

MiniSKiiP® 3

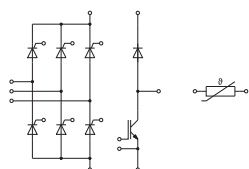
SKiiP 39ATB16V2

Features*

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

Remarks

- V_{CEsat} , V_F = chip level value
- Case temp. limited to $T_C = 125^\circ\text{C}$ max. (for baseplateless modules $T_C = T_S$)
- Product rel. results valid for $T_j \leq 150^\circ\text{C}$ (recomm. $T_{op} = -40 \dots +150^\circ\text{C}$)
- -B is limited to $I_{trms} = 60\text{A}$ (3 springs)

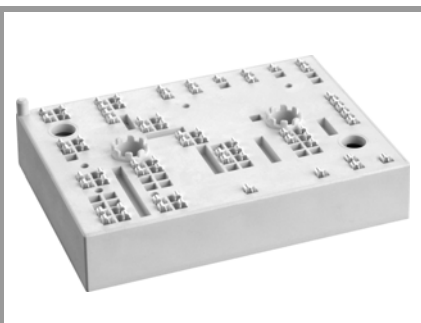


Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
IGBT 1			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$\lambda_{paste} = 0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	181
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	147
I_C	$\lambda_{paste} = 2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	214
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	174
I_{Chom}		150	A
I_{CRM}		450	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 800 \text{ V}$ $V_{GE} \leq 15 \text{ V}$ $V_{CES} \leq 1200 \text{ V}$	$T_j = 150^\circ\text{C}$	10
T_j		-40 ... 175	$^\circ\text{C}$

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Diode 1			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$\lambda_{paste} = 0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	162
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	129
I_F	$\lambda_{paste} = 2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	187
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	149
I_{FRM}		300	A
I_{FSM}	10 ms	$T_j = 25^\circ\text{C}$	774
	sin 180°	$T_j = 150^\circ\text{C}$	774
T_j		-40 ... 175	$^\circ\text{C}$

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Thyristor 1			
V_{RRM}	$T_j = 25^\circ\text{C}$	1600	V
$I_{T(AV)}$	$T_j = 130^\circ\text{C}$	81	A
	$T_s = 70^\circ\text{C}$ sin. 180°	107	A
I_{TSM}	10 ms, sin 180°, $T_j = 130^\circ\text{C}$	1250	A
i^2t	10 ms, sin 180°, $T_j = 130^\circ\text{C}$	7813	A^2s
T_j		-40 ... 130	$^\circ\text{C}$

Absolute Maximum Ratings			
Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	20 A per spring	100	A
T_{stg}	module without TIM	-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50 Hz, $t = 1 \text{ min}$	2500	V



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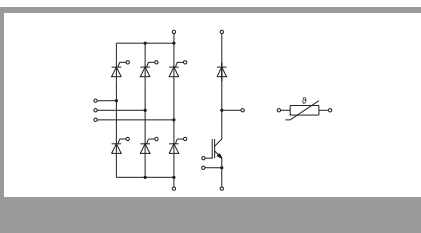
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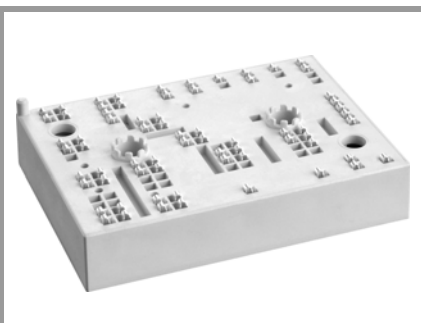
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- -B is limited to $I_{trms} = 60\text{A}$ (3 springs)

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$		1.85	2.10	V
		$T_j = 150^\circ\text{C}$		2.25	2.45	V
V_{CE0}	chipllevel	$T_j = 25^\circ\text{C}$		0.80	0.90	V
		$T_j = 150^\circ\text{C}$		0.70	0.80	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$		7.0	8.0	m Ω
		$T_j = 150^\circ\text{C}$		10	11	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 6\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_j = 25^\circ\text{C}$				0.3	mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		8.80		nF
C_{oes}		$f = 1\text{ MHz}$		0.58		nF
C_{res}		$f = 1\text{ MHz}$		0.47		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$			850		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			5.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 150\text{ A}$	$T_j = 150^\circ\text{C}$		135		ns
t_r	$V_{GE} = +15/-15\text{ V}$ $R_{G on} = 1\ \Omega$	$T_j = 150^\circ\text{C}$		42		ns
E_{on}	$R_{G on} = 1\ \Omega$	$T_j = 150^\circ\text{C}$		17.7		mJ
$t_{d(off)}$	$R_{G off} = 1\ \Omega$	$T_j = 150^\circ\text{C}$		372		ns
t_f	$di/dt_{on} = 3400\text{ A}/\mu\text{s}$ $di/dt_{off} = 1340\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		79		ns
E_{off}	$dv/dt = 3670\text{ V}/\mu\text{s}$ $L_s = 25\text{ nH}$	$T_j = 150^\circ\text{C}$		16.2		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 0.8\text{ W}/(\text{mK})$			0.28		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste} = 2.5\text{ W}/(\text{mK})$			0.21		K/W

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	$I_F = 150\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$		2.17	2.49	V
		$T_j = 150^\circ\text{C}$		2.11	2.42	V
V_{F0}	chipllevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
r_F	chipllevel	$T_j = 25^\circ\text{C}$		5.8	6.6	m Ω
		$T_j = 150^\circ\text{C}$		8.1	8.8	m Ω
I_{RRM}	$I_F = 150\text{ A}$ $di/dt_{off} = 3320\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		137		A
Q_{rr}	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		25		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		9.2		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8\text{ W}/(\text{mK})$			0.39		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 2.5\text{ W}/(\text{mK})$			0.31		K/W





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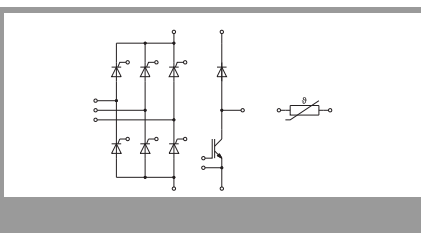
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Thyristor 1						
V_T	$I_T = 110\text{ A}$ chiplevel	$T_j = 25^\circ\text{C}$			1.26	V
		$T_j = 130^\circ\text{C}$			1.19	V
$V_{T(TO)}$	$T_j = 130^\circ\text{C}$, chiplevel				0.85	V
r_T	$T_j = 130^\circ\text{C}$, chiplevel				3.2	m Ω
V_{GT}	$T_j = 25^\circ\text{C}$		1.65			V
I_{GT}	$T_j = 25^\circ\text{C}$		100			mA
I_H	$T_j = 25^\circ\text{C}$		220			mA
I_L	$T_j = 25^\circ\text{C}$		550			mA
dv/dt_{cr}	$T_j = 130^\circ\text{C}$				1000	V/ μs
di/dt_{cr}	$T_j = 130^\circ\text{C}$				100	A/ μs
$R_{th(j-s)}$	per Thyristor, $\lambda_{paste} = 0.8\text{ W/(mK)}$, sin. 180°			0.5		K/W
$R_{th(j-s)}$	per Thyristor, $\lambda_{paste} = 2.5\text{ W/(mK)}$, sin. 180°			0.33		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}	$T_r = 100^\circ\text{C}$ ($R_{25} = 1000\Omega$)			$1670 \pm 3\%$		Ω
$R_{(T)}$	$R_{(T)} = 1000\Omega [1 + A(T - 25^\circ\text{C}) + B(T - 25^\circ\text{C})^2]$, $A = 7.635 \cdot 10^{-3} \text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{C}^{-2}$					

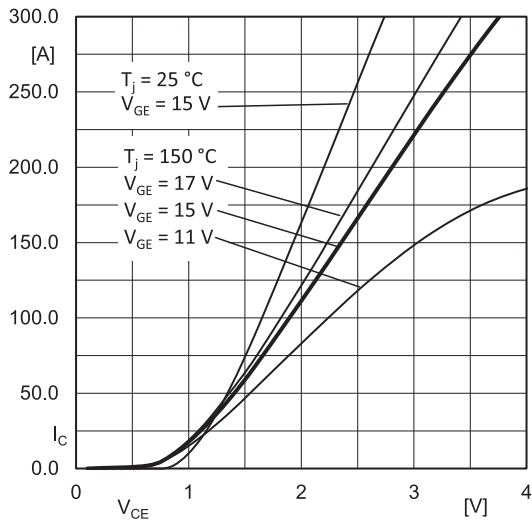


Fig. 1: Typ. output characteristic, inclusive R_{CC+EE}

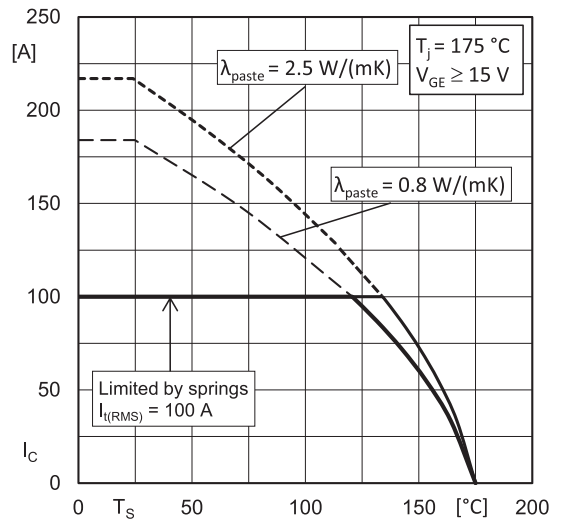


Fig. 2: Rated current vs. temperature $I_c = f(T_s)$

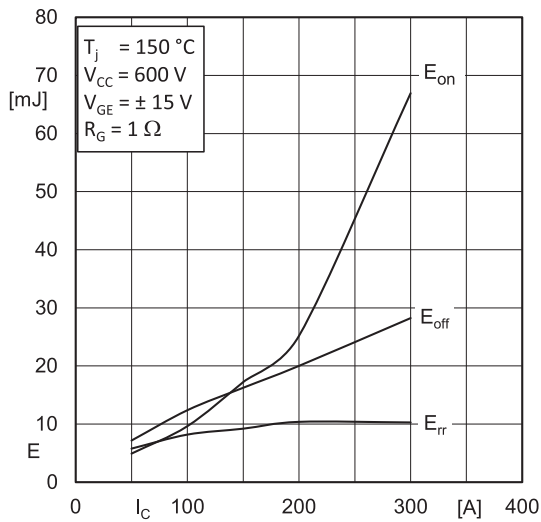


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

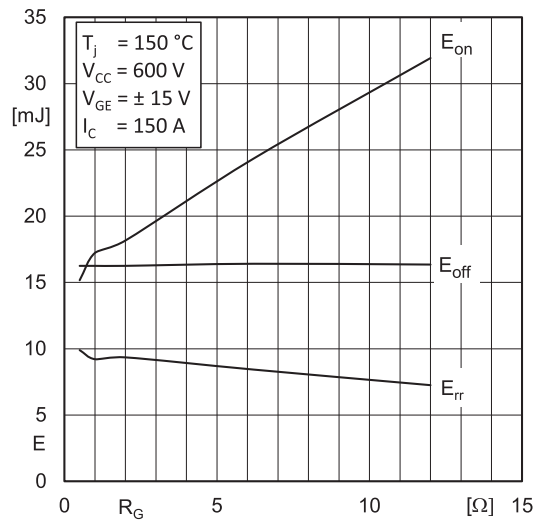


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

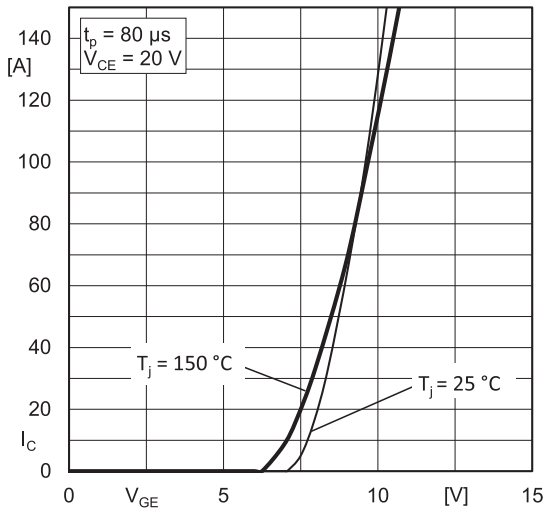


Fig. 5: Typ. transfer characteristic

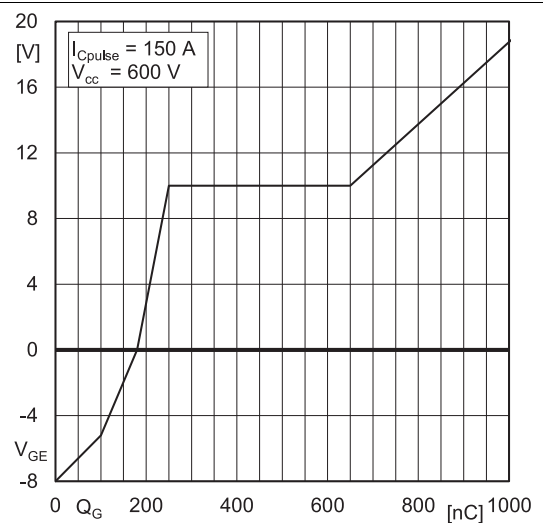


Fig. 6: Typ. gate charge characteristic

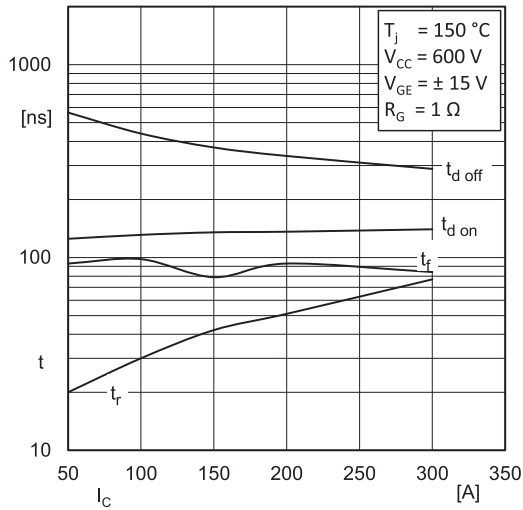


Fig. 7: Typ. switching times vs. I_C

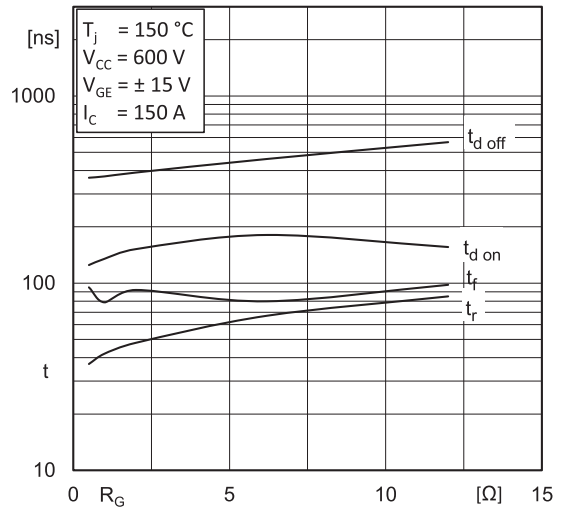


Fig. 8: Typ. switching times vs. gate resistor R_G

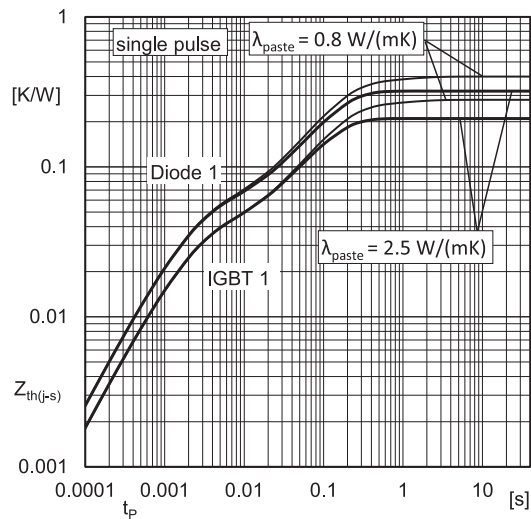


Fig. 9: Typ. transient thermal impedance

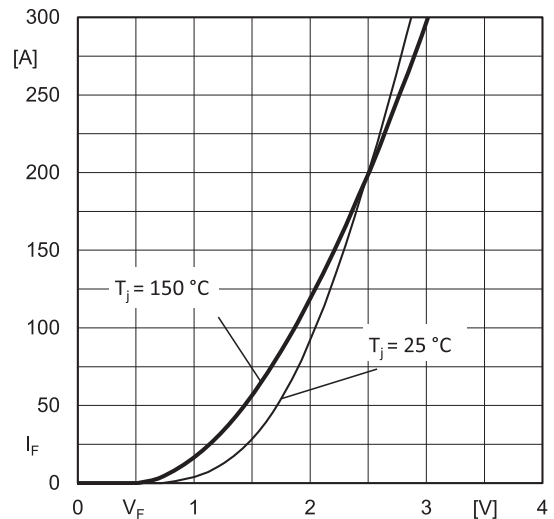


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC+EE'}$

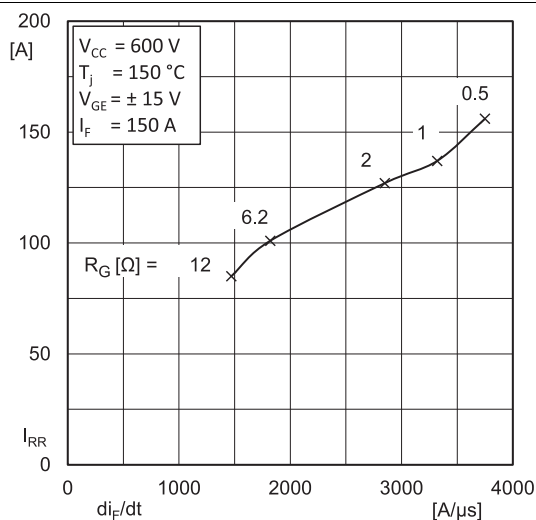


Fig. 11: Typ. CAL diode peak reverse recovery current

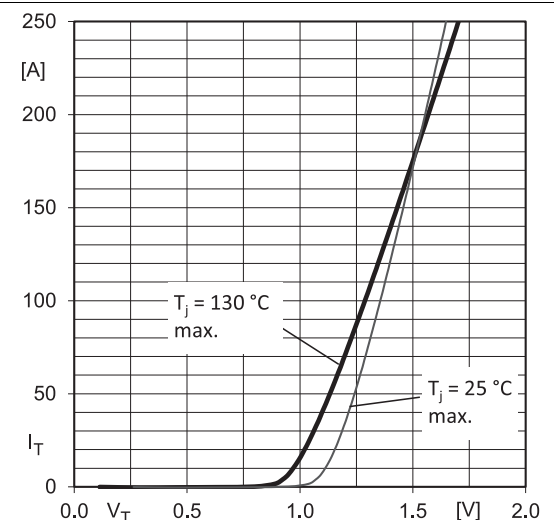
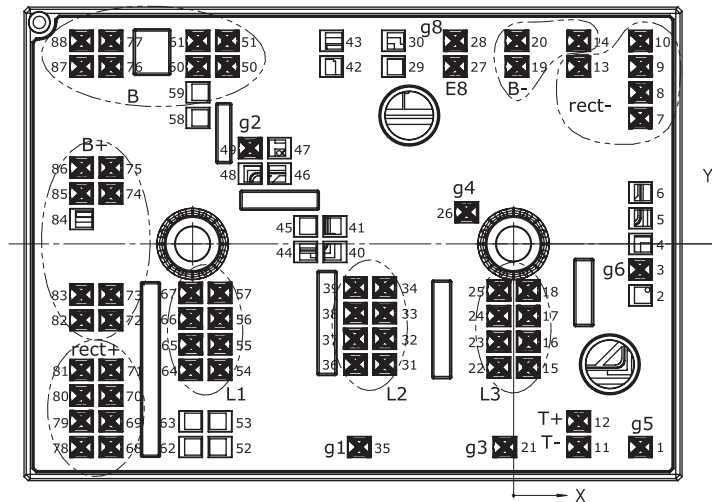


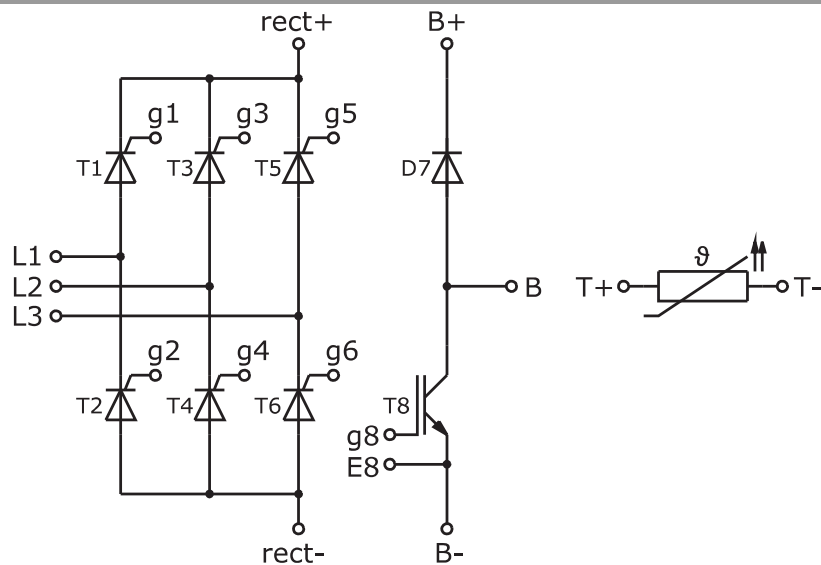
Fig. 12: Max. input bridge forward characteristic incl. $R_{CC+EE'}$

Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	15,83	-25,30	g5	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	g6	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		35	-19,23	-25,30	g1	65	-40,23	-12,50	L1
6	15,83	6,40		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	B-	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		78	-53,83	-25,30	rect+
19	0,43	22,10	B-	49	-32,83	11,94	g2	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	g3	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	g4	56	-36,58	-9,30	L1	86	-53,83	9,50	B+
27	-7,28	22,10	E8	57	-36,58	-6,10	L1	87	-53,83	22,10	B
28	-7,28	25,30	g8	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.

***IMPORTANT INFORMATION AND WARNINGS**

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