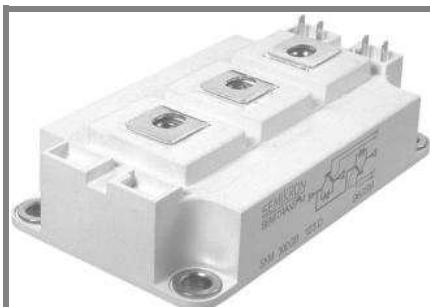


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SEMITRANS® 3

Trench IGBT Modules

SKM 400GB176D

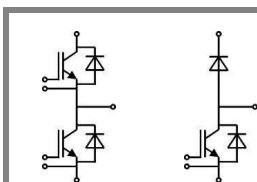
SKM 400GAL176D

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



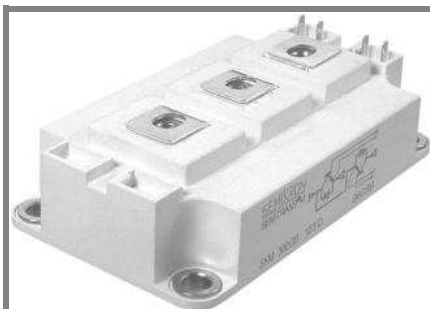
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Absolute Maximum Ratings			T _{case} = 25°C, unless otherwise specified	
Symbol	Conditions		Values	Units
IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	T _j = 150 °C	T _c = 25 °C	430	A
		T _c = 80 °C	310	A
I _{CRM}	I _{CRM} =2xI _{Cnom}		600	A
V _{GES}			± 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°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		4			mA
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			mΩ
	T _j = 125°C		5,2			mΩ
V _{CE(sat)}	I _{Cnom} = 300 A, V _{GE} = 15 V T _j = 25°C _{chiplev.}		2			V
	T _j = 125°C _{chiplev.}		2,45			V
C _{ies}	V _{CE} = 25, V _{GE} = 0 V f = 1 MHz		19,8			nF
C _{oes}			1,1			nF
C _{res}			0,88			nF
Q _G	V _{GE} = -8V...+15V		2500			nC
t _{d(on)}	R _{Gon} = 4 Ω	V _{CC} = 1200V I _C = 300A	330			ns
t _r			55			ns
E _{on}			170			mJ
t _{d(off)}	R _{Goff} = 4 Ω	T _j = 125 °C V _{GE} = ± 15V	880			ns
t _f			145			ns
E _{off}			118			mJ
R _{th(j-c)}	per IGBT		0,075			K/W

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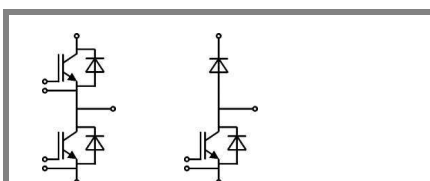
Typical Applications*

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

Characteristics					
Symbol	Conditions	min.	typ.	max.	Units
Inverse Diode					
$V_F = V_{EC}$	$I_{Fnom} = 300 \text{ A}; V_{GE} = 0 \text{ V}$				
	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$		1,7	1,9	V
	$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$		1,8	2	V
V_{F0}	$T_j = 25 \text{ }^\circ\text{C}$		1,2	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	1,7	mΩ
	$T_j = 125 \text{ }^\circ\text{C}$		3	3	mΩ
I_{RRM}	$I_F = 300 \text{ A}$		418		A
Q_{rr}	$di/dt = 5800 \text{ A}/\mu\text{s}$		117		μC
E_{rr}	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$		78		mJ
$R_{th(j-c)D}$	per diode			0,125	K/W
FWD					
$V_F = V_{EC}$	$I_{Fnom} = 300 \text{ A}; V_{GE} = 0 \text{ V}$				
	$T_j = 25 \text{ }^\circ\text{C}_{chiplev.}$		1,7	1,9	V
	$T_j = 125 \text{ }^\circ\text{C}_{chiplev.}$		1,8	2	V
V_{F0}	$T_j = 25 \text{ }^\circ\text{C}$		1,2	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	1,7	V
	$T_j = 125 \text{ }^\circ\text{C}$		3	3	V
I_{RRM}	$I_F = 300 \text{ A}$		418		A
Q_{rr}	$di/dt = 5800 \text{ A}/\mu\text{s}$		117		μC
E_{rr}	$V_{GE} = -15 \text{ V}; V_{CC} = 1200 \text{ V}$		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	$T_{case} = 25 \text{ }^\circ\text{C}$	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				325	g

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

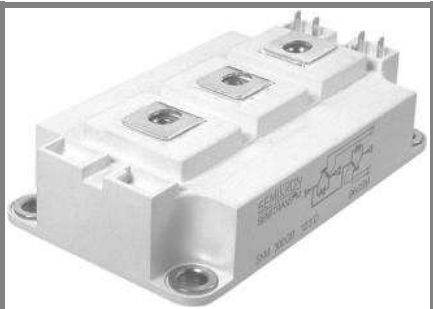
* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and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



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Trench IGBT Modules

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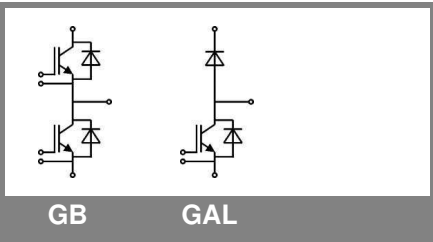
Features

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Typical Applications*

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- 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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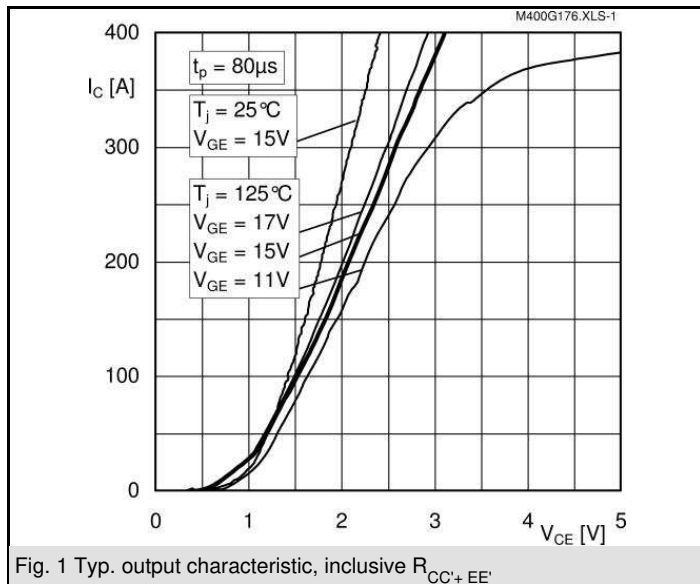


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

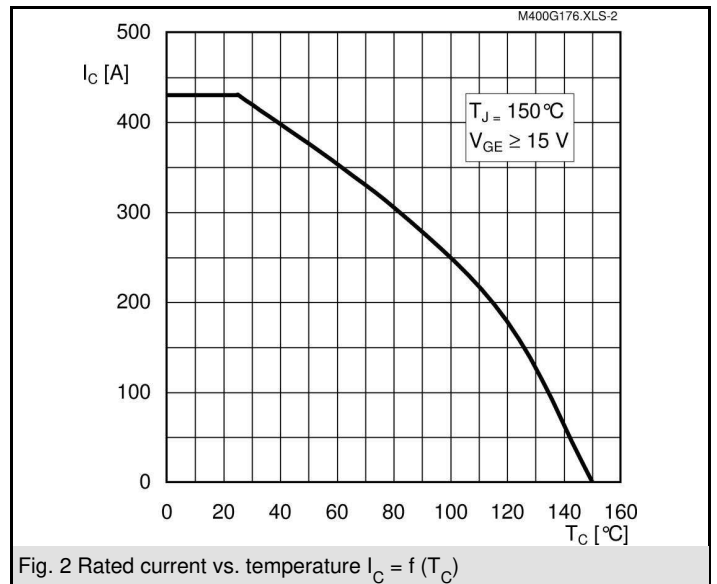


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

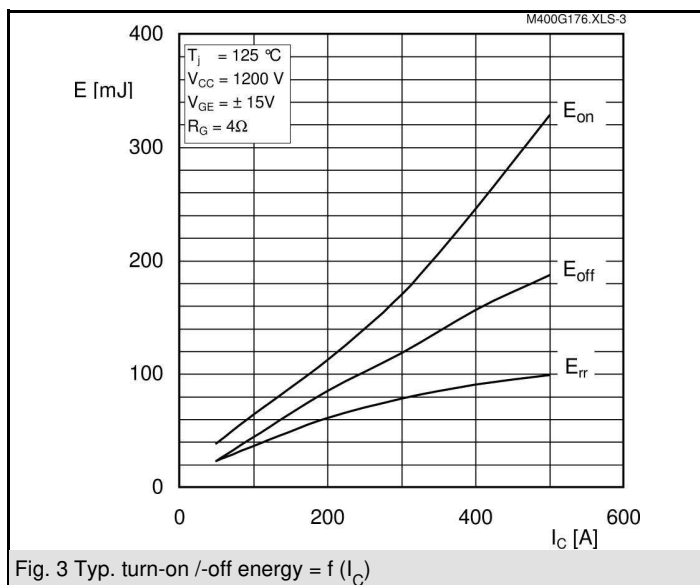


Fig. 3 Typ. turn-on /-off energy = $f(I_C)$

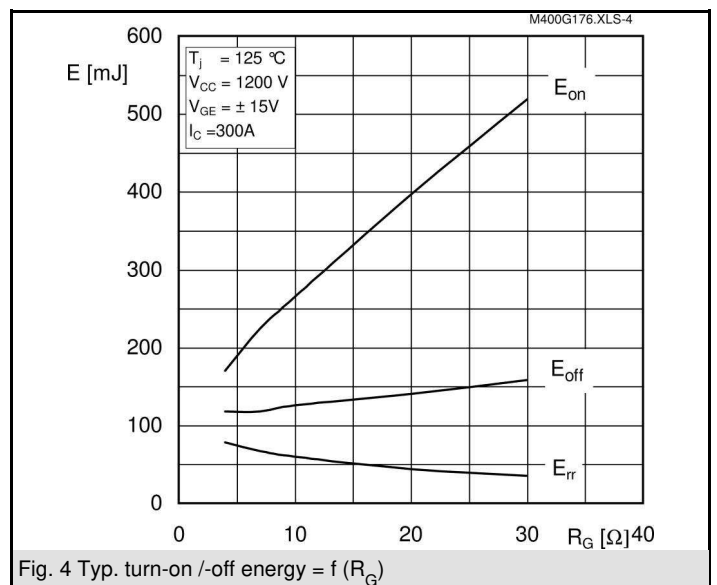


Fig. 4 Typ. turn-on /-off energy = $f(R_G)$

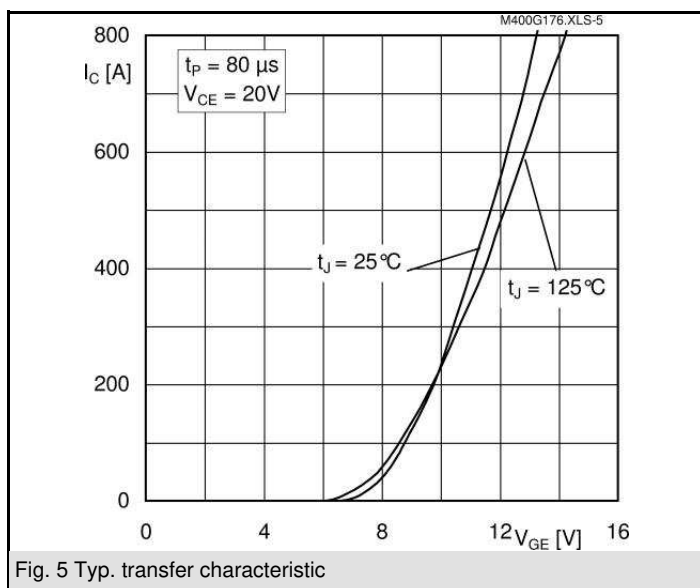


Fig. 5 Typ. transfer characteristic

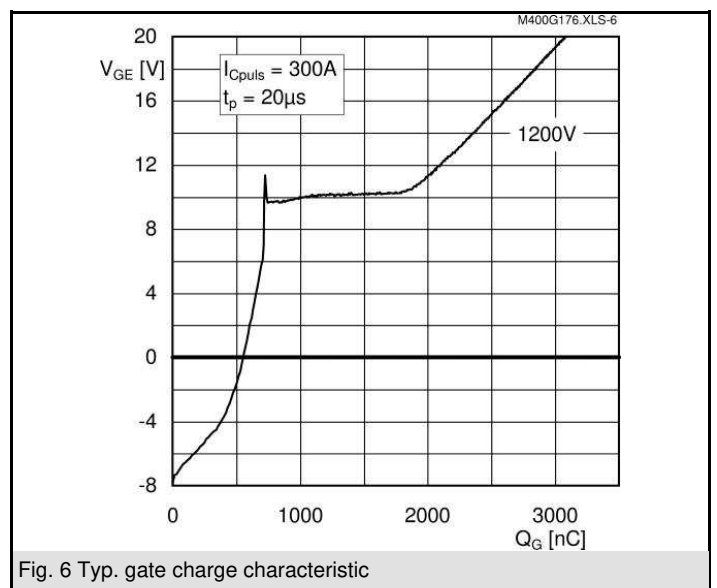
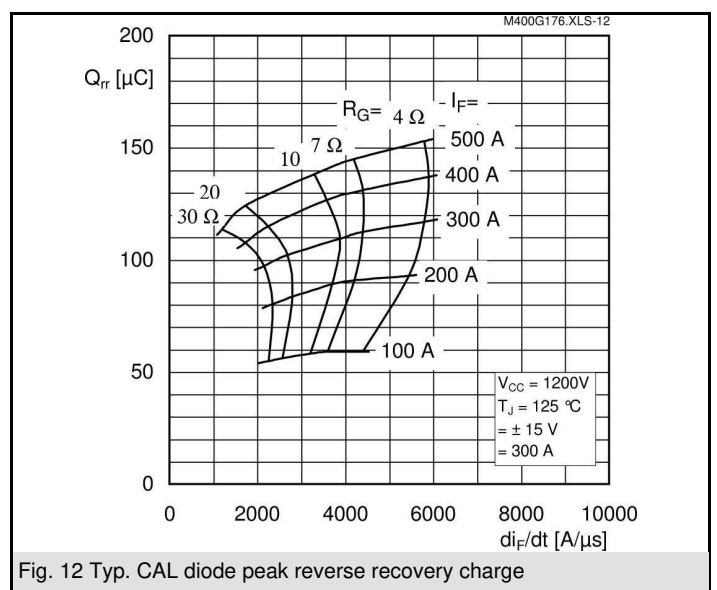
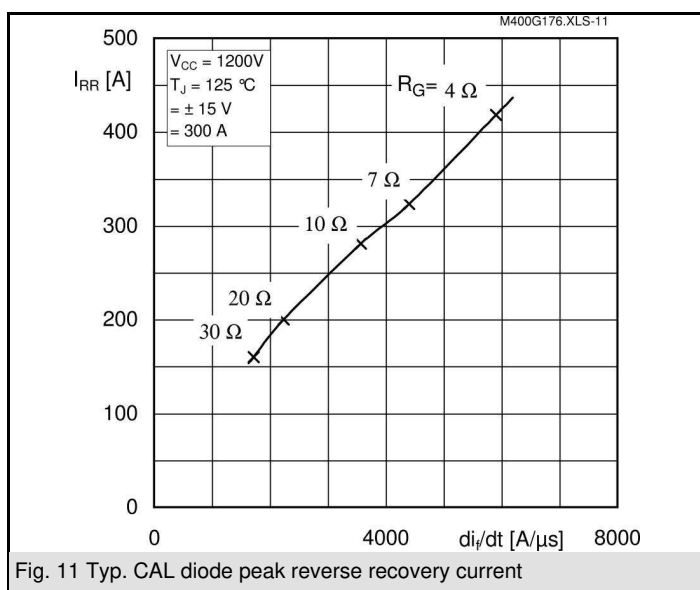
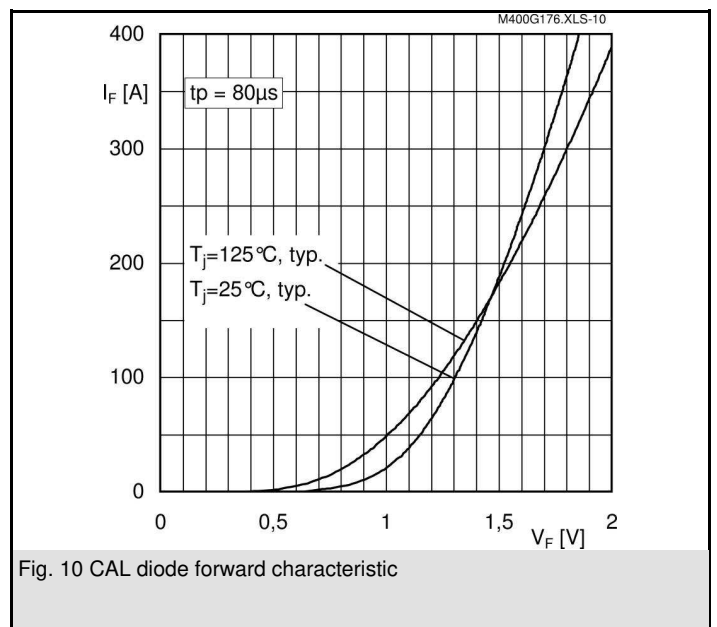
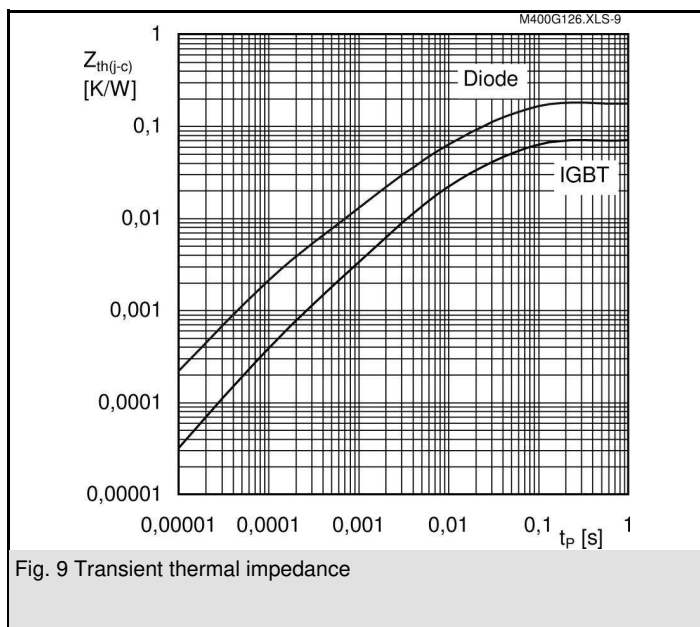
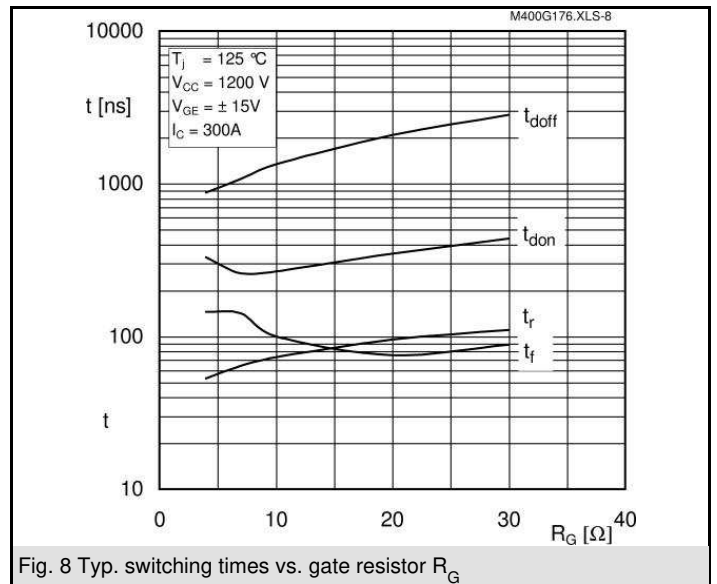
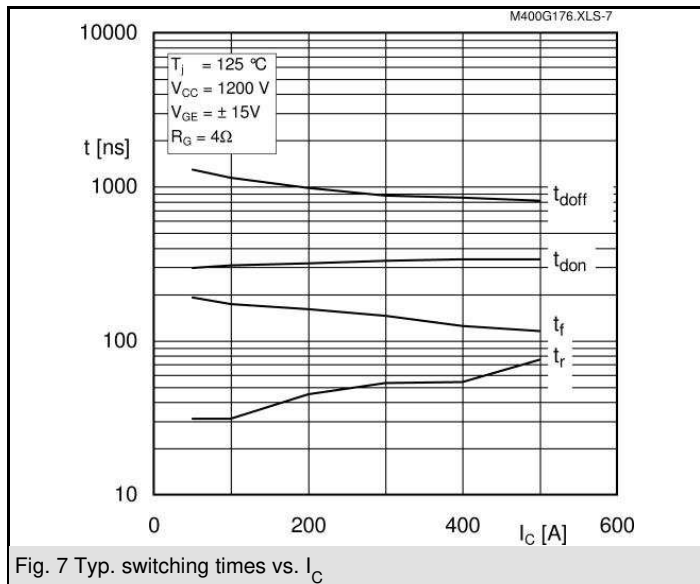
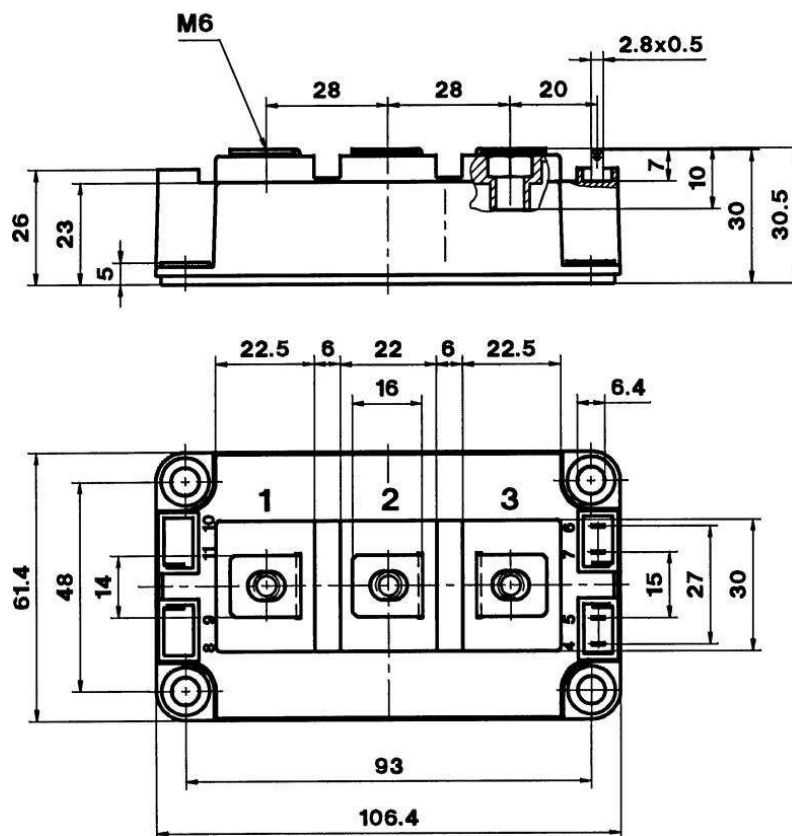
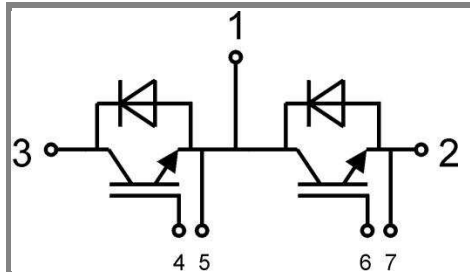


Fig. 6 Typ. gate charge characteristic



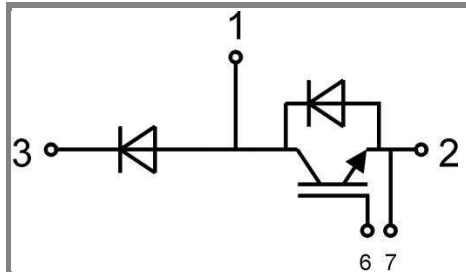


Case D 56



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Case D56



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Case D57