80°C T_c=80°C	P_{tot}	41 62	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

Description	Symbol	Conditions					Datasheet values			Unit
		T(C°)	Other conditions (Rgon-Rgoff)	VGE(V) VGS(V)	VCE(V) VDS(V)	IC(A) IF(A) Id(A)	Min	Typ	Max	
Transistor Inverter, inductive load **Transistor Wechselrichter**										
Gate emitter threshold voltage Gate-Schwellenspannung	$V_{GE(th)}$	Tj=25°C Tj=125°C	VCE=VGE			0,002	5	5,8	6,5	V
Collector-emitter saturation voltage Kollektor-Emitter Sättigungsspannung	$V_{CE(sat)}$	Tj=25°C Tj=125°C		15 15		50 50		1,71 1,95	2,3	V
Collector-emitter cut-off Kollektor-Emitter Reststrom	I_{CES}	Tj=25°C Tj=125°C		0	1200				0,4 6	mA
Gate-emitter leakage current Gate-Emitter Reststrom	I_{GES}	Tj=25°C Tj=125°C		30	0				650	nA
Integrated Gate resistor Integrirter Gate Widerstand	R_{gint}							4		Ohm
Turn-on delay time Einschaltverzögerungszeit	$t_{d(on)}$	Tj=25°C Tj=125°C	Rgon=18 Ohm Rgoff=18 Ohm	±15	600	50		72		ns
Rise time Anstiegszeit	t_r	Tj=25°C Tj=125°C	Rgon=18 Ohm Rgoff=18 Ohm	±15	600	50		22		ns
Turn-off delay time Abschaltverzögerungszeit	$t_{d(off)}$	Tj=25°C Tj=125°C	Rgon=18 Ohm Rgoff=18 Ohm	±15	600	50		462		ns
Fall time Fallzeit	t_f	Tj=25°C Tj=125°C	Rgon=18 Ohm Rgoff=18 Ohm	±15	600	50		182		ns
Turn-on energy loss per pulse Einschaltverlustenergie pro Puls	E_{on}	Tj=25°C Tj=125°C	Rgon=18 Ohm Rgoff=18 Ohm	±15	600	50		4,87		mWs
Turn-off energy loss per pulse Abschaltverlustenergie pro Puls	E_{off}	Tj=25°C Tj=125°C	Rgon=18 Ohm Rgoff=18 Ohm	±15	600	50		5,12		mWs
Input capacitance Eingangskapazität	C_{ies}	Tj=25°C Tj=125°C	f=1MHz					3,6		nF
Output capacitance Ausgangskapazität	C_{oss}	Tj=25°C Tj=125°C	f=1MHz					0,18		nF
Reverse transfer capacitance Rückwirkungskapazität	C_{rss}	Tj=25°C Tj=125°C	f=1MHz					0,16		nF
Gate charge Gate Ladung	Q_{Gate}	Tj=25°C Tj=125°C						280		nC
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}	Thermal grease thickness≤50um Warmeleitpaste Dicke≤50um, λ = 0,61 W/mK						1,04 0,6864		K/W
Coupled thermal resistance inverter diode-transistor Gekoppelte Wärmewiderstand Wechselrichter Diode-Transistor	R_{thJH}	Thermal grease thickness≤50um Warmeleitpaste Dicke≤50um, λ = 0,61 W/mK						0,55		K/W
Diode Inverter **Diode Wechselrichter**										
Diode forward voltage Durchlaßspannung	V_F	Tj=25°C Tj=125°C				50 50		2,35 2,04	3,35	V
Peak reverse recovery current Rückstromspitze	I_{RM}	Tj=25°C Tj=125°C	Rgon=18 Ohm	±15	600	50		109		A
Reverse recovery time Sperreverzögerungszeit	t_{rr}	Tj=25°C Tj=125°C	Rgon=18 Ohm	±15	600	50		60		ns
Reverse recovered charge Sperrverzögerungsladung	Q_{rr}	Tj=25°C Tj=125°C	Rgon=18 Ohm	±15	600	50		8,4		uC
Reverse recovered energy Sperrverzögerungsenergie	Erec	Tj=25°C Tj=125°C	Rgon=18 Ohm	±15	600	50		2,97		mWs
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}	Thermal grease Warmeleitpaste						1,72 1,1352		K/W
Coupled thermal resistance inverter transistor-diode Gekoppelte Wärmewiderstand Wechselrichter Transistor-Diode	R_{thJH}	Thermal grease thickness≤50um Warmeleitpaste Dicke≤50um, λ = 0,61 W/mK						0,53		K/W
NTC-Thermistor **NTC-Widerstand**										
Rated resistance Nennwiderstand	R_{25}	Tj=25°C	Tol. ±5%				4,46	4,7	4,94	kOhm
Deviation of R100 Abweichung von R100	$D_{R/R}$	Tc=100°C	R100=435Ohm					3		%/K
Power dissipation given Epcos-Typ Verlustleistung Epcos-Typ angeben	P	Tj=25°C						210		mW
B-value B-Wert	$B_{(25/100)}$	Tj=25°C	Tol. ±3%					3530		K

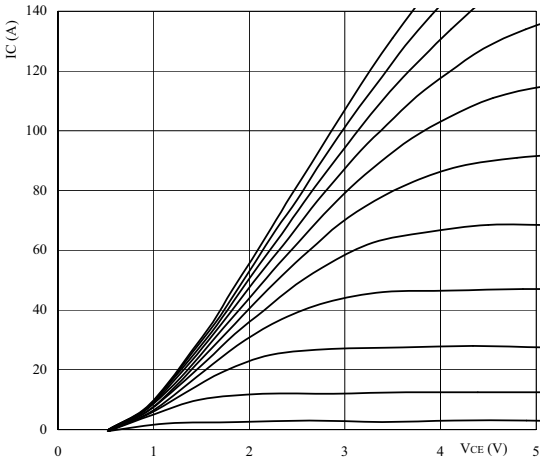
Output inverter

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



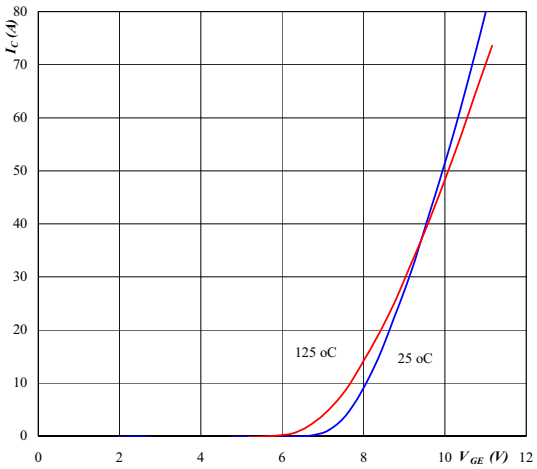
parameter: tp = 250 us Tj = 25 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



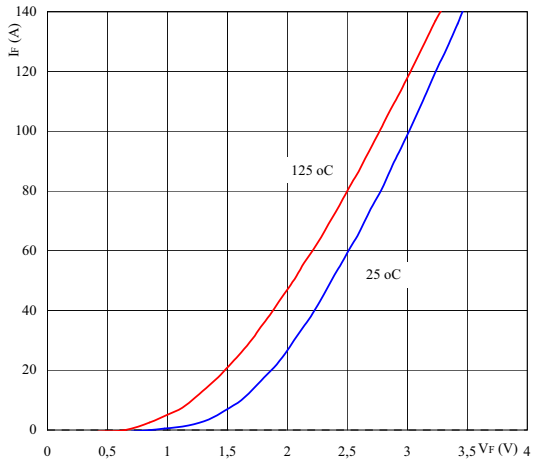
parameter: tp = 250 us Tj = 125 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



parameter: tp = 250 us VCE = 10 V

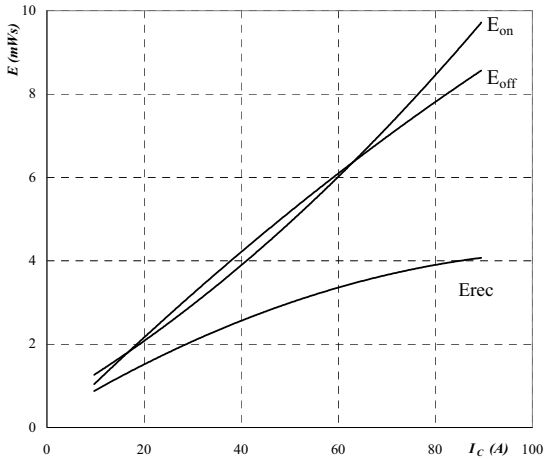
Figure 4. **Typical diode forward current as a function of forward voltage**
Output inverter FRED IF=f(VF)



parameter: tp = 250 us

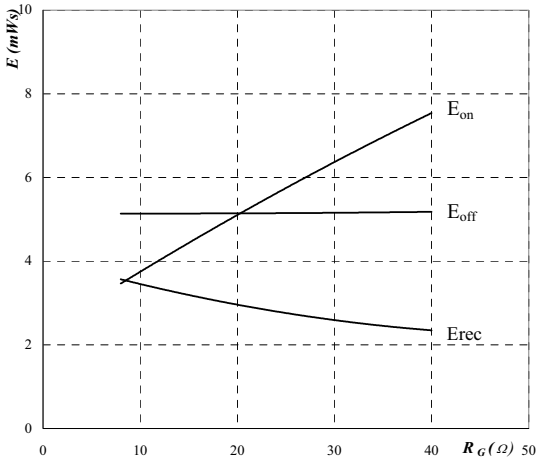
Output inverter

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



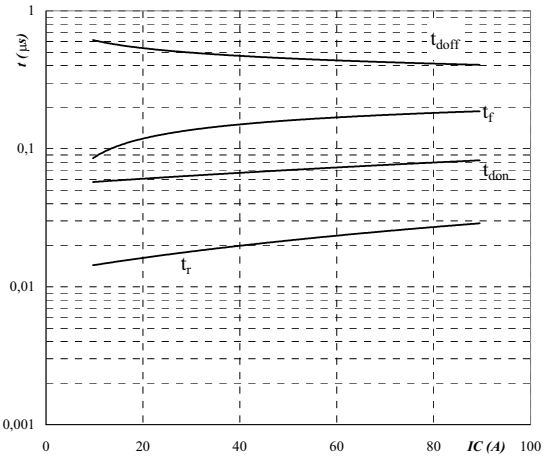
inductive load, Tj = 125 °C
V_{CE} = 600 V
V_{GE} = ±15 V
Rgon = 18 Ω
Rgoff = 18 Ω

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



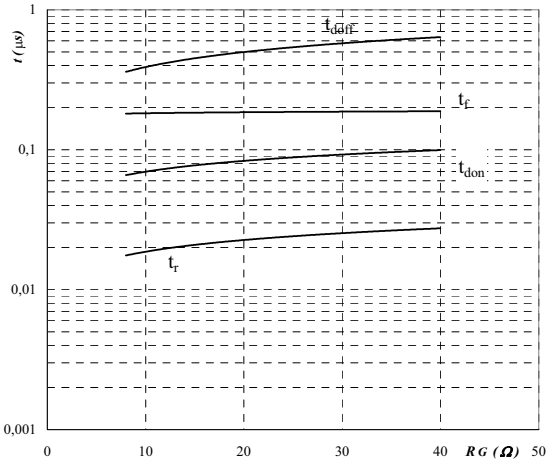
inductive load, Tj = 125 °C
V_{CE} = 600 V
V_{GE} = ±15 V
Ic = 50 A

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



inductive load, Tj = 125 °C
V_{CE} = 600 V
V_{GE} = ±15 V
Rgon = 18 Ω
Rgoff = 18 Ω

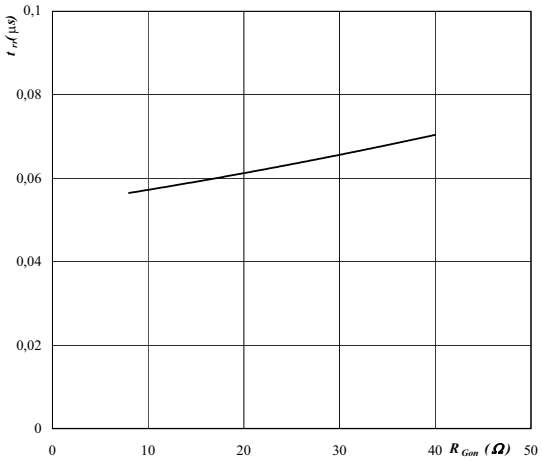
Figure 8. **Typical switching times as a function of gate resistor**
Output inverter IGBT
t = f (R_G)



inductive load, Tj = 125 °C
V_{CE} = 600 V
V_{GE} = ±15 V
Ic = 50 A

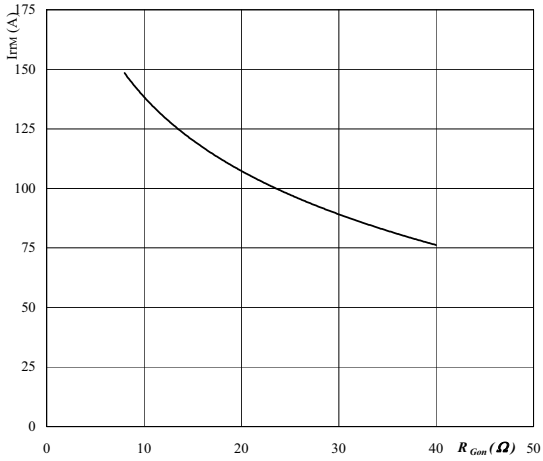
Output inverter

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



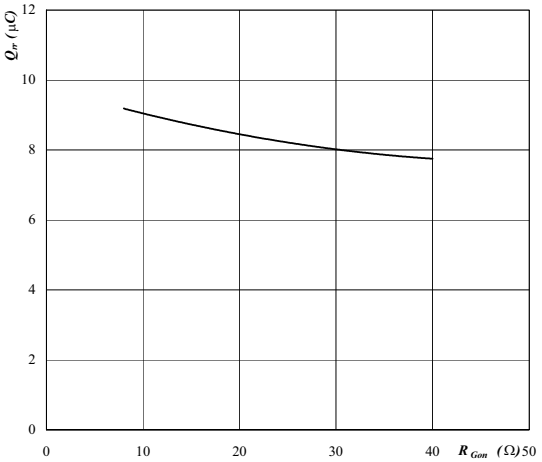
Tj = 125 °C
VR = 600 V
IF = 50 A
VGE = ±15 V

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



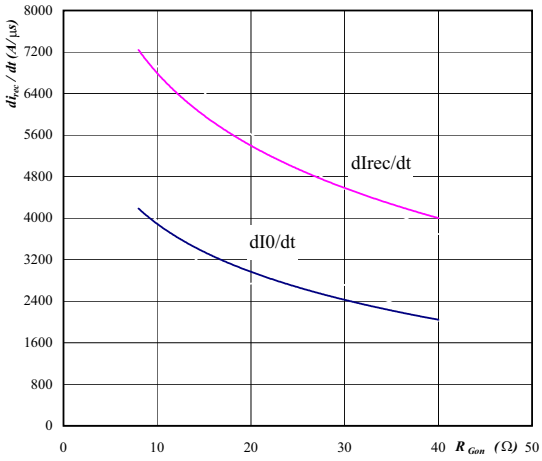
Tj = 125 °C
VR = 600 V
IF = 50 A
VGE = ±15 V

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
VR = 600 V
IF = 50 A
VGE = ±15 V

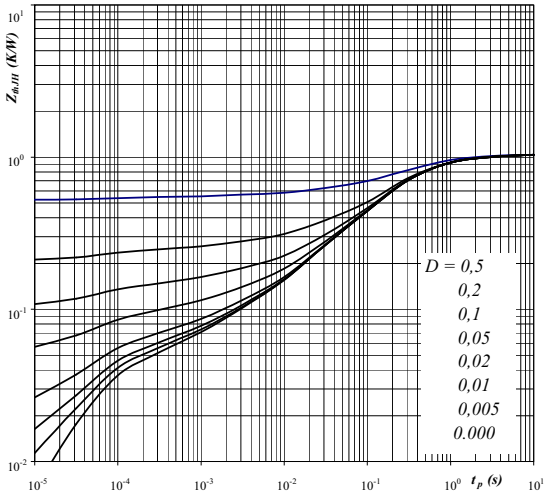
Figure 12. **Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor**
Output inverter FRED diode
dI0/dt,dIrec/dt= f (Rgon)



Tj = 125 °C
VR = 600 V
IF = 50 A
VGE = ±15 V

Output inverter

Figure 13. IGBT transient thermal impedance as a function of pulse width
$Z_{thJH} = f(tp)$

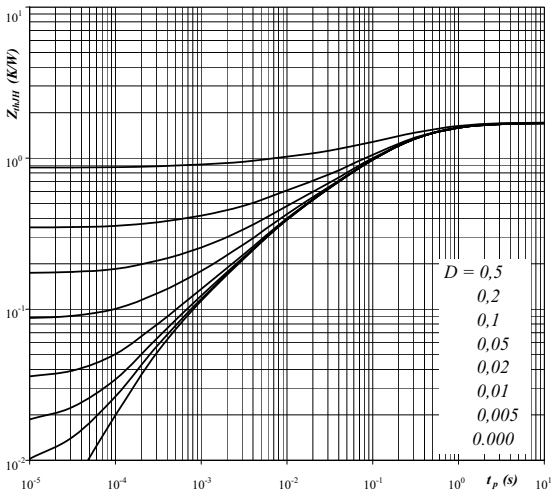


Parameter: D = tp / T RthJH= 1,04 K/W

IGBT thermal model values

R (C/W)	Tau (s)
0,07	5,2E+00
0,28	7,1E-01
0,50	1,9E-01
0,12	2,0E-02

Figure 14. FRED transient thermal impedance as a function of pulse width
$Z_{thJH} = f(tp)$



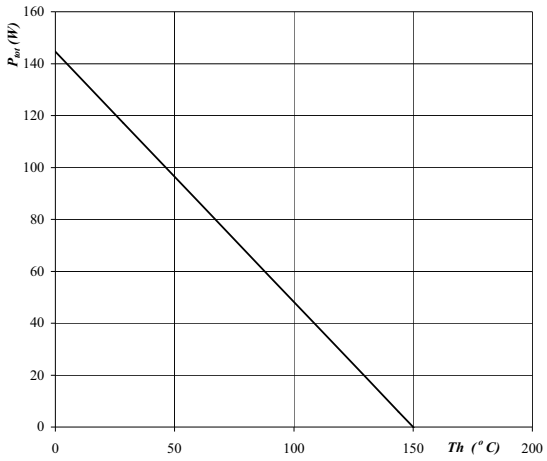
Parameter: D = tp / T RthJH= 1,72 K/W

FRED thermal model values

R (C/W)	Tau (s)
0,04	2,1E+01
0,25	1,1E+00
0,76	2,0E-01
0,41	3,4E-02

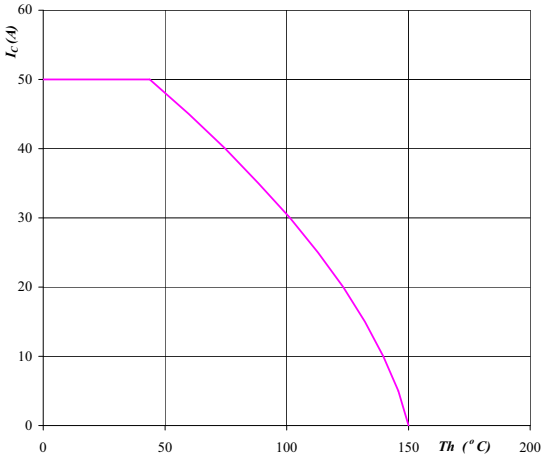
Output inverter

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



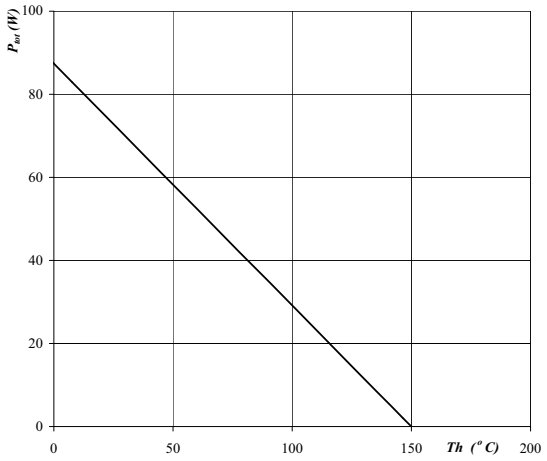
parameter: Tj = 150°C

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



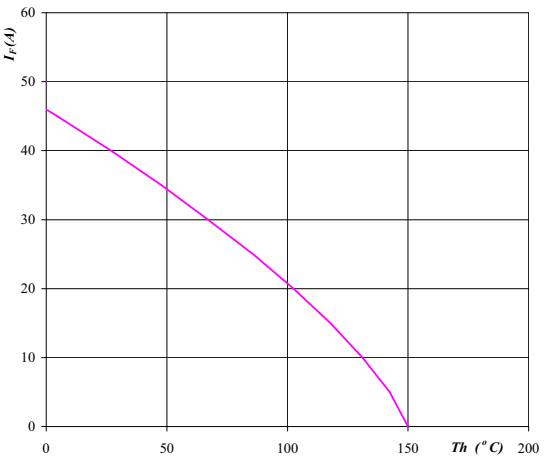
parameter: Tj = 150°C
V_{GE}= 15 V

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

Thermistor

Figure 37. Typical NTC characteristic as a function of temperature

$R_T = f(T)$