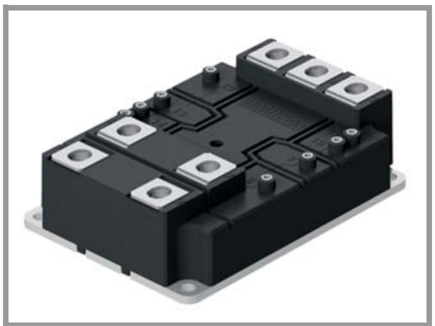


SEMITRANS® 20

IGBT4 Modules

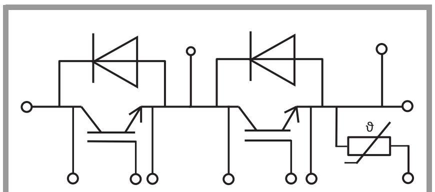
SKM1200GB17E4S2I4

Features*

- Open standard module platform
- Low losses and high power density
- Low inductance design
- Ideal for paralleling and scaling
- Highest reliability

Remarks

- Case temperature limited to $T_C = 125°C$ max.
- Recommended $T_{j,op}$ = -40 ... +150°C
- Product reliability results valid for T_j = 150°C



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT				
V_{CES}	T_j = 25 °C		1700	V
I_C	T_j = 175 °C	T_c = 25 °C	1694	A
		T_c = 80 °C	1295	A
I_{Cnom}			1200	A
I_{CRM}			2400	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 1000 V V_{GE} = ± 15 V V_{CES} ≤ 1700 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse diode				
V_{RRM}	T_j = 25 °C		1700	V
I_F	T_j = 175 °C	T_c = 25 °C	1485	A
		T_c = 80 °C	1093	A
I_{FRM}			2400	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		6240	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$			1000	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 = 1200 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.96	2.30	V
		T_j = 150 °C		2.46		V
V_{CE0}	chiplevel	T_j = 25 °C		1.02	1.20	V
		T_j = 150 °C		0.92		V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		0.78	0.92	mΩ
		T_j = 150 °C		1.28		mΩ
$V_{GE(th)}$	V_{GE}=V_{CE}, I_C = 48 mA		5.2	5.8	6.4	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1700 V, T_j = 25 °C				5	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		93.0		nF
C_{oes}		f = 1 MHz		3.96		nF
C_{res}		f = 1 MHz		3.30		nF
Q_G	V_{GE} = - 8 V...+ 15 V			9600		nC
R_{Gint}	T_j = 25 °C			1.0		Ω
$t_{d(on)}$	V_{CC} = 900 V I_C = 1200 A V_{GE} = +15/-15 V $R_{G\,on}$ = 1.8 Ω $R_{G\,off}$ = 1 Ω di/dt$_{on}$ = 9700 A/µs di/dt$_{off}$ = 5100 A/µs dv/dt = 3200 V/µs L_s = 25 nH	T_j = 150 °C		330		ns
t_r		T_j = 150 °C		111		ns
E_{on}		T_j = 150 °C		430		mJ
$t_{d(off)}$		T_j = 150 °C		979		ns
t_f		T_j = 150 °C		192		ns
E_{off}		T_j = 150 °C		458		mJ
$R_{th(j-c)}$	per IGBT				0.024	K/W
$R_{th(c-s)}$	per IGBT, P12 (reference)			0.020		K/W
$R_{th(c-s)}$	per IGBT, HP-PCM			0.012		K/W

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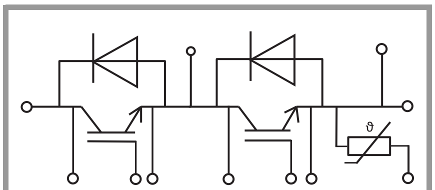
Remarks

- Case temperature limited to T_C = 125°C max.
- Recommended $T_{j,op}$ = -40 ... +150°C
- Product reliability results valid for T_j = 150°C

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	I_F = 1200 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.89	2.25	V
		T_j = 150 °C		1.97		V
V_{F0}	chiplevel	T_j = 25 °C		1.32	1.56	V
		T_j = 150 °C		1.08		V
r_F	chiplevel	T_j = 25 °C		0.47	0.57	mΩ
		T_j = 150 °C		0.74		mΩ
I_{RRM}	I_F = 1200 A di/dt$_{off}$ = 9900 A/µs V_{GE} = -15 V V_{CC} = 900 V	T_j = 150 °C		1082		A
Q_{rr}		T_j = 150 °C		396		µC
E_{rr}		T_j = 150 °C		242		mJ
$R_{th(j-c)}$	per diode				0.04	K/W
$R_{th(c-s)}$	per diode, P12 (reference)			0.020		K/W
$R_{th(c-s)}$	per diode, HP-PCM			0.010		K/W
Module						
L_{CE}	Between C_1(main) and E_2 (main)			10	12	nH
$R_{CC'+EE'}$	measured per switch, $R_{C\ AUX\ C'}$ + $R_{E\ AUX\ E'}$	T_C = 25 °C		0.3		mΩ
		T_C = 125 °C		0.4		mΩ
$R_{th(c-s)1}$	per switch			0.005		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, P12 (reference)			0.0082		K/W
$R_{th(c-s)}$	including thermal coupling, T_s underneath module, HP-PCM			0.0045		K/W
M_s	to heat sink M6		4		6	Nm
M_t		to terminals M3	0.9		1.1	Nm
		to terminals M8	9		11	Nm
w				1200		g

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Temperature Sensor					
R_{100}	T_c=100°C		493.3 ± 5%		Ω
$B_{25/100}$	$R_{(T)}=R_{100}*\exp[B_{25/100}*(1/T-1/T_{100})]$, T[K];		3480 ± 1%		K



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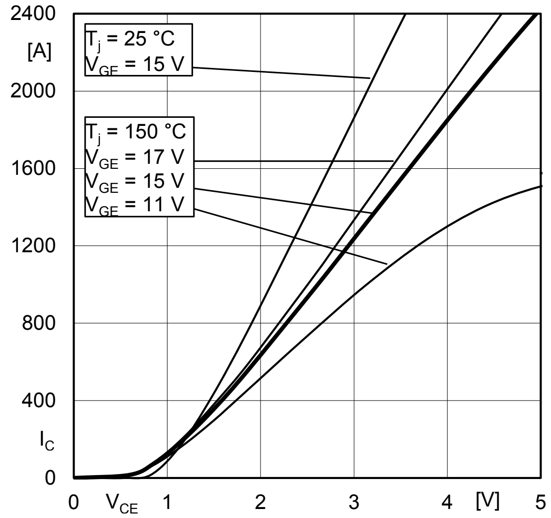


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

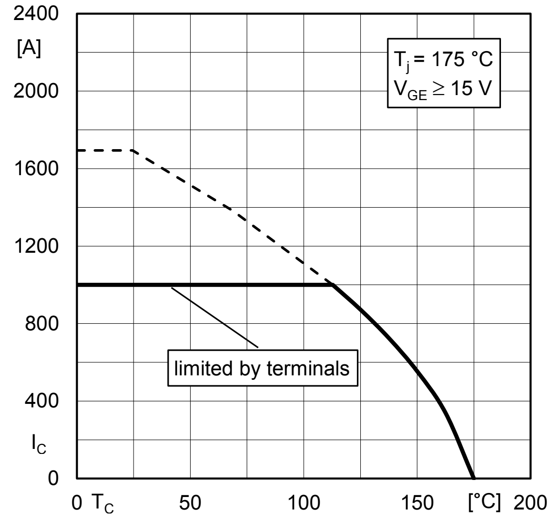


Fig. 2: Rated current vs. temperature $I_c = f(T_c)$

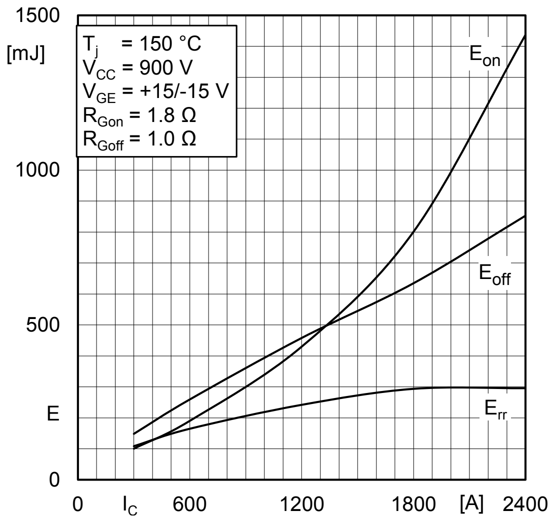


Fig. 3: Typ. turn-on /-off energy = f (I_C)

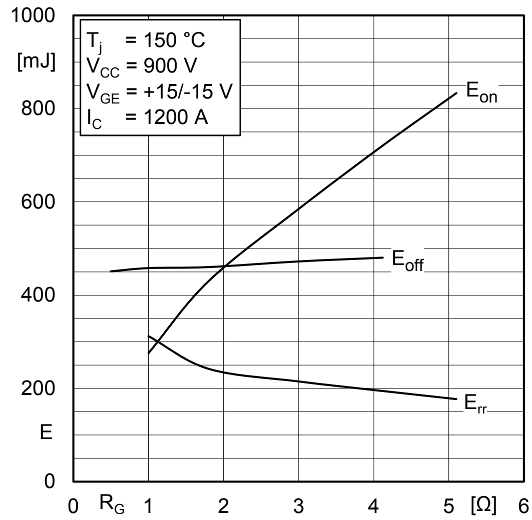


Fig. 4: Typ. turn-on /-off energy = f (R_G)

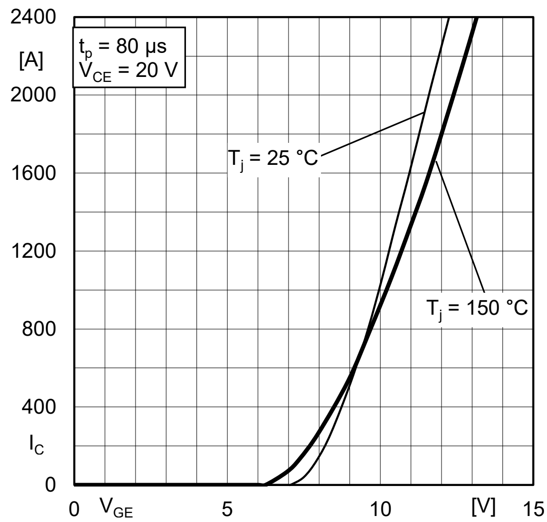


Fig. 5: Typ. transfer characteristic

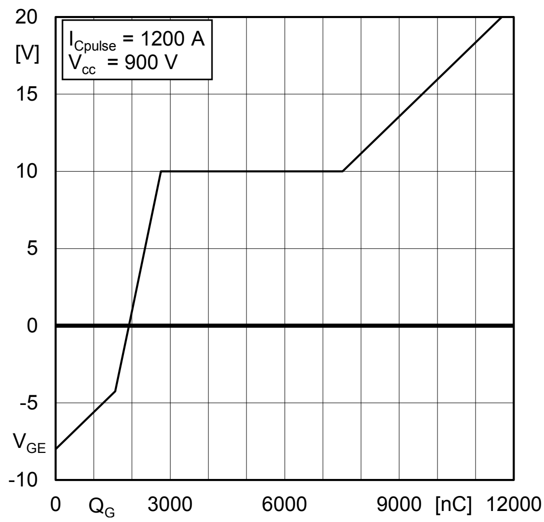


Fig. 6: Typ. gate charge characteristic

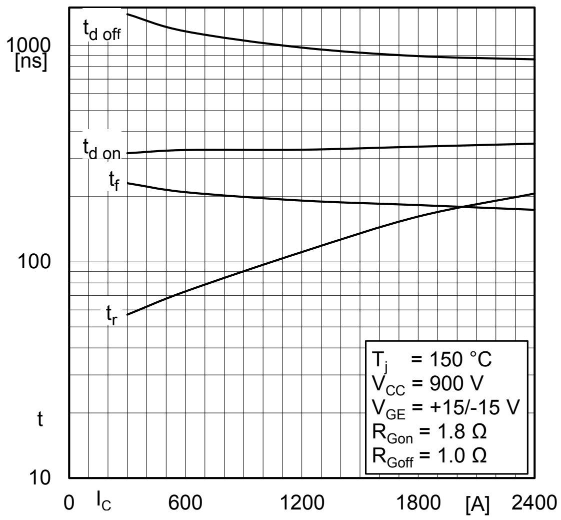


Fig. 7: Typ. switching times vs. I_C

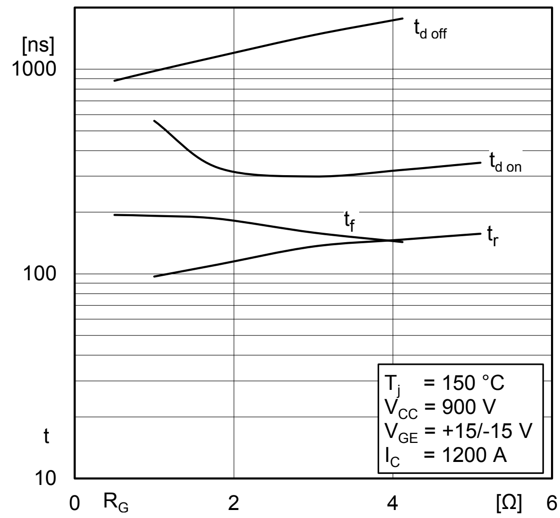


Fig. 8: Typ. switching times vs. gate resistor R_G

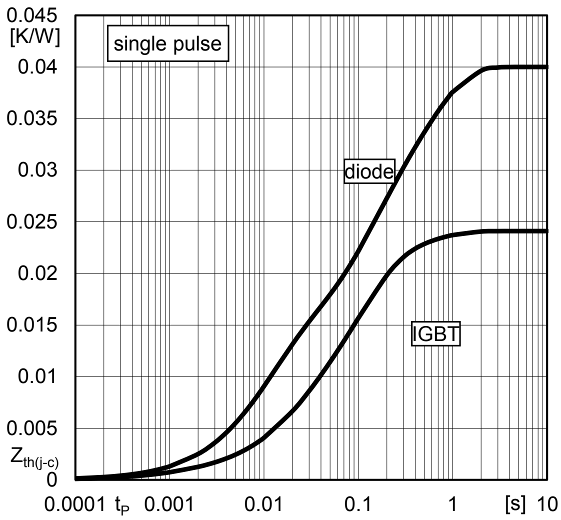


Fig. 9: Transient thermal impedance

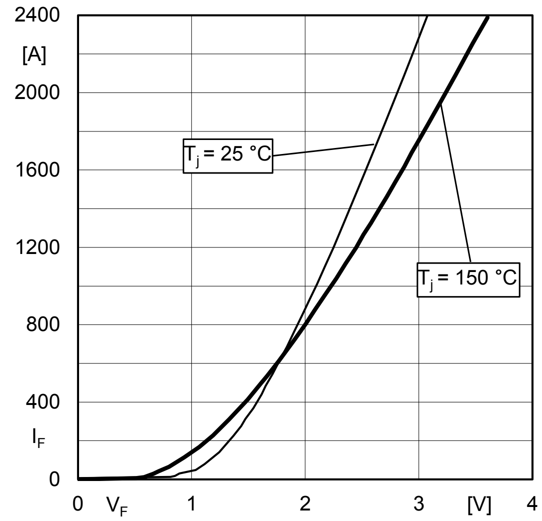


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

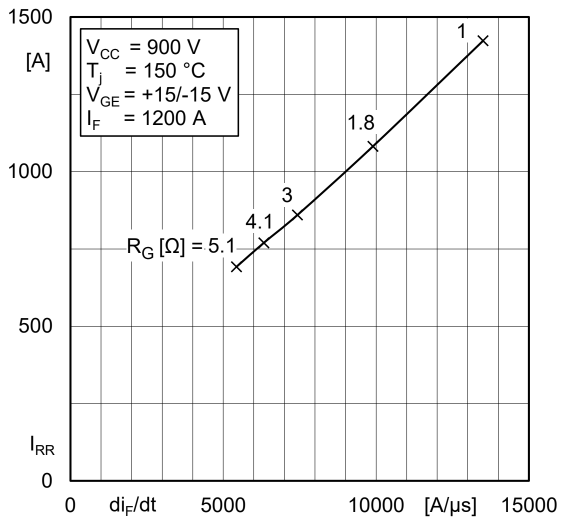


Fig. 11: Typ. CAL diode peak reverse recovery current

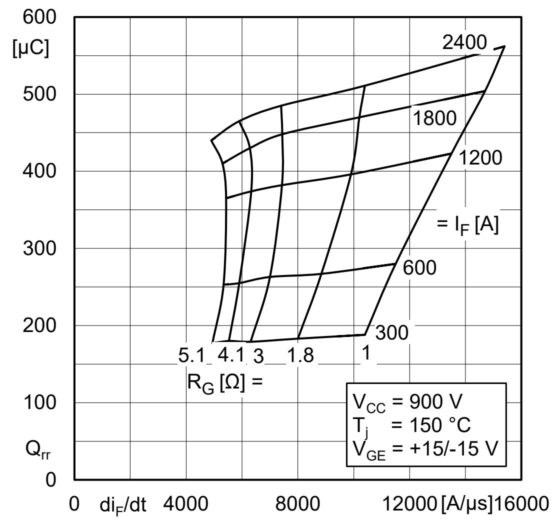
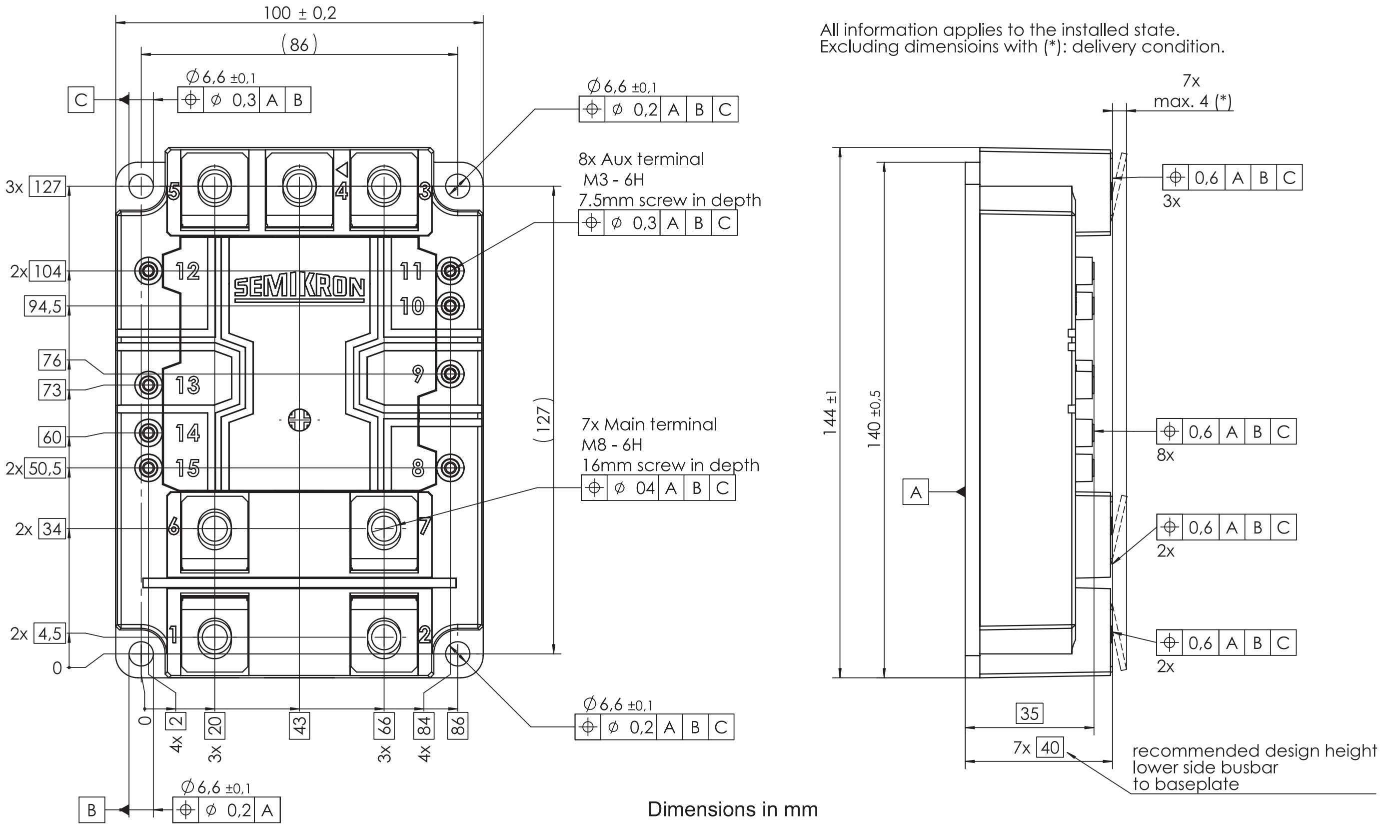
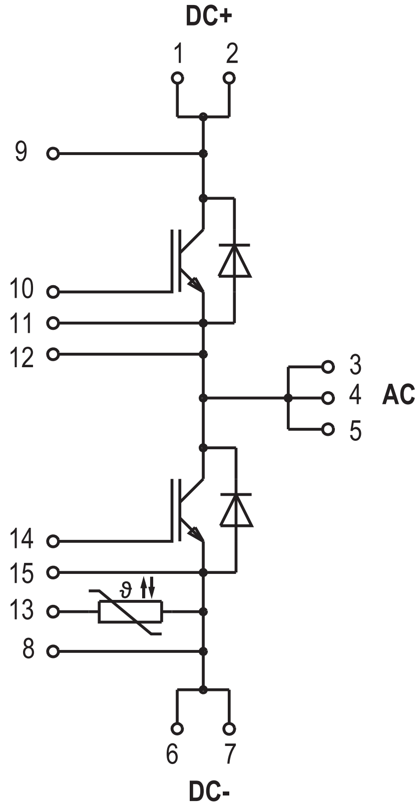


Fig. 12: Typ. CAL diode peak reverse recovery charge



Dimensions in mm

SEMITRANS 20



Remark: No internal connection between terminal 1/2 and between terminal 6/7. An external connection must be ensured.

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Terminal	
1	DC^+ / C1 main
2	DC^+ / C1 main
3	AC main
4	AC main
5	AC main
6	DC^- / E2-main
7	DC^- / E2-main
8	T1
9	C1-aux
10	G1 (=top)
11	E1-aux
12	C2-aux
13	T2
14	G2 (=bottom)
15	E2-aux

main = main power terminals
aux = auxiliary terminals

IMPORTANT INFORMATION AND WARNINGS

This is an electrostatic discharge sensitive device (ESDS) according to international standard IEC 61340.
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