SKM300GB126D

SEMITRANS® 3

Trench IGBT Modules

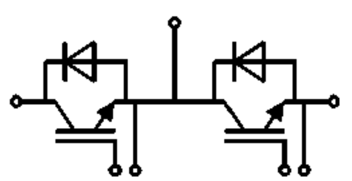
SKM300GB126D

Features

- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability, self limiting to 6 x I_C
- UL recognized, file no. E63532

Typical Applications*

- **Electronic welders**
- **AC inverter drives**
- **UPS**



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 150 °C	T_c = 25 °C	310	A
		T_c = 80 °C	218	A
I_{Cnom}			200	A
I_{CRM}	I_{CRM} = 2xI_{Cnom}		400	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 600 V V_{GE} ≤ 15 V V_{CES} ≤ 1200 V	T_j = 125 °C	10	µs
T_j			-40 ... 150	°C
Inverse diode				
I_F	T_j = 150 °C	T_c = 25 °C	250	A
		T_c = 80 °C	169	A
I_{Fnom}			200	A
I_{FRM}	I_{FRM} = 2xI_{Fnom}		400	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		1656	A
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$			500	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min		4000	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$V_{CE(sat)}$	I_C = 200 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.70	2.10	V
		T_j = 125 °C		2.00	2.46	V
V_{CE0}	chiplevel	T_j = 25 °C		1	1.2	V
		T_j = 125 °C		0.9	1.1	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		3.5	4.5	mΩ
		T_j = 125 °C		5.5	6.8	mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 8 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V V_{CE} = 1200 V	T_j = 25 °C			2.7	mA
		T_j = 125 °C				mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		14.4		nF
C_{oes}		f = 1 MHz		0.75		nF
C_{res}		f = 1 MHz		0.65		nF
Q_G	V_{GE} = - 8 V...+ 20 V			1800		nC
R_{Gint}	T_j = 25 °C			3.8		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 200 A V_{GE} = +15/-15 V $R_{G\,on}$ = 1.5 Ω $R_{G\,off}$ = 1.5 Ω	T_j = 125 °C		280		ns
t_r		T_j = 125 °C		37		ns
E_{on}		T_j = 125 °C		21		mJ
$t_{d(off)}$		T_j = 125 °C		560		ns
t_f		T_j = 125 °C		100		ns
E_{off}		T_j = 125 °C		33		mJ
$R_{th(j-c)}$	per IGBT				0.12	K/W

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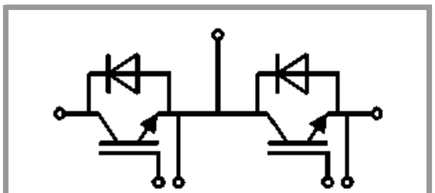

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Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	I_F = 200 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.60	1.80	V
		T_j = 125 °C		1.60	1.80	V
V_{F0}	chiplevel	T_j = 25 °C		1	1.1	V
		T_j = 125 °C		0.8	0.9	V
r_F	chiplevel	T_j = 25 °C		3	3.5	mΩ
		T_j = 125 °C		4	4.5	mΩ
I_{RRM}	I_F = 200 A di/dt$_{off}$ = 6200 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 125 °C		290		A
Q_{rr}		T_j = 125 °C		44		µC
E_{rr}		T_j = 125 °C		18		mJ
$R_{th(j-c)}$	per diode				0.25	K/W
Module						
L_{CE}				15		nH
$R_{CC'+EE'}$	terminal-chip	T_C = 25 °C		0.35		mΩ
		T_C = 125 °C		0.5		mΩ
$R_{th(c-s)}$	per module			0.02	0.038	K/W
M_s	to heat sink M6		3		5	Nm
M_t		to terminals M6	2.5		5	Nm
						Nm
w					325	g

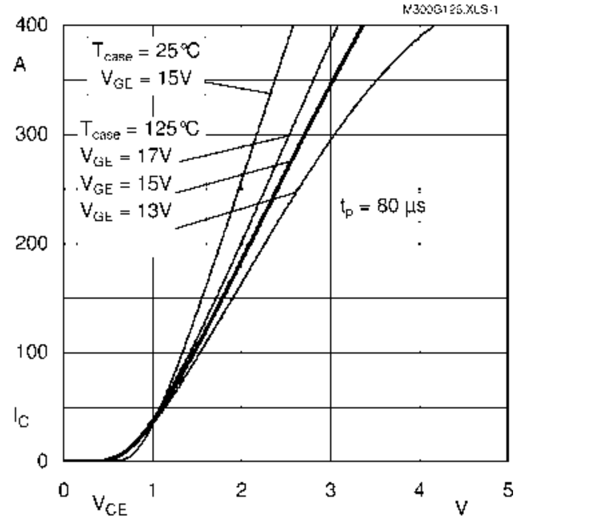


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

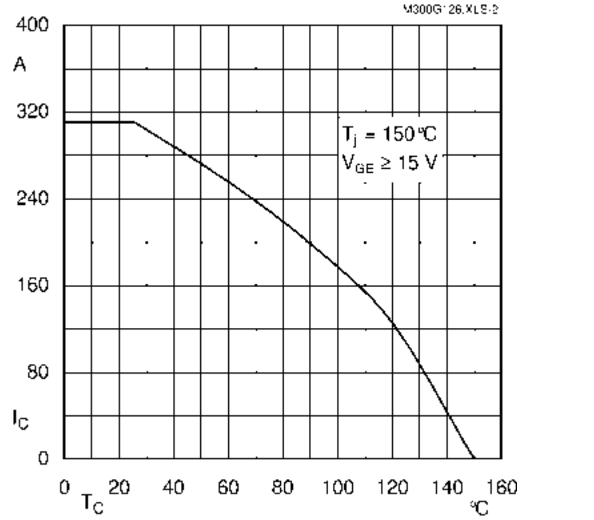


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

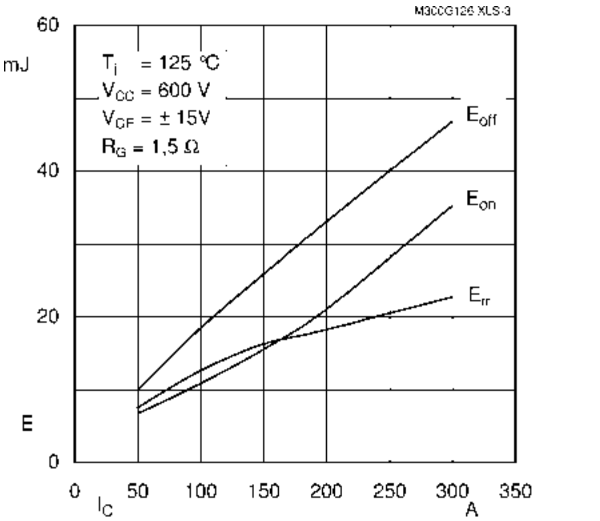


Fig. 3: Typ. turn-on /-off energy = f (I_C)

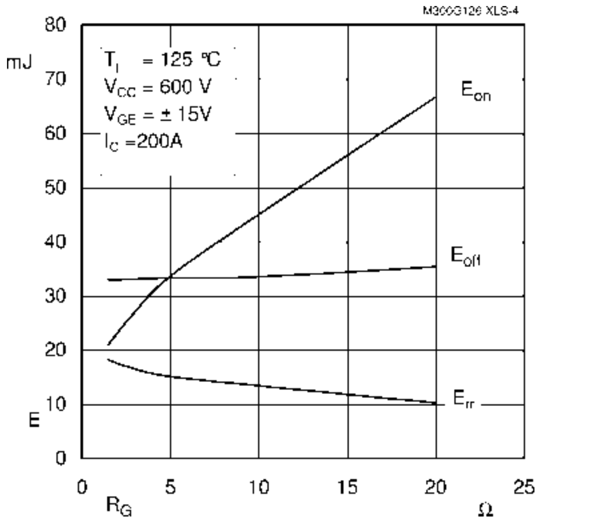


Fig. 4: Typ. turn-on /-off energy = f (R_G)

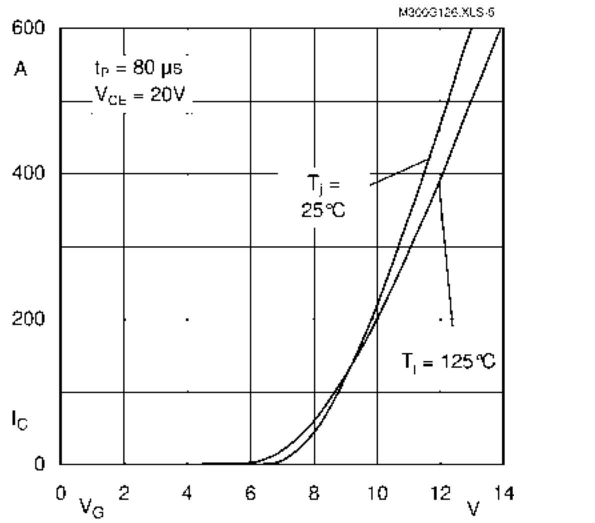


Fig. 5: Typ. transfer characteristic

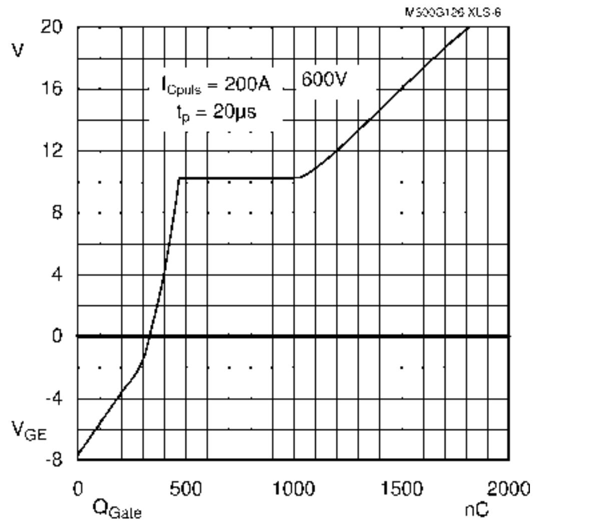


Fig. 6: Typ. gate charge characteristic

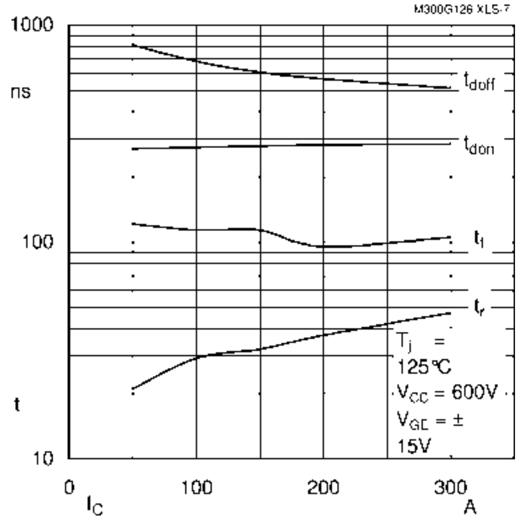


Fig. 7: Typ. switching times vs. I_C

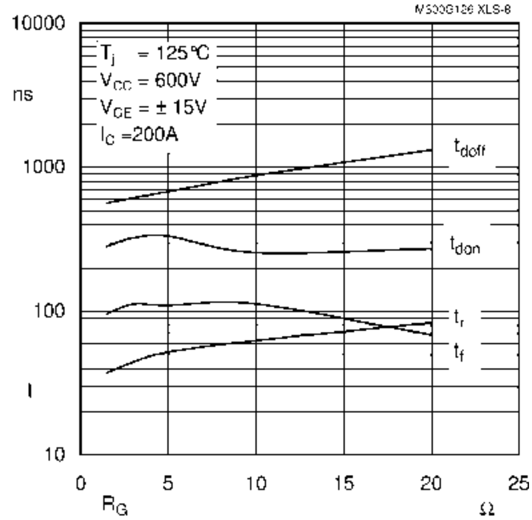


Fig. 8: Typ. switching times vs. gate resistor R_G

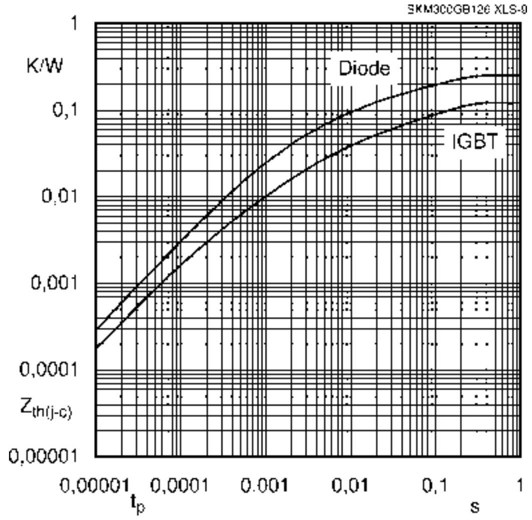


Fig. 9: Transient thermal impedance

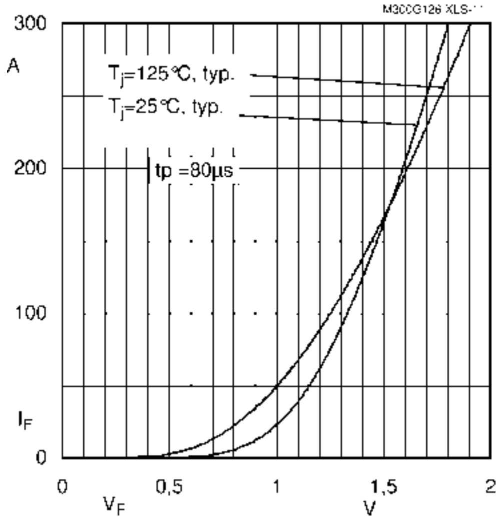


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

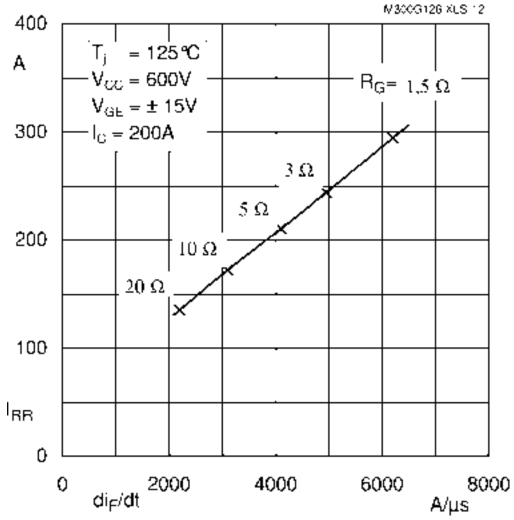


Fig. 11: Typ. CAL diode peak reverse recovery current

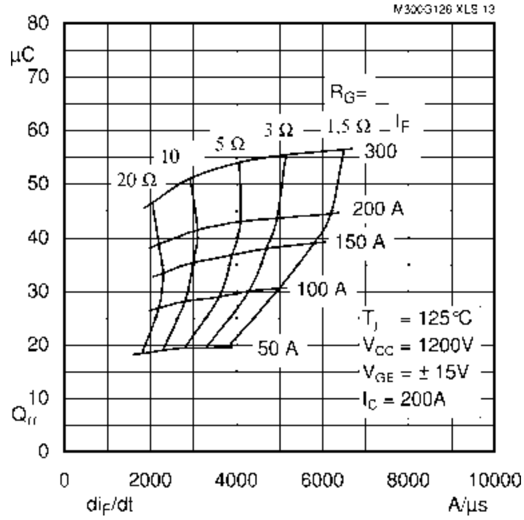
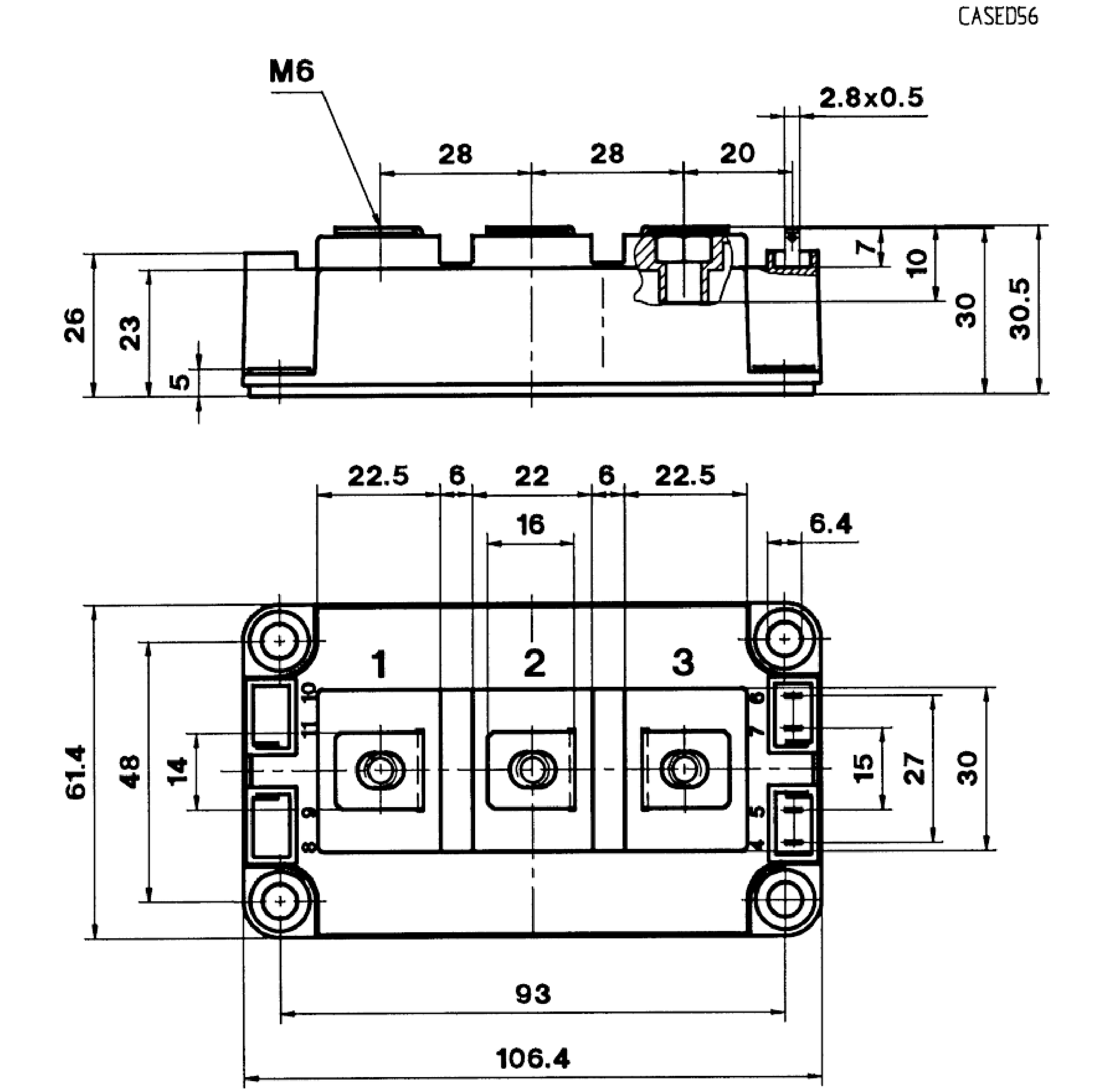


Fig. 12: Typ. CAL diode peak reverse recovery charge



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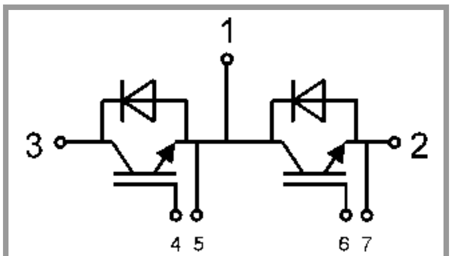

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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

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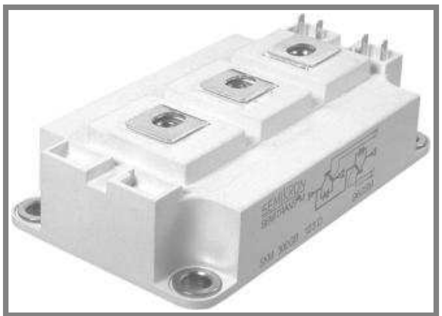

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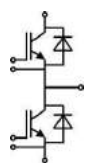
- High short circuit capability, self limiting to 6 x I_C

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders

Remarks

- Case temperature limited to T_c = 125°C max, recommended T_{op} = -40 ... +150°C
- Product reliability results are valid for $T_j \le$150°C
- Short circuit data: $t_p \le 6$ s; $V_{GE} \le$ 15V; T_j = 150°C; $V_{cc} \le$ 360V, use of soft R_G necessary !
- Take care of over-voltage caused by stray inductances



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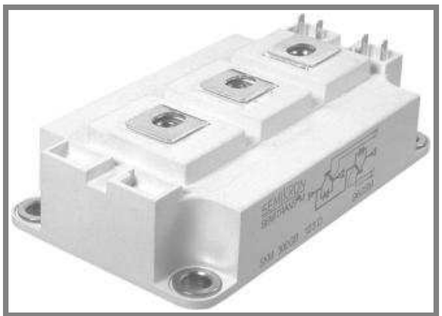
Absolute Maximum Ratings		T_{case} = 25°C, unless otherwise specified		
Symbol	**Conditions**		**Values**	**Units**
IGBT				
V_{CES}	T_j = 25 °C		600	V
I_C	T_j = 175 °C	T_c = 25 °C	390	A
		T_c = 80 °C	300	A
I_{CRM}	I_{CRM}=2xI_{Cnom}		600	A
V_{GES}			± 20	V
t_{psc}	V_{CC} = 360 V; $V_{GE} \le$ 15 V; VCES < 600 V	T_j = 150 °C	6	s
Inverse Diode				
I_F	T_j = 175 °C	T_c = 25 °C	350	A
		T_c = 80 °C	250	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 175 °C	1760	A
Module				
$I_{t(RMS)}$			500	A
T_{vj}			- 40 ... + 175	°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 = 4,8 mA		5	5,8	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		0,9	1	V
		T_j = 150 °C		0,85	0,9	V
r_{CE}	V_{GE} = 15 V	T_j = 25°C		1,8	3	mΩ
		T_j = 150°C		2,7	3,8	mΩ
$V_{CE(sat)}$	I_{Cnom} = 300 A, V_{GE} = 15 V	T_j = 25°$C_{chiplev.}$		1,45	1,9	V
		T_j = 150°$C_{chiplev.}$		1,7	2,1	V
C_{ies}	V_{CE} = 25, V_{GE} = 0 V	f = 1 MHz		18,5		nF
C_{oes}				1,2		nF
C_{res}				0,55		nF
Q_G	V_{GE} = -8V...+15V			2400		nC
R_{Gint}	T_j = °C			1		Ω
$t_{d(on)}$	R_{Gon} = 2,4 Ω	V_{CC} = 300V		150		ns
t_r		I_C= 300A		48		ns
E_{on}		T_j = 150 °C		7,5		mJ
$t_{d(off)}$	R_{Goff} = 2,4 Ω	V_{GE} = -8V/+15V		540		ns
t_f				53		ns
E_{off}				11,5		mJ
$R_{th(j-c)}$	per IGBT				0,15	K/W



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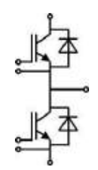

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Units**
Inverse Diode						
$V_F = V_{EC}$	I_{Fnom} = 300 A; V_{GE} = 0 V	T_j = 25 °$C_{chiplev.}$		1,4	1,6	V
V_{F0}		T_j = 25 °C		0,95	1	V
r_F		T_j = 25 °C		1,5	2	mΩ
I_{RRM}	I_F = 300 A	T_j = 150 °C		340		A
Q_{rr}	di/dt = 7000 A/ s			47		C
E_{rr}	V_{GE} = -8 V; V_{CC} = 300 V			10,5		mJ
$R_{th(j-c)D}$	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

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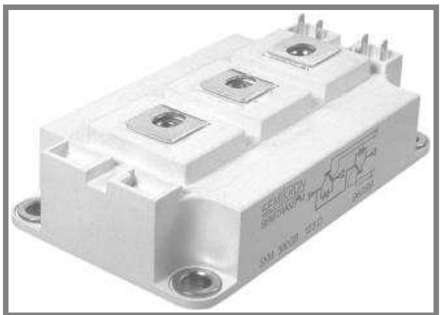

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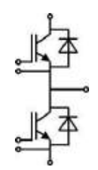

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Z_{th} Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	i = 1	107	mk/W
R_i	i = 2	30	mk/W
R_i	i = 3	11,6	mk/W
R_i	i = 4	1,4	mk/W
tau_i	i = 1	0,054	s
tau_i	i = 2	0,0144	s
tau_i	i = 3	0,0007	s
tau_i	i = 4	0,0004	s
$Z_{th(j-c)D}$			
R_i	i = 1	140	mk/W
R_i	i = 2	82	mk/W
R_i	i = 3	23,5	mk/W
R_i	i = 4	4,5	mk/W
tau_i	i = 1	0,054	s
tau_i	i = 2	0,01	s
tau_i	i = 3	0,0015	s
tau_i	i = 4	0,0002	s

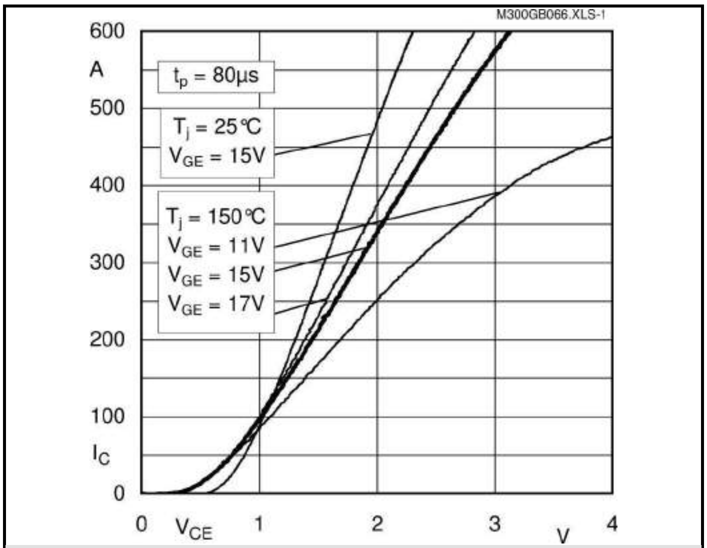


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

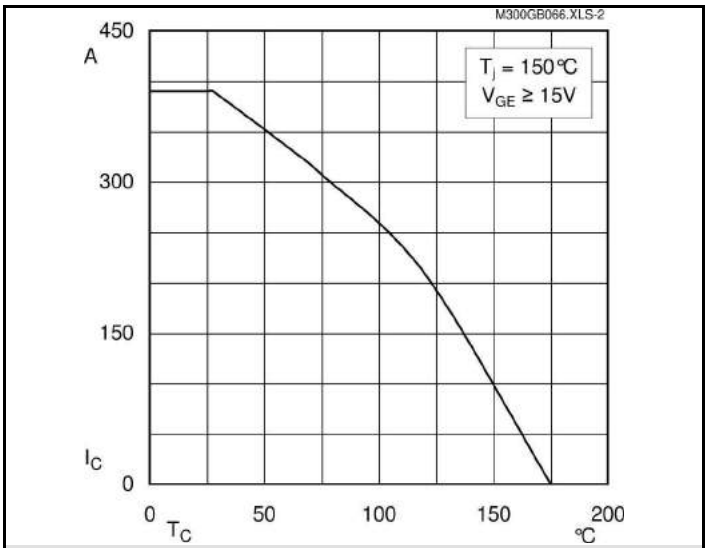


Fig. 2 Rated current vs. temperature I_C = f (T_C)

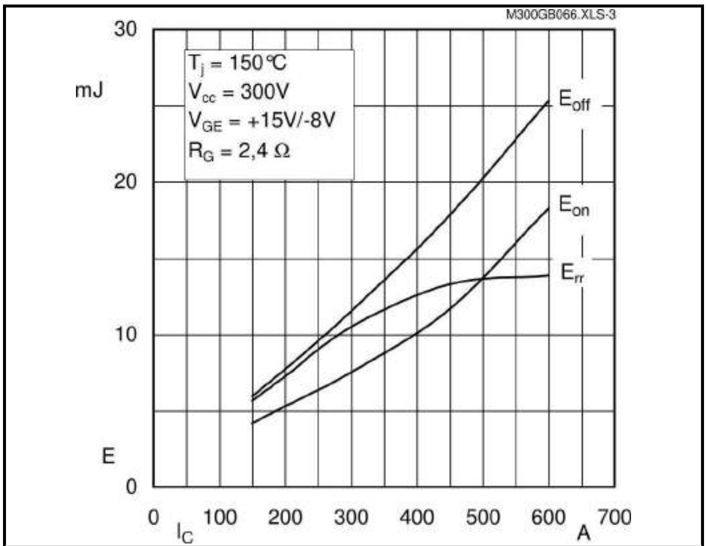


Fig. 3 Typ. turn-on /-off energy = f (I_C)

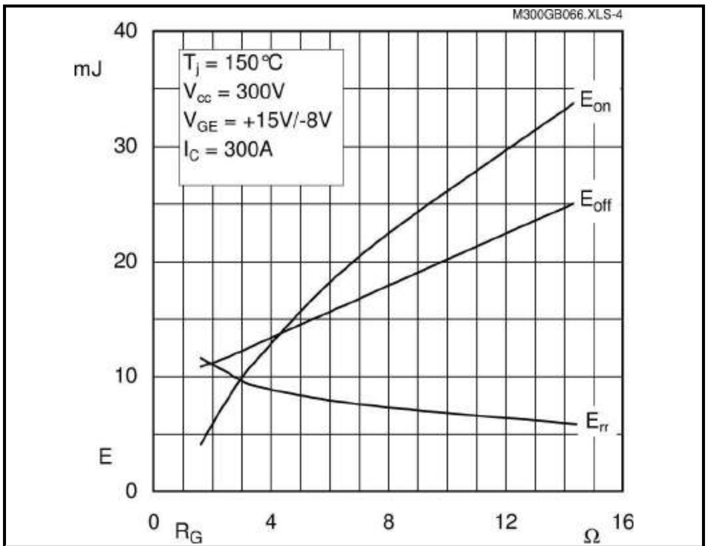


Fig. 4 Typ. turn-on /-off energy = f (R_G)

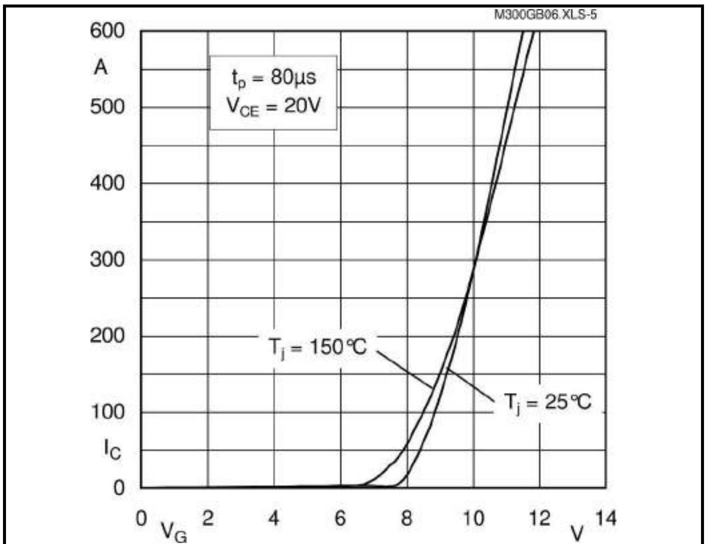


Fig. 5 Typ. transfer characteristic

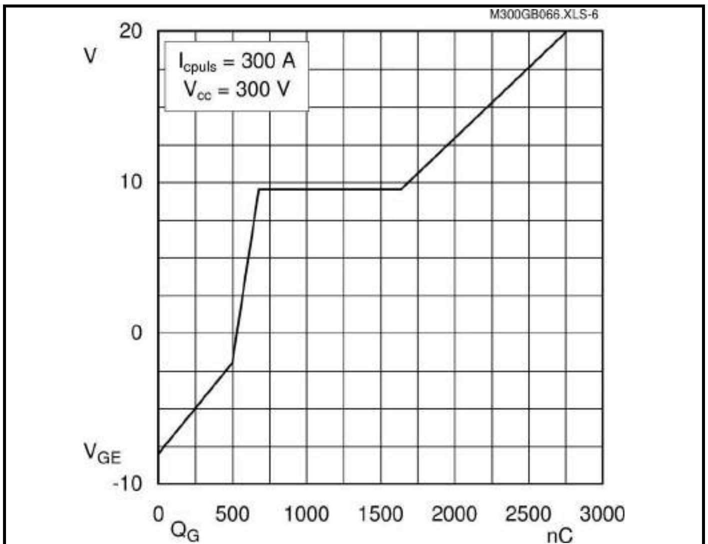


Fig. 6 Typ. gate charge characteristic

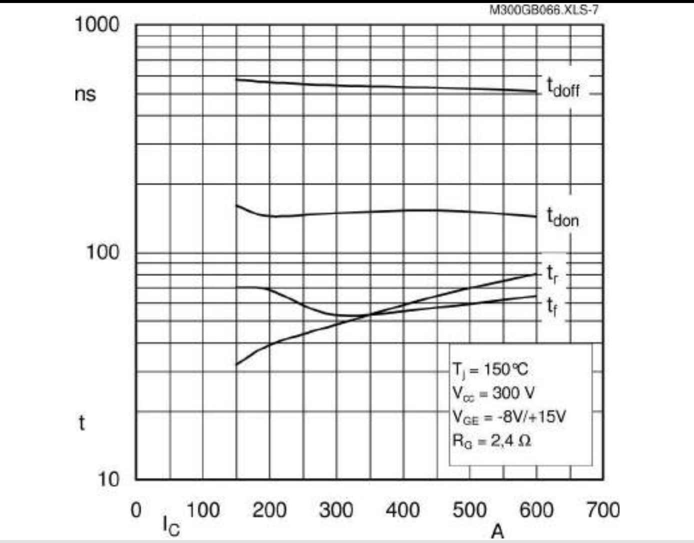


Fig. 7 Typ. switching times vs. I_C

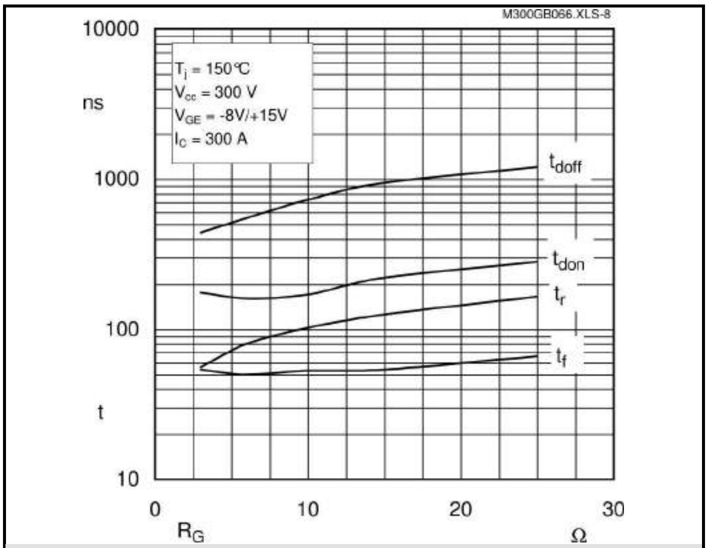


Fig. 8 Typ. switching times vs. gate resistor R_G

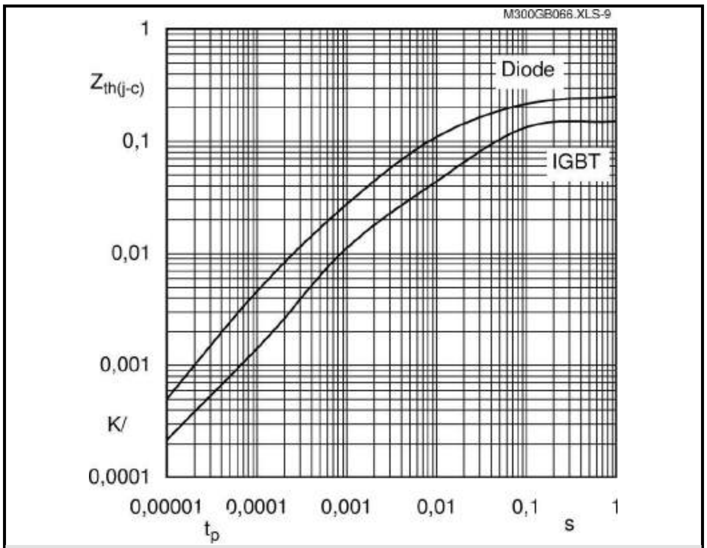


Fig. 9 Transient thermal impedance of IGBT and Diode

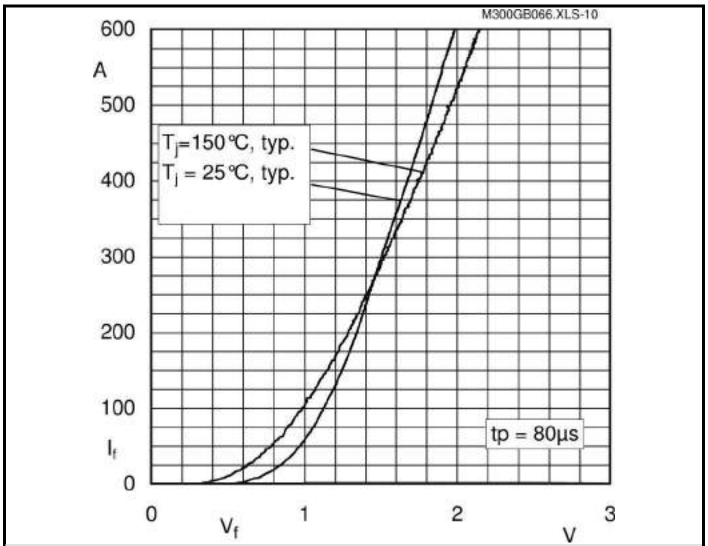


Fig. 10 CAL diode forward characteristic

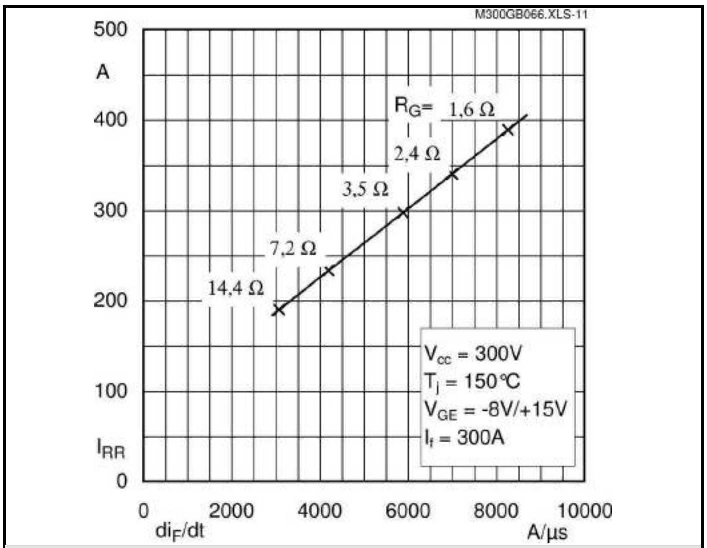


Fig. 11 Typ. CAL diode peak reverse recovery current

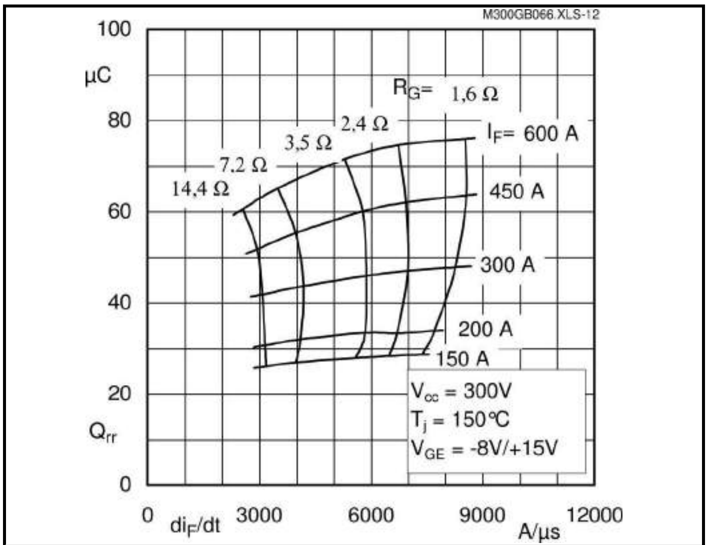
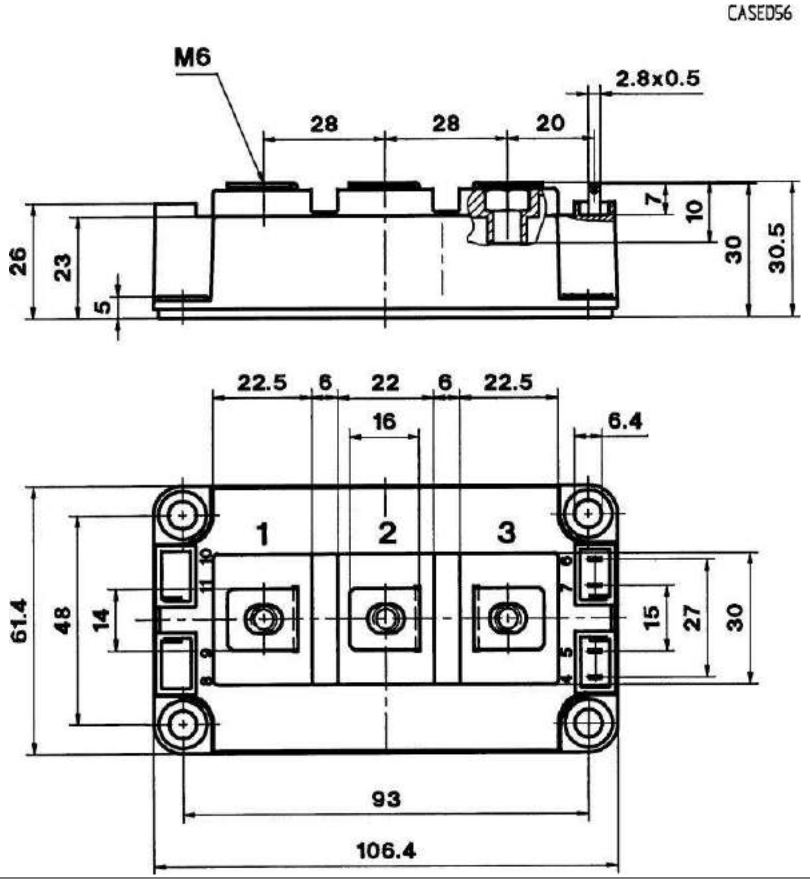
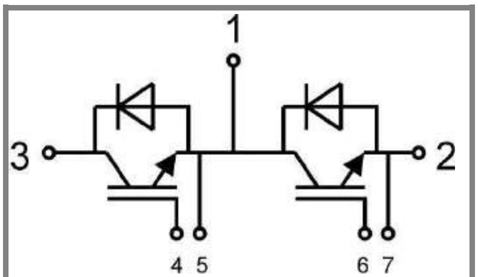


Fig. 12 CAL diode recovered charge

UL recognized, file no. E 63 532

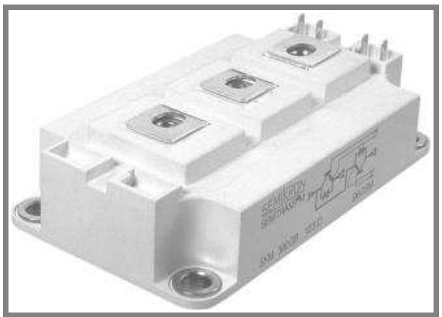


Case D 56



GB Case D56

SKM 300GB063D



SEMITRANS® 3

Superfast IGBT Modules

SKM 300GB063D

SKM 300GAR063D

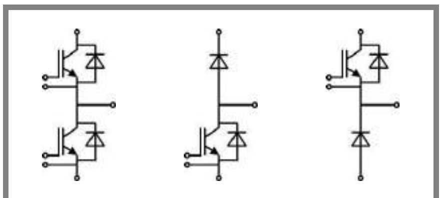
SKM 300GAL063D

Features

- NPT- Non punch-through IGBT
- Low tail current with low temperature dependence
- High short circuit capability, self limiting if term. G is clamped to E
- Pos. temp.-coeff. of V_{CEsat}
- 50 % less turn off losses
- 30 % less short circuit current
- Very low C_{ies}, C_{oes}, C_{res}
- Latch-up free
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DCB Direct Copper Bonding Technology without hard mould
- Large clearance (13 mm) and creepage distances (20 mm)

Typical Applications*

- Switching (not for linear use)
- Switched mode power supplies
- AC inverter servo drives
- UPS uninterruptable power supplies
- Welding inverters



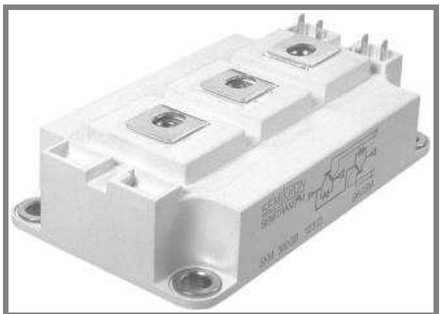
GB GAL GAR

Absolute Maximum Ratings — T_c = 25 °C, unless otherwise specified

Symbol	Conditions		Values	Units
IGBT				
V_{CES}	T_j = 25 °C		600	V
I_C	T_j = 150 °C	T_{case} = 25 °C	400	A
		T_{case} = 70 °C	300	A
I_{CRM}	I_{CRM}=2xI_{Cnom}		600	A
V_{GES}			± 20	V
t_{psc}	V_{CC} = 300 V; $V_{GE} \leq$ 20 V; V_{CES} < 600 V	T_j = 125 °C	10	µs
Inverse Diode				
I_F	T_j = 150 °C	T_{case} = 25 °C	250	A
		T_{case} = 80 °C	170	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		600	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	1600	A
Freewheeling Diode				
I_F	T_j = 150 °C	T_c = 25 °C	400	A
		T_c = 80 °C	270	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		800	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	2800	A
Module				
$I_{t(RMS)}$			500	A
T_{vj}			- 40 ... + 150	°C
T_{stg}			- 40 ... + 125	°C
V_{isol}	AC, 1 min.		2500	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		4,5	5,5	6,5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = V_{CES}	T_j = 25 °C		0,2	0,6	mA
V_{CE0}		T_j = 25 °C		1,05		V
		T_j = 125 °C		1		V
r_{CE}	V_{GE} = 15 V	T_j = 25°C		3,2		mΩ
		T_j = 125°C		4,7		mΩ
$V_{CE(sat)}$	I_{Cnom} = 300 A, V_{GE} = 15 V	T_j = 25°$C_{chiplev.}$		2,1	2,5	V
		T_j = 125°$C_{chiplev.}$		2,4	2,8	V
C_{ies}	V_{CE} = 25, V_{GE} = 0 V	f = 1 MHz		17		nF
C_{oes}				2		nF
C_{res}				1,2		nF
Q_G	V_{GE} = 0V...+15V			720		nC
R_{Gint}	T_j = °C			1,2		Ω
$t_{d(on)}$	R_{Gon} = 6 Ω	V_{CC} = 300V		160		ns
t_r		I_C= 300A		80		ns
E_{on}		T_j = 125 °C		14		mJ
$t_{d(off)}$	R_{Goff} = 6 Ω	V_{GE} = ± 15V		550		ns
t_f				50		ns
E_{off}				13		mJ
$R_{th(j-c)}$	per IGBT				0,09	K/W



SEMITRANS® 3

Superfast IGBT Modules

SKM 300GB063D

SKM 300GAR063D

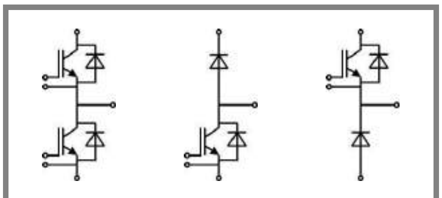
SKM 300GAL063D

Features

- NPT- Non punch-through IGBT
- Low tail current with low temperature dependence
- High short circuit capability, self limiting if term. G is clamped to E
- Pos. temp.-coeff. of V_{CEsat}
- 50 % less turn off losses
- 30 % less short circuit current
- Very low C_{ies}, C_{oes}, C_{res}
- Latch-up free
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DCB Direct Copper Bonding Technology without hard mould
- Large clearance (13 mm) and creepage distances (20 mm)

Typical Applications*

- Switching (not for linear use)
- Switched mode power supplies
- AC inverter servo drives
- UPS uninterruptable power supplies
- Welding inverters



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 °$C_{chiplev.}$		1,65	2	V
		T_j = 125 °$C_{chiplev.}$		1,65	2	V
V_{F0}		T_j = 125 °C			0,9	V
r_F		T_j = 125 °C		3	3,7	mΩ
I_{RRM}	I_F = 300 A	T_j = 125 °C		120		A
Q_{rr}				18		µC
E_{rr}	V_{GE} = -15 V; V_{CC} = 300 V					mJ
$R_{th(j-c)D}$	per diode				0,25	K/W
Freewheeling Diode						
$V_F = V_{EC}$	I_{Fnom} = 400 A; V_{GE} = 0 V	T_j = 25 °$C_{chiplev.}$		1,65	2	V
		T_j = 125 °$C_{chiplev.}$		1,65	2	V
V_{F0}		T_j = 125 °C			0,9	V
r_F		T_j = 125 °C			3	V
I_{RRM}	I_F = 300 A	T_j = 125 °C		130		A
Q_{rr}				23		µC
E_{rr}	V_{GE} = -15 V; V_{CC} = 300 V					mJ
$R_{th(j-c)FD}$	per diode				0,15	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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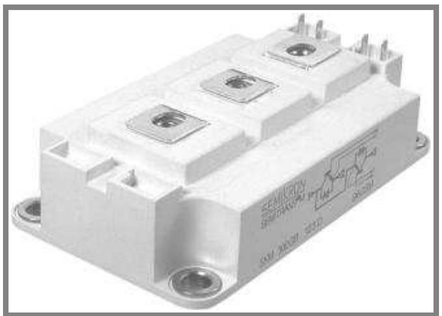
The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics
("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.

SKM 300GB063D



SEMITRANS® 3

Superfast IGBT Modules

SKM 300GB063D

SKM 300GAR063D

SKM 300GAL063D

Features

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- Low tail current with low temperature dependence
- High short circuit capability, self limiting if term. G is clamped to E
- Pos. temp.-coeff. of V_{CEsat}
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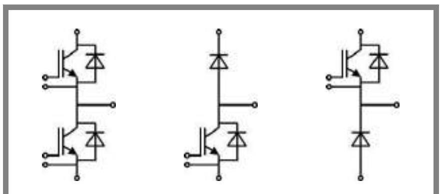


GB GAL GAR

Z_{th} Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	i = 1	65	mk/W
R_i	i = 2	19	mk/W
R_i	i = 3	4,7	mk/W
R_i	i = 4	1,3	mk/W
tau_i	i = 1	0,0518	s
tau_i	i = 2	0,0241	s
tau_i	i = 3	0,0021	s
tau_i	i = 4	0,0001	s
$Z_{th(j-c)D}$			
R_i	i = 1	140	mk/W
R_i	i = 2	85	mk/W
R_i	i = 3	20,55	mk/W
R_i	i = 4	4,45	mk/W
tau_i	i = 1	0,0613	s
tau_i	i = 2	0,0041	s
tau_i	i = 3	0,0045	s
tau_i	i = 4	0,0003	s

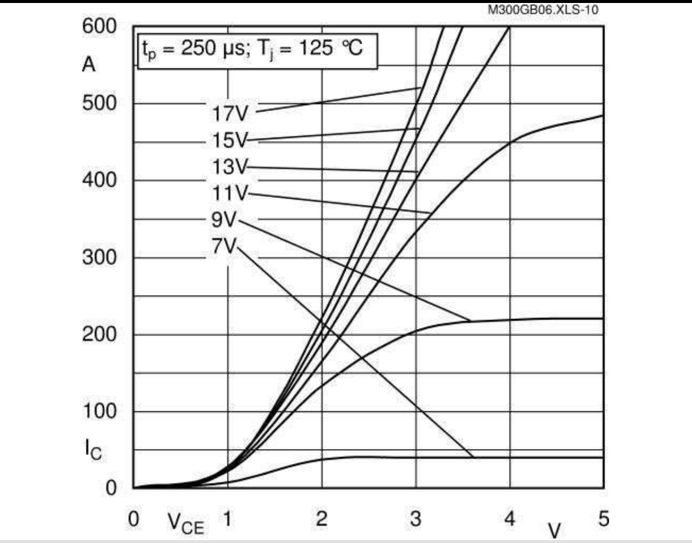


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

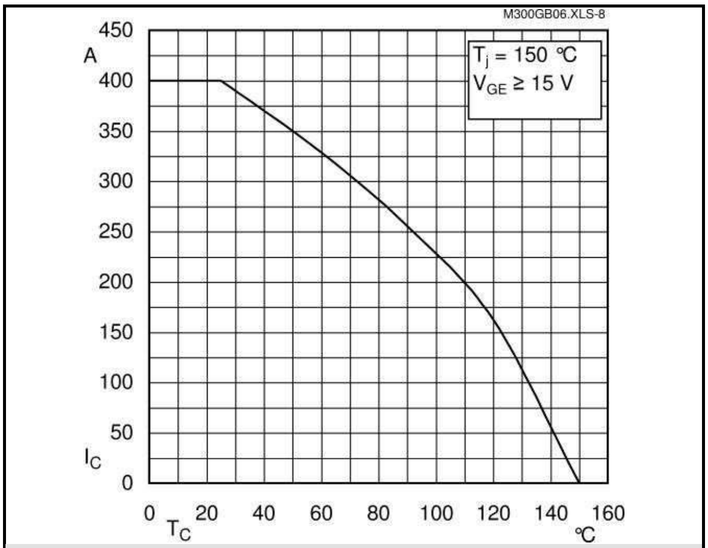


Fig. 2 Rated current vs. temperature I_C = f (T_C)

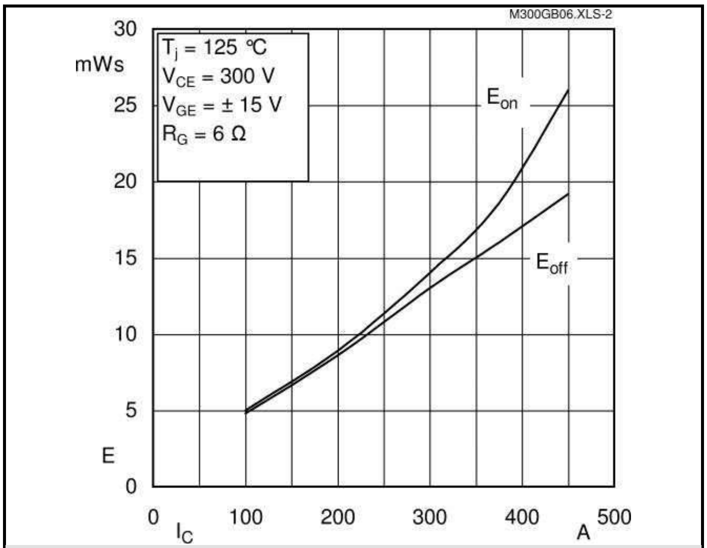


Fig. 3 Typ. turn-on /-off energy = f (I_C)

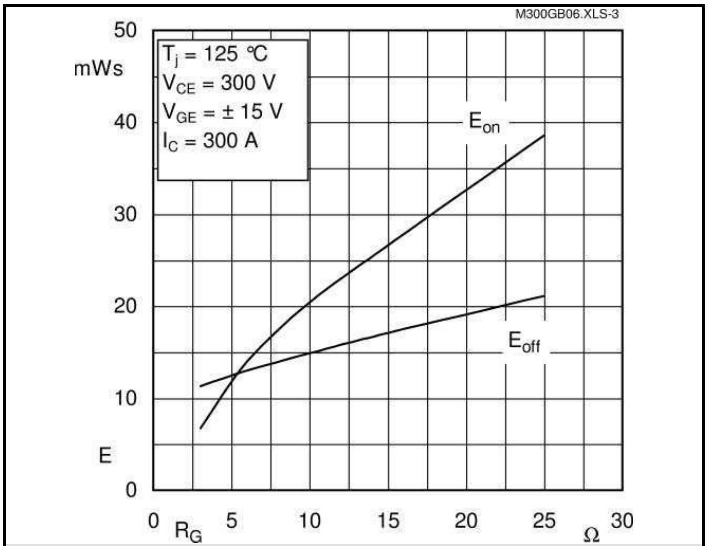


Fig. 4 Typ. turn-on /-off energy = f (R_G)

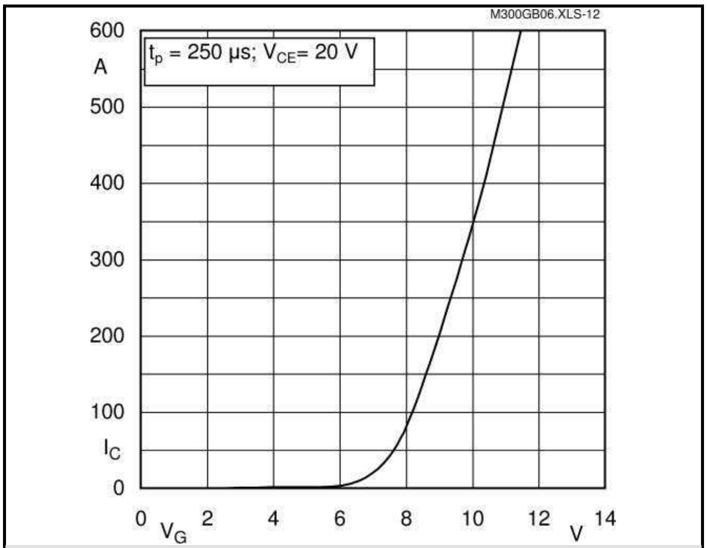


Fig. 5 Typ. transfer characteristic

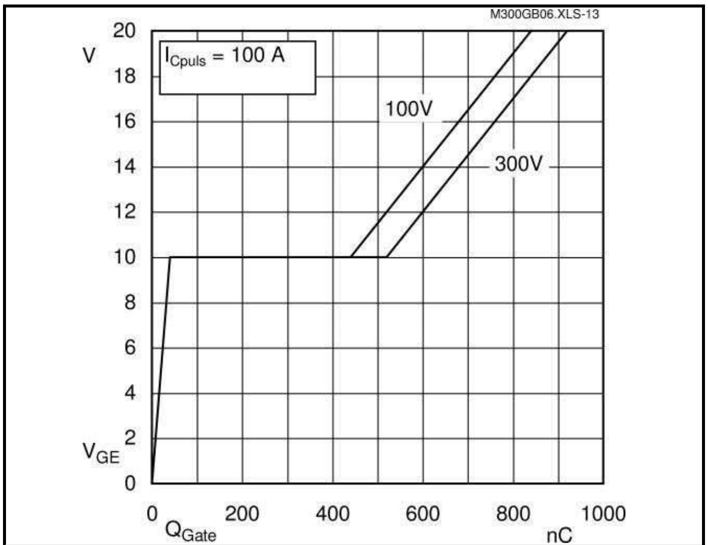


Fig. 6 Typ. gate charge characteristic

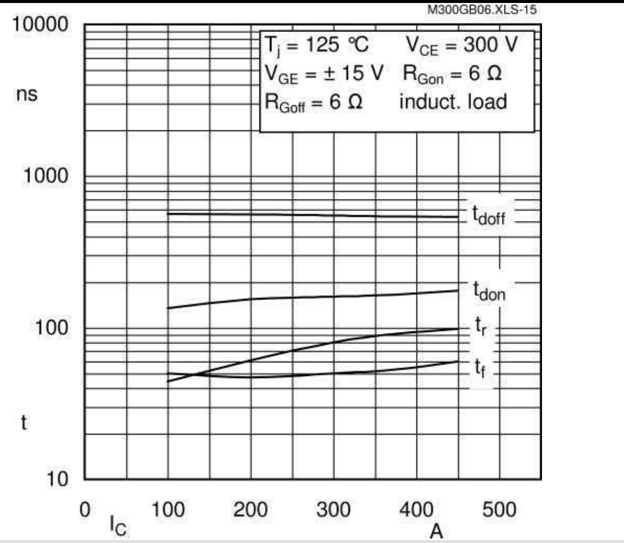


Fig. 7 Typ. switching times vs. I_C

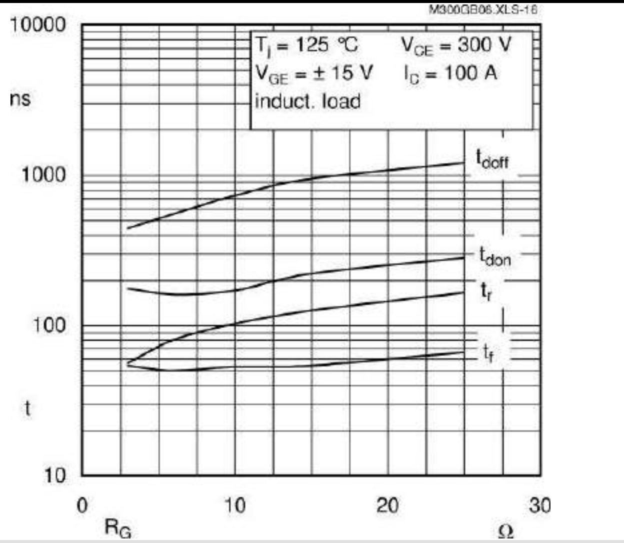


Fig. 8 Typ. switching times vs. gate resistor R_G

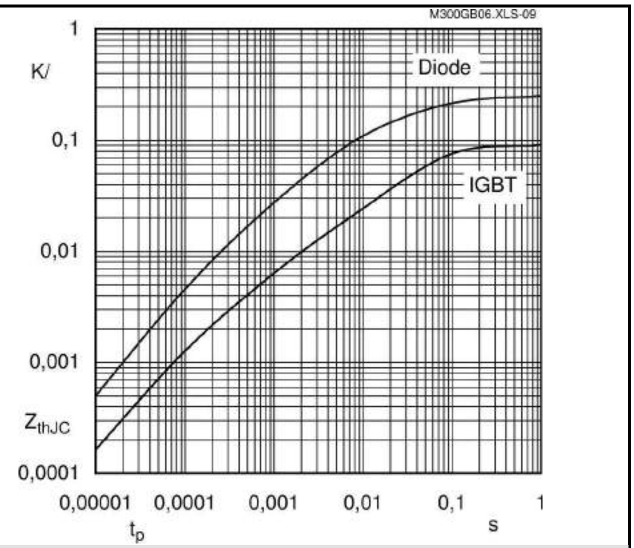


Fig. 9 Transient thermal impedance of IGBT and Diode

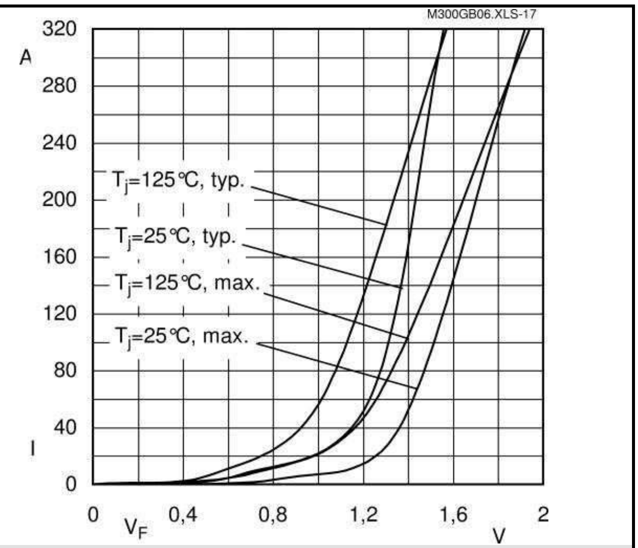


Fig. 10 CAL diode forward characteristic, inclusive $R_{CC'+ EE'}$

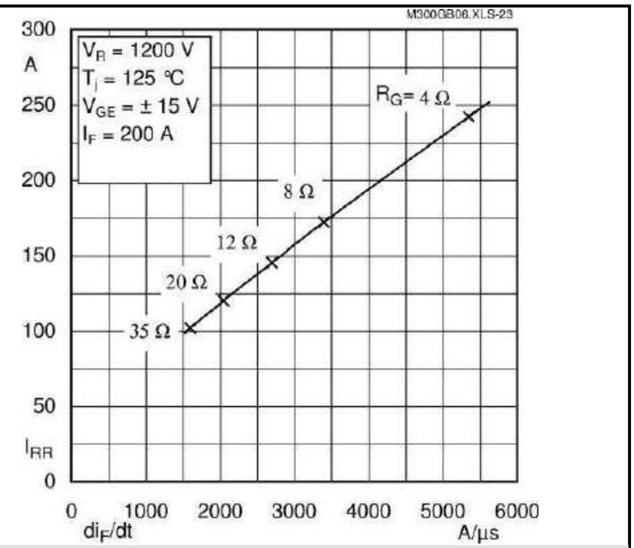


Fig. 11 Typ. CAL diode peak reverse recovery current

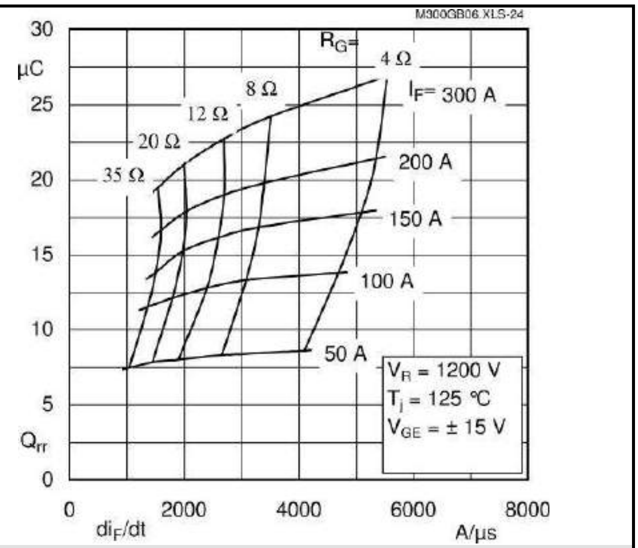
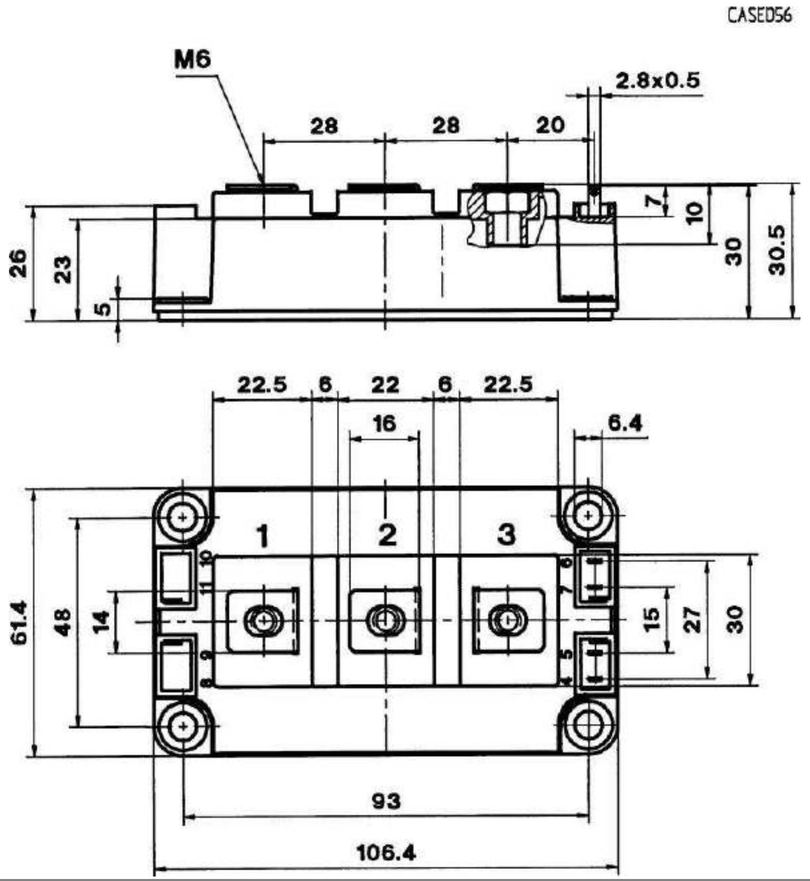


Fig. 12 Typ. CAL diode recovered charge

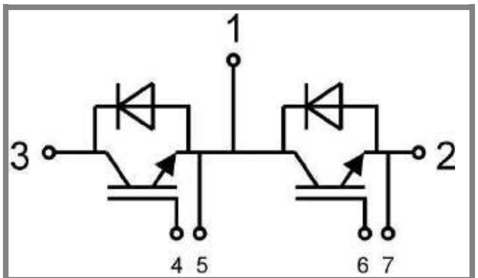
SKM 300GB063D

UL Recognized

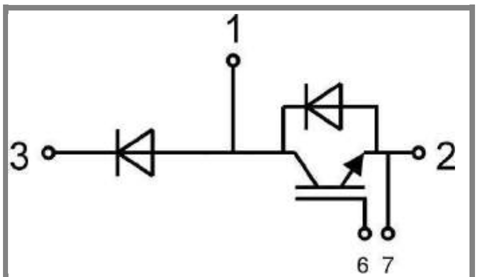
File no. E 63 532



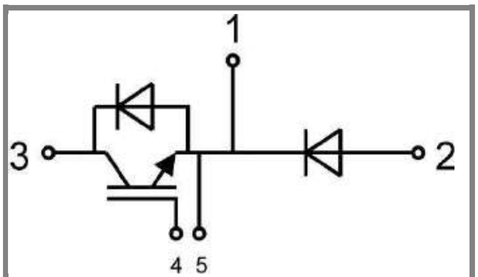
Case D 56



GB Case D 56

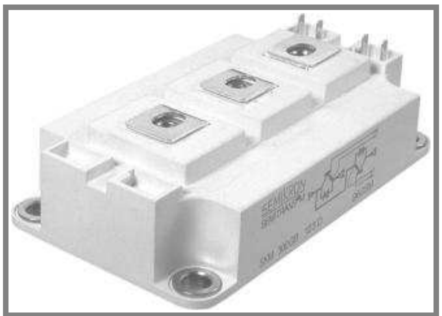


GAL Case D 57 (➞ D 56)



GAR Case D 58 (➞ D 56)

SKM 400GB125D



SEMITRANS® 3

Ultra Fast IGBT Modules

SKM 400GB125D

SKM 400GAL125D

SKM 400GAR125D

Features

- Low inductance case
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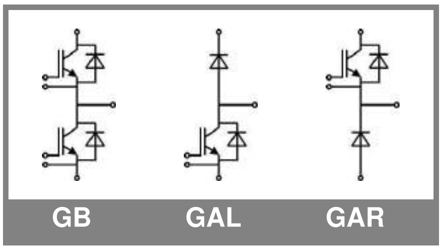
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DBC Direct Copper Bonding Technology
- Large clearance (13 mm) and creepage distances (20 mm)

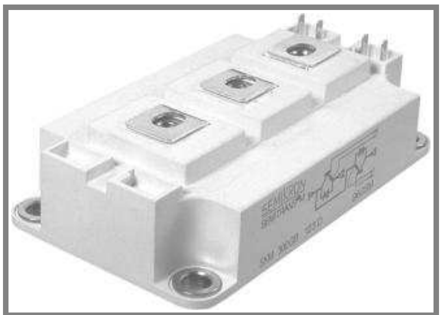
Typical Applications*

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



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} ≤ 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
$t_{d(on)}$		V_{CC} = 600V		70		ns
t_r	R_{Gon} = 2 Ω	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



SEMITRANS® 3

Ultra Fast IGBT Modules

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SKM 400GAL125D

SKM 400GAR125D

Features

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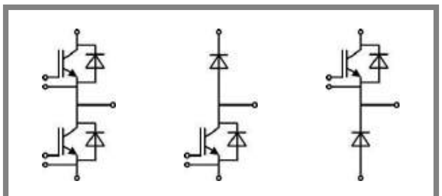
- Large clearance (13 mm) and creepage distances (20 mm)

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

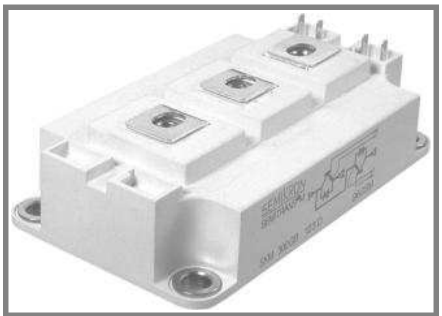


GB GAL GAR

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.

* 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.



SEMITRANS® 3

Ultra Fast IGBT Modules

SKM 400GB125D

SKM 400GAL125D

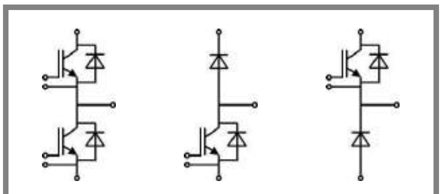
SKM 400GAR125D

Features

- Low inductance case
- Short tail current with low temperature dependence
- High short circuit capability, self limiting to 6 x I_{cnom}
- 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*

- 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

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

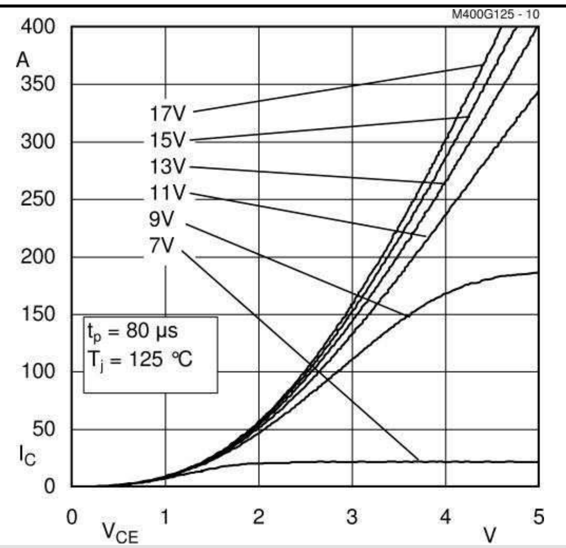


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

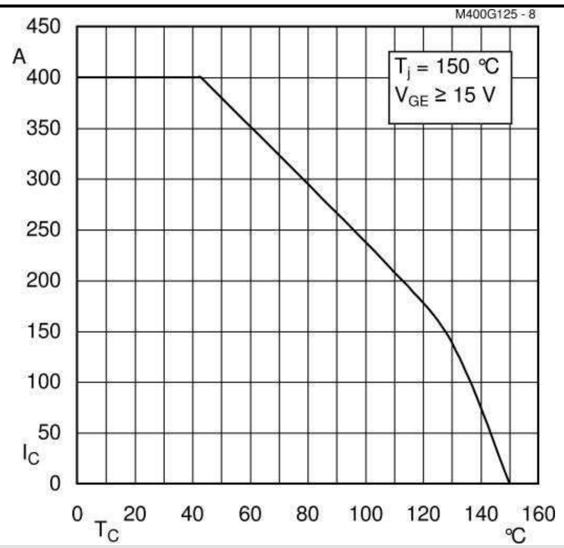


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

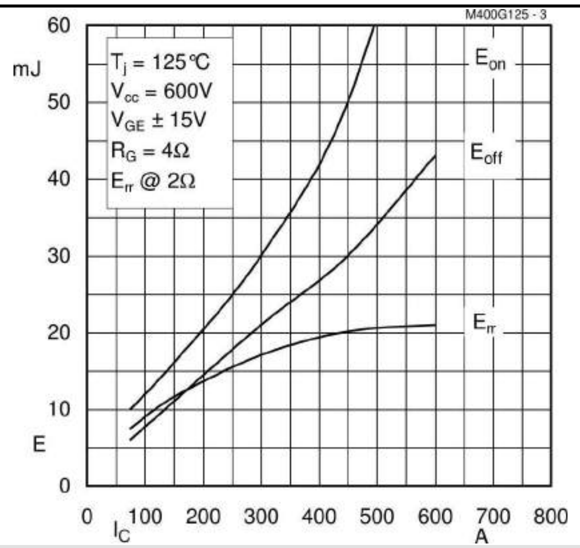


Fig. 3 Typ. turn-on /-off energy = f (I_C)

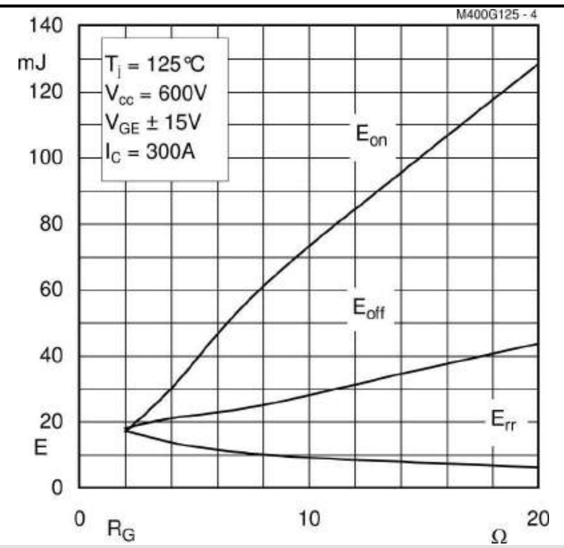


Fig. 4 Typ. turn-on /-off energy = f (R_G)

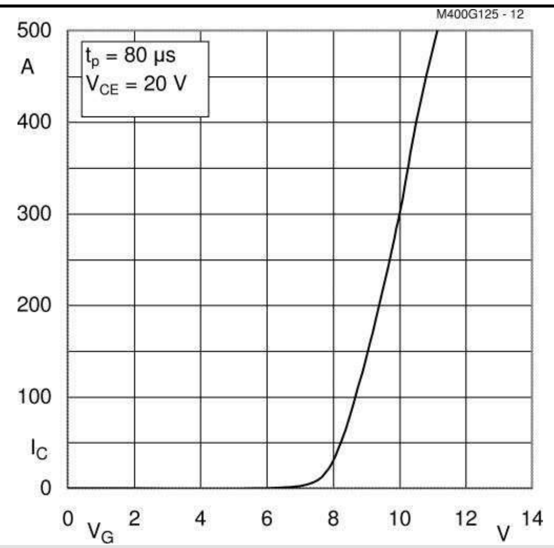


Fig. 5 Typ. transfer characteristic

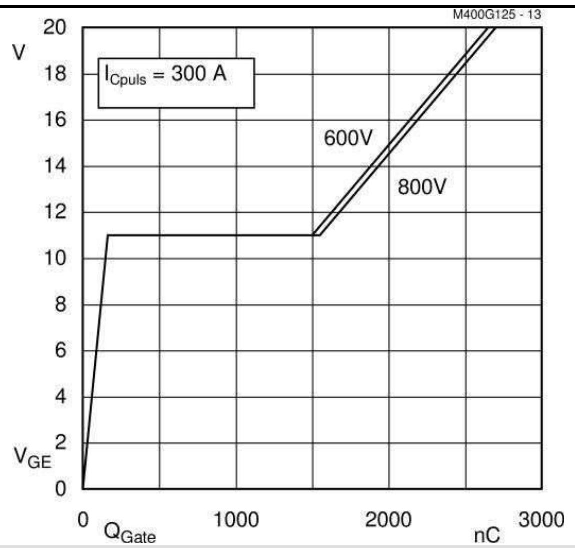


Fig. 6 Typ. gate charge characteristic

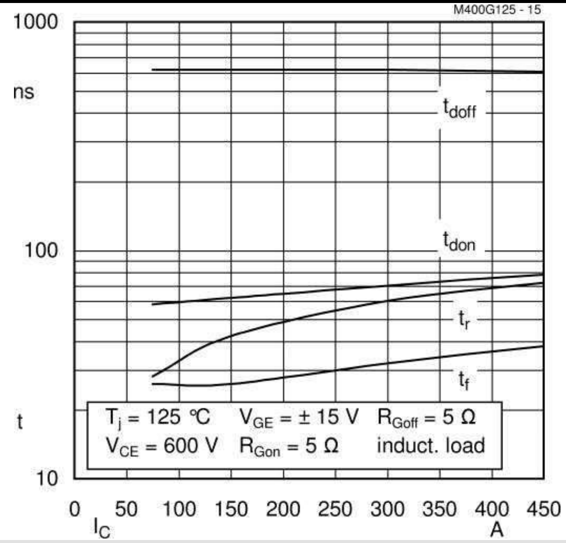


Fig. 7 Typ. switching times vs. I_C

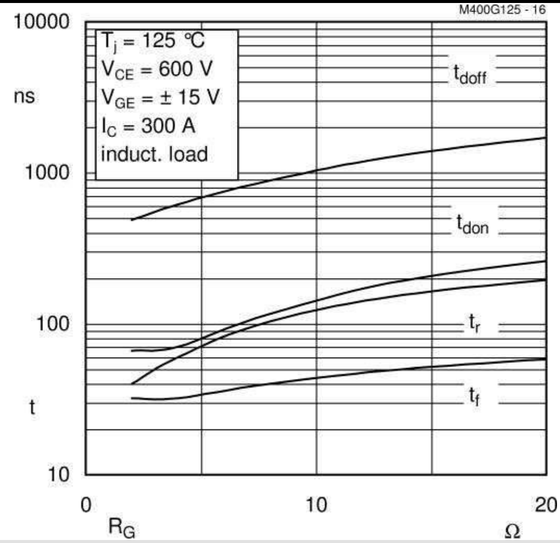


Fig. 8 Typ. switching times vs. gate resistor R_G

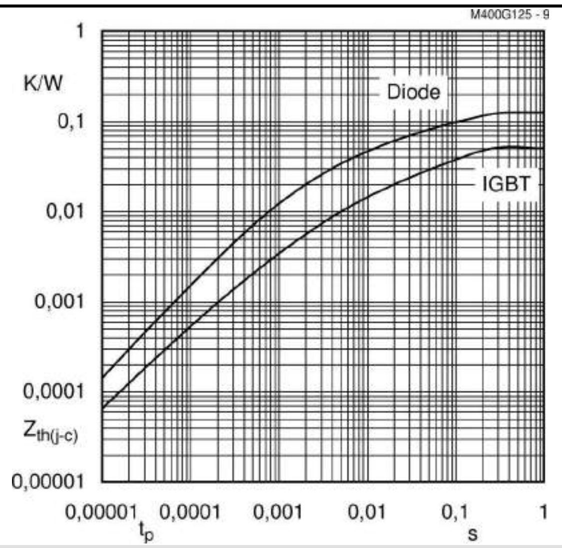


Fig. 9 Transient thermal impedance

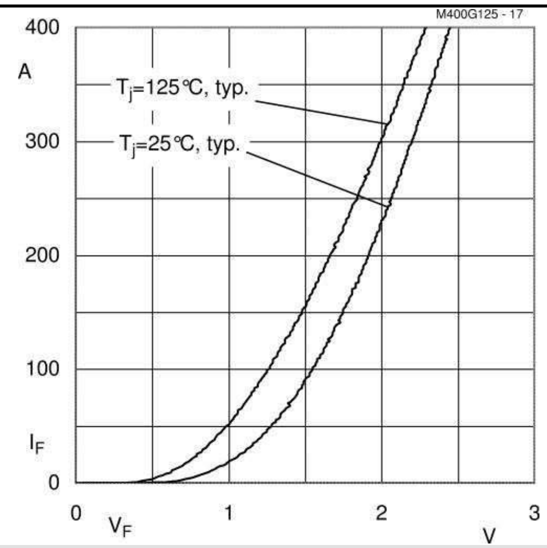


Fig. 10 CAL diode forward characteristic

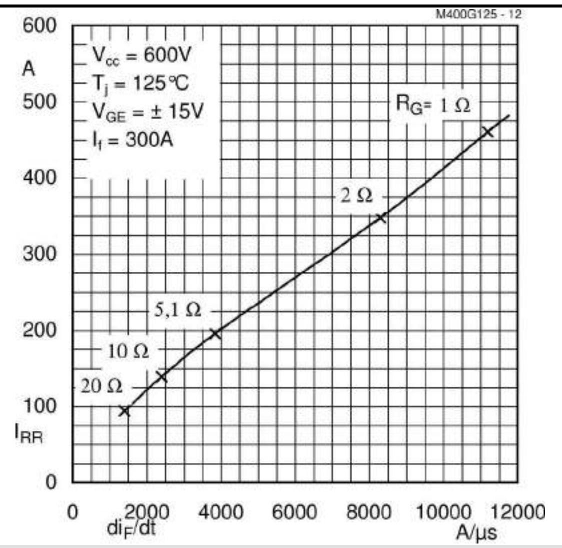


Fig. 11 Typ. CAL diode peak reverse recovery current

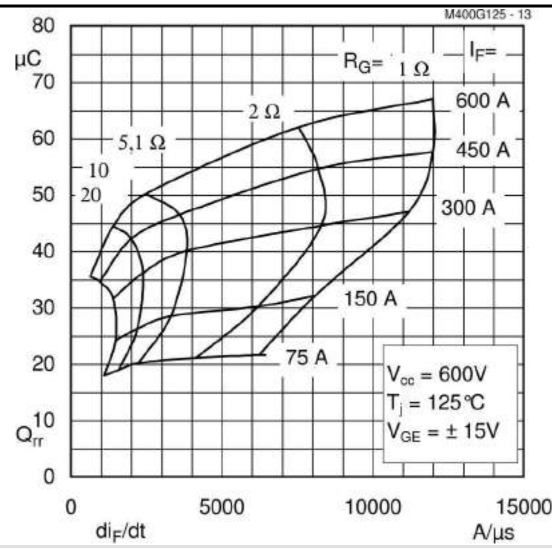


Fig. 12 Typ. CAL diode peak reverse recovery charge

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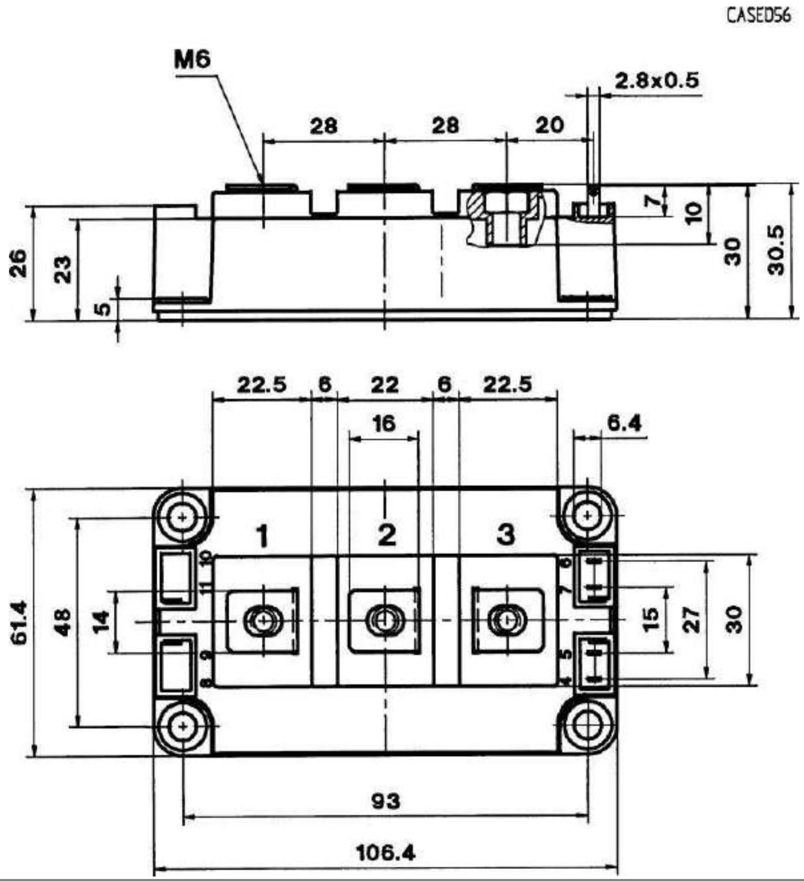
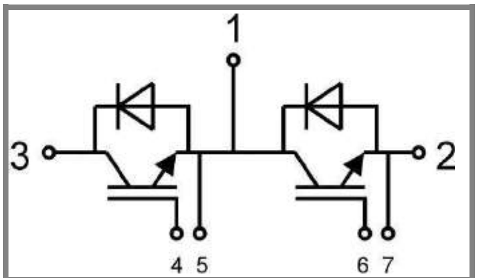
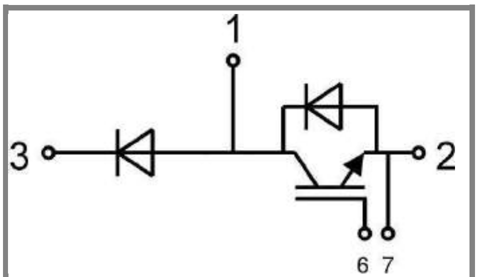


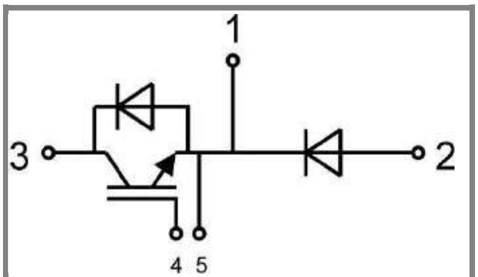
Case D 56



GB Case D 56

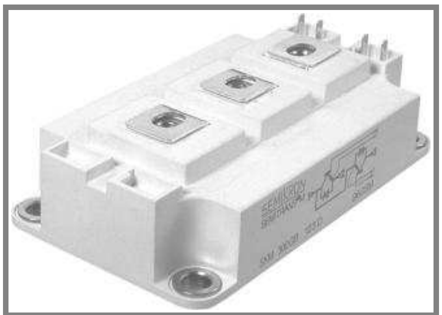


GAL Case D 57 (➞ D 56)



GAR Case D 58 (➞ D 56)

SKM 200GB125D



SEMITRANS® 3

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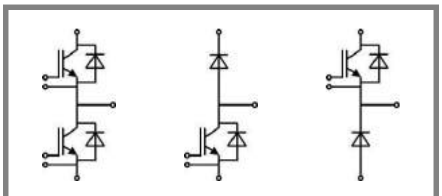
- Large clearance (13 mm) and creepage distance (20 mm)

Typical Applications*

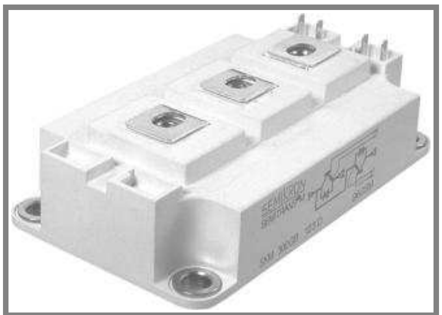
- Switched mode power supplies at f_{sw} > 20 kHz
- Resonant inverters up to 100 kHz
- Inductive heating
- Electronic welders at f_{sw} > 20 kHz



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	200	A
		T_{case} = 80 °C	160	A
I_{CRM}	I_{CRM}=2xI_{Cnom}		300	A
V_{GES}			± 20	V
t_{psc}	V_{CC} = 600 V; V_{GE} ≤ 20 V; V_{CES} < 1200 V	T_j = 125 °C	10	µs
Inverse Diode				
I_F	T_j = 150 °C	T_{case} = 25 °C	200	A
		T_{case} = 80 °C	130	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		300	A
I_{FSM}	t_p = 10 ms; sin.	T_j = 150 °C	1440	A
Freewheeling Diode				
I_F	T_j = °C	T_c = 25 °C	200	A
		T_c = 80 °C	130	A
I_{FRM}	I_{FRM}=2xI_{Fnom}		300	A
I_{FSM}	t_p = 10 ms;	T_j = 150 °C	1440	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 = 6 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		1,5	1,75	V
		T_j = 125 °C				V
r_{CE}	V_{GE} = 15 V	T_j = 25°C		12	14	mΩ
		T_j = 125°C				mΩ
$V_{CE(sat)}$	I_{Cnom} = 150 A, V_{GE} = 15 V	T_j = °$C_{chiplev.}$		3,3	3,85	V
C_{ies}	V_{CE} = 25, V_{GE} = 0 V	f = 1 MHz		10	13	nF
C_{oes}				1,5	2	nF
C_{res}				0,8	1,2	nF
Q_G	V_{GE} = 0V - +20V			1300		nC
R_{Gint}	T_j = °C			2,5		Ω
$t_{d(on)}$	R_{Gon} = 4 Ω	V_{CC} = 600V		75		ns
t_r		I_C= 150A		36		ns
E_{on}		T_j = 125 °C		14		mJ
$t_{d(off)}$	R_{Goff} = 4 Ω	V_{GE} = ±15V		420		ns
t_f				25		ns
E_{off}						mJ
$R_{th(j-c)}$	per IGBT				0,09	K/W



SEMITRANS® 3

Ultra Fast IGBT Modules

SKM 200GB125D

SKM 200GAL125D

SKM 200GAR125D

Features

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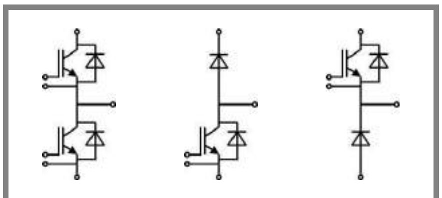
- Fast & soft inverse CAL diodes
- Isolated copper baseplate using DCB Direct Copper Bonding Technology
- Large clearance (13 mm) and creepage distance (20 mm)

Typical Applications*

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



Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Units**
Inverse Diode						
$V_F = V_{EC}$	I_{Fnom} = 150 A; V_{GE} = 0 V	T_j = 25 °$C_{chiplev.}$		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		6	8,7	mΩ
		T_j = 125 °C				mΩ
I_{RRM}	I_F = 150 A	T_j = 125 °C		230		A
Q_{rr}	di/dt = 5500 A/µs			24		µC
E_{rr}	V_{GE} = 0 V; V_{CC} = 600 V					mJ
$R_{th(j-c)D}$	per diode				0,25	K/W
Freewheeling Diode						
$V_F = V_{EC}$	I_{Fnom} = 150 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		6	8,7	V
		T_j = 125 °C				V
I_{RRM}	I_F = 150 A	T_j = 125 °C		230		A
Q_{rr}	di/dt = 5500 A/µs			24		µC
E_{rr}	V_{GE} = 0 V; V_{CC} = 600 V					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.

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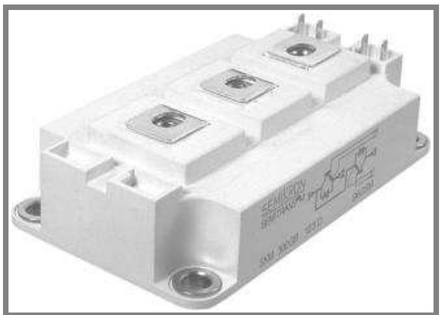

SEMITRANS® 3

Ultra Fast IGBT Modules

SKM 200GB125D

SKM 200GAL125D

SKM 200GAR125D

Features

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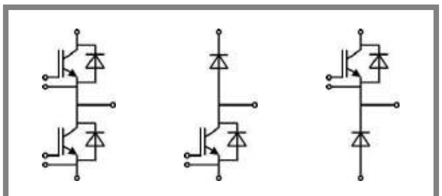
Typical Applications*

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



Z_{th}

Symbol	Conditions	Values	Units
$Z_{th(j-c)I}$			
R_i	i = 1	60	mk/W
R_i	i = 2	23	mk/W
R_i	i = 3	5,9	mk/W
R_i	i = 4	1,1	mk/W
tau_i	i = 1	0,0744	s
tau_i	i = 2	0,0087	s
tau_i	i = 3	0,002	s
tau_i	i = 4	0,0015	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	0,0536	s
tau_i	i = 2	0,0034	s
tau_i	i = 3	0,077	s
tau_i	i = 4	0,0003	s

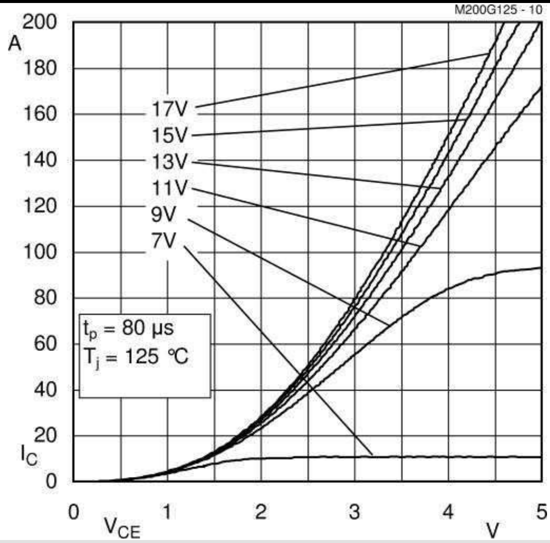


Fig. 1 Typ. output characteristic, inclusive $R_{CC'+ EE'}$

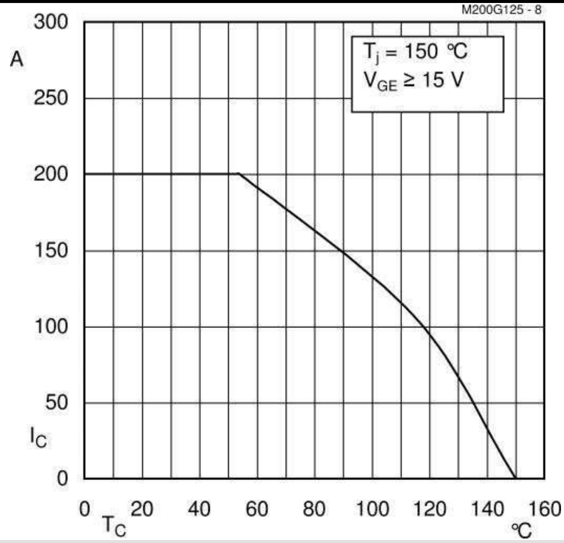


Fig. 2 Rated current vs. temperature $I_C = f(T_C)$

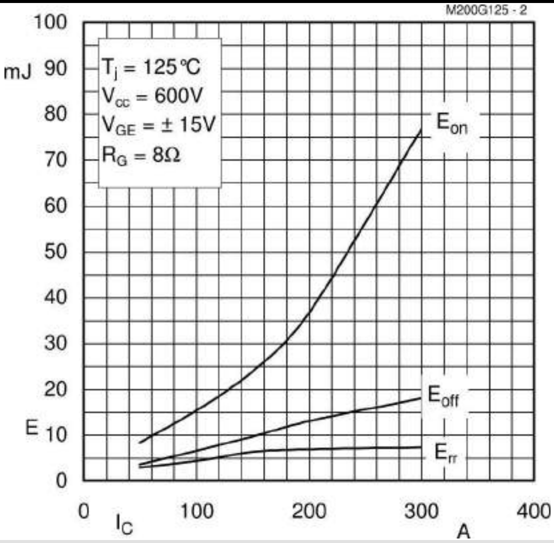


Fig. 3 Typ. turn-on /-off energy = f (I_C)

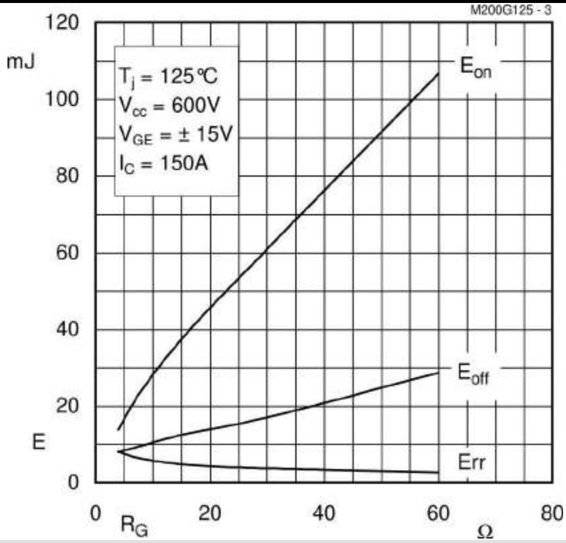


Fig. 4 Typ. turn-on /-off energy = f (R_G)

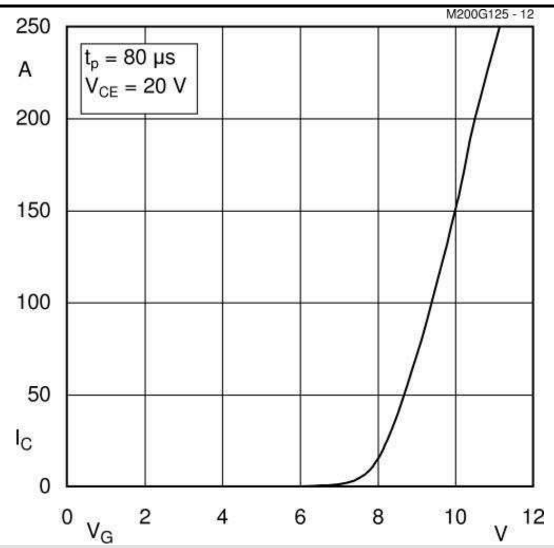


Fig. 5 Typ. transfer characteristic

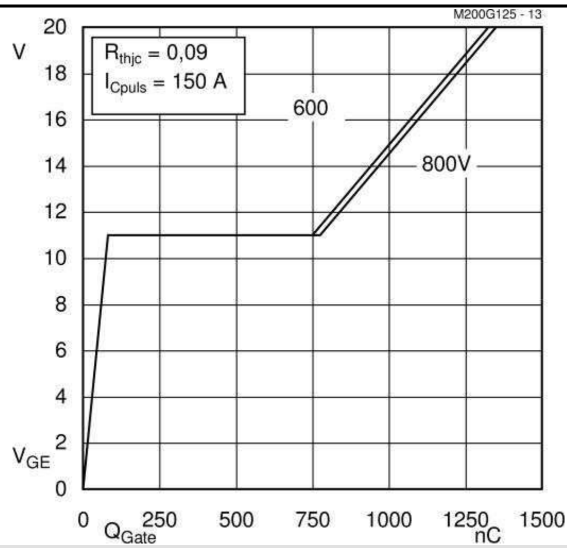


Fig. 6 Typ. gate charge characteristic

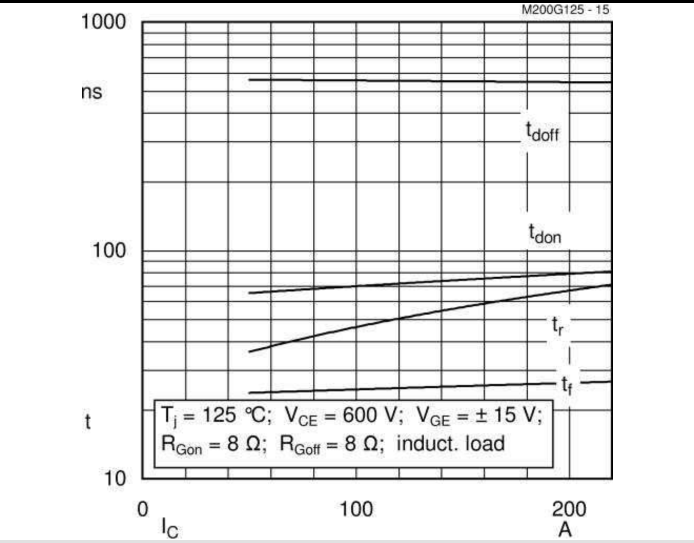


Fig. 7 Typ. switching times vs. I_C

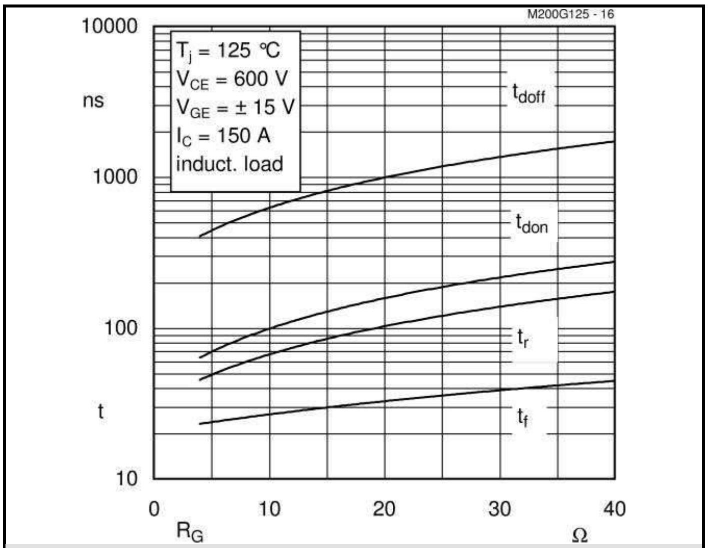


Fig. 8 Typ. switching times vs. gate resistor R_G

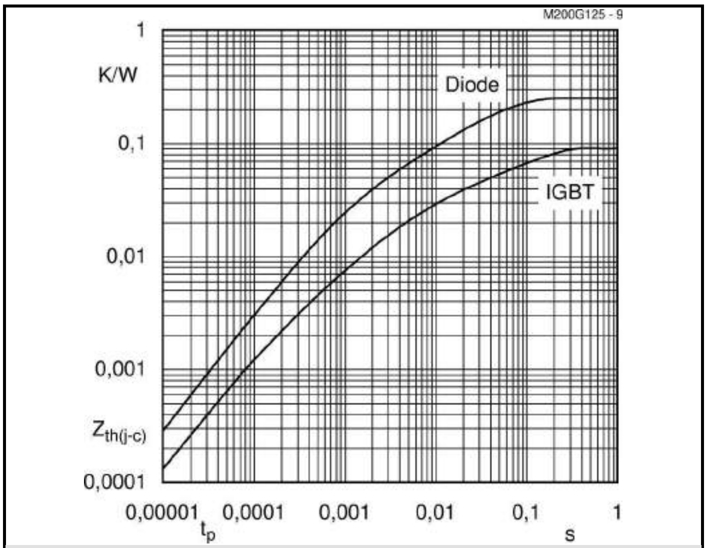


Fig. 9 Transient thermal impedance

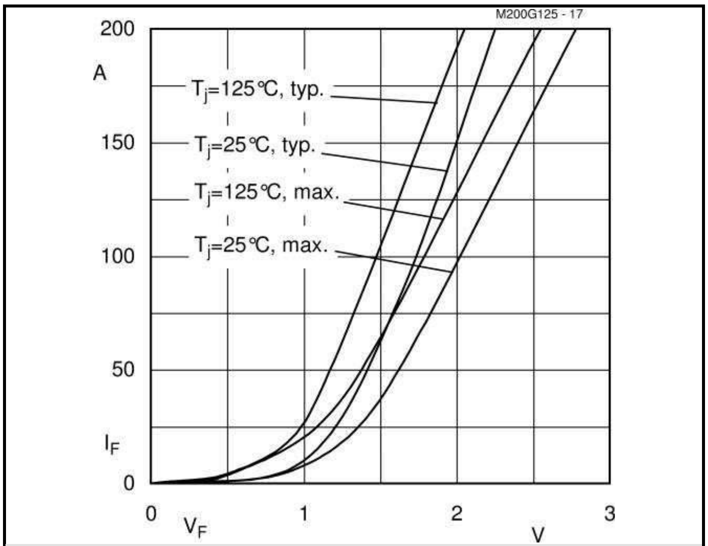


Fig. 10 CAL diode forward characteristic

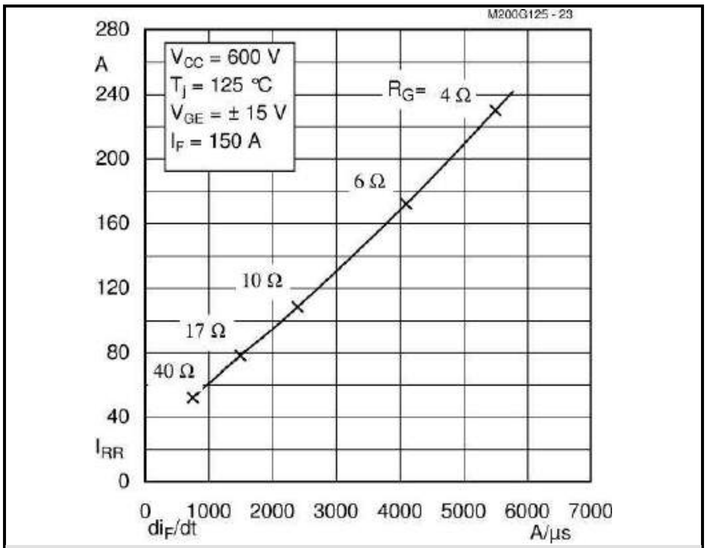


Fig. 11 Typ. CAL diode peak reverse recovery current

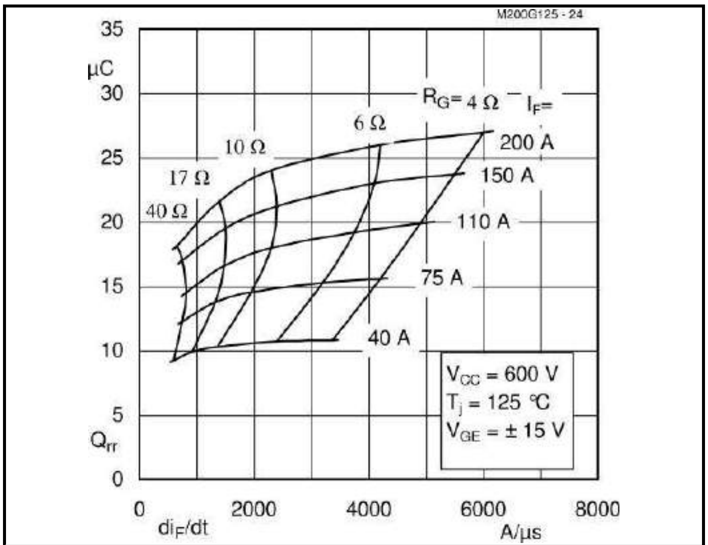


Fig. 12 Typ. CAL diode peak reverse recovery charge

SKM 200GB125D

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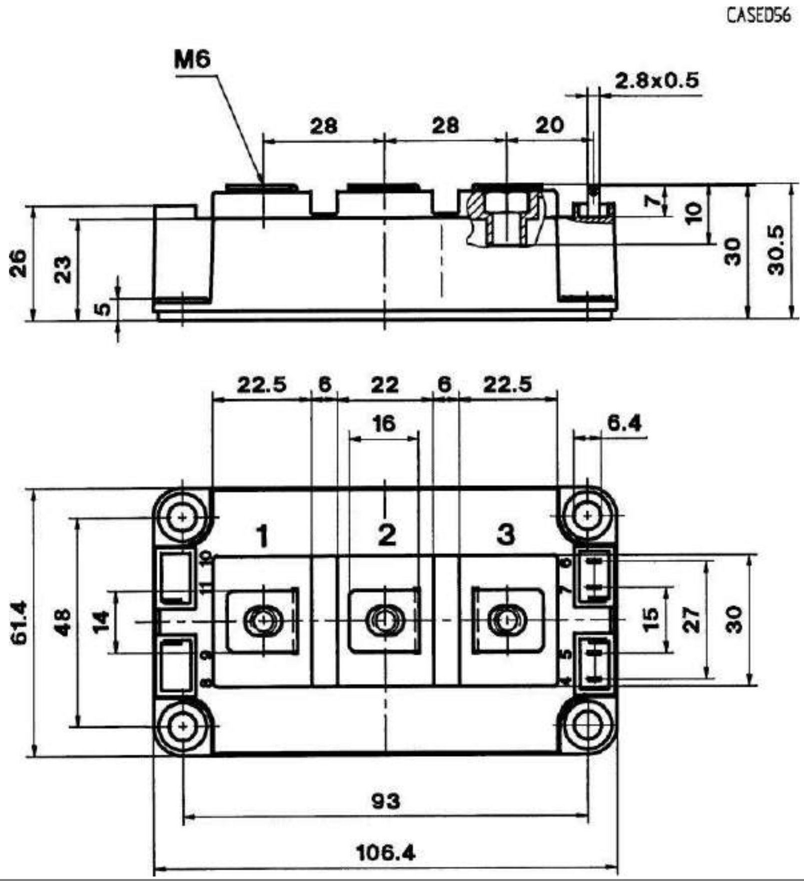
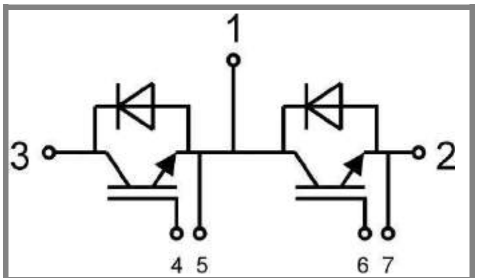
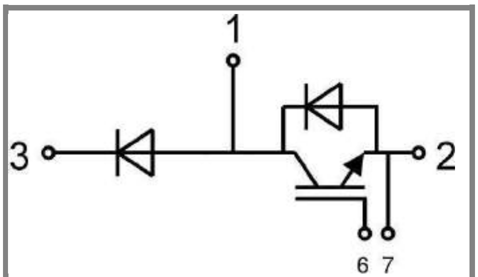


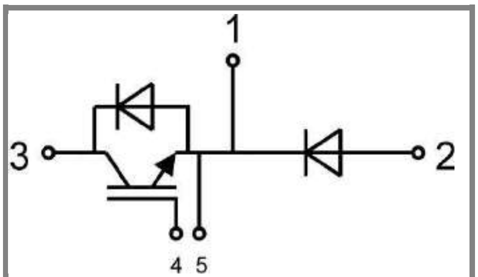
Case D 56



GB Case D 56



GAL Case D 57 (➞ D 56)



GAR Case D 58 (➞ D 56)

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