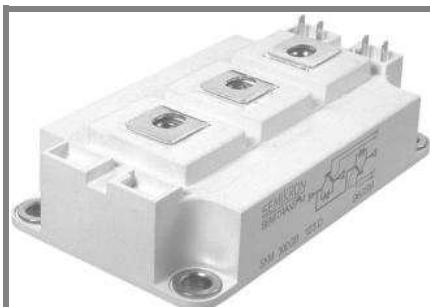


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SEMITRANS® 3

Trench IGBT Modules

SKM 400GB176D

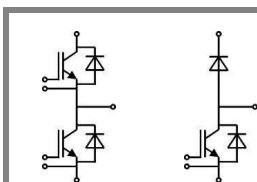
SKM 400GAL176D

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



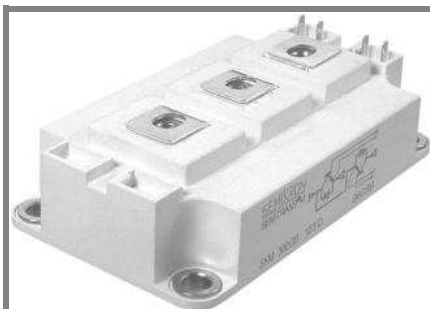
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Absolute Maximum Ratings		T _{case} = 25°C, unless otherwise specified		
Symbol	Conditions		Values	Units
IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	T _j = 150 °C	T _c = 25 °C	430	A
		T _c = 80 °C	310	A
I _{CRM}	I _{CRM} =2xI _{Cnom}		600	A
V _{GES}			± 20	V
t _{psc}	V _{CC} = 1200 V; V _{GE} ≤ 20 V; T _j = 125 °C V _{CES} < 1700 V		10	μs
Inverse Diode				
I _F	T _j = 150 °C	T _c = 25 °C	440	A
		T _c = 80 °C	300	A
I _{FRM}	I _{FRM} =2xI _{Fnom}		600	A
I _{FSM}	t _p = 10 ms; sin.	T _j = 150 °C	2200	A
Freewheeling Diode				
I _F	T _j = 150 °C	T _{case} = 25 °C	440	A
		T _{case} = 80 °C	300	A
I _{FRM}	I _{FRM} =2xI _{Fnom}		600	A
I _{FSM}	t _p = 10 ms; sin.	T _j = 150 °C	2200	A
Module				
I _{t(RMS)}			500	A
T _{vj}			- 40 ... + 150	°C
T _{stg}			- 40 ... + 125	°C
V _{isol}	AC, 1 min.		4000	V

Characteristics		$T_{case} = 25^\circ\text{C}$, unless otherwise specified			
Symbol	Conditions	min.	typ.	max.	Units
IGBT					
$V_{GE(th)}$	$V_{GE} = V_{CES}, I_C = 12\text{ mA}$	5,2	5,8	6,4	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = V_{CES}$			4	mA
V_{CE0}			$T_j = 25^\circ\text{C}$	1	V
			$T_j = 125^\circ\text{C}$	0,9	V
r_{CE}	$V_{GE} = 15\text{ V}$		$T_j = 25^\circ\text{C}$	3,3	m Ω
			$T_j = 125^\circ\text{C}$	5,2	m Ω
$V_{CE(sat)}$	$I_{Cnom} = 300\text{ A}, V_{GE} = 15\text{ V}$		$T_j = 25^\circ\text{C}_{chiplev.}$	2	V
			$T_j = 125^\circ\text{C}_{chiplev.}$	2,45	V
C_{ies}	$V_{CE} = 25, V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		19,8	nF
C_{oes}				1,1	nF
C_{res}				0,88	nF
Q_G	$V_{GE} = -8\text{V}...+15\text{V}$		2500		nC
$t_{d(on)}$	$R_{Gon} = 4\ \Omega$	$V_{CC} = 1200\text{V}$ $I_C = 300\text{A}$	330		ns
t_r			55		ns
E_{on}	$R_{Goff} = 4\ \Omega$	$T_j = 125^\circ\text{C}$ $V_{GE} = \pm 15\text{V}$	170		mJ
$t_{d(off)}$			880		ns
t_f			145		ns
E_{off}			118		mJ
$R_{th(j-c)}$	per IGBT			0,075	K/W

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SEMITRANS® 3

Trench IGBT Modules

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Features

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

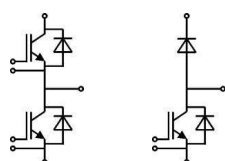
Typical Applications*

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

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.}		1,7	1,9	V
		T _j = 125 °C _{chiplev.}		1,8	2	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	1,7	mΩ
		T _j = 125 °C		3	3	mΩ
I _{RRM}	I _F = 300 A	T _j = 125 °C		418		A
Q _{rr}	di/dt = 5800 A/μs			117		μC
E _{rr}	V _{GE} = -15 V; V _{CC} = 1200 V			78		mJ
R _{th(j-c)D}	per diode				0,125	K/W
FWD						
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		1,2	1,4	V
		T _j = 125 °C		0,9	1,1	V
r _F		T _j = 25 °C		1,7	1,7	V
		T _j = 125 °C		3	3	V
I _{RRM}	I _F = 300 A	T _j = 125 °C		418		A
Q _{rr}	di/dt = 5800 A/μs			117		μC
E _{rr}	V _{GE} = -15 V; V _{CC} = 1200 V			78		mJ
R _{th(j-c)FD}	per diode				0,125	K/W
Module						
L _{CE}				15	20	nH
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					325	g

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

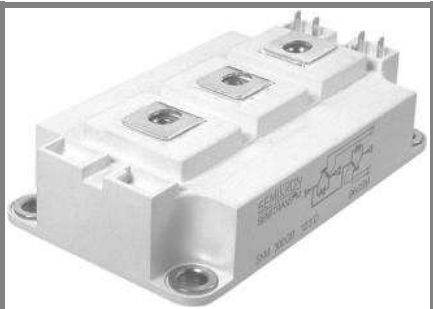
* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our personal.



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Trench IGBT Modules

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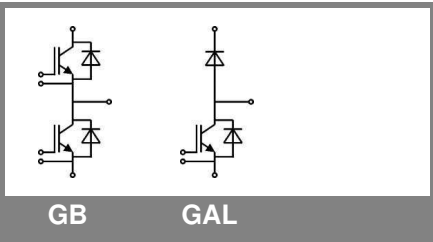
Features

- 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

Z_{th}			
Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	$i = 1$	52	mk/W
R_i	$i = 2$	18	mk/W
R_i	$i = 3$	4,6	mk/W
R_i	$i = 4$	0,4	mk/W
τ_{ui}	$i = 1$	0,0569	s
τ_{ui}	$i = 2$	0,0122	s
τ_{ui}	$i = 3$	0,002	s
τ_{ui}	$i = 4$	0,02	s
$Z_{th(j-c)D}$			
R_i	$i = 1$	85	mk/W
R_i	$i = 2$	28	mk/W
R_i	$i = 3$	10,5	mk/W
R_i	$i = 4$	1,5	mk/W
τ_{ui}	$i = 1$	0,054	s
τ_{ui}	$i = 2$	0,0075	s
τ_{ui}	$i = 3$	0,0018	s
τ_{ui}	$i = 4$	0,0002	s



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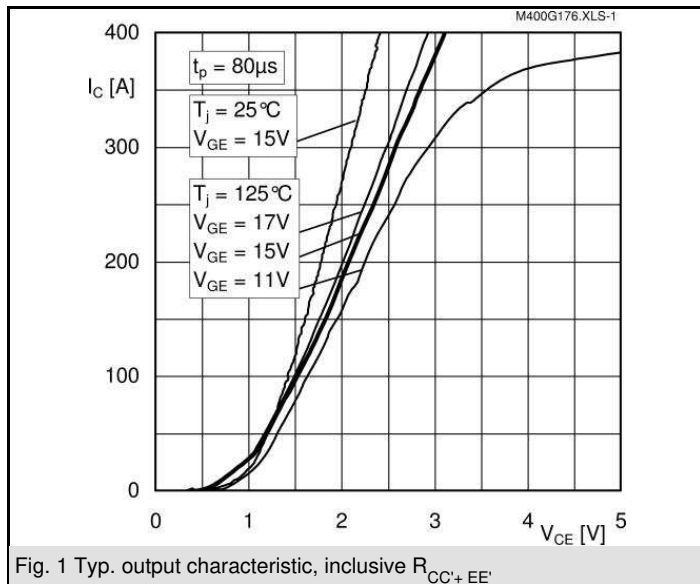


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

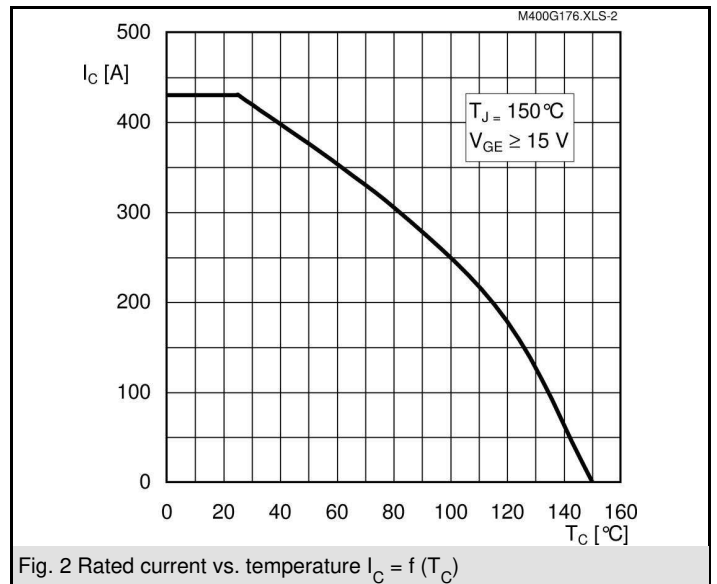


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

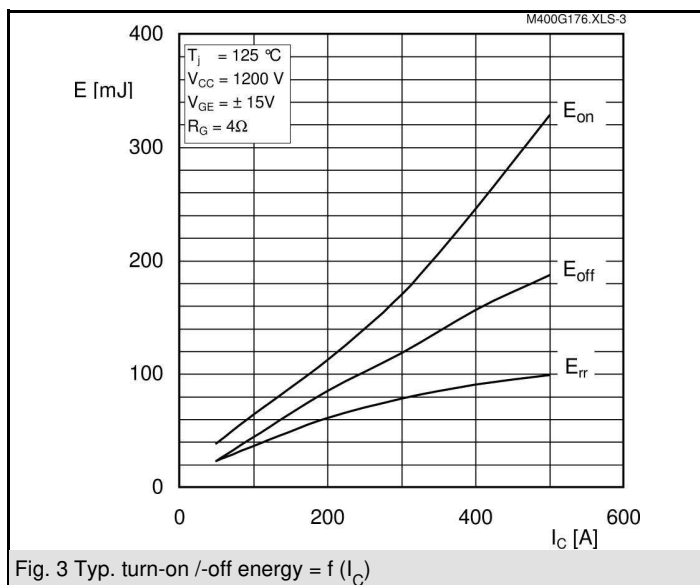


Fig. 3 Typ. turn-on /-off energy = $f(I_C)$

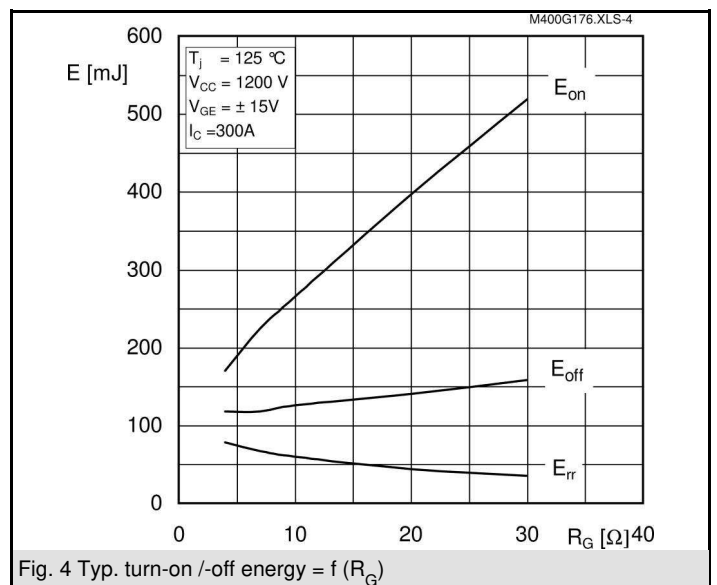


Fig. 4 Typ. turn-on /-off energy = $f(R_G)$

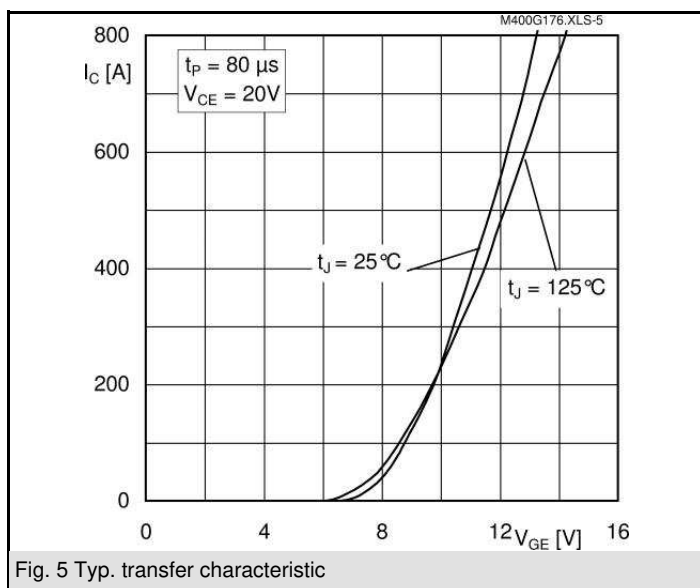


Fig. 5 Typ. transfer characteristic

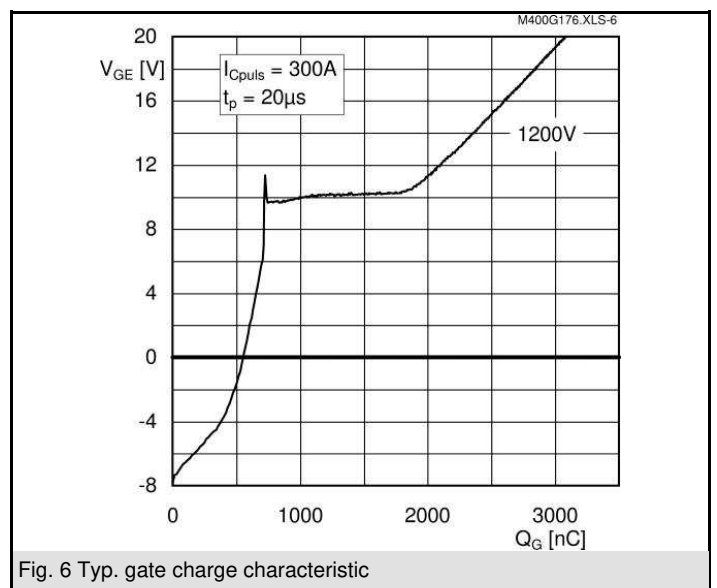
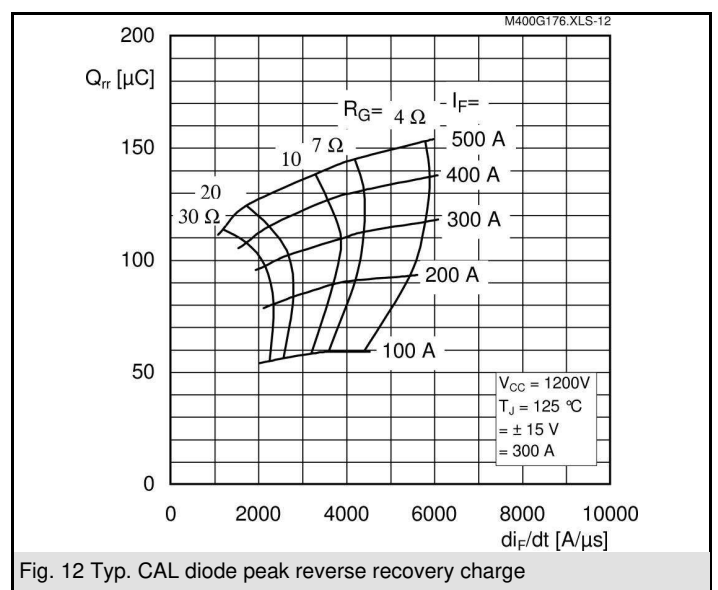
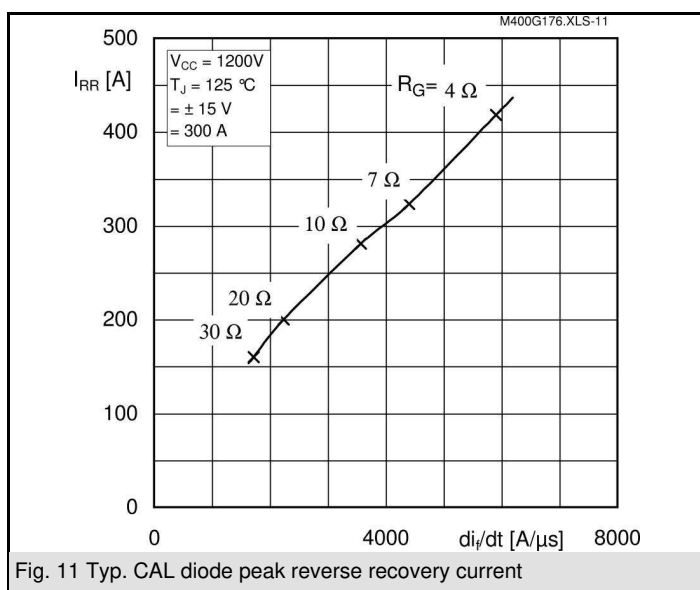
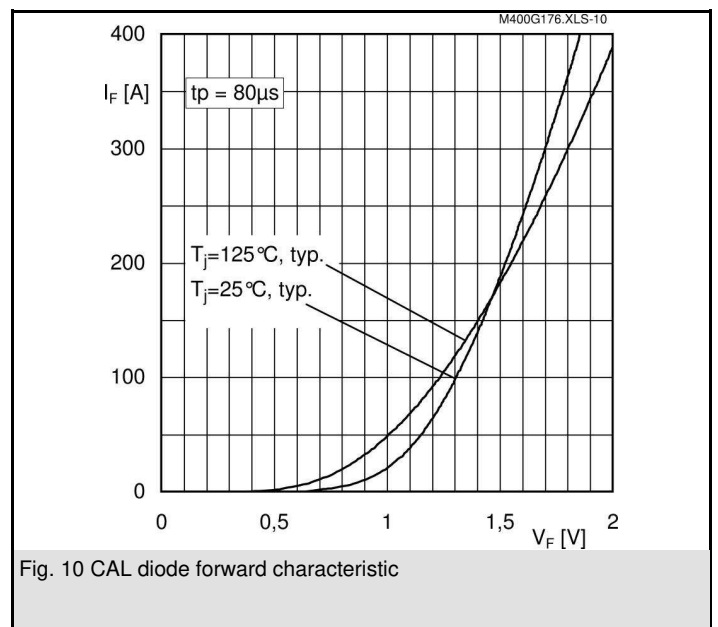
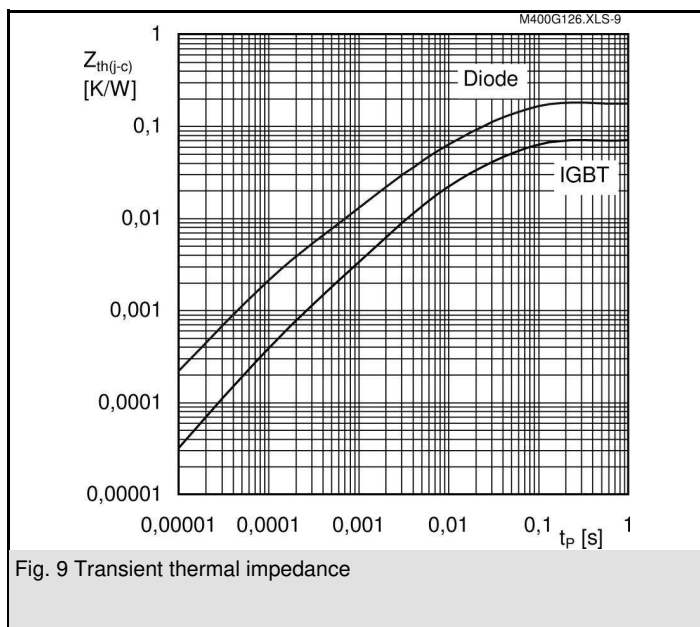
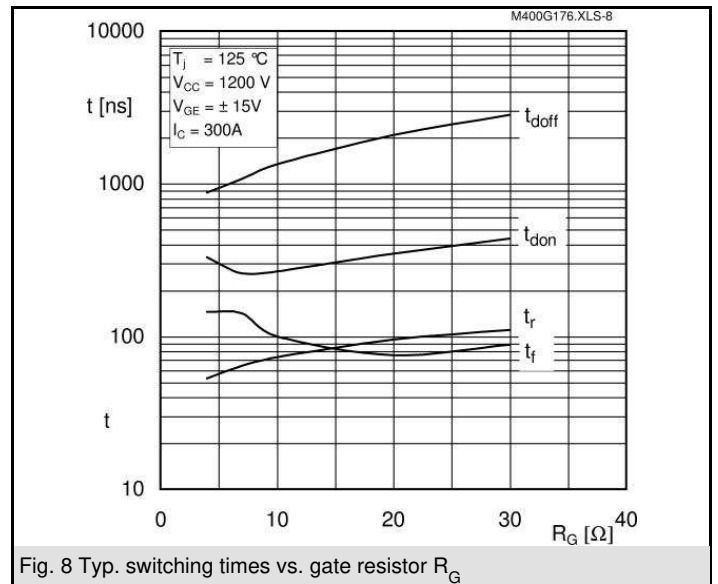
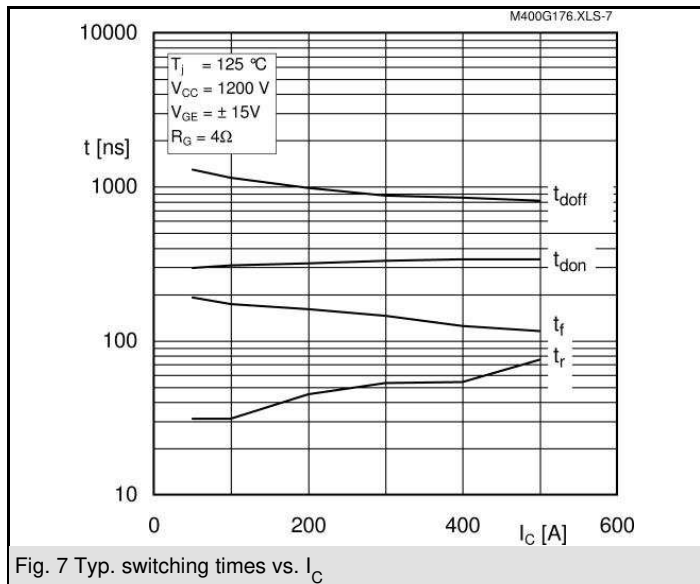
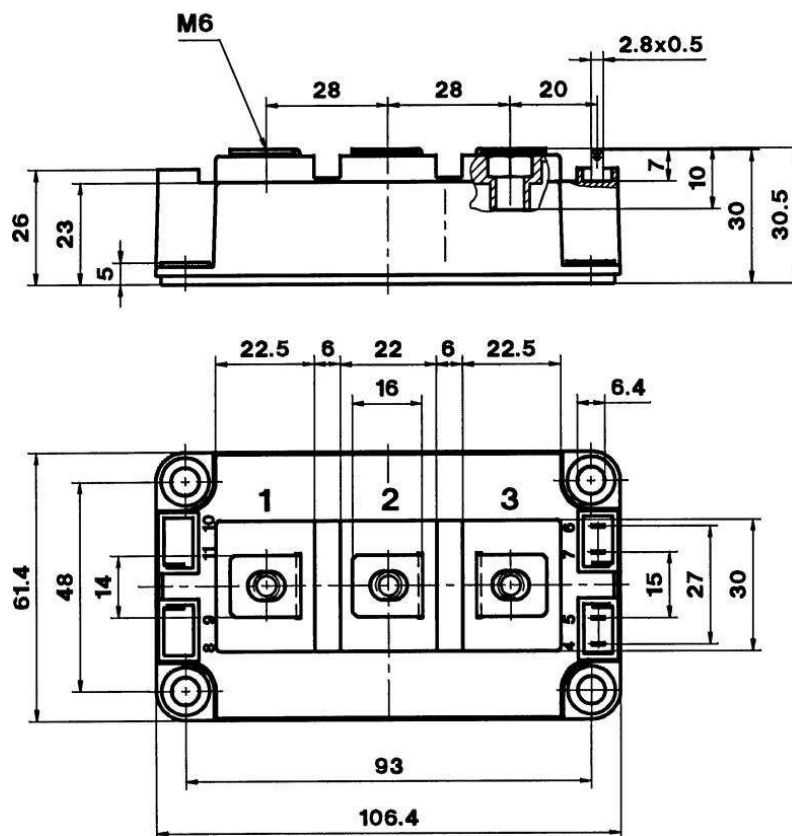
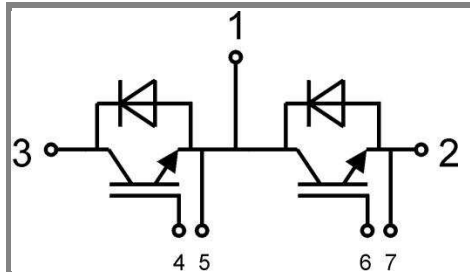


Fig. 6 Typ. gate charge characteristic



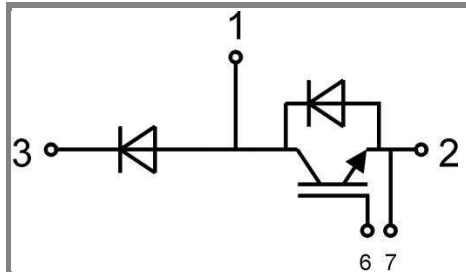


Case D 56



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Case D56



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Case D57