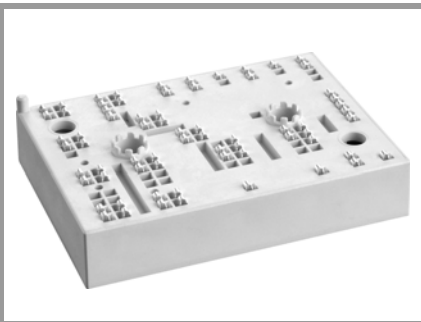


# SKiiP 39AC12T4V21



MiniSKiiP® 3

## Sixpack

### SKiiP 39AC12T4V21

#### Features\*

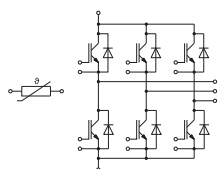
- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532
- Insulated by Si<sub>3</sub>N<sub>4</sub> (Silicon Nitride) AMB (Active Metal Brazed) ceramic substrate for optimized thermal performance

#### Typical Applications

- Inverter up to 50 kVA
- Typical motor power 30 kW

#### Remarks

- Max. case temperature limited to T<sub>C</sub>=125°C
- Product reliability results valid for T<sub>j</sub>≤150°C (recommended T<sub>j,op</sub>=-40...+150°C)
- For short circuit: Soft R<sub>Goff</sub> recommended
- MiniSKiiP “Technical Explanations” and “Mounting Instructions” are part of the data sheet. Please refer to both documents for further information.

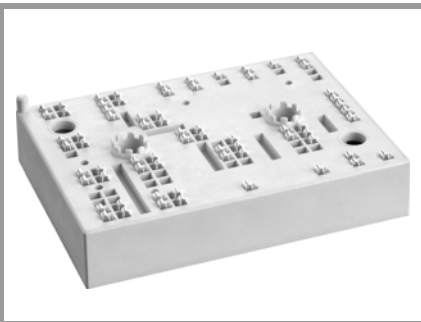


AC

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
<b>Inverter - IGBT</b>				
V <sub>CES</sub>	T <sub>j</sub> = 25 °C		1200	V
I <sub>C</sub>	λ <sub>paste</sub> =0.8 W/(mK)	T <sub>s</sub> = 25 °C	189	A
		T <sub>j</sub> = 175 °C	154	A
I <sub>C</sub>	λ <sub>paste</sub> =2.5 W/(mK)	T <sub>s</sub> = 25 °C	249	A
		T <sub>j</sub> = 175 °C	204	A
I <sub>Cnom</sub>			150	A
I <sub>CRM</sub>			450	A
V <sub>GES</sub>			-20 ... 20	V
t <sub>psc</sub>	V <sub>CC</sub> = 800 V V <sub>GE</sub> ≤ 15 V V <sub>CES</sub> ≤ 1200 V	T <sub>j</sub> = 150 °C	10	μs
T <sub>j</sub>			-40 ... 175	°C
<b>Inverse - Diode</b>				
V <sub>RRM</sub>	T <sub>j</sub> = 25 °C		1200	V
I <sub>F</sub>	λ <sub>paste</sub> =0.8 W/(mK)	T <sub>s</sub> = 25 °C	149	A
		T <sub>s</sub> = 70 °C	118	A
I <sub>F</sub>	λ <sub>paste</sub> =2.5 W/(mK)	T <sub>s</sub> = 25 °C	221	A
		T <sub>s</sub> = 70 °C	177	A
I <sub>FRM</sub>			450	A
I <sub>FSM</sub>	t <sub>p</sub> = 10 ms, sin 180°, T <sub>j</sub> = 150 °C		900	A
T <sub>j</sub>			-40 ... 175	°C
<b>Module</b>				
I <sub>t(RMS)</sub>	T <sub>terminal</sub> = 80 °C, 20 A per spring		160	A
T <sub>stg</sub>	module without TIM		-40 ... 125	°C
V <sub>isol</sub>	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverter - IGBT</b>						
V <sub>CE(sat)</sub>	I <sub>C</sub> = 150 A V <sub>GE</sub> = 15 V chipelevel	T <sub>j</sub> = 25 °C	1.85	2.10		V
		T <sub>j</sub> = 150 °C	2.25	2.45		V
V <sub>CE0</sub>	chipelevel	T <sub>j</sub> = 25 °C	0.80	0.90		V
		T <sub>j</sub> = 150 °C	0.70	0.80		V
r <sub>CE</sub>	V <sub>GE</sub> = 15 V chipelevel	T <sub>j</sub> = 25 °C	7.0	8.0		mΩ
		T <sub>j</sub> = 150 °C	10	11		mΩ
V <sub>GE(th)</sub>	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 6 mA		5	5.8	6.5	V
I <sub>CES</sub>	V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1200 V, T <sub>j</sub> = 25 °C				1.5	mA
C <sub>ies</sub>	V <sub>CE</sub> = 25 V V <sub>GE</sub> = 0 V	f = 1 MHz	8.80			nF
C <sub>oes</sub>		f = 1 MHz	0.58			nF
C <sub>res</sub>		f = 1 MHz	0.47			nF
Q <sub>G</sub>	V <sub>GE</sub> = - 8 V...+ 15 V			850		nC
R <sub>Gint</sub>	T <sub>j</sub> = 25 °C			5.0		Ω
t <sub>d(on)</sub>	V <sub>CC</sub> = 600 V	T <sub>j</sub> = 150 °C		165		ns
t <sub>r</sub>	I <sub>C</sub> = 150 A R <sub>G on</sub> = 1 Ω	T <sub>j</sub> = 150 °C		50		ns
		T <sub>j</sub> = 150 °C		22.5		mJ
E <sub>on</sub>	R <sub>G off</sub> = 1 Ω	T <sub>j</sub> = 150 °C		22.5		mJ
t <sub>d(off)</sub>	di/dt <sub>on</sub> = 2840 A/μs	T <sub>j</sub> = 150 °C		390		ns
t <sub>f</sub>	di/dt <sub>off</sub> = 1880 A/μs	T <sub>j</sub> = 150 °C		80		ns
E <sub>off</sub>	V <sub>GE</sub> = +15/-15 V	T <sub>j</sub> = 150 °C		14		mJ
R <sub>th(j-s)</sub>	per IGBT, λ <sub>paste</sub> =0.8 W/(mK)			0.26		K/W
R <sub>th(j-s)</sub>	per IGBT, λ <sub>paste</sub> =2.5 W/(mK)			0.16		K/W

# SKiiP 39AC12T4V21



MiniSKiiP® 3

## Sixpack

### SKiiP 39AC12T4V21

#### Features\*

- Trench 4 IGBTs
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- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532
- Insulated by Si3N4 (Silicon Nitride) AMB (Active Metal Brazed) ceramic substrate for optimized thermal performance

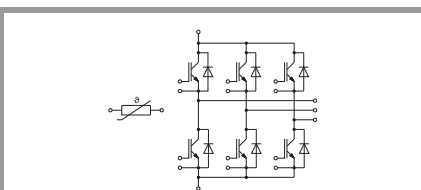
#### Typical Applications

- Inverter up to 50 kVA
- Typical motor power 30 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  $T_{j,op} = -40 \dots +150^{\circ}\text{C}$ )
- For short circuit: Soft  $R_{Goff}$  recommended
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents 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
$Q_{rr}$	$di/dt_{off} = 4020\text{ A}/\mu\text{s}$	$T_j = 150^{\circ}\text{C}$		27		$\mu\text{C}$
$E_{rr}$	$V_{GE} = +15/-15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^{\circ}\text{C}$		11.4		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			0.45		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			0.24		K/W
<b>Module</b>						
$L_{CE}$				-		nH
$M_s$	to heat sink		2		2.5	Nm
$w$				82		g
<b>Temperature Sensor</b>						
$R_{100}$	$T_r=100^{\circ}\text{C}$ ( $R_{25}=1000\Omega$ )			$1670 \pm 3\%$		$\Omega$
$R_{(T)}$	$R_{(T)}=1000\Omega[1+A(T-25^{\circ}\text{C})+B(T-25^{\circ}\text{C})^2]$ , $A = 7.635 \cdot 10^{-3} \text{ }^{\circ}\text{C}^{-1}$ , $B = 1.731 \cdot 10^{-5} \text{ }^{\circ}\text{C}^{-2}$					



AC

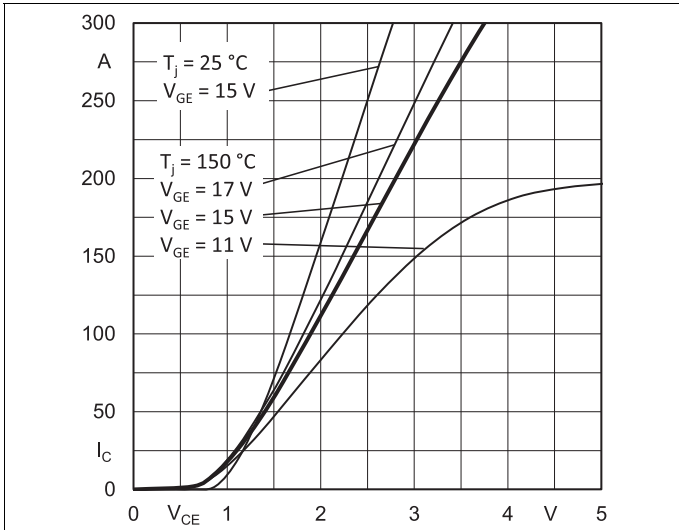


Fig. 1: Typ. output characteristic

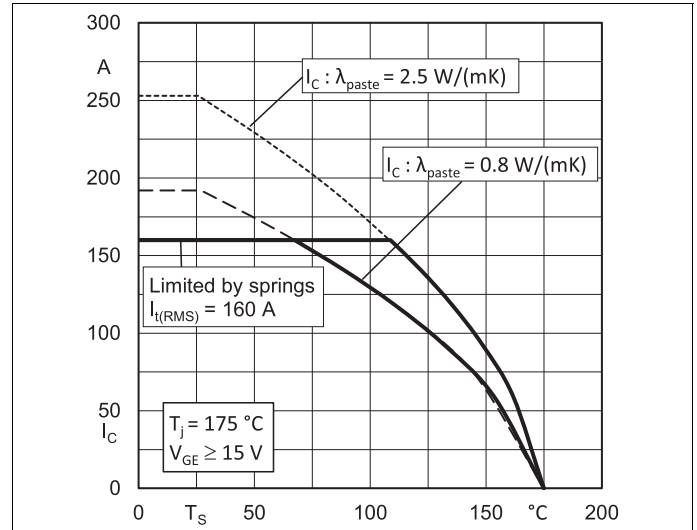


Fig. 2: Rated current vs. temperature  $I_C = f(T_S)$

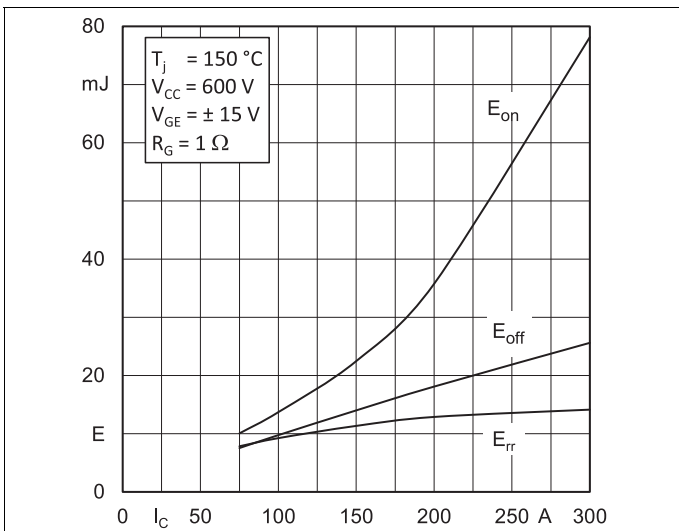


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

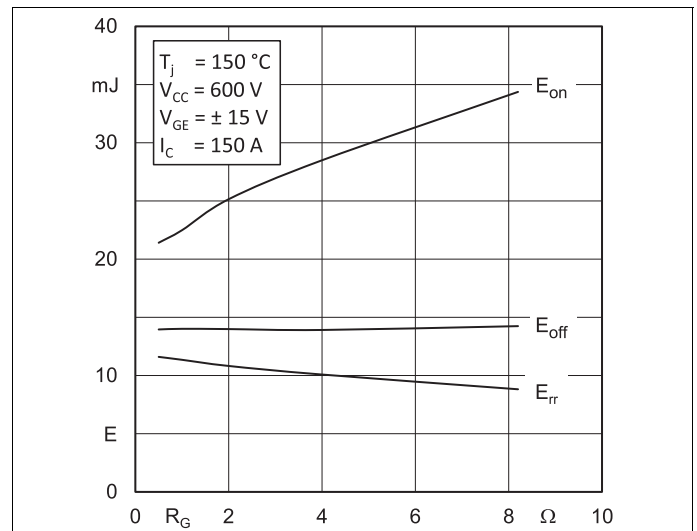


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

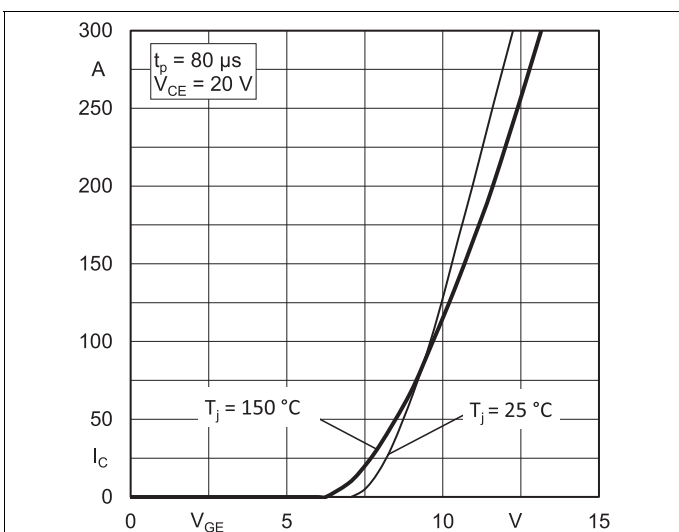


Fig. 5: Typ. transfer characteristic

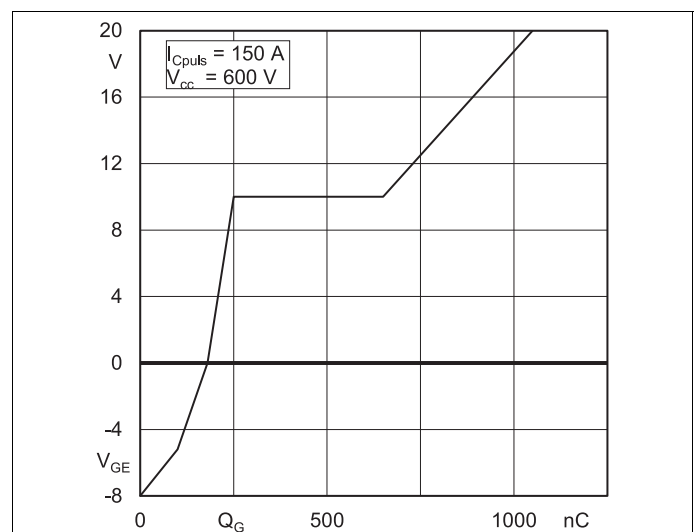
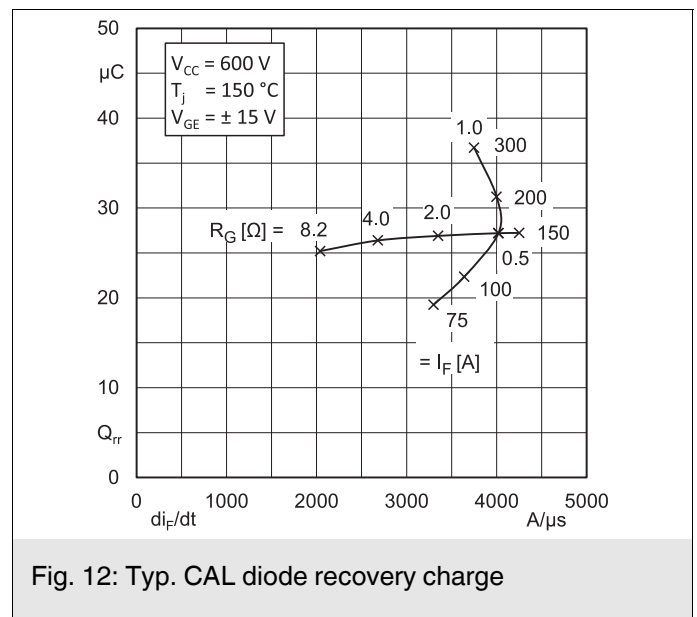
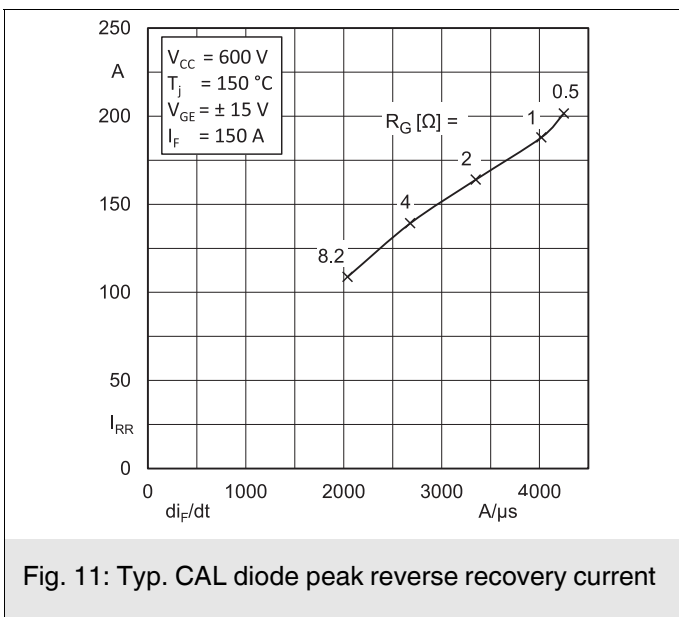
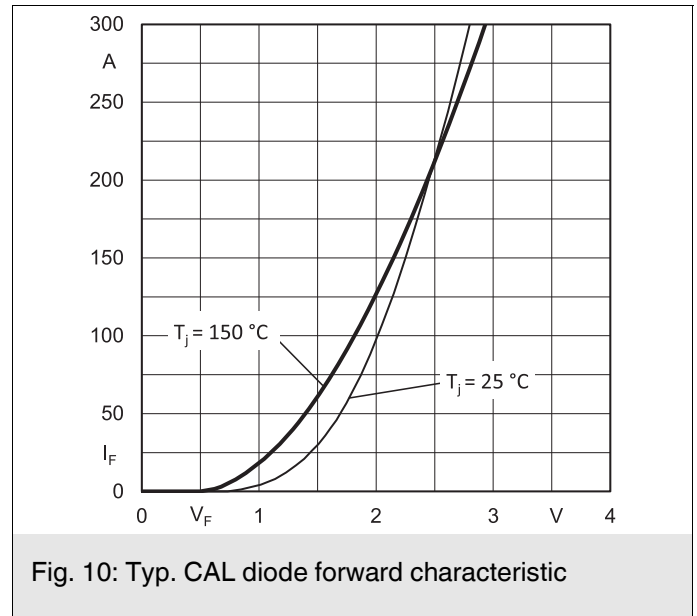
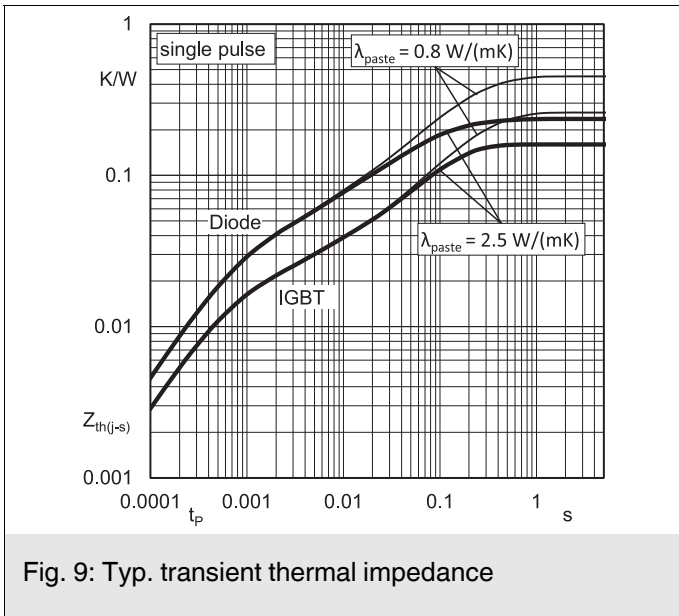
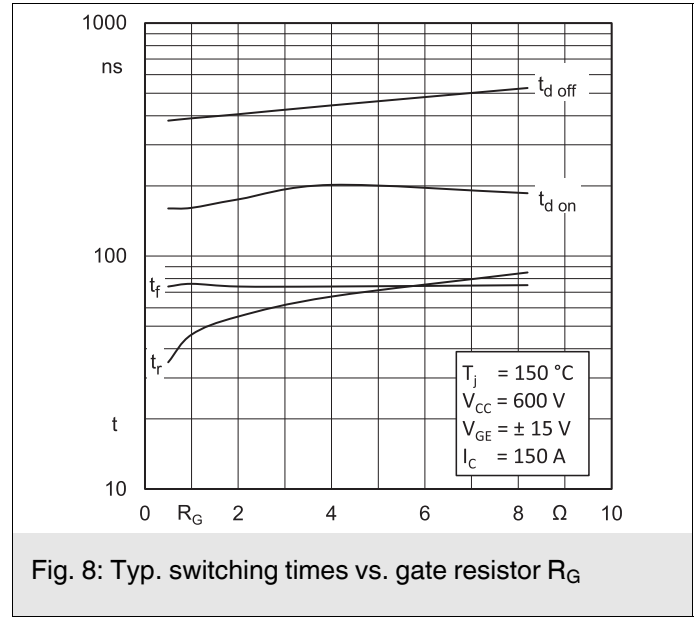
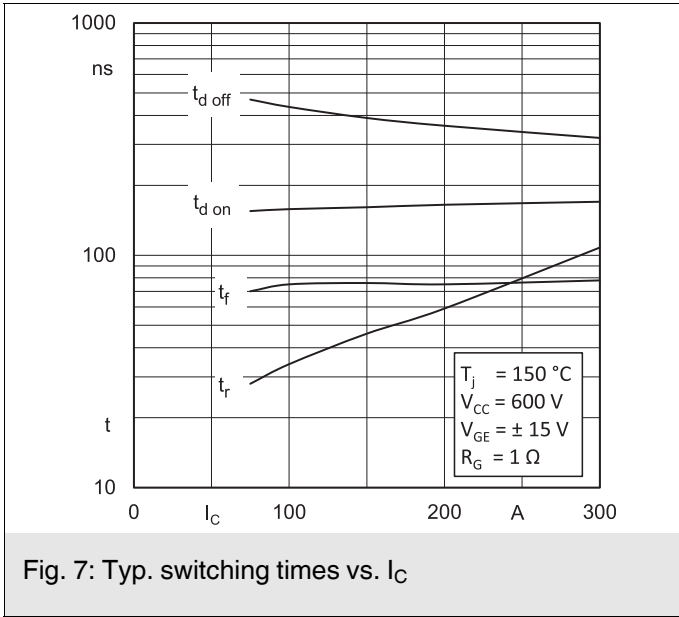


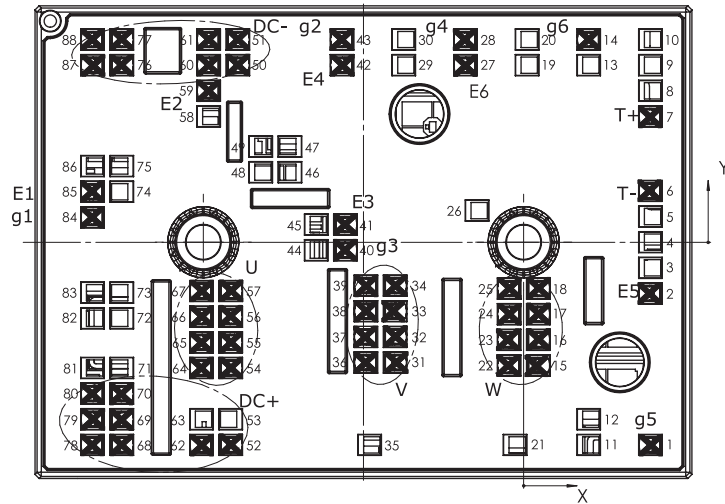
Fig. 6: Typ. gate charge characteristic



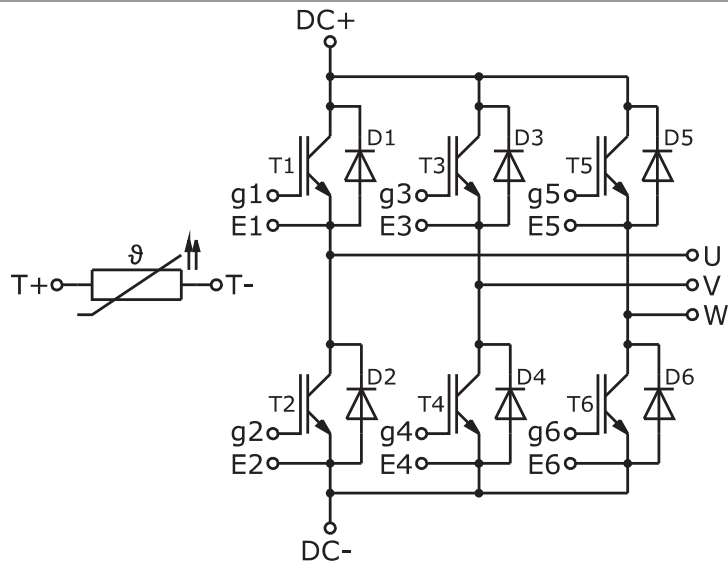
# SKiP 39AC12T4V21

Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	15,83	-25,30	g5	31	-16,05	-15,02	V	61	-39,33	25,30	DC-
2	15,83	-6,40	E5	32	-16,05	-11,82	V	62	-40,23	-25,30	DC+
3	15,83	-3,20		33	-16,05	-8,62	V	63	-40,23	-22,10	
4	15,83	0		34	-16,05	-5,42	V	64	-40,23	-15,70	U
5	15,83	3,20		35	-19,23	-25,30		65	-40,23	-12,50	U
6	15,83	6,40	T-	36	-19,70	-15,02	V	66	-40,23	-9,30	U
7	15,83	15,70	T+	37	-19,70	-11,82	V	67	-40,23	-6,10	U
8	15,83	18,90		38	-19,70	-8,62	V	68	-50,18	-25,30	DC+
9	15,83	22,10		39	-19,70	-5,42	V	69	-50,18	-22,10	DC+
10	15,83	25,30		40	-22,26	-1,00	g3	70	-50,18	-18,90	DC+
11	8,13	-25,30		41	-22,26	2,20	E3	71	-50,18	-15,70	
12	8,13	-22,10		42	-22,68	22,10	E4	72	-50,18	-9,50	
13	8,13	22,10		43	-22,68	25,30	g2	73	-50,18	-6,30	
14	8,13	25,30	g6	44	-25,91	-1,00		74	-50,18	6,30	
15	1,83	-15,39	W	45	-25,91	2,20		75	-50,18	9,50	
16	1,83	-12,19	W	46	-29,18	8,74		76	-50,18	22,10	DC-
17	1,83	-8,99	W	47	-29,18	11,94		77	-50,18	25,30	DC-
18	1,83	-5,79	W	48	-32,83	8,74		78	-53,83	-25,30	DC+
19	0,43	22,10		49	-32,83	11,94		79	-53,83	-22,10	DC+
20	0,43	25,30		50	-35,68	22,10	DC-	80	-53,83	-18,90	DC+
21	-1,08	-25,30		51	-35,68	25,30	DC-	81	-53,83	-15,70	
22	-1,83	-15,39	W	52	-36,58	-25,30	DC+	82	-53,83	-9,50	
23	-1,83	-12,19	W	53	-36,58	-22,10		83	-53,83	-6,30	
24	-1,83	-8,99	W	54	-36,58	-15,70	U	84	-53,83	3,10	g1
25	-1,83	-5,79	W	55	-36,58	-12,50	U	85	-53,83	6,30	E1
26	-5,83	3,95		56	-36,58	-9,30	U	86	-53,83	9,50	
27	-7,28	22,10	E6	57	-36,58	-6,10	U	87	-53,83	22,10	DC-
28	-7,28	25,30	g4	58	-39,33	15,70		88	-53,83	25,30	DC-
29	-14,98	22,10		59	-39,33	18,90	E2				
30	-14,98	25,30		60	-39,33	22,10	DC-				

all values in mm



Pinout and Dimensions



Pinout

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

## **\*IMPORTANT INFORMATION AND WARNINGS**

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