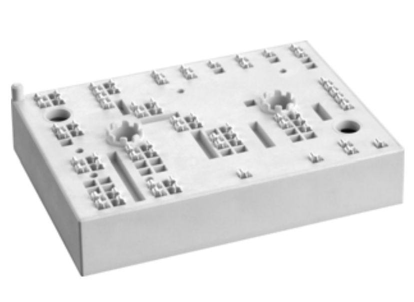

MiniSKiiP® 3

SKiiP 38NAB12T4V1

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- Trench 4 IGBT´s
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Typical Applications*

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Remarks

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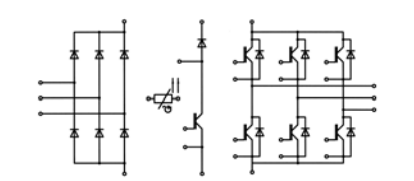
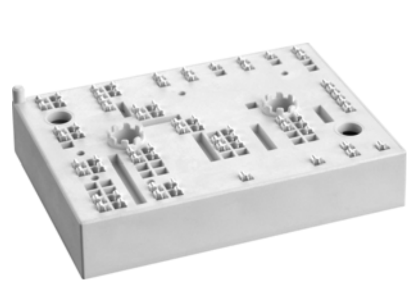


NAB

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 150 °C	T_s = 25 °C	103	A
		T_s = 70 °C	79	A
I_C	T_j = 175 °C	T_s = 25 °C	115	A
		T_s = 70 °C	93	A
I_{Cnom}			100	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		300	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Chopper - IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	T_j = 150 °C	T_s = 25 °C	103	A
		T_s = 70 °C	79	A
I_C	T_j = 175 °C	T_s = 25 °C	115	A
		T_s = 70 °C	93	A
I_{Cnom}			100	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		300	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V $V_{GE} \leq$ 15 V $V_{CES} \leq$ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 150 °C	T_s = 25 °C	89	A
		T_s = 70 °C	66	A
I_F	T_j = 175 °C	T_s = 25 °C	99	A
		T_s = 70 °C	79	A
I_{Fnom}			100	A
I_{FRM}	I_{FRM} = 3 x I_{Fnom}		300	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		550	A
T_j			-40 ... 175	°C
Freewheeling - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	T_j = 150 °C	T_s = 25 °C	89	A
		T_s = 70 °C	66	A
I_F	T_j = 175 °C	T_s = 25 °C	100	A
		T_s = 70 °C	79	A
I_{Fnom}			100	A
I_{FRM}	I_{FRM} = 3 x I_{Fnom}		300	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		550	A
T_j			-40 ... 175	°C



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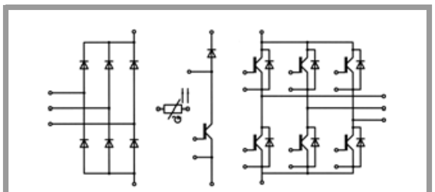


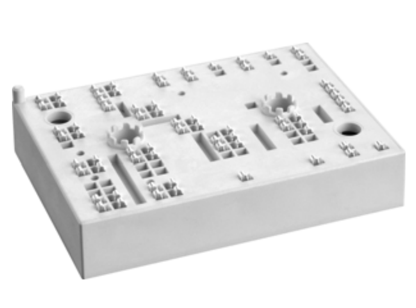
NAB

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Rectifier - Diode				
V_{RRM}	T_j = 25 °C		1600	V
I_F	T_s = 25 °C, T_j = 150 °C		117	A
I_{Fnom}			45	A
I_{FSM}	10 ms sin 180°	T_j = 25 °C	1000	A
		T_j = 150 °C	890	A
I^2t	10 ms sin 180°	T_j = 25 °C	5000	A^2s
		T_j = 150 °C	3900	A^2s
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C, 20A per spring		80	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50Hz, 1 min		2500	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
$V_{CE(sat)}$	I_C = 100 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.80	2.05	V
		T_j = 150 °C		2.20	2.40	V
V_{CE0}		T_j = 25 °C		0.8	0.9	V
		T_j = 150 °C		0.7	0.8	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		10	12	mΩ
		T_j = 150 °C		15	16	mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}$ V, I_C = 4 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	T_j = 25 °C		0.1	0.3	mA
						mA
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V	f = 1 MHz		6.15		nF
C_{oes}		f = 1 MHz		0.41		nF
C_{res}		f = 1 MHz		0.34		nF
Q_G	- 8 V...+ 15 V			565		nC
R_{Gint}	T_j = 25 °C			7.50		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 100 A, $R_{G\,on}$ = 1 Ω, $R_{G\,off}$ = 1 Ω	T_j = 150 °C		160		ns
t_r		T_j = 150 °C		35		ns
E_{on}		T_j = 150 °C		11.2		mJ
$t_{d(off)}$		T_j = 150 °C		390		ns
t_f		T_j = 150 °C		75		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		10		mJ
$R_{th(j-s)}$	per IGBT			0.48		K/W
Chopper - IGBT						
$V_{CE(sat)}$	I_C = 100 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.80	2.05	V
		T_j = 150 °C		2.20	2.40	V
V_{CE0}		T_j = 25 °C		0.8	0.9	V
		T_j = 150 °C		0.7	0.8	V
r_{CE}	V_{GE} = 15 V	T_j = 25 °C		10	12	mΩ
		T_j = 150 °C		15	16	mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}$ V, I_C = 4 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	T_j = 25 °C		0.1	0.3	mA
		T_j = 150 °C				mA
Q_G	- 8 V...+ 15 V			565		nC
R_{Gint}	T_j = 25 °C			7.50		Ω



MiniSKiiP® 3

SKiiP 38NAB12T4V1

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- V_{CEsat} , V_F= chip level value
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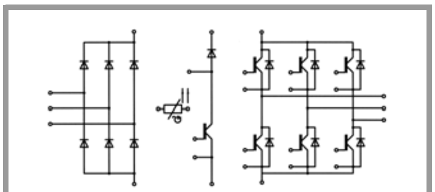
- product rel. results valid for $T_j \leq 150$ (recomm. T_{op} = -40 ... +150°C)
- for short circuit: Soft R_{Goff} recommended



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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
$t_{d(on)}$	V_{CC} = 600 V	T_j = 150 °C		160		ns
t_r	I_C = 100 A	T_j = 150 °C		35		ns
E_{on}	$R_{G\ on}$ = 1 Ω	T_j = 150 °C		11.2		mJ
$t_{d(off)}$	$R_{G\ off}$ = 1 Ω	T_j = 150 °C		390		ns
t_f		T_j = 150 °C		75		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		10		mJ
$R_{th(j-s)}$	per IGBT			0.48		K/W
Inverse - Diode						
$V_F = V_{EC}$	I_F = 100 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.2	2.5	V
		T_j = 150 °C		2.1	2.5	V
V_{F0}		T_j = 25 °C		1.3	1.5	V
		T_j = 150 °C		0.9	1.1	V
r_F		T_j = 25 °C		9.0	10	mΩ
		T_j = 150 °C		13	14	mΩ
I_{RRM}	I_F = 100 A	T_j = 150 °C		82		A
Q_{rr}	di/dt_{off} = 2400 A/µs	T_j = 150 °C		16.4		µC
E_{rr}	V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		6.5		mJ
$R_{th(j-s)}$	per Diode			0.66		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	I_F = 100 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.2	2.5	V
		T_j = 150 °C		2.1	2.5	V
V_{F0}		T_j = 25 °C		1.3	1.5	V
		T_j = 150 °C		0.9	1.1	V
r_F		T_j = 25 °C		9.0	10	mΩ
		T_j = 150 °C		13	14	mΩ
I_{RRM}	I_F = 100 A	T_j = 150 °C		82		A
Q_{rr}	di/dt_{off} = 2400 A/µs	T_j = 150 °C		16.4		µC
E_{rr}	V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		6.5		mJ
$R_{th(j-s)}$	per Diode			0.66		K/W
Rectifier - Diode						
$V_F = V_{EC}$	I_F = 45 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1	1.21	V
		T_j = 125 °C			1.1	V
V_{F0}		T_j = 25 °C			1.0	V
		T_j = 125 °C			0.8	V
r_F		T_j = 25 °C		2.7	5.2	mΩ
		T_j = 125 °C			6.0	mΩ
$R_{th(j-s)}$	per Diode			0.7		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				95		g
Temperatur Sensor						
R_{100}	T_r = 100 °C, tolerance = 3 %			1670 ± 3%		Ω
R(T)	$R(T)=1000\Omega[1+A(T-25°C)+B(T-25°C)^2]$, $A = 7.635*10^{-3}\ °C^{-1}$, $B = 1.731*10^{-5}\ °C^{-2}$					

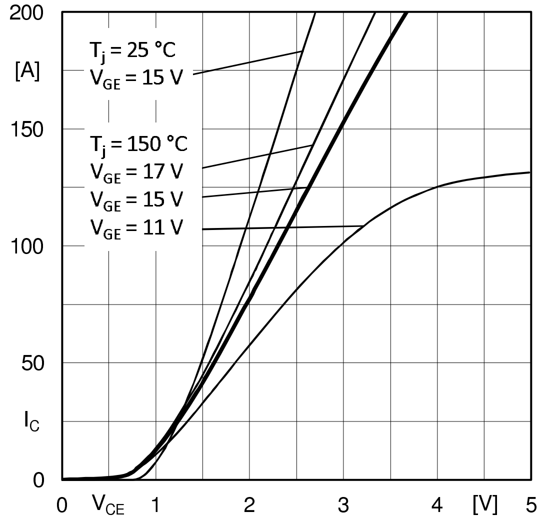


Fig. 1: Typ. output characteristic

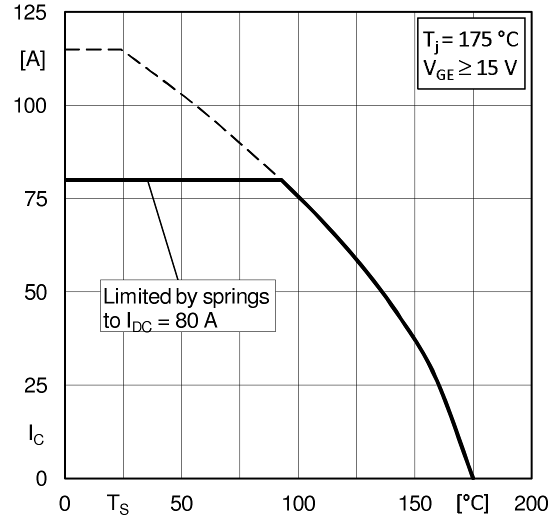


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

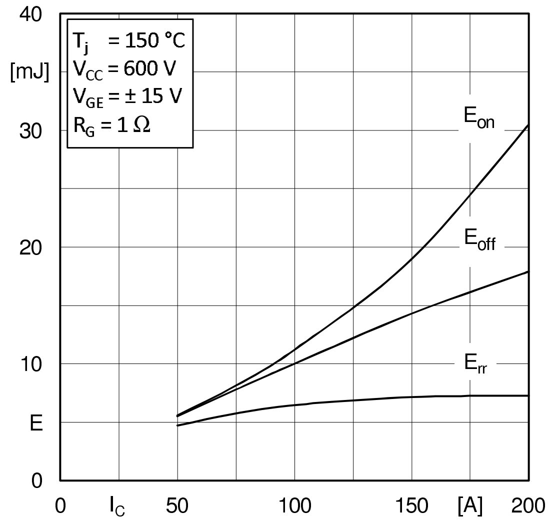


Fig. 3: Typ. turn-on /-off energy = f (I_C)

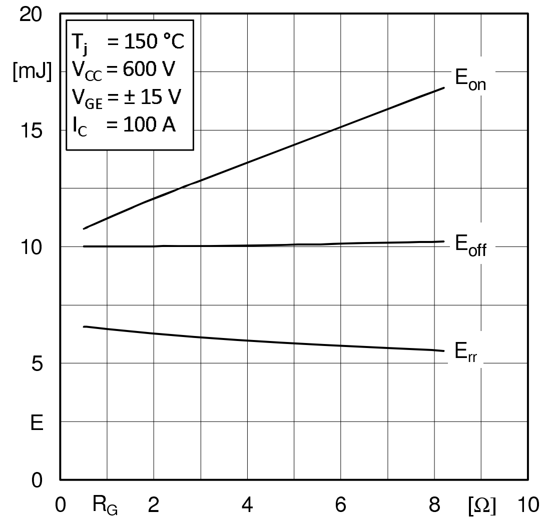


Fig. 4: Typ. turn-on /-off energy = f (R_G)

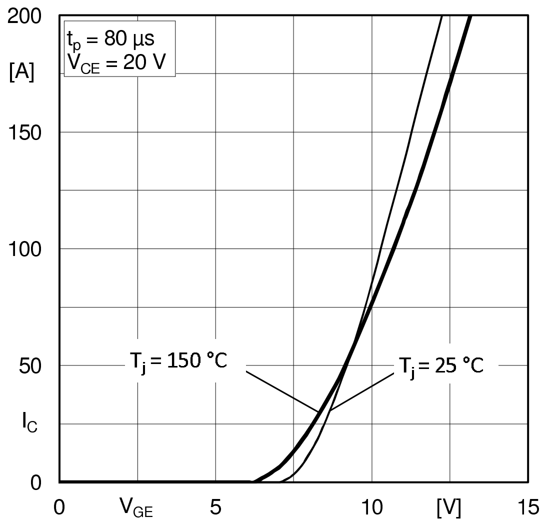


Fig. 5: Typ. transfer characteristic

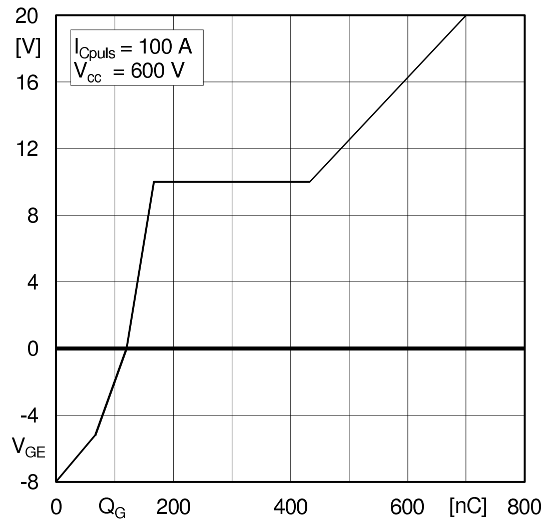


Fig. 6: Typ. gate charge characteristic

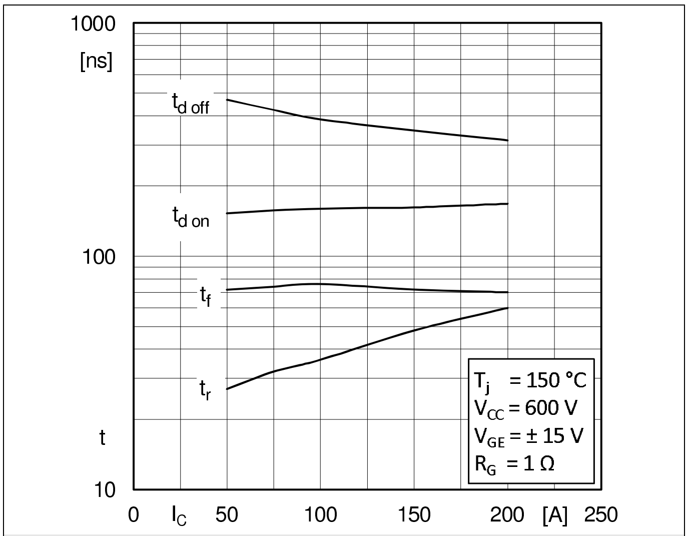


Fig. 7: Typ. switching times vs. I_C

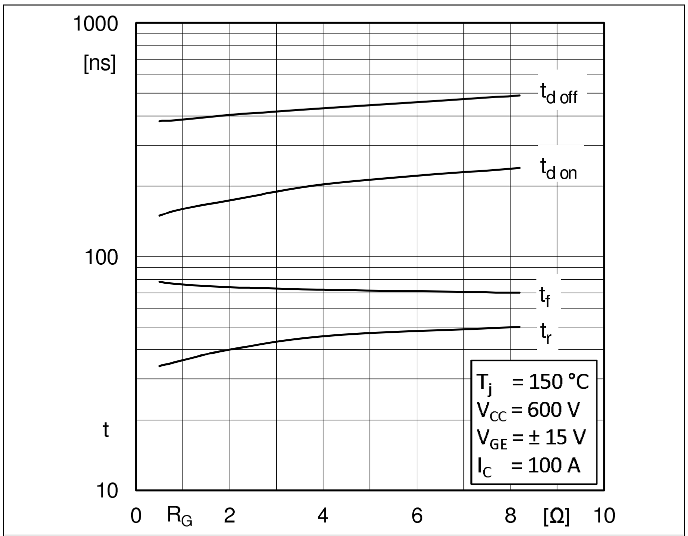


Fig. 8: Typ. switching times vs. gate resistor R_G

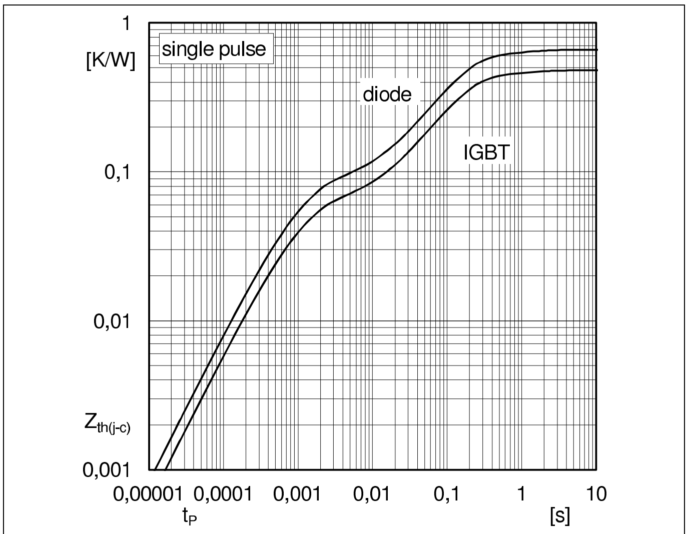


Fig. 9: Transient thermal impedance of IGBT and Diode

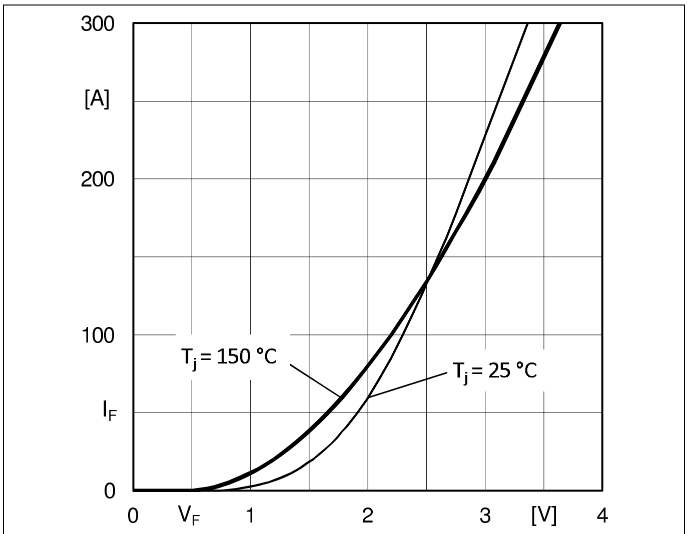


Fig. 10: CAL diode forward characteristic

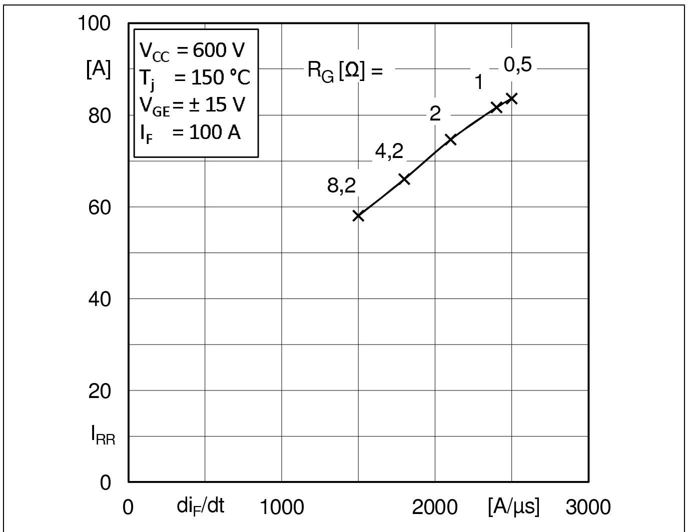


Fig. 11: Typ. CAL diode peak reverse recovery current

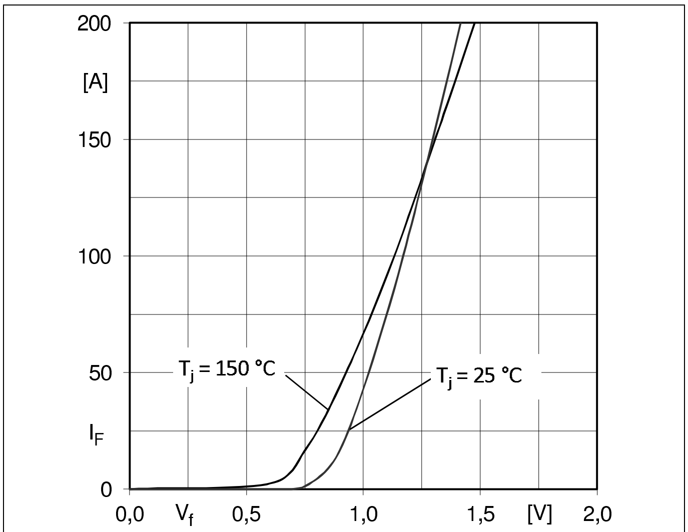
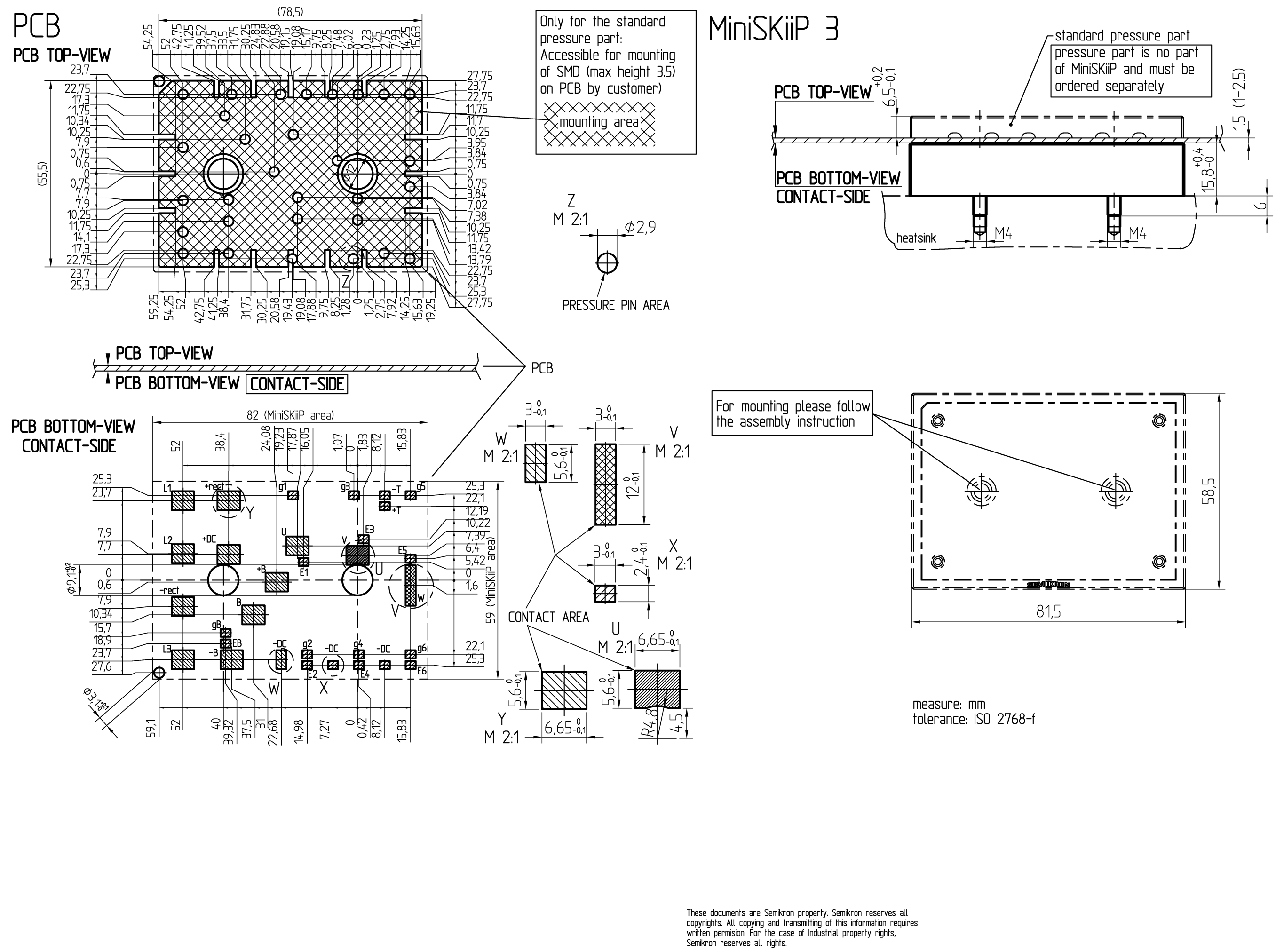
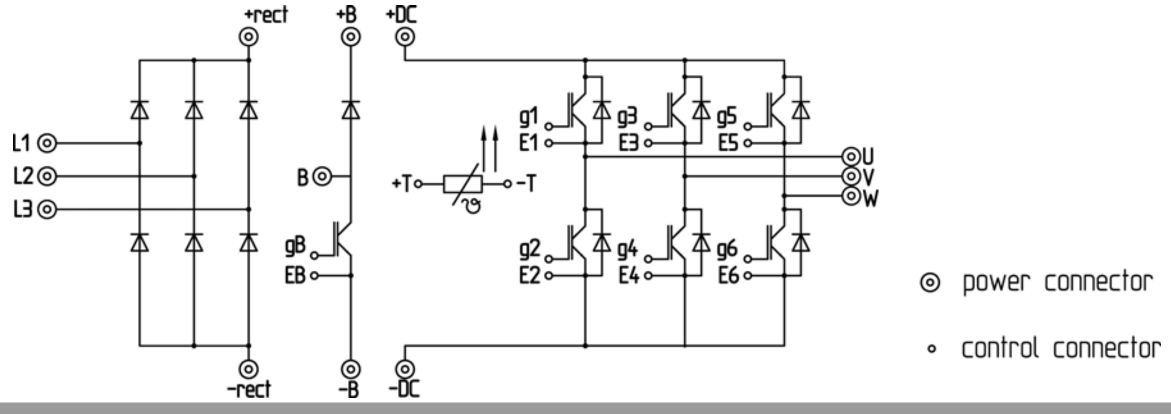


Fig. 12: Typ. input bridge forward characteristic



pinout, dimensions



pinout

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 staff.