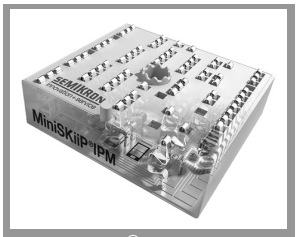
SKiiP 25ACI12T4V2



MiniSKiiP® AC IPM

Three-phase inverter intelligent power module

SKiiP 25ACI12T4V2

Data sheet status: preliminary

Features

- One screw assembly of driver, module and heat sink
- Solder-free assembly of power, control and auxiliary contacts
- Trench-Field-Stop IGBT
- Robust and soft freewheeling diodes in CAL technology
- Latch-up free SOI driver IC
- Advanced level shifter technology
- Bootstrap power supply technology
- Matched propagation delay for all channels
- Overcurrent shut-down via current sensing
- Interlock logic for shoot-through prevention
- Common shut-down signal
- Undervoltage lockout for all channels with hysteresis band
- Integrated temperature sensor (NTC)
- RoHS compliant

Typical Applications

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

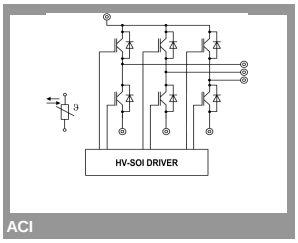
Remarks

Absolute Maximum Ratings (T_s=25℃, unless otherwise specified)

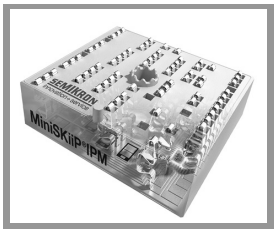
Symbol	Parameter	Conditions	Values	Units
IGBT - Inverter				
V_{CES}			1200	V
I_C	T_j = 175 ℃	T_S = 25 ℃	61	A
		T_S = 70 ℃	50	A
I_{Cnom}			50	A
I_{CRM}	I_{CRM} = 3xI_{Cnom}		150	A
t_{psc}	V_{CC} = 600V	T_j=150℃	≤10	µs
$T_{j(max)}$	Junction temperature		-40 ... +175	℃
Diode				
I_F	T_j=175℃	T_s= 25 ℃	57	A
		T_s= 70 ℃	45	A
I_{Fnom}			50	A
I_{FRM}	I_{FRM} = 3xI_{Cnom}	$T_j < T_{j(max)}$	150	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 ℃		265	A
$T_{j(max)}$	Junction temperature		-40 … +175	℃
Driver				
VCC	Applied between VCC-VSS, VCCL-VSSL		17	V
VBx	Applied between VB1-U, VB2-V, VB3-W		17	V
VSx	Voltage to VSS, t_p<500ns		-3 … 1200	V
V_{in}	Applied between HIN1, LIN1, HIN2, LIN2, HIN3, LIN3 - VSS		VSS-0.3 … VCC+0.3	
V_{oErr}	Applied between /ERROUT-VSS		VSS-0.3 … VCC+0.3	V
$I_{max(EO)}$	Between /ERROUT-VSS		10	mA
V_{ITRIP}	Applied between ITRIP-VSS		VSS-0.3 … VCC+0.3	V
f_{max}			20	kHz
Temperature				
T_c			-40 … +125	℃
T_{stg}			-40 … +125	℃
System				
V_{isol}		AC, rms, f=60Hz, t=1min, all pins to heat sink	2500	V
I_{tRMS}		Per power terminal (20A / Spring)	20	A

Electrical Characteristics (T_s=25℃, unless otherwise specified)

Symbol	Parameter	Conditions	Limits min.	typ.	max.	Units
IGBT						
V_{CEsat}	I_C = 50 A	T_j = 25 ℃		1.85	2.05	V
	V_{GE} = 15 V	T_j = 150 ℃		2.25	2.45	V
V_{CEO}		T_j = 25 ℃		0.8	0.9	V
		T_j = 150 ℃		0.7	0.8	V
r_{CE}	V_{GE} = 15 V	T_j = 25 ℃		21	23	mΩ
		T_j = 150 ℃		31	33	mΩ
I_{CES}	V_{GE} = 0 V	T_j = 25 ℃			0.3	mA
	V_{CE} = 600 V					
E_{on}	V_{CC} = 600V	T_j = 150 ℃		7.2		mJ
E_{off}	I_c = 50 A	T_j = 150 ℃		5.6		mJ
$t_{d(on)}$	R_{gon}/R_{goff} = 4.7 Ω	T_j = 150 ℃		1065		ns
t_r	di/dt_{on} = 1061 A/µs	T_j = 150 ℃		50		ns
$t_{d(off)}$	di/dt_{off} = 693 A/µs	T_j = 150 ℃		1670		ns
t_r		T_j = 150 ℃		252		ns
$R_{th(j-s)}$	per IGBT			0.84		K/W
Diode						
V_F = V_{EC}	I_F = 50 A	T_j = 25 ℃		2.25	2.55	V
	V_{GE} = 0 V (Chiplevel)	T_j = 150 ℃		2.2	2.5	V
V_{F0}		T_j = 25 ℃		1.3	1.5	V
		T_j = 150 ℃		0.9	1.1	V
r_F		T_j = 25 ℃		19	21	mΩ
		T_j = 150 ℃		26	28	mΩ
E_{rr}	I_F = 50 A	T_j = 150 ℃		3		mJ
Q_{rr}	di_F/dt = -1479 A/µs	T_j = 150 ℃		8.3		µC
I_{RRM}	V_{cc} = 600 V, V_{GE} = 0 V	T_j = 150 ℃		56		A
$R_{th(j-s)}$	per Diode			0,99		K/W



ACI



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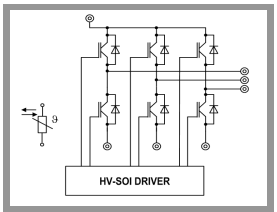
Remarks

Electrical Characteristics (T_s=25℃, unless otherwise specified)

Symbol	Parameter	Conditions	Limits min.	typ.	max.	Units
Driver						
VDC	Applied between VCC-VSS, VCCL-VSSL			15		V
ICC	VCC=15V, all logic inputs = open, VCC-VSS				5.0	mA
VBx	Applied between VB1-U, VB2-V, VB3-W			15		V
IBx	VBx = 15 V, $V_{iH} = V_{iL}$ = 0 V			60		µA
V_{iT+}	Applied between HIN1, HIN2, HIN3, LIN1, LIN2, LIN3, LIN4, /ERRIN-VSS			1.9	2.4	V
V_{iT-}	Applied between HIN1, HIN2, HIN3, LIN1, LIN2, LIN3, LIN4, /ERRIN-VSS		0.8	1.1		V
V_{oErr}	Error Output Voltage Applied between /ERROUT-VSS				15	V
V_{UV}			10,5			V
V_{UVr}					12,3	V
$t_{d,ITRIP}$	Itrip to output propagation delay			500		ns
t_{SIS}	Short pulse suppression for signals inputs			460		ns
t_{TD}	Interlock Dead time			460		ns
f_{sw}				15	25	kHz
Temperature Sensor						
R_{100}	T_{Sensor} = 100 ℃ (R_{25} = 5 kΩ)			339		Ω
$B_{100/125}$	$R_{(T)} = R_{100}\exp[B_{100/125}(1/T-1/373)]$; [T] = K			4096		K
Module						
m					65	g
M_S			2		2.5	Nm



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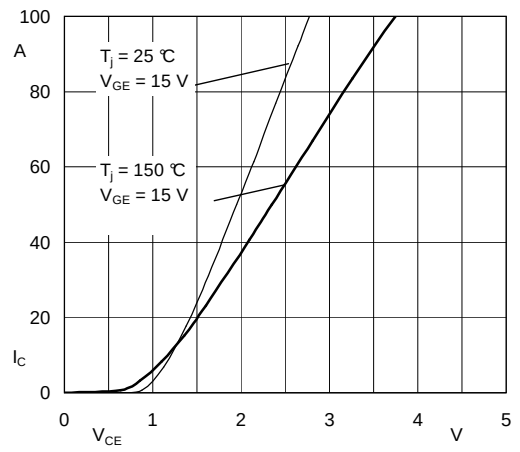

Fig.1: Typ. output charcteristic

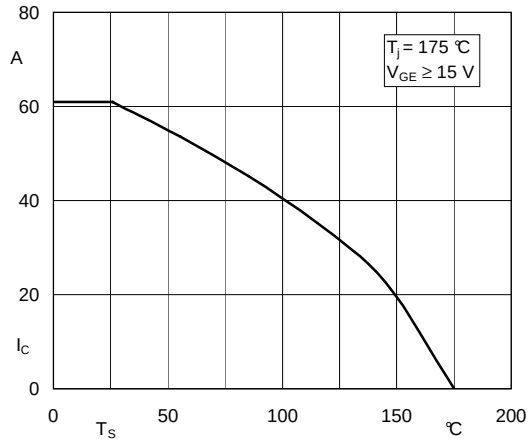

Fig. 2: Typ. rated current vs. Temperature

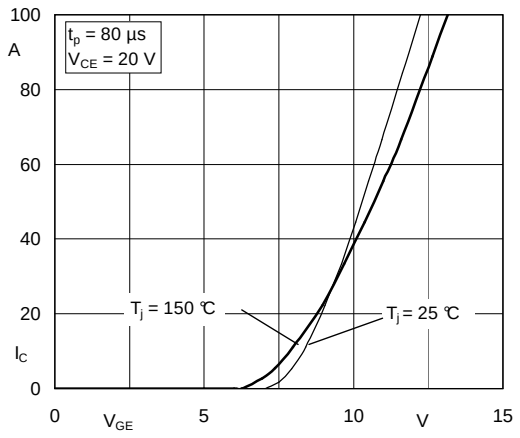

Fig. 3: Typ. transfer characteristic

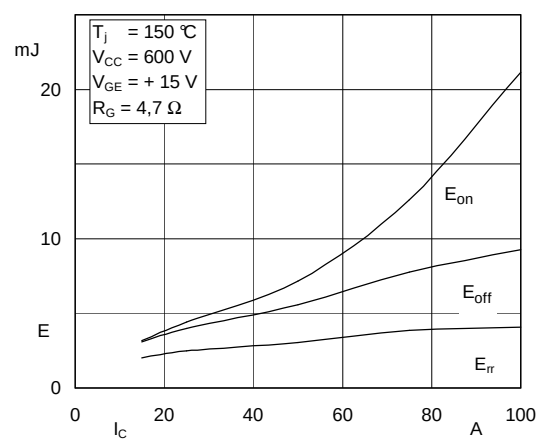

Fig. 4: Turn-on/-off energy = f(IC)

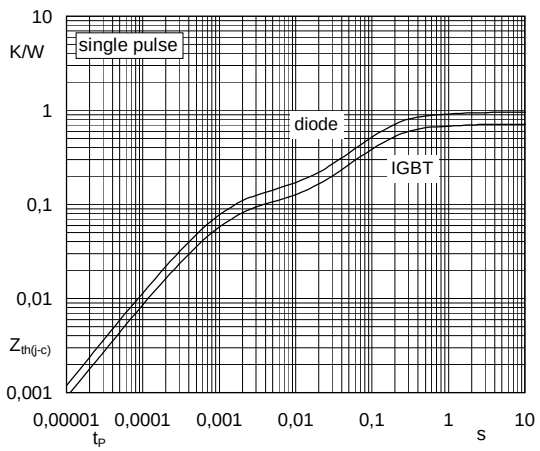

Fig. 5: Typ. thermal impedance

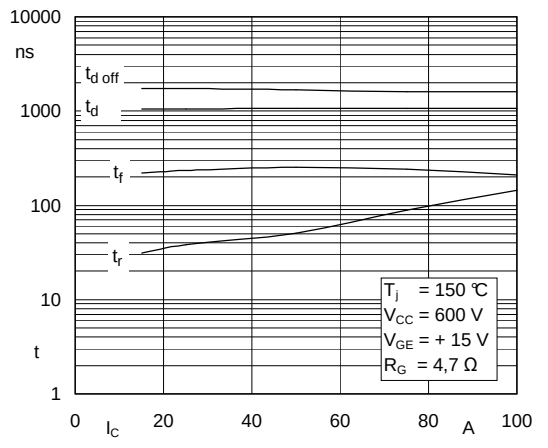

Fig. 6: Typ. switching times vs. IC

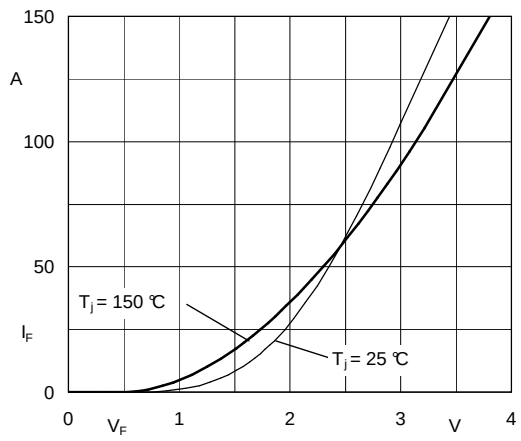

Fig. 7: Typ. freewheeling diode forward characteristic

Pin Number	Signal Name	Description
1	VB1	Floating supply for U phase high side IGBT
2	HIN1	PWM signal input for U phase high side switch
3	LIN1	PWM signal input for U phase low side switch
4	HIN2	PWM signal input for V phase high side switch
5	VCC	Driver IC main supply voltage
6	HIN3	PWM signal input for W phase high side switch
7	/ERRIN	External error / shut-down logic input (inverted)
8	VSS	Driver IC supply voltage ground
9	/ERROUT	Error logic output (inverted)
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 for V phase high side IGBT
14	VB3	Floating supply for W phase high side IGBT
15	LIN2	PWM signal input for V phase low side switch
16	LIN3	PWM signal input for W phase low side switch
	U	U phase power output
	E1	Auxiliary emitter terminal for U phase high side IGBT
	V	V phase power output
	E3	Auxiliary emitter terminal for V phase high side IGBT
	W	W phase power output
	E5	Auxiliary emitter terminal for W phase high side IGBT
	NU	Negative DC-Link power terminal for U phase
	E2	Auxiliary emitter terminal for U phase low side IGBT
	NV	Negative DC-Link power terminal for V phase
	E4	Auxiliary emitter terminal for V phase low side IGBT
	NW	Negative DC-Link power terminal for W phase
	E6	Auxiliary emitter terminal for W phase low side IGBT
	P	Positive DC-Link power terminal
	+T	Temperature sensor terminal (+)
	-T	Temperature sensor terminal (-)

Fig. 4: PIN Description

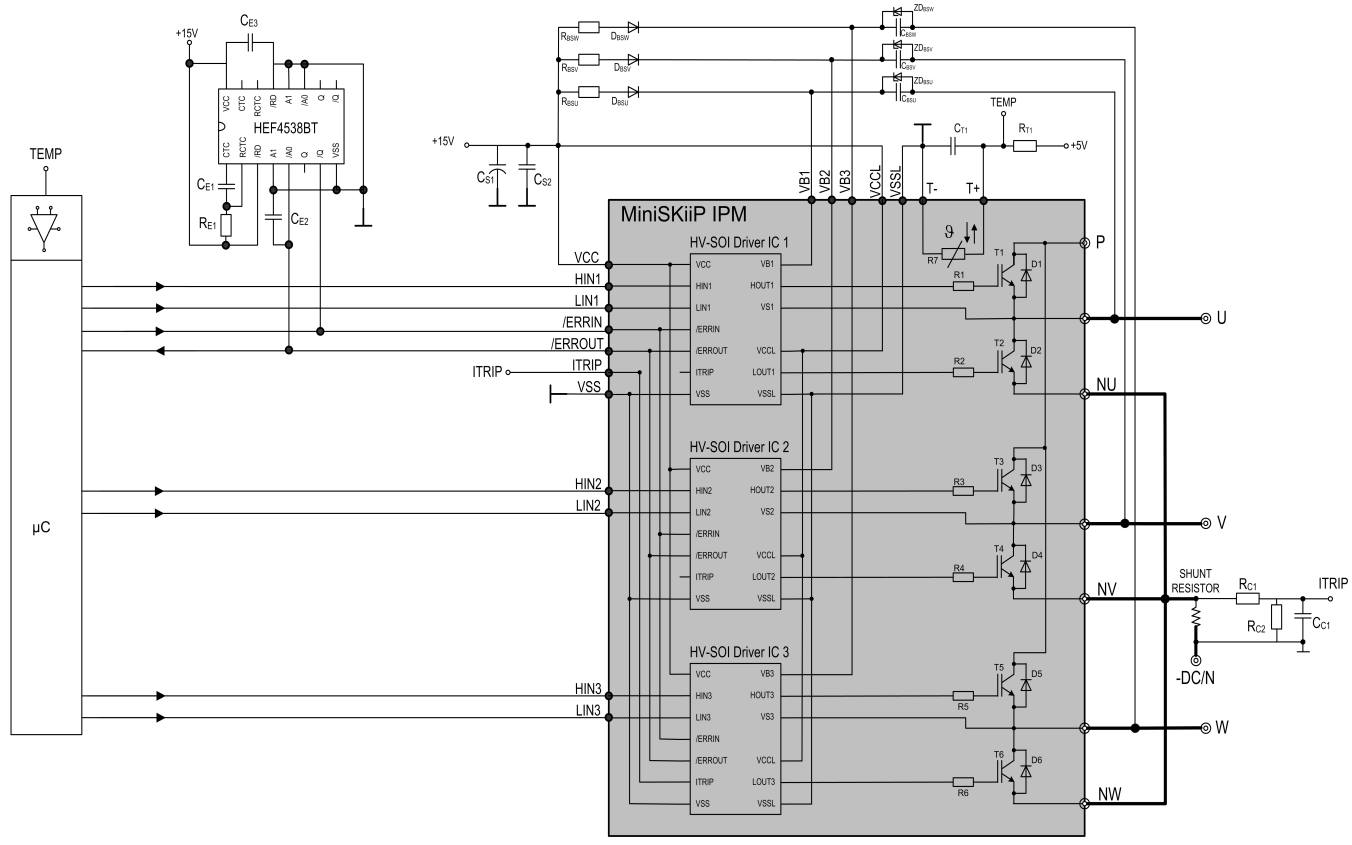

Fig. 5: Internal Circuit and Typ. Application

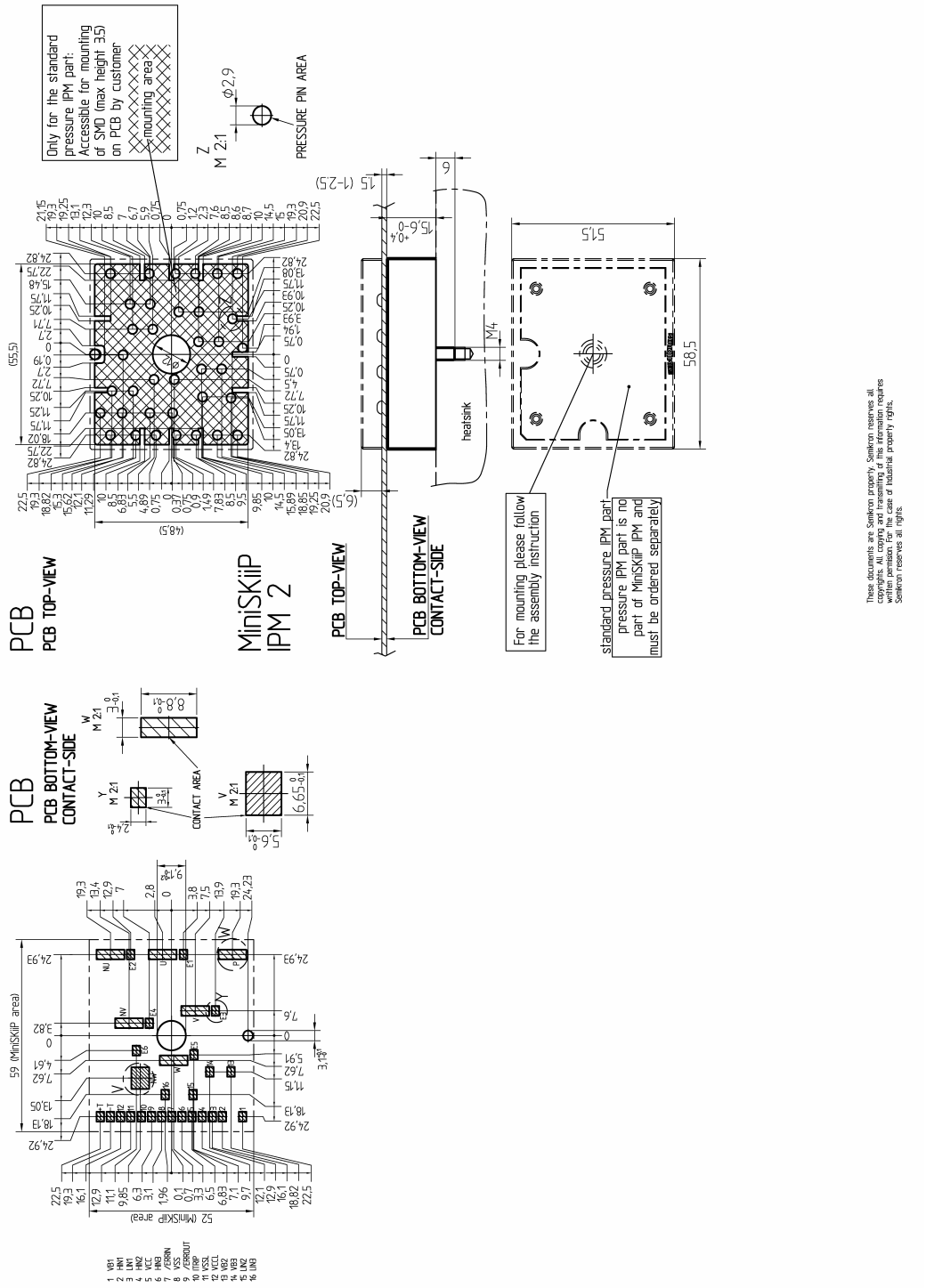

Fig. 6: Package Outline, Pinout

The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our personal.