MiniSKiiP® 3

SKiiP 39AHB16V3

Features*

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

Typical Applications

- Input bridge for inverter up to 45 kVA

Remarks

- V_{CEsat}, V_F = chip level value
- Case temp. limited to T_C = 125°C max. (for baseplateless modules $T_C = T_S$)
- product rel. results valid for $T_j \leq$ 150°C (recomm. T_{op} = -40 ... +150°C)
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- Diode 1 = D1
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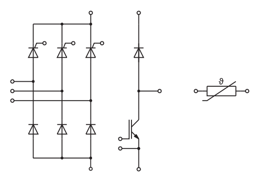
- IGBT 1 = T4
- -B limited to $I_{t(RMS)}$=80A



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Thyristor 1				
V_{RRM}	T_j = 25 °C		1600	V
$I_{T(AV)}$	T_j = 130 °C		86	A
	T_s = 70 °C sin. 180°		110	A
I_{TSM}	10 ms, sin 180°, T_j = 130 °C		1170	A
i^2t	10 ms, sin 180°, T_j = 130 °C		6845	A^2s
T_j			-40 ... 130	°C

Absolute Maximum Ratings

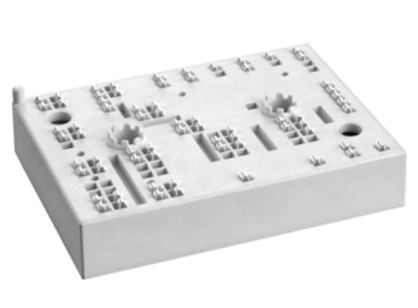
Symbol	Conditions		Values	Unit
Diode 1				
V_{RRM}	T_j = 25 °C		1600	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	176	A
	T_j = 150 °C	T_s = 70 °C	128	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	215	A
	T_j = 150 °C	T_s = 70 °C	159	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		1280	A
i^2t	10 ms, sin 180°, T_j = 150 °C		8192	A^2s
T_j			-40 ... 150	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Diode 2				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	204	A
	T_j = 175 °C	T_s = 70 °C	161	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	260	A
	T_j = 175 °C	T_s = 70 °C	207	A
I_{FRM}			600	A
I_{FSM}	10 ms	T_j = 25 °C	990	A
	sin 180°	T_j = 150 °C	990	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT 1				
V_{CES}	T_j = 25 °C		1200	V
I_C	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	181	A
	T_j = 175 °C	T_s = 70 °C	147	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	233	A
	T_j = 175 °C	T_s = 70 °C	190	A
I_{Cnom}			150	A
I_{CRM}			450	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



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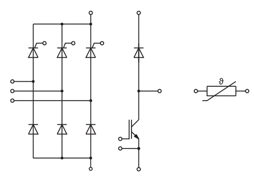

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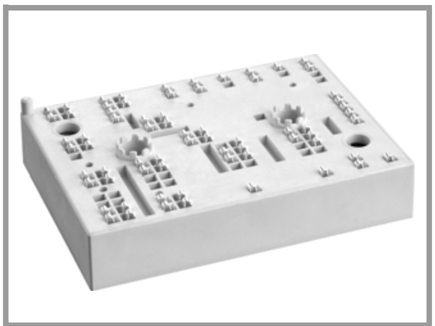
Absolute Maximum Ratings			
Symbol	**Conditions**	**Values**	**Unit**
Module			
$I_{t(RMS)}$	20 A per spring	160	A
T_{stg}	module without TIM	-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min	2500	V

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Thyristor 1						
V_T	I_T = 110 A chiplevel	T_j = 25 °C			1.26	V
		T_j = 130 °C			1.19	V
$V_{T(TO)}$	T_j = 130 °C, chiplevel				0.85	V
r_T	T_j = 130 °C, chiplevel				3.2	mΩ
V_{GT}	T_j = 25 °C		2			V
I_{GT}	T_j = 25 °C		100			mA
I_H	T_j = 25 °C		220			mA
I_L	T_j = 25 °C		550			mA
dv/dt_{cr}	T_j = 130 °C				1000	V/µs
di/dt_{cr}	T_j = 130 °C				100	A/µs
$R_{th(j-s)}$	per Thyristor, λ_{paste}=0.8 W/(mK), sin. 180°			0.46		K/W
$R_{th(j-s)}$	per Thyristor, λ_{paste}=2.5 W/(mK), sin. 180°			0.32		K/W

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 1						
V_F	I_F = 77 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		1.56	3.0	mΩ
		T_j = 125 °C		2.2	3.5	mΩ
I_R	T_j = 145 °C, V_{RRM}				1.1	mA
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.5		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.37		K/W

Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 2						
V_F	I_F = 200 A V_{GE} = 0 V chiplevel	T_j = 25 °C		1.77	2.09	V
		T_j = 150 °C		1.79	2.17	V
V_{F0}	chiplevel	T_j = 25 °C		1.19	1.40	V
		T_j = 150 °C		0.97	1.10	V
r_F	chiplevel	T_j = 25 °C		2.9	3.5	mΩ
		T_j = 150 °C		4.1	5.4	mΩ
I_{RRM}	I_F = 150 A di/dt_{off} = 5900 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		286		A
Q_{rr}		T_j = 150 °C		25		µC
E_{rr}		T_j = 150 °C		10		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.35		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.24		K/W



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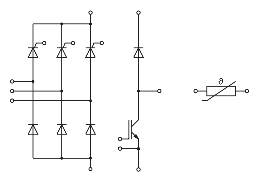

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Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	I_C = 150 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		7.0	8.0	mΩ
		T_j = 150 °C		10	11	mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}$, I_C = 6 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1.5	mA
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V	f = 1 MHz		8.80		nF
C_{oes}		f = 1 MHz		0.58		nF
C_{res}		f = 1 MHz		0.47		nF
Q_G	V_{GE} = - 8 V...+ 15 V			850		nC
R_{Gint}	T_j = 25 °C			5.0		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 150 A, V_{GE} = +15/-15 V, $R_{G\,on}$ = 0.5 Ω, $R_{G\,off}$ = 0 Ω, di/dt_{on} = 5900 A/µs, di/dt_{off} = 1300 A/µs, dv/dt = 4700 V/µs, L_s = 48 nH	T_j = 150 °C		114		ns
t_r		T_j = 150 °C		30		ns
E_{on}		T_j = 150 °C		9		mJ
$t_{d(off)}$		T_j = 150 °C		357		ns
t_f		T_j = 150 °C		92		ns
E_{off}		T_j = 150 °C		17		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.28		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.18		K/W

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Module					
M_s	to heat sink	2		2.5	Nm
w	weight		82		g

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
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}				

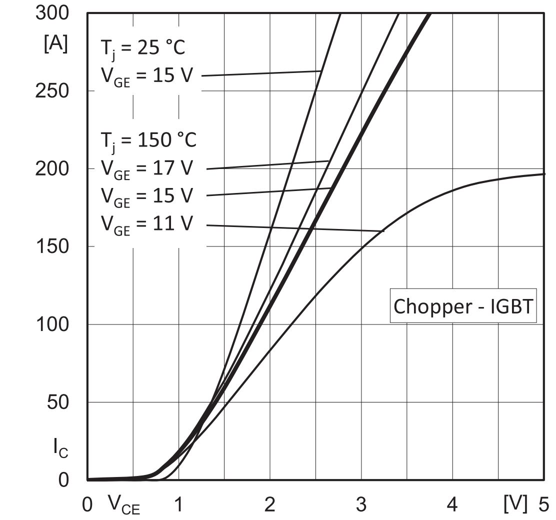


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+ EE'}$

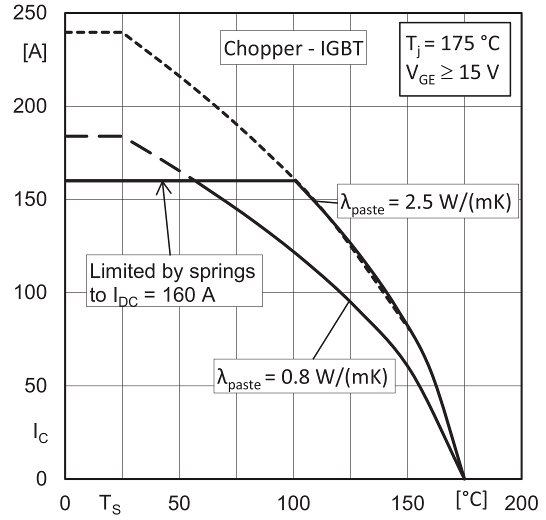


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

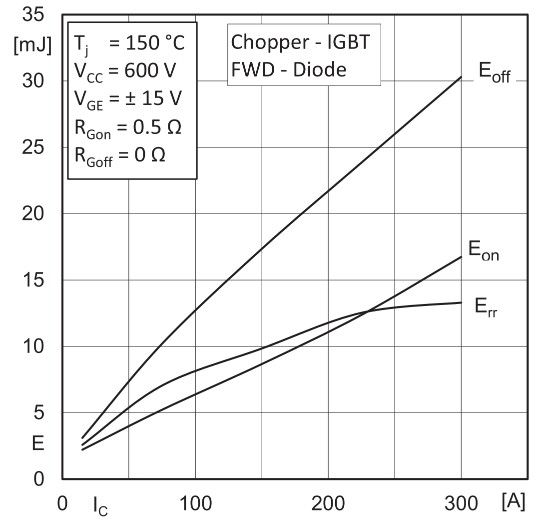


Fig. 3: Typ. turn-on /-off energy = f (I_C)

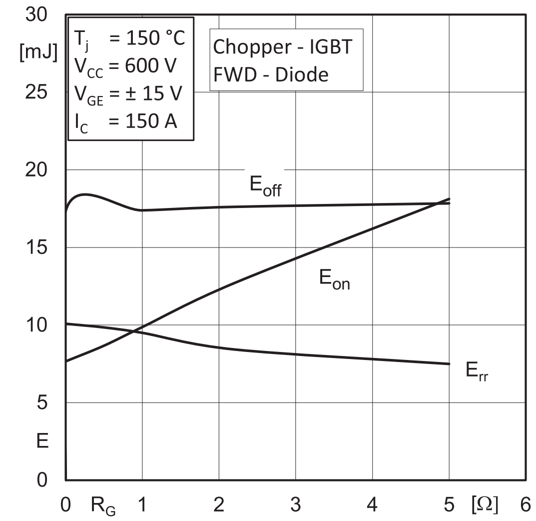


Fig. 4: Typ. turn-on /-off energy = f (R_G)

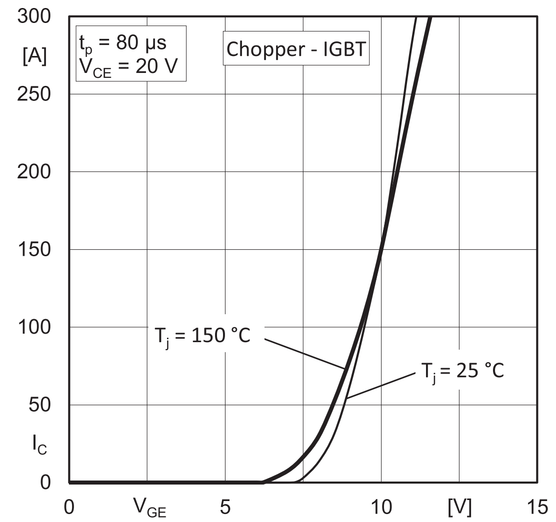


Fig. 5: Typ. transfer characteristic

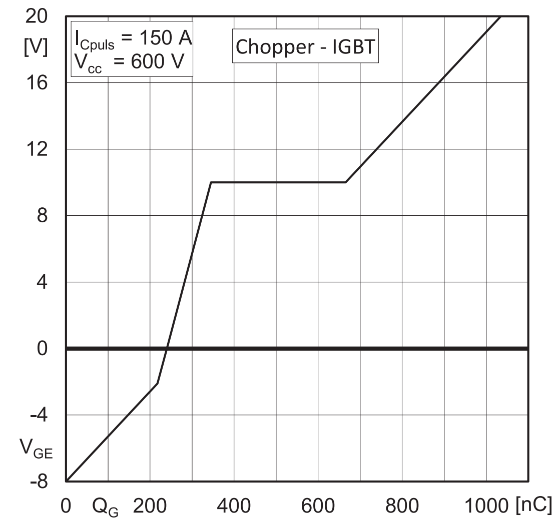


Fig. 6: Typ. gate charge characteristic

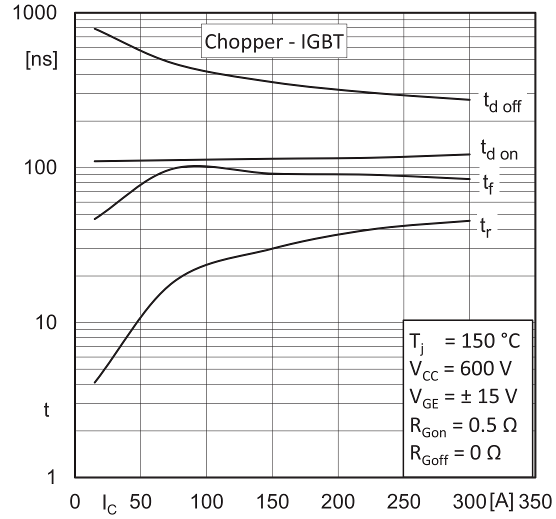


Fig. 7: Typ. switching times vs. I_C

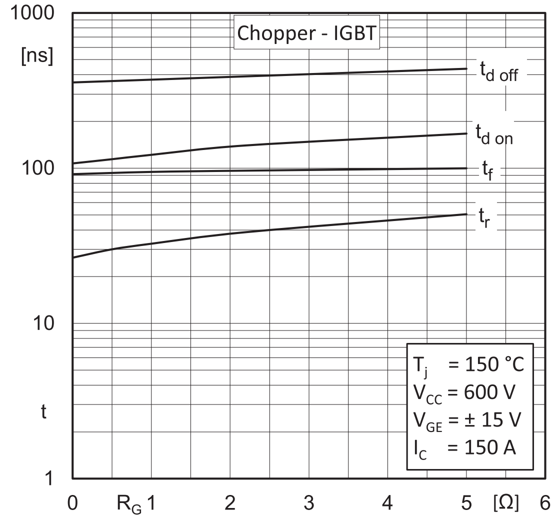


Fig. 8: Typ. switching times vs. gate resistor R_G

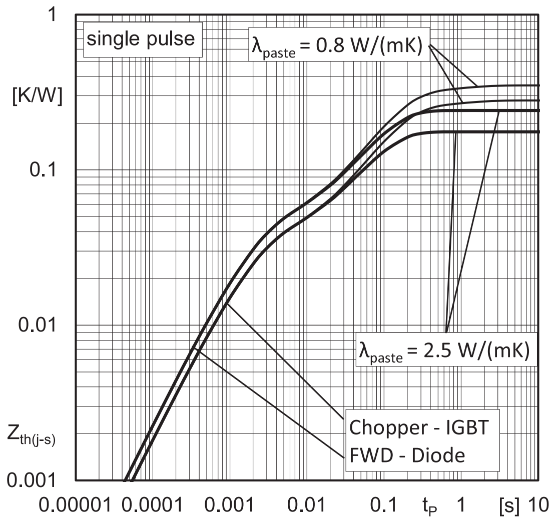


Fig. 9: Typ. transient thermal impedance

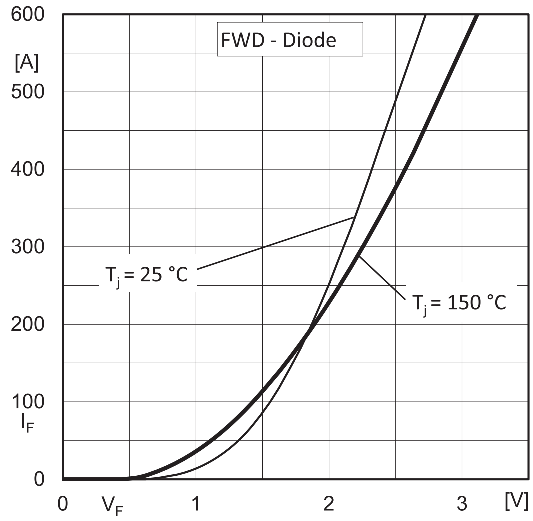


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

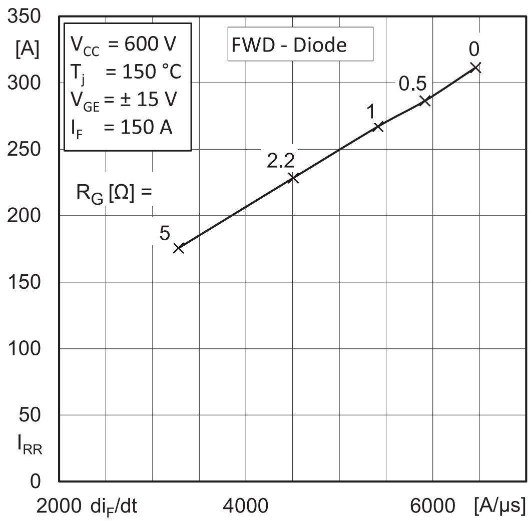


Fig. 11: Typ. CAL diode peak reverse recovery current

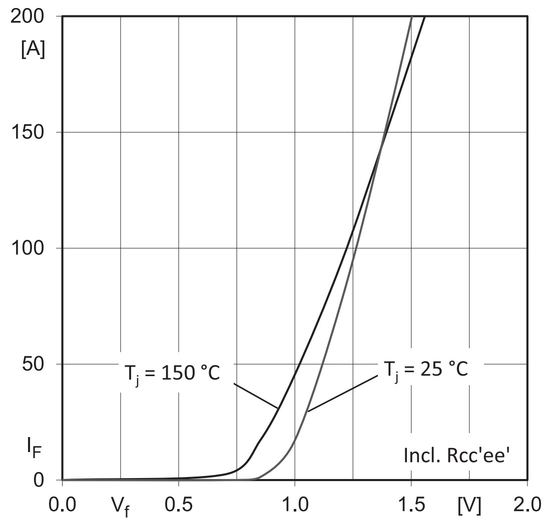


Fig. 12: Typ. input bridge forward characteristic

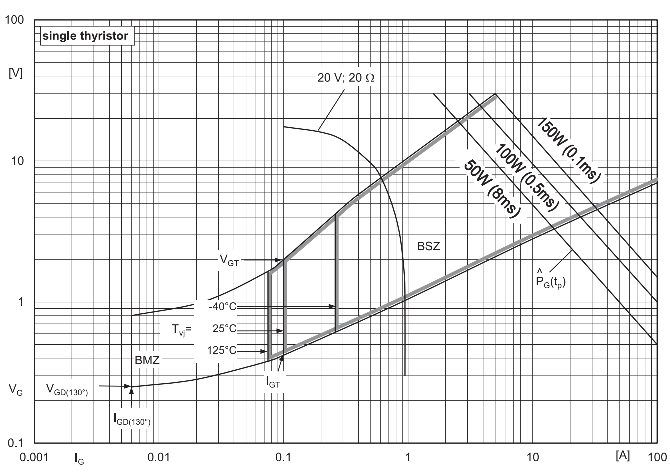
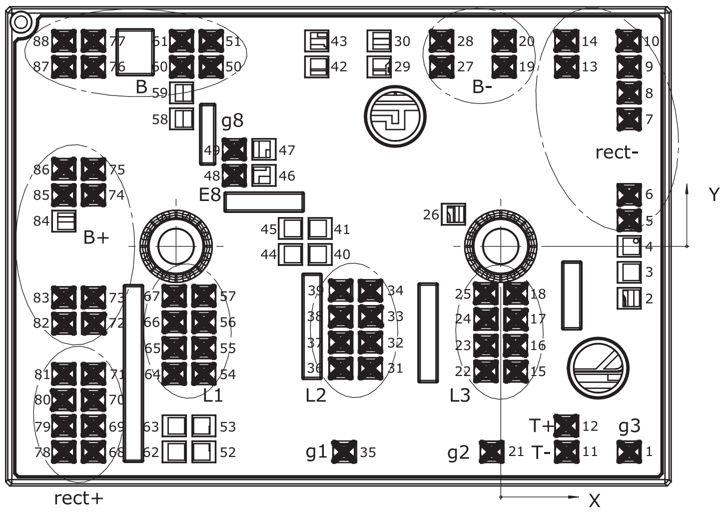


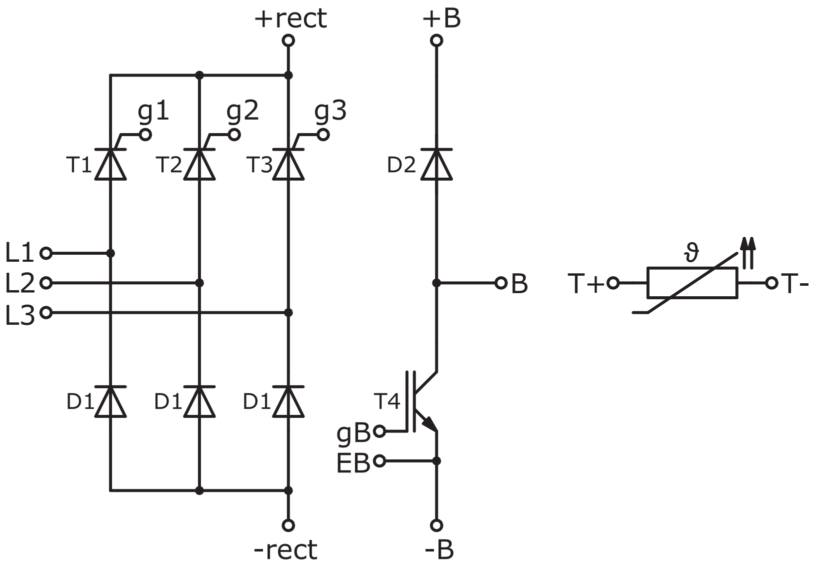
Fig. 13: Gate trigger characteristics

Pin out											
Pin	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*
1	15,83	-25,30	g3	31	-16,05	-15,02	L2	61	-39,33	25,30	B
2	15,83	-6,40		32	-16,05	-11,82	L2	62	-40,23	-25,30	
3	15,83	-3,20		33	-16,05	-8,62	L2	63	-40,23	-22,10	
4	15,83	0		34	-16,05	-5,42	L2	64	-40,23	-15,70	L1
5	15,83	3,20	rect-	35	-19,23	-25,30	g1	65	-40,23	-12,50	L1
6	15,83	6,40	rect-	36	-19,70	-15,02	L2	66	-40,23	-9,30	L1
7	15,83	15,70	rect-	37	-19,70	-11,82	L2	67	-40,23	-6,10	L1
8	15,83	18,90	rect-	38	-19,70	-8,62	L2	68	-50,18	-25,30	rect+
9	15,83	22,10	rect-	39	-19,70	-5,42	L2	69	-50,18	-22,10	rect+
10	15,83	25,30	rect-	40	-22,26	-1,00		70	-50,18	-18,90	rect+
11	8,13	-25,30	T-	41	-22,26	2,20		71	-50,18	-15,70	rect+
12	8,13	-22,10	T+	42	-22,68	22,10		72	-50,18	-9,50	B+
13	8,13	22,10	rect-	43	-22,68	25,30		73	-50,18	-6,30	B+
14	8,13	25,30	rect-	44	-25,91	-1,00		74	-50,18	6,30	B+
15	1,83	-15,39	L3	45	-25,91	2,20		75	-50,18	9,50	B+
16	1,83	-12,19	L3	46	-29,18	8,74		76	-50,18	22,10	B
17	1,83	-8,99	L3	47	-29,18	11,94		77	-50,18	25,30	B
18	1,83	-5,79	L3	48	-32,83	8,74	E8	78	-53,83	-25,30	rect+
19	0,43	22,10	B-	49	-32,83	11,94	g8	79	-53,83	-22,10	rect+
20	0,43	25,30	B-	50	-35,68	22,10	B	80	-53,83	-18,90	rect+
21	-1,08	-25,30	g2	51	-35,68	25,30	B	81	-53,83	-15,70	rect+
22	-1,83	-15,39	L3	52	-36,58	-25,30		82	-53,83	-9,50	B+
23	-1,83	-12,19	L3	53	-36,58	-22,10		83	-53,83	-6,30	B+
24	-1,83	-8,99	L3	54	-36,58	-15,70	L1	84	-53,83	3,10	
25	-1,83	-5,79	L3	55	-36,58	-12,50	L1	85	-53,83	6,30	B+
26	-5,83	3,95		56	-36,58	-9,30	L1	86	-53,83	9,50	B+
27	-7,28	22,10	B-	57	-36,58	-6,10	L1	87	-53,83	22,10	B
28	-7,28	25,30	B-	58	-39,33	15,70		88	-53,83	25,30	B
29	-14,98	22,10		59	-39,33	18,90					
30	-14,98	25,30		60	-39,33	22,10	B				

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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