
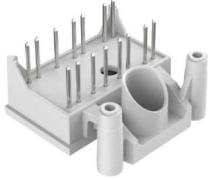
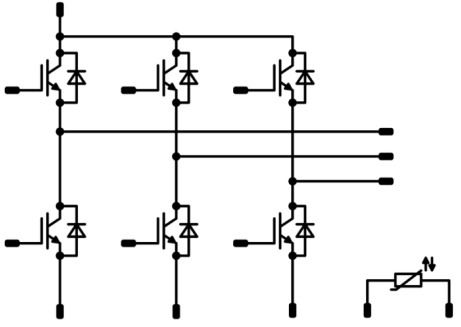




Vincotech

<i>flow</i> PACK 0B	600 V / 6 A
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> IGBT3 (600V) technology Open emitter topology New ultra-compact housing Single-screw heat sink mounting 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">flow 0B housing</div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  12 mm </div> <div style="text-align: center;">  17 mm </div> </div>
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Industrial drives Embedded drives 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Schematic</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 10-OB066PA006SB-M992F09 10-ZB066PA006SB-M992F08 	

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		600	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	8	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	18	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	27	W
Gate-emitter voltage	V_{GE}		± 20	V
Short circuit ratings	t_{SC}	$T_j \leq 150\text{ °C}$	6	μs
	V_{CC}	$V_{GE} = 15\text{ V}$	360	V
Maximum junction temperature	T_{jmax}		175	$^{\circ}C$



Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	8	A
Repetitive peak forward current	I_{FRM}		12	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	23	W
Maximum junction temperature	T_{jmax}		175	°C

Module Properties

Thermal Properties

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

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage $t_p = 2\text{ s}$	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_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	

Inverter Switch

Static

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$				0,00018	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15			6	25 125	1,1	1,49 1,68	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600			25			0,04	μA
Gate-emitter leakage current	I_{GES}		20	0			25			300	nA
Internal gate resistance	r_g								none		Ω
Input capacitance	C_{ies}								368		pF
Output capacitance	C_{oes}	$f = 100$ KHz	0	25		25			28		
Reverse transfer capacitance	C_{res}								11		
Gate charge	Q_g		15	180	6		25		42		nC

Thermal

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 μm $\lambda = 1$ W/mK							3,50		K/W

Dynamic

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 64$ Ω $R_{gon} = 64$ Ω	±15	300	6		25		105		ns
Rise time	t_r							150	102		
Turn-off delay time	$t_{d(off)}$							25	22		
Fall time	t_f							150	28		
Turn-on energy (per pulse)	E_{on}	$Q_{FWD} = 0,3$ μC $Q_{FWD} = 0,8$ μC	±15	300	6		25		0,150		mWs
Turn-off energy (per pulse)	E_{off}							150	0,225		
							25		0,146		
							150		0,193		



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Inverter Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			6		25 125		1,58 1,50	1,95	V
Reverse leakage current	I_R		600			25			27	μ A

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness $\leq 50 \mu\text{m}$ $\lambda = 1 \text{ W/mK}$	4,20	K/W

Dynamic

Parameter	Symbol	di/dt	\pm	I_D	I_F	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}					25 150		4 6		A
Reverse recovery time	t_{rr}					25 150		183 288		ns
Recovered charge	Q_r	$di/dt = 219 \text{ A}/\mu\text{s}$ $di/dt = 191 \text{ A}/\mu\text{s}$	± 15	300	6	25 150		0,324 0,775		μ C
Reverse recovered energy	E_{rec}					25 150		0,059 0,156		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		45 57		A/ μ s

Thermistor

Parameter	Symbol	Value	T_j [°C]	Min	Typ	Max	Unit
Rated resistance	R		25		21,5		k Ω
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1486 \Omega$	100	-4,5		+4,5	%
Power dissipation	P		25		210		mW
Power dissipation constant			25		3,5		mW/K
B-value	$B_{(25/50)}$		25		3884		K
B-value	$B_{(25/100)}$		25		3964		K
Vincotech NTC Reference						F	



Inverter Switch Characteristics

figure 1. IGBT

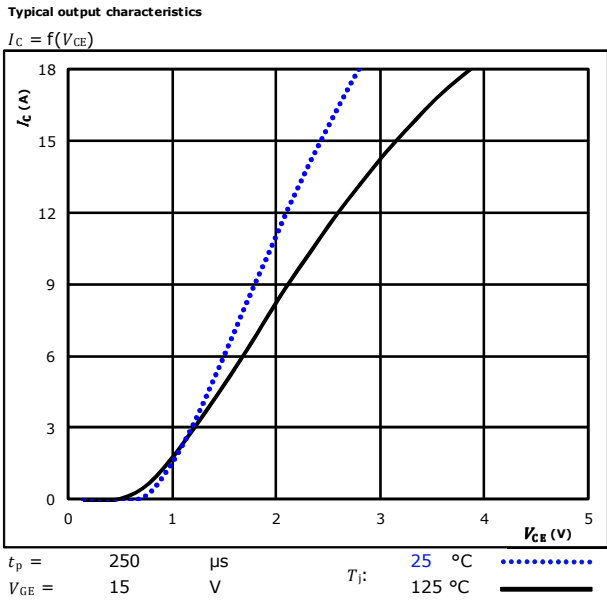


figure 2. IGBT

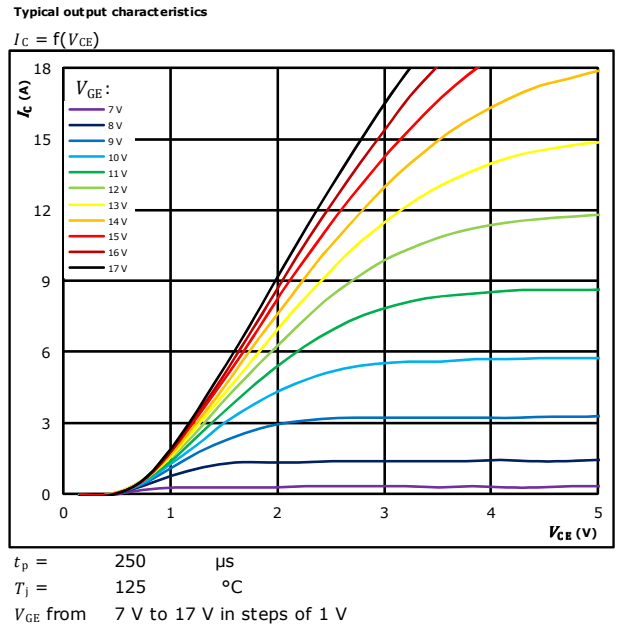


figure 3. IGBT

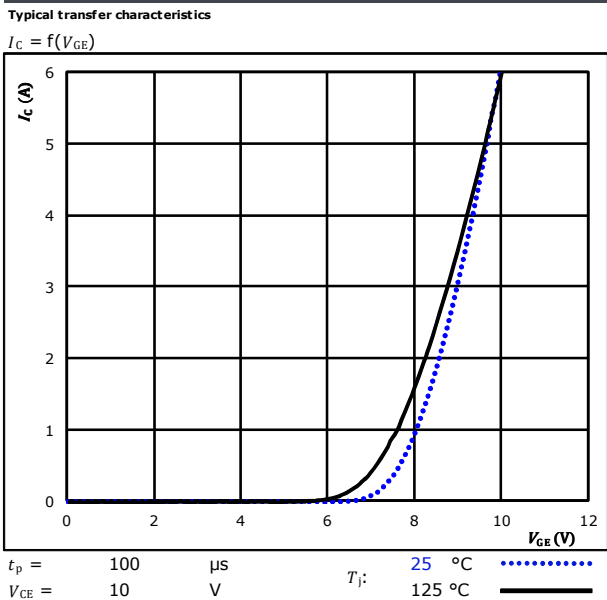
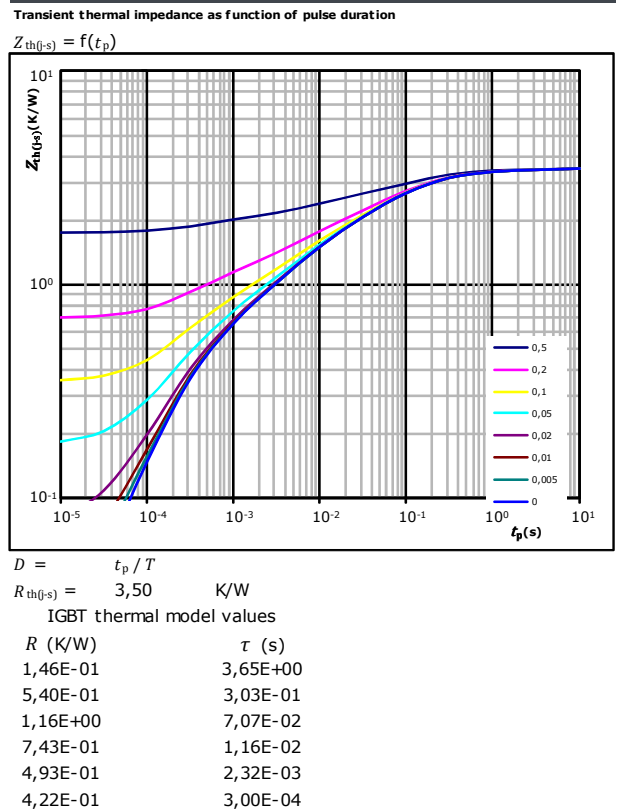


figure 4. IGBT





Inverter Switch Characteristics

figure 5. IGBT

Gate voltage vs gate charge

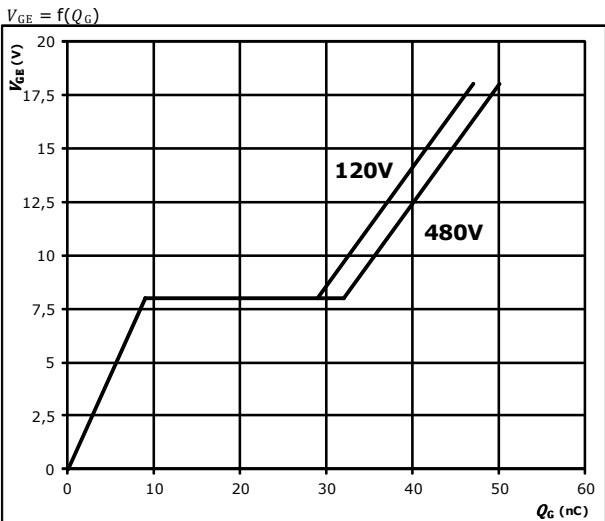
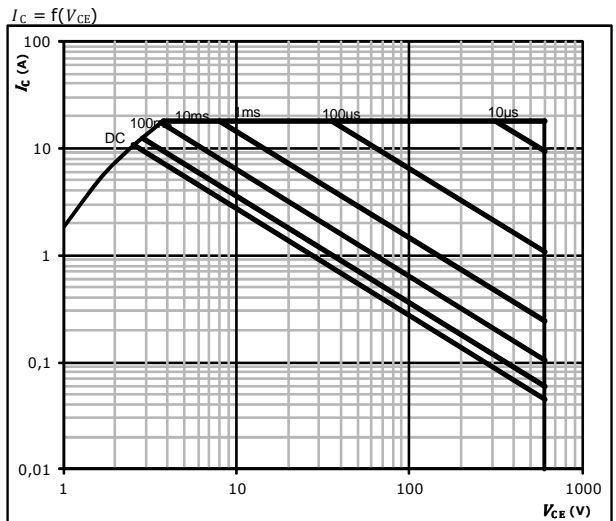


figure 6. IGBT

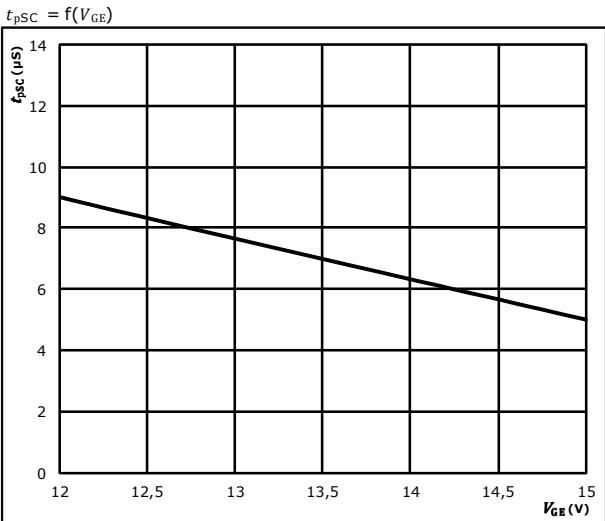
Safe operating area



$D =$ single pulse
 $T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = \pm 15 \text{ V}$
 $T_j = T_{jmax} \text{ } ^\circ\text{C}$

figure 7. IGBT

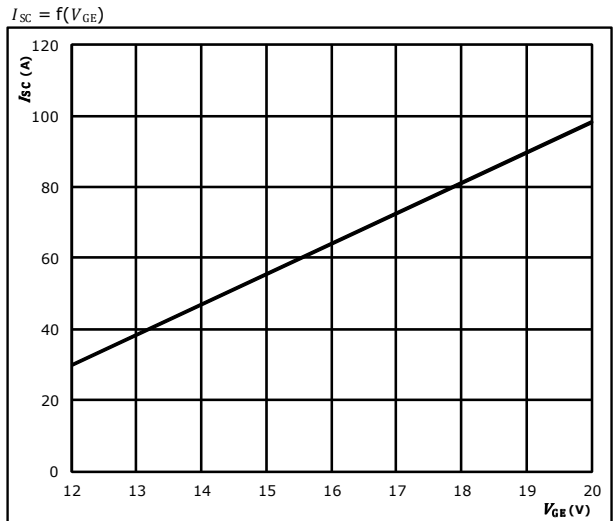
Short circuit duration as a function of V_{GE}



$V_{CE} = 600 \text{ V}$
 $T_j \leq 175 \text{ } ^\circ\text{C}$

figure 8. IGBT

Typical short circuit current as a function of V_{CE}



$V_{CE} \leq 600 \text{ V}$
 $T_j \leq 175 \text{ } ^\circ\text{C}$



Inverter Diode Characteristics

figure 1. FWD

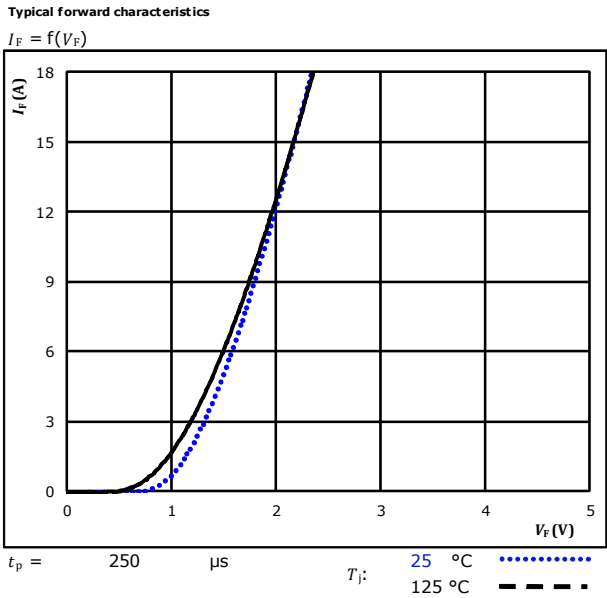
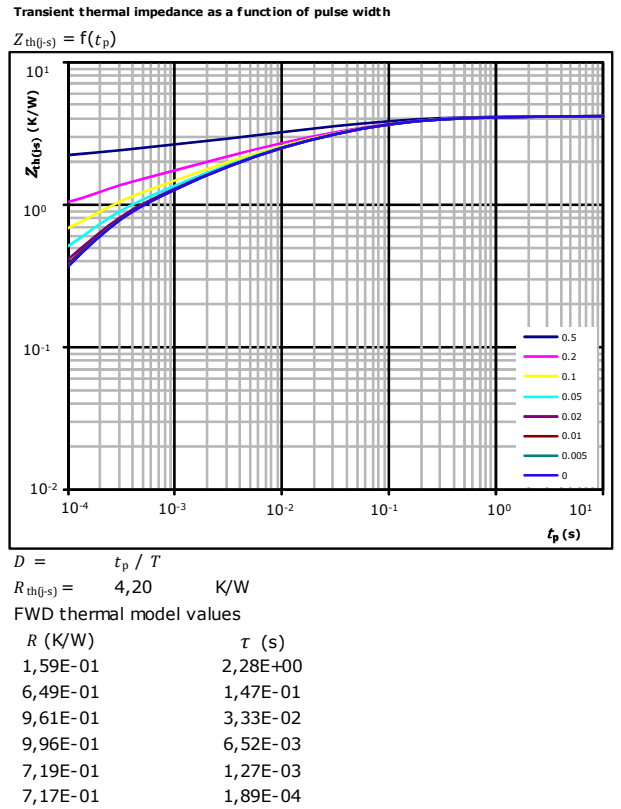


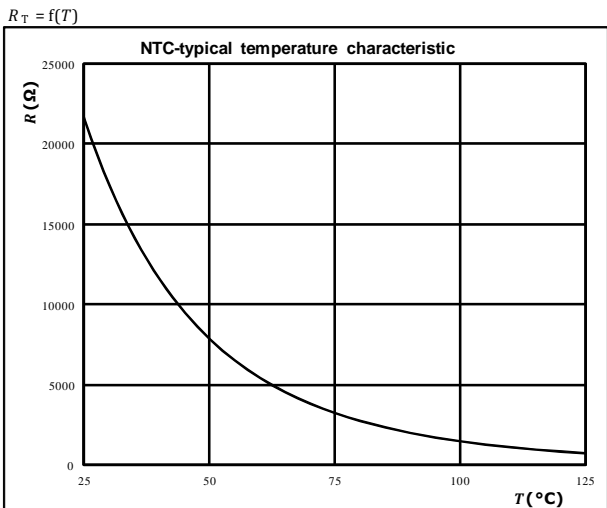
figure 2. FWD



Thermistor Characteristics

Thermistor typical temperature characteristic

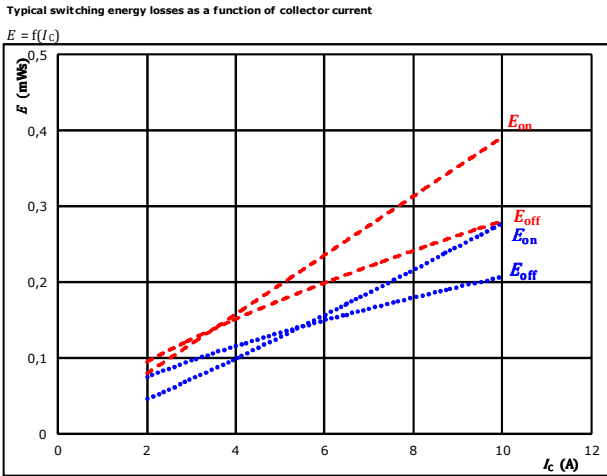
Typical NTC characteristic
 as a function of temperature





Inverter Switching Characteristics

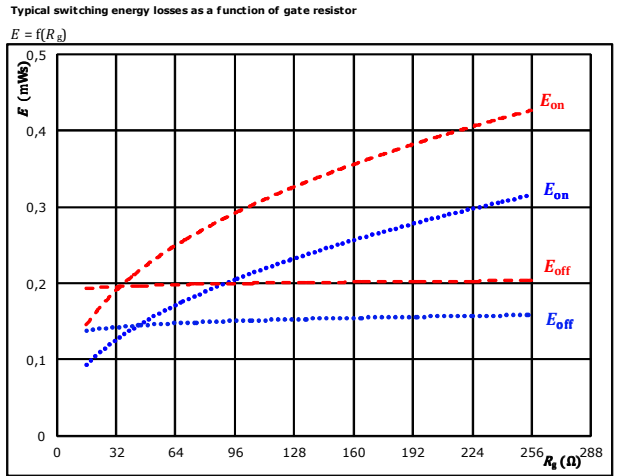
figure 1. IGBT



With an inductive load at

$V_{CE} =$ 300 V	$T_j:$ 25 °C
$V_{GE} =$ ±15 V	150 °C	-----
$R_{gon} =$ 64 Ω		
$R_{goff} =$ 64 Ω		

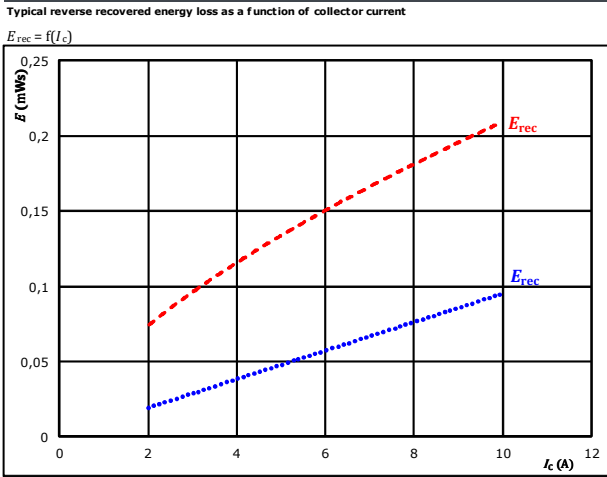
figure 2. IGBT



With an inductive load at

$V_{CE} =$ 300 V	$T_j:$ 25 °C
$V_{GE} =$ ±15 V	150 °C	-----
$I_c =$ 6 A		

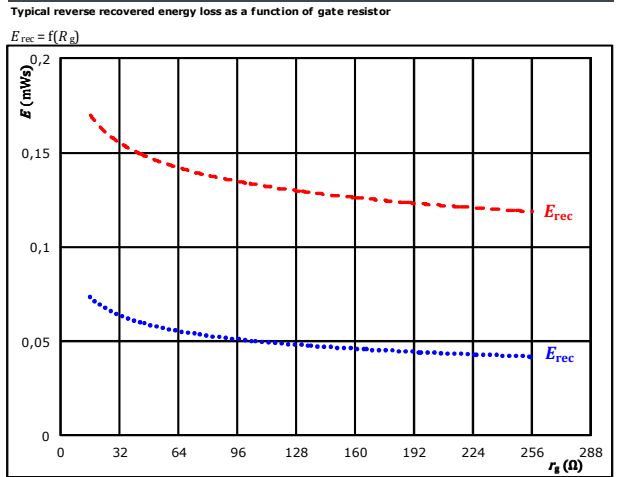
figure 3. FWD



With an inductive load at

$V_{CE} =$ 300 V	$T_j:$ 25 °C
$V_{GE} =$ ±15 V	150 °C	-----
$R_{gon} =$ 64 Ω		

figure 4. FWD



With an inductive load at

$V_{CE} =$ 300 V	$T_j:$ 25 °C
$V_{GE} =$ ±15 V	150 °C	-----
$I_c =$ 6 A		

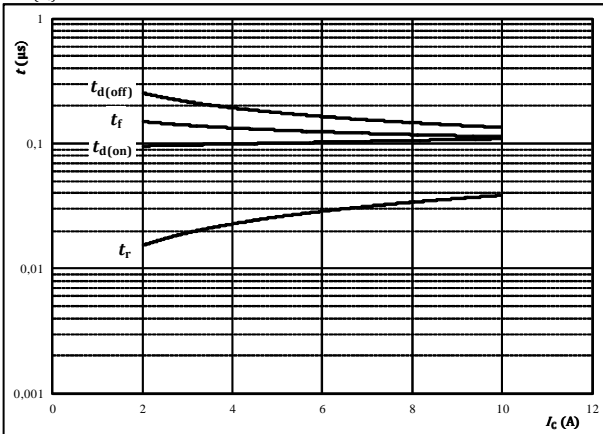


Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



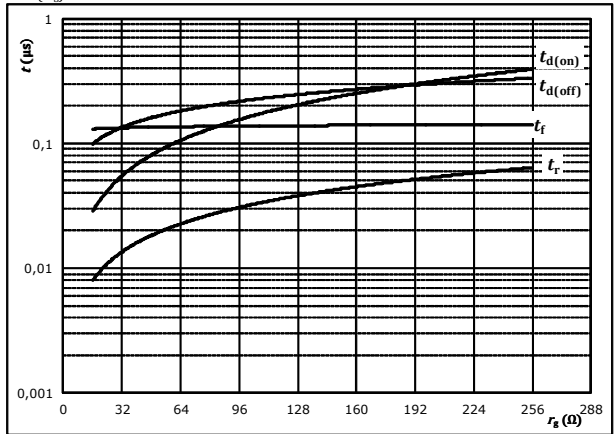
With an inductive load at

$T_j =$	150	$^{\circ}C$
$V_{CE} =$	300	V
$V_{GE} =$	± 15	V
$R_{gon} =$	64	Ω
$R_{goff} =$	64	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



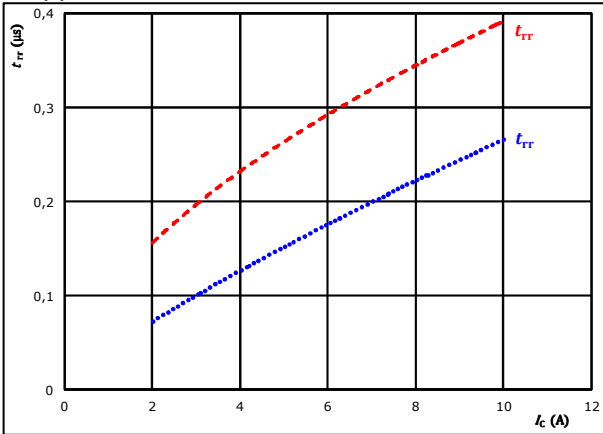
With an inductive load at

$T_j =$	150	$^{\circ}C$
$V_{CE} =$	300	V
$V_{GE} =$	± 15	V
$I_C =$	6	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

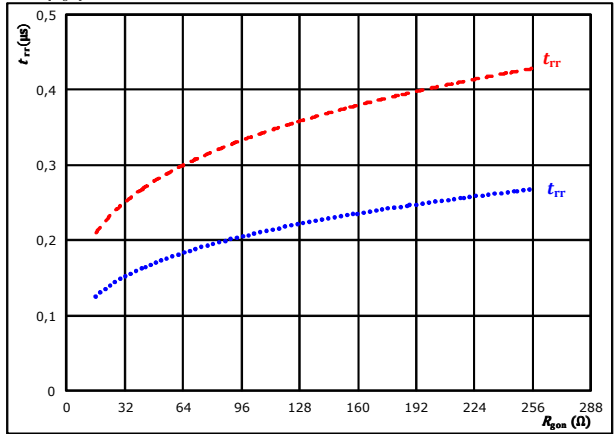


At	$V_{CE} =$	300	V	$T_j =$	25 $^{\circ}C$
	$V_{GE} =$	± 15	V		150 $^{\circ}C$	-----
	$R_{gon} =$	64	Ω			

figure 8. FWD

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

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



At	$V_{CE} =$	300	V	$T_j =$	25 $^{\circ}C$
	$V_{GE} =$	± 15	V		150 $^{\circ}C$	-----
	$I_C =$	6	A			

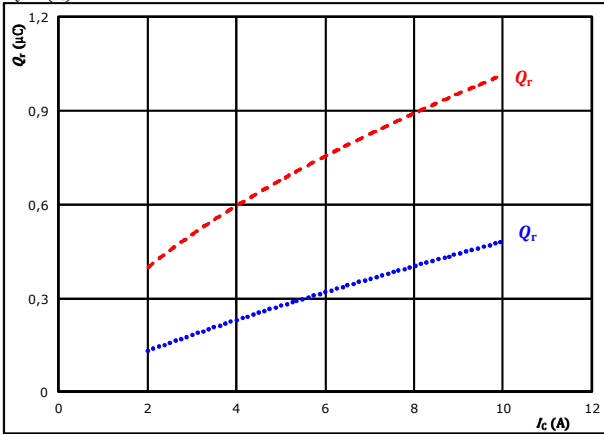


Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

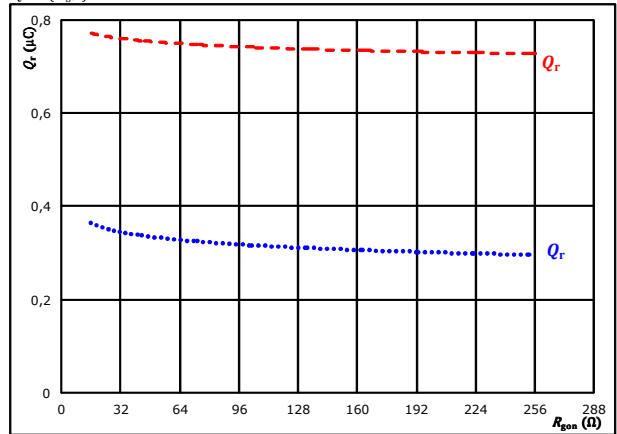


At $V_{CE} = 300$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 150$ °C (red dashed line)
 $R_{gpn} = 64$ Ω

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gpn})$$

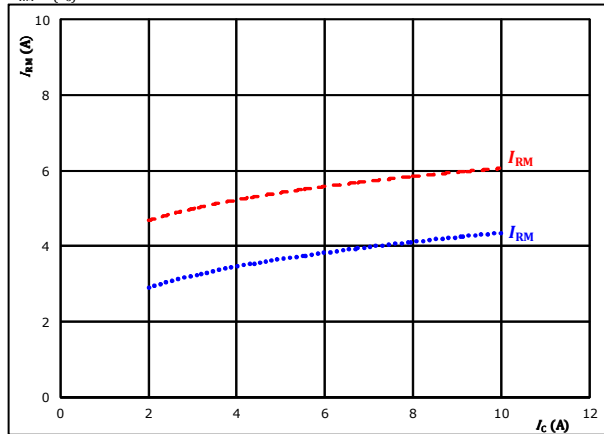


At $V_{CE} = 300$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 150$ °C (red dashed line)
 $I_c = 6$ A

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

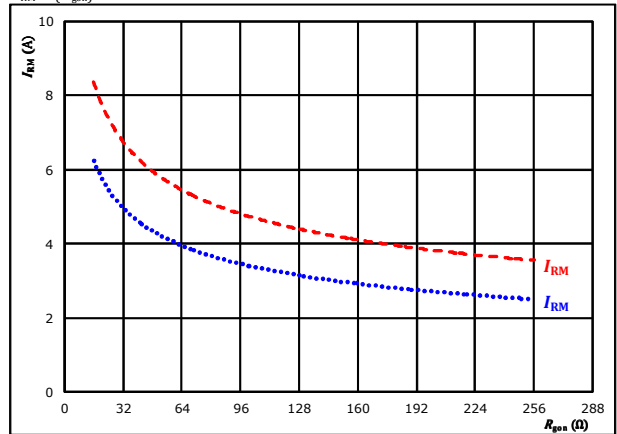


At $V_{CE} = 300$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 150$ °C (red dashed line)
 $R_{gpn} = 64$ Ω

figure 12. FWD

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

$$I_{RM} = f(R_{gpn})$$



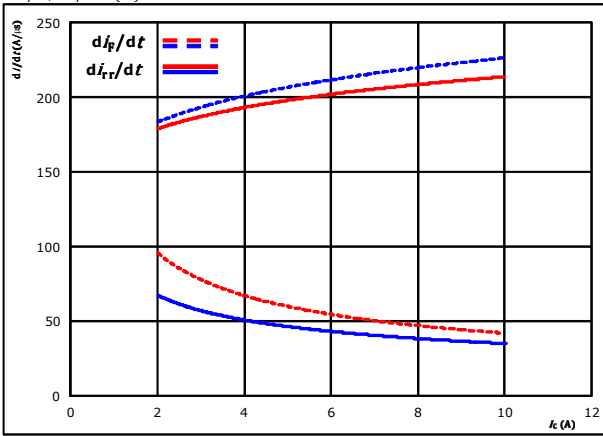
At $V_{CE} = 300$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 150$ °C (red dashed line)
 $I_c = 6$ A



Inverter Switching Characteristics

figure 13. FWD

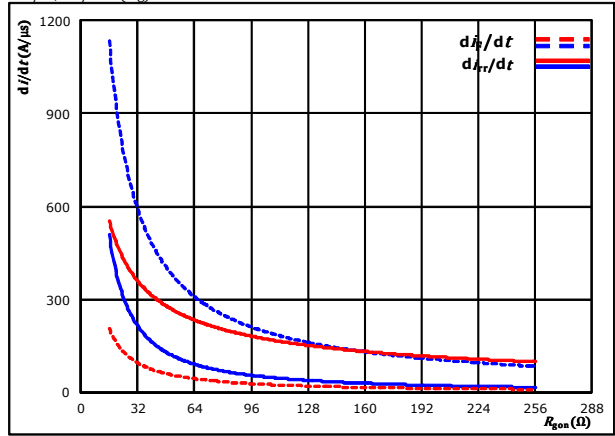
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 300$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 150$ °C - - - - -
 $R_{gon} = 64$ Ω

figure 14. FWD

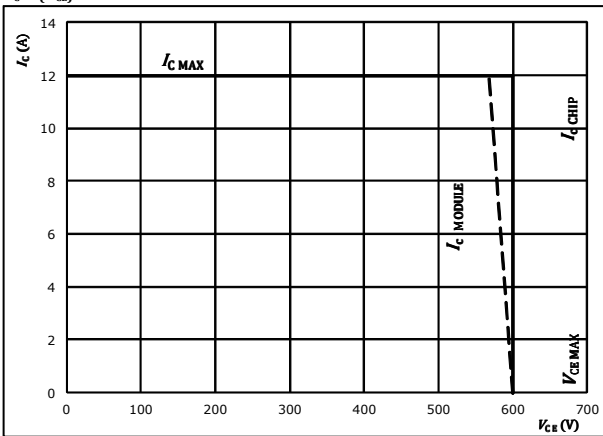
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



At $V_{CE} = 300$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 150$ °C - - - - -
 $I_c = 6$ A

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



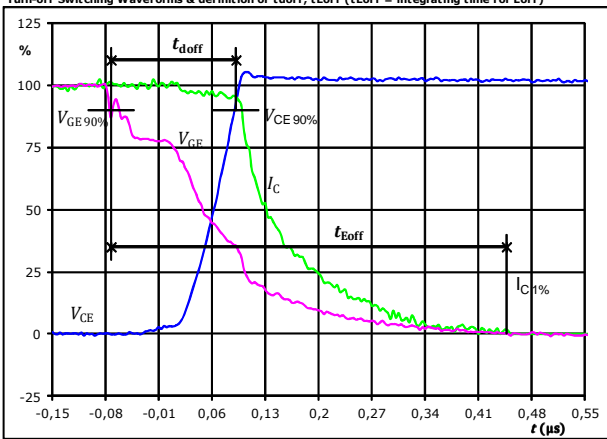
At $T_j = 175$ °C
 $R_{gon} = 64$ Ω
 $R_{goff} = 64$ Ω



Inverter Switching Characteristics

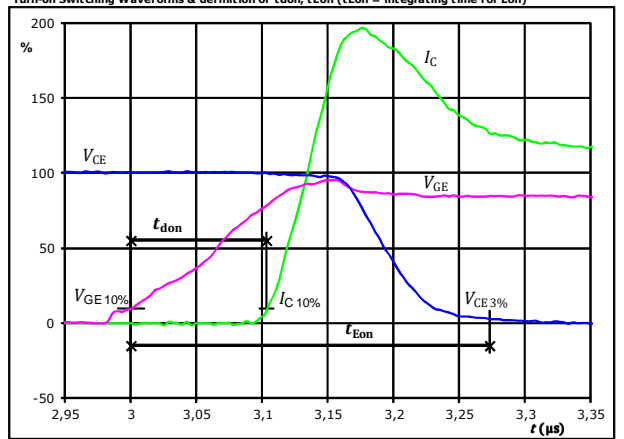
T_j	=	150 °C
R_{gon}	=	64 Ω
R_{goff}	=	64 Ω

figure 1. IGBT
 Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



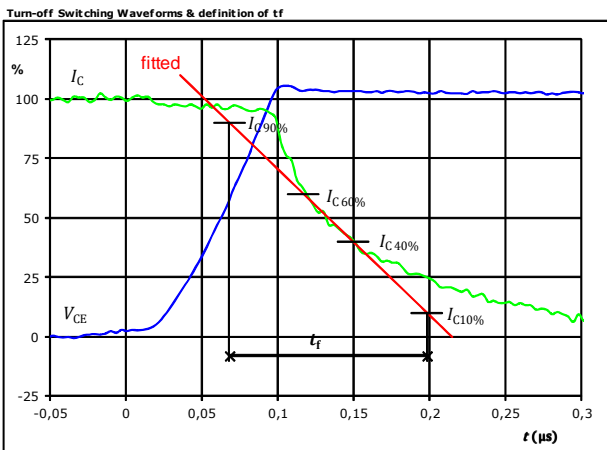
$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	310	V
$I_C(100\%) =$	6	A
$t_{doff} =$	0,164	μs
$t_{Eoff} =$	0,519	μs

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



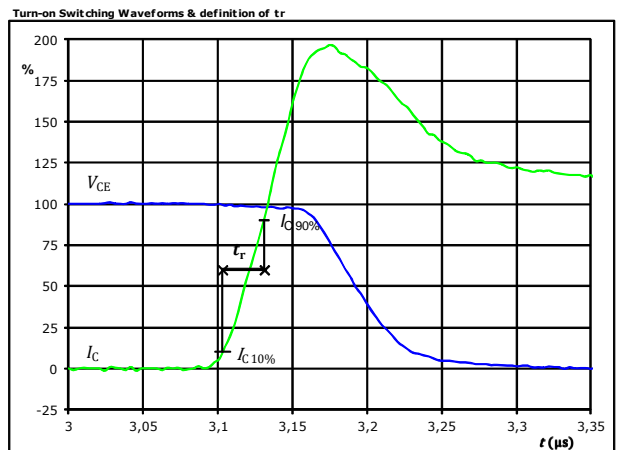
$V_{CE}(0\%) =$	-15	V
$V_{CE}(100\%) =$	15	V
$V_C(100\%) =$	310	V
$I_C(100\%) =$	6	A
$t_{don} =$	0,102	μs
$t_{Eon} =$	0,273	μs

figure 3. IGBT
 Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	310	V
$I_C(100\%) =$	6	A
$t_f =$	0,132	μs

figure 4. IGBT
 Turn-on Switching Waveforms & definition of t_r



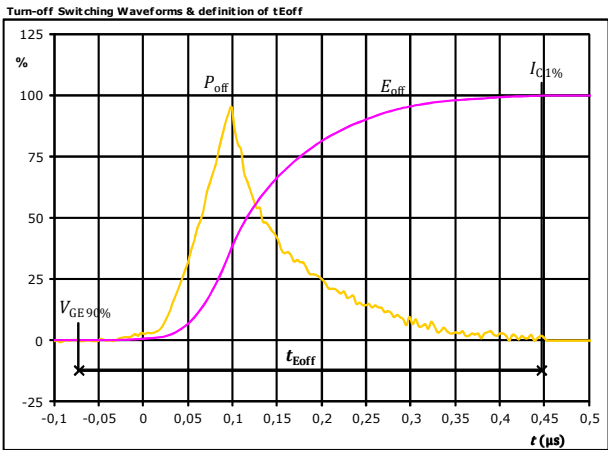
$V_C(100\%) =$	310	V
$I_C(100\%) =$	6	A
$t_r =$	0,028	μs



Vincotech

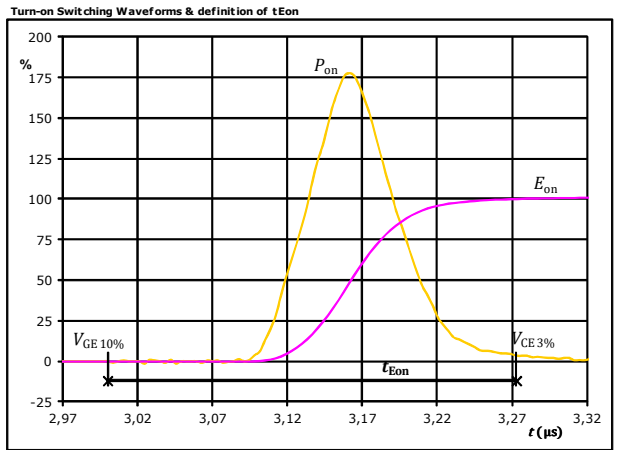
Inverter Switching Characteristics

figure 5. IGBT



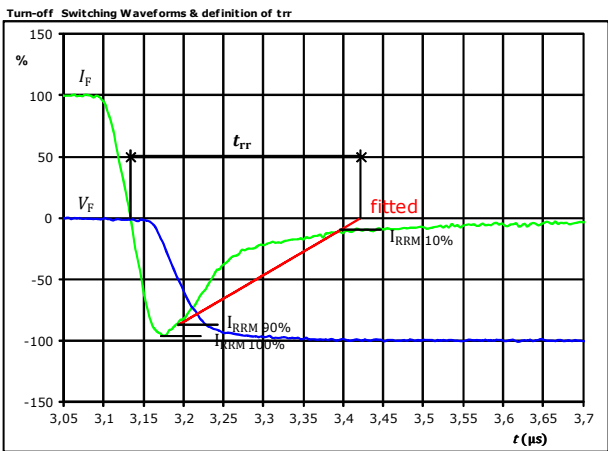
$P_{off}(100\%) =$	1,86	kW
$E_{off}(100\%) =$	0,19	mJ
$t_{Eoff} =$	0,519	µs

figure 6. IGBT



$P_{on}(100\%) =$	1,86	kW
$E_{on}(100\%) =$	0,23	mJ
$t_{Eon} =$	0,27	µs

figure 7. FWD

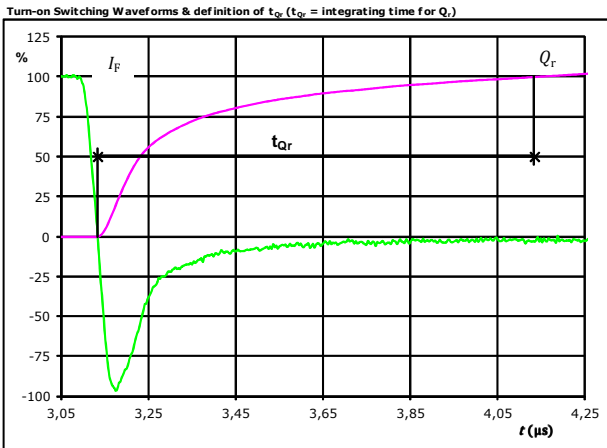


$V_F(100\%) =$	310	V
$I_F(100\%) =$	6	A
$I_{RRM}(100\%) =$	-6	A
$t_{rr} =$	0,288	µs



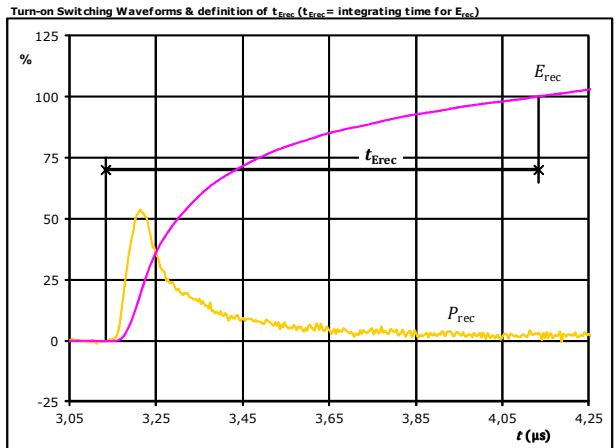
Inverter Switching Characteristics

figure 8. FWD



I_F (100%) =	6	A
Q_r (100%) =	0,78	μC
t_{Qr} =	1,00	μs

figure 9. FWD



P_{rec} (100%) =	1,86	kW
E_{rec} (100%) =	0,16	mJ
t_{Erec} =	1,00	μs



Ordering Code & Marking																														
Version			Ordering Code																											
without thermal paste 17 mm housing with solder pins			10-0B066PA006SB-M992F09																											
without thermal paste 12 mm housing with solder pins			10-ZB066PA006SB-M992F08																											
			<table border="1"> <thead> <tr> <th>Text</th> <th>Name</th> <th>Type&Ver</th> <th>Date code</th> <th>VIN & Lot</th> <th>Serial&UL</th> </tr> </thead> <tbody> <tr> <td></td> <td>NN-NNNNNNNNNNNNNN</td> <td>TTTTTTTVV</td> <td>WWYY</td> <td>VIN LLLLL</td> <td>SSSS UL</td> </tr> <tr> <th>Datamatrix</th> <th>Type&Ver</th> <th>Lot number</th> <th>Serial</th> <th>Date code</th> <td></td> </tr> <tr> <td></td> <td>TTTTTTTVV</td> <td>LLLLL</td> <td>SSSS</td> <td>WWYY</td> <td></td> </tr> </tbody> </table>				Text	Name	Type&Ver	Date code	VIN & Lot	Serial&UL		NN-NNNNNNNNNNNNNN	TTTTTTTVV	WWYY	VIN LLLLL	SSSS UL	Datamatrix	Type&Ver	Lot number	Serial	Date code			TTTTTTTVV	LLLLL	SSSS	WWYY	
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Pin table [mm]			
Pin	X	Y	Function
1	27,8	0	G6
2	24,9	0	E6
3	19,1	0	G5
4	16,2	0	E5
5	11,6	0	NTC2
6	7,6	0	NTC1
7	2,9	0	E4
8	0	0	G4
9	0	13,7	U
10	2,9	13,7	G1
11	8,8	13,7	DC+
12	14,6	13,7	V
13	17,5	13,7	G2
14	24,9	13,7	G3
15	27,8	13,7	W

12 mm

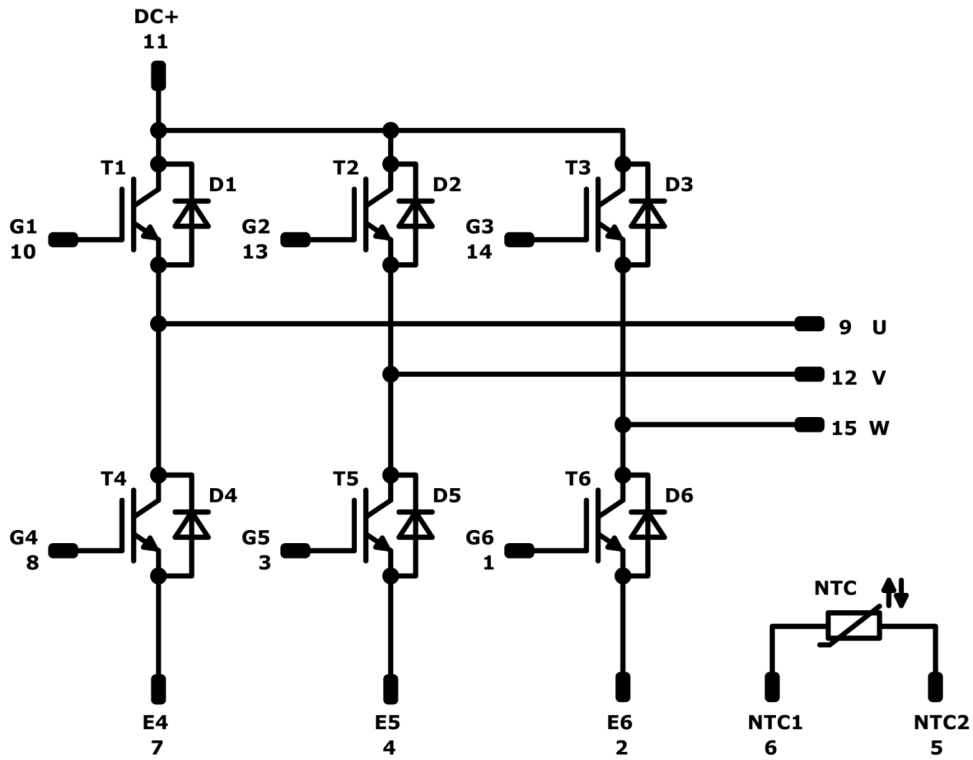
17 mm

Tolerance of pinpositions: ±0,5mm at the end of pins
 Dimension of coordinate axis is only offset without tolerance
 PCB cutouts and holes see in handling instruction document



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	600 V	6 A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	600 V	6 A	Inverter Diode	
NTC	Thermistor			Thermistor	




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Packaging instruction			
Standard packaging quantity (SPQ)	160	>SPQ	Standard
		<SPQ	Sample

Handling instruction
Handling instructions for <i>flow0</i> B packages see vincotech.com website.

Package data
Package data for <i>flow0</i> B packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website. 

Document No.:	Date:	Modification:	Pages
10-xB066PA006SB-M992F0x-D4-14	25 May. 2018	12 mm version added	All

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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.