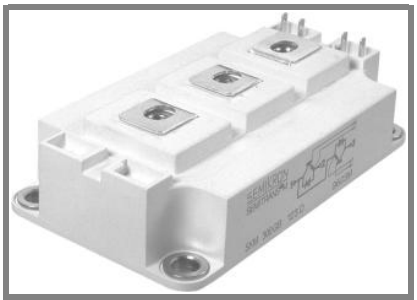
SKM 400GB125D



SEMITRANS® 3

Ultra Fast IGBT Modules

SKM 400GB125D

SKM 400GAL125D

SKM 400GAR125D

Features

- Low inductance case
- Short tail current with low temperature dependence
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- Fast & soft inverse CAL diodes
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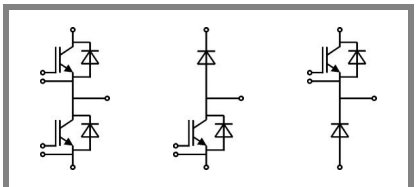
- Large clearance (13 mm) and creepage distances (20 mm)

Typical Applications

- Switched mode power supplies at f_{sw} >20kHz
- Resonant inverters up to 100 kHz
- Inductive heating
- Electronic welders at f_{sw} > 20 kHz



GB GAL GAR

Absolute Maximum Ratings			T_c = 25 °C, unless otherwise specified	
Symbol	**Conditions**		**Values**	**Units**
IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 150 °C	T_{case} = 25 °C	400	A
		T_{case} = 80 °C	300	A
I_{CRM}	I_{CRM}=2xI_{Cnom}		600	A
V_{GES}			± 20	V
t_{psc}	V_{CC} = 600 V; $V_{GE} \leq$ 20 V; V_{CES} < 1200 V	T_j = 125 °C	10	µs
Inverse Diode				
I_F	T_j = 150 °C	T_{case} = 25 °C	390	A
		T_{case} = 80 °C	260	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	2880	A
Freewheeling Diode				
I_F	T_j = 150 °C	T_{case} = 25 °C	390	A
		T_{case} = 80 °C	260	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	2880	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 = 12 mA		4,5	5,5	6,5	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		1,4		V
		T_j = 125 °C		1,7		V
r_{CE}	V_{GE} = 15 V	T_j = 25°C		6,3		mΩ
		T_j = 125°C		7,6		mΩ
$V_{CE(sat)}$	I_{Cnom} = 300 A, V_{GE} = 15 V	T_j = 25°C$_{chiplev.}$		3,3	3,85	V
		T_j = 125°C$_{chiplev.}$		4	4,55	V
C_{ies}				22	30	nF
C_{oes}	V_{CE} = 25, V_{GE} = 0 V	f = 1 MHz		3,3	4	nF
C_{res}				1,2	1,6	nF
Q_G	V_{GE} = 0V - +20V			2650		nC
R_{Gint}	T_j = °C			1,25		Ω
$t_{d(on)}$	R_{Gon} = 2 Ω	V_{CC} = 600V		70		ns
t_r		I_C= 300A		50		ns
E_{on}		T_j = 125 °C		17		mJ
$t_{d(off)}$	R_{Goff} = 2 Ω	V_{GE} = ±15V		500		ns
t_f				32		ns
E_{off}				18		mJ
$R_{th(j-c)}$	per IGBT				0,05	K/W

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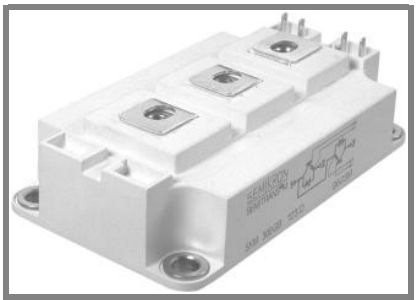
SKM 400GB125D



SEMITRANS® 3

Ultra Fast IGBT Modules

SKM 400GB125D

SKM 400GAL125D

SKM 400GAR125D

Features

- Low inductance case
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Typical Applications

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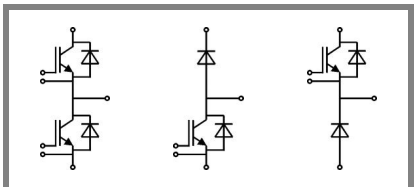
- Electronic welders at f_{sw} > 20 kHz



GB GAL GAR

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	2,5	V
		T_j = 125 °C$_{chiplev.}$		1,8		V
V_{F0}		T_j = 25 °C		1,1	1,2	V
		T_j = 125 °C				V
r_F		T_j = 25 °C		3	4,3	mΩ
		T_j = 125 °C				mΩ
I_{RRM}	I_F = 300 A	T_j = 125 °C		350		A
Q_{rr}	di/dt = 8300 A/µs			45		µC
E_{rr}	V_{GE} = 0 V; V_{CC} = 600 V			16		mJ
$R_{th(j-c)D}$	per diode				0,125	K/W
Freewheeling Diode						
$V_F = V_{EC}$	I_{Fnom} = 300 A; V_{GE} = 0 V	T_j = 25 °C$_{chiplev.}$		2	2,5	V
		T_j = 125 °C$_{chiplev.}$		1,8		V
V_{F0}		T_j = 25 °C		1,1	1,2	V
		T_j = 125 °C				V
r_F		T_j = 25 °C		3	4,3	V
		T_j = 125 °C				V
I_{RRM}	I_F = 300 A	T_j = 125 °C		350		A
Q_{rr}	di/dt = 8300 A/µs			45		µC
E_{rr}	V_{GE} = 0 V; V_{CC} = 600 V			16		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.

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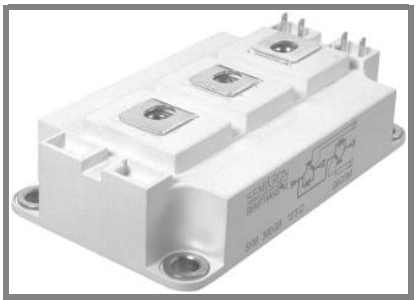

SEMITRANS® 3

Ultra Fast IGBT Modules

SKM 400GB125D

SKM 400GAL125D

SKM 400GAR125D

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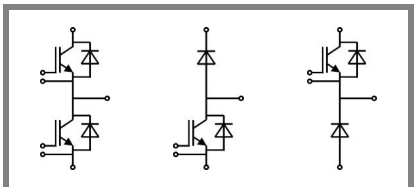

GB GAL GAR

Z_{th} Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	i = 1	36	mk/W
R_i	i = 2	10,5	mk/W
R_i	i = 3	3	mk/W
R_i	i = 4	0,5	mk/W
tau_i	i = 1	0,0744	s
tau_i	i = 2	0,0078	s
tau_i	i = 3	0,0016	s
tau_i	i = 4	0,0002	s
$Z_{th(j-c)D}$			
R_i	i = 1	75	mk/W
R_i	i = 2	38	mk/W
R_i	i = 3	10,6	mk/W
R_i	i = 4	1,4	mk/W
tau_i	i = 1	0,0386	s
tau_i	i = 2	0,0201	s
tau_i	i = 3	0,001	s
tau_i	i = 4	0,003	s

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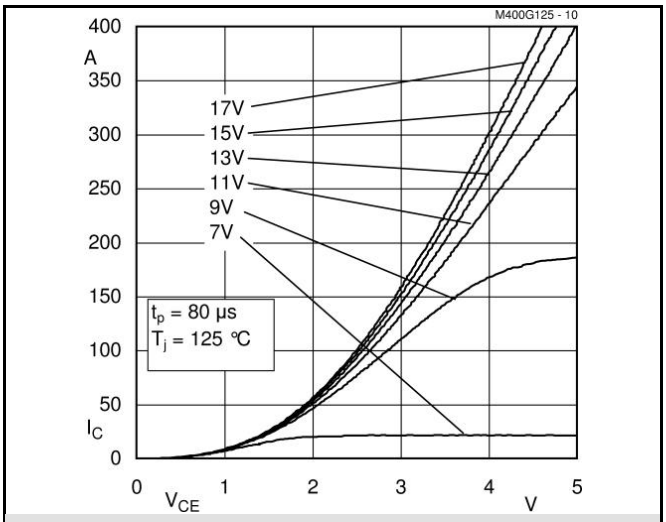

Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

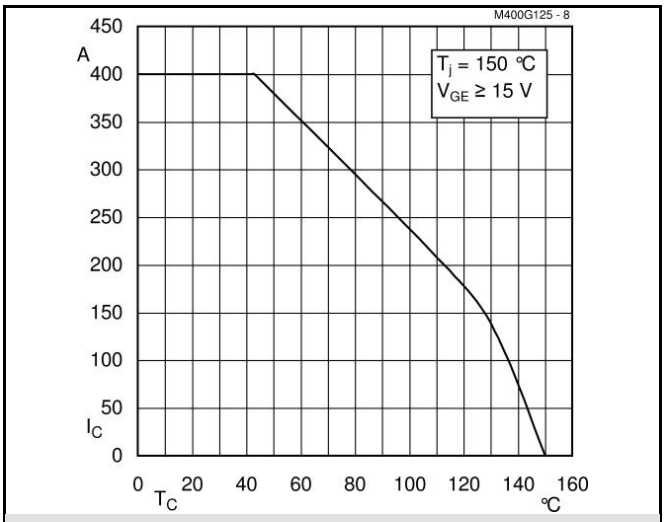

Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

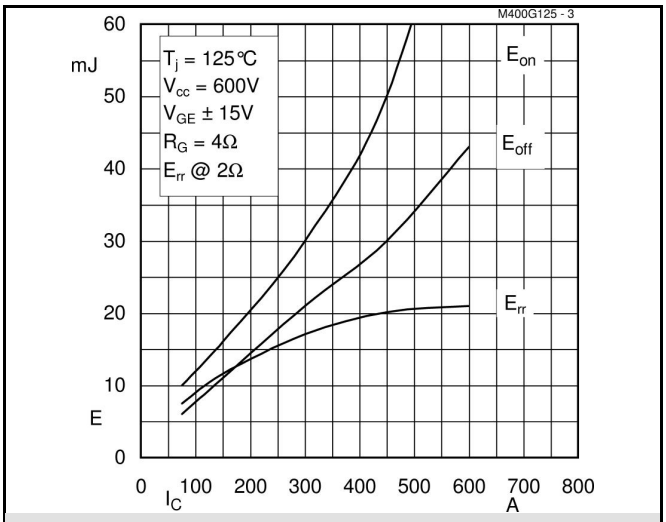

Fig. 3 Typ. turn-on /-off energy = f (I_C)

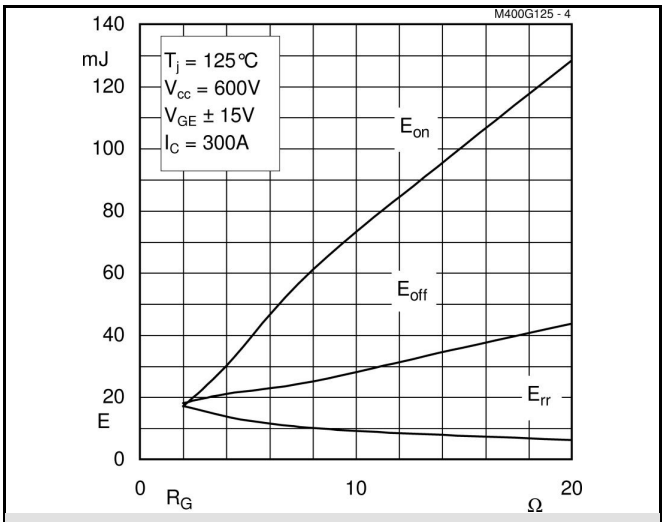

Fig. 4 Typ. turn-on /-off energy = f (R_G)

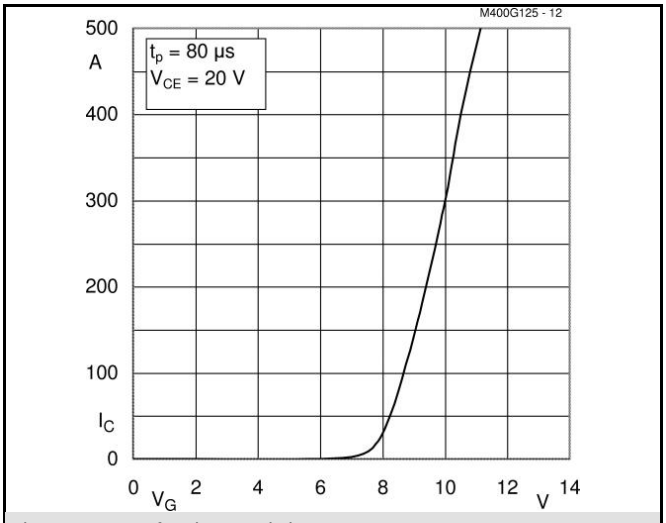

Fig. 5 Typ. transfer characteristic

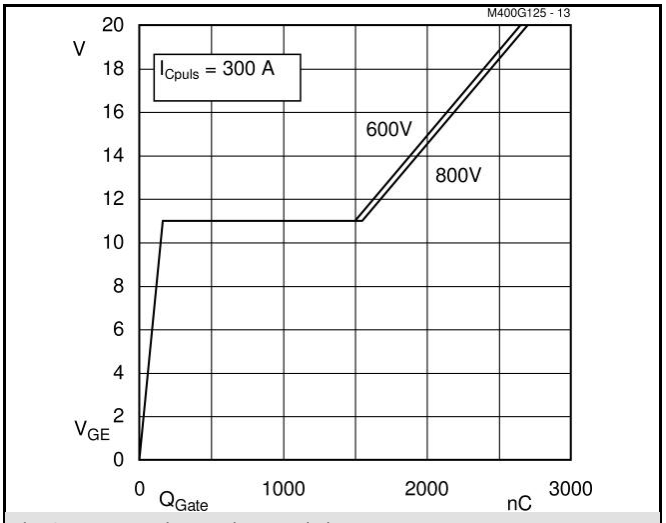

Fig. 6 Typ. gate charge characteristic

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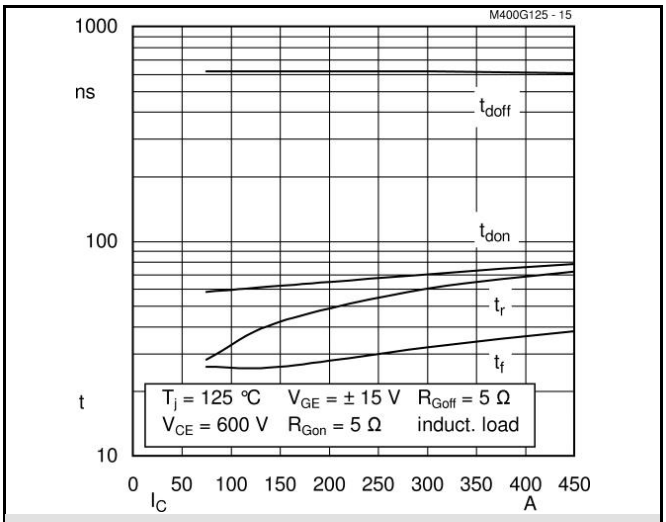

Fig. 7 Typ. switching times vs. I_C

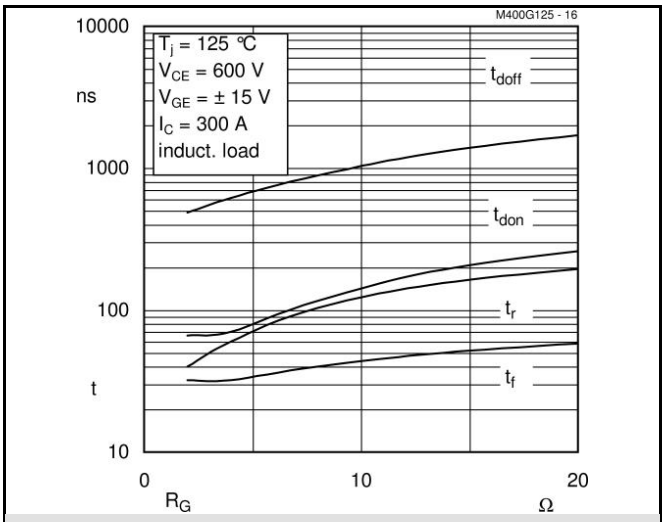

Fig. 8 Typ. switching times vs. gate resistor R_G

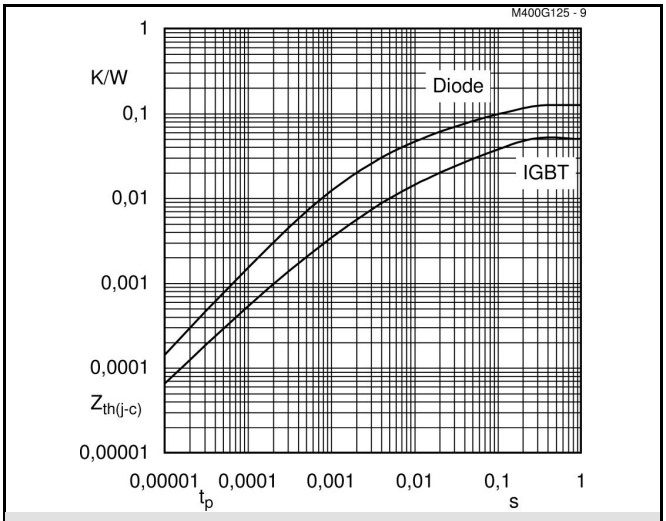

Fig. 9 Transient thermal impedance

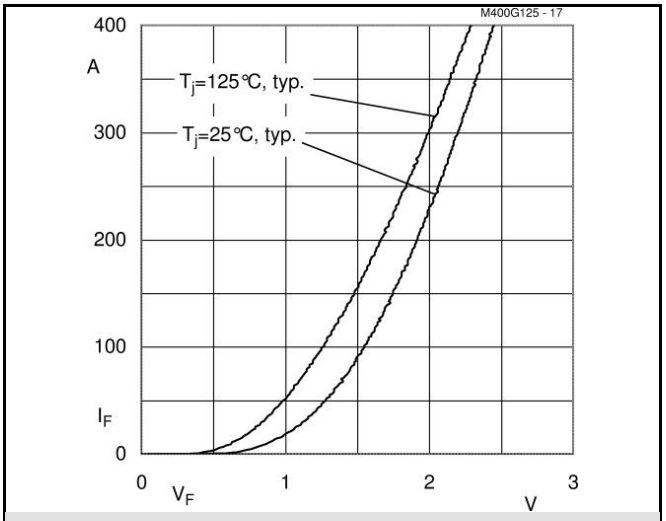

Fig. 10 CAL diode forward characteristic

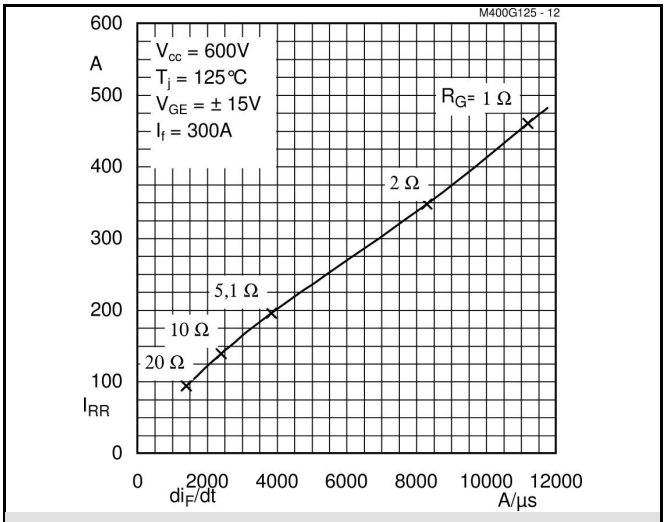

Fig. 11 Typ. CAL diode peak reverse recovery current

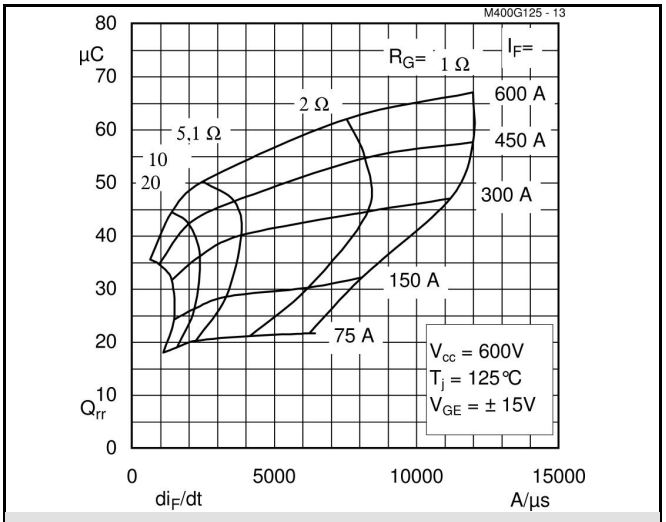

Fig. 12 Typ. CAL diode peak reverse recovery charge

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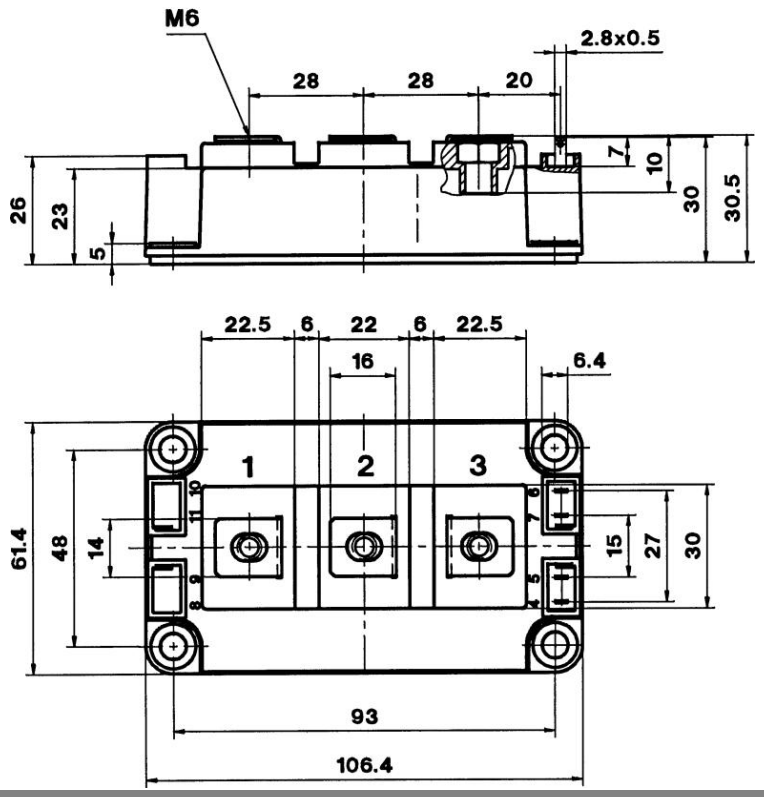
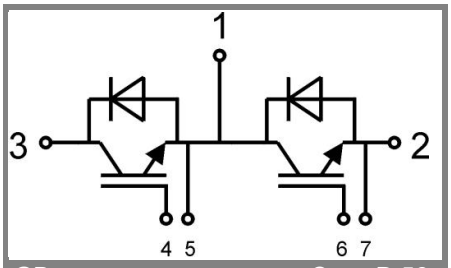
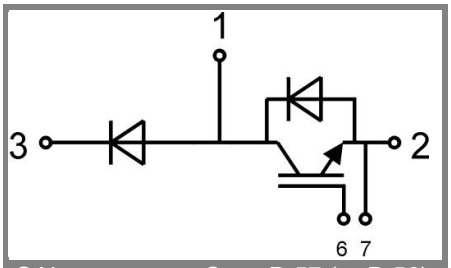


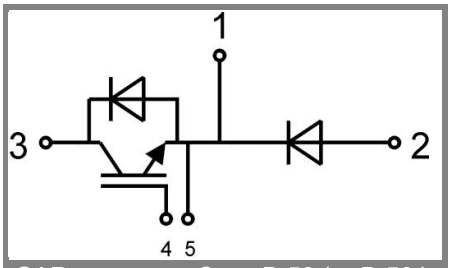
Case D 56



GB Case D 56



GAL Case D 57 (➞ D 56)



GAR Case D 58 (➞ D 56)

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