

# SKM 400 GB 176 DL3



**SEMITRANS™ 9**

## Trench IGBT Modules

**SKM 400 GB 176 DL3**

**SKM 400 GAL 176 DL3**

Preliminary Data

### Features

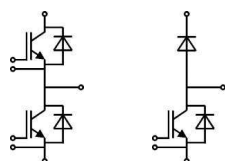
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_C$
- Humidity according to DIN 40 040: Class F
- Climate according to DIN IEC 68 T.1: 40/125/256

### Typical Applications

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

### Remarks

- Terminals 1,4 - 2,5 - 3,6 need to be connected externally



**GB**

**GAL**

Absolute Maximum Ratings		$T_{case} = 25^\circ C$ , unless otherwise specified		
Symbol	Conditions	Values		Units
<b>IGBT</b>				
$V_{CES}$	$T_j = 25^\circ C$	1700		V
$I_C$	$T_j = 150^\circ C$	$T_c = 25^\circ C$	450	A
		$T_c = 80^\circ C$	315	A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$	600		A
$V_{GES}$		$\pm 20$		V
$t_{psc}$	$V_{CC} = 600 V$ ; $V_{GE} \leq 20 V$ ; $T_j = 125^\circ C$ $V_{CES} < 1200 V$	10		$\mu s$
<b>Inverse Diode</b>				
$I_F$	$T_j = 150^\circ C$	$T_c = 25^\circ C$	350	A
		$T_c = 80^\circ C$	230	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$	800		A
$I_{FSM}$	$t_p = 10 ms$ ; sin.	$T_j = 150^\circ C$	1420	A
<b>Freewheeling Diode</b>				
$I_F$	$T_j = 150^\circ C$	$T_c = 25^\circ C$	470	A
		$T_c = 80^\circ C$	317	A
$I_{FRM}$		600		A
$I_{FSM}$	$t_p = 10 ms$ ; sin.	$T_j = 150^\circ C$	2600	A
<b>Module</b>				
$I_{t(RMS)}$				A
$T_{vj}$		- 40 ... + 150 (125)		$^\circ C$
$T_{stg}$		125		$^\circ C$
$V_{isol}$	AC, 1 min.	9500		V

Characteristics		$T_{case} = 25^\circ C$ , unless otherwise specified				
Symbol	Conditions	min.	typ.	max.	Units	
<b>IGBT</b>						
$V_{GE(th)}$	$V_{GE} = V_{CE}$ , $I_C = 12 mA$	5,2	5,8	6,4	V	
$I_{CES}$	$V_{GE} = 0 V$ , $V_{CE} = V_{CES}$	$T_j = 25^\circ C$	0,0164		mA	
		$T_j = 125^\circ C$			mA	
$I_{GES}$	$V_{CE} = 0 V$ , $V_{GE} = 20 V$	$T_j = 25^\circ C$	1200		nA	
		$T_j = 125^\circ C$			nA	
$V_{CE0}$		$T_j = 25^\circ C$	1		V	
		$T_j = 125^\circ C$	0,9		V	
$r_{CE}$	$V_{GE} = 15 V$	$T_j = 25^\circ C$	3,3	4,2	$m\Omega$	
		$T_j = 125^\circ C$	5,2	6	$m\Omega$	
$V_{CE(sat)}$	$I_{Cnom} = 300 A$ , $V_{GE} = 15 V$	$T_j = 25^\circ C_{chiplev.}$	2	2,45	V	
		$T_j = 125^\circ C_{chiplev.}$	2,45	2,9	V	
$C_{ies}$	$V_{CE} = 25$ , $V_{GE} = 0 V$			26,2	nF	
$C_{oes}$				1,1	nF	
$C_{res}$				0,88	nF	
$Q_G$	0V; +20V			3000	nC	
$R_{Gint}$	$T_j = 25^\circ C$			5	$\Omega$	
$t_{d(on)}$	$R_{Gon} = 4 \Omega$ $di/dt = 2100 A/\mu s$	$V_{CC} = 1200V$ $I_C = 300A$ $T_j = 125^\circ C$			933	ns
$t_r$					159	ns
$E_{on}$					143	mJ
$t_{d(off)}$	$R_{Goff} = 4 \Omega$ $di/dt = 2100 A/\mu s$	$T_j = 125^\circ C$			1250	ns
$t_f$					150	ns
$E_{off}$					108,9	mJ
$R_{th(j-c)}$	per IGBT			0,09	K/W	

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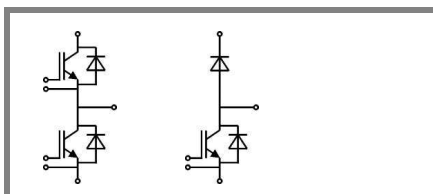
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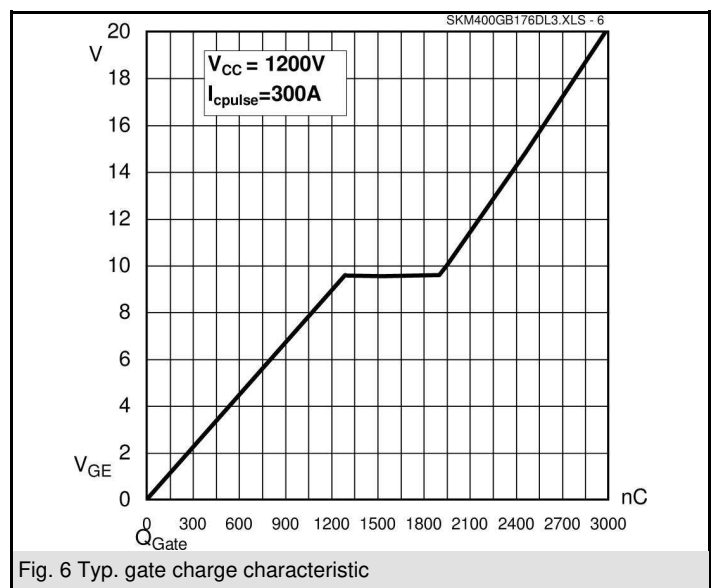
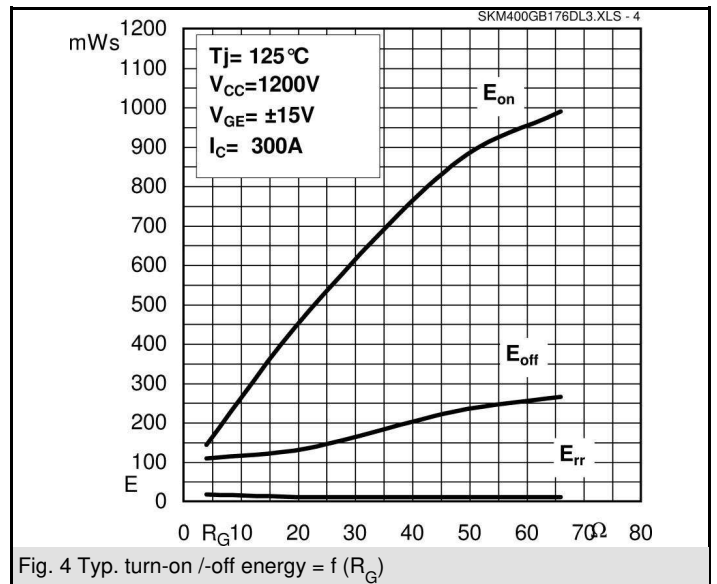
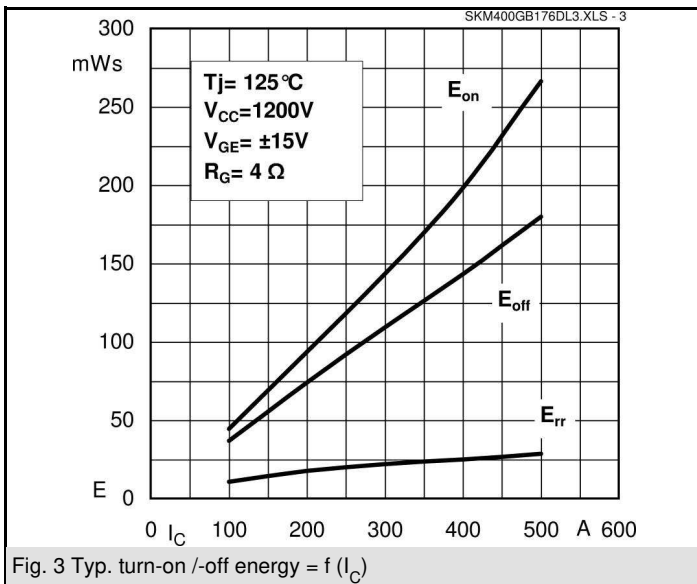
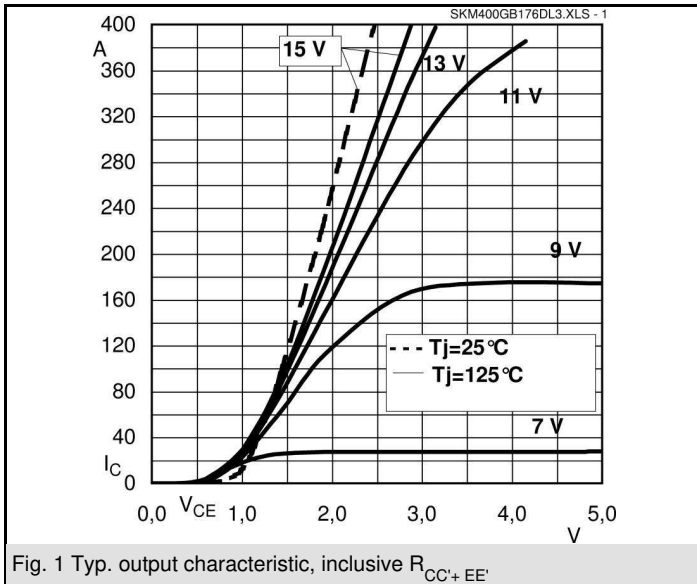
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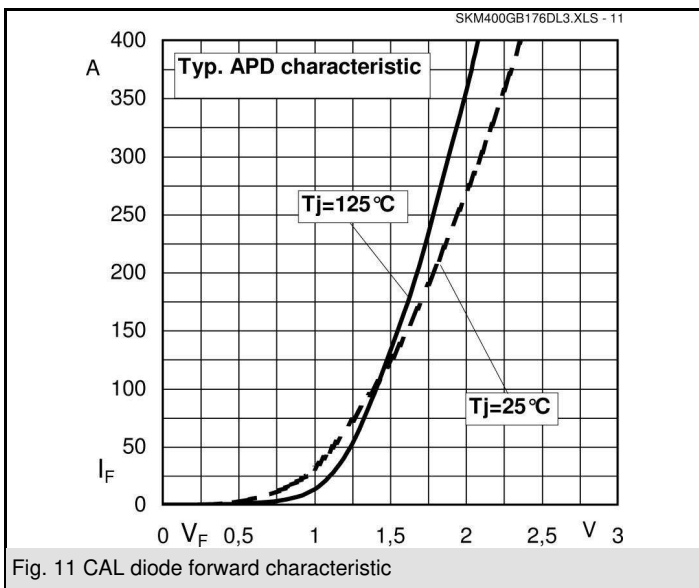
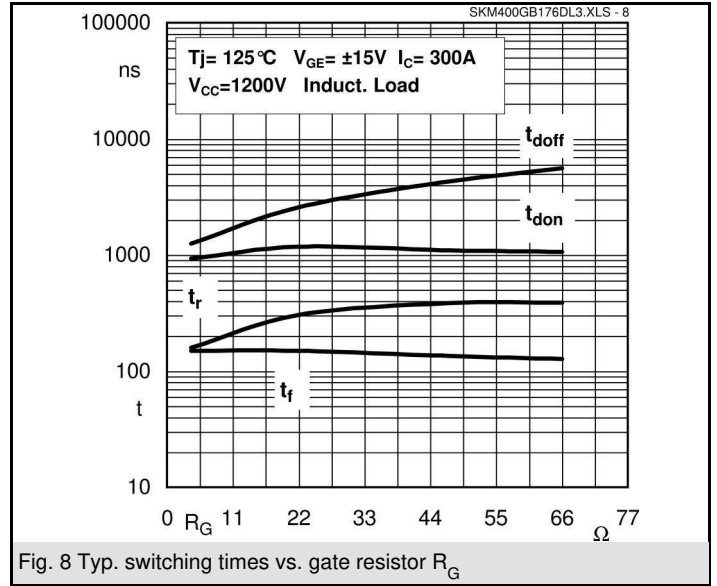
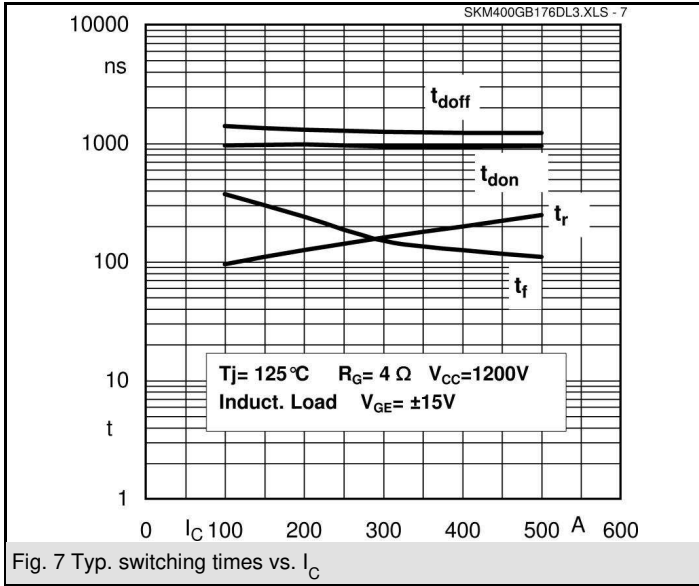
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Units
<b>Inverse Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 300 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	1,8	1,9	V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$	2,1	2,5	V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1,2	1,4	V
		$T_j = 125 \text{ }^\circ\text{C}$	0,9	1,1	V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	1,7		mΩ
		$T_j = 125 \text{ }^\circ\text{C}$	3		mΩ
$I_{RRM}$	$I_F = 300 \text{ A}$	$T_j = 125 \text{ }^\circ\text{C}$	120		A
$Q_{rr}$	$di/dt = 2100 \text{ A}/\mu\text{s}$		45		μC
$E_{rr}$	$V_{GE} = 0 \text{ V}; V_{CC} = 1200 \text{ V}$		22		mJ
$R_{th(j-c)D}$	per diode			0,14	K/W
<b>Freewheeling Diode</b>					
$V_F = V_{EC}$	$I_{Fnom} = 300 \text{ A}; V_{GE} = 0 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$	1,7	1,9	V
		$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$	1,8	2	V
$V_{F0}$		$T_j = 25 \text{ }^\circ\text{C}$	1,1	1,3	V
		$T_j = 125 \text{ }^\circ\text{C}$	0,9	1,1	V
$r_F$		$T_j = 25 \text{ }^\circ\text{C}$	2		V
		$T_j = 125 \text{ }^\circ\text{C}$	3		V
$I_{RRM}$	$I_F = \text{A}$	$T_j = 125 \text{ }^\circ\text{C}$			A
$Q_{rr}$					μC
$E_{rr}$	$V_{GE} = 0 \text{ V}; V_{CC} = 1200 \text{ V}$				mJ
$R_{th(j-c)FD}$	per diode			0,09	K/W
$R_{CC'+EE'}$	res., terminal-chip	$T_{case} = 25 \text{ }^\circ\text{C}$	0,35		mΩ
		$T_{case} = 125 \text{ }^\circ\text{C}$	0,5		mΩ
$R_{th(c-s)}$	per module			0,038	K/W
$M_s$	to heat sink M6		3	5	Nm
$M_t$	to terminals M6		2,5	5	Nm
w				460	g

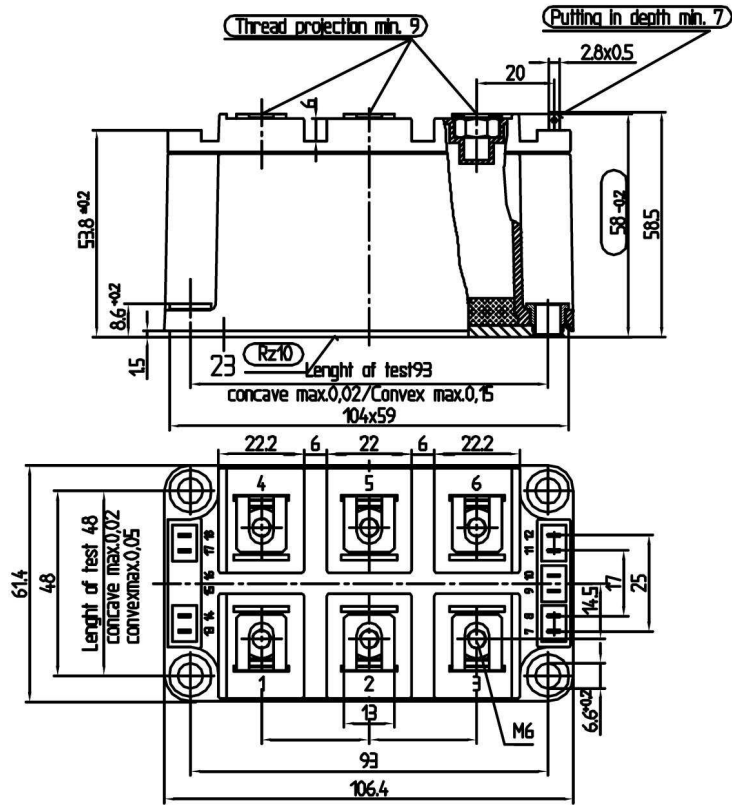
This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX.

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



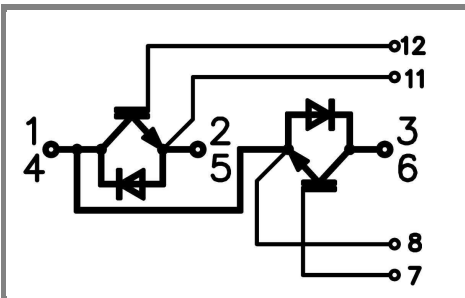


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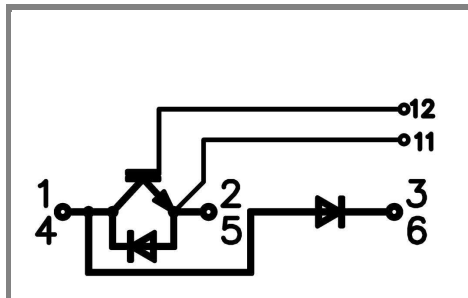
Terminals 1, 4 - 2, 5 - 3, 6 need to be connected externally

Case D 61



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