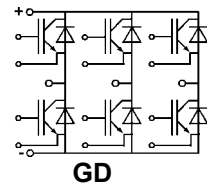


### SKiM® 5 IGBT Modules

### SKiM 500 GD 128 DM

Preliminary Data



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

Characteristics		min.	typ.	max.	Units
Symbol	Conditions <sup>1)</sup>				
$V_{(BR)CES}$	$V_{GE} = 0, I_C = 1 \text{ mA}$	$\geq V_{CES}$	-	-	V
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6 \text{ mA}$	4,5		6,5	V
$I_{CES}$	$V_{GE} = 0$ $V_{CE} = V_{CES}$ } $T_j = 125 \text{ }^\circ\text{C}$	-	15	-	mA
$I_{GES}$	$V_{GE} = 20 \text{ V}, V_{CE} = 0$	-	-	500	nA
$V_{CESat}^4)$	$I_C = 300 \text{ A}$ } $V_{GE} = 15 \text{ V};$ } $T_j = 25 (125) \text{ }^\circ\text{C}$ }	-	2,0(2,1)	2,3	V
$C_{ies}$	$V_{GE} = 0$	-	27	-	nF
$C_{oes}$	$V_{CE} = 25 \text{ V}$	-	6,5	-	nF
$C_{res}$	$f = 1 \text{ MHz}$	-	5,4	-	nF
$L_{CE}$		-	-	20	nH
$R_{CC'+EE'}$	resistance, terminal-chip; $T_{HS} = 25 (125) \text{ }^\circ\text{C}$	-	1,15(1,35)	-	$\text{m}\Omega$
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	-	225	-	ns
$t_r$	$V_{GE} = +15 \text{ V} / -15 \text{ V}^3)$	-	68	-	ns
$t_{d(off)}$	$I_C = 300 \text{ A, ind. load}$	-	1050	-	ns
$t_f$	$R_{Gon} = R_{Goff} = 5 \text{ }\Omega$	-	75	-	ns
$E_{on}$	$T_j = 125 \text{ }^\circ\text{C}$	-	32	-	mJ
$E_{off}$		-	30	-	mJ
Inverse Diode <sup>8)</sup>					
$V_F = V_{EC}$	$I_F = 300 \text{ A}$ } $V_{GE} = 0 \text{ V};$ } $T_j = 25 (125) \text{ }^\circ\text{C}$ }	-	2,3(2,1)	2,6	V
$V_F = V_{EC}$	$I_F = 150 \text{ A}$ } $T_j = 25 (125) \text{ }^\circ\text{C}$ }	-	1,8(1,6)		V
$V_{TO}$	$T_j = 125 \text{ }^\circ\text{C}$	-	1,1		V
$r_T$	$T_j = 125 \text{ }^\circ\text{C}$	-	3,3		$\text{m}\Omega$
$I_{RRM}$	$I_F = 300 \text{ A}; T_j = 25 (125) \text{ }^\circ\text{C}^2)$	-	TBD	-	A
$Q_{rr}$	$I_F = 300 \text{ A}; T_j = 25 (125) \text{ }^\circ\text{C}^2)$	-	TBD	-	$\mu\text{C}$
Thermal Characteristics <sup>5)</sup>					
$R_{thjh}$	per IGBT	-	-	0,09	$^\circ\text{C}/\text{W}$
$R_{thjD}$	per diode	-	-	0,125	$^\circ\text{C}/\text{W}$
$R'_{thjc}^6)$	per IGBT	-	-	0,014	$^\circ\text{C}/\text{W}$
$R'_{thjD}^6)$	per diode	-	-	0,025	$^\circ\text{C}/\text{W}$
Temperature Sensor					
$R_{TS}$	$T = 25 \text{ }^\circ\text{C} / 100 \text{ }^\circ\text{C}$		1,0 / 1,67		$\text{k}\Omega$
tolerance	$T = 25 \text{ }^\circ\text{C} / 100 \text{ }^\circ\text{C}$		3,0 / 2,0		%

### Features

- N channel, homogeneous planar IGBT Silicon structure with n+ buffer layer in SPT (soft punch through) technology
- Low inductance case
- Fast & soft inverse CAL diodes <sup>8)</sup>
- 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)

<sup>1)</sup>  $T_{HS} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified

<sup>2)</sup> TBD

<sup>3)</sup> Use  $V_{GEoff} = -5 \dots -15 \text{ V}$

<sup>4)</sup> Measured at chip level

<sup>5)</sup> See mounting instructions

<sup>6)</sup> Corresponding value. This value cannot be measured. It is only given for comparison.

<sup>8)</sup> CAL = Controlled Axial Lifetime Technology

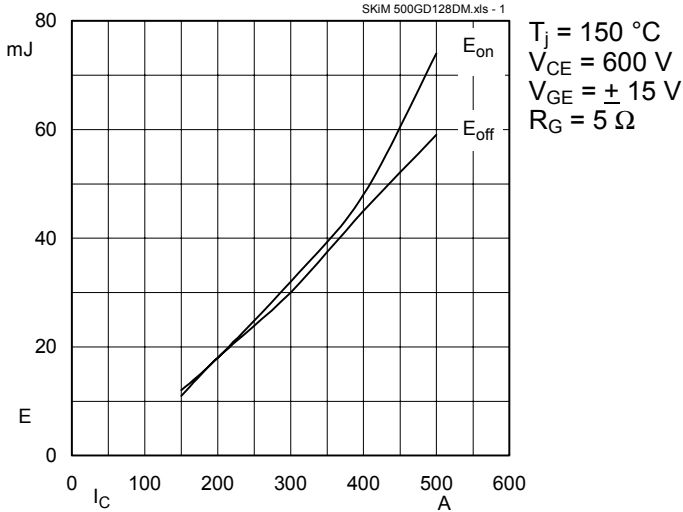


Fig. 1 Turn-on /-off energy =  $f(I_C)$

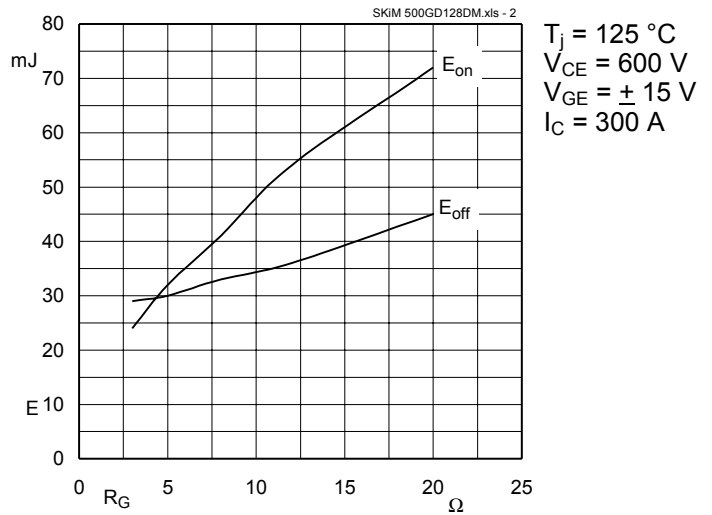


Fig. 2 Turn-on /-off energy =  $f(R_G)$

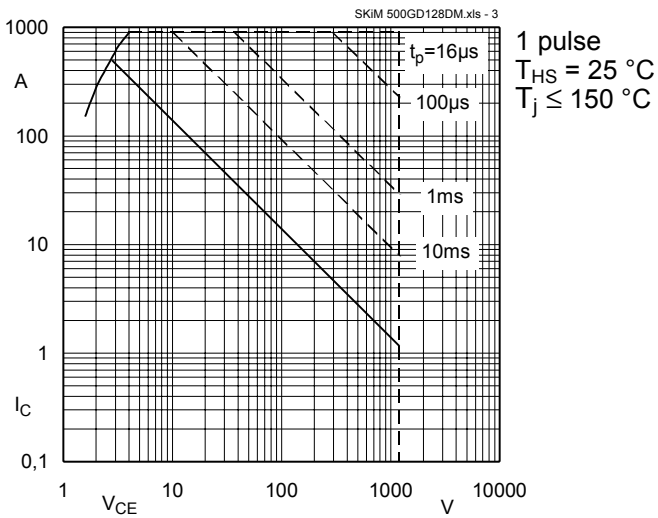


Fig. 3 Maximum safe operating area (SOA)  $I_C = f(V_{CE})$

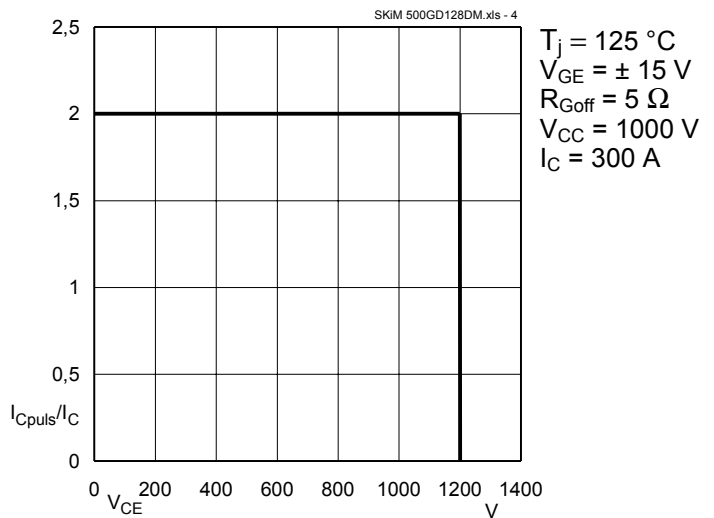


Fig. 4 Turn-off safe operating area (RBSOA)

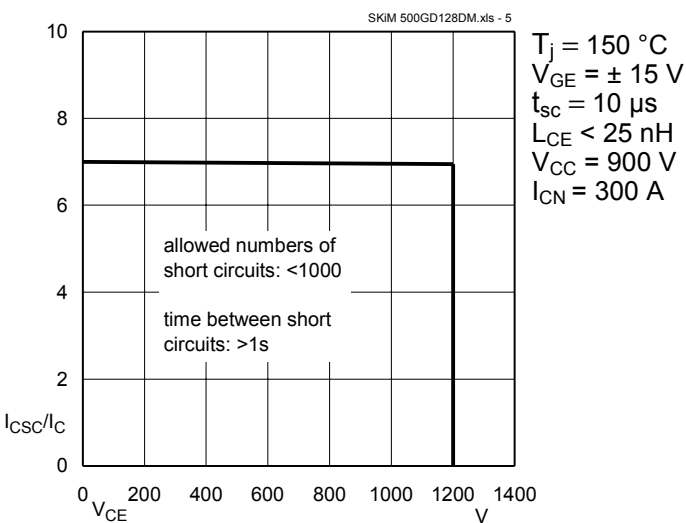


Fig. 5 Safe operating area at short circuit  $I_C = f(V_{CE})$

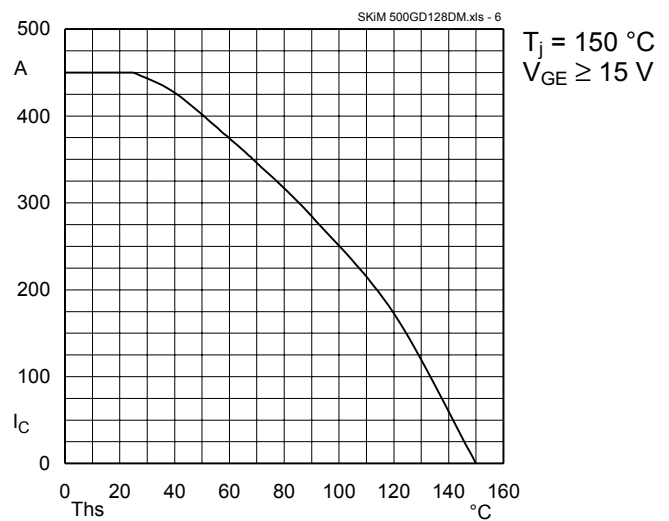


Fig. 6 Rated current vs. temperature  $I_C = f(T_{HS})$

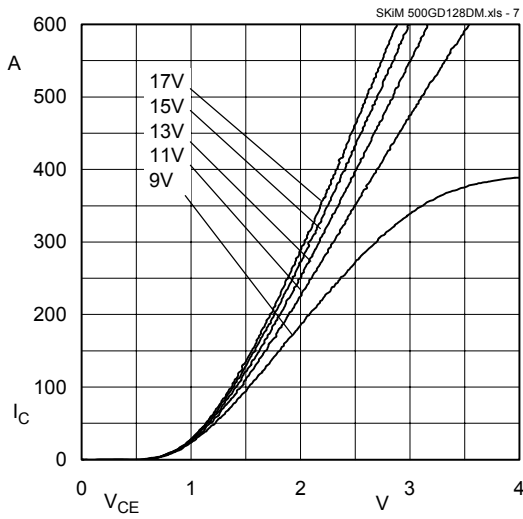


Fig. 7 Typ. output characteristic,  $t_p = 80 \mu s$ ;  $25 \text{ }^\circ\text{C}$

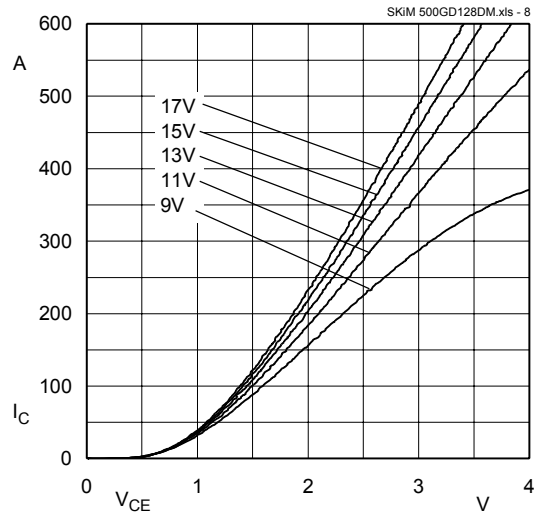


Fig. 8 Typ. output characteristic,  $t_p = 80 \mu s$ ;  $125 \text{ }^\circ\text{C}$

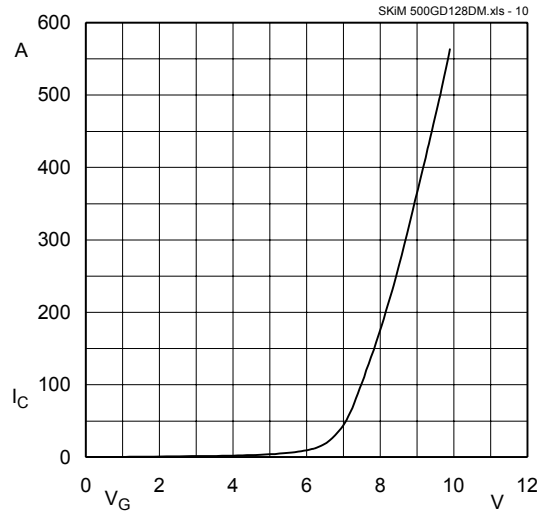


Fig. 9 Saturation characteristic (IGBT)  
Calculation elements and equations

Fig. 10 Typ. transfer characteristic,  $t_p = 80 \mu s$ ;  $V_{CE} = 20 \text{ V}$

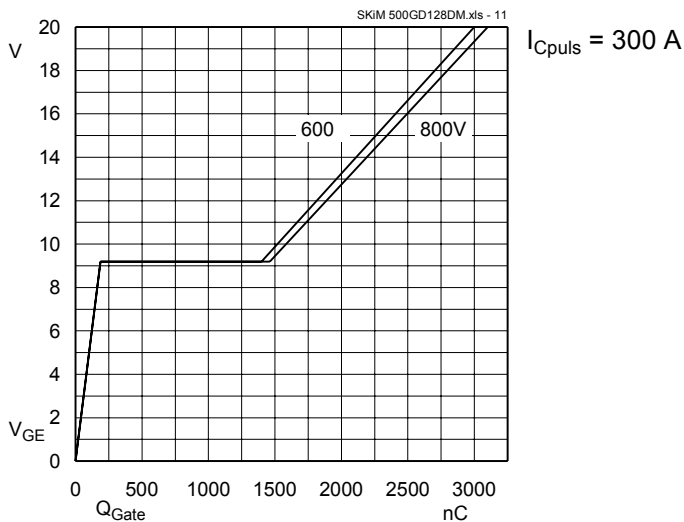


Fig. 11 Typ. gate charge characteristic

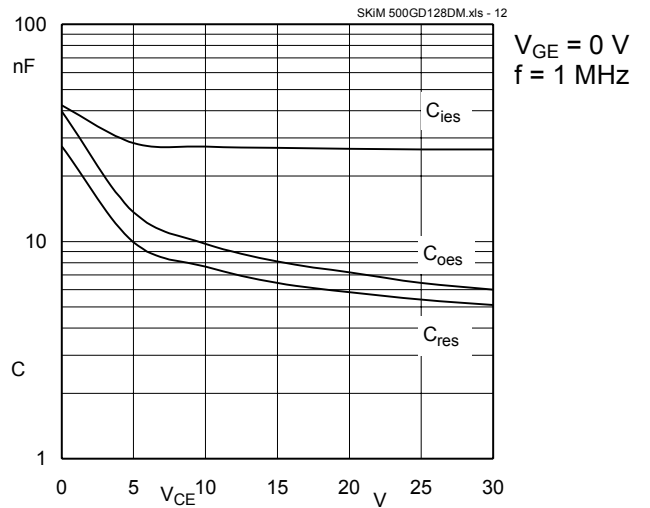


Fig. 12 Typ. capacitances vs.  $V_{CE}$

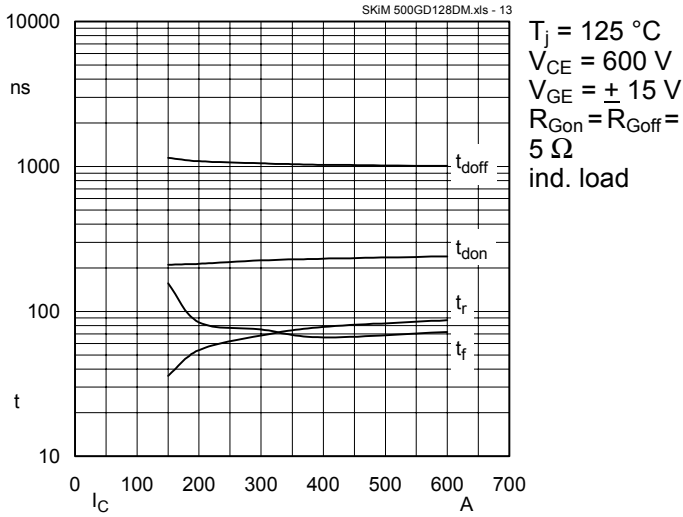


Fig. 13 Typ. switch times vs.  $I_C$

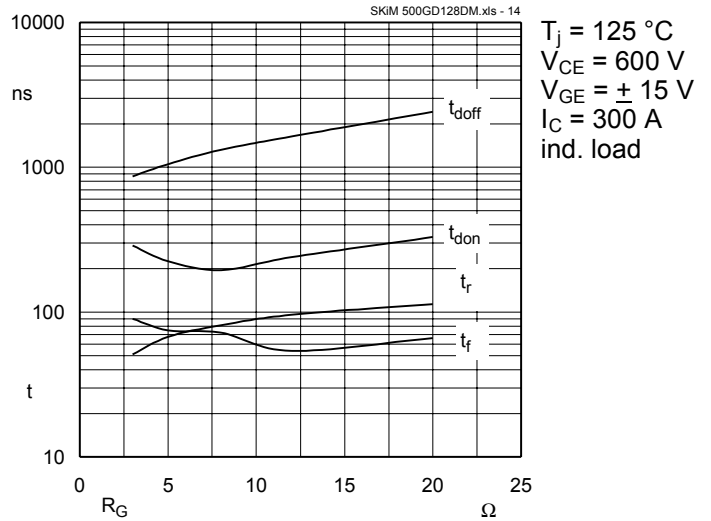


Fig. 14 Typ. switch times vs. gate resistor  $R_G$

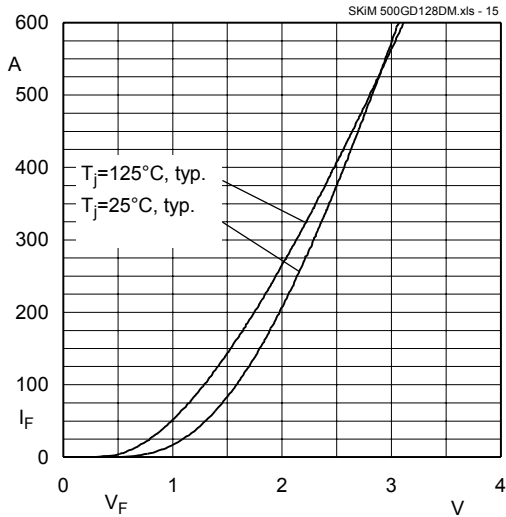


Fig. 15 Typ. CAL diode forward characteristic

Fig. 16 Diode turn-off energy dissipation per pulse

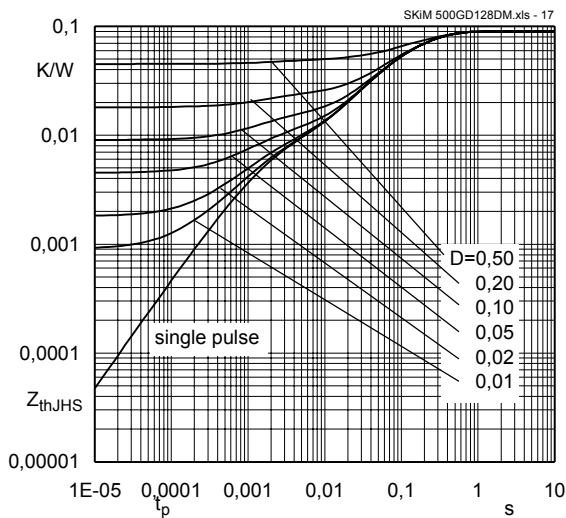


Fig. 17 Transient thermal impedance of IGBT  
 $Z_{thJHS} = f(t_p)$ ;  $D = t_p / t_c = t_p \cdot f$

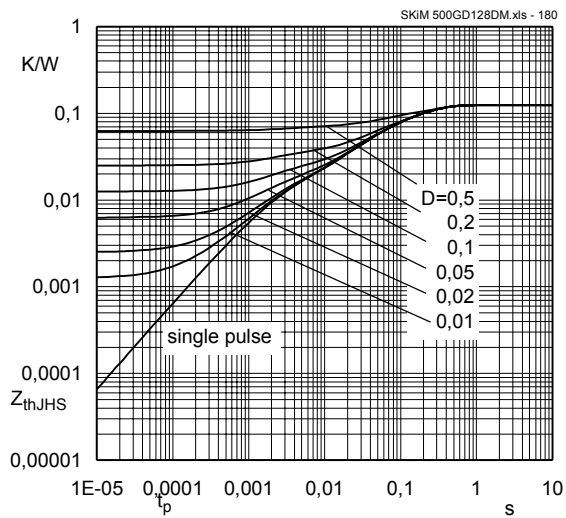
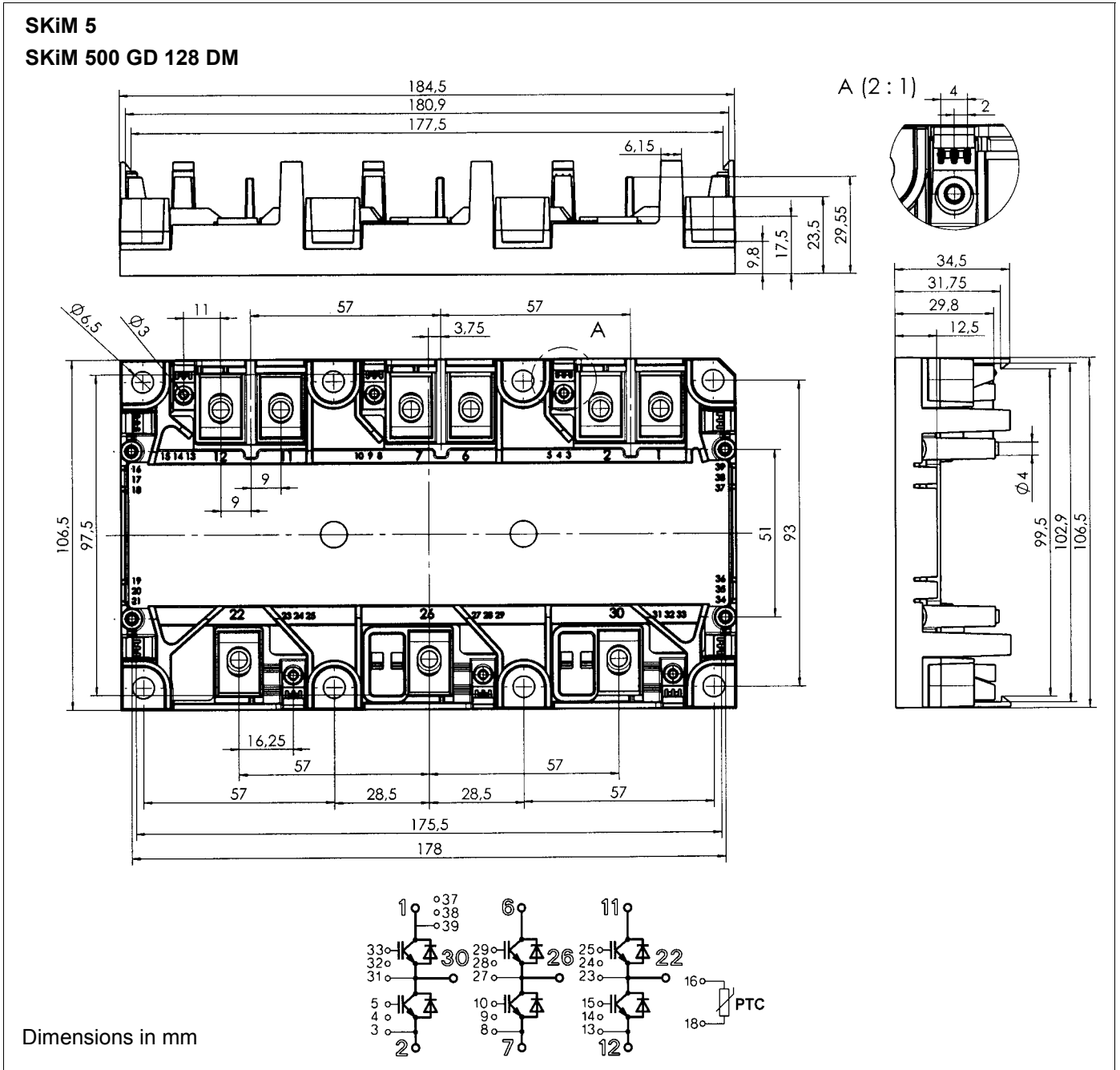


Fig. 18 Transient thermal impedance of inverse CAL diodes  
 $Z_{thJHS} = f(t_p)$ ;  $D = t_p / t_c = t_p \cdot f$



Case outline and circuit diagram

Mechanical Data			Values			Units
Symbol	Conditions		min.	typ.	max.	
M <sub>1</sub>	to heatsink, SI Units to heatsink, US Units	(M5)	2	—	3	Nm lb.in.
M <sub>2</sub>	for terminals, SI Units for terminals, US Units	(M6)	4	—	5	Nm lb.in.
a			—	—	5x9,81	m/s <sup>2</sup>
w			—	—	460	g

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

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee expressed or implied is made regarding delivery, performance or suitability.