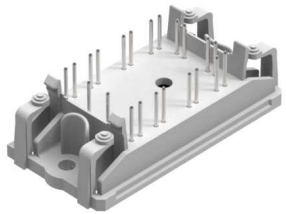
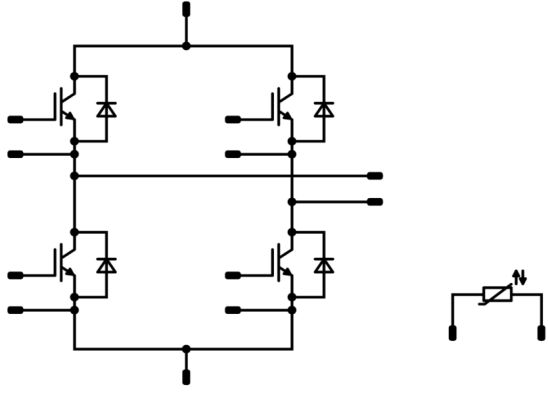




Vincotech

fastPACK 0 H		600 V / 100 A
Features • High efficient H-Bridge • High-speed IGBT • High-switching frequency • Low inductive design		flow 0 17mm housing 
Target applications • Solar Inverter • UPS • Welding • Power Supply		Schematic 
Types • V23990-P625-F24-PM		

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
H-Bridge Switch				
Collector-emitter voltage	V_{CES}		600	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	83	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	141	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq 150\text{ °C}$ $V_{GE} = 15\text{ V}$	6 360	μs V
Maximum Junction Temperature	T_{jmax}		175	°C



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Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
H-Bridge Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	70	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	100	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_{jop}		-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	



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Characteristic Values

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

H-Bridge Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0016	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125	1,05	1,57 1,75	1,85	V
Collector-emitter cut-off current	I_{CES}		0	600		25			5,1	μA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Internal gate resistance	r_g							2		Ω
Input capacitance	C_{ies}	$f = 1 \text{ MHz}$	0	25		25		6160		pF
Output capacitance	C_{oes}							384		
Reverse transfer capacitance	C_{res}							183		

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4 \text{ W/mK}$						0,68		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 4 \Omega$ $R_{gon} = 4 \Omega$	± 15	300	100	25 150		156 162		ns
Rise time	t_r					25 150		20 27		
Turn-off delay time	$t_{d(off)}$					25 150		212 242		
Fall time	t_f					25 150		99 116		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 4,9 \mu\text{C}$ $Q_{tFWD} = 9,1 \mu\text{C}$				25 150		0,919 1,397		mWs
Turn-off energy (per pulse)	E_{off}					25 150		2,684 3,554		



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Characteristic Values

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

H-Bridge Diode

Static

Forward voltage	V_F				100	25 125		1,67 1,69	1,9	V
Reverse leakage current	I_r			600		25			660	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						0,95		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$di/dt = 5235$ A/μs $di/dt = 4954$ A/μs	± 15	300	100	25 150		105 131		A
Reverse recovery time	t_{rr}					25 150		116 138		ns
Recovered charge	Q_r					25 150		4,924 9,112		μC
Reverse recovered energy	E_{rec}					25 150		1,132 2,147		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		4869 3253		A/μs

Thermistor

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484$ Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ± 1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ± 1 %				25		4000		K
Vincotech NTC Reference									I	



H-Bridge Switch Characteristics

figure 1. IGBT
Typical output characteristics

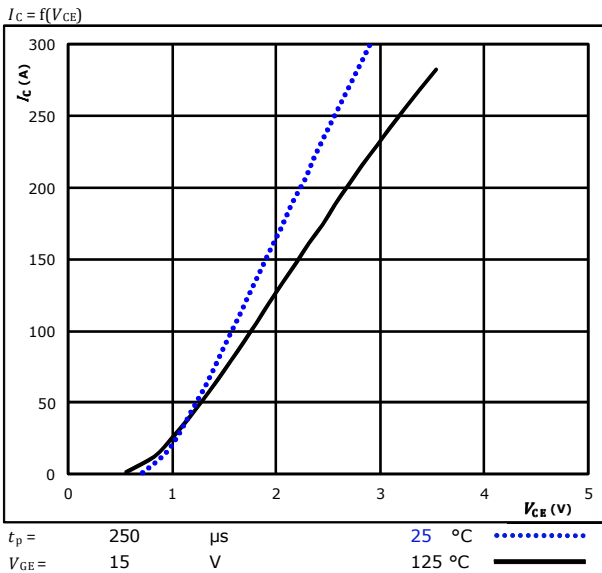


figure 2. IGBT
Typical output characteristics

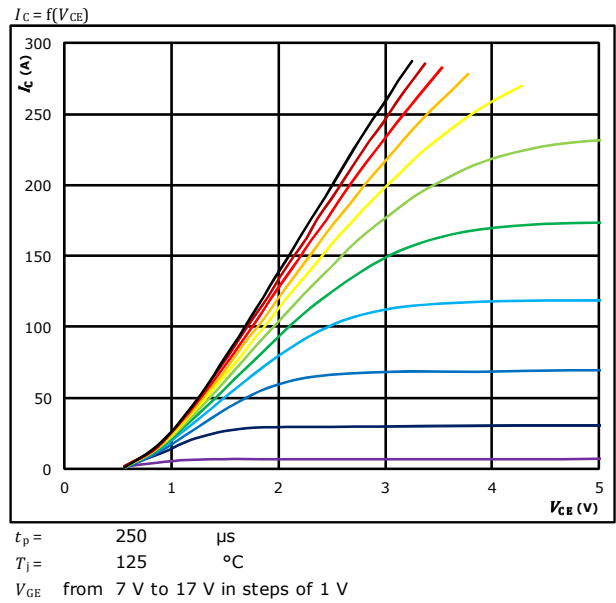


figure 4. IGBT
Typical transfer characteristics

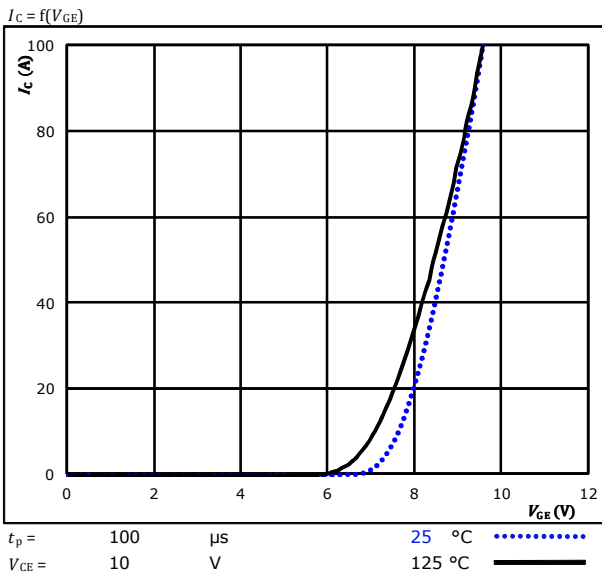
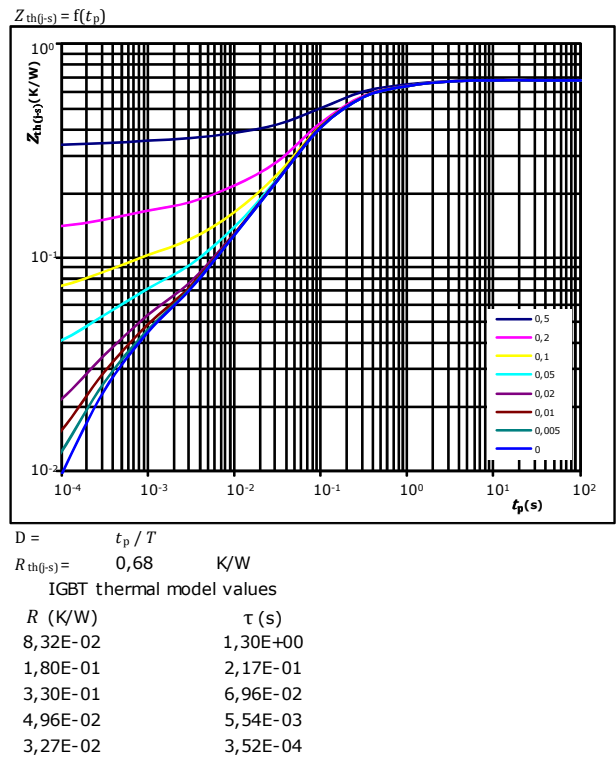


figure 5. IGBT
Transient Thermal Impedance as function of Pulse duration





Vincotech

H-Bridge Diode Characteristics

figure 1. Typical forward characteristics FWD

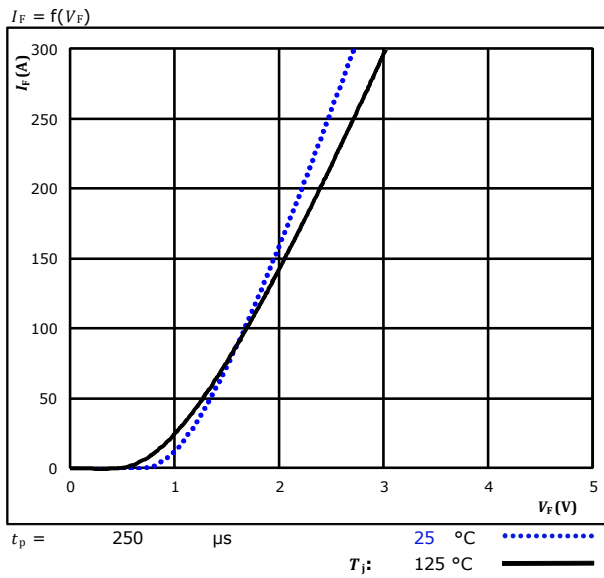
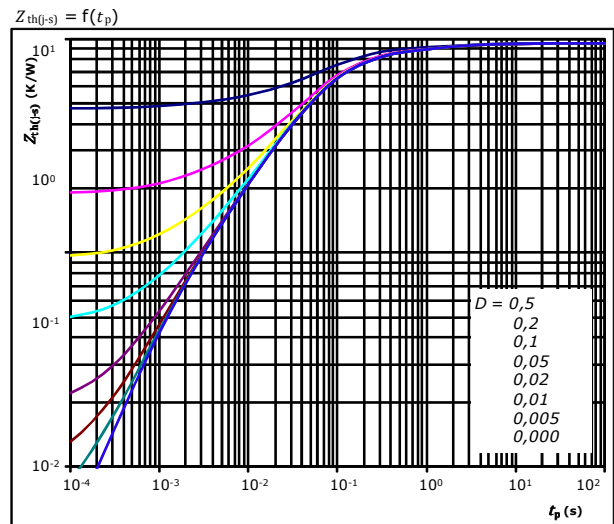


figure 2. Transient thermal impedance as a function of pulse width FWD



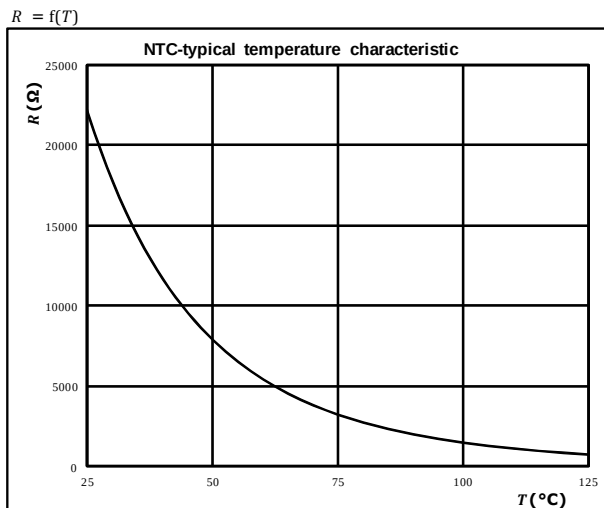
$D = t_p / T$
 $R_{th(j-s)} = 0,95 \text{ K/W}$

FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
3,6020E-02	4,8450E+00
1,0300E-01	7,9480E-01
2,8420E-01	1,2630E-01
3,8050E-01	4,5360E-02
1,0180E-01	9,1110E-03
4,0130E-02	1,4160E-03

Thermistor Characteristics

figure 1. Typical NTC characteristic as a function of temperature

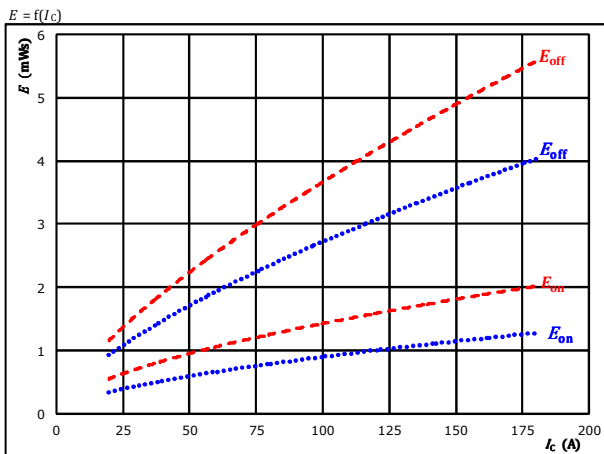




Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

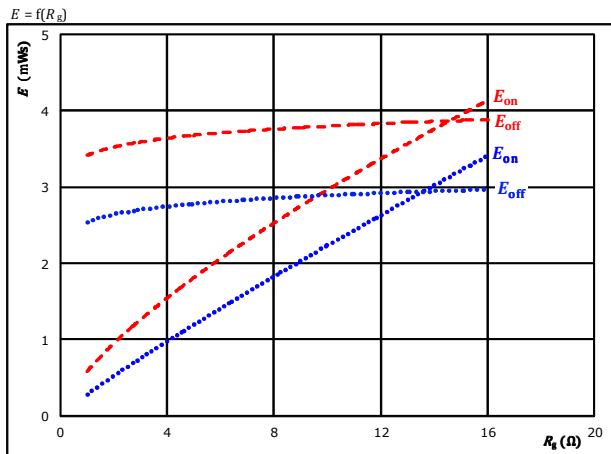


With an inductive load at

$V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω
 T_j : 25 °C (blue dotted), 150 °C (red dashed)

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

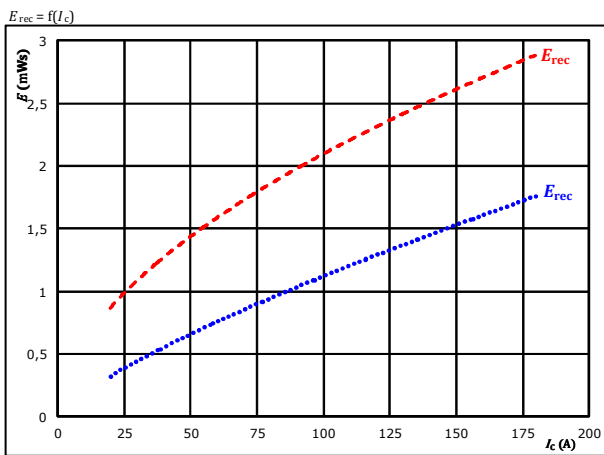


With an inductive load at

$V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $I_C = 100$ A
 T_j : 25 °C (blue dotted), 150 °C (red dashed)

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

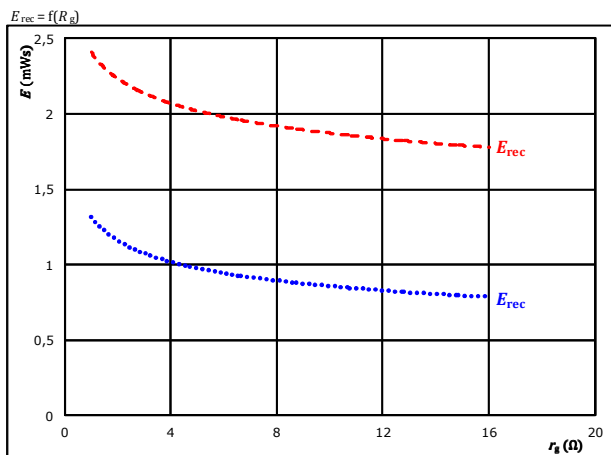


With an inductive load at

$V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 T_j : 25 °C (blue dotted), 150 °C (red dashed)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at

$V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $I_C = 100$ A
 T_j : 25 °C (blue dotted), 150 °C (red dashed)

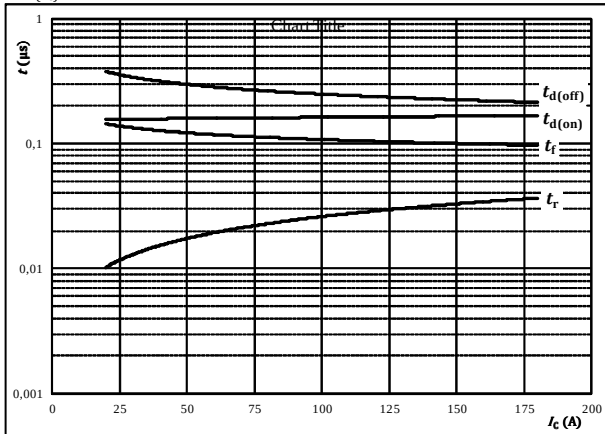


Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



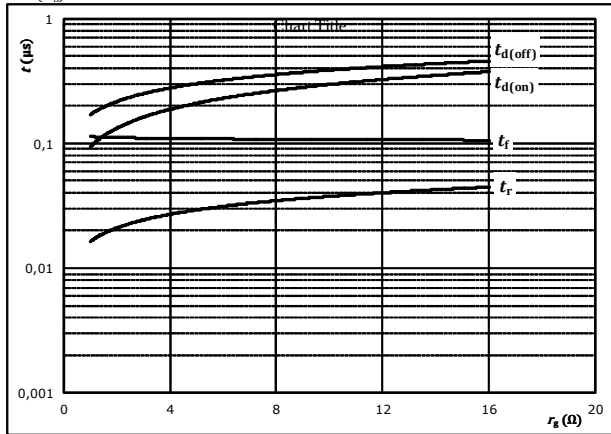
With an inductive load at

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

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



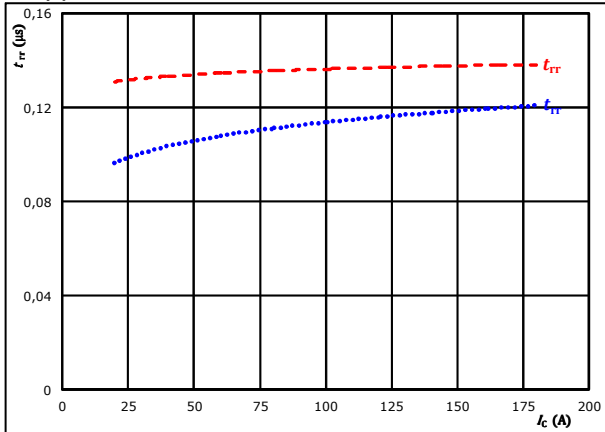
With an inductive load at

$T_j =$	150	$^{\circ}C$
$V_{CE} =$	300	V
$V_{GE} =$	± 15	V
$I_C =$	100	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

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

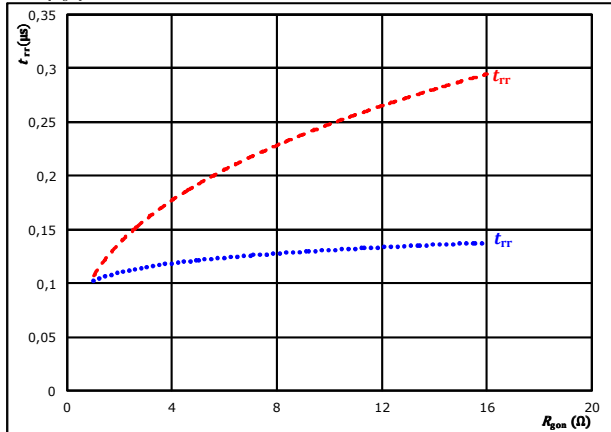


At	$V_{CE} =$	300	V	$T_j =$	25 $^{\circ}C$	
	$V_{GE} =$	± 15	V		150 $^{\circ}C$	-----
	$R_{gon} =$	4	Ω			

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 $^{\circ}C$	-----
	$I_C =$	100	A			

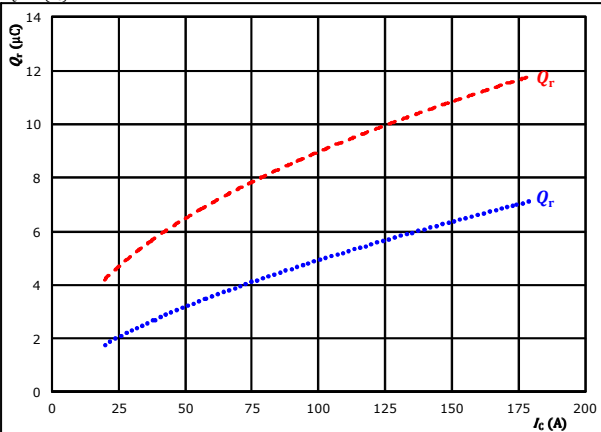


Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

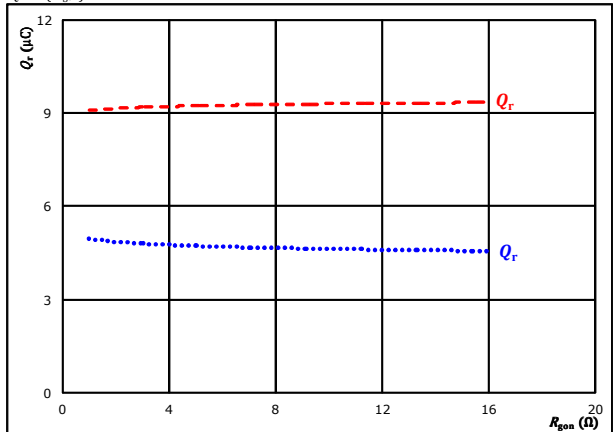


At $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)

figure 10. FWD

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

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

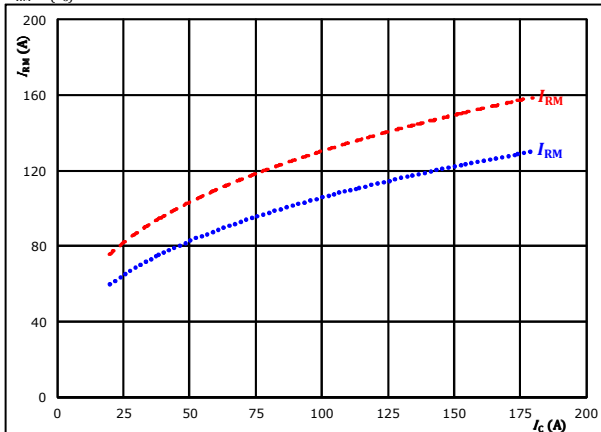


At $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $I_C = 100$ A
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

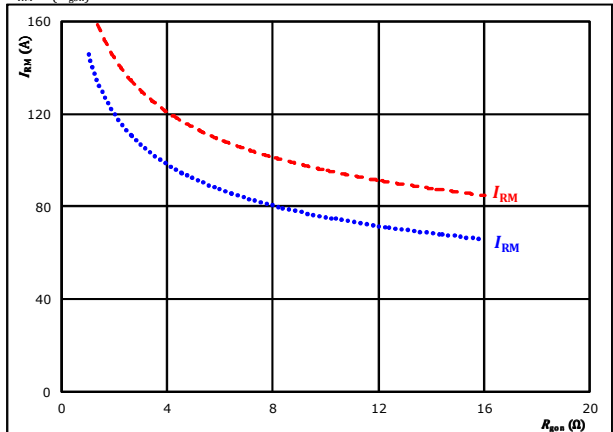


At $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)

figure 12. FWD

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

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



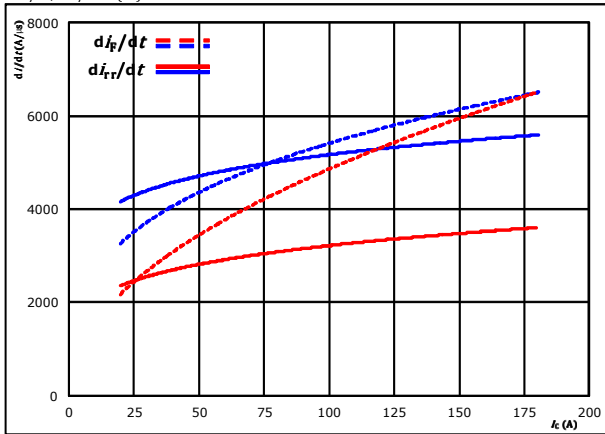
At $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $I_C = 100$ A
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)



Switching Characteristics

figure 13. FWD

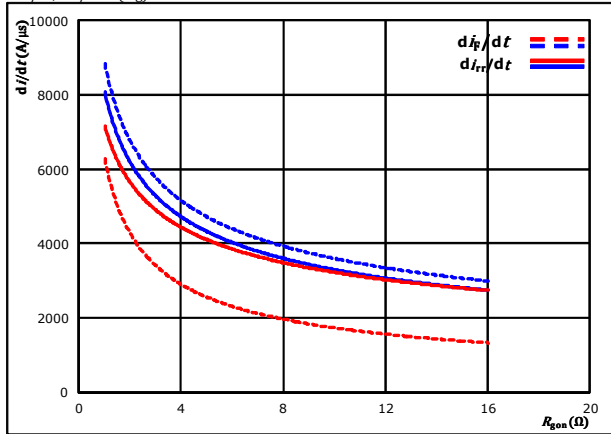
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $T_j = 25$ °C (blue dotted line)
 $T_j = 150$ °C (red dashed line)

figure 14. FWD

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

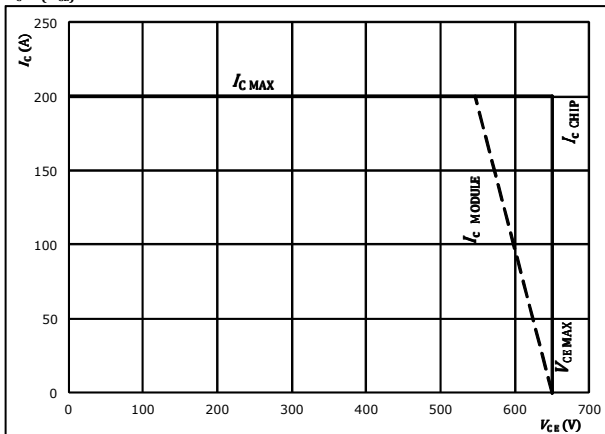


At $V_{CE} = 300$ V
 $V_{GE} = \pm 15$ V
 $I_c = 100$ A
 $T_j = 25$ °C (blue dotted line)
 $T_j = 150$ °C (red dashed line)

figure 15. IGBT

Reverse bias safe operating area

$I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω

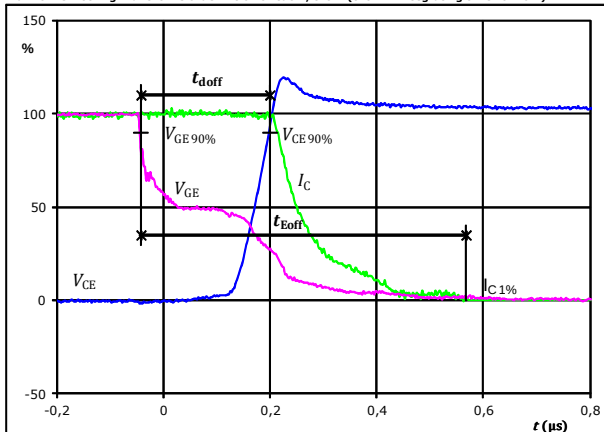


Switching Characteristics

General conditions

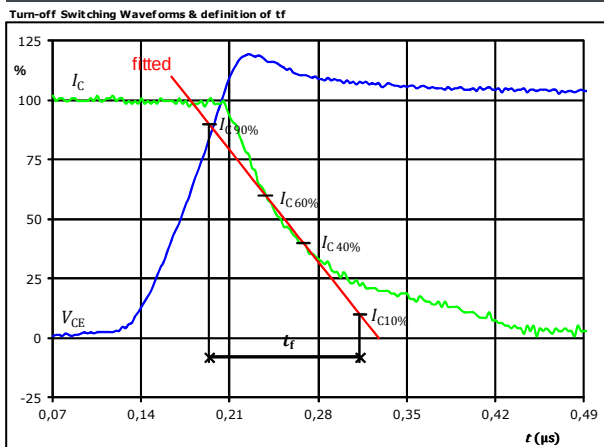
T_j	=	150 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

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



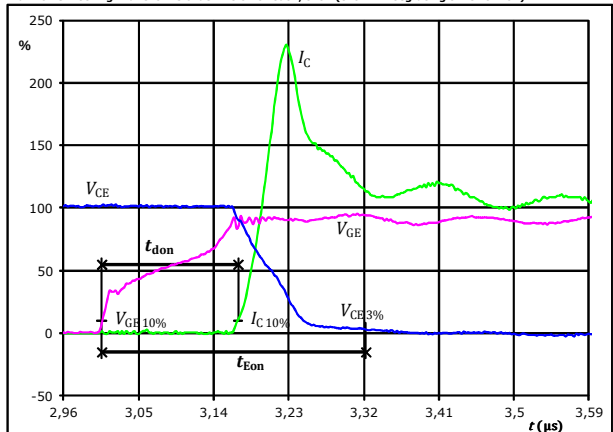
$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	300	V
$I_C(100\%)$	=	99	A
t_{doff}	=	0,242	μs
t_{Eoff}	=	0,610	μs

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



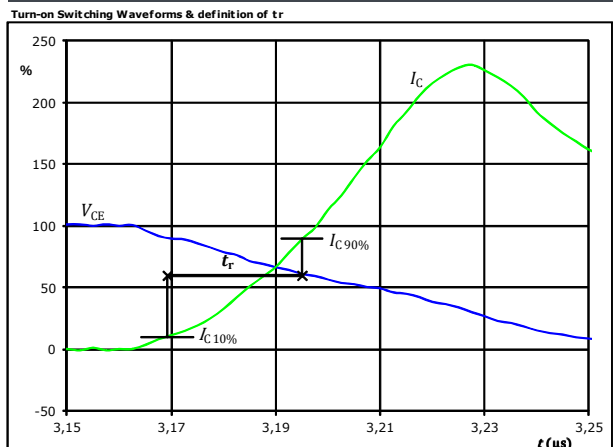
$V_C(100\%)$	=	300	V
$I_C(100\%)$	=	99	A
t_f	=	0,114	μs

figure 2. 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
$I_C(100\%)$	=	99	A
t_{don}	=	0,161	μs
t_{Eon}	=	0,317	μs

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



$V_C(100\%)$	=	300	V
$I_C(100\%)$	=	99	A
t_r	=	0,027	μs



Vincotech

Switching Characteristics

figure 5. IGBT

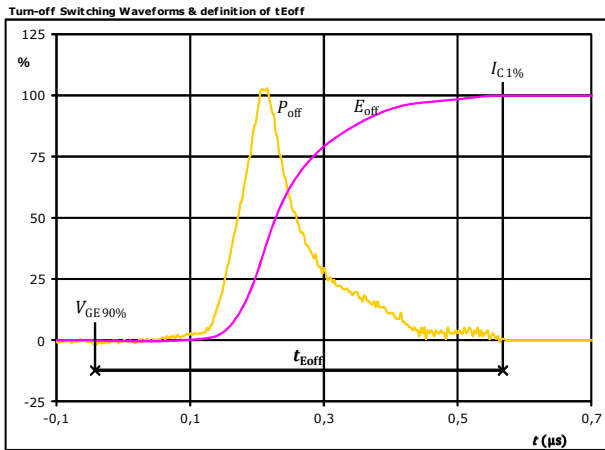


figure 6. IGBT

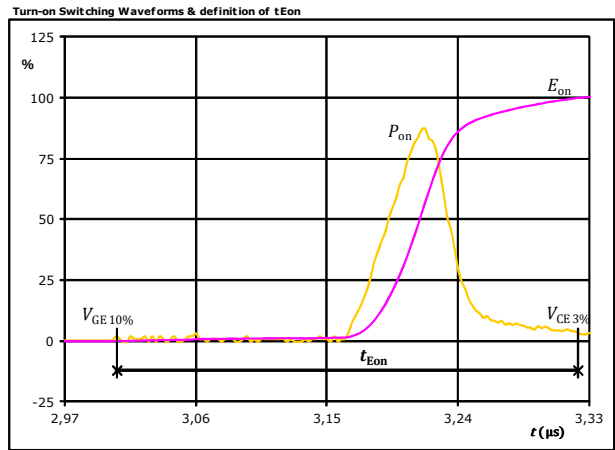
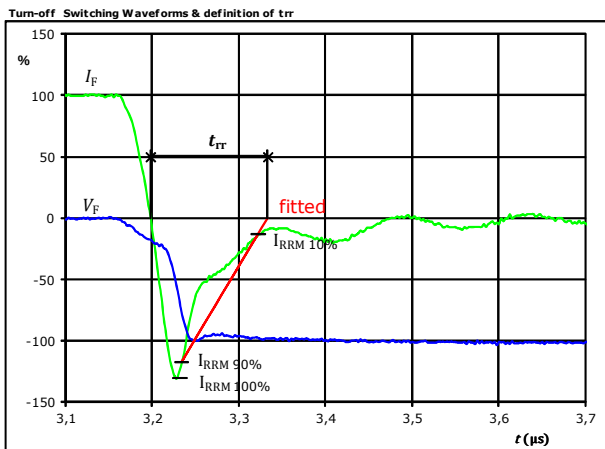


figure 7. FWD

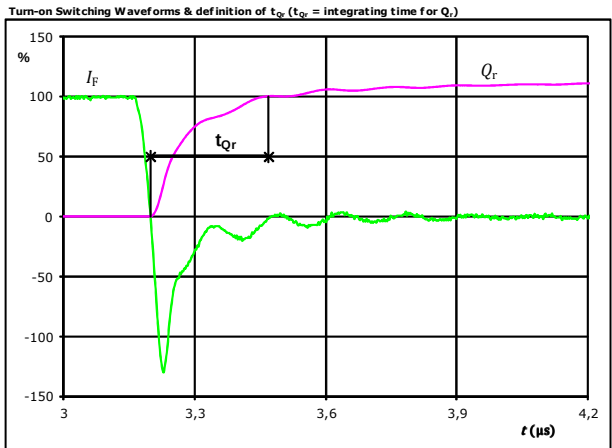




Vincotech

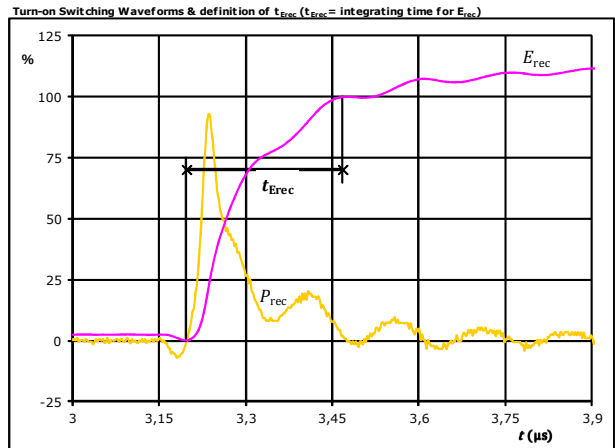
Switching Characteristics

figure 8. FWD



I_F (100%) = 99 A
 Q_r (100%) = 8,86 μC
 t_{Qr} = 0,27 μs

figure 9. FWD



P_{rec} (100%) = 29,81 kW
 E_{rec} (100%) = 2,07 mJ
 t_{Erec} = 0,27 μs



V23990-P625-F24-PM

datasheet

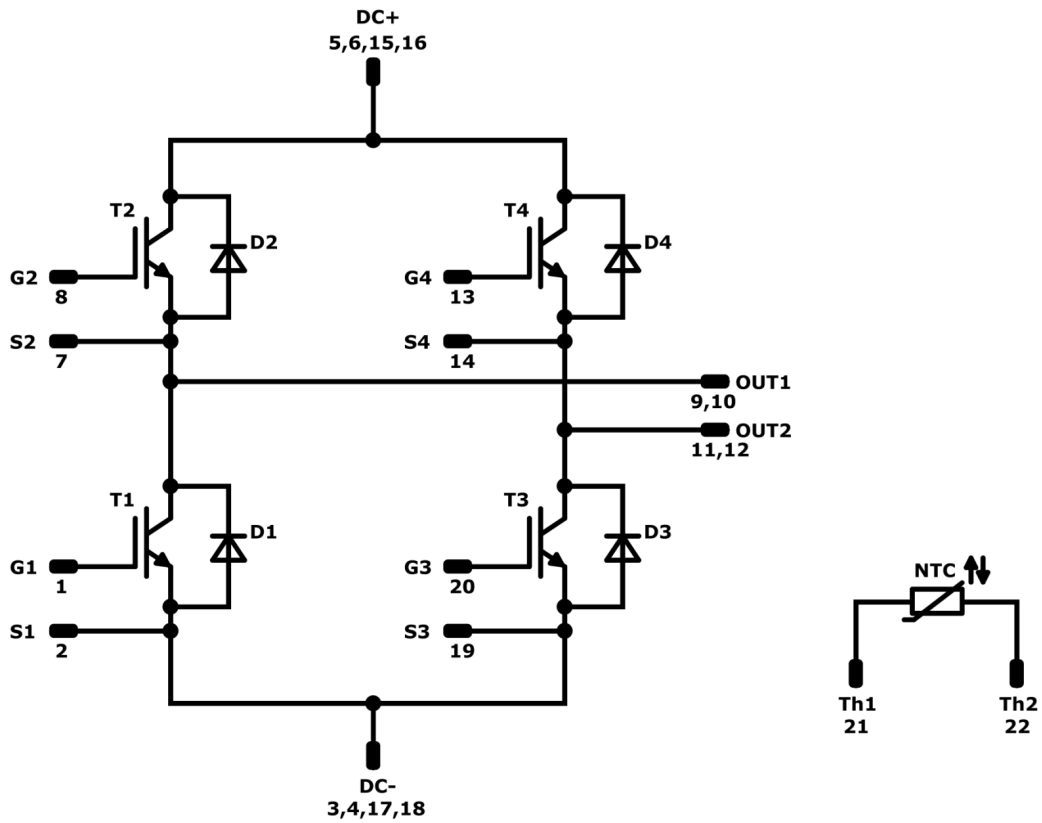
Vincotech

Ordering Code & Marking							
Version				Ordering Code			
without thermal paste 17 mm housing with solder pins				V23990-P625-F24-PM			



Vincotech

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1-T4	IGBT	600 V	100 A	H-Bridge Switch	
D1-D4	FWD	600 V	100 A	H-Bridge Diode	
NTC	Thermistor			Thermistor	



Vincotech

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

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

Package data
Package data for <i>flow 0</i> 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
V23990-P625-F24-D1-14	21 Jul. 2016		

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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.