Characteristic values

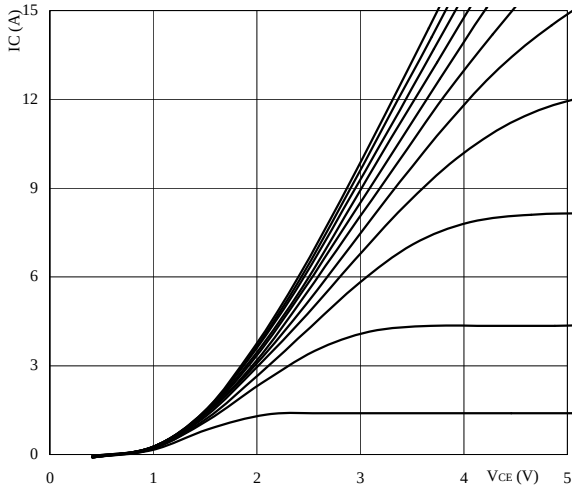
Description	Symbol	Conditions					Datasheet values			Unit
		T(C°)	Other conditions (Rgon-Rgoff)	VGE(V) VGS(V)	VR(V) VCE(V) VDS(V)	IC(A) IF(A) Id(A)	Min	Typ	Max	
Transistor Inverter, inductive load **Transistor Wechselrichter**										
Gate emitter threshold voltage Gate-Schwellenspannung	$V_{GE(th)}$	Tj=25°C Tj=125°C	VCE=VGE			0,0002	3	4	5	V
Collector-emitter saturation voltage Kollektor-Emitter Sättigungsspannung	$V_{CE(sat)}$	Tj=25°C Tj=125°C		15		5		2,21 2,61	2,9	V
Collector-emitter cut-off Kollektor-Emitter Reststrom	I_{CES}	Tj=25°C Tj=125°C		0	600				0,06 0,5	mA
Gate-emitter leakage current Gate-Emitter Reststrom	I_{GES}	Tj=25°C Tj=125°C		25	0				200	nA
Integrated Gate resistor Integrirter Gate Widerstand	R_{gint}							-		Ohm
Turn-on delay time Einschaltverzögerungszeit	$t_{d(on)}$	Tj=25°C Tj=125°C	Rgon=137 Ohm Rgoff=68,5 Ohm	15	300	5		18		ns
Rise time Anstiegszeit	t_r	Tj=25°C Tj=125°C	Rgon=137 Ohm Rgoff=68,5 Ohm	15	300	5		16		ns
Turn-off delay time Abschaltverzögerungszeit	$t_{d(off)}$	Tj=25°C Tj=125°C	Rgon=137 Ohm Rgoff=68,5 Ohm	15	300	5		245		ns
Fall time Fallzeit	t_f	Tj=25°C Tj=125°C	Rgon=137 Ohm Rgoff=68,5 Ohm	15	300	5		25		ns
Turn-on energy loss per pulse Einschaltverlustenergie pro Puls	E_{on}	Tj=25°C Tj=125°C	Rgon=137 Ohm Rgoff=68,5 Ohm	15	300	5		0,114		mWs
Turn-off energy loss per pulse Abschaltverlustenergie pro Puls	E_{off}	Tj=25°C Tj=125°C	Rgon=137 Ohm Rgoff=68,5 Ohm	15	300	5		0,112		mWs
Input capacitance Eingangskapazität	C_{ies}	Tj=25°C Tj=125°C	f=1MHz	0	25			0,264	0,32	nF
Output capacitance Ausgangskapazität	C_{oss}	Tj=25°C Tj=125°C	f=1MHz	0	25			0,029	0,04	nF
Reverse transfer capacitance Rückwirkungskapazität	C_{rss}	Tj=25°C Tj=125°C	f=1MHz	0	25			0,017	0,02	nF
Gate charge Gate Ladung	Q_{Gate}	Tj=25°C Tj=125°C		15	480	4		24	31	nC
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}		Thermal grease thickness≤50um Warmeleitpaste					2,87		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehause pro Chip	R_{thJC}		Dicke≤50um λ = 0,61 W/mK					1,8942		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					TBD		K/W
Diode Inverter **Diode Wechselrichter**										
Diode forward voltage Durchlaßspannung	V_F	Tj=25°C Tj=125°C				5		1,38 1,08	2,1	V
Peak reverse recovery current Rückstromspitze	I_{RRM}	Tj=25°C Tj=125°C	Rgon=137 Ohm	15	300	5		8,2		A
Reverse recovery time Sperreverzögerungszeit	t_{rr}	Tj=25°C Tj=125°C	Rgon=137 Ohm	15	300	5		60		ns
Reverse recovered charge Sperrverzögerungsladung	Q_{rr}	Tj=25°C Tj=125°C	Rgon=137 Ohm	15	300	5		0,27		uC
Reverse recovered energy Sperrverzögerungsenergie	Erec	Tj=25°C Tj=125°C	Rgon=137 Ohm	15	300	5		0,034		mWs
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}		Thermal grease thickness≤50um Warmeleitpaste					3,03		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehause pro Chip	R_{thJC}		Dicke≤50um λ = 0,61 W/mK					1,9998		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					TBD		K/W

Characteristic values

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	
NTC-Thermistor **NTC-Widerstand**										
Rated resistance Nennwiderstand	R_{25}	Tj=25°C	Tol. ±5%				20,9	22	23,1	kOhm
Deviation of R100 Abweichung von R100	$D_{R/R}$	Tc=100°C	R100=1503Ohm					2,9		%/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%					3980		K

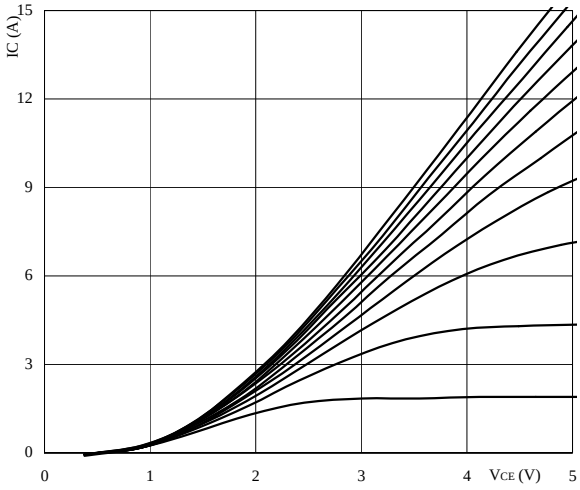
Output inverter

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



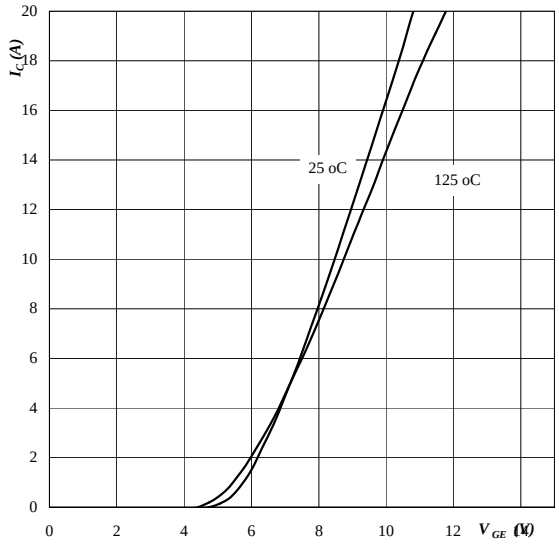
parameter: tp = 250 µs Tj = 25 °C
VGE parameter: from: 6 V to 16 V
in 1 V steps

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



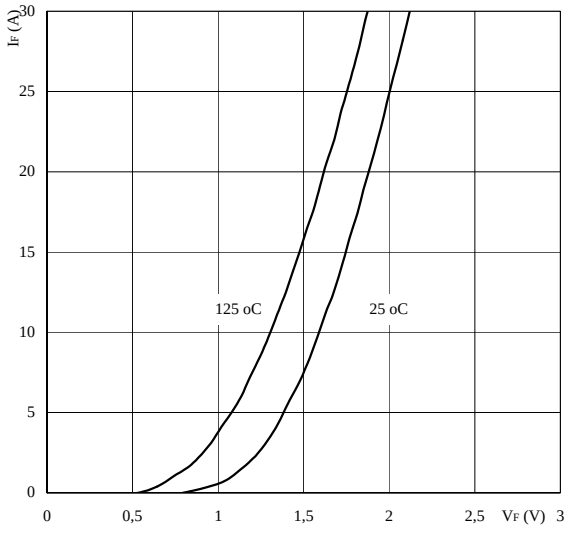
parameter: tp = 250 µs Tj = 125 °C
VGE parameter: from: 6 V to 16 V
in 1 V steps

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



parameter: tp = 250 µs VCE = 12 V

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



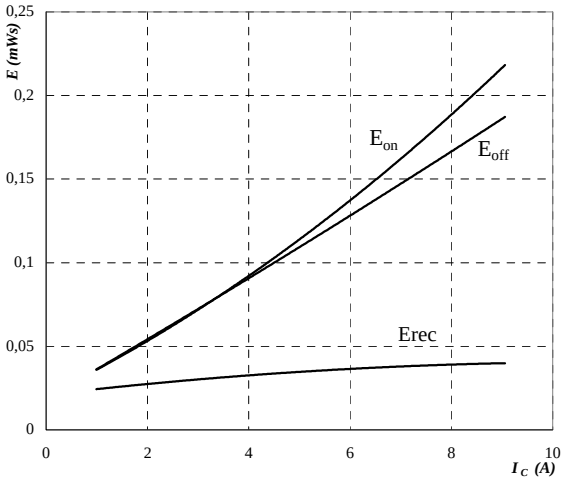
parameter: tp = 250 µs

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} = 300 V

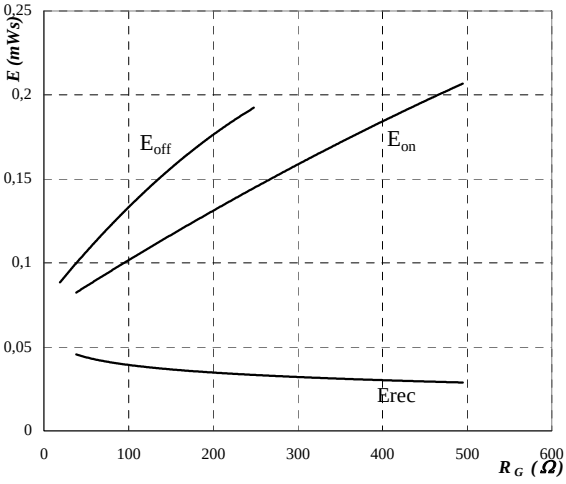
V_{GE} = 15 V

$R_{Gon} = 2*R_{Goff}$ = 137 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} = 300 V

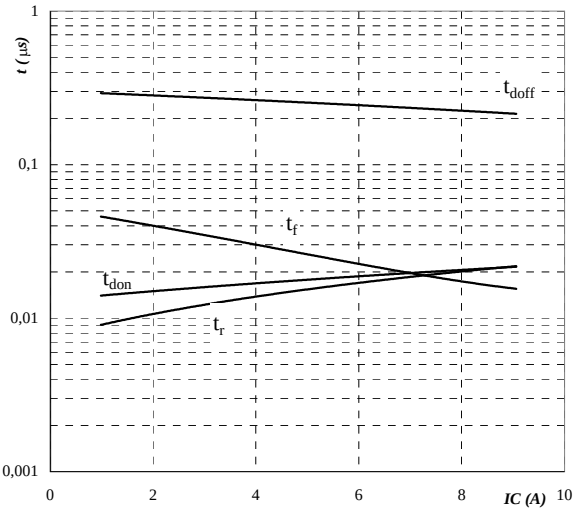
V_{GE} = 15 V

Ic = 5 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} = 300 V

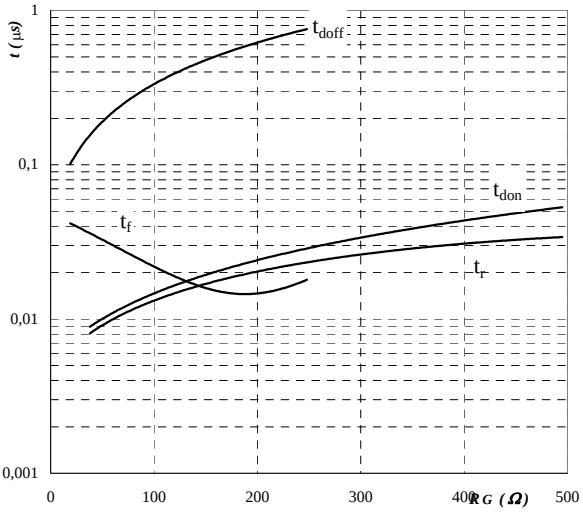
V_{GE} = 15 V

$R_{Gon} = 2*R_{Goff}$ = 137 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} = 300 V

V_{GE} = 15 V

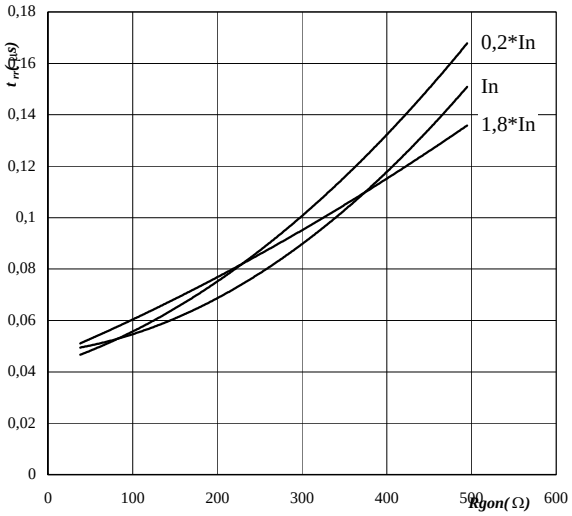
Ic = 5 A

Output inverter

Figure 9. Typical reverse recovery time as a function of gate resistor

Output inverter FRED diode

t_{rr} = f (Rgon)

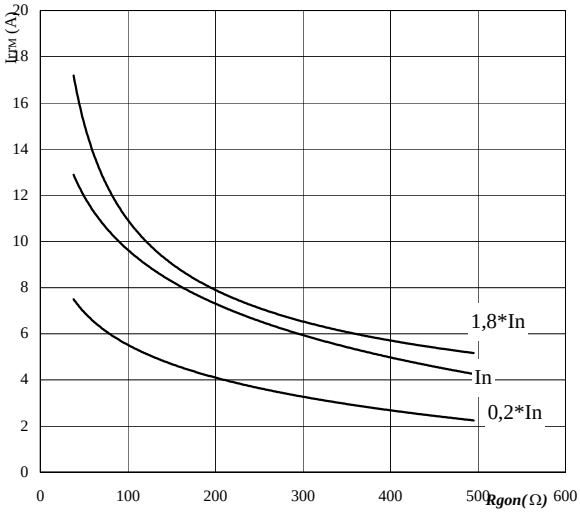


Tj = 125 °C
V_R = 300 V
In= 5 A

Figure 10. Typical reverse recovery current as a function of gate resistor

Output inverter FRED diode

I_{RRM} = f (Rgon)

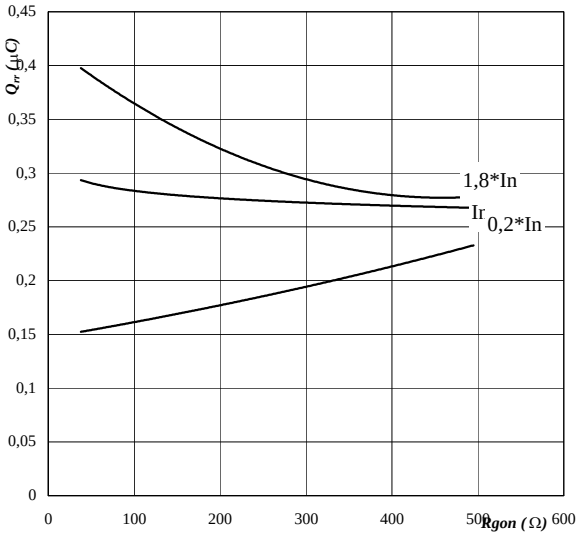


Tj = 125 °C
V_R = 300 V
In= 5 A

Figure 11. Typical reverse recovery charge as a function of gate resistor

Output inverter FRED diode

Q_{rr} = f (Rgon)

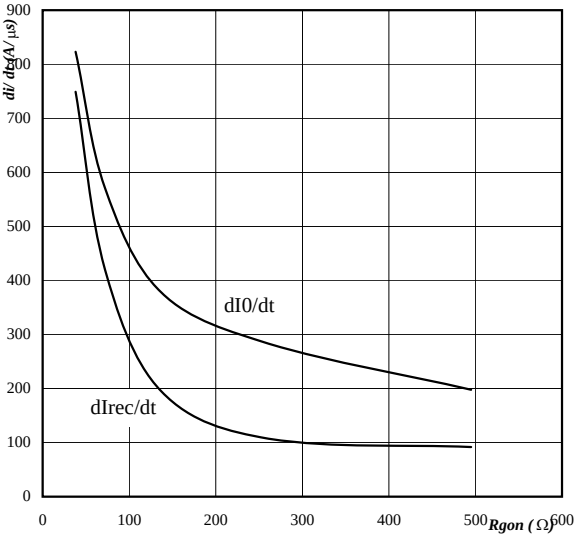


Tj = 125 °C
V_R = 300 V
In= 5 A

Figure 12. Typical diode peak rate of fall of forward and reverse recovery current as a function of gate resistor

Output inverter FRED diode

di0/dt,dIrec/dt= f (Rgon)

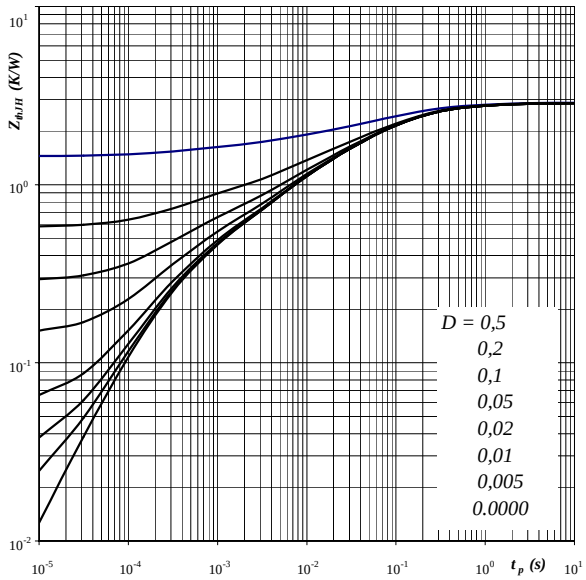


Tj = 125 °C
V_R = 300 V
I_F = 5 A

Output inverter

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

$Z_{thJH} = f(tp)$



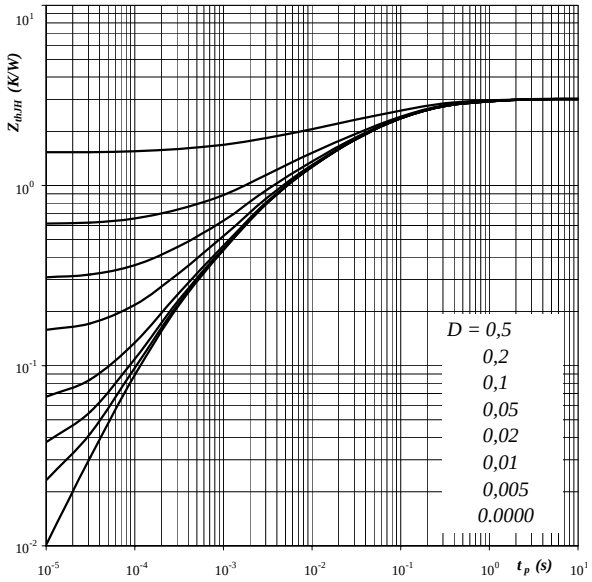
Parameter: D = tp / T RthJH 2,87 K/W

IGBT thermal model values

R (C/W)	Tau (s)
0,05	1,3E+01
0,31	6,6E-01
0,93	1,2E-01
0,73	2,7E-02
0,49	4,8E-03

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

$Z_{thJH} = f(tp)$



Parameter: D = tp / T RthJH 3,0 K/W

FRED thermal model values

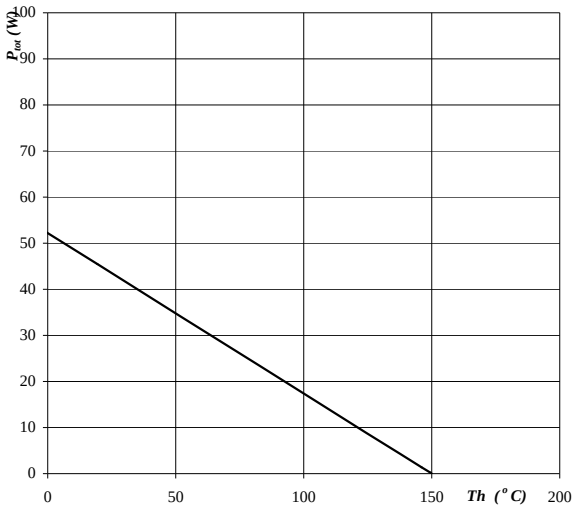
R (C/W)	Tau (s)
0,04	4,2E+01
0,22	1,0E+00
0,84	1,4E-01
0,78	3,4E-02
0,61	7,4E-03

Output inverter

Figure 15. Power dissipation as a function of heatsink temperature

Output inverter IGBT

P_{tot} = f (Th)

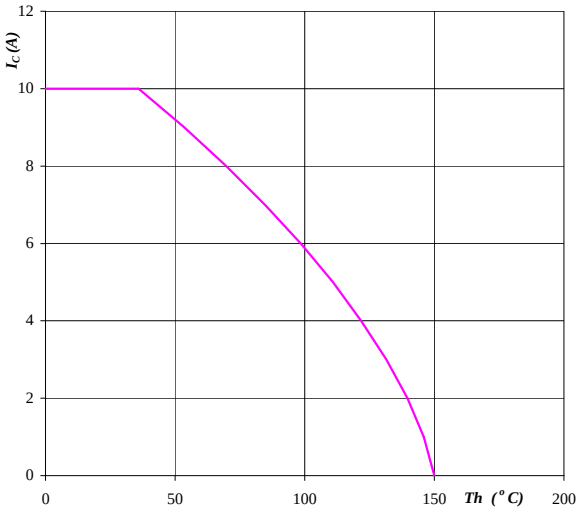


parameter: Tj = 150°C

Figure 16. Collector current as a function of heatsink temperature

Output inverter IGBT

I_C = f (Th)



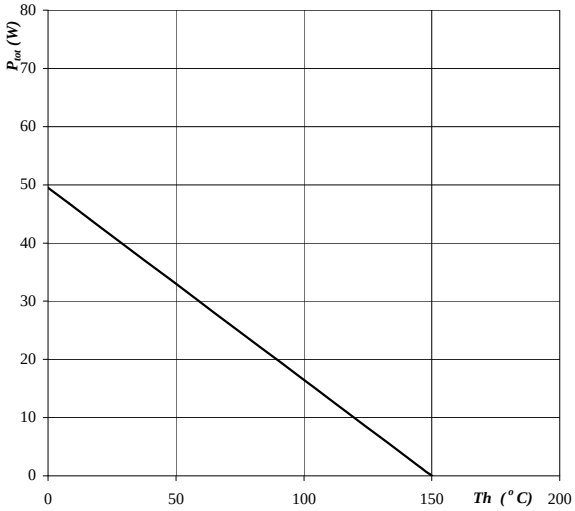
parameter: Tj = 150°C

V_{GE}= 15 V

Figure 17. Power dissipation as a function of heatsink temperature

Output inverter FRED

P_{tot} = f (Th)

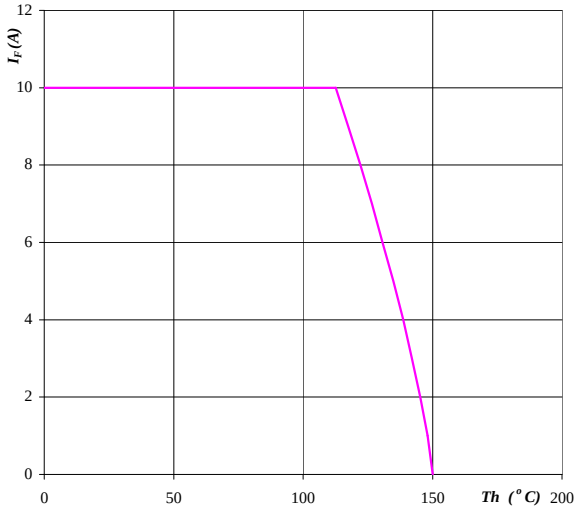


parameter: Tj = 150°C

Figure 18. Forward current as a function of heatsink temperature

Output inverter FRED

I_F = f (Th)



parameter: Tj = 150°C

Thermistor

Figure 23. Typical NTC characteristic as a function of temperature

NTC

$R_T = f(T)$