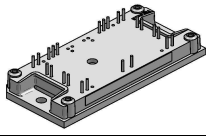
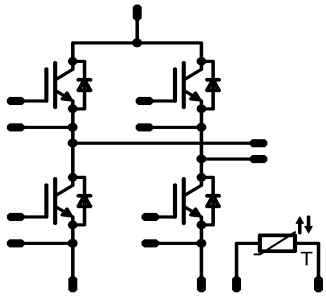


<p>flowPACK 1 H</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #000080; color: white; margin: 0;">Features</p> <ul style="list-style-type: none"> Low inductive 12mm flow1 package H-Bridge topology High-speed IGBT + ultrafast FWD Temperature sensor </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #000080; color: white; margin: 0;">Target Applications</p> <ul style="list-style-type: none"> Solar inverter Power Supply Inverter based welding </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #000080; color: white; margin: 0;">Types</p> <ul style="list-style-type: none"> 10-FY064PA075SG-M583F08 </div>	<p style="text-align: right;">650V/75A</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #000080; color: white; margin: 0;">flowPACK 1 H</p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #000080; color: white; margin: 0;">Schematic</p>  </div>
---	--

Maximum Ratings

$T_j=25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
H-Bridge IGBT				
Collector-emitter break down voltage	V_{CE}		650	V
DC collector current	I_{DC}	$T_j=T_{jmax}$ $T_h=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	53 71	A
Pulsed collector current	I_{Cpulse}	t_p limited by T_{jmax}	225	A
Turn off safe operating area		$V_{CE} \leq 650\text{V}$, $T_j \leq T_{op max}$	150	A
Power dissipation per IGBT	P_{tot}	$T_j=T_{jmax}$ $T_h=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	93 141	W
Gate-emitter peak voltage	V_{GE}		± 20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq 150^{\circ}\text{C}$ $V_{GE} = 15\text{V}$	5 400	μs V
Maximum Junction Temperature	T_{jmax}		175	$^{\circ}\text{C}$
H-Bridge FWD				
Peak Repetitive Reverse Voltage	V_{RRM}	$T_j=25^{\circ}\text{C}$	650	V
DC forward current	I_F	$T_j=T_{jmax}$ $T_h=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	42 55	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	225	A
Power dissipation per Diode	P_{tot}	$T_j=T_{jmax}$ $T_h=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	70 106	W
Maximum Junction Temperature	T_{jmax}		175	$^{\circ}\text{C}$

Maximum Ratings

$T_j=25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
-----------	--------	-----------	-------	------

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{op}		-40...+(T_{jmax} - 25)	°C

Insulation Properties

Insulation voltage	V_{is}	t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm
Comparative tracking index	CTI		>200	

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}[V]$ or $V_{GS}[V]$	$V_r[V]$ or $V_{CE}[V]$ or $V_{DS}[V]$	$I_c[A]$ or $I_F[A]$ or $I_b[A]$	T_j	Min	Typ	Max		
H-Bridge IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0012	$T_j=25^{\circ}C$ $T_j=150^{\circ}C$	4,2	5,1	5,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	$T_j=25^{\circ}C$ $T_j=150^{\circ}C$	1,38	1,72 1,97	2,5	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	650		$T_j=25^{\circ}C$ $T_j=150^{\circ}C$			15	μA
Gate-emitter leakage current	I_{GES}		20	0		$T_j=25^{\circ}C$ $T_j=150^{\circ}C$			150	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ω Rgon=4 Ω	± 15	300	75	$T_j=25^{\circ}C$	85			ns
Rise time	t_r					$T_j=150^{\circ}C$	87			
Turn-off delay time	$t_{d(off)}$					$T_j=25^{\circ}C$	14			
						$T_j=150^{\circ}C$	17			
Fall time	t_f					$T_j=25^{\circ}C$	125			
						$T_j=150^{\circ}C$	147			
Turn-on energy loss per pulse	E_{on}					$T_j=25^{\circ}C$	18			
Turn-off energy loss per pulse	E_{off}	$T_j=25^{\circ}C$	31							
		$T_j=150^{\circ}C$	0,51							
Input capacitance	C_{ies}	f=1MHz	0	25		$T_j=25^{\circ}C$	4620			pF
Reverse transfer capacitance	C_{rss}							137		
Gate charge	Q_{Gate}		15	480	75	$T_j=25^{\circ}C$		470		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness50um $\lambda = 1 W/mK$						1,02		K/W

H-Bridge FWD

Diode forward voltage	V_F				50	$T_j=25^{\circ}C$ $T_j=125^{\circ}C$	2,4 1,9	3		V
Peak reverse recovery current	I_{RRM}	Rgon=4 Ω	± 15	300	75	$T_j=25^{\circ}C$	63			A
Reverse recovery time	t_{rr}					$T_j=150^{\circ}C$	82			
						$T_j=25^{\circ}C$	17			
Reverse recovered charge	Q_{rr}					$T_j=150^{\circ}C$	94			
						$T_j=25^{\circ}C$	0,96			
Peak rate of fall of recovery current	$di(rec)max/dt$					$T_j=150^{\circ}C$	2,94			
						$T_j=25^{\circ}C$	15698			
Reverse recovered energy	Erec	$T_j=150^{\circ}C$	5163							
		$T_j=25^{\circ}C$	0,13							
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness50um $\lambda = 1 W/mK$				$T_j=25^{\circ}C$	0,54			K/W

Thermistor

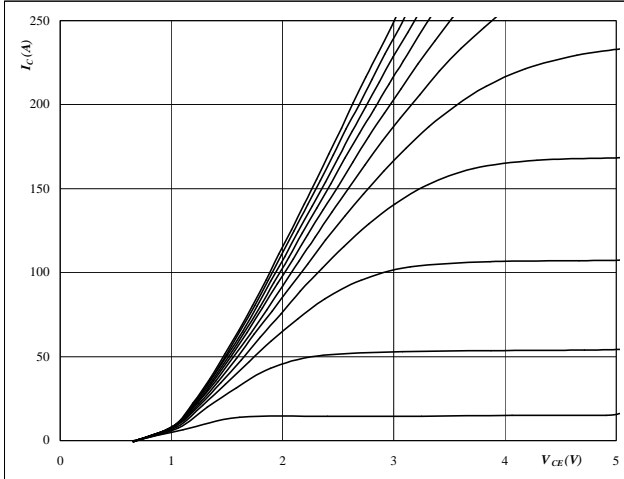
Rated resistance	R					$T=25^{\circ}C$	22000			Ω
Deviation of R25	$\Delta R/R$	R100=1486 Ω				$T=100^{\circ}C$	-5	5		%
Power dissipation	P					$T=25^{\circ}C$	200			mW
Power dissipation constant						$T_j=25^{\circ}C$	2			mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 3\%$				$T_j=25^{\circ}C$	3950			K
B-value	$B_{(25/100)}$	Tol. $\pm 3\%$				$T_j=25^{\circ}C$	3996			K
Vincotech NTC Reference									B	

Output Inverter

Figure 1 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$

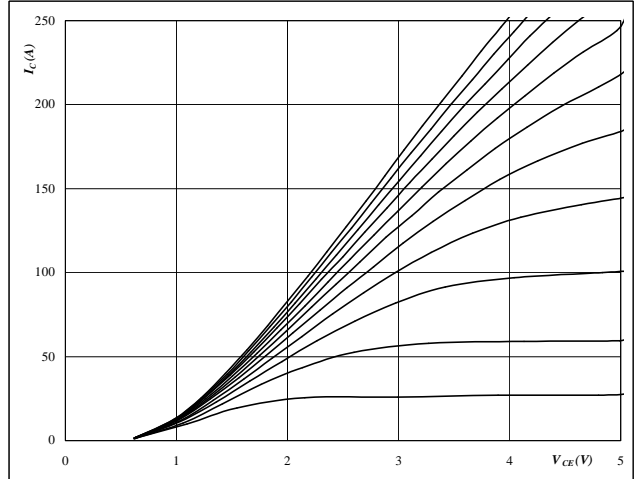


At
 $t_p = 250 \mu s$
 $T_j = 25 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

Figure 2 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$

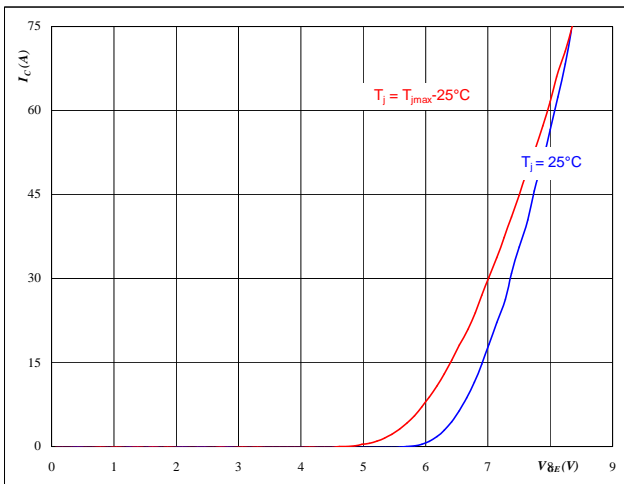


At
 $t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

Figure 3 Output inverter IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

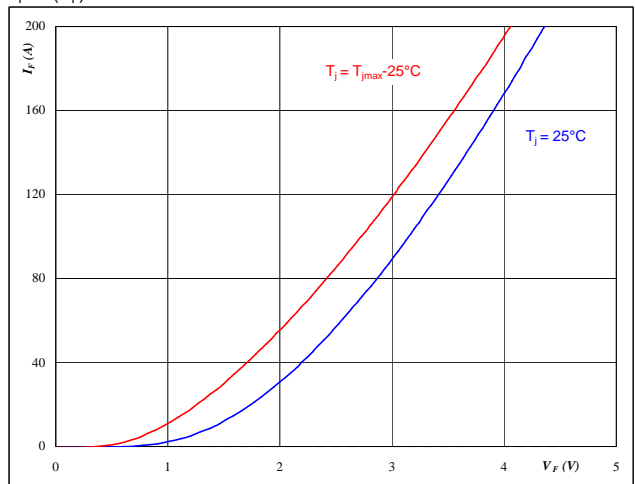


At
 $t_p = 250 \mu s$
 $V_{CE} = 10 \text{ V}$

Figure 4 Output inverter FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$

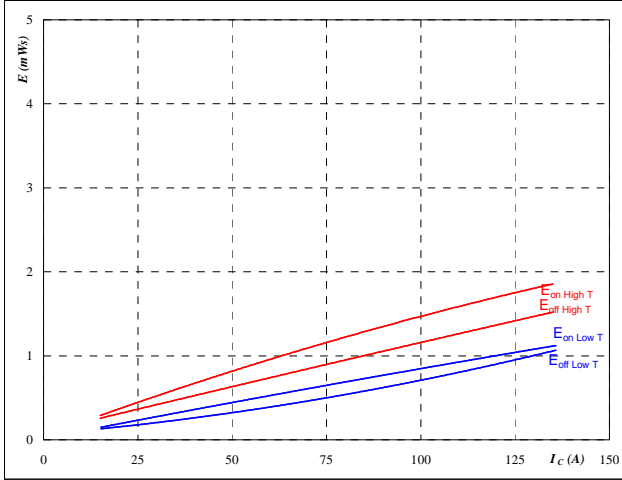


At
 $t_p = 250 \mu s$

Output Inverter

Figure 5 Output inverter IGBT

Typical switching energy losses as a function of collector current
 $E = f(I_C)$

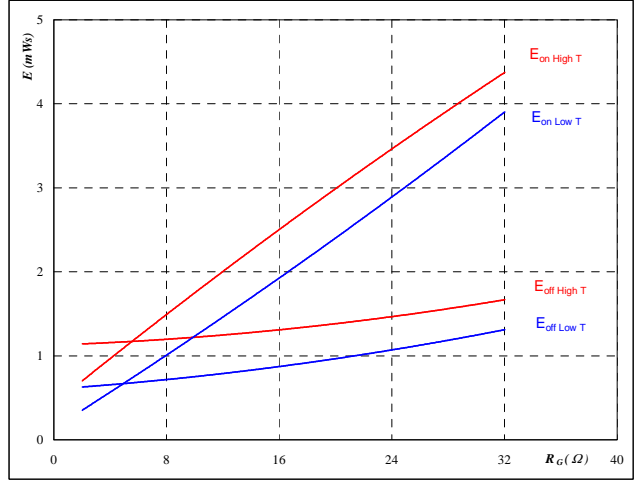


With an inductive load at

$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 300 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$
 $R_{goff} = 4 \text{ } \Omega$

Figure 6 Output inverter IGBT

Typical switching energy losses as a function of gate resistor
 $E = f(R_G)$

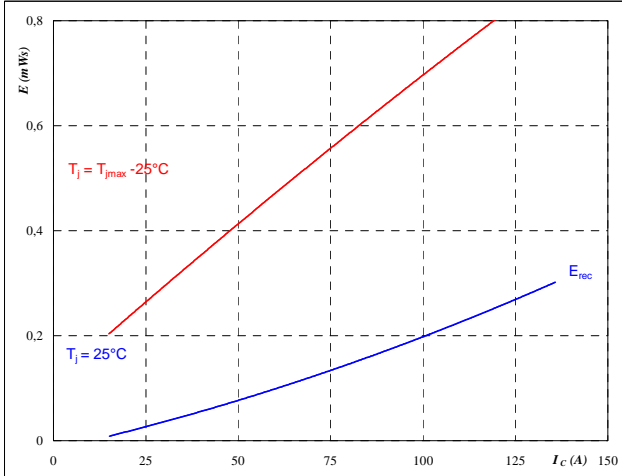


With an inductive load at

$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 300 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 75 \text{ A}$

Figure 7 Output inverter FWD

Typical reverse recovery energy loss as a function of collector current
 $E_{rec} = f(I_C)$

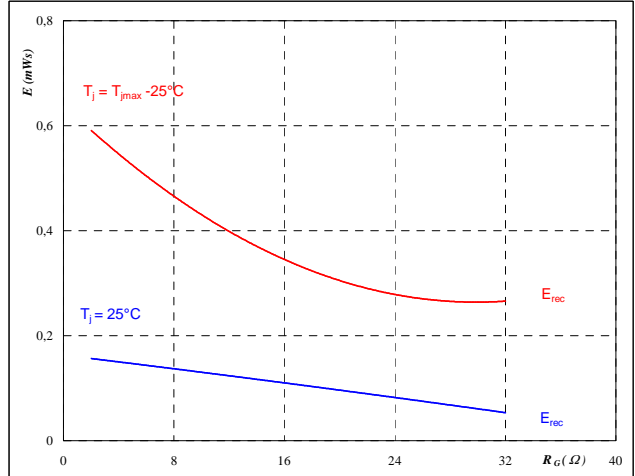


With an inductive load at

$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 300 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$

Figure 8 Output inverter FWD

Typical reverse recovery energy loss as a function of gate resistor
 $E_{rec} = f(R_G)$



With an inductive load at

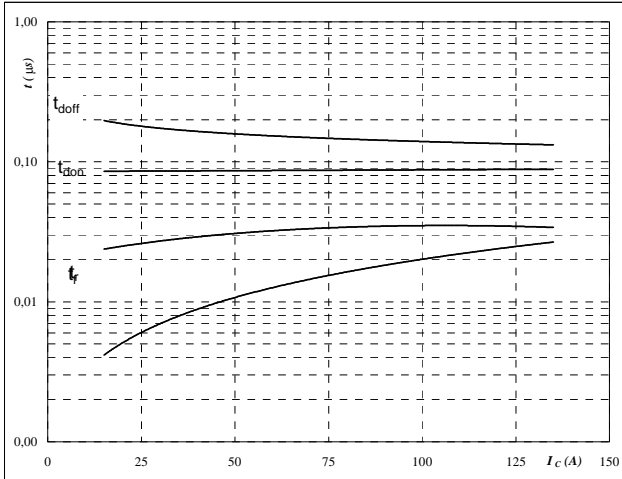
$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 300 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 75 \text{ A}$

Output Inverter

Figure 9 Output inverter IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



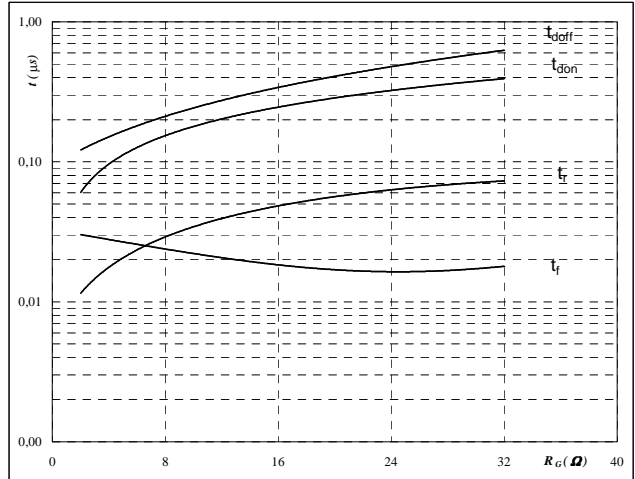
With an inductive load at

$T_J =$	150	$^{\circ}C$
$V_{CE} =$	300	V
$V_{GE} =$	± 15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

Figure 10 Output inverter IGBT

Typical switching times as a function of gate resistor

$$t = f(R_G)$$



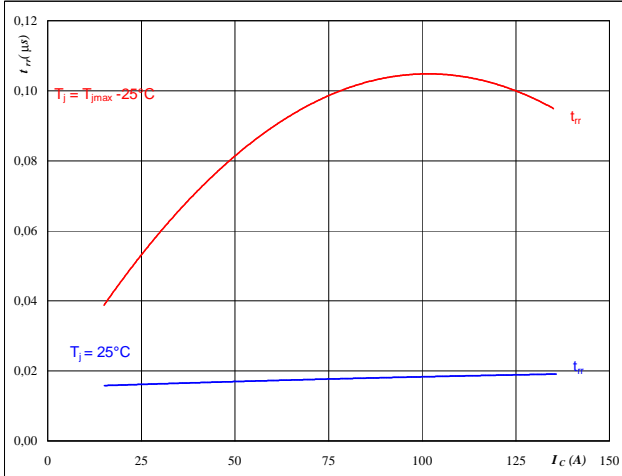
With an inductive load at

$T_J =$	150	$^{\circ}C$
$V_{CE} =$	300	V
$V_{GE} =$	± 15	V
$I_C =$	75	A

Figure 11 Output inverter FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$



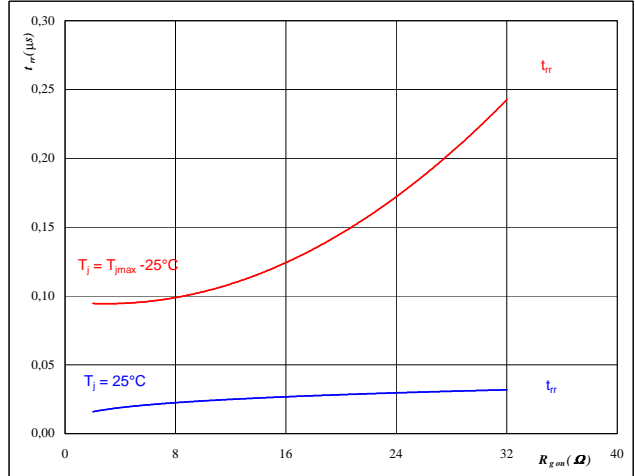
At

$T_J =$	25/150	$^{\circ}C$
$V_{CE} =$	300	V
$V_{GE} =$	± 15	V
$R_{gon} =$	4	Ω

Figure 12 Output inverter FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{gon})$$



At

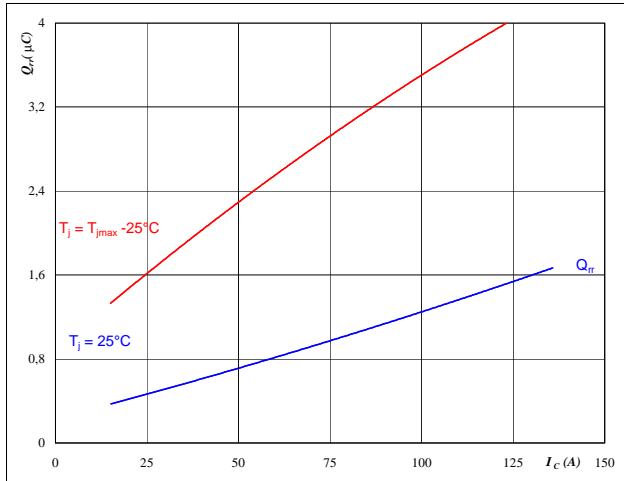
$T_J =$	25/150	$^{\circ}C$
$V_R =$	300	V
$I_F =$	75	A
$V_{GE} =$	± 15	V

Output Inverter

Figure 13 Output inverter FWD

Typical reverse recovery charge as a function of collector current

$$Q_{rr} = f(I_C)$$

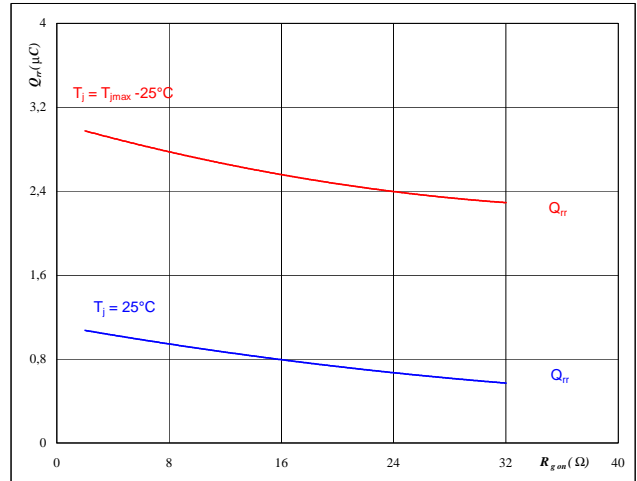


At
 $T_j = 25/150$ °C
 $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω

Figure 14 Output inverter FWD

Typical reverse recovery charge as a function of IGBT turn on gate resistor

$$Q_{rr} = f(R_{gon})$$

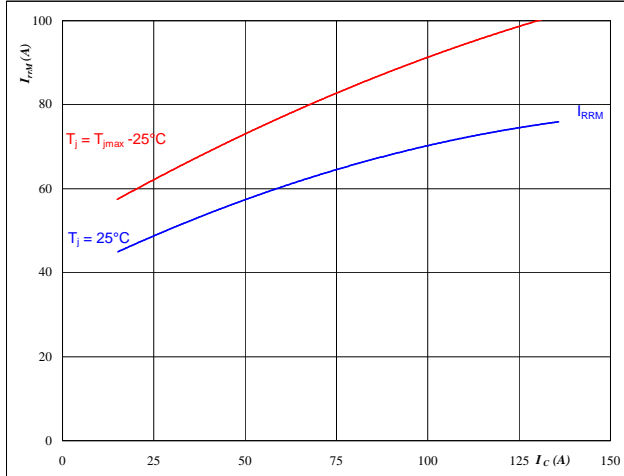


At
 $T_j = 25/150$ °C
 $V_R = 300$ V
 $I_F = 75$ A
 $V_{GE} = \pm 15$ V

Figure 15 Output inverter FWD

Typical reverse recovery current as a function of collector current

$$I_{RRM} = f(I_C)$$

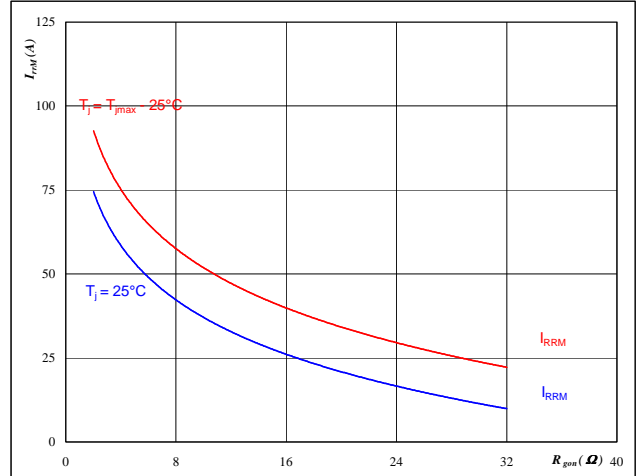


At
 $T_j = 25/150$ °C
 $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω

Figure 16 Output inverter FWD

Typical reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RRM} = f(R_{gon})$$



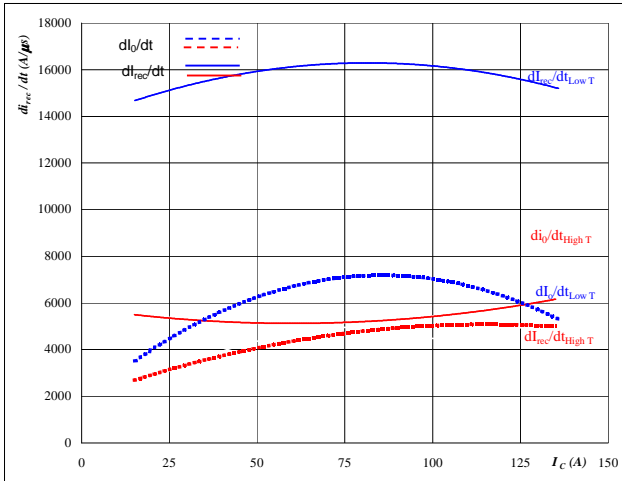
At
 $T_j = 25/150$ °C
 $V_R = 300$ V
 $I_F = 75$ A
 $V_{GE} = \pm 15$ V

Output Inverter

Figure 17 Output inverter FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current

$$dI_o/dt, dI_{rec}/dt = f(I_c)$$

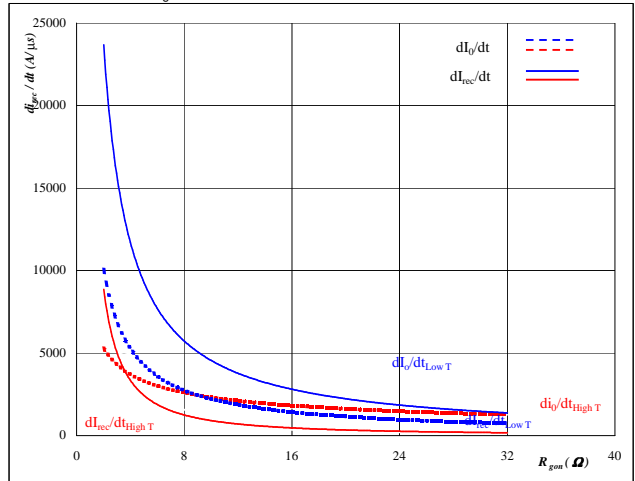


At
 $T_j = 25/150$ °C
 $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω

Figure 18 Output inverter FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

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

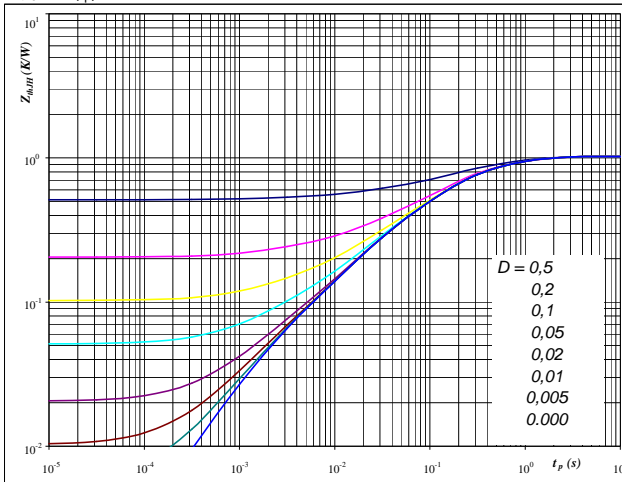


At
 $T_j = 25/150$ °C
 $V_R = 300$ V
 $I_F = 75$ A
 $V_{GE} = \pm 15$ V

Figure 19 Output inverter IGBT

IGBT transient thermal impedance as a function of pulse width

$$Z_{thJH} = f(t_p)$$



At
 $D = t_p / T$
 $R_{thJH} = 1,02$ K/W $0,87$

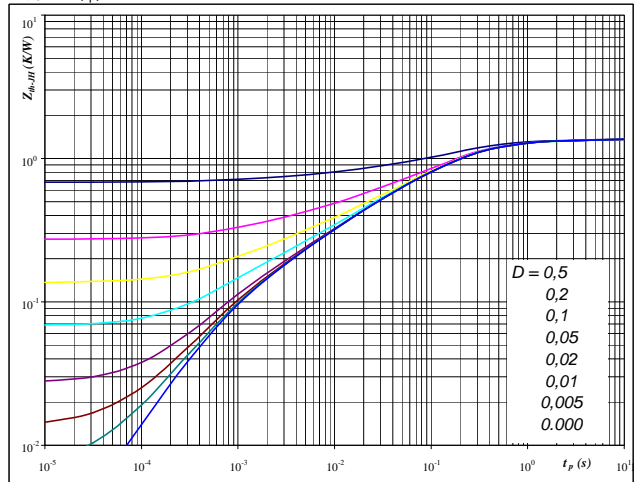
IGBT thermal model values

Thermal grease		Phase change interface	
R (C/W)	Tau (s)	R (C/W)	Tau (s)
0,20	9,7E-01	0,17	8,2E-01
0,49	2,1E-01	0,42	1,8E-01
0,19	6,2E-02	0,16	5,2E-02
0,11	1,4E-02	0,09	1,2E-02
0,03	1,7E-03	0,03	1,4E-03

Figure 20 Output inverter FWD

FWD transient thermal impedance as a function of pulse width

$$Z_{thJH} = f(t_p)$$



At
 $D = t_p / T$
 $R_{thJH} = 1,36$ K/W $1,16$

FWD thermal model values

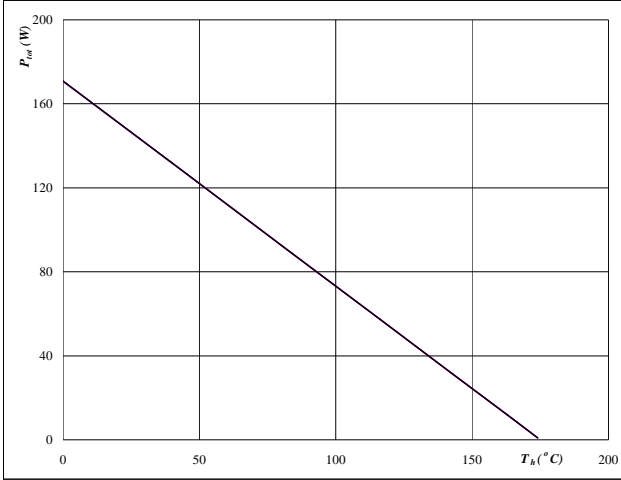
Thermal grease		Phase change interface	
R (C/W)	Tau (s)	R (C/W)	Tau (s)
0,09	3,0E+00	0,07	2,5E+00
0,40	3,3E-01	0,34	2,8E-01
0,49	9,8E-02	0,41	8,3E-02
0,22	1,7E-02	0,19	1,5E-02
0,10	3,2E-03	0,09	2,8E-03
0,06	6,7E-04	0,05	5,7E-04

Output Inverter

Figure 21 Output inverter IGBT

Power dissipation as a function of heatsink temperature

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

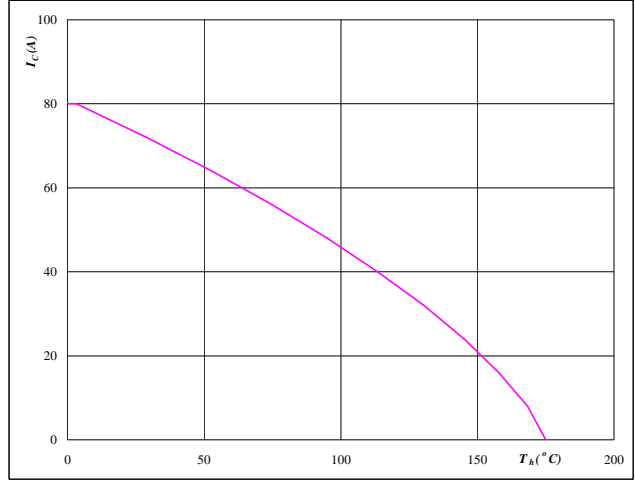


At
 $T_j = 175$ °C

Figure 22 Output inverter IGBT

Collector current as a function of heatsink temperature

$$I_C = f(T_h)$$

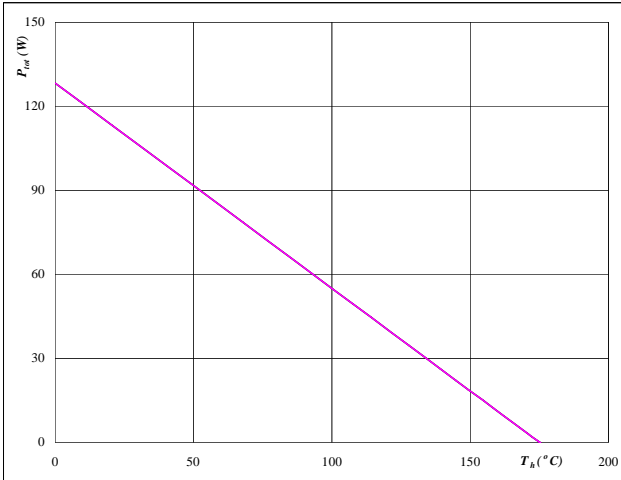


At
 $T_j = 175$ °C
 $V_{GE} = 15$ V

Figure 23 Output inverter FWD

Power dissipation as a function of heatsink temperature

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

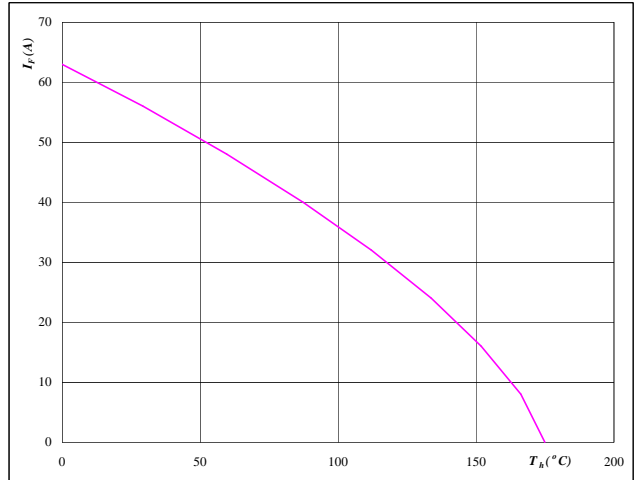


At
 $T_j = 175$ °C

Figure 24 Output inverter FWD

Forward current as a function of heatsink temperature

$$I_F = f(T_h)$$

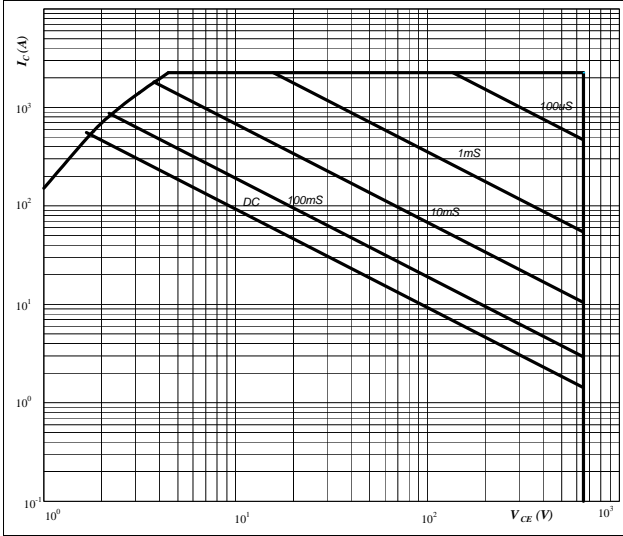


At
 $T_j = 175$ °C

Output Inverter

Figure 25 Output inverter IGBT

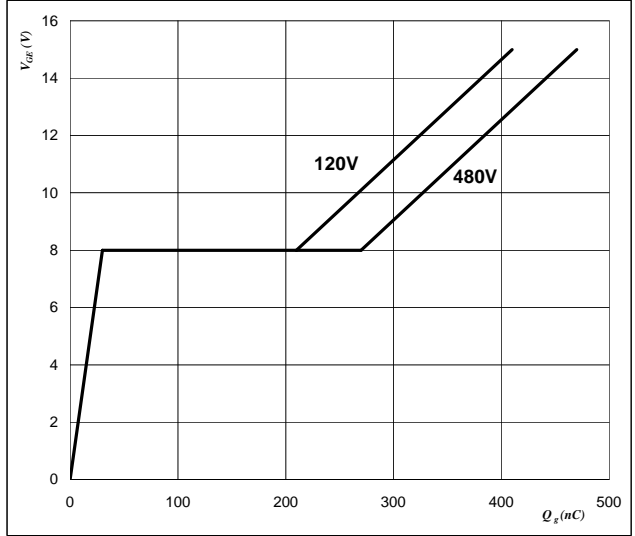
Safe operating area as a function of collector-emitter voltage
 $I_C = f(V_{CE})$



At
 D = single pulse
 $T_h = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$ °C

Figure 26 Output inverter IGBT

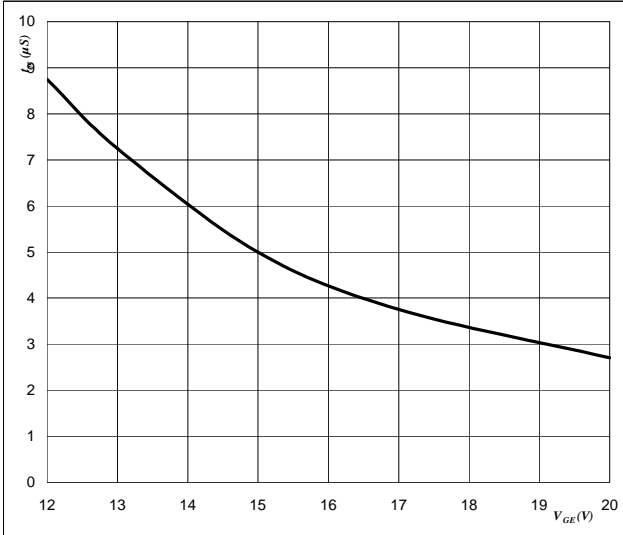
Gate voltage vs Gate charge
 $V_{GE} = f(Q_{GE})$



At
 $I_C = 75$ A

Figure 27 Output inverter IGBT

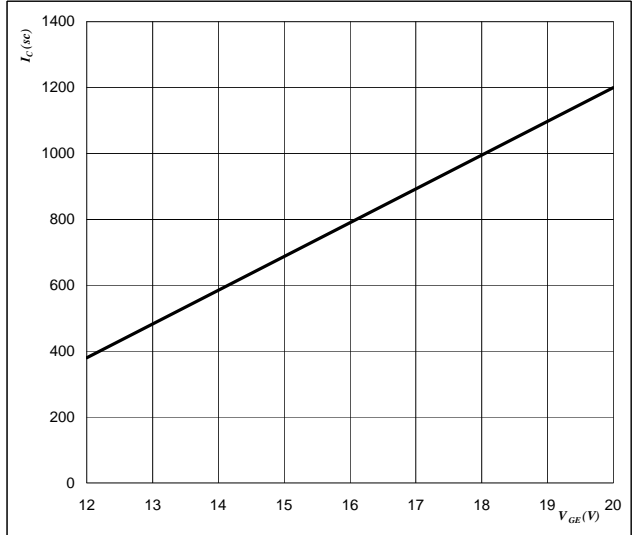
Short circuit withstand time as a function of gate-emitter voltage
 $t_{sc} = f(V_{GE})$



At
 $V_{CE} = 400$ V
 $T_j \leq 150$ °C

Figure 28 Output inverter IGBT

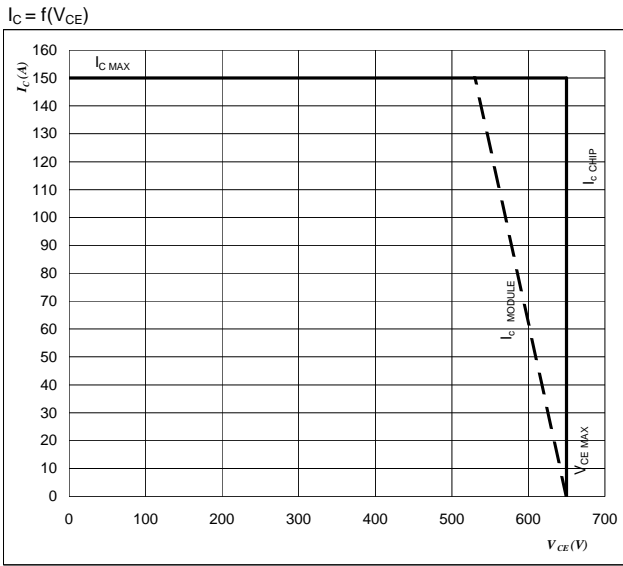
Typical short circuit collector current as a function of gate-emitter voltage
 $V_{GE} = f(Q_{GE})$



At
 $V_{CE} \leq 400$ V
 $T_j = 150$ °C

Figure 29 IGBT

Reverse bias safe operating area



At
 $T_J = T_{jmax} - 25 \text{ } ^\circ\text{C}$
 Switching mode : 3phase SPWM

Thermistor

Figure 1 Thermistor

Typical NTC characteristic as a function of temperature

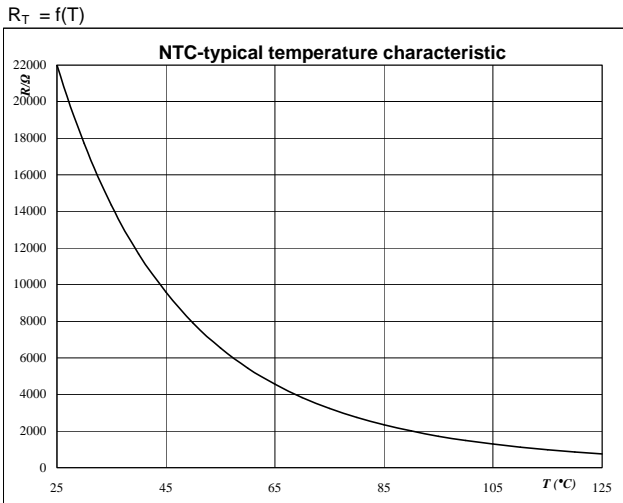


Figure 2 Thermistor

Typical NTC resistance values

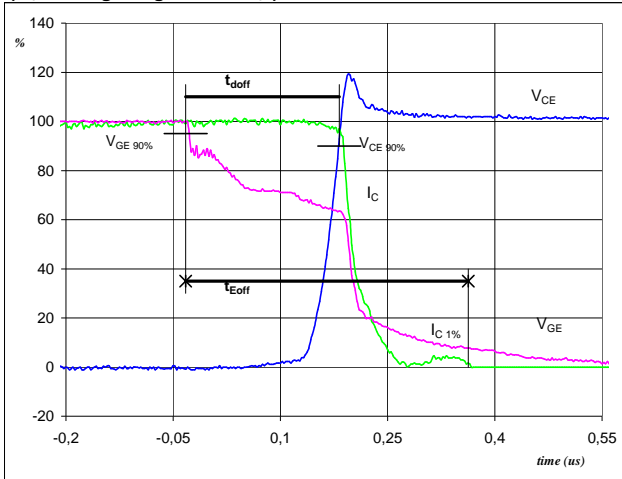
$$R(T) = R_{25} \cdot e^{\left(B_{25/100} \left(\frac{1}{T} - \frac{1}{T_{25}} \right) \right)} \quad [\Omega]$$

Switching Definitions Output Inverter

General conditions	
T_j	= 150 °C
R_{gon}	= 8 Ω
R_{goff}	= 8 Ω

Figure 1 Output inverter IGBT

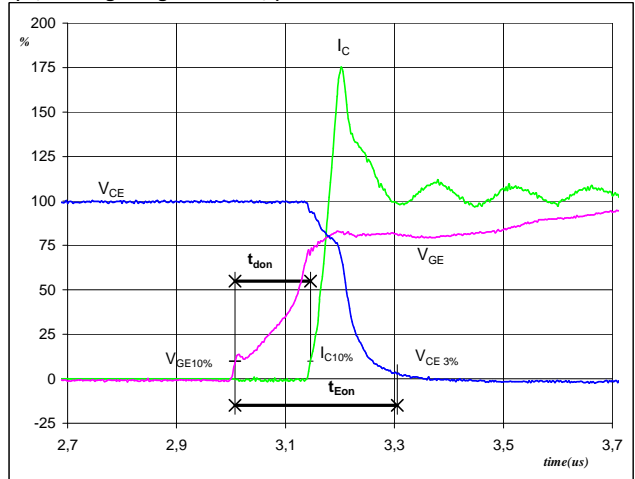
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff}
 (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	300	V
$I_C(100\%) =$	75	A
$t_{doff} =$	0,21	μ s
$t_{Eoff} =$	0,40	μ s

Figure 2 Output inverter IGBT

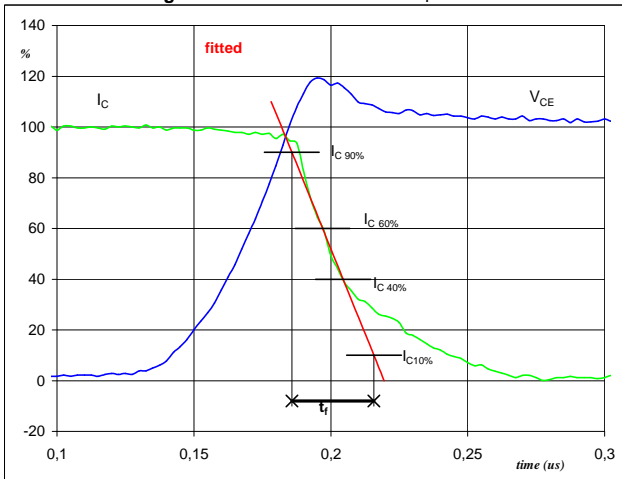
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon}
 (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	300	V
$I_C(100\%) =$	75	A
$t_{don} =$	0,14	μ s
$t_{Eon} =$	0,30	μ s

Figure 3 Output inverter IGBT

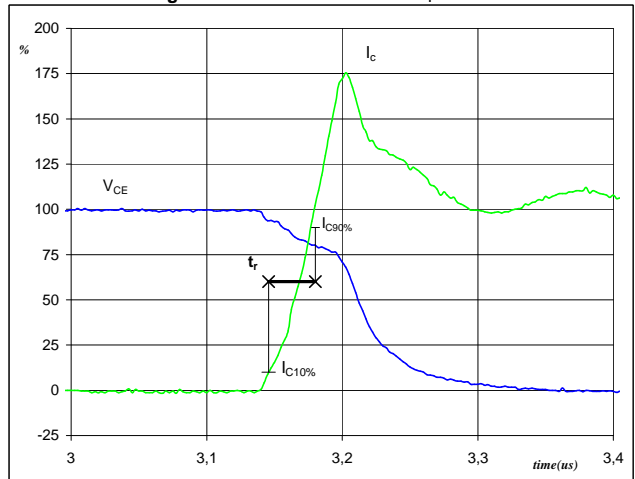
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	300	V
$I_C(100\%) =$	75	A
$t_f =$	0,03	μ s

Figure 4 Output inverter IGBT

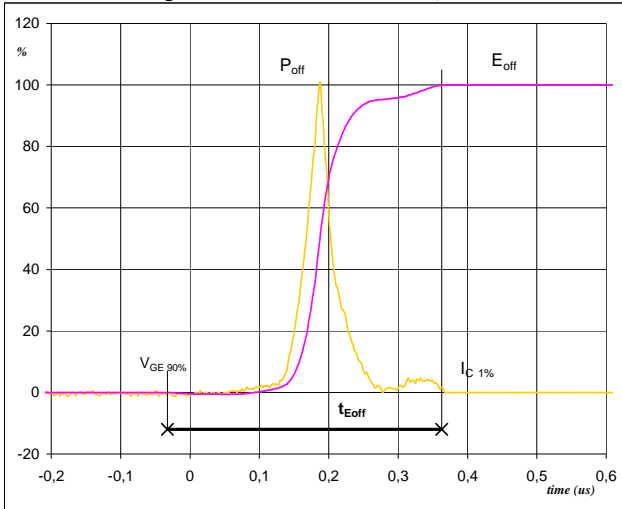
Turn-on Switching Waveforms & definition of t_r



$V_C(100\%) =$	300	V
$I_C(100\%) =$	75	A
$t_r =$	0,03	μ s

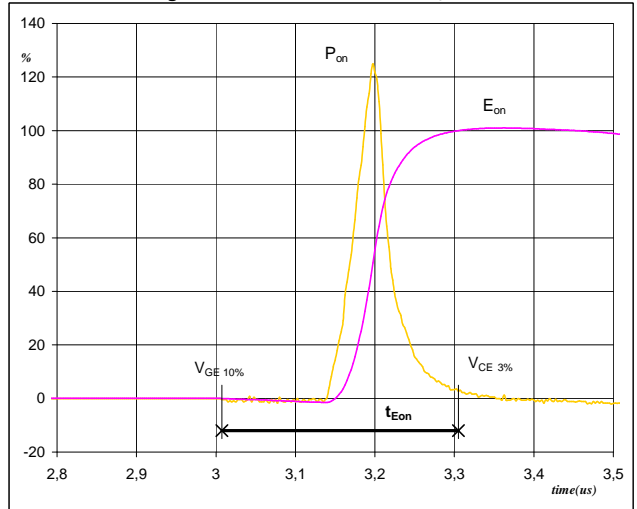
Switching Definitions Output Inverter

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



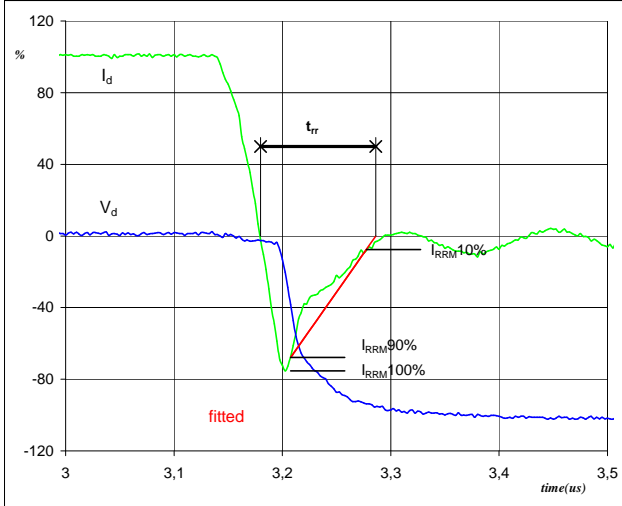
$P_{off} (100\%) = 22,61 \text{ kW}$
 $E_{off} (100\%) = 1,15 \text{ mJ}$
 $t_{Eoff} = 0,40 \text{ }\mu\text{s}$

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



$P_{on} (100\%) = 22,61 \text{ kW}$
 $E_{on} (100\%) = 1,52 \text{ mJ}$
 $t_{Eon} = 0,30 \text{ }\mu\text{s}$

Figure 7 Output inverter IGBT
Turn-off Switching Waveforms & definition of t_{rr}

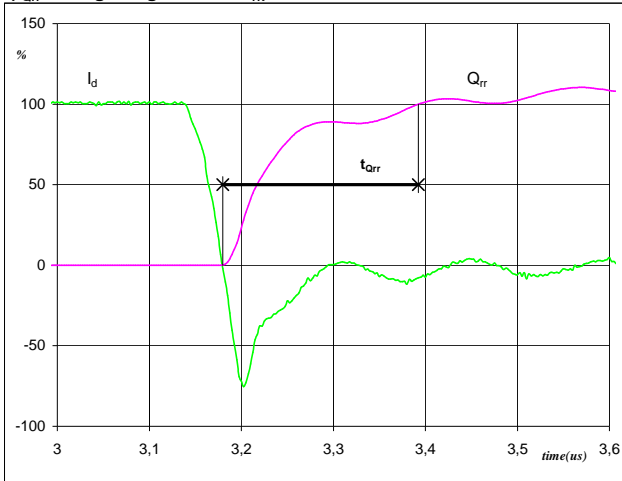


$V_d (100\%) = 300 \text{ V}$
 $I_d (100\%) = 75 \text{ A}$
 $I_{RRM} (100\%) = -57 \text{ A}$
 $t_{rr} = 0,11 \text{ }\mu\text{s}$

Switching Definitions Output Inverter

Figure 8 Output inverter FWD

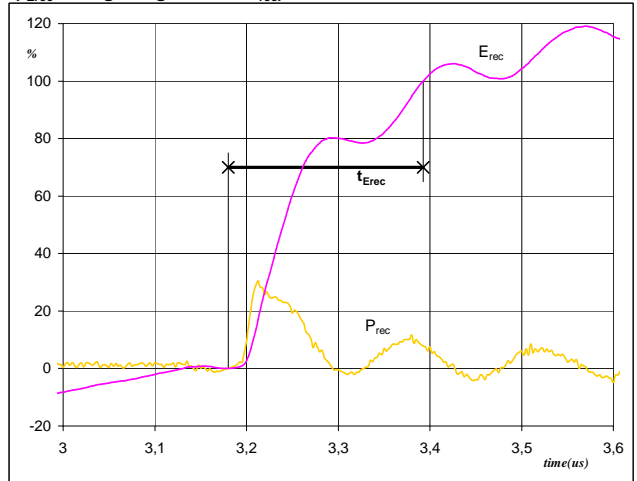
Turn-on Switching Waveforms & definition of t_{Qrr}
 (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	75	A
Q_{rr} (100%) =	2,94	μC
t_{Qrr} =	0,21	μs

Figure 9 Output inverter FWD

Turn-on Switching Waveforms & definition of t_{Erec}
 (t_{Erec} = integrating time for E_{rec})



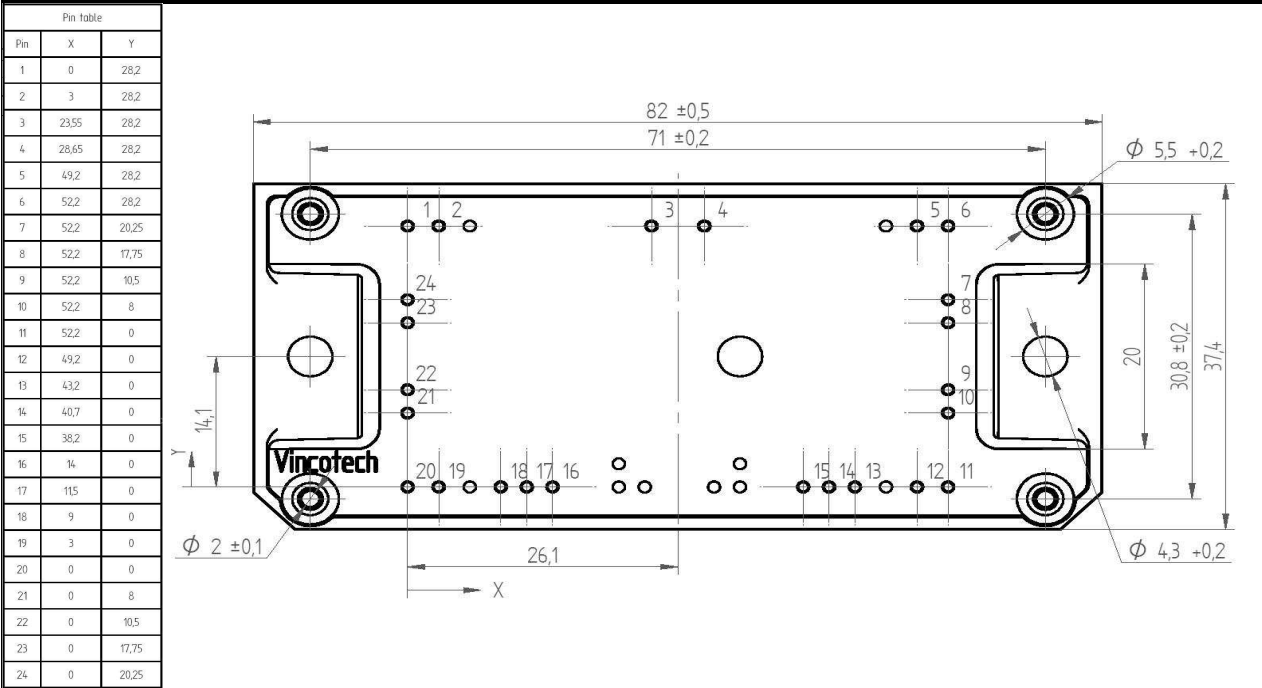
P_{rec} (100%) =	22,61	kW
E_{rec} (100%) =	0,50	mJ
t_{Erec} =	0,21	μs

Ordering Code and Marking - Outline - Pinout

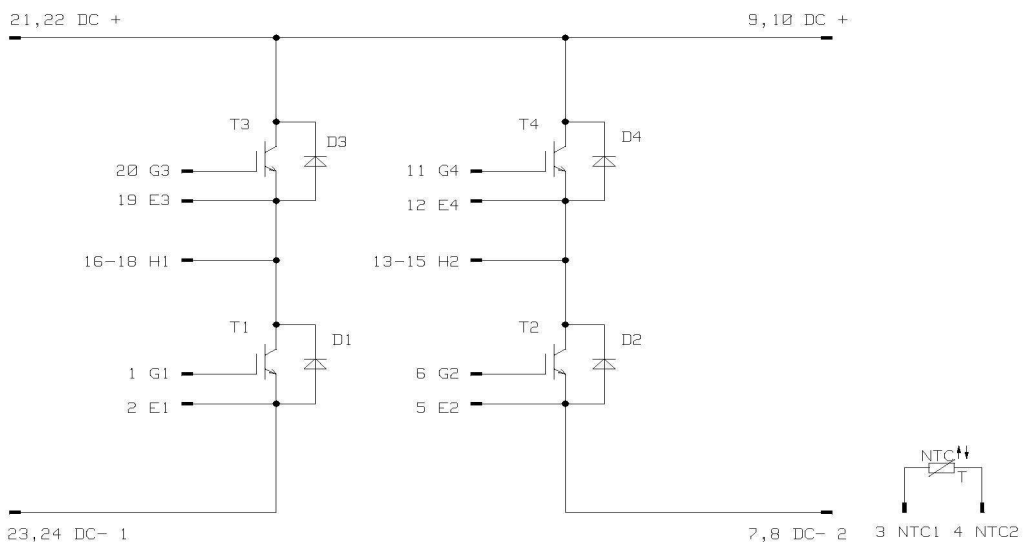
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FY064PA075SG-M583F08	M583F08	M583F08

Outline



Pinout



DISCLAIMER

The information given in this datasheet describes the type of component and does not represent assured characteristics. For tested values please contact Vincotech. Vincotech reserves the right to make changes without further notice to any products herein to improve reliability, function or design. Vincotech does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.