

Maximum Ratings / Höchstzulässige Werte

Parameter	Condition	Symbol	Values	Unit
			max.	
Input Rectifier Bridge				
Gleichrichter				
Repetitive peak reverse voltage		V_{RRM}	1600	V
Periodische Rückw. Spitzensperrspannung				
Forward current per diode	DC current $T_h=80^\circ\text{C}$;	I_{FAV}	62	A
Dauergrenzstrom	$T_c=80^\circ\text{C}$		80	
Surge forward current	$t_p=10\text{ms}$ $T_j=25^\circ\text{C}$	I_{FSM}	700	A
Stoßstrom Grenzwert				
I^2t -value	$t_p=10\text{ms}$ $T_j=25^\circ\text{C}$	I^2t	2450	A^2s
Grenzlastintegral				
Power dissipation per Diode	$T_j=150^\circ\text{C}$ $T_h=80^\circ\text{C}$	P_{tot}	65	W
Verlustleistung pro Diode	$T_c=80^\circ\text{C}$		98	
Transistor Inverter				
Transistor Wechselrichter				
Collector-emitter break down voltage		V_{CE}	1200	V
Kollektor-Emitter-Sperrspannung				
DC collector current	$T_j=150^\circ\text{C}$ $T_h=80^\circ\text{C}$,	I_C	54	A
Kollektor-Dauergleichstrom	$T_c=80^\circ\text{C}$		70	
Repetitive peak collector current	$t_p=1\text{ms}$ $T_h=80^\circ\text{C}$	I_{cpuls}	108	A
Periodischer Kollektorspitzenstrom				
Power dissipation per IGBT	$T_j=150^\circ\text{C}$ $T_h=80^\circ\text{C}$	P_{tot}	96	W
Verlustleistung pro IGBT	$T_c=80^\circ\text{C}$		146	
Gate-emitter peak voltage		V_{GE}	± 20	V
Gate-Emitter-Spitzenspannung				
SC withstand time	$T_j \leq 125^\circ\text{C}$ $V_{GE}=15\text{V}$	t_{SC}	10	us
Kurzschlußverhalten	$V_{CC}=900\text{V}$			
Diode Inverter				
Diode Wechselrichter				
DC forward current	$T_j=150^\circ\text{C}$ $T_h=80^\circ\text{C}$,	I_F	51	A
Dauergleichstrom	$T_c=80^\circ\text{C}$		69	
Repetitive peak forward current	$t_p=1\text{ms}$ $T_h=80^\circ\text{C}$	I_{FRM}	102	A
Periodischer Spitzenstrom				
Power dissipation per Diode	$T_j=150^\circ\text{C}$ $T_h=80^\circ\text{C}$	P_{tot}	73	W
Verlustleistung pro Diode	$T_c=80^\circ\text{C}$		111	

Maximum Ratings / Höchstzulässige Werte

Parameter	Condition	Symbol	Values	Unit
			max.	
Transistor BRC				
Transistor BRC				
Collector-emitter break down voltage Kollektor-Emitter-Sperrspannung		V_{CE}	1200	V
DC collector current Kollektor-Dauergleichstrom	$T_j=150^{\circ}\text{C}$ $T_h=80^{\circ}\text{C}$	I_C	65	A
Repetitive peak collector current Periodischer Kollektorspitzenstrom	$T_j=150^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$		80	
	$t_p=1\text{ms}$ $T_h=80^{\circ}\text{C}$	I_{cpuls}	131	A
Power dissipation per IGBT Verlustleistung pro IGBT	$T_j=150^{\circ}\text{C}$ $T_h=80^{\circ}\text{C}$	P_{tot}	123	W
	$T_c=80^{\circ}\text{C}$		187	
Gate-emitter peak voltage Gate-Emitter-Spitzenspannung		V_{GE}	± 20	V
SC withstand time Kurzschlußverhalten	$T_j \leq 125^{\circ}\text{C}$ $V_{GE}=15\text{V}$ $V_{CE}=900\text{V}$	t_{sc}	10	us
Diode BRC				
Diode BRC				
DC forward current Dauergleichstrom	$T_j=150^{\circ}\text{C}$ $T_h=80^{\circ}\text{C}$	I_F	59	A
Repetitive peak forward current Periodischer Spitzenstrom	$T_j=150^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$		80	
	$t_p=1\text{ms}$ $T_h=80^{\circ}\text{C}$	I_{FRM}	118	A
Power dissipation per Diode Verlustleistung pro Diode	$T_j=150^{\circ}\text{C}$ $T_h=80^{\circ}\text{C}$	P_{tot}	85	W
	$T_c=80^{\circ}\text{C}$		129	
Thermal properties				
Thermische Eigenschaften				
max. Chip temperature max. Chiptemperatur		T_{jmax}	150	$^{\circ}\text{C}$
Storage temperature Lagertemperatur		T_{stg}	-40...+125	$^{\circ}\text{C}$
Operation temperature Betriebstemperatur		T_{op}	-40...+125	$^{\circ}\text{C}$
Insulation properties				
Modulisolation				
Insulation voltage Isolationsspannung	$t=1\text{min}$	V_{is}	4000	Vdc
Creepage distance Kriechstrecke			min 12,7	mm
Clearance Luftstrecke			min 12,7	mm

Characteristic values

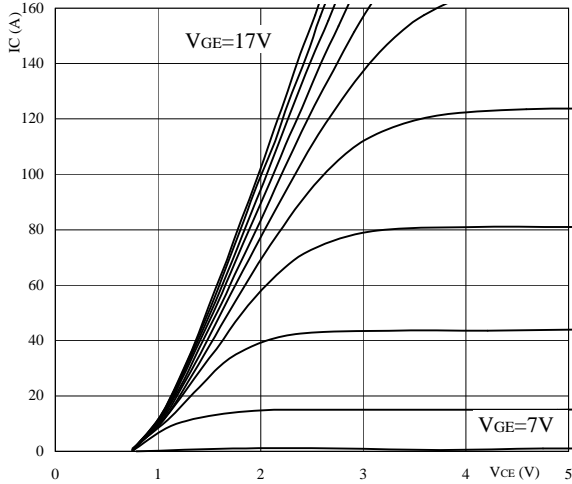
Description	Symbol	Conditions					Values			Unit	
		T(C°)	Other conditions (Rgon-Rgoff)	V _{GE} (V) V _{GS} (V)	V _R (V) V _{CE} (V) V _{DS} (V)	I _C (A) I _F (A) I _D (A)	Min	Typ	Max		
Input Rectifier Bridge											
Gleichrichter											
Forward voltage	V _F	T _J =25°C				35		1,02		V	
Durchlaßspannung		T _J =125°C						0,93			
Threshold voltage (for power loss calc. only)	V _{to}	T _J =25°C						0,87		V	
Schleusenspannung		T _J =125°C				35		0,75			
Slope resistance (for power loss calc. only)	r _t	T _J =25°C						0,004		Ohm	
Ersatzwiderstand		T _J =125°C				35		0,005			
Reverse current	I _r	T _J =25°C				1500		0	0,1	mA	
Sperrstrom		T _J =140±10°C				1500		0	2		
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R _{thJH}		Thermal grease thickness≤50um					1,08		K/W	
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehäuse pro Chip	R _{thJC}		Wärmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,71		K/W	
Transistor Inverter											
Transistor Wechselrichter											
Gate emitter threshold voltage	V _{GE(th)}	T _J =25°C	VCE=VGE				0,003	5	5,8	6,5	V
Gate-Schwellenspannung		T _J =125°C									
Collector-emitter saturation voltage	V _{CE(sat)}	T _J =25°C		15		70		1,35	1,73	2,15	V
Kollektor-Emitter Sättigungsspannung		T _J =125°C		15		70		1,99			
Collector-emitter cut-off current incl. Diode	I _{CES}	T _J =25°C		0	1224			0		0,1	mA
Kollektor-Emitter Reststrom		T _J =125°C									
Gate-emitter leakage current	I _{GES}	T _J =25°C		25	0			0		300	nA
Gate-Emitter Reststrom		T _J =125°C									
Integrated Gate resistor	R _{gint}							3			Ohm
Integrierter Gate Widerstand											
Turn-on delay time	t _{d(on)}	T _J =25°C	Rgoff=14 Ohm								ns
Einschaltverzögerungszeit		T _J =125°C	Rgon=14 Ohm	±15	600	70		77			
Rise time	t _r	T _J =25°C	Rgoff=14 Ohm								ns
Anstiegszeit		T _J =125°C	Rgon=14 Ohm	±15	600	70		28			
Turn-off delay time	t _{d(off)}	T _J =25°C	Rgoff=14 Ohm								ns
Abschaltverzögerungszeit		T _J =125°C	Rgon=14 Ohm	±15	600	70		486			
Fall time	t _f	T _J =25°C	Rgoff=14 Ohm								ns
Fallzeit		T _J =125°C	Rgon=14 Ohm	±15	600	70		188			
Turn-on energy loss per pulse	E _{on}	T _J =25°C	Rgoff=14 Ohm								mWs
Einschaltverlustenergie pro Puls		T _J =125°C	Rgon=14 Ohm	±15	600	70		8,768			
Turn-off energy loss per pulse	E _{off}	T _J =25°C	Rgoff=14 Ohm								mWs
Abschaltverlustenergie pro Puls		T _J =125°C	Rgon=14 Ohm	±15	600	70		7,181			
Input capacitance	C _{ies}	T _J =25°C	f=1MHz	0	25			4,8			nF
Eingangskapazität		T _J =125°C									
Output capacitance	C _{oss}	T _J =25°C	f=1MHz	0	25			1			nF
Ausgangskapazität		T _J =125°C									
Reverse transfer capacitance	C _{rss}	T _J =25°C	f=1MHz	0	25			0,6			nF
Rückwirkungskapazität		T _J =125°C									
Gate charge	Q _{Gate}	T _J =25°C	VCE=600V	±15				500			nC
Gate Ladung		T _J =125°C	ICpulse=70A								
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R _{thJH}		Thermal grease thickness≤50um					0,73			K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehäuse pro Chip	R _{thJC}		Wärmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,48			K/W
Diode Inverter											
Diode Wechselrichter											
Diode forward voltage	V _F	T _J =25°C				70		1,25	1,57	1,8	V
Durchlaßspannung		T _J =125°C				70			1,6		
Peak reverse recovery current	I _{RM}	T _J =25°C	Rgon=14 Ohm			600	70				A
Rückstromspitze		T _J =125°C	diF/dt = 2719 A/us	0	600	70		115,4			
Reverse recovery time	t _{rr}	T _J =25°C	Rgon=14 Ohm			600	70				ns
Sperrverzögerungszeit		T _J =125°C	diF/dt = 2719 A/us	0	600	70		474			
Reverse recovered charge	Q _{rr}	T _J =25°C	Rgon=14 Ohm			600	70				uC
Sperrverzögerungsladung		T _J =125°C	diF/dt = 2719 A/us	0	600	70		17,18			
Reverse recovered energy	E _{rec}	T _J =25°C	Rgon=14 Ohm			600	70				mWs
Sperrverzögerungsenergie		T _J =125°C	diF/dt = 2719 A/us	0	600	70		6,647			
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R _{thJH}		Thermal grease thickness≤50um					0,96			K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehäuse pro Chip	R _{thJC}		Wärmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,6			K/W

Characteristic values

Description	Symbol	Conditions					Values			Unit
		T(C°)	Other conditions (Rgon-Rgoff)	V _{GE} (V) V _{GS} (V)	V _R (V) V _{CE} (V) V _{DS} (V)	I _C (A) I _F (A) I _D (A)	Min	Typ	Max	
Transistor BRC										
Transistor BRC										
Gate emitter threshold voltage Gate-Schwellenspannung	V _{GE(th)}	T _J =25°C T _J =125°C	VCE=VGE			0,003	5	5,8	6,5	V
Collector-emitter saturation voltage Kollektor-Emitter Sättigungsspannung	V _{CE(sat)}	T _J =25°C T _J =125°C		15		70	1,35	1,68	2,15	V
Collector-emitter cut-off Kollektor-Emitter Reststrom	I _{CES}	T _J =25°C T _J =125°C		0	1224		0		0,1	mA
Gate-emitter leakage current Gate-Emitter Reststrom	I _{GES}	T _J =25°C T _J =125°C		25	0		0		300	nA
Integrated Gate resistor Integrierter Gate Widerstand	R _{gint}							3		Ohm
Turn-on delay time Einschaltverzögerungszeit	t _{di(on)}	T _J =25°C T _J =125°C	Rgoff=14 Ohm Rgon=14 Ohm							ns
Rise time Anstiegszeit	t _r	T _J =25°C T _J =125°C	Rgoff=14 Ohm Rgon=14 Ohm	±15	600	70				ns
Turn-off delay time Abschaltverzögerungszeit	t _{di(off)}	T _J =25°C T _J =125°C	Rgoff=14 Ohm Rgon=14 Ohm	±15	600	70				ns
Fall time Fallzeit	t _f	T _J =25°C T _J =125°C	Rgoff=14 Ohm Rgon=14 Ohm	±15	600	70			188,8	ns
Turn-on energy loss per pulse Einschaltverlustenergie pro Puls	E _{on}	T _J =25°C T _J =125°C	Rgoff=14 Ohm Rgon=14 Ohm	±15	600	70			9,44	mWs
Turn-off energy loss per pulse Abschaltverlustenergie pro Puls	E _{off}	T _J =25°C T _J =125°C	Rgoff=14 Ohm Rgon=14 Ohm	±15	600	70			6,93	mWs
Input capacitance Eingangskapazität	C _{iss}	T _J =25°C T _J =125°C	f=1MHz	0	25				4,8	nF
Output capacitance Ausgangskapazität	C _{oss}	T _J =25°C T _J =125°C	f=1MHz	0	25			1		nF
Reverse transfer capacitance Rückwirkungskapazität	C _{ies}	T _J =25°C T _J =125°C	f=1MHz	0	25			0,6		nF
Gate charge Gate Ladung	Q _{gate}	T _J =25°C T _J =125°C	VCE=600V ICpulse=70A	±15				500		nC
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R _{thJH}		Thermal grease thickness≤50um Warmeleitpaste Dicke≤50um					0,57		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehäuse pro Chip	R _{thJC}		Thermal grease thickness≤50um Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,37		K/W
Diode BRC										
Diode BRC										
Diode forward voltage Durchlaßspannung	V _F	T _J =25°C T _J =125°C				70	1,25	1,52	1,8	V
Reverse current Sperrstrom	I _r	T _J =25°C T _J =125°C			1224		0		100	uA
Reverse recovery time Sperrverzögerungszeit	t _{rr}	T _J =25°C T _J =125°C	Rgon= 14 Ohm diF/dt = 2550 A/us	0	600	70		550,7		ns
Reverse recovered charge Sperrverzögerungsladung	Q _{rr}	T _J =25°C T _J =125°C	Rgon= 14 Ohm diF/dt = 2550 A/us	0	600	70		16,1		uC
Reverse recovery energy Sperrverzögerungsenergie	E _{rec}	T _J =25°C T _J =125°C	Rgon= 14 Ohm diF/dt = 2550 A/us	0	600	70		6,04		mWs
Thermal resistance chip to heatsink per chip Wärmewiderstand Chip-Kühlkörper pro Chip	R _{thJH}		Thermal grease thickness≤50um Warmeleitpaste Dicke≤50um					0,82		K/W
Thermal resistance chip to case per chip Wärmewiderstand Chip-Gehäuse pro Chip	R _{thJC}		Thermal grease thickness≤50um Warmeleitpaste Dicke≤50um λ = 0,61 W/mK					0,54		K/W
PTC-Thermistor										
PTC-Widerstand										
Nominal resistance Nominaler Widerstand	R ₂₅ R ₁₀₀	T _J =25°C T _J =100°C	tolerance = 3% tolerance = 2%				0,97	1	1,03	kOhm kOhm
Typical temperature coefficient Typischer Temperaturkoeffizient	α	T _J =25°C T _J =125°C						0,76		%/K
Recommended measuring current Empfohlener Messstrom	I _m	T _J =25°C T _J =125°C					1		3	mA
Measured values Gemessene Werte	V _{PTC}	T _J =25°C	I _m = 1mA I _m = 3mA				0,93		1,03	V
							2,84		3,4	V

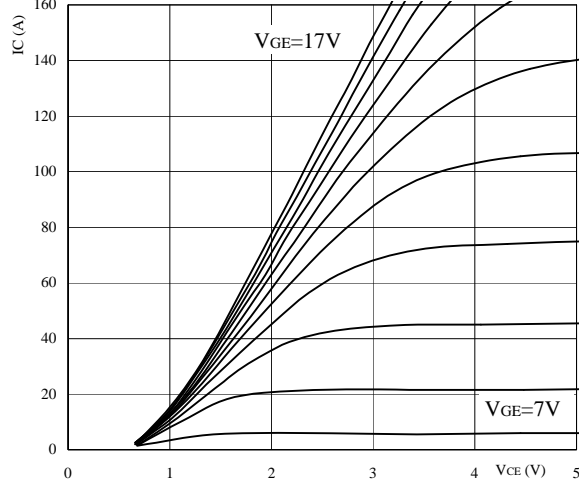
Output inverter

Figure 1. Typical output characteristics
Output inverter IGBT
 $I_c = f(V_{CE})$



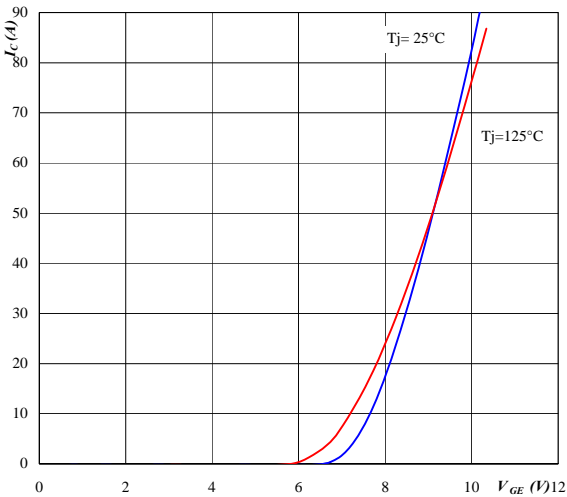
parameter: $t_p = 250 \mu s$ $T_j = 25^\circ C$
 V_{GE} parameter: from: 7 V to 17 V
in 1 V steps

Figure 2. Typical output characteristics
Output inverter IGBT
 $I_c = f(V_{CE})$



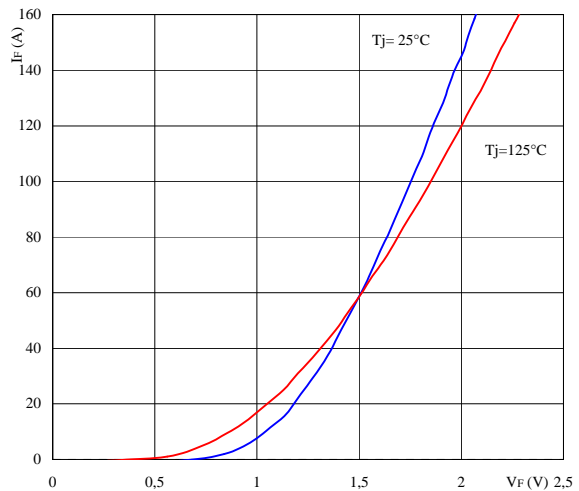
parameter: $t_p = 250 \mu s$ $T_j = 125^\circ C$
 V_{GE} parameter: from: 7 V to 17 V
in 1 V steps

Figure 3. Typical transfer characteristics
Output inverter IGBT
 $I_c = f(V_{GE})$



parameter: $t_p = 250 \mu s$ $V_{CE} = 10 V$

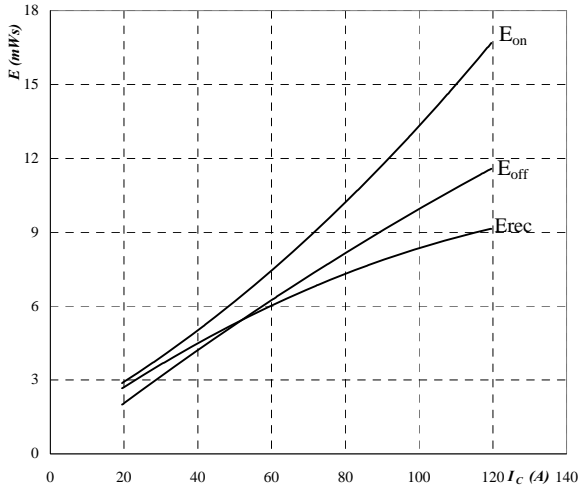
Figure 4. Typical diode forward current as a function of forward voltage
Output inverter FRED $I_F = f(V_F)$



parameter: $t_p = 250 \mu s$

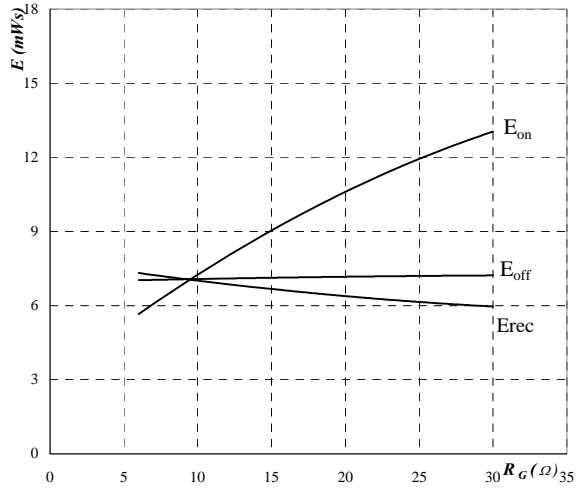
Output inverter

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



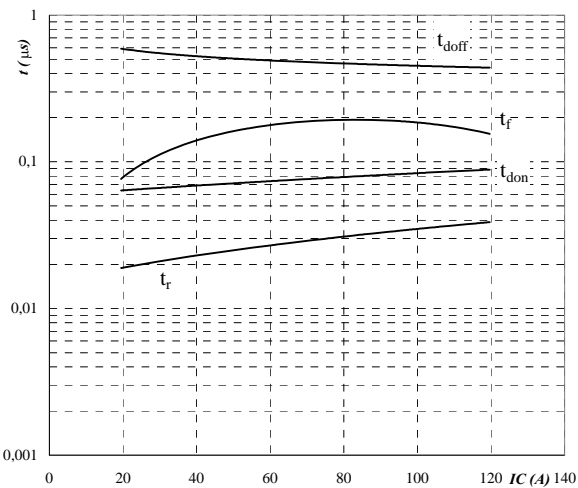
inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $R_{gon} = 14\text{ }\Omega$
 $R_{goff} = 14\text{ }\Omega$

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



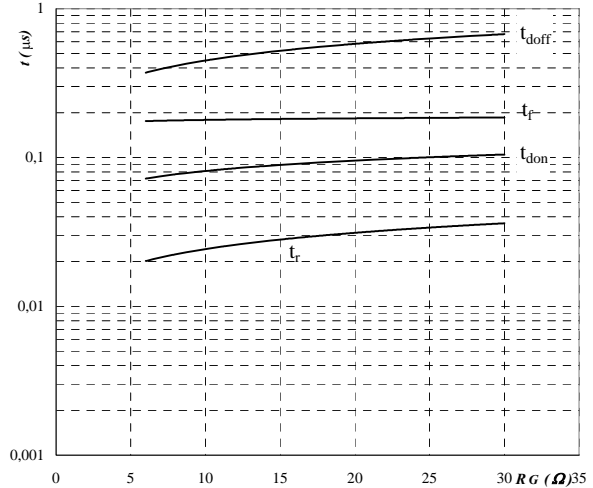
inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $I_c = 70\text{ A}$

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



inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $R_{gon} = 14\text{ }\Omega$
 $R_{goff} = 14\text{ }\Omega$

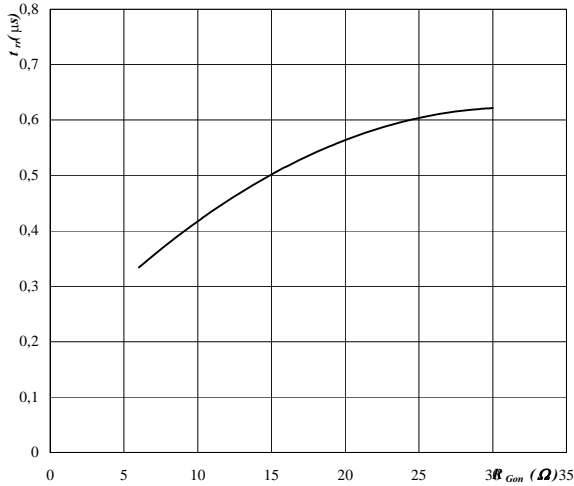
Figure 8. Typical switching times as a function of gate resistor
Output inverter IGBT
 $t = f(R_G)$



inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $I_c = 70\text{ A}$

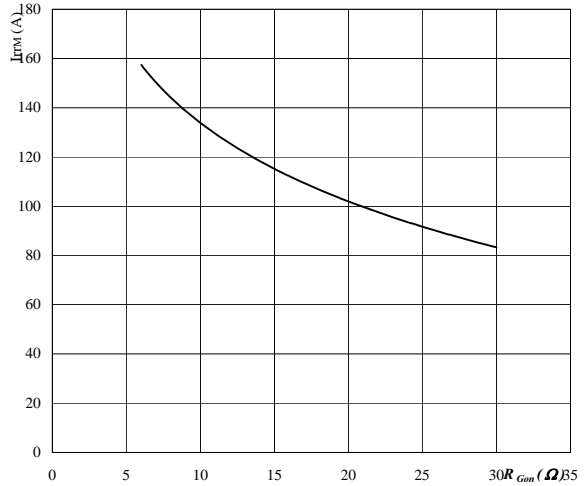
Output inverter

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



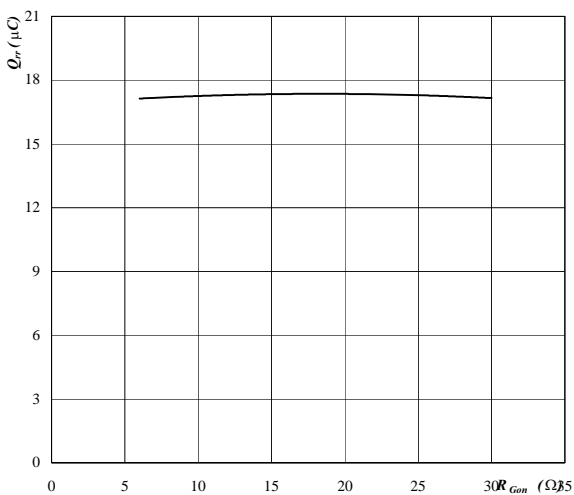
$T_j = 125\text{ °C}$
 $V_R = 600\text{ V}$
 $I_F = 70\text{ A}$
 $V_{GE} = \pm 15\text{ V}$

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



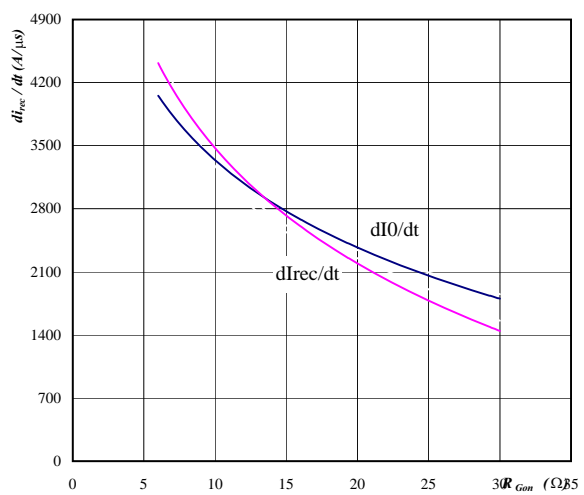
$T_j = 125\text{ °C}$
 $V_R = 600\text{ V}$
 $I_F = 70\text{ A}$
 $V_{GE} = \pm 15\text{ V}$

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



$T_j = 125\text{ °C}$
 $V_R = 600\text{ V}$
 $I_F = 70\text{ A}$
 $V_{GE} = \pm 15\text{ V}$

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
 $dI_0/dt, dI_{rec}/dt = f(R_{gon})$

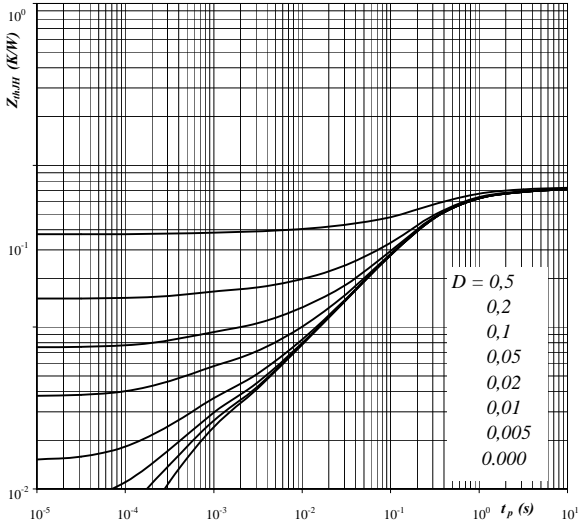


$T_j = 125\text{ °C}$
 $V_R = 600\text{ V}$
 $I_F = 70\text{ A}$
 $V_{GE} = \pm 15\text{ V}$

Output inverter

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

$Z_{thJH} = f(t_p)$



Parameter: $D = t_p / T$

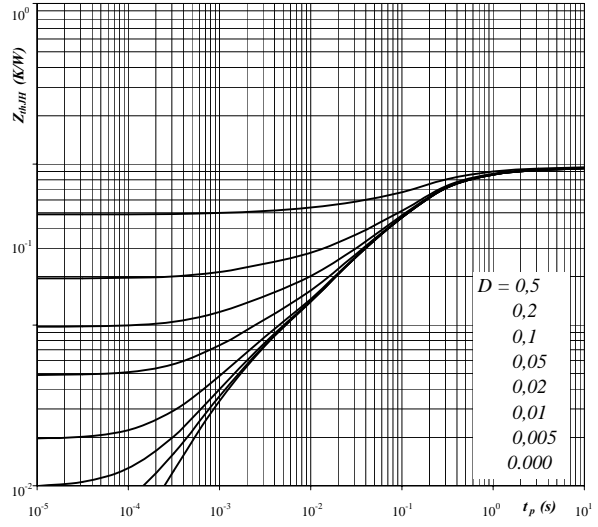
$R_{thJH} = 0,73 \text{ K/W}$

IGBT thermal model values

R (C/W)	Tau (s)
0,05	2,8E+01
0,08	2,3E+00
0,32	3,9E-01
0,23	1,2E-01
0,05	1,0E-02
0,02	5,7E-04
0,05	1,2E-04
0,00	0,0E+00

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

$Z_{thJH} = f(t_p)$



Parameter: $D = t_p / T$

$R_{thJH} = 0,96 \text{ K/W}$

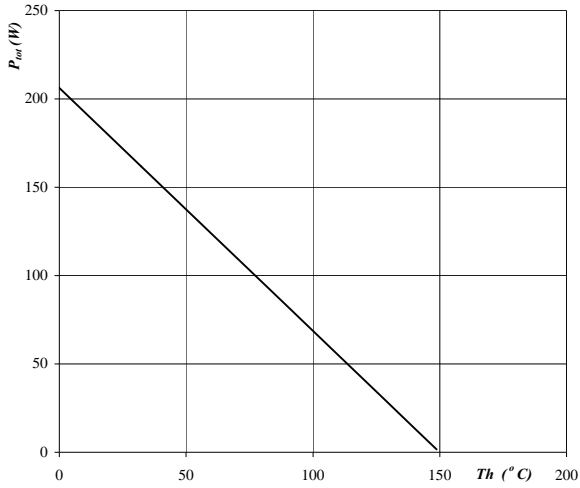
FRED thermal model values

R (C/W)	Tau (s)
0,03	4,0E+01
0,06	3,9E+00
0,23	5,6E-01
0,50	1,3E-01
0,12	1,7E-02
0,05	1,5E-03
0,04	2,0E-04
0,06	1,4E-04

Output inverter

Figure 15. Power dissipation as a function of heatsink temperature

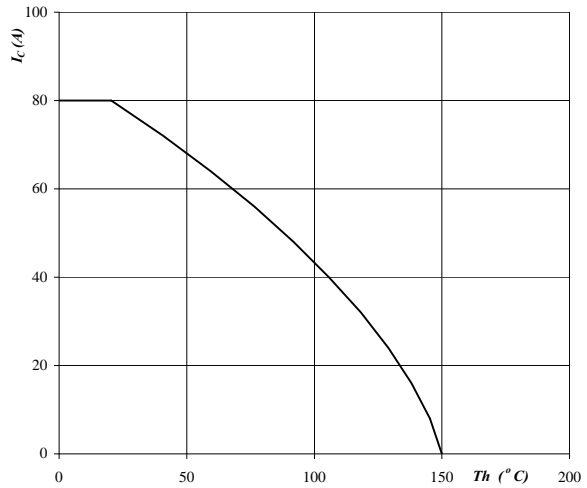
Output inverter IGBT
 $P_{tot} = f(T_h)$



parameter: T_j = 150°C

Figure 16. Collector current as a function of heatsink temperature

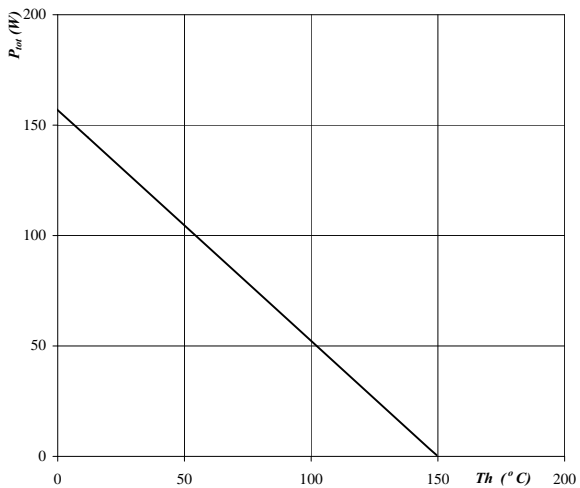
Output inverter IGBT
 $I_c = f(T_h)$



parameter: T_j = 150°C
V_{GE} = 15 V

Figure 17. Power dissipation as a function of heatsink temperature

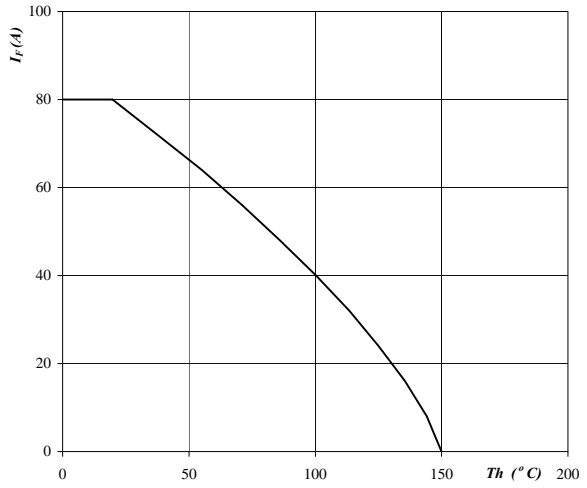
Output inverter FRED
 $P_{tot} = f(T_h)$



parameter: T_j = 150°C

Figure 18. Forward current as a function of heatsink temperature

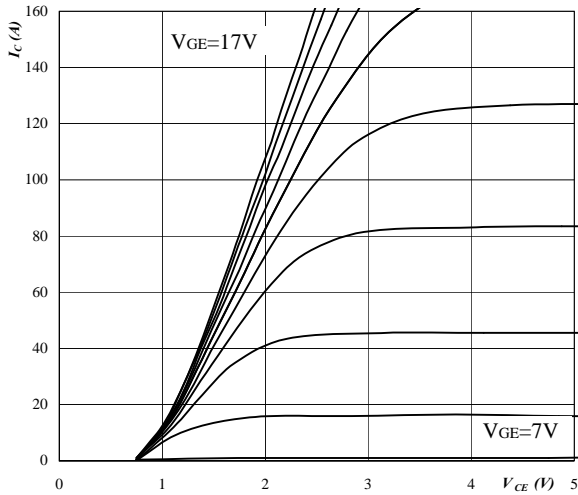
Output inverter FRED
 $I_F = f(T_h)$



parameter: T_j = 150°C

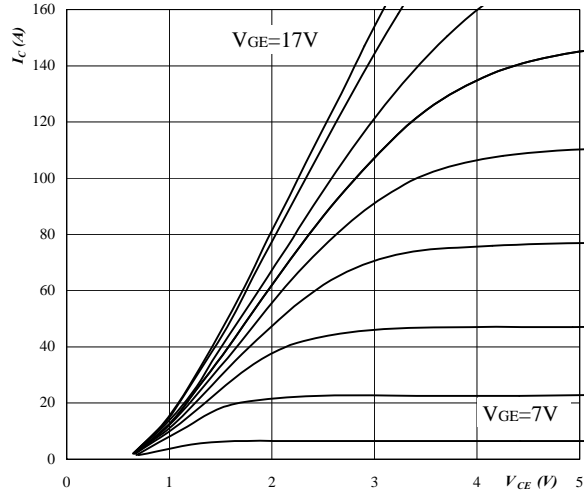
Brake

Figure 19. Typical output characteristics
Brake IGBT
 $I_c = f(V_{CE})$



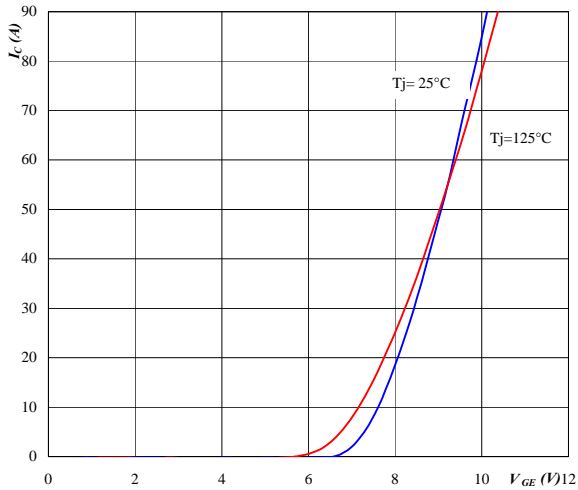
parameter: $t_p = 250 \mu s$ $T_j = 25^\circ C$
 V_{GE} parameter: from: 7 V to 17 V
in 1 V steps

Figure 20. Typical output characteristics
Brake IGBT
 $I_c = f(V_{CE})$



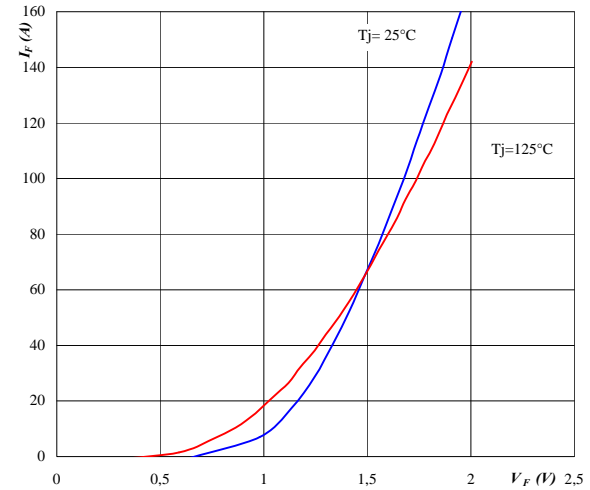
parameter: $t_p = 250 \mu s$ $T_j = 125^\circ C$
 V_{GE} parameter: from: 7 V to 17 V
in 1 V steps

Figure 21. Typical transfer characteristics
Brake IGBT
 $I_c = f(V_{GE})$



parameter: $t_p = 250 \mu s$ $V_{CE} = 10 V$

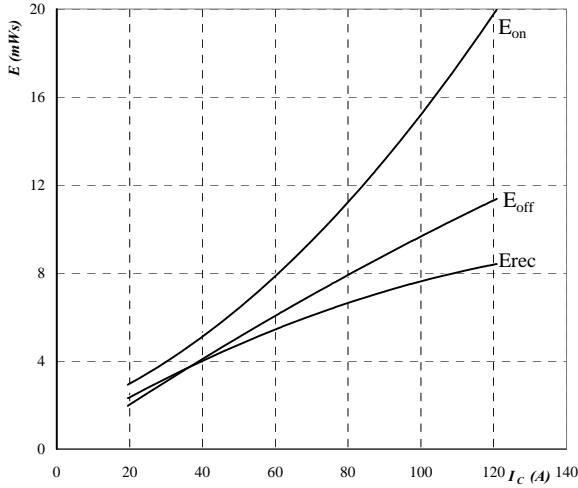
Figure 22. Typical diode forward current as a function of forward voltage
Brake FRED $I_F = f(V_F)$



parameter: $t_p = 250 \mu s$

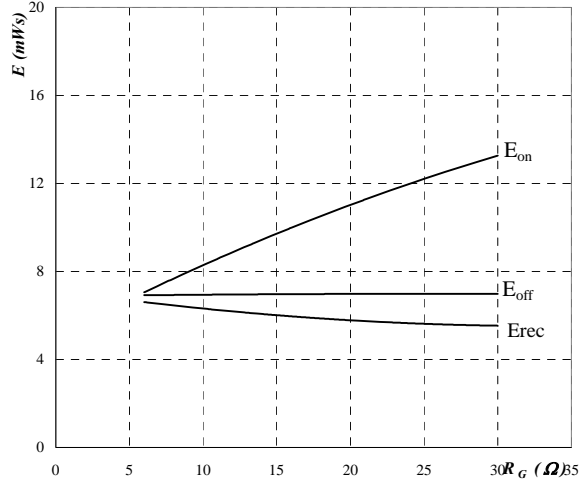
Brake

Figure 23. Typical switching energy losses as a function of collector current
Brake IGBT
 $E = f(I_c)$



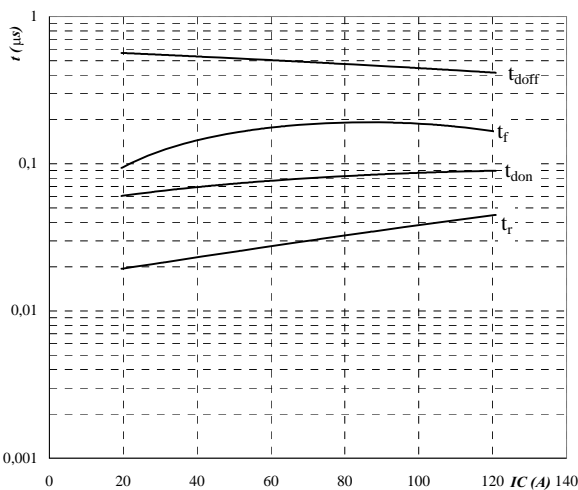
inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $R_{gon} = 14\text{ }\Omega$
 $R_{goff} = 14\text{ }\Omega$

Figure 24. Typical switching energy losses as a function of gate resistor
Brake IGBT
 $E = f(R_G)$



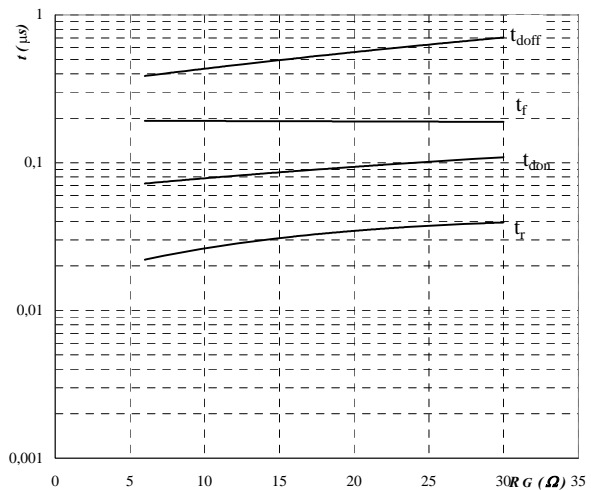
inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $I_c = 70\text{ A}$

Figure 25. Typical switching times as a function of collector current
Brake IGBT
 $t = f(I_c)$



inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $R_{gon} = 14\text{ }\Omega$
 $R_{goff} = 14\text{ }\Omega$

Figure 26. Typical switching times as a function of gate resistor
Brake IGBT
 $t = f(R_G)$

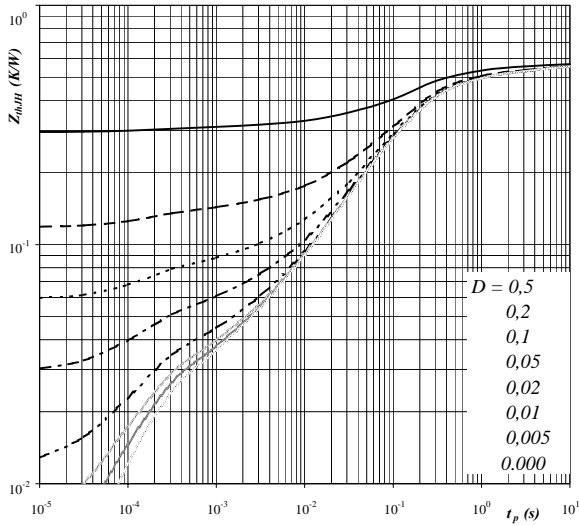


inductive load, $T_j = 125\text{ }^\circ\text{C}$
 $V_{CE} = 600\text{ V}$
 $V_{GE} = \pm 15\text{ V}$
 $I_c = 70\text{ A}$

Brake

Figure 27. IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$

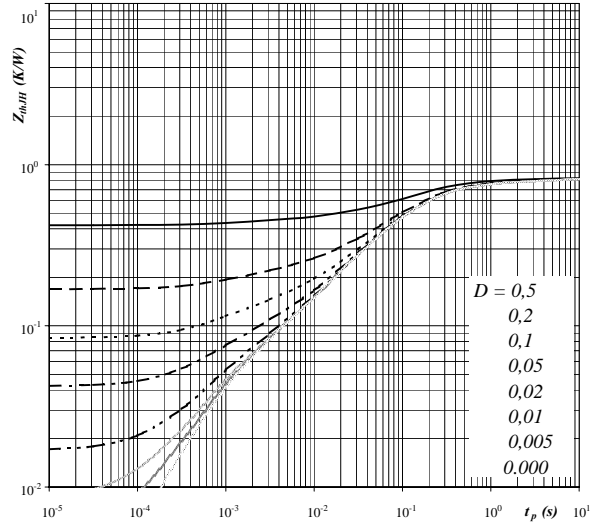


Parameter: $D = t_p / T$

$R_{thJH} = 0,57 \text{ K/W}$

Figure 28. FRED transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$

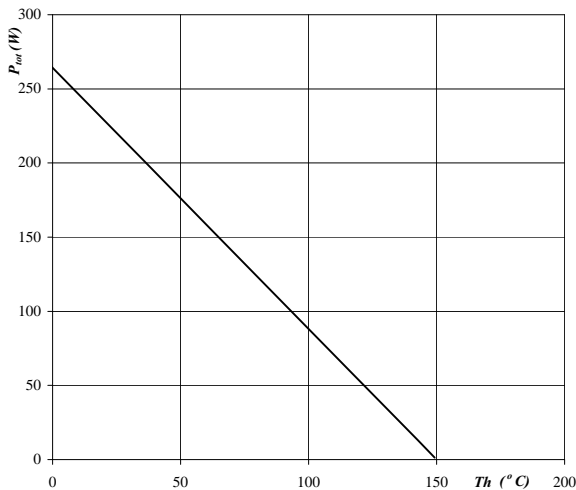


Parameter: $D = t_p / T$

$R_{thJH} = 0,82 \text{ K/W}$

Figure 29. Power dissipation as a function of heatsink temperature

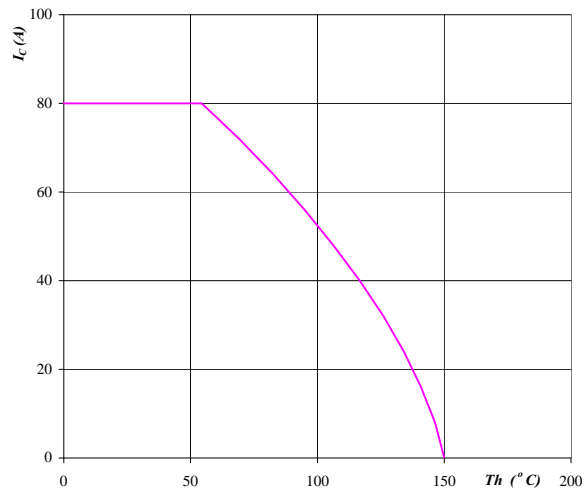
Brake IGBT
 $P_{tot} = f(T_h)$



parameter: $T_j = 150^\circ\text{C}$

Figure 30. Collector current as a function of heatsink temperature

Brake IGBT
 $I_c = f(T_h)$



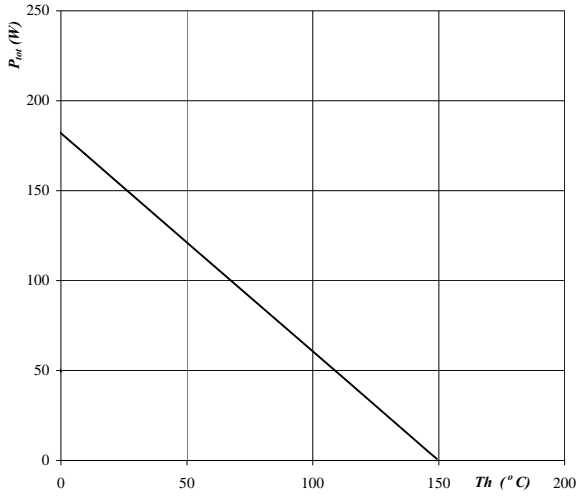
parameter: $T_j = 150^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$

Brake

Figure 31. Power dissipation as a function of heatsink temperature

Brake FRED

$P_{tot} = f(T_h)$

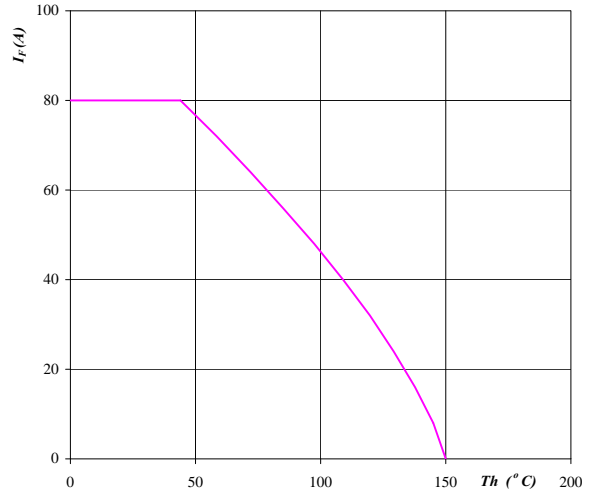


parameter: $T_j = 150^\circ\text{C}$

Figure 32. Forward current as a function of heatsink temperature

Brake FRED

$I_F = f(T_h)$



parameter: $T_j = 150^\circ\text{C}$

Input rectifier bridge

Figure 33. Typical diode forward current as a function of forward voltage
Rectifier diode $I_F = f(V_F)$

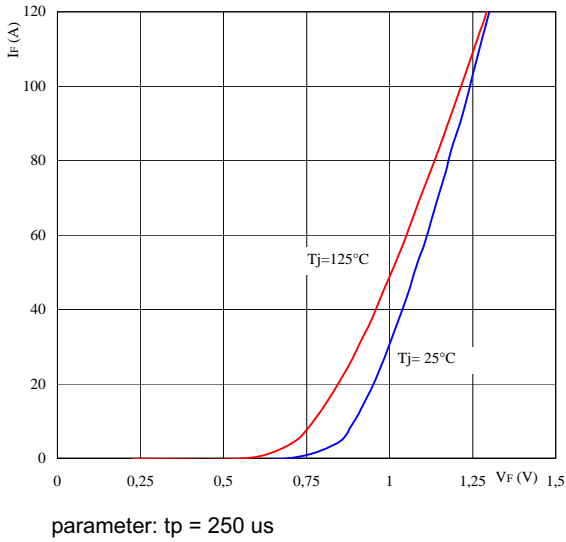


Figure 34. Diode transient thermal impedance as a function of pulse width
 $Z_{thJC} = f(t_p)$

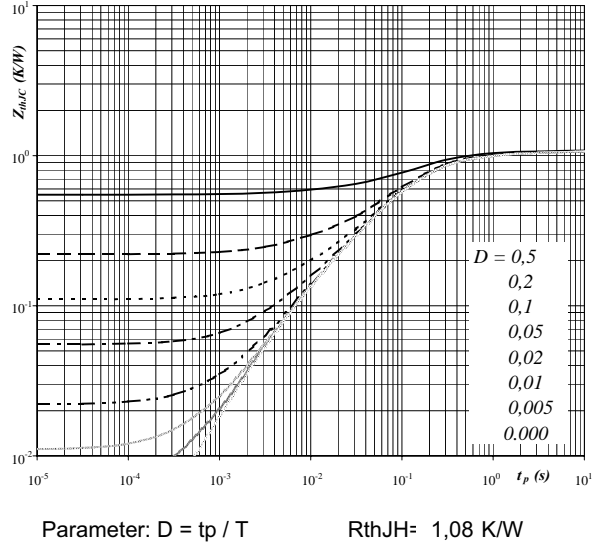


Figure 35. Power dissipation as a function of heatsink temperature
Rectifier diode $P_{tot} = f(Th)$

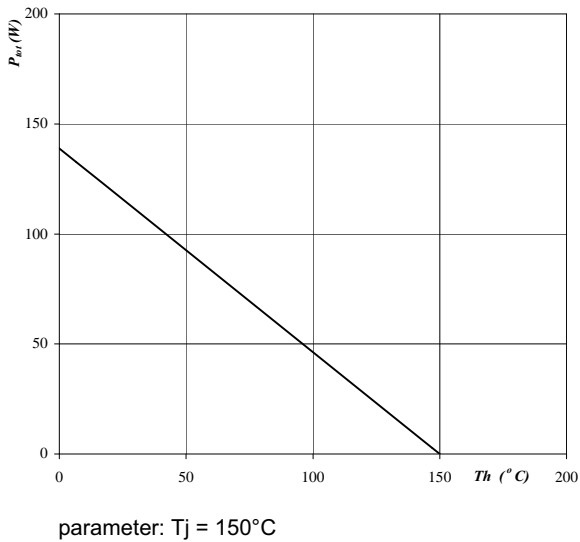
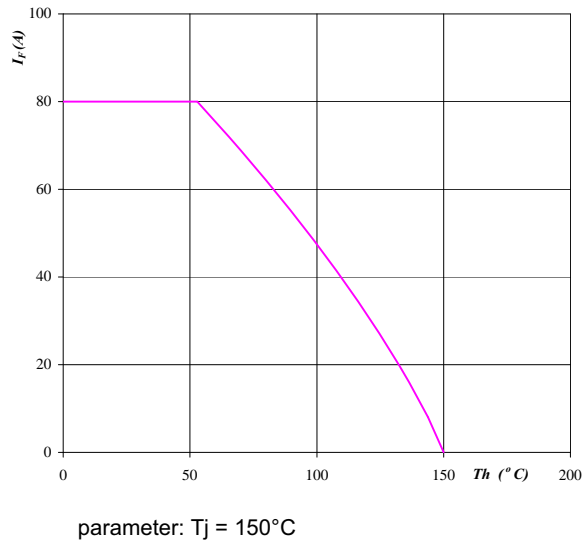


Figure 36. Forward current as a function of heatsink temperature
Rectifier diode $I_F = f(Th)$



Thermistor**Figure 37. Typical PTC characteristic
as a function of temperature**

$$R_T = f(T)$$

PTC-typical temperature characteristic