

# SKiiP 12AC12T4V1



MiniSKiiP® 1

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### Features

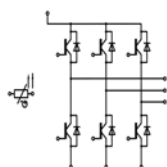
- Trench 4 IGBT's
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised file no. E63532

### Typical Applications\*

- Inverter up to 12 kVA
- Typical motor power 5,5 kW

### Remarks

- $V_{CEsat}$ ,  $V_F$  = 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.  $T_{op} = -40 \dots +150^\circ\text{C}$ )



AC

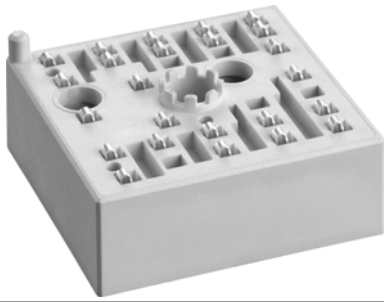
### Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
<b>Inverter - IGBT</b>			
$V_{CES}$	$T_j = 25^\circ\text{C}$	1200	V
$I_C$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	18
		$T_s = 70^\circ\text{C}$	18
$I_{Cnom}$		15	A
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$	45	A
$V_{GES}$		-20 ... 20	V
$t_{psc}$	$V_{CC} = 800\text{ V}$	$T_j = 150^\circ\text{C}$	10
	$V_{GE} \leq 15\text{ V}$		
	$V_{CES} \leq 1200\text{ V}$		
$T_j$		-40 ... 175	$^\circ\text{C}$
<b>Inverse - Diode</b>			
$I_F$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	23
		$T_s = 70^\circ\text{C}$	18
$I_{Fnom}$		15	A
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$	45	A
$I_{FSM}$	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	65	A
$T_j$		-40 ... 175	$^\circ\text{C}$
<b>Module</b>			
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$ , 20A per spring	20	A
$T_{stg}$		-40 ... 125	$^\circ\text{C}$
$V_{isol}$	AC sinus 50Hz, t = 1 min	2500	V

### Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
<b>Inverter - IGBT</b>					
$V_{CE(sat)}$	$I_C = 15\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
$V_{CE0}$		$T_j = 25^\circ\text{C}$	0.8	0.9	V
		$T_j = 150^\circ\text{C}$	0.7	0.8	V
$r_{CE}$	$V_{GE} = 15\text{ V}$	$T_j = 25^\circ\text{C}$	70	80	m $\Omega$
		$T_j = 150^\circ\text{C}$	103	110	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
					mA
$C_{ies}$	$V_{CE} = 25\text{ V}$		0.90		nF
$C_{oes}$	$V_{GE} = 0\text{ V}$		0.08		nF
$C_{res}$			0.06		nF
$Q_G$	- 8 V...+ 15 V		85		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$		0.00		$\Omega$
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	31		ns
$t_r$	$I_C = 15\text{ A}$	$T_j = 150^\circ\text{C}$	30		ns
$E_{on}$	$R_{Gon} = 39\ \Omega$ $R_{Goff} = 39\ \Omega$	$T_j = 150^\circ\text{C}$	1.65		mJ
$t_{d(off)}$	$di/dt_{on} = 400\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	315		ns
$t_f$	$di/dt_{off} = 200\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	66		ns
$E_{off}$	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	1.5		mJ
$R_{th(j-s)}$	per IGBT		1.3		K/W

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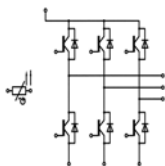
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverse - Diode</b>						
$V_F = V_{EC}$	$I_F = 15 \text{ A}$ $V_{GE} = 0 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$		2.4	2.7	V
		$T_j = 150^\circ\text{C}$		2.4	2.8	V
$V_{F0}$		$T_j = 25^\circ\text{C}$		1.3	1.5	V
		$T_j = 150^\circ\text{C}$		0.9	1.1	V
$r_F$		$T_j = 25^\circ\text{C}$		72	81	m $\Omega$
		$T_j = 150^\circ\text{C}$		103	111	m $\Omega$
$I_{RRM}$	$I_F = 15 \text{ A}$	$T_j = 150^\circ\text{C}$		12		A
$Q_{rr}$	$di/dt_{off} = 500 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		2		$\mu\text{C}$
$E_{rr}$	$V_{GE} = -15 \text{ V}$ $V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		0.79		mJ
$R_{th(j-s)}$	per Diode			1.92		K/W
<b>Module</b>						
$M_s$	to heat sink		2		2.5	Nm
w				35		g
<b>Temperatur Sensor</b>						
$R_{100}$	$T_C = 100^\circ\text{C}$ ( $R_{25} = 1000\Omega$ )			$1670 \pm 3\%$		$\Omega$
$R(T)$	$R(T) = 1000\Omega [1 + A(T - 25^\circ\text{C}) + B(T - 25^\circ\text{C})^2]$ ], $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$ , $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



AC

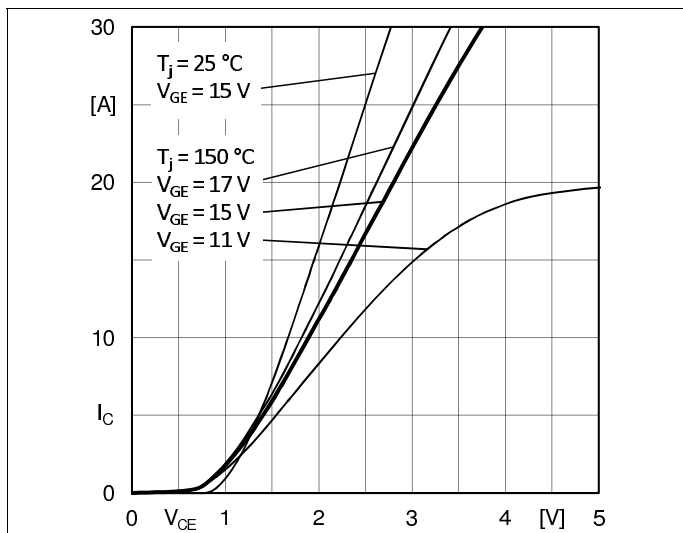


Fig. 1: Typ. output characteristic, inclusive  $R_{CC+EE}$

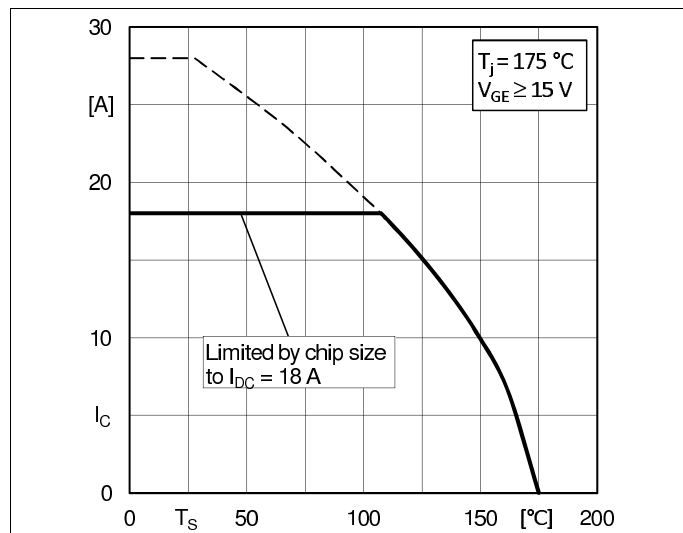


Fig. 2: Rated current vs. temperature  $I_C = f(T_S)$

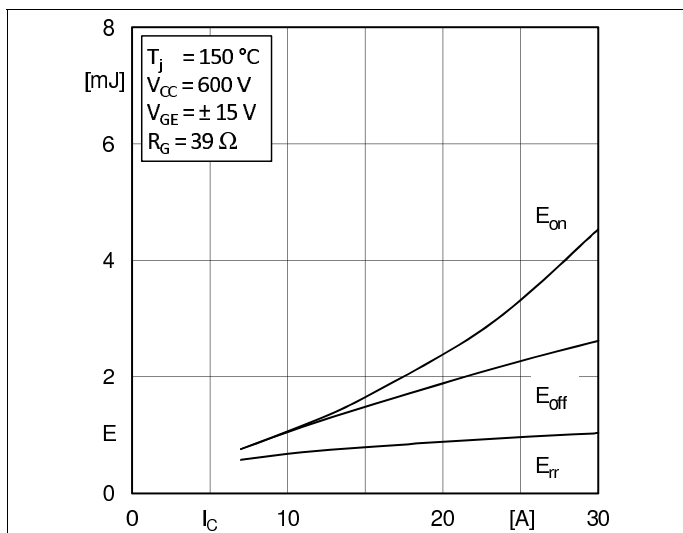


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

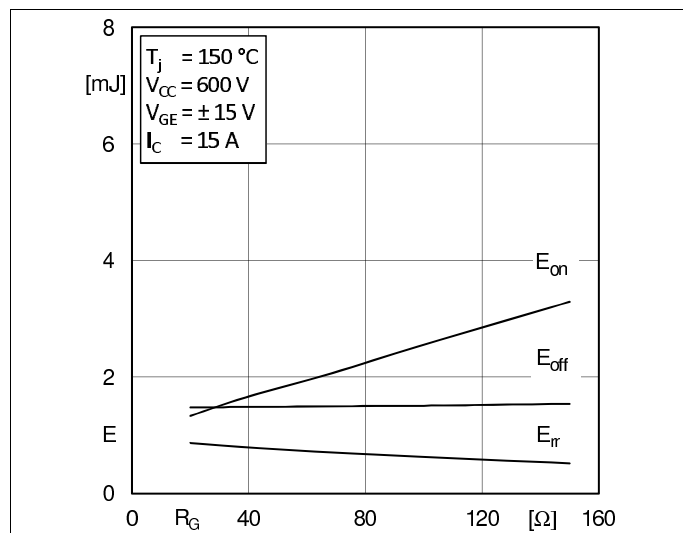


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

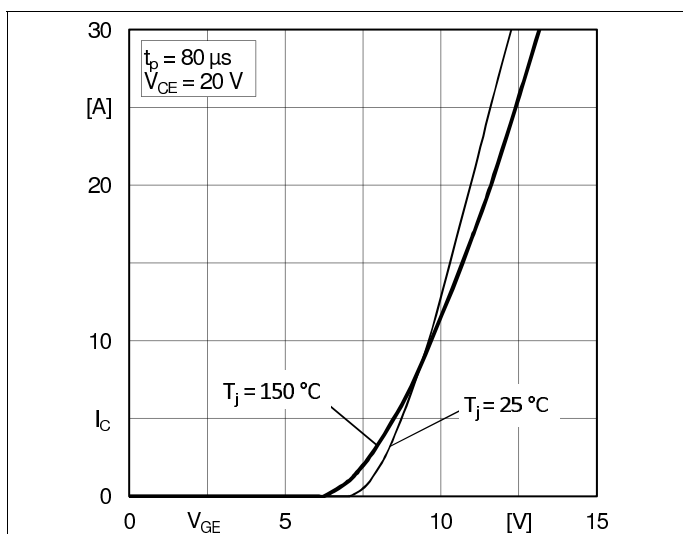


Fig. 5: Typ. transfer characteristic

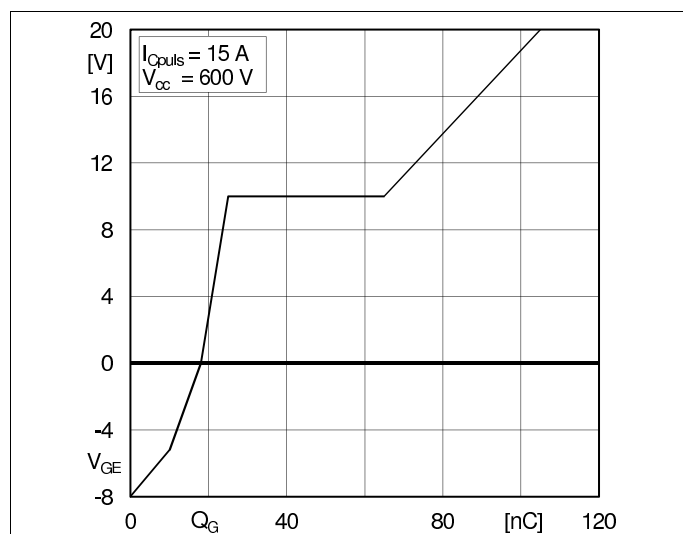


Fig. 6: Typ. gate charge characteristic

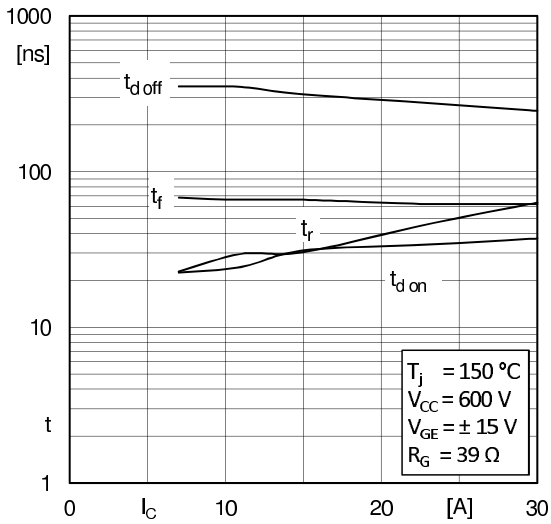


Fig. 7: Typ. switching times vs.  $I_C$

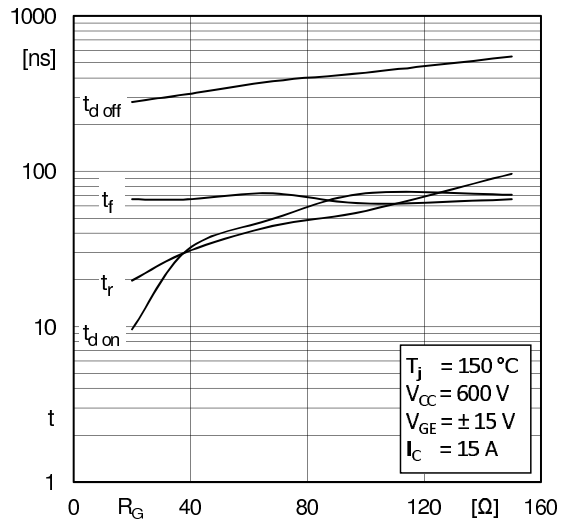


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

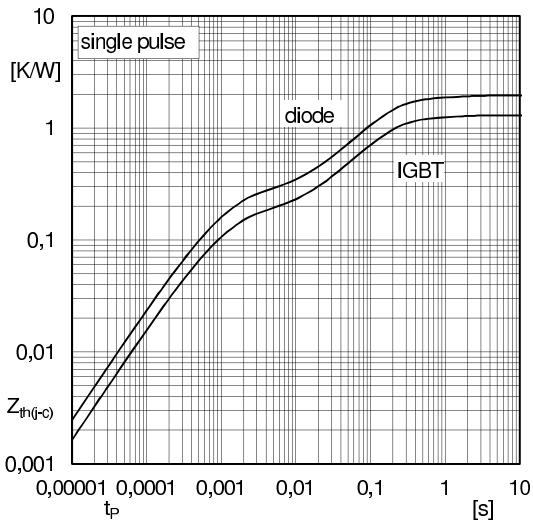


Fig. 9: Transient thermal impedance of IGBT and Diode

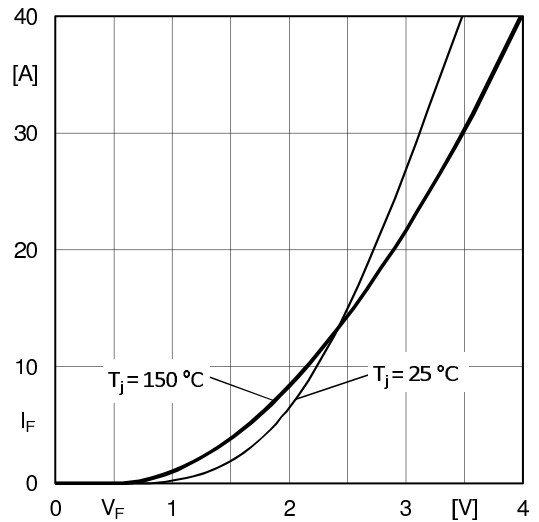


Fig. 10: CAL diode forward characteristic

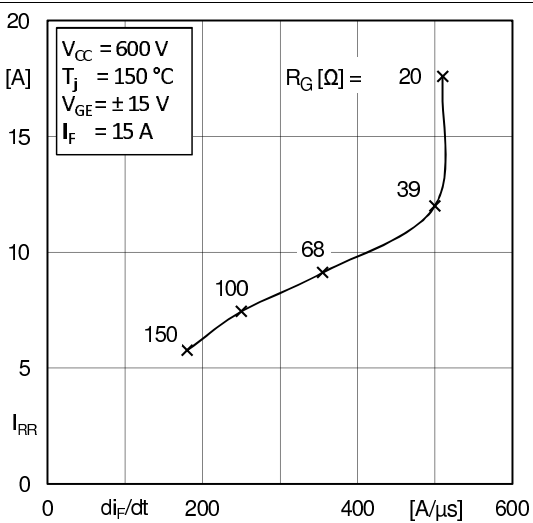


Fig. 11: Typ. CAL diode peak reverse recovery current

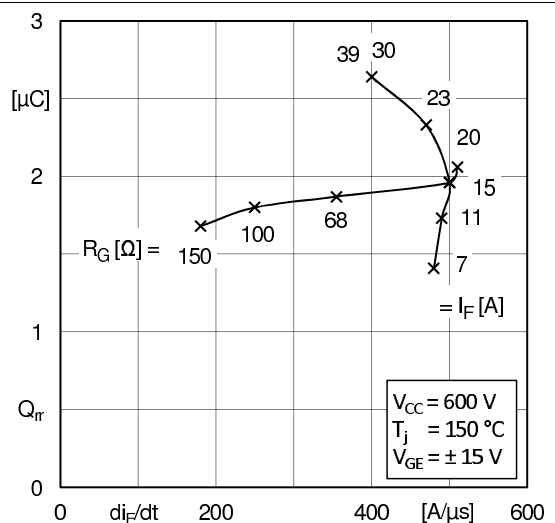
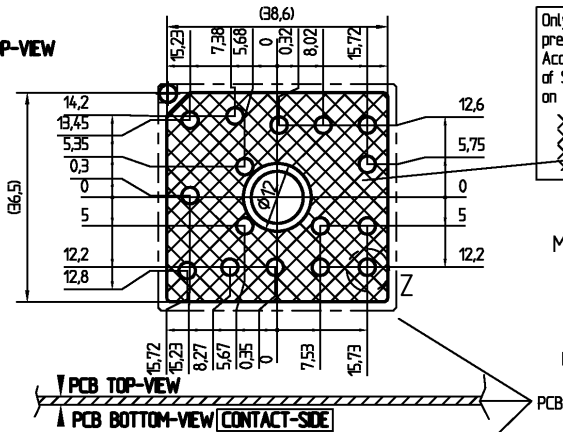
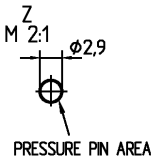
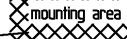


Fig. 12: Typ. CAL diode recovery charge

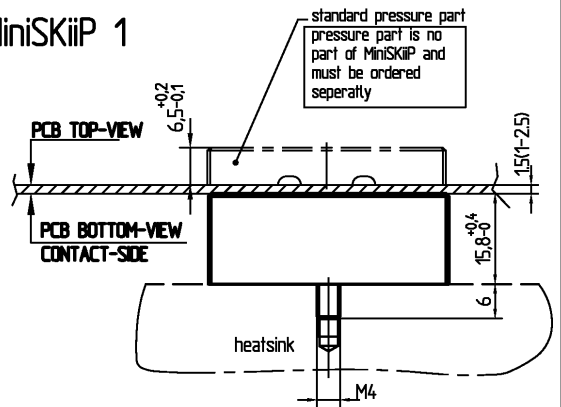
## PCB PCB TOP-VIEW



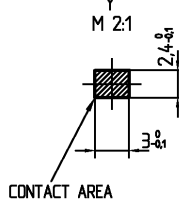
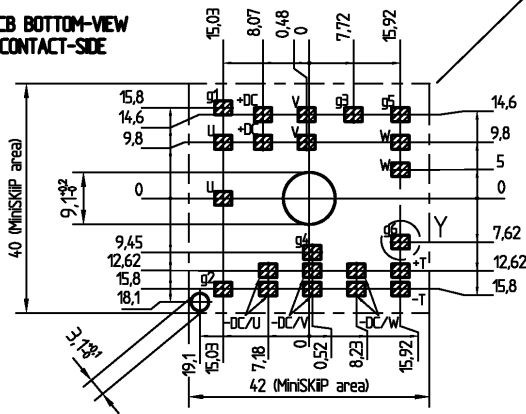
Only for the standard pressure part:  
Accessible for mounting of SMD (max height 3.5) on PCB by customer



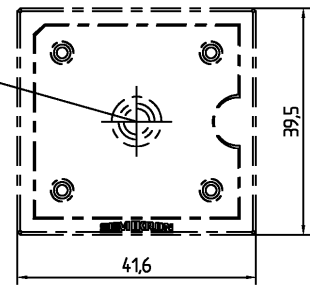
## MiniSKiIP 1



## PCB BOTTOM-VIEW CONTACT-SIDE

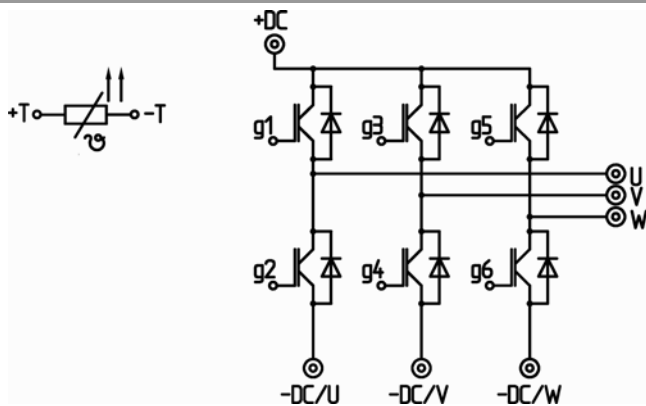


For mounting please follow the assembly instruction



measure: mm  
tolerance: ISO 2768-f

## pinout, dimensions



- ⊙ power connector
- control connector

## pinout

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

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