

SKiiP 25ACI12T4V2



MiniSKiiP® AC IPM

3-phase bridge inverter
intelligent power module

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Features

- Contact springs for solder-free and quick assembly
- Trench-Field-Stop IGBT
- Freewheeling diodes in CAL technology
- HVIC gate driver in SOI technology with advanced level shifter
- Matched propagation delay
- Over-current and under-voltage detection
- Interlock logic for cross conduction protection
- Multi-purpose error input
- Integrated temperature sensor (NTC)
- RoHs compliant
- UL recognised file no. E63532

Typical Applications*

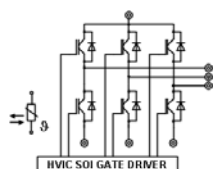
- Industrial & consumer drives
- Power supplies (SMPS & UPS)

Remarks

- Product reliability results valid for $T_j \leq 150^\circ\text{C}$
- Case temp. limited to $T_c = 125^\circ\text{C}$ max. (for baseplateless modules $T_c = T_s$)

Footnotes

¹⁾ Please refer to Technical Explanations



ACI

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _s = 25 °C	62	A
		T _s = 70 °C	50	A
I _{Cnom}			50	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		150	A
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				
I _F	T _j = 175 °C	T _s = 25 °C	59	A
		T _s = 70 °C	47	A
I _{Fnom}			50	A
I _{FRM}	I _{FRM} = 3 x I _{Fnom}		150	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		270	A
T _j			-40 ... 175	°C
Driver				
V _{CC}	V _{CC} -V _{SS} , V _{CC} L-V _{SS} L		17	V
V _{Bx}	V _B 1-U, V _B 2-V, V _B 3-W		17	V
V _{Sx}	Voltage to V _{SS}		-3 ... 1200	V
V _{in}	HINx-V _{SS} , LINx-V _{SS} , /ERRIN-V _{SS}		V _{SS} -0.3 ... V _{CC} +0.3	V
V _{oErr}	/ERROUT-V _{SS}		V _{SS} -0.3 ... V _{CC} +0.3	V
I _{max} (EO)	/ERROUT-V _{SS}		10	mA
V _{ITRIP}	ITRIP-V _{SS}		V _{SS} -0.3 ... V _{CC} +0.3	V
Module				
T _c			-40 ... 125	°C
T _{stg}			-40 ... 125	°C
V _{isol}	AC sinus 50Hz, all pins to heat sink, 1 min		2500	V
I _t (RMS)	T _{terminal} = 80 °C, 20A per spring		60	A

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
V _{CE(sat)}	I _C = 50 A	T _j = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.20	2.40	V
V _{CE0}	chiplevel	T _j = 25 °C		0.8	0.9	V
		T _j = 150 °C		0.7	0.8	V
r _{CE}	V _{GE} = 15 V chiplevel	T _j = 25 °C		21	24	mΩ
		T _j = 150 °C		30	32	mΩ
I _{CES}	V _{GE} = 0 V	T _j = 25 °C		0.1	0.3	mA
	V _{CE} = 1200 V					mA
Q _G	0 V ... +15 V			220		nC
t _{d(on)}	V _{CC} = 600 V I _C = 50 A V _{GE} = +15/0 V ¹⁾	T _j = 150 °C		943		ns
t _r		T _j = 150 °C		47		ns
E _{on}		T _j = 150 °C		6.6		mJ
t _{d(off)}		T _j = 150 °C		1613		ns
t _f		T _j = 150 °C		69		ns
E _{off}		T _j = 150 °C		5.7		mJ
R _{th(j-s)}	per IGBT			0.84		K/W



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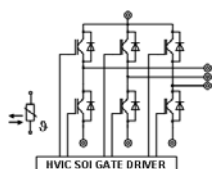
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Footnotes

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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 50 A	T _j = 25 °C		2.25	2.5	V
	V _{GE} = 0 V	T _j = 150 °C		2.2	2.5	V
	chipelevel					
V _{F0}		T _j = 25 °C		1.3	1.5	V
	chipelevel	T _j = 150 °C		0.9	1.1	V
r _F		T _j = 25 °C		18	21	mΩ
	chipelevel	T _j = 150 °C		26	28	mΩ
I _{RRM}	I _F = 50 A	T _j = 150 °C		51		A
Q _{rr}	V _{GE} = 0 V	T _j = 150 °C		8.5		μC
E _{rr}	V _{CC} = 600 V	T _j = 150 °C		3		mJ
R _{th(j-s)}	per Diode			0.99		K/W
Driver						
VCC	VCC-VSS, VCCL-VSSL ¹⁾			15		V
ICC ₀	Quiescent current, VCC=15V ¹⁾				8.5	mA
VBx	VB1-U, VB2-V, VB2-W ¹⁾			15		V
IBx	Quiescent high side driver supply current per channel, VBx=15V ¹⁾			80	90	μA
V _{IT+}	Input threshold voltage (HIGH) ¹⁾			2	2.4	V
V _{IT-}	Input threshold voltage (LOW) ¹⁾		0.8	0.9		V
V _{ITRIP+}	ITRIP set threshold voltage ¹⁾			0.47	0.6	V
V _{ITRIP-}	ITRIP reset threshold voltage ¹⁾		0.35	0.41		V
V _{oErr}	Error output, open drain ¹⁾				15	V
V _{UV}	Supply under-voltage protection set ¹⁾		10.5	11.1		V
V _{UVr}	Supply under-voltage protection reset ¹⁾			11.5	12.3	V
t _{d,ITRIP}	ITRIP to LOUTx/HOUTx shutdown propagation delay (W-phase)			820		ns
t _{SIS}	PWM short pulse suppression			0.5		μs
t _{TD}	Interlock dead time			0.58		μs
f _{SW}	Switching frequency				25	kHz
Temperatur Sensor						
R ₂₅	T _r = 25 °C ¹⁾			5.0 ± 5%		kΩ
Module						
M _s	to heat sink		2		2.5	Nm
w	weight			55		g



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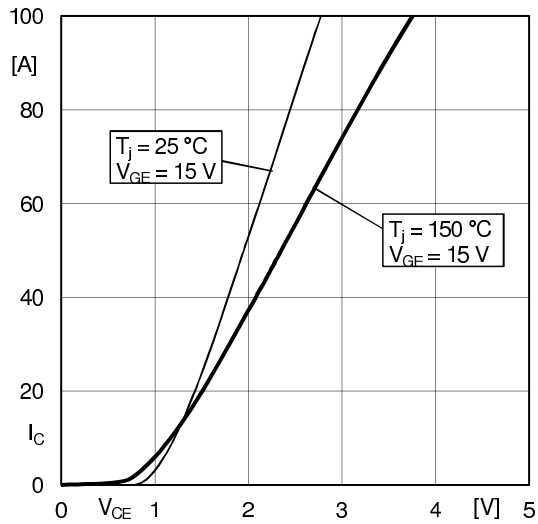


Fig. 1: Typ. output characteristic

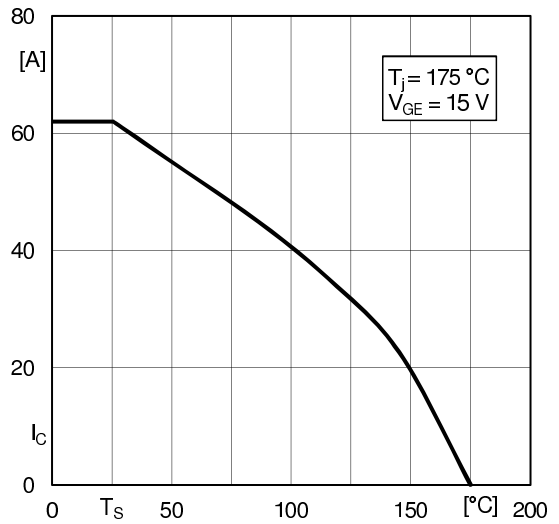


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

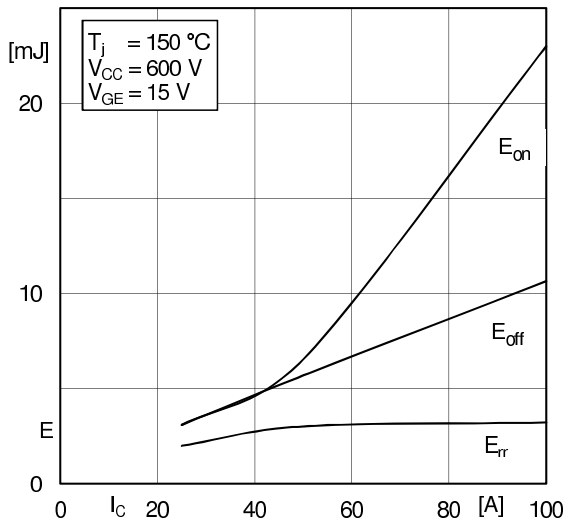


Fig. 3: Typ. turn-on /-off energy $E = f(I_C)$

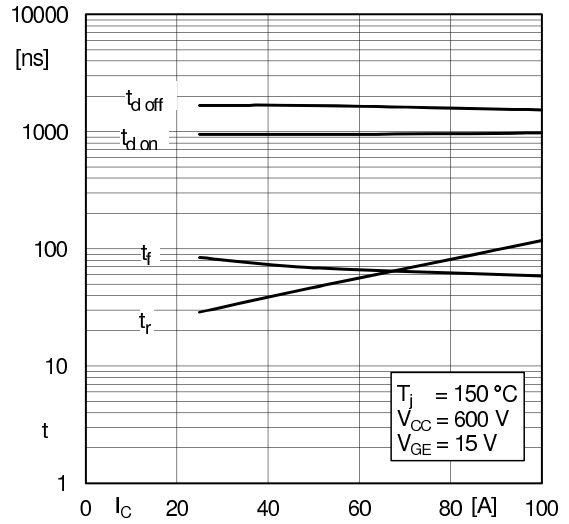


Fig. 4: Typ. switching times vs. I_C

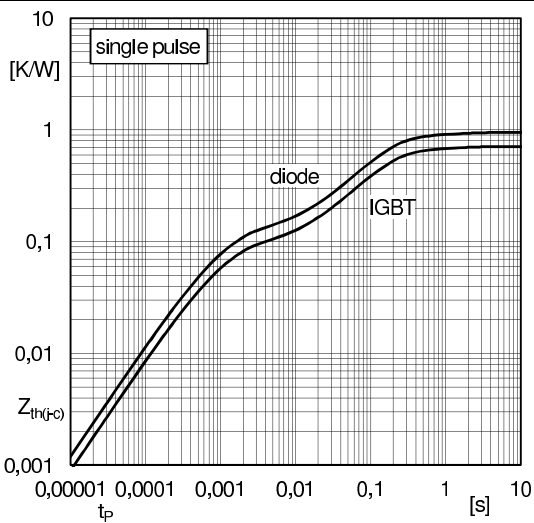


Fig. 5: Transient thermal impedance of IGBT and diode

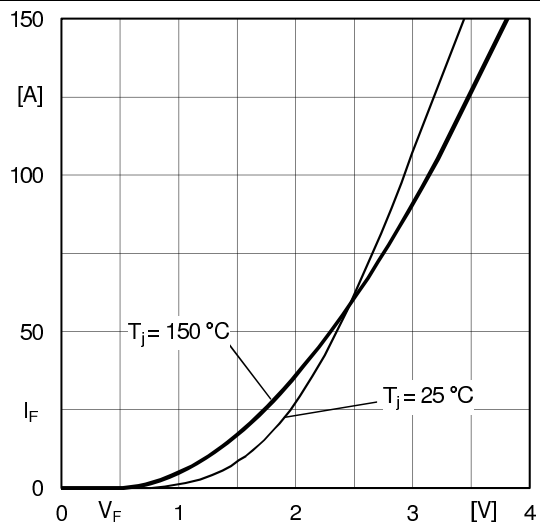
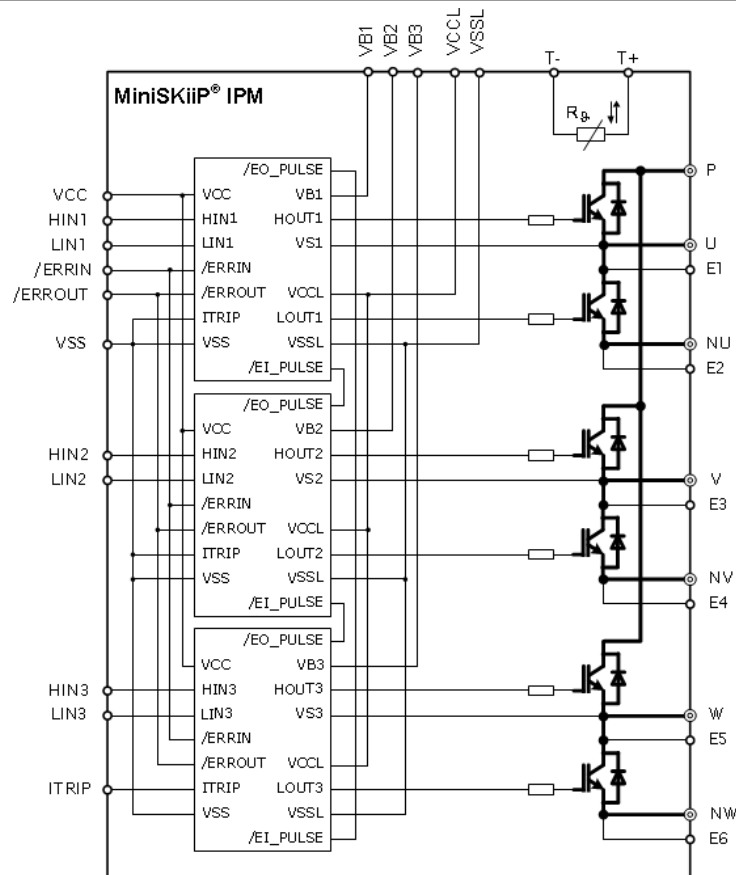


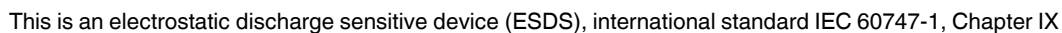
Fig. 6: Typ. freewheeling diode forward characteristic



Internal circuit

Pin	Signal	Description
1	VB1	Floating supply voltage for phase U high side IGBT
2	HIN1	PWM signal input for phase U high side switch
3	LIN1	PWM signal input for phase U low side switch
4	HIN2	PWM signal input for phase V high side switch
5	VCC	Driver IC main supply voltage
6	HIN3	PWM signal input for phase W high side switch
7	/ERRIN	Multi-purpose error input for common shut-down (low active)
8	VSS	Driver IC supply voltage ground
9	/ERROUT	Error logic output (low active)
10	ITRIP	Comparator input / current sense input for overcurrent shut-down
11	VSSL	Low side supply voltage ground
12	VCCL	Low side supply voltage
13	VB2	Floating supply voltage for phase V high side IGBT
14	VB3	Floating supply voltage for phase W high side IGBT
15	LIN2	PWM signal input for phase V low side switch
16	LIN3	PWM signal input for phase W low side switch
U	U	Phase U AC terminal
E1	E1	Auxiliary emitter terminal of phase U high side IGBT
V	V	Phase V AC terminal
E3	E3	Auxiliary emitter terminal of phase V high side IGBT
W	W	Phase W AC terminal
E5	E5	Auxiliary emitter terminal of phase W high side IGBT
NU	NU	Phase U -DC terminal
E2	E2	Auxiliary emitter terminal of phase U low side IGBT
NV	NV	Phase V -DC terminal
E4	E4	Auxiliary emitter terminal of phase V low side IGBT
NW	NW	Phase W -DC terminal
E6	E6	Auxiliary emitter terminal of phase W low side IGBT
P	P	+DC terminal
+T	+T	Temperature sensor terminal (+)
-T	-T	Temperature sensor terminal (-)

Pin and signal description



5