SKiiP 38NAB12T4V1

MiniSKiiP® 3

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Features

- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Typical Applications*

- Inverter up to 41 kVA
- Typical motor power 22 kW

Remarks

- Max. case temperature limited to T_C=125°C
- Product reliability results valid for T_j≤150°C (recommended $T_{j,op}$=-40...+150°C)
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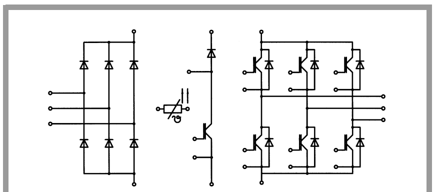

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Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Inverter - IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	115	A
		T_s = 70 °C	93	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	140	A
		T_s = 70 °C	114	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} ≤ 15 V V_{CES} ≤ 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	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	115	A
		T_s = 70 °C	93	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	140	A
		T_s = 70 °C	114	A
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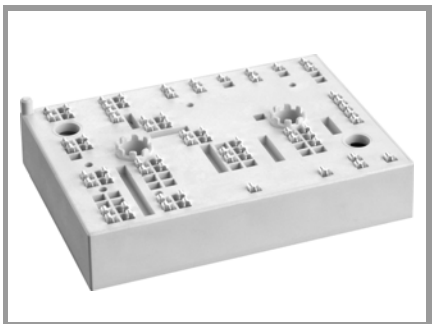
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 15 V V_{CES} ≤ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	99	A
		T_s = 70 °C	79	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	116	A
		T_s = 70 °C	93	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	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	100	A
		T_s = 70 °C	79	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	116	A
		T_s = 70 °C	93	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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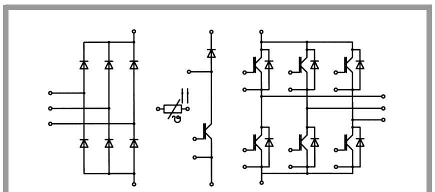

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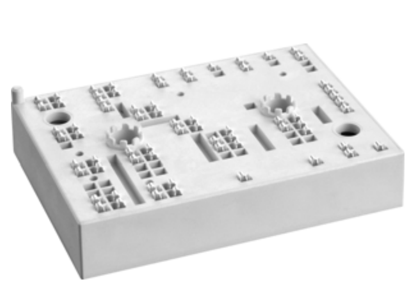
Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Rectifier - Diode				
V_{RRM}	T_j = 25 °C		1600	V
I_F	λ_{paste}=0.8 W/(mK) T_j = 150 °C	T_s = 25 °C	117	A
		T_s = 70 °C	86	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 150 °C	T_s = 25 °C	136	A
		T_s = 70 °C	101	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	4000	A^2s
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C, 20 A per spring		80	A
T_{stg}			-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, 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}	chiplevel	T_j = 25 °C		0.80	0.90	V
		T_j = 150 °C		0.70	0.80	V
r_{CE}	V_{GE} = 15 V chiplevel	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
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		0.35		nF
Q_G	V_{GE} = - 8 V...+ 15 V			565		nC
R_{Gint}	T_j = 25 °C			7.5		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, λ_{paste}=0.8 W/(mK)			0.48		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.34		K/W



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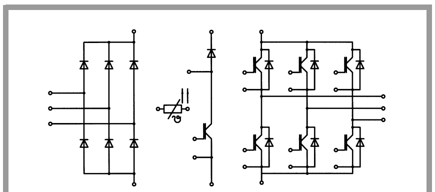

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
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}	chiplevel	T_j = 25 °C		0.80	0.90	V
		T_j = 150 °C		0.70	0.80	V
r_{CE}	V_{GE} = 15 V, chiplevel	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
Q_G	V_{GE} = - 8 V...+ 15 V			565		nC
R_{Gint}	T_j = 25 °C			7.5		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, λ_{paste}=0.8 W/(mK)			0.48		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.34		K/W
Inverse - Diode						
$V_F = V_{EC}$	I_F = 100 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.20	2.52	V
		T_j = 150 °C		2.15	2.47	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		9.0	10	mΩ
		T_j = 150 °C		13	14	mΩ
I_{RRM}	I_F = 100 A, di/dt_{off} = 2400 A/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		82		A
Q_{rr}		T_j = 150 °C		16.4		µC
E_{rr}		T_j = 150 °C		6.5		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.66		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.52		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	I_F = 100 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.20	2.52	V
		T_j = 150 °C		2.15	2.47	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		9.0	10	mΩ
		T_j = 150 °C		13	14	mΩ
I_{RRM}	I_F = 100 A, di/dt_{off} = 2400 A/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		82		A
Q_{rr}		T_j = 150 °C		16.4		µC
E_{rr}		T_j = 150 °C		6.5		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.66		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.52		K/W

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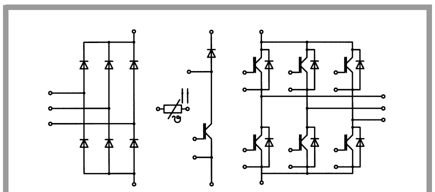
Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Rectifier - Diode						
$V_F = V_{EC}$	I_F = 45 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.00	1.21	V
		T_j = 125 °C		0.90	1.10	V
V_{F0}	chiplevel	T_j = 25 °C		0.88	0.98	V
		T_j = 125 °C		0.73	0.83	V
r_F	chiplevel	T_j = 25 °C		2.7	5.1	mΩ
		T_j = 125 °C		3.8	6.0	mΩ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.7		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.56		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				82		g
L_{CE}				-		nH
Temperature Sensor						
R_{100}	T_r = 100 °C			1670 ± 3%		Ω
R(T)	R(T)=1000Ω[1+A(T-25°C)+B(T-25°C)^2], A = 7.635*10^{-3} °C^{-1}, B = 1.731*10^{-5} °C^{-2}					



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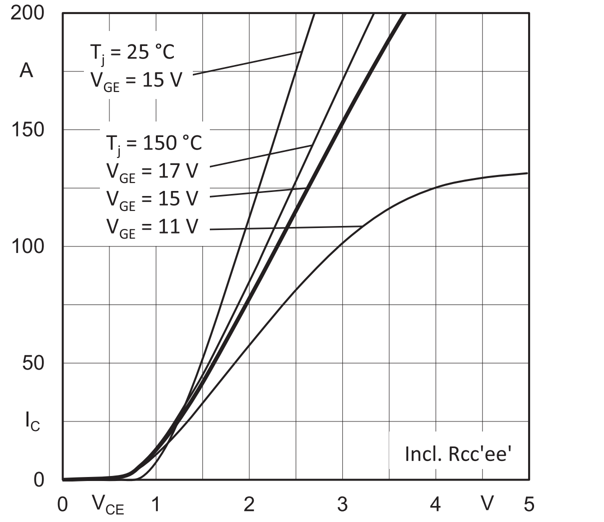


Fig. 1: Typ. output characteristic

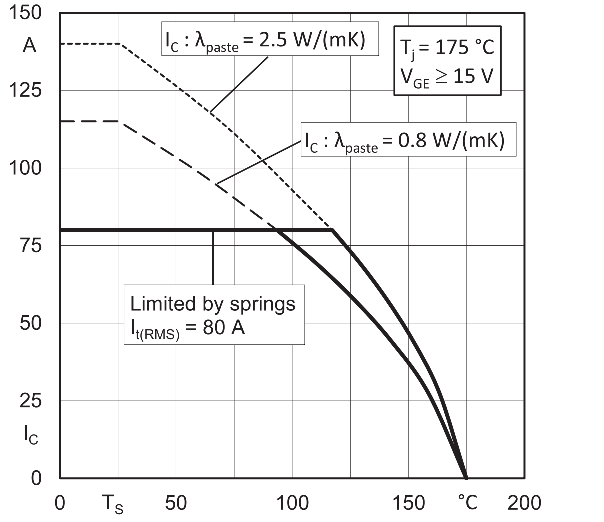


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

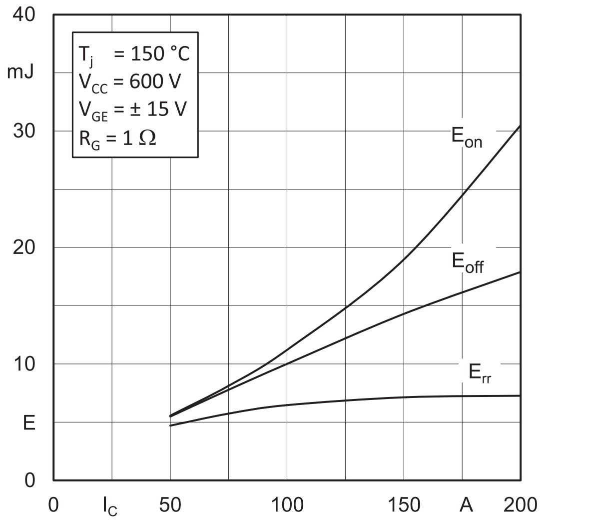


Fig. 3: Typ. turn-on /-off energy = f (I_C)

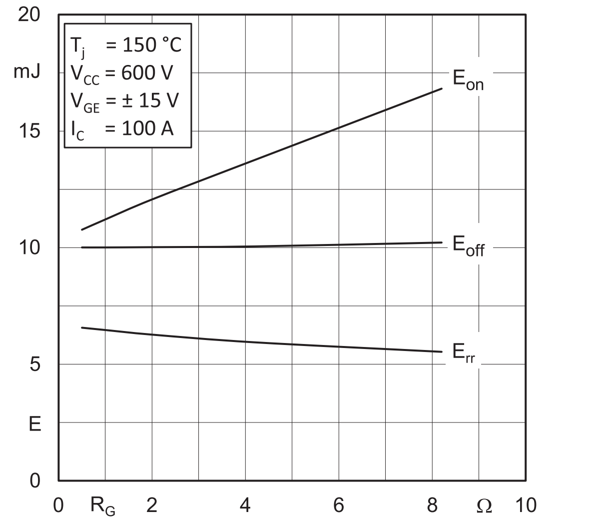


Fig. 4: Typ. turn-on /-off energy = f (R_G)

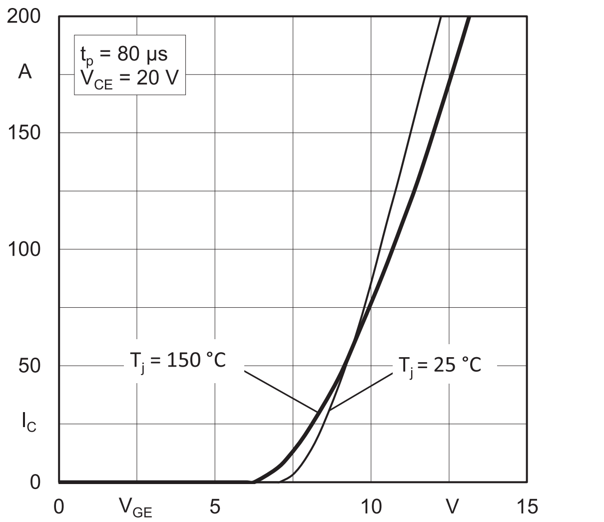


Fig. 5: Typ. transfer characteristic

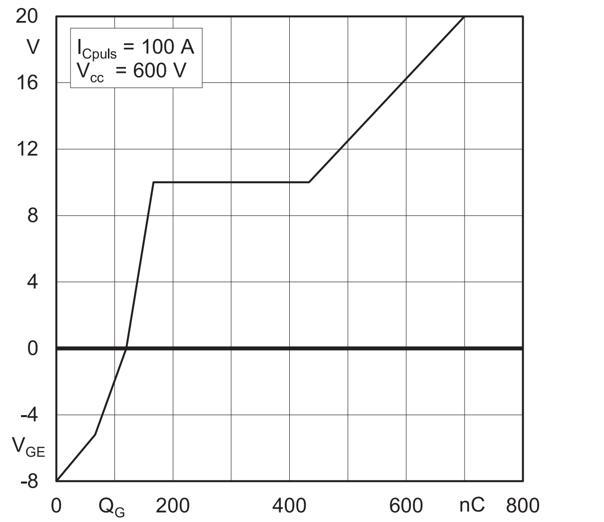


Fig. 6: Typ. gate charge characteristic

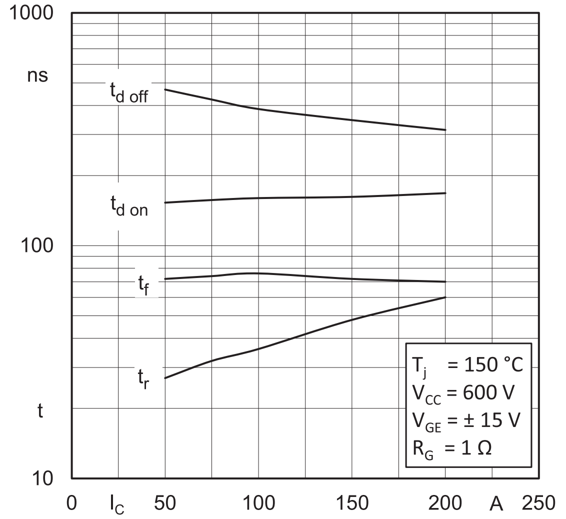


Fig. 7: Typ. switching times vs. I_C

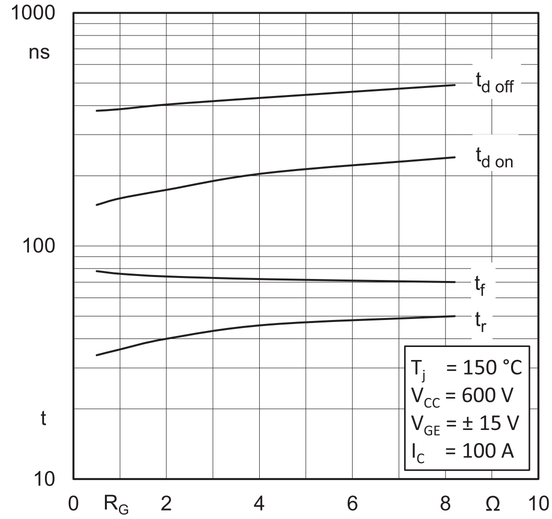


Fig. 8: Typ. switching times vs. gate resistor R_G

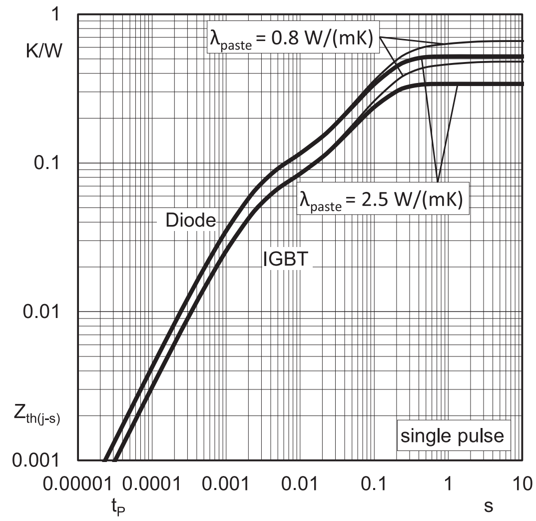


Fig. 9: Transient thermal impedance of IGBT and Diode

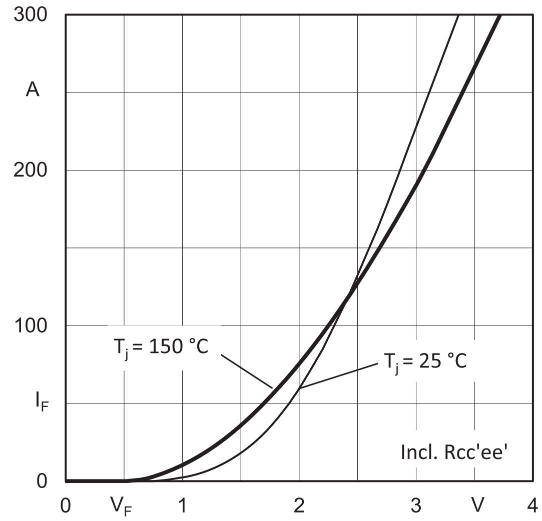


Fig. 10: CAL diode forward characteristic

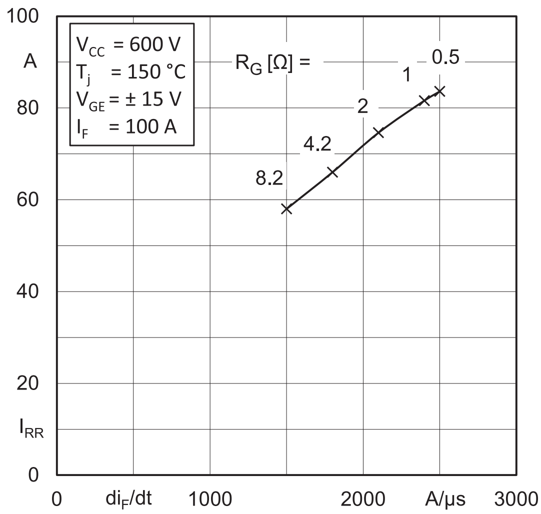


Fig. 11: Typ. CAL diode peak reverse recovery current

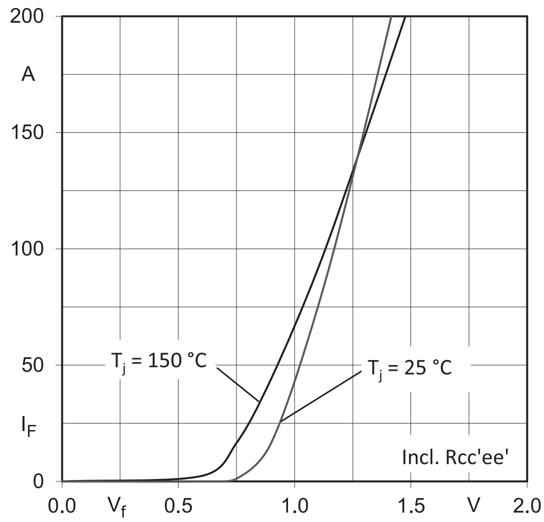
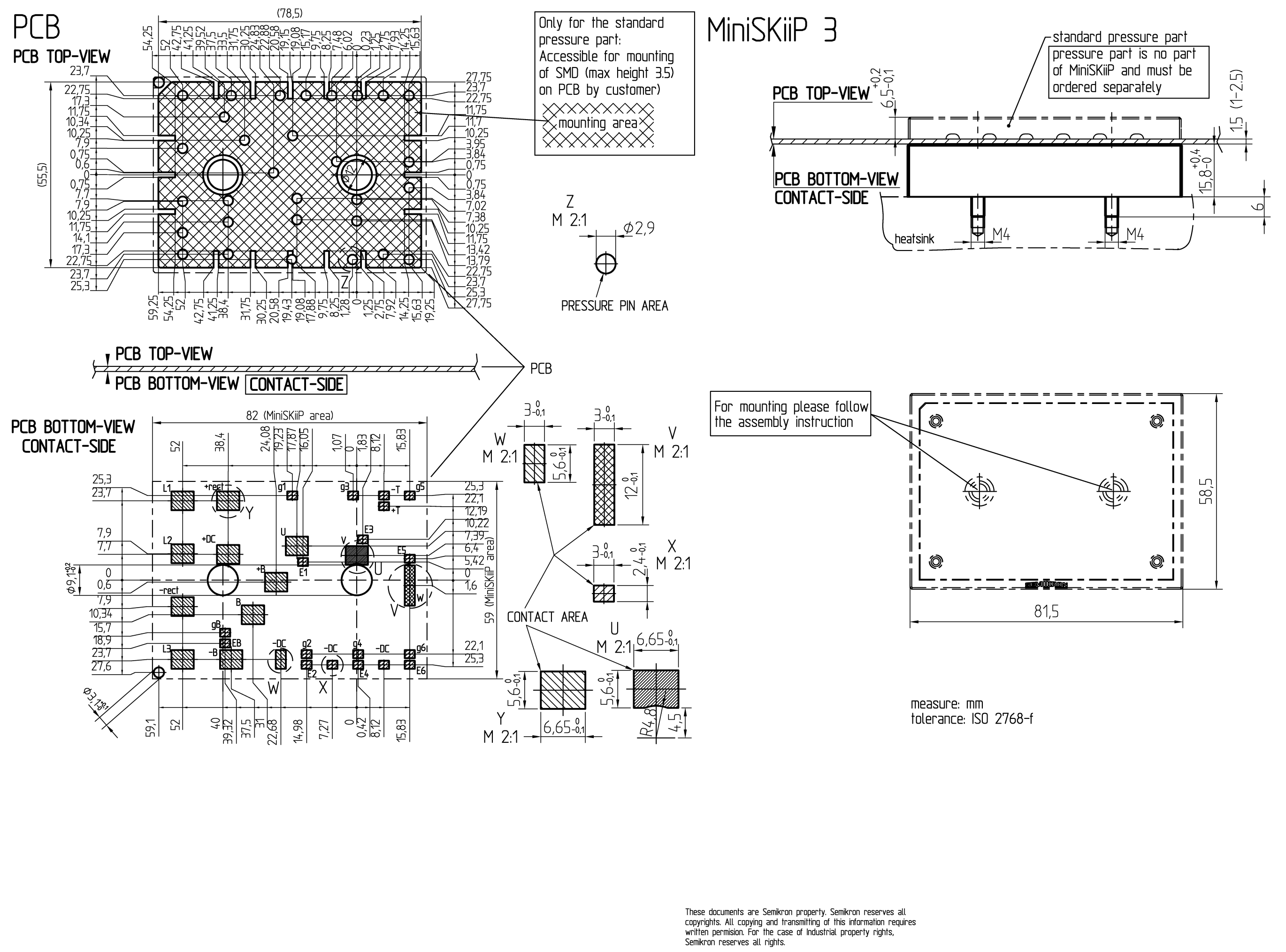
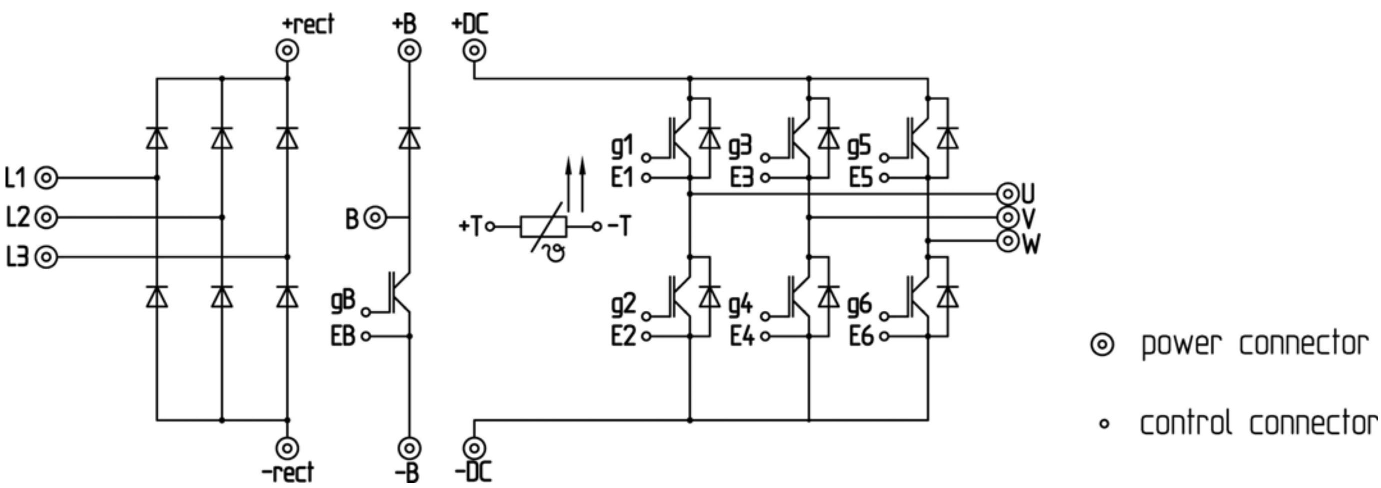


Fig. 12: Typ. input bridge forward characteristic



pinout, dimensions



pinout

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

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