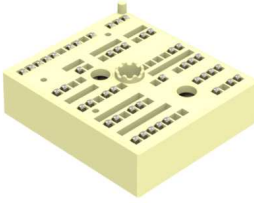
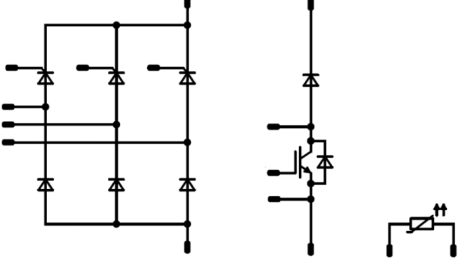




# Vincotech

MiniSKiiP® CON 2	1600 V / 60 A
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Features</b></p> <ul style="list-style-type: none"> <li>3phase half controlled rectifier</li> <li>Brake chopper</li> </ul> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Target applications</b></p> <ul style="list-style-type: none"> <li>Charging Stations</li> <li>Industrial Drives</li> </ul> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Types</b></p> <ul style="list-style-type: none"> <li>80-M2166BA060RW02-K369G</li> </ul> </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>MiniSKiiP® 2 housing</b></p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: #cccccc; margin: 0;"><b>Schematic</b></p>  </div>

## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Rectifier Diode</b>				
Peak Repetitive Reverse Voltage	$V_{RRM}$		1600	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	79	A
Surge (non-repetitive) forward current	$I_{FSM}$	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ 50 Hz sine $T_j = 150\text{ °C}$	890	A
Surge current capability	$I^2t$		3960	A <sup>2</sup> s
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	101	W
Maximum Junction Temperature	$T_{jmax}$		150	°C



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## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
<b>Rectifier Thyristor</b>				
Repetitive peak reverse voltage	$V_{RRM}$		1600	V
Mean on-state current	$I_{T(AV)}$	sine, $d = 0,5$ $T_j = T_{jmax}$	$T_s = 80\text{ °C}$ 90	A
Surge forward current	$I_{FSM}$		1100	A
$I^2t$ value	$I^2t$	$t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	6050	A <sup>2</sup> s
Mean total power loss	$P_{tot(AV)}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	91	W
Maximum Junction Temperature	$T_{jmax}$		125	°C

## Brake Switch

Collector-emitter voltage	$V_{CES}$		1200	V
Collector current	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	99	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	200	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	218	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$ $V_{CC}$	$T_j \leq 150\text{ °C}$ $V_{GE} = 15V$	10 850	$\mu s$ V
Maximum Junction Temperature	$T_{jmax}$		175	°C

## Brake Diode

Peak Repetitive Reverse Voltage	$V_{RRM}$		1200	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	48	A
Repetitive peak forward current	$I_{FRM}$		100	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	98	W
Maximum Junction Temperature	$T_{jmax}$		175	°C

## Brake Sw. Protection Diode

Peak Repetitive Reverse Voltage	$V_{RRM}$		1200	V
Continuous (direct) forward current	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	11	A
Repetitive peak forward current	$I_{FRM}$		15	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	30	W
Maximum Junction Temperature	$T_{jmax}$		150	°C



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## Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
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### Module Properties

#### Thermal Properties

Storage temperature	$T_{stg}$		-40...+125	°C
Operation temperature under switching condition	$T_{top}$		-40...(T <sub>jmax</sub> - 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			min 12,7	mm
Clearance			min 12,7	mm
Comparative Tracking Index	CTI		> 200	

\*100 % tested in production



## Characteristic Values

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

### Rectifier Diode

#### Static

Parameter	Symbol	$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Forward voltage	$V_F$			60	25 150		1,17 1,15	1,5	V
Reverse leakage current	$I_r$		1600		25 150			100 2000	$\mu$ A

#### Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness $\leq 50\mu\text{m}$ $\lambda = 1 \text{ W/mK}$	0,69	K/W

### Rectifier Thyristor

Parameter	Symbol	Conditions	$V_{GE}$ [V]	$V_{CE}$ [V]	$I_C$ [A]	$T_j$ [°C]	Min	Typ	Max	Unit
Forward voltage	$V_T$	$I_T = 150\text{A}$ $t_b = 380\mu\text{s}$				25			1,8	V
Critical rate of rise of off-state voltage	$(dv/dt)_{cr}$			$2/3 V_{DRM}$		125	1000			V/ $\mu$ s
Holding current	$I_H$	$I_T = 1\text{A}$		6V		25			150	mA
Latching current	$I_L$	$I_G = 1,2 I_{GT}$				25			200	mA
Gate trigger voltage	$V_{GT}$	$V_0 = 12\text{V}$		12V		25			1,5	V
Gate trigger current	$I_{GT}$	$R_L = 30\Omega$			25	10		80	mA	
Gate non-trigger voltage	$V_{GD}$			$2/3 V_{DRM}$		125	0,25			V

#### Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance chip to sink	$R_{th(j-s)}$	Thermal grease thickness $\leq 50\mu\text{m}$ $\lambda = 1 \text{ W/mK}$	0,49	K/W



## 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	

### Brake Switch

#### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,01	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CEsat}$		15		100	25 125 150	1,2	1,77 2,05 2,11	2,2	V
Collector-emitter cut-off current	$I_{CES}$		0	1200		25			300	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			1000	nA
Internal gate resistance	$r_g$							none		Ω
Input capacitance	$C_{ies}$							10000		pF
Output capacitance	$C_{oes}$		0	10		25		2000		
Reverse transfer capacitance	$C_{res}$							160		
Gate charge	$Q_g$		15	600	100	25		210		nC

#### Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 μm $\lambda = 1$ W/mK						0,44		K/W
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### Brake Diode

#### Static

Forward voltage	$V_F$				50	25 125		2,73 2,19	3,3	V
Reverse leakage current	$I_r$			1200		25			50	μA

#### Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 μm $\lambda = 1$ W/mK						0,97		K/W
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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		

### Brake Sw. Protection Diode

#### Static

Forward voltage	$V_F$				7,5	25 125		1,65 1,61		V
Reverse leakage current	$I_r$			1200		25			250	μA

#### Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 μm $\lambda = 1$ W/mK						2,37		K/W
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### 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 <sup>2</sup>
Vincotech PTC Reference									E	



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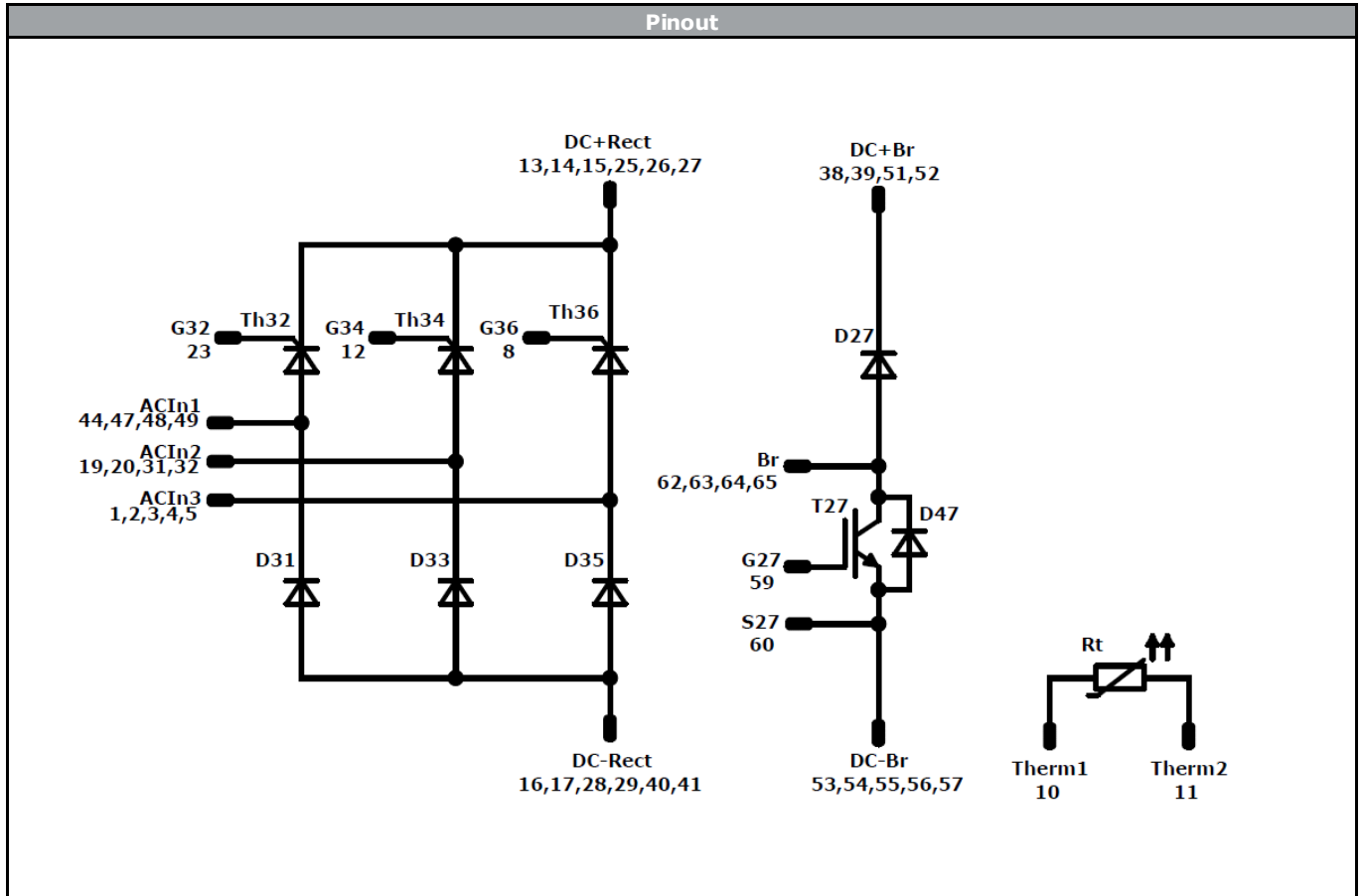
Ordering Code & Marking								
Version				Ordering Code				
with std lid (black V23990-K22-T)				80-M2166BA060RW02-K369G-/0A/				
with std lid (black V23990-K22-T) and P12				80-M2166BA060RW02-K369G-/1A/				
with std lid (white V23990-K23-T)				80-M2166BA060RW02-K369G-/0B/				
with std lid (white V23990-K23-T) and P12				80-M2166BA060RW02-K369G-/1B/				
NN-NNNNNNNNNNNNNN TTTTUVVWWYY UL VIN LLLLL SSSS			Text	Name	Date code	UL & VIN	Lot	Serial
				NN-NNNNNNNNNNNNNN-TTTTUVV WWYY UL VIN LLLLL SSSS	WWYY	UL VIN	LLLLL	SSSS
				Type&Ver	Lot number	Serial	Date code	
			Datamatrix	TTTTTUVV	LLLLL	SSSS	WWYY	

Outline							
PCB pad table				PCB pad table			
Pin	X	Y	Function	Pin	X	Y	Function
1	24,38	-21,8	ACIn3	52	-12,22	21,8	DC+Br
2	24,38	-18,6	ACIn3	53	-24,38	-21,8	DC-Br
3	24,38	-15,4	ACIn3	54	-24,38	-18,6	DC-Br
4	24,38	-12,2	ACIn3	55	-24,38	-15,4	DC-Br
5	24,38	-9	ACIn3	56	-24,38	-12,2	DC-Br
6	Not assembled			57	-24,38	-9	DC-Br
7	Not assembled			58	Not assembled		
8	24,38	12,2	G36	59	-24,38	-2,5	G27
9	Not assembled			60	-24,38	0,7	S27
10	24,38	18,6	Therm1	61	Not assembled		
11	24,38	21,8	Therm2	62	-24,38	7,1	Br
12	16,58	12,2	G34	63	-24,38	15,4	Br
13	16,58	15,4	DC+Rect	64	-24,38	18,6	Br
14	16,58	18,6	DC+Rect	65	-24,38	21,8	Br
15	16,58	21,8	DC+Rect				
16	13,42	-21,8	DC-Rect				
17	13,42	-18,6	DC-Rect				
18	Not assembled						
19	13,42	-12,2	ACIn2				
20	13,42	-9	ACIn2				
21	Not assembled						
22	Not assembled						
23	8,38	5,8	G32				
24	Not assembled						
25	8,38	15,4	DC+Rect				
26	8,38	18,6	DC+Rect				
27	8,38	21,8	DC+Rect				
28	2,46	-21,8	DC-Rect				
29	2,46	-18,6	DC-Rect				
30	Not assembled						
31	2,46	-12,2	ACIn2				
32	2,46	-9	ACIn2				
33	Not assembled						
34	Not assembled						
35	Not assembled						
36	Not assembled						
37	Not assembled						
38	0,03	18,6	DC+Br				
39	0,03	21,8	DC+Br				
40	-8,5	-21,8	DC-Rect				
41	-8,5	-18,6	DC-Rect				
42	Not assembled						
43	Not assembled						
44	-12,22	-9	ACIn1				
45	Not assembled						
46	Not assembled						
47	-12,22	3,9	ACIn1				
48	-12,22	7,1	ACIn1				
49	-12,22	10,3	ACIn1				
50	Not assembled						
51	-12,22	18,6	DC+Br				

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
D31, D33, D35	FWD	1600 V	60 A	Rectifier Diode	
Th32, Th34, Th36	Thyristor	1600 V	90 A	Rectifier Thyristor	
T27	IGBT	1200 V	100 A	Brake Switch	
D27	FWD	1200 V	50 A	Brake Diode	
D47	FWD	1200 V	7,5 A	Brake Sw. Protection Diode	
Rt	NTC			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-M2166BA060RW02-K369G-T2-14	26 Jun. 2017	Corrected Marketing name	All

Product status definition		
Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.

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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.