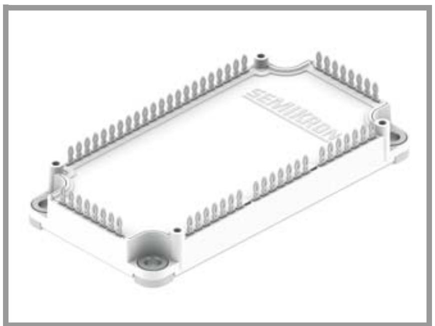
SEMiX206DGDL12M7p



SEMiX® 6p

3-phase bridge rectifer + brake chopper + 3-phase bridge inverter

SEMiX206DGDL12M7p

Features*

- Press Fit
- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- High short circuit capability
- SKR PEP diode-technology for enhanced power and environmental robustness
- UL recognized file no. E63532

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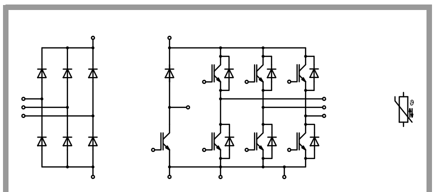
- AC inverter drives
- UPS
- Electronic Welding

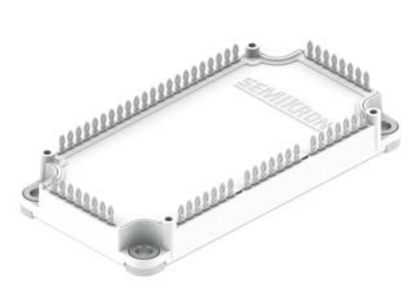
Remarks

- Case temperature limited to T_C=125°C max.
- V_{isol} between temperature sensor and power section is 2500V
- For storage and case temperature with TIM see document “TP(*) SEMiX 6p”



DGDL

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Inverter - IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 175 °C	T_c = 25 °C	287	A
		T_c = 80 °C	217	A
I_{Cnom}			200	A
I_{CRM}			400	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 15 V V_{CES} ≤ 1200 V	T_j = 150 °C	8	µs
T_j			-40 ... 175	°C
Chopper - IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 175 °C	T_c = 25 °C	229	A
		T_c = 80 °C	174	A
I_{Cnom}			150	A
I_{CRM}			300	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 15 V V_{CES} ≤ 1200 V	T_j = 150 °C	8	µs
T_j			-40 ... 175	°C
Inverse - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_c = 25 °C	181	A
		T_c = 80 °C	136	A
I_{FRM}			300	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		900	A
T_j			-40 ... 175	°C
Freewheeling - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 175 °C	T_c = 25 °C	95	A
		T_c = 80 °C	72	A
I_{FRM}			150	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 25 °C		430	A
T_j			-40 ... 175	°C



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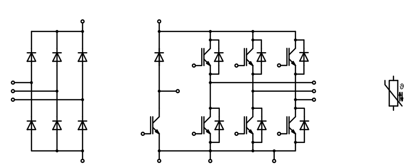
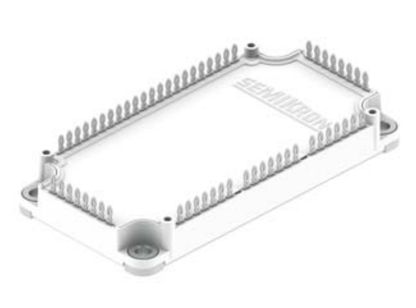


DGDL

Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Rectifier - Diode				
V_{RRM}	T_j = 25 °C		1600	V
I_F	T_j = 150 °C	T_c = 25 °C	262	A
		T_c = 80 °C	174	A
I_{FSM}	t_p = 10 ms sin 180°	T_j = 25 °C	1600	A
		T_j = 150 °C	1260	A
i^2t	t_p = 10 ms sin 180°	T_j = 25 °C	13000	A^2s
		T_j = 150 °C	7940	A^2s
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$	per connector pin		50	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50Hz, 1 min		4000	V

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Inverter - IGBT						
$V_{CE(sat)}$	I_C = 200 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.54	1.88	V
		T_j = 150 °C		1.80		V
V_{CE0}	chiplevel	T_j = 25 °C		0.85	1.02	V
		T_j = 150 °C		0.75		V
r_{CE}	V_{GE} = 15 V, chiplevel	T_j = 25 °C		3.5	4.3	mΩ
		T_j = 150 °C		5.3		mΩ
$V_{GE(th)}$	V_{CE} = 10 V, I_C = 20 mA		5.4	6	6.6	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				2.0	mA
C_{ies}	V_{CE} = 10 V, V_{GE} = 0 V	f = 1 MHz		37.0		nF
C_{oes}		f = 1 MHz		1.2		nF
C_{res}		f = 1 MHz		0.42		nF
Q_G	V_{GE} = -8V ... + 15V			1780		nC
R_{Gint}	T_j = 25 °C			2.0		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 200 A, $R_{G\,on}$ = 1 Ω, $R_{G\,off}$ = 1 Ω, di/dt_{on} = 1300 A/µs, di/dt_{off} = 2300 A/µs, dv/dt = 5850 V/µs, V_{GE} = +15/-15 V, L_s = 35	T_j = 150 °C		256		ns
t_r		T_j = 150 °C		92		ns
E_{on}		T_j = 150 °C		27.8		mJ
$t_{d(off)}$		T_j = 150 °C		316		ns
t_f		T_j = 150 °C		80		ns
E_{off}		T_j = 150 °C		21.2		mJ
$R_{th(j-c)}$	per IGBT				0.19	K/W
$R_{th(c-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.04		K/W



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SEMiX206DGDL12M7p

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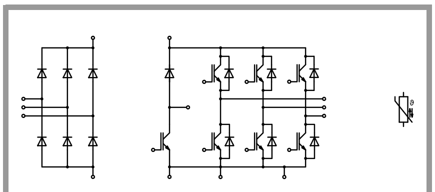
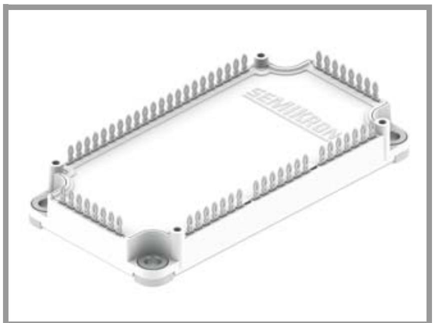


DGDL

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Chopper - IGBT						
$V_{CE(sat)}$	I_C = 150 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.55	1.88	V
		T_j = 150 °C		1.80		V
V_{CE0}	chiplevel	T_j = 25 °C		0.85	1.02	V
		T_j = 150 °C		0.75		V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		4.7	5.7	mΩ
		T_j = 150 °C		7.0		mΩ
$V_{GE(th)}$	V_{CE} = 10 V, I_C = 15 mA		5.4	6	6.6	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1.5	mA
Q_G	V_{GE} = -8V ... + 15V			1340		nC
R_{Gint}	T_j = 25 °C			3.0		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 150 A $R_{G\ on}$ = 1 Ω $R_{G\ off}$ = 1 Ω di/dt_{on} = 820 A/µs di/dt_{off} = 1800 A/µs dv/dt = 5830 V/µs V_{GE} = +15/-15 V L_s = 35 nH	T_j = 150 °C		251		ns
t_r		T_j = 150 °C		106		ns
E_{on}		T_j = 150 °C		20.8		mJ
$t_{d(off)}$		T_j = 150 °C		308		ns
t_f		T_j = 150 °C		69		ns
E_{off}		T_j = 150 °C		16.7		mJ
$R_{th(j-c)}$	per IGBT				0.23	K/W
$R_{th(c-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.04		K/W
Inverse - Diode						
$V_F = V_{EC}$	I_F = 150 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.14	2.46	V
		T_j = 150 °C		2.07		V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90		V
r_F	chiplevel	T_j = 25 °C		5.6	6.4	mΩ
		T_j = 150 °C		7.8		mΩ
I_{RRM}	I_F = 150 A di/dt_{off} = 3411 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		173		A
Q_{rr}		T_j = 150 °C		24.7		µC
E_{rr}		T_j = 150 °C		11.6		mJ
$R_{th(j-c)}$	per diode				0.33	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(mK))			0.05		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	I_F = 75 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.17	2.49	V
		T_j = 150 °C		2.11		V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90		V
r_F	chiplevel	T_j = 25 °C		12	13	mΩ
		T_j = 150 °C		16		mΩ
I_{RRM}	I_F = 75 A di/dt_{off} = 1161 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		51		A
Q_{rr}		T_j = 150 °C		12		µC
E_{rr}		T_j = 150 °C		5.3		mJ
$R_{th(j-c)}$	per diode				0.6	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(mK))			0.08		K/W



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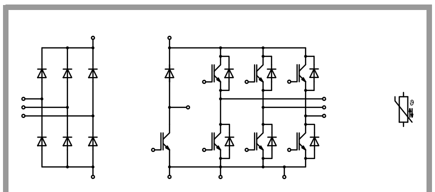


DGDL

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Rectifier - Diode						
$V_F = V_{EC}$	I_F = 71 A chiplevel	T_j = 25 °C		1.00	1.10	V
		T_j = 125 °C		0.91	1.01	V
V_{F0}	chiplevel	T_j = 25 °C		0.90	0.97	V
		T_j = 125 °C		0.78	0.83	V
r_F	chiplevel	T_j = 25 °C		1.41	1.90	mΩ
		T_j = 125 °C		1.83	2.5	mΩ
I_R	T_j = 150 °C, V_{RRM}				2.3	mA
$R_{th(j-c)}$	per diode				0.32	K/W
$R_{th(c-s)}$	per diode (λ_{grease}=0.81 W/(mK))			0.07		K/W
Module						
L_{CE}				21		nH
$R_{CC'+EE'}$	measured per switch	T_C = 25 °C		1.8		mΩ
		T_C = 125 °C		2.5		mΩ
$R_{th(c-s)1}$	calculated without thermal coupling (λ_{grease}=0.81 W/(m*K))			0.003		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module (λ_{grease}=0.81 W/(m*K))			0.005		K/W
M_s	to heat sink (M5)		3		6	Nm
M_t				-		Nm
				-		Nm
w				300		g
Temperature Sensor						
R_{100}	T_r = 100 °C			493 ± 5%		Ω
$B_{100/125}$	$R_{(T)}=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; T[K];			3550 ±2%		K

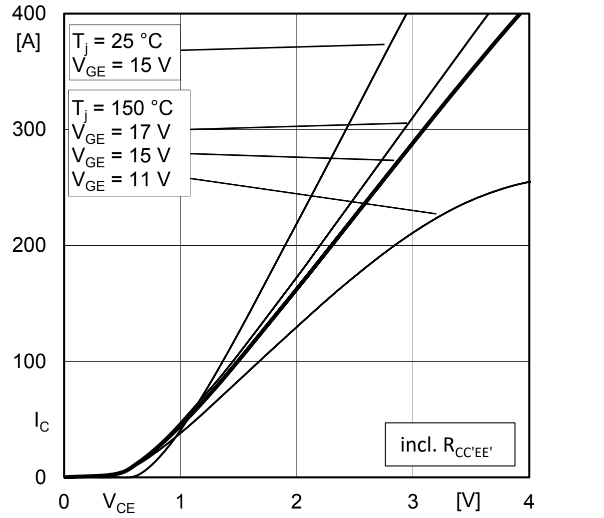


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

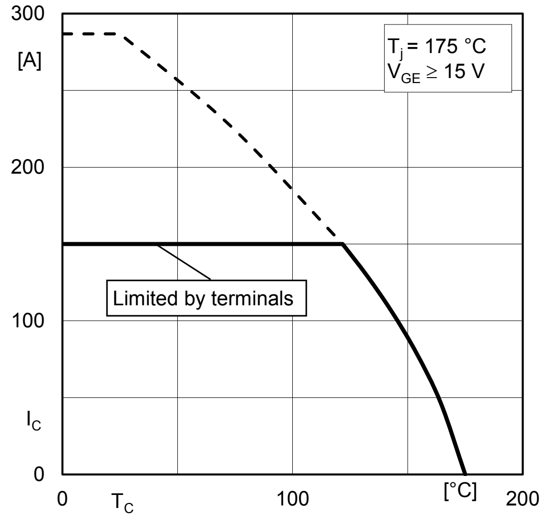


Fig. 2: IGBT rated current vs. temperature I_c=f(T_c)

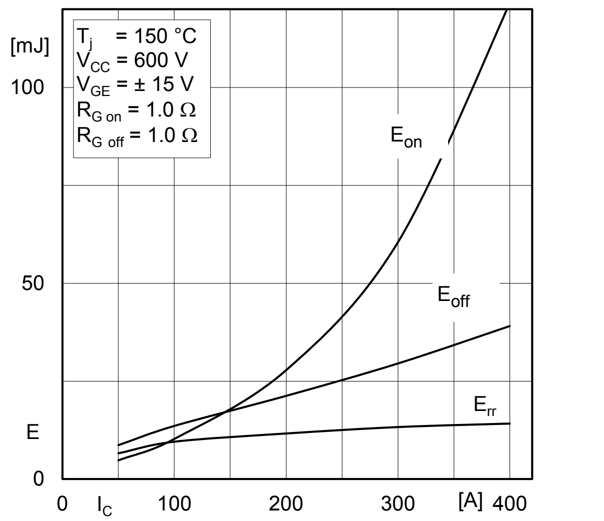


Fig. 3: Typ. turn-on /-off energy = f (I_C)

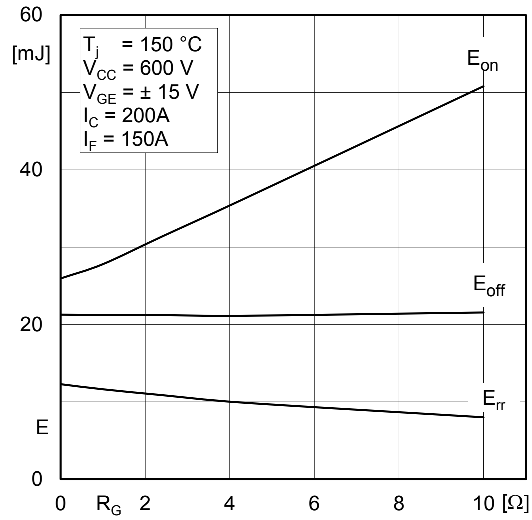


Fig. 4: Typ. turn-on /-off energy = f (R_G)

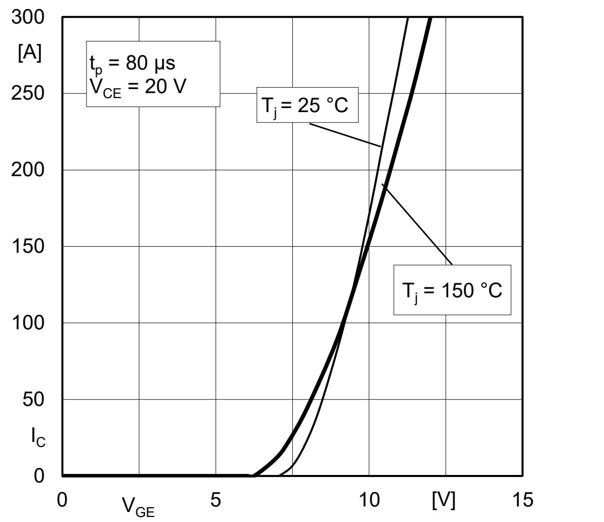


Fig. 5: Typ. transfer characteristic

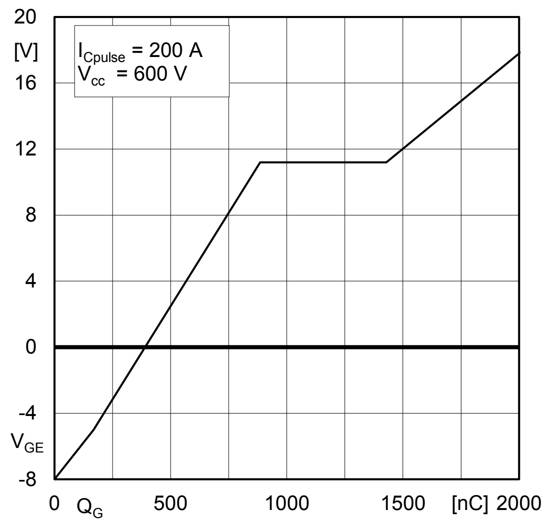


Fig. 6: Typ. gate charge characteristic

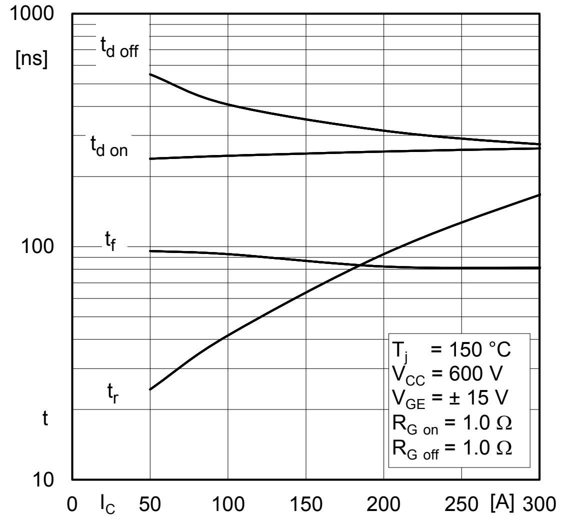


Fig. 7: Typ. switching times vs. I_C

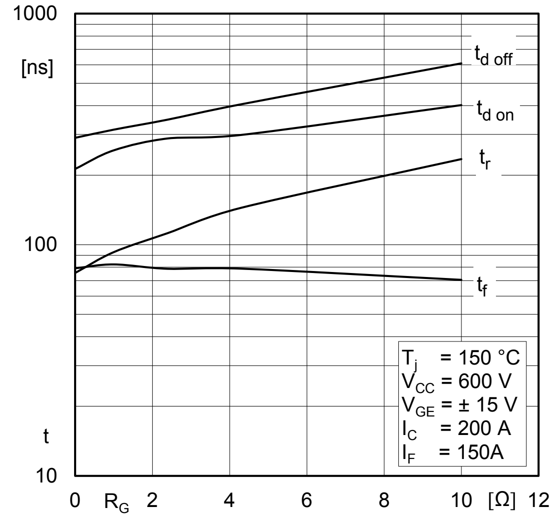


Fig. 8: Typ. switching times vs. gate resistor R_G

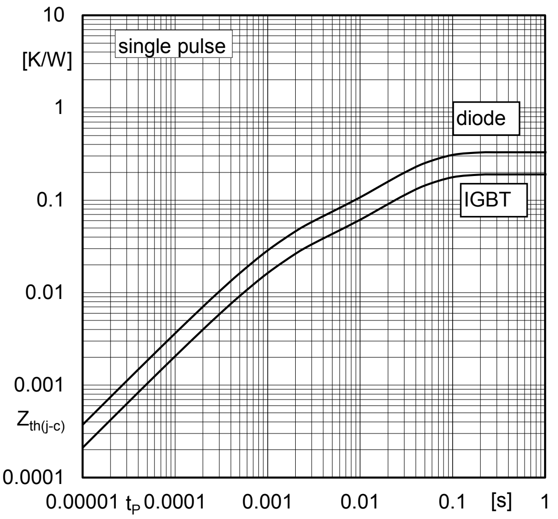


Fig. 9: Transient thermal impedance

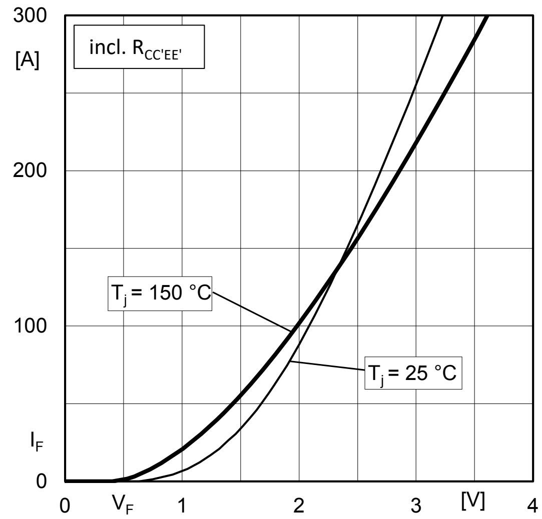


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

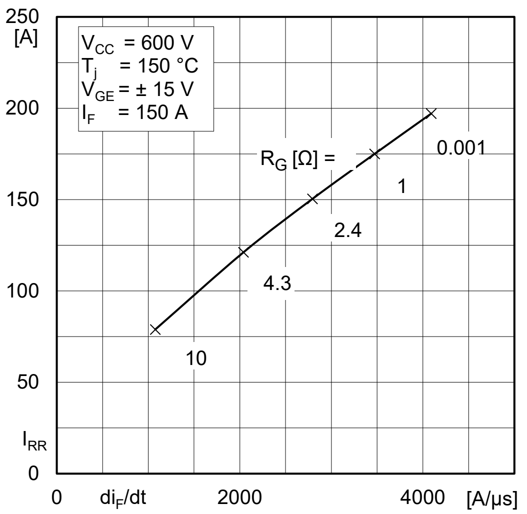


Fig. 11: Typ. CAL diode peak reverse recovery current

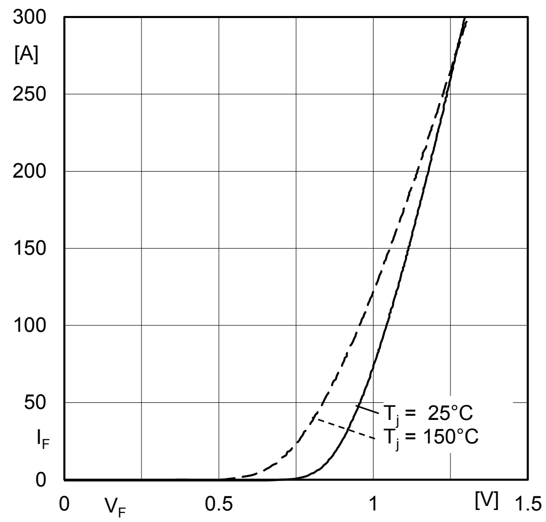
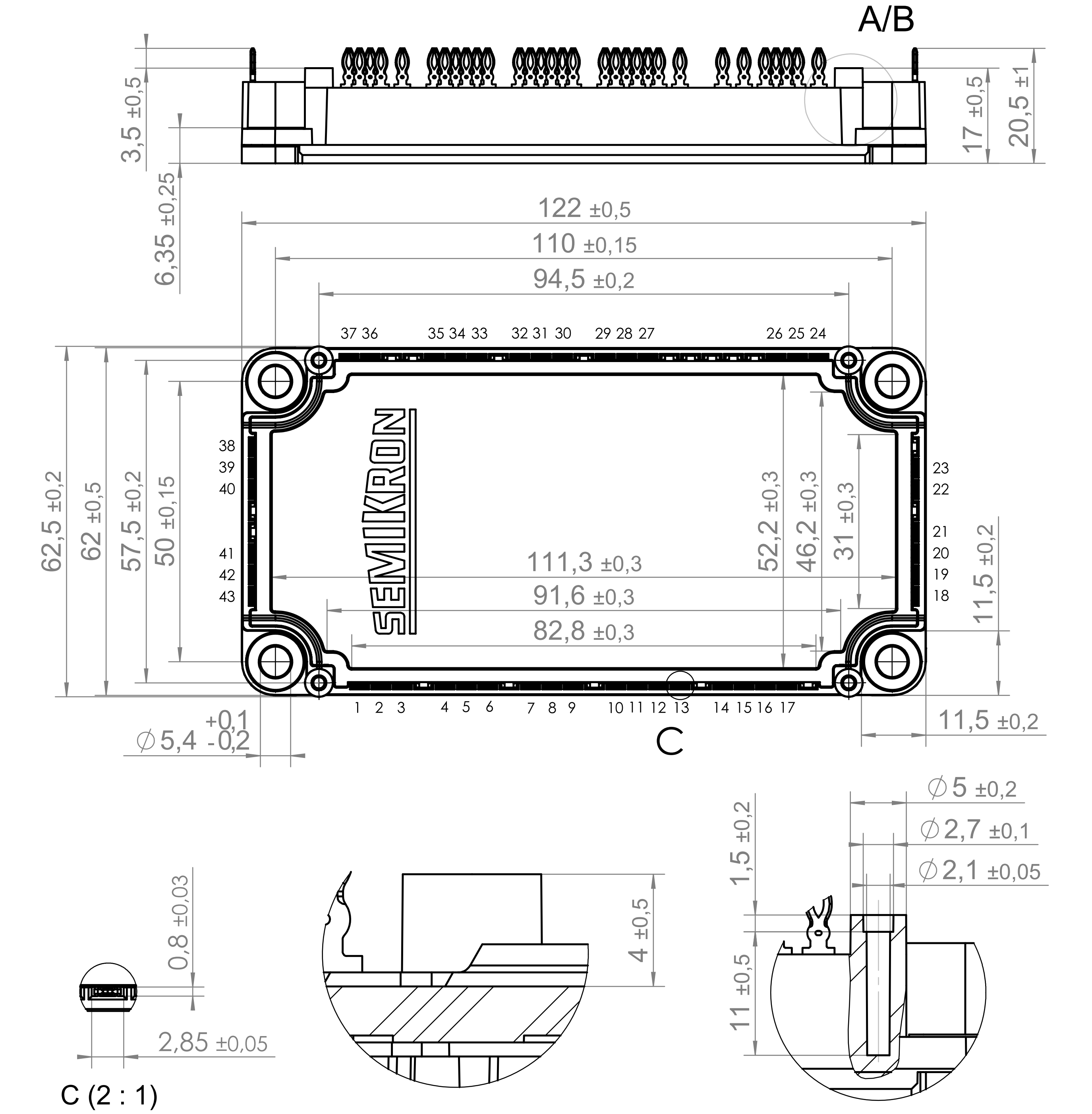


Fig. 12: Typ. input bridge forward characteristic



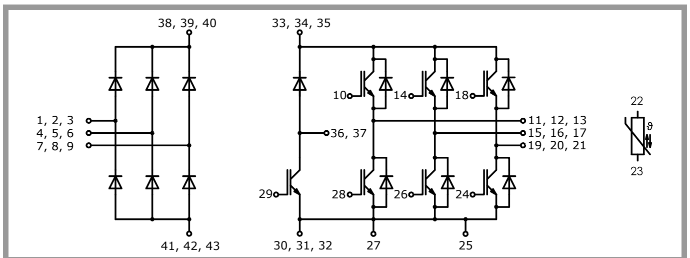
C (2 : 1)

B (5 : 1)
Cross-sectional plane in the middle of the module

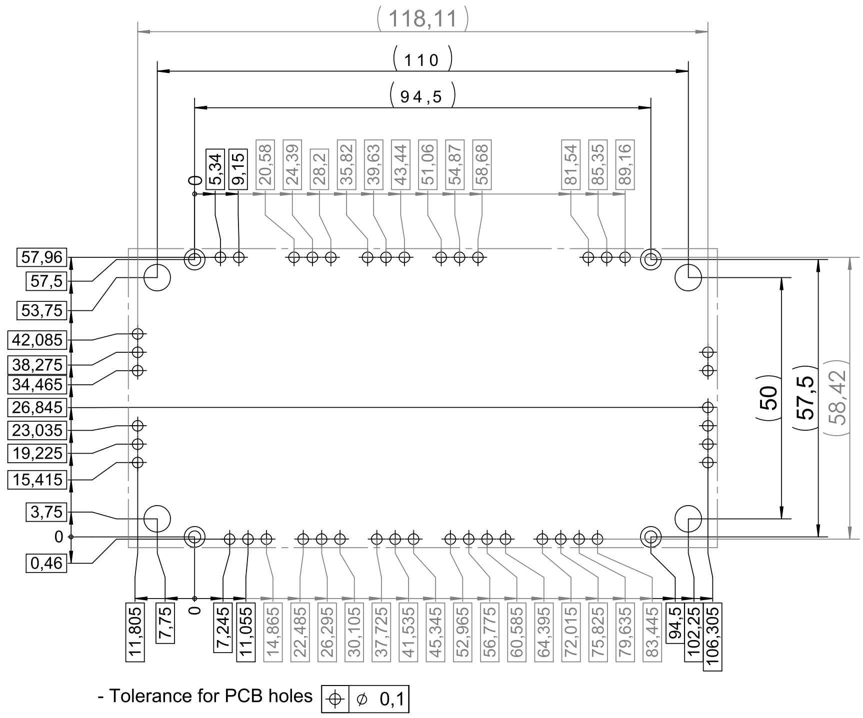
A (2 : 1)
Cut-out shows section through the center of the PCB-dome

Dimensions in mm

SEMiX 6p



pinout



Spring configuration

IMPORTANT INFORMATION AND WARNINGS

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

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