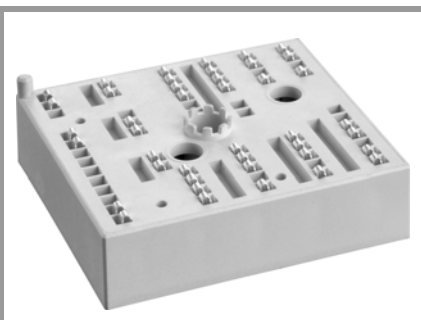


# SKiiP 24AC12T4V1



MiniSKiiP® 2

## SKiiP 24AC12T4V1

### Features

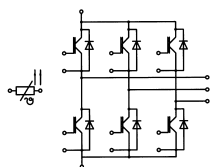
- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

### Typical Applications\*

- Inverter up to 22 kVA
- Typical motor power 11 kW

### Remarks

- $V_{CEsat}$ ,  $V_F$  = chip level value
- Case temp. limited to  $T_C = 125^\circ\text{C}$  max. (for baseplateless modules  $T_C = T_S$ )
- product rel. results valid for  $T_j \leq 150^\circ\text{C}$  (recomm.  $T_{op} = -40 \dots +150^\circ\text{C}$ )



AC

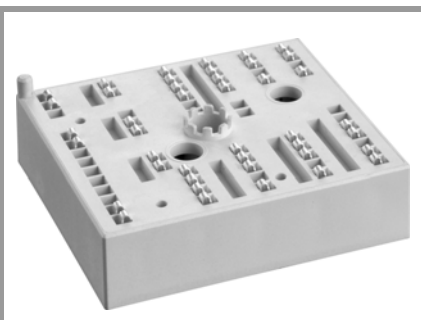
### Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
<b>Inverter - IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200	V	
$I_C$	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	52	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	43	A
$I_C$	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	59	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	48	A
$I_{Cnom}$		35	A	
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	105	A	
$V_{GES}$		-20 ... 20	V	
$t_{psc}$	$V_{CC} = 800 \text{ V}$	$T_j = 150^\circ\text{C}$	10	$\mu\text{s}$
	$V_{GE} \leq 15 \text{ V}$			
	$V_{CES} \leq 1200 \text{ V}$			
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Inverse - Diode</b>				
$I_F$	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	44	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	35	A
$I_F$	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	49	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	40	A
$I_{Fnom}$		35	A	
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$	105	A	
$I_{FSM}$	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	170	A	
$T_j$		-40 ... 175	$^\circ\text{C}$	
<b>Module</b>				
$I_t(\text{RMS})$	$T_{terminal} = 80^\circ\text{C}$ , 20 A per spring	100	A	
$T_{stg}$		-40 ... 125	$^\circ\text{C}$	
$V_{isol}$	AC sinus 50 Hz, t = 1 min	2500	V	

### Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
<b>Inverter - IGBT</b>					
$V_{CE(sat)}$	$I_C = 35 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
$V_{CE0}$	chipllevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.70	0.80	V
$r_{CE}$	$V_{GE} = 15 \text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	30	34	m $\Omega$
		$T_j = 150^\circ\text{C}$	44	47	m $\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$ , $I_C = 1 \text{ mA}$	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
$C_{ies}$	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	1.95		nF
$C_{oes}$		$f = 1 \text{ MHz}$	0.16		nF
$C_{res}$		$f = 1 \text{ MHz}$	0.12		nF
$Q_G$	- 8 V...+ 15 V		200		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$		0		$\Omega$
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$	21		ns
$t_r$	$I_C = 35 \text{ A}$ $R_{Gon} = 15 \Omega$	$T_j = 150^\circ\text{C}$	31		ns
		$T_j = 150^\circ\text{C}$	3.7		mJ
$E_{on}$	$R_{Goff} = 15 \Omega$	$T_j = 150^\circ\text{C}$			mJ
$t_{d(off)}$	$di/dt_{on} = 1300 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	310		ns
$t_f$	$di/dt_{off} = 460 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	63		ns
$E_{off}$	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	3		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		0.85		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		0.69		K/W

# SKiiP 24AC12T4V1



MiniSKiiP® 2

## SKiiP 24AC12T4V1

### Features

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

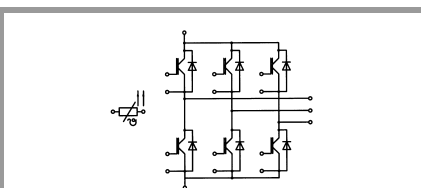
### Typical Applications\*

- Inverter up to 22 kVA
- Typical motor power 11 kW

### Remarks

- $V_{CEsat}$ ,  $V_F$  = chip level value
- Case temp. limited to  $T_C = 125^\circ\text{C}$  max. (for baseplateless modules  $T_C = T_S$ )
- product rel. results valid for  $T_j \leq 150$  (recomm.  $T_{op} = -40 \dots +150^\circ\text{C}$ )

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverse - Diode</b>						
$V_F = V_{EC}$	$I_F = 35 \text{ A}$ $V_{GE} = 0 \text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$		2.30	2.62	V
		$T_j = 150^\circ\text{C}$		2.29	2.62	V
$V_{F0}$	chipllevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
$r_F$	chipllevel	$T_j = 25^\circ\text{C}$		29	32	m $\Omega$
		$T_j = 150^\circ\text{C}$		40	43	m $\Omega$
$I_{RRM}$	$I_F = 35 \text{ A}$	$T_j = 150^\circ\text{C}$		38		A
$Q_{rr}$	$di/dt_{off} = 1400 \text{ A}/\mu\text{s}$ $V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$		6.2		$\mu\text{C}$
$E_{rr}$	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		2.3		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{mK})$			1.2		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W}/(\text{mK})$			1		K/W
<b>Module</b>						
$L_{CE}$				-		nH
$M_s$	to heat sink		2		2.5	Nm
$w$				55		g
<b>Temperature Sensor</b>						
$R_{100}$	$T_r=100^\circ\text{C}$ ( $R_{25}=1000\Omega$ )			$1670 \pm 3\%$		$\Omega$
$R(T)$	$R(T)=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$ ], $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$ , $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



AC

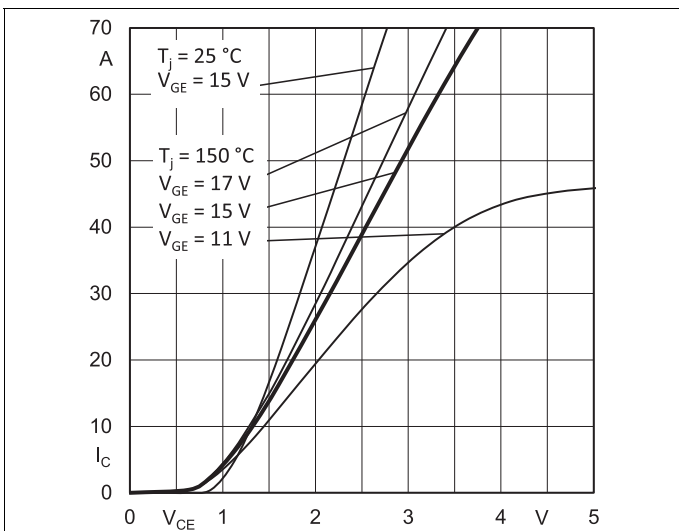


Fig. 1: Typ. output characteristic, inclusive  $R_{CC'+EE'}$

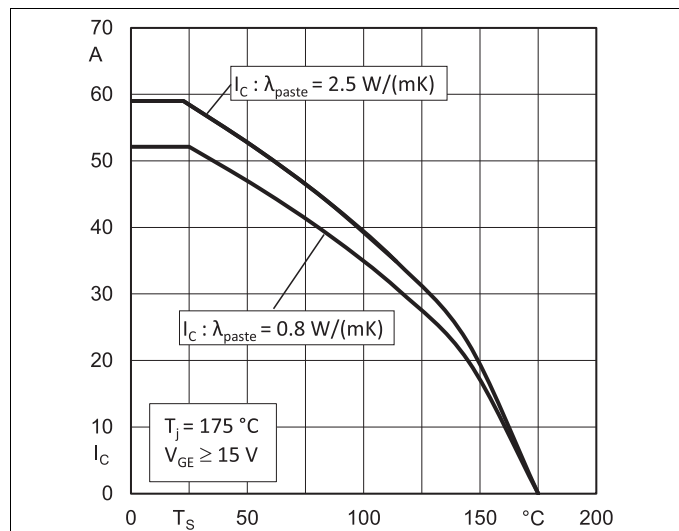


Fig. 2: Rated current vs. temperature  $I_C = f(T_s)$

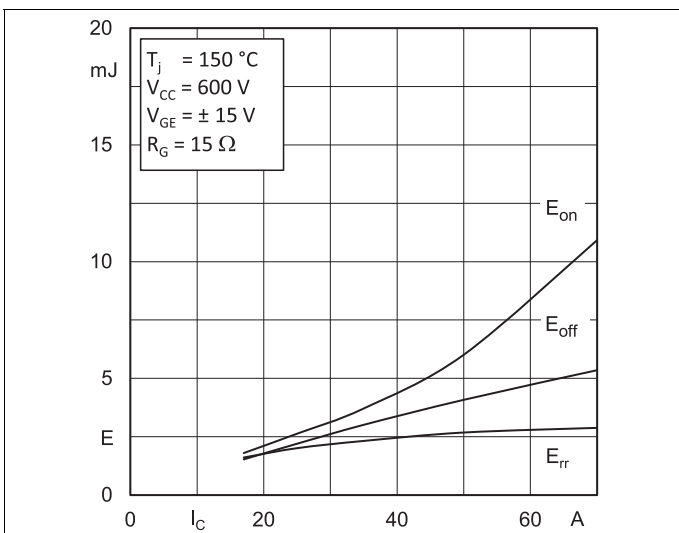


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

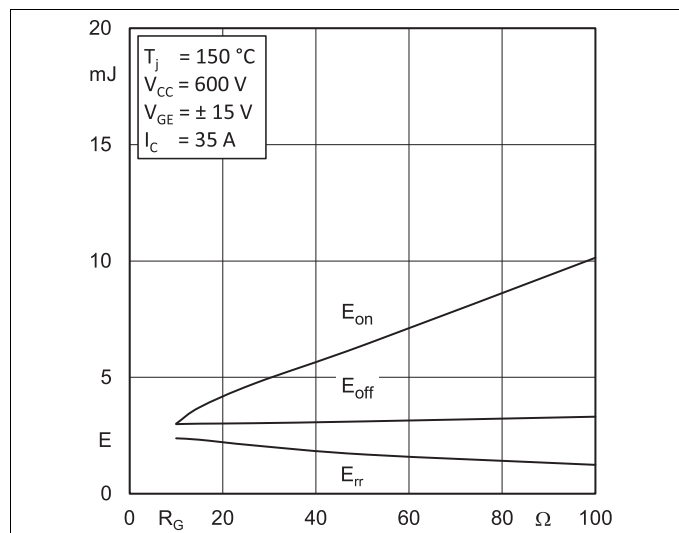


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

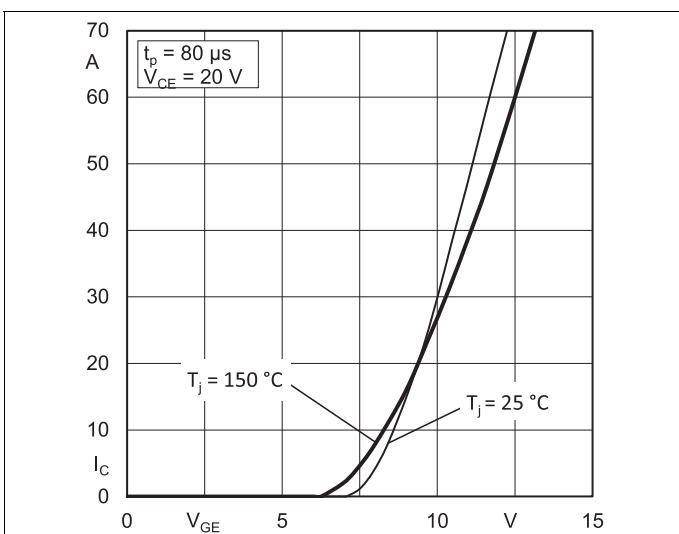


Fig. 5: Typ. transfer characteristic

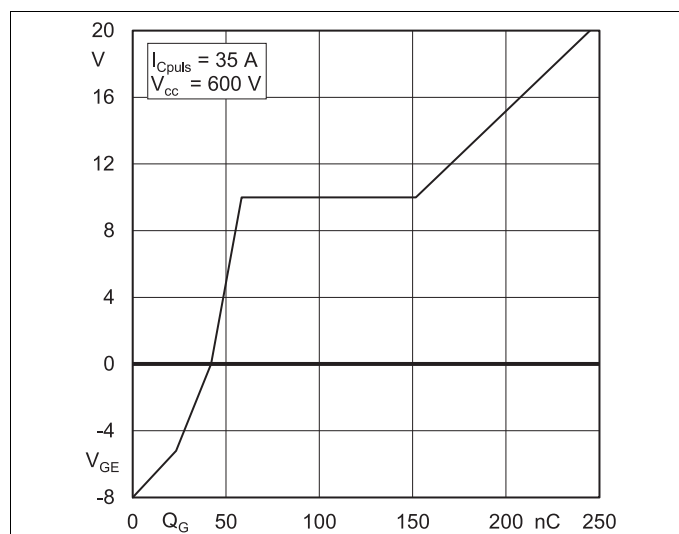


Fig. 6: Typ. gate charge characteristic

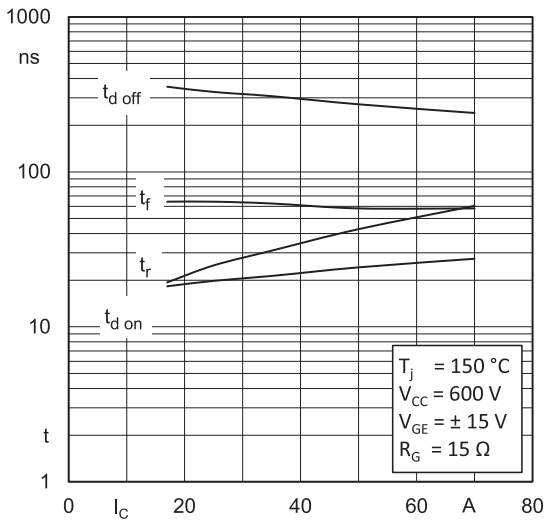


Fig. 7: Typ. switching times vs.  $I_C$

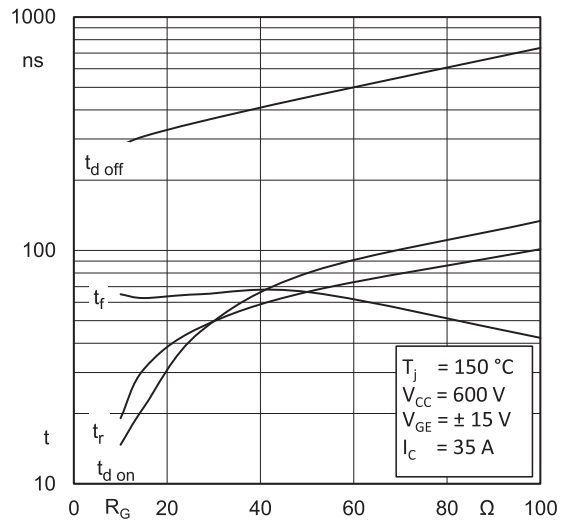


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

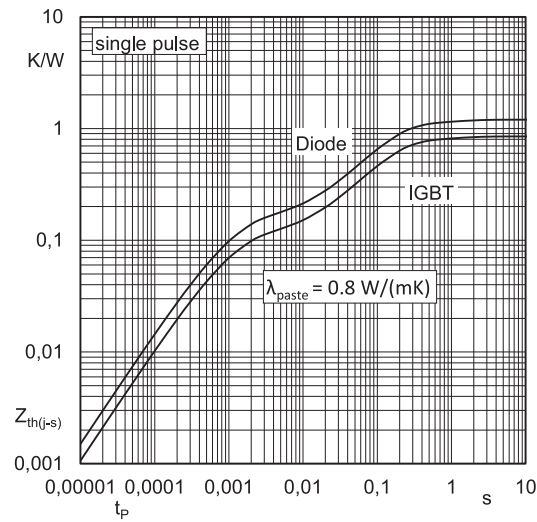


Fig. 9: Transient thermal impedance of IGBT and Diode

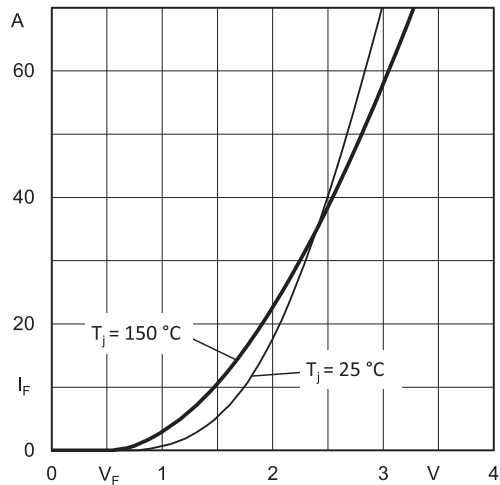


Fig. 10: CAL diode forward characteristic

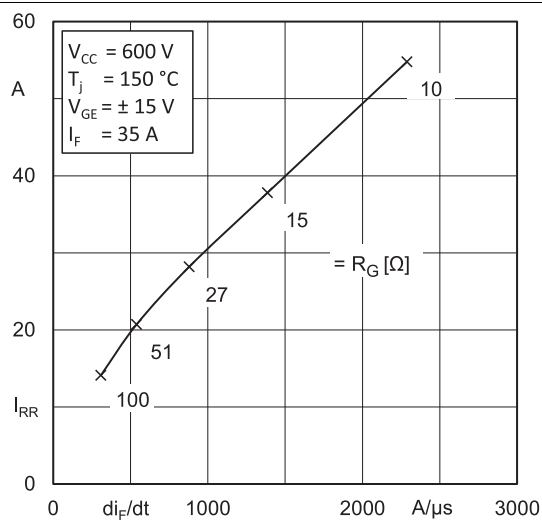


Fig. 11: Typ. CAL diode peak reverse recovery current

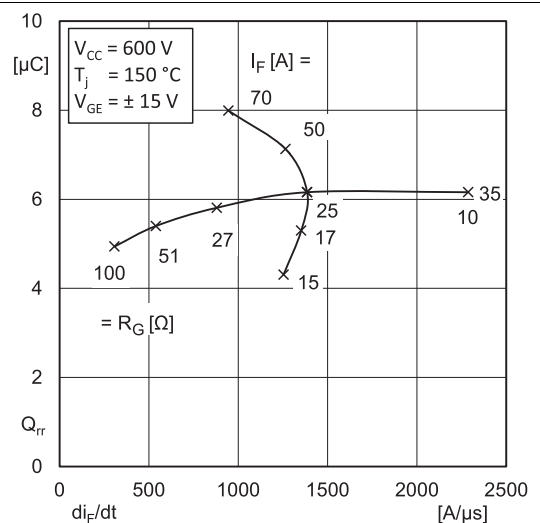
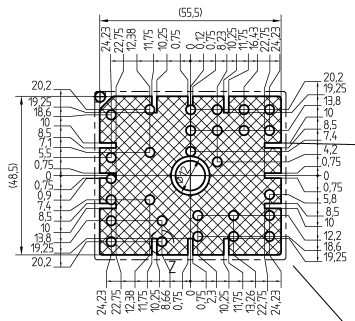


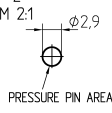
Fig. 12: Typ. CAL diode recovery charge

# SKiiP 24AC12T4V1

PCB TOP-VIEW

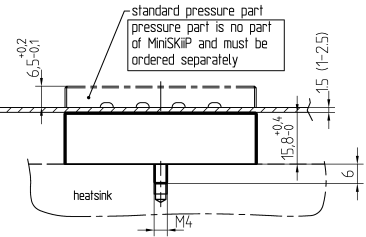


Only for the standard pressure part:  
Accessible for mounting of SMD (max height 3.5) on PCB by customer



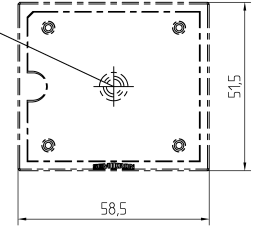
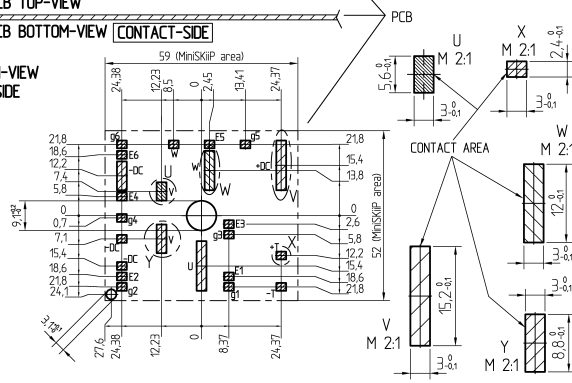
## MiniSKiiP 2

PCB TOP-VIEW  
PCB BOTTOM-VIEW CONTACT-SIDE



PCB TOP-VIEW  
PCB BOTTOM-VIEW CONTACT-SIDE

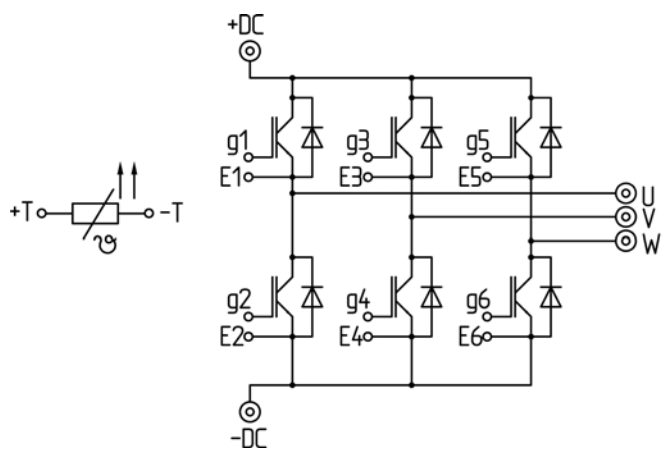
PCB BOTTOM-VIEW CONTACT-SIDE



measure: mm  
tolerance: ISO 2768-f

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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**

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