SKiiP 35NAB12T4V1

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 26 kVA
- Typical motor power 15 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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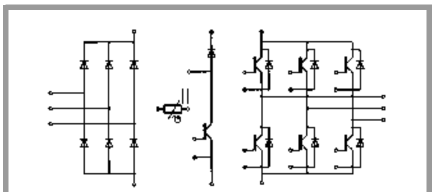

NAB

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_s = 25 °C	69	A
	T_j = 175 °C	T_s = 70 °C	56	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	78	A
	T_j = 175 °C	T_s = 70 °C	63	A
I_{Cnom}			50	A
I_{CRM}	I_{CRM} = 3 x I_{Cnom}		150	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_s = 25 °C	69	A
	T_j = 175 °C	T_s = 70 °C	56	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	78	A
	T_j = 175 °C	T_s = 70 °C	63	A
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I_{CRM}	I_{CRM} = 3 x I_{Cnom}		150	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
Inverse - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	60	A
	T_j = 175 °C	T_s = 70 °C	48	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	68	A
	T_j = 175 °C	T_s = 70 °C	54	A
I_{Fnom}			50	A
I_{FRM}	I_{FRM} = 3 x I_{Fnom}		150	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		270	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_s = 25 °C	60	A
	T_j = 175 °C	T_s = 70 °C	48	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	68	A
	T_j = 175 °C	T_s = 70 °C	54	A
I_{Fnom}			50	A
I_{FRM}	I_{FRM} = 3 x I_{Fnom}		150	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		270	A
T_j			-40 ... 175	°C

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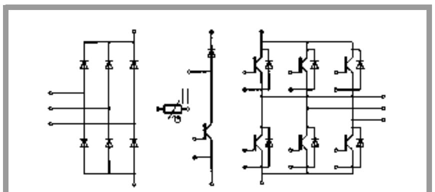

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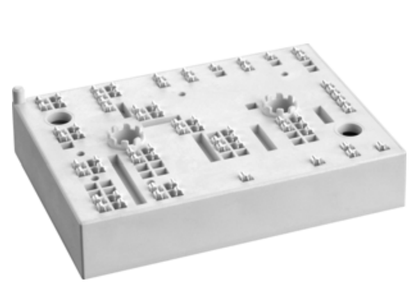
Absolute Maximum Ratings

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	81	A
		T_s = 70 °C	60	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 150 °C	T_s = 25 °C	92	A
		T_s = 70 °C	68	A
I_{Fnom}			25	A
I_{FSM}	10 ms sin 180°	T_j = 25 °C	700	A
		T_j = 150 °C	490	A
I^2t	10 ms sin 180°	T_j = 25 °C	2500	A^2s
		T_j = 150 °C	1200	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 = 50 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.10	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		21	24	mΩ
		T_j = 150 °C		30	32	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE} V, I_C = 2 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		2.77		nF
C_{oes}		f = 1 MHz		0.21		nF
C_{res}		f = 1 MHz		0.16		nF
Q_G	V_{GE} = - 8 V...+ 15 V			280		nC
R_{Gint}	T_j = 25 °C			4.0		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 50 A $R_{G\ on}$ = 15 Ω $R_{G\ off}$ = 15 Ω	T_j = 150 °C		60		ns
t_r		T_j = 150 °C		35		ns
E_{on}		T_j = 150 °C		6		mJ
$t_{d(off)}$		T_j = 150 °C		370		ns
t_f		T_j = 150 °C		60		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		4.7		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.71		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.57		K/W



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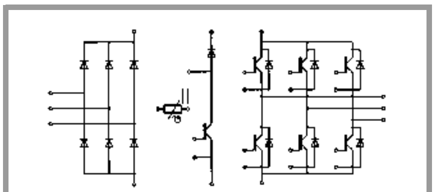

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Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Chopper - IGBT						
$V_{CE(sat)}$	I_C = 50 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.20	2.40	V
V_{CE0}	chiplevel	T_j = 25 °C		0.80	0.90	V
		T_j = 150 °C		0.70	0.80	V
r_{CE}	V_{GE} = 15 V, chiplevel	T_j = 25 °C		21	24	mΩ
		T_j = 150 °C		30	32	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE} V, I_C = 2 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			280		nC
R_{Gint}	T_j = 25 °C			4.0		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 50 A, $R_{G\,on}$ = 15 Ω, $R_{G\,off}$ = 15 Ω	T_j = 150 °C		60		ns
t_r		T_j = 150 °C		35		ns
E_{on}		T_j = 150 °C		6		mJ
$t_{d(off)}$		T_j = 150 °C		370		ns
t_f		T_j = 150 °C		60		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		4.7		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.71		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.57		K/W
Inverse - Diode						
$V_F = V_{EC}$	I_F = 50 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.22	2.54	V
		T_j = 150 °C		2.18	2.50	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		18	21	mΩ
		T_j = 150 °C		26	28	mΩ
I_{RRM}	I_F = 50 A, di/dt_{off} = 1400 A/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		45		A
Q_{rr}		T_j = 150 °C		8.6		µC
E_{rr}		T_j = 150 °C		3.4		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.95		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.79		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	I_F = 50 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.22	2.54	V
		T_j = 150 °C		2.18	2.50	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		18	21	mΩ
		T_j = 150 °C		26	28	mΩ
I_{RRM}	I_F = 50 A, di/dt_{off} = 1400 A/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		45		A
Q_{rr}		T_j = 150 °C		8.6		µC
E_{rr}		T_j = 150 °C		3.4		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.95		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.79		K/W

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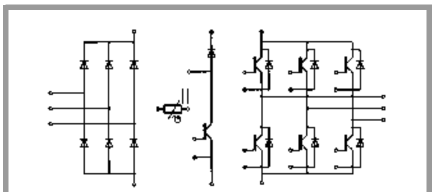


NAB

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Rectifier - Diode						
$V_F = V_{EC}$	I_F = 25 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		4.8	9.2	mΩ
		T_j = 125 °C		6.8	11	mΩ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.9		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.75		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}					

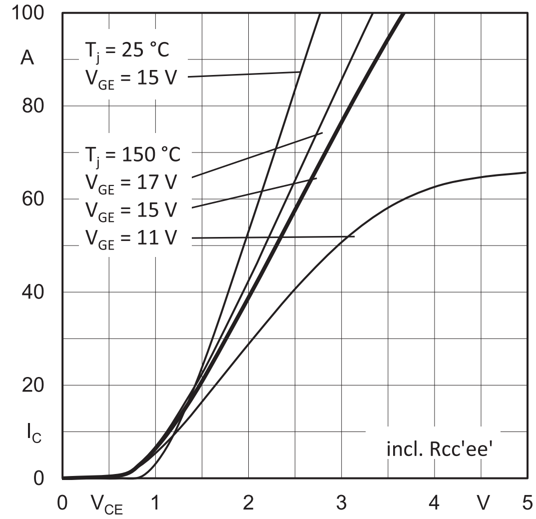


Fig. 1: Typ. output characteristic

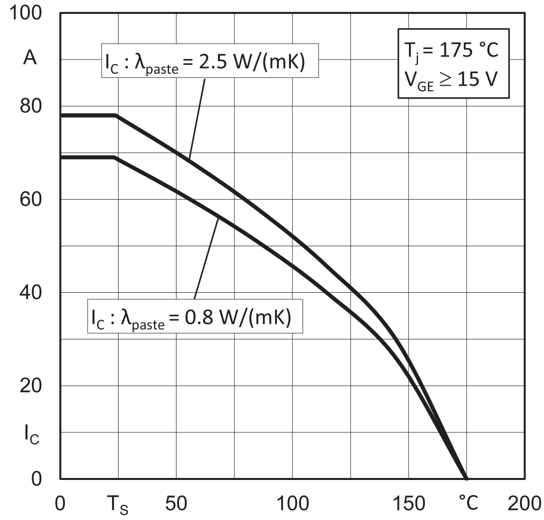


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

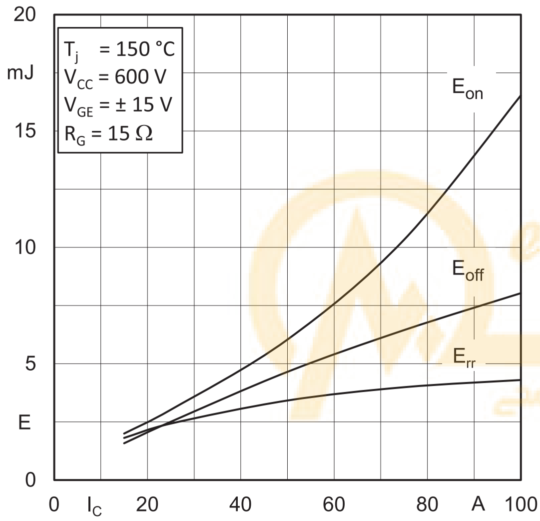


Fig. 3: Typ. turn-on /-off energy = f (I_C)

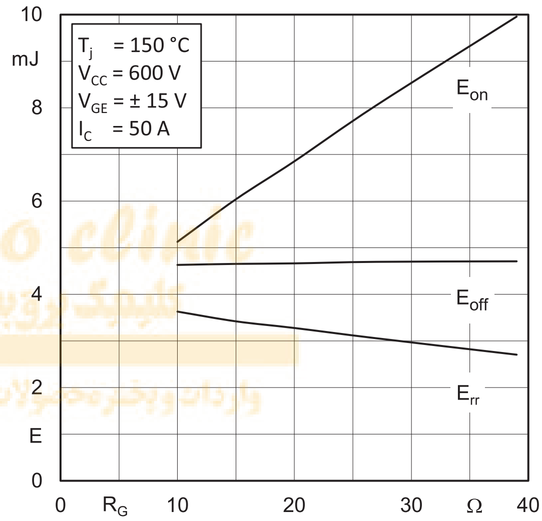


Fig. 4: Typ. turn-on /-off energy = f (R_G)

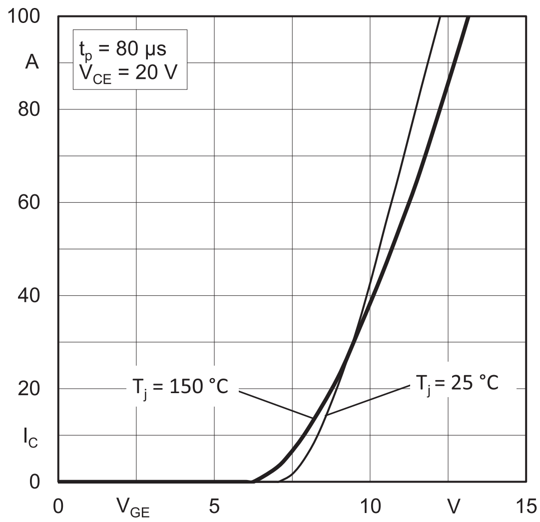


Fig. 5: Typ. transfer characteristic

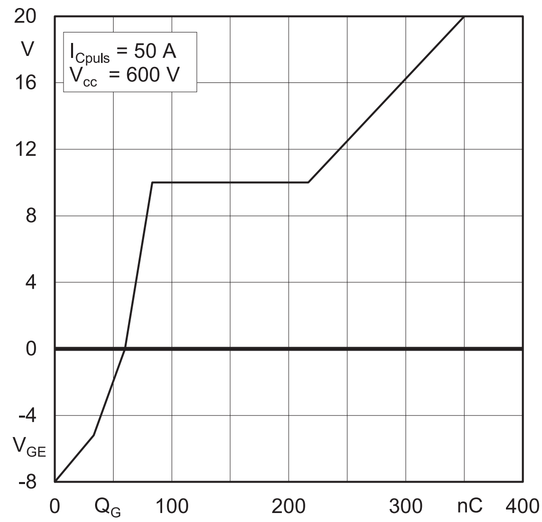


Fig. 6: Typ. gate charge characteristic

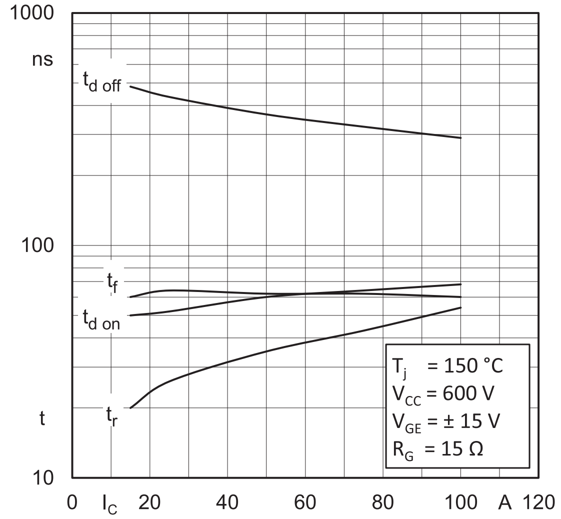


Fig. 7: Typ. switching times vs. I_C

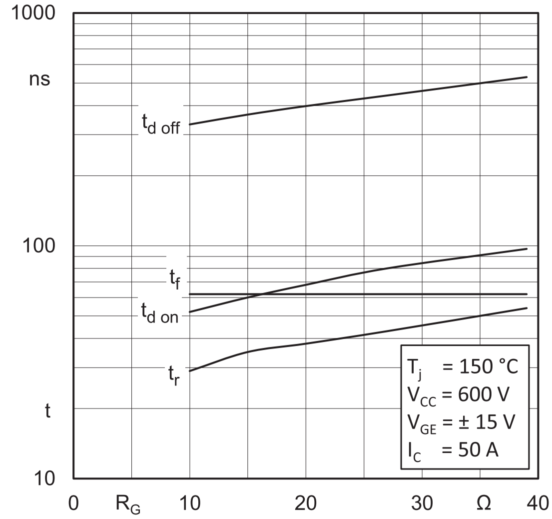


Fig. 8: Typ. switching times vs. gate resistor R_G

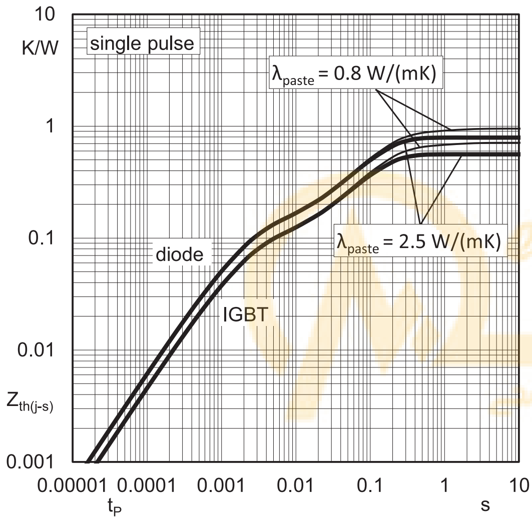


Fig. 9: Transient thermal impedance of IGBT and Diode

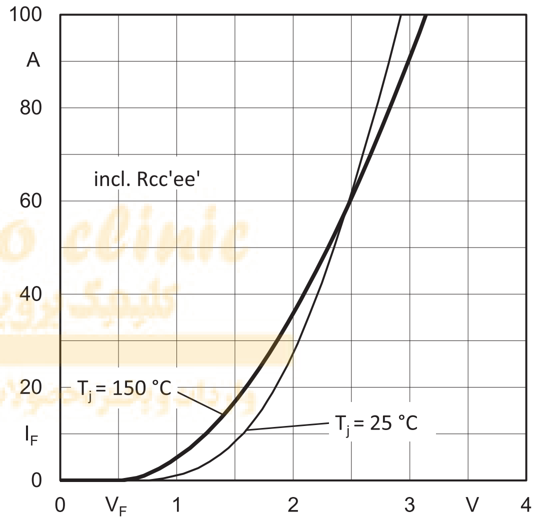


Fig. 10: CAL diode forward characteristic

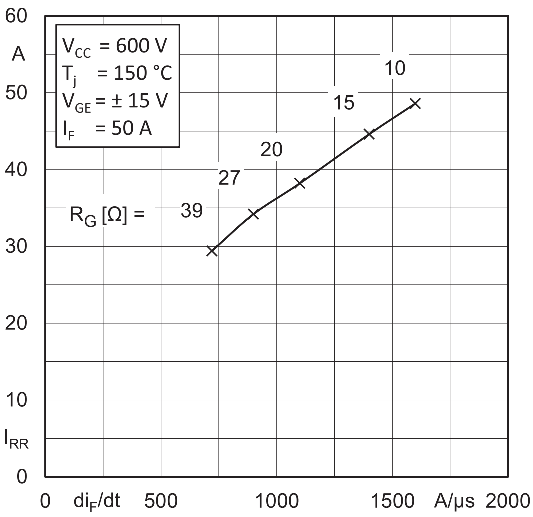


Fig. 11: Typ. CAL diode peak reverse recovery current

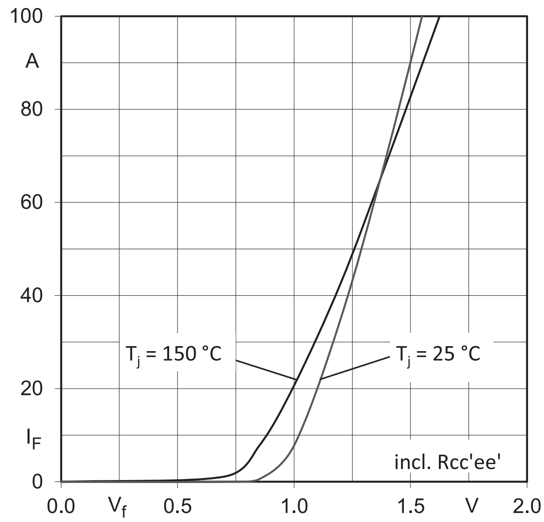
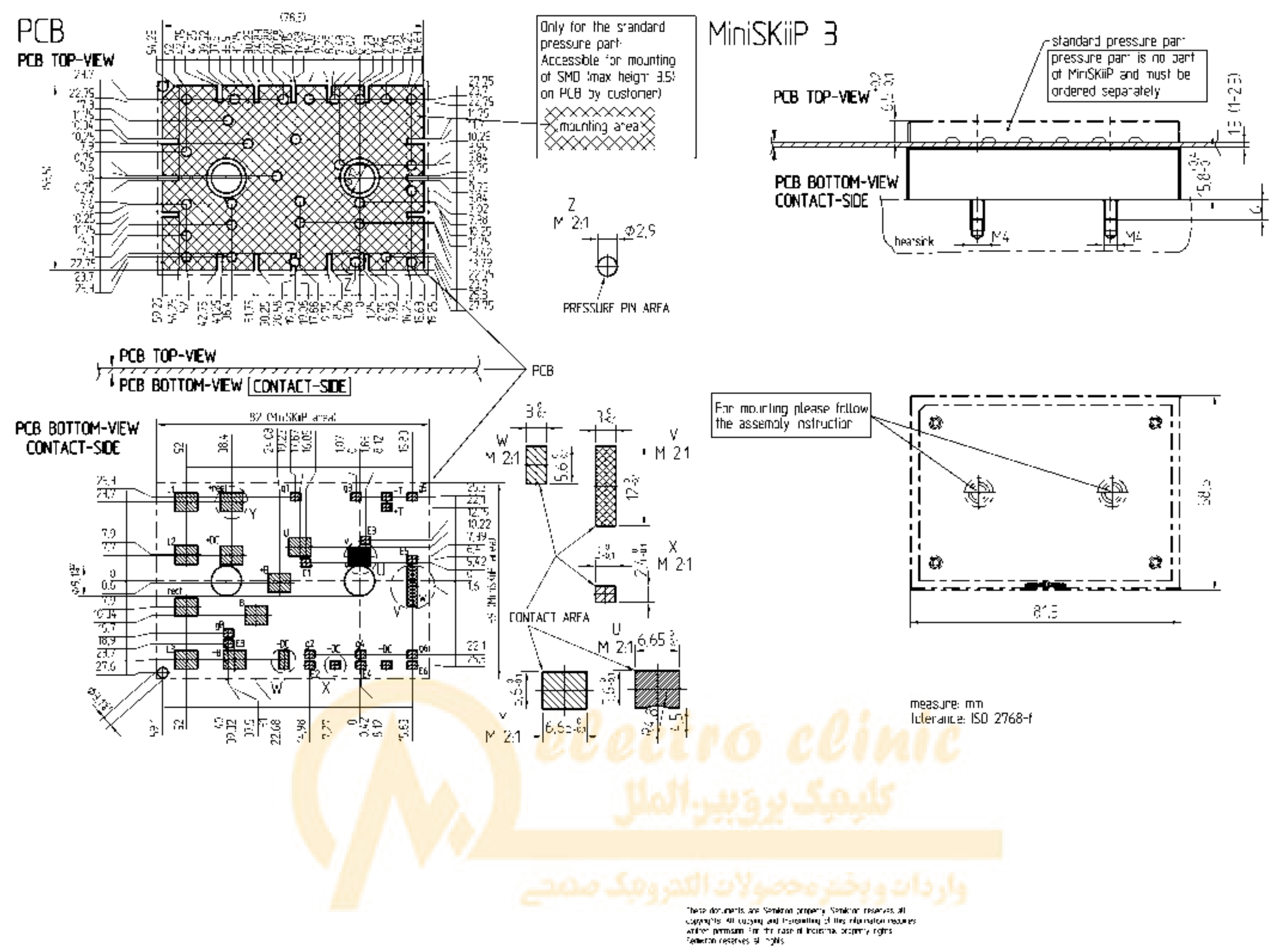
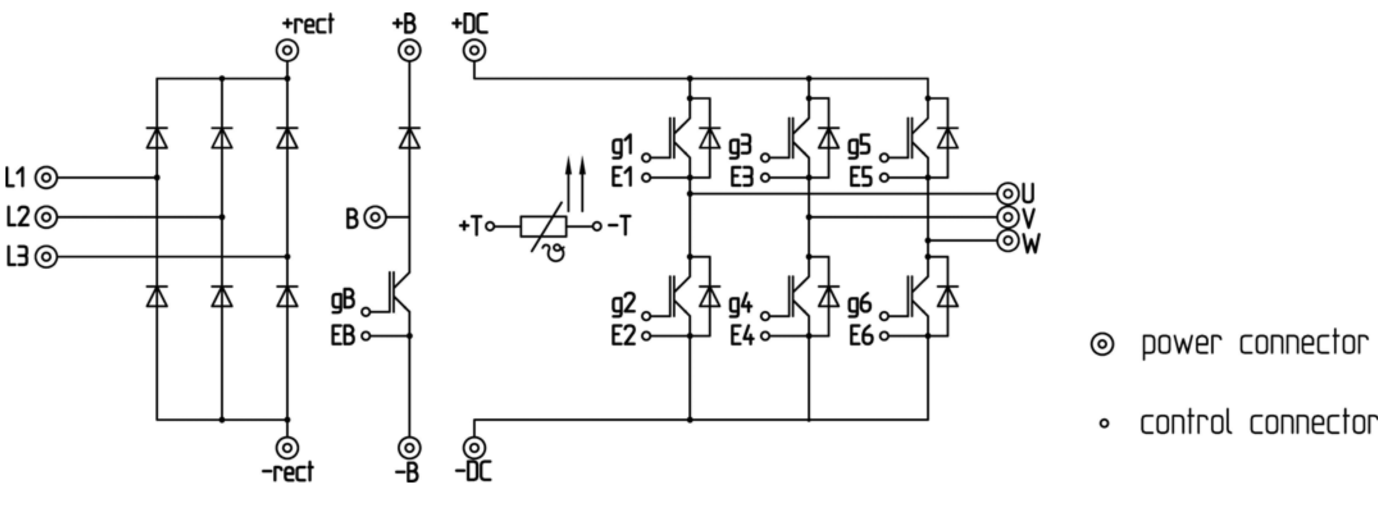


Fig. 12: Typ. input bridge forward characteristic



pinout, dimensions



pinout

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

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