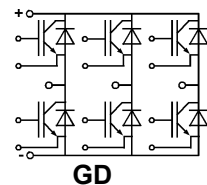
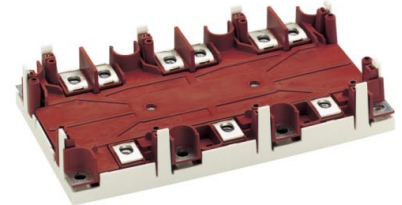


SKiM® 5 IGBT Modules

SKiM 400 GD 128 D

Preliminary Data



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 diodes⁸⁾
- Isolated by 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)

Absolute Maximum Ratings		Values	Units
Symbol	Conditions ¹⁾		
V_{CES}		1200	V
V_{CGR}	$R_{GE} = 20 \text{ k}\Omega$	1200	V
I_C	$T_{HS} = 25/70 \text{ }^\circ\text{C}$	350 / 270	A
I_{CM}	$T_{HS} = 25/70 \text{ }^\circ\text{C}; t_p = 1 \text{ ms}$	700 / 540	A
V_{GES}		± 20	V
P_{tot}	per IGBT, $T_{HS} = 25 \text{ }^\circ\text{C}$	960	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			
$I_F = -I_C$	$T_{HS} = 25/70 \text{ }^\circ\text{C}$	350 / 300	A
$I_{FM} = -I_{CM}$	$T_{HS} = 25/70 \text{ }^\circ\text{C}; t_p = 1 \text{ ms}$	700 / 600	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	A^2s

Characteristics		min.	typ.	max.	Units
Symbol	Conditions ¹⁾				
$V_{(BR)CES}$	$V_{GE} = 0, I_C = 1 \text{ mA}$	$\geq V_{CES}$	-	-	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; $T_{HS} = 25 (125) \text{ }^\circ\text{C}$	-	0,9(1,1)	-	$\text{m}\Omega$
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $V_{GE} = +15 \text{ V} / -15 \text{ V}^3)$	-	225	-	ns
t_r		-	68	-	ns
$t_{d(off)}$	$I_C = 300 \text{ A, ind. load}$	-	1050	-	ns
t_f	$R_{Gon} = R_{Goff} = 5 \text{ }^\circ\Omega$	-	75	-	ns
E_{on}	$T_j = 125 \text{ }^\circ\text{C}$	-	32	-	mJ
E_{off}		-	30	-	mJ
Inverse Diode⁸⁾					
$V_F = V_{EC}$	$I_F = 300 \text{ A}$ } $V_{GE} = 0 \text{ V};$ } $T_j = 25 (125) \text{ }^\circ\text{C}$ }	-	2,3(2,1)	2,6	V
$V_F = V_{EC}$	$I_F = 150 \text{ A}$	-	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	-	μC
Thermal Characteristics⁵⁾					
R_{thjh}	per IGBT	-	-	0,13	$^\circ\text{C}/\text{W}$
R_{thjD}	per diode	-	-	0,19	$^\circ\text{C}/\text{W}$
R'_{thjc} ⁶⁾	per IGBT	-	-	0,053	$^\circ\text{C}/\text{W}$
R'_{thjD} ⁶⁾	per diode	-	-	0,085	$^\circ\text{C}/\text{W}$
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		%

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

2) TBD

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

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

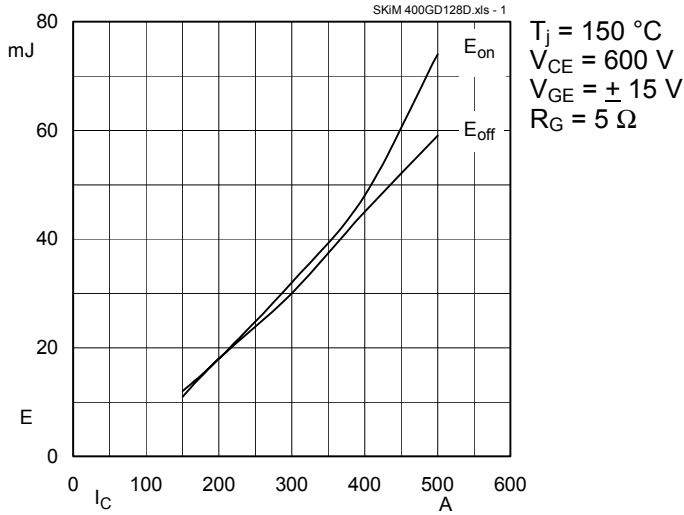


Fig. 1 Turn-on /off energy = f (I_C)

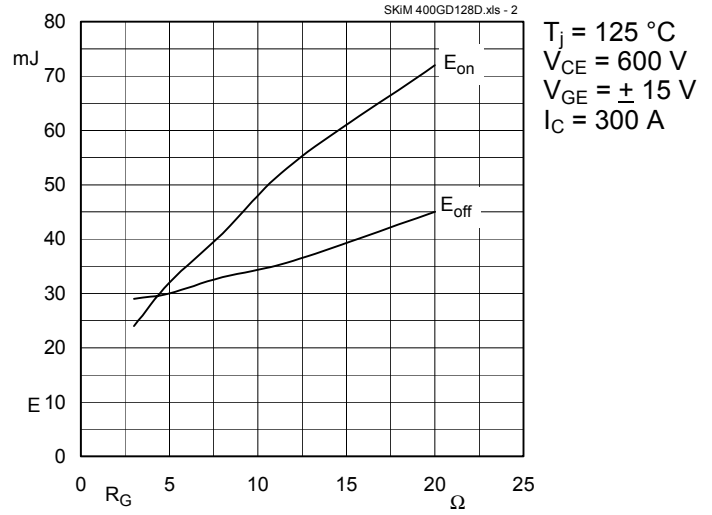


Fig. 2 Turn-on /off energy = f (R_G)

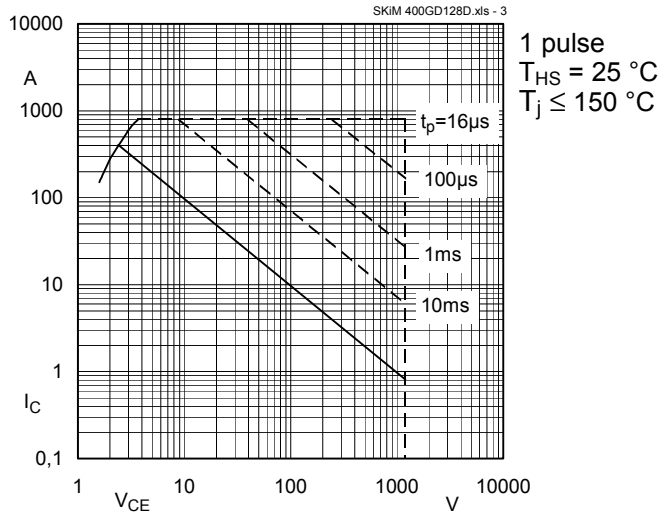


Fig. 3 Maximum safe operating area (SOA) $I_C = f(V_{CE})$

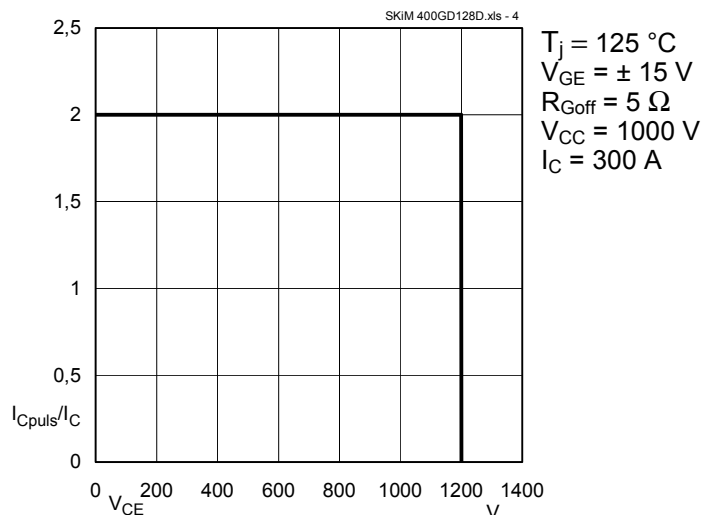


Fig. 4 Turn-off safe operating area (RBSOA)

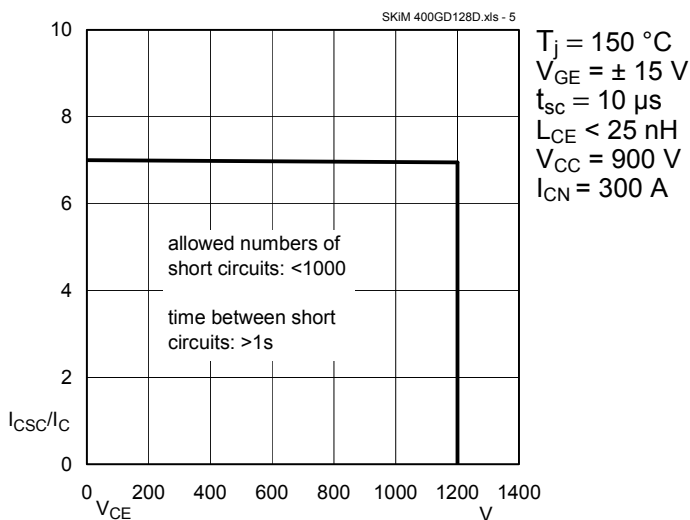


Fig. 5 Safe operating area at short circuit $I_C = f(V_{CE})$

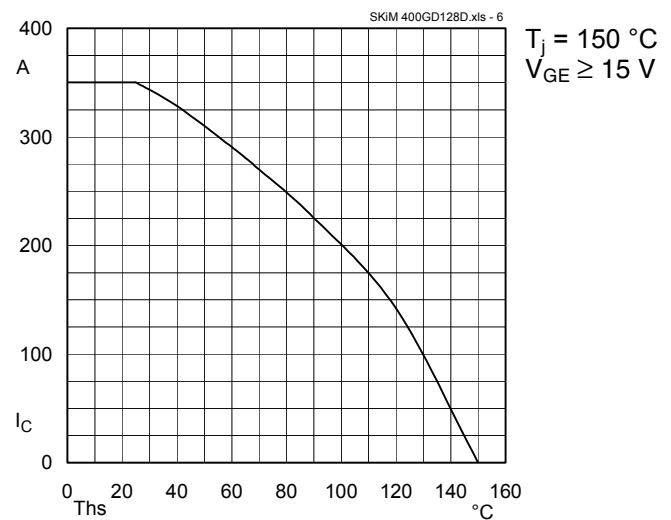


Fig. 6 Rated current vs. temperature $I_C = f(T_{HS})$

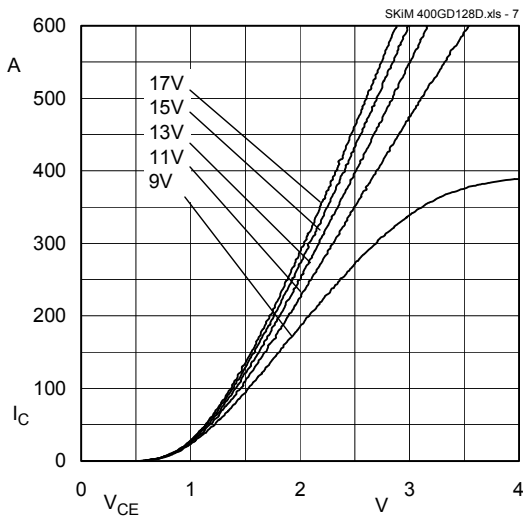


Fig. 7 Typ. output characteristic, $t_p = 80 \mu s$; $25^\circ C$

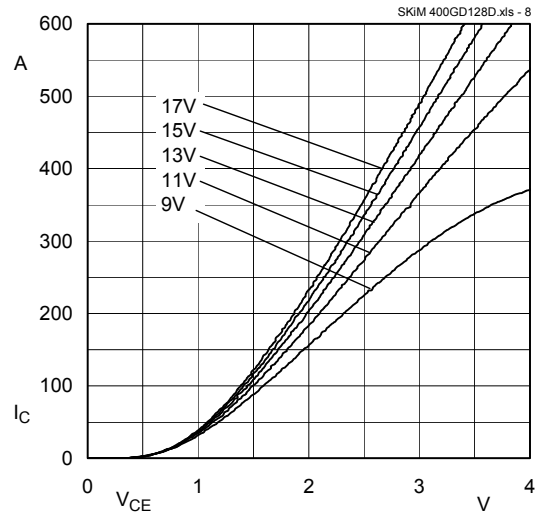


Fig. 8 Typ. output characteristic, $t_p = 80 \mu s$; $125^\circ C$

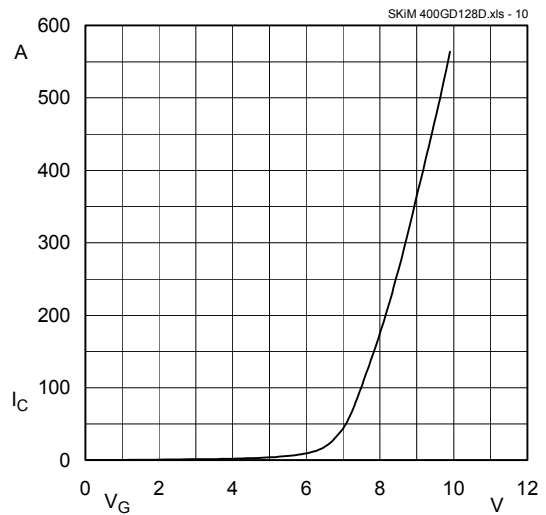


Fig. 9 Saturation characteristic (IGBT)
Calculation elements and equations

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

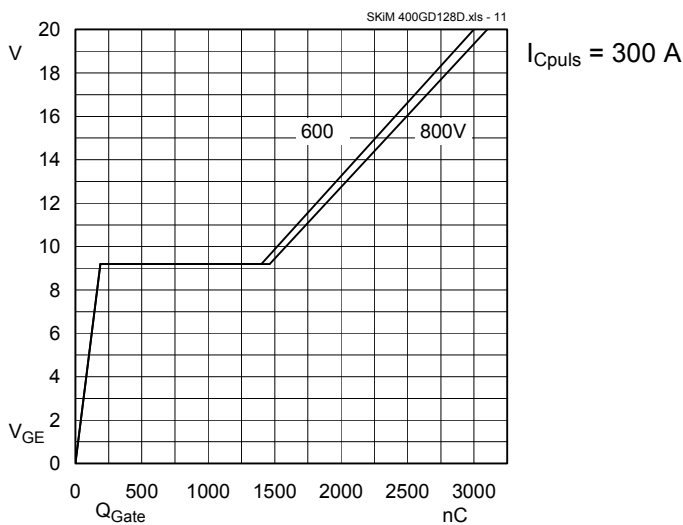


Fig. 11 Typ. gate charge characteristic

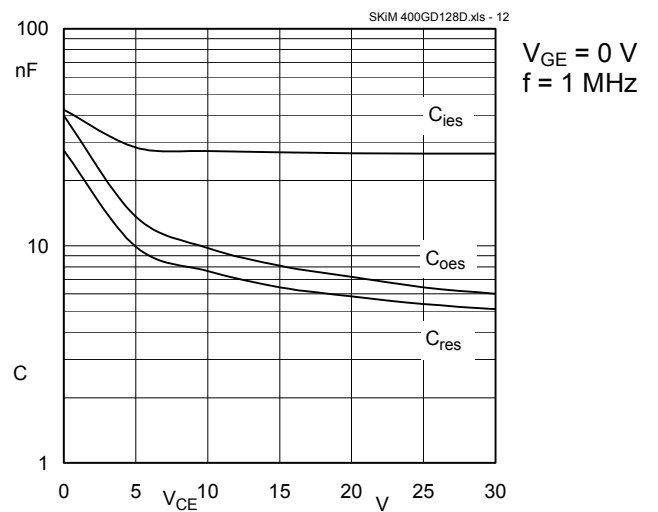


Fig. 12 Typ. capacitances vs. V_{CE}

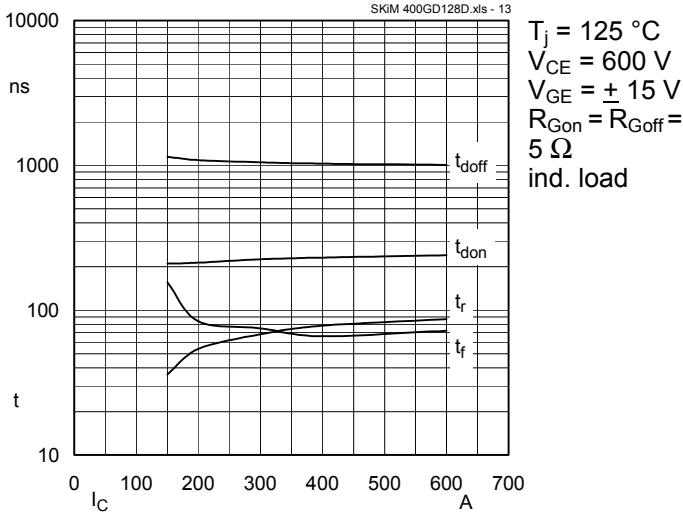


Fig. 13 Typ. switch times vs. I_C

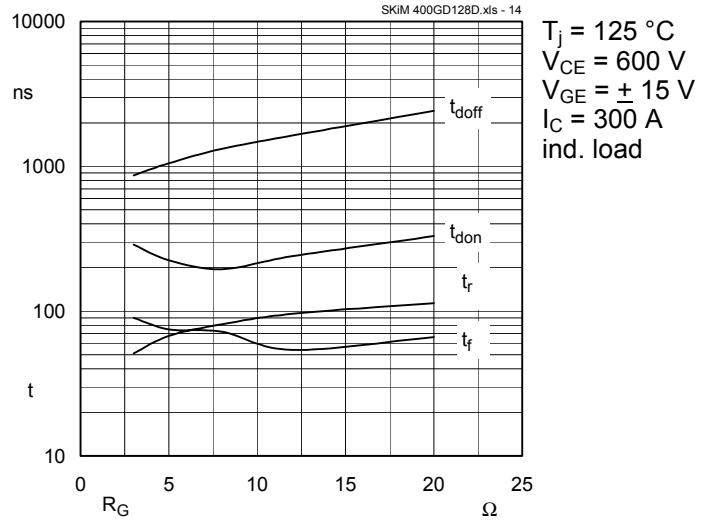


Fig. 14 Typ. switch times vs. gate resistor R_G

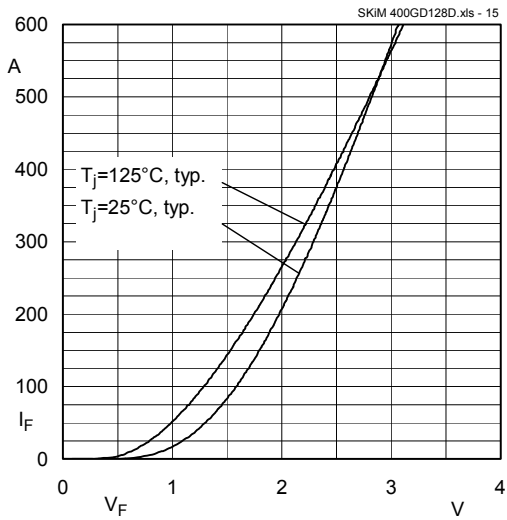


Fig. 15 Typ. CAL diode forward characteristic

Fig. 16 Diode turn-off energy dissipation per pulse

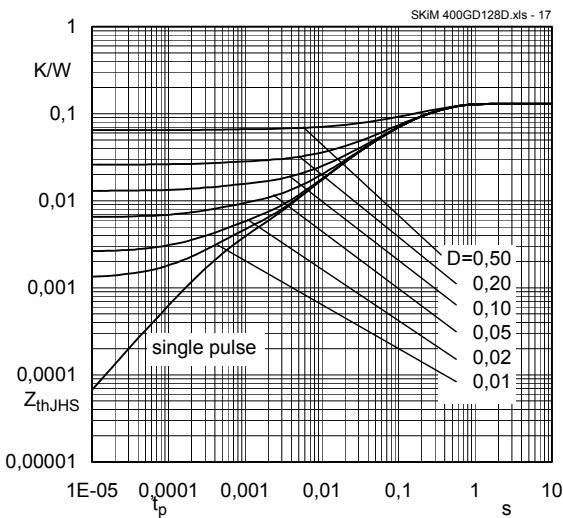


Fig. 17 Transient thermal impedance of IGBT
 $Z_{thJHS} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

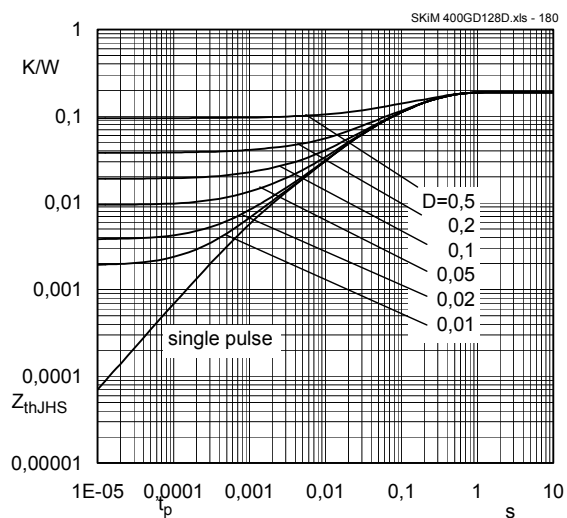
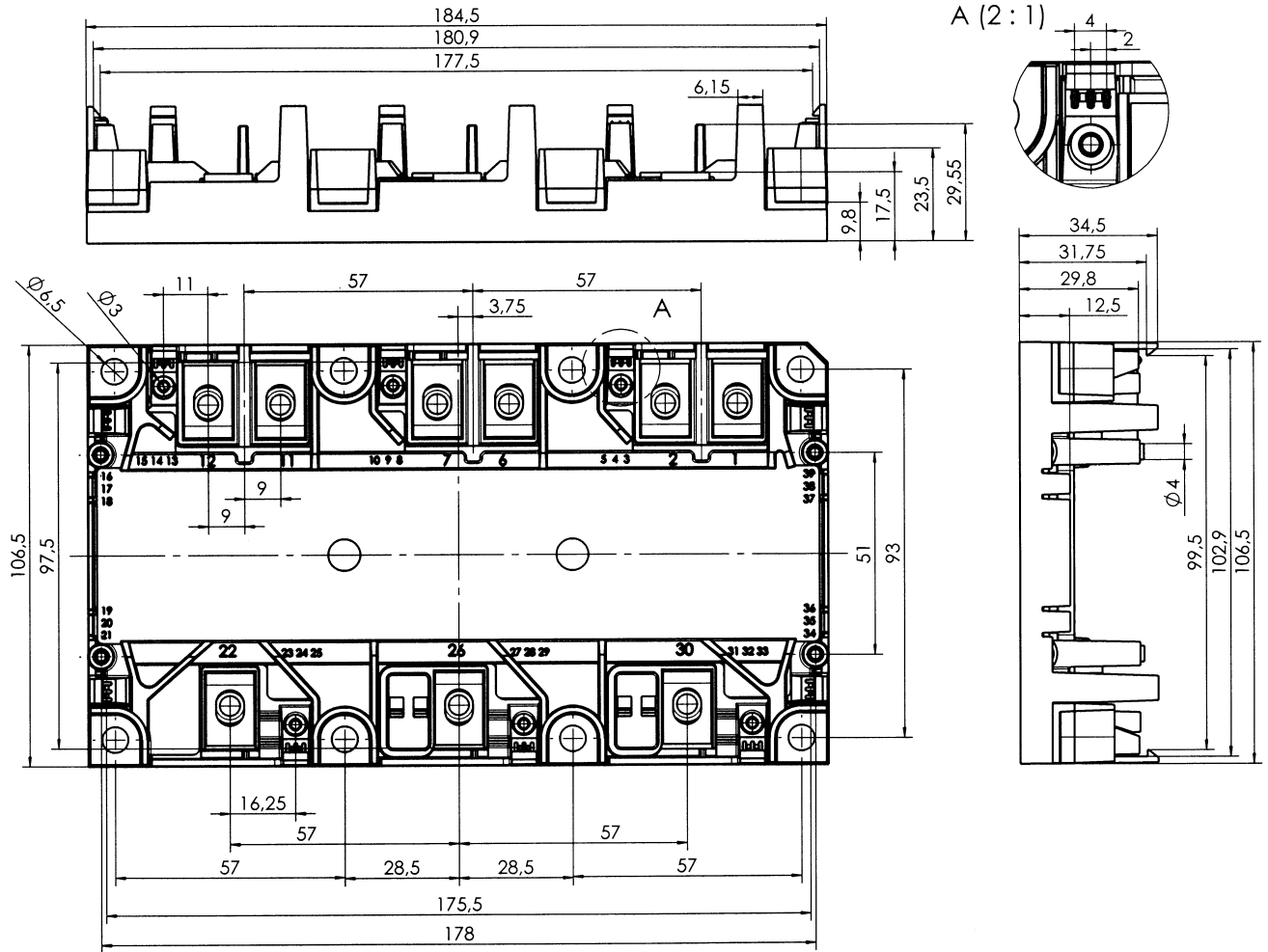
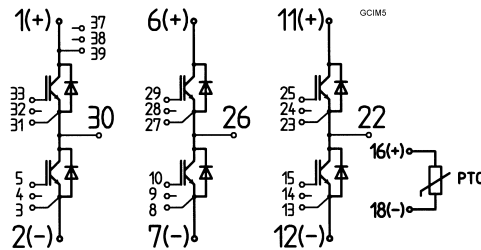


Fig. 18 Transient thermal impedance of inverse CAL diodes
 $Z_{thJHS} = f(t_p)$; $D = t_p / t_c = t_p \cdot f$

SKiM 5
SKiM 400 GD 128 D



Dimensions in mm



Case outline and circuit diagram

Mechanical Data			Values			Units
Symbol	Conditions		min.	typ.	max.	
M ₁	to heatsink, SI Units to heatsink, US Units	(M5)	2	—	3	Nm lb.in.
M ₂	for terminals, SI Units for terminals, US Units	(M6)	4	—	5	Nm 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.

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

