SEMIKRON

Absolute Maximum Ratings

Symbol	Conditions 1)	Values	Units
V_{CES}		600	V
V_{CGR}	R_{GE} = 20 kΩ	600	V
I_C	T_{HS} = 25/70 °C	350 / 280	A
I_{CM}	T_{HS} = 25/70 °C; t_p = 1 ms	700 / 560	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{HS} = 25 °C	926	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	400 / 300	A
$I_{FM} = –I_{CM}$	T_{HS} = 25/70 °C; t_p = 1 ms	800 / 600	A
I_{FSM}	t_p = 10 ms; sin.; T_j = 150 °C	2880	A
I^2t	t_p = 10 ms; T_j = 150 °C	41 472	A^2s

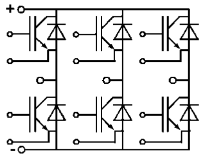
Characteristics

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 = 4 mA	4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0 } T_j = 25 °C	–	0,4	–	mA
	$V_{CE} = V_{CES}$ } T_j = 125 °C	–	15	–	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	0,6	µA
V_{CEsat} 4)	I_C = 250 A { V_{GE} = 15 V; T_j = 25 (125) °C }	–	1,6(1,7)	2,0	V
C_{ies}	V_{GE} = 0	–	18	–	nF
C_{oes}	V_{CE} = 25 V	–	2,8	–	nF
C_{res}	f = 1 MHz	–	2,6	–	nF
L_{CE}		–	–	20	nH
$R_{CC'+EE'}$	resistance, terminal-chip; T_{HS} = 25(125) °C	–	1,35(1,85)	–	mΩ
$t_{d(on)}$	V_{CC} = 300 V	–	130	–	ns
t_r	V_{GE} = +15 V / –15 V 3)	–	85	–	ns
$t_{d(off)}$	I_C = 250 A, ind. load	–	690	–	ns
t_f	$R_{Gon} = R_{Goff}$ = 8 Ω	–	55	–	ns
E_{on}	T_j = 125 °C	–	12	–	mJ
E_{off}		–	11	–	mJ
Inverse Diode 8)					
$V_F = V_{EC}$	I_F = 250 A { V_{GE} = 0 V;	–	1,7(1,8)	–	V
$V_F = V_{EC}$	I_F = 150 A { T_j = 25 (125) °C	–	1,4(1,4)	–	V
V_{TO}	T_j = 125 °C	–	0,8	–	V
r_T	T_j = 125 °C	–	4	–	mΩ
I_{RRM}	I_F = 250 A; T_j = 25 (125) °C 2)	–	TBD	–	A
Q_{rr}	I_F = 250 A; T_j = 25 (125) °C 2)	–	TBD	–	µC
Thermal Characteristics 5)					
R_{thjh}	per IGBT	–	–	0,135	°C/W
R_{thjhD}	per diode	–	–	0,185	°C/W
R'_{thjc} 6)	per IGBT	–	–	0,034	°C/W
R'_{thjcD} 6)	per diode	–	–	0,045	°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® 4
IGBT Modules

SKiM 351 GD 063 DM

Preliminary Data



GD

Features

- N channel, homogeneous planar IGBT Silicon structure with n+ buffer layer in NPT (non punch through) technology
- 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
- Posts for additional fixing of PCB

Typical Applications

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

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

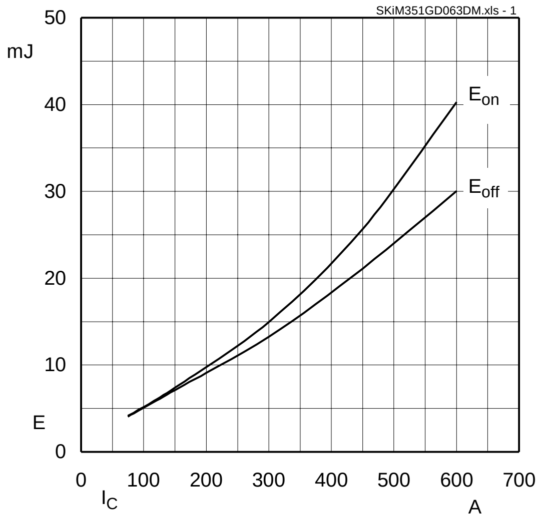


Fig. 1 Turn-on /-off energy = f (I_C)

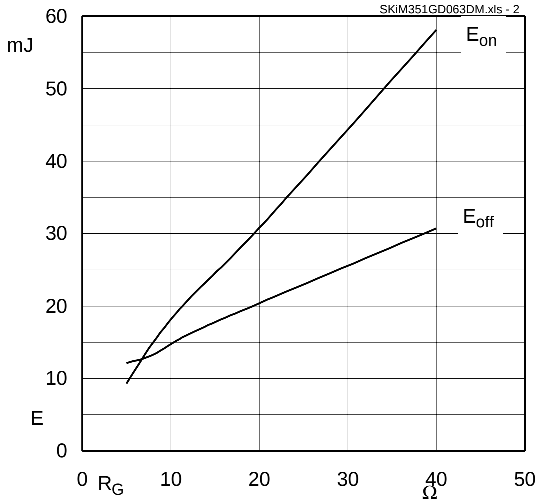


Fig. 2 Turn-on /-off energy = f (R_G)

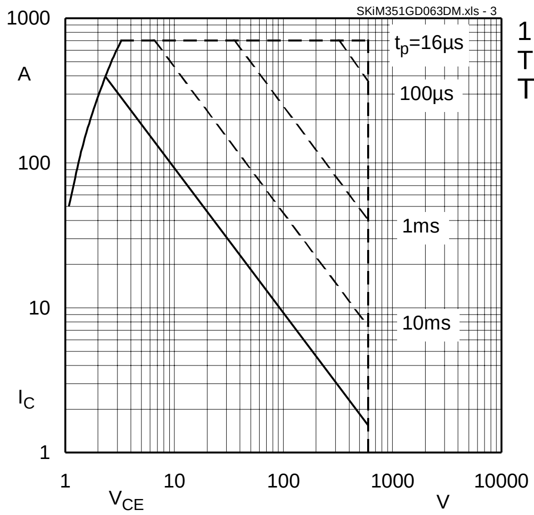


Fig. 3 Maximum safe operating area (SOA) I_C = f (V_{CE})

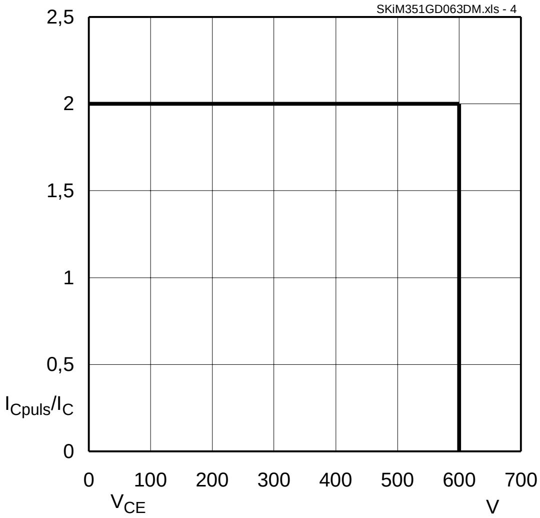


Fig. 4 Turn-off safe operating area (RBSOA)

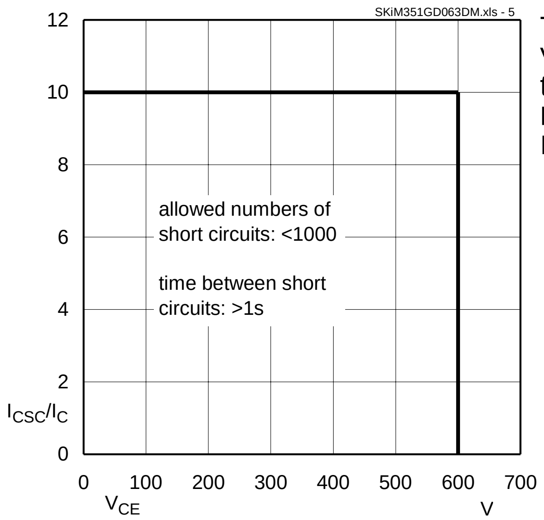


Fig. 5 Safe operating area at short circuit I_C = f (V_{CE})

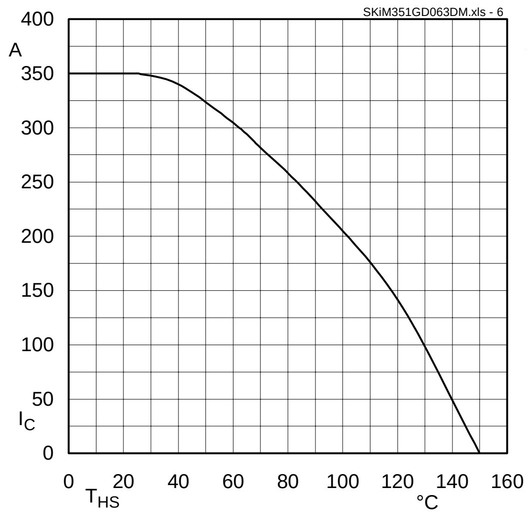


Fig. 6 Rated current vs. temperature I_C = f (T_{HS})

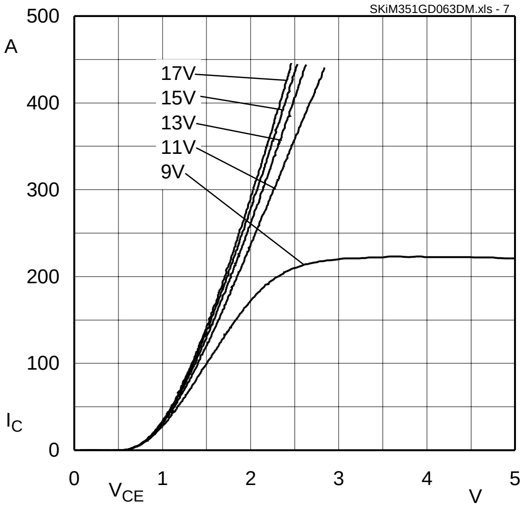


Fig. 7 Typ. output characteristic, t_p = 80 µs; 25 °C

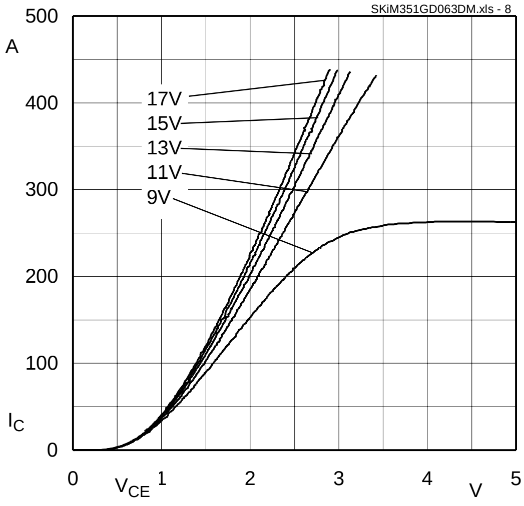


Fig. 8 Typ. output characteristic, t_p = 80 µs; 125 °C

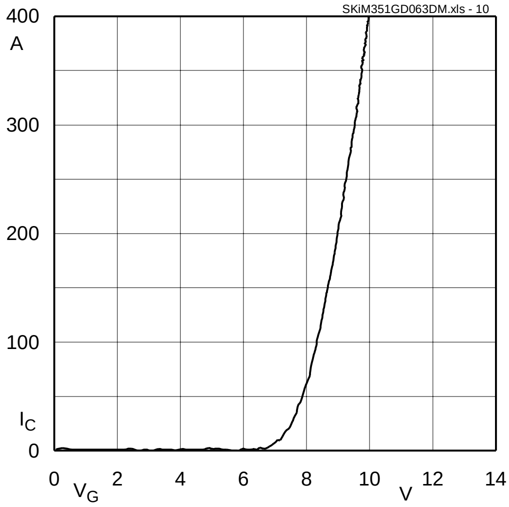


Fig. 9 Saturation characteristic (IGBT)
Calculation elements and equations

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

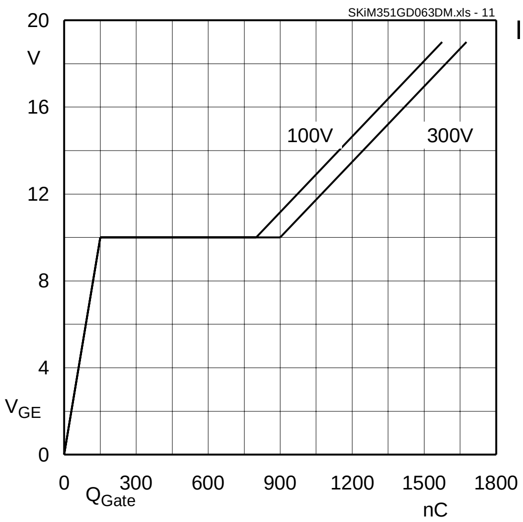


Fig. 11 Typ. gate charge characteristic

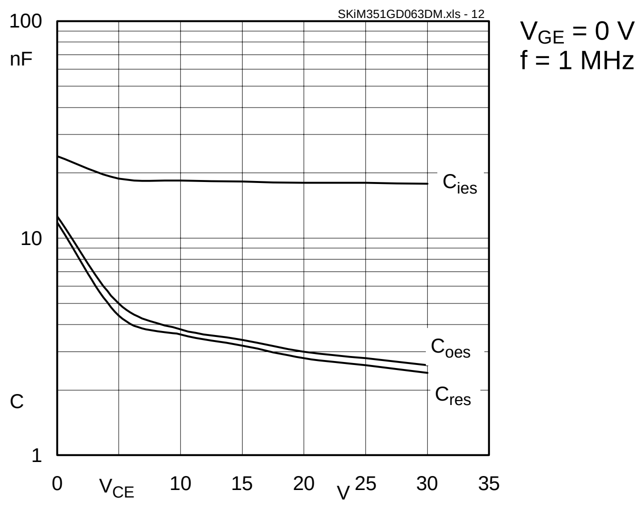


Fig. 12 Typ. capacitances vs. V_{CE}

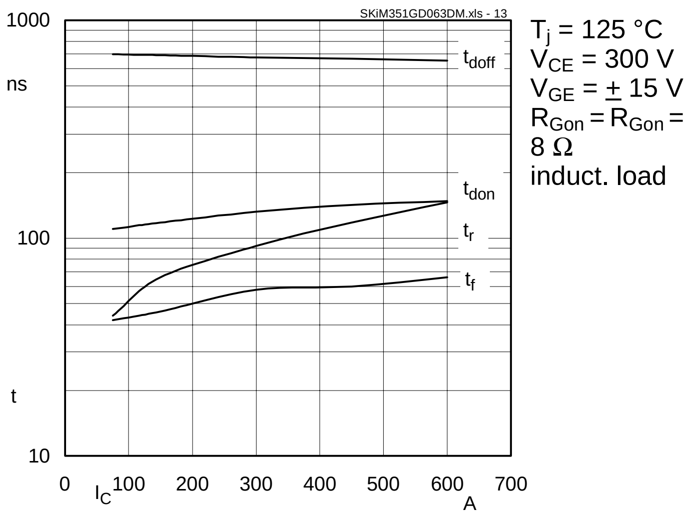


Fig. 13 Typ. switch times vs. I_C

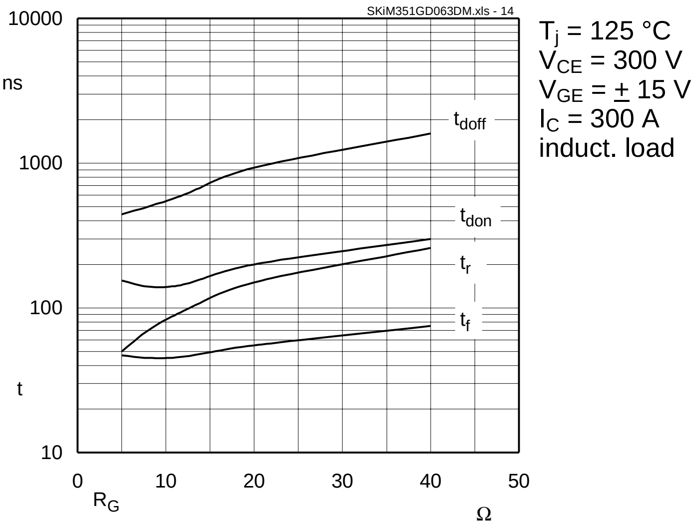


Fig. 14 Typ. switch times vs. gate resistor R_G

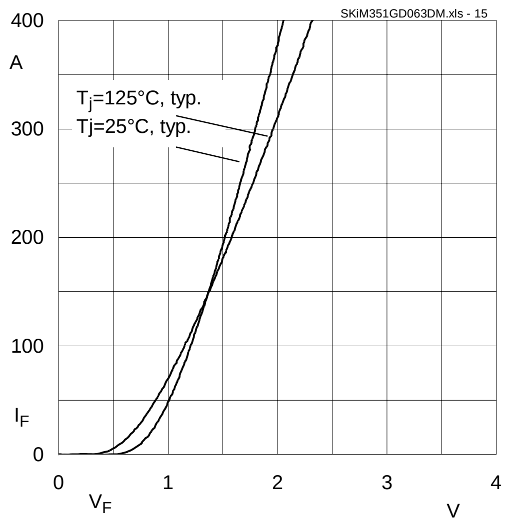


Fig. 15 Typ. CAL diode forward characteristic

Fig. 16 Diode turn-off energy dissipation per pulse

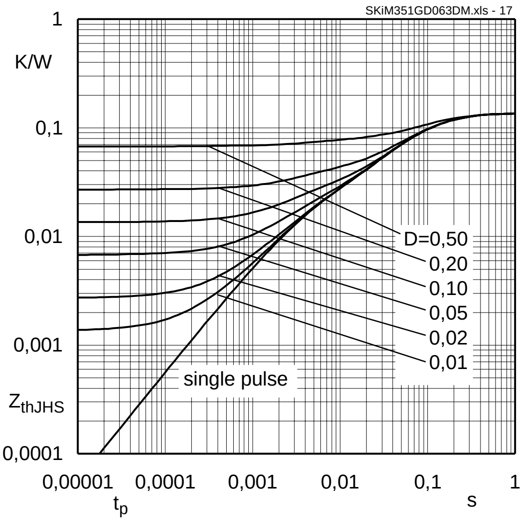


Fig. 17 Transient thermal impedance of IGBT Z_{thJHS} = f (t_p); D = t_p / t_c = t_p · f

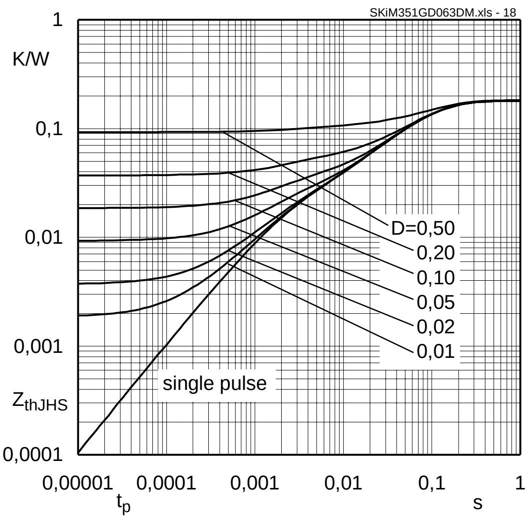


Fig. 18 Transient thermal impedance of inverse CAL diodes Z_{thJHS} = f (t_p); D = t_p / t_c = t_p · f

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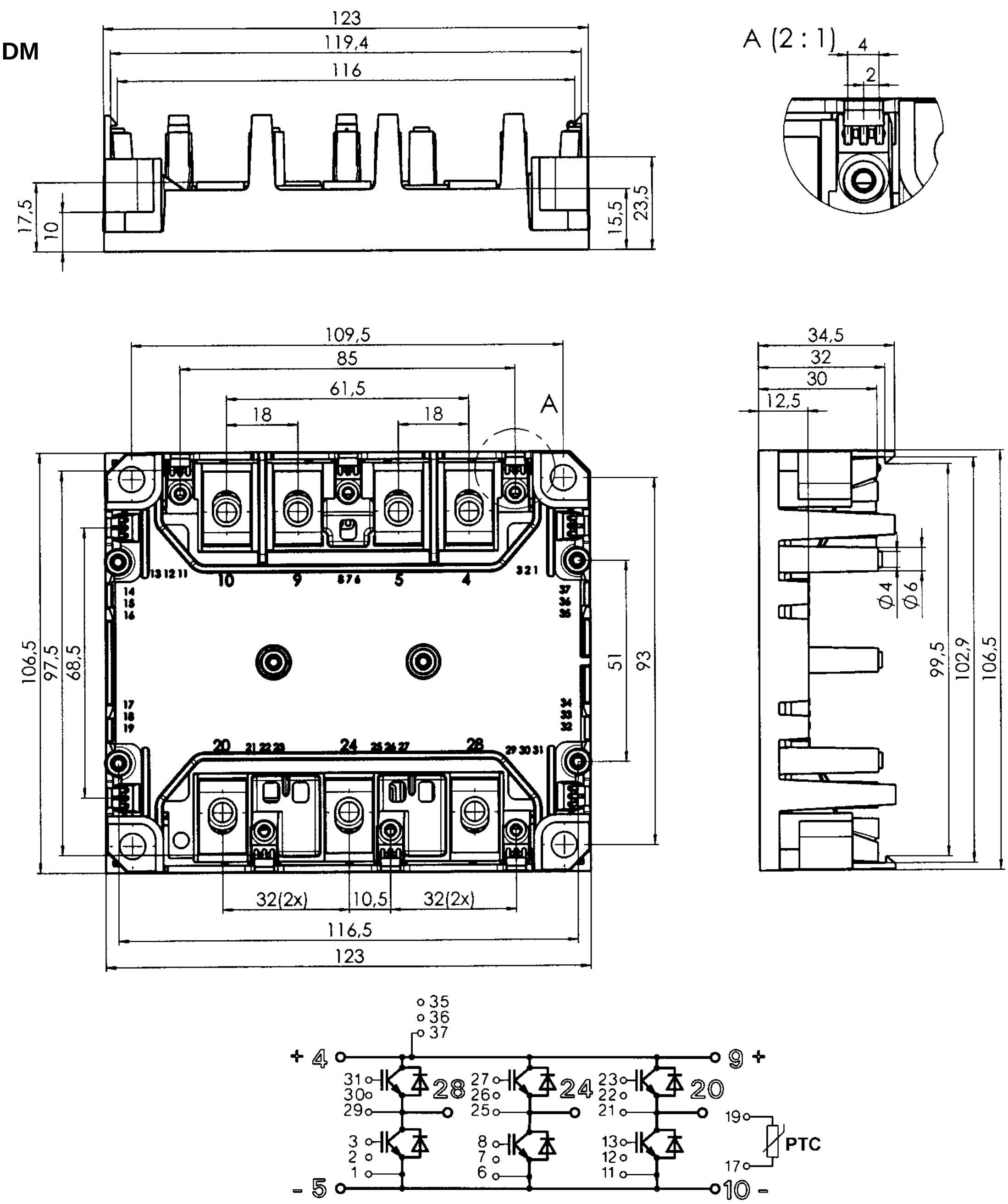

Dimensions in mm

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		–	–	310	g

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