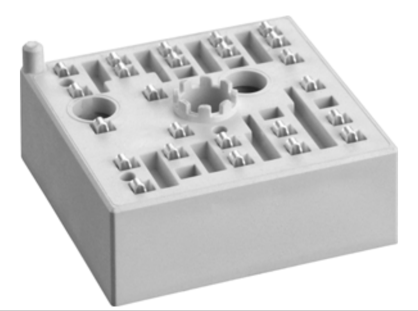
SKiiP 12NAB12T4V1



MiniSKiiP® 1

Converter-Inverter-Brake (CIB)

SKiiP 12NAB12T4V1

Features*

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

Typical Applications

- Inverter up to 12 kVA
- Typical motor power 5,5 kW

Remarks

- Max. case temperature limited to T_C=125°C
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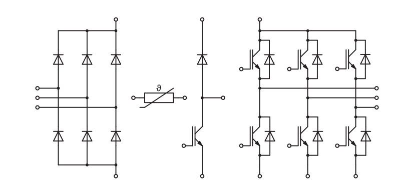
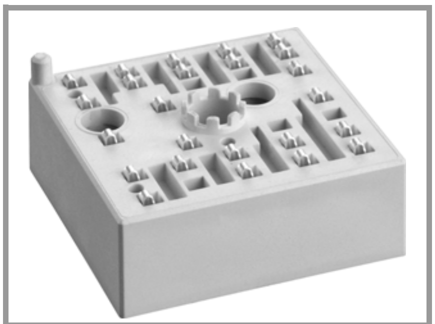


NAB

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	28	A
	T_j = 175 °C	T_s = 70 °C	23	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	31	A
	T_j = 175 °C	T_s = 70 °C	26	A
I_{Cnom}			15	A
I_{CRM}			45	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	28	A
	T_j = 175 °C	T_s = 70 °C	23	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	31	A
	T_j = 175 °C	T_s = 70 °C	26	A
I_{Cnom}			15	A
I_{CRM}			45	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	23	A
	T_j = 175 °C	T_s = 70 °C	18	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	25	A
	T_j = 175 °C	T_s = 70 °C	20	A
I_{FRM}			45	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		65	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	23	A
	T_j = 175 °C	T_s = 70 °C	18	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	25	A
	T_j = 175 °C	T_s = 70 °C	20	A
I_{FRM}			45	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		65	A
T_j			-40 ... 175	°C



MiniSKiiP® 1

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SKiiP 12NAB12T4V1

Features*

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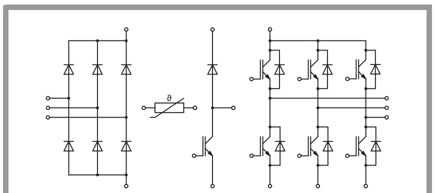

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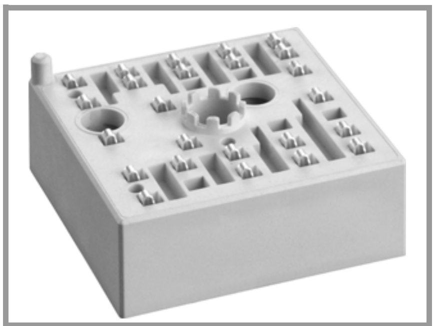
Absolute Maximum Ratings				
Symbol	**Conditions**		**Values**	**Unit**
Rectifier - Diode				
V_{RRM}	T_j = 25 °C		1600	V
I_F	$λ_{paste}$=0.8 W/(mK) T_j = 150 °C	T_s = 25 °C	39	A
		T_s = 70 °C	29	A
I_F	$λ_{paste}$=2.5 W/(mK) T_j = 150 °C	T_s = 25 °C	42	A
		T_s = 70 °C	32	A
I_{FSM}	t_p = 10 ms sin 180°	T_j = 25 °C	220	A
		T_j = 150 °C	200	A
i^2t	t_p = 10 ms sin 180°	T_j = 25 °C	242	A^2s
		T_j = 150 °C	200	A^2s
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C,		18	A
T_{stg}	module without TIM		-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 = 15 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.25	2.45	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		70	80	mΩ
		T_j = 150 °C		103	110	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		0.90		nF
C_{oes}		f = 1 MHz		0.08		nF
C_{res}		f = 1 MHz		0.06		nF
Q_G	V_{GE} = - 8 V...+ 15 V			85		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 15 A $R_{G\,on}$ = 16 Ω $R_{G\,off}$ = 16 Ω	T_j = 150 °C		15		ns
t_r		T_j = 150 °C		25		ns
E_{on}		T_j = 150 °C		1.4		mJ
$t_{d(off)}$		T_j = 150 °C		260		ns
t_f		T_j = 150 °C		75		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		1.3		mJ
$R_{th(j-s)}$	per IGBT, $λ_{paste}$=0.8 W/(mK)			1.3		K/W
$R_{th(j-s)}$	per IGBT, $λ_{paste}$=2.5 W/(mK)			1.1		K/W



MiniSKiiP® 1

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SKiiP 12NAB12T4V1

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Typical Applications

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- Typical motor power 5,5 kW

Remarks

- Max. case temperature limited to T_C=125°C
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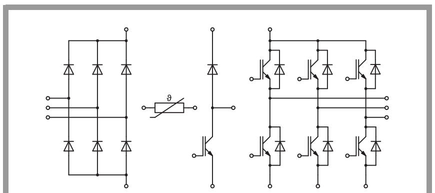
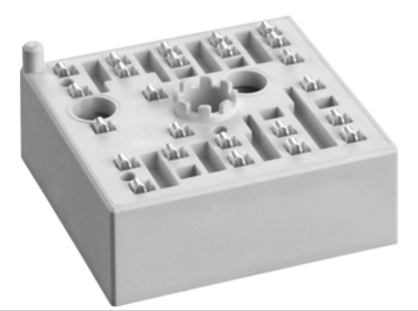


NAB

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Chopper - IGBT						
$V_{CE(sat)}$	I_C = 15 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.25	2.45	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		70	80	mΩ
		T_j = 150 °C		103	110	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1	mA
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V	f = 1 MHz		0.90		nF
C_{oes}		f = 1 MHz		0.08		nF
C_{res}		f = 1 MHz		0.06		nF
Q_G	V_{GE} = - 8 V...+ 15 V			85		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 15 A, $R_{G\,on}$ = 16 Ω, $R_{G\,off}$ = 16 Ω	T_j = 150 °C		15		ns
t_r		T_j = 150 °C		25		ns
E_{on}		T_j = 150 °C		1.4		mJ
$t_{d(off)}$		T_j = 150 °C		260		ns
t_f		T_j = 150 °C		75		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		1.3		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			1.3		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			1.1		K/W
Inverse - Diode						
V_F = V_{EC}	I_F = 15 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.38	2.71	V
		T_j = 150 °C		2.44	2.77	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		72	81	mΩ
		T_j = 150 °C		103	111	mΩ
I_{RRM}	I_F = 15 A, di/dt_{off} = 1180 A/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		28		A
Q_{rr}		T_j = 150 °C		2.6		µC
E_{rr}		T_j = 150 °C		1.1		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.92		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1.66		K/W
Freewheeling - Diode						
V_F = V_{EC}	I_F = 15 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.38	2.71	V
		T_j = 150 °C		2.44	2.77	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		72	81	mΩ
		T_j = 150 °C		103	111	mΩ
I_{RRM}	I_F = 15 A, di/dt_{off} = 1180 A/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		28		A
Q_{rr}		T_j = 150 °C		2.6		µC
E_{rr}		T_j = 150 °C		1.1		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.92		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1.66		K/W

SKiiP 12NAB12T4V1



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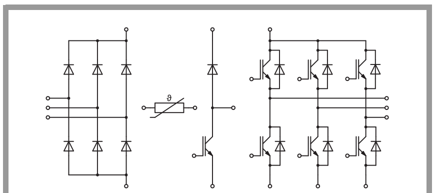


NAB

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Rectifier - Diode						
$V_F = V_{EC}$	I_F = 8 A 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		15	29	mΩ
		T_j = 125 °C		21	34	mΩ
I_R	T_j = 145 °C, V_{RRM}				1.1	mA
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.5		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1.29		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				30		g
L_{CE}				-		nH
Temperature Sensor						
R_{100}	T_r=100°C (R_{25}=1000Ω)			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}					

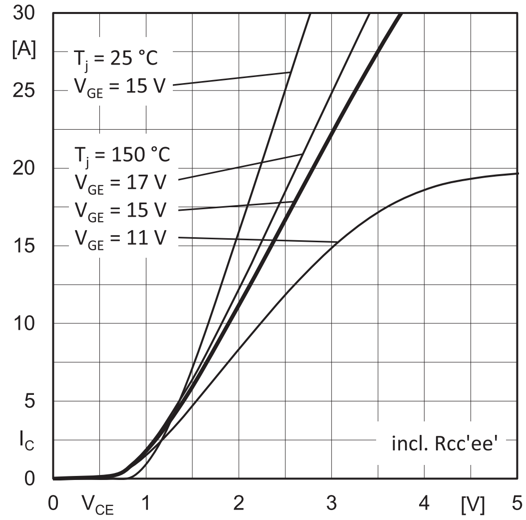


Fig. 1: Typ. output characteristic

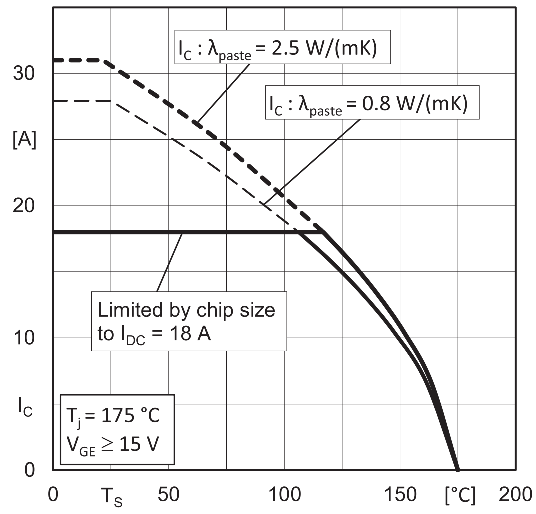


Fig. 2: Typ. rated current vs. temperature Ic = f(Ts)

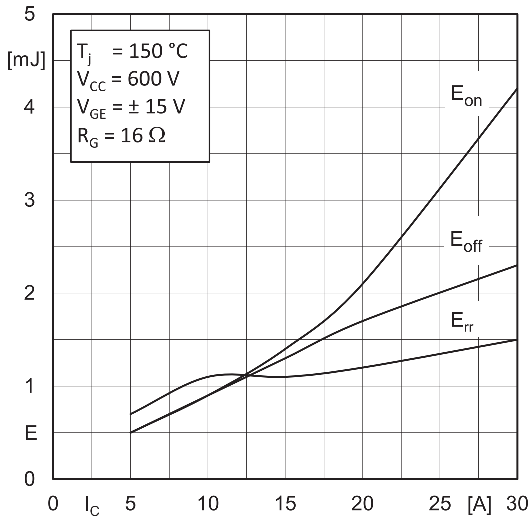


Fig. 3: Typ. turn-on /-off energy = f (I_C)

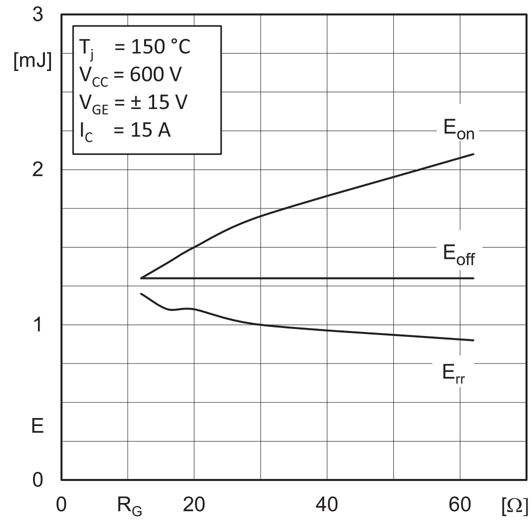


Fig. 4: Typ. turn-on /-off energy = f (R_G)

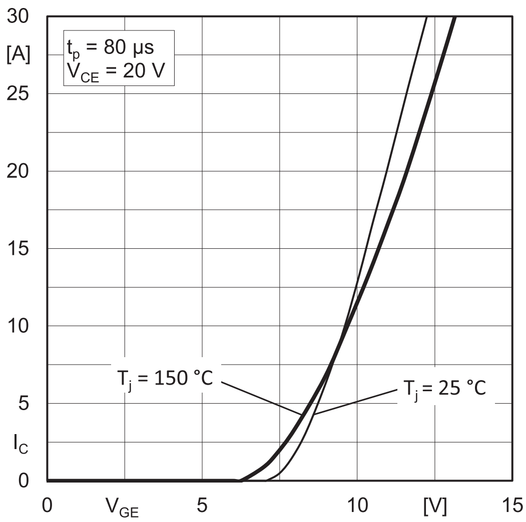


Fig. 5: Typ. transfer characteristic

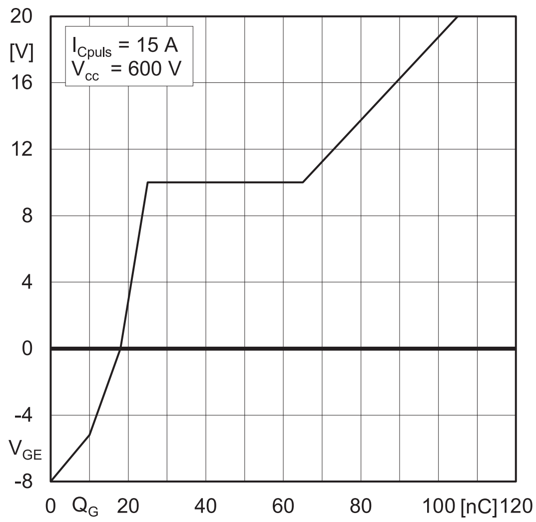


Fig. 6: Typ. gate charge characteristic

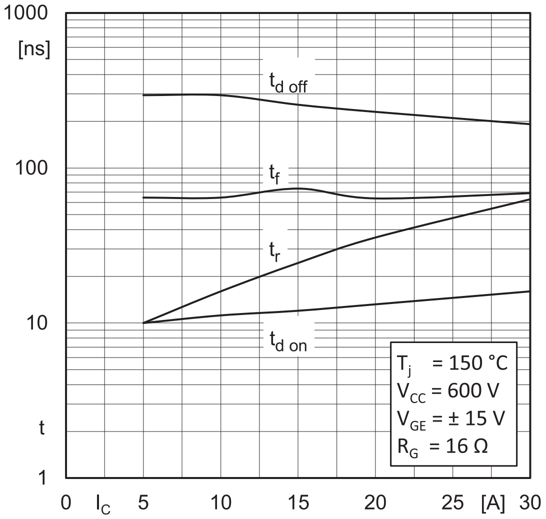


Fig. 7: Typ. switching times vs. I_C

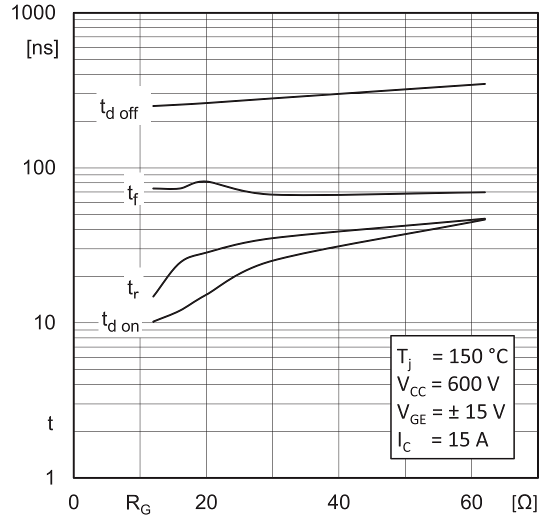


Fig. 8: Typ. switching times vs. gate resistor R_G

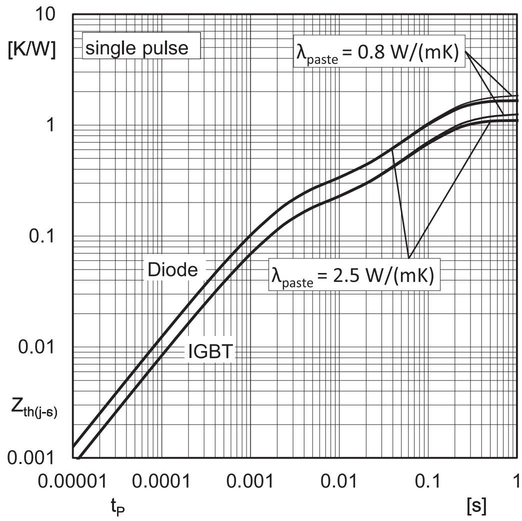


Fig. 9: Typ. transient thermal impedance

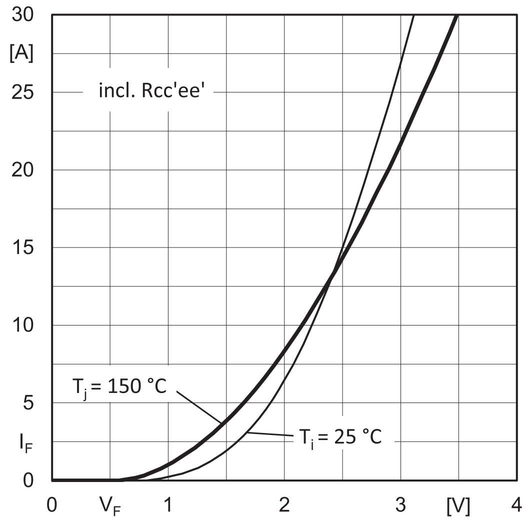


Fig. 10: Typ. CAL diode forward characteristic

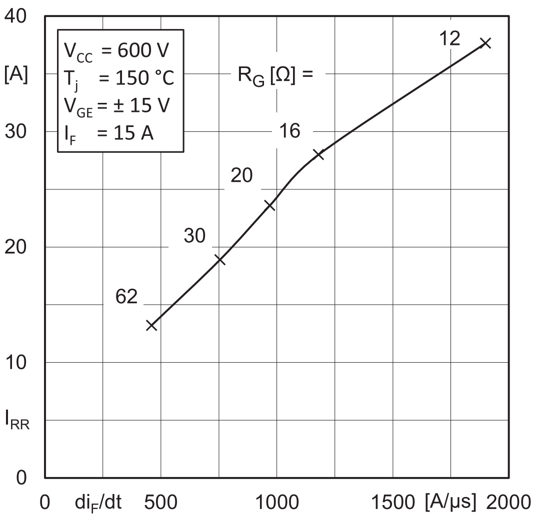


Fig. 11: Typ. CAL diode peak reverse recovery current

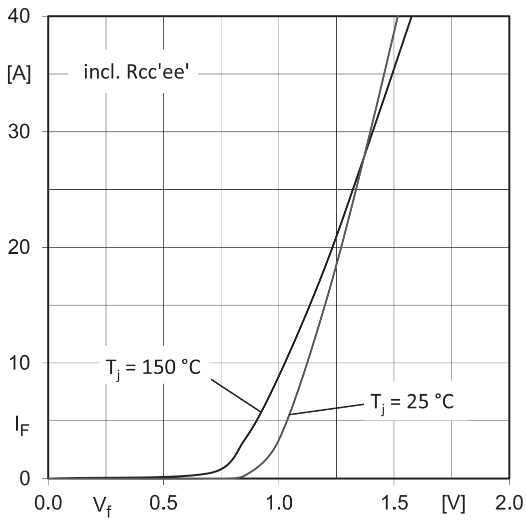
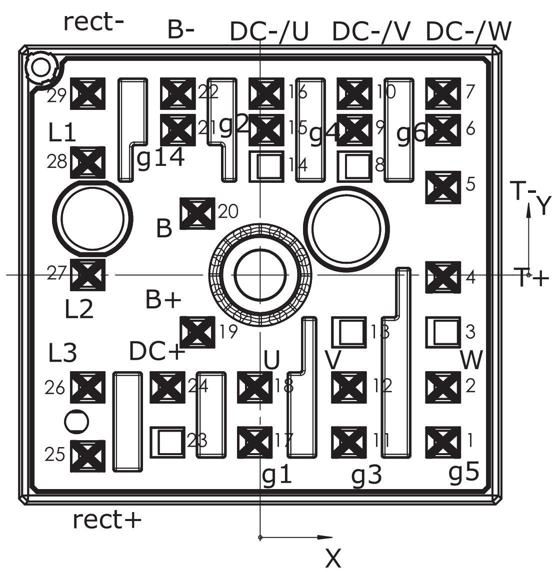


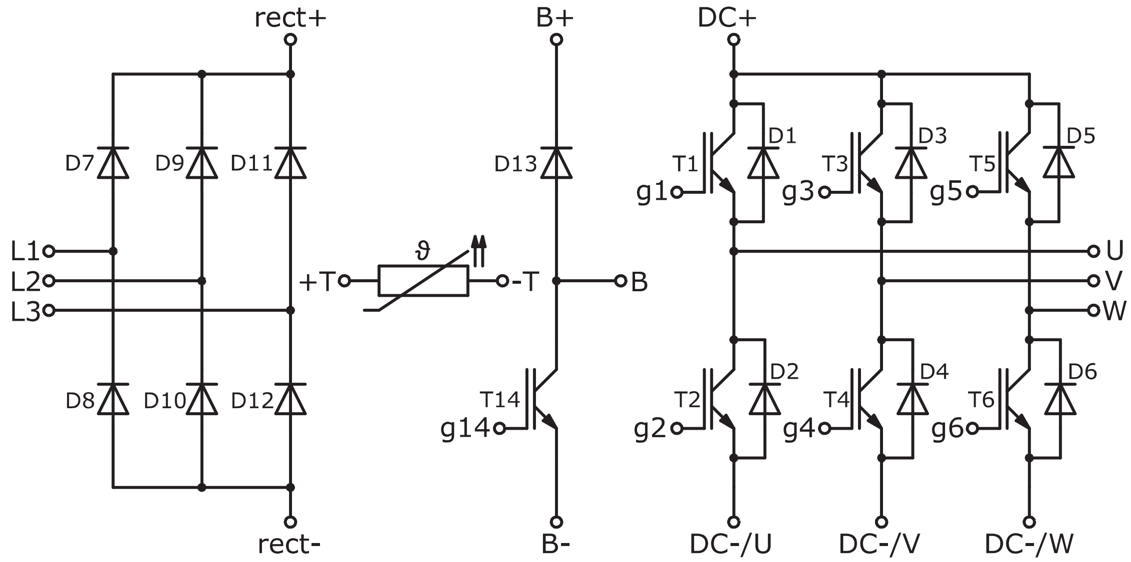
Fig. 12: Typ. input bridge forward characteristic

Pin out							
Pin	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*
1	15,93	-14,60	g5	16	0,53	15,80	DC-/U
2	15,93	-9,80	W	17	-0,48	-14,6	g1
3	15,93	-5,00		18	-0,48	-9,80	U
4	15,93	-0,20	T+	19	-5,48	-5,00	B+
5	15,93	7,63	T-	20	-5,48	5,35	B
6	15,93	12,63	g6	21	-7,18	12,63	g14
7	15,93	15,80	DC-/W	22	-7,18	15,80	B-
8	8,23	9,45		23	-8,08	-14,60	
9	8,23	12,63	g4	24	-8,08	-9,80	DC+
10	8,23	15,80	DC-/V	25	-15,03	-15,80	rect+
11	7,73	-14,60	g3	26	-15,03	-9,80	L3
12	7,73	-9,80	V	27	-15,03	0	L2
13	7,73	-5,00		28	-15,03	9,80	L1
14	0,53	9,45		29	-15,03	15,80	rect-
15	0,53	12,63	g2				

all values in mm



Pinout and Dimensions



Pinout

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

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