
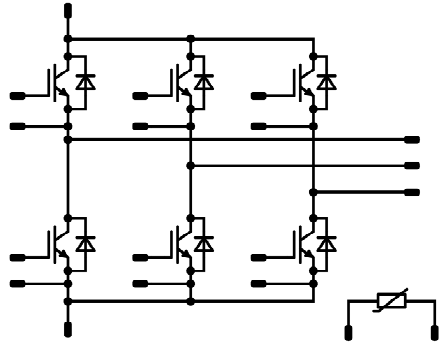




Vincotech

MiniSkiip® PACK 2	1200 V / 75 A
<div style="background-color: #eee; padding: 5px; margin-bottom: 10px;">Features</div> <ul style="list-style-type: none"> IGBT M7 technology with low V_{CESat} and improved EMC behavior Solder-free spring contact technology <div style="background-color: #eee; padding: 5px; margin-bottom: 10px;">Target applications</div> <ul style="list-style-type: none"> Industrial Drives <div style="background-color: #eee; padding: 5px;">Types</div> <ul style="list-style-type: none"> 80-M2126PA075M7-K719F70 	<div style="background-color: #eee; padding: 5px; margin-bottom: 10px;">MiniSkiip® 2 housing</div> <div style="text-align: center;">  </div> <div style="background-color: #eee; padding: 5px;">Schematic</div> <div style="text-align: center;">  </div>

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		75	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	196	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	83	A
Repetitive peak forward current	I_{FRM}		200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	149	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* $t_p = 2\text{ s}$	5500	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance		With std lid For more informations see handling	6,3	mm
Clearance		With std lid For more informations see handling	6,3	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



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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	$V_{GE(th)}$				0,0075	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 125 150		1,55 1,70 1,75	1,9	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			100	μA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							4		Ω
Input capacitance	C_{ies}							16000		pF
Output capacitance	C_{oes}		0	10		25		480		
Reverse transfer capacitance	C_{res}							190		
Gate charge	Q_g		15	600	75	25		570		nC

Thermal

Parameter	Symbol	$\lambda_{paste} = 2,5$ W/mK (HPTP)	V_{GS} [V]	V_{CE} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$							0,49		K/W

Dynamic

Parameter	Symbol	$R_{gon} = 2$ Ω $R_{goff} = 2$ Ω	V_{GS} [V]	V_{CE} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$					25 125 150		197 208 212		ns
Rise time	t_r					25 125 150		29 38 39		
Turn-off delay time	$t_{d(off)}$					25 125 150		203 233 242		
Fall time	t_f					25 125 150		86 113 111		
Turn-on energy (per pulse)*	E_{on}	$Q_{rFWD} = 8,5$ μC $Q_{rFWD} = 13,4$ μC $Q_{rFWD} = 15,3$ μC				25 125 150		5,559 7,819 8,496		mWs
Turn-off energy (per pulse)*	E_{off}					25 125 150		5,076 6,804 7,285		

* $L_s = 12$ nH



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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		

Inverter Diode

Static

Forward voltage	V_F				100	25 125 150		1,82 1,96 1,97	2,1	V
Reverse leakage current	I_R			1200		25			40	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,64		K/W
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Dynamic

Peak recovery current	I_{RRM}					25 125 150		75 77 78		A
Reverse recovery time	t_{rr}					25 125 150		278 432 459		ns
Recovered charge	Q_r	$di/dt = 2268 \text{ A/}\mu\text{s}$ $di/dt = 1969 \text{ A/}\mu\text{s}$ $di/dt = 1970 \text{ A/}\mu\text{s}$	± 15	600	75	25 125 150		8,539 13,394 15,308		μC
Reverse recovered energy	E_{rec}					25 125 150		3,195 5,193 5,995		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		802 614 544		A/μs

Thermistor

Rated resistance	R					25		1		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1670 \Omega$				100	-2		+2	%
R_{100}	R					100		1670		Ω
Power dissipation constant						25		0,76		mW/K
A-value	$A_{(25/50)}$					25		$7,635 \cdot 10^{-3}$		1/K
B-value	$B_{(25/100)}$					25		$1,731 \cdot 10^{-5}$		1/K ²
Vincotech PTC Reference									E	

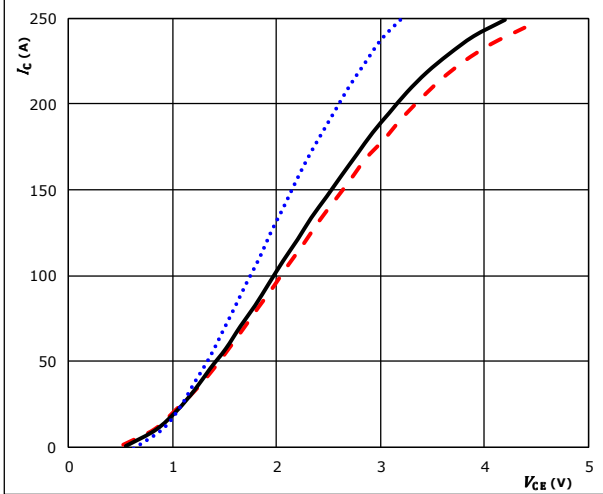


Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

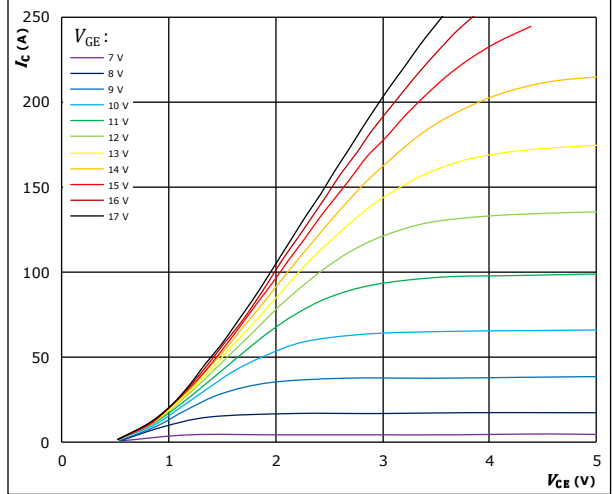


$t_p = 250 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - - -

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

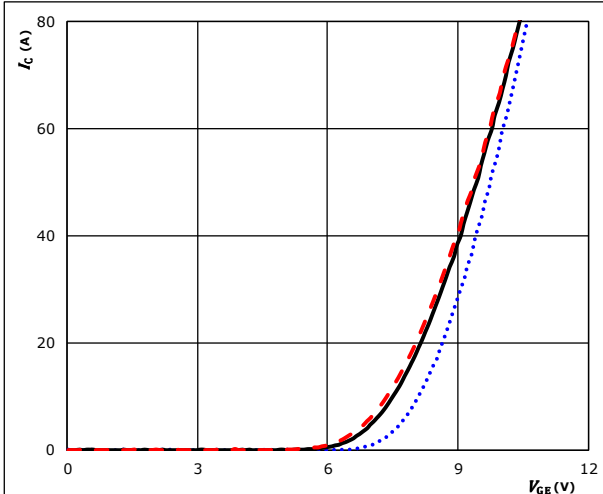


$t_p = 250 \mu s$
 $T_j = 150 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

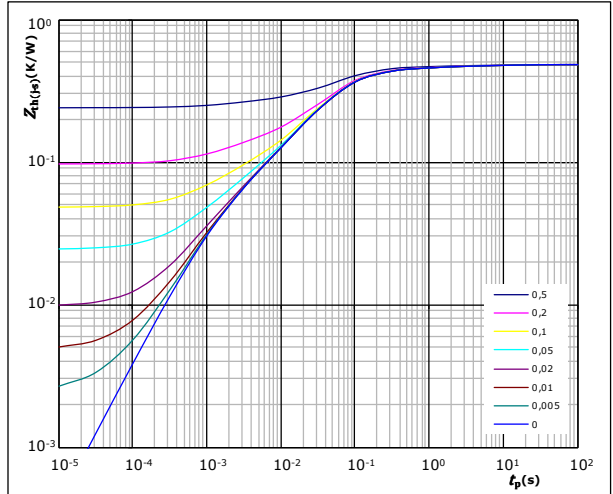


$t_p = 100 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - - -

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,49 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
1,81E-02	3,62E+00
3,38E-02	3,08E-01
8,98E-02	5,50E-02
2,60E-01	1,84E-02
4,85E-02	3,57E-03
3,25E-02	5,49E-04
2,24E-03	2,65E-04



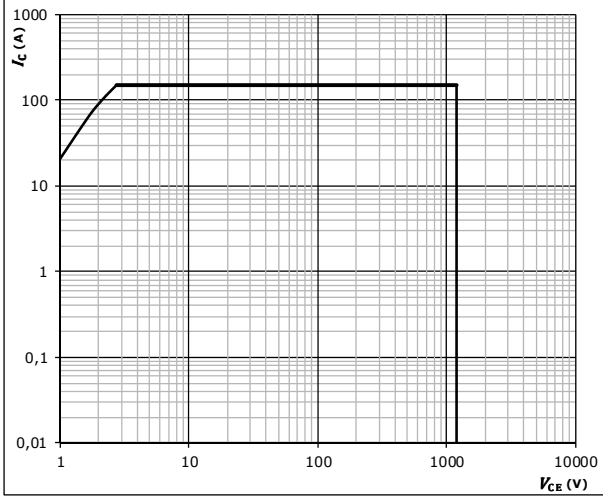
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Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



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

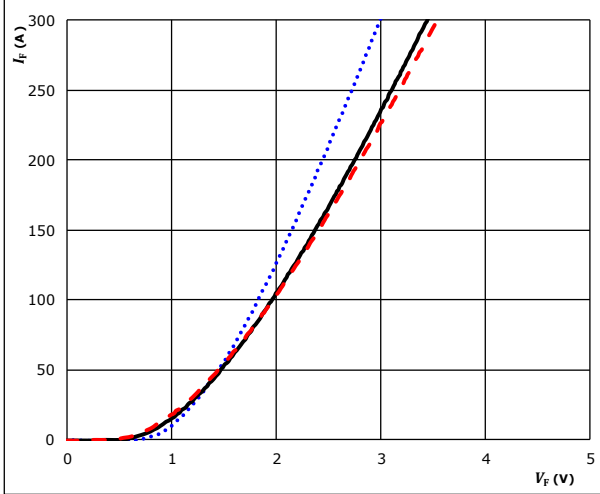


Inverter Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

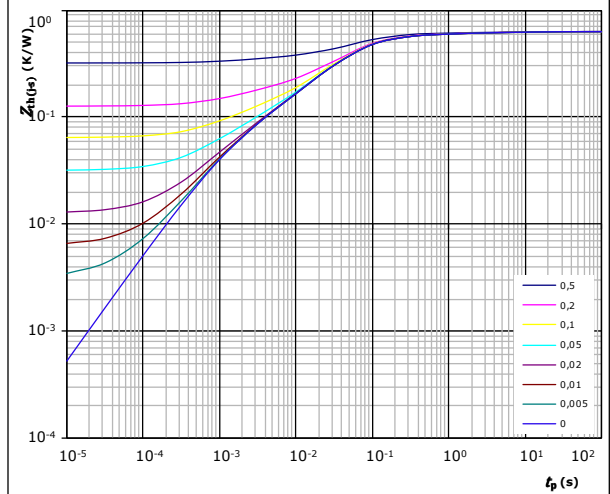


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,64 \text{ K/W}$

FWD thermal model values

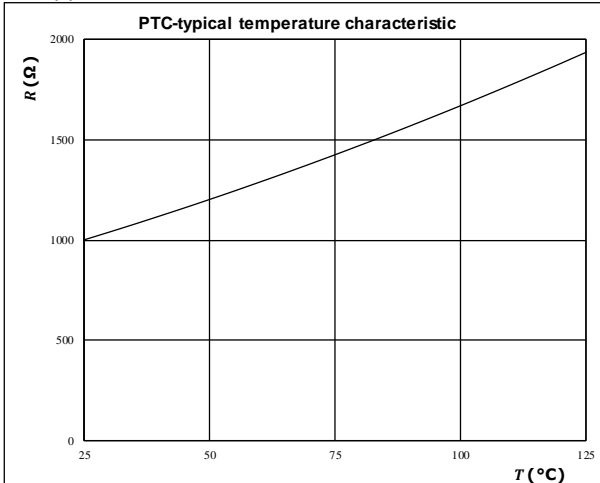
R (K/W)	τ (s)
2,37E-02	4,76E+00
4,45E-02	4,05E-01
1,18E-01	7,23E-02
3,42E-01	2,42E-02
6,37E-02	4,70E-03
4,28E-02	7,22E-04
2,95E-03	3,48E-04

Thermistor Characteristics

figure 1. Thermistor

Typical PTC characteristic as a function of temperature

$$R = f(T)$$



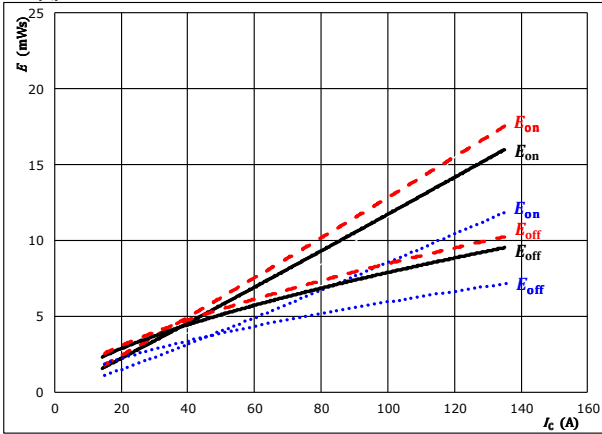


Inverter Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



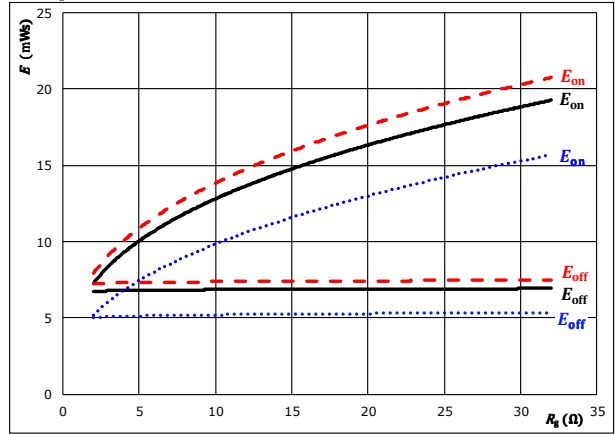
With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$R_{g(on)} = 2$ Ω	150 °C	-----
$R_{g(off)} = 2$ Ω		

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



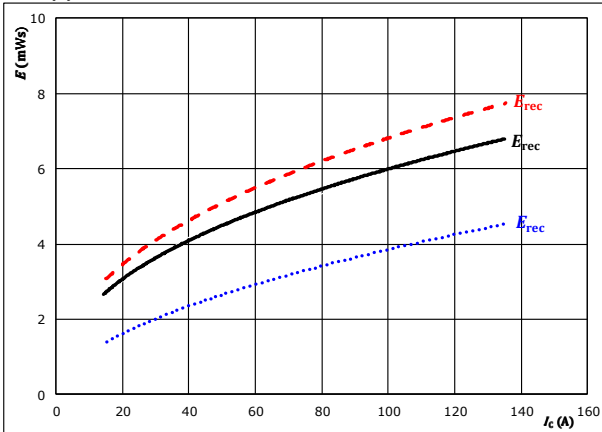
With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$I_c = 75$ A	150 °C	-----

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

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



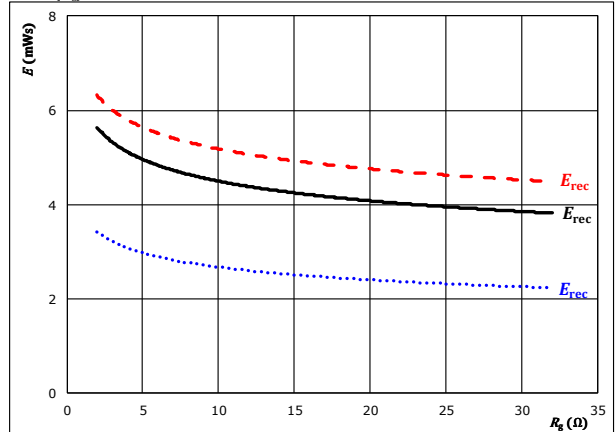
With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$R_{g(on)} = 2$ Ω	150 °C	-----

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 600$ V	$T_j: 25$ °C
$V_{GE} = \pm 15$ V	125 °C	————
$I_c = 75$ A	150 °C	-----

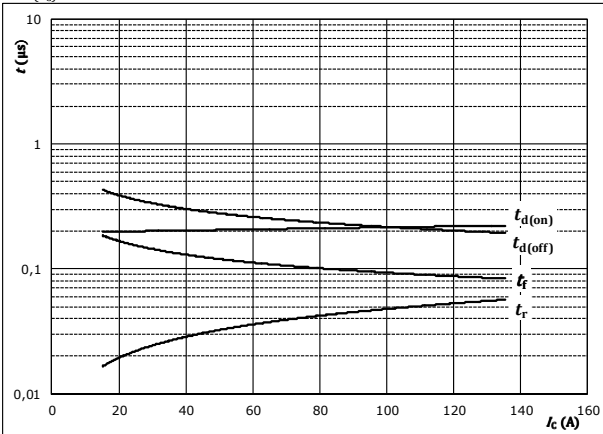


Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



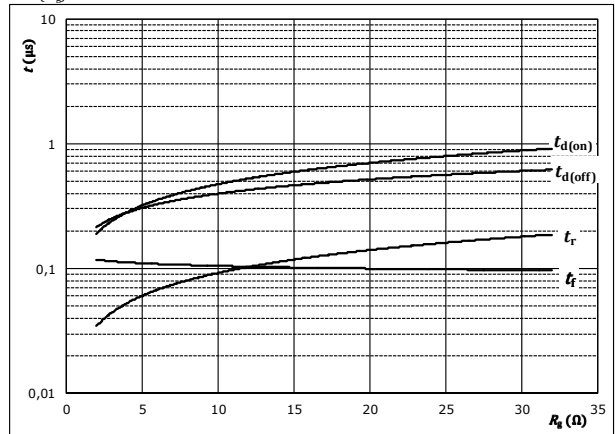
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gpn} =$	2	Ω
$R_{goff} =$	2	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



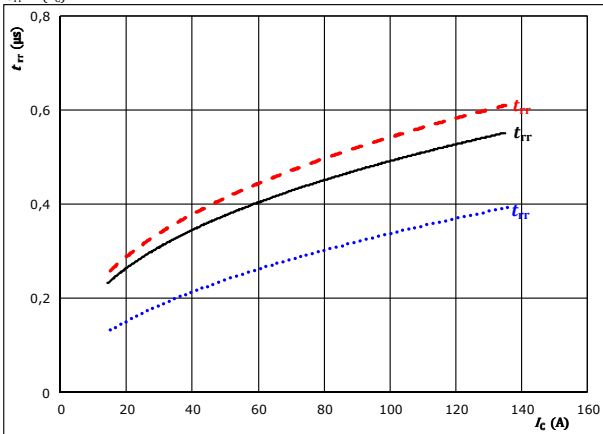
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	75	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

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

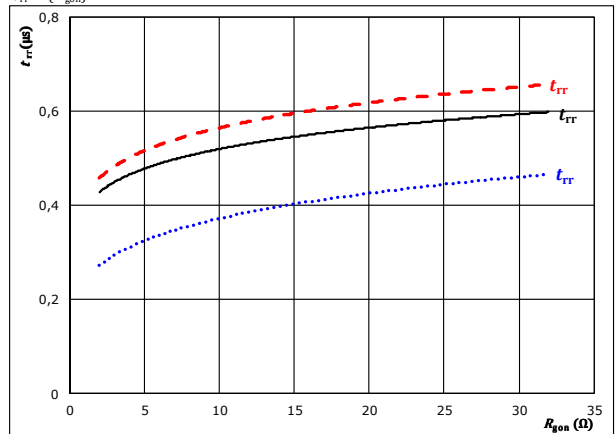


At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gpn} =$	2	Ω		150 °C	-----

figure 8. FWD

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

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



At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	75	A		150 °C	-----

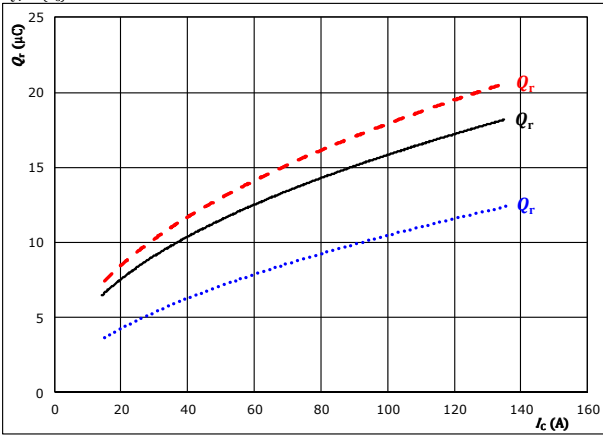


Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

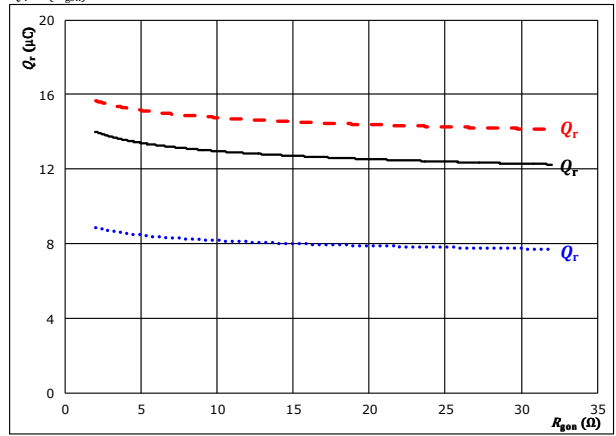


At $V_{CE} = 600$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (black solid line)
 $R_{gpn} = 2$ Ω $T_j = 150$ °C (red dashed line)

figure 10. FWD

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

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

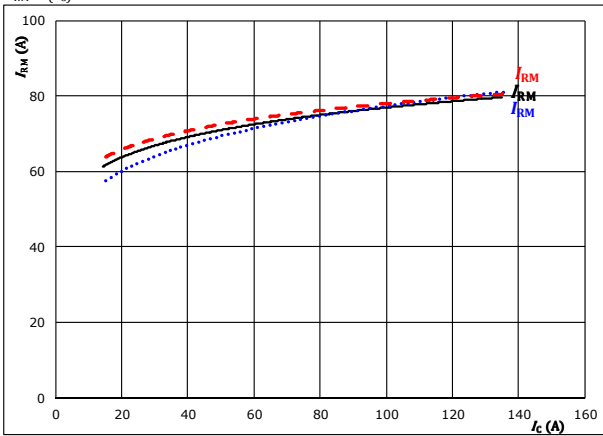


At $V_{CE} = 600$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (black solid line)
 $I_c = 75$ A $T_j = 150$ °C (red dashed line)

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

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

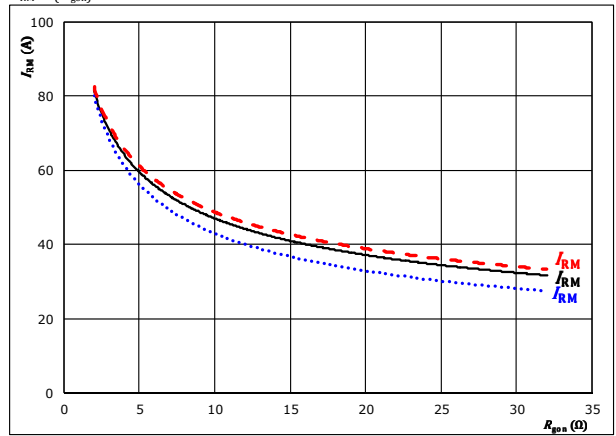


At $V_{CE} = 600$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (black solid line)
 $R_{gpn} = 2$ Ω $T_j = 150$ °C (red dashed line)

figure 12. FWD

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

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



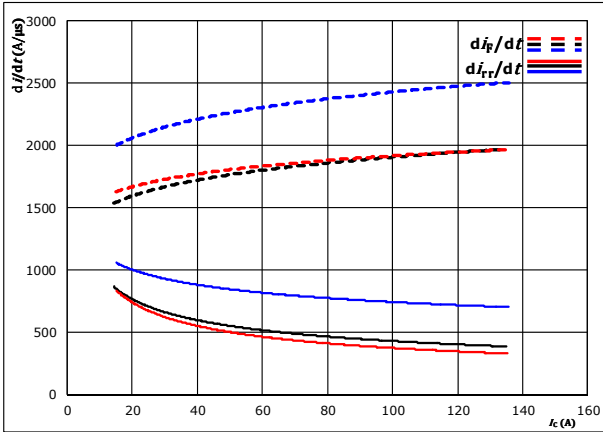
At $V_{CE} = 600$ V $T_j = 25$ °C (blue dotted line)
 $V_{GE} = \pm 15$ V $T_j = 125$ °C (black solid line)
 $I_c = 75$ A $T_j = 150$ °C (red dashed line)



Inverter Switching Characteristics

figure 13. FWD

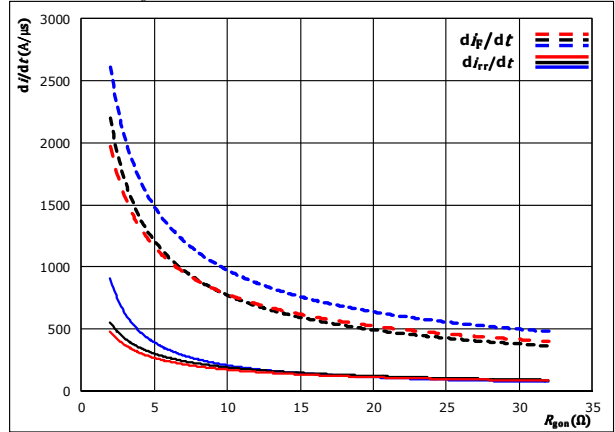
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $R_{gnn} = 2$ Ω $T_j = 150$ °C

figure 14. FWD

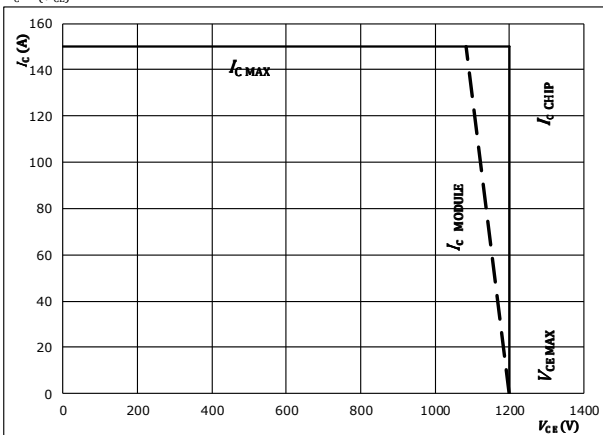
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gnn})$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C
 $I_c = 75$ A $T_j = 150$ °C

figure 15. IGBT

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



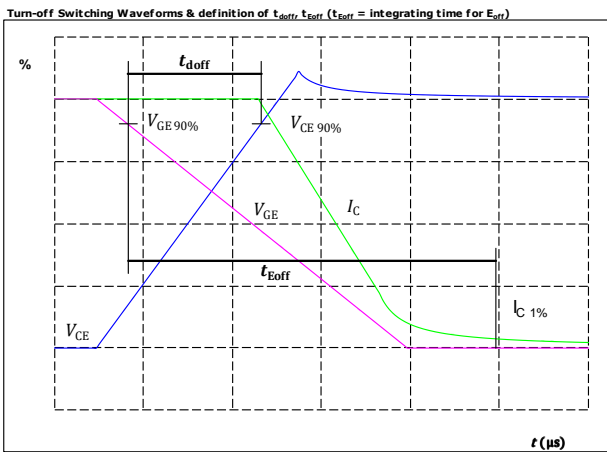
At $T_j = 125$ °C
 $R_{gnn} = 2$ Ω
 $R_{goff} = 2$ Ω



Inverter Switching Definitions

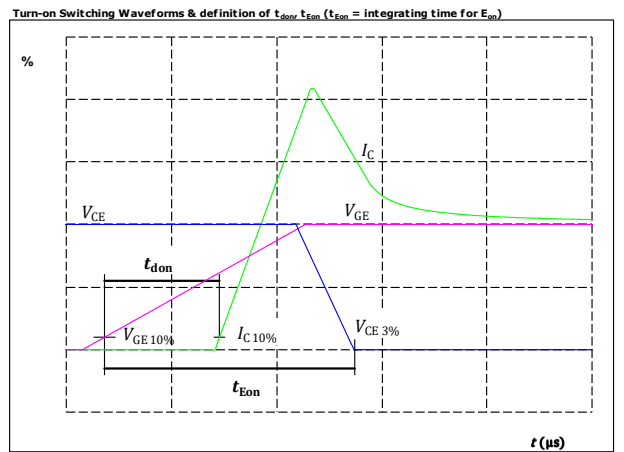
General conditions		
T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT



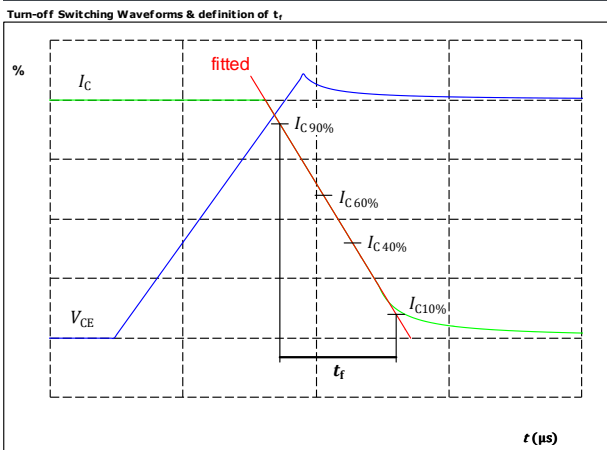
$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	75	A
$t_{doff} =$	233	ns

figure 2. IGBT



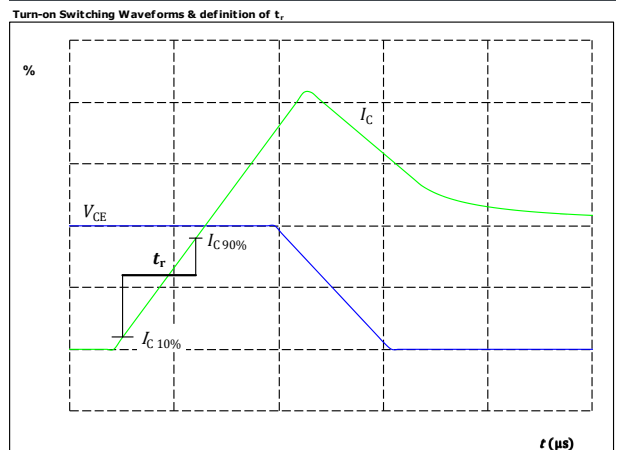
$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	75	A
$t_{don} =$	208	ns

figure 3. IGBT



$V_C(100\%) =$	600	V
$I_C(100\%) =$	75	A
$t_f =$	113	ns

figure 4. IGBT



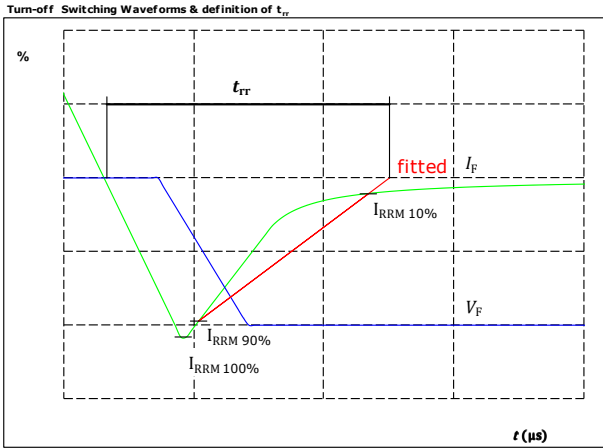
$V_C(100\%) =$	600	V
$I_C(100\%) =$	75	A
$t_r =$	38	ns



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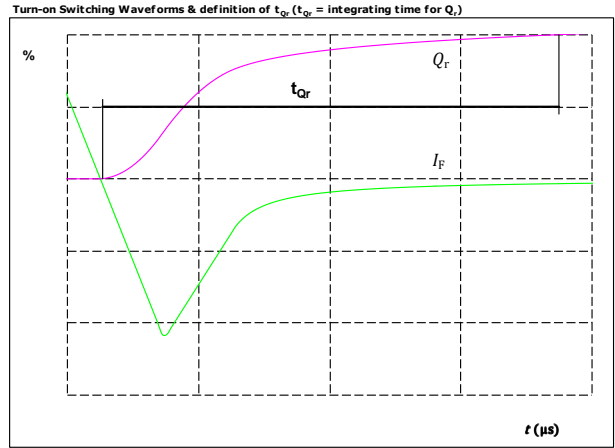
Inverter Switching Characteristics

figure 5. FWD



$V_F(100\%) =$	600	V
$I_F(100\%) =$	75	A
$I_{RRM}(100\%) =$	77	A
$t_{rr} =$	432	ns

figure 6. FWD



$I_F(100\%) =$	75	A
$Q_r(100\%) =$	13,39	μC



Vincotech

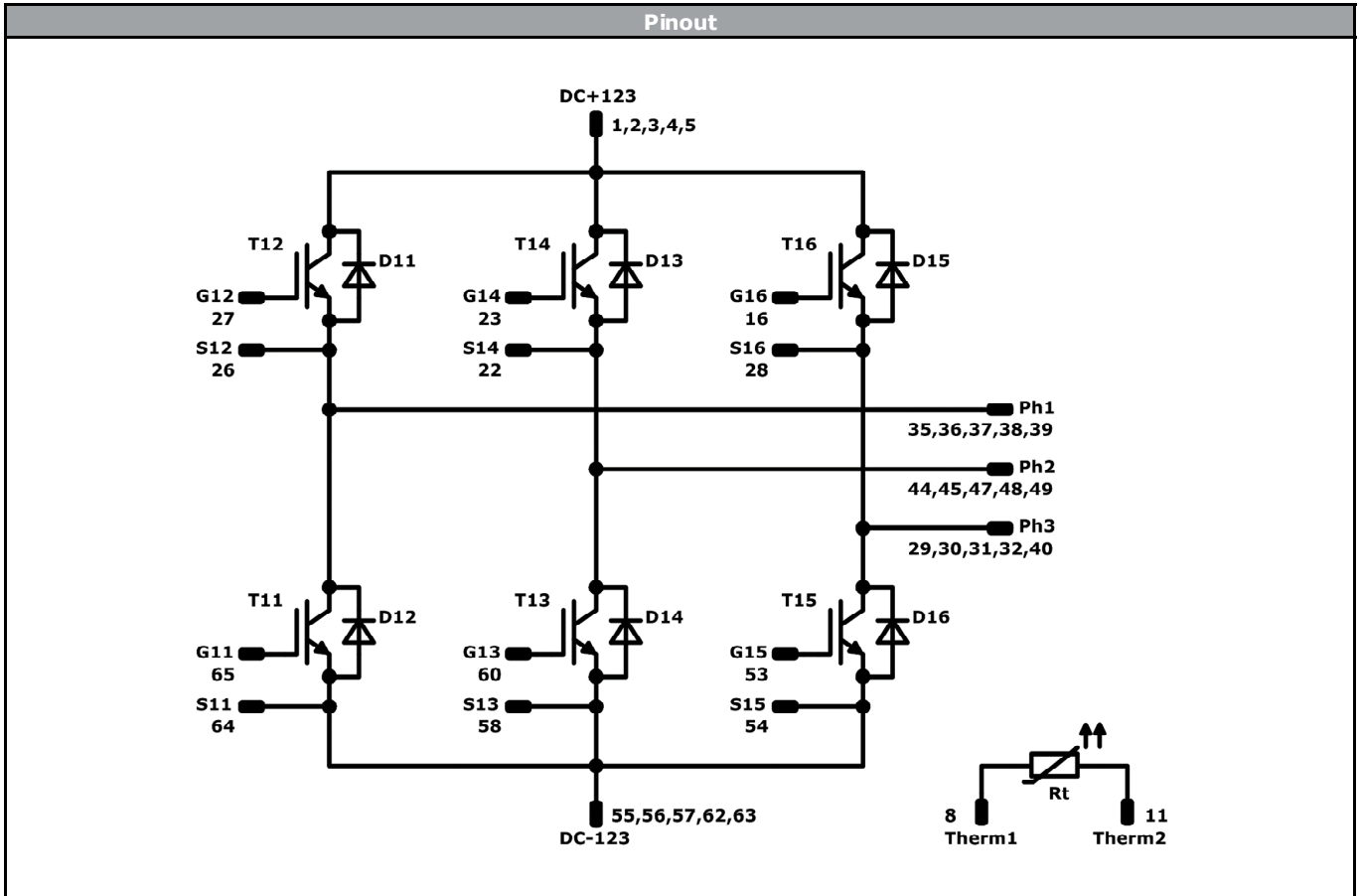
Ordering Code & Marking								
Version			Ordering Code					
With std lid (6.5mm height) + no thermal grease			80-M2126PA075M7-K719F70-/0A/					
With thin lid (2.8mm height) + no thermal grease			80-M2126PA075M7-K719F70-/0B/					
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M2126PA075M7-K719F70-/1A/					
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M2126PA075M7-K719F70-/1B/					
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M2126PA075M7-K719F70-/4A/					
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M2126PA075M7-K719F70-/4B/					
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M2126PA075M7-K719F70-/5A/					
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M2126PA075M7-K719F70-/5B/					
NN-NNNNNNNNNNNN TTTTWW WWYY UL VIN LLLLL SSSS			Text	Name	Date code	UL & VIN	Lot	Serial
			Datamatrix	NN-NNNNNNNNNNNN-TTTTWW	WWYY	UL VIN	LLLLL	SSSS
				Type&Ver TTTTTWW	Lot number LLLLL	Serial SSSS	Date code WWYY	

Outline							
PCB pad table				PCB pad table			
Pin	X	Y	Function	Pin	X	Y	Function
1	24,38	-21,8	DC+123	48	-12,22	7,1	Ph2
2	24,38	-18,6	DC+123	49	-12,22	10,3	Ph2
3	24,38	-15,4	DC+123	50			Not assembled
4	24,38	-12,2	DC+123	51			Not assembled
5	24,38	-9	DC+123	52			Not assembled
6			Not assembled	53	-24,38	-21,8	G15
7			Not assembled	54	-24,38	-18,6	S15
8	24,38	12,2	Therm1	55	-24,38	-15,4	DC-123
9			Not assembled	56	-24,38	-12,2	DC-123
10			Not assembled	57	-24,38	-9	DC-123
11	24,38	21,8	Therm2	58	-24,38	-5,8	S13
12			Not assembled	59			Not assembled
13			Not assembled	60	-24,38	0,7	G13
14			Not assembled	61			Not assembled
15			Not assembled	62	-24,38	7,1	DC-123
16	13,42	-21,8	G16	63	-24,38	15,4	DC-123
17			Not assembled	64	-24,38	18,6	S11
18			Not assembled	65	-24,38	21,8	G11
19			Not assembled				
20			Not assembled				
21			Not assembled				
22	8,38	2,6	S14				
23	8,38	5,8	G14				
24			Not assembled				
25			Not assembled				
26	8,38	18,6	S12				
27	8,38	21,8	G12				
28	2,46	-21,8	S16				
29	2,46	-18,6	Ph3				
30	2,46	-15,4	Ph3				
31	2,46	-12,2	Ph3				
32	2,46	-9	Ph3				
33			Not assembled				
34			Not assembled				
35	0,03	9	Ph1				
36	0,03	12,2	Ph1				
37	0,03	15,4	Ph1				
38	0,03	18,6	Ph1				
39	0,03	21,8	Ph1				
40	-8,5	-21,8	Ph3				
41			Not assembled				
42			Not assembled				
43			Not assembled				
44	-12,22	-9	Ph2				
45	-12,22	-5,8	Ph2				
46			Not assembled				
47	-12,22	3,9	Ph2				

Pad positions refers to center point. For more informations on pad design please see package data



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	75 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	100 A	Inverter Diode	
Rt	PTC			Thermistor	




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Packaging instruction			
Standard packaging quantity (SPQ) 72	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for MiniSkiiP® 2 packages see vincotech.com website.

Package data
Package data for MiniSkiiP® 2 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
80-M2126PA075M7-K719F70-D2-14	27 Aug. 2018	Thermal interface changed to HPTP.	All

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