Vincotech

V23990-P623-F24-PM
preliminary datasheet

fast PACK 0 H 2nd gen — 600V / 50A

Features

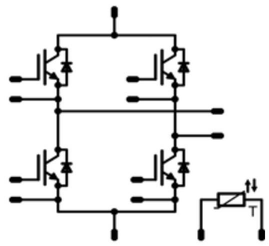
- Low inductive design
- Clip-in PCB mounting

flow 0 housing

Target Applications

- Distributed Power Generation
- Welding

Schematic



P623-F24

Types

- V23990-P623-F24

Maximum Ratings

Parameter	Symbol	Condition		Value	Unit
Transistor H-bridge (IGBT)					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	$T_j=T_jmax$	$T_h=80°C$	43	A
			$T_c=80°C$	50	
Repetitive peak collector current	I_{cpuls}	tp limited by T_jmax		150	A
Power dissipation per IGBT	P_{tot}	$T_j=T_jmax$	$T_h=80°C$	79	W
			$T_c=80°C$	120	
Gate-emitter peak voltage	V_{GE}			±20	V
SC withstand time*	t_{SC}	Tj=125°C $V_{GE}=15V$ $V_{CC}=360V$		6	µs
Maximum junction temperature	T_jmax			175	°C

* It is recommended to not exceed 1000 short circuit situations in the lifetime of the module and to allow at least 1s between short circuits

Parameter	Symbol	Condition		Value	Unit
Diode H-bridge					
DC forward current	I_F	$T_j=T_jmax$	$T_h=80°C$	41	A
			$T_c=80°C$	50	
Repetitive peak forward current	I_{FRM}	tp limited by T_jmax		150	A
Power dissipation per Diode	P_{tot}	$T_j=T_jmax$	$T_h=80°C$	64	W
			$T_c=80°C$	97	
Maximum junction temperature	T_jmax			175	°C

Maximum Ratings

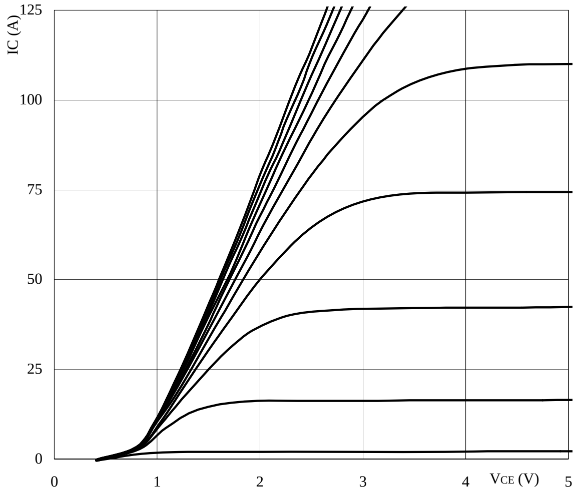
Parameter	Symbol	Condition	Value	Unit
Thermal properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature	T_{op}		-40…+125	°C
Insulation properties				
Insulation voltage	V_{is}	t=1min	4000	Vdc
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm

Characteristic Values

Parameter	Symbol	Conditions	V_{GE}(V) or V_{GS}(V)	V_r(V) or V_{CE}(V) or V_{DS}(V)	I_C(A) or I_F(A) or I_D(A)	T(C°)	Value Min	Value Typ	Value Max	Unit
Transistor H-bridge (IGBT)										
Gate emitter threshold voltage	$V_{GE(th)}$	VGE=VCE			0,0008	Tj=25°C Tj=125°C	4 	5,8 	7 	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	Tj=25°C Tj=125°C		1,64 1,9	2,35 	V
Collector-emitter cut-off	I_{CES}		0	600		Tj=25°C Tj=125°C			0,35 	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			650 	nA
Integrated Gate resistor	R_{gint}					Tj=25°C Tj=125°C		- 		Ohm
Turn-on delay time	$t_{d(on)}$	Rgoff=8 Ω Rgon=8 Ω	±15	300	50	Tj=25°C Tj=125°C		 100		ns
Rise time	t_r					Tj=25°C Tj=125°C		 15		ns
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		 174		ns
Fall time	t_f					Tj=25°C Tj=125°C		 96		ns
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		 0,5		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		 1,37		mWs
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C Tj=125°C		3,14 		nF
Output capacitance	C_{oss}					Tj=25°C Tj=125°C		0,2 		nF
Reverse transfer capacitance	C_{rss}					Tj=25°C Tj=125°C		0,09 		nF
Gate charge	Q_{Gate}	Rgon=8 Ω Rgoff=8 Ω	±15	300	50	Tj=25°C Tj=125°C		 518		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 0,61 W/mK						1,2		K/W
Thermal resistance chip to case per chip	R_{thJC}									K/W
Diode H-bridge										
Diode forward voltage	V_F				50	Tj=25°C Tj=125°C		1,68 1,7	2,3 	V
Peak reverse recovery current	I_{RM}	Rgon=8 Ω dI0/dt=4429 A/us	-15	300	50	Tj=25°C Tj=125°C		 89		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		 133		ns
Reverse recovery charge	Q_{rr}					Tj=25°C Tj=125°C		 3,85		μC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 0,61 W/mK						1,48		K/W
Thermal resistance chip to case per chip	R_{thJC}									K/W
NTC Thermistor										
Rated resistance	R_{25}					Tj=25°C	20,9	22	23,1	kOhm
Deviation of R100	$D_{R/R}$	R100=1503Ω				Tc=100°C		2,9		%/K
Power dissipation given Epcos-Type	P					Tj=25°C		210		mW
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25°C		3980		K

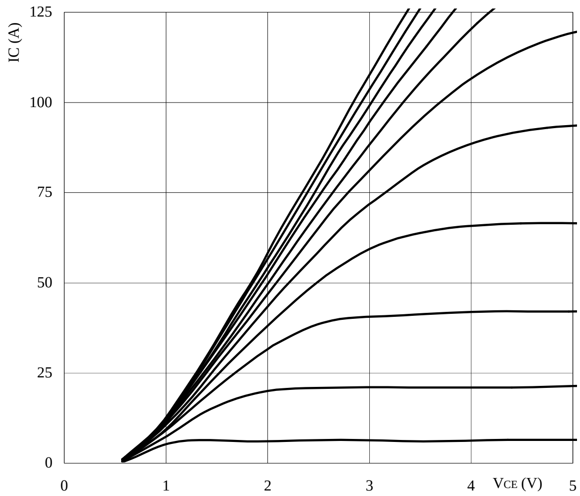
Output inverter

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



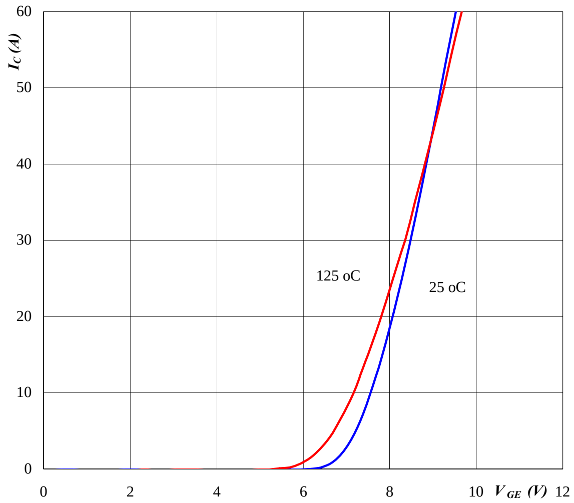
parameter: tp = 250 us Tj = 25 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



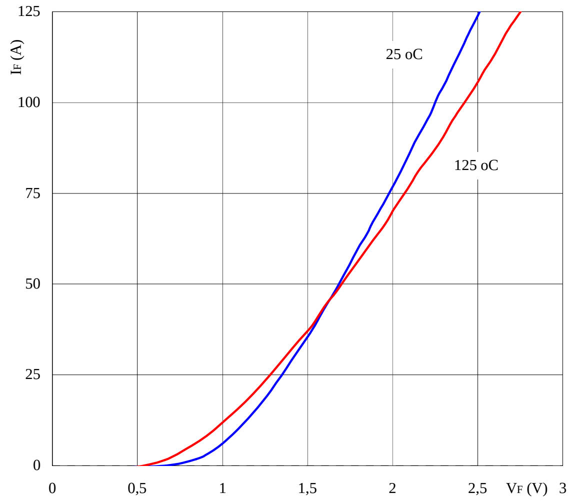
parameter: tp = 250 us Tj = 125 °C
VGE parameter: from: 7 V to 17 V
in 1 V steps

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



parameter: tp = 250 us VCE = 10 V

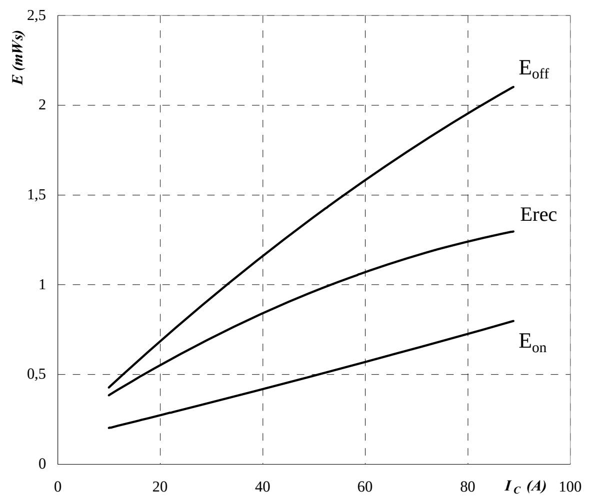
Figure 4. Typical diode forward current as a function of forward voltage
Output inverter FRED IF=f(VF)



parameter: tp = 250 us

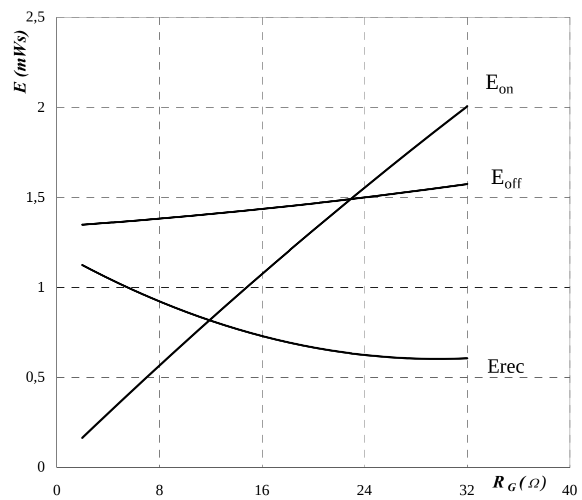
Output inverter

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



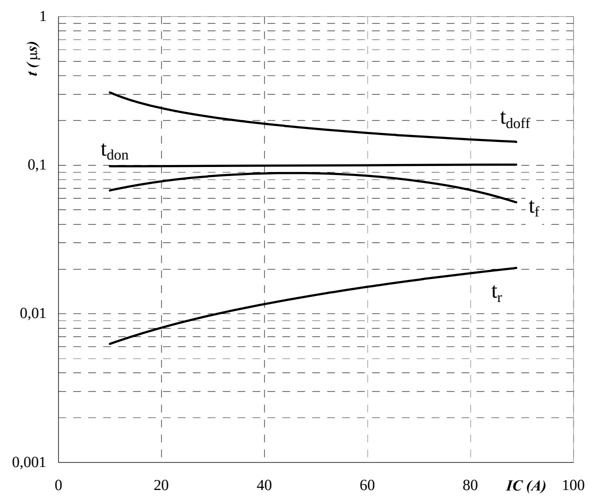
inductive load, Tj = 125 °C
VCE = 300 V
VGE= ±15 V
Rgon= 8 Ω
Rgoff= 8 Ω

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



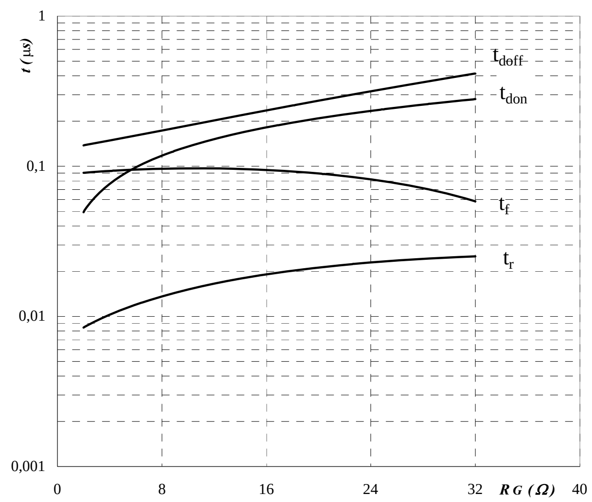
inductive load, Tj = 125 °C
VCE = 300 V
VGE= ±15 V
Ic = 50 A

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



inductive load, Tj = 125 °C
VCE = 300 V
VGE= ±15 V
Rgon= 8 Ω
Rgoff= 8 Ω

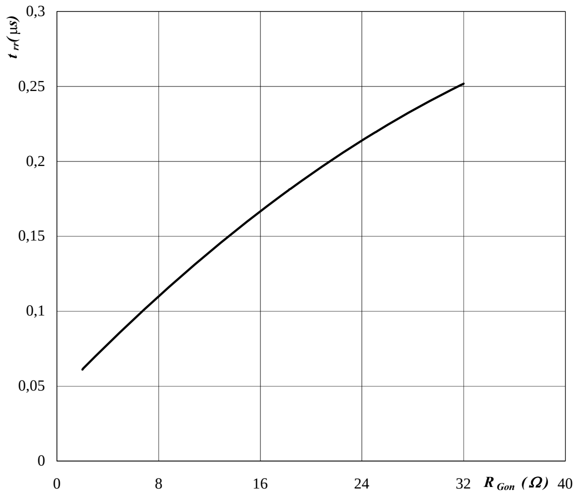
Figure 8. Typical switching times as a function of gate resistor
Output inverter IGBT
t = f (RG)



inductive load, Tj = 125 °C
VCE = 300 V
VGE= ±15 V
Ic = 50 A

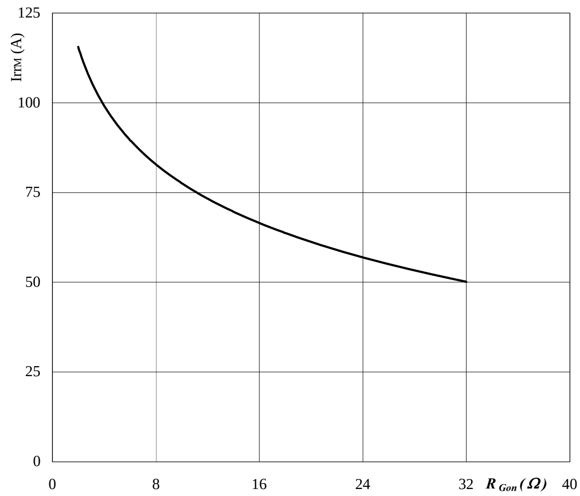
Output inverter

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



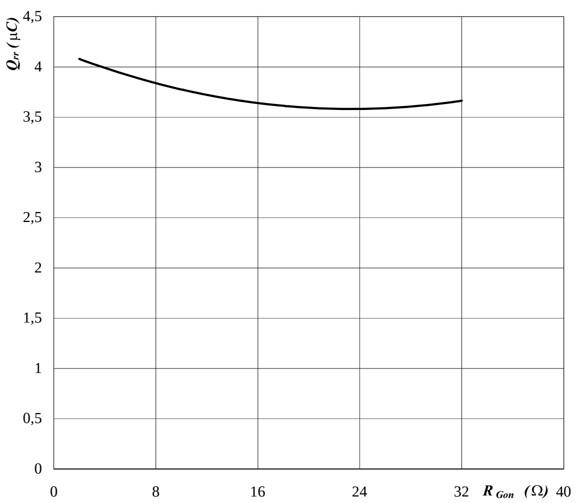
Tj = 125 °C
V_R = 300 V
I_F = 50 A
V_{GE} = ±15 V

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



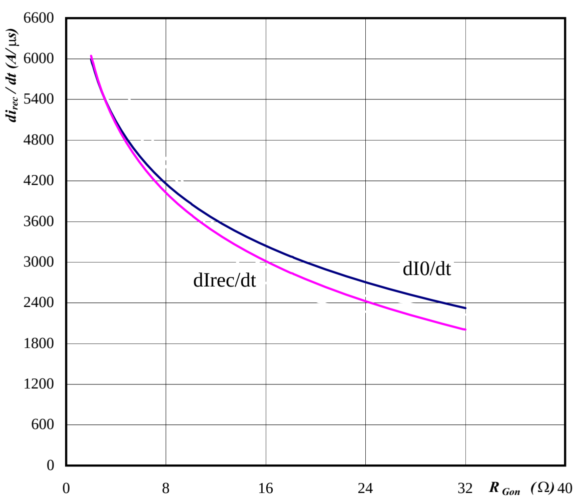
Tj = 125 °C
V_R = 300 V
I_F = 50 A
V_{GE} = ±15 V

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 = 300 V
I_F = 50 A
V_{GE} = ±15 V

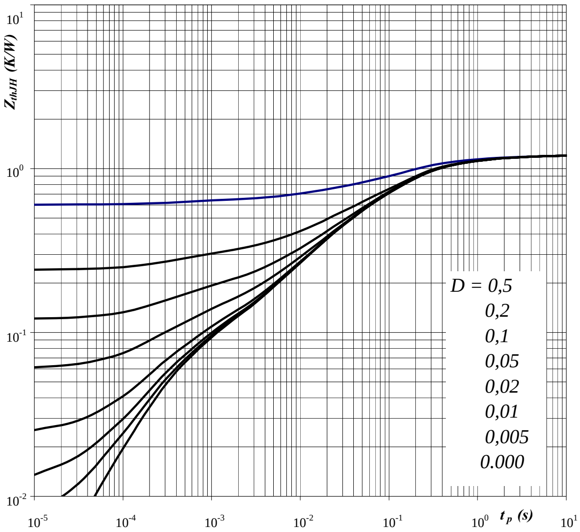
Figure 12. Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
Output inverter FRED diode
dI0/dt,dIrec/dt= f (Rgon)



Tj = 125 °C
V_R = 300 V
I_F = 50 A
V_{GE} = ±15 V

Output inverter

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

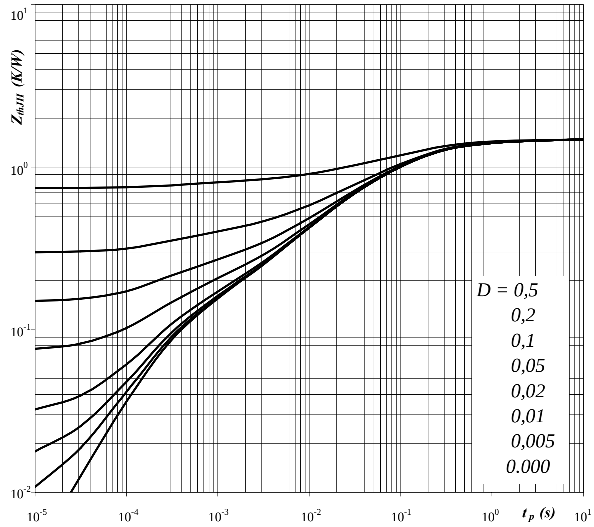


Parameter: D = tp / T   RthJH= 1,20 K/W

IGBT thermal model values

R (C/W)	Tau (s)
0,07	3,9E+00
0,21	5,8E-01
0,54	1,3E-01
0,25	2,1E-02
0,07	3,5E-03
0,06	3,5E-04
0,00	0,0E+00
0,00	0,0E+00
0,00	0,0E+00
0,00	0,0E+00

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



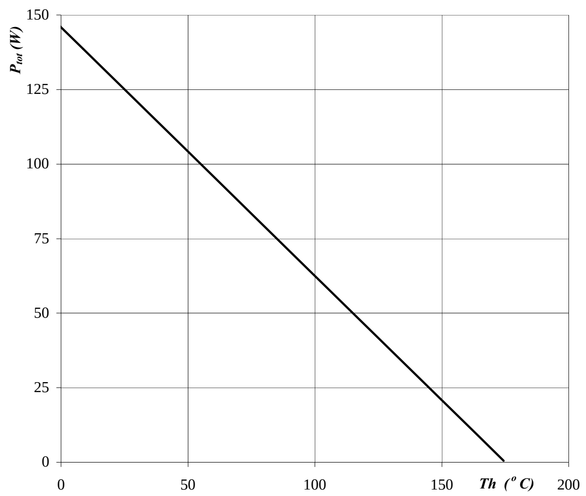
Parameter: D = tp / T   RthJH= 1,48 K/W

FRED thermal model values

R (C/W)	Tau (s)
0,08	2,9E+00
0,26	3,7E-01
0,62	8,7E-02
0,33	1,5E-02
0,09	2,5E-03
0,10	2,8E-04
0,00	0,0E+00
0,00	0,0E+00
0,00	0,0E+00
0,00	0,0E+00

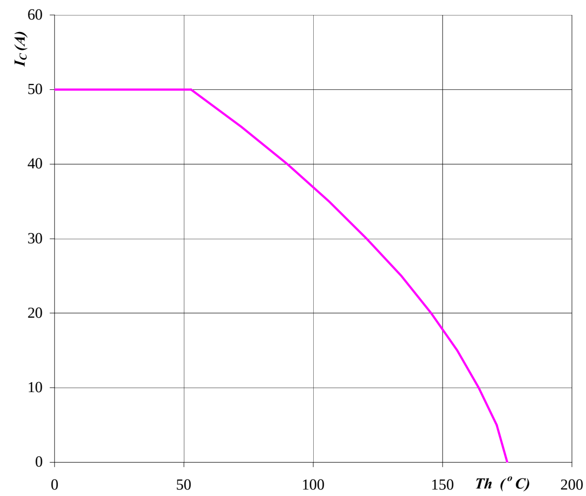
Output inverter

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



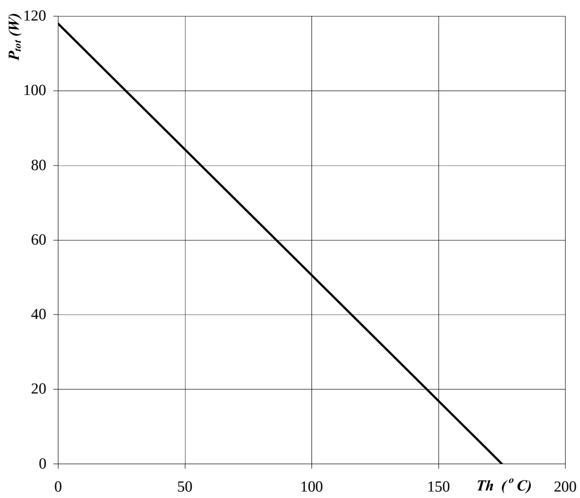
parameter: Tj= 175 ºC

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



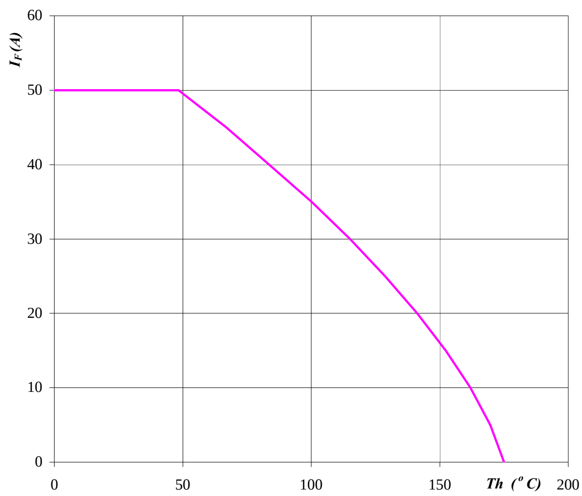
parameter: Tj= 175 ºC
V_{GE}= 15 V

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



parameter: Tj= 175 ºC

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

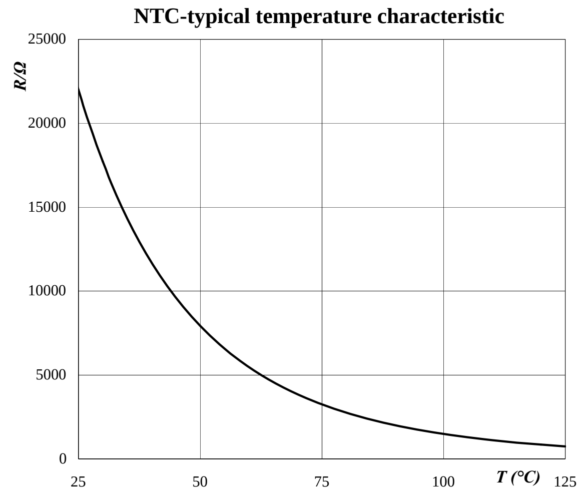


parameter: Tj= 175 ºC

Thermistor

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

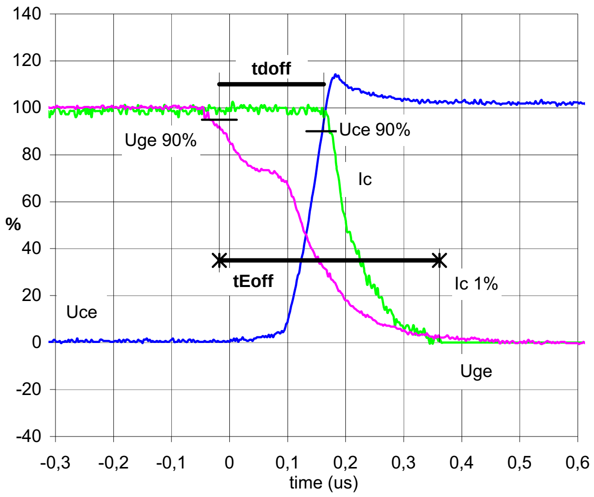
$R_T = f(T)$



Switching definitions

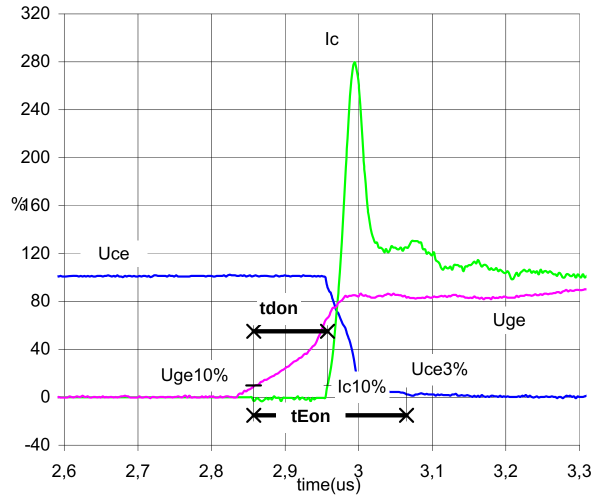
General conditions: Tj= 125 °C Rgon= 8 Ω Rgoff= 8 Ω

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



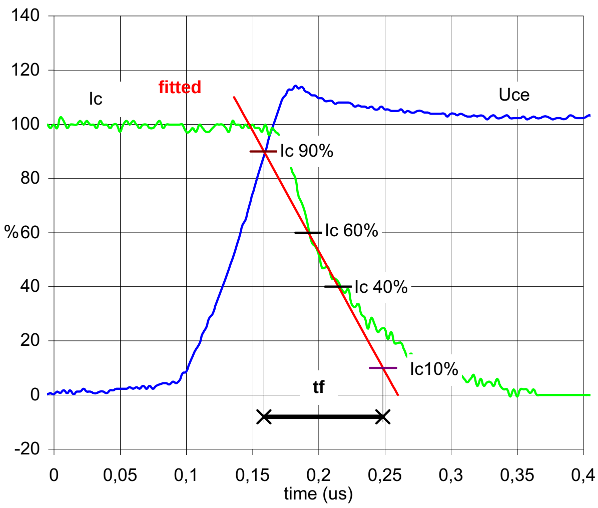
Uge(0%)= -15 V
Uge(100%)= 15 V
Uc(100%)= 300 V
Ic(100%)= 50 A
tdoff= 0,17 us
t_{Eoff}= 0,38 us

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



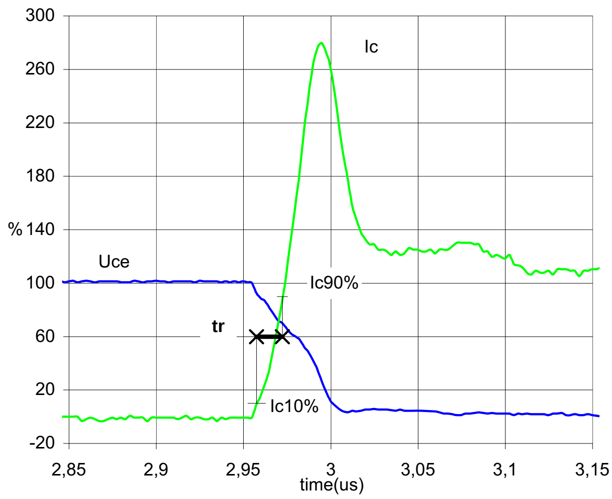
Uge(0%)= -15 V
Uge(100%)= 15 V
Uc(100%)= 300 V
Ic(100%)= 50 A
tdon= 0,10 us
t_{Eon}= 0,21 us

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



Uc(100%)= 300 V
Ic(100%)= 50 A
t_f= 0,096 us

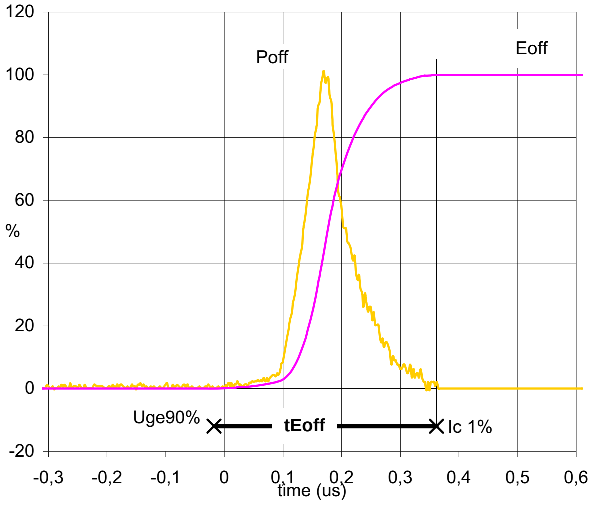
Figure 4. Turn-on Switching Waveforms & definition of t_r
Output inverter IGBT



Uc(100%)= 300 V
Ic(100%)= 50 A
t_r= 0,015 us

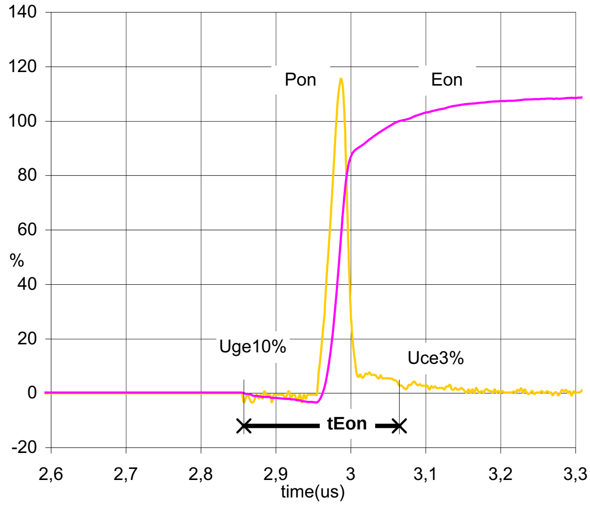
Switching definitions

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



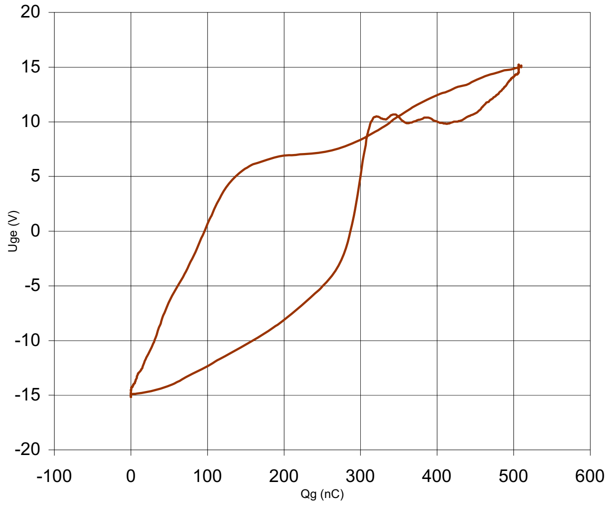
Poff(100%)= 14,89 kW
Eoff(100%)= 1,38 mJ
t_{Eoff}= 0,38 us

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



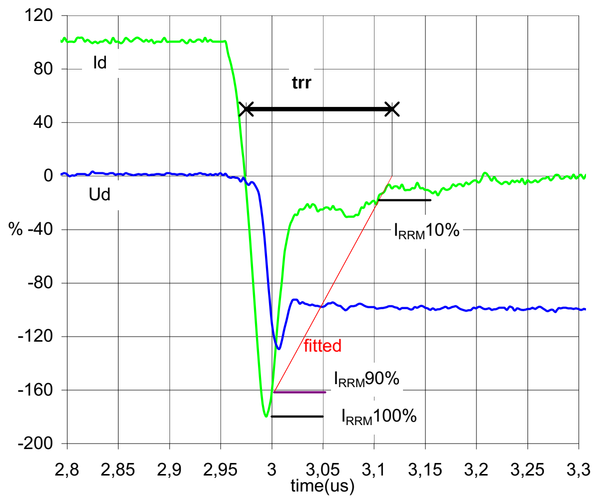
Pon(100%)= 14,9 kW
Eon(100%)= 0,50 mJ
t_{Eon}= 0,21 us

Figure 7. Gate voltage vs Gate charge
Output inverter IGBT



Ugeoff= -15 V
Ugeon= 15 V
Uc(100%)= 300 V
Ic(100%)= 50 A
Qg= 509,8 nC

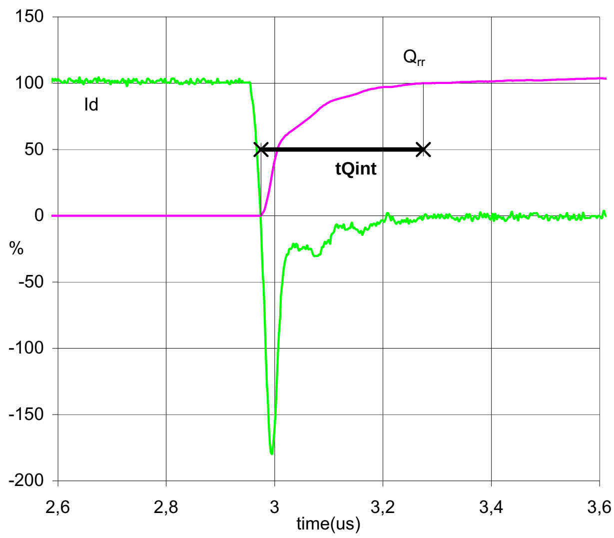
Figure 8. Turn-off Switching Waveforms & definition of t_{rr}
Output inverter FRED



Ud(100%)= 300 V
Id(100%)= 50 A
I_{RRM}(100%)= 89 A
trr= 0,13 us

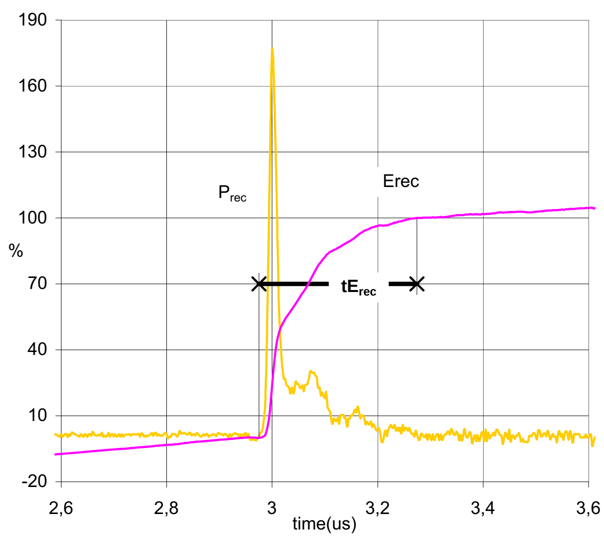
Switching definitions

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



Id(100%)=	50 A
Qrr(100%)=	3,85 uC
tQint=	0,30 us

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

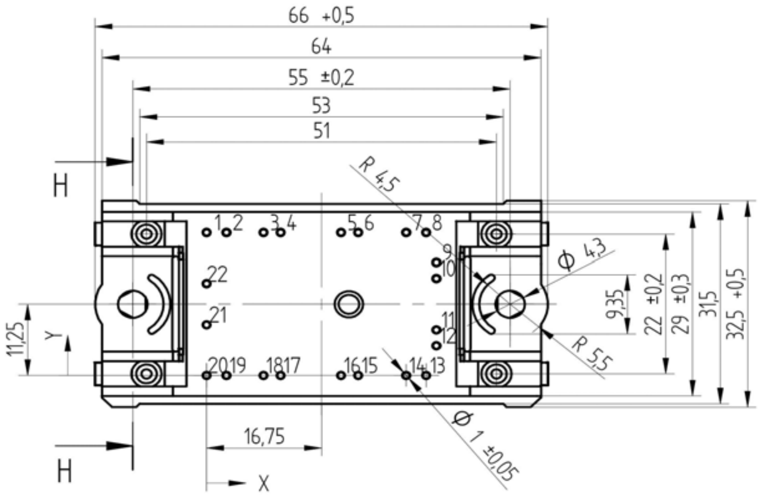


Prec(100%)=	14,9 kW
Erec(100%)=	0,94 mJ
tErec=	0,30 us

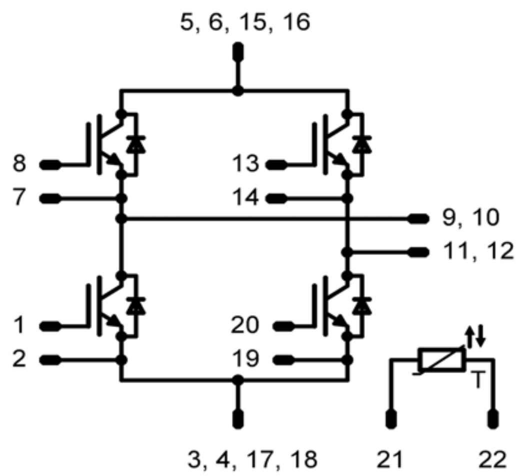
Package Outline and Pinout

Outline

Pin Table		
Pin	X	Y
1	0	22,5
2	2,9	22,5
3	8,3	22,5
4	10,8	22,5
5	19,6	22,5
6	22,1	22,5
7	29,1	22,5
8	32	22,5
9	33,5	17,8
10	33,5	15,3
11	33,5	7,2
12	33,5	4,7
13	32	0
14	29,1	0
15	22,1	0
16	19,6	0
17	10,8	0
18	8,3	0
19	2,9	0
20	0	0
21	0	8
22	0	14,5



Pinout



PRODUCT STATUS DEFINITIONS

Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data may be published at a later date. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.
Final	Full Production	This datasheet contains final specifications. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.

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For tested values please contact Vincotech.
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.