
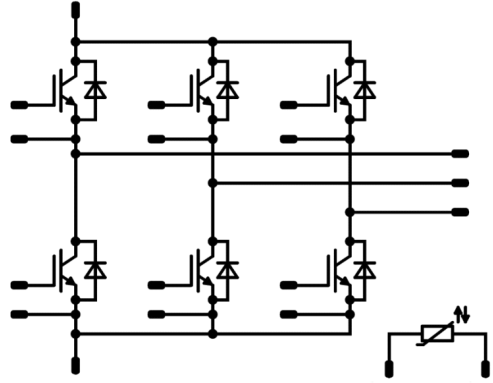




VINcoPACK E3	1200 V / 150 A
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> IGBT M7 technology with low $V_{CE(sat)}$ and improved EMC behavior New SoLid Cover Technology for higher reliability Industry standard housing Press-fit pin and pre-applied phase-change Thermal Interface Material available 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">VINco E3</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Industrial 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"> A0-VS126PA150M7-L998F70 A0-VP126PA150M7-L998F70T 	

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	148	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	272	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C



Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Inverter Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	131	A
Repetitive peak forward current	I_{FRM}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	204	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
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			9	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



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	$V_{GE} = V_{CE}$	V_{GS} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$				0,015	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,55 1,75 1,80	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			160	μA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							3		Ω
Input capacitance	C_{ies}							30000		pF
Output capacitance	C_{oes}		0	10		25		880		
Reverse transfer capacitance	C_{res}							320		
Gate charge	Q_g		15	600	150	25		1000		nC

Thermal

Parameter	Symbol	Material	λ [W/mK]	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material	$\lambda = 3,4$ W/mK	K/W

Dynamic

Parameter	Symbol	$R_{goff} = 1 \Omega$ $R_{gon} = 1 \Omega$	± 15	600	150	25 125 150	269 290 292	60 73 77	231 267 273	73 90 96	16,785 22,035 23,734	9,701 12,816 13,803	ns	mWs
Turn-on delay time	$t_{d(on)}$												ns	mWs
Rise time	t_r													
Turn-off delay time	$t_{d(off)}$													
Fall time	t_f													
Turn-on energy (per pulse)	E_{on}	$Q_{t-FWD} = 15,5 \mu C$ $Q_{t-FWD} = 23,4 \mu C$ $Q_{t-FWD} = 26,1 \mu C$												
Turn-off energy (per pulse)	E_{off}													



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_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			150	25 125 150		1,60 1,65 1,65	2,1	V
Reverse leakage current	I_r		1200		25			90	μA

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK	0,46	K/W

Dynamic

Parameter	Symbol	Conditions	Value	Unit
Peak recovery current	I_{RRM}		25 125 150	78 83 85
Reverse recovery time	t_{rr}		25 125 150	385 531 590
Recovered charge	Q_r	$di/dt = 1603$ A/μs $di/dt = 1435$ A/μs $di/dt = 1541$ A/μs	±15 600 150	25 125 150
Reverse recovered energy	E_{rec}		25 125 150	15,528 23,396 26,076
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$		25 125 150	5,492 8,659 9,652
				490 293 264

Thermistor

Parameter	Symbol	Conditions	Value	Unit
Rated resistance	R		25	5
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 493 \Omega$	100	-5
Power dissipation	P		25	245
Power dissipation constant			25	1,4
B-value	$B_{(25/50)}$	Tol. ±2 %	25	3375
B-value	$B_{(25/100)}$	Tol. ±2 %	25	3437
Vincotech NTC Reference				K

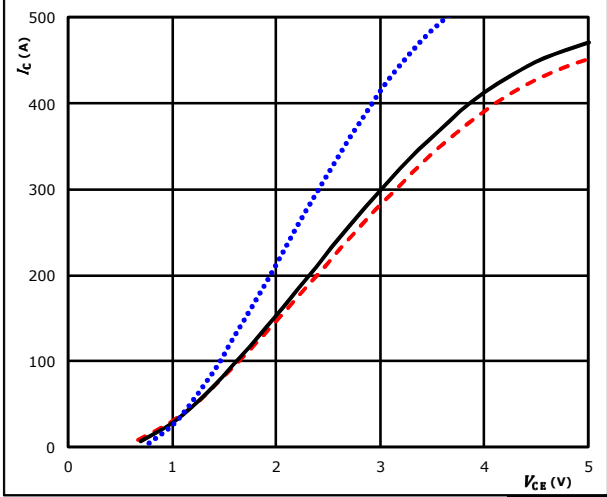


Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

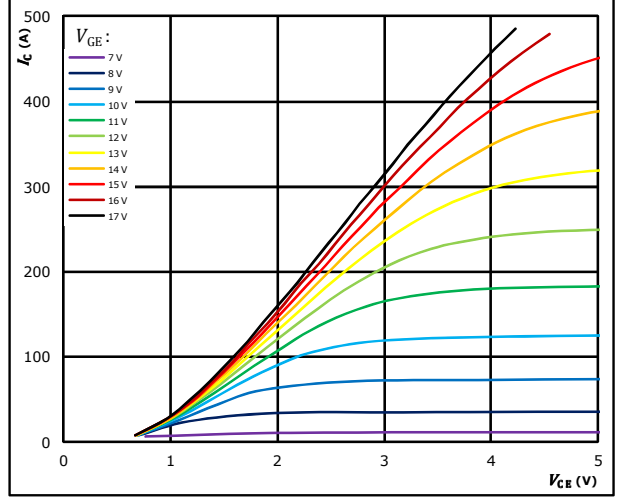


$t_p = 250 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - -

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

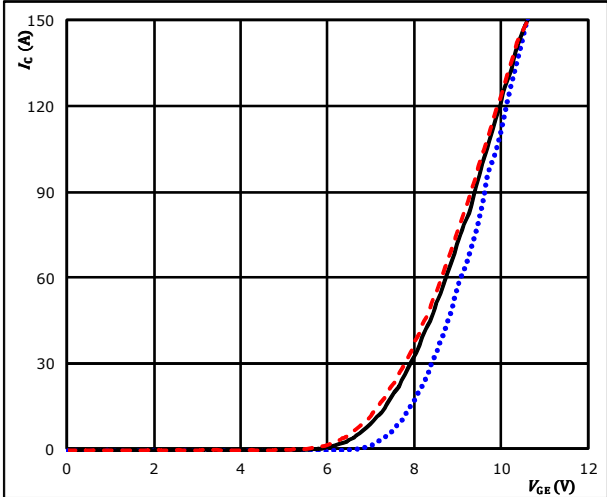


$t_p = 250 \mu s$
 $T_j = 150 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

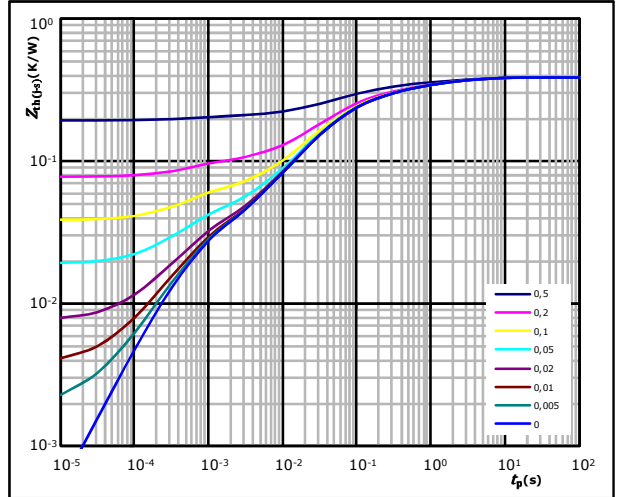


$t_p = 100 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - -

figure 4. IGBT

Transient thermal impedance as function of pulse duration

$Z_{th(j-s)} = f(t_p)$



$D = t_p / T$
 $R_{th(j-s)} = 0,35 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
4,47E-02	2,80E+00
9,73E-02	5,59E-01
2,47E-01	1,59E-01
3,88E-02	2,12E-02
1,13E-02	5,12E-03
1,42E-02	6,59E-04

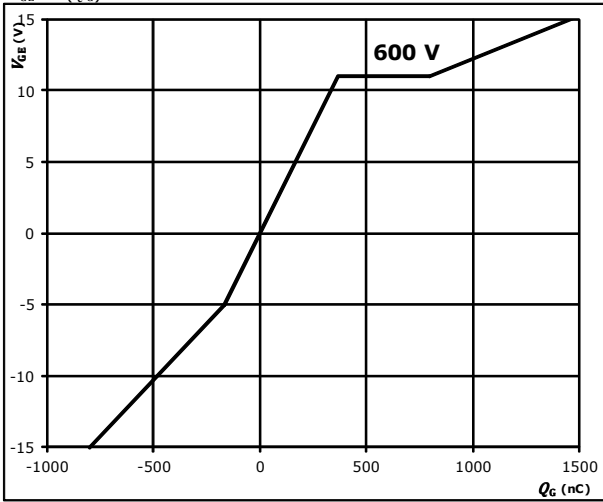


Inverter Switch Characteristics

figure 5. IGBT

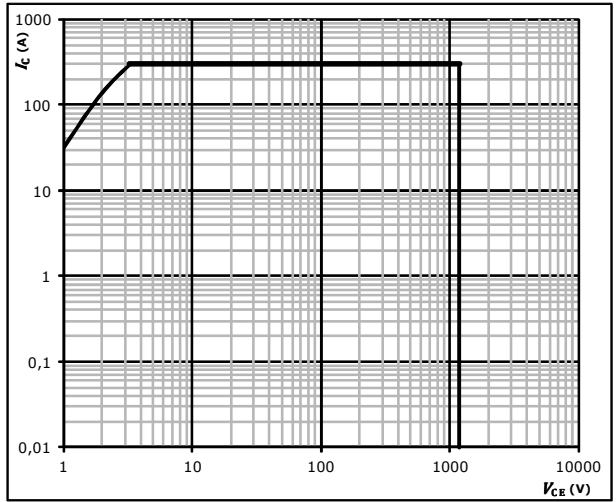
Gate voltage vs gate charge

$V_{GE} = f(Q_G)$



$I_C = 150$ A
 $V_{GE} = \pm 15$ V
 $V_{CC} = 600$ V

figure 6. IGBT

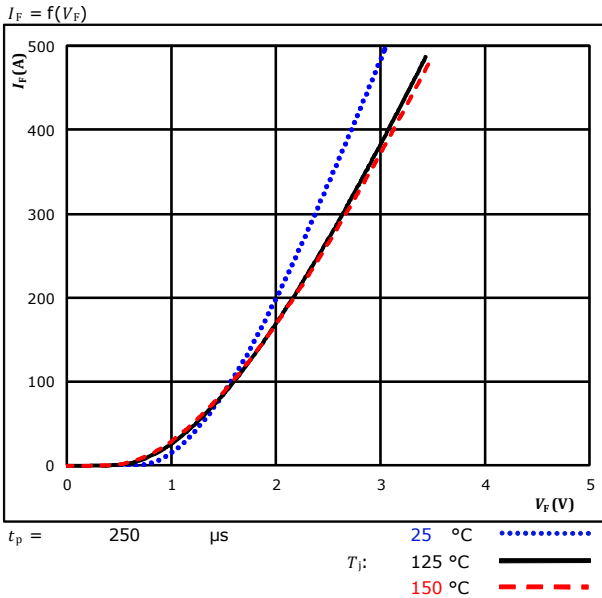


$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$

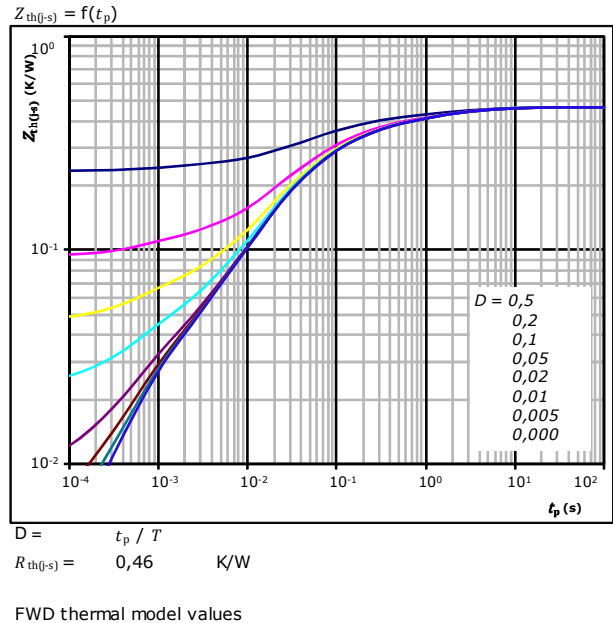


Inverter Diode Characteristics

Typical forward characteristics **FWD**



Transient thermal impedance as a function of pulse width **FWD**

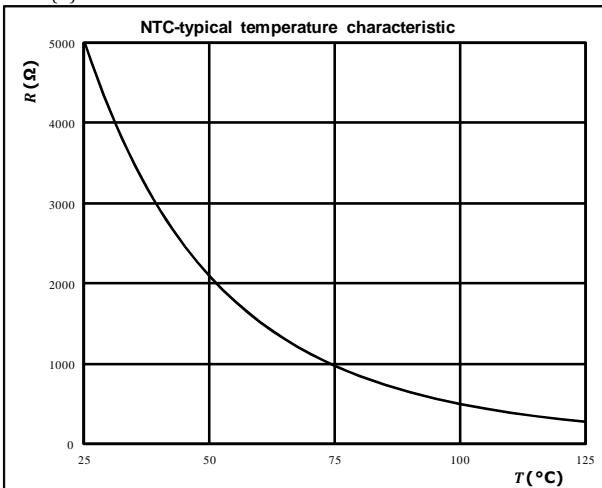


Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

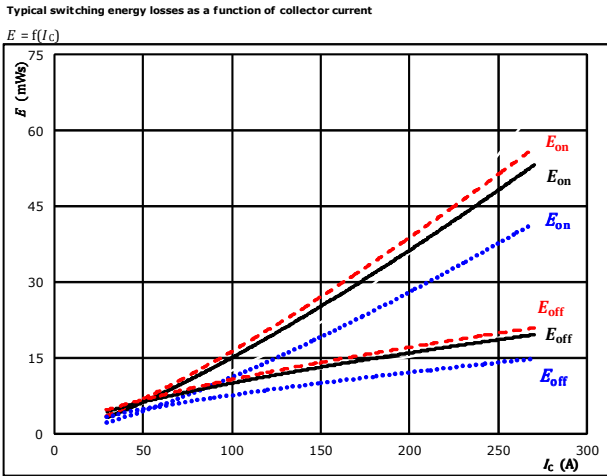
$R = f(T)$





Inverter Switching Characteristics

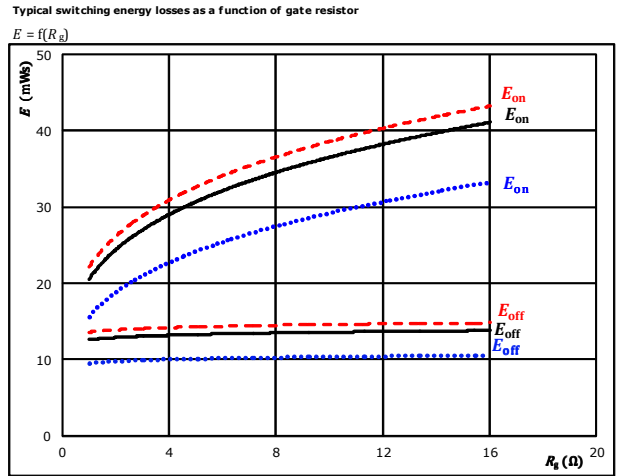
figure 1. IGBT



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$R_{g\text{on}} = 1$ Ω	150 °C	-----
$R_{g\text{off}} = 1$ Ω		

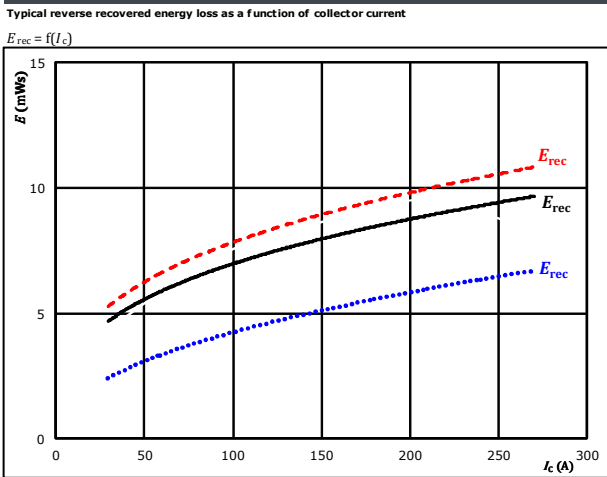
figure 2. IGBT



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 150$ A	150 °C	-----

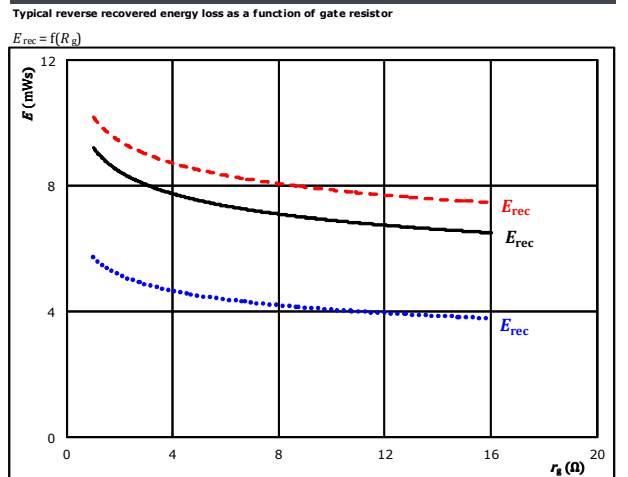
figure 3. FWD



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$R_{g\text{on}} = 1$ Ω	150 °C	-----

figure 4. FWD



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 150$ A	150 °C	-----

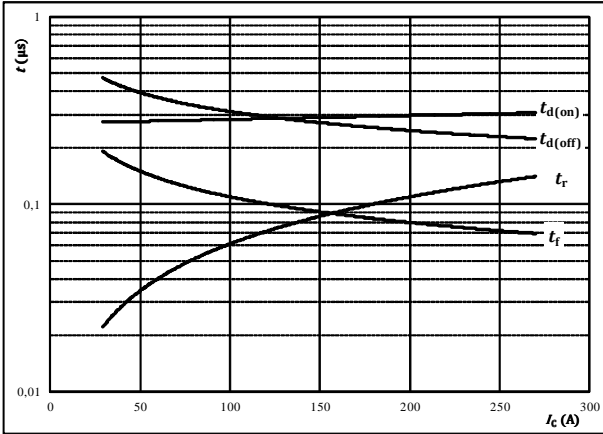


Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



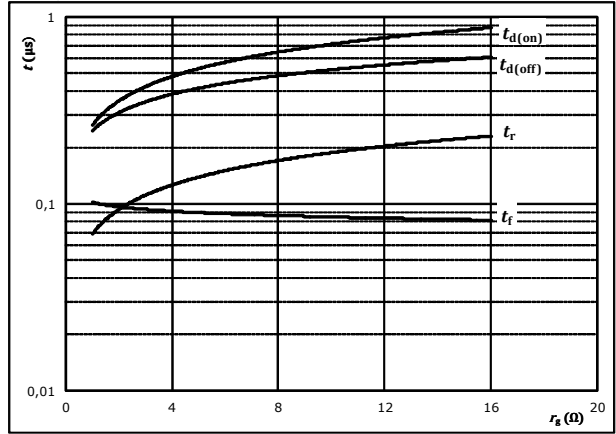
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	1	Ω
$R_{goff} =$	1	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



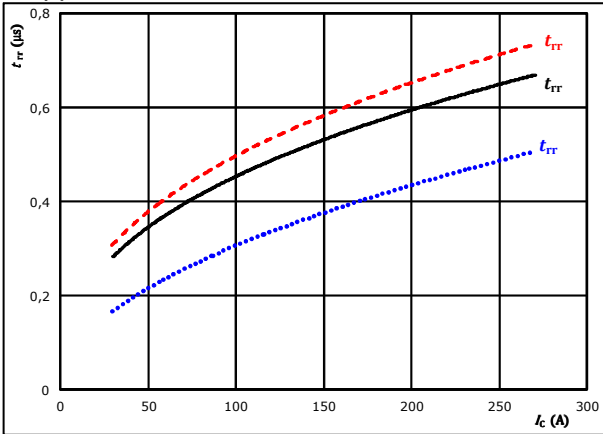
With an inductive load at

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

figure 7. FWD

Typical reverse recovery time as a function of collector current

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

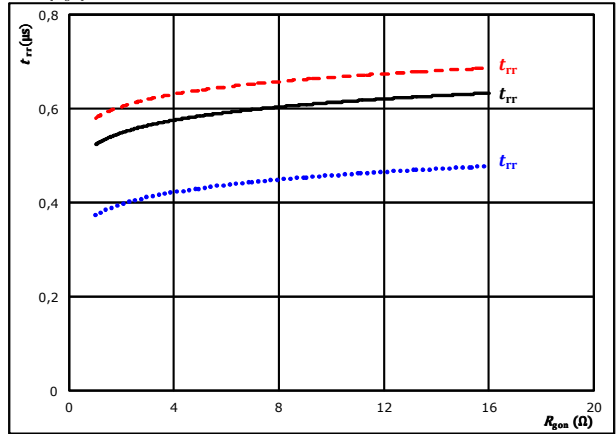


At	$V_{CE} =$	600	V	$T_j =$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	1	Ω		150 °C	-----

figure 8. FWD

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

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



At	$V_{CE} =$	600	V	$T_j =$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$I_c =$	150	A		150 °C	-----

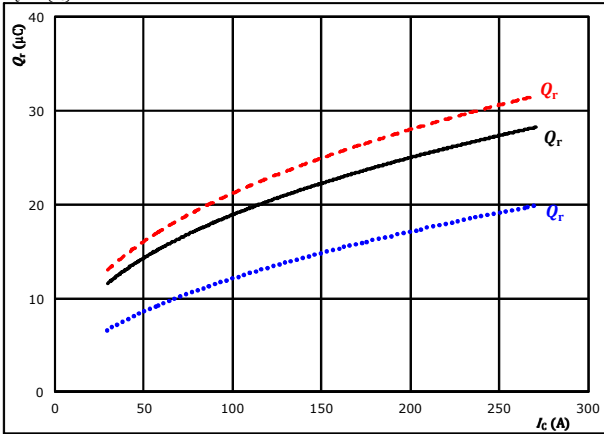


Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

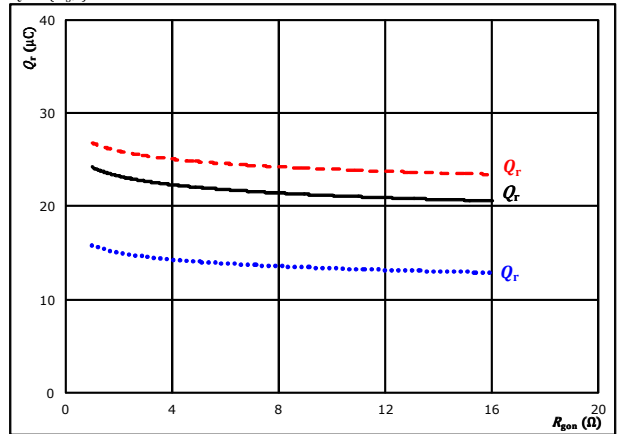


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gpn} = 1$ Ω $T_j = 150$ °C - - - -

figure 10. FWD

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

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

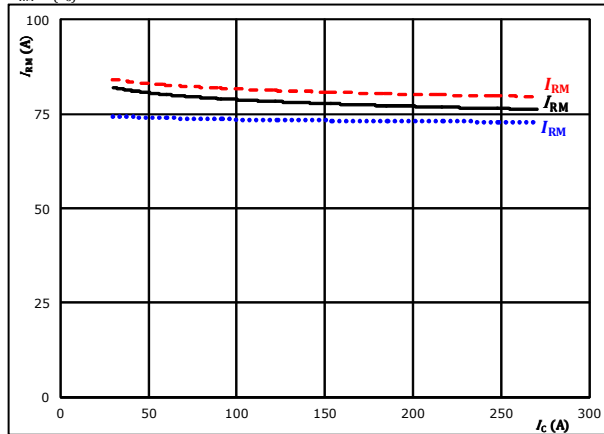


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 150$ A $T_j = 150$ °C - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

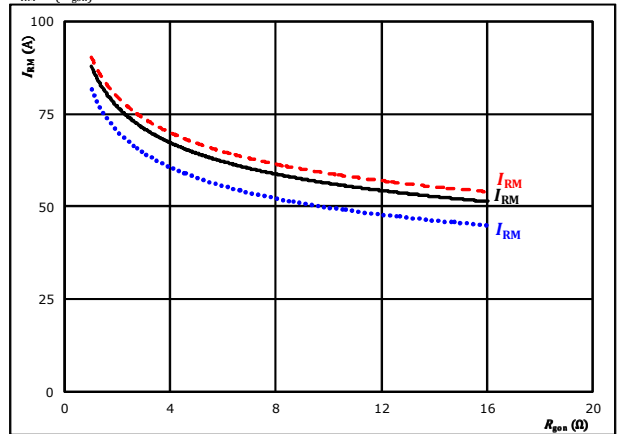


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gpn} = 1$ Ω $T_j = 150$ °C - - - -

figure 12. FWD

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

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



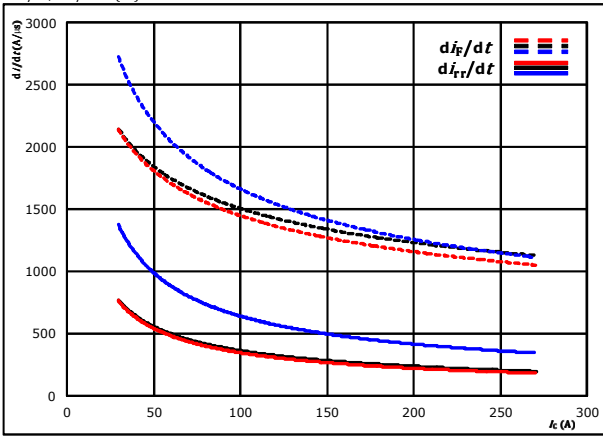
At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 150$ A $T_j = 150$ °C - - - -



Inverter Switching Characteristics

figure 13. FWD

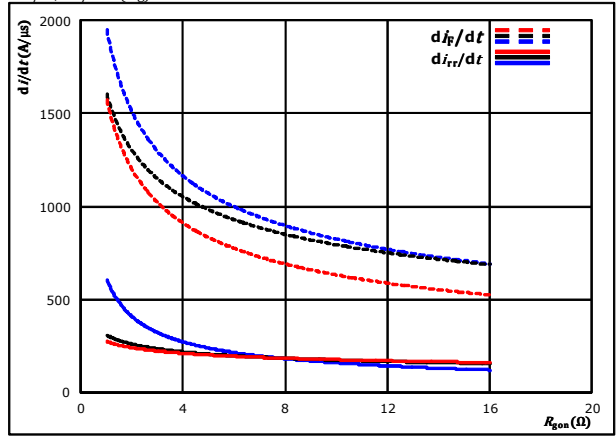
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gon} = 1$ Ω $T_j = 150$ °C - - - - -

figure 14. FWD

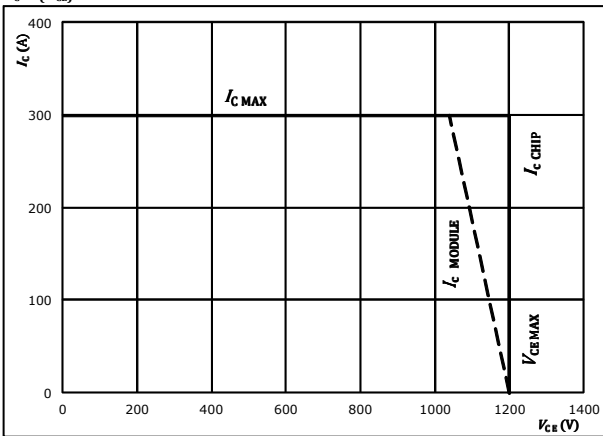
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_g)$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 150$ A $T_j = 150$ °C - - - - -

figure 15. IGBT

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



At $T_j = 175$ °C
 $R_{gon} = 1$ Ω
 $R_{goff} = 1$ Ω



Vincotech

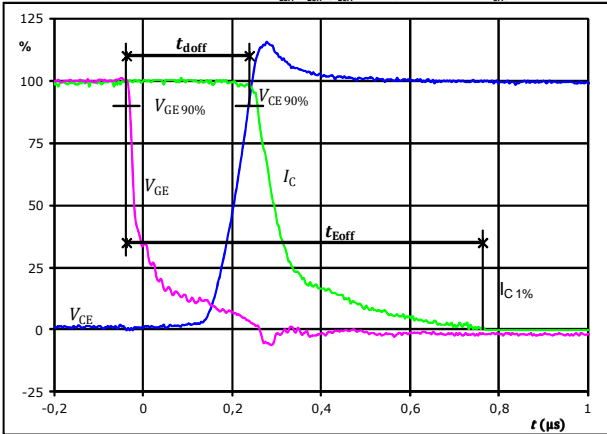
Inverter Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	1 Ω
R_{goff}	=	1 Ω

figure 1. IGBT

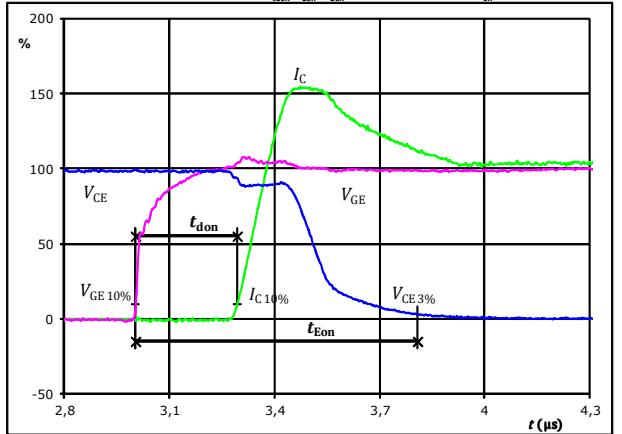
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	150	A
t_{doff}	=	0,267	μs
t_{Eoff}	=	0,801	μs

figure 2. IGBT

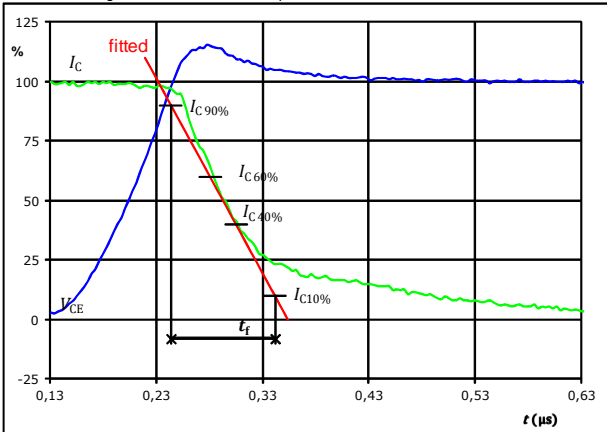
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	150	A
t_{don}	=	0,290	μs
t_{Eon}	=	0,805	μs

figure 3. IGBT

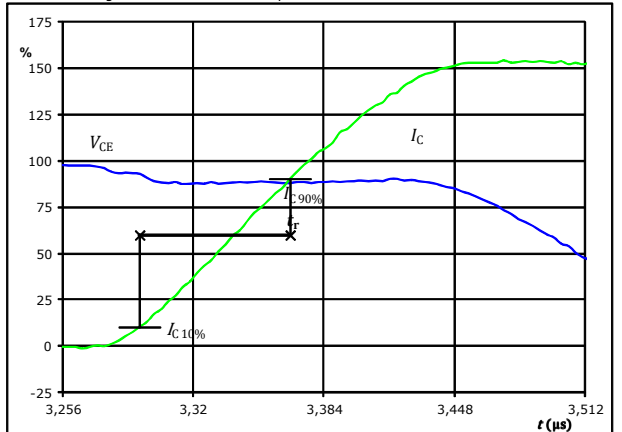
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	150	A
t_f	=	0,090	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



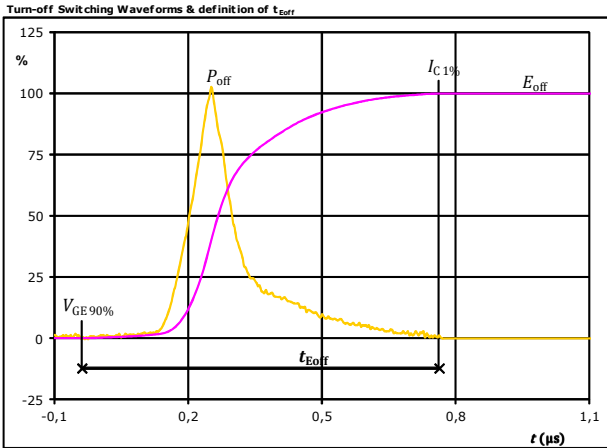
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	150	A
t_r	=	0,073	μs



Vincotech

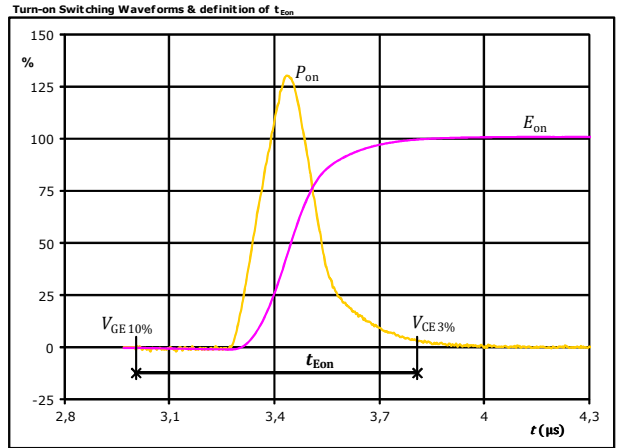
Inverter Switching Characteristics

figure 5. IGBT



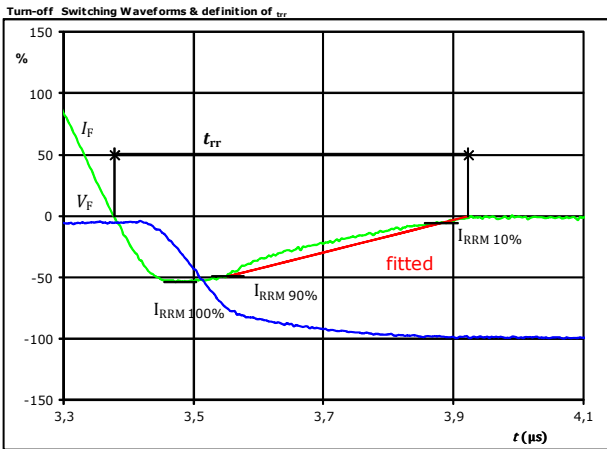
$P_{off}(100\%) = 90,17$ kW
 $E_{off}(100\%) = 12,82$ mJ
 $t_{Eoff} = 0,80$ µs

figure 6. IGBT



$P_{on}(100\%) = 90,17$ kW
 $E_{on}(100\%) = 22,03$ mJ
 $t_{Eon} = 0,80$ µs

figure 7. FWD

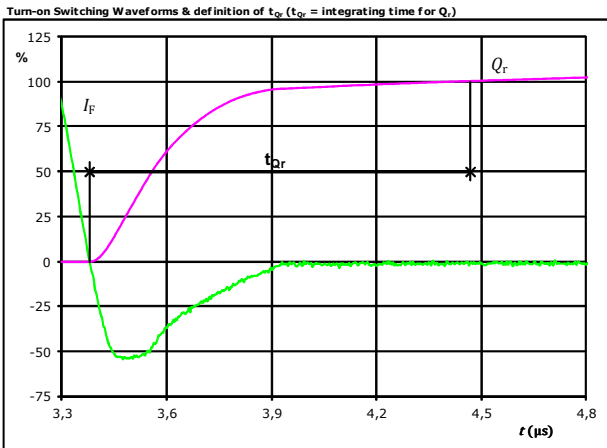


$V_F(100\%) = 600$ V
 $I_F(100\%) = 150$ A
 $I_{RRM}(100\%) = -83$ A
 $t_{rr} = 0,531$ µs



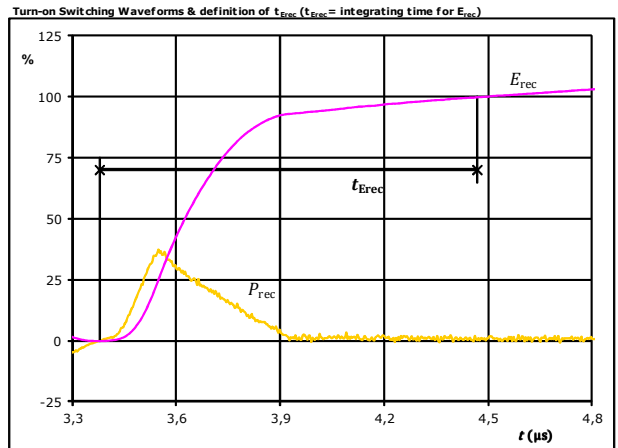
Inverter Switching Characteristics

figure 8. FWD



I_F (100%) =	150	A
Q_r (100%) =	23,40	μC
t_{Qr} =	1,09	μs

figure 9. FWD



P_{rec} (100%) =	90,17	kW
E_{rec} (100%) =	8,66	mJ
t_{Erec} =	1,09	μs



A0-VS126PA150M7-L998F70
A0-VP126PA150M7-L998F70T
 datasheet

Vincotech

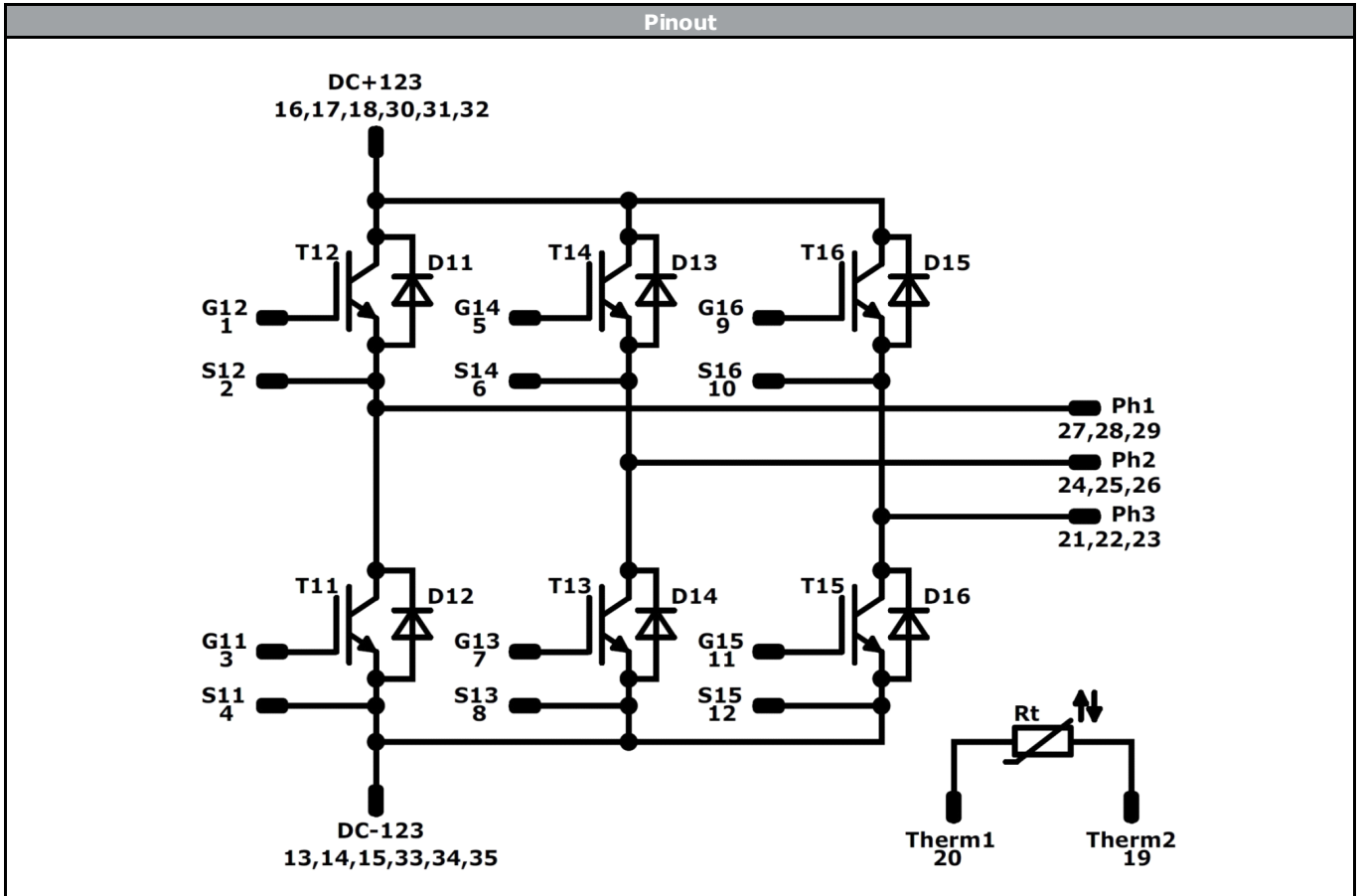
Ordering Code & Marking								
Version				Ordering Code				
without thermal paste				A0-VS126PA150M7-L998F70				
with thermal paste				A0-VS126PA150M7-L998F70-/3/				
without thermal paste and press-fit pins				A0-VP126PA150M7-L998F70T				
with thermal paste and press-fit pins				A0-VP126PA150M7-L998F70T-/3/				
NN-NNNNNNNNNNNN TTTTTVVWWYY UL VIN LLLL SSSS			Text	Name	Date code	UL & VIN	Lot	Serial
				NNNNNNNNNN-T	WWYY	UL VIN	LLLLL	SSSS
			Datamatrix	Type&Ver	Lot number	Serial	Date code	
				TTTTTTVV	LLLLL	SSSS	WWYY	

Pin table [mm]				Outline	
Pin	X	Y	Function		
1	19,05	0	G12		
2	22,86	0	S12		
3	34,29	0	G11		
4	38,1	0	S11		
5	49,53	0	G14		
6	53,34	0	S14		
7	64,77	0	G13		
8	68,58	0	S13		
9	80,01	0	G16		
10	83,82	0	S16		
11	95,25	0	G15		
12	99,06	0	S15		
13	118,11	15,865	DC-123		
14	118,11	19,675	DC-123		
15	118,11	23,485	DC-123		
16	118,11	34,915	DC+123		
17	118,11	38,725	DC+123		
18	118,11	42,535	DC+123		
19	100,97	58,4	Therm1		
20	97,155	58,4	Therm2		
21	81,915	58,4	Ph3		
22	78,105	58,4	Ph3		
23	74,295	58,4	Ph3		
24	59,055	58,4	Ph2		
25	55,245	58,4	Ph2		
26	51,435	58,4	Ph2		
27	36,195	58,4	Ph1		
28	32,385	58,4	Ph1		
29	28,575	58,4	Ph1		
30	0	42,535	DC+123		
31	0	38,725	DC+123		
32	0	34,915	DC+123		
33	0	23,485	DC-123		
34	0	19,675	DC-123		
35	0	15,865	DC-123		

The outline drawing shows a rectangular component with four mounting holes at the corners. Pin locations are numbered 1 through 35. The X-axis is horizontal and the Y-axis is vertical. A dimension of 59.055 mm is shown for the width of the central pin array, and 29.2 mm is shown for the height of the central pin array. Pin locations 1-12 are along the bottom edge, 13-35 along the right edge, and 30-35 along the left edge. Pin locations 19-29 are along the top edge. The drawing also shows the locations of thermistors (Therm1, Therm2) and phase pins (Ph1, Ph2, Ph3).



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11 , T12 , T13 , T14 , T15 , T16	IGBT	1200 V	150 A	Inverter Switch	
D11 , D12 , D13 , D14 , D15 , D16	FWD	1200 V	150 A	Inverter Diode	
Rt	Thermistor			Thermistor	




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Packaging instruction			
Standard packaging quantity (SPQ) 24	>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
A0-Vx126PA150M7-L998F70x-D1-14	10 May. 2017		

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