SEMIKRON

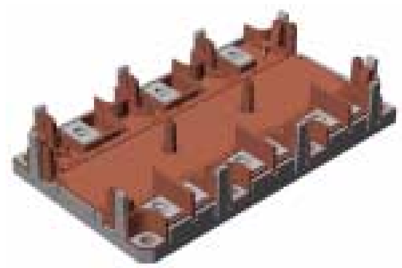
Absolute Maximum Ratings		Values	
Symbol	Conditions [1]		Units
V_{CES}		1200	V
V_{CGR}	R_{GE} = 20 kΩ	1200	V
I_C	T_{HS} = 25/70 °C	480 / 370	A
I_{CM}	T_{HS} = 25/70 °C; t_p = 1 ms	960 / 740	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{HS} = 25 °C	1390	W
T_j, (T_{stg})		–40 ... +150 (125)	°C
T_{cop}	max. case operating temperature	125	°C
V_{isol}	AC, 1 min.	2500	V
humidity	IEC-EN 60721-3-3		
climate	IEC 68 T.1	40/125/56	
Inverse Diode			
$I_F = -I_C$	T_{HS} = 25/70 °C	450 / 340	A
$I_{FM} = -I_{CM}$	T_{HS} = 25/70 °C; t_p = 1 ms	900 / 680	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	3300	A
I^2t	t_p = 10 ms; T_j = 150 °C	54 450	A^2s

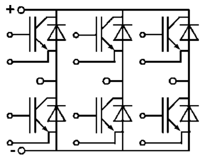
Characteristics					
Symbol	Conditions [1]	min.	typ.	max.	Units
$V_{(BR)CES}$	V_{GE} = 0, I_C = 1 mA	≥ V_{CES}	–	–	V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 6 mA	5,0	5,8	6,5	V
I_{CES}	V_{GE} = 0, V_{CE} = V_{CES}; T_j = 125 °C	–	15	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	600	nA
V_{CEsat} [4]	I_C = 450 A; V_{GE} = 15 V; T_j = 25 (125) °C	–	1,7(2,0)	–	V
C_{ies}	V_{GE} = 0	–	35		nF
C_{oes}	V_{CE} = 25 V	–	2,5		nF
C_{res}	f = 1 MHz	–	2,4	–	nF
L_{CE}		–	–	20	nH
$R_{CC'+EE'}$	resistance, terminal-chip; T_{HS} = 25 (125) °C	–	0,9(1,1)	–	mΩ
$t_{d(on)}$	V_{CC} = 600 V	–	250	–	ns
t_r	V_{GE} = +15 V / –15 V[3]	–	55	–	ns
$t_{d(off)}$	I_C = 350 A, ind. load	–	800	–	ns
t_f	R_{Gon} = R_{Goff} = 3 Ω	–	120	–	ns
E_{on}	T_j = 125 °C	–	26	–	mJ
E_{off}		–	48	–	mJ
Inverse Diode [8]					
$V_F = V_{EC}$	I_F = 350 A; V_{GE} = 0 V; T_j = 25 (125) °C	–	2,4(2,3)	–	V
		–	–		V
V_{TO}	T_j = 125 °C	–	1,1		V
r_T	T_j = 125 °C	–	3,3		mΩ
I_{RRM}	I_F = 350 A; T_j = 25 (125) °C[2]	–	TBD	–	A
Q_{rr}	I_F = 350 A; T_j = 25 (125) °C[2]	–	TBD	–	µC
Thermal Characteristics [5]					
R_{thjh}	per IGBT	–	–	0,09	°C/W
R_{thjhD}	per diode	–	–	0,125	°C/W
R'_{thjc} [6]	per IGBT	–	–	0,014	°C/W
R'_{thjcD} [6]	per diode	–	–	0,025	°C/W
Temperature Sensor					
R_{TS}	T = 25 °C / 100 °C		1,0 / 1,67		kΩ
tolerance	T = 25 °C / 100 °C		3,0 / 2,0		%

SKiM® 5 IGBT Modules

SKiM 601 GD 126 DM

Preliminary Data





GD

Features

- Trench gate IGBT with field stop layer
- Low inductance case
- Fast & soft inverse CAL diodes [8]
- Isolated by AlN DCB (Direct Copper Bonded) ceramic plate
- Pressure contact technology for thermal contacts
- Spring contact system to attach driver PCB to the control terminals
- Integrated temperature sensor

Typical Applications

- Switched mode power supplies
- Three phase inverters for AC motor speed control
- Switching (not for linear use)

[1] T_{HS} = 25 °C, unless otherwise specified
[2] TBD
[3] Use V_{GEoff} = –5... –15 V
[4] Measured at chip level
[5] See mounting instructions
[6] Corresponding value. This value cannot be measured. It is only given for comparison.
[8] CAL = Controlled Axial Lifetime Technology

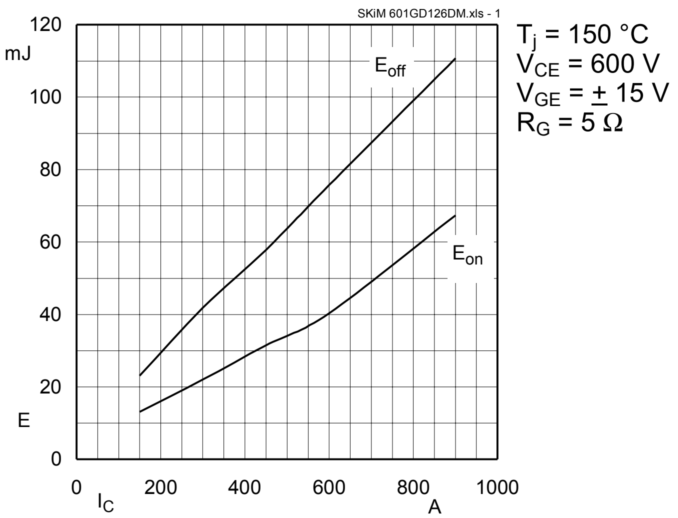


Fig. 1 Turn-on /-off energy = f (I_C)

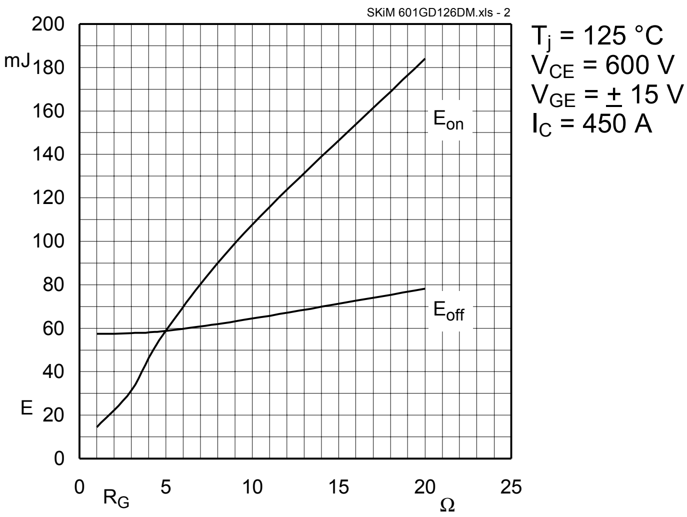


Fig. 2 Turn-on /-off energy = f (R_G)

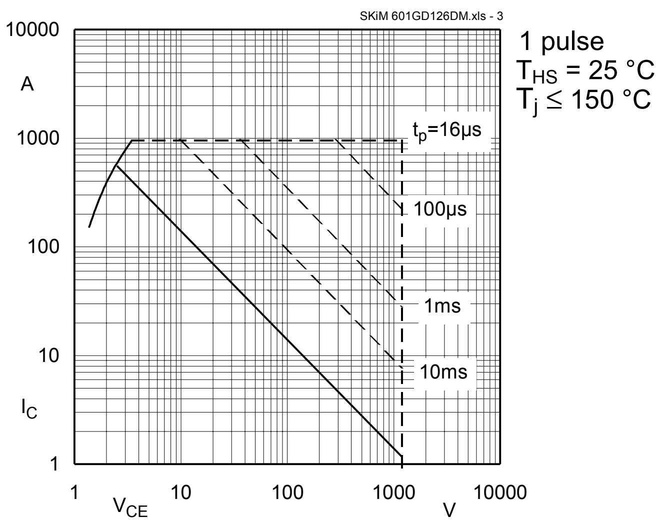


Fig. 3 Maximum safe operating area (SOA) I_C = f (V_{CE})

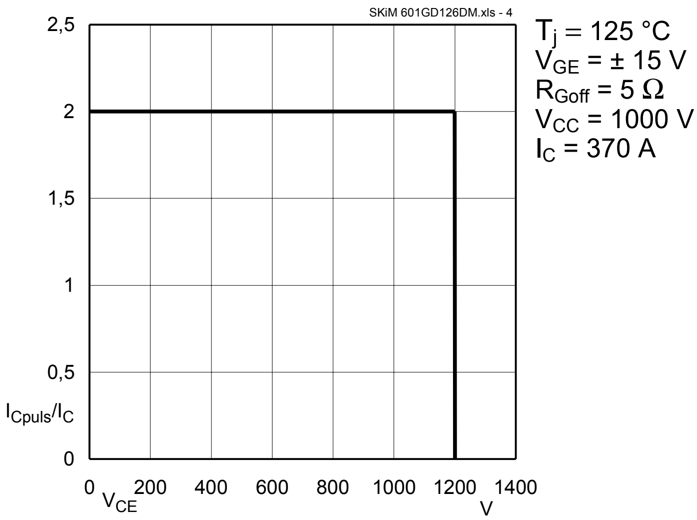


Fig. 4 Turn-off safe operating area (RBSOA)

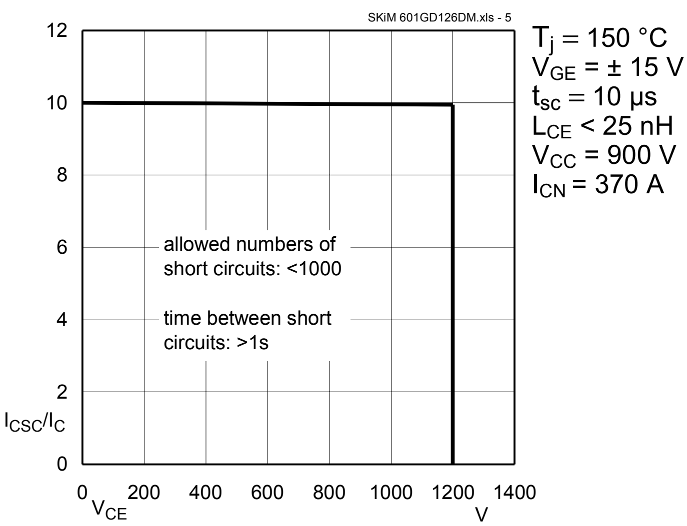


Fig. 5 Safe operating area at short circuit I_C = f (V_{CE})

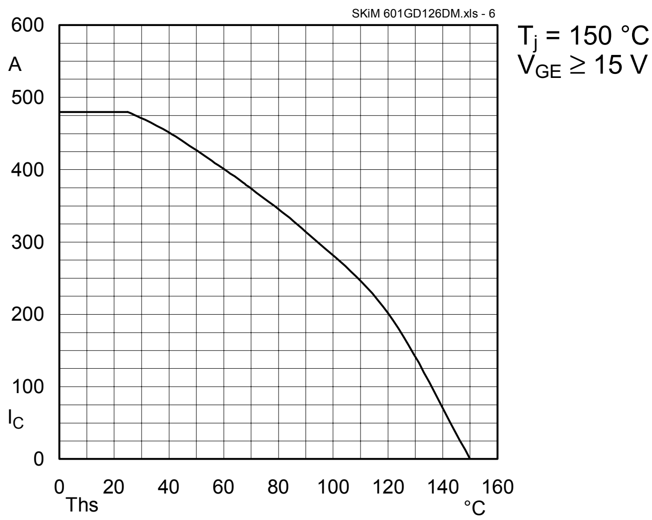


Fig. 6 Rated current vs. temperature I_C = f (T_{HS})

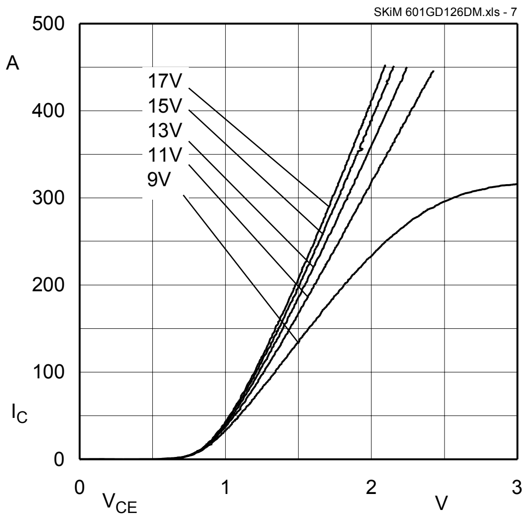


Fig. 7 Typ. output characteristic, t_p = 80 µs; 25 °C

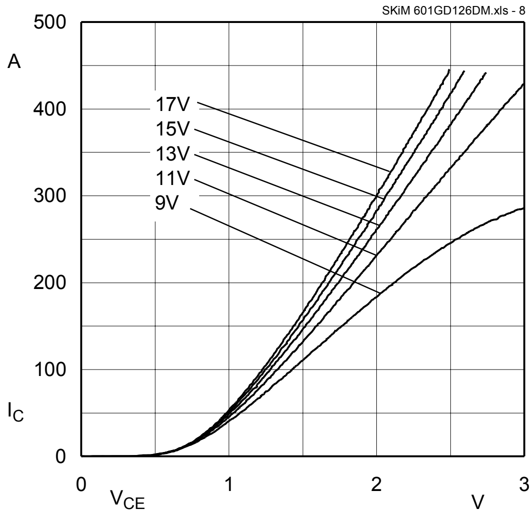


Fig. 8 Typ. output characteristic, t_p = 80 µs; 125 °C

Fig. 9 Saturation characteristic (IGBT)
Calculation elements and equations

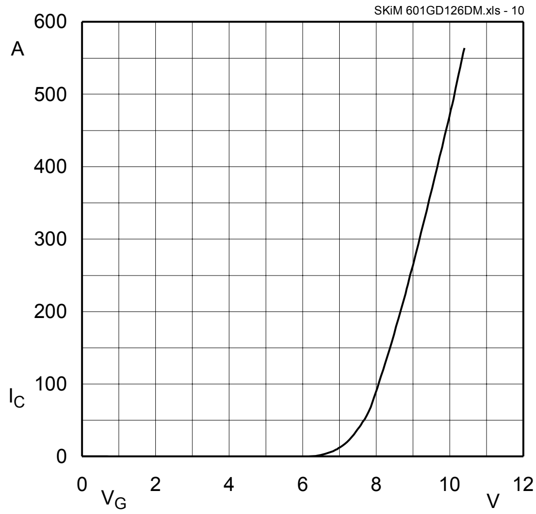


Fig. 10 Typ. transfer characteristic, t_p = 80 µs; V_{CE} = 20 V

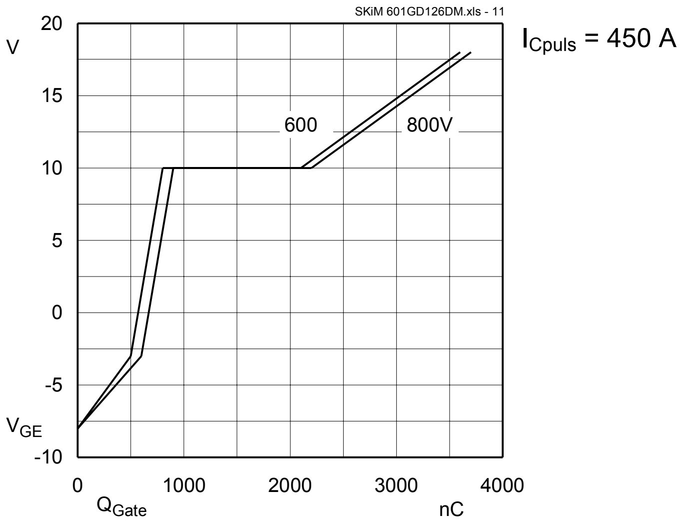


Fig. 11 Typ. gate charge characteristic

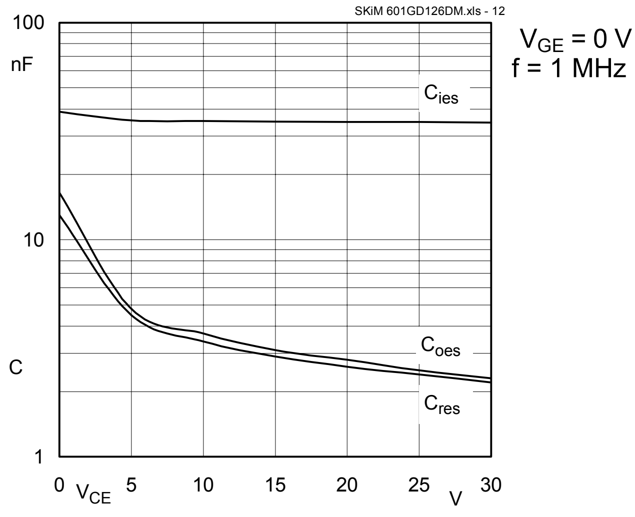


Fig. 12 Typ. capacitances vs. V_{CE}

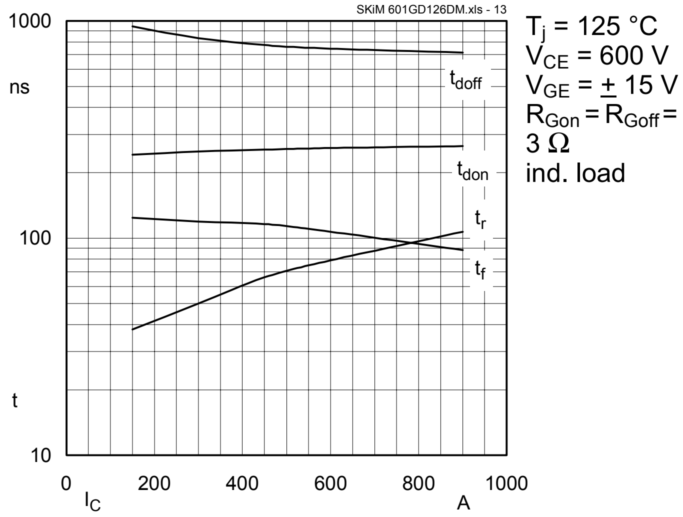


Fig. 13 Typ. switch times vs. I_C

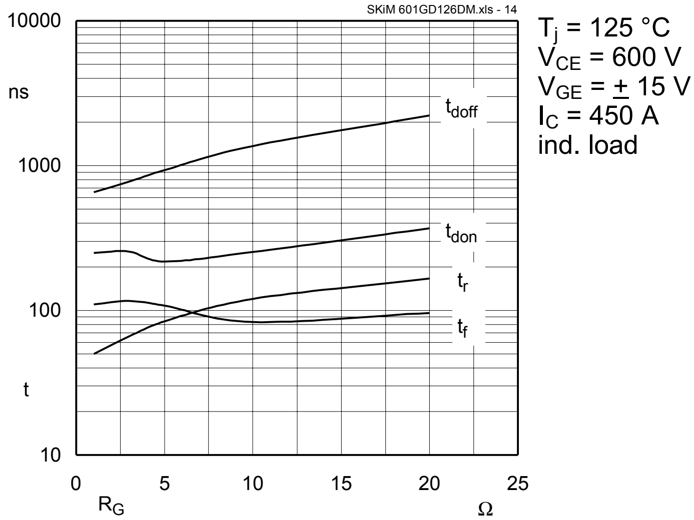


Fig. 14 Typ. switch times vs. gate resistor R_G

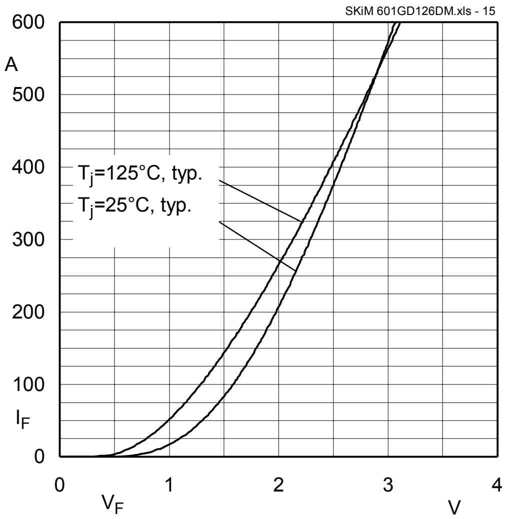


Fig. 15 Typ. CAL diode forward characteristic

Fig. 16 Diode turn-off energy dissipation per pulse

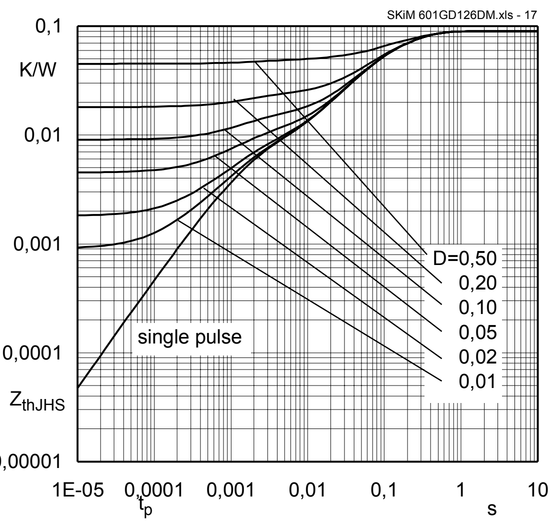


Fig. 17 Transient thermal impedance of IGBT
Z_{thJHS} = f (t_p); D = t_p / t_c = t_p · f

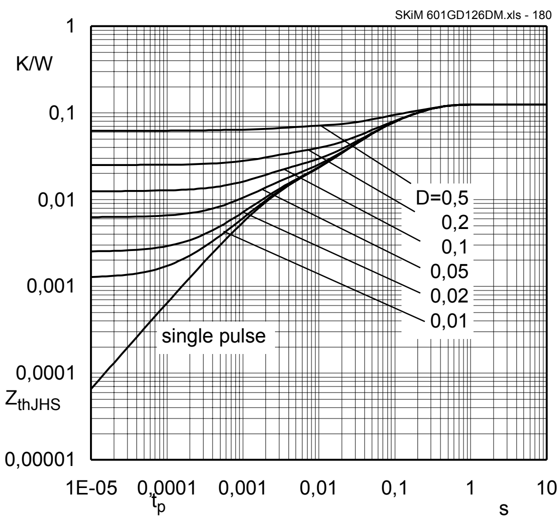


Fig. 18 Transient thermal impedance of inverse CAL diodes Z_{thJHS} = f (t_p); D = t_p / t_c = t_p · f

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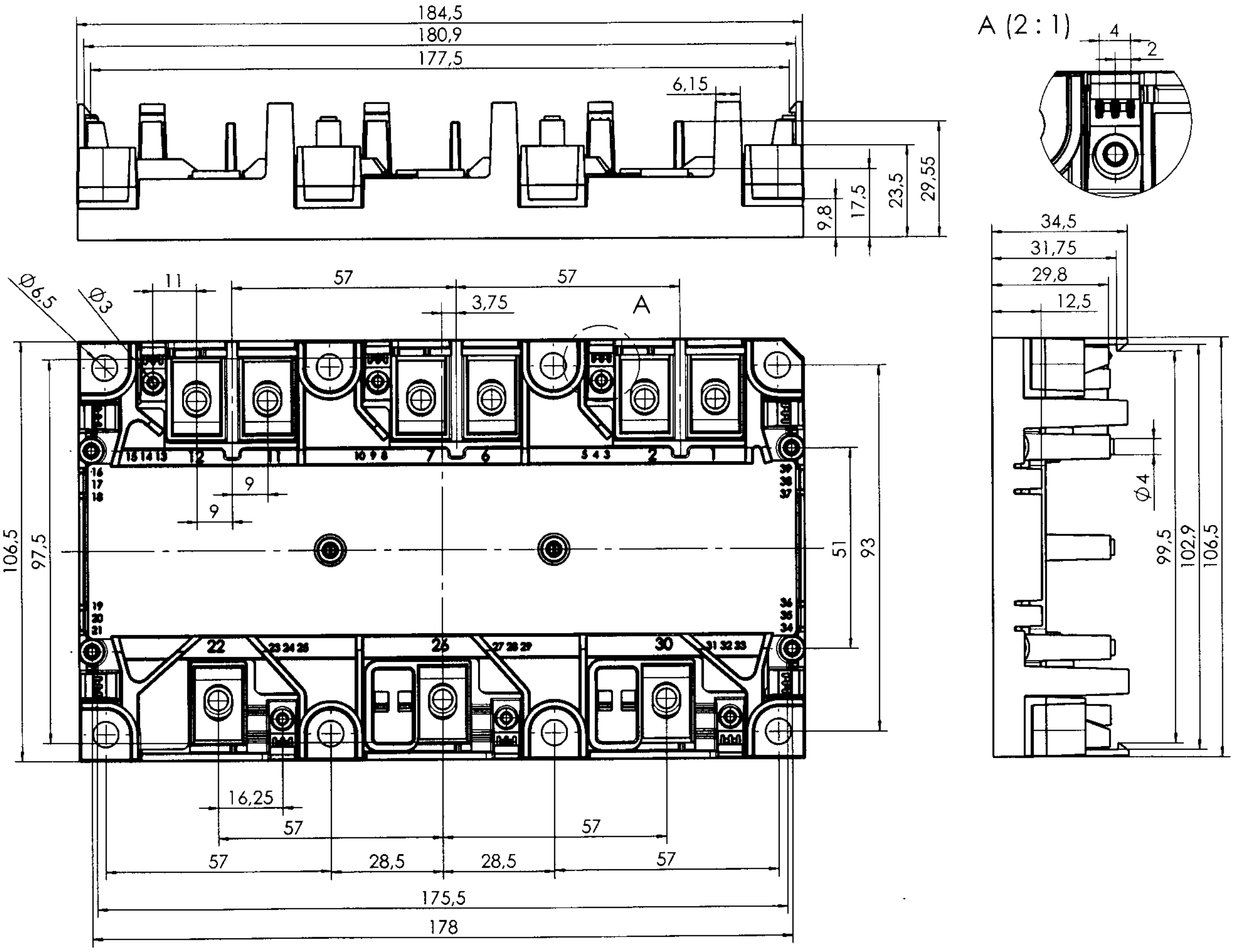

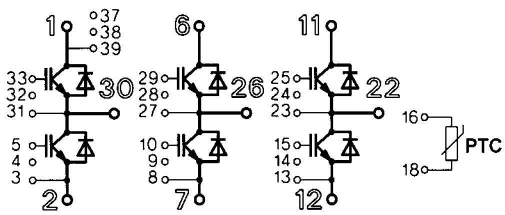

Dimensions in mm

Case outline and circuit diagram

Mechanical Data					
Symbol	**Conditions**	**Values**			**Units**
		min.	**typ.**	**max.**	
M_1	to heatsink, SI Units (M5)	2	–	3	Nm
	to heatsink, US Units	18	–	26	lb.in.
M_2	for terminals, SI Units (M6)	4	–	5	Nm
	for terminals, US Units	35	–	44	lb.in.
a		–	–	5x9,81	m/s^2
w		–	–	460	g

This is an electrostatic discharge sensitive device (ESDS).
Please observe the international standard IEC 747-1, Chapter IX.