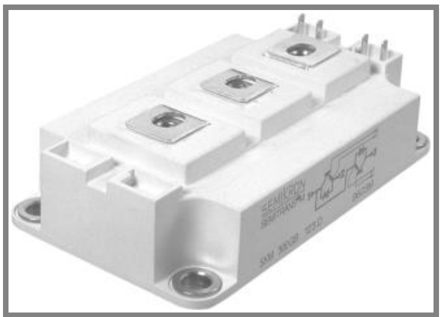
SKM 400GB176D



SEMITRANS® 3

Trench IGBT Modules

SKM 400GB176D

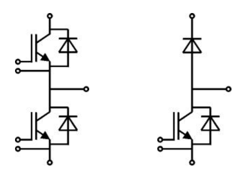
SKM 400GAL176D

Features

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

Typical Applications*

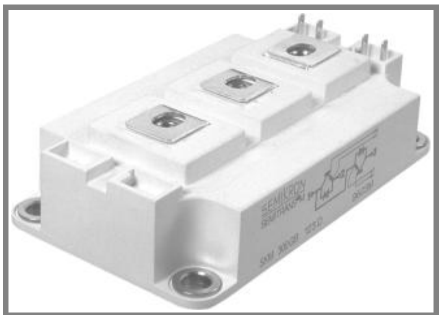
- AC inverter drives
- mains 575 - 750 V AC
- Public transport (auxiliary syst.)
- Wind power



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	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; $V_{GE} \leq$ 20 V; V_{CES} < 1700 V	T_j = 125 °C	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	1,2	V
		T_j = 125 °C		0,9	1,1	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	2,4	V
		T_j = 125°$C_{chiplev.}$		2,45	2,9	V
C_{ies}				19,8		nF
C_{oes}	V_{CE} = 25, V_{GE} = 0 V	f = 1 MHz		1,1		nF
C_{res}				0,88		nF
Q_G	V_{GE} = -8V...+15V			2500		nC
$t_{d(on)}$				330		ns
t_r	R_{Gon} = 4 Ω	V_{CC} = 1200V		55		ns
E_{on}		I_C= 300A		170		mJ
$t_{d(off)}$	R_{Goff} = 4 Ω	T_j = 125 °C		880		ns
t_f		V_{GE} = ± 15V		145		ns
E_{off}				118		mJ
$R_{th(j-c)}$	per IGBT				0,075	K/W



SEMITRANS® 3

Trench IGBT Modules

SKM 400GB176D

SKM 400GAL176D

Features

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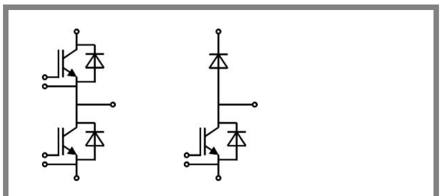
- AC inverter drives
- mains 575 - 750 V AC
- Public transport (auxiliary syst.)
- Wind power

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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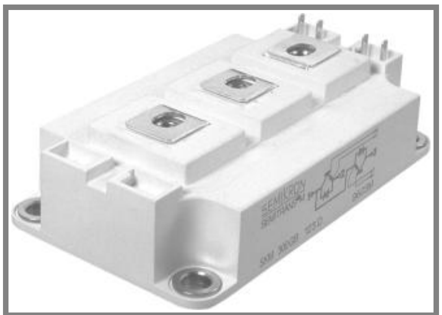

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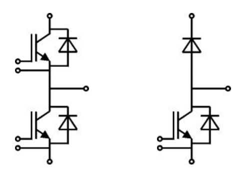

GB GAL

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
tau_i	i = 1	0,0569	s
tau_i	i = 2	0,0122	s
tau_i	i = 3	0,002	s
tau_i	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
tau_i	i = 1	0,054	s
tau_i	i = 2	0,0075	s
tau_i	i = 3	0,0018	s
tau_i	i = 4	0,0002	s

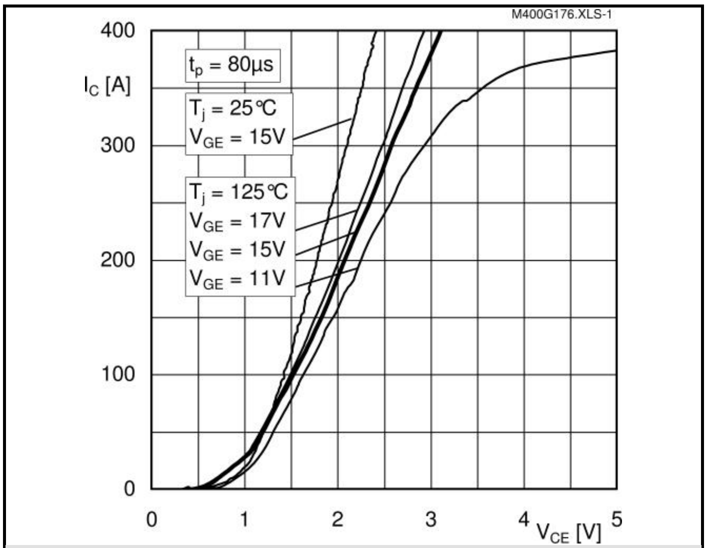

Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

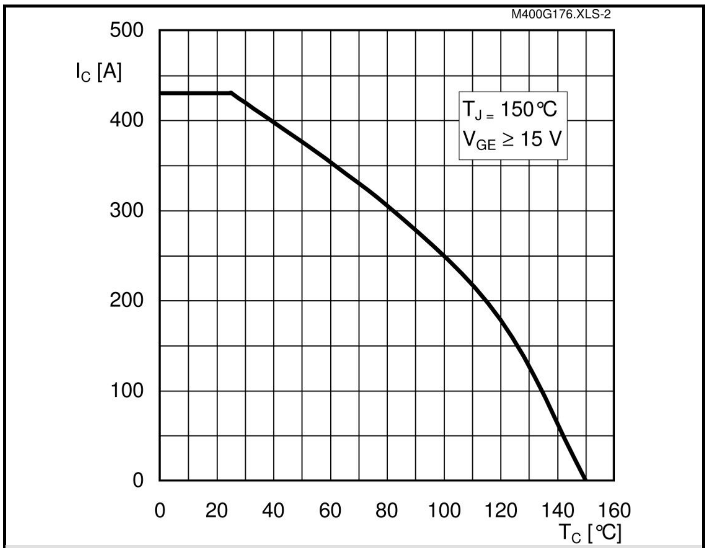

Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

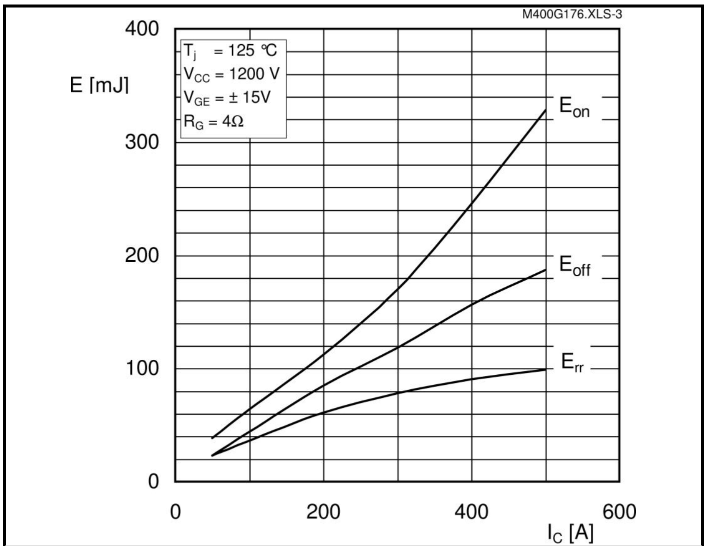

Fig. 3 Typ. turn-on /-off energy = f (I_C)

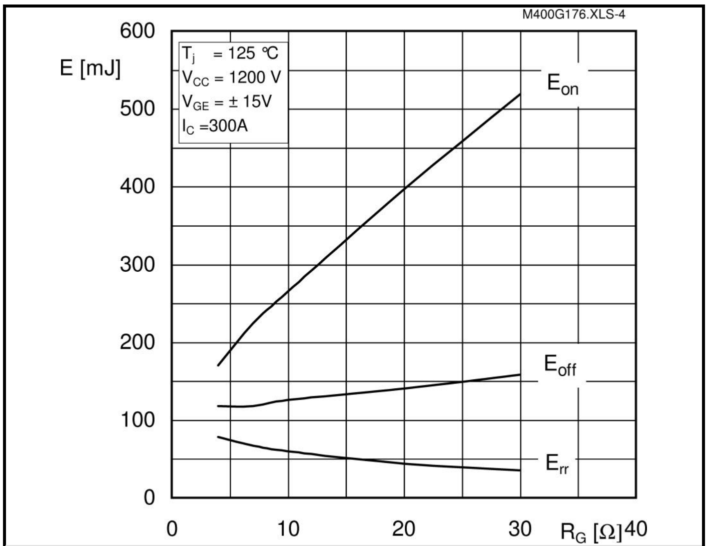

Fig. 4 Typ. turn-on /-off energy = f (R_G)

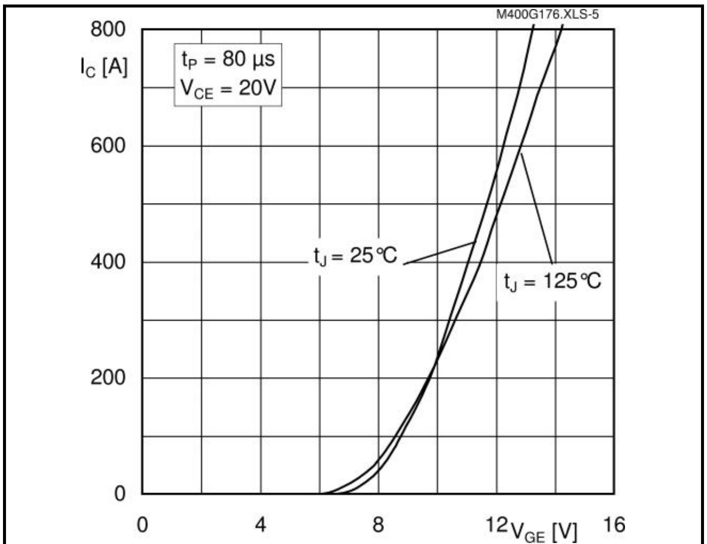

Fig. 5 Typ. transfer characteristic

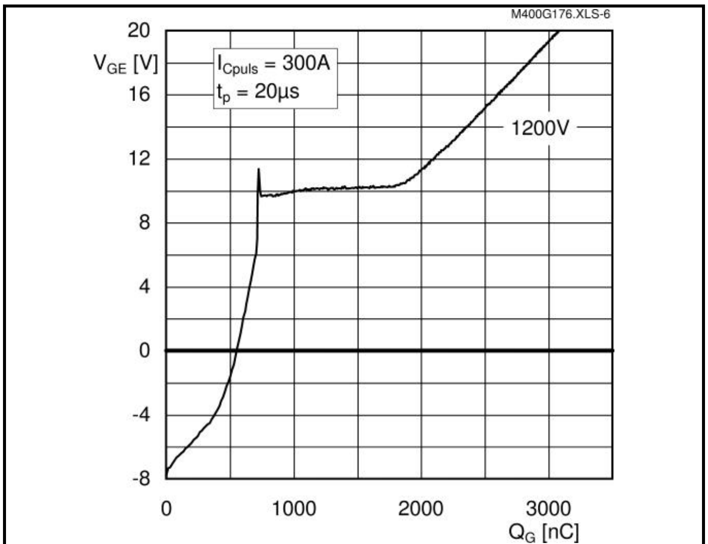

Fig. 6 Typ. gate charge characteristic

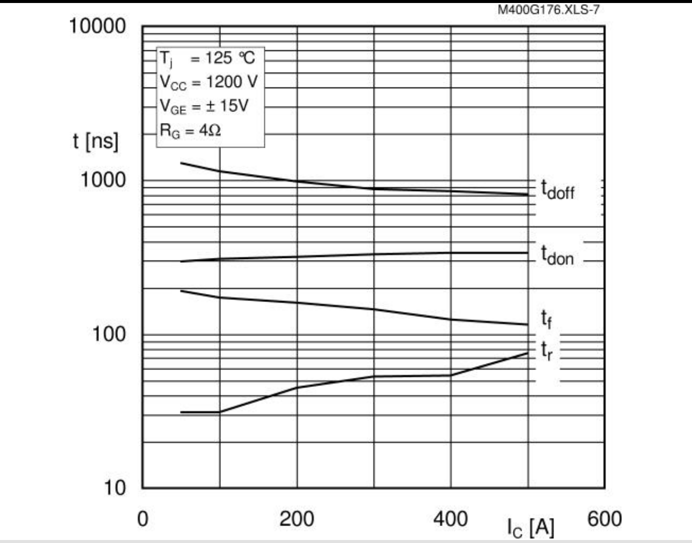

Fig. 7 Typ. switching times vs. I_C

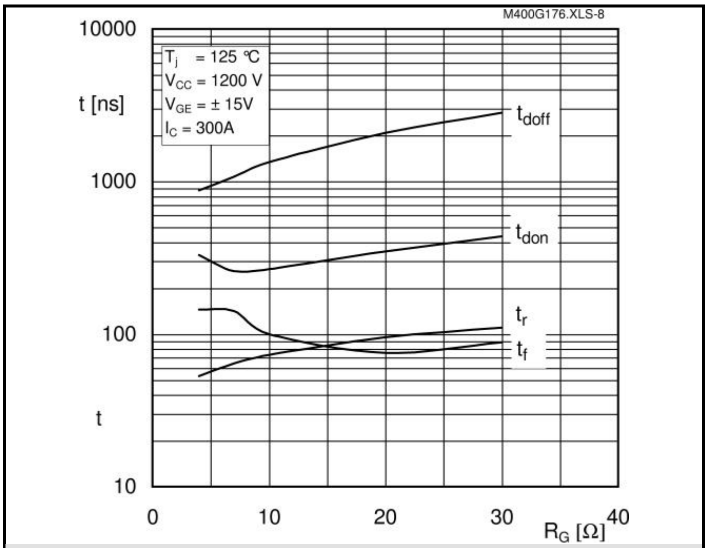

Fig. 8 Typ. switching times vs. gate resistor R_G

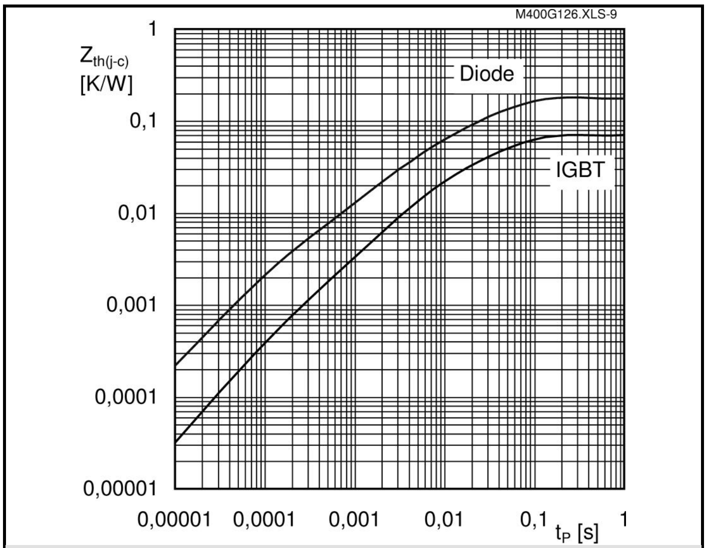

Fig. 9 Transient thermal impedance

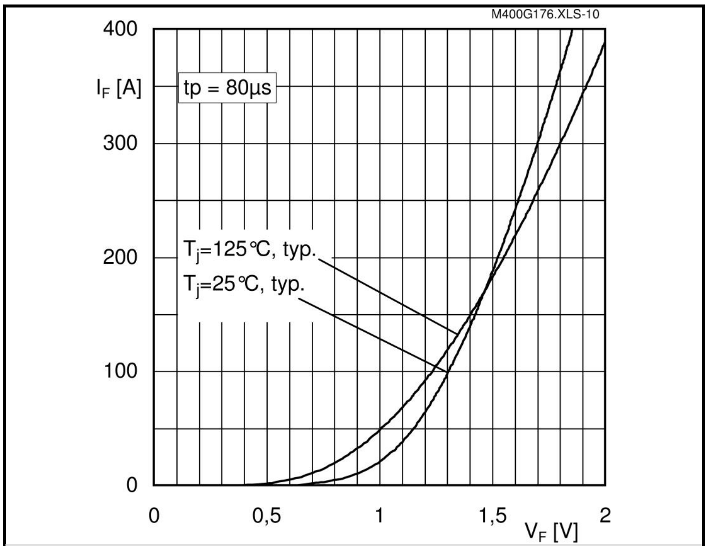

Fig. 10 CAL diode forward characteristic

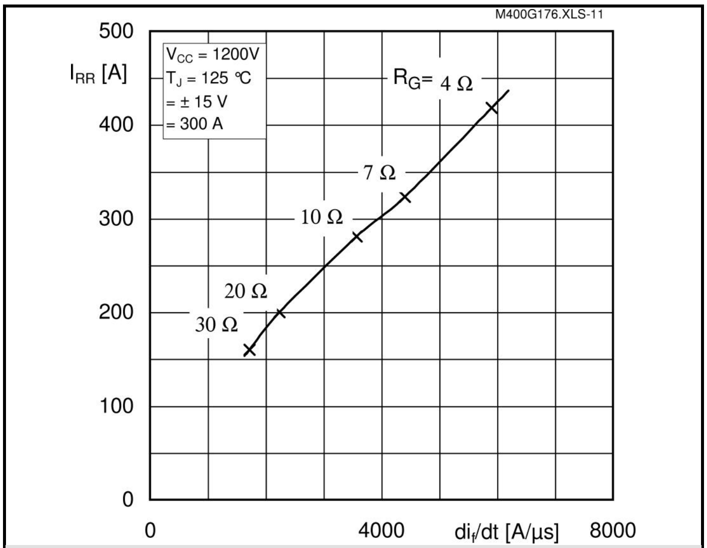

Fig. 11 Typ. CAL diode peak reverse recovery current

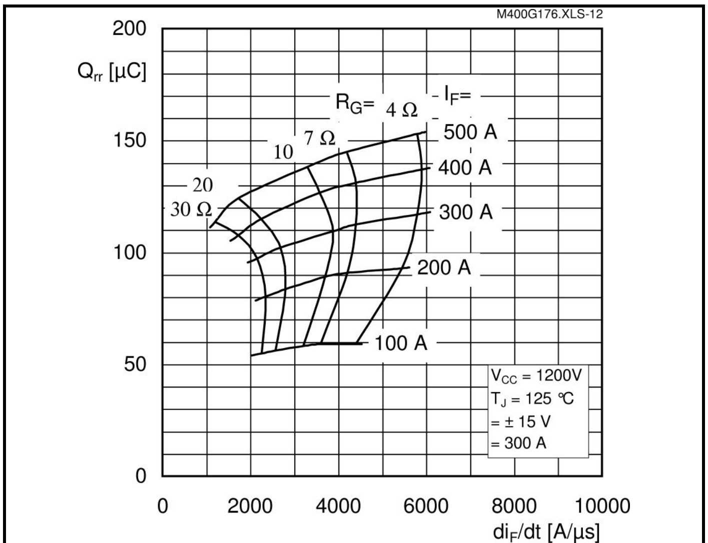

Fig. 12 Typ. CAL diode peak reverse recovery charge

SKM 400GB176D

UL Recognized

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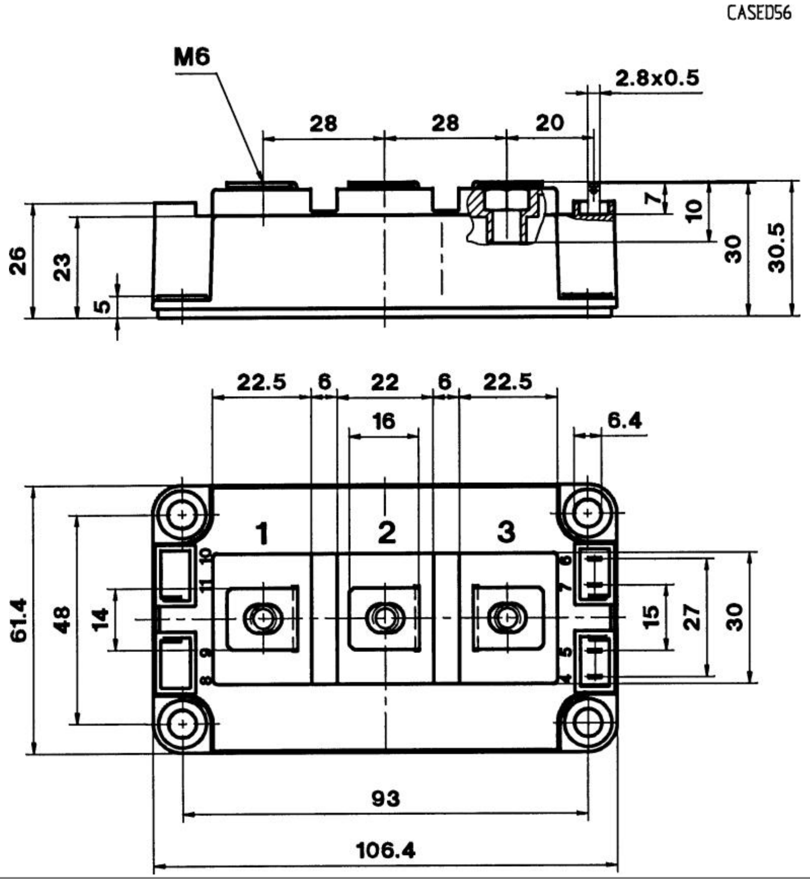
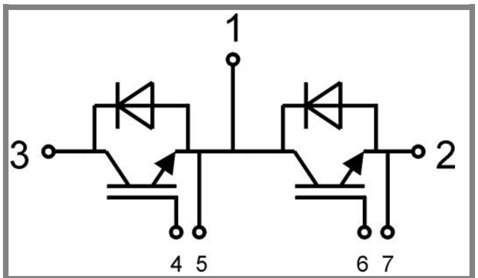


Case D 56



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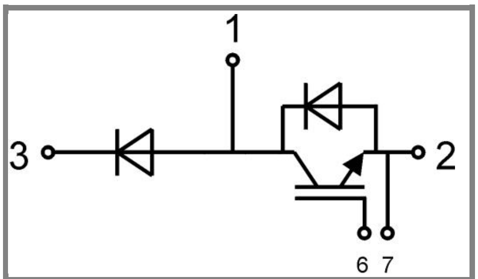

GAL Case D57