SKM 400 GB 176 DL3

SEMITRANS™ 9

Trench IGBT Modules

SKM 400 GB 176 DL3

SKM 400 GAL 176 DL3

Preliminary Data

Features

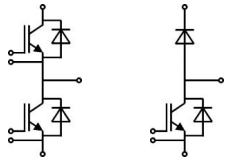
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_C
- Humidity according to DIN 40 040: Class F
- Climate according to DIN IEC 68 T.1: 40/125/256

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

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

SKM 400 GB 176 DL3

SEMITRANS™ 9

Trench IGBT Modules

SKM 400 GB 176 DL3

SKM 400 GAL 176 DL3

Preliminary Data

Features

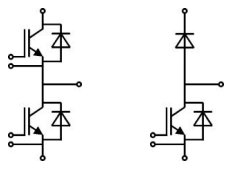
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_C
- Humidity according to DIN 40 040: Class F
- Climate according to DIN IEC 68 T.1: 40/125/256

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**

Characteristics

Symbol	Conditions		min.	typ.	max.	Units
Inverse Diode						
$V_F = V_{EC}$	I_{Fnom} = 300 A; V_{GE} = 0 V	T_j = 25 °C$_{chiplev.}$		1,8	1,9	V
		T_j = 125 °C$_{chiplev.}$		2,1	2,5	V
V_{F0}		T_j = 25 °C		1,2	1,4	V
		T_j = 125 °C		0,9	1,1	V
r_F		T_j = 25 °C		1,7		mΩ
		T_j = 125 °C		3		mΩ
I_{RRM}	I_F = 300 A	T_j = 125 °C		120		A
Q_{rr}	di/dt = 2100 A/µs			45		µC
E_{rr}	V_{GE} = 0 V; V_{CC} = 1200 V			22		mJ
$R_{th(j-c)D}$	per diode				0,14	K/W
Freewheeling Diode						
$V_F = V_{EC}$	I_{Fnom} = 300 A; V_{GE} = 0 V	T_j = 25 °C$_{chiplev.}$		1,7	1,9	V
		T_j = 125 °C$_{chiplev.}$		1,8	2	V
V_{F0}		T_j = 25 °C		1,1	1,3	V
		T_j = 125 °C		0,9	1,1	V
r_F		T_j = 25 °C		2		V
		T_j = 125 °C		3		V
I_{RRM}	I_F = A	T_j = 125 °C				A
Q_{rr}						µC
E_{rr}	V_{GE} = 0 V; V_{CC} = 1200 V					mJ
$R_{th(j-c)FD}$	per diode				0,09	K/W
$R_{CC'+EE'}$	res., terminal-chip	T_{case}= 25 °C		0,35		mΩ
		T_{case}= 125 °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.

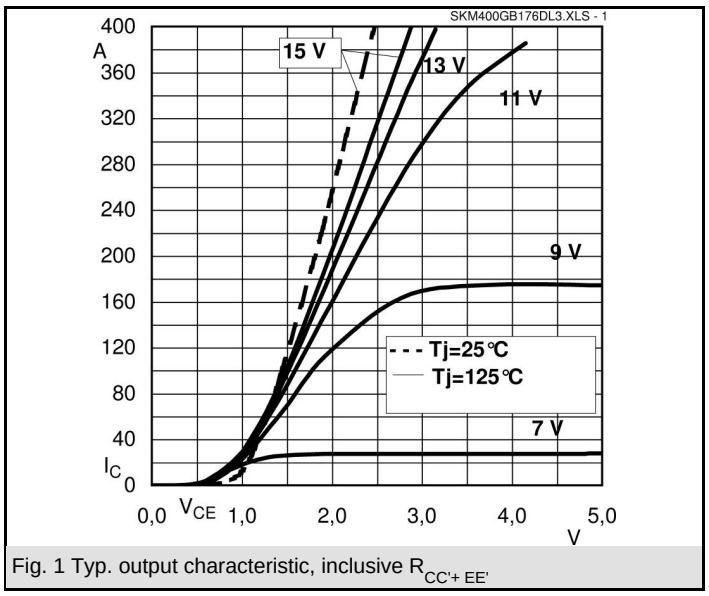


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

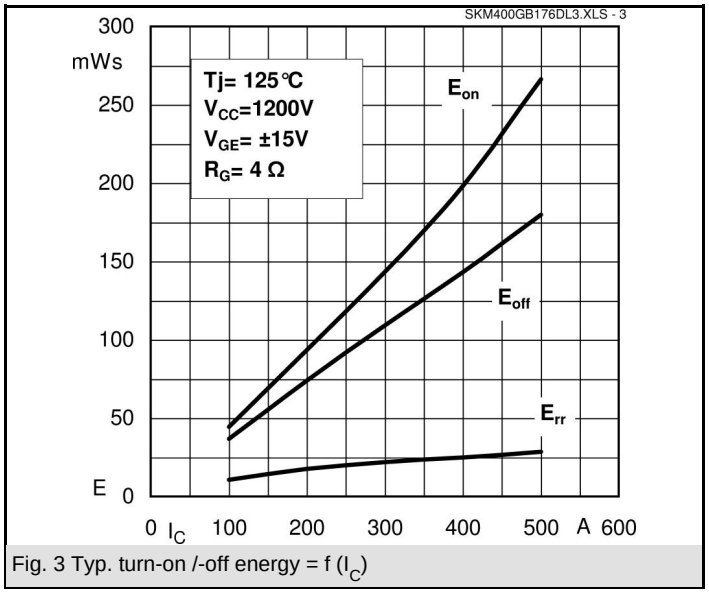


Fig. 3 Typ. turn-on /-off energy = f (I_C)

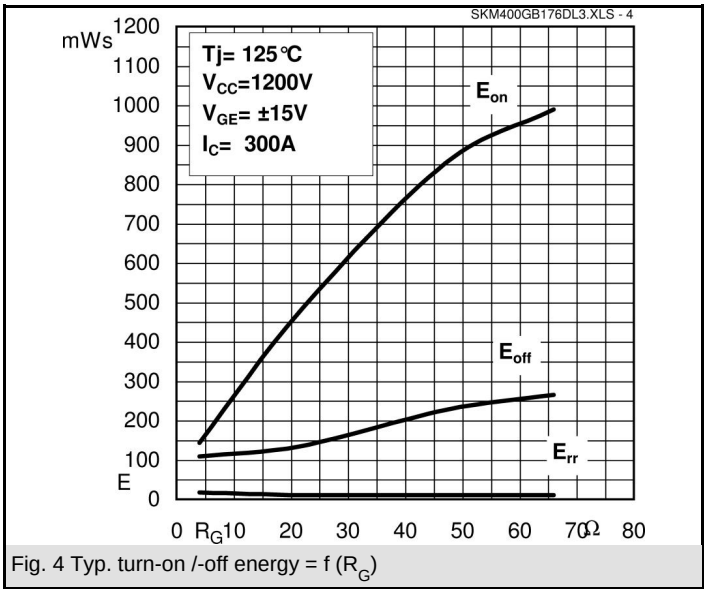


Fig. 4 Typ. turn-on /-off energy = f (R_G)

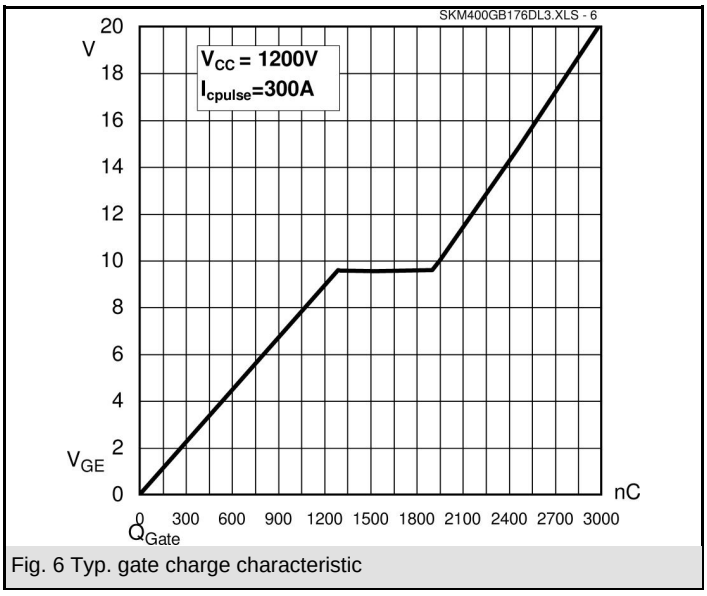


Fig. 6 Typ. gate charge characteristic

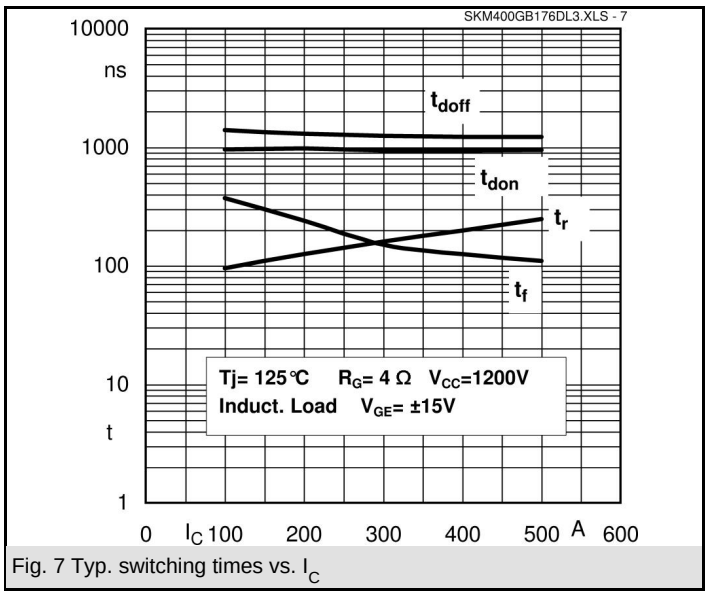


Fig. 7 Typ. switching times vs. I_C

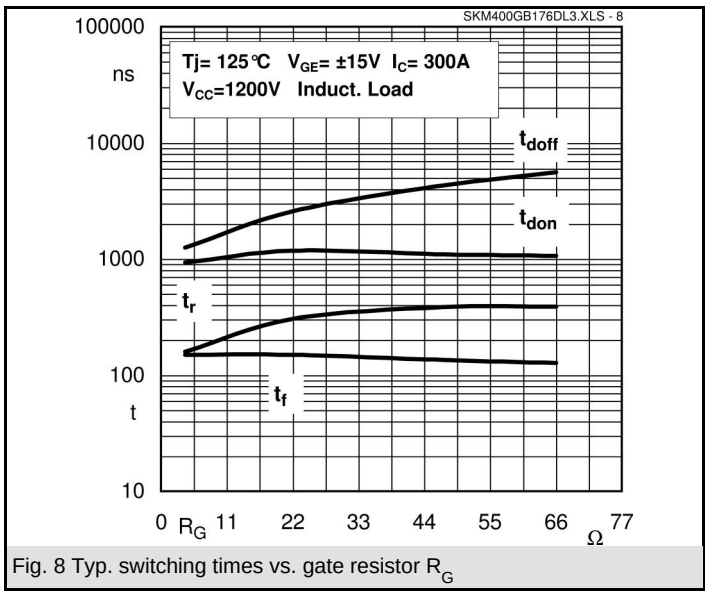


Fig. 8 Typ. switching times vs. gate resistor R_G

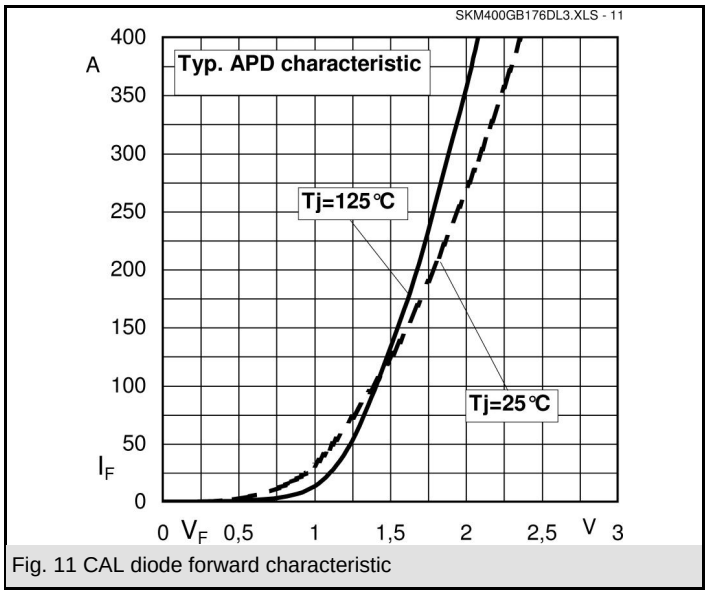
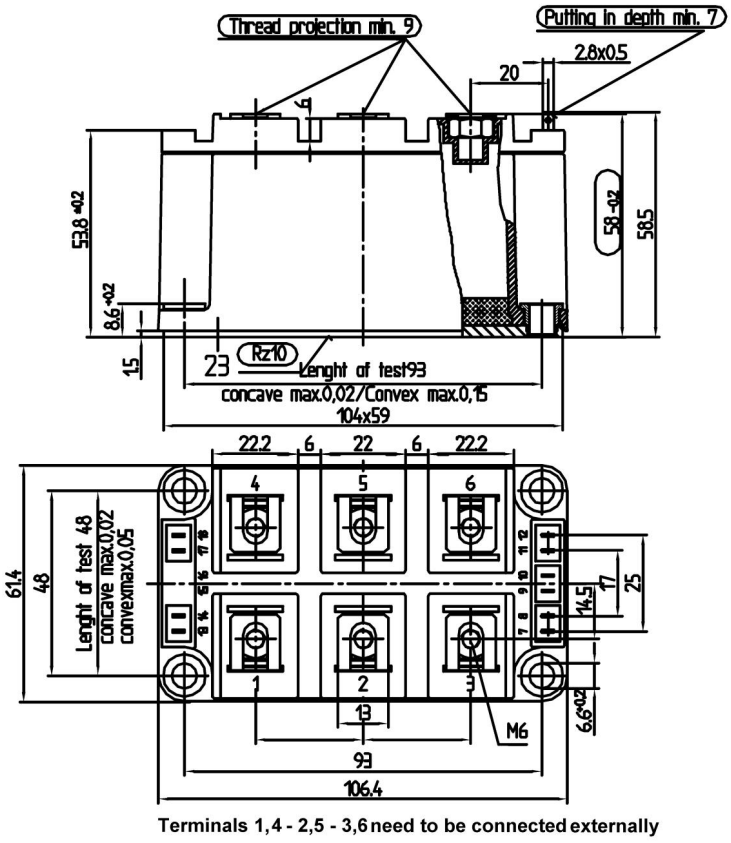
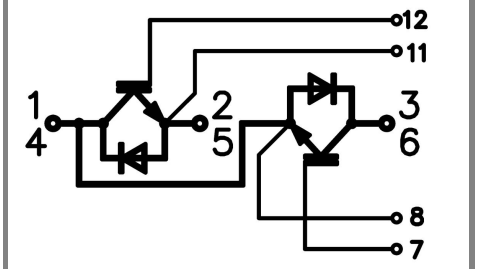


Fig. 11 CAL diode forward characteristic

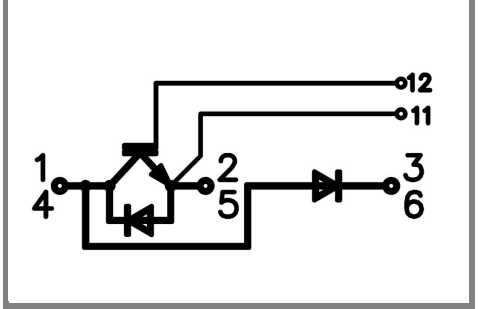
SKM 400 GB 176 DL3



Case D 61



GB Case D 61



GAL Case D 61

