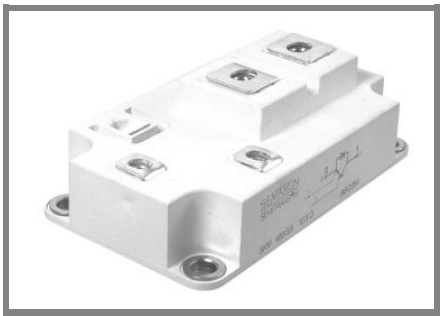
SKM 400GA173D



SEMITRANS® 4

IGBT Modules

SKM 400GA173D

SKM 400GA173D1S

Features

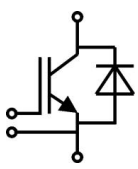
- MOS input (voltage controlled)
- N channel, Homgeneous Si
- Low inductance case
- Very low tail current with low temperature dependence
- High short circuit capability, self limiting to 6 x I_{cnom}
- Latch-up free
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DBC Direct Copper Bonding Technology
- Large clearance (13 mm) and creepage distances (20 mm)

Typical Applications

- AC inverter drives on mains 575-750 V_{AC}
- DC bus voltage 750-1200 V_{DC}
- Public transport
- Switching (not for linear use)

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_{case} = 25 °C	440	A
		T_{case} = 80 °C	300	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_{case} = 25 °C	300	A
		T_{case} = 80 °C	200	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	2900	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_c = 25 °C, unless otherwise specified			
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Units**
IGBT						
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 20 mA		4,8	5,5	6,2	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		1,65	1,9	V
		T_j = 125 °C		1,9	2,15	V
r_{CE}	V_{GE} = 15 V	T_j = 25°C		9	6,6	mΩ
		T_j = 125°C		16	9,5	mΩ
$V_{CE(sat)}$	I_{Cnom} = 300 A, V_{GE} = 15 V	T_j = 25°C$_{chiplev.}$		3	3,9	V
		T_j = 125°C$_{chiplev.}$		4,3	5	V
C_{ies}	V_{CE} = 25, V_{GE} = 0 V	f = 1 MHz		44		nF
C_{oes}				3,5		nF
C_{res}				1		nF
Q_G	V_{GE} = 0V...+15V			330		nC
$t_{d(on)}$	R_{Gon} = 2 Ω	V_{CC} = 1200V		550		ns
t_r		I_{Cnom}= 300A		120		ns
E_{on}		T_j = 125 °C		180		mJ
$t_{d(off)}$	R_{Goff} = 2 Ω	V_{GE} = ± 15V		850		ns
t_f				50		ns
E_{off}				100		mJ
$R_{th(j-c)}$	per IGBT				0,05	K/W



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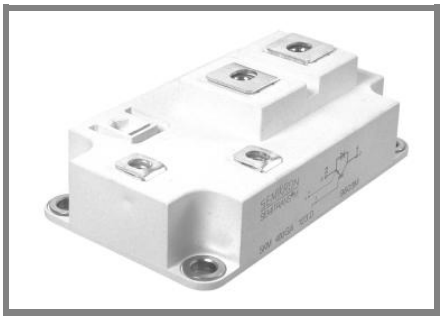
SKM 400GA173D



SEMITRANS® 4

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SKM 400GA173D1S

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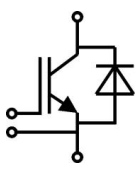

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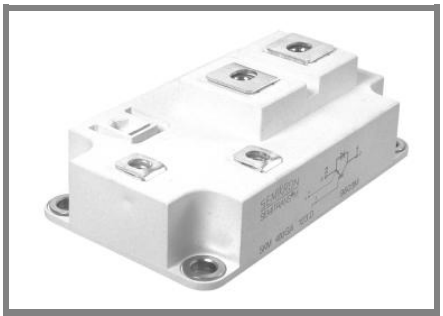
Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Units**
Inverse Diode						
$V_F = V_{EC}$	I_{Fnom} = 300 A; V_{GE} = 0 V	T_j = 25 °$C_{chiplev.}$		2,2	2,7	V
		T_j = 125 °$C_{chiplev.}$		1,9	2,4	V
V_{F0}		T_j = 125 °C		1,3	1,5	V
r_F		T_j = 125 °C		2,9	3,2	mΩ
I_{RRM}	I_{Fnom} = 300 A	T_j = 125 °C		170		A
Q_{rr}	di/dt = 1500 A/µs			72		µC
E_{rr}	V_{GE} = -15 V; V_{CC} = 1200 V					mJ
$R_{th(j-c)D}$	per diode				0,17	K/W
Module						
L_{CE}				15	20	nH
$R_{CC'+EE'}$	res., terminal-chip	T_{case}= 25 °C		0,18		mΩ
		T_{case}= 125 °C		0,22		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 (M4)		2,5 (1,1)		5 (2)	Nm
w					330	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 400GA173D



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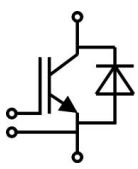

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Z_{th} Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	i = 1	34	mk/W
R_i	i = 2	12,3	mk/W
R_i	i = 3	2,7	mk/W
R_i	i = 4	1	mk/W
tau_i	i = 1	0,2395	s
tau_i	i = 2	0,0044	s
tau_i	i = 3	0,008	s
tau_i	i = 4	0	s
$Z_{th(j-c)D}$			
R_i	i = 1	136	mk/W
R_i	i = 2	28	mk/W
R_i	i = 3	5	mk/W
R_i	i = 4	1	mk/W
tau_i	i = 1	0,0772	s
tau_i	i = 2	0,0148	s
tau_i	i = 3	0,0008	s
tau_i	i = 4	0,005	s

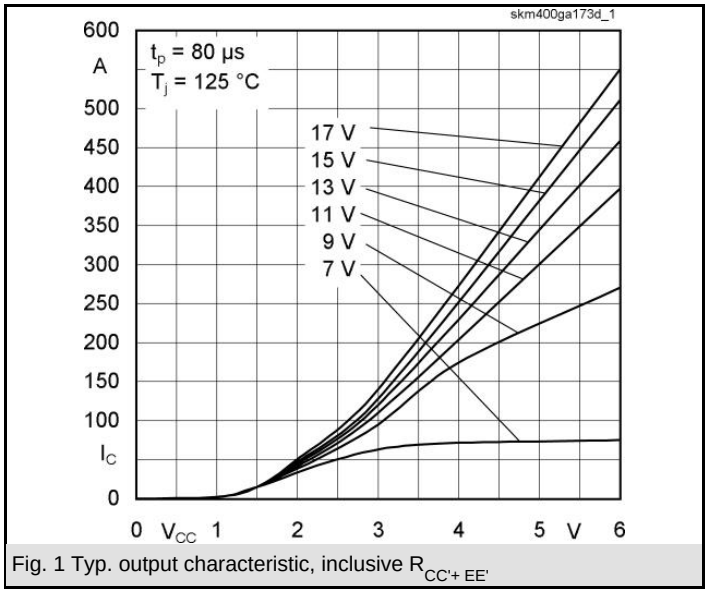

Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

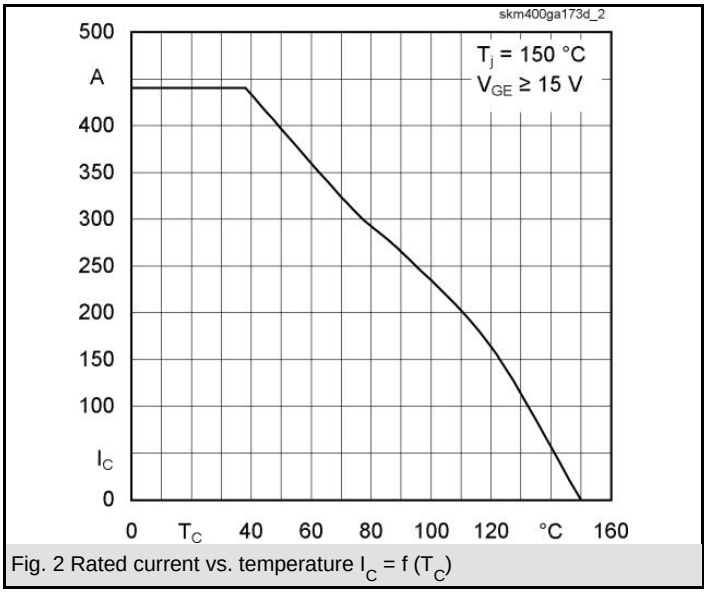

Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

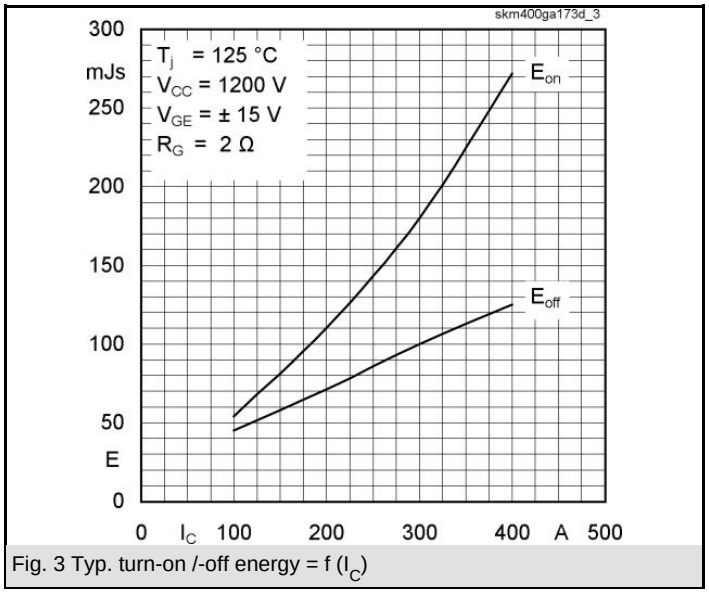

Fig. 3 Typ. turn-on /-off energy = f (I_C)

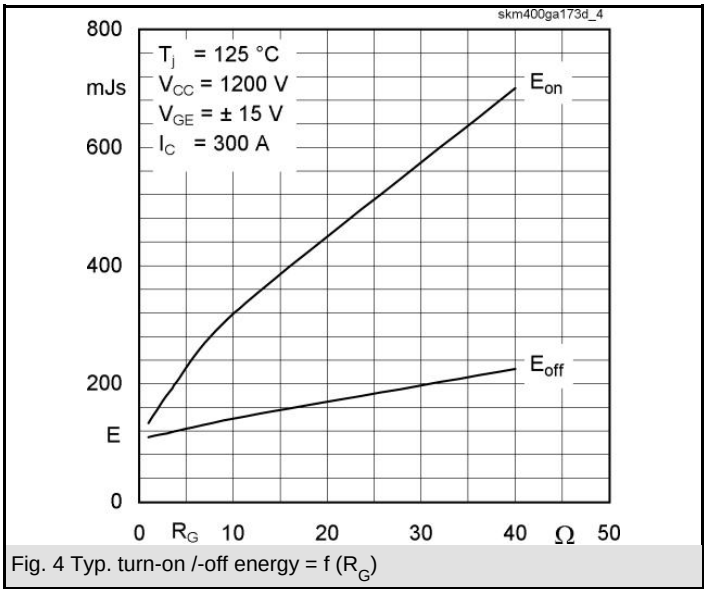

Fig. 4 Typ. turn-on /-off energy = f (R_G)

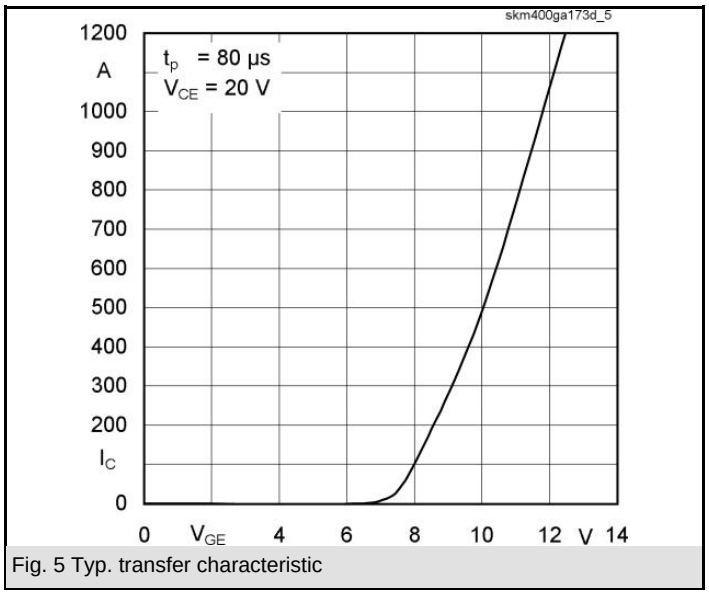

Fig. 5 Typ. transfer characteristic

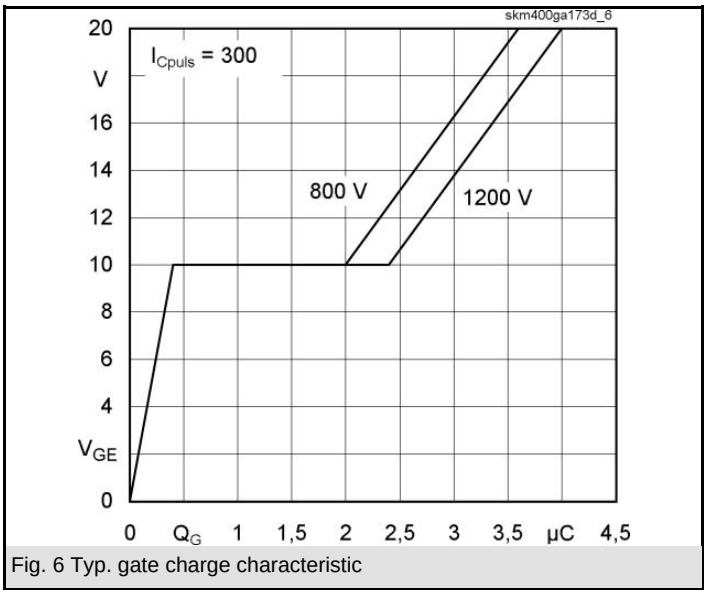

Fig. 6 Typ. gate charge characteristic

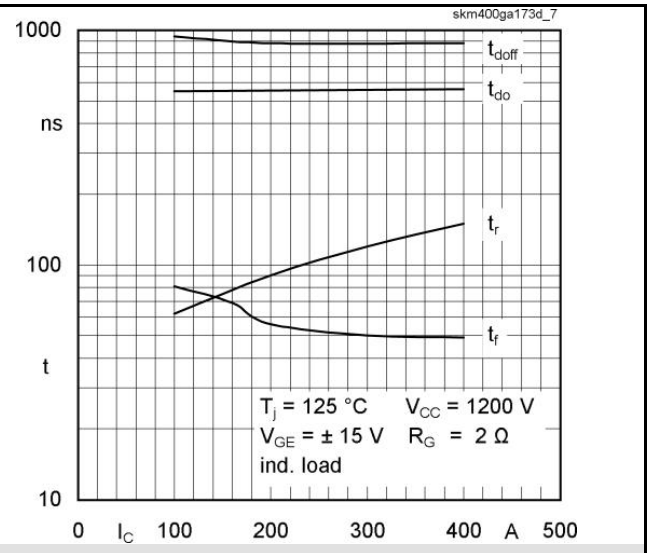

Fig. 7 Typ. switching times vs. I_C

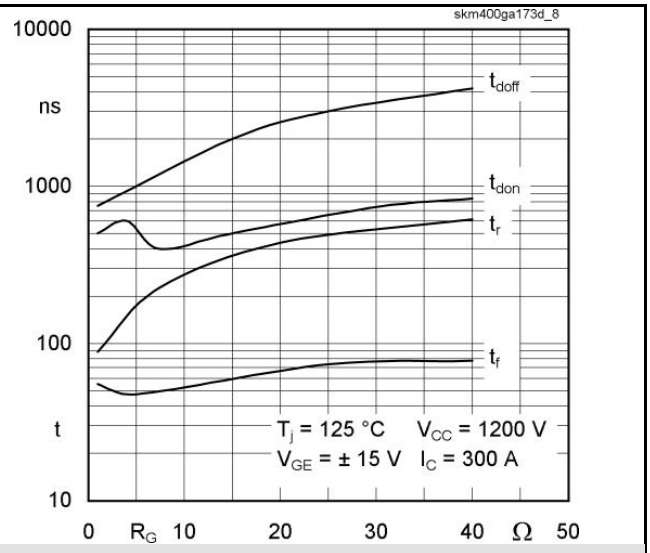

Fig. 8 Typ. switching times vs. gate resistor R_G

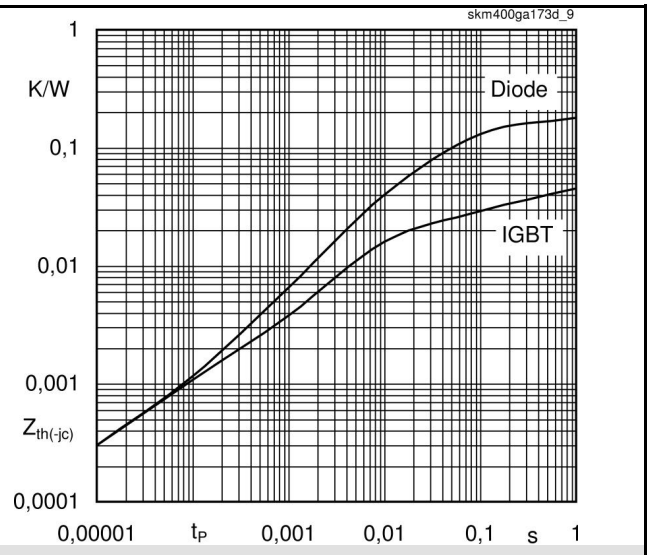

Fig. 9 Transient thermal impedance

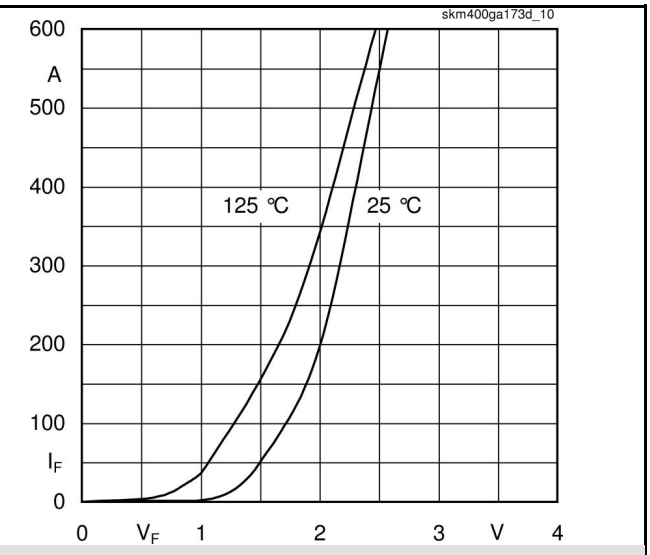

Fig. 10 CAL diode forward characteristic

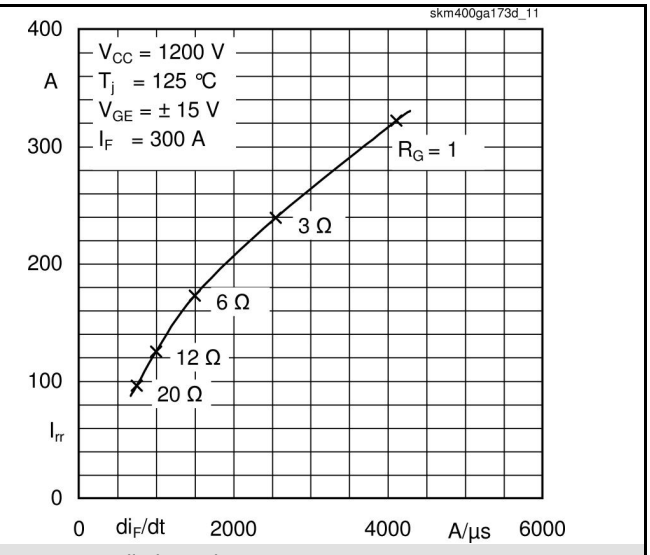

Fig. 11 Typ. CAL diode peak reverse recovery current

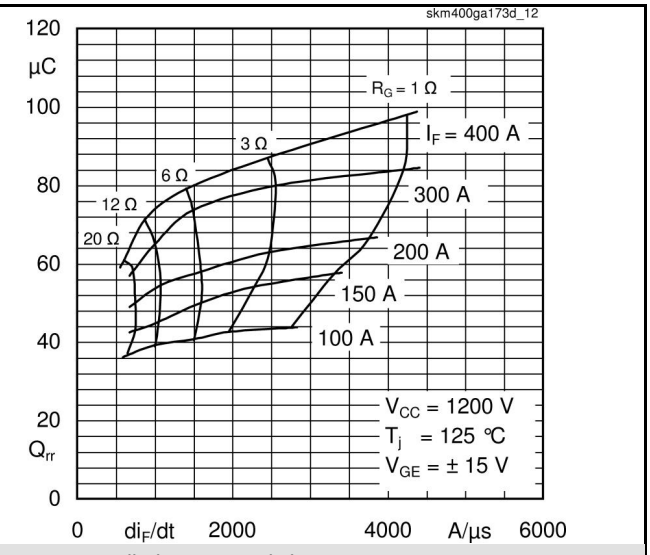

Fig. 12 Typ. CAL diode recovered charge

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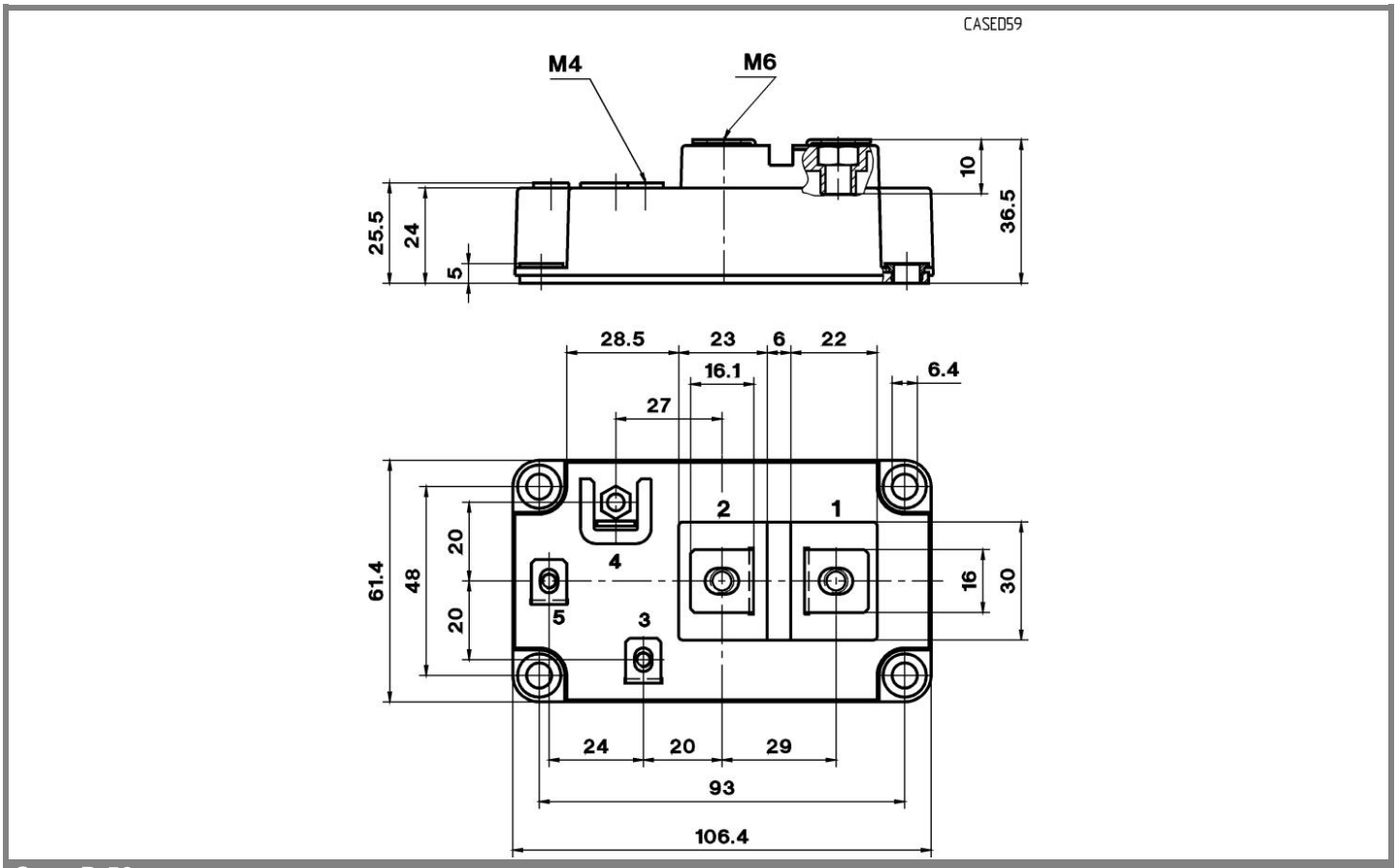
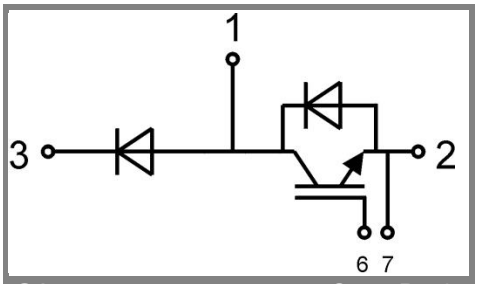


Case D 59



GA Case D 59

