Maximum Ratings / Höchstzulässige Werte

Parameter	Condition		Symbol	Datasheet values max.	Unit
Input Rectifier Bridge **Gleichrichter**					
Repetitive peak reverse voltage Periodische Rückw. Spitzensperrspannung			V_{RRM}	1600	V
Forward current per diode Dauergrenzstrom	DC current	T_h=80°C; Tc=80°C	I_{FAV}	35 40	A
Surge forward current Stoßstrom Grenzwert	t_p=10ms	T_j=25°C	I_{FSM}	200	A
I^2t-value Grenzlastintegral	t_p=10ms	T_j=25°C	I^2t	200	A2s
Power dissipation per Diode Verlustleistung pro Diode	T_j=150°C	T_h=80°C T_c=80°C	P_{tot}	44 66	W
max. Chip temperature max. Chiptemperatur			T_{jmax}	150	°C
Transistor Inverter **Transistor Wechselrichter**					
Collector-emitter break down voltage Kollektor-Emitter-Sperrspannung			V_{CE}	1200	V
DC collector current Kollektor-Dauergleichstrom	T_j=175°C	T_h=80°C, T_c=80°C	I_C	20 20	A
Repetitive peak collector current Periodischer Kollektorspitzenstrom	tp limited by Tj max		I_{cpuls}	45	A
Power dissipation per IGBT Verlustleistung pro IGBT	T_j=175°C	T_h=80°C T_c=80°C	P_{tot}	41 63	W
Gate-emitter peak voltage Gate-Emitter-Spitzenspannung			V_{GE}	±20	V
SC withstand time* Kurzschlußverhalten*	Tj≤150°C V_{CE}=900V	V_{GE}=15V	t_{SC}	10	us
max. Chip temperature max. Chiptemperatur			T_{jmax}	150	°C
Diode Inverter **Diode Wechselrichter**					
DC forward current Dauergleichstrom	T_j=175°C	T_h=80°C, T_c=80°C	I_F	18 20	A
Repetitive peak forward current Periodischer Spitzenstrom	tp limited by Tj max		I_{FRM}	30	A
Power dissipation per Diode Verlustleistung pro Diode	T_j=175°C	T_h=80°C T_c=80°C	P_{tot}	33 50	W
max. Chip temperature max. Chiptemperatur			T_{jmax}	150	°C

Maximum Ratings / Höchstzulässige Werte

Parameter	Condition		Symbol	Datasheet values max.	Unit
Transistor BRC **Transistor Wechselrichter**					
Collector-emitter break down voltage Kollektor-Emitter-Sperrspannung			V_{CE}	1200	V
DC collector current Kollektor-Dauergleichstrom	T_j=150°C T_j=150°C	T_h=80°C	I_C	13 16	A
Repetitive peak collector current Periodischer Kollektorspitzenstrom	t_p=1ms	T_h=80°C	I_{cpuls}	24	A
Power dissipation per IGBT Verlustleistung pro IGBT	T_j=150°C	T_h=80°C	P_{tot}	32 49	W
Gate-emitter peak voltage Gate-Emitter-Spitzenspannung			V_{GE}	±20	V
SC withstand time Kurzschlußverhalten	Tj≤150°C VCE=900 V	VGE=15V	t_{SC}	10	us
max. Chip temperature max. Chiptemperatur			T_{jmax}	150	°C
Diode BRC **Diode BRC**					
DC forward current Dauergleichstrom	T_j=150°C T_j=150°C	T_h=80°C	I_F	10 10	A
Repetitive peak forward current Periodischer Spitzenstrom	t_p=1ms	T_h=80°C	I_{FRM}	15	A
Power dissipation per Diode Verlustleistung pro Diode	T_j=150°C	T_h=80°C	P_{tot}	28 43	W
max. Chip temperature max. Chiptemperatur			T_{jmax}	150	°C
Thermal properties **Thermische Eigenschaften**					
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

Additional notes and remarks: ** Allowed number of short circuits must be less than 1000 times, and time duration between short circuits should be more than 1 second!*

Characteristic values/ Charateristische Werte

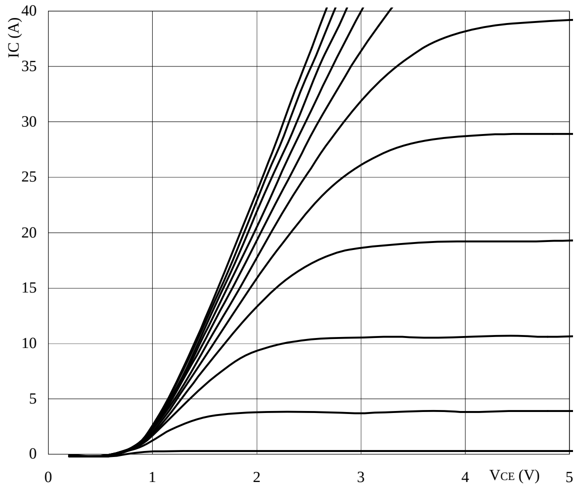
Description	Symbol	Conditions T(C°)	Other conditions (Rgon-Rgoff)	VGE(V) VGS(V)	VCE(V) VDS(V)	IC(A) IF(A) Id(A)	Datasheet values Min	Typ	Max	Unit
Input Rectifier Bridge **Gleichrichter**										
Forward voltage Durchlaßpannung	V_F					30		1,24 1,19	1,5	V
Threshold voltage (for power loss calc. only) Schleusenspannung	V_{to}					30		0,91 0,8		V
Slope resistance (for power loss calc. only) Ersatzwiderstand	r_t					 30		0,011 0,013		Ohm
Reverse current Sperrstrom	I_r				1500				0,01	mA
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}		Thermal grease thickness≤50um					1,59		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehause pro Chip	R_{thJC}		Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					1,0494		
Transistor Inverter **Transistor Wechselrichter**										
Gate emitter threshold voltage Gate-Schwellenspannung	$V_{GE(th)}$	Tj=25°C Tj=125°C	VCE=VGE			0,0006	5	5,8	6,5	
Collector-emitter saturation voltage Kollektor-Emitter Sättigungsspannung	$V_{CE(sat)}$	Tj=25°C Tj=125°C		15		15		1,68 1,88	2,2	V
Collector-emitter cut-off Kollektor-Emitter Reststrom	I_{CES}	Tj=25°C Tj=125°C		0	1200				0,25	mA
Gate-emitter leakage current Gate-Emitter Reststrom	I_{GES}	Tj=25°C Tj=125°C		20	0				200	nA
Integrated Gate resistor Integrirter Gate Widerstand	R_{gint}							none		Ohm
Turn-on delay time Einschaltverzögerungszeit	$t_{d(on)}$	Tj=25°C Tj=125°C	Rgoff=64 Ω Rgon=64 Ω	 ±15	 600	 15		 210		ns
Rise time Anstiegszeit	t_r	Tj=25°C Tj=125°C	Rgoff=64 Ω Rgon=64 Ω	 ±15	 600	 15		 27		ns
Turn-off delay time Abschaltverzögerungszeit	$t_{d(off)}$	Tj=25°C Tj=125°C	Rgoff=64 Ω Rgon=64 Ω	 ±15	 600	 15		 387		ns
Fall time Fallzeit	t_f	Tj=25°C Tj=125°C	Rgoff=64 Ω Rgon=64 Ω	 ±15	 600	 15		 192		ns
Turn-on energy loss per pulse Einschaltverlustenergie pro Puls	E_{on}	Tj=25°C Tj=125°C	Rgoff=64 Ω Rgon=64 Ω	 ±15	 600	 15		 1,881		mWs
Turn-off energy loss per pulse Abschaltverlustenergie pro Puls	E_{off}	Tj=25°C Tj=125°C	Rgoff=64 Ω Rgon=64 Ω	 ±15	 600	 15		 1,674		mWs
SC withstand time Kurzschlußverhalten	t_{SC}									us
Input capacitance Eingangskapazität	C_{ies}	Tj=25°C Tj=125°C	f=1MHz	0	25			1,09		nF
Output capacitance Ausgangskapazität	C_{oss}	Tj=25°C Tj=125°C	f=1MHz	0	25			0,06		nF
Reverse transfer capacitance Rückwirkungskapazität	C_{rss}	Tj=25°C Tj=125°C	f=1MHz	0	25			0,05		nF
Gate charge Gate Ladung	Q_{Gate}	Tj=25°C Tj=125°C		±15				tbd		nC
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}		Thermal grease thickness≤50um					1,7		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehause pro Chip	R_{thJC}		Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					1,12		K/W
Diode Inverter **Diode Wechselrichter**										
Diode forward voltage Durchlaßspannung	V_F	Tj=25°C Tj=125°C				15		1,76 1,72	2,2	V
Peak reverse recovery current Rückstromspitze	I_{RM}	Tj=25°C Tj=125°C	 diF/dt = 63 A/us	 0	 600	 15		 14,89		A
Reverse recovery time Sperreverzögerungszeit	t_{rr}	Tj=25°C Tj=125°C	 diF/dt = 63 A/us	 0	 600	 15		 560,5		ns
Reverse recovered charge Sperrverzögerungsladung	Q_{rr}	Tj=25°C Tj=125°C	 diF/dt = 63 A/us	 0	 600	 15		 3,22		uC
Reverse recovered energy Sperrverzögerungsenergie	Erec	Tj=25°C Tj=125°C	 diF/dt = 63 A/us	 0	 600	 15		 1,27		mWs
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R_{thJH}		Thermal grease thickness≤50um					2,14		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehause pro Chip	R_{thJC}		Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					1,41		K/W

Characteristic values/ Charateristische Werte

Description	Symbol	Conditions T(C°)	Other conditions (Rgon-Rgoff)	VGE(V) VGS(V)	VCE(V) VDS(V)	IC(A) IF(A) Id(A)	Datasheet values Min	Typ	Max	Unit
Transistor BRC										
Transistor BRC										
Gate emitter threshold voltage	$V_{GE(th)}$	Tj=25°C	VCE=VGE			0,0003	4,5	5,8	6,5	V
Gate-Schwellenspannung		Tj=125°C								
Collector-emitter saturation voltage	$V_{CE(sat)}$	Tj=25°C		15		8		1,63	2,2	V
Kollektor-Emitter Sättigungsspannung		Tj=125°C						1,83		
Collector-emitter cut-off	I_{CES}	Tj=25°C		0	1200				0,05	mA
Kollektor-Emitter Reststrom		Tj=125°C								
Gate-emitter leakage current	I_{GES}	Tj=25°C		20	0				200	nA
Gate-Emitter Reststrom		Tj=125°C								
Integrated Gate resistor	R_{gint}									Ohm
Integrirter Gate Widerstand										
Turn-on delay time	$t_{d(on)}$	Tj=25°C	Rgon=64Ω	15	600	8				ns
Einschaltverzögerungszeit		Tj=125°C	Rgoff=64Ω					129,5		
Rise time	t_r	Tj=25°C	Rgon=64Ω	15	600	8				ns
Anstiegszeit		Tj=125°C	Rgoff=64Ω					23		
Turn-off delay time	$t_{d(off)}$	Tj=25°C	Rgon=64Ω	15	600	8				ns
Abschaltverzögerungszeit		Tj=125°C	Rgoff=64Ω					324,7		
Fall time	t_f	Tj=25°C	Rgon=64Ω	15	600	8				ns
Fallzeit		Tj=125°C	Rgoff=64Ω					204,5		
Turn-on energy loss per pulse	E_{on}	Tj=25°C	Rgon=64Ω	15	600	8				uWs
Einschaltverlustenergie pro Puls		Tj=125°C	Rgoff=64Ω					0,83		
Turn-off energy loss per pulse	E_{off}	Tj=25°C	Rgon=64Ω	15	600	8				uWs
Abschaltverlustenergie pro Puls		Tj=125°C	Rgoff=64Ω					0,9		
SC withstand time	t_{SC}									us
Kurzschlußverhalten										
Input capacitance	C_{iss}	Tj=25°C	f=1MHz	0	25			0,61		nF
Eingangskapazität		Tj=125°C								
Output capacitance	C_{oss}	Tj=25°C	f=1MHz	0	25			0,04		nF
Ausgangskapazität		Tj=125°C								
Reverse transfer capacitance	Cies	Tj=25°C	f=1MHz	0	25			0,03		nF
Rückwirkungskapazität		Tj=125°C								
Gate charge	Qgate	Tj=25°C						tbd		nC
Gate Ladung		Tj=125°C								
Thermal resistance chip to heatsink per chip	R_{thJH}		Thermal grease thickness≤50um					2,16		K/W
Wärmewiderstand Chip-Kühlkörper pro Chip			Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					1,4256		
Diode BRC										
Diode BRC										
Diode forward voltage	V_F	Tj=25°C				7,5		1,68	2,3	V
Durchlaßspannung		Tj=125°C						1,64		
Reverse current	I_r	Tj=25°C			1200				0,06	uA
Sperrstrom		Tj=125°C								
Reverse recovery time	t_{rr}	Tj=25°C	Rgon=64Ω	15	600	8				ns
Sperreverzögerungszeit		Tj=125°C						486,2		
Reverse recovered charge	Q_{rr}	Tj=25°C	Rgon=64Ω	15	600	8				uC
Sperrverzögerungsladung		Tj=125°C						1,71		
Reverse recovery energy	E_{rec}	Tj=25°C	Rgon=64Ω	15	600	8				uWs
Sperrverzögerungsenergie		Tj=125°C								
Thermal resistance chip to heatsink per chip	R_{thJH}		Thermal grease thickness≤50um					2,49		K/W
Wärmewiderstand Chip-Kühlkörper pro Chip			Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					1,6434		
NTC-Thermistor										
NTC-Widerstand										
Rated resistance	R_{25}	Tj=25°C	Tol. ±5%				20,9	22	23,1	kOhm
Nennwiderstand										
Deviation of R100	$D_{R/R}$	Tc=100°C	R100=1503Ω					2,9		%/K
Abweichung von R100										
Power dissipation given Epcos-Typ	P	Tj=25°C						210		mW
Verlustleistung Epcos-Typ angeben										
B-value	$B_{(25/100)}$	Tj=25°C	Tol. ±3%					3980		K
B-Wert										

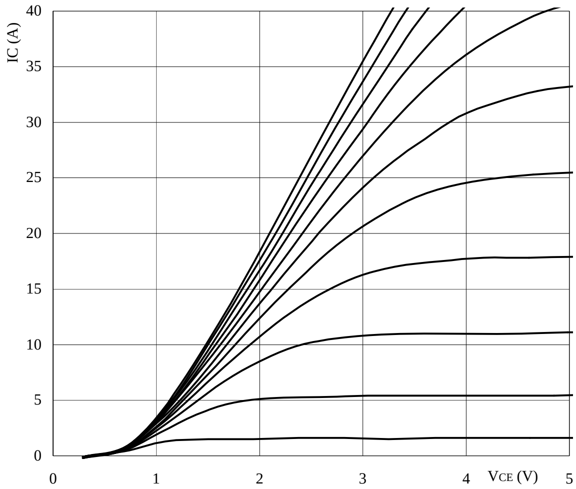
Output inverter

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



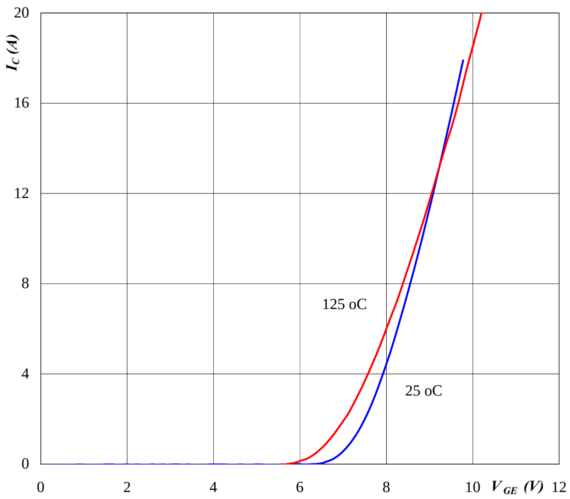
parameter: tp = 250 us   Tj = 25 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



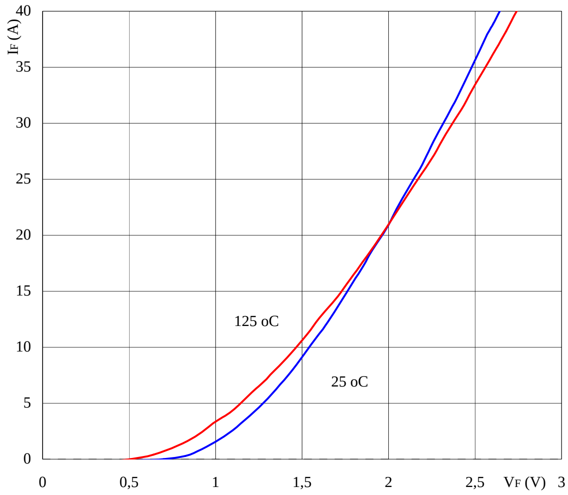
parameter: tp = 250 us   Tj = 125 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



parameter: tp = 250 us   VCE = 10 V

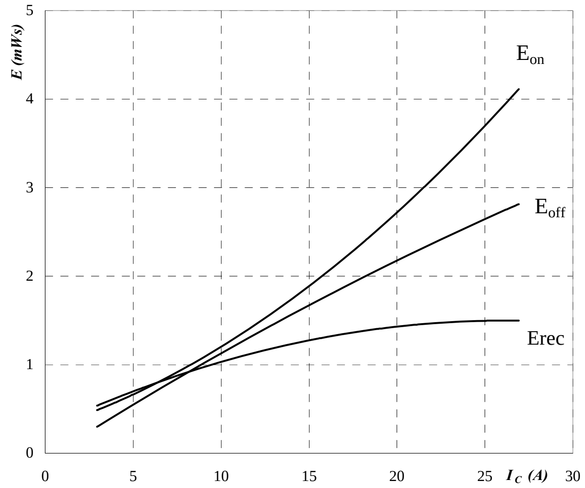
Figure 4. **Typical diode forward current as a function of forward voltage**
Output inverter FRED   IF=f(VF)



parameter: tp = 250 us

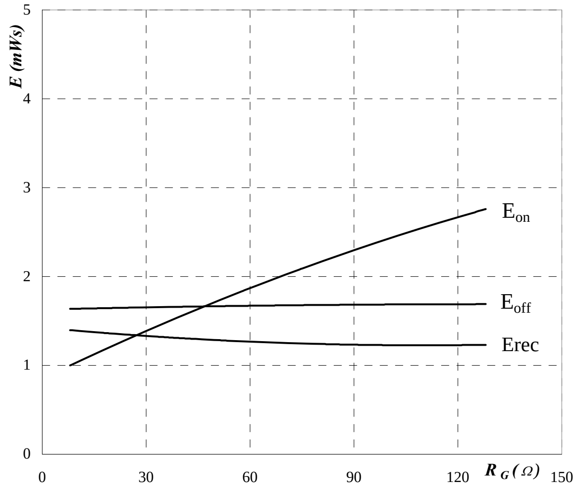
Output inverter

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



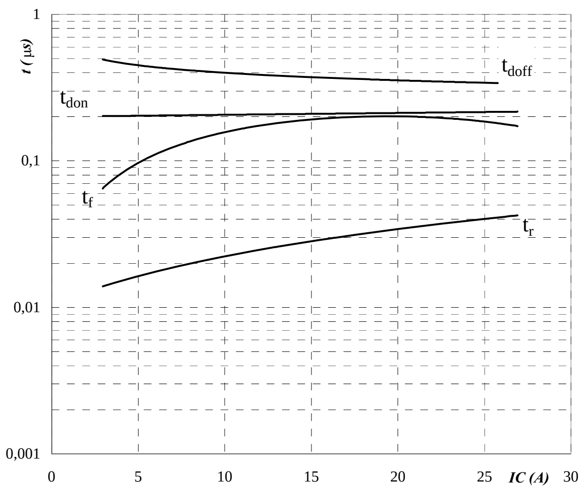
inductive load, Tj = 125 °C
VCE = 600 V
VGE= ±15 V
Rgon= 64 Ω
Rgoff= 64 Ω

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



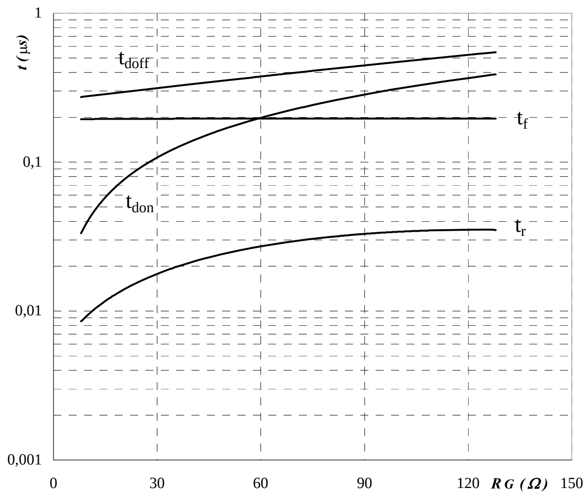
inductive load, Tj = 125 °C
VCE = 600 V
VGE= ±15 V
Ic = 15 A

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= 64 Ω
Rgoff= 64 Ω

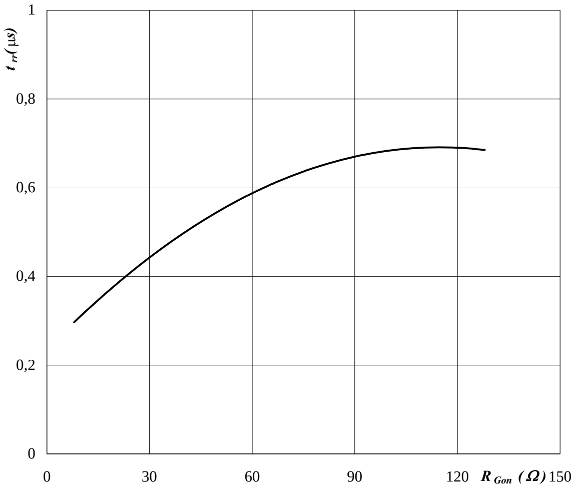
Figure 8. Typical switching times as a function of gate resistor
Output inverter IGBT
t = f (RG)



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

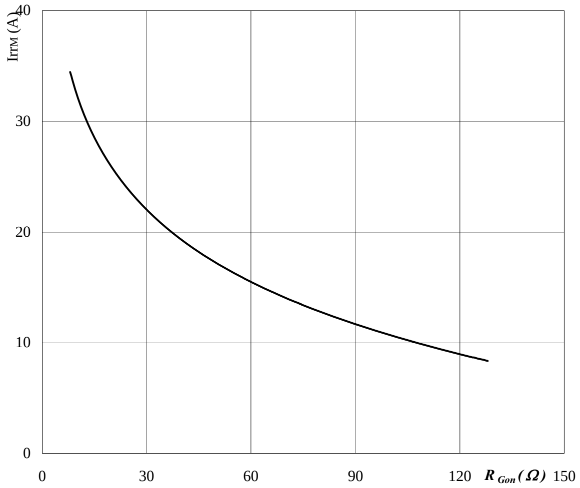
Output inverter

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



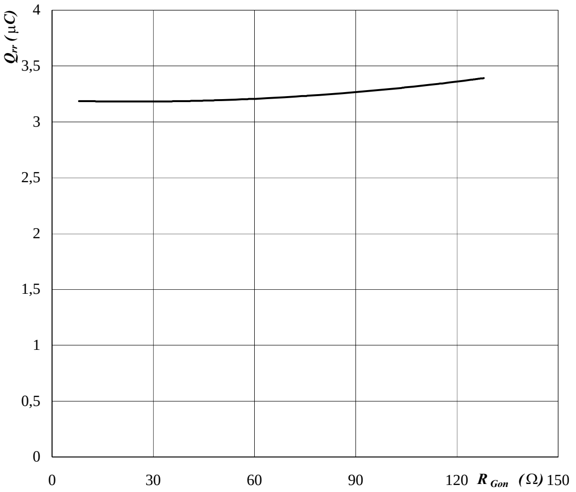
Tj =	125 °C
V_R =	600 V
I_F=	15 A
V_{GE}=	±15 V

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



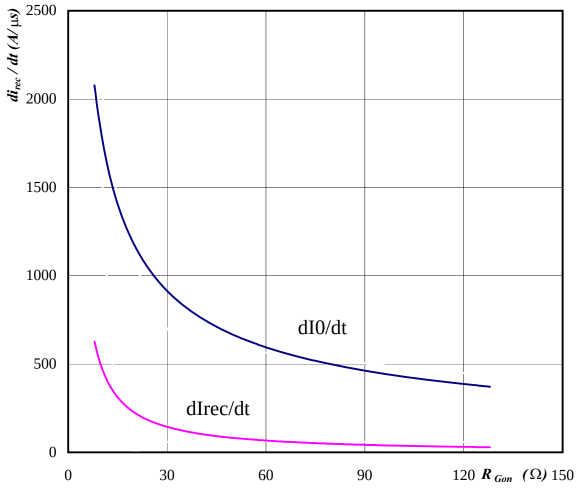
Tj =	125 °C
V_R =	600 V
I_F=	15 A
V_{GE}=	±15 V

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
V_R =	600 V
I_F=	15 A
V_{GE}=	±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)

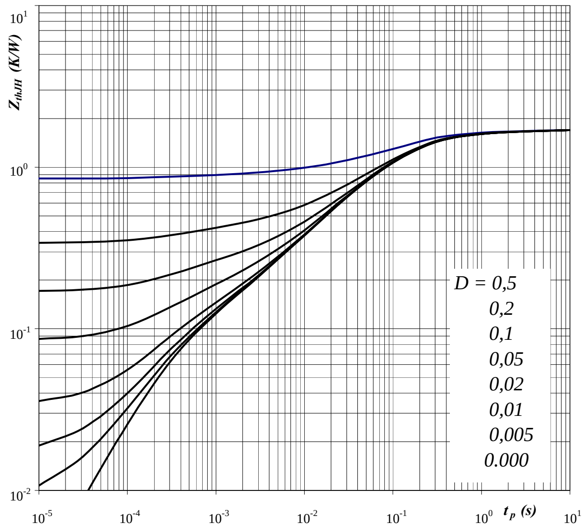


Tj =	125 °C
V_R =	600 V
I_F=	15 A
V_{GE}=	±15 V

Output inverter

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

$Z_{th}JH = f(tp)$



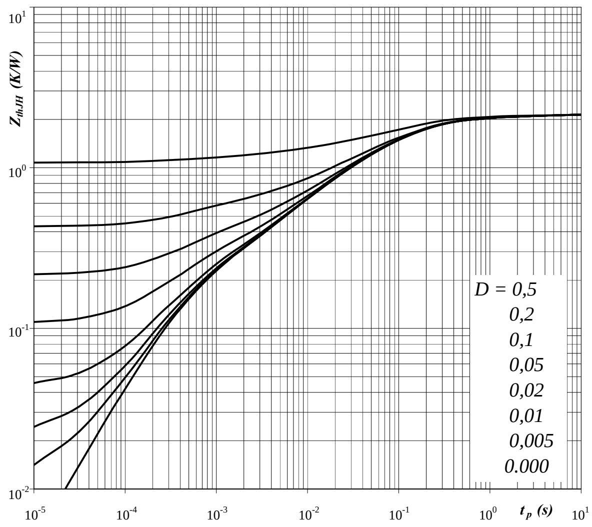
Parameter: D = tp / T RthJH= 1,70 K/W

IGBT thermal model values

R (C/W)	Tau (s)
0,12	2,6E+00
0,39	3,0E-01
0,80	8,4E-02
0,26	1,3E-02
0,07	1,5E-03
0,06	2,9E-04

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

$Z_{th}JH = f(tp)$



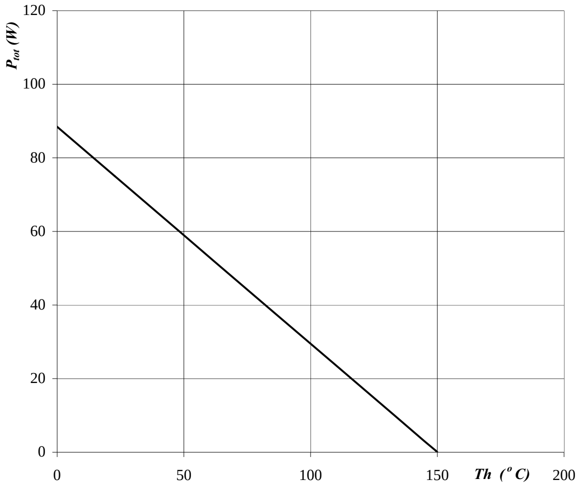
Parameter: D = tp / T RthJH= 2,14 K/W

FRED thermal model values

R (C/W)	Tau (s)
0,10	4,5E+00
0,27	4,7E-01
0,90	1,0E-01
0,53	2,0E-02
0,19	3,4E-03
0,16	4,4E-04

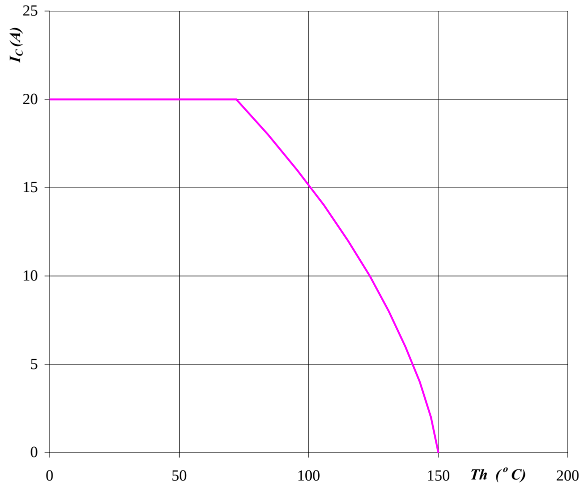
Output inverter

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



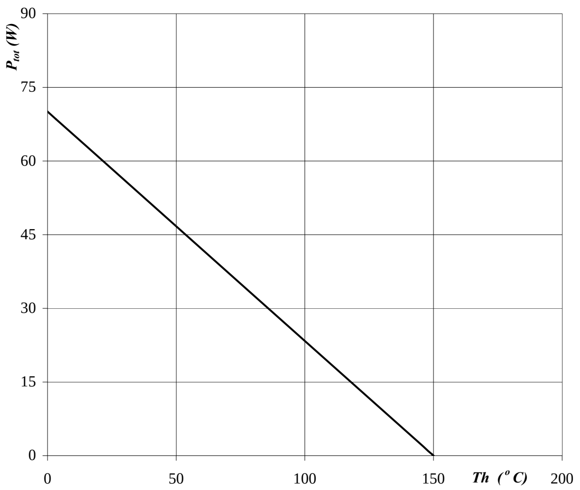
parameter: Tj= 150 ºC

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



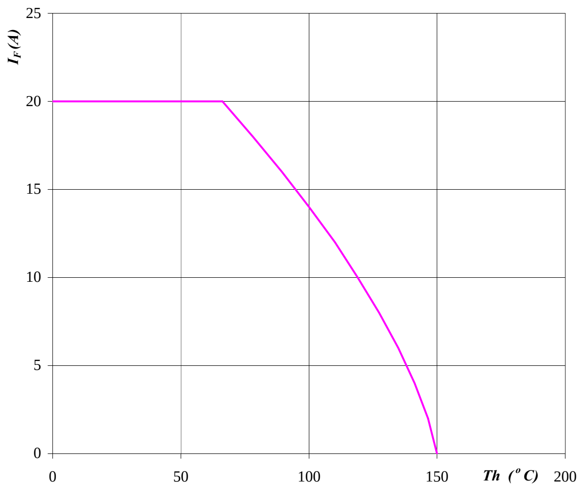
parameter: Tj= 150 ºC
V_{GE}= 15 V

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



parameter: Tj= 150 ºC

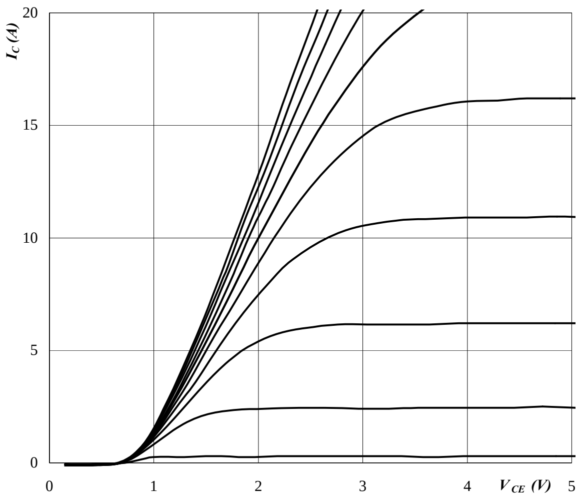
Figure 18. Forward current as a function of heatsink temperature
Output inverter FRED
I_F = f (Th)



parameter: Tj= 150 ºC

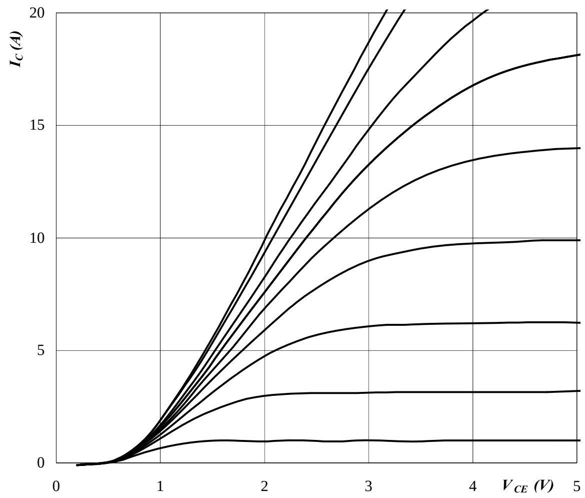
Brake

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



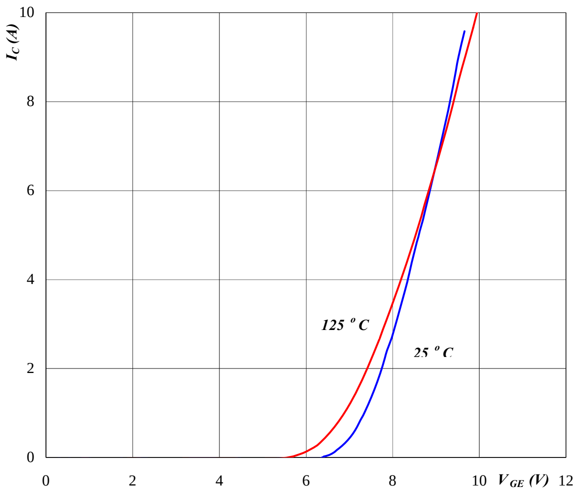
parameter: tp = 250 us   Tj = 25 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



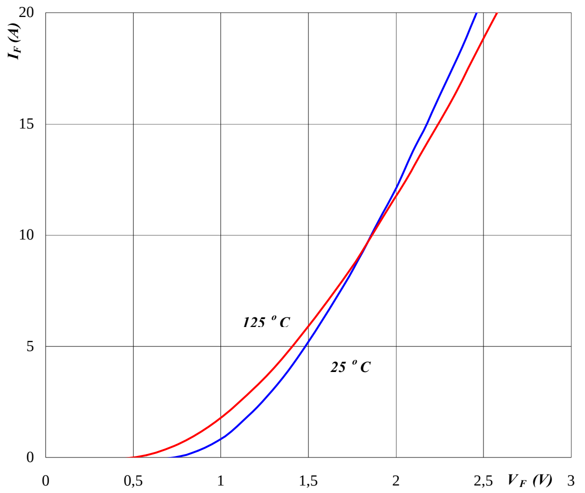
parameter: tp = 250 us   Tj = 125 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



parameter: tp = 250 us   VCE = 10 V

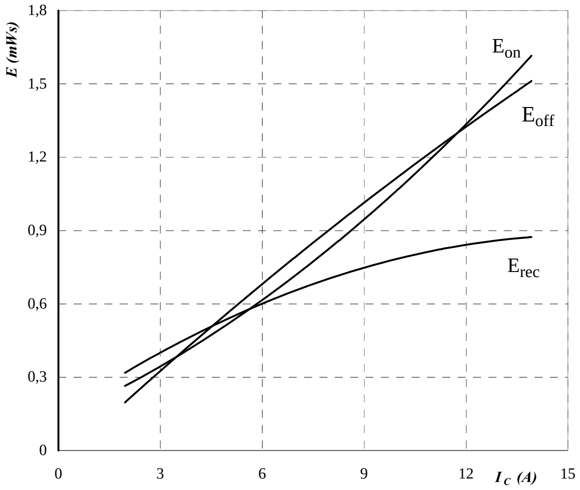
Figure 4. Typical diode forward current as a function of forward voltage
Brake FRED   IF=f(VF)



parameter: tp = 250 us

Brake

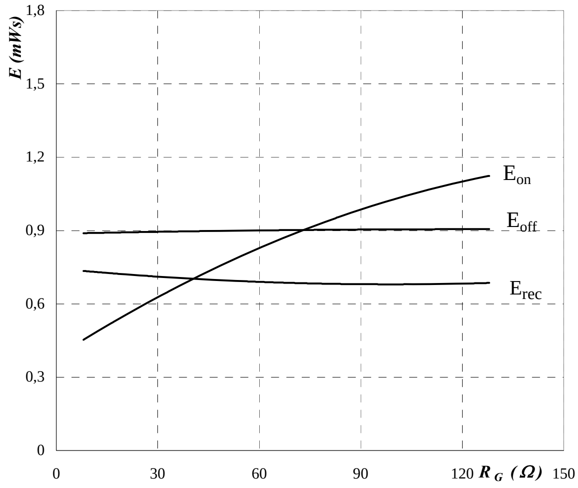
Figure 5. Typical switching energy losses as a function of collector current
Brake IGBT
E = f (Ic)



inductive load, Tj = 125 °C

V_{CE} =	600 V
V_{GE}=	±15 V
Rgon =	64 Ω
Rgoff =	64 Ω

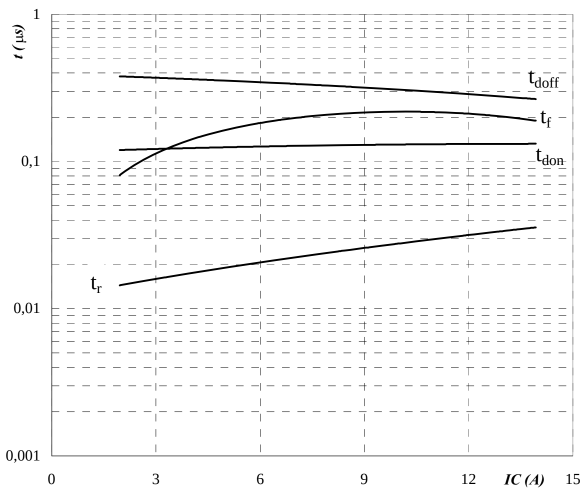
Figure 6. Typical switching energy losses as a function of gate resistor
Brake IGBT
E = f (RG)



inductive load, Tj = 125 °C

V_{CE} =	600 V
V_{GE}=	±15 V
Ic =	8 A

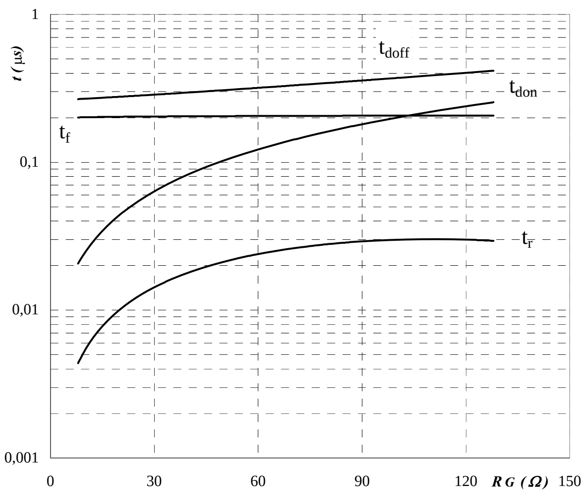
Figure 7. Typical switching times as a function of collector current
Brake IGBT
t = f (Ic)



inductive load, Tj = 125 °C

V_{CE} =	600 V
V_{GE}=	±15 V
Rgon =	64 Ω
Rgoff =	64 Ω

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

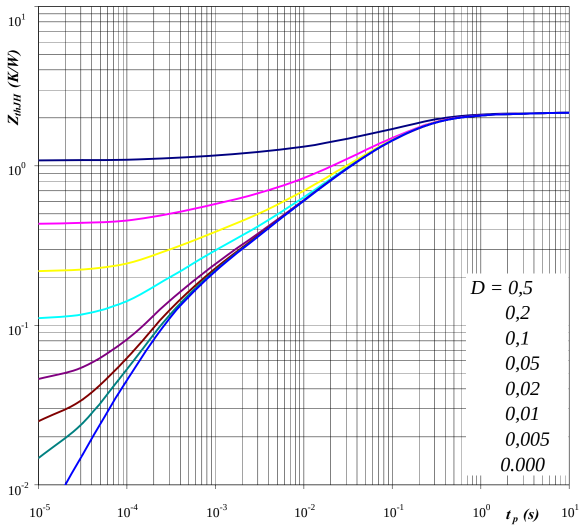


inductive load, Tj = 125 °C

V_{CE} =	600 V
V_{GE}=	±15 V
Ic =	8 A

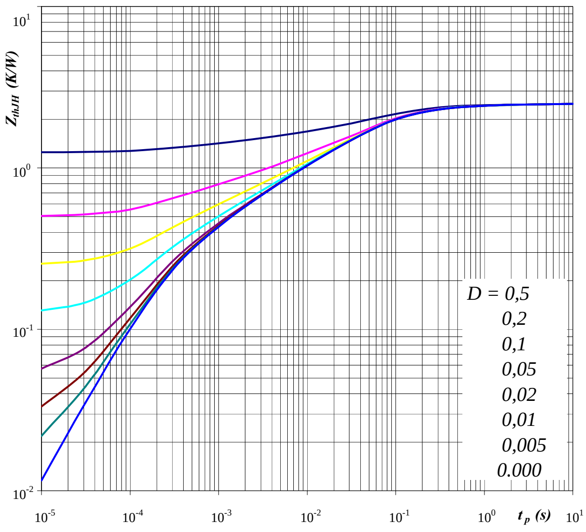
Brake

Figure9. IGBT transient thermal impedance as a function of pulse width
ZthJH = f(tp)



Parameter: D = tp / T RthJH= 2,16 K/W

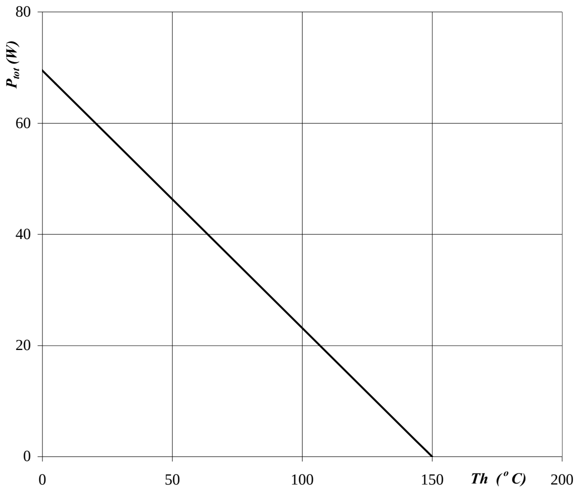
Figure 10. FRED transient thermal impedance as a function of pulse width
ZthJH = f(tp)



Parameter: D = tp / T RthJH= 2,49 K/W

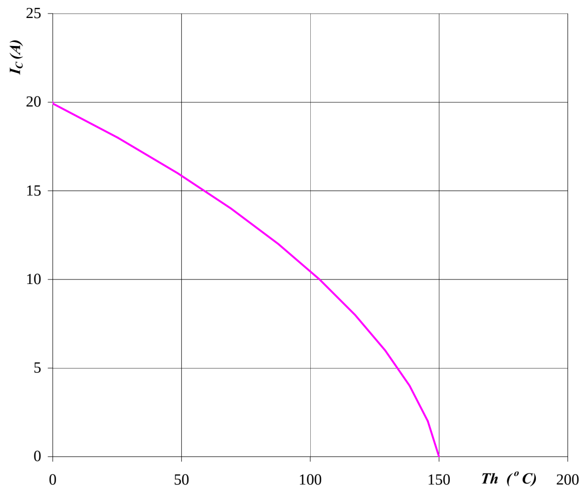
Brake

Figure 11. Power dissipation as a function of heatsink temperature
Brake IGBT
Ptot = f (Th)



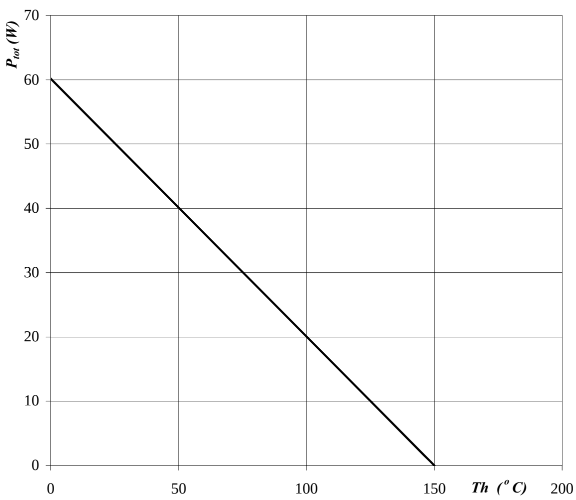
parameter: Tj= 150 ºC

Figure 12. Collector current as a function of heatsink temperature
Brake IGBT
Ic = f (Th)



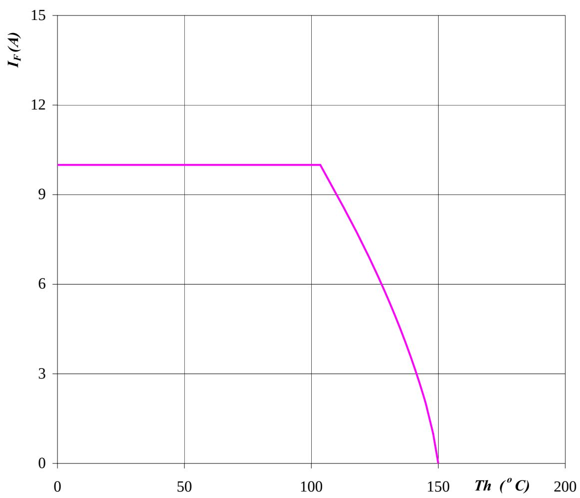
parameter: Tj= 150 ºC
VGE= 15 V

Figure 13. Power dissipation as a function of heatsink temperature
Brake FRED
Ptot = f (Th)



parameter: Tj= 150 ºC

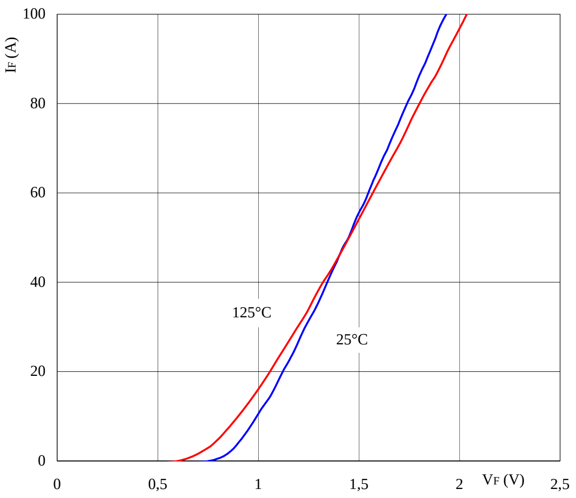
Figure 14. Forward current as a function of heatsink temperature
Brake FRED
IF = f (Th)



parameter: Tj= 150 ºC

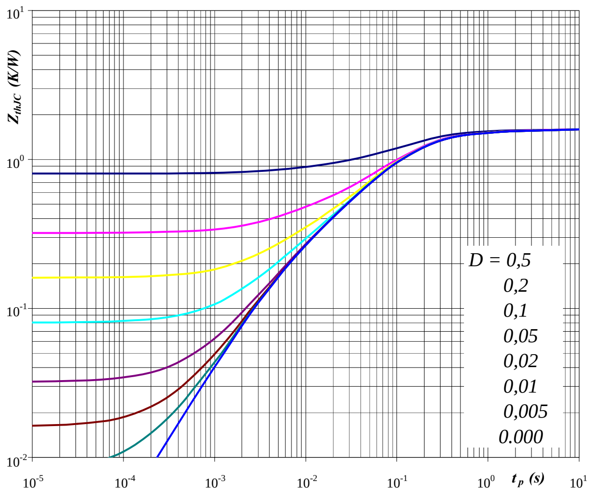
Input rectifier bridge

Figure 1. Typical diode forward current as a function of forward voltage
Rectifier diode IF=f(VF)



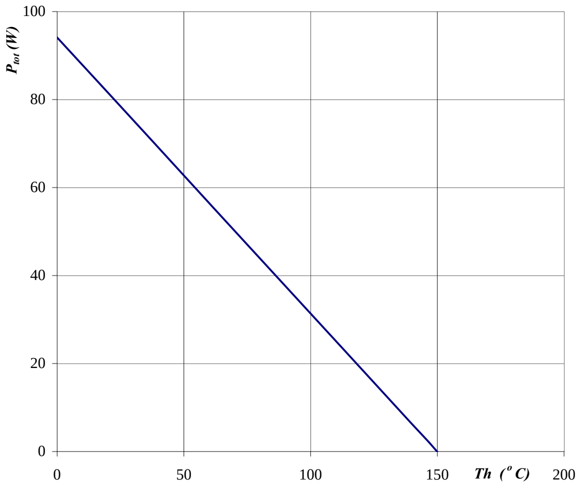
parameter: tp = 250 us

Figure 2. Diode transient thermal impedance as a function of pulse width
ZthJH = f(tp)



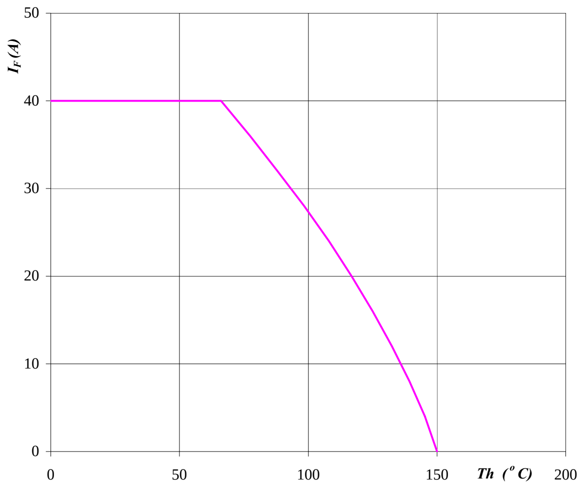
Parameter: D = tp / T RthJH= 1,59 K/W

Figure 3. Power dissipation as a function of heatsink temperature
Rectifier diode
Ptot = f (Th)



parameter: Tj= 150 ºC

Figure 4. Forward current as a function of heatsink temperature
Rectifier diode
IF = f (Th)

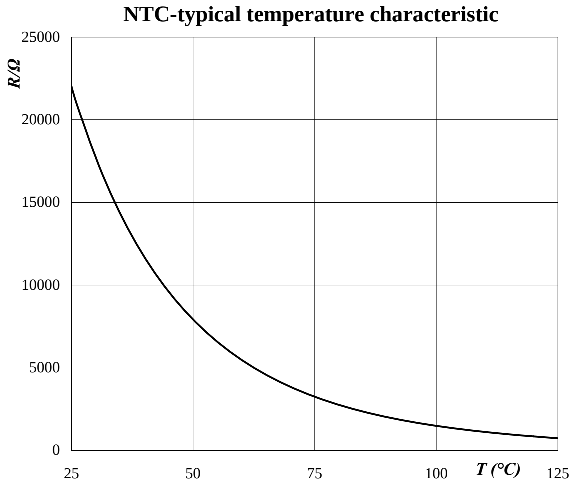


parameter: Tj= 150 ºC

Thermistor

Figure 1. **Typical NTC characteristic as afunction of temperature**

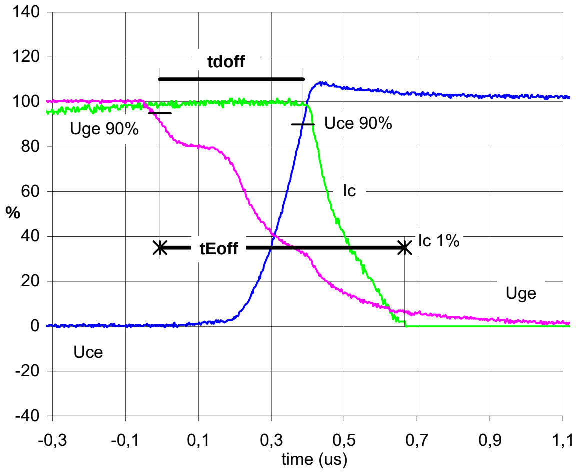
$R_T = f(T)$



Switching definitions

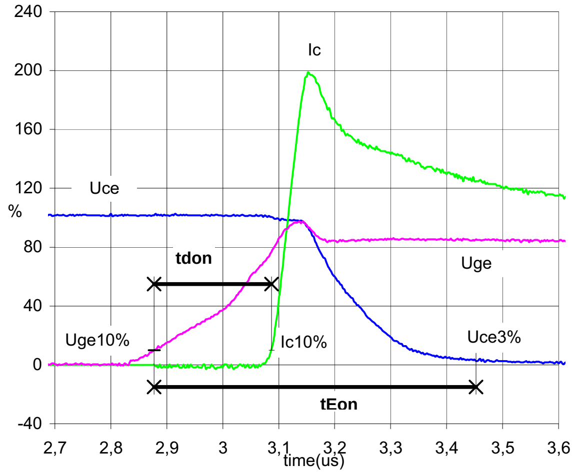
General conditions: Tj= 125 °C Rgon= 64 Ω Rgoff= 64 Ω

Figure 1. **Turn-off Switching Waveforms & definition of tdoff, t_{Eoff} (t_{Eoff} = integrating time for E_{off})**
Output inverter IGBT



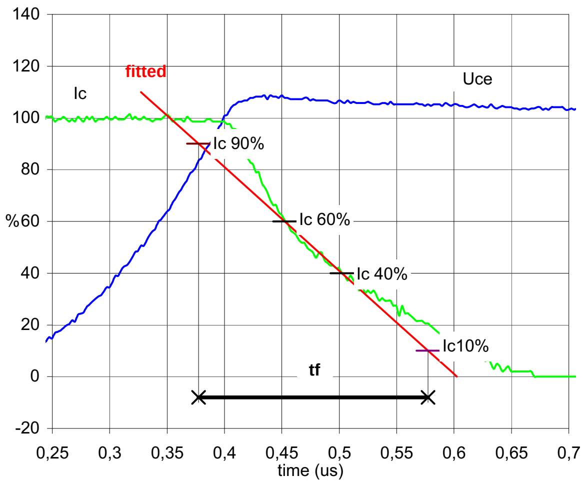
Uge(0%)=	-15 V
Uge(100%)=	15 V
Uc(100%)=	600 V
Ic(100%)=	15 A
tdoff=	0,39 us
t_{Eoff}=	0,67 us

Figure 2. **Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})**
Output inverter IGBT



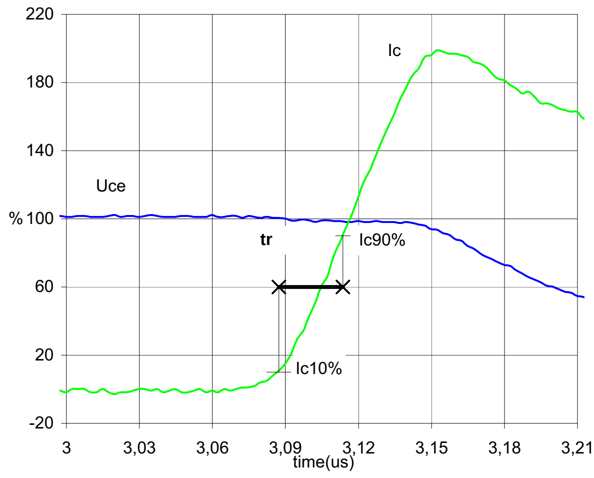
Uge(0%)=	-15 V
Uge(100%)=	15 V
Uc(100%)=	600 V
Ic(100%)=	15 A
tdon=	0,21 us
t_{Eon}=	0,57 us

Figure 3. **Turn-off Switching Waveforms & definition of t_f**
Output inverter IGBT



Uc(100%)=	600 V
Ic(100%)=	15 A
t_f=	0,192 us

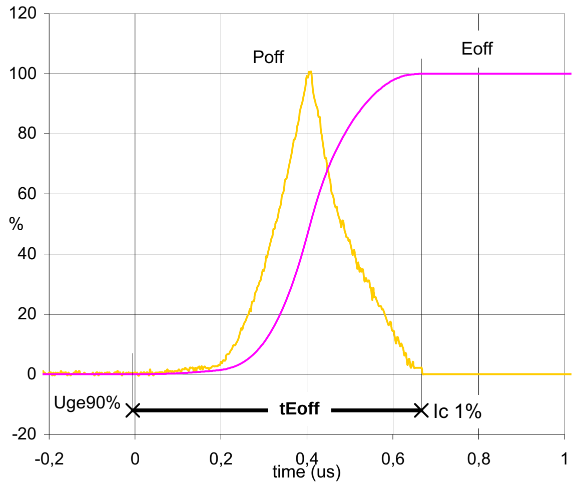
Figure 4. **Turn-on Switching Waveforms & definition of t_r**
Output inverter IGBT



Uc(100%)=	600 V
Ic(100%)=	15 A
t_r=	0,027 us

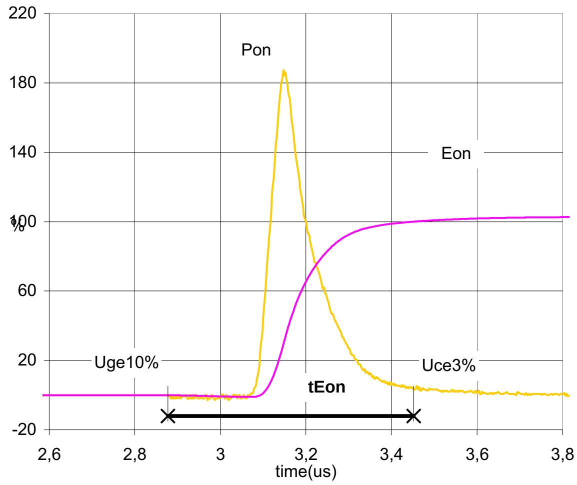
Switching definitions

Figure 5. Turn-off Switching Waveforms & definition of t_{Eoff}
Output inverter IGBT



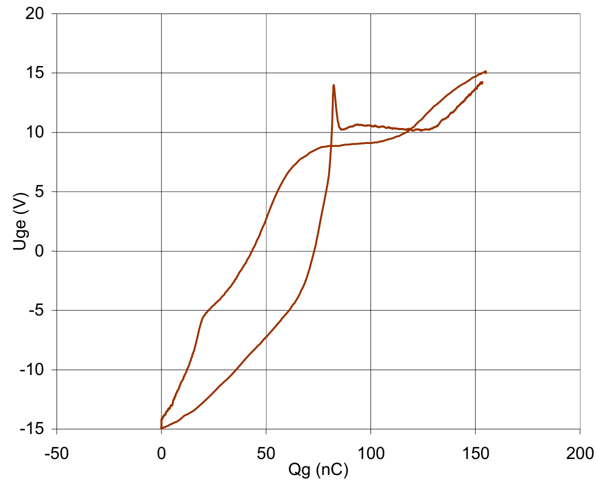
Poff(100%)= 8,95 kW
Eoff(100%)= 1,67 mJ
t_{Eoff}= 0,67 us

Figure 6. Turn-on Switching Waveforms & definition of t_{Eon}
Output inverter IGBT



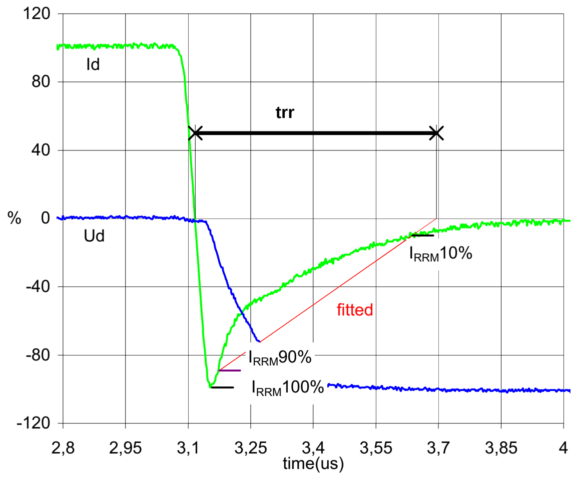
Pon(100%)= 8,95 kW
Eon(100%)= 1,88 mJ
t_{Eon}= 0,57 us

Figure 7. Gate voltage vs Gate charge
Output inverter IGBT



Ugeoff= -15 V
Ugeon= 15 V
Uc(100%)= 600 V
Ic(100%)= 15 A
Qg= 154,8 nC

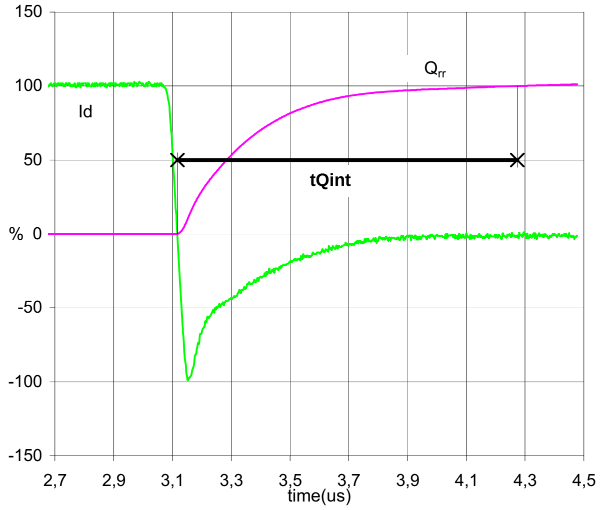
Figure 8. Turn-off Switching Waveforms & definition of t_{rr}
Output inverter FRED



Ud(100%)= 600 V
Id(100%)= 15 A
I_{RRM}(100%)= 15 A
trr= 0,56 us

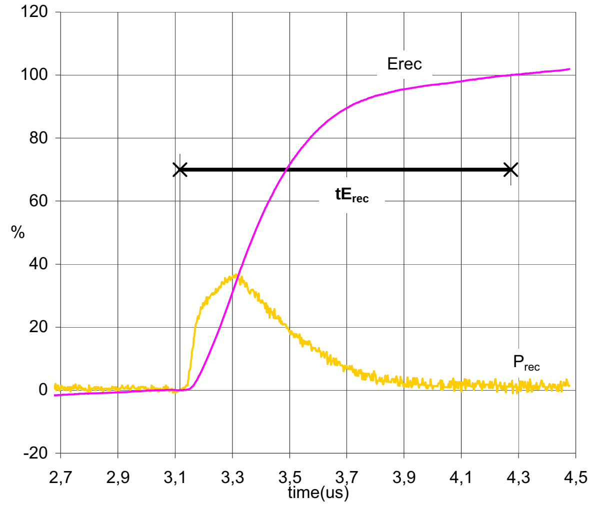
Switching definitions

Figure 9. Turn-on Switching Waveforms & definition of t_{Qrr}
(tQrr= integrating time for Qrr)
Output inverter FRED



Id(100%)= 15 A
Qrr(100%)= 3,22 uC
tQint= 1,16 us

Figure 10. Turn-on Switching Waveforms & definition of t_{Erec}
(t_{Erec}= integrating time for E_{rec})
Output inverter FRED



Prec(100%)= 8,95 kW
Erec(100%)= 1,27 mJ
tErec= 1,16 us