

# SKiIP 23AC12T4V1



MiniSKiIP® 2

## Sixpack

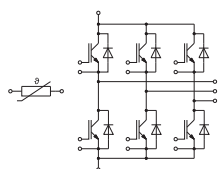
### SKiIP 23AC12T4V1

#### 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  $T_{j,op} = -40 \dots +150^\circ\text{C}$ )
- MiniSKiIP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information

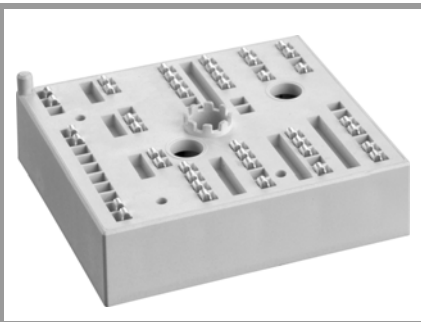


AC

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
<b>Inverter - IGBT</b>				
$V_{CES}$	$T_j = 25^\circ\text{C}$		1200	V
$I_C$	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	41	A
		$T_j = 175^\circ\text{C}$	34	A
$I_C$	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	46	A
		$T_j = 175^\circ\text{C}$	37	A
$I_{Cnom}$			25	A
$I_{CRM}$			75	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
$I_F$	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	32	A
		$T_j = 175^\circ\text{C}$	26	A
$I_F$	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	35	A
		$T_j = 175^\circ\text{C}$	28	A
$I_{FRM}$			75	A
$I_{FSM}$	$t_p = 10 \text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$		100	A
$T_j$			-40 ... 175	$^\circ\text{C}$
<b>Module</b>				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}, 20 \text{ A per spring}$		100	A
$T_{stg}$	module without TIM		-40 ... 125	$^\circ\text{C}$
$V_{isol}$	AC sinus 50 Hz, $t = 1 \text{ min}$		2500	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverter - IGBT</b>						
$V_{CE(sat)}$	$I_C = 25 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10		V
		$T_j = 150^\circ\text{C}$	2.25	2.45		V
$V_{CE0}$	chipelevel	$T_j = 25^\circ\text{C}$	0.80	0.90		V
		$T_j = 150^\circ\text{C}$	0.70	0.80		V
$r_{CE}$	$V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	42	48		$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	62	66		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1 \text{ mA}$		5.3	5.8	6.3	V
$I_{CES}$	$V_{GE} = 0 \text{ V}, V_{CE} = 1200 \text{ V}, T_j = 25^\circ\text{C}$				1	mA
$C_{ies}$	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	1.45			nF
$C_{oes}$		$f = 1 \text{ MHz}$	0.12			nF
$C_{res}$		$f = 1 \text{ MHz}$	0.05			nF
$Q_G$	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$			142		nC
$R_{Gint}$	$T_j = 25^\circ\text{C}$			0		$\Omega$
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $I_C = 25 \text{ A}$	$T_j = 150^\circ\text{C}$	44			ns
$t_r$		$T_j = 150^\circ\text{C}$	46			ns
$E_{on}$	$R_{Gon} = 39 \Omega$ $R_{Goff} = 39 \Omega$	$T_j = 150^\circ\text{C}$	3.7			mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$	330			ns
$t_f$	$di/dt_{on} = 465 \text{ A}/\mu\text{s}$ $di/dt_{off} = 350 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	62			ns
$E_{off}$		$T_j = 150^\circ\text{C}$	2.4			mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$			1		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$			0.83		K/W

# SKiiP 23AC12T4V1



MiniSKiiP® 2

## Sixpack

### SKiiP 23AC12T4V1

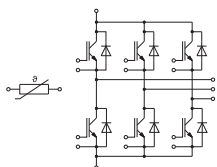
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>Inverse - Diode</b>						
$V_F = V_{EC}$	$I_F = 25\text{ A}$ $V_{GE} = 0\text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$		2.41	2.74	V
		$T_j = 150^\circ\text{C}$		2.45	2.79	V
$V_{F0}$	chiplevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
$r_F$	chiplevel	$T_j = 25^\circ\text{C}$		44	50	m $\Omega$
		$T_j = 150^\circ\text{C}$		62	68	m $\Omega$
$I_{RRM}$	$I_F = 25\text{ A}$	$T_j = 150^\circ\text{C}$		19		A
$Q_{rr}$	$di/dt_{off} = 640\text{ A}/\mu\text{s}$ $V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$		4		$\mu\text{C}$
$E_{rr}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		1.64		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			1.52		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.29		K/W
<b>Module</b>						
$L_{CE}$				-		nH
$M_s$	to heat sink		2		2.5	Nm
$W$				55		g
<b>Temperature Sensor</b>						
$R_{100}$	$T_r=100^\circ\text{C}$ ( $R_{25}=1000\Omega$ )			$1670 \pm 3\%$		$\Omega$
$R_{(T)}$	$R_{(T)}=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$ , $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$ , $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



AC

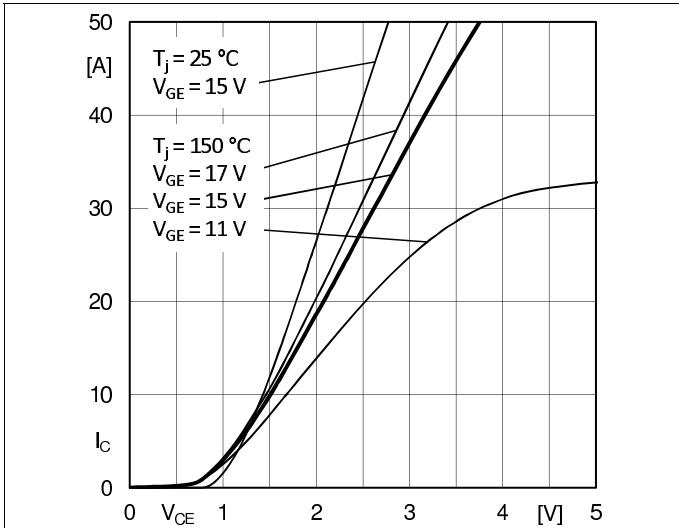


Fig. 1: Typ. output characteristic

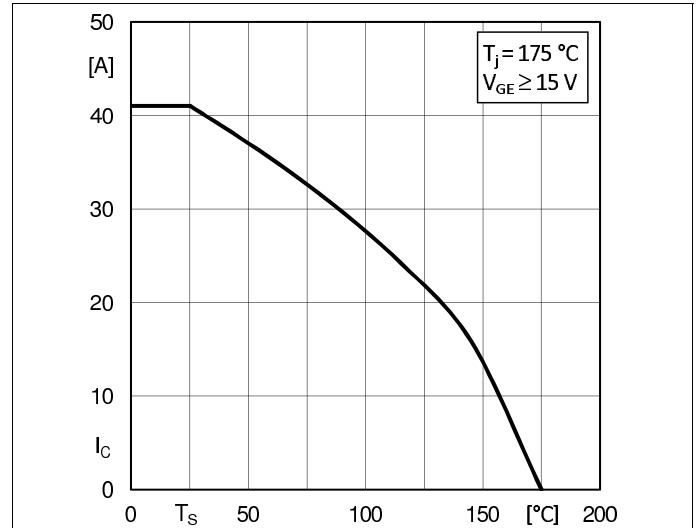


Fig. 2: Rated current vs. temperature  $I_C = f(T_S)$

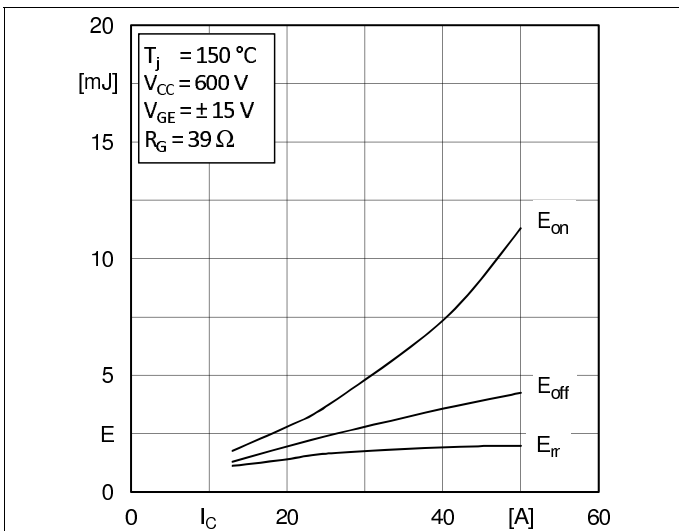


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

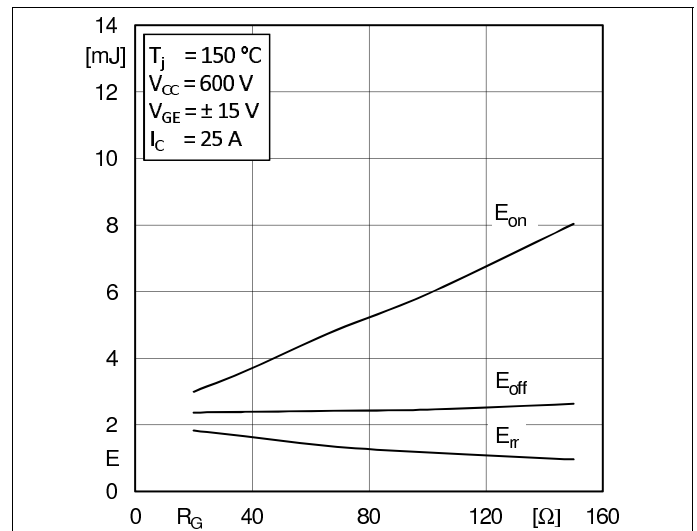


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

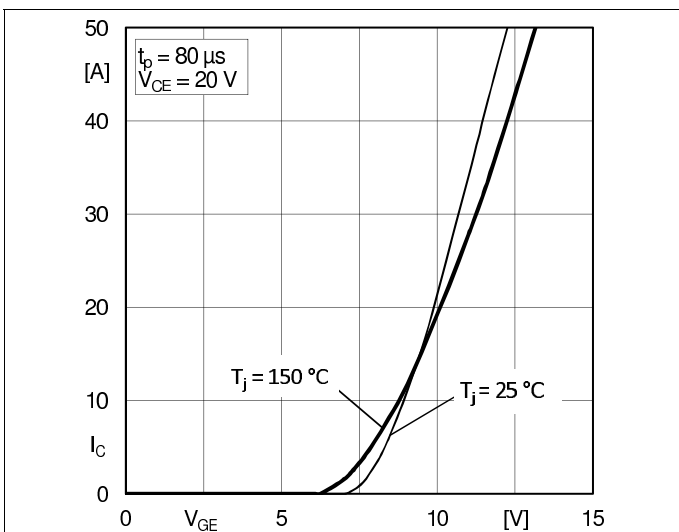


Fig. 5: Typ. transfer characteristic

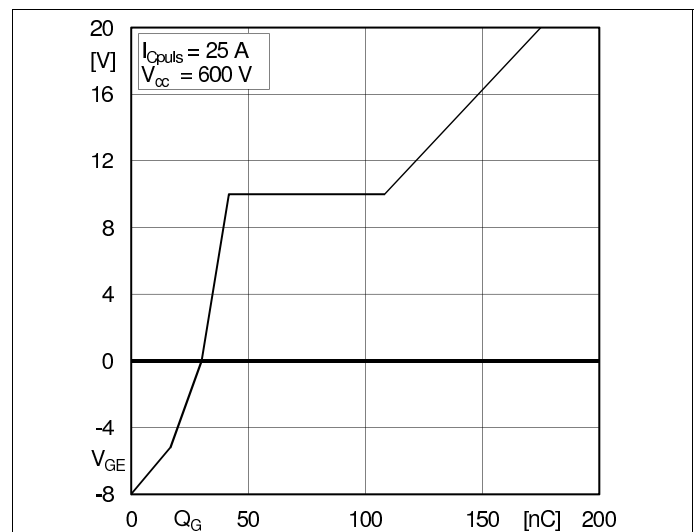


Fig. 6: Typ. gate charge characteristic

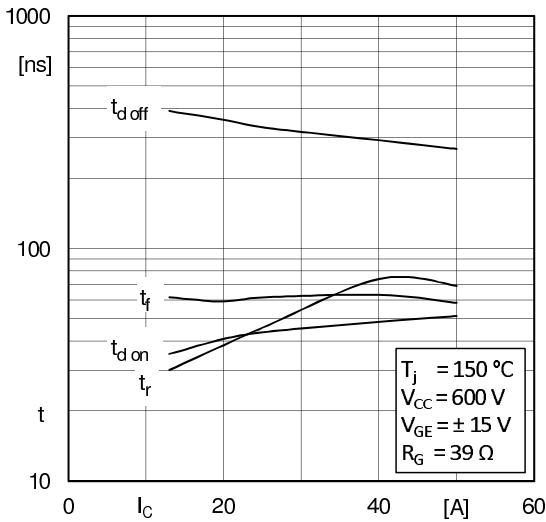


Fig. 7: Typ. switching times vs.  $I_C$

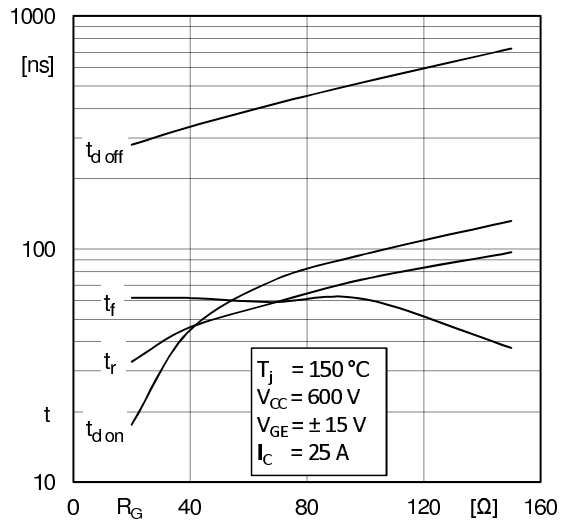


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

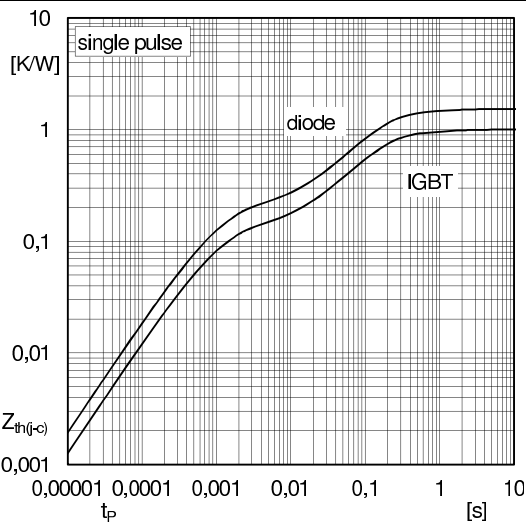


Fig. 9: Typ. transient thermal impedance

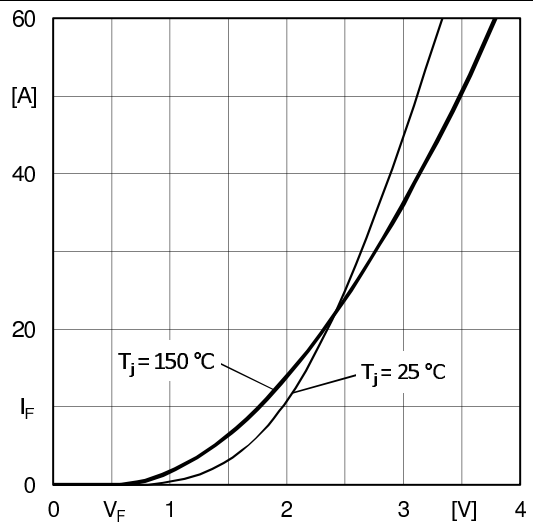


Fig. 10: Typ. CAL diode forward characteristic

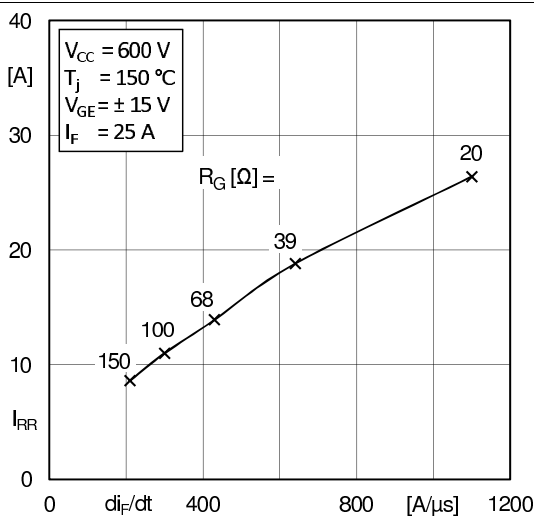


Fig. 11: Typ. CAL diode peak reverse recovery current

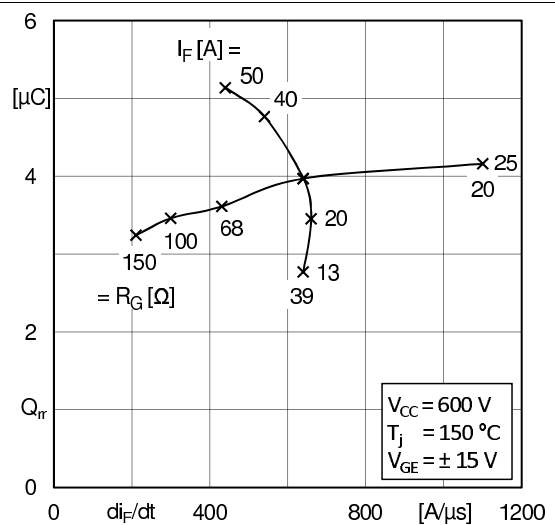
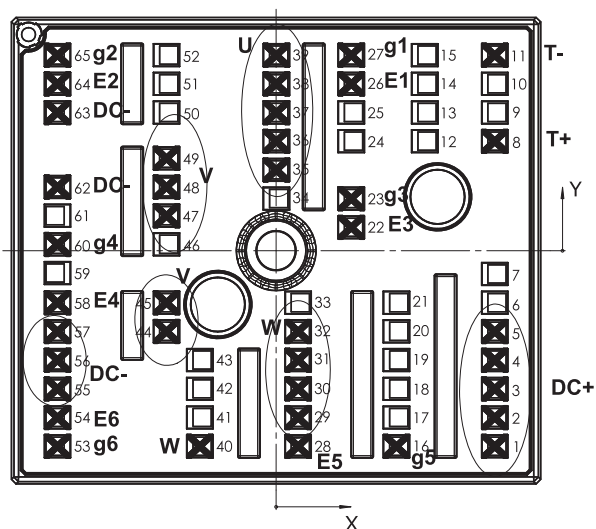


Fig. 12: Typ. CAL diode recovery charge

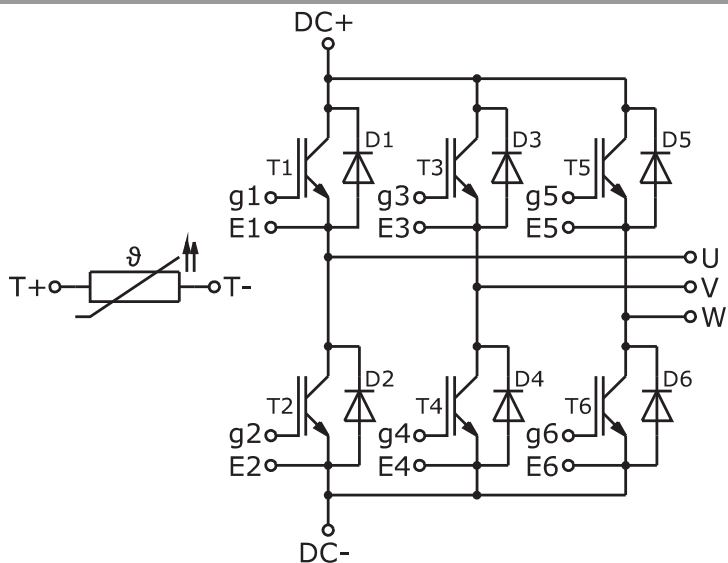
# SKiiP 23AC12T4V1

Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	24,38	-21,80	DC+	23	8,38	5,80	g3	45	-12,23	-5,80	V
2	24,38	-18,60	DC+	24	8,38	12,20		46	-12,23	0,70	
3	24,38	-15,40	DC+	25	8,38	15,40		47	-12,23	3,90	V
4	24,38	-12,20	DC+	26	8,38	18,60	E1	48	-12,23	7,10	V
5	24,38	-9,00	DC+	27	8,38	21,80	g1	49	-12,23	10,30	V
6	24,38	-5,80		28	2,46	-21,80	E5	50	-12,23	15,40	
7	24,38	-2,60		29	2,46	-18,60	W	51	-12,23	18,60	
8	24,38	12,20	T+	30	2,46	-15,40	W	52	-12,23	21,80	
9	24,38	15,40		31	2,46	-12,20	W	53	-24,38	-21,80	g6
10	24,38	18,60		32	2,46	-9,00	W	54	-24,38	-18,60	E6
11	24,38	21,80	T-	33	2,46	-5,80		55	-24,38	-15,40	DC-
12	16,58	12,20		34	0,03	5,80		56	-24,38	-12,20	DC-
13	16,58	15,40		35	0,03	9,00	U	57	-24,38	-9,00	DC-
14	16,58	18,60		36	0,03	12,20	U	58	-24,38	-5,80	E4
15	16,58	21,80		37	0,03	15,40	U	59	-24,38	-2,50	
16	13,42	-21,80	g5	38	0,03	18,60	U	60	-24,38	0,70	g4
17	13,42	-18,60		39	0,03	21,80	U	61	-24,38	3,90	
18	13,42	-15,40		40	-8,51	-21,80	W	62	-24,38	7,10	DC-
19	13,42	-12,20		41	-8,51	-18,60		63	-24,38	15,40	DC-
20	13,42	-9,00		42	-8,51	-15,40		64	-24,38	18,60	E2
21	13,42	-5,80		43	-8,51	-12,20		65	-24,38	21,80	g2
22	8,38	2,60	E3	44	-12,23	-9,00	V				

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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