

MiniSKiiP® 3

3-phase bridge inverter

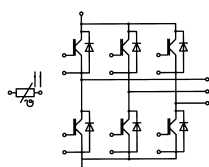
SKiiP 38AC176V2

Features

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

Remarks

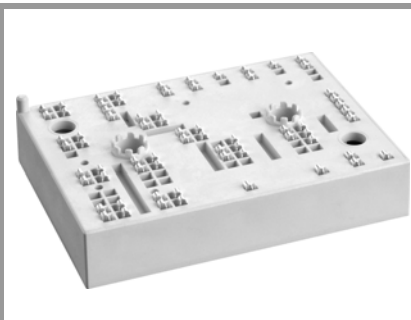
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_J \leq 150^\circ\text{C}$ (recommended $T_{J,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information



AC

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	118	A
	T _j = 175 °C	T _s = 70 °C	95	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	151	A
	T _j = 175 °C	T _s = 70 °C	122	A
I _{Cnom}			100	A
I _{CRM}	I _{CRM} = 2 x I _{Cnom}		200	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1200 V V _{GE} ≤ 20 V V _{CES} ≤ 1700 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Inverse - Diode				
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	115	A
	T _j = 175 °C	T _s = 70 °C	89	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	142	A
	T _j = 175 °C	T _s = 70 °C	111	A
I _{Fnom}			150	A
I _{FRM}	I _{FRM} = 2 x I _{Fnom}		300	A
I _{FSM}	10 ms, sin 180°, T _j = 150 °C		860	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}	T _{terminal} = 80 °C, 20 A per spring		120	A
T _{stg}			-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 = 100 A	T _J = 25 °C		2.00	2.40	V
	V _{GE} = 15 V chiplevel	T _J = 150 °C		2.45	2.90	V
V _{CE0}	chiplevel	T _J = 25 °C		1.00	1.20	V
		T _J = 150 °C		0.90	1.10	V
r _{CE}	V _{GE} = 15 V	T _J = 25 °C		10	12	mΩ
	chiplevel	T _J = 150 °C		16	18	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 4 mA		5.2	5.8	6.4	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1700 V, T _J = 25 °C			0.1	0.3	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		8.82		nF
C _{oes}		f = 1 MHz		0.37		nF
C _{res}		f = 1 MHz		0.29		nF
Q _G	- 8 V...+ 15 V			934		nC
R _{Gint}	T _J = 25 °C			4.8		Ω
t _{d(on)}	V _{CC} = 900 V	T _J = 150 °C		160		ns
t _r	I _C = 100 A	T _J = 150 °C		35		ns
E _{on}	R _{G on} = 1 Ω	T _J = 150 °C		23.8		mJ
	R _{G off} = 1 Ω					
t _{d(off)}	di/dt _{on} = 3000 A/μs	T _J = 150 °C		580		ns
t _f	di/dt _{off} = 600 A/μs	T _J = 150 °C		150		ns
	du/dt = 4500 V/μs					
E _{off}	V _{GE} = +15/-15 V L _s = 40 nH	T _J = 150 °C		32.2		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.38		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			0.25		K/W



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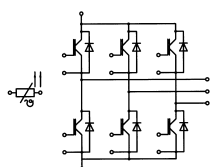
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse - Diode						
V _F = V _{EC}	I _F = 100 A	T _j = 25 °C		1.76	2.10	V
	V _{GE} = 0 V chiplevel	T _j = 150 °C		1.77	2.09	V
V _{F0}	chiplevel	T _j = 25 °C		1.32	1.56	V
		T _j = 150 °C		1.08	1.22	V
r _F	chiplevel	T _j = 25 °C		4.4	5.4	mΩ
		T _j = 150 °C		6.9	8.7	mΩ
I _{RRM}	I _F = 100 A	T _j = 150 °C		226		A
Q _{rr}	di/dt _{off} = 4000 A/μs	T _j = 150 °C		38.5		μC
E _{rr}	V _{CC} = 900 V	T _j = 150 °C		26.2		mJ
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.61		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			0.45		K/W
Module						
L _{CE}				20		nH
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					



AC

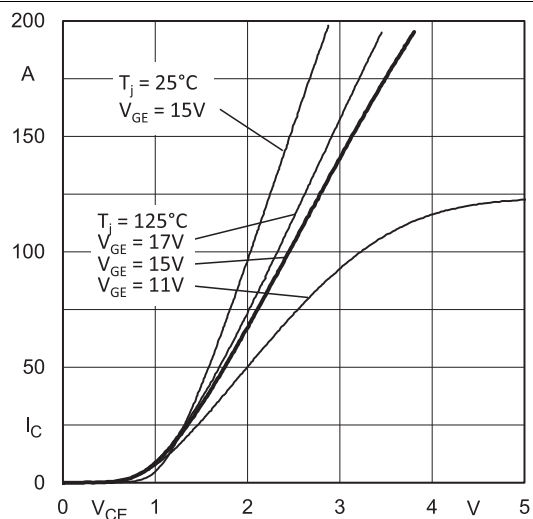


Fig. 1: Typ. output characteristic

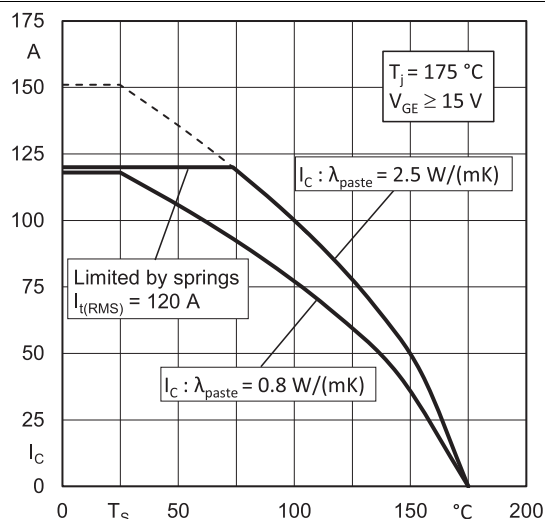


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

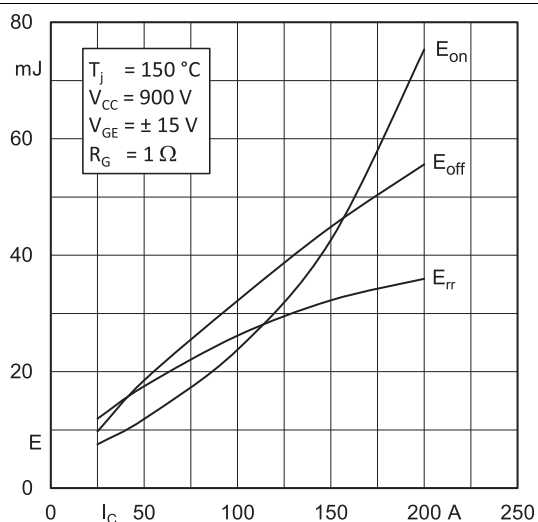


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

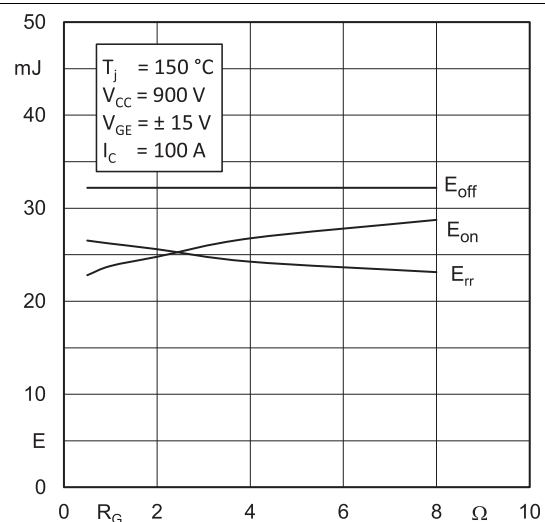


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

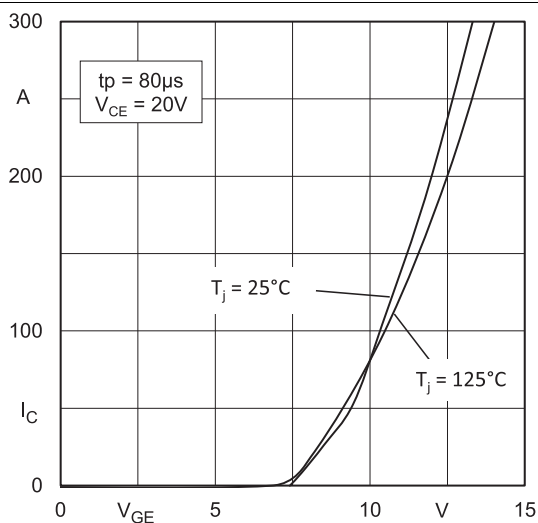


Fig. 5: Typ. transfer characteristic

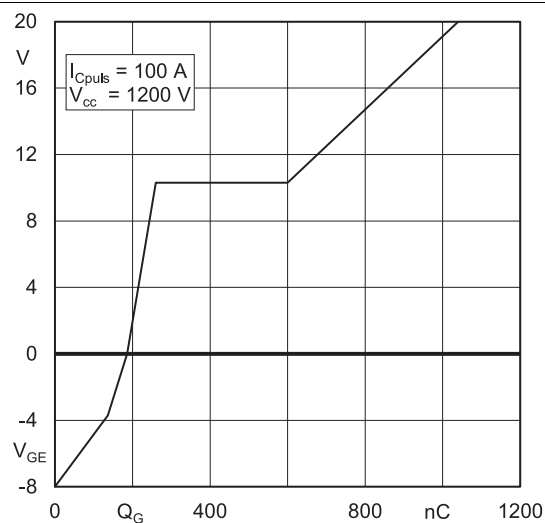


Fig. 6: Typ. gate charge characteristic

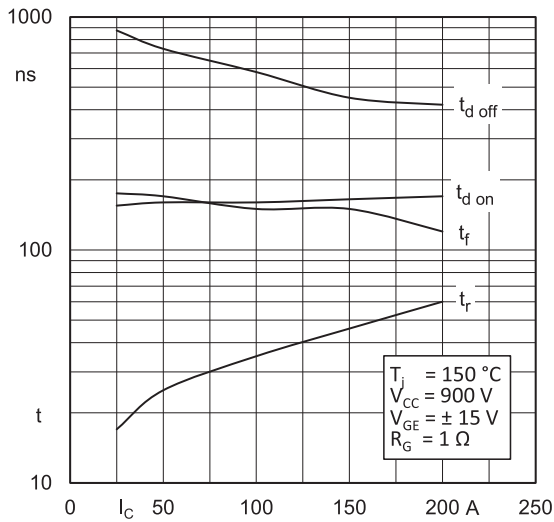


Fig. 7: Typ. switching times vs. I_C

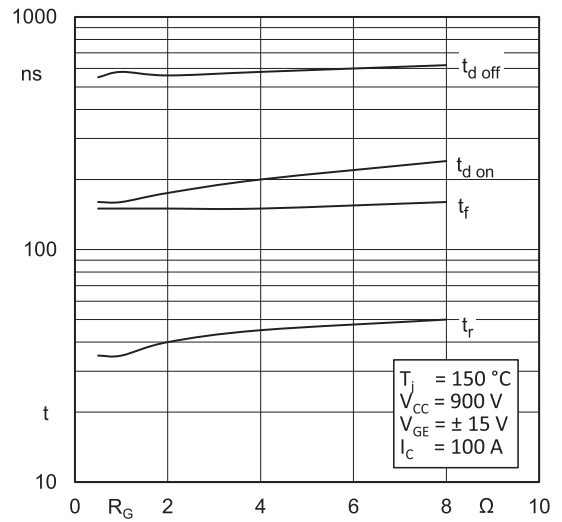


Fig. 8: Typ. switching times vs. gate resistor R_G

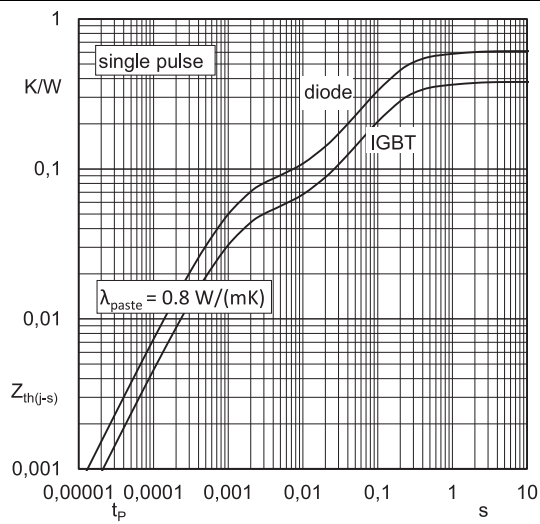


Fig. 9: Transient thermal impedance of IGBT and Diode

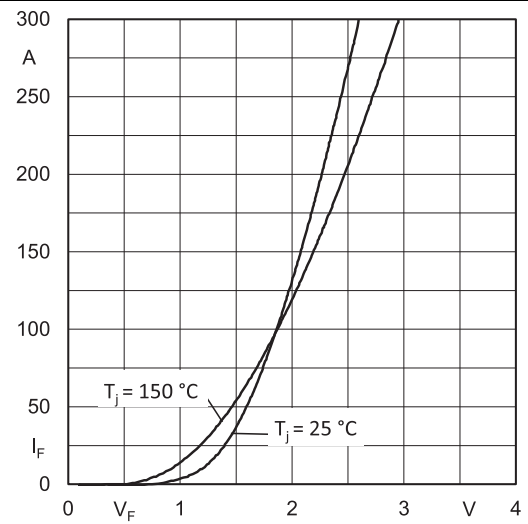


Fig. 10: CAL diode forward characteristic

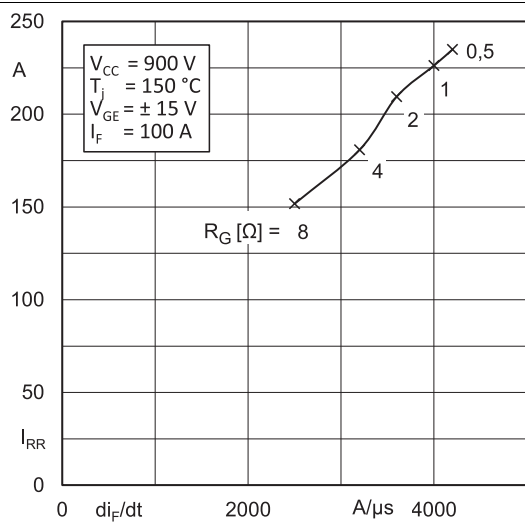


Fig. 11: Typ. CAL diode peak reverse recovery current

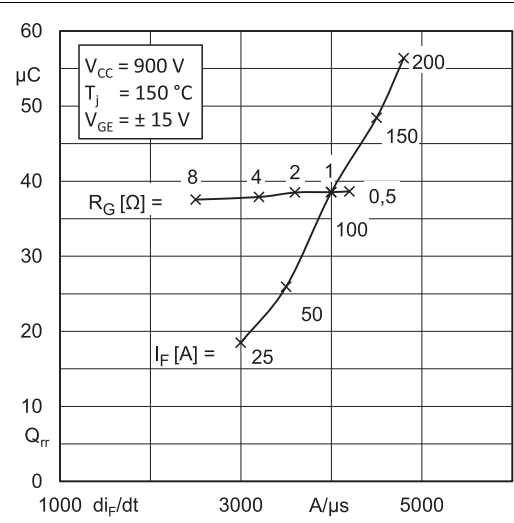
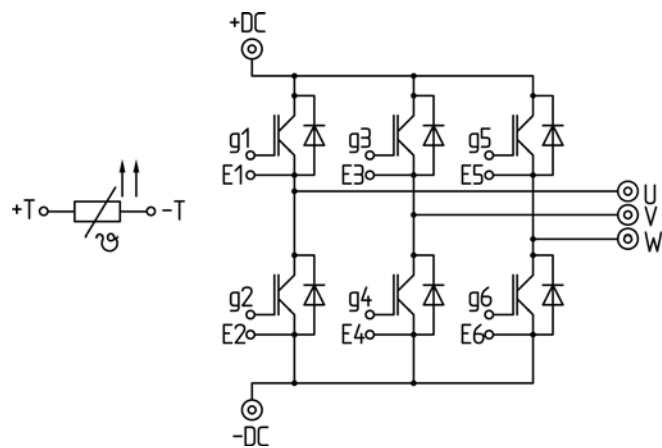
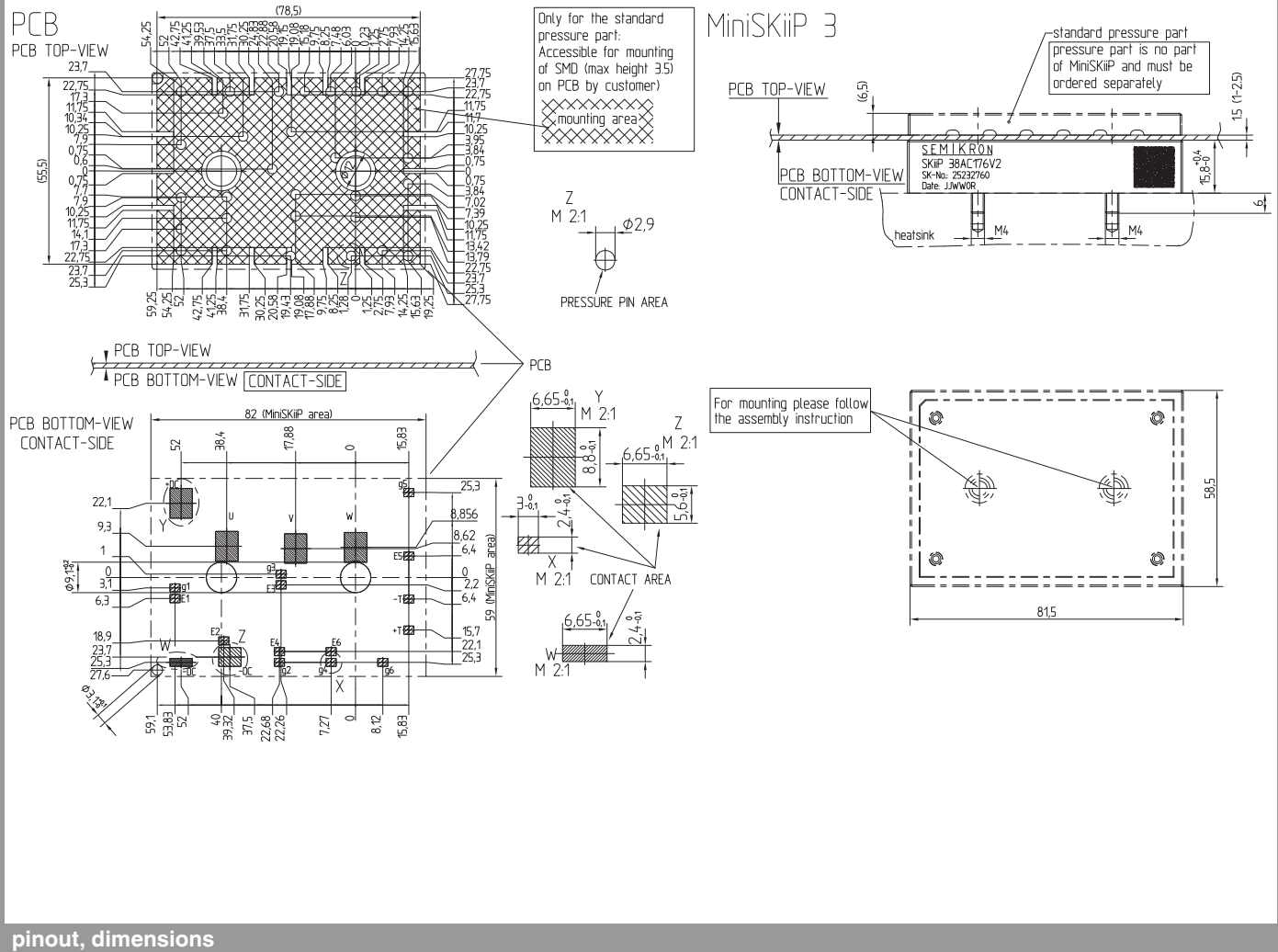


Fig. 12: Typ. CAL diode recovery charge



pinout

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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