

MiniSKiiP® 1

SKiiP 12NAB12T4V1

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 12 kVA
- Typical motor power 5,5 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

NAB

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	28	A
	T _j = 175 °C	T _s = 70 °C	23	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	31	A
	T _j = 175 °C	T _s = 70 °C	26	A
I _{Cnom}			15	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		45	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	28	A
	T _j = 175 °C	T _s = 70 °C	23	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	31	A
	T _j = 175 °C	T _s = 70 °C	26	A
I _{Cnom}			15	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		45	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	23	A
	T _j = 175 °C	T _s = 70 °C	18	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	25	A
	T _j = 175 °C	T _s = 70 °C	20	A
I _{Fnom}			15	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		45	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		65	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	23	A
	T _j = 175 °C	T _s = 70 °C	18	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	25	A
	T _j = 175 °C	T _s = 70 °C	20	A
I _{Fnom}			15	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		45	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		65	A
T _j			-40 ... 175	°C

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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 _j = 150 °C	T _s = 25 °C	39	A
		T _s = 70 °C	29	A
I _F	λ _{paste} =2.5 W/(mK) T _j = 150 °C	T _s = 25 °C	42	A
		T _s = 70 °C	32	A
I _{Fnom}			8	A
I _{FSM}	10 ms	T _j = 25 °C	220	A
	sin 180°	T _j = 150 °C	200	A
I ² t	10 ms	T _j = 25 °C	242	A ² s
	sin 180°	T _j = 150 °C	200	A ² s
T _j			-40 ... 150	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C,		18	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 = 15 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		70	80	mΩ
	chipelevel	T _j = 150 °C		103	110	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
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		0.90		nF
C _{oes}		f = 1 MHz		0.08		nF
C _{res}		f = 1 MHz		0.06		nF
Q _G	V _{GE} = - 8 V...+ 15 V			85		nC
R _{Gint}	T _j = 25 °C			0		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		15		ns
t _r	I _C = 15 A	T _j = 150 °C		25		ns
E _{on}	R _{G on} = 16 Ω	T _j = 150 °C		1.4		mJ
	R _{G off} = 16 Ω	T _j = 150 °C		260		ns
t _{d(off)}						
t _f					75	
E _{off}	V _{GE} = +15/-15 V	T _j = 150 °C		1.3		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			1.3		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			1.1		K/W

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
V _{CE(sat)}	I _C = 15 A	T _j = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.25	2.45	V
V _{CE0}	chiplevel	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		70	80	mΩ
	chiplevel	T _j = 150 °C		103	110	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			85		nC
R _{Gint}	T _j = 25 °C			0		Ω
t _{d(on)}	V _{CC} = 600 V	T _j = 150 °C		15		ns
t _r	I _C = 15 A	T _j = 150 °C		25		ns
E _{on}	R _{G on} = 16 Ω	T _j = 150 °C		1.4		mJ
t _{d(off)}	R _{G off} = 16 Ω	T _j = 150 °C		260		ns
t _f		T _j = 150 °C		75		ns
E _{off}	V _{GE} = +15/-15 V	T _j = 150 °C		1.3		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			1.3		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			1.1		K/W
Inverse - Diode						
V _F = V _{EC}	I _F = 15 A	T _j = 25 °C		2.38	2.71	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.44	2.77	V
V _{F0}	chiplevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90	1.10	V
r _F	chiplevel	T _j = 25 °C		72	81	mΩ
		T _j = 150 °C		103	111	mΩ
I _{RRM}	I _F = 15 A	T _j = 150 °C		28		A
Q _{rr}	di/dt _{off} = 1180 A/μs	T _j = 150 °C		2.6		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _j = 150 °C		1.1		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1.92		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			1.66		K/W
Freewheeling - Diode						
V _F = V _{EC}	I _F = 15 A	T _j = 25 °C		2.38	2.71	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		2.44	2.77	V
V _{F0}	chiplevel	T _j = 25 °C		1.30	1.50	V
		T _j = 150 °C		0.90	1.10	V
r _F	chiplevel	T _j = 25 °C		72	81	mΩ
		T _j = 150 °C		103	111	mΩ
I _{RRM}	I _F = 15 A	T _j = 150 °C		28		A
Q _{rr}	di/dt _{off} = 1180 A/μs	T _j = 150 °C		2.6		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	T _j = 150 °C		1.1		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1.92		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			1.66		K/W

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
V _F = V _{EC}	I _F = 8 A	T _j = 25 °C		1.00	1.21	V
	V _{GE} = 0 V	T _j = 125 °C		0.90	1.10	V
	chipelevel					
V _{F0}		T _j = 25 °C		0.88	0.98	V
	chipelevel	T _j = 125 °C		0.73	0.83	V
r _F		T _j = 25 °C		15	29	mΩ
	chipelevel	T _j = 125 °C		21	34	mΩ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			1.5		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			1.29		K/W
Module						
M _s	to heat sink		2		2.5	Nm
w				30		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					

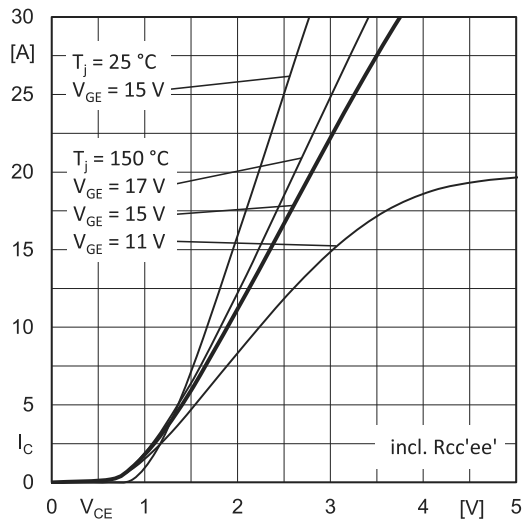


Fig. 1: Typ. output characteristic

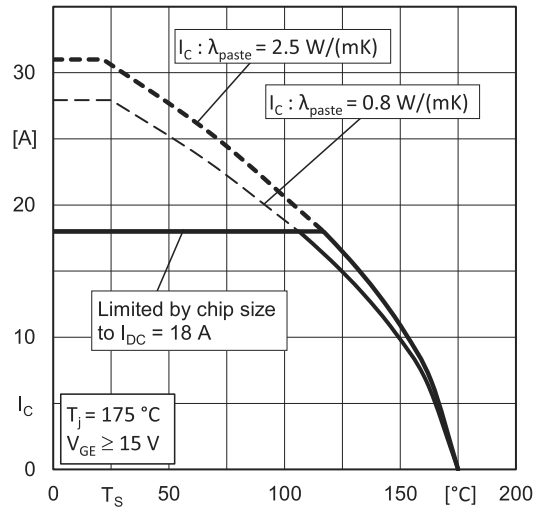


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

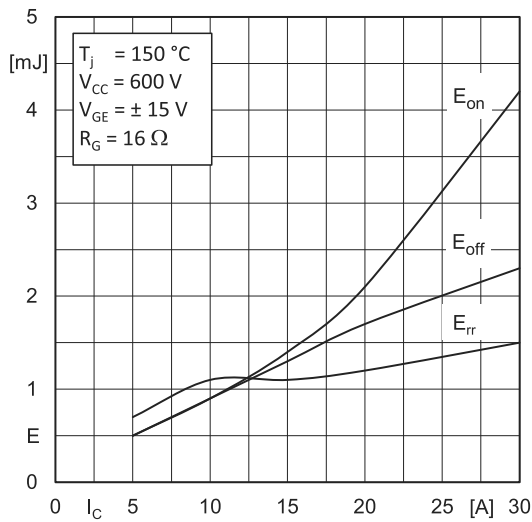


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

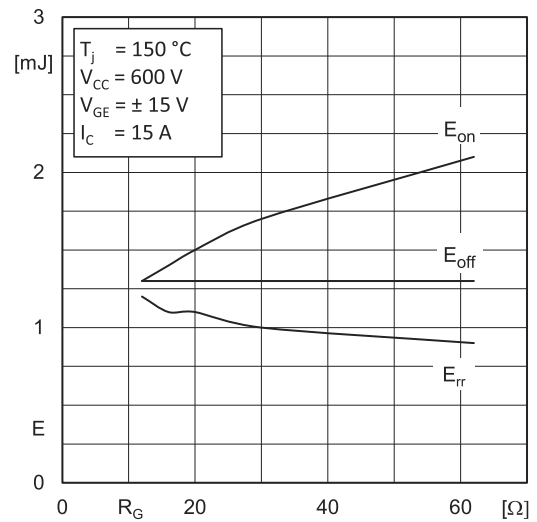


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

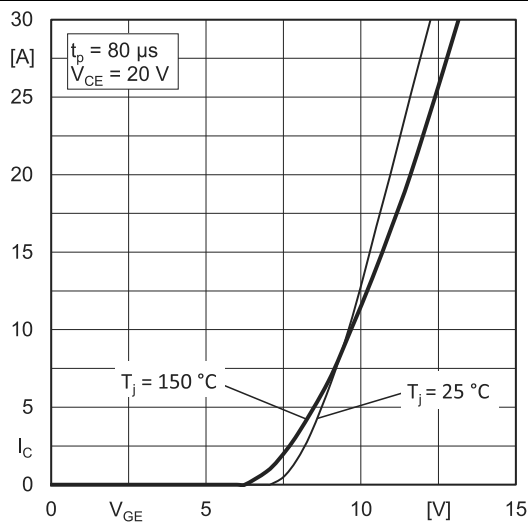


Fig. 5: Typ. transfer characteristic

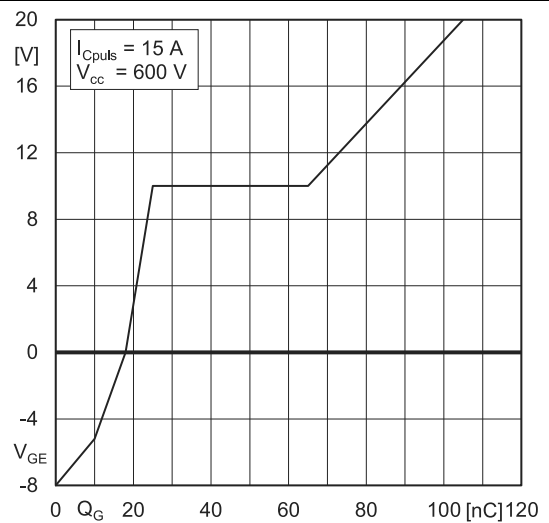


Fig. 6: Typ. gate charge characteristic

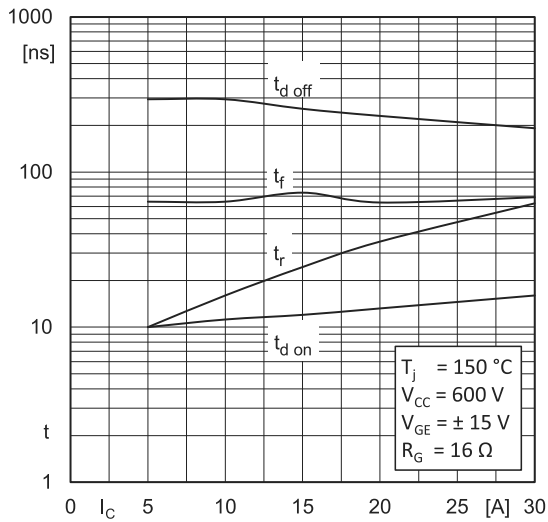


Fig. 7: Typ. switching times vs. I_C

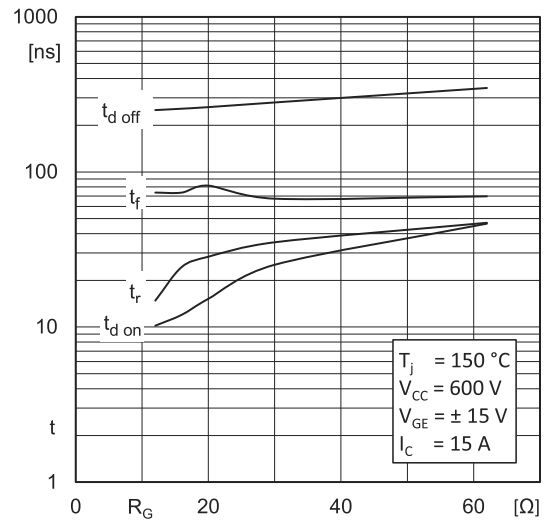


Fig. 8: Typ. switching times vs. gate resistor R_G

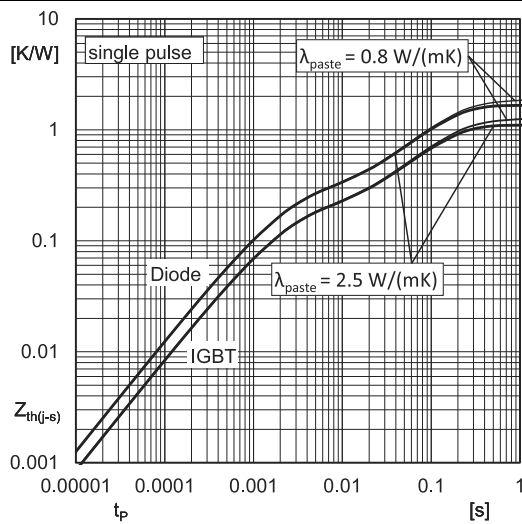


Fig. 9: Transient thermal impedance of IGBT and Diode

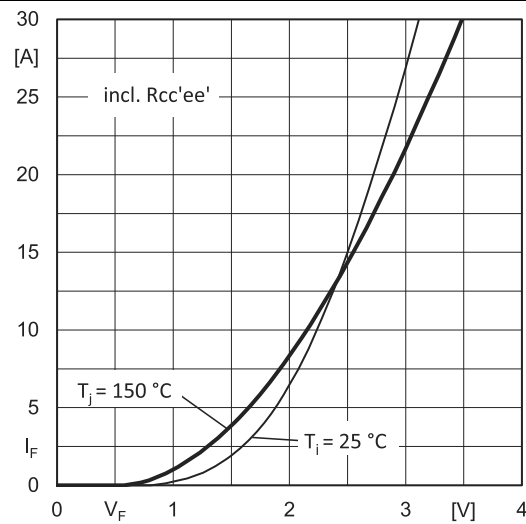


Fig. 10: CAL diode forward characteristic

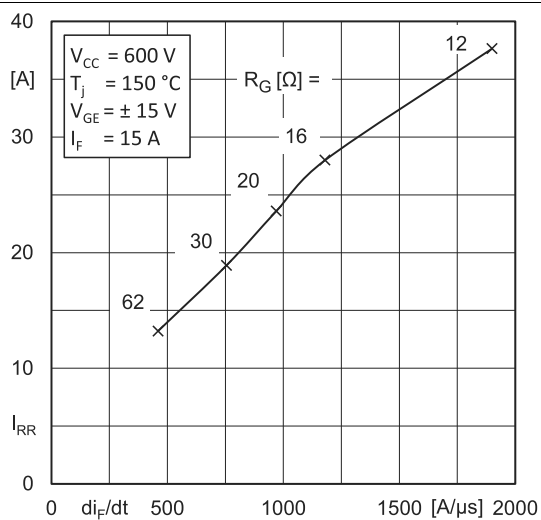


Fig. 11: Typ. CAL diode peak reverse recovery current

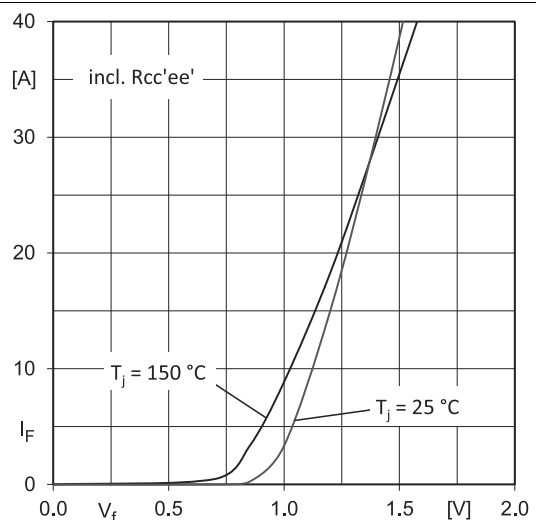
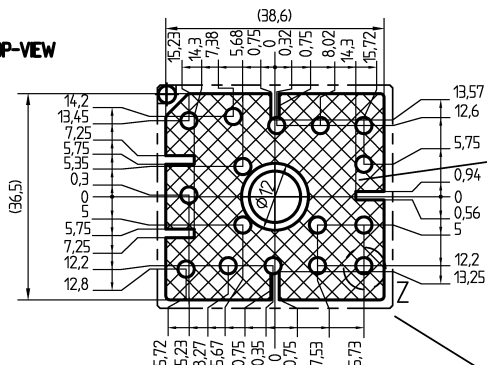
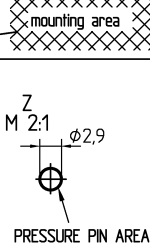


Fig. 12: Typ. input bridge forward characteristic

PCB PCB TOP-VIEW

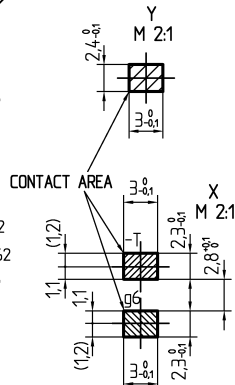
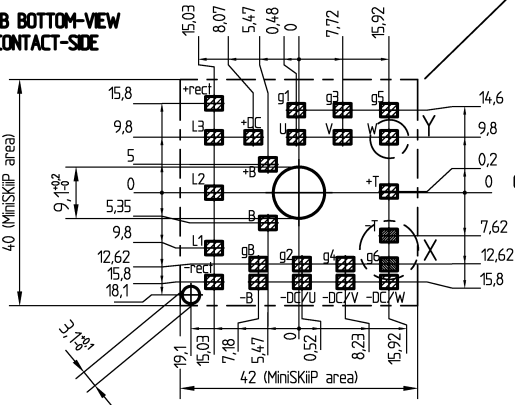


Only for the standard pressure part:
Accessible for mounting of SMD (max height 3.5) on PCB by customer

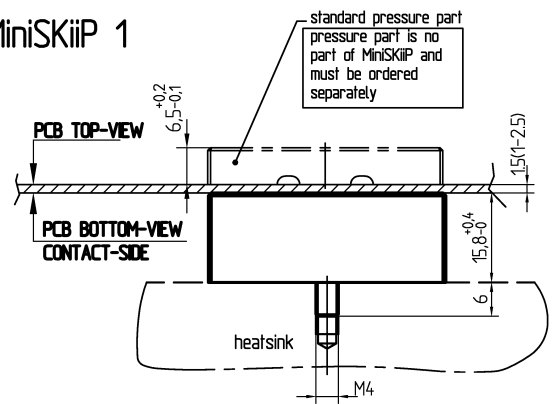


PCB TOP-VIEW
PCB BOTTOM-VIEW CONTACT-SIDE

PCB BOTTOM-VIEW CONTACT-SIDE

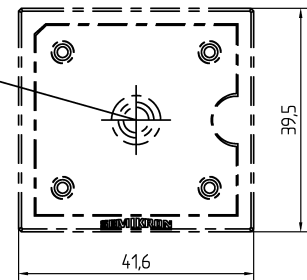


MiniSKiiP 1



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

For mounting please follow the assembly instruction



measure: mm

pinout, dimensions

pinout

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

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