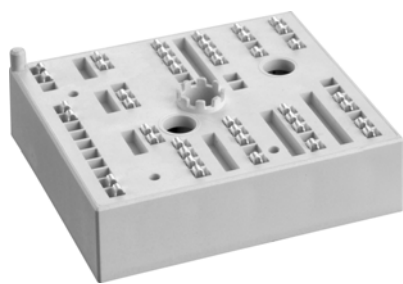


SKiiP 23NAB12T4V1



MiniSKiiP® 2

SKiiP 23NAB12T4V1

Features

- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Typical Applications*

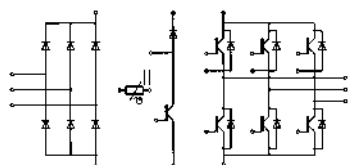
- Inverter up to 14 kVA
- Typical motor power 7,5 kW

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

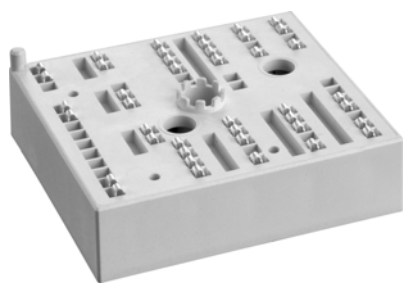
Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	37	A
	T _j = 175 °C	T _s = 70 °C	30	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	41	A
	T _j = 175 °C	T _s = 70 °C	34	A
I _{Cnom}			25	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		75	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Chopper - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	37	A
	T _j = 175 °C	T _s = 70 °C	30	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	41	A
	T _j = 175 °C	T _s = 70 °C	34	A
I _{Cnom}			25	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		75	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Inverse - Diode				
V _{RRM}	T _j = 25 °C		1200	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	32	A
	T _j = 175 °C	T _s = 70 °C	26	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	35	A
	T _j = 175 °C	T _s = 70 °C	28	A
I _{Fnom}			25	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		75	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		100	A
T _j			-40 ... 175	°C
Freewheeling - Diode				
V _{RRM}	T _j = 25 °C		1200	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	32	A
	T _j = 175 °C	T _s = 70 °C	26	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	35	A
	T _j = 175 °C	T _s = 70 °C	28	A
I _{Fnom}			25	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		75	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		100	A
T _i			-40 ... 175	°C



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SKiiP 23NAB12T4V1



MiniSKiiP® 2

SKiiP 23NAB12T4V1

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- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Typical Applications*

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- Typical motor power 7,5 kW

Remarks

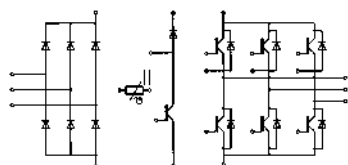
- Max. case temperature limited to $T_C=125^\circ\text{C}$
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- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Rectifier - Diode				
V _{RRM}	T _j = 25 °C		1600	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	52	A
	T _j = 150 °C	T _s = 70 °C	39	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	58	A
	T _j = 150 °C	T _s = 70 °C	44	A
I _{Fnom}			13	A
I _{FSM}	10 ms	T _j = 25 °C	370	A
	sin 180°	T _j = 150 °C	270	A
I ² t	10 ms	T _j = 25 °C	685	A ² s
	sin 180°	T _j = 150 °C	365	A ² s
T _j			-40 ... 150	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C, 20 A per spring		40	A
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, 1 min		2500	V

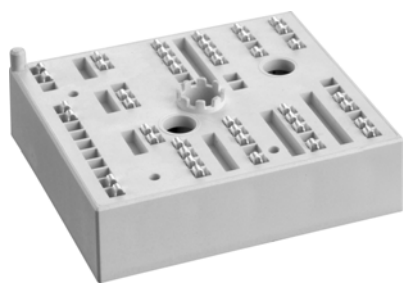
Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 25 \text{ A}$ $V_{GE} = 15 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
V_{CE0}	chiplevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.70	0.80	V
r_{CE}	$V_{GE} = 15 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	42	48	mΩ
		$T_j = 150^\circ\text{C}$	62	66	mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE} \text{ V}$, $I_C = 1 \text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0 \text{ V}$, $V_{CE} = 1200 \text{ V}$, $T_j = 25^\circ\text{C}$	0.1	0.3		mA
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	1.43		nF
C_{oes}		$f = 1 \text{ MHz}$	0.12		nF
C_{res}		$f = 1 \text{ MHz}$	0.09		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		142		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $I_C = 25 \text{ A}$	$T_j = 150^\circ\text{C}$	28		ns
t_r	$R_{G on} = 24 \Omega$ $R_{G off} = 24 \Omega$	$T_j = 150^\circ\text{C}$	40		ns
E_{on}		$T_j = 150^\circ\text{C}$	2.65		mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$	295		ns
t_f		$T_j = 150^\circ\text{C}$	68		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	2.3		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		1.2		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		1		K/W



NAB

SKiiP 23NAB12T4V1



MiniSKiiP® 2

SKiiP 23NAB12T4V1

Features

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- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

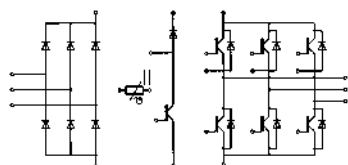
Typical Applications*

- Inverter up to 14 kVA
- Typical motor power 7,5 kW

Remarks

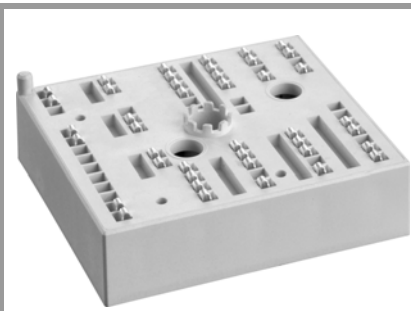
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_J \leq 150^\circ\text{C}$ (recommended $T_{J,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
V _{CE(sat)}	I _C = 25 A	T _J = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chipelevel	T _J = 150 °C		2.25	2.45	V
V _{CE0}	chipelevel	T _J = 25 °C		0.80	0.90	V
		T _J = 150 °C		0.70	0.80	V
r _{CE}	V _{GE} = 15 V	T _J = 25 °C		42	48	mΩ
	chipelevel	T _J = 150 °C		62	66	mΩ
V _{GE(th)}	V _{GE} = V _{CE} V, I _C = 1 mA		5	5.8	6.5	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _J = 25 °C			0.1	0.3	mA
Q _G	V _{GE} = - 8 V...+ 15 V			142		nC
R _{Gint}	T _J = 25 °C			0		Ω
t _{d(on)}	V _{CC} = 600 V	T _J = 150 °C		28		ns
t _r	I _C = 25 A	T _J = 150 °C		40		ns
E _{on}	R _{G on} = 24 Ω	T _J = 150 °C		2.65		mJ
t _{d(off)}	R _{G off} = 24 Ω	T _J = 150 °C		295		ns
t _f		T _J = 150 °C		68		ns
E _{off}	V _{GE} = +15/-15 V	T _J = 150 °C		2.3		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			1.2		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			1		K/W
Inverse - Diode						
V _F = V _{EC}	I _F = 25 A	T _J = 25 °C		2.41	2.74	V
	V _{GE} = 0 V chipelevel	T _J = 150 °C		2.45	2.79	V
V _{F0}	chipelevel	T _J = 25 °C		1.30	1.50	V
		T _J = 150 °C		0.90	1.10	V
r _F	chipelevel	T _J = 25 °C		44	50	mΩ
		T _J = 150 °C		62	68	mΩ
I _{RRM}	I _F = 25 A	T _J = 150 °C		24		A
Q _{rr}	di/dt _{off} = 850 A/μs	T _J = 150 °C		3.7		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _J = 150 °C		1.6		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1.52		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			1.29		K/W
Freewheeling - Diode						
V _F = V _{EC}	I _F = 25 A	T _J = 25 °C		2.41	2.74	V
	V _{GE} = 0 V chipelevel	T _J = 150 °C		2.45	2.79	V
V _{F0}	chipelevel	T _J = 25 °C		1.30	1.50	V
		T _J = 150 °C		0.90	1.10	V
r _F	chipelevel	T _J = 25 °C		44	50	mΩ
		T _J = 150 °C		62	68	mΩ
I _{RRM}	I _F = 25 A	T _J = 150 °C		24		A
Q _{rr}	di/dt _{off} = 850 A/μs	T _J = 150 °C		3.7		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _J = 150 °C		1.6		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1.52		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			1.29		K/W



NAB

SKiiP 23NAB12T4V1



MiniSKiiP® 2

SKiiP 23NAB12T4V1

Features

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- Highly reliable spring contacts for electrical connections
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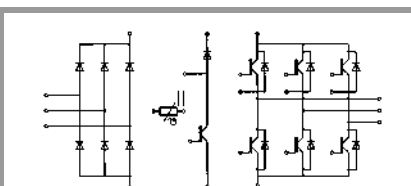
Typical Applications*

- Inverter up to 14 kVA
- Typical motor power 7,5 kW

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
V _F = V _{EC}	I _F = 13 A	T _j = 25 °C		1.00	1.21	V
	V _{GE} = 0 V chiplevel	T _j = 125 °C		0.90	1.10	V
V _{F0}	chiplevel	T _j = 25 °C		0.88	0.98	V
		T _j = 125 °C		0.73	0.83	V
r _F	chiplevel	T _j = 25 °C		9.2	18	mΩ
		T _j = 125 °C		13	21	mΩ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1.25		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			1.06		K/W
Module						
M _s	to heat sink		2		2.5	Nm
w				55		g
L _{CE}				-		nH
Temperature Sensor						
R ₁₀₀	T _r = 100 °C			1670 ± 3%		Ω
R(T)	R(T)=1000Ω[1+A(T-25°C)+B(T-25°C) ²], A = 7.635*10 ⁻³ °C ⁻¹ , B = 1.731*10 ⁻⁵ °C ⁻²					



NAB

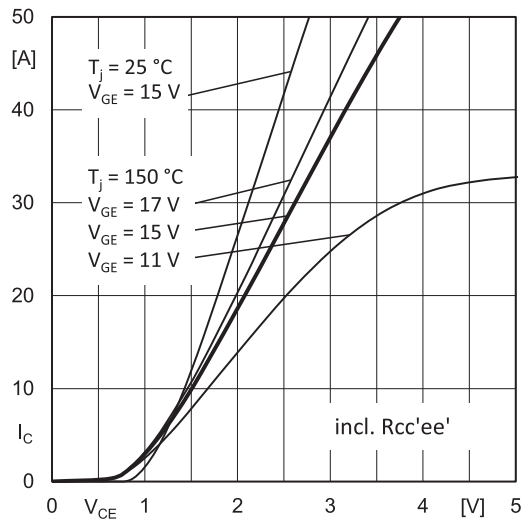


Fig. 1: Typ. output characteristic

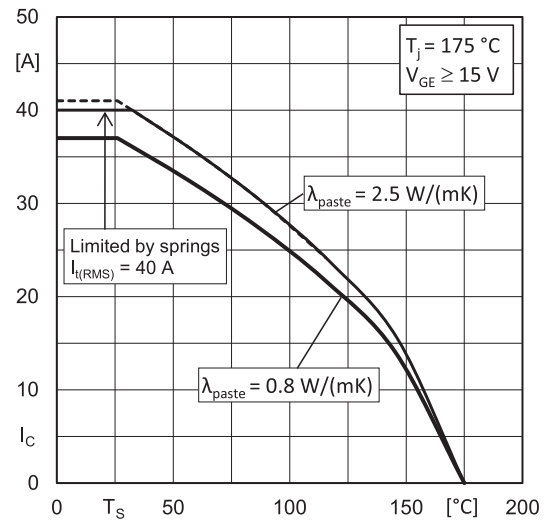


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

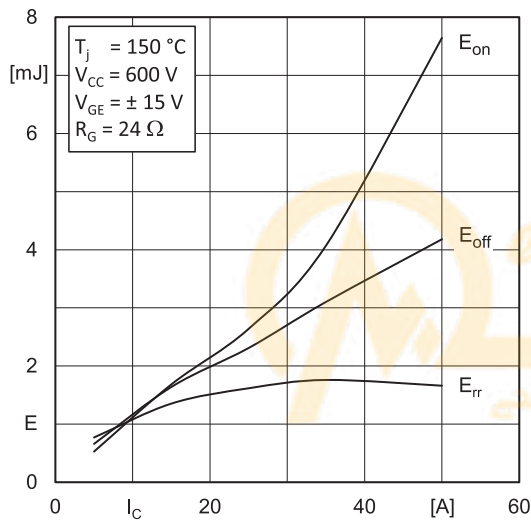


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

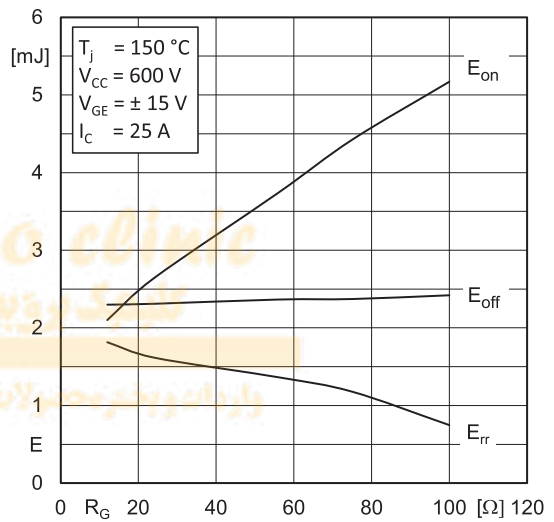


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

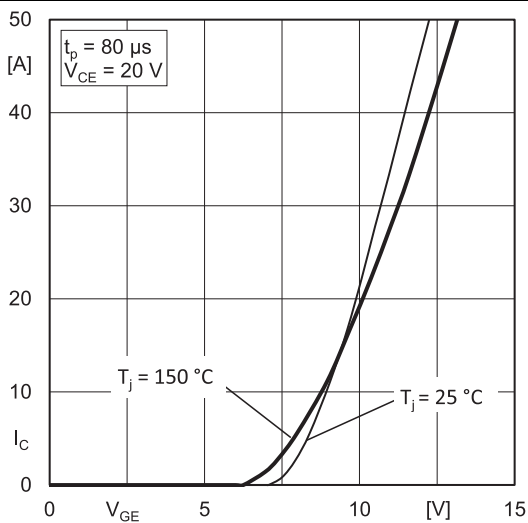


Fig. 5: Typ. transfer characteristic

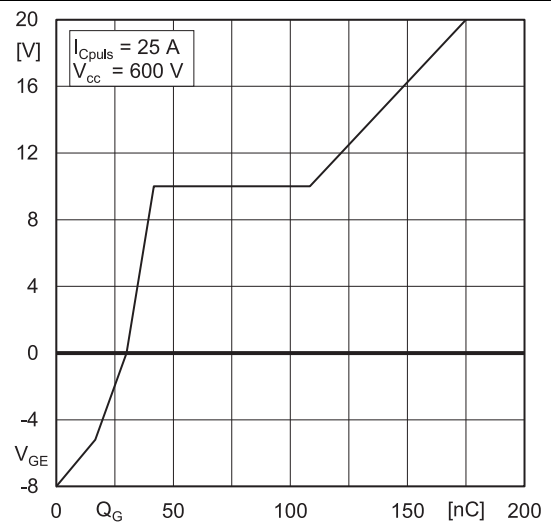


Fig. 6: Typ. gate charge characteristic

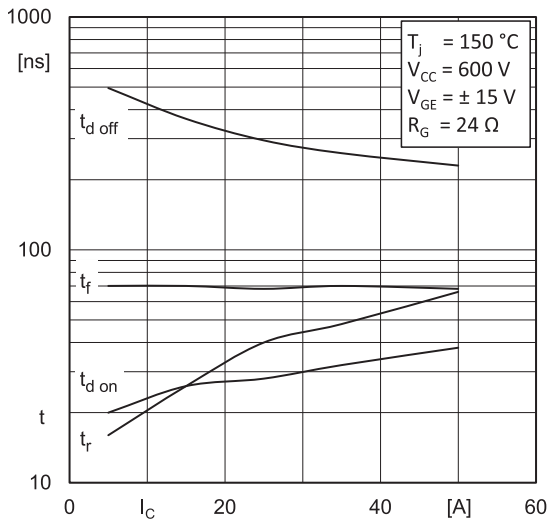


Fig. 7: Typ. switching times vs. I_C

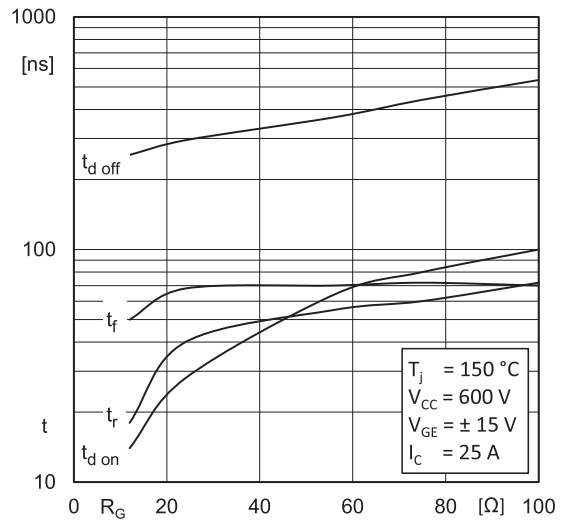


Fig. 8: Typ. switching times vs. gate resistor R_G

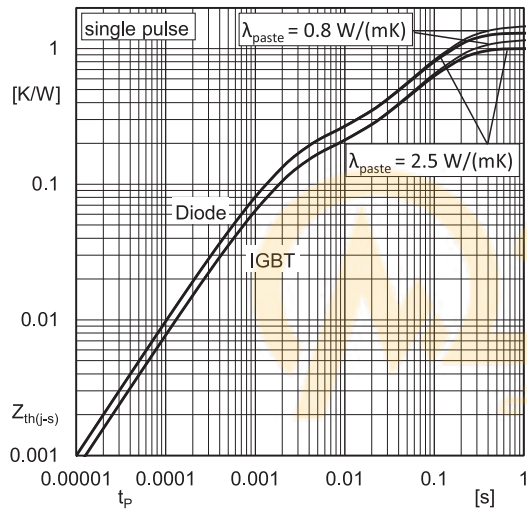


Fig. 9: Transient thermal impedance of IGBT and Diode

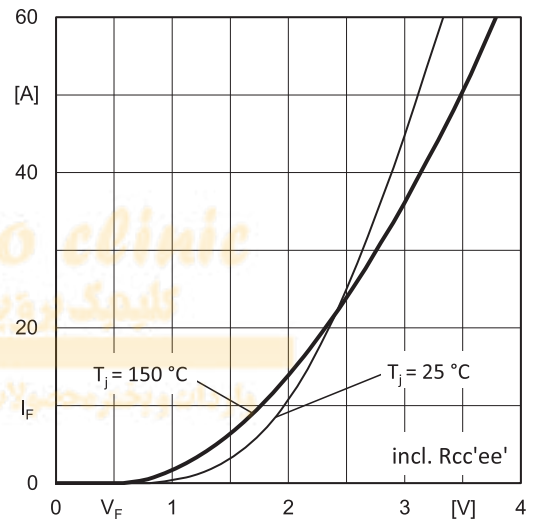


Fig. 10: CAL diode forward characteristic

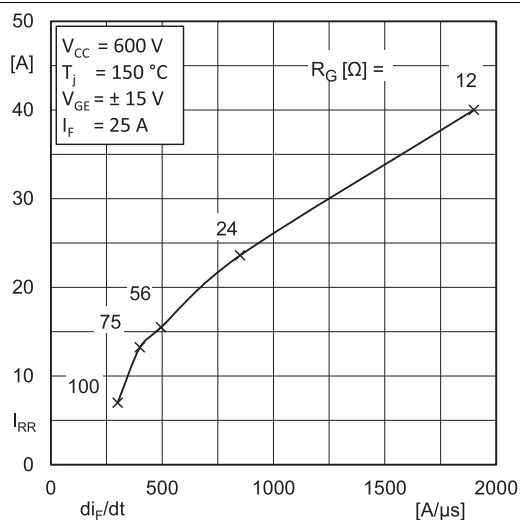


Fig. 11: Typ. CAL diode peak reverse recovery current

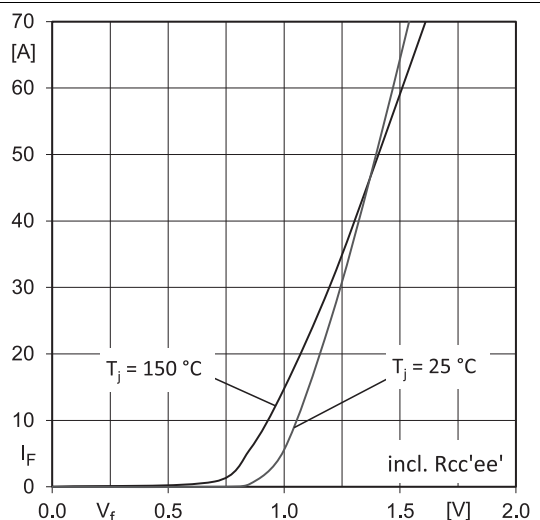
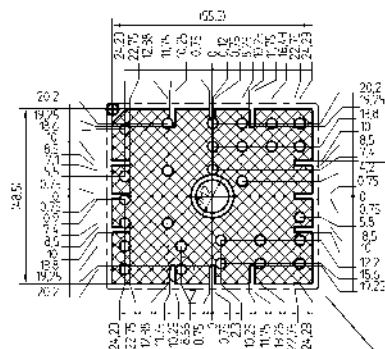
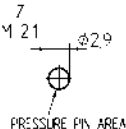


Fig. 12: Typ. input bridge forward characteristic

PCB
PCB TOP-VIEW

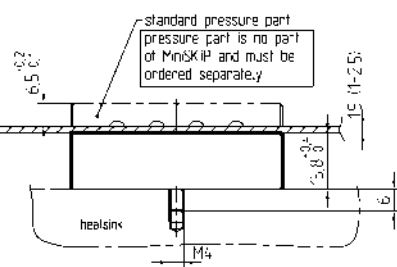


Only for the standard pressure part:
Accessible for mounting of SMD (max height 35) on PCB by customer
mounting area

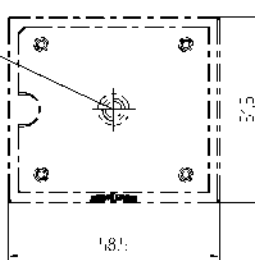


MiniSKiiP 2

PCB TOP-VIEW
PCB BOTTOM-VIEW
CONTACT-SIDE



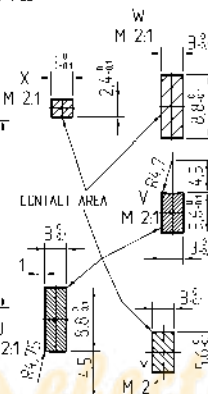
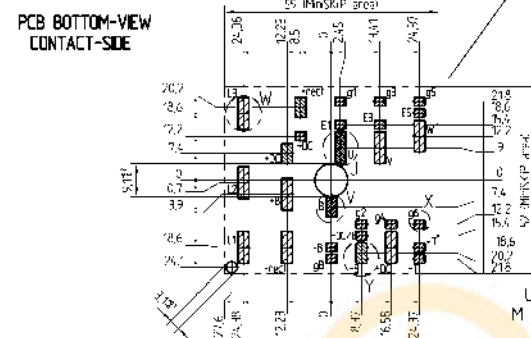
standard pressure part
pressure part is no part of MiniSKiiP and must be ordered separately



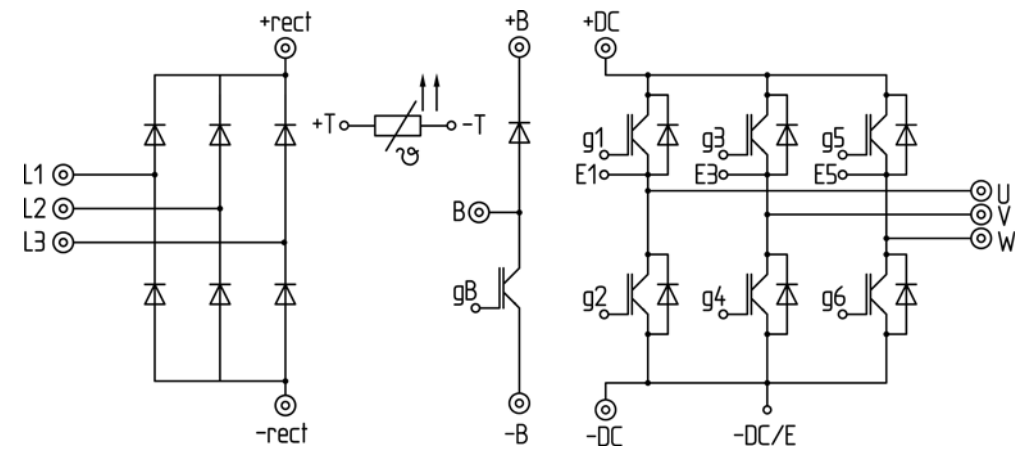
For mounting please follow the assembly instruction

measure: mm
tolerance: ISO 2768-t

PCB TOP-VIEW
PCB BOTTOM-VIEW
CONTACT-SIDE



pinout, dimensions



⊙ power connector
• control connector

pinout

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

*IMPORTANT INFORMATION AND WARNINGS

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.

