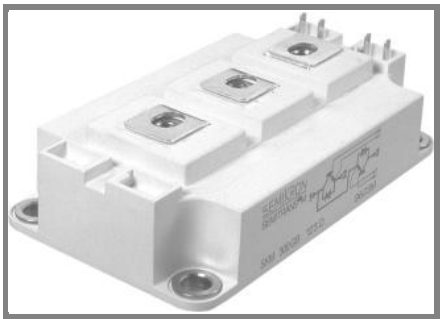
SKM 200GB176D...



SEMITRANS® 3

Trench IGBT Modules

SKM 200GB176D

SKM 200GAL176D

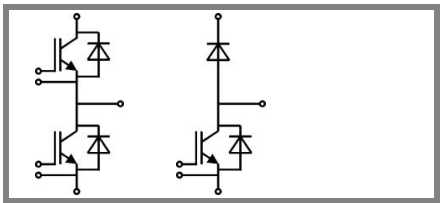
Preliminary Data

Features

- Homogeneous Si
- Trench = Trenchgate technology
- V_{CEsat} 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.)



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Absolute Maximum Ratings			T_c = 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	260	A
		T_c = 80 °C	180	A
I_{CRM}	I_{CRM}=2xI_{Cnom}, t_p = 1 ms		300	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	210	A
		T_c = 80 °C	140	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}, t_p = 1 ms		300	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	1100	A
Freewheeling Diode				
I_F	T_j = 150 °C	T_{case} = 25 °C	210	A
		T_{case} = 80 °C	140	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}, t_p = 1 ms		300	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	1100	A
Module				
$I_{t(RMS)}$			500	A
T_{vj}			- 40 ... + 150	°C
T_{stg}	$T_{OPERATION} \leq T_{stg}$		-40...+125	°C
V_{isol}	AC, 1 min.		4000	V

Characteristics			T_c = 25 °C, unless otherwise specified			
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Units**
IGBT						
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 6 mA		5,2	5,8	6,4	V
I_{CES}	V_{GE} = 0 V, V_{CE} = V_{CES}	T_j = 25 °C		0,1	0,3	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		6,7	8,3	mΩ
		T_j = 125°C		10	12	mΩ
$V_{CE(sat)}$	I_{Cnom} = 150 A, V_{GE} = 15 V	T_j = 25°C$_{chiplev.}$		2	2,45	V
		T_j = 125°C$_{chiplev.}$		2,4	2,9	V
C_{ies}	V_{CE} = 25, V_{GE} = 0 V	f = 1 MHz		11,4		nF
C_{oes}				0,55		nF
C_{res}				0,44		nF
Q_G	V_{GE} = -8V...+15V			1200		nC
$t_{d(on)}$	R_{Gon} = 5 Ω	V_{CC} = 1200V		360		ns
t_r		I_{Cnom}= 150A		45		ns
E_{on}		T_j = 125 °C		93		mJ
$t_{d(off)}$	R_{Goff} = 5 Ω	V_{GE} = ± 15V		760		ns
t_f				140		ns
E_{off}				58		mJ
$R_{th(j-c)}$	per IGBT				0,12	K/W

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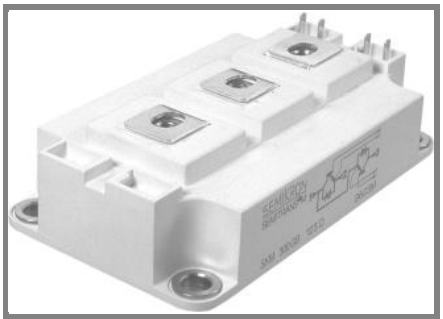


SEMITRANS® 3

Trench IGBT Modules

SKM 200GB176D

SKM 200GAL176D

Preliminary Data

Features

- Homogeneous Si
- Trench = Trenchgate technology
- V_{CEsat} with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_c

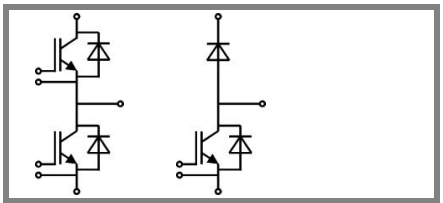
Typical Applications

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

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Units**
Inverse Diode						
$V_F = V_{EC}$	I_{Fnom} = 150 A; V_{GE} = 0 V	T_j = 25 °$C_{chiplev.}$		1,7	1,9	V
		T_j = 125 °$C_{chiplev.}$		1,7	1,9	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		4	4	mΩ
		T_j = 125 °C		5,3	5,3	mΩ
I_{RRM}	I_{Fnom} = 150 A	T_j = 125 °C		195		A
Q_{rr}	di/dt = 3700 A/µs			52		µC
E_{off}	V_{GE} = -15 V; V_{CC} = 1200 V			31		mJ
$R_{th(j-c)D}$	per diode				0,25	K/W
FWD						
$V_F = V_{EC}$	I_{Fnom} = 150 A; V_{GE} = 0 V	T_j = 25 °$C_{chiplev.}$		1,7	1,9	V
		T_j = 125 °$C_{chiplev.}$		1,7	1,9	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		4	4	V
		T_j = 125 °C		5,3	5,3	V
I_{RRM}	I_{Fnom} = 150 A	T_j = 125 °C		195		A
Q_{rr}	di/dt = 3700 A/µs			52		µC
E_{off}	V_{GE} = -15 V; V_{CC} = 1200 V			31		mJ
$R_{th(j-c)FD}$	per diode				0,25	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.



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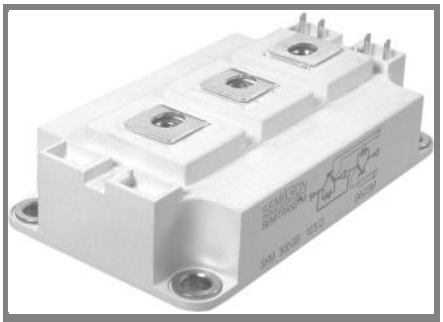

SEMITRANS® 3

Trench IGBT Modules

SKM 200GB176D

SKM 200GAL176D

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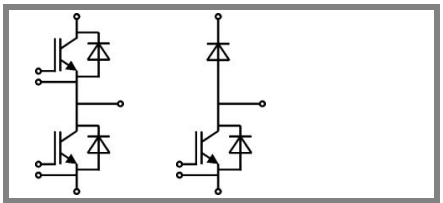

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Z_{th} Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	i = 1	80	mk/W
R_i	i = 2	30	mk/W
R_i	i = 3	8,2	mk/W
R_i	i = 4	1,8	mk/W
tau_i	i = 1	0,0753	s
tau_i	i = 2	0,01	s
tau_i	i = 3	0,0008	s
tau_i	i = 4	0,0003	s
$Z_{th(j-c)D}$			
R_i	i = 1	160	mk/W
R_i	i = 2	67	mk/W
R_i	i = 3	20	mk/W
R_i	i = 4	3	mk/W
tau_i	i = 1	0,0382	s
tau_i	i = 2	0,009	s
tau_i	i = 3	0,0009	s
tau_i	i = 4	0,005	s

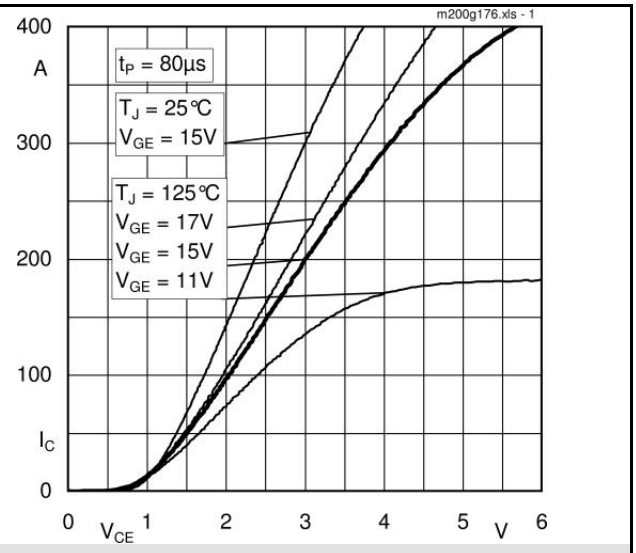


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+EE'}$

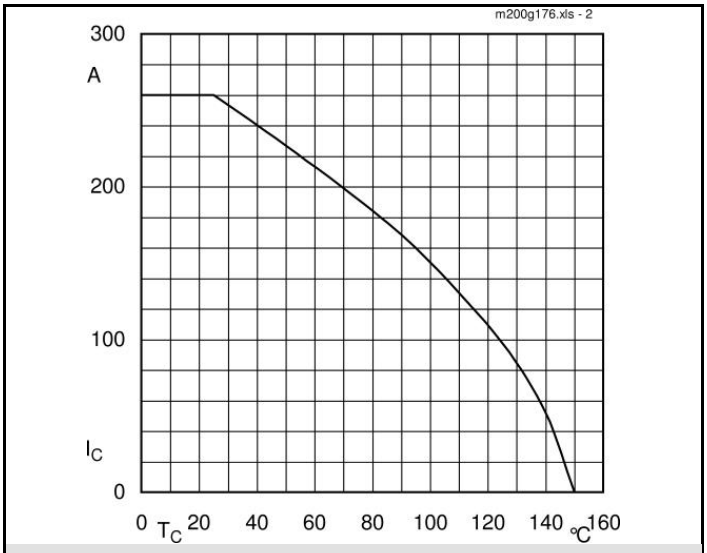


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

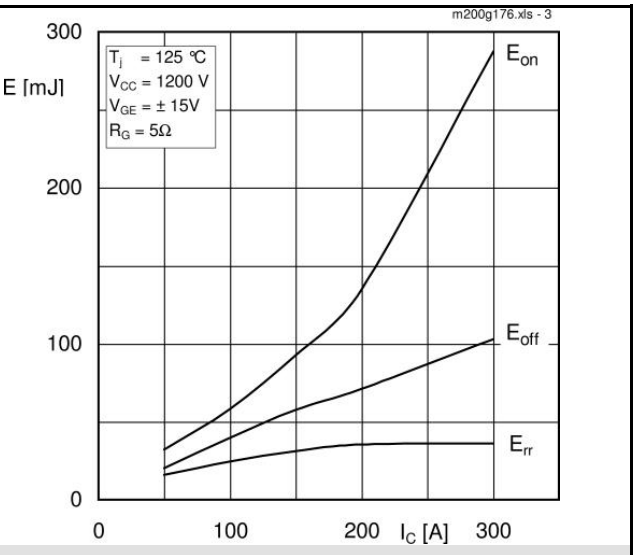


Fig. 3 Typ. turn-on /-off energy = f (I_C)

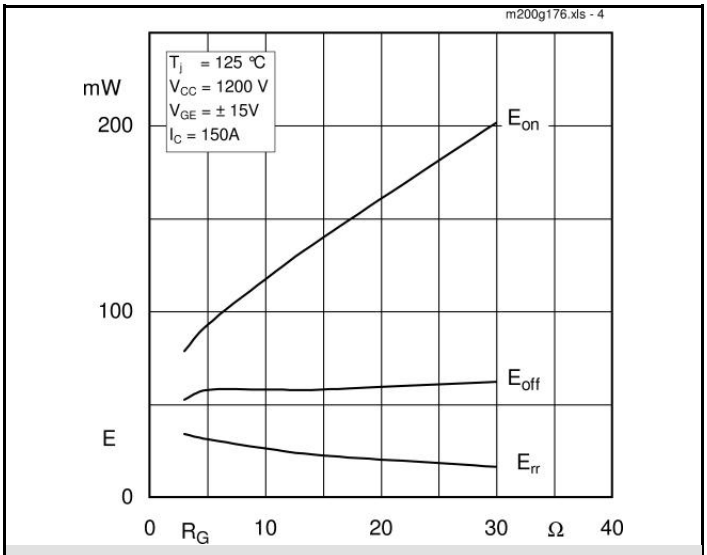


Fig. 4 Typ. turn-on /-off energy = f (R_G)

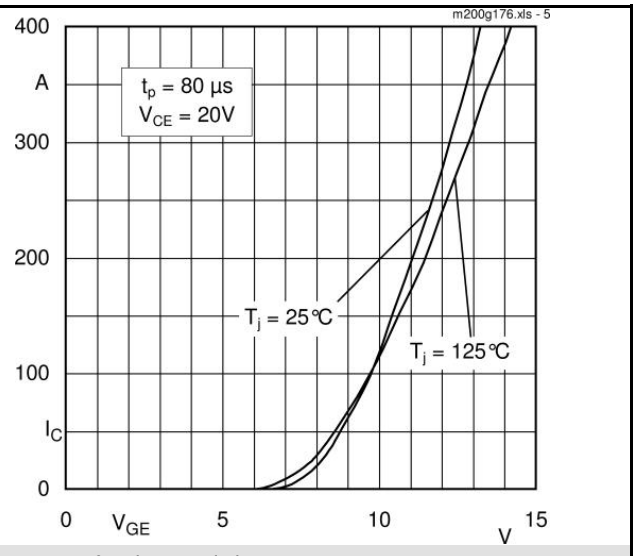


Fig. 5 Typ. transfer characteristic

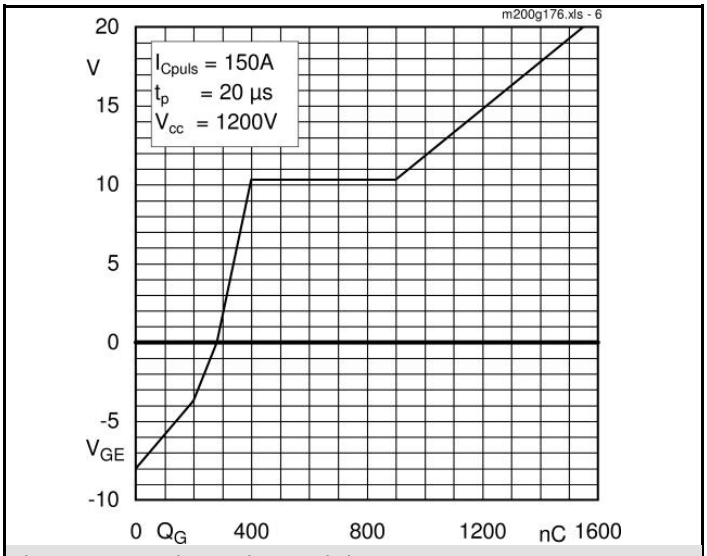


Fig. 6 Typ. gate charge characteristic

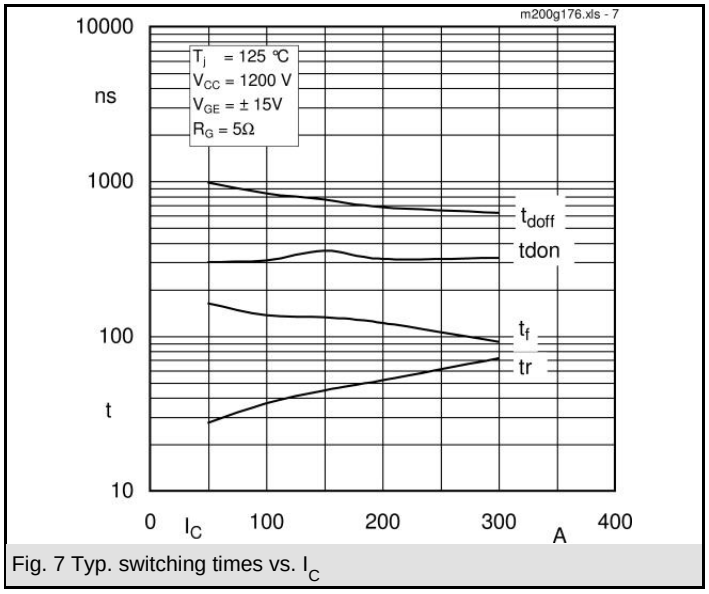


Fig. 7 Typ. switching times vs. I_C

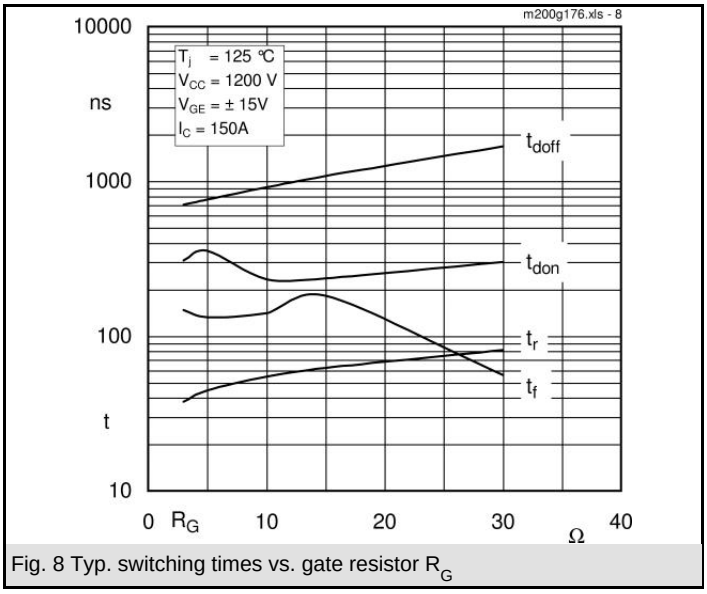


Fig. 8 Typ. switching times vs. gate resistor R_G

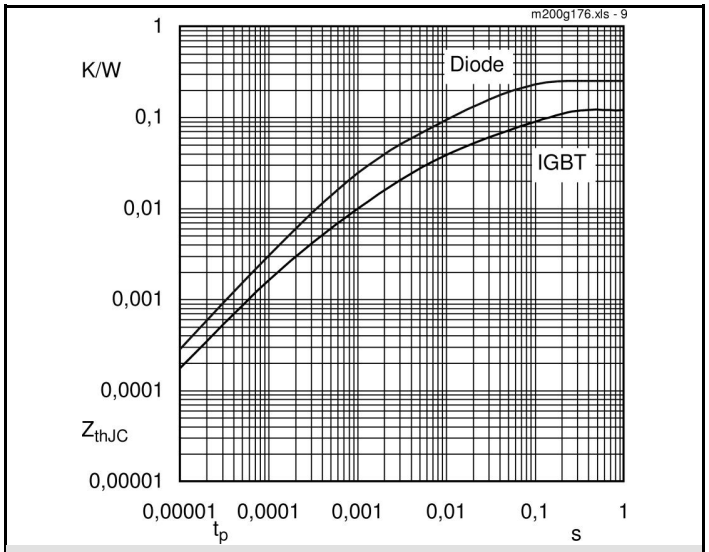


Fig. 9 Transient thermal impedance

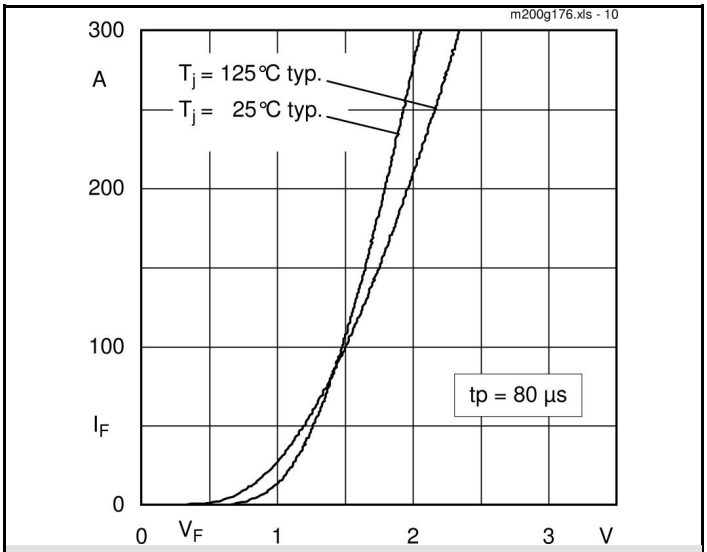


Fig. 10 Typ. CAL diode forward characteristic

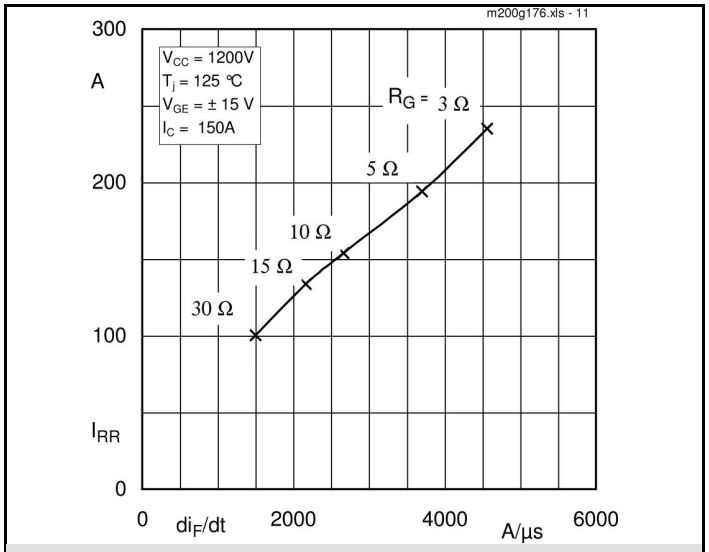


Fig. 11 Typ. CAL diode peak reverse recovery current

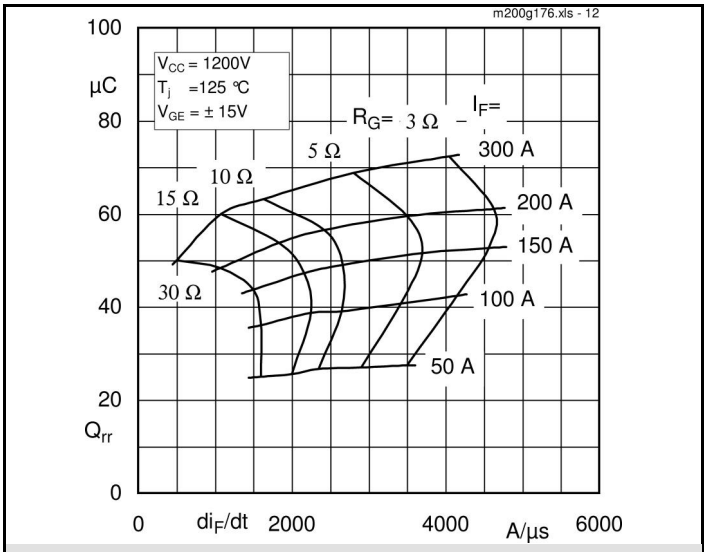
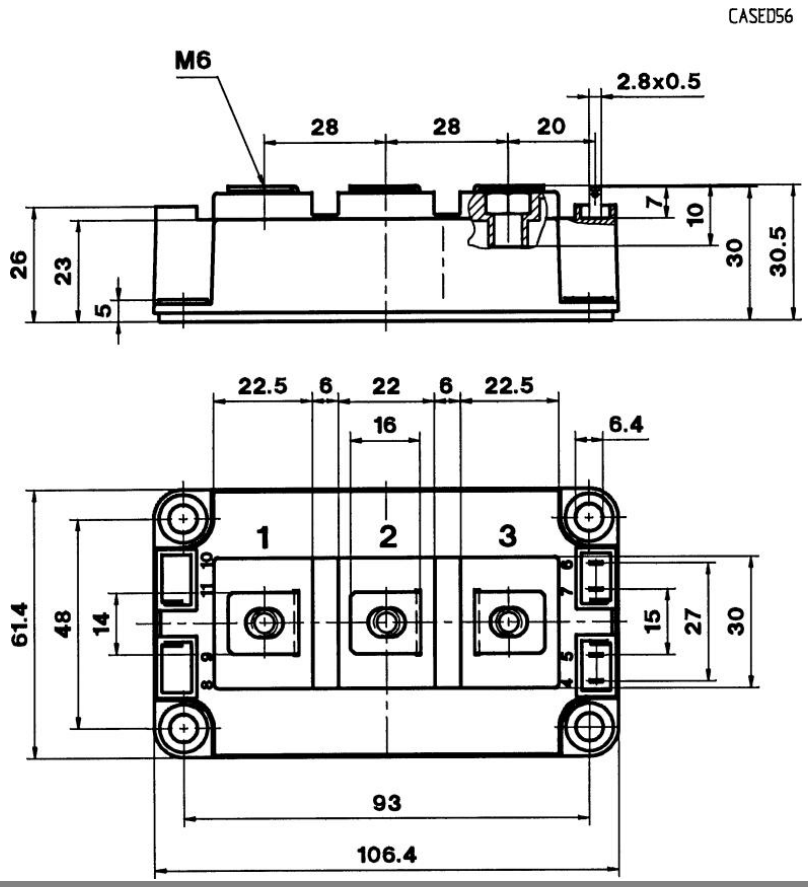


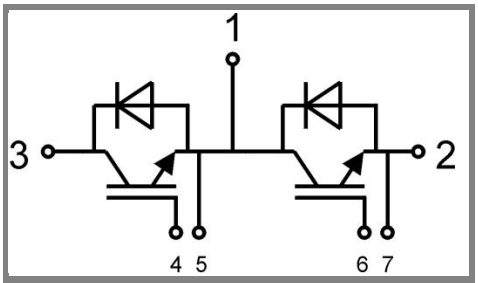
Fig. 12 Typ. CAL diode reverse recovery charge

UL Recognized
File no. E 63 532

Dimensions in mm



Case D 56



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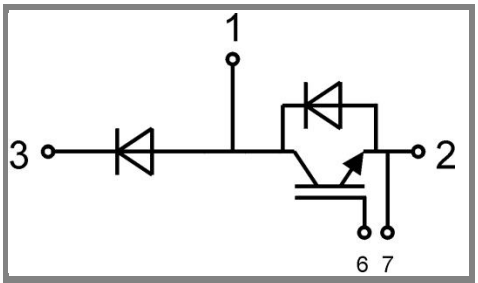

GAL Case D 57

