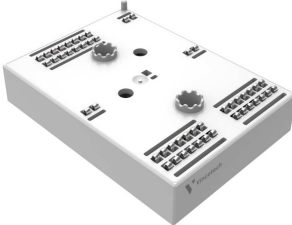
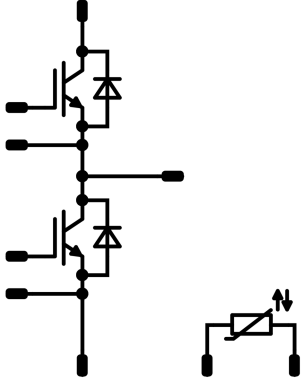




Vincotech

MiniSKiiP®DUAL 3	1200 V / 300 A
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Features</p> <ul style="list-style-type: none"> IGBT M7 technology with low V_{CESat} and improved EMC behavior Solder-free spring contact technology Standard MiniSKiiP package sizes Built-in NTC </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Target applications</p> <ul style="list-style-type: none"> Industrial Drives Power Supply Solar Inverters UPS </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Types</p> <ul style="list-style-type: none"> 80-M3122PA300M7-K839F70 </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">MiniSKiiP®3 housing</p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;">Schematic</p>  </div>

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Half-Bridge Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C		300	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	722	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$ $V_{CE} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	µs
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
Half-Bridge Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	258	A
Repetitive peak forward current	I_{FRM}		600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	447	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 instructions	6,3	mm
Clearance		With std lid For more informations see handling instructions	6,3	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



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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		

Half-Bridge Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$		10	0,03	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}	15		300	25 125 150		1,55 1,70 1,75	1,9	V
Collector-emitter cut-off current	I_{CES}	0	1200		25			400	μA
Gate-emitter leakage current	I_{GES}	20	0		25			2000	nA
Internal gate resistance	r_g						1		Ω
Input capacitance	C_{ies}						64000		pF
Output capacitance	C_{oes}	0	10		25		1920		
Reverse transfer capacitance	C_{res}						760		
Gate charge	Q_g	15	600	300	25		2280		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)					0,13		K/W
-------------------------------------	---------------	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$				25 125 150		381 387 386		ns
Rise time	t_r	$R_{gon} = 2$ Ω $R_{goff} = 2$ Ω			25 125 150		48 56 59		
Turn-off delay time	$t_{d(off)}$		±15	600	300	25 125 150	331 365 372		
Fall time	t_f					25 125 150	78 93 103		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 31,6$ μC $Q_{tFWD} = 48,5$ μC $Q_{tFWD} = 53,8$ μC				25 125 150	26,05 33,99 37,10		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150	21,56 27,54 29,53		



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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			
Half-Bridge Diode											
Static											
Forward voltage	V_F			300	25 125 150		1,73 1,83 1,84	2,15		V	
Reverse leakage current	I_R		1200		25			220		μA	
Thermal											
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,21			K/W
Dynamic											
Peak recovery current	I_{RRM}				25 125 150		241 241 248			A	
Reverse recovery time	t_{rr}				25 125 150		323 467 507			ns	
Recovered charge	Q_r	$di/dt = 6099 \text{ A/}\mu\text{s}$ $di/dt = 5119 \text{ A/}\mu\text{s}$ $di/dt = 5338 \text{ A/}\mu\text{s}$	± 15	600	300	25 125 150	31,61 48,49 53,78			μC	
Reverse recovered energy	E_{rec}				25 125 150		11,27 17,91 19,96			mWs	
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$				25 125 150		1525 1174 1151			A/μs	
Thermistor											
Rated resistance	R				25		5			kΩ	
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 493 \Omega$			100	-5		+5		%	
Power dissipation	P				25		245			mW	
Power dissipation constant					25		1,4			mW/K	
B-value	$B_{(25/50)}$	Tol. $\pm 2 \%$			25		3375			K	
B-value	$B_{(25/100)}$	Tol. $\pm 2 \%$			25		3437			K	
Vincotech NTC Reference									K		

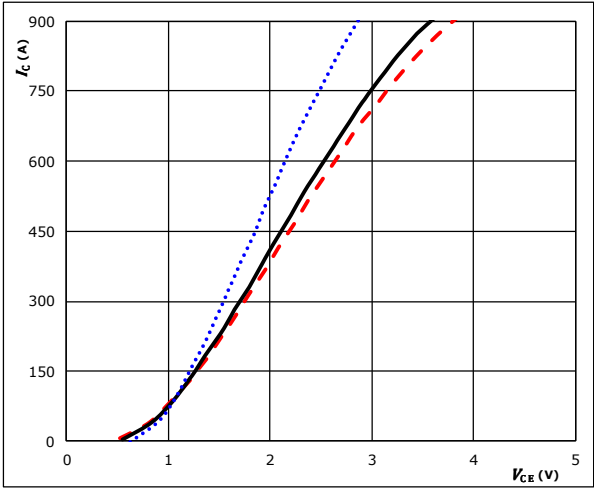


Half-Bridge Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

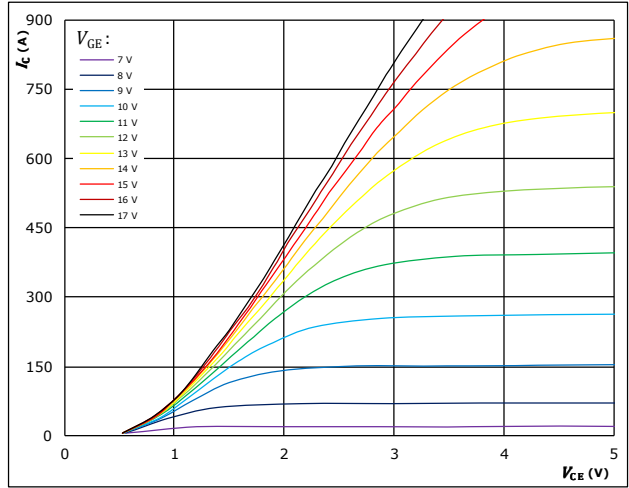


$t_p = 250 \mu s$
 $V_{CE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 2. IGBT

Typical output characteristics

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

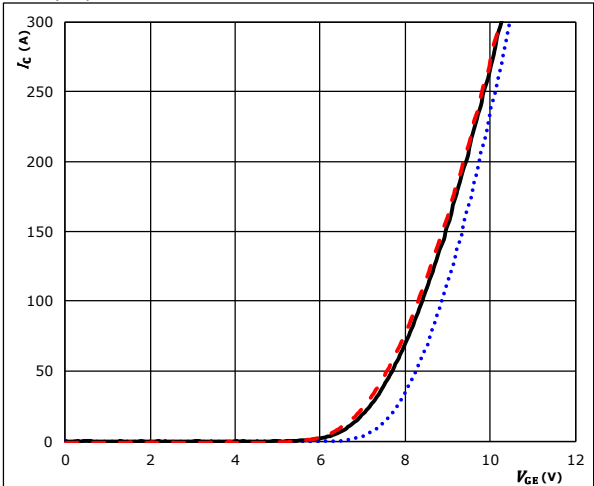


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

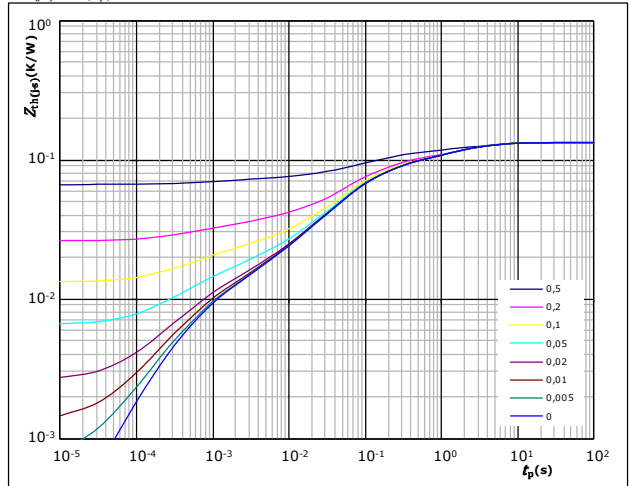


$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,13 \text{ K/W}$

IGBT thermal model values

R (K/W)	τ (s)
3,61E-02	1,83E+00
2,63E-02	2,40E-01
5,03E-02	5,34E-02
8,46E-03	7,56E-03
5,96E-03	1,02E-03
4,50E-03	2,62E-04



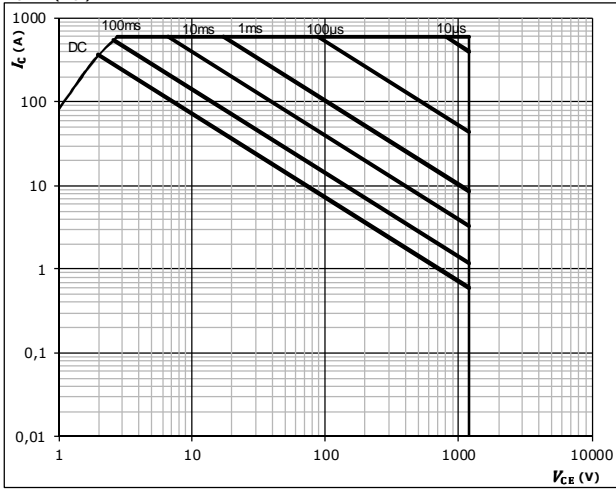
Vincotech

Half-Bridge Switch Characteristics

figure 5. IGBT

Safe operating area

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



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

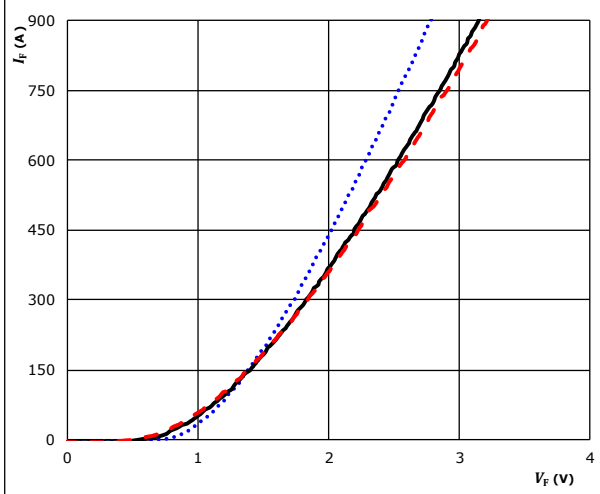


Half-Bridge Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

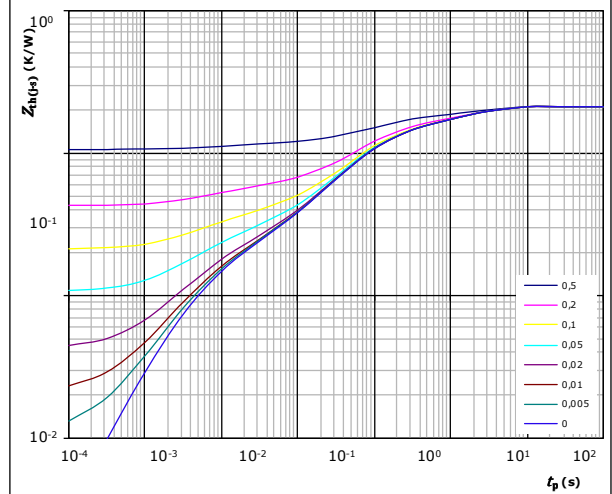


$t_p = 250 \mu s$
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,21 \text{ K/W}$
 FWD thermal model values

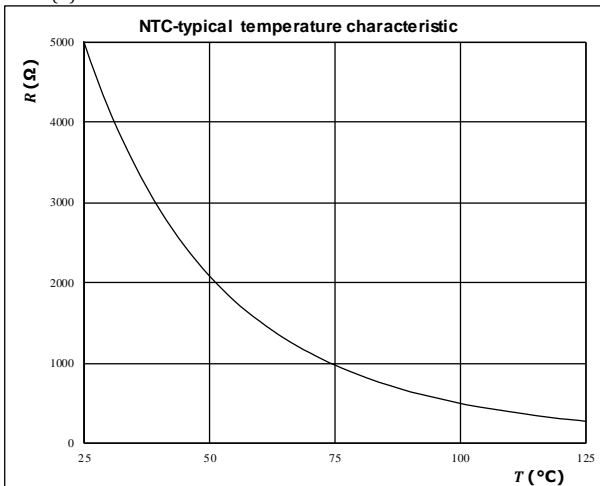
R (K/W)	τ (s)
5,84E-02	2,95E+00
4,24E-02	3,87E-01
8,13E-02	8,62E-02
1,37E-02	1,22E-02
9,63E-03	1,64E-03
7,27E-03	4,23E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
as a function of temperature

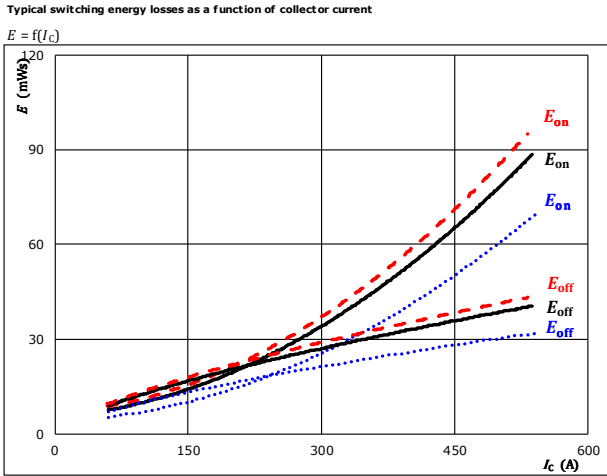
$$R = f(T)$$





Half-Bridge Switching Characteristics

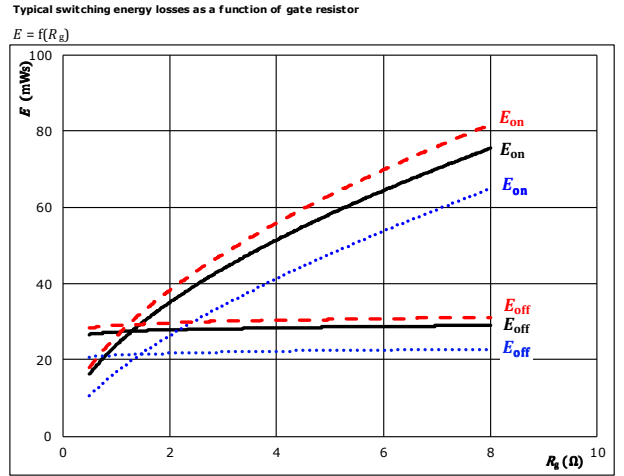
figure 1. IGBT
Typical switching energy losses as a function of collector current



With an inductive load at

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

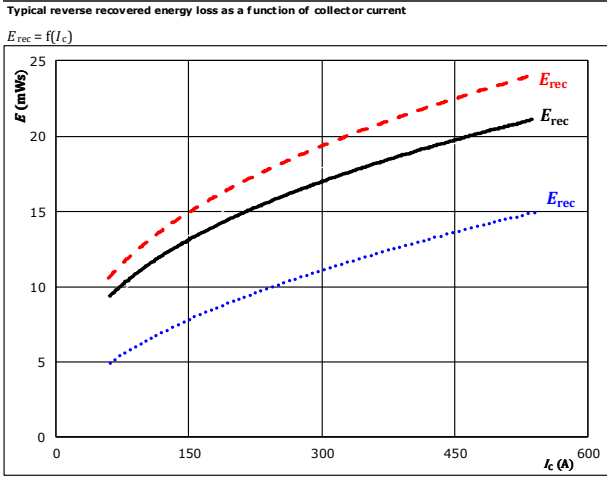
figure 2. IGBT
Typical switching energy losses as a function of gate resistor



With an inductive load at

$V_{CE} = 600$ V	$T_j:$ 25 °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 300$ A	150 °C	- - - -

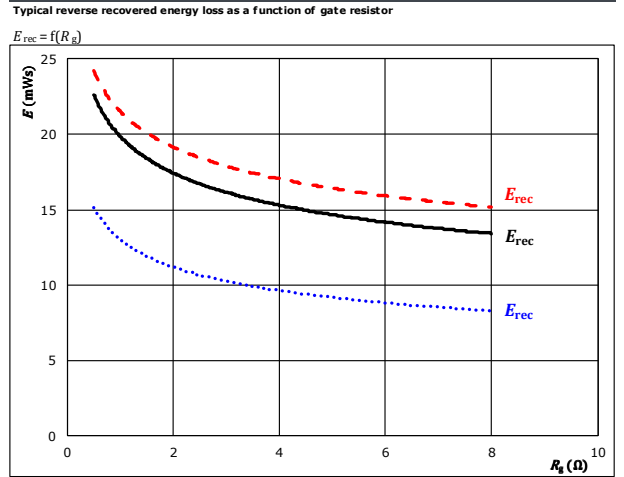
figure 3. FWD
Typical reverse recovered energy loss as a function of collector current



With an inductive load at

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

figure 4. FWD
Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at

$V_{CE} = 600$ V	$T_j:$ 25 °C	.....
$V_{GE} = \pm 15$ V	125 °C	————
$I_C = 300$ A	150 °C	- - - -

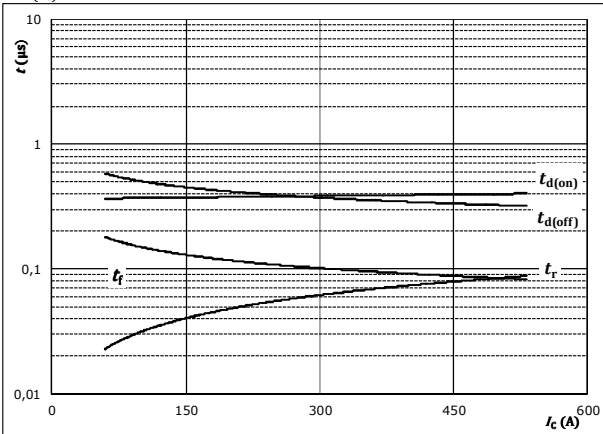


Half-Bridge Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



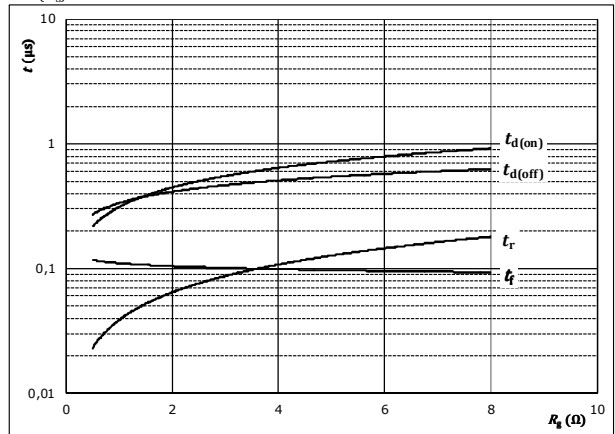
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{g(on)} =$	2	Ω
$R_{g(off)} =$	2	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



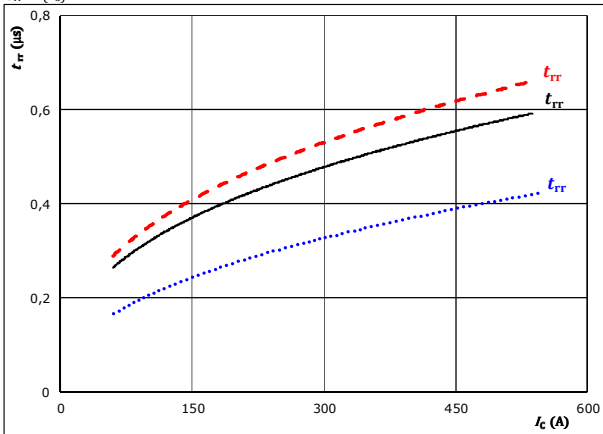
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_C =$	300	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

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



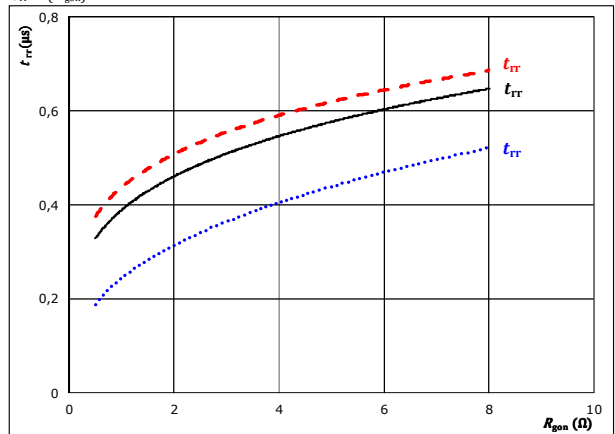
With an inductive load at

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

figure 8. FWD

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

$$t_{rr} = f(R_{g(on)})$$



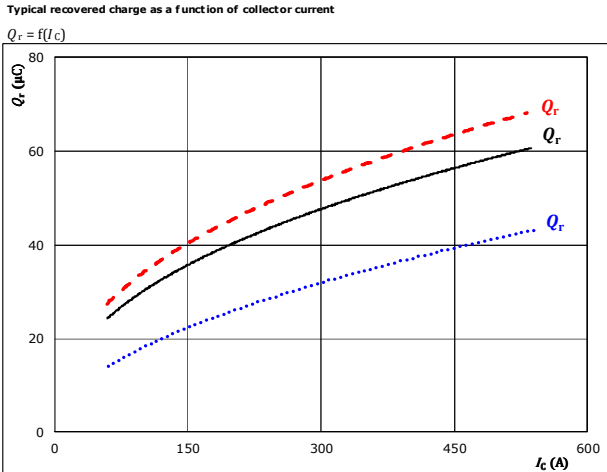
With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C	.....
$V_{GE} =$	±15	V		125 °C	————
$I_C =$	300	A		150 °C	-----



Half-Bridge Switching Characteristics

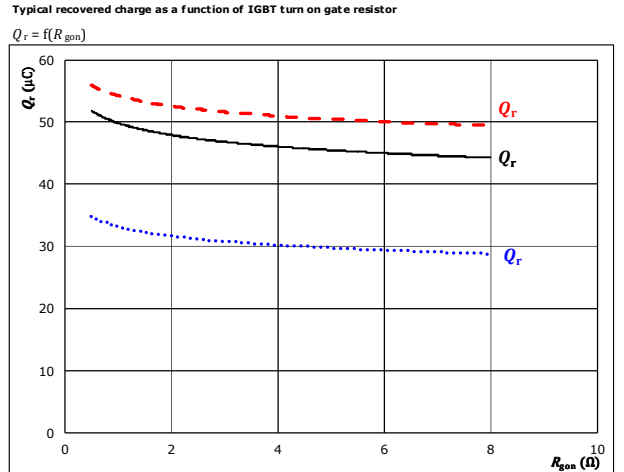
figure 9. FWD
Typical recovered charge as a function of collector current



With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C	.....
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$R_{gpn} = 2$ Ω	$T_j = 150$ °C	-----

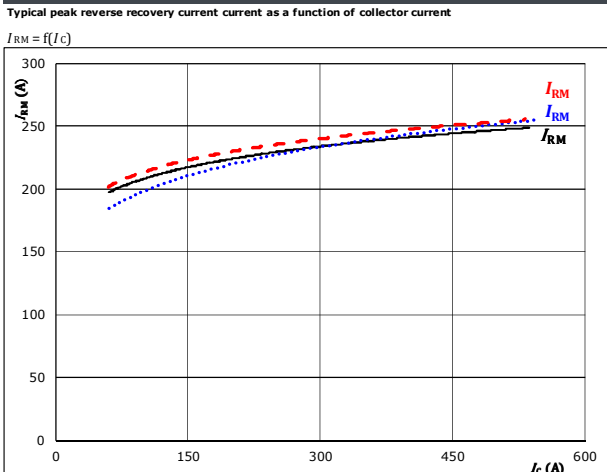
figure 10. FWD
Typical recovered charge as a function of IGBT turn on gate resistor



With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C	.....
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$I_c = 300$ A	$T_j = 150$ °C	-----

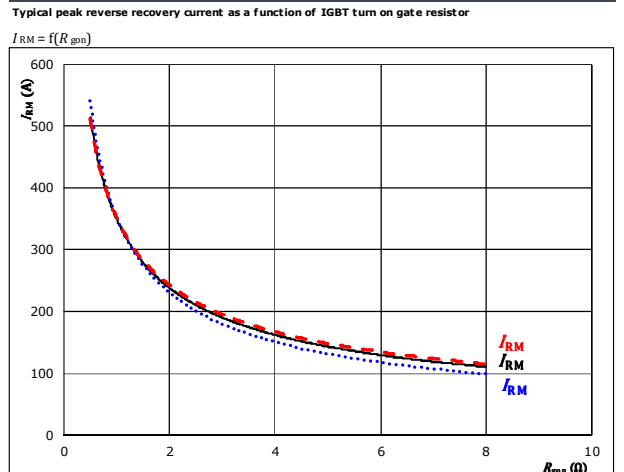
figure 11. FWD
Typical peak reverse recovery current current as a function of collector current



With an inductive load at

$V_{CE} = 600$ V	$T_j = 25$ °C	.....
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$R_{gpn} = 2$ Ω	$T_j = 150$ °C	-----

figure 12. FWD
Typical peak reverse recovery current as a function of IGBT turn on gate resistor



With an inductive load at

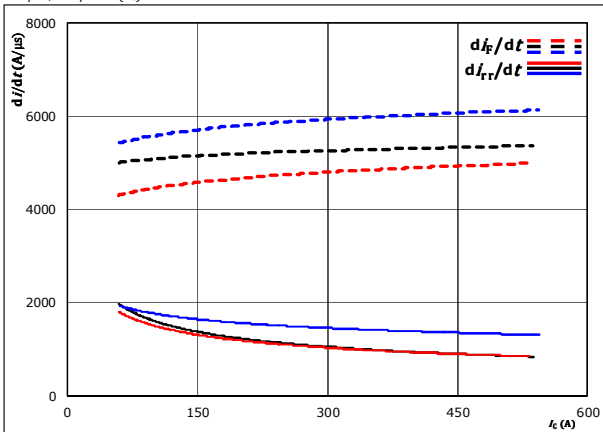
$V_{CE} = 600$ V	$T_j = 25$ °C	.....
$V_{GE} = \pm 15$ V	$T_j = 125$ °C	————
$I_c = 300$ A	$T_j = 150$ °C	-----



Half-Bridge Switching Characteristics

figure 13. FWD

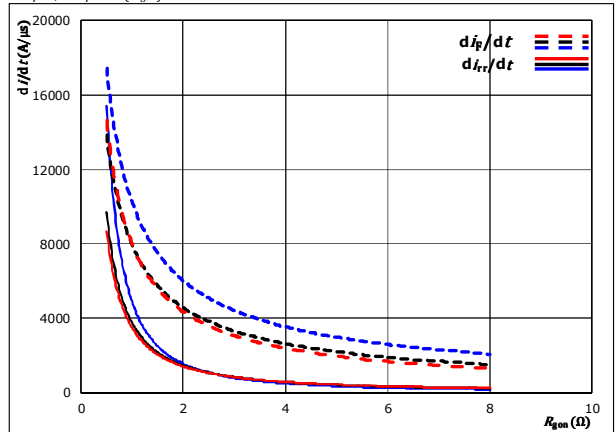
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g(on)} = 2$ Ω
 $T_j = 25$ °C
 125 °C
 150 °C

figure 14. FWD

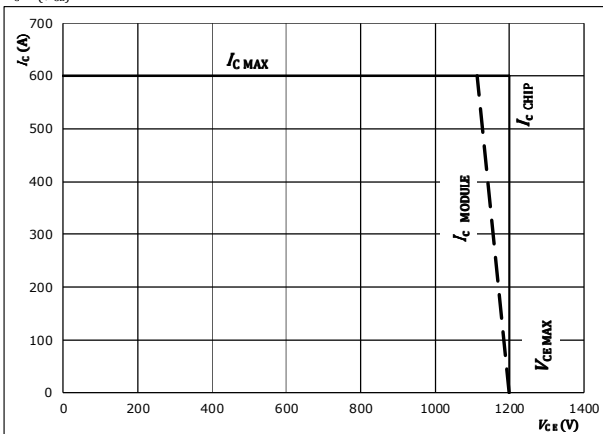
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



With an inductive load at
 $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 300$ A
 $T_j = 25$ °C
 125 °C
 150 °C

figure 15. IGBT

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



At
 $T_j = 125$ °C
 $R_{g(on)} = 2$ Ω
 $R_{g(off)} = 2$ Ω



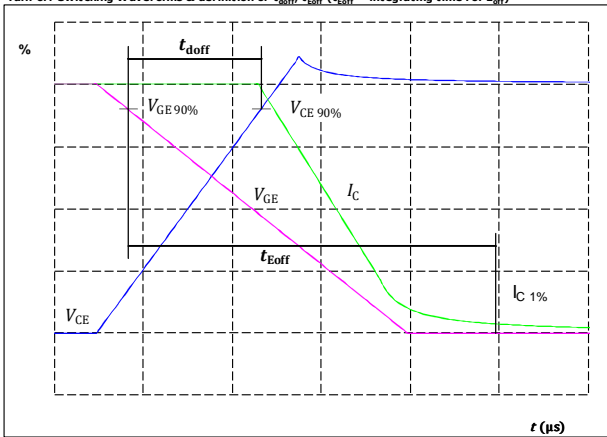
Half-Bridge Switching Definitions

General conditions

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

figure 1. IGBT

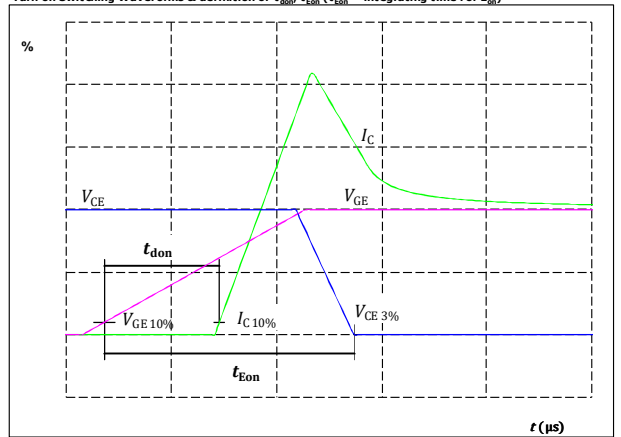
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	300	A
$t_{doff} =$	365	ns

figure 2. IGBT

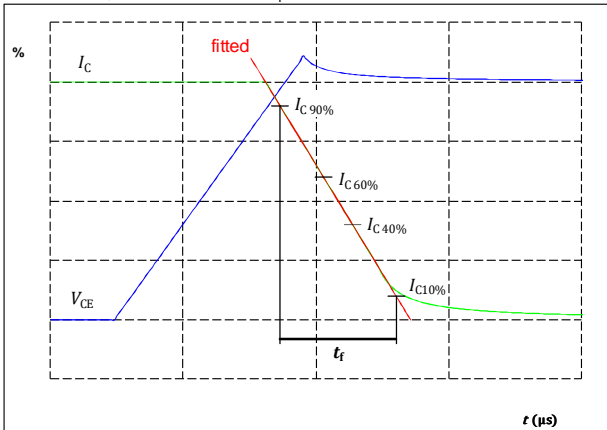
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	300	A
$t_{don} =$	387	ns

figure 3. IGBT

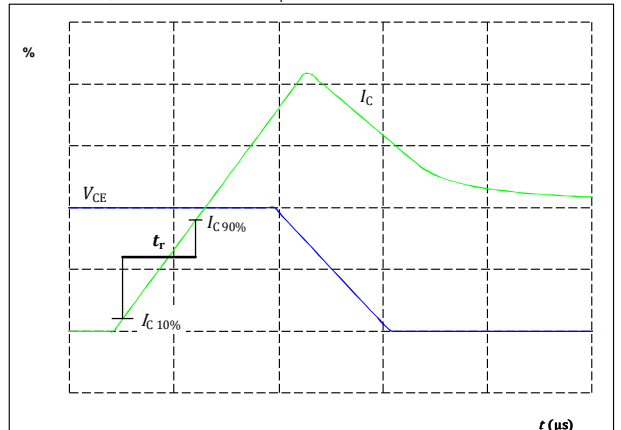
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	600	V
$I_C(100\%) =$	300	A
$t_f =$	93	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



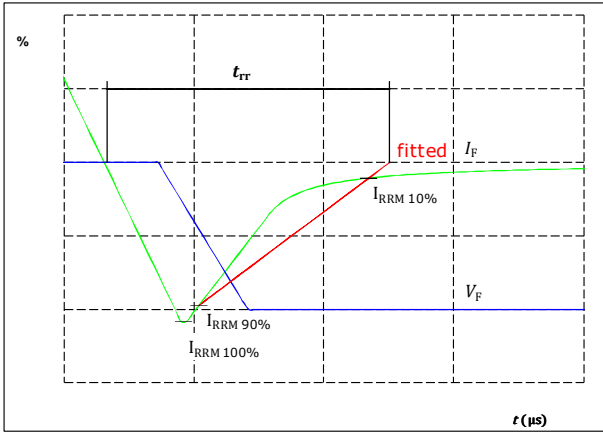
$V_C(100\%) =$	600	V
$I_C(100\%) =$	300	A
$t_r =$	56	ns



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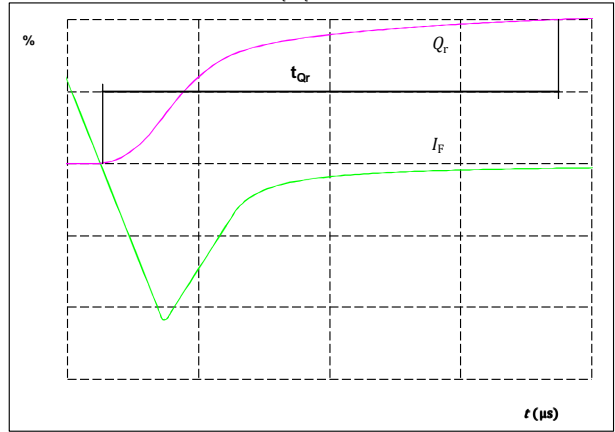
Half-Bridge Switching Characteristics

figure 5. FWD
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%) =$	600	V
$I_F(100\%) =$	300	A
$I_{RRM}(100\%) =$	241	A
$t_{rr} =$	467	ns

figure 6. FWD
Turn-on Switching Waveforms & definition of t_{Qr} ($t_{Qr} =$ integrating time for Q_r)



$I_F(100\%) =$	300	A
$Q_r(100\%) =$	48,49	μC



Vincotech

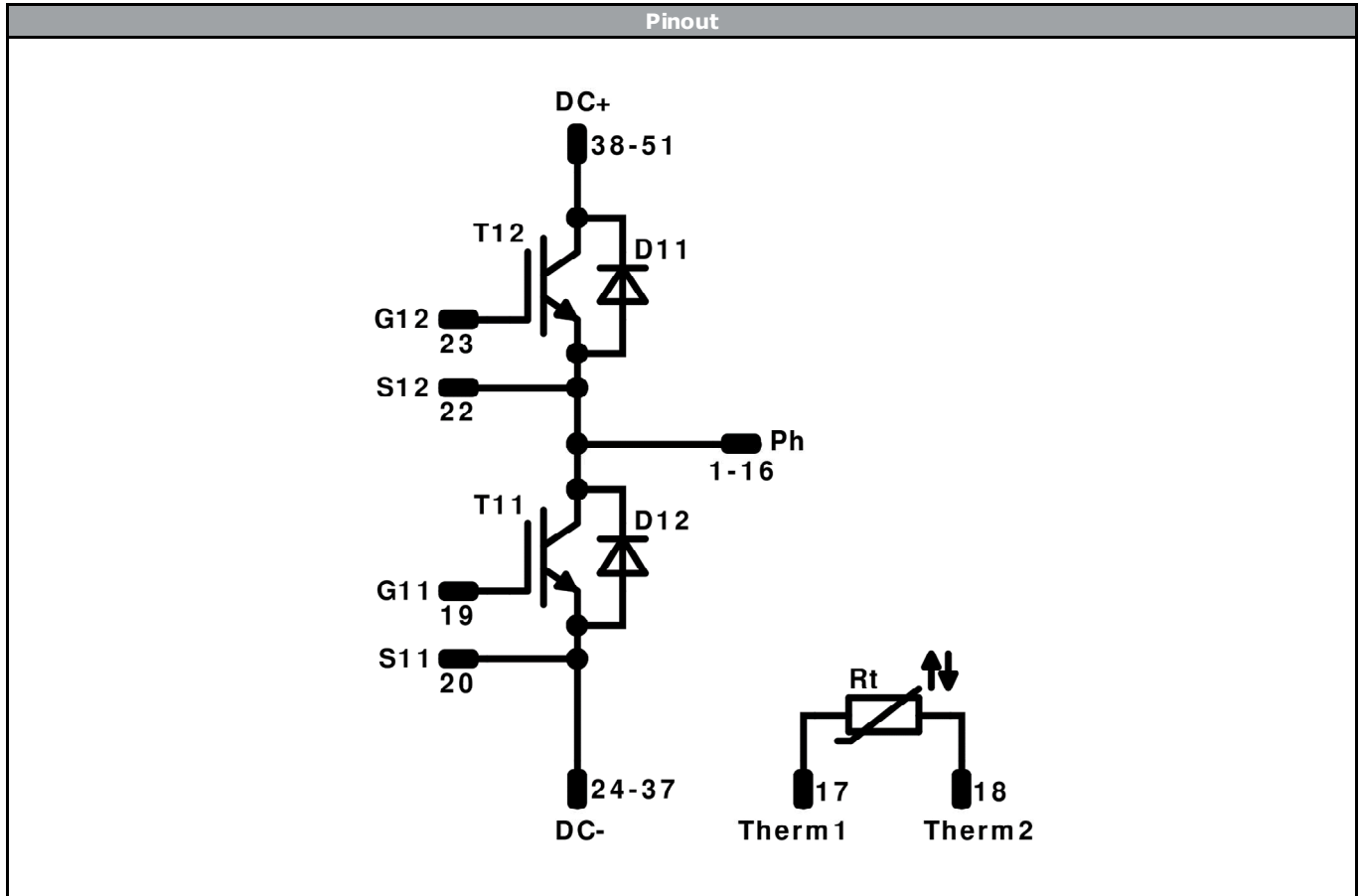
Ordering Code & Marking							
Version			Ordering Code				
With std lid (6.5mm height) + no thermal grease			80-M3122PA300M7-K839F70-/0A/				
With thin lid (2.8mm height) + no thermal grease			80-M3122PA300M7-K839F70-/0B/				
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M3122PA300M7-K839F70-/1A/				
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M3122PA300M7-K839F70-/1B/				
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M3122PA300M7-K839F70-/4A/				
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M3122PA300M7-K839F70-/4B/				
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M3122PA300M7-K839F70-/5A/				
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M3122PA300M7-K839F70-/5B/				
	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN-TTTTTWW		WWYY	UL VIN	LLLLL	SSSS
		Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTWW	LLLLL	SSSS	WWYY		

Outline							
PCB pad table				PCB pad table			
Pin	X	Y	Function	Pin	X	Y	Function
1	-53,95	-17,8	Ph	48	13,95	15,4	+DC
2	-53,95	-14,6	Ph	49	13,95	18,6	+DC
3	-53,95	-11,4	Ph	50	13,95	21,8	+DC
4	-53,95	-8,2	Ph	51	13,95	25	+DC
5	-53,95	-5	Ph				
6	-53,95	-1,8	Ph				
7	-53,95	1,4	Ph				
8	-53,95	4,6	Ph				
9	-49,95	-17,8	Ph				
10	-49,95	-14,6	Ph				
11	-49,95	-11,4	Ph				
12	-49,95	-8,2	Ph				
13	-49,95	-5	Ph				
14	-49,95	-1,8	Ph				
15	-49,95	1,4	Ph				
16	-49,95	4,6	Ph				
17	-51,75	21,8	Therm1				
18	-51,75	25,4	Therm2				
19	-20,25	-25,4	G11				
20	-20,25	-22	S11				
21	Not assembled						
22	-20,15	21,8	S12				
23	-20,15	25,4	G12				
24	9,95	-25	-DC				
25	9,95	-21,8	-DC				
26	9,95	-18,6	-DC				
27	9,95	-15,4	-DC				
28	9,95	-12,2	-DC				
29	9,95	-9	-DC				
30	9,95	-5,8	-DC				
31	13,95	-25	-DC				
32	13,95	-21,8	-DC				
33	13,95	-18,6	-DC				
34	13,95	-15,4	-DC				
35	13,95	-12,2	-DC				
36	13,95	-9	-DC				
37	13,95	-5,8	-DC				
38	9,95	5,8	+DC				
39	9,95	9	+DC				
40	9,95	12,2	+DC				
41	9,95	15,4	+DC				
42	9,95	18,6	+DC				
43	9,95	21,8	+DC				
44	9,95	25	+DC				
45	13,95	5,8	+DC				
46	13,95	9	+DC				
47	13,95	12,2	+DC				

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	IGBT	1200 V	300 A	Half-Bridge Switch	
D11, D12	FWD	1200 V	300 A	Half-Bridge Diode	
Rt	NTC			Thermistor	




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Packaging instruction			
Standard packaging quantity (SPQ) 48	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for MiniSkiiP® 3 packages see vincotech.com website.

Package data
Package data for MiniSkiiP® 3 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-M3122PA300M7-K839F70-D1-14	08 Nov. 2018		

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