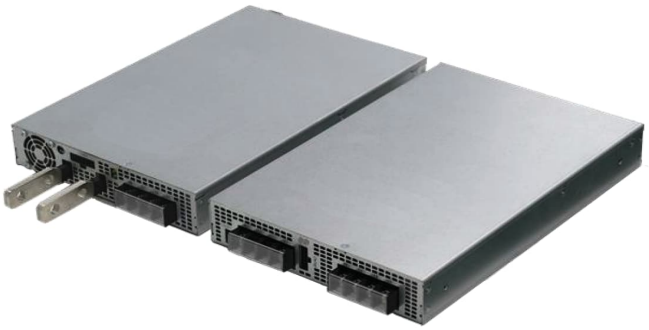
Technical Data Sheet

SAB6000-3F Bi-directional
6000 W / Ultra-Wide Range

BIDIRECTIONAL CONVERTER

FEATURES

- SiC-based, 94% High Efficiency
- Wide Range input
- 6000W DC side Rated Power
- 8"x11.9"x1.67" compact size
- Compatible With 3-Phase and Single-Phase Input
- -30°C ÷ +70°C Operation Temperature Range
- Output Voltage and Constant Current Programmable
- Intelligent Fan Speed Control
- LED Indication of Power OK
- DC_OK Analog Indication Signal
- Remote Sense, Remote ON/OFF Control
- Auto and Manual Charge / Discharge Control
- Active Current Sharing
- CAN Bus Communication



Dimensions: 302.5 x 204.0 x 42.5mm (11.90 x 8.00 x 1.67 inch)

- 12V / 0.5A Standby Power
- Support Semi-Custom Design
- Optional CAN Bus
- Optional Optimized for Motor Load Version
- Optional Version Support Off-grid Operation Mode

APPLICATION



- Automation
- Battery Cell Formation & Grading
- Battery Charging / Discharging Module
- Energy Storage System

SAFETY & EMC

CE UKCA RoHS² compliant 10 from 10 Reach compliant

- The product follows LVD Directive 2014/35/EU and EMC Directive 2014/30/EU.
- The product is CE compliant. EMC radiation must be evaluated and tested in the complete system since mounting and wiring have a large influence on radiation behaviour.
- Cybersecurity: the product features a serial communication interface. CRA-relevant security aspects have been considered in the product design and documentation, including risk assessment. The product complies with the Cyber Resilience Act (CRA, EU Regulation 2024/2847) when installed in accordance with the instruction sheet.

DESCRIPTION

The SAB6000-3F is a SiC-based, high-efficiency (94%) bi-directional AC/DC power supply with a wide input range and 6000W DC-side rated power. It features a compact 8"x11.9"x1.67" design, supports both 3-phase and single-phase input, and operates from -30°C to 70°C. Key features include programmable output voltage and constant current, intelligent fan speed control, LED indication of power status, DC_OK analog signal, remote ON/OFF control, auto and manual charge/discharge control, active current sharing, CAN Bus communication, and 12V/0.5A standby power. It is suitable for battery cell formation and grading, battery charging modules, and energy storage systems.

SAB6000- -3F- - -

- nom. power
- input type
- nom. input
- options
- nom. output

Note (1) Accessories must be ordered in a separate order line

OPTIONS

BS	The product can be operated off grid: Black-Start-Capability (Now is available only for SAB6000-LV-3F-480-48 and SAB6000-HV-3F-480-800 models) For other models available on request. Please contact RECOM Power Systems.

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MODEL

Part Number	AC – DC Direction			DC – AC Direction			Connections type
	Input Voltage Nom [VAC]	Output Voltage Nom. [VDC]	Output Current Max. [A]	Input Voltage Range [VDC]	Input Current Max. [A]	Output Voltage Nom. [VAC]	
SAB6000-LV-3F-480-24	200 - 480	24	250	22 - 26	250	180 - 528	Type1(LV)
SAB6000-LV-3F-480-30		30	200	27 - 33	200		
SAB6000-LV-3F-480-36		36	166.7	33 - 40	167		
SAB6000-LV-3F-480-48		48	125	44 - 53	125		
SAB6000-LV-3F-480-60		60	100	54 - 66	100		
SAB6000-LV-3F-480-72		72	83.3	64 - 80	83		
SAB6000-LV-3F-480-85		85	70.6	77 - 94	70.6		
SAB6000-LV-3F-480-100		100	60	90 - 110	60		
SAB6000-LV-3F-480-120		120	50	100 - 120	50		
SAB6000-HV-3F-480-150		150	40	135 - 165	40		Type2 (HV)
SAB6000-HV-3F-480-250		250	24	225 - 275	24		
SAB6000-HV-3F-480-330		330	18.2	297 - 363	18.2		
SAB6000-HV-3F-480-400		400	15	360 - 430	15		
SAB6000-HV-3F-480-650		650	9.2	600 - 700	9.2		
SAB6000-HV-3F-480-800		800	7.5	750 - 850	7.5		

Note (2) References subject to special MOQs and lead times.

BASIC CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.
	AC – DC Direction AC			
Rated AC Input Voltage	3 Phase line to line voltage without neutral. Output power derating to 65% rated load at 180VAC three phase input. See Fig.1 for derating curve	200VAC		480VAC
AC Input Voltage Range		180VAC		528VAC
Rated AC Input Frequency		50Hz		60Hz
AC Input Frequency		47Hz		63Hz
AC Input Current	Per phase			16A
Power Factor	With Max rated output power	0.99		
THDi	@rated load, 380VAC input, tested with AC Source			5%
Efficiency	SAB6000-LV-3F-480-24 @rated load, 380VAC input			94%
	SAB6000-LV-3F-480-30			TBD
	SAB6000-LV-3F-480-36			TBD
	SAB6000-LV-3F-480-48 @rated load, 380VAC input			94.5%
	SAB6000-LV-3F-480-60			TBD
	SAB6000-LV-3F-480-72			TBD
	SAB6000-LV-3F-480-85			TBD
	SAB6000-LV-3F-480-100			TBD
	SAB6000-LV-3F-480-120			TBD
	SAB6000-HV-3F-480-150			TBD
	SAB6000-HV-3F-480-250			TBD
	SAB6000-HV-3F-480-330			TBD
	SAB6000-HV-3F-480-400			TBD
	SAB6000-HV-3F-480-650 @rated load, 380VAC input			95.5%
	SAB6000-HV-3F-480-800			TBD
AC Inrush Current	@480VAC input			32A

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Parameter	Conditions	Min.	Typ.	Max.
	AC – DC Direction DC			
Rated DC Voltage	SAB6000-LV-3F-480-24		24V	
	SAB6000-LV-3F-480-30		30V	
	SAB6000-LV-3F-480-36		36V	
	SAB6000-LV-3F-480-48		48V	
	SAB6000-LV-3F-480-60		60V	
	SAB6000-LV-3F-480-72		72V	
	SAB6000-LV-3F-480-85		85V	
	SAB6000-LV-3F-480-100		100V	
	SAB6000-LV-3F-480-120		120V	
	SAB6000-HV-3F-480-150		150V	
	SAB6000-HV-3F-480-250		250V	
	SAB6000-HV-3F-480-330		330V	
	SAB6000-HV-3F-480-400		400V	
	SAB6000-HV-3F-480-650		650V	
	SAB6000-HV-3F-480-800		800V	
DC Output Voltage Range	SAB6000-LV-3F-480-24	22V		26V
	SAB6000-LV-3F-480-30	27V		33V
	SAB6000-LV-3F-480-36	33V		40V
	SAB6000-LV-3F-480-48	44V		53V
	SAB6000-LV-3F-480-60	54V		66V
	SAB6000-LV-3F-480-72	64V		80V
	SAB6000-LV-3F-480-85	77V		94V
	SAB6000-LV-3F-480-100	90V		110V
	SAB6000-LV-3F-480-120	100V		120V
	SAB6000-HV-3F-480-150	135V		165V
	SAB6000-HV-3F-480-250	225V		275V
	SAB6000-HV-3F-480-330	297V		363V
	SAB6000-HV-3F-480-400	360V		430V
	SAB6000-HV-3F-480-650	600V		700V
	SAB6000-HV-3F-480-800	750V		850V
Rated DC Power	See Fig.1 for derating curve. Derating when single Phase @230Vac	3000W		6000W
Total Regulation	Including line regulation and load regulation, measured at output terminal			1%
Output Ripple & Noise	Peak-Peak value, measured at 5cm from PSU with 0.1uF ceramic and 100uF electrolytic capacitor, 20MHz BW			1%
Dynamic Response	With 50% load step, min from 5% load			5%
Power Up Time				3s
DC Rise Time				50ms
DC Hold-up time	@380VAC / 50Hz, 4kW load	10ms		

BASIC CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.
	DC – AC Direction DC			
Rated DC Input Voltage	SAB6000-LV-3F-480-24		24V	
	SAB6000-LV-3F-480-30		30V	
	SAB6000-LV-3F-480-36		36V	
	SAB6000-LV-3F-480-48		48V	
	SAB6000-LV-3F-480-60		60V	
	SAB6000-LV-3F-480-72		72V	
	SAB6000-LV-3F-480-85		85V	
	SAB6000-LV-3F-480-100		100V	
	SAB6000-LV-3F-480-120		120V	
	SAB6000-HV-3F-480-150		150V	
	SAB6000-HV-3F-480-250		250V	
	SAB6000-HV-3F-480-330		330V	
	SAB6000-HV-3F-480-400		400V	
	SAB6000-HV-3F-480-650		650V	
	SAB6000-HV-3F-480-800		800V	

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Parameter	Conditions	Min.	Typ.	Max.
DC Input Voltage Range	SAB6000-LV-3F-480-24	22V		26V
	SAB6000-LV-3F-480-30	27V		33V
	SAB6000-LV-3F-480-36	33V		40V
	SAB6000-LV-3F-480-48	44V		53V
	SAB6000-LV-3F-480-60	54V		66V
	SAB6000-LV-3F-480-72	64V		80V
	SAB6000-LV-3F-480-85	77V		94V
	SAB6000-LV-3F-480-100	90V		110V
	SAB6000-LV-3F-480-120	100V		120V
	SAB6000-HV-3F-480-150	135V		165V
	SAB6000-HV-3F-480-250	225V		275V
	SAB6000-HV-3F-480-330	297V		363V
	SAB6000-HV-3F-480-400	360V		430V
	SAB6000-HV-3F-480-650	600V		700V
	SAB6000-HV-3F-480-800	750V		850V
Rated DC Power	See Fig.1 for derating curve			6000W

Parameter	Conditions	Min.	Typ.	Max.
DC – AC Direction AC				
AC Rated Output Voltage	3 Phase line to line voltage without neutral. Output power derating to 65% rated load at 180VAC three phase input. See Fig.1 for derating curve		480VAC	
AC Output Voltage Range		180VAC		528VAC
AC Rated Output Frequency		50Hz		60Hz
AC Output Frequency Range		47Hz		63Hz
AC Output Current	Per phase			14A
THDI				5%

POWER DERATING vs AMBIENT TEMPERATURE

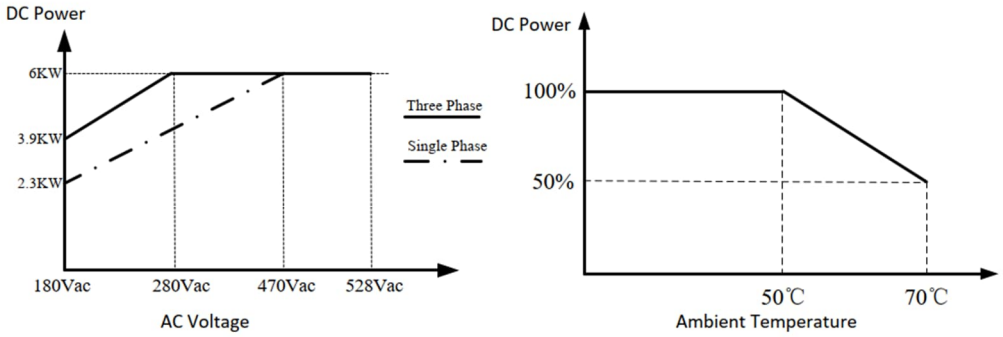


Fig.1

STANDBY OUTPUT SPECIFICATION				
Function	**Conditions**	**Min.**	**Typ.**	**Max.**
Output voltage		11.4V	12V	12.6V
Output current		0A		0.5A
Over current protection (OCP)	Auto-restart after fault is removed	1A		
Short circuit protection (SCP)	Auto-restart after fault is removed			

12VBS output presents when V_{L-L}=180-528VAC. It is isolated from the main output.
12VSB stays present when 400VDC goes to protection mode (OCP, SCP, OVP and OTP), PS-on/off 400VDC.
12VSB shuts down when AC turned off and 12VSB goes to protection mode.

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PROTECTION SPECIFICATION

Function	Conditions	Min.	Typ.	Max.
DC side Over Current Protection	CC control, Auto-restart			105% Rated DC Current
AC side Over Current Protection	CC control, Auto-restart			105% Rated DC Current
Short Circuit Protection	Auto-restart			
DC Side Over Voltage Protection	Latch off (3)			
OTP	Auto-restart			
Islanding Protection -DC-AC Direction	Auto-restart; Non off-grid version			

(3) Protection mode latch or auto-restart can be customed, please contact Recom for more details.

LED & SIGNAL INDICATOR

Operation Mode	Power Supply Conditions	Alert	Front		Back		DC_OK
			Green Led	Yellow Led	Green Led	Yellow Led	
Normal Operation	AC-DC operation	Low	On	Off	On	Off	High
	DC-AC operation	Low	Blink	Off	On	Off	High
	Standby Mode	Low	Off	Blink	On	On	Low
Fault Condition	DC Undervoltage	High	Off	On	On	Off	Low
	DC Overvoltage	High	Off	On	On	Off	Low
	Fan Fault	High	Off	On	On	Off	Low
	Over temperature	High	Off	On	On	Off	Low
	AC Undervoltage	High	Off	On	Off	On	Low
	DC Overcurrent	High	Off	On	On	Off	Low
	AC Overcurrent	High	Off	On	On	On	Low
	Islanding	High	Off	On	On	On	Low

ENVIRONMENTAL CONDITIONS

Parameter	Conditions	Min.	Typ.	Max.
Operating Ambient Temperature	See derating curve	-30°C		+70°C
Storage Temperature		-40°C		+85°C
Operating Humidity	Non-Condensing	5% RH		95% RH
Storage and Transportation Humidity	Non-Condensing	5% RH		95% RH
Operating Altitude		0		5000m
Acoustic Noise	80% Load, 1m distance			50dB
Shock	Base plate mounting			196m/s2
Vibration	10-500Hz 1 hour for each axis; base plate mounting			19.6m/s2

RELIABILITY

Parameter	Conditions	Min.	Typ.	Max.
MTBF	According to Telecordia RS-332. 480Vac 25°C ambient with rated load	500Khrs		
Life	Rated condition	5 years		

LEAKAGE CURRENT

Parameter	Conditions	Min.	Typ.	Max.
Input-PE Leakage	480Vac / 60Hz Normal Condition			2mA
	480Vac / 60Hz Single Fault Condition			4mA
Output-PE Leakage	480Vac / 60Hz Normal Condition			100µA
	480Vac / 60Hz Single Fault Condition			500µA

SAFETY AND PROTECTIVE FUNCTIONS

Parameter	Conditions		Min.	Typ.	Max.
Dielectrics withstand voltage	Input to Output			3000Vac	
	Input to Ground			1800Vac	
	Output to Ground	48V and below models		500Vac	
		60V and above models		1500Vac	
DC side Over Current Protection	CC control, Auto-restart. Rated DC Current				105%
AC side Over Current Protection	CC control, Auto-restart. Rated DC Current				105%
Short Circuit Protection	Auto-restart				
DC Side Over Voltage Protection	Latch off (4)				
OTP	Auto-restart				
Islanding Protection - DC-AC Direction	Auto-restart; Non off-grid version				

(4) Protection mode latch or auto-restart can be customed, please contact Recom for more details.

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SAFETY & CERTIFICATIONS

Certificate	Standard
RoHS2	RoHS 2011/65/EU + AM2015/863
REACH Regulation	EC 1907/2006
CE Conformity	CE 2014/30/EU
UKCA Conformity	UKCA

[5] Compliance only, contact RECOM Power Systems for detailed safety certifications.

SAFETY Compliance	Conditions	Standard / Criterion
PECS [6]		IEC 62477-1
ITE Safety [6]		IEC 62368-1
		UL 62368-1 + CAN/CSA No.62368-1
		GB 4943.1-2022, GB/T9254.1-2021, GB/T9254.2-2021, GB 17625.1-2022

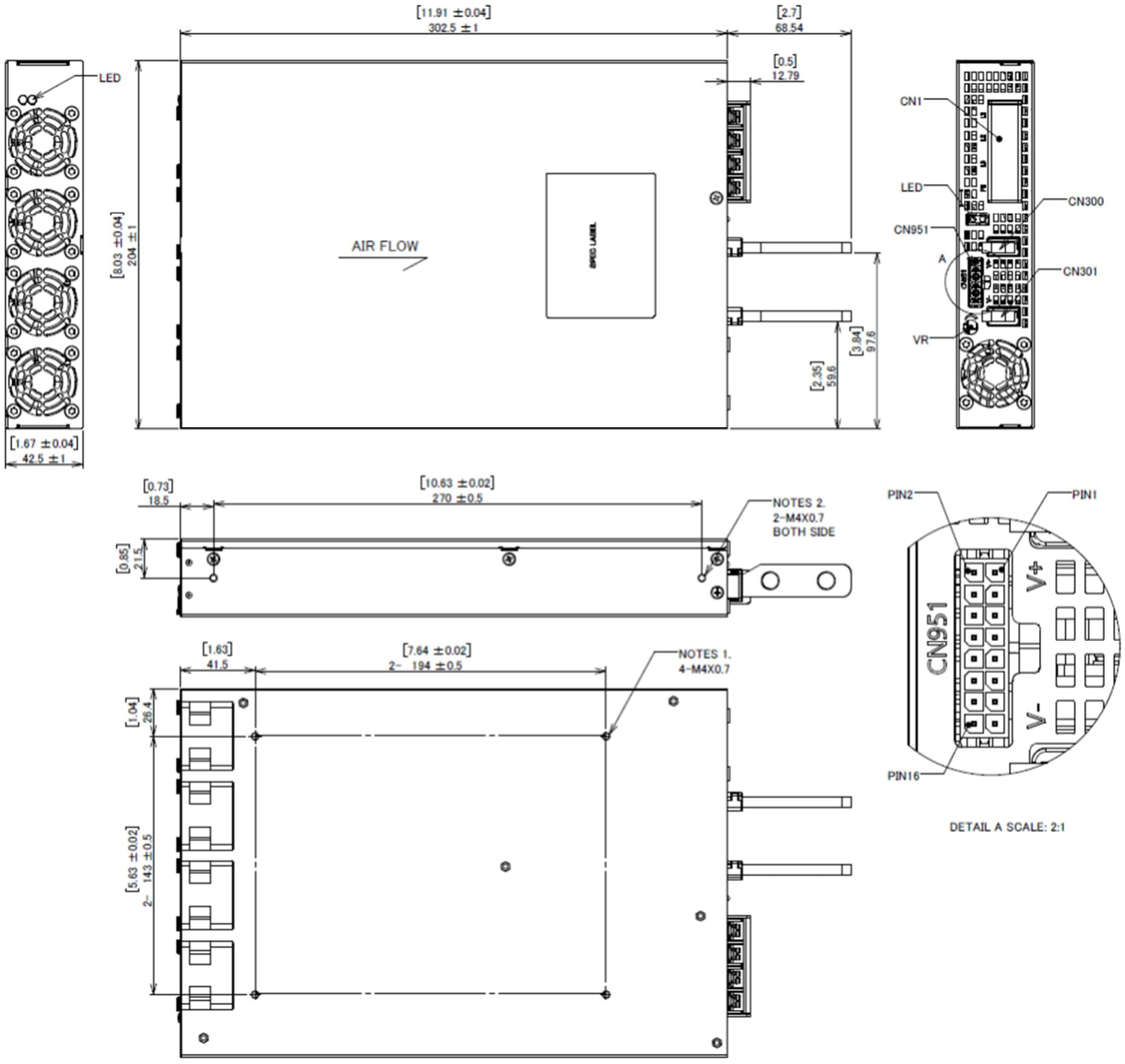
[6] Compliance only, contact RECOM Power Systems for detailed safety certifications.

EMC Compliance	Conditions	Standard / Criterion
Conducted Emissions [7]		EN55032, Class A
Radiated Emissions [7]		EN55032, Class A
Note[7] : SAB6000-3F Series is an enclosed type PSU as a component intended to be assembled and built inside the system cabinet, PSU normally is to mounted connecting to an earthed metal plate, all the EMC tests are performed with the PSU and resistive loads plated on a metal plate to simulate the system application. The final system must re-evaluate to confirm it can still meet the EMC directions.		
Harmonic Current Emissions		IEC 61000-3-2 Meet Class A limit
Voltage Flicker		IEC 61000-3-3
Electrostatic Discharge	Air discharge:15kV, Contact Discharge: 8kV Criteria A	IEC 61000-4-2 Level 4
Radiated Field		IEC 61000-4-3 Criteria A
Electrical Fast Transient / Burst		IEC 61000-4-4 Level 2 (1kV), Criteria A
Surge	Common Mode 2kV, Differential Mode 1kV	IEC 61000-4-5 Level 3 Criteria A
CS	150kHz-80MHz, 3Vrms, 6Vrms at ISM bands and Amateur radio bands	IEC 61000-4-6 Level 2 Criteria A
Power Frequency Magnetic Fields	Magnetic field strength 30A/m	IEC 61000-4-8 Criteria A,
Voltage Dips	Criteria A: @3000W or lower 0%UT. 0.5 Cycle (10ms) (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°, 360° Criteria B: 0%UT. 1 Cycle (20ms), 0° Criteria B: 70%UT, 25 Cycle (500ms), 0° 0%UT, 250 Cycle (500ms), 0°	IEC 61000-4-11
Voltage Dips	30% 10ms Criteria A @3000W or lower 60% 100ms Criteria B 100% 5000ms Criteria B	IEC 61000-4-11

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MECHANICAL DATA				
Parameter	Conditions	Min.	Typ.	Max.
Width			204.0 mm 8.00 inch	
Length			302.5 mm 11.90 inch	
Height			42.5 mm 1.67 inch	

DIMENSIONS for models with 120V output or below

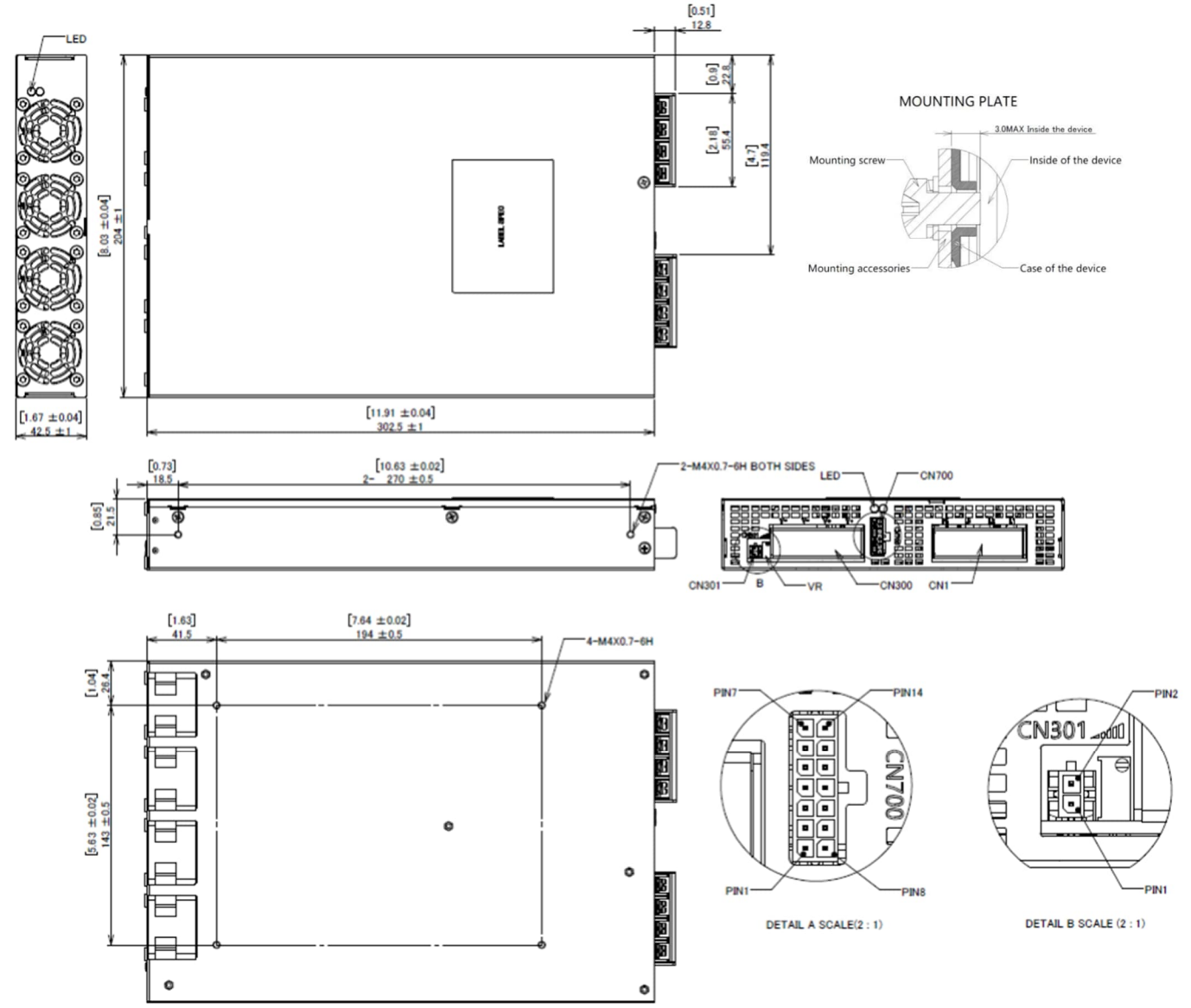


Notes:

- Base plate mounting, M4 thread holes, maximum penetration 3.0mm (0.12 inch) from outside face of chassis.
- Side mounting, M4 thread holes, maximum penetration 3.0mm (0.12 inch) from outside face of chassis
- CN1 is AC input/output terminal block and with M4 screw in four positions, wire gauge is 8-20AWG
- CN300/CN301 is DC output/input terminal block and suggest using M8 screw and nut to fix wire
- CN951 is signal and control connector, type is MOLEX 430451600, mate with 430251600 or equivalent.
- VR: clockwise is to increase the output voltage, anti-clockwise is to reduce the output voltage.

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DIMENSIONS for models with 150V output or above



Notes:

- Base plate mounting, M4 thread holes, maximum penetration 3.0mm (0.12 inch) from outside face of chassis.
- Side mounting, M4 thread holes, maximum penetration 3.0mm (0.12 inch) from outside face of chassis
- CN1 is AC input/output terminal block and with M4 screw in four positions, wire gauge is 8-20AWG
- CN300 is DC output/input terminal block and with M4 screw in four positions, wire gauge is 8-20AWG
- CN700 is signal and control connector, type is MOLEX 430451400, mate with 430251400 or equivalent.
- VR: clockwise is to increase the output voltage, anti-clockwise is to reduce the output voltage.
- CN301 is signal connector, type is MOLEX 430450200, mating with MOLEX 430250200 or equivalent.

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CONNECTORS AND PINS ASSIGNMENT

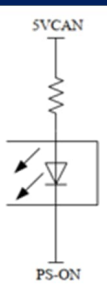
Connector	Pin	Assignment	Function/Description
CN951 (For models with 120V output or below on Grid version)	1	CANH	CAN-Bus high Communication pin
	2	C/D	Conversion direction manually control signal. This pin is enable when the Bi-C signal is low
	3	Bi-C	Bi-directional Control signal
	4	PS_ON	Remote ON/OFF control pin
	5	5VCAN	This is the CAN-Bus 5V voltage supply pin
	6	ALERT	Fault/Warning – An open collector signal is provided to indicate any fault or warning such as over temperature, overvoltage, overcurrent, undervoltage, and fan fault
	7	CANL	CAN-Bus low Communication pin
	8	DC_OK	DC OK indicator
	9	COM	Common – This is the common return pin for the CN951 signal pin 1 to pin 10
	10	12VSB	This is the 12V standby output voltage pin
	13	Remote sense+	Remote Sense Positive
	14	Remote sense-	Remote Sense Return
	15, 16	Current share	This pin must be connected of the power supplies when DC output parallel connected

Connector	Pin	Assignment	Function/Description
CN700 (For models with 150V output or above)	1,8	12VSB	This is the 12V standby output voltage pin
	2, 9	12V GND	This is the 12V GND pin. It is isolated from the main output
	3	CANH	CAN-Bus high Communication pin
	4	ALERT	Fault/Warning – An open collector signal is provided to indicate any fault or warning such as over temperature, overvoltage, overcurrent, undervoltage, and fan fault
	5	DC_OK-	DC OK Return
	6	C/D	Conversion direction manually controls signal. This pin is enabled when the Bi-C signal is low
	10	CANL	CAN-Bus low Communication pin
	11	PS_ON	Remote ON/OFF control pin
	12	DC_OK+	DC OK Positive
	13	Bi-C	Bi-directional Control signal
	7, 14	5VCAN	This is the CAN-Bus 5V voltage supply pin

Connector	Pin	Assignment	Function/Description
CN301 (For models with 150V output or above)	1,2	Current share	This must be connected for current share function

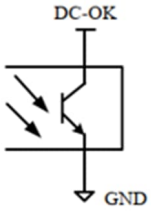
REMOTE ON/OFF

PS_ON Pin can be used to remotely turn on and off the power supply unit. This pin can be directly connected to common or controlled to common on the system backplane. Low to shut down the power supply. Open or high to turn on the power supply. This pin also can be used to clear any latched fault condition.



DC_OK SIGNAL

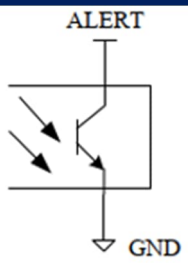
DC_OK Signal is designed to indicate the main DC output status When DC output is present, DC_OK Signal (Shown in below figure) generated will be high. When DC output is off, the internal transistor will be turned off. When AC input is off, there will be a minimum of 5 milliseconds between the time the DC_OK internal transistor turns off, and the time when the output reaches 90% of its rated value



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ALERT

The Alert signal is an indicator of internal protection. The connection is an open-collector output. Low for normal operation, open for any protection triggered.

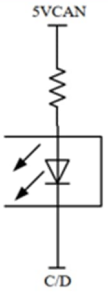


REMOTE SENSE

Low voltage output models support remote sense features. It can be used to compensate for the extra voltage drop on output wires that are connected from the main output terminals to the load. With wires connected from the remote sense pins, at the same locations as the wires from the main output, the remote sense function can compensate for up to 500mV voltage drop.

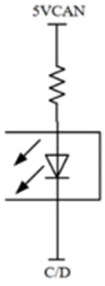
OPERATION MODE

BI-C Pin can be used to control the switching mode of conversion direction. This pin in internally connected to an opto-coupler. When this pin is floating the conversion direction is determined automatically by DC side load energy flow. When this pin is low the conversion direction is manually switched by C/D signal.



OPERATION DIRECTION

The C/D Pin can be used to control the conversion direction of power supply. This pin is internally connected to an opto-coupler. Pull low to force the power supply into DC to AC operation direction. Floating to force the power supply into AC to DC operation direction. The function can be initialized as enable or disable by BI-C signal or CAN Bus.



COMMUNICATION

Use CAN bus protocol to control the power supply unit via communication. Please contact RECOM for details of communication specification.

CURRENT SHARING

SAB6000-3F series supports current sharing function on DC Output side. Please contact RECOM for details

WARRANTY AND GUARANTEE

The warranty corresponds to the regulations in our currently valid general terms and conditions.

INSTRUCTIONS REGARDING DISPOSAL

A basic requirement for the re-use and recycling of used electronic devices is the correct disposal. With the implementation of the electric and electronic device regulation, electronic devices may no longer be disposed of along with ordinary household waste but must be separately collected and recorded by a specialist service.
Disposal through a specialist service significantly helps to avoid dangers to people and nature. Therefore, in the case of disposal, we recommend contacting a recognized specialist disposal service.

REQUIREMENTS ON THE OPERATION PERSONNEL

All courses of action described in this manual may only be carried out by a qualified electrician! Specialist staff are defined as electricians who have had specific professional training and have knowledge and experience in the field of electronics as well as knowledge of relevant provisions and dangers for which they can provide proof. Furthermore, they must be able to assess the work assigned to them independently, identify possible dangers, and establish necessary protection measures.

The product information and specifications may be subject to changes even without prior written notice. The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.