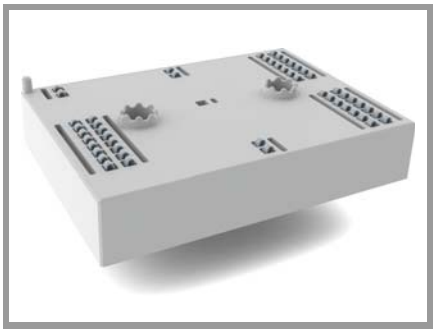
SKiiP39GAL12E4V1



MiniSKiiP® 3

Boost Chopper

SKiiP39GAL12E4V1

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
- NTC T-Sensor

Remarks

- Max. case temperature limited to T_C=125°C
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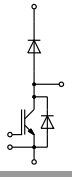

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Absolute Maximum Ratings

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	389	A
	T_j = 175 °C	T_s = 70 °C	313	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	484	A
	T_j = 175 °C	T_s = 70 °C	393	A
I_{Cnom}			400	A
I_{CRM}			1200	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

Absolute Maximum Ratings

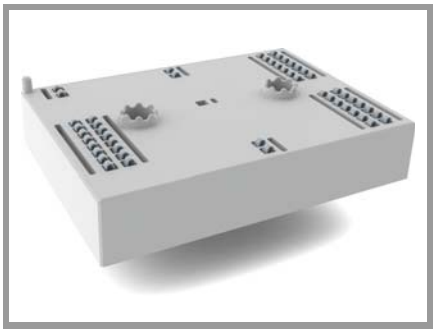
Symbol	Conditions		Values	Unit
Diode 1				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	376	A
	T_j = 175 °C	T_s = 70 °C	297	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	440	A
	T_j = 175 °C	T_s = 70 °C	351	A
I_{FRM}			800	A
I_{FSM}	10 ms	T_j = 25 °C	1980	A
	sin 180°	T_j = 150 °C	1980	A
T_j			-40 ... 175	°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	17	A
	T_j = 175 °C	T_s = 70 °C	13	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	17	A
	T_j = 175 °C	T_s = 70 °C	14	A
I_{FRM}			16	A
I_{FSM}	10 ms	T_j = 25 °C	36	A
	sin 180°	T_j = 150 °C	36	A
T_j			-40 ... 175	°C

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Module			
$I_{t(RMS)}$	20 A per spring	280	A
T_{stg}	module without TIM	-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, t = 1 min	2500	V



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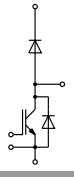

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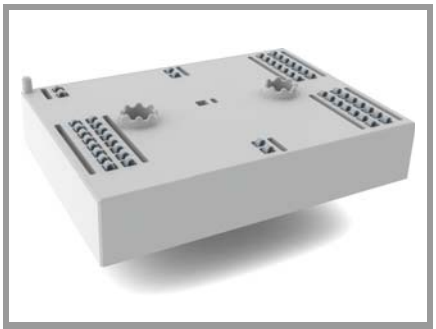
Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1						
$V_{CE(sat)}$	I_C = 400 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.80	2.05	V
		T_j = 150 °C		2.20	2.40	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		2.5	2.9	mΩ
		T_j = 150 °C		3.8	4.0	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 15.2 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				4.0	mA
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V	f = 1 MHz		24.60		nF
C_{oes}		f = 1 MHz		1.62		nF
C_{res}		f = 1 MHz		1.38		nF
Q_G	V_{GE} = - 8 V...+ 15 V			2260		nC
R_{Gint}	T_j = 25 °C			1.9		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 400 A, V_{GE} = +15/-15 V, $R_{G\,on}$ = 1.5 Ω, $R_{G\,off}$ = 1.5 Ω, di/dt$_{on}$ = 6940 A/µs, di/dt$_{off}$ = 2930 A/µs, L_s = 25 nH	T_j = 150 °C		183		ns
t_r		T_j = 150 °C		62		ns
E_{on}		T_j = 150 °C		20.8		mJ
$t_{d(off)}$		T_j = 150 °C		520		ns
t_f		T_j = 150 °C		118		ns
E_{off}		T_j = 150 °C		49.7		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.16		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.11		K/W

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Diode 1						
V_F	I_F = 400 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.20	2.52	V
		T_j = 150 °C		2.15	2.47	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		2.3	2.6	mΩ
		T_j = 150 °C		3.1	3.4	mΩ
I_{RRM}	I_F = 400 A, di/dt$_{off}$ = 6840 A/µs, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		425		A
Q_{rr}		T_j = 150 °C		63.2		µC
E_{rr}		T_j = 150 °C		30.2		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.18		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.14		K/W



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- Diode 1 = D1
- Diode 2 = D2
- IGBT 1 = T2

Characteristics

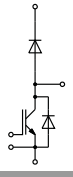
Symbol	Conditions		min.	typ.	max.	Unit
Diode 2						
V_F	I_F = 8 A, V_{GE} = 0 V, chiplevel	T_j = 25 °C		2.33	2.65	V
		T_j = 150 °C		2.35	2.68	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		129	144	mΩ
		T_j = 150 °C		181	198	mΩ
I_{RRM}	I_F = 8 A, V_{GE} = -15 V, V_{CC} = 600 V	T_j = 150 °C		t.b.d.		A
Q_{rr}		T_j = 150 °C		t.b.d.		µC
E_{rr}		T_j = 150 °C		t.b.d.		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			2.2		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			2		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_c=100°C (R_{25}=5 kΩ)		493 ± 5%		Ω
$B_{25/85}$	$R_{(T)}=R_{25}*\exp[B_{25/85}*(1/T-1/298)]$, T[K]		3420		K



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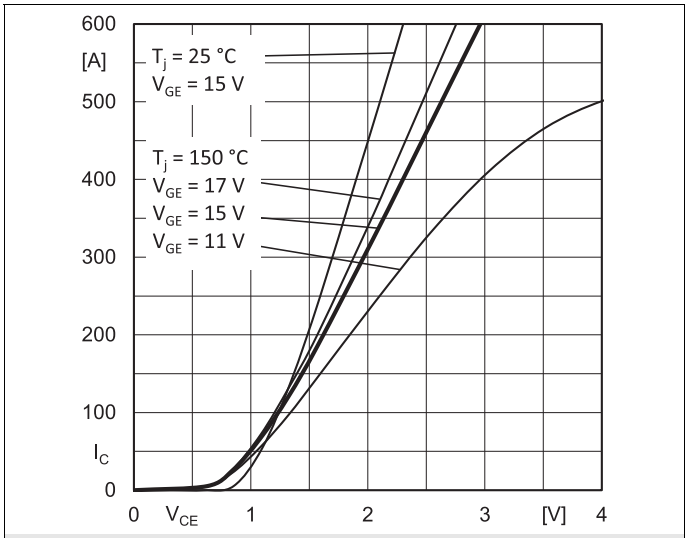


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

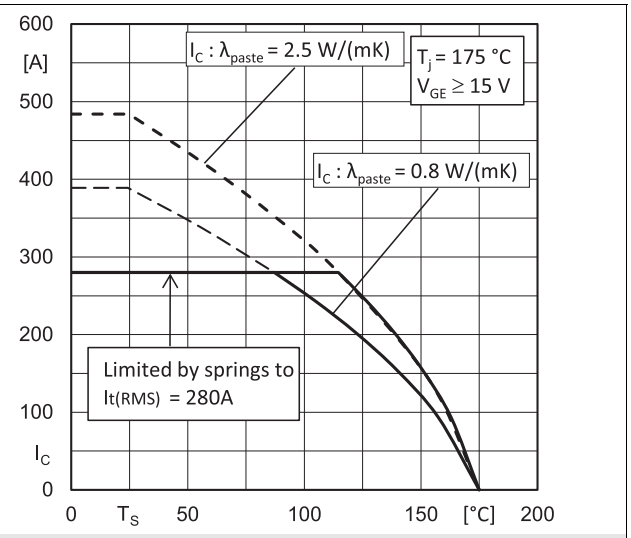


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

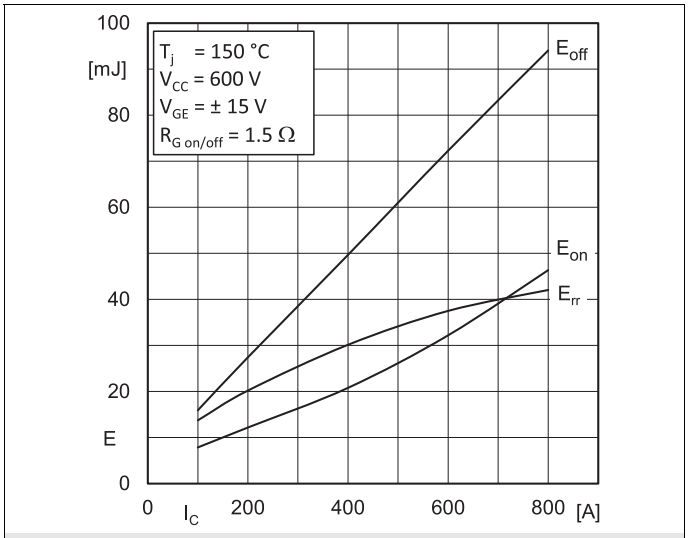


Fig. 3: Typ. turn-on /-off energy = f (I_C)

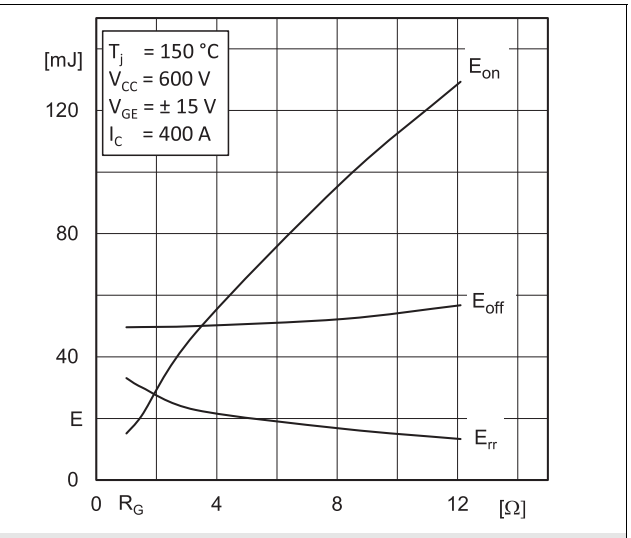


Fig. 4: Typ. turn-on /-off energy = f (R_G)

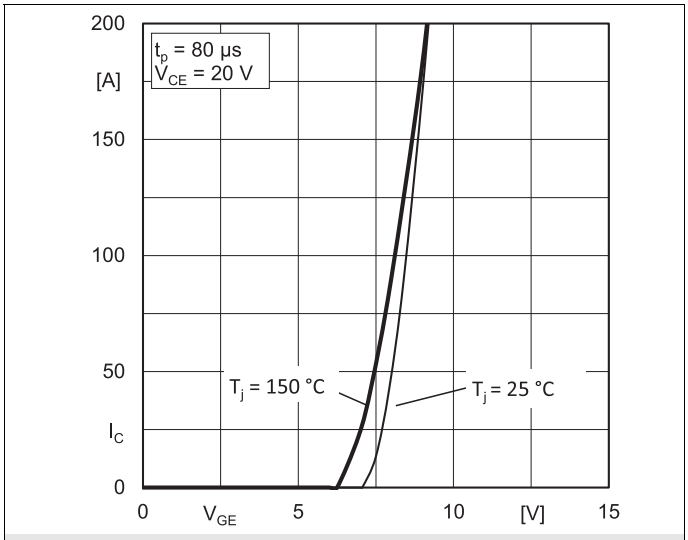


Fig. 5: Typ. transfer characteristic

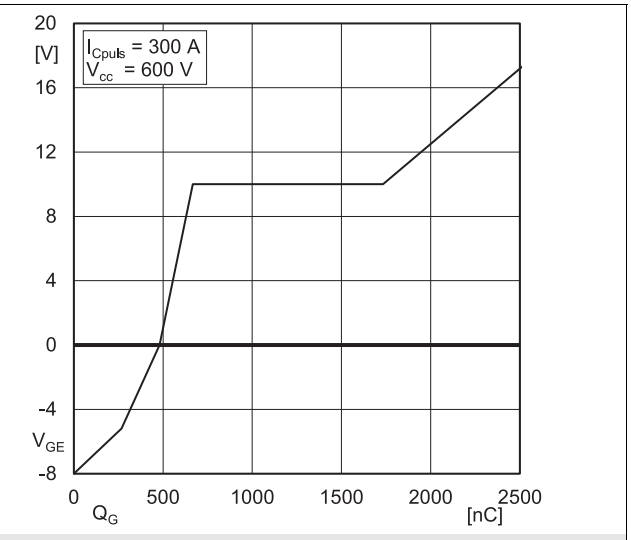


Fig. 6: Typ. gate charge characteristic

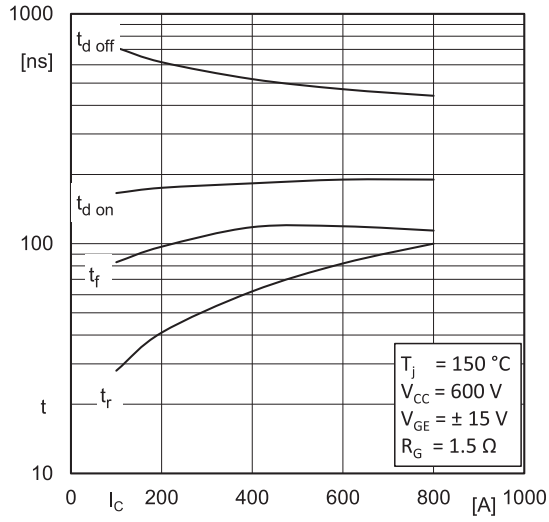


Fig. 7: Typ. switching times vs. I_C

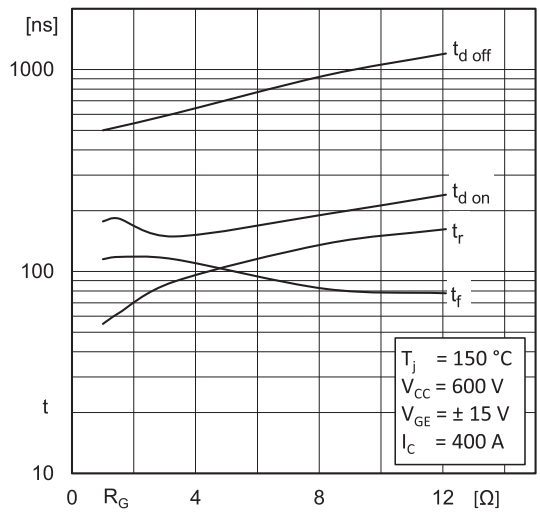


Fig. 8: Typ. switching times vs. gate resistor R_G

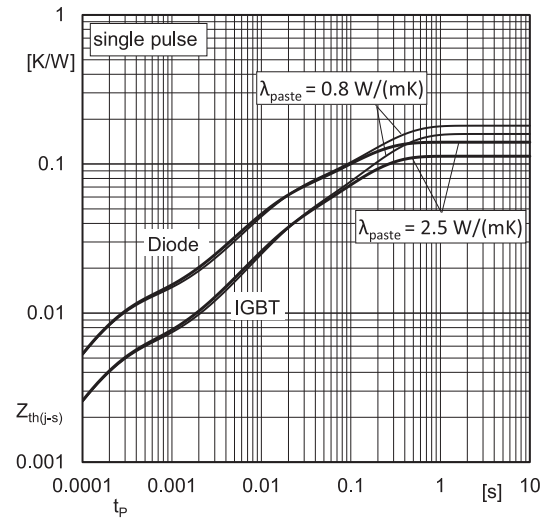


Fig. 9: Typ. transient thermal impedance

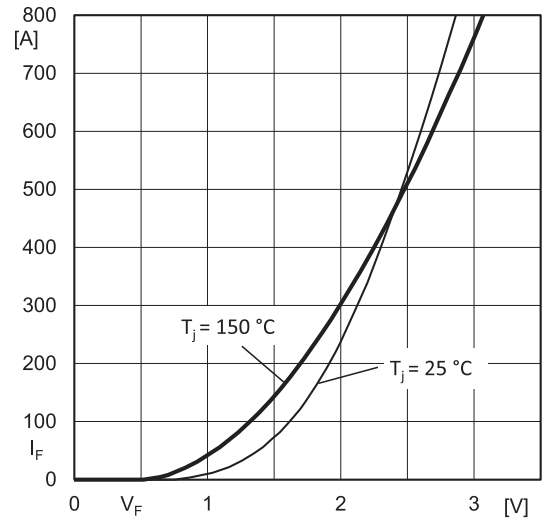


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

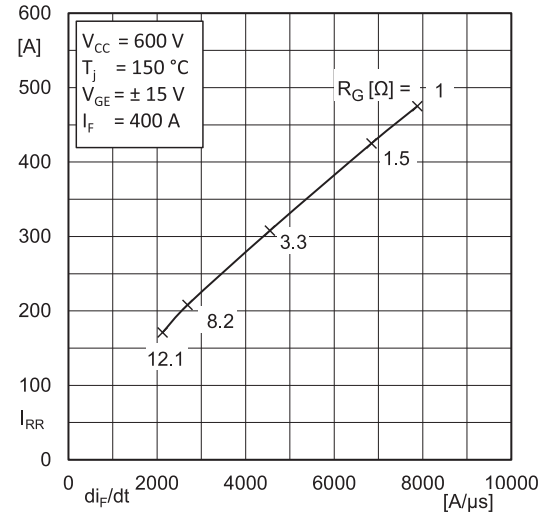


Fig. 11: Typ. CAL diode peak reverse recovery current

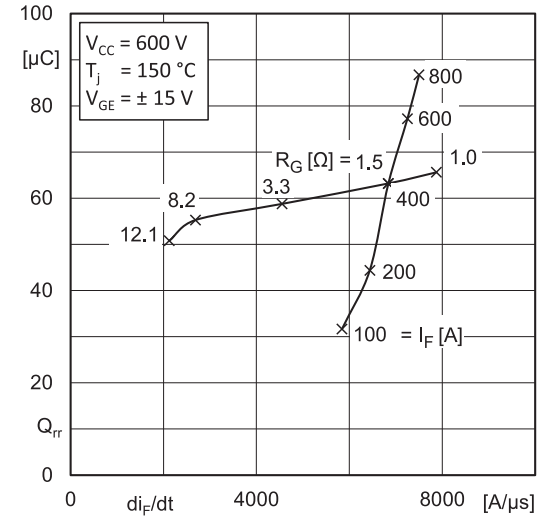
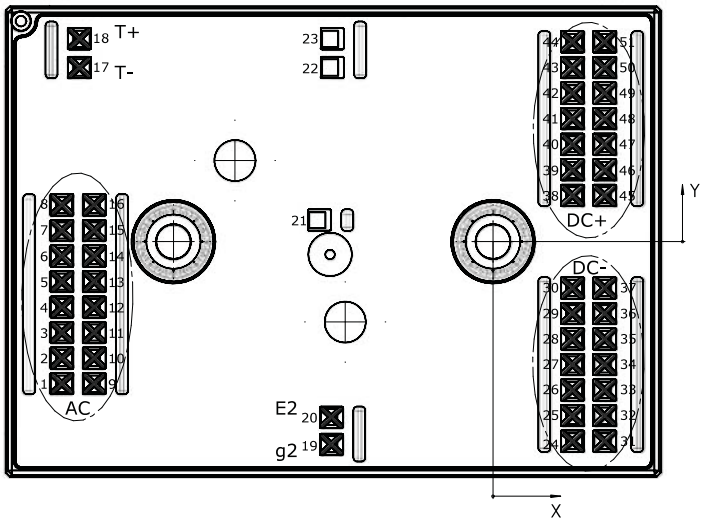


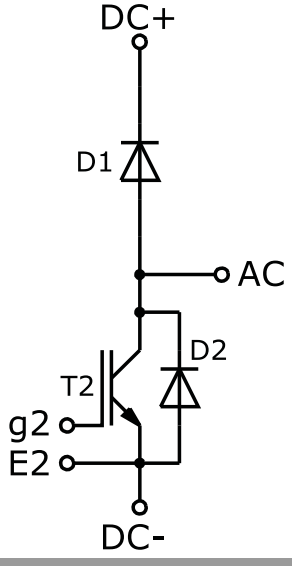
Fig. 12: Typ. CAL diode recovery charge

Pin out											
Pin	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*
1	-53,98	-17,80	AC	18	-51,78	25,40	T+	35	13,98	-12,20	DC-
2	-53,98	-14,60	AC	19	-20,23	-25,40	g2	36	13,98	-9,00	DC-
3	-53,98	-11,40	AC	20	-20,23	-22,00	E2	37	13,98	-5,80	DC-
4	-53,98	-8,20	AC	21	-21,73	2,70		38	9,93	5,80	DC+
5	-53,98	-5,00	AC	22	-20,13	21,80		39	9,93	9,00	DC+
6	-53,98	-1,80	AC	23	-20,13	25,40		40	9,93	12,20	DC+
7	-53,98	1,40	AC	24	9,93	-25,00	DC-	41	9,93	15,40	DC+
8	-53,98	4,60	AC	25	9,93	-21,80	DC-	42	9,93	18,60	DC+
9	-49,93	-17,80	AC	26	9,93	-18,60	DC-	43	9,93	21,80	DC+
10	-49,93	-14,60	AC	27	9,93	-15,40	DC-	44	9,93	25,00	DC+
11	-49,93	-11,40	AC	28	9,93	-12,20	DC-	45	13,98	5,80	DC+
12	-49,93	-8,20	AC	29	9,93	-9,00	DC-	46	13,98	9,00	DC+
13	-49,93	-5,00	AC	30	9,93	-5,80	DC-	47	13,98	12,20	DC+
14	-49,93	-1,80	AC	31	13,98	-25,00	DC-	48	13,98	15,40	DC+
15	-49,93	1,40	AC	32	13,98	-21,80	DC-	49	13,98	18,60	DC+
16	-49,93	4,60	AC	33	13,98	-18,60	DC-	50	13,98	21,80	DC+
17	-51,78	21,80	T-	34	13,98	-15,40	DC-	51	13,98	25,00	DC+

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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