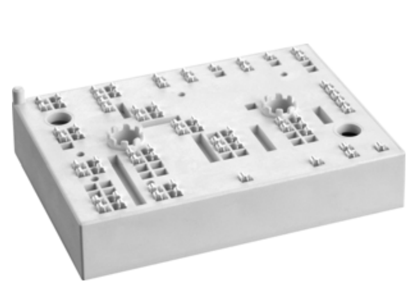
SKiiP 35NAC12F4V1



MiniSKiiP® 3

3-phase Converter – Inverter (CI)

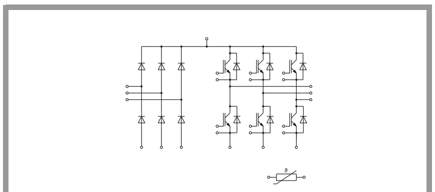
SKiiP 35NAC12F4V1

Features*

- Fast Trench 4 IGBTs
- Robust and soft switching diodes in CAL technology
- NEW SKR PEP diode-technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Remarks

- Case temperature limited to T_C=125°C max.; T_C = T_S (for baseplateless modules)
- Product reliability results valid for T_j≤150°C (recommended T_{jop}=-40...+150°C)
- MiniSKiiP “Technical Explanations” and “Mounting Instructions” are part of the data sheet. Please refer to both documents for further information.
- The creepage distance between T-sensor and DC- is 0,8mm (functional insulation of T-sensor only up to 200V)



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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_j = 175 °C	T_s = 25 °C	54	A
		T_s = 70 °C	43	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	61	A
		T_s = 70 °C	49	A
I_{Cnom}			50	A
I_{CRM}			150	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_j = 175 °C	T_s = 25 °C	59	A
		T_s = 70 °C	47	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	65	A
		T_s = 70 °C	52	A
I_{FRM}			100	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		270	A
T_j			-40 ... 175	°C
Rectifier - Diode				
V_{RRM}	T_j = 25 °C		1600	V
I_F	λ_{paste}=0.8 W/(mK) T_j = 175 °C	T_s = 25 °C	108	A
		T_s = 70 °C	84	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	123	A
		T_s = 70 °C	97	A
I_{FSM}	t_p = 10 ms sin 180°	T_j = 25 °C	635	A
		T_j = 150 °C	490	A
i^2t	t_p = 10 ms sin 180°	T_j = 25 °C	2020	A^2s
		T_j = 150 °C	1200	A^2s
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C, 20 A per spring		80	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 = 50 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		2.05	2.42	V
		T_j = 150 °C		2.59	2.96	V
V_{CE0}	chiplevel	T_j = 25 °C		1.10	1.28	V
		T_j = 150 °C		0.95	1.13	V
r_{CE}	V_{GE} = 15 V chiplevel	T_j = 25 °C		19	23	mΩ
		T_j = 150 °C		33	37	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1.7 mA		5.2	5.8	6.4	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1	mA

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SKiiP 35NAC12F4V1

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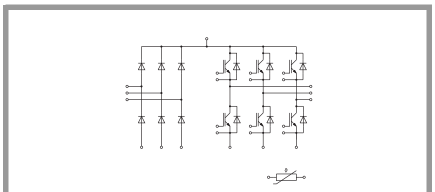
Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		2.77		nF
C_{oes}		f = 1 MHz		0.21		nF
C_{res}		f = 1 MHz		0.16		nF
Q_G	V_{GE} = - 8 V...+ 15 V			283		nC
R_{Gint}	T_j = 25 °C			4.0		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 50 A $R_{G\ on}$ = 6.2 Ω $R_{G\ off}$ = 0 Ω di/dt_{on} = 2500 A/µs di/dt_{off} = 1080 A/µs V_{GE} = +15/-15 V	T_j = 150 °C		28		ns
t_r		T_j = 150 °C		21		ns
E_{on}		T_j = 150 °C		4.8		mJ
$t_{d(off)}$		T_j = 150 °C		234		ns
t_f		T_j = 150 °C		47		ns
E_{off}		T_j = 150 °C		3.4		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.87		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.7		K/W
Inverse - Diode						
$V_F = V_{EC}$	I_F = 50 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.22	2.54	V
		T_j = 150 °C		2.18	2.50	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		18	21	mΩ
		T_j = 150 °C		26	28	mΩ
I_{RRM}	I_F = 50 A V_{GE} = -15 V V_{CC} = 600 V di/dt_{off} = 2400 A/µs	T_j = 150 °C		90		A
Q_{rr}		T_j = 150 °C		8.3		µC
E_{rr}		T_j = 150 °C		3		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.84		K/W
Rectifier - Diode						
$V_F = V_{EC}$	I_F = 26 A chiplevel	T_j = 25 °C		0.97	1.20	V
		T_j = 150 °C		0.84	1.07	V
V_{F0}	chiplevel	T_j = 25 °C		0.89	1.09	V
		T_j = 150 °C		0.73	0.92	V
r_F	chiplevel	T_j = 25 °C		3.1	4.2	mΩ
		T_j = 150 °C		4.4	5.9	mΩ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.88		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.72		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				82		g
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}					



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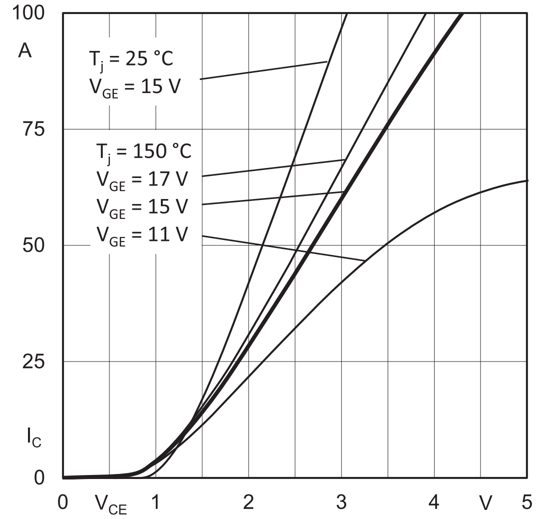


Fig. 1: Typ. output characteristic

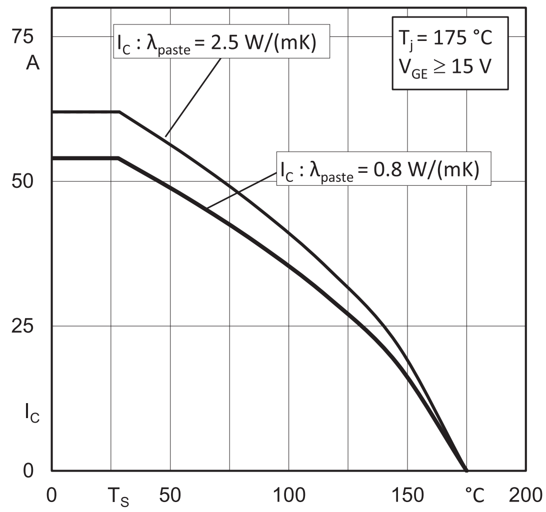


Fig. 2: Rated current vs. temperature I_C = f (T_S)

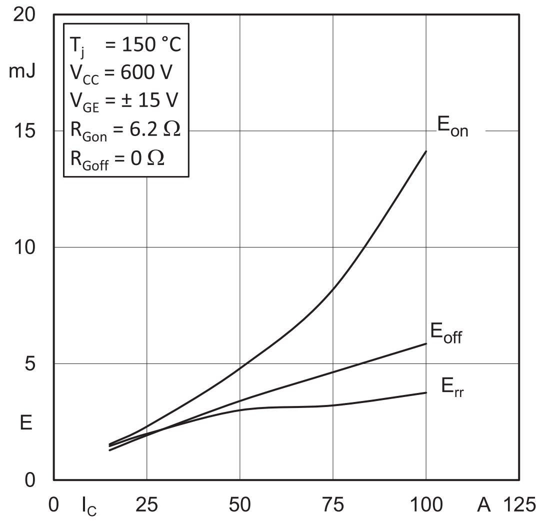


Fig. 3: Typ. turn-on /-off energy = f (I_C)

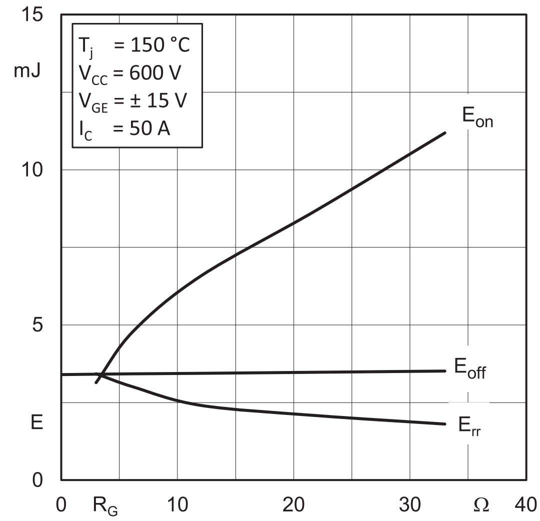


Fig. 4: Typ. turn-on /-off energy = f (R_G)

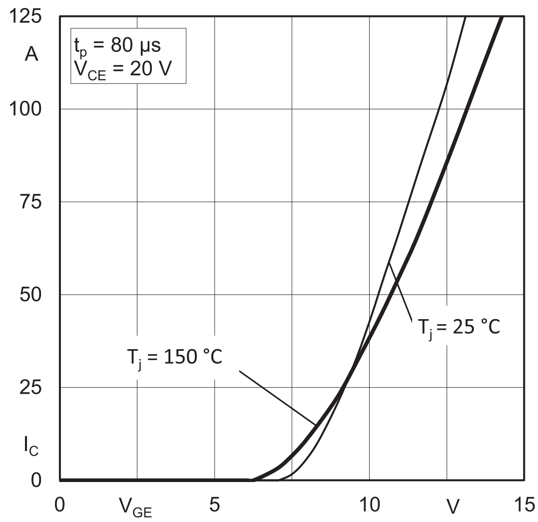


Fig. 5: Typ. transfer characteristic

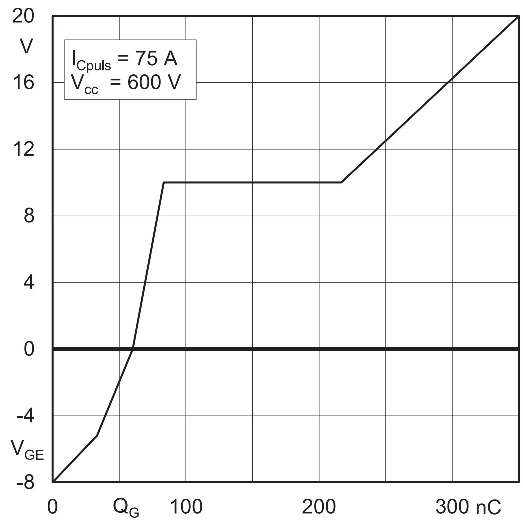


Fig. 6: Typ. gate charge characteristic

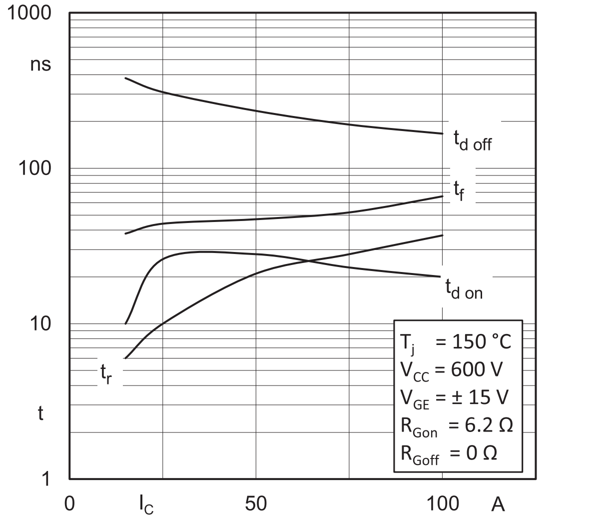


Fig. 7: Typ. switching times vs. I_C

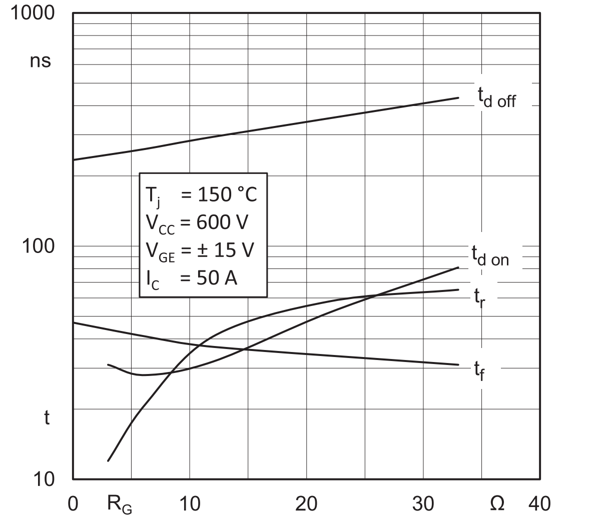


Fig. 8: Typ. switching times vs. gate resistor R_G

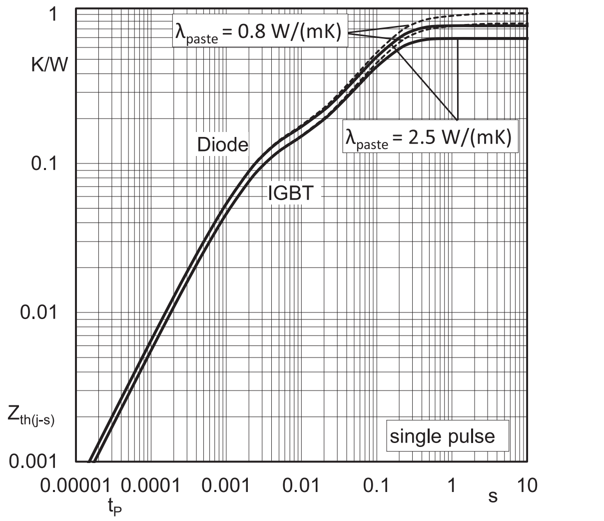


Fig. 9: Typ. transient thermal impedance

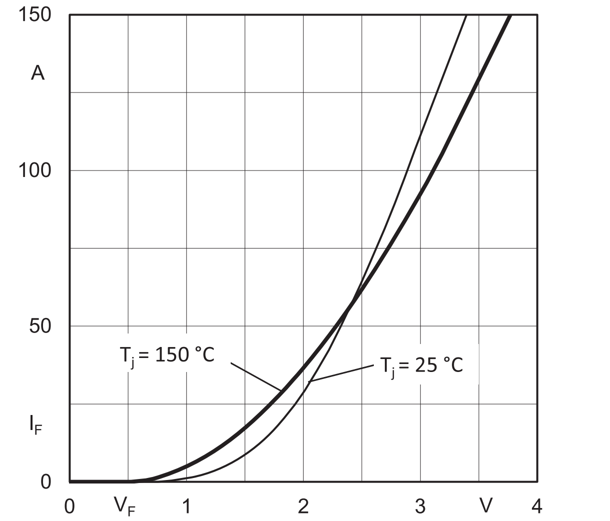


Fig. 10: Typ. CAL diode forward characteristic

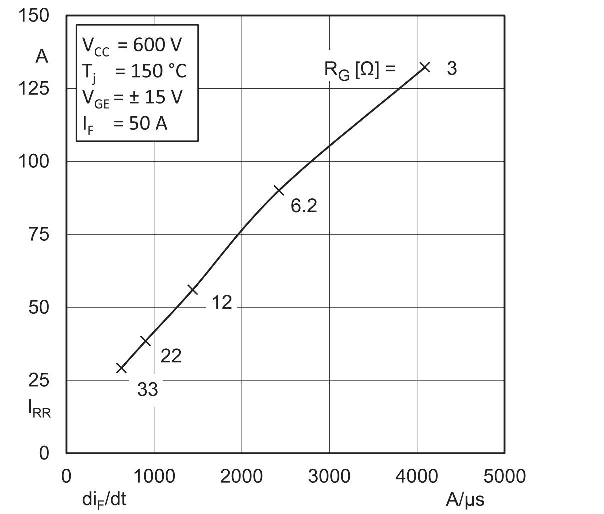


Fig. 11: Typ. CAL diode peak reverse recovery current

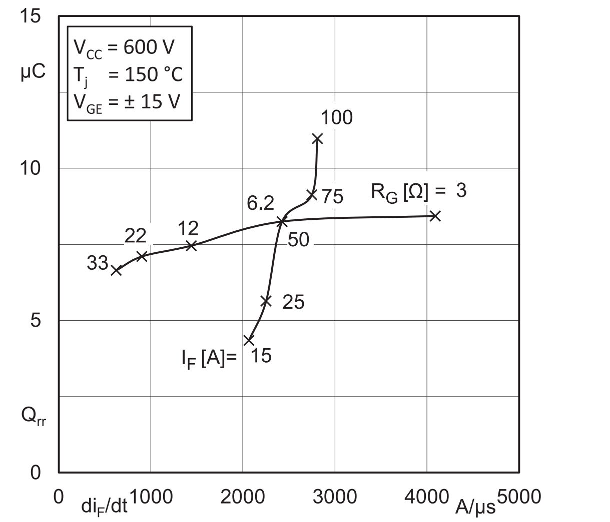
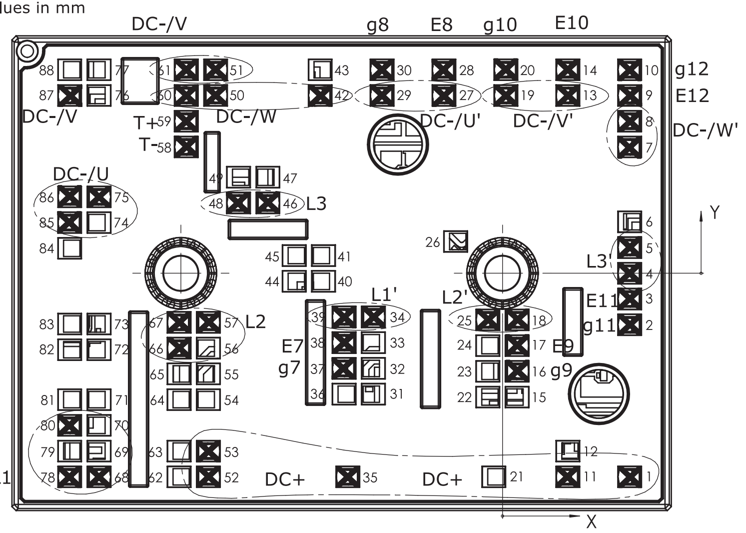


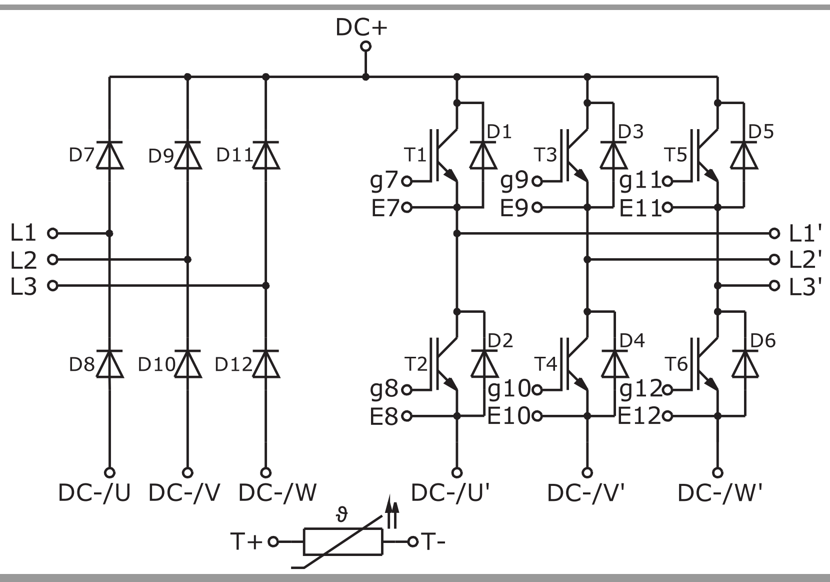
Fig. 12: Typ. CAL diode recovery charge

Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	15,83	-25,30	DC+	31	-16,05	-15,02		61	-39,33	25,30	DC-/V
2	15,83	-6,40	g11	32	-16,05	-11,82		62	-40,23	-25,30	
3	15,83	-3,20	E11	33	-16,05	-8,62		63	-40,23	-22,10	
4	15,83	0	L3'	34	-16,05	-5,42	L1'	64	-40,23	-15,70	
5	15,83	3,20	L3'	35	-19,23	-25,30	DC+	65	-40,23	-12,50	
6	15,83	6,40		36	-19,70	-15,02		66	-40,23	-9,30	L2
7	15,83	15,70	DC-/W'	37	-19,70	-11,82	g7	67	-40,23	-6,10	L2
8	15,83	18,90	DC-/W'	38	-19,70	-8,62	E7	68	-50,18	-25,30	L1
9	15,83	22,10	E12	39	-19,70	-5,42	L1'	69	-50,18	-22,10	
10	15,83	25,30	g12	40	-22,26	-1,00		70	-50,18	-18,90	
11	8,13	-25,30	DC+	41	-22,26	2,20		71	-50,18	-15,70	
12	8,13	-22,10		42	-22,68	22,10	DC-/W	72	-50,18	-9,50	
13	8,13	22,10	DC-/V'	43	-22,68	25,30		73	-50,18	-6,30	
14	8,13	25,30	E10	44	-25,91	-1,00		74	-50,18	6,30	
15	1,83	-15,39		45	-25,91	2,20		75	-50,18	9,50	DC-/U
16	1,83	-12,19	g9	46	-29,18	8,74	L3	76	-50,18	22,10	
17	1,83	-8,99	E9	47	-29,18	11,94		77	-50,18	25,30	
18	1,83	-5,79	L2'	48	-32,83	8,74	L3	78	-53,83	-25,30	L1
19	0,43	22,10	DC-/V'	49	-32,83	11,94		79	-53,83	-22,10	
20	0,43	25,30	g10	50	-35,68	22,10	DC-/W	80	-53,83	-18,90	L1
21	-1,08	-25,30		51	-35,68	25,30	DC-/V	81	-53,83	-15,70	
22	-1,83	-15,39		52	-36,58	-25,30	DC+	82	-53,83	-9,50	
23	-1,83	-12,19		53	-36,58	-22,10	DC+	83	-53,83	-6,30	
24	-1,83	-8,99		54	-36,58	-15,70		84	-53,83	3,10	
25	-1,83	-5,79	L2'	55	-36,58	-12,50		85	-53,83	6,30	DC-/U
26	-5,83	3,95		56	-36,58	-9,30		86	-53,83	9,50	DC-/U
27	-7,28	22,10	DC-/U'	57	-36,58	-6,10	L2	87	-53,83	22,10	DC-/V
28	-7,28	25,30	E8	58	-39,33	15,70	T-	88	-53,83	25,30	
29	-14,98	22,10	DC-/U'	59	-39,33	18,90	T+				
30	-14,98	25,30	g8	60	-39,33	22,10	DC-/W				

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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