

# SKiM 120GD176D



SKiM<sup>®</sup> 4

## IGBT Modules

### SKiM 120GD176D

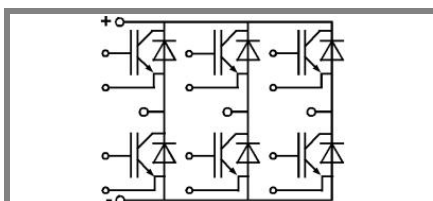
Preliminary Data

#### Features

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

#### Typical Applications

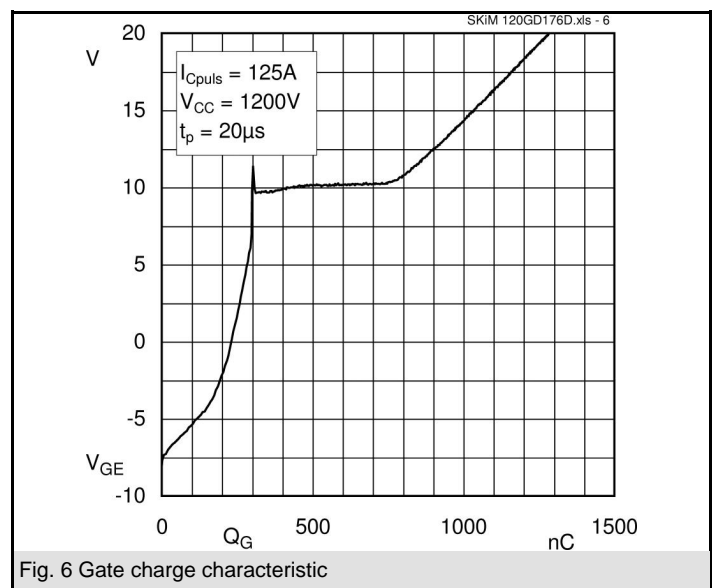
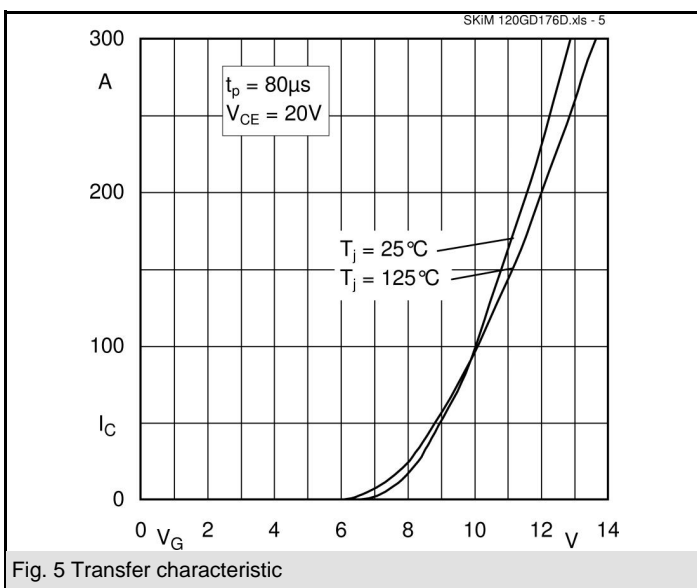
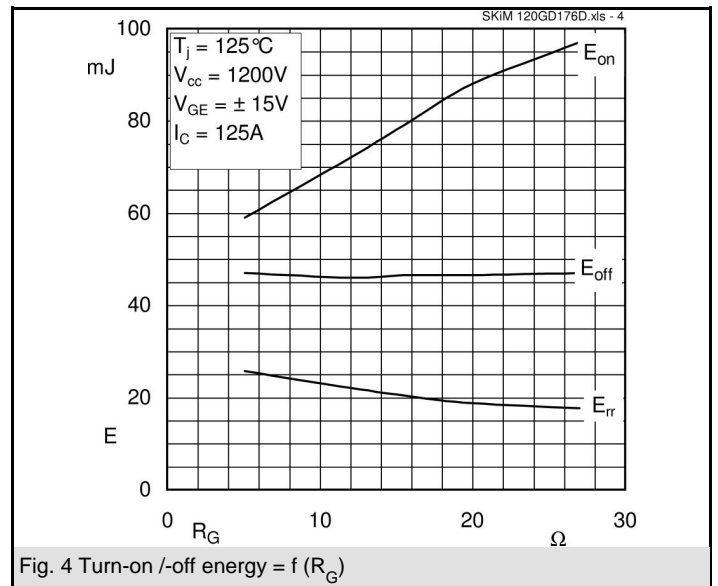
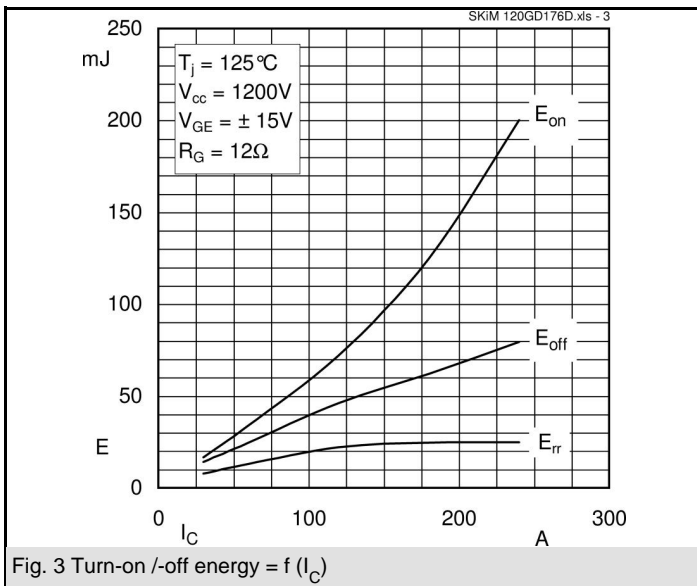
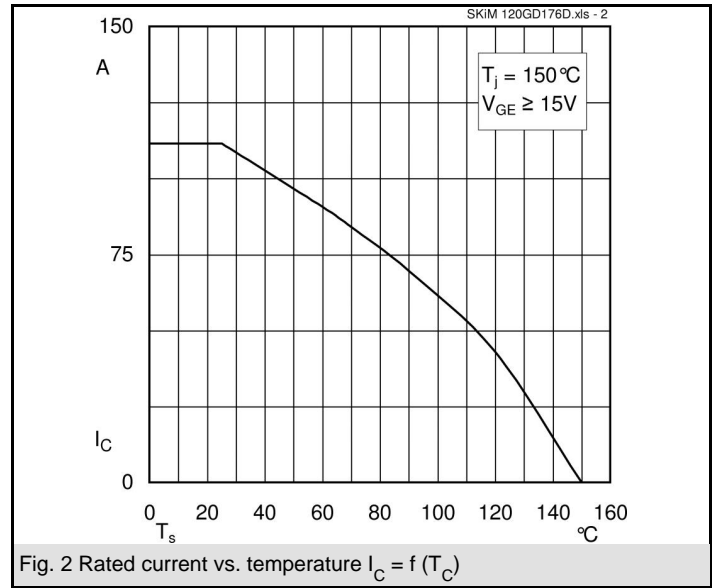
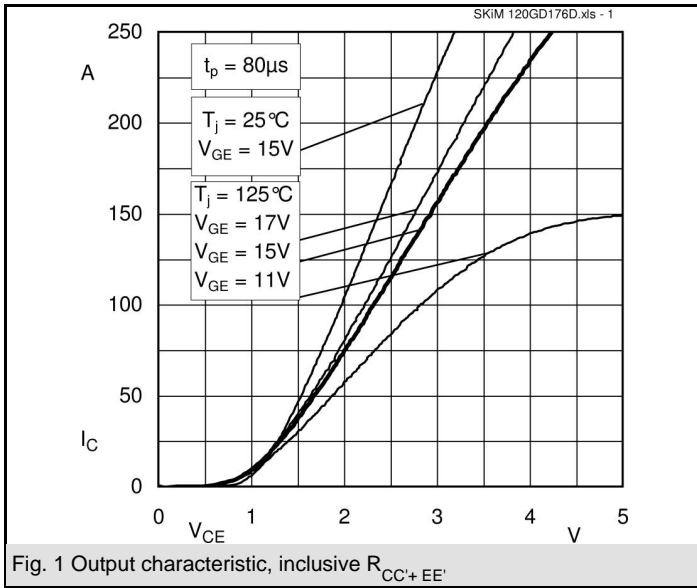
- AC inverter drives mains 575 - 750 V AC
- public transport (auxiliary syst.)



GD

Absolute Maximum Ratings		$T_c = 25\text{ }^\circ\text{C}$ , unless otherwise specified	
Symbol	Conditions	Values	Units
<b>IGBT</b>			
$V_{CES}$		1700	V
$I_C$	$T_s = 25\text{ (70) }^\circ\text{C}$	110 (85)	A
$I_{CRM}$	$t_p = 1\text{ ms}$	250	A
$V_{GES}$		$\pm 20$	V
$T_j$ ( $T_{stg}$ )		-40 ... 150	$^\circ\text{C}$
$T_{cop}$	max. case operating temperature	125	$^\circ\text{C}$
$V_{isol}$	AC, 1 min.	3300	V
<b>Inverse diode</b>			
$I_F$	$T_s = 25\text{ (70) }^\circ\text{C}$	105 (80)	A
$I_{FRM}$	$t_p = 1\text{ ms}$	200	A
$I_{FSM}$	$t_p = 10\text{ ms}$ ; sin.; $T_j = 150\text{ }^\circ\text{C}$	1200	A

Characteristics		$T_c = 25\text{ }^\circ\text{C}$ , unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
<b>IGBT</b>					
$V_{GE(th)}$	$V_{GE} = V_{CE}$ ; $I_C = 5\text{ mA}$	5,15	5,8	6,45	V
$I_{CES}$	$V_{GE} = 0$ ; $V_{CE} = V_{CES}$ ; $T_j = 25\text{ }^\circ\text{C}$			0,3	mA
$V_{CEO}$	$T_j = 25\text{ (125) }^\circ\text{C}$		1 (0,9)	1,2 (1,1)	V
$r_{CE}$	$T_j = 25\text{ (125) }^\circ\text{C}$		8 (12)	10 (14,4)	m $\Omega$
$V_{CEsat}$	$I_{Cnom} = 125\text{ A}$ ; $V_{GE} = 15\text{ V}$ ; $T_j = 25\text{ (125) }^\circ\text{C}$ on chip level		2 (2,4)	2,45	V
$C_{ies}$	$V_{GE} = 0$ ; $V_{CE} = 25\text{ V}$ ; $f = 1\text{ MHz}$		11		nF
$C_{oes}$	$V_{GE} = 0$ ; $V_{CE} = 25\text{ V}$ ; $f = 1\text{ MHz}$		0,45		nF
$C_{res}$	$V_{GE} = 0$ ; $V_{CE} = 25\text{ V}$ ; $f = 1\text{ MHz}$		0,35		nF
$L_{CE}$			10	15	nH
$R_{CC'+EE'}$	resistance, terminal-chip $T_c = 25\text{ (125) }^\circ\text{C}$		1,35 (1,75)		m $\Omega$
$t_{d(on)}$	$V_{CC} = 1200\text{ V}$		320		ns
$t_r$	$I_{Cnom} = 125\text{ A}$		40		ns
$t_{d(off)}$	$R_{Gon} = R_{Goff} = 12\text{ }^\circ\Omega$		850		ns
$t_f$	$T_j = 125\text{ }^\circ\text{C}$		120		ns
$E_{on}$ ( $E_{off}$ )	$V_{GE} = \pm 15\text{ V}$		72 (46)		mJ
$E_{on}$ ( $E_{off}$ )	with SKHI 6; $T_j = \text{ }^\circ\text{C}$ $V_{CC} = V$ ; $I_C = A$				mJ
<b>Inverse diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 100\text{ A}$ ; $V_{GE} = 15\text{ V}$ ; $T_j = 25\text{ (125) }^\circ\text{C}$		1,6 (1,6)	1,9 (2)	V
$V_{TO}$	$T_j = 25\text{ (125) }^\circ\text{C}$		1,1 (0,9)	1,3 (1,1)	V
$r_T$	$T_j = 25\text{ (125) }^\circ\text{C}$		5 (7)	6 (8)	m $\Omega$
$I_{RRM}$	$I_F = 125\text{ A}$ ; $T_j = 125\text{ }^\circ\text{C}$		170		A
$Q_{rr}$	$V_{GE} = V\text{ di/dt} = 3100\text{ A}/\mu\text{s}$		37		$\mu\text{C}$
$E_{rr}$	$R_{Gon} = R_{Goff} = 12\text{ }^\circ\Omega$		22		mJ
<b>Thermal characteristics</b>					
$R_{th(j-s)}$	per IGBT			0,4	K/W
$R_{th(j-s)}$	per FWD			0,56	K/W
<b>Temperature Sensor</b>					
$R_{TS}$	$T = 25\text{ (100) }^\circ\text{C}$		1 (1,67)		k $\Omega$
tolerance	$T = 25\text{ (100) }^\circ\text{C}$		3 (2)		%
<b>Mechanical data</b>					
$M_1$	to heatsink (M5)	2		3	Nm
$M_2$	for terminals (M6)	4		5	Nm
w				310	g



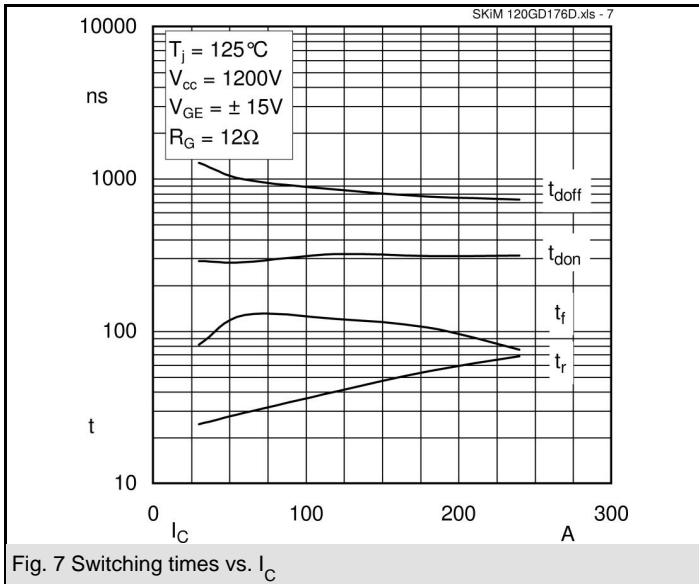


Fig. 7 Switching times vs.  $I_C$

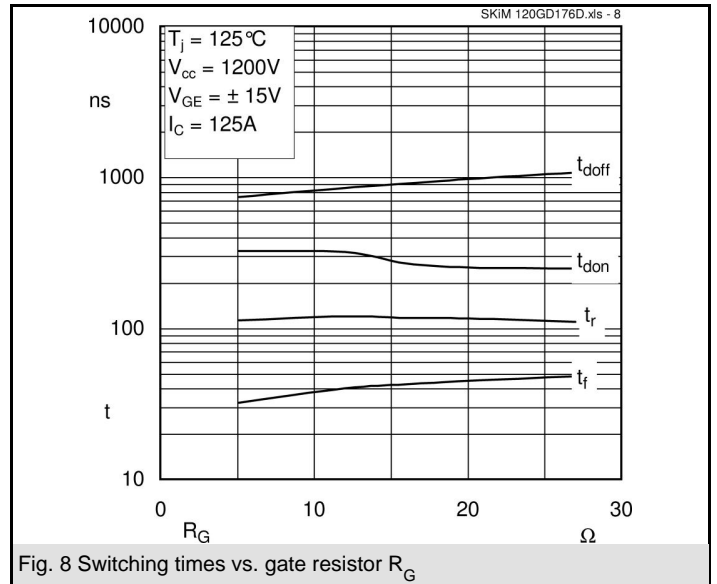


Fig. 8 Switching times vs. gate resistor  $R_G$

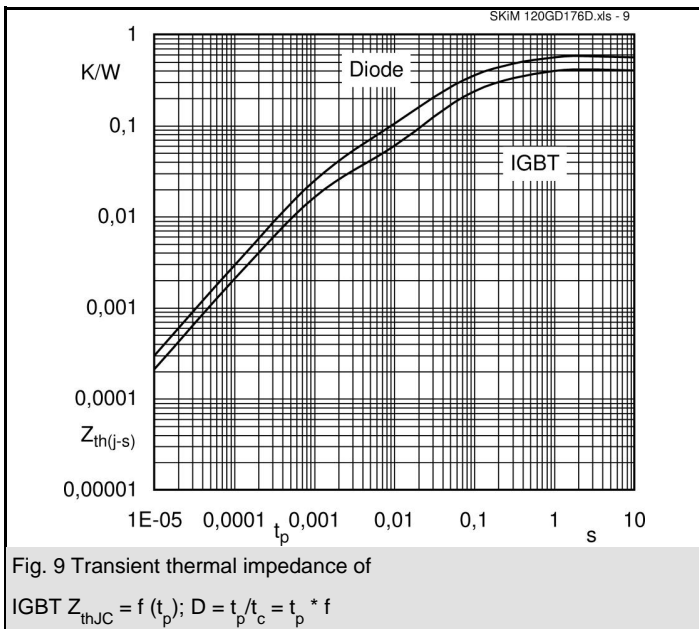


Fig. 9 Transient thermal impedance of

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

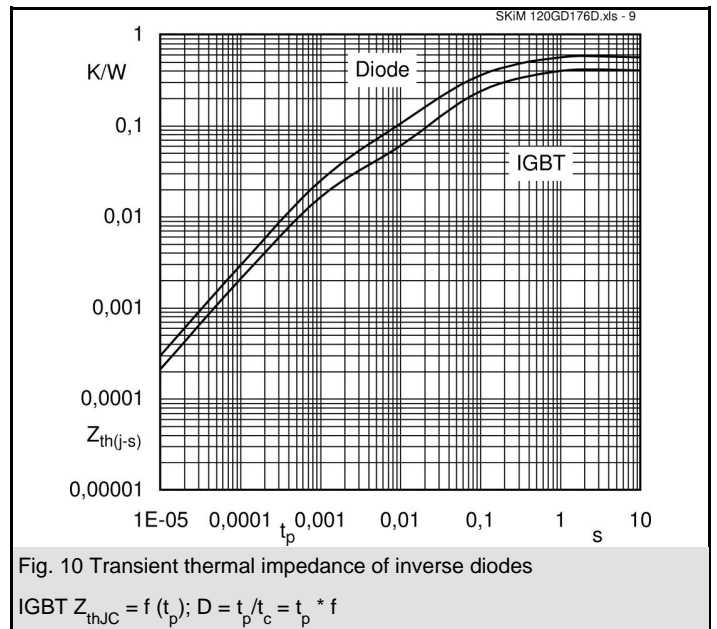


Fig. 10 Transient thermal impedance of inverse diodes

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

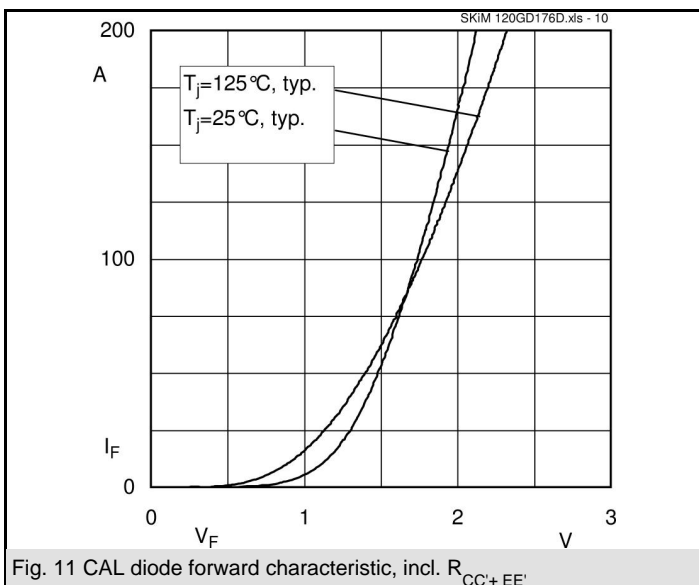


Fig. 11 CAL diode forward characteristic, incl.  $R_{CC'+EE'}$

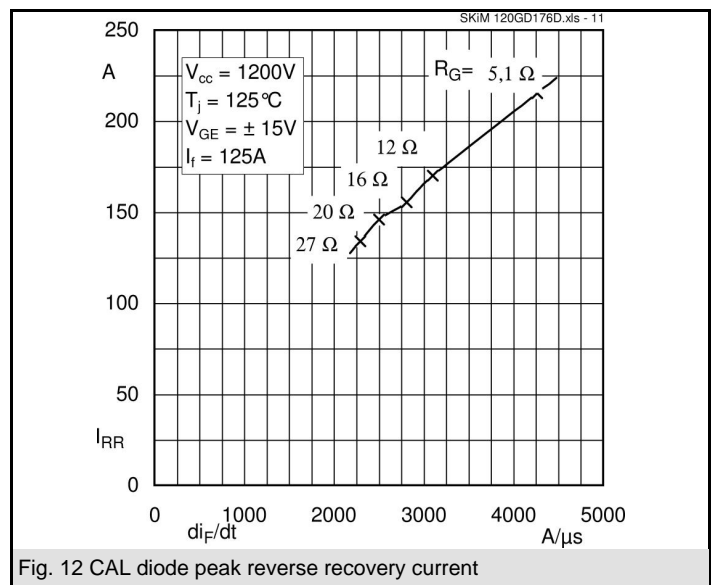
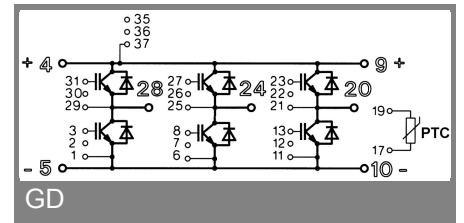
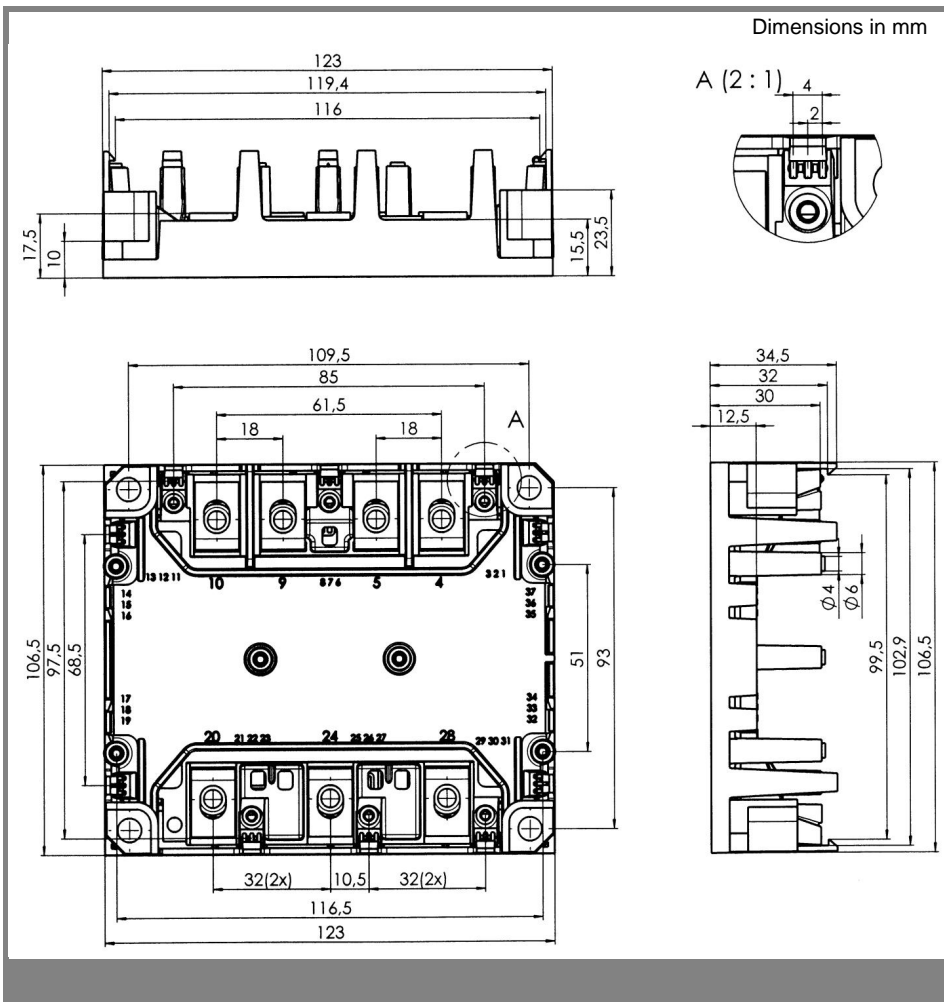
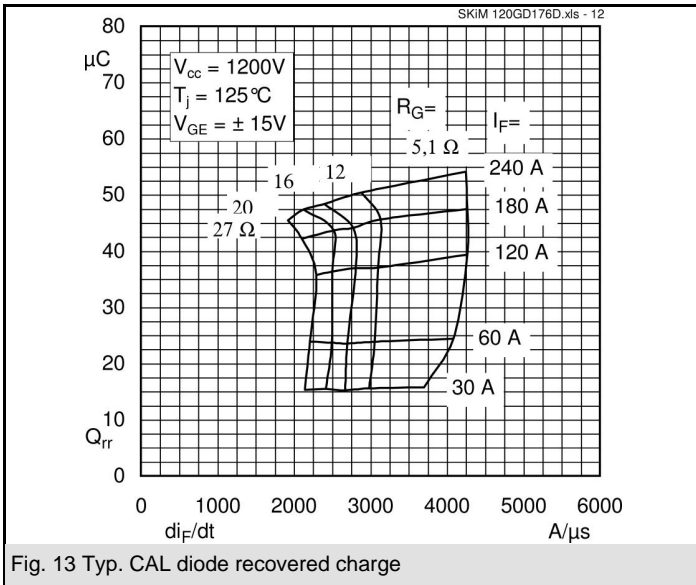


Fig. 12 CAL diode peak reverse recovery current



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

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