

SKiiP 11AC12T4V1



MiniSKiiP® 1

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Features*

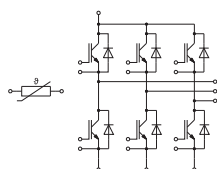
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 8 kVA
- Typical motor power 4 kW

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 $T_J \leq 150$ (recomm. $T_{op} = -40 \dots +150^\circ\text{C}$)



AC

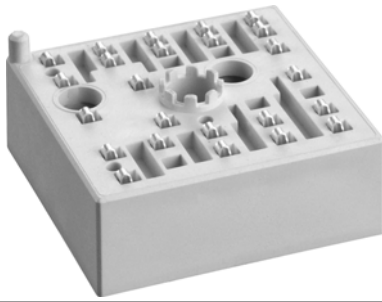
Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	12	A
	T _j = 175 °C	T _s = 70 °C	12	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	19	A
	T _j = 175 °C	T _s = 70 °C	16	A
I _{Cnom}			8	A
I _{CRM}			24	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 _s = 25 °C	15	A
	T _j = 175 °C	T _s = 70 °C	12	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	17	A
	T _j = 175 °C	T _s = 70 °C	13	A
I _{FRM}			24	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		36	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C, 20 A per spring		20	A
T _{stg}	module without TIM		-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		2500	V

Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 8 \text{ A}$ $V_{GE} = 15 \text{ V}$ 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	$T_J = 25^\circ\text{C}$	131	150	m Ω
		$T_J = 150^\circ\text{C}$	194	206	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1 \text{ mA}$	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	mA
C_{ies}	$V_{CE} = 25 \text{ V}$	$f = 1 \text{ MHz}$	0.49		nF
C_{oes}	$V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	0.05		nF
C_{res}		$f = 1 \text{ MHz}$	0.03		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		45		nC
R_{Gint}	$T_J = 25^\circ\text{C}$		0		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	$T_J = 150^\circ\text{C}$	32		ns
t_r	$I_C = 8 \text{ A}$ $R_{Gon} = 56 \Omega$	$T_J = 150^\circ\text{C}$	28		ns
		$T_J = 150^\circ\text{C}$	0.87		mJ
E_{on}	$R_{Goff} = 56 \Omega$	$T_J = 150^\circ\text{C}$			mJ
$t_{d(off)}$	$di/dt_{on} = 280 \text{ A}/\mu\text{s}$	$T_J = 150^\circ\text{C}$	300		ns
t_f	$di/dt_{off} = 90 \text{ A}/\mu\text{s}$	$T_J = 150^\circ\text{C}$	65		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$	$T_J = 150^\circ\text{C}$	0.75		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		1.84		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		1.58		K/W

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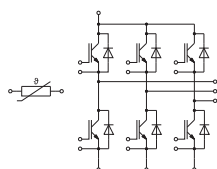
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
V _F = V _{EC}	I _F = 8 A	T _j = 25 °C		2.33	2.65	V
	V _{GE} = 0 V	T _j = 150 °C		2.35	2.68	V
	chiplevel					
V _{F0}		T _j = 25 °C		1.30	1.50	V
	chiplevel	T _j = 150 °C		0.90	1.10	V
r _F		T _j = 25 °C		129	144	mΩ
	chiplevel	T _j = 150 °C		181	198	mΩ
I _{RRM}	I _F = 8 A	T _j = 150 °C		7.7		A
Q _{rr}	di/dt _{off} = 350 A/μs	T _j = 150 °C		1.3		μC
E _{rr}	V _{GE} = +15/-15 V	T _j = 150 °C		0.53		mJ
	V _{CC} = 600 V					
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			2.53		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			2.19		K/W
Module						
L _{CE}				-		nH
M _s	to heat sink		2		2.5	Nm
w				30		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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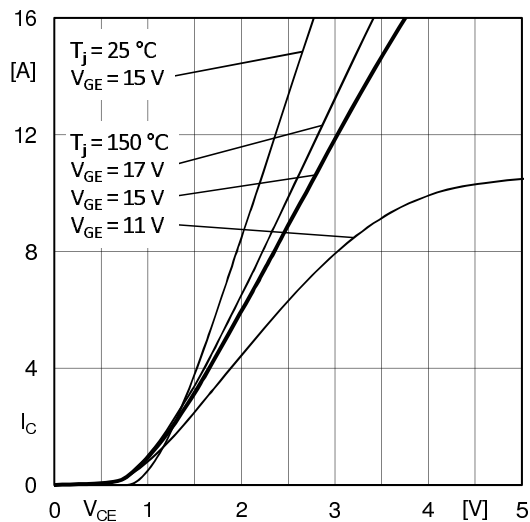


Fig. 1: Typ. output characteristic

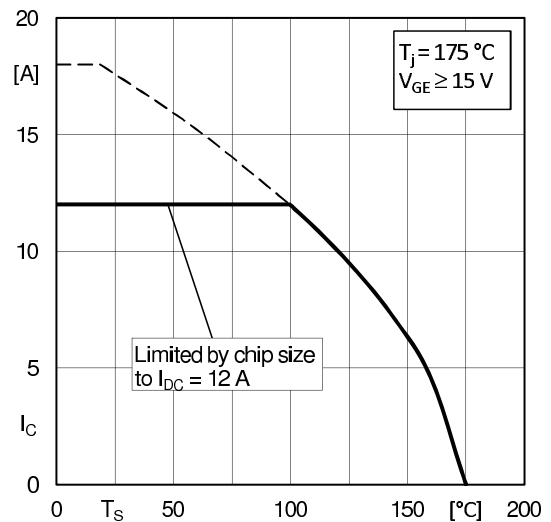


Fig. 2: Rated current vs. temperature $I_C = f(T_S)$

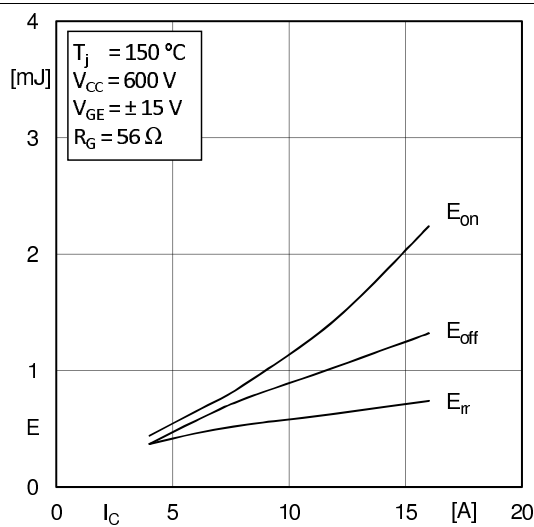


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

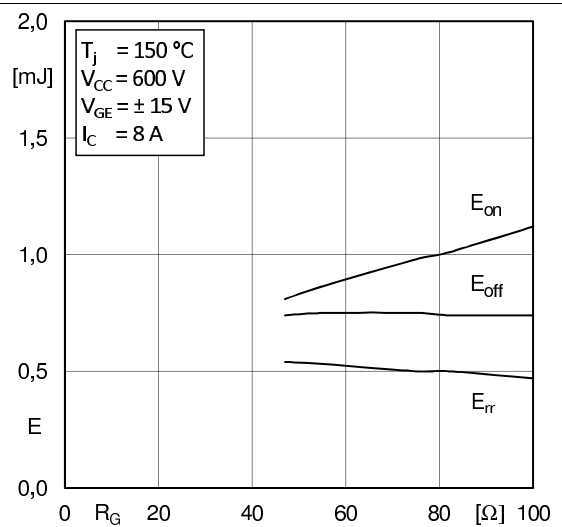


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

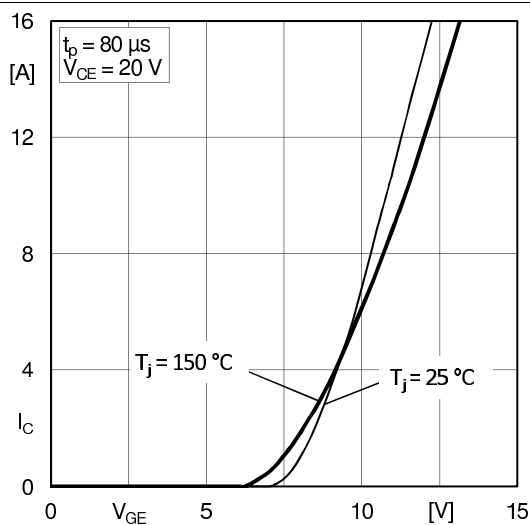


Fig. 5: Typ. transfer characteristic

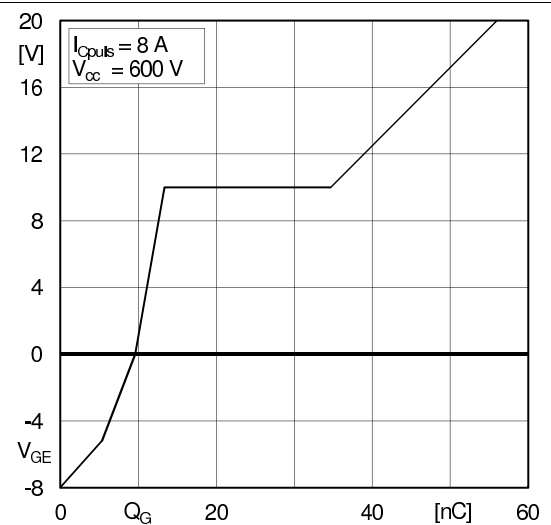


Fig. 6: Typ. gate charge characteristic

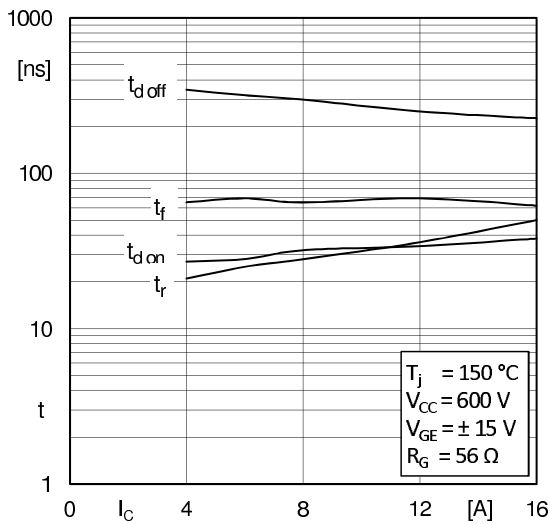


Fig. 7: Typ. switching times vs. I_C

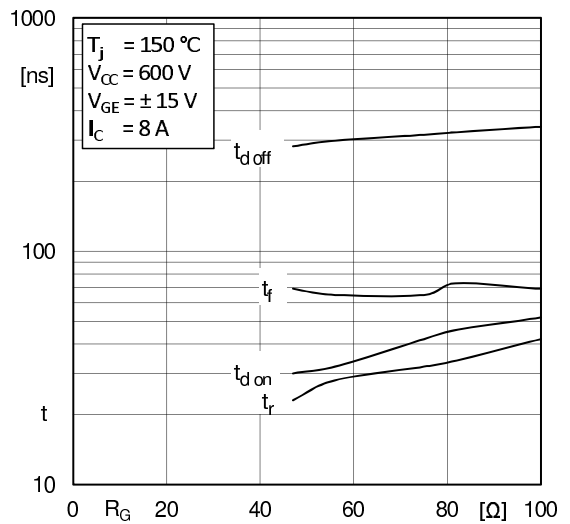


Fig. 8: Typ. switching times vs. gate resistor R_G

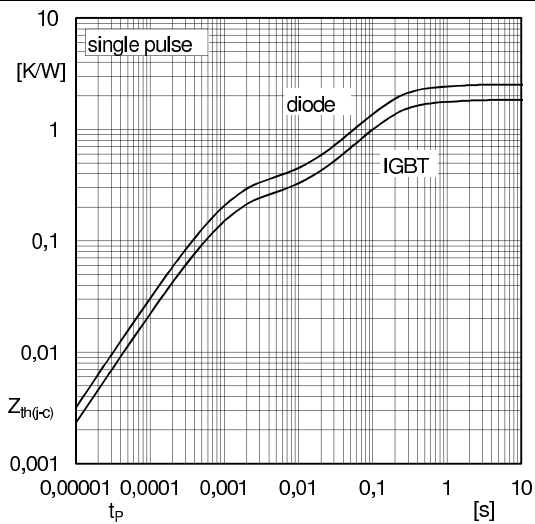


Fig. 9: Typ. transient thermal impedance

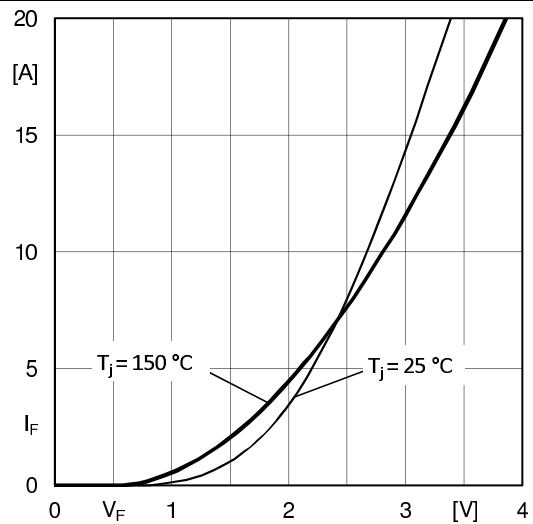


Fig. 10: Typ. CAL diode forward characteristic

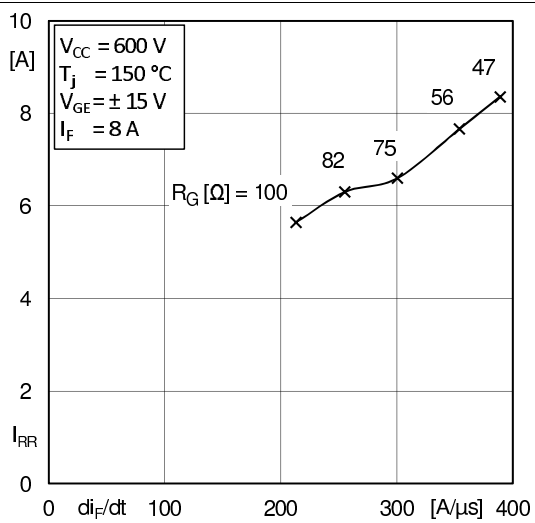


Fig. 11: Typ. CAL diode peak reverse recovery current

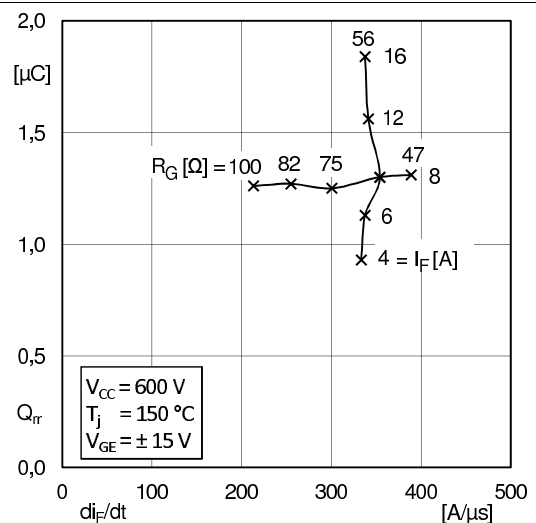
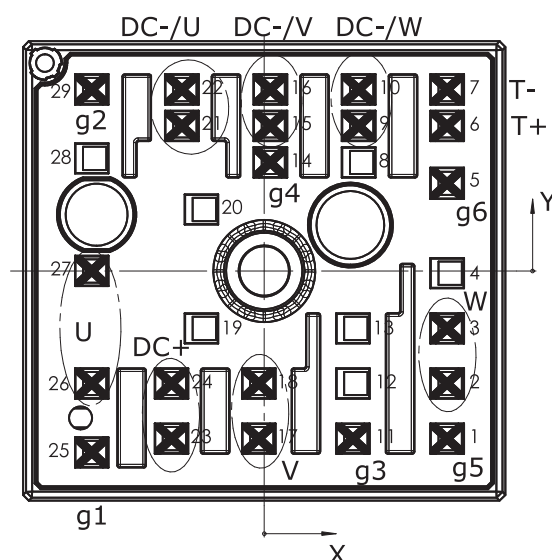


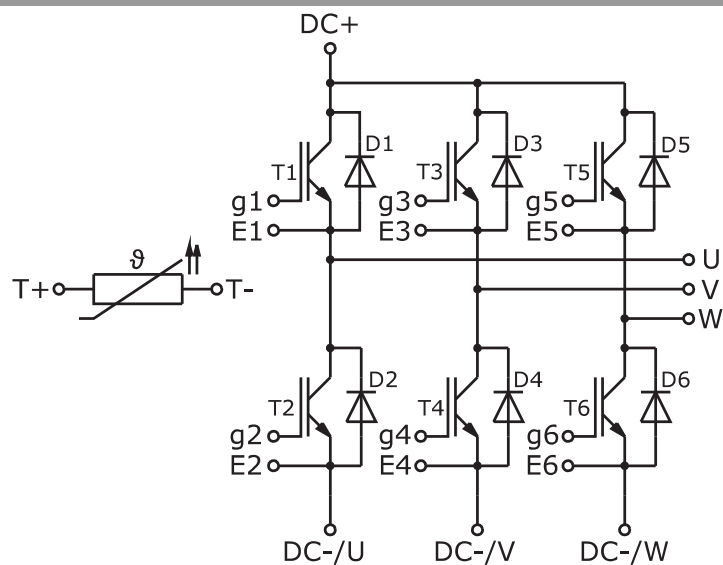
Fig. 12: Typ. CAL diode recovery charge

Pin out							
Pin	X	Y	Function	Pin	X	Y	Function
1	15,93	-14,60	g5	16	0,53	15,80	DC-/V
2	15,93	-9,80	W	17	-0,48	-14,6	V
3	15,93	-5,00	W	18	-0,48	-9,80	V
4	15,93	-0,20		19	-5,48	-5,00	
5	15,93	7,63	g6	20	-5,48	5,35	
6	15,93	12,63	T+	21	-7,18	12,63	DC-/U
7	15,93	15,80	T-	22	-7,18	15,80	DC-/U
8	8,23	9,45		23	-8,08	-14,60	DC+
9	8,23	12,63	DC-/W	24	-8,08	-9,80	DC+
10	8,23	15,80	DC-/W	25	-15,03	-15,80	g1
11	7,73	-14,60	g3	26	-15,03	-9,80	U
12	7,73	-9,80		27	-15,03	0	U
13	7,73	-5,00		28	-15,03	9,80	
14	0,53	9,45	g4	29	-15,03	15,80	g2
15	0,53	12,63	DC-/V				

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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