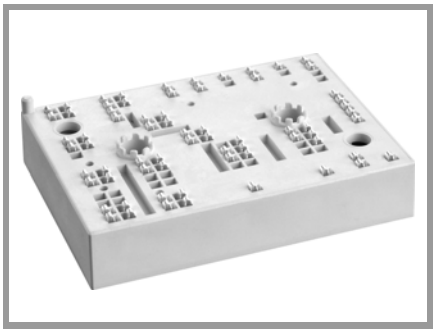
SKiiP 39GA12T7V1



MiniSKiiP® 3

Single IGBT Switch

SKiiP 39GA12T7V1

Features*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Remarks

- Max. case temperature limited to T_C=T_S=125 °C
- Product reliability results valid for T_j≤150 °C (recommended $T_{j,op}$=-40...+150 °C)
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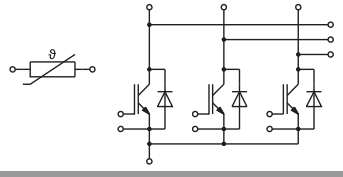
- For storage and case temperature with TIM see document: "Technical Explanations Thermal Interface Materials"

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 = 70 °C	139	A
	T_j = 175 °C	T_s = 100 °C	112	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 70 °C	163	A
	T_j = 175 °C	T_s = 100 °C	131	A
I_{Cnom}			150	A
I_{CRM}			300	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 15 V V_{CES} ≤ 1200 V	T_j = 175 °C	7	µs
T_j			-40 ... 175	°C
Inverse - Diode				
I_F	λ_{paste}=0.8 W/(mK)	T_s = 70 °C	103	A
	T_j = 175 °C	T_s = 100 °C	82	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 70 °C	128	A
	T_j = 175 °C	T_s = 100 °C	102	A
I_{FRM}			300	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		900	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C, 20 A per spring		160	A
T_{stg}	module without TIM		-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
$V_{CE(sat)}$	I_C = 150 A	T_j = 25 °C		1.55	1.70	V
	V_{GE} = 15 V	T_j = 150 °C		1.73	1.88	V
	chiplevel	T_j = 175 °C		1.77	1.92	V
V_{CE0}		T_j = 25 °C		1.00	1.05	V
	chiplevel	T_j = 150 °C		0.80	0.85	V
		T_j = 175 °C		0.75	0.80	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		3.7	4.3	mΩ
	chiplevel	T_j = 150 °C		6.2	6.9	mΩ
		T_j = 175 °C		6.8	7.5	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 3.4 mA		5.15	5.8	6.45	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1.5	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		30.20		nF
C_{oes}		f = 1 MHz		0.39		nF
C_{res}		f = 1 MHz		1.08		nF
Q_G	V_{GE} = - 8V ... + 15 V			2100		nC
R_{Gint}	T_j = 25 °C			1.0		Ω



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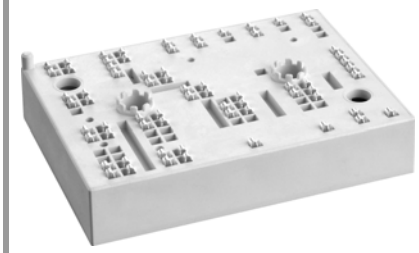

MiniSKiiP® 3

Single IGBT Switch

SKiiP 39GA12T7V1

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- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
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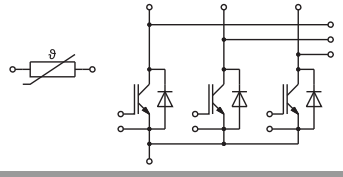

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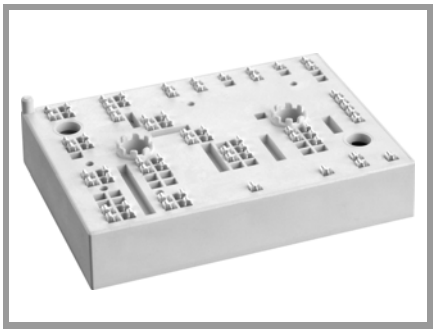
Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
$t_{d(on)}$	V_{CC} = 600 V I_C = 150 A $R_{G\ on}$ = 1.1 Ω $R_{G\ off}$ = 1.1 Ω V_{GE} = +15/-15 V @ T_j = 150 °C: di/dt_{on} = 3970 A/µs di/dt_{off} = 1530 A/µs dv/dt = 3730 V/µs	T_j = 25 °C		173		ns
		T_j = 150 °C		181		ns
		T_j = 175 °C		179		ns
t_r		T_j = 25 °C		32		ns
		T_j = 150 °C		37		ns
		T_j = 175 °C		39		ns
E_{on}		T_j = 25 °C		6.9		mJ
		T_j = 150 °C		12		mJ
		T_j = 175 °C		13		mJ
$t_{d(off)}$		T_j = 25 °C		347		ns
		T_j = 150 °C		437		ns
		T_j = 175 °C		462		ns
t_f		T_j = 25 °C		67		ns
		T_j = 150 °C		103		ns
		T_j = 175 °C		130		ns
E_{off}		T_j = 25 °C		10		mJ
		T_j = 150 °C		17		mJ
		T_j = 175 °C		18		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.41		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.32		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
$V_F = V_{EC}$	I_F = 150 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.14	2.46	V
		T_j = 150 °C		2.07	2.38	V
		T_j = 175 °C		1.93	2.24	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
		T_j = 175 °C		0.82	0.98	V
r_F	chiplevel	T_j = 25 °C		5.6	6.4	mΩ
		T_j = 150 °C		7.8	8.5	mΩ
		T_j = 175 °C		7.4	8.4	mΩ
I_{RRM}	I_F = 150 A V_{GE} = +15/-15 V V_{CC} = 600 V @ T_j = 150 °C: di/dt_{off} = 3910 A/µs	T_j = 25 °C		107		A
		T_j = 150 °C		145		A
		T_j = 175 °C		175		A
Q_{rr}		T_j = 25 °C		7.4		µC
		T_j = 150 °C		24		µC
		T_j = 175 °C		24.5		µC
E_{rr}		T_j = 25 °C		2.6		mJ
		T_j = 150 °C		8.6		mJ
		T_j = 175 °C		11		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.55		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.4		K/W
Module						
L_{CE}				-		nH
M_s	to heat sink		2		2.5	Nm
w				82		g



MiniSKiiP® 3

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SKiiP 39GA12T7V1

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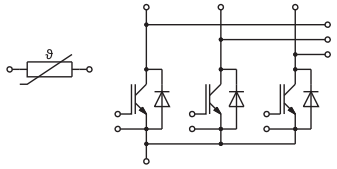
Characteristics					
Symbol	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
Temperature Sensor					
R_{100}	T_r=100°C (R_{25}=1000Ω)		1670 ± 3%		Ω
$R_{(T)}$	$R_{(T)}=1000\Omega[1+A(T-25°C)+B(T-25°C)^2]$, A = $7.635*10^{-3}{}^{o}C^{-1}$, B = $1.731*10^{-5}{}^{o}C^{-2}$				



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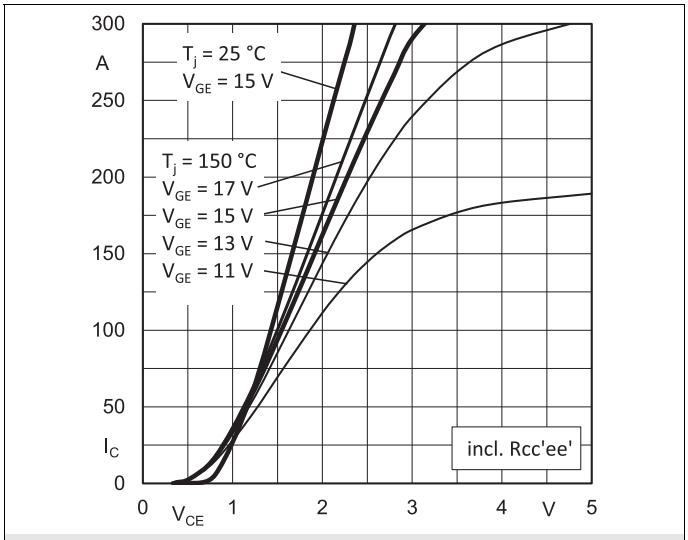


Fig. 1: Typ. output characteristic

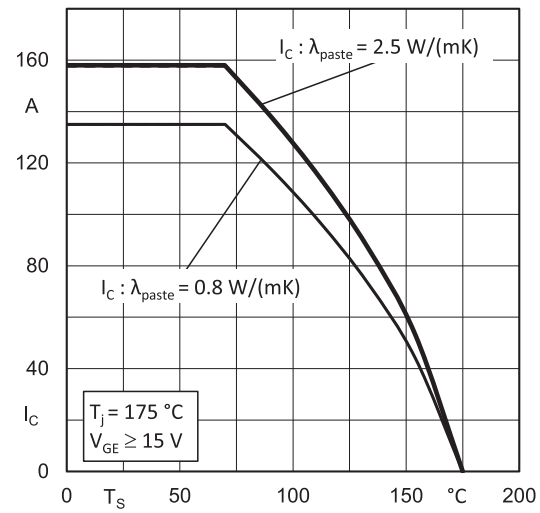


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

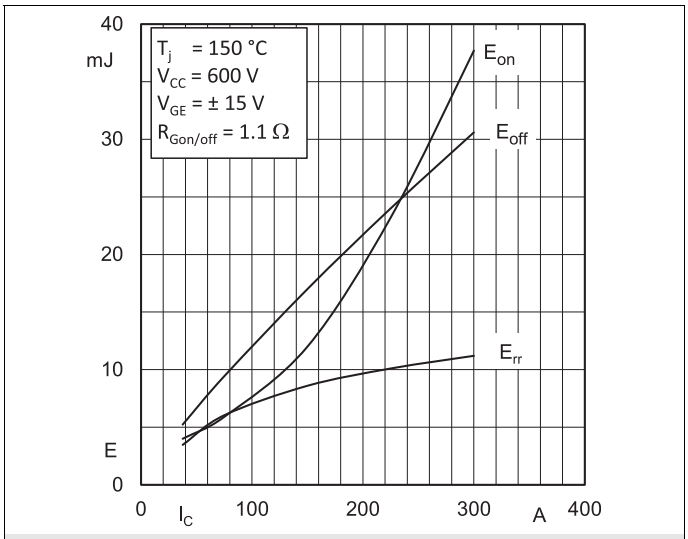


Fig. 3: Typ. turn-on /-off energy = f (I_C)

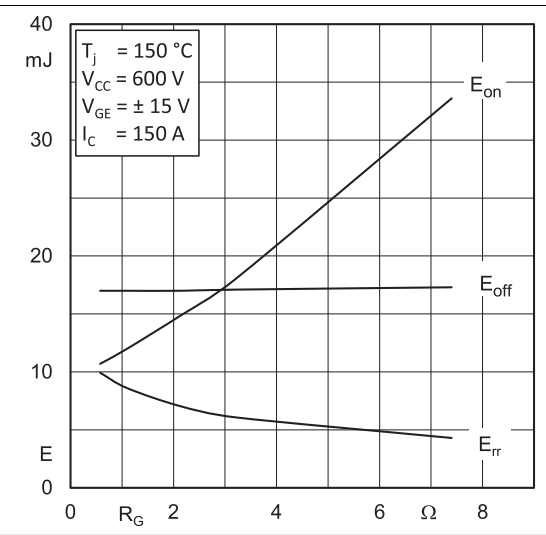


Fig. 4: Typ. turn-on /-off energy = f (R_G)

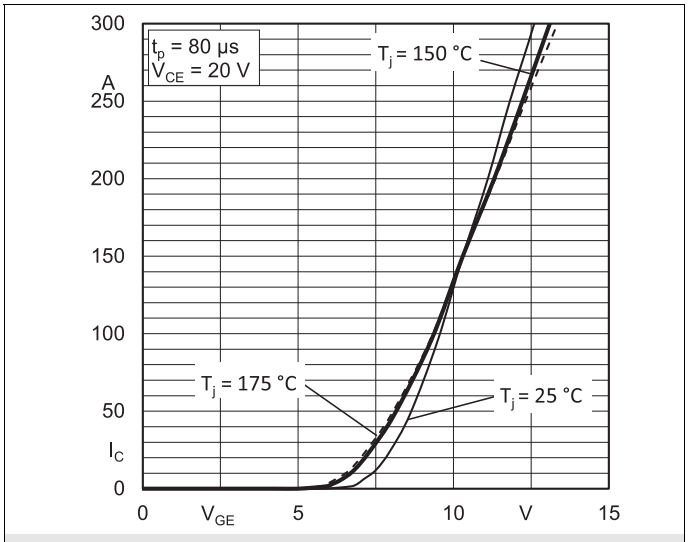


Fig. 5: Typ. transfer characteristic

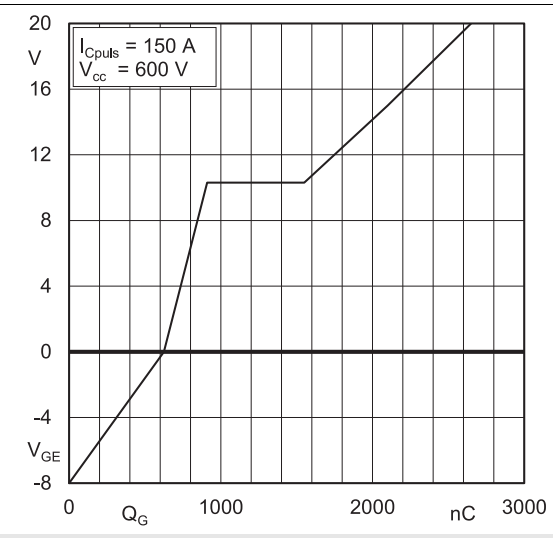


Fig. 6: Typ. gate charge characteristic

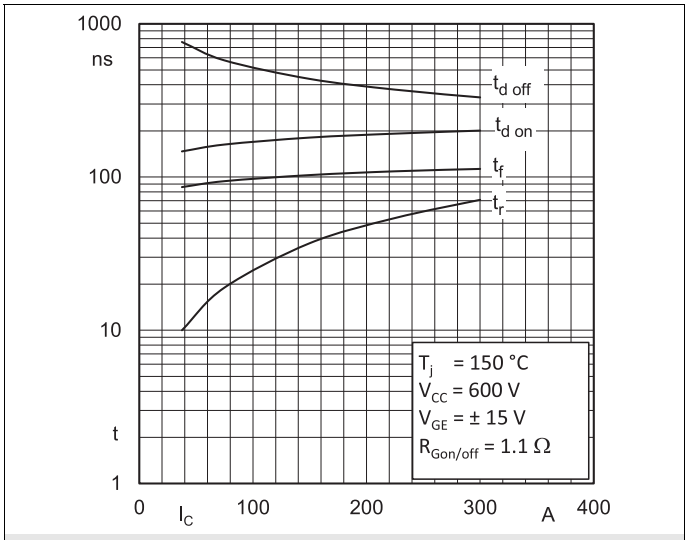


Fig. 7: Typ. switching times vs. I_C

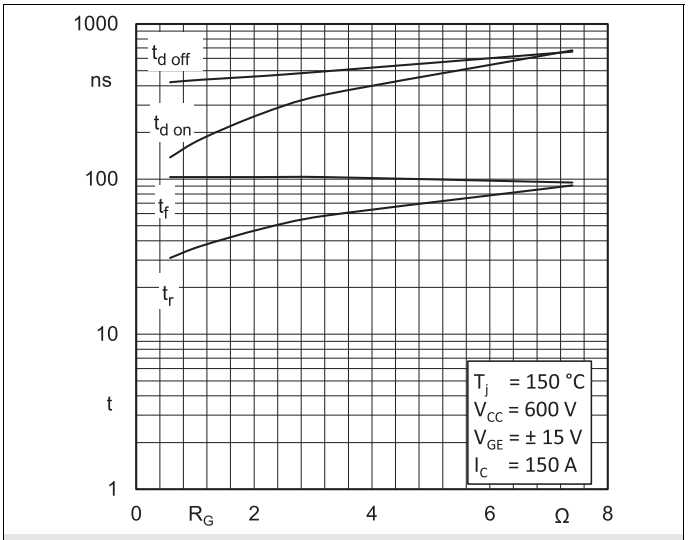


Fig. 8: Typ. switching times vs. gate resistor R_G

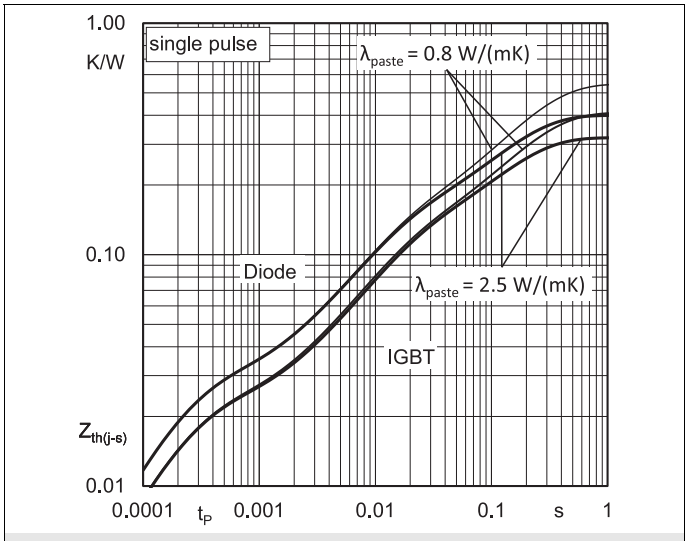


Fig. 9: Typ. transient thermal impedance

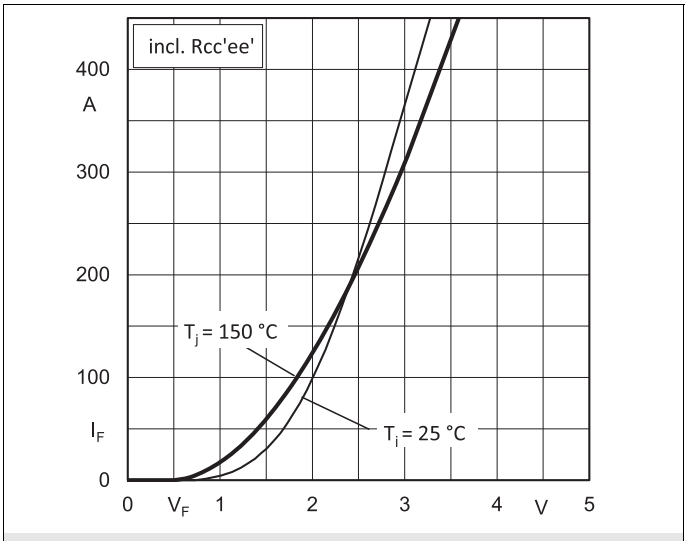


Fig. 10: Typ. CAL diode forward characteristic

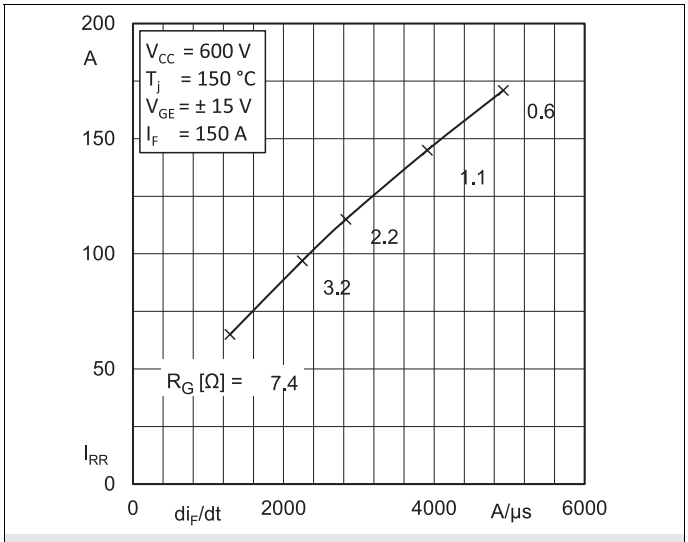


Fig. 11: Typ. CAL diode peak reverse recovery current

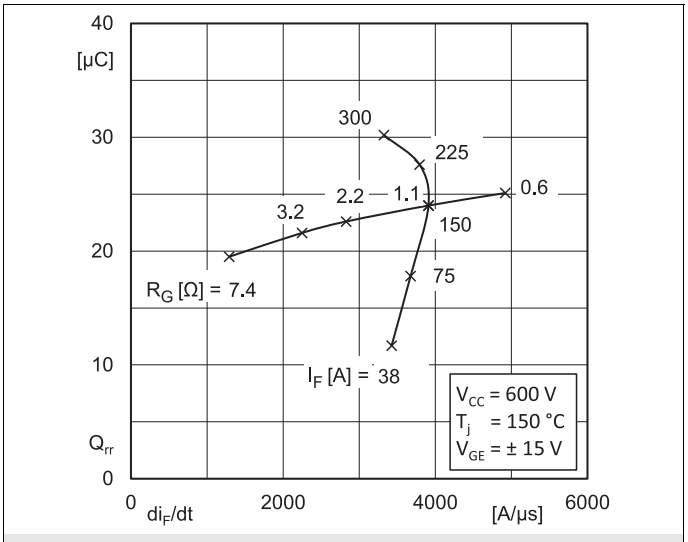
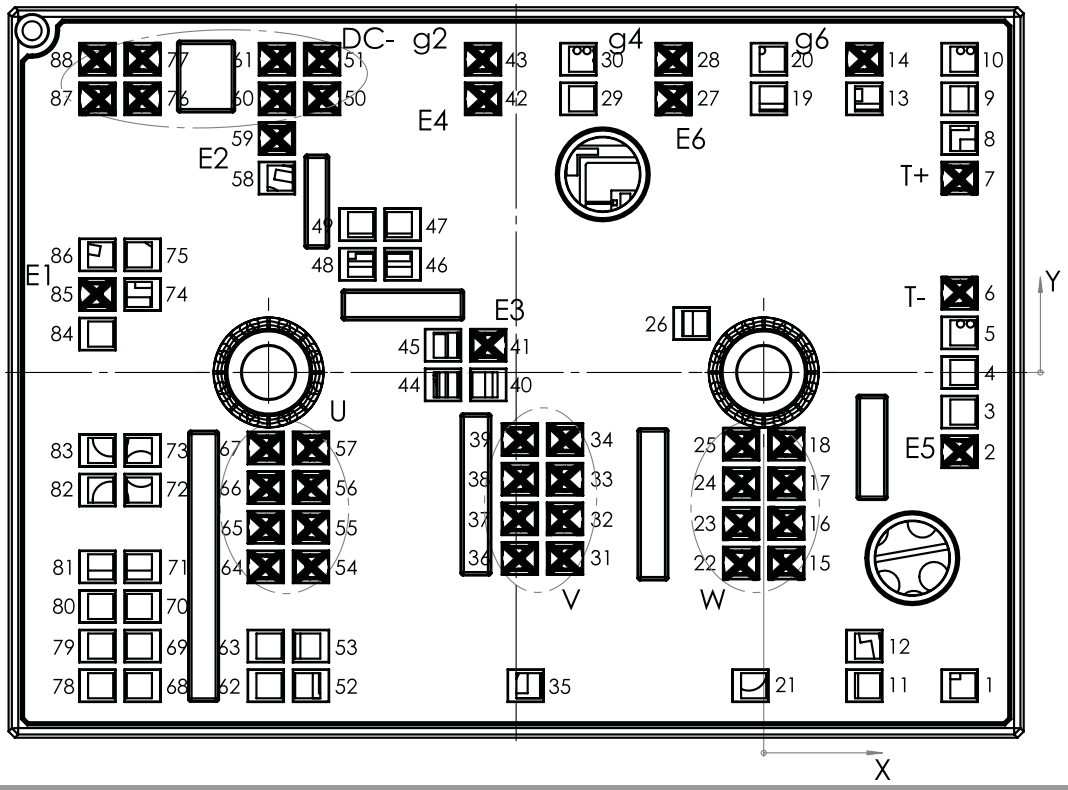


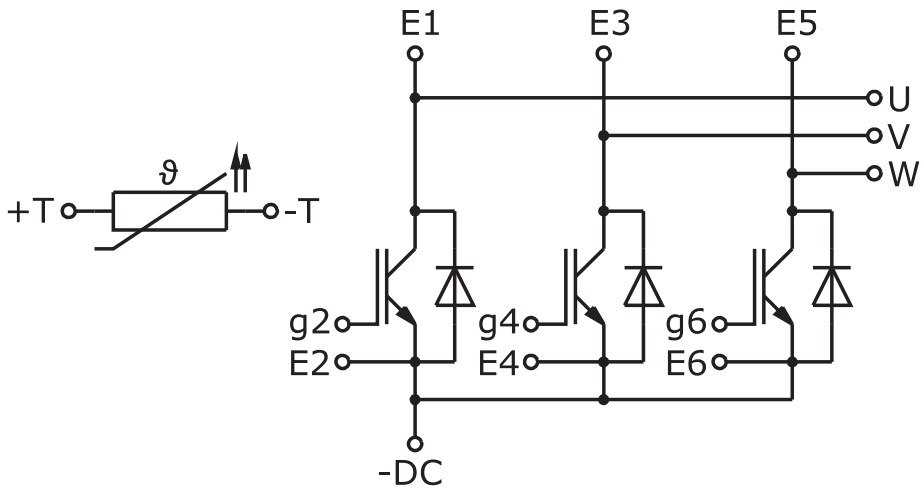
Fig. 12: Typ. CAL diode recovery charge

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

all values in mm



Pinout and Dimensions



Pinout

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

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