



SKiM[®] 4

IGBT Modules

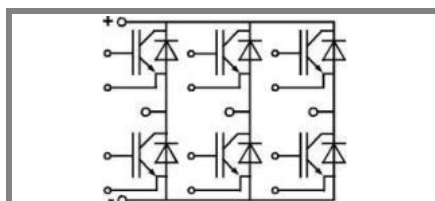
SKiM 220GD176D H4

Features

- Homogenous Si
- Trench = Trenchgate Technology
- V_{CEsat} with positive temperature coefficient
- High short circuit capability, self limiting to $6 \times I_C$

Typical Applications*

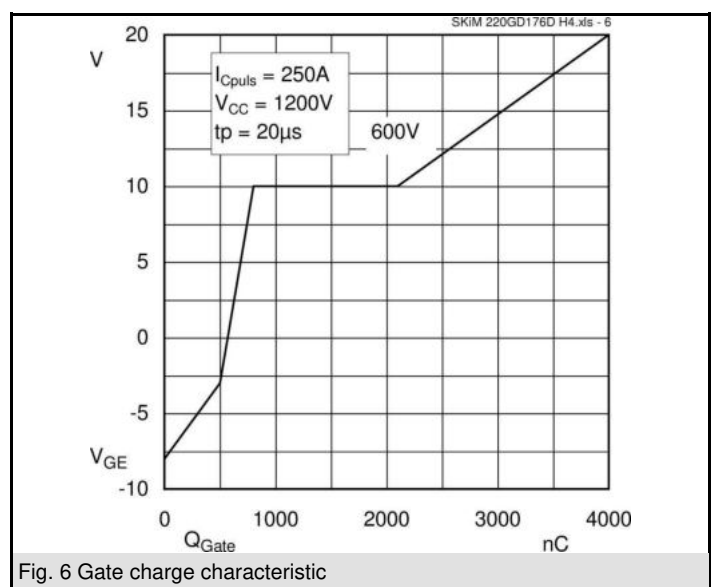
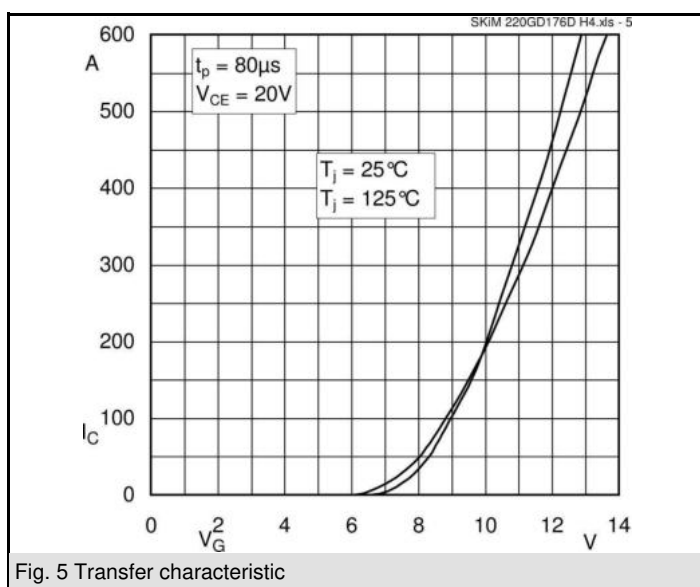
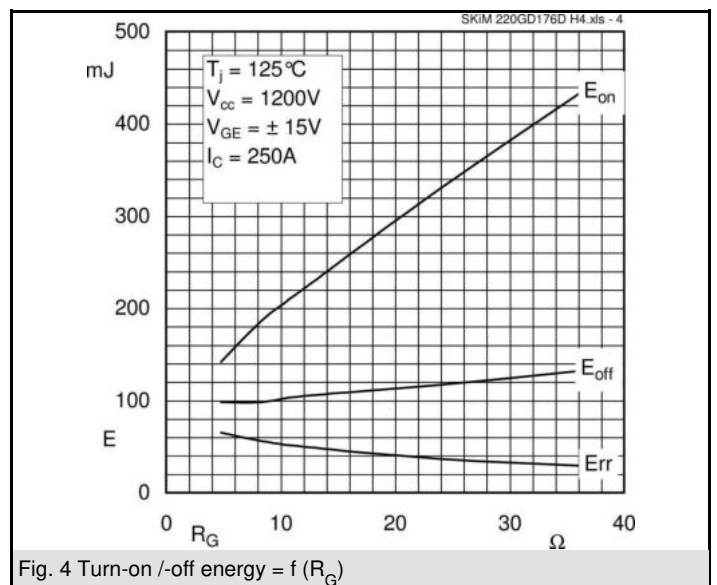
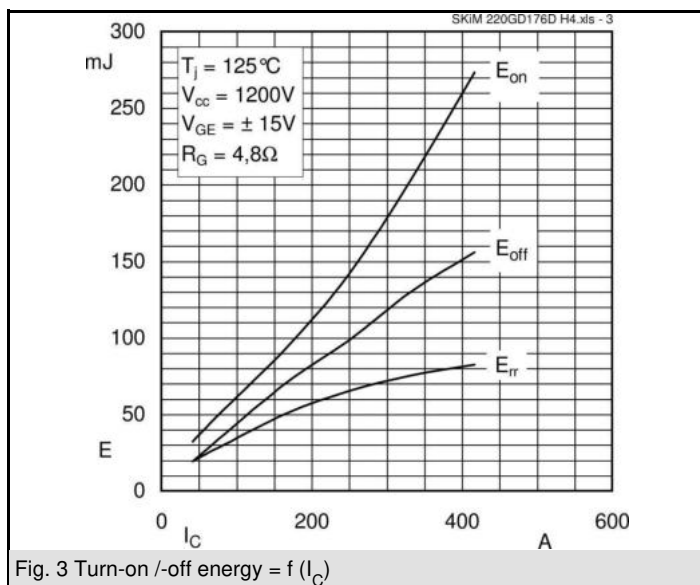
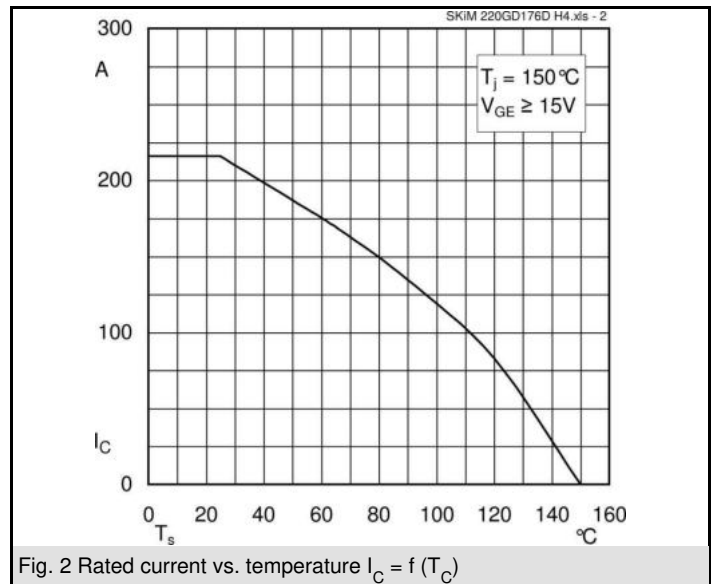
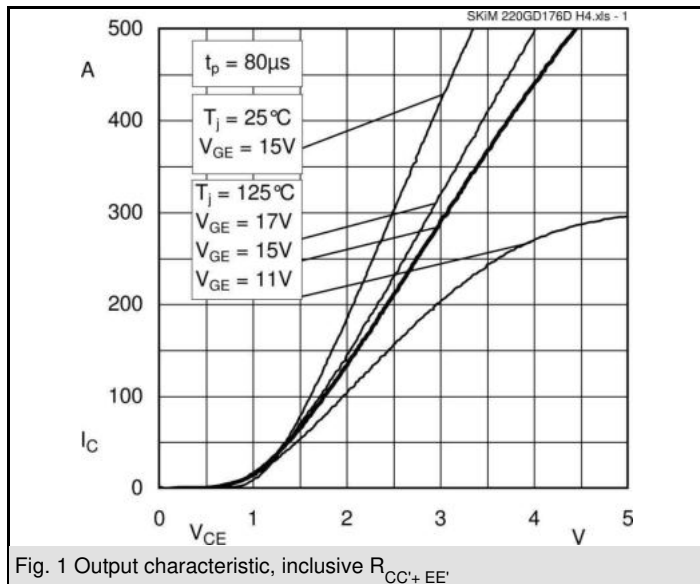
- AC inverter drives mains 575 - 750 V AC
- public transport (auxiliary syst.)



GD

Absolute Maximum Ratings		$T_c = 25\text{ °C}$, unless otherwise specified	
Symbol	Conditions	Values	Units
IGBT			
V_{CES}		1700	V
I_C	$T_s = 25\text{ (70) °C}$	220 (165)	A
I_{CRM}	$t_p = 1\text{ ms}$	440	A
V_{GES}		± 20	V
T_j (T_{stg})		- 40 ... + 150 (125)	°C
T_{cop}	max. case operating temperature	125	°C
V_{isol}	AC, 1 min.	4000	V
Inverse diode			
I_F	$T_s = 25\text{ (70) °C}$	220 (165)	A
I_{FRM}	$t_p = 1\text{ ms}$	440	A
I_{FSM}	$t_p = 10\text{ ms}$; sin.; $T_j = 150\text{ °C}$	2200	A

Characteristics		$T_c = 25\text{ °C}$, unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
IGBT					
$V_{GE(th)}$	$V_{GE} = V_{CE}$; $I_C = 10\text{ mA}$	5,15	5,8	6,45	V
I_{CES}	$V_{GE} = 0$; $V_{CE} = V_{CES}$; $T_j = 25\text{ °C}$			3	mA
V_{CEO}	$T_j = 0\text{ °C}$		1 (0,9)	1,2 (1,1)	V
r_{CE}	$T_j = \text{°C}$		4 (6)	5	mΩ
V_{CEsat}	$I_{Cnom} = 250\text{ A}$; $V_{GE} = 15\text{ V}$; $T_j = 25\text{ (125) °C}$ on chip level		2 (2,4)	2,45	V
C_{ies}	$V_{GE} = 0$; $V_{CE} = 25\text{ V}$; $f = 1\text{ MHz}$		22		nF
C_{oes}	$V_{GE} = 0$; $V_{CE} = 25\text{ V}$; $f = 1\text{ MHz}$		0,9		nF
C_{res}	$V_{GE} = 0$; $V_{CE} = 25\text{ V}$; $f = 1\text{ MHz}$		0,7		nF
L_{CE}				15	nH
$R_{CC'+EE'}$	resistance, terminal-chip $T_c = 25\text{ (125) °C}$		1,35 (1,75)		mΩ
$t_{d(on)}$	$V_{CC} = 1200\text{ V}$		330		ns
t_r	$I_{Cnom} = 250\text{ A}$		55		ns
$t_{d(off)}$	$R_{Gon} = R_{Goff} = 4,8\text{ Ω}$		880		ns
t_f	$T_j = 125\text{ °C}$		145		ns
$E_{on} (E_{off})$	$V_{GE} \pm 15\text{ V}$		145 (100)		mJ
$E_{on} (E_{off})$	with SKHI 64; $T_j = 125\text{ °C}$; $V_{CC} = 1200\text{ V}$; $I_C = 250\text{ A}$				mJ
Inverse diode					
$V_F = V_{EC}$	$I_{Fnom} = 250\text{ A}$; $V_{GE} = 15\text{ V}$; $T_j = 25\text{ (125) °C}$		1,7 (1,8)	1,9 (2)	V
V_{TO}	$T_j = 25\text{ (125) °C}$		1,1 (0,9)	1,3 (1,1)	V
r_T	$T_j = 25\text{ (125) °C}$		3 (4,5)	3 (4,5)	mΩ
I_{RRM}	$I_F = 200\text{ A}$; $T_j = 125\text{ °C}$				A
Q_{rr}	$V_{GE} = 0\text{ V}$ di/dt = A/μs				μC
E_{rr}	$R_{Gon} = R_{Goff} = 4,8\text{ Ω}$		(65)		mJ
Thermal characteristics					
$R_{th(j-s)}$	per IGBT			0,21	K/W
$R_{th(j-s)}$	per FWD			0,26	K/W
Temperature Sensor					
R_{TS}	$T = 25\text{ (100) °C}$		1 (1,67)		kΩ
tolerance	$T = 25\text{ (100) °C}$		3 (2)		%
Mechanical data					
M_1	to heatsink (M5)	2		3	Nm
M_2	for terminals (M6)	4		5	Nm
w				310	g



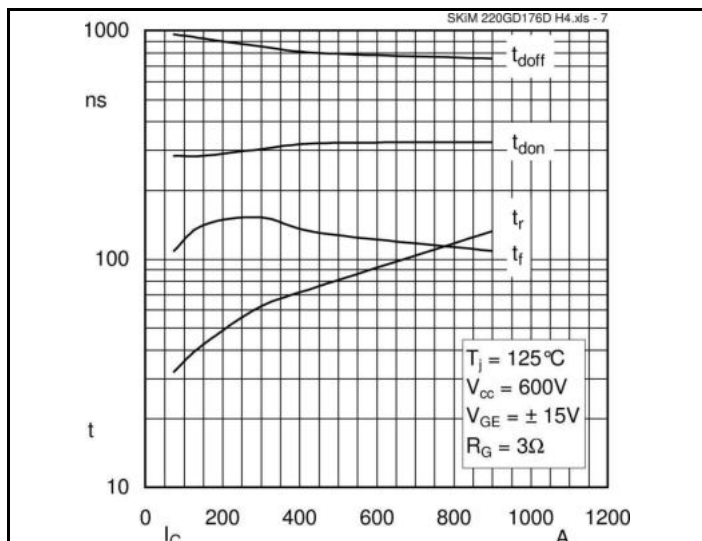


Fig. 7 Switching times vs. I_C

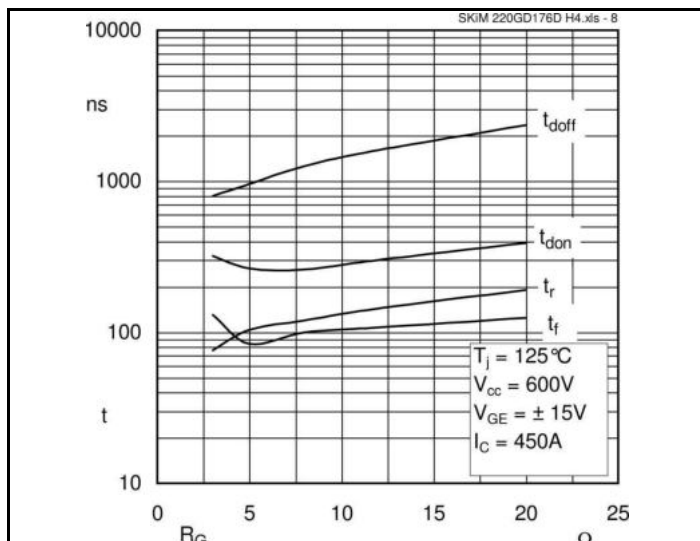


Fig. 8 Switching times vs. gate resistor R_G

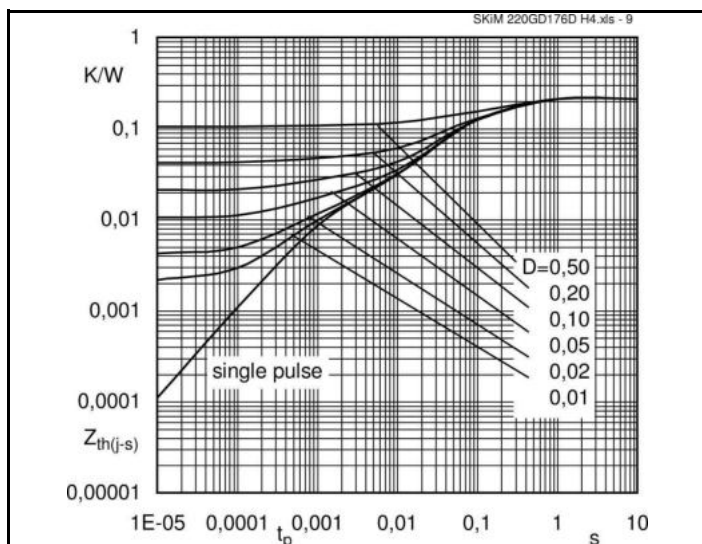


Fig. 9 Transient thermal impedance of

$$\text{IGBT } Z_{thJC} = f(t_p); D = t_p/t_c = t_p * f$$

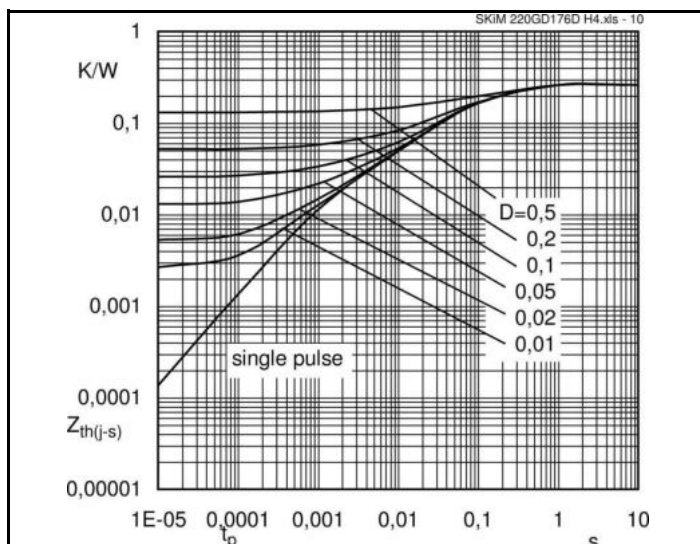


Fig. 10 Transient thermal impedance of inverse diodes

$$\text{IGBT } Z_{thJC} = f(t_p); D = t_p/t_c = t_p * f$$

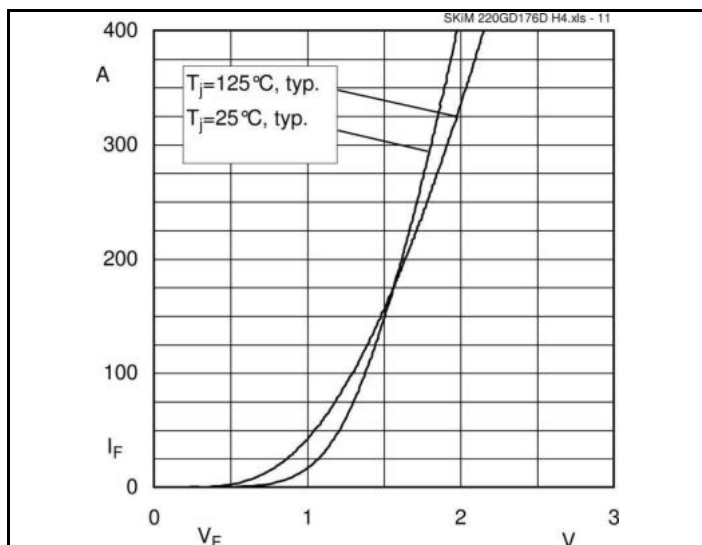
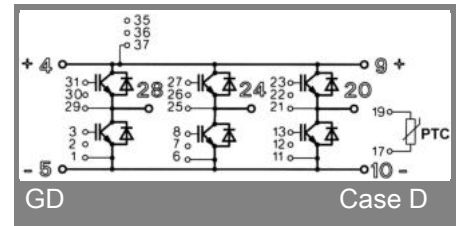
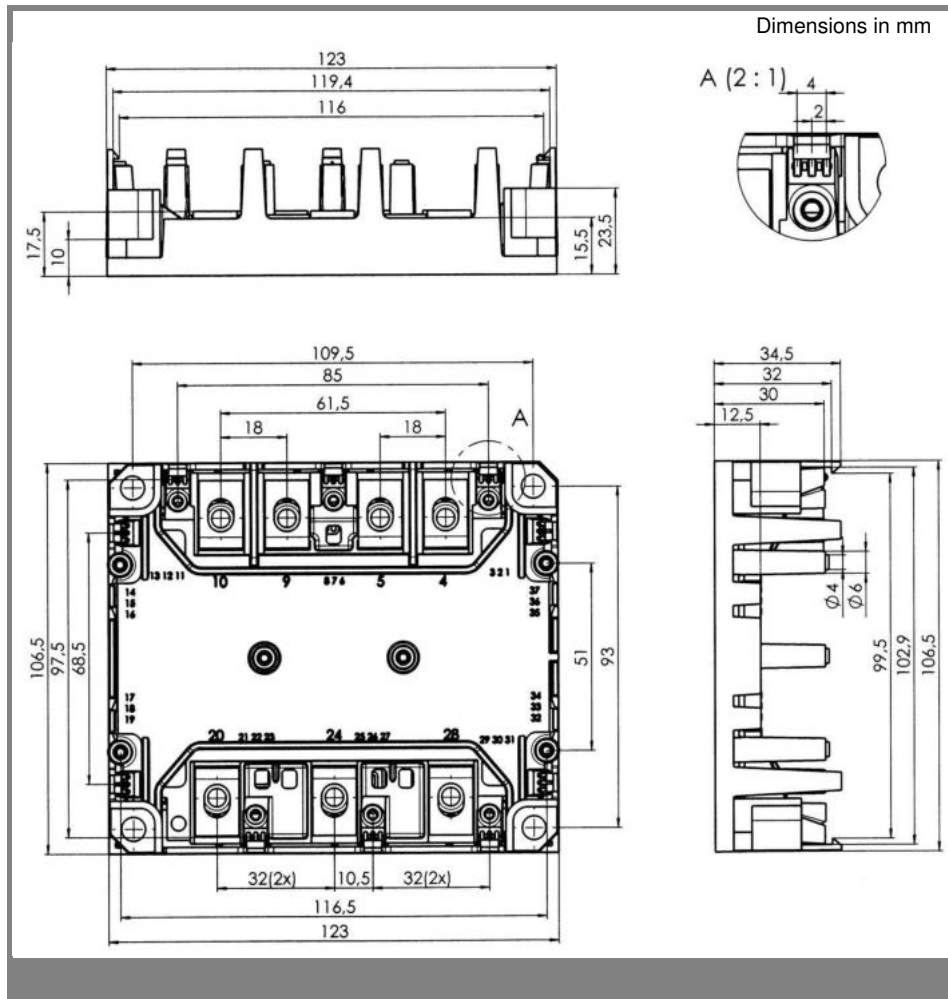


Fig. 11 CAL diode forward characteristic, incl. $R_{CC'+EE'}$



This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

*IMPORTANT INFORMATION AND WARNINGS

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