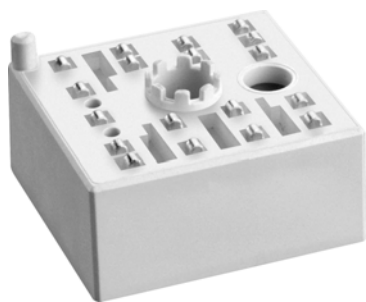


# SKiiP 03NAC12T4V1



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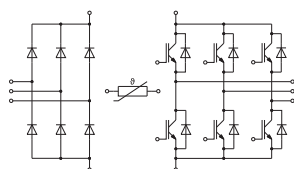
## SKiiP 03NAC12T4V1

### 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

### Remarks

- Max. case temperature limited to  $T_C=125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$  (recommended  $T_{j,op} = -40 \dots +150^\circ\text{C}$ )
- Temperature sensor: No basic insulation to main circuit, max. potential difference 850V to -DC

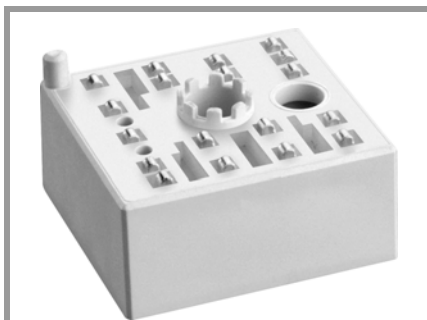


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Absolute Maximum Ratings					
Symbol	Conditions		Values	Unit	
<b>Inverter - IGBT</b>					
$V_{CES}$	$T_j = 25^\circ\text{C}$		1200	V	
$I_C$	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	7.5	A	
		$T_s = 70^\circ\text{C}$	7.5	A	
$I_C$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	7.5	A	
		$T_s = 70^\circ\text{C}$	7.5	A	
$I_{Chom}$			8	A	
$I_{CRM}$			24	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	$\mu\text{s}$	
$T_j$			-40 ... 175	$^\circ\text{C}$	
<b>Inverse - Diode</b>					
$V_{RRM}$	$T_j = 25^\circ\text{C}$		1200	V	
$I_F$	$T_j = 150^\circ\text{C}$	$T_s = 25^\circ\text{C}$	9	A	
		$T_s = 70^\circ\text{C}$	9	A	
$I_F$	$T_j = 175^\circ\text{C}$	$T_s = 25^\circ\text{C}$	9	A	
		$T_s = 70^\circ\text{C}$	9	A	
$I_{FRM}$			24	A	
$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$		36	A	
$T_j$			-40 ... 175	$^\circ\text{C}$	
<b>Rectifier - Diode</b>					
$V_{RRM}$	$T_j = 25^\circ\text{C}$		1600	V	
$I_F$	$T_s = 25^\circ\text{C}, T_j = 150^\circ\text{C}$		39	A	
$I_{FSM}$	$t_p = 10\text{ ms}$ $\text{sin } 180^\circ$	$T_j = 25^\circ\text{C}$	220	A	
		$T_j = 150^\circ\text{C}$	200	A	
$i^2t$	$t_p = 10\text{ ms}$ $\text{sin } 180^\circ$	$T_j = 25^\circ\text{C}$	242	$\text{A}^2\text{s}$	
		$T_j = 150^\circ\text{C}$	200	$\text{A}^2\text{s}$	
$T_j$			-40 ... 150	$^\circ\text{C}$	
<b>Module</b>					
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}, 20\text{ A per spring}$		t.b.d.	A	
$T_{stg}$	module without TIM		-40 ... 125	$^\circ\text{C}$	
$V_{isol}$	AC sinus 50 Hz, 1 min		2500	V	

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverter - IGBT</b>						
$V_{CE(sat)}$	$I_C = 8\text{ A}$ $V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V	
		$T_j = 150^\circ\text{C}$	2.25	2.45	V	
$V_{CE0}$	chiplevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V	
		$T_j = 150^\circ\text{C}$	0.70	0.80	V	
$r_{CE}$	$V_{GE} = 15\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	131	150	$\text{m}\Omega$	
		$T_j = 150^\circ\text{C}$	194	206	$\text{m}\Omega$	
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$		5	5.8	6.5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$	-		1	$\text{mA}$
			-			$\text{mA}$
$C_{ies}$	$V_{CE} = 25\text{ V}$	$f = 1\text{ MHz}$	0.49		$\text{nF}$	
$C_{oes}$	$V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.05		$\text{nF}$	
$C_{res}$			0.03		$\text{nF}$	

# SKiiP 03NAC12T4V1



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## SKiiP 03NAC12T4V1

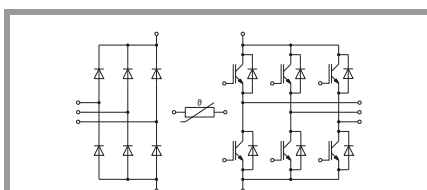
### Features\*

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

### Remarks

- Max. case temperature limited to  $T_C=125^\circ\text{C}$
- Product reliability results valid for  $T_j \leq 150^\circ\text{C}$  (recommended  $T_{j,op} = -40 \dots +150^\circ\text{C}$ )
- Temperature sensor: No basic insulation to main circuit, max. potential difference 850V to -DC

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
<b>Inverter - IGBT</b>					
$Q_G$	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		45		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$		0		$\Omega$
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	$T_j = 150^\circ\text{C}$	32		ns
$t_r$	$I_C = 8 \text{ A}$	$T_j = 150^\circ\text{C}$	34		ns
$E_{on}$	$R_{G on} = 47 \Omega$	$T_j = 150^\circ\text{C}$	0.9		mJ
$t_{d(off)}$	$R_{G off} = 47 \Omega$	$T_j = 150^\circ\text{C}$	295		ns
$t_f$		$T_j = 150^\circ\text{C}$	68		ns
$E_{off}$	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	0.7		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W}/(\text{K}\cdot\text{m})$		1.84		K/W
<b>Inverse - Diode</b>					
$V_F = V_{EC}$	$I_F = 8 \text{ A}$	$T_j = 25^\circ\text{C}$	2.33	2.65	V
	$V_{GE} = 0 \text{ V}$	$T_j = 150^\circ\text{C}$	2.35	2.68	V
	chipelevel				
$V_{F0}$		$T_j = 25^\circ\text{C}$	1.30	1.50	V
	chipelevel	$T_j = 150^\circ\text{C}$	0.90	1.10	V
$r_F$		$T_j = 25^\circ\text{C}$	129	144	m $\Omega$
	chipelevel	$T_j = 150^\circ\text{C}$	181	198	m $\Omega$
$I_{RRM}$	$I_F = 8 \text{ A}$	$T_j = 150^\circ\text{C}$	7.7		A
$Q_{rr}$	$V_{GE} = -15 \text{ V}$	$T_j = 150^\circ\text{C}$	1.23		$\mu\text{C}$
	$V_{CC} = 600 \text{ V}$				
$E_{rr}$	$di/dt_{off} = 335 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	0.5		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{K}\cdot\text{m})$		2.53		K/W
<b>Rectifier - Diode</b>					
$V_F = V_{EC}$	$I_F = 8 \text{ A}$	$T_j = 25^\circ\text{C}$	1.00	1.21	V
	chipelevel	$T_j = 125^\circ\text{C}$	0.90	1.10	V
$V_{F0}$		$T_j = 25^\circ\text{C}$	0.88	0.98	V
	chipelevel	$T_j = 125^\circ\text{C}$	0.73	0.83	V
$r_F$		$T_j = 25^\circ\text{C}$	15	29	m $\Omega$
	chipelevel	$T_j = 125^\circ\text{C}$	21	34	m $\Omega$
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W}/(\text{K}\cdot\text{m})$		1.5		K/W
<b>Module</b>					
$M_s$	to heat sink	2		2.5	Nm
$w$			20		g
<b>Temperature Sensor</b>					
$R_{100}$	$T_r = 100^\circ\text{C}$ , tolerance = 3 %		1670 $\pm$ 3%		$\Omega$
$R_{(T)}$	$R_{(T)} = 1000 \Omega [1 + A(T - 25^\circ\text{C}) + B(T - 25^\circ\text{C})^2]$ $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$ , $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$				



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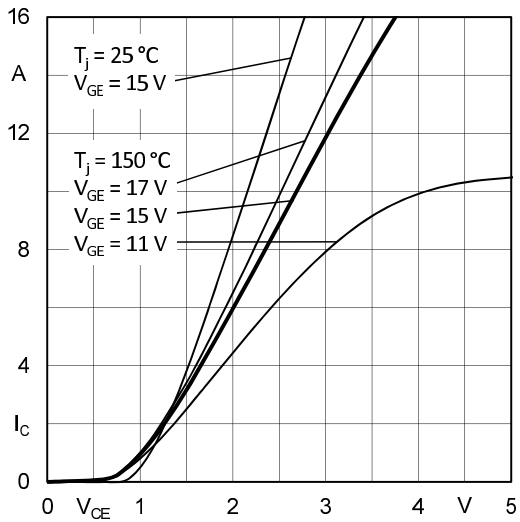


Fig. 1: Typ. output characteristic

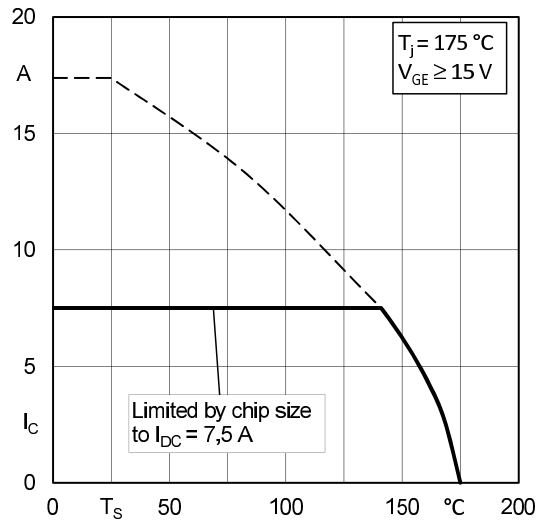


Fig. 2: Typ. rated current vs. temperature  $I_C = f(T_s)$

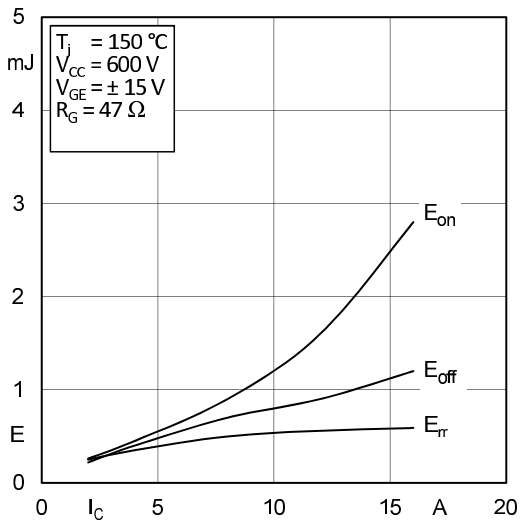


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

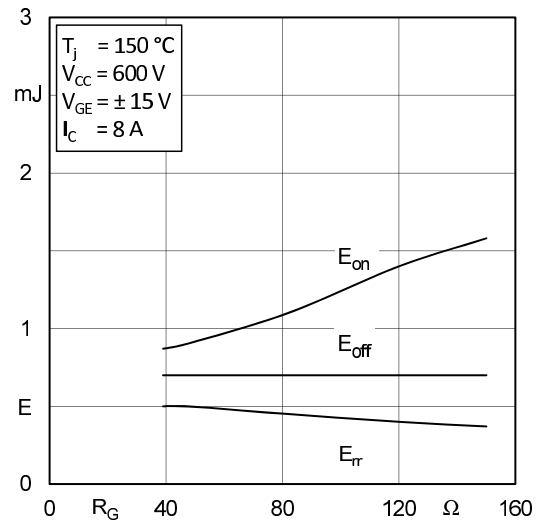


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

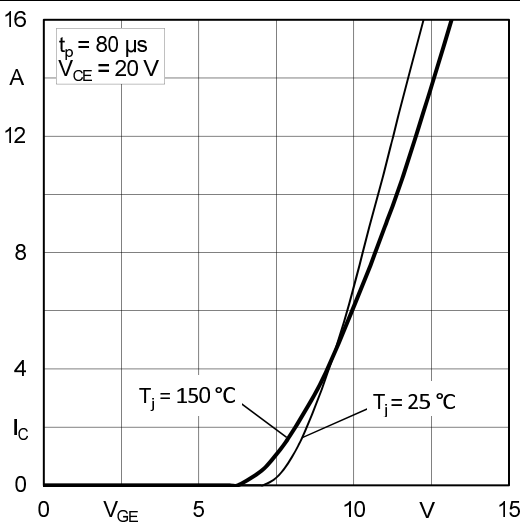


Fig. 5: Typ. transfer characteristic

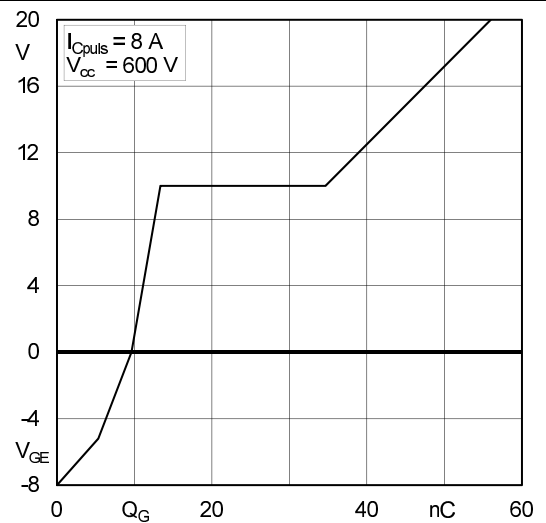


Fig. 6: Typ. gate charge characteristic

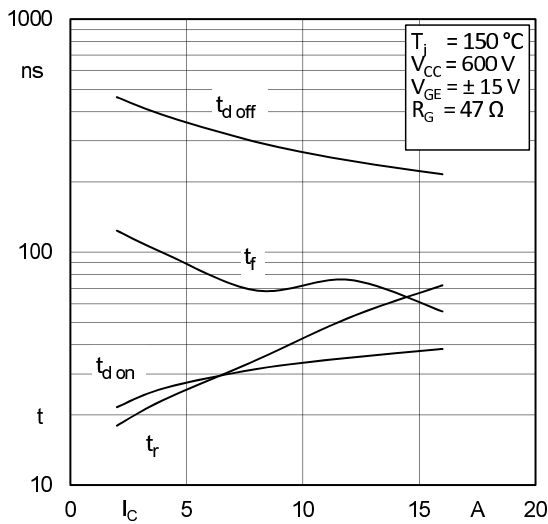


Fig. 7: Typ. switching times vs.  $I_c$

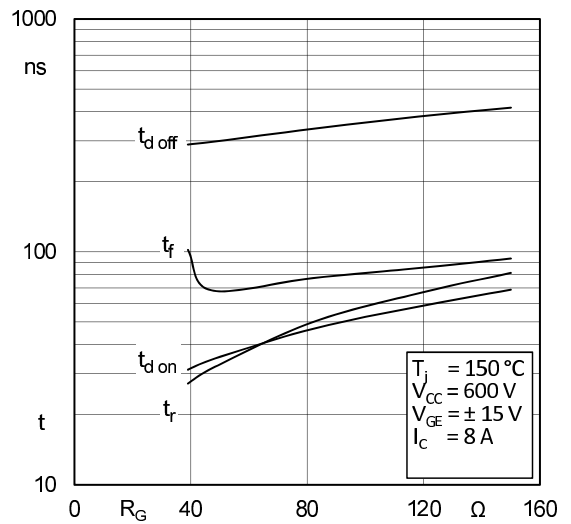


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

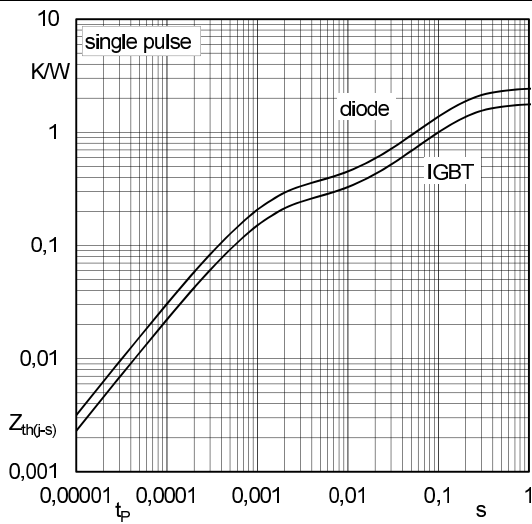


Fig. 9: Typ. transient thermal impedance

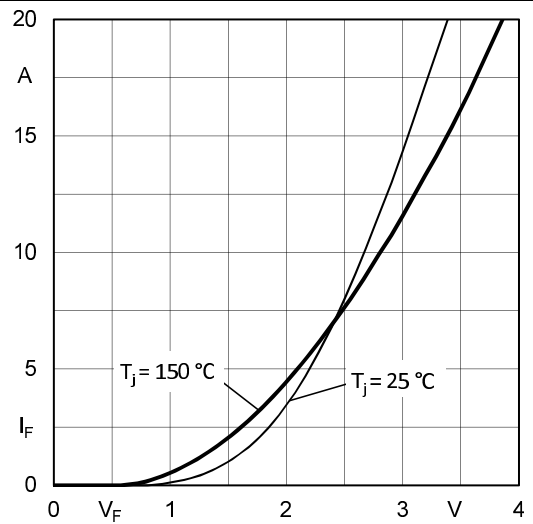


Fig. 10: Typ. CAL diode forward characteristic

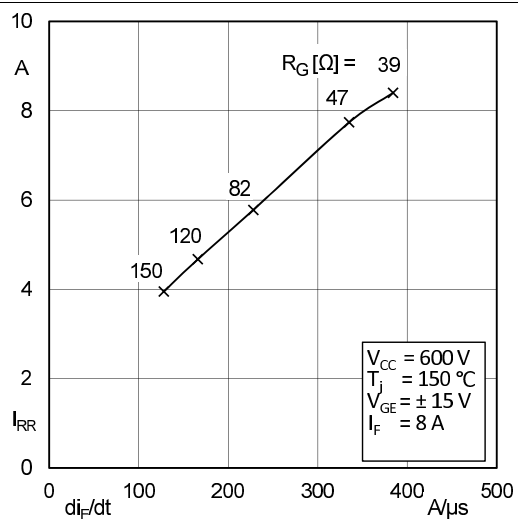


Fig. 11: Typ. CAL diode peak reverse recovery current

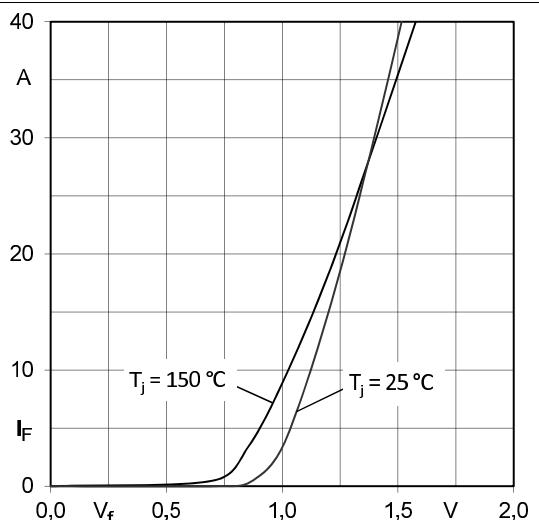
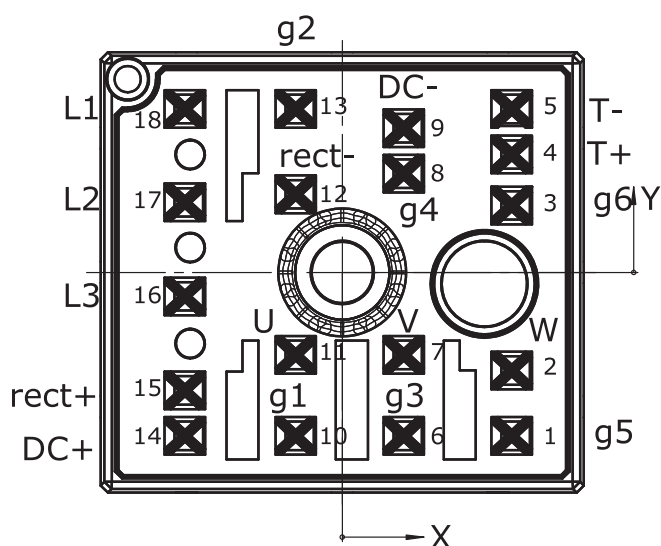


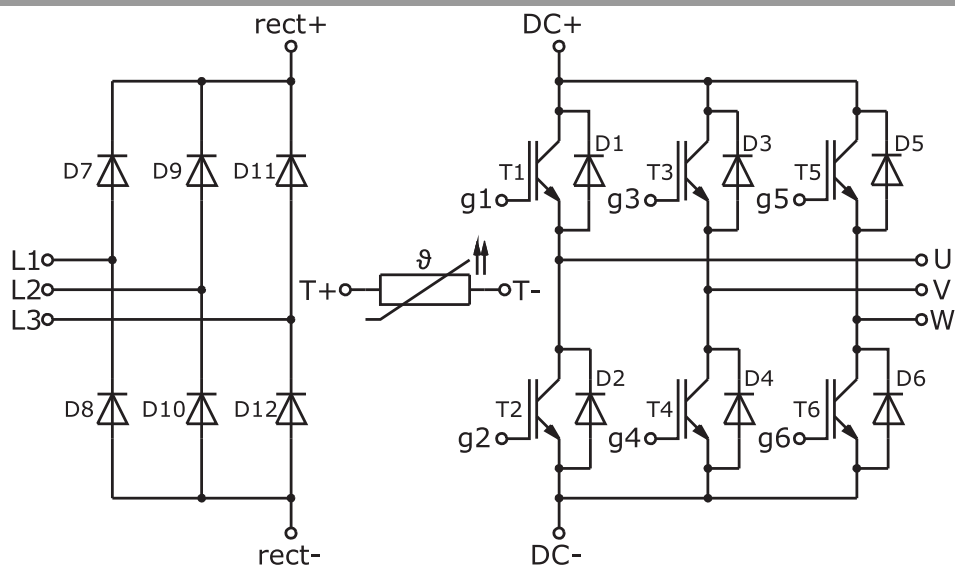
Fig. 12: Typ. input bridge forward characteristic

Pin out							
Pin	X	Y	Function	Pin	X	Y	Function
1	11,93	-11,50	g5	10	-3,28	-11,50	g1
2	11,93	-6,90	W	11	-3,28	-5,80	U
3	11,93	4,71	g6	12	-3,28	5,50	rect-
4	11,93	8,3	T+	13	-3,28	11,50	g2
5	11,93	11,50	T-	14	-11,08	-11,50	DC+
6	4,33	-11,50	g3	15	-11,08	-8,30	rect+
7	4,33	-5,80	V	16	-11,08	-1,68	L3
8	4,33	6,95	g4	17	-11,08	4,93	L2
9	4,33	10,15	DC-	18	-11,08	11,50	L1

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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