

**SEMITRANS™ 3**

## Trench IGBT Modules

**SKM 400GB176D**

**SKM 400GAL176D**

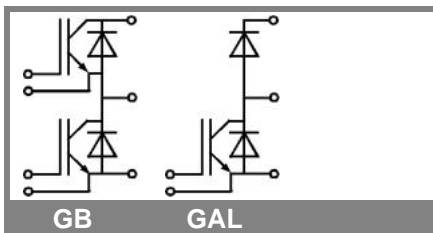
Preliminary Data

### Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_C$

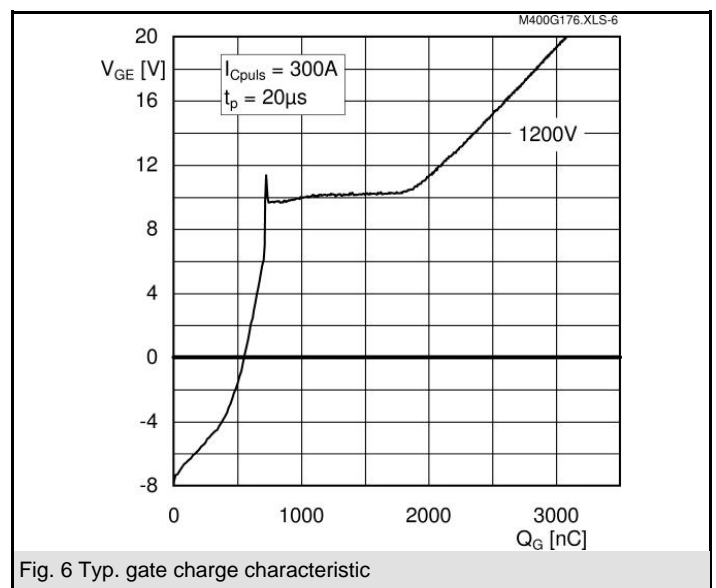
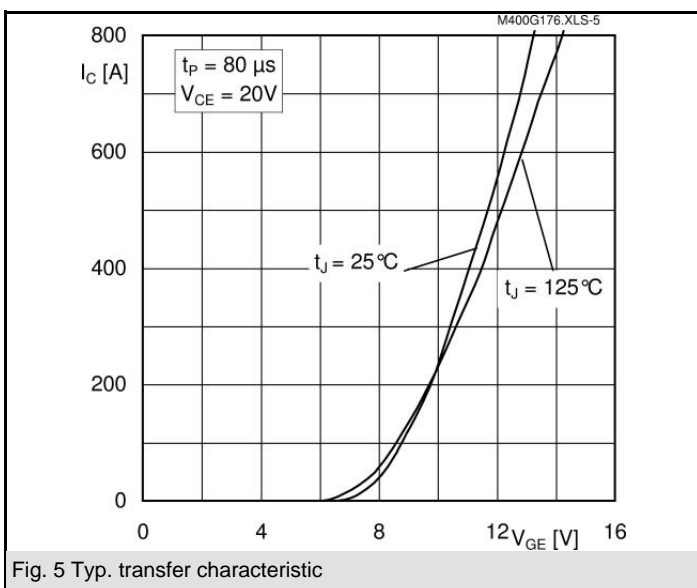
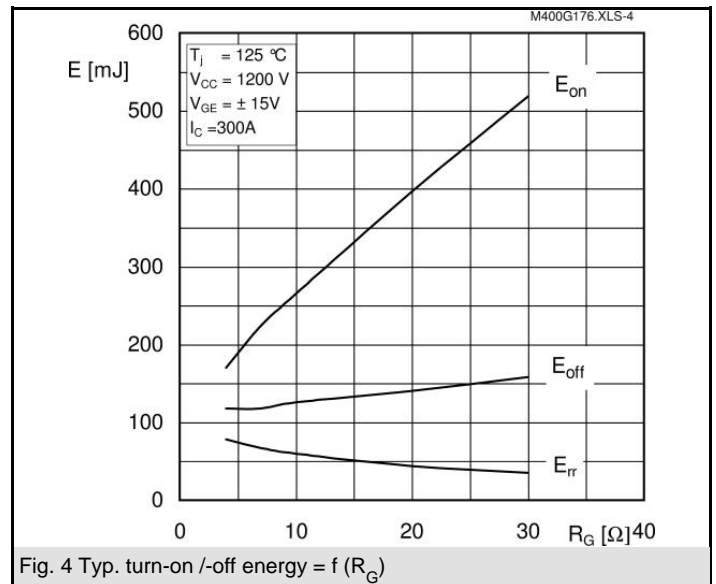
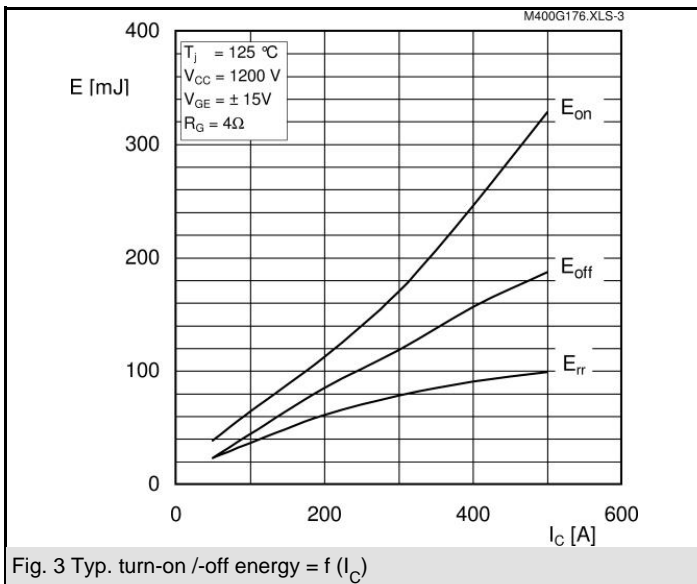
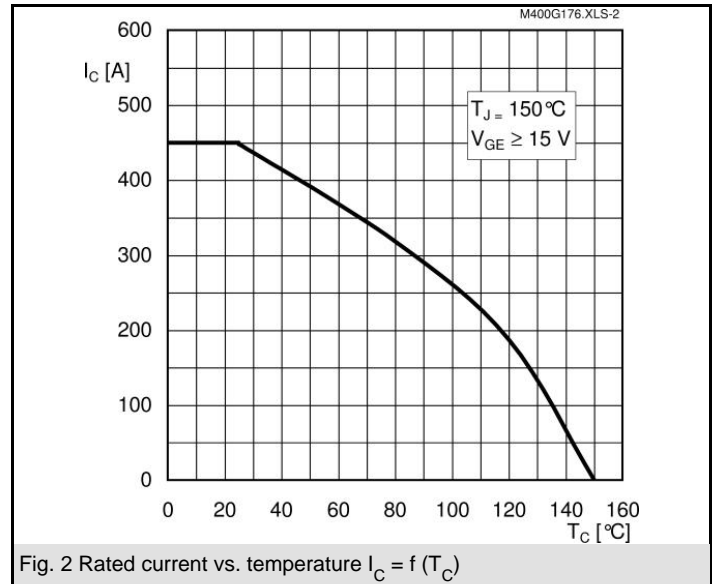
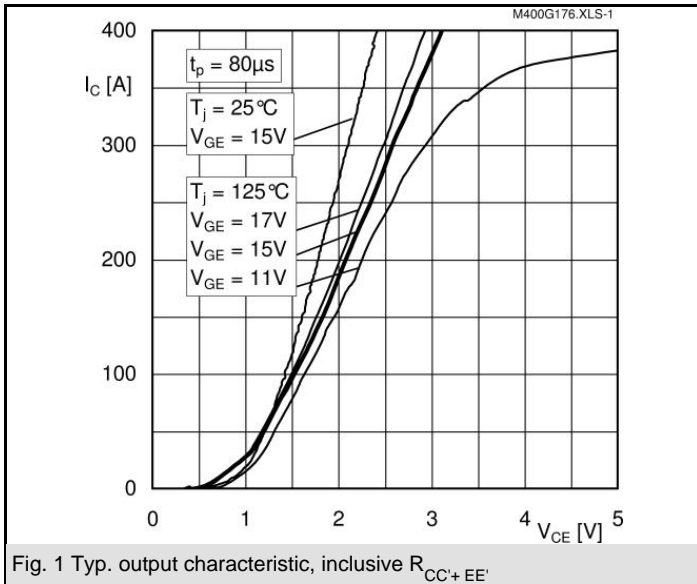
### Typical Applications

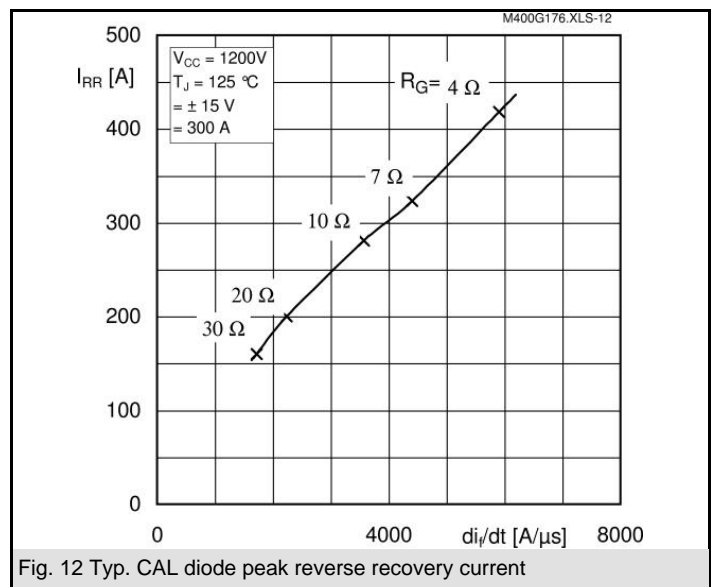
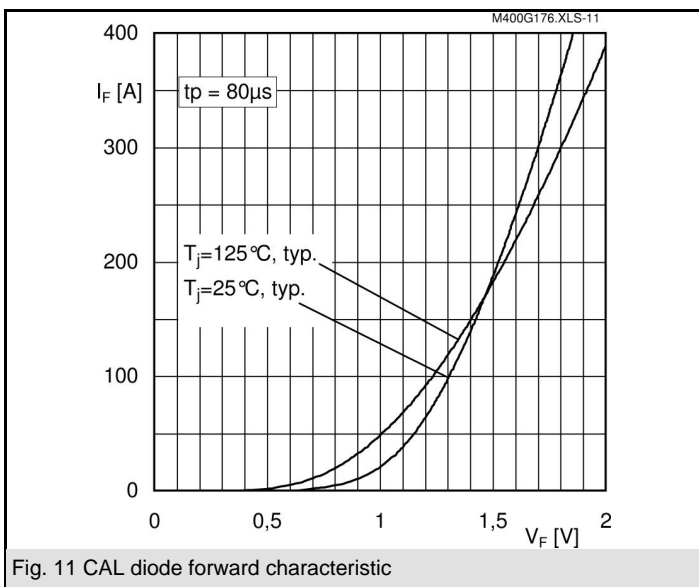
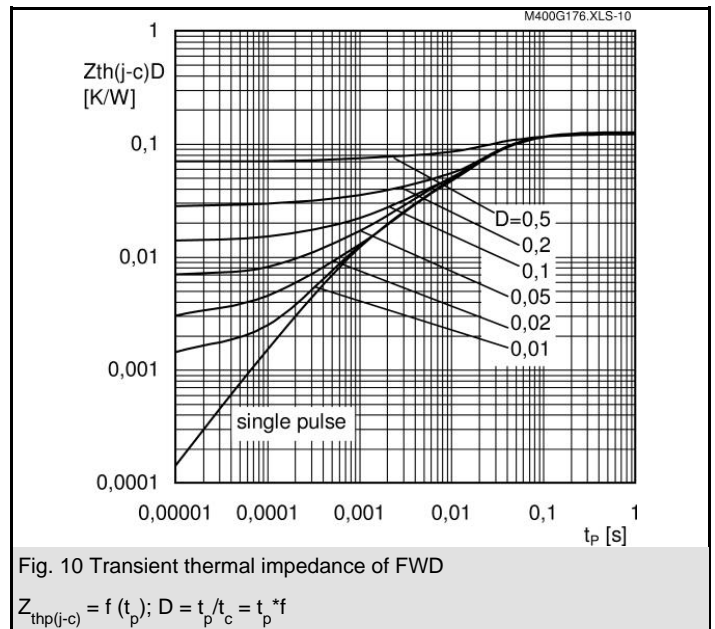
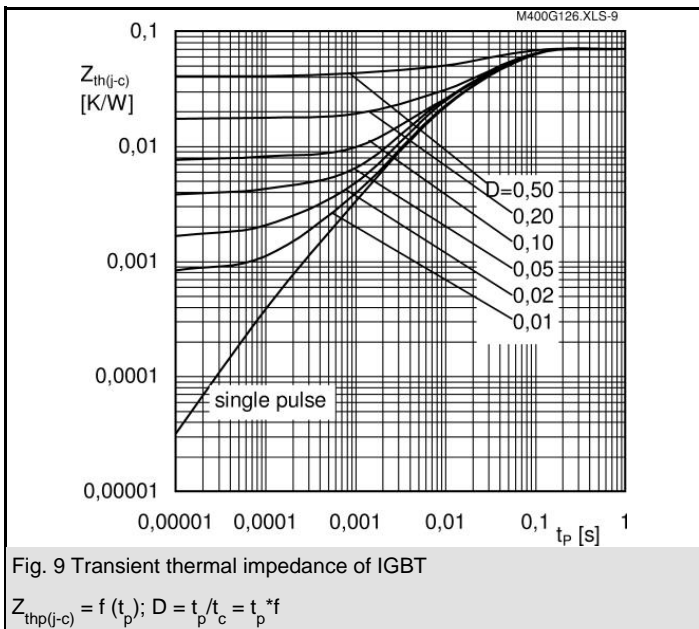
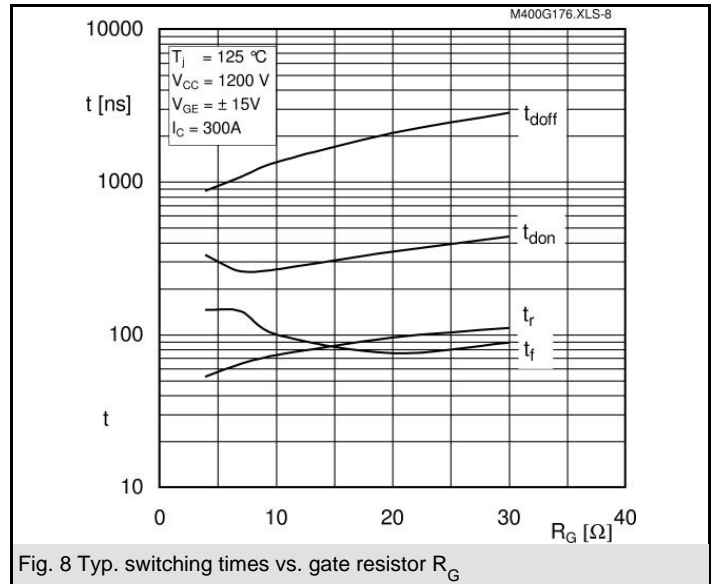
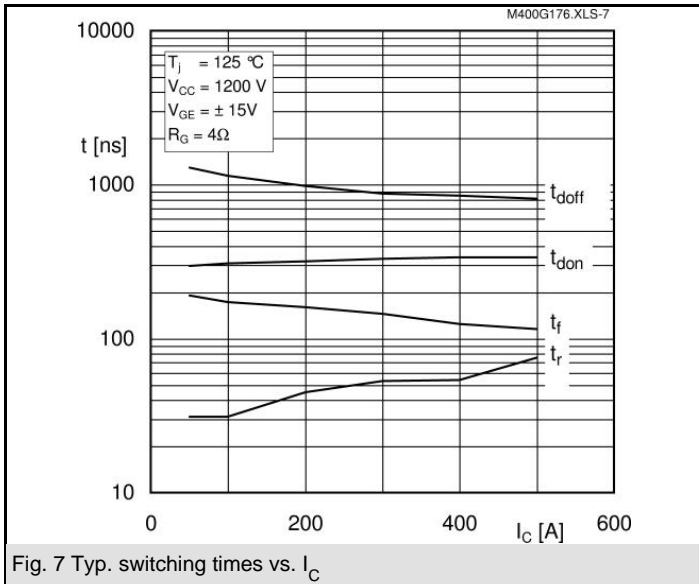
- AC inverter drives
- mains 575 - 750 V AC
- Public transport (auxiliary syst.)
- Wind power



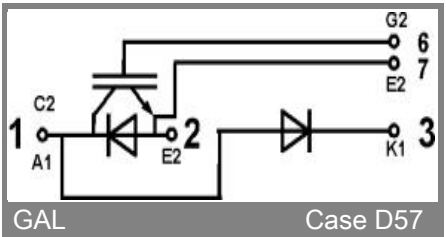
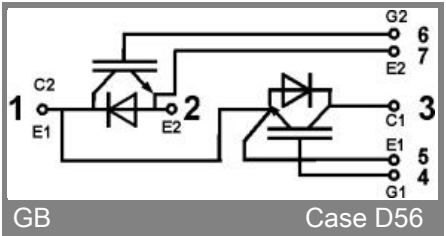
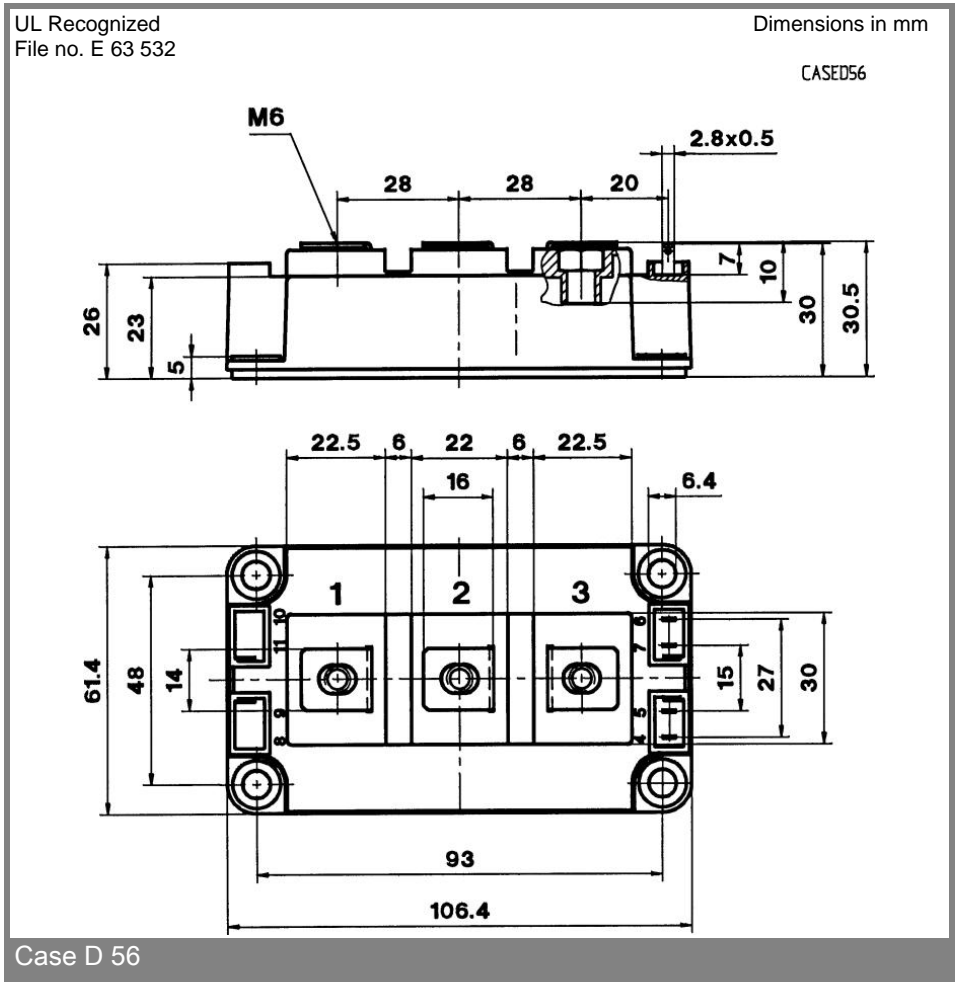
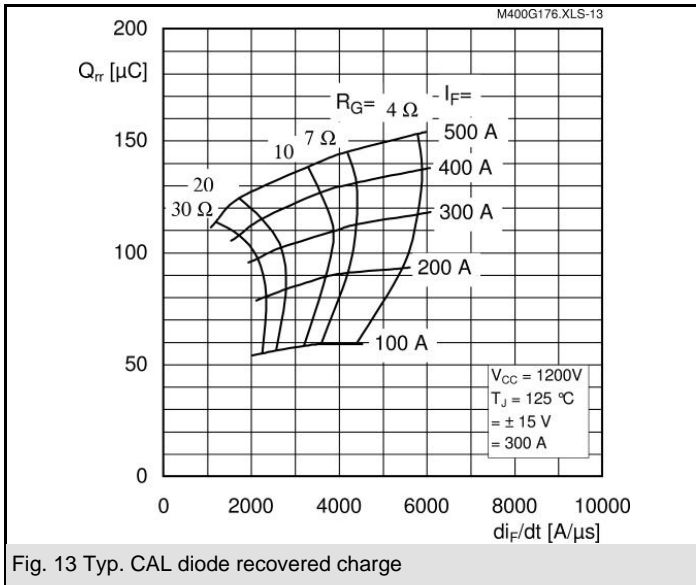
Absolute Maximum Ratings		$T_{case} = 25^\circ\text{C}$ , unless otherwise specified	
Symbol	Conditions	Values	Units
<b>IGBT</b>			
$V_{CES}$		1700	V
$I_C$	$T_c = 25 (80)^\circ\text{C}$	450 (320)	A
$I_{CRM}$	$T_c = 25 (80)^\circ\text{C}$ , $t_p = 1 \text{ ms}$	900 (640)	A
$V_{GES}$		$\pm 20$	V
$T_{vj}$ ( $T_{stg}$ )	$T_{OPERATION} \leq T_{stg}$	- 40 ... + 150 (125)	$^\circ\text{C}$
$V_{isol}$	AC, 1 min.	4000	V
<b>Inverse diode</b>			
$I_F$	$T_c = 25 (80)^\circ\text{C}$	420 (280)	A
$I_{FRM}$	$T_c = 25 (80)^\circ\text{C}$ , $t_p = 1 \text{ ms}$	900 (640)	A
$I_{FSM}$	$t_p = 10 \text{ ms}$ ; sin.; $T_j = 150^\circ\text{C}$	2200	A
<b>Freewheeling diode</b>			
$I_F$	$T_c = 25 (80)^\circ\text{C}$	420 (280)	A
$I_{FRM}$	$T_c = 25 (80)^\circ\text{C}$ , $t_p = 1 \text{ ms}$	900 (640)	A
$I_{FSM}$	$t_p = 10 \text{ ms}$ ; sin.; $T_j = 150^\circ\text{C}$	2200	A

Characteristics		$T_{case} = 25^\circ\text{C}$ , unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
<b>IGBT</b>					
$V_{GE(th)}$	$V_{GE} = V_{CE}$ , $I_C = 12 \text{ mA}$	5,2	5,8	6,4	V
$I_{CES}$	$V_{GE} = 0$ , $V_{CE} = V_{CES}$ , $T_j = 25 (125)^\circ\text{C}$		0,15	0,45	mA
$V_{CE(TO)}$	$T_j = 25 (125)^\circ\text{C}$		1 (0,9)	1,2 (1,1)	V
$r_{CE}$	$V_{GE} = 15 \text{ V}$ , $T_j = 25 (125)^\circ\text{C}$		3,3 (5,2)	4,2 (6)	m $\Omega$
$V_{CE(sat)}$	$I_C = 300 \text{ A}$ , $V_{GE} = 15 \text{ V}$ , chip level		2 (2,45)	2,4 (2,9)	V
$C_{ies}$	under following conditions		13,2		nF
$C_{oes}$	$V_{GE} = 0$ , $V_{CE} = 25 \text{ V}$ , $f = 1 \text{ MHz}$		0,6		nF
$C_{res}$			0,5		nF
$L_{CE}$				20	nH
$R_{CC'+EE'}$	res., terminal-chip $T_c = 25 (125)^\circ\text{C}$		0,35 (0,5)		m $\Omega$
$t_{d(on)}$	$V_{CC} = 1200 \text{ V}$ , $I_C = 300 \text{ A}$		330		ns
$t_r$	$R_{Gon} = R_{Goff} = 4 \Omega$ , $T_j = 125^\circ\text{C}$		55		ns
$t_{d(off)}$	$V_{GE} \pm 15 \text{ V}$		880		ns
$t_f$			145		ns
$E_{on} (E_{off})$			170 (118)		mJ
<b>Inverse diode</b>					
$V_F = V_{EC}$	$I_F = 300 \text{ A}$ ; $V_{GE} = 0 \text{ V}$ ; $T_j = 25 (125)^\circ\text{C}$		1,7 (1,8)	1,9 (2)	V
$V_{(TO)}$	$T_j = 25 (125)^\circ\text{C}$		1,2 (0,9)	1,4 (1,1)	V
$r_T$	$T_j = 25 (125)^\circ\text{C}$		1,7 (3)	1,7 (3)	m $\Omega$
$I_{RRM}$	$I_F = 300 \text{ A}$ ; $T_j = 125 ( )^\circ\text{C}$		418		A
$Q_{rr}$	$di/dt = 5800 \text{ A}/\mu\text{s}$		117		$\mu\text{C}$
$E_{rr}$	$V_{GE} = 0 \text{ V}$		78		mJ
<b>FWD</b>					
$V_F = V_{EC}$	$I_F = 300 \text{ A}$ ; $V_{GE} = 0 \text{ V}$ ; $T_j = 25 (125)^\circ\text{C}$		1,7 (1,8)	1,9 (2)	V
$V_{(TO)}$	$T_j = 25 (125)^\circ\text{C}$		1,2 (0,9)	1,4 (1,1)	V
$r_T$	$T_j = 25 (125)^\circ\text{C}$		1,7 (3)	1,7 (3)	m $\Omega$
$I_{RRM}$	$I_F = 300 \text{ A}$ ; $T_j = 125 ( )^\circ\text{C}$		418		A
$Q_{rr}$	$di/dt = 5800 \text{ A}/\mu\text{s}$		117		$\mu\text{C}$
$E_{rr}$	$V_{GE} = 0 \text{ V}$		78		mJ
<b>Thermal characteristics</b>					
$R_{th(j-c)}$	per IGBT			0,07	K/W
$R_{th(j-c)D}$	per Inverse Diode			0,125	K/W
$R_{th(j-c)FD}$	per FWD			0,125	K/W
$R_{th(c-s)}$	per module			0,038	K/W
<b>Mechanical data</b>					
$M_s$	to heatsink M6	3		5	Nm
$M_t$	to terminals M6	2,5		5	Nm
w				325	g





# SKM 400GB176D ...



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