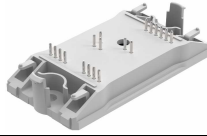
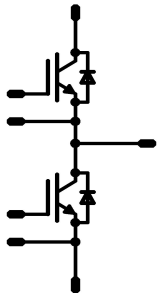




Vincotech

flow PHASE0		1200 V / 50 A	
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; margin: 0;">Features</p> <ul style="list-style-type: none"> Trench Fieldstop IGBT⁴ technology 2-clip housing in 12mm height Compact and low inductance design </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; margin: 0;">Target Applications</p> <ul style="list-style-type: none"> Motor Drive UPS </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; margin: 0;">Types</p> <ul style="list-style-type: none"> 10-FZ122PA050SC-P997F08 </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center; margin: 0;">flow 0 12mm housing</p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; margin: 0;">Schematic</p>  </div>		

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit	
Output Inverter Switch					
Collector-emitter break down voltage	V_{CE}		1200	V	
DC collector current	I_C	$T_j=T_{jmax}$	$T_s=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	55 71	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A	
Power dissipation	P_{tot}	$T_j=T_{jmax}$	$T_s=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	144 218	W
Gate-emitter peak voltage	V_{GE}		± 20	V	
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq 150^{\circ}\text{C}$ $V_{GE} = 15\text{V}$	10 800	μs V	
Maximum Junction Temperature	T_{jmax}		175	$^{\circ}\text{C}$	
Output Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	$T_j=25^{\circ}\text{C}$	1200	V	
DC forward current	I_F	$T_j=T_{jmax}$	$T_s=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	50 66	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	100	A	
Power dissipation	P_{tot}	$T_j=T_{jmax}$	$T_s=80^{\circ}\text{C}$ $T_c=80^{\circ}\text{C}$	90 136	W
Maximum Junction Temperature	T_{jmax}		175	$^{\circ}\text{C}$	



Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Thermal Properties				
Storage temperature	T_{stg}		-40...+125	$^{\circ}\text{C}$
Operation temperature under switching condition	T_{op}		-40...+(T_{jmax} - 25)	$^{\circ}\text{C}$
Insulation Properties				
Insulation voltage	V_{is}	t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			9,88	mm
Comparative Tracking Index	CTI			



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_D [A]	T_j [°C]	Min	Typ	Max		

Output Inverter Switch

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0018	25 150	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 150	1,5	1,96 2,33	2,3	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25 150			0,02	mA
Gate-emitter leakage current	I_{GES}		20	0		25 150			700	nA
Integrated Gate resistor	R_{gint}							4		Ω
Turn-on delay time	$t_{d(on)}$					25 150		102 106		ns
Rise time	t_r					25 150		17 24		
Turn-off delay time	$t_{d(off)}$	$R_{gon}=8\ \Omega$ $R_{goff}=8\ \Omega$	±15	600	50	25 150		225 289		
Fall time	t_f					25 150		97 131		
Turn-on energy loss	E_{on}					25 150		2,49 4,04		mWs
Turn-off energy loss	E_{off}					25 150		2,88 4,63		
Input capacitance	C_{ies}							2770		pF
Output capacitance	C_{oss}	f=1MHz	0	25		25		205		
Reverse transfer capacitance	C_{rss}							166		
Gate charge	Q_G		±15			25		193		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4\ \text{W/mK}$						0,66		K/W

Output Inverter Diode

Diode forward voltage	V_F				50	25 150	1	1,76 1,69	2,2	V
Peak reverse recovery current	I_{RRM}					25 150		80,03 87		A
Reverse recovery time	t_{rr}					25 150		128,7 290,7		ns
Reverse recovered charge	Q_{rr}	$R_{gon}=8\ \Omega$	±15	600	50	25 150		4,26 8,9		μC
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 150		4953 1407		A/μs
Reverse recovered energy	E_{rec}					25 150		1,57 3,55		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4\ \text{W/mK}$						1,06		K/W

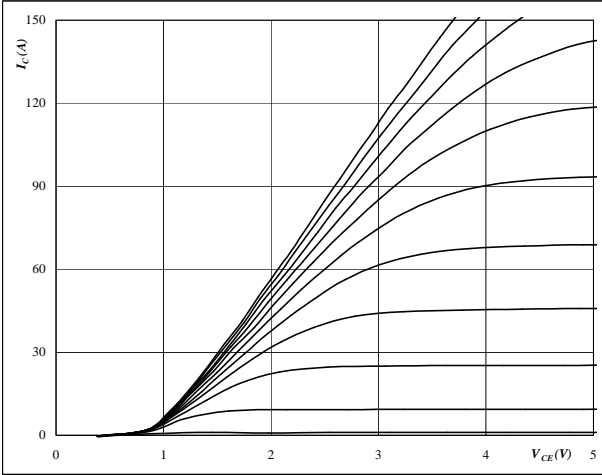


Output Inverter Switch

Figure 1 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



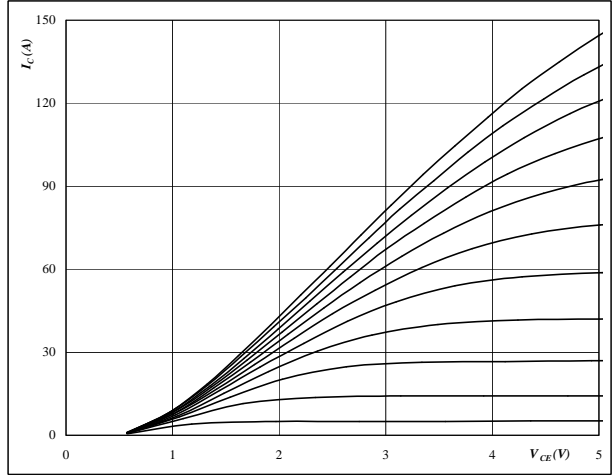
At

$t_p = 350 \mu s$
 $T_j = 25 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

Figure 2 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



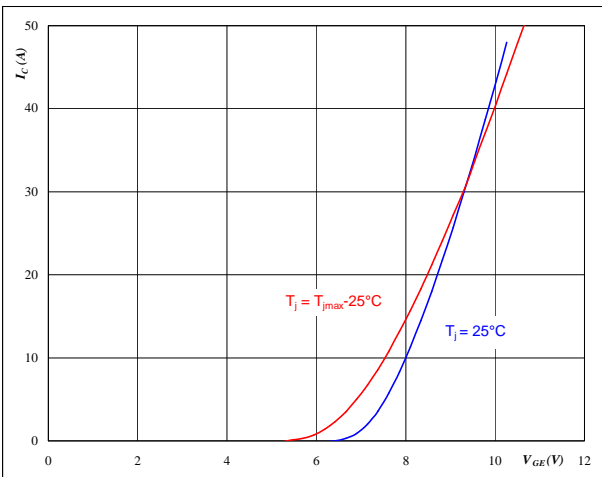
At

$t_p = 350 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

Figure 3 Output inverter IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



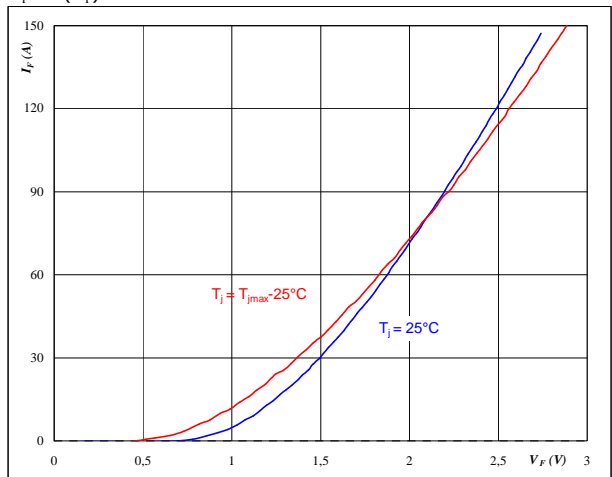
At

$t_p = 350 \mu s$
 $V_{CE} = 10 V$

Figure 4 Output inverter FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

$t_p = 350 \mu s$

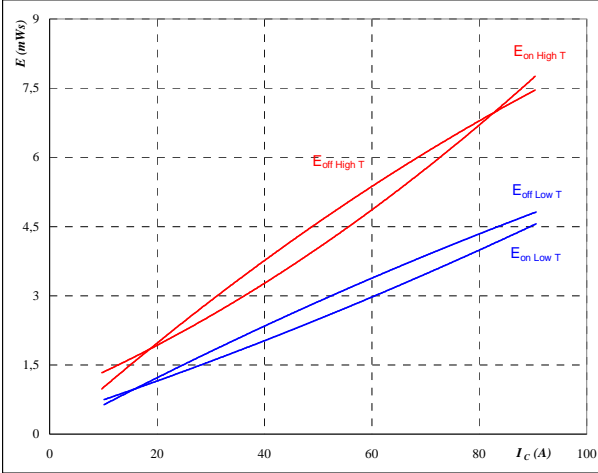


Output Inverter Switch

Figure 5 Output inverter IGBT

Typical switching energy losses
as a function of collector current

$$E = f(I_C)$$



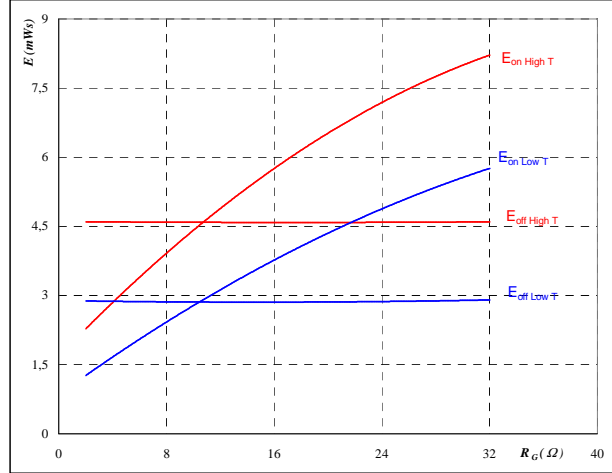
With an inductive load at

$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 8 \text{ } \Omega$

Figure 6 Output inverter IGBT

Typical switching energy losses
as a function of gate resistor

$$E = f(R_G)$$



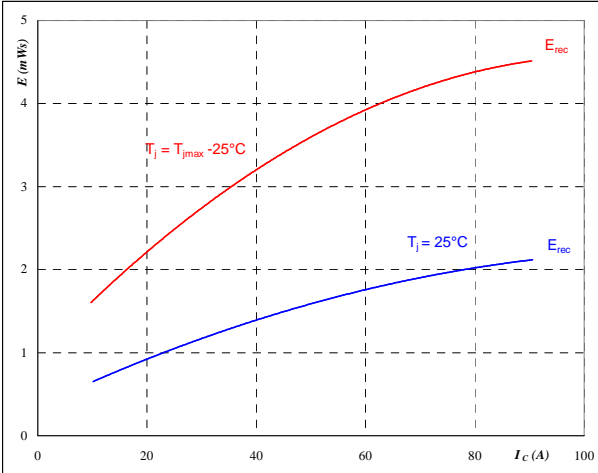
With an inductive load at

$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$

Figure 7 Output inverter IGBT

Typical reverse recovery energy loss
as a function of collector current

$$E_{rec} = f(I_C)$$



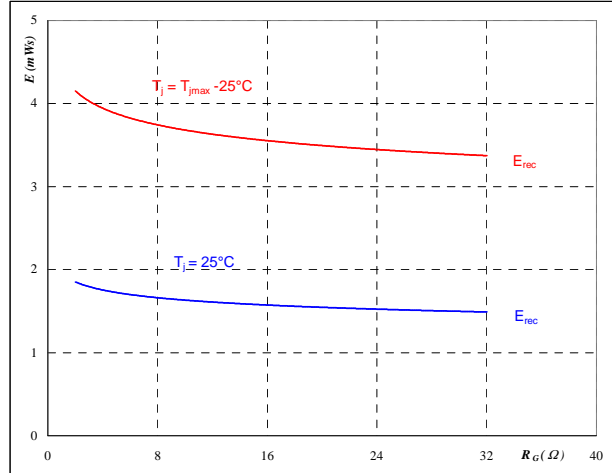
With an inductive load at

$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

Figure 8 Output inverter IGBT

Typical reverse recovery energy loss
as a function of gate resistor

$$E_{rec} = f(R_G)$$



With an inductive load at

$T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$

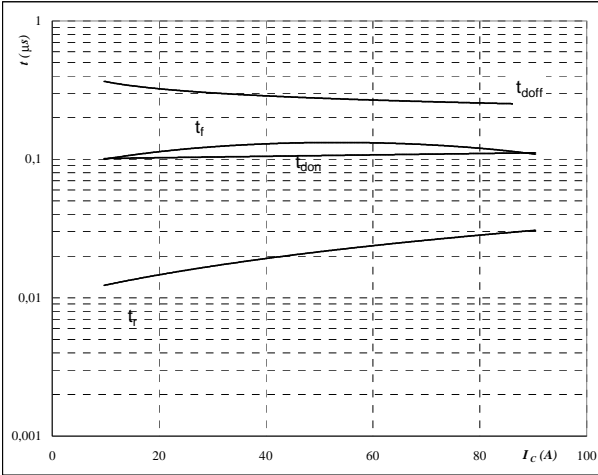


Output Inverter Switch

Figure 9 Output inverter IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



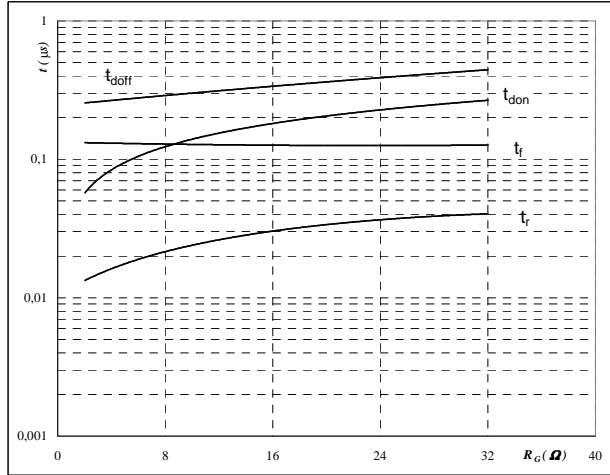
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	8	Ω
$R_{goff} =$	8	Ω

Figure 10 Output inverter IGBT

Typical switching times as a function of gate resistor

$$t = f(R_G)$$



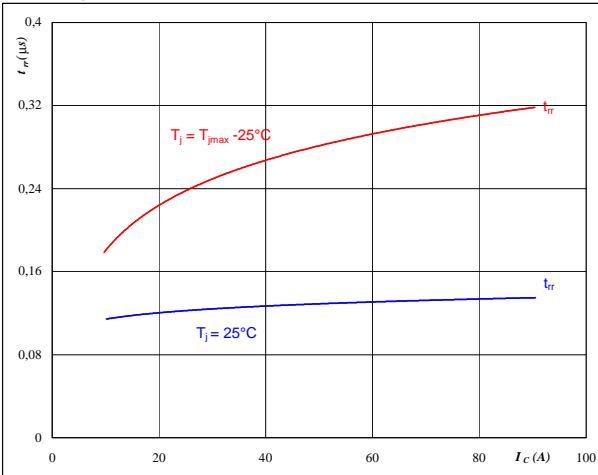
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	50	A

Figure 11 Output inverter FWD

Typical reverse recovery time as a function of collector current

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



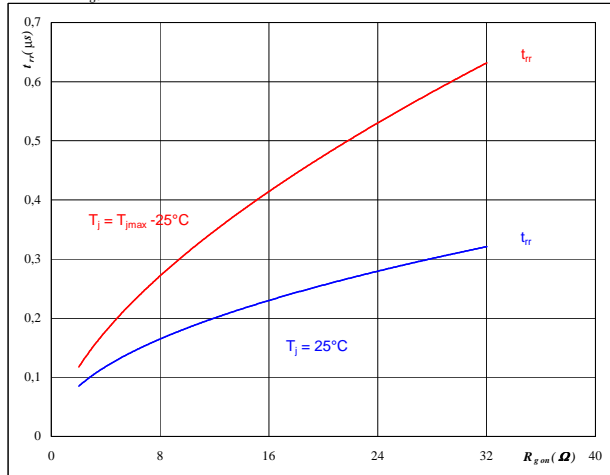
At

$T_j =$	25/150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	8	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	°C
$V_R =$	600	V
$I_F =$	50	A
$V_{GE} =$	±15	V

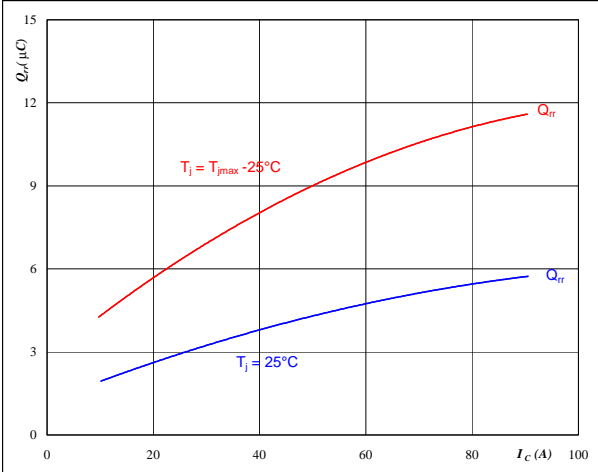


Output Inverter Switch

Figure 13 Output inverter FWD

Typical reverse recovery charge as a function of collector current

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

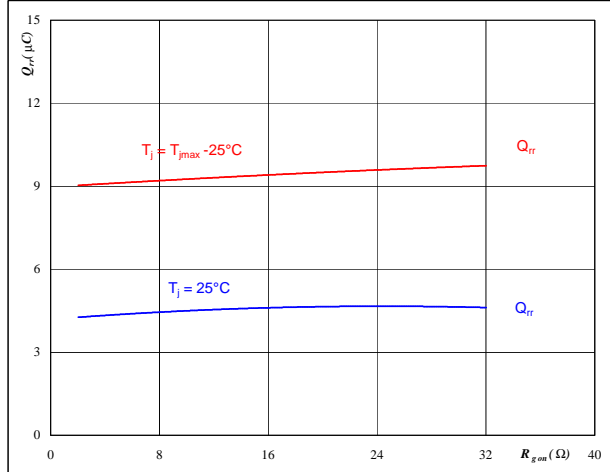


At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

Figure 14 Output inverter FWD

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

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

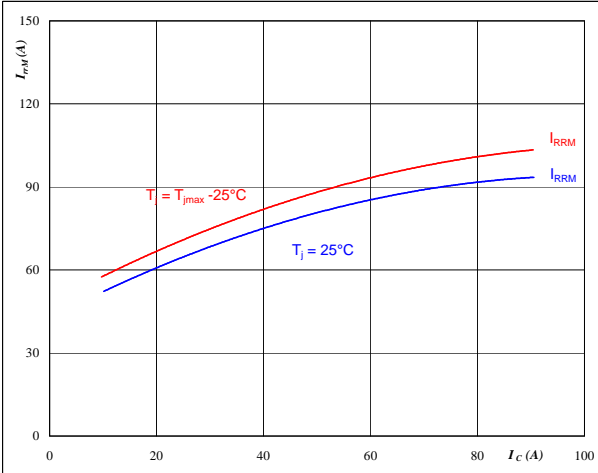


At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_R = 600 \text{ V}$
 $I_F = 50 \text{ A}$
 $V_{GE} = \pm 15 \text{ V}$

Figure 15 Output inverter FWD

Typical reverse recovery current as a function of collector current

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

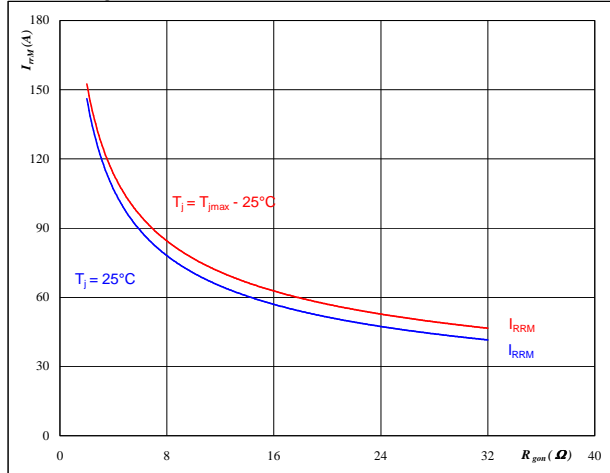


At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

Figure 16 Output inverter FWD

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

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



At
 $T_j = 25/150 \text{ } ^\circ\text{C}$
 $V_R = 600 \text{ V}$
 $I_F = 50 \text{ A}$
 $V_{GE} = \pm 15 \text{ V}$

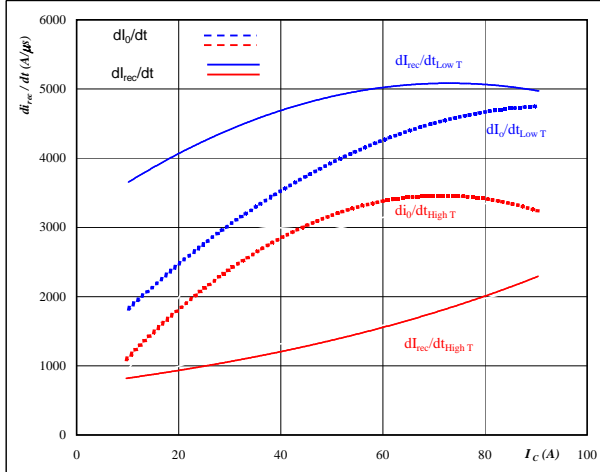


Output Inverter Switch

Figure 17 Output inverter FWD

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

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

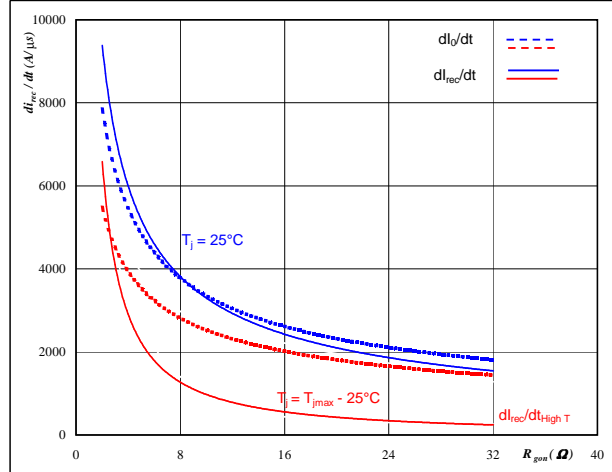


At
 $T_j = 25/150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

Figure 18 Output inverter FWD

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

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

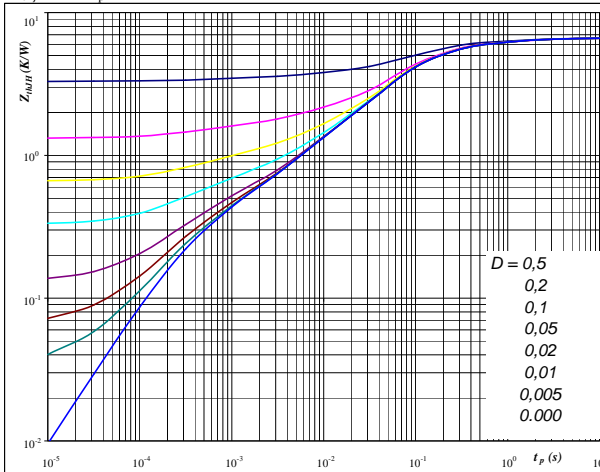


At
 $T_j = 25/150$ °C
 $V_R = 600$ V
 $I_F = 50$ A
 $V_{GE} = \pm 15$ V

Figure 19 Output inverter IGBT

IGBT transient thermal impedance as a function of pulse width

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



At
 $D = t_p / T$
 $R_{thjH} = 0,66$ K/W

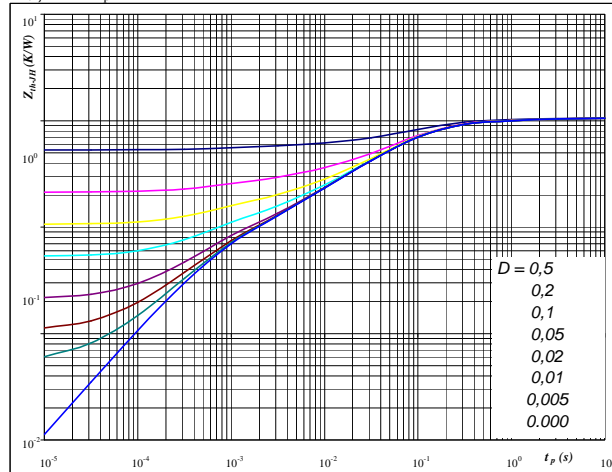
IGBT thermal model values

R (K/W)	Tau (s)
0,09	1,3E+00
0,18	1,9E-01
0,31	6,0E-02
0,05	4,7E-03
0,03	3,7E-04

Figure 20 Output inverter FWD

FWD transient thermal impedance as a function of pulse width

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



At
 $D = t_p / T$
 $R_{thjH} = 1,06$ K/W

FWD thermal model values

R (K/W)	Tau (s)
0,04	4,7E+00
0,09	8,8E-01
0,50	1,2E-01
0,28	4,1E-02
0,09	6,5E-03
0,06	6,8E-04

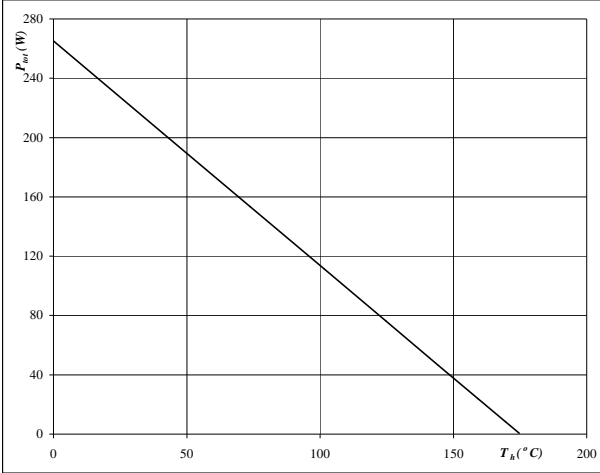


Output Inverter Switch

Figure 21 Output inverter IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

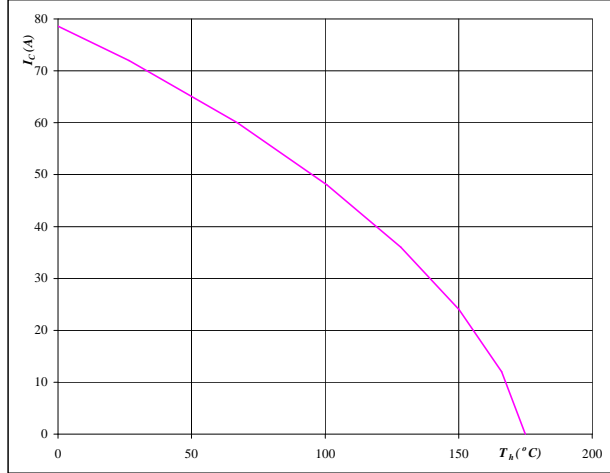


At
 $T_j = 175 \text{ } ^\circ\text{C}$

Figure 22 Output inverter IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$

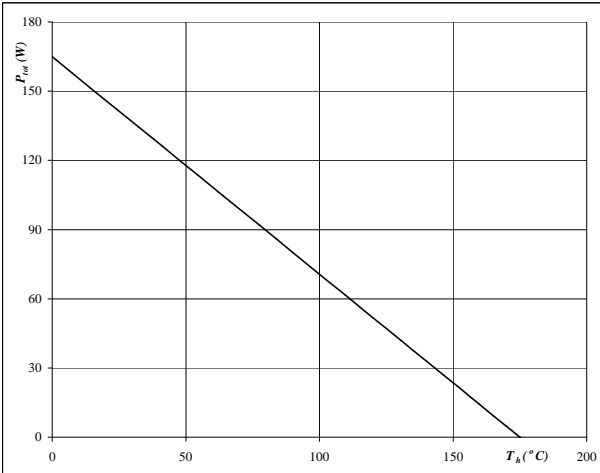


At
 $T_j = 175 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$

Figure 23 Output inverter FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

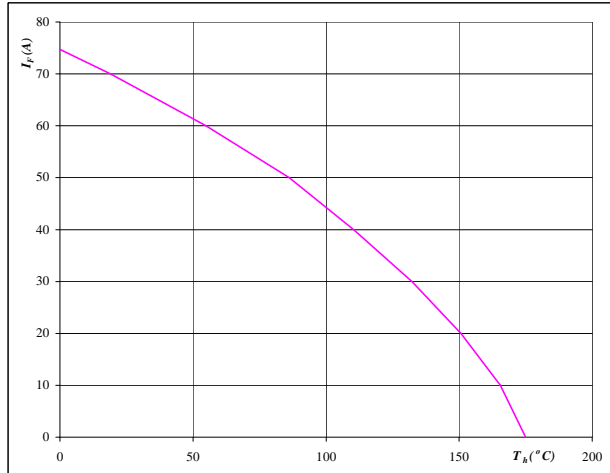


At
 $T_j = 175 \text{ } ^\circ\text{C}$

Figure 24 Output inverter FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At
 $T_j = 175 \text{ } ^\circ\text{C}$

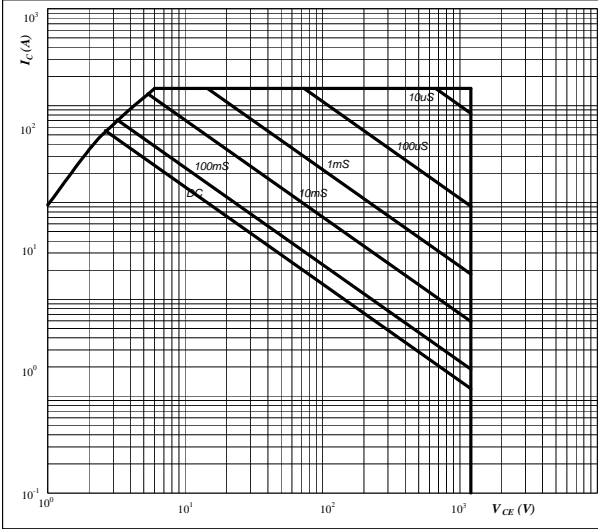


Output Inverter Switch

Figure 25 Output inverter IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$

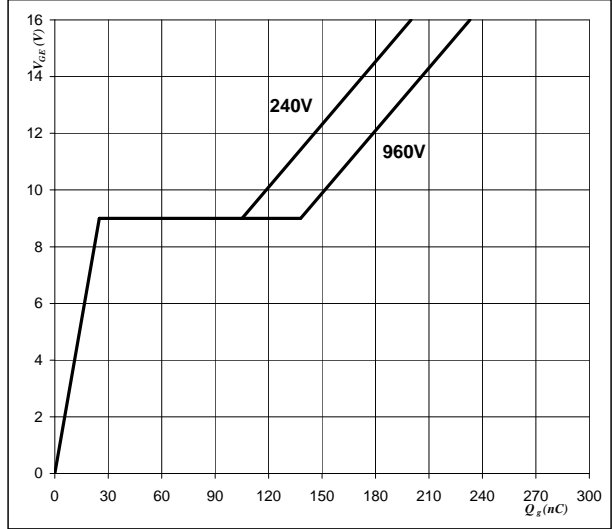


At
 $D =$ single pulse
 $T_h = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$ °C

Figure 26 Output inverter IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_{GE})$



At
 $I_C = 50$ A



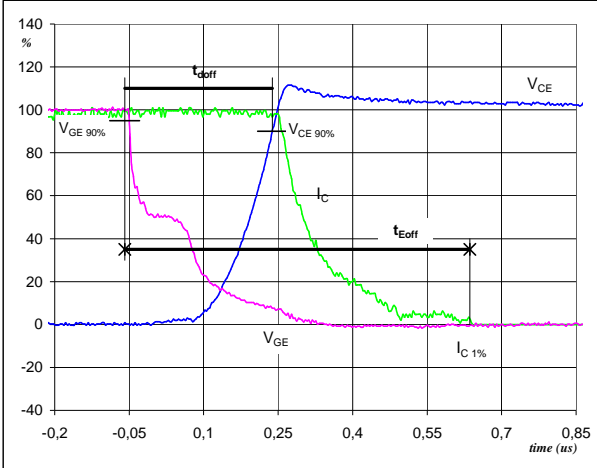
Switching Definitions Output Inverter

General conditions

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

Figure 1 Output inverter IGBT

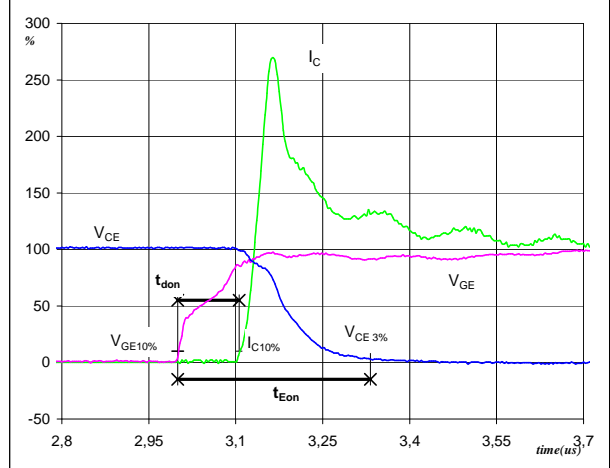
Turn-off Switching Waveforms & definition of t_{doff} t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	50	A
t_{doff} =	0,29	μs
t_{Eoff} =	0,70	μs

Figure 2 Output inverter IGBT

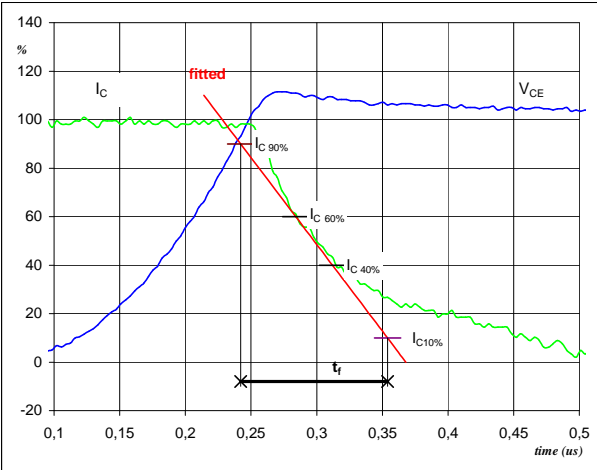
Turn-on Switching Waveforms & definition of t_{donr} t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	50	A
t_{don} =	0,10	μs
t_{Eon} =	0,33	μs

Figure 3 Output inverter IGBT

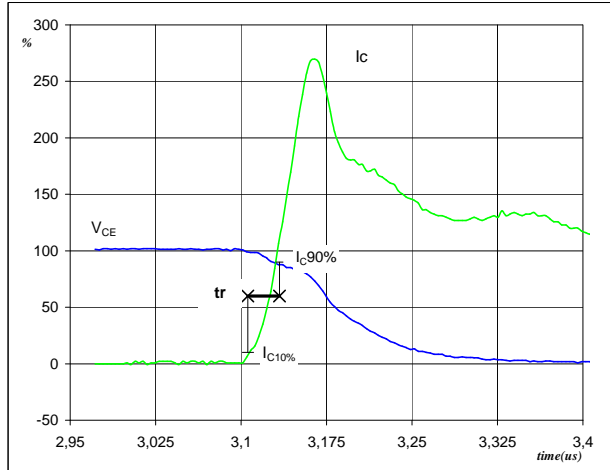
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	50	A
t_f =	0,13	μs

Figure 4 Output inverter IGBT

Turn-on Switching Waveforms & definition of t_r

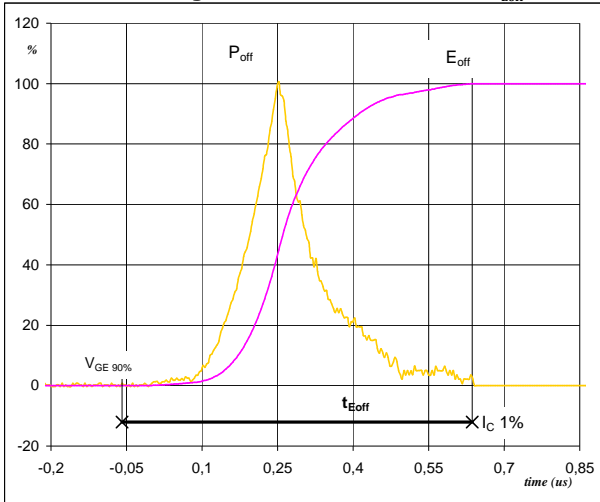


V_C (100%) =	600	V
I_C (100%) =	50	A
t_r =	0,03	μs



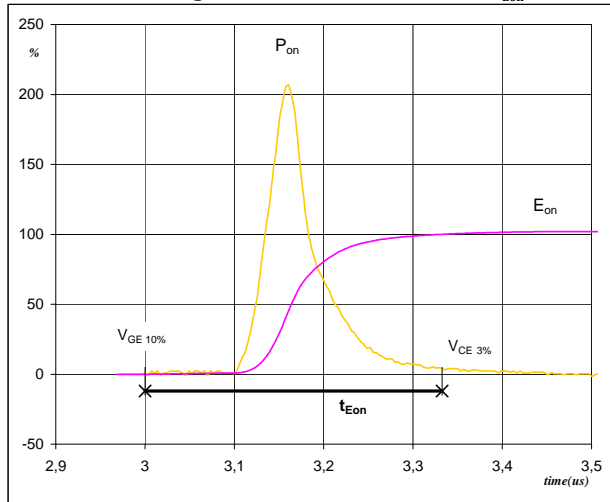
Switching Definitions Output Inverter

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



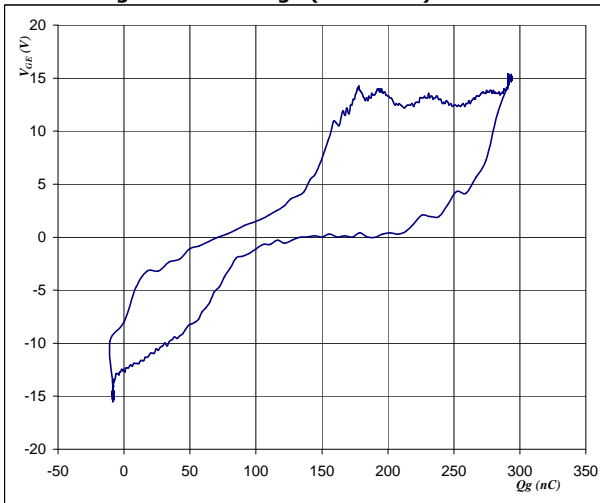
$P_{off} (100\%) = 30,25 \text{ kW}$
 $E_{off} (100\%) = 4,66 \text{ mJ}$
 $t_{Eoff} = 0,70 \text{ }\mu\text{s}$

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



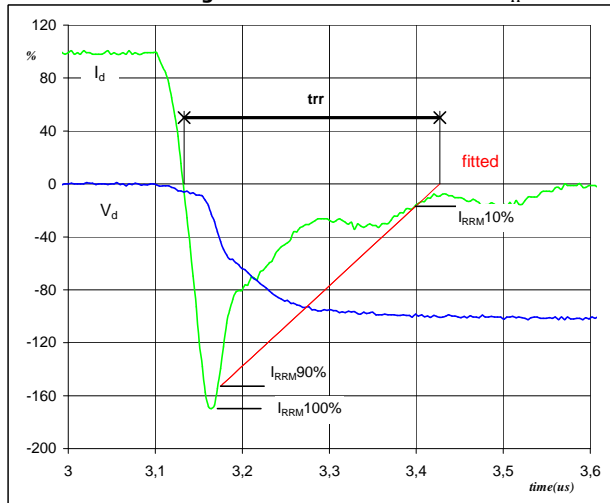
$P_{on} (100\%) = 30,25 \text{ kW}$
 $E_{on} (100\%) = 4,02 \text{ mJ}$
 $t_{Eon} = 0,33 \text{ }\mu\text{s}$

Figure 7 Output inverter FWD
Gate voltage vs Gate charge (measured)



$V_{GEoff} = -15 \text{ V}$
 $V_{GEon} = 15 \text{ V}$
 $V_C (100\%) = 600 \text{ V}$
 $I_C (100\%) = 50 \text{ A}$
 $Q_g = 2286,11 \text{ nC}$

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

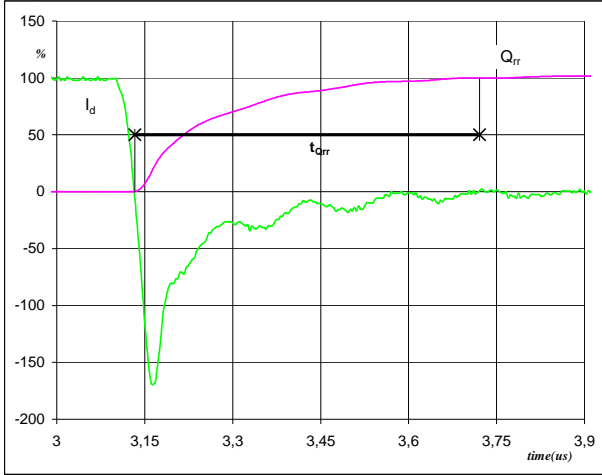


$V_d (100\%) = 600 \text{ V}$
 $I_d (100\%) = 50 \text{ A}$
 $I_{RRM} (100\%) = -87 \text{ A}$
 $t_{rr} = 0,29 \text{ }\mu\text{s}$



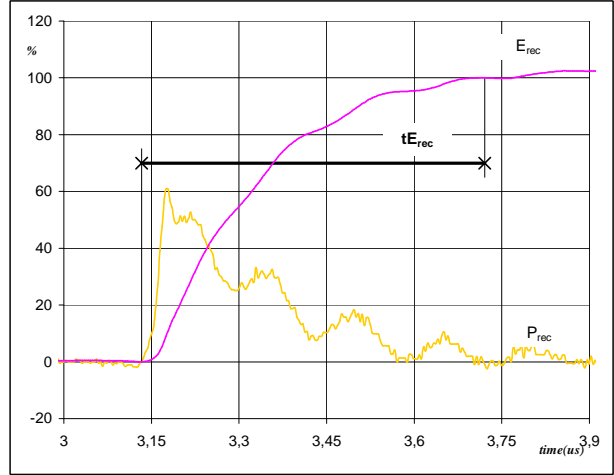
Switching Definitions Output Inverter

Figure 9 Output inverter FWD
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	50	A
Q_{rr} (100%) =	8,75	μC
t_{Qrr} =	0,59	μs

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



P_{rec} (100%) =	30,25	kW
E_{rec} (100%) =	3,45	mJ
t_{Erec} =	0,59	μs

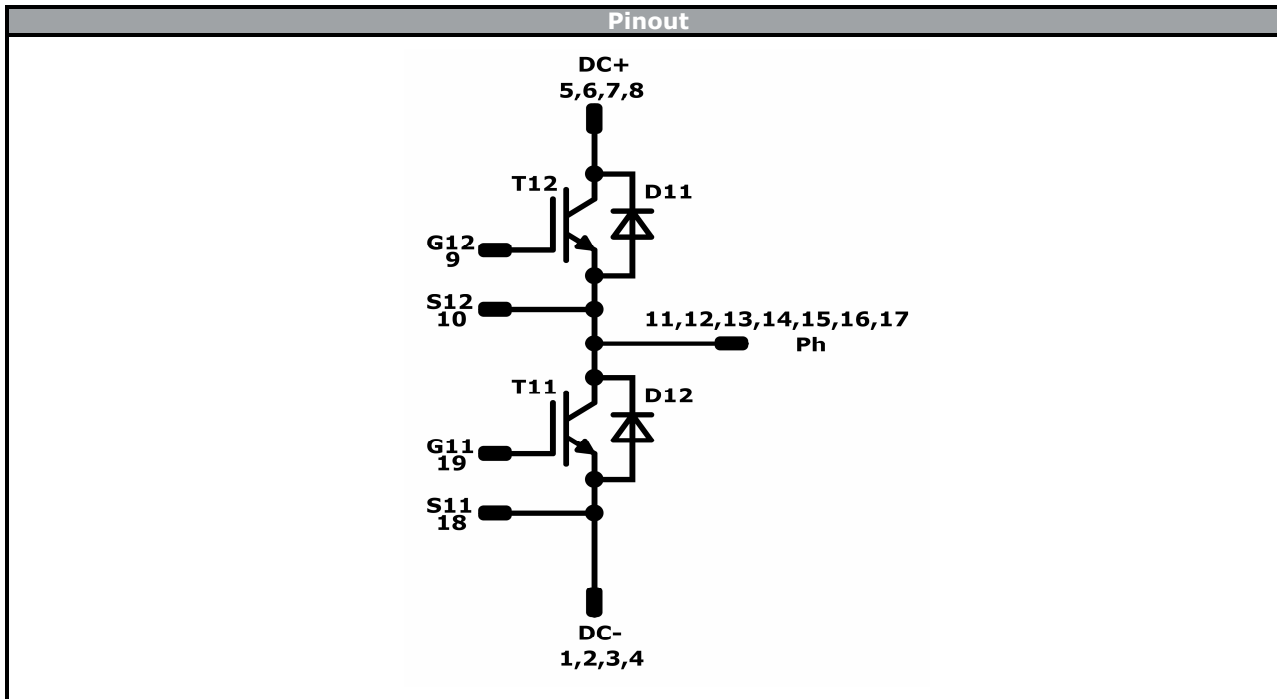


Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking							
Version			Ordering Code				
without thermal paste 12mm housing solder pins			10-FZ122PA050SC-P997F08				
NN-NNNNNNNNNNNNNN TTTTTTVV WWYY UL Vinco LLLLL SSSS		Text	Name	Date code	UL & Vinco	Lot	Serial
			Datamatrix	Type&Ver	Lot number	Serial	Date code
			NN-NNNNNNNNNNNNNN	WWYY	UL Vinco	LLLLL	SSSS
			TTTTTVV	LLLLL	SSSS	WWYY	

Pin table			
Pin	X	Y	Function
1	0	0	DC-
2	0	2,3	DC-
3	0	4,6	DC-
4	0	6,9	DC-
5	0	15,6	DC+
6	0	17,9	DC+
7	0	20,2	DC+
8	0	22,5	DC+
9	13,85	16,45	G12
10	16,75	16,45	S12
11	33,5	11,5	Ph
12	33,5	9,2	Ph
13	33,5	6,9	Ph
14	33,5	4,6	Ph
15	33,5	2,3	Ph
16	33,5	0	Ph
17	13,85	13,55	Ph
18	19,55	4,95	S11
19	19,55	7,85	G11

Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	50 A	Output Inverter Switch	
D11, D12	FWD	1200 V	50 A	Output Inverter Diode	



Packaging instruction			
Standard packaging quantity (SPQ)	135	>SPQ Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow</i> 0 packages see vincotech.com website.

Package data
Package data for <i>flow</i> 0 packages see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-FZ122PA050SC-P997F08-D3-14	12 Jan. 2016	Header	

DISCLAIMER

The information, specifications, procedures, methods and recommendations herein (together "information") are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader's sole responsibility to test and determine the suitability of the information and the product for reader's intended use.

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.