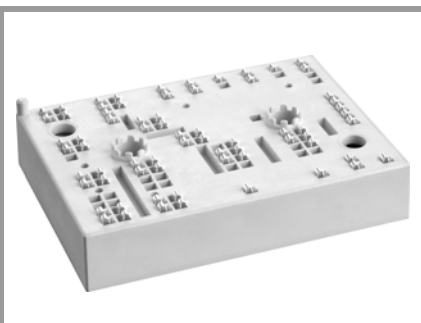


# SKiiP 39GA12T4V1



MiniSKiiP® 3

## IGBT module

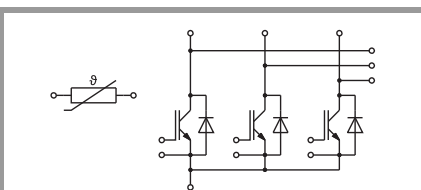
### SKiiP 39GA12T4V1

#### Features

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

#### 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

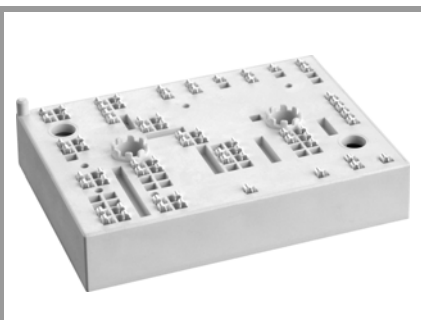


GA

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
<b>Inverter - IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$		1200	V
$I_C$	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	167	A
		$T_j = 175^\circ\text{C}$	135	A
$I_C$	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	217	A
		$T_j = 175^\circ\text{C}$	177	A
$I_{Cnom}$			150	A
$I_{CRM}$	$I_{CRM} = 3 \times I_{Cnom}$		450	A
$V_{GES}$			-20 ... 20	V
$t_{psc}$	$V_{CC} = 800 \text{ V}$ $V_{GE} \leq 15 \text{ V}$ $V_{CES} \leq 1200 \text{ V}$	$T_j = 150^\circ\text{C}$	10	$\mu\text{s}$
$T_j$			-40 ... 175	$^\circ\text{C}$
<b>Inverse - Diode</b>				
$I_F$	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	136	A
		$T_j = 175^\circ\text{C}$	107	A
$I_F$	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	163	A
		$T_j = 175^\circ\text{C}$	130	A
$I_{Fnom}$			150	A
$I_{FRM}$	$I_{FRM} = 3 \times I_{Fnom}$		450	A
$I_{FSM}$	$t_p = 10 \text{ ms}, \sin 180^\circ, T_j = 150^\circ\text{C}$		900	A
$T_j$			-40 ... 175	$^\circ\text{C}$
<b>Module</b>				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}, 20 \text{ A per spring}$		160	A
$T_{stg}$			-40 ... 125	$^\circ\text{C}$
$V_{isol}$	AC sinus 50 Hz, $t = 1 \text{ min}$		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverter - IGBT</b>						
$V_{CE(sat)}$	$I_C = 150 \text{ A}$ $V_{GE} = 15 \text{ V}$ 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	$T_j = 25^\circ\text{C}$		7.0	8.0	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$		10	11	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6 \text{ mA}$		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	$\text{mA}$
$C_{ies}$	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$		8.80		$\text{nF}$
$C_{oes}$		$f = 1 \text{ MHz}$		0.58		$\text{nF}$
$C_{res}$		$f = 1 \text{ MHz}$		0.47		$\text{nF}$
$Q_G$	- 8 V...+ 15 V			850		$\text{nC}$
$R_{Gint}$	$T_j = 25^\circ\text{C}$			5.0		$\Omega$
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$		165		ns
$t_r$	$I_C = 150 \text{ A}$ $R_{Gon} = 1 \Omega$	$T_j = 150^\circ\text{C}$		50		ns
		$T_j = 150^\circ\text{C}$				
$E_{on}$	$R_{Goff} = 1 \Omega$	$T_j = 150^\circ\text{C}$		22.5		$\text{mJ}$
$t_{d(off)}$	$di/dt_{on} = 2840 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		390		ns
$t_f$	$di/dt_{off} = 1880 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		80		ns
$E_{off}$	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$		14		$\text{mJ}$
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$			0.33		$\text{K/W}$
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$			0.21		$\text{K/W}$

# SKiiP 39GA12T4V1



MiniSKiiP® 3

## IGBT module

### SKiiP 39GA12T4V1

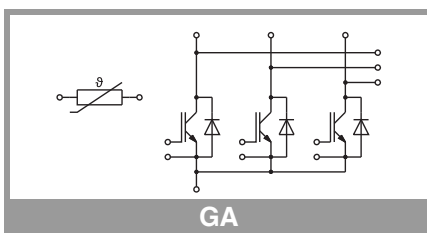
#### Features

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- Robust and soft freewheeling diodes in CAL technology
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#### 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
<b>Inverse - Diode</b>						
$V_F = V_{EC}$	$I_F = 150\text{ A}$ $V_{GE} = 0\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$		2.14	2.46	V
		$T_j = 150^\circ\text{C}$		2.07	2.38	V
$V_{F0}$	chiplevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
$r_F$	chiplevel	$T_j = 25^\circ\text{C}$		5.6	6.4	m $\Omega$
		$T_j = 150^\circ\text{C}$		7.8	8.5	m $\Omega$
$I_{RRM}$	$I_F = 150\text{ A}$	$T_j = 150^\circ\text{C}$		188		A
$Q_{rr}$	$di/dt_{off} = 4020\text{ A}/\mu\text{s}$ $V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		27		$\mu\text{C}$
$E_{rr}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		11.4		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			0.52		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			0.39		K/W
<b>Module</b>						
$L_{CE}$				-		nH
$M_s$	to heat sink		2		2.5	Nm
$w$				82		g
<b>Temperature Sensor</b>						
$R_{100}$	$T_r=100^\circ\text{C}$ ( $R_{25}=1000\Omega$ )			$1670 \pm 3\%$		$\Omega$
$R(T)$	$R(T)=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$ $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$ , $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



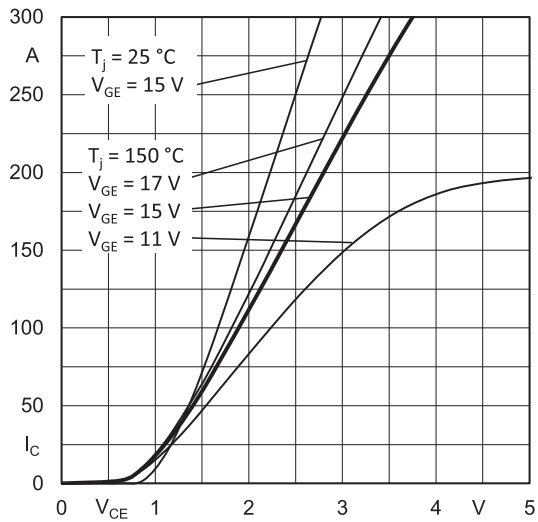


Fig. 1: Typ. output characteristic, inclusive  $R_{CC+EE}$

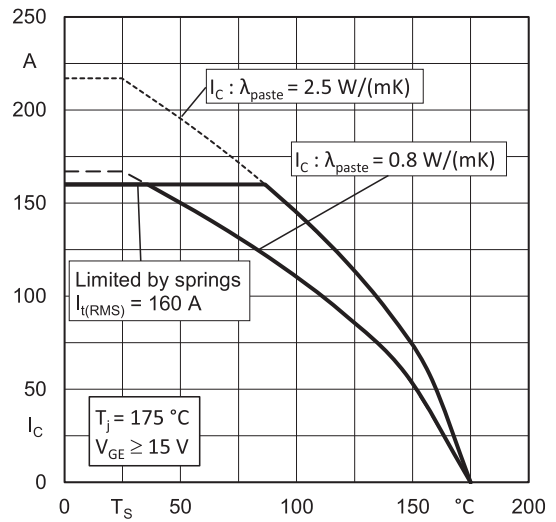


Fig. 2: Rated current vs. temperature  $I_C = f(T_S)$

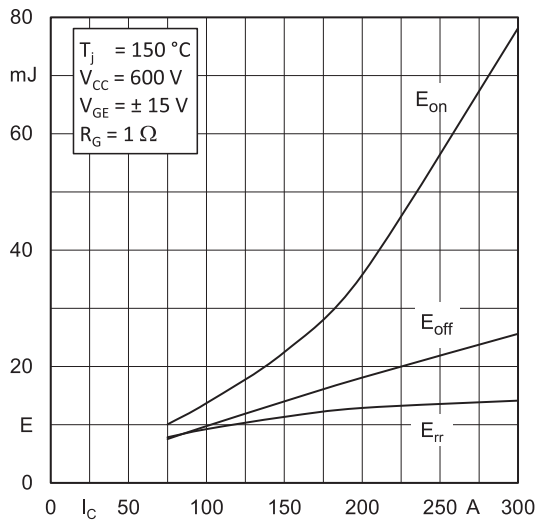


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

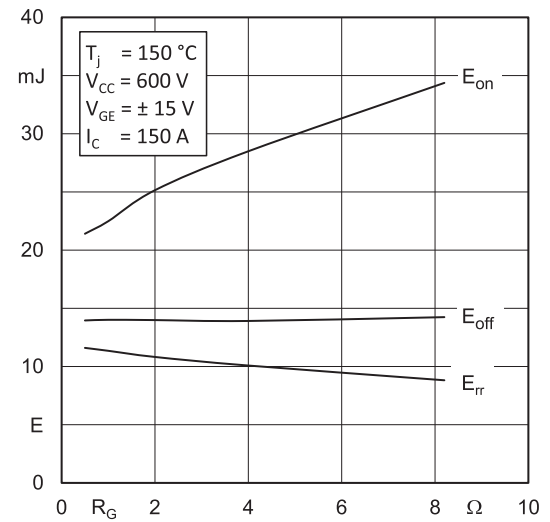


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

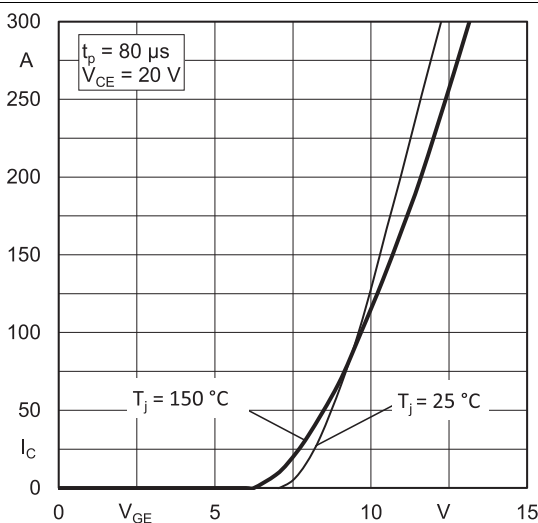


Fig. 5: Typ. transfer characteristic

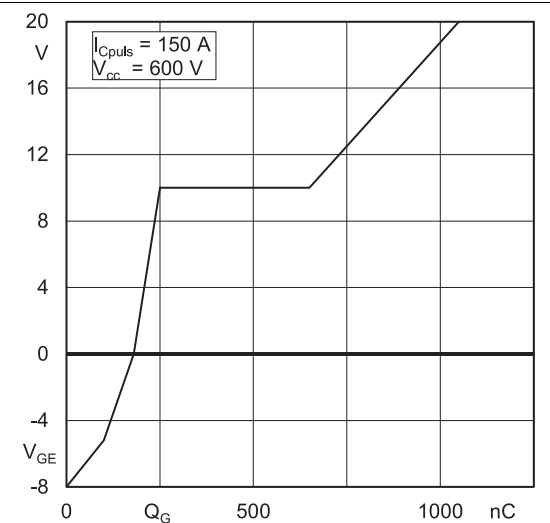
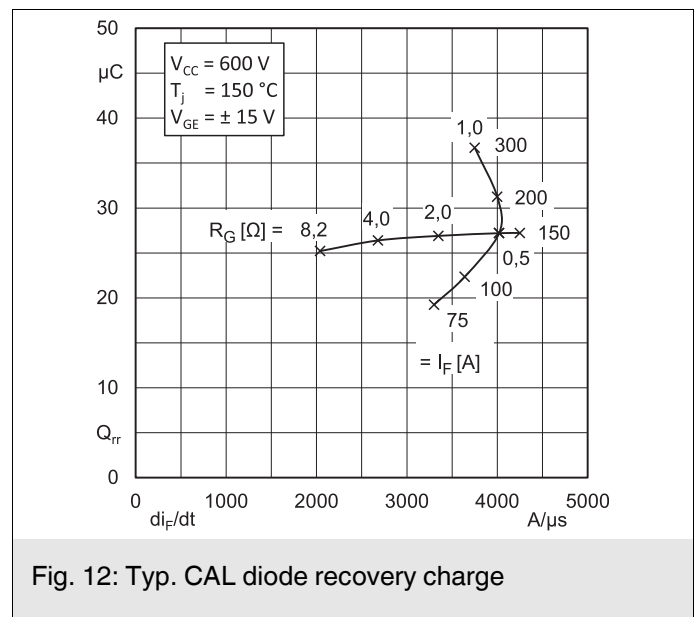
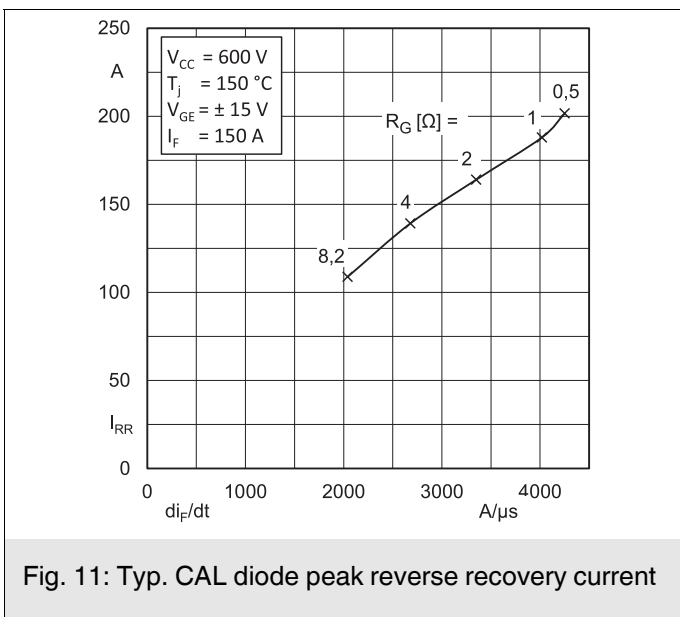
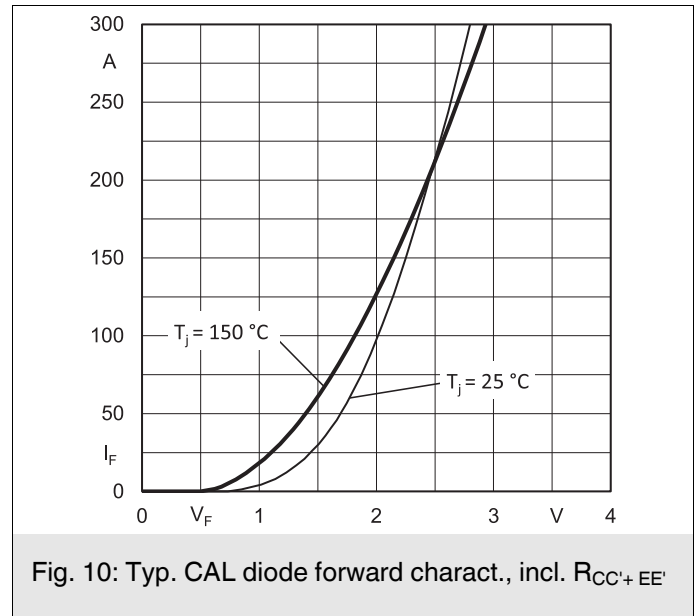
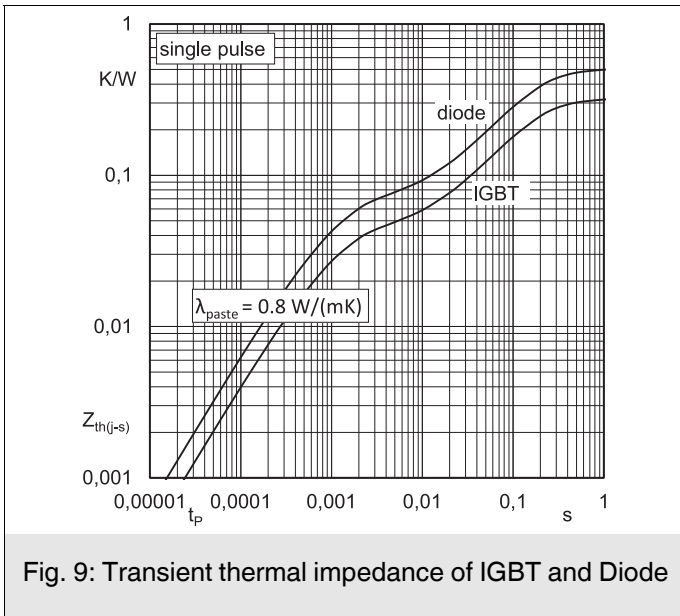
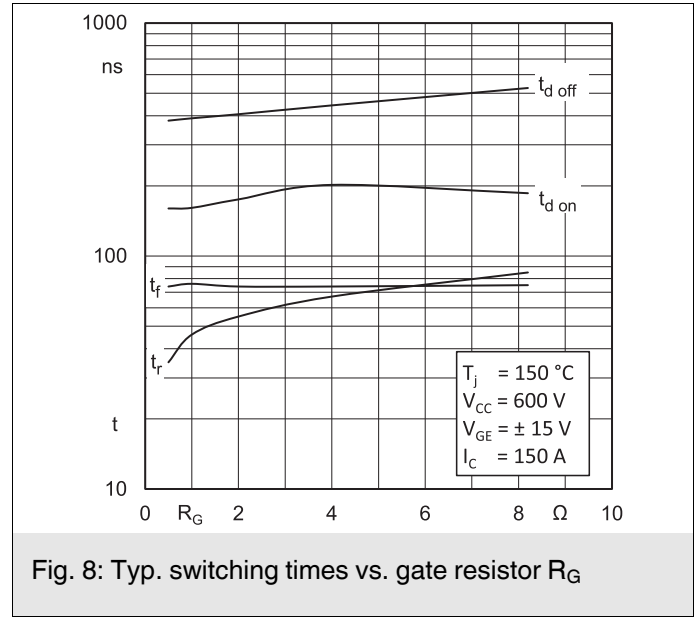
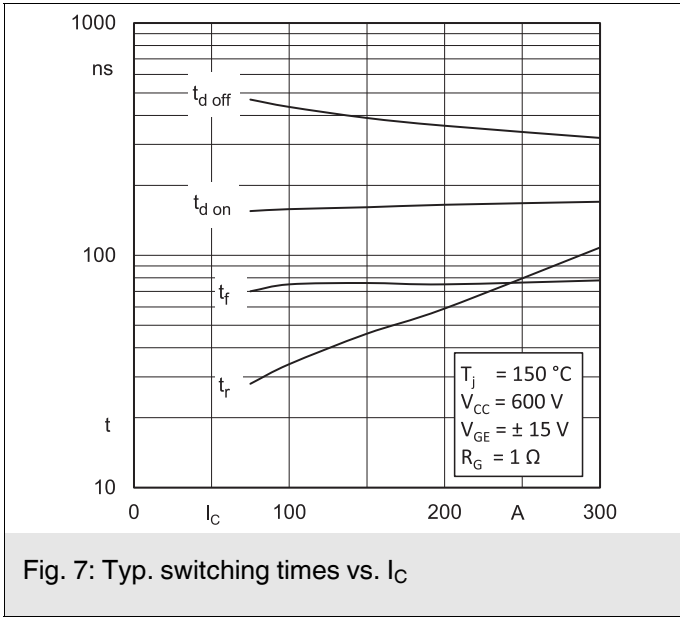
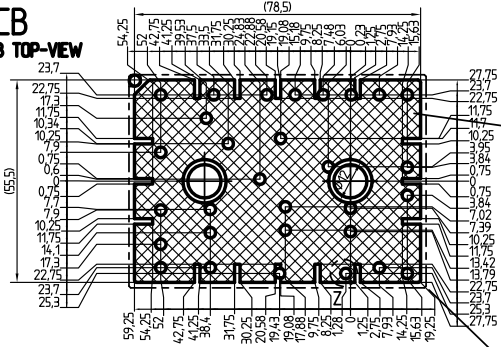


Fig. 6: Typ. gate charge characteristic

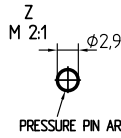


## PCB PCB TOP-VIEW



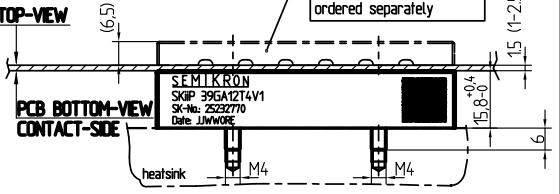
Only for the standard pressure part:  
Accessible for mounting of SMD (max height 3.5) on PCB by customer

mounting area



## MiniSKiIP 3

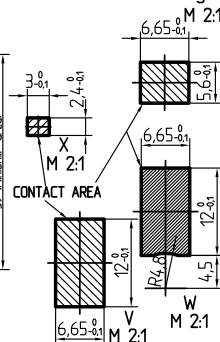
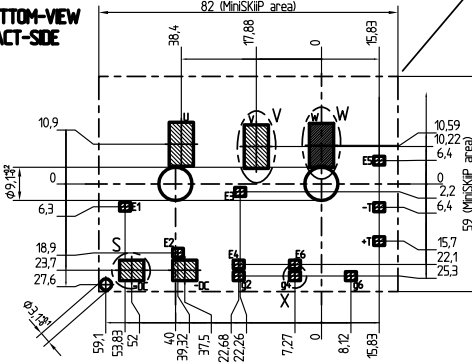
### PCB TOP-VIEW



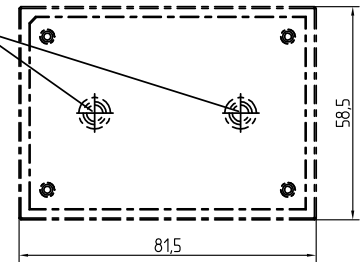
### PCB TOP-VIEW

### PCB BOTTOM-VIEW CONTACT-SIDE

### PCB BOTTOM-VIEW CONTACT-SIDE



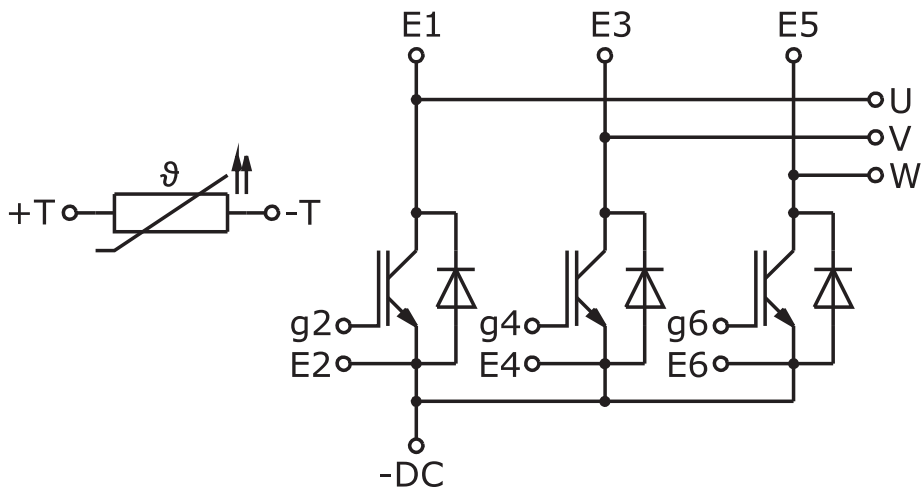
For mounting please follow the assembly instruction



dimensions in mm  
tolerances acc. ISO 2768-f

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## pinout, dimensions



## pinout

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

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