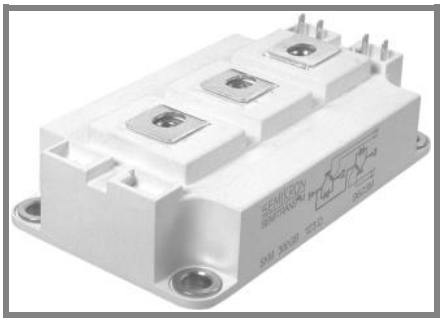
SKM 400GB176D



SEMITRANS® 3

Trench IGBT Modules

SKM 400GB176D

SKM 400GAL176D

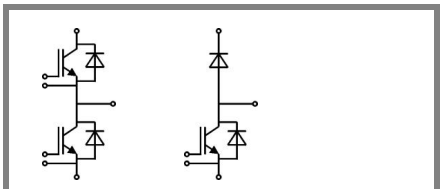
Preliminary Data

Features

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

Typical Applications

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

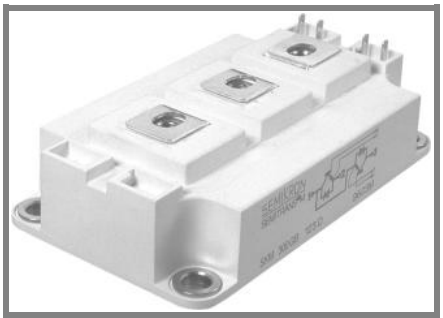


GB **GAL**

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		0,15	0,45	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}	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		330		ns
t_r		I_C= 300A		55		ns
E_{on}		T_j = 125 °C		170		mJ
$t_{d(off)}$	R_{Goff} = 4 Ω	V_{GE} = ± 15V		880		ns
t_f				145		ns
E_{off}				118		mJ
$R_{th(j-c)}$	per IGBT				0,075	K/W

SKM 400GB176D



SEMITRANS® 3

Trench IGBT Modules

SKM 400GB176D

SKM 400GAL176D

Preliminary Data

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- mains 575 - 750 V AC
- Public transport (auxiliary syst.)
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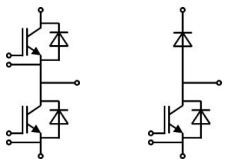


GB **GAL**

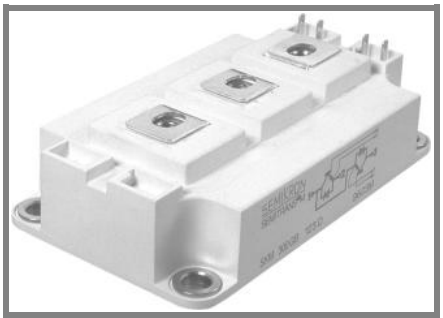
Characteristics

Symbol	Conditions		min.	typ.	max.	Units
Inverse Diode						
$V_F = V_{EC}$	I_{Fnom} = 300 A; V_{GE} = 0 V	T_j = 25 °C$_{chiplev.}$		1,7	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.

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

SKM 400GB176D



SEMITRANS® 3

Trench IGBT Modules

SKM 400GB176D

SKM 400GAL176D

Preliminary Data

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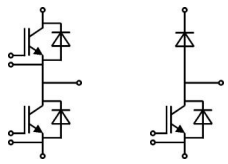

GB **GAL**

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

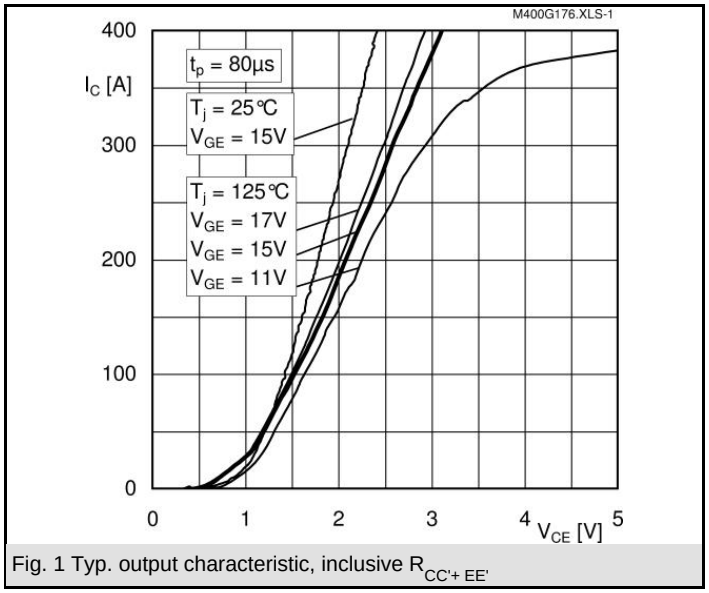

Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

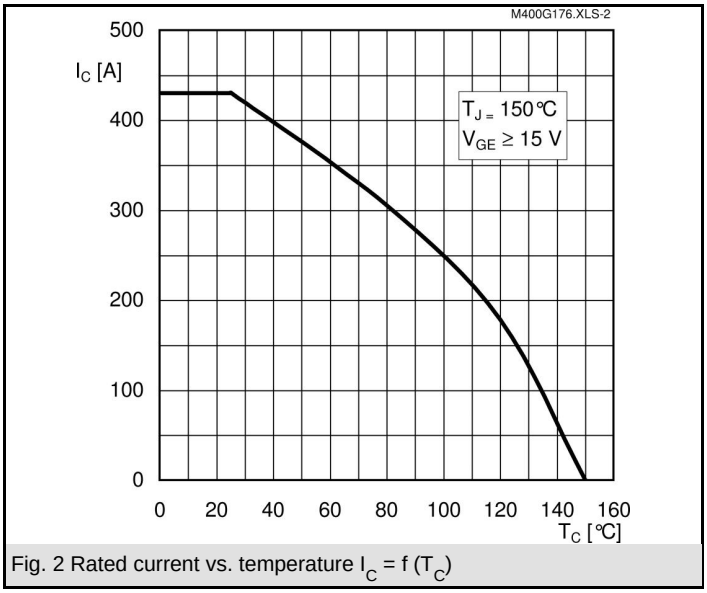

Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

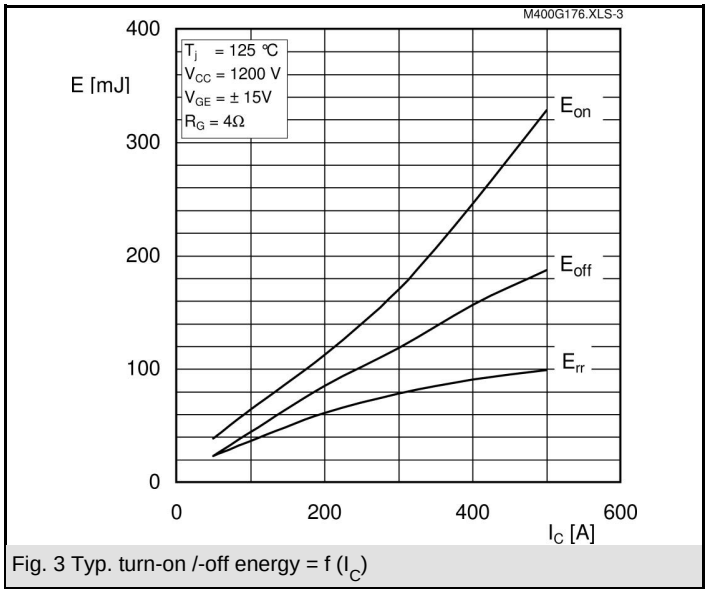

Fig. 3 Typ. turn-on /-off energy = f (I_C)

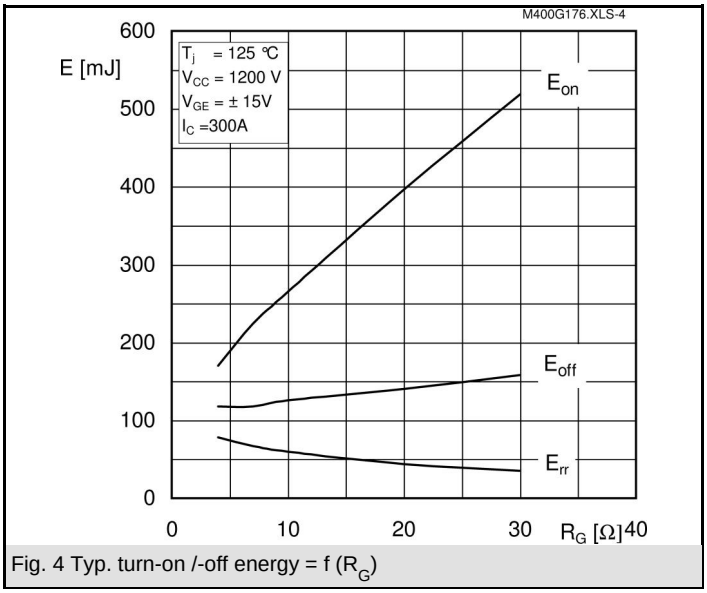

Fig. 4 Typ. turn-on /-off energy = f (R_G)

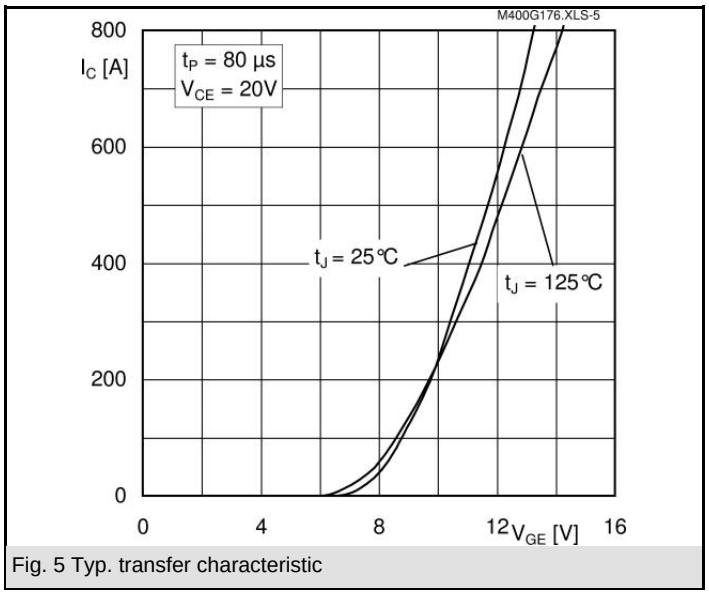

Fig. 5 Typ. transfer characteristic

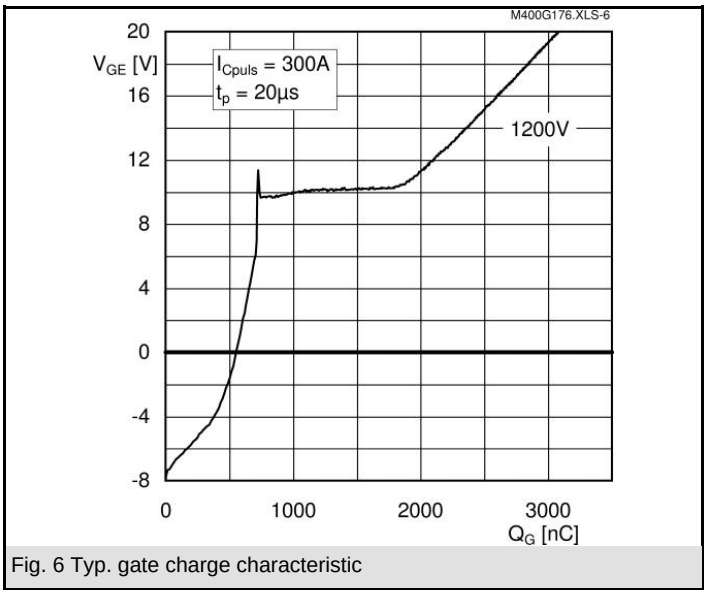

Fig. 6 Typ. gate charge characteristic

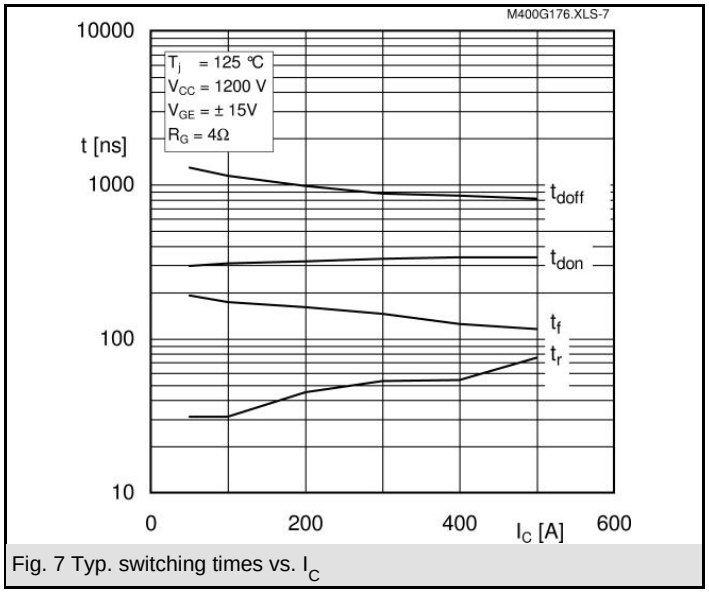

Fig. 7 Typ. switching times vs. I_C

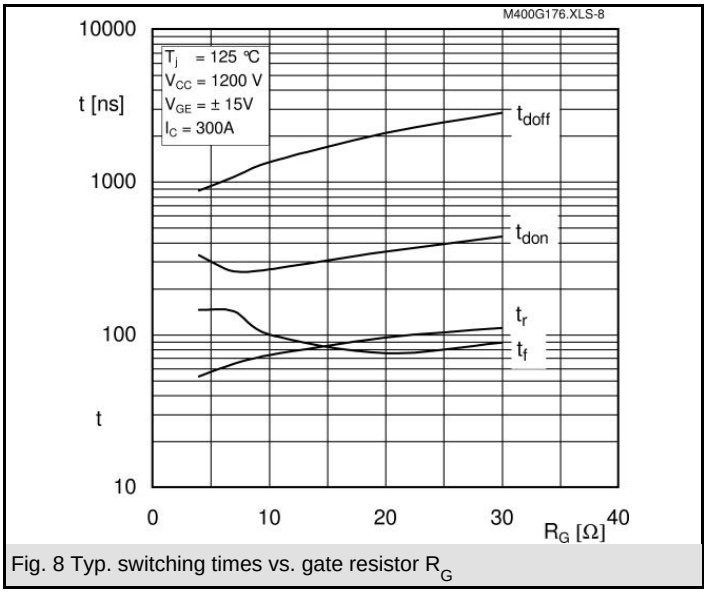

Fig. 8 Typ. switching times vs. gate resistor R_G

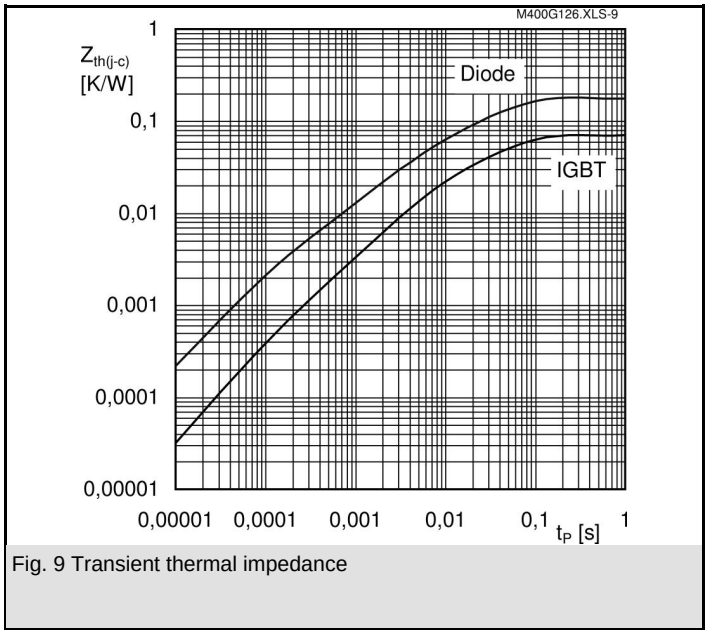

Fig. 9 Transient thermal impedance

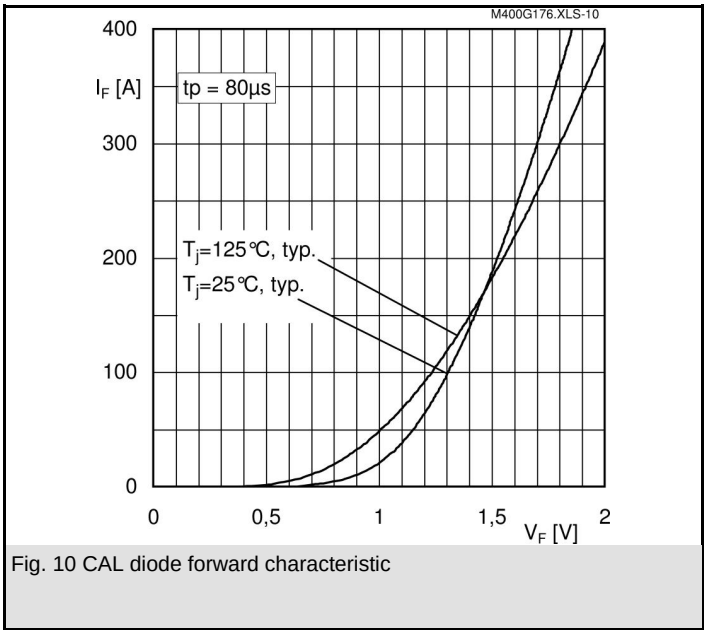

Fig. 10 CAL diode forward characteristic

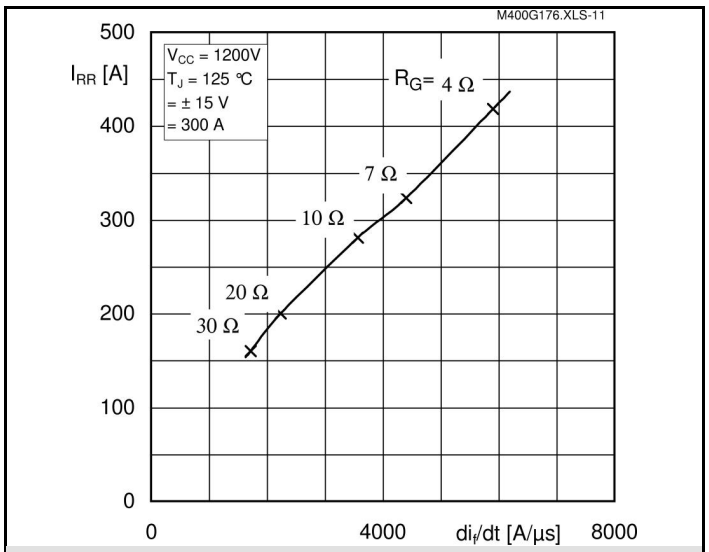

Fig. 11 Typ. CAL diode peak reverse recovery current

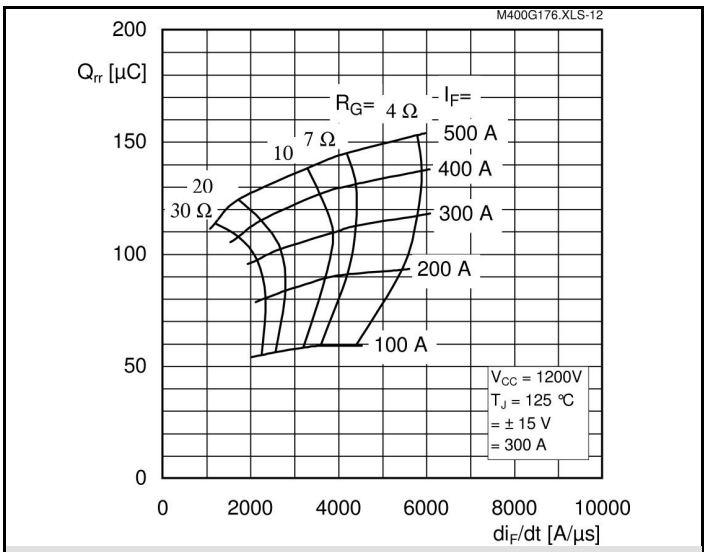

Fig. 12 Typ. CAL diode peak reverse recovery charge

UL Recognized File no. 63 532

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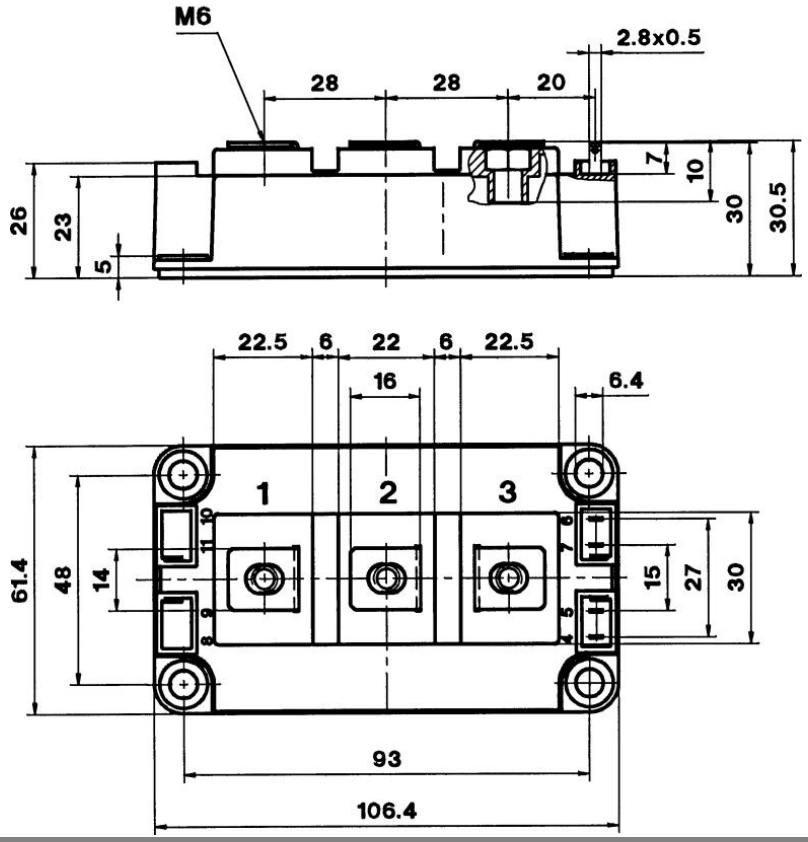
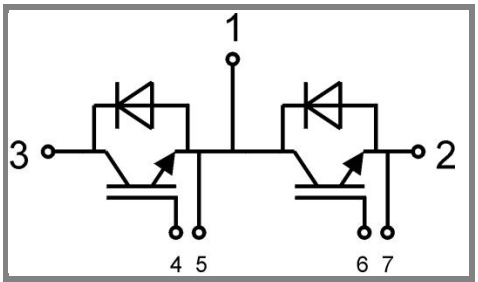
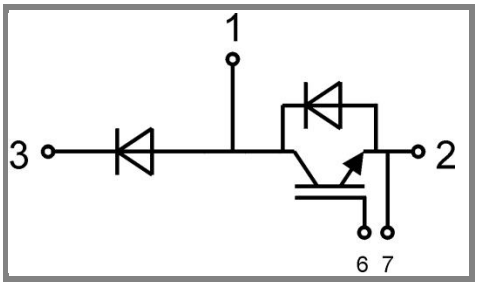


Case D 56



GB Case D56



GAL Case D57

