

ABC601 Series

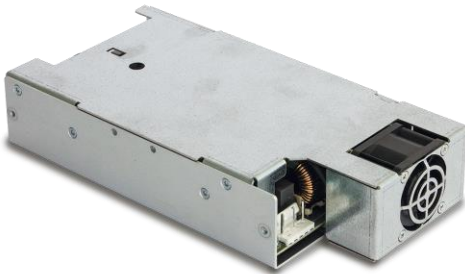
600 W AC-DC Power Supplies

The ABC601 Series of industrial and medical AC-DC power supplies provides up to 600 W of regulated output power through wide input voltage range 85 – 305 VAC in single outputs of 24, 28, 36 or 48 VDC.

The ABC601 Series comes in two packages, U-frame chassis or enclosed with a front mounted fan, offering 12 and 5 VSB standby outputs and a full set of protection features.

The ABC601 Series features a built-in I-share circuit for parallel operation between power units to enhance total power. An optional OR-ing external circuit can be provided for N+1 redundant operation.

The ABC601 Series complies with the latest international safety standards for IT and medical equipment and displays the CE-Mark for the European Low Voltage Directive (LVD).



Key Features & Benefits

- Universal input voltage range (85 – 305 VAC)
- Input surge current limiting
- 800 W peak power (up to 10 s)
- High efficiency up to 94%
- 24, 28, 36 and 48 VDC standard output voltages
- Low stand-by consumption (<0.35 W)
- Active PFC, EN 61000-3-2 compliant (Class C, >25% load)
- Low earth / touch leakage current
- Fan speed control circuit
- Over temperature, OV, OC and SC protections.
- Stand by +5 V, 1.5 A and auxiliary / fan 12 VDC, 1 A outputs
- Built-in current share signal for parallel operation
- Remote On / Off signal
- Power good and remote sense signals
- Medical safety approval to IEC 60601-1, 2x MoPP protection grade
- BF appliances compatible
- IEC 60601-1-2 4th edition EMC compliant
- IEC 62368-1 standards for Audio Video & IT equipment
- LED lighting approval to UL 8750
- RoHS 3 compliant (Directive EU 2015/863)



Applications

- Video Wall Display and SSL Lighting
- Industrial Process Control and Automation
- Telecommunications
- Laboratory / Analysis Equipment
- Test and Measurement Equipment
- Medical Applications



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1. MODEL SELECTION

MODEL NUMBER	PACKAGE & COOLING	INPUT VOLTAGE RANGE [VAC]	NOM. OUTPUT VOLTAGE [VDC]	MAX. OUTPUT POWER [W]	MAX. OUTPUT CURRENT [A]	DIMENSIONS
ABC601-1T24-S	Enclosed Front Mounted Fan	85 - 305	24	600	25	107.0 x 206.0 x 41.0 mm 4.21 x 8.11 x 1.6 in
ABC601-1T24	U-Chassis Convection / Forced Air	85 - 305	24	600	25	107.0 x 178.5 x 41.0 mm 4.21 x 7.03 x 1.61 in
ABC601-1T28-S	Enclosed Front Mounted Fan	85 - 305	28	600	21.4	107.0 x 206.0 x 41.0 mm 4.21 x 8.11 x 1.6 in
ABC601-1T28	U-Chassis Convection / Forced Air	85 - 305	28	600	21.4	107.0 x 178.5 x 41.0 mm 4.21 x 7.03 x 1.61 in
ABC601-1T36-S	Enclosed Front Mounted Fan	85 - 305	36	600	16.7	107.0 x 206.0 x 41.0 mm 4.21 x 8.11 x 1.6 in
ABC601-1T36	U-Chassis Convection / Forced Air	85 - 305	36	600	16.7	107.0 x 178.5 x 41.0 mm 4.21 x 7.03 x 1.61 in
ABC601-1T48-S	Enclosed Front Mounted Fan	85 - 305	48	600	12.5	107.0 x 206.0 x 41.0 mm 4.21 x 8.11 x 1.6 in
ABC601-1T48	U-Chassis Convection / Forced Air	85 - 305	48	600	12.5	107.0 x 178.5 x 41.0 mm 4.21 x 7.03 x 1.61 in

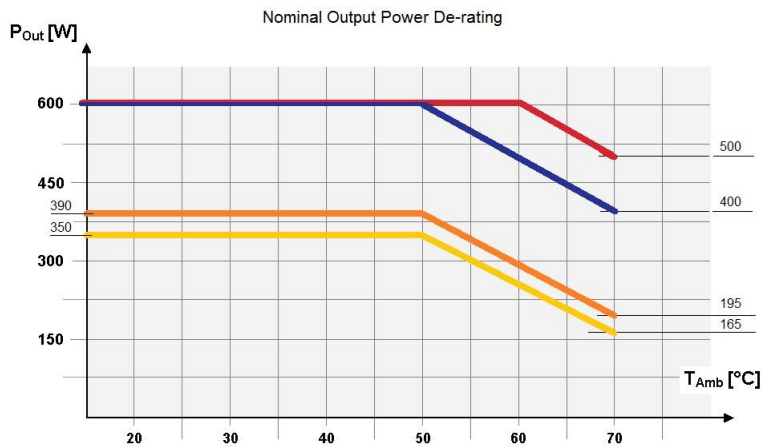
2. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
AC Input Voltage	PS starts and operates at 85 V _{AC} at all load conditions	85	100-277	305	V _{RMS}
DC Input Voltage		170	-	300	V _{DC}
Input Frequency	440 Hz with reduced PFC and output power rating. Consult factory for details.	47	50/60	440	Hz
Input Current	RMS at 180 V _{AC} , maximum load, 50 / 60 Hz RMS at 85 V _{AC} , maximum load, 50 / 60 Hz	-	-	4.0 8.5	A
Inrush Current	Cold start, 25 °C ambient, full load	115 V _{AC} 230 V _{AC}	-	20 30	A
Fusing	High breaking, 10 A, 250 V on each AC lines.	-	-	10	A
Efficiency	At 115 V _{AC}	20% rated load	89	-	%
		50% rated load	93	-	
		100% rated load	92	-	
	At 230 / 277 V _{AC}	20% rated load	90	-	
		50% rated load	94	-	
		100% rated load	94	-	
Input Power Consumption	Power on, 115 V _{AC} , no load	-	-	5	W
	Power on, 230 V _{AC} , no load	-	-	4	
	Stand by, 115, 230 V _{AC} , no load	-	-	0.35	
Power Factor	From 50 to 100% of rated load, 230, 115 V _{AC} , 50 / 60 Hz input voltages.	0.90	-	-	-
THDi	From 50 to 100% rated load, 115, 230, 277 V _{AC} 50 / 60 Hz.	-	-	20	%
Harmonic Current Fluctuations and Flicker	Complies with EN 61000-3-2 at 230 V _{AC} , 50/60 Hz, Class A, D. Complies with EN 61000-3-2 Class C at 230 V _{AC} , 50/60 Hz, >150 W load. Complies with EN 61000-3-3 at nominal voltages and full load.				
Earth Leakage Current	Normal conditions				μA
	115 V _{RMS} , 60 Hz	-	130	-	
	230 V _{RMS} , 50 Hz	-	240	-	
	264 V _{RMS} , 60 Hz (worst case)	-	-	400	
Touch Leakage Current	277 V _{RMS} , 60 Hz	-	-	-	μA
	264 V _{RMS} , 60 Hz	-	-	-	
	Normal Condition (NC)	-	-	100	
Patient Leakage Current	Single Fault Condition (SFC)	-	-	500	μA
	264 V _{RMS} , 60 Hz	-	-	-	
	Normal Condition (NC)	-	-	100	
	Single Fault Condition (SFC)	-	-	500	

3. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
V1 Output Voltages	±0.5% set point accuracy RS+ closed on +V1, RS- closed on V1 RTN, at 20% load.	-	24 28 36 48	-	V
V1 Output Power Rating	Convection cooling (Refer to the de-rating curves below) Forced air cooling Refer to the de-rating curves below) Peak (less than 10 s, after P_OK high)			400 600 800	W
V1 Output Current	V1: 24 V _{DC} V1: 28 V _{DC} V1: 36 V _{DC} V1: 48 V _{DC}			25.0 21.4 16.7 12.5	A
V1 Voltage Adjustment Range	Manually by potentiometer	-	-	±5	%V1
V1 Line Regulation	V _{AC} : 85 – 305 V _{RMS}	-	-	±0.1	%V1
V1 Load-Line-Cross Regulation	V _{AC} : 85 – 305 V _{RMS} ; I _I : 0 – 100%	-	-	±2	%V1
V1 Ripple and Noise	Rated load, Peak-to-peak, 20 MHz BW. (100 nF ceramic, 10 µF tantalum at load) *	-	-	1	%V1
Transient Response: V1, 5V _{SB} Voltage Deviation	25% load changes at 1 A/µs 24 V at 1000 µF load / I _{OUT} > 2.5 A 28 V at 1000 µF load / I _{OUT} > 2.5 A 36 V at 680 µF load / I _{OUT} > 1.9 A 48 V at 560 µF load / I _{OUT} > 1.25 A 5 V _{SB} at 560 µF load / I _{OUT} > 0.1 A	-	-	±5	%V1 %V _{SB}
V1 Start-up Rise Time	85 < V _{IN} < 305, any load conditions.	10	-	100	ms
V1 Hold-up Time	At nominal V _{IN} , full load **	16	-	-	ms
V1 Current Sharing Accuracy	Two units in parallel at I _I rated load. VS-Logic and I-Share signals connected together. RS+, RS- signals connected together and to the load	45.5	-	54.5	%I _I
Start-up Delay	V1 in regulation after de-asserting PS_Inhibit V1 in regulation after AC is applied (worst case: 85 V _{AC}) 5 V _{SB} in regulation after AC is applied (worst case: 85 V _{AC})	- - -	- - -	450 2050 1500	ms
Turn-on Overshoot		- -	- -	10 10	%V1 %V _{SB}
Minimum Load	V1, V2, 5V _{SB}	0	-	-	A
Maximum Load Capacitance	V1: 24 V _{DC} V1: 28 V _{DC} V1: 36 V _{DC} V1: 48 V _{DC}	- - - -	- - - -	16000 15000 12000 8000	µF
V2 Output Voltage	V1 at nominal voltage	10.5	12.25	14.00	V
V2 Output Current	Convection / forced air cooling	-	-	1	A
5 V _{SB} Output Voltage	±3% set point accuracy, 20% load.	-	5	-	V
5 V _{SB} Output Current	Front Mounted Fan models (-S) U-Chassis models	- -	- -	1.5 1.2	A
5 V _{SB} Load, line cross Regulation	V _{AC} : 85 – 305 V _{RMS} ; I _{SB} : 0 – 100%	-	-	±5	%V _{SB}

3.1 OUTPUT POWER DE-RATING CURVES



Natural Convection
U-Chassis Models
Vertical Mounting
180 – 305 V_{AC}

Natural Convection
U-Chassis Models
Horizontal Mounting
180 – 305 V_{AC}

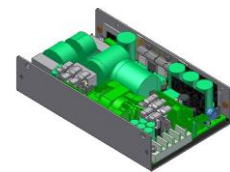
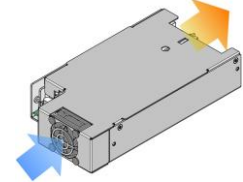
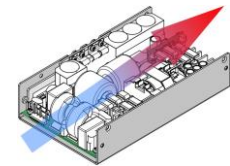
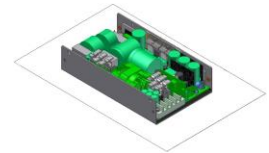
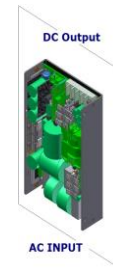
Forced Air Cooling
U-Chassis Models

>500 LFM
At 180 – 305 V_{AC}

>600 LFM
At 85 – 180 V_{AC}

Enclosed Front Mounted
Fan Models
85 – 305 V_{AC}

Natural Convection
Any Orientation
85 – 305 V_{AC}



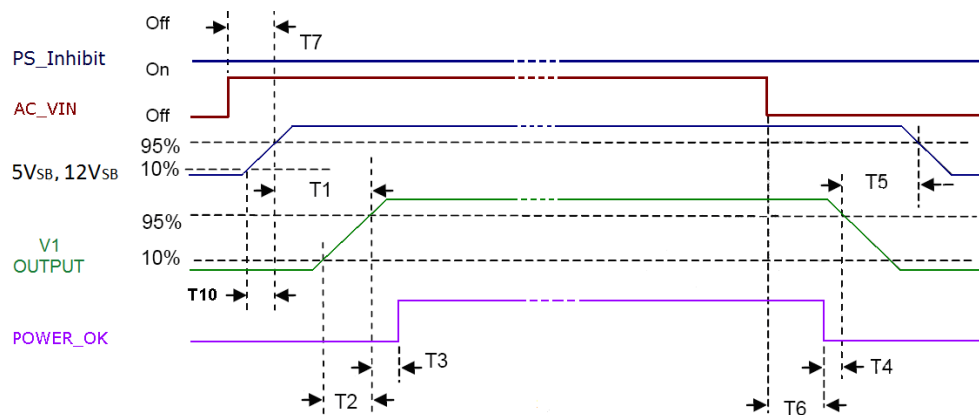
4. SIGNALS, CONTROLS & TIMING SPECIFICATIONS

Base signals and controls are accessible from signal connector P204.

SIGNAL	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
+PS_Inhibit	Active high. Input low voltage	0	-	1.5	V
	Input high voltage ($I_{IN} = 300 \mu A$)	3.5	-	5.5	V
	V1 and V2 disabled when PS_Inhibit is pulled high				
	5V _{SB} not affected by PS_Inhibit				
-PS_Inhibit	V1 and V2 enabled when PS_Inhibit is open or low				
	Active low (reverse control, same voltage levels)				
P_OK *	Logic level low (<10 mA sinking)	-	-	0.7	V
	Logic level high (100 μA sourcing)	2.4	-	5.5	V
	Low to high time after V1 in regulation	40	-	350	ms
	Power down warning time	1	-	-	ms
5V _{SB} Output	Active and in regulation after a $85 < V_{AC} < 305$ is applied	-	-	1500	ms
	5V _{SB} not affected by PS_Inhibit				

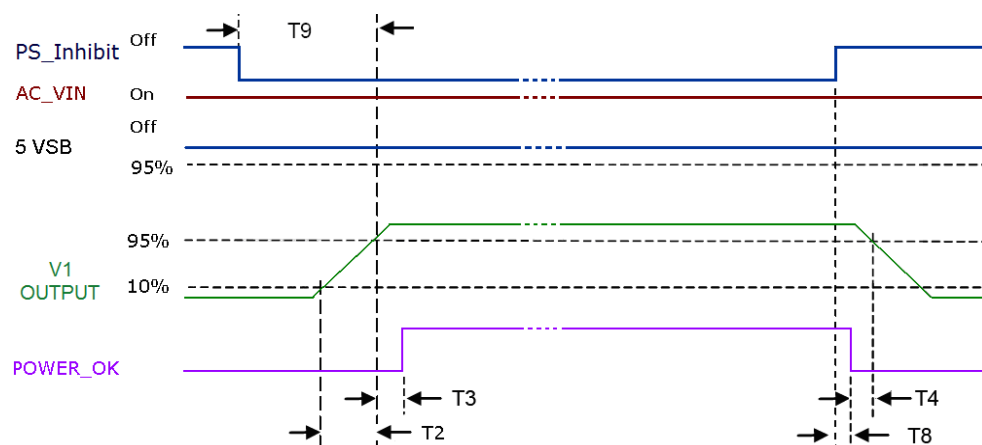
* When V1 is On, a P_OK low may indicate V1 under voltage condition. When two ABC601 operate in parallel, P_OK low in one unit indicates that it is not sharing the expected amount of current (current sharing fault). A 10 k Ω internal pull up to 5V_{SB} is used; do not add any other external pull up.

AC/DC INPUT OFF-TO-ON AND ON-TO-OFF TIMINGS



5V _{SB} On – V1 On	$250 \text{ ms} \leq T1 \leq 550 \text{ ms}$
V1 rise time	$10 \text{ ms} \leq T2 \leq 100 \text{ ms}$
5V _{SB} rise time	$3 \text{ ms} \leq T10 \leq 40 \text{ ms}$
V1 On – POWER_OK delay	$200 \text{ ms} \leq T3 \leq 350 \text{ ms}$
Power down warning	$T4 \geq 1 \text{ ms}$
V1 Off – 5V _{SB} Off	$T5 \geq 0.5 \text{ s (V1 load > 25 W)}$
AC Off – POWER_OK low	$T6 \geq 15 \text{ ms}$
AC_On – 5V _{SB} turn on time	$T7 \leq 1.5 \text{ s}$

PS_INHIBIT OFF-TO-ON AND ON-TO-OFF TIMINGS



V1 rise time	$10\text{ ms} \leq T2 \leq 100\text{ ms}$
V1 On – POWER_OK delay	$200\text{ ms} \leq T3 \leq 350\text{ ms}$
Power down warning	$T4 \geq 1\text{ ms}$
PS_Inhibit – POWER_OK low timing	$T8 \leq 2\text{ ms}$
PS_Inhibit – V1 On delay	$T9 \leq 450\text{ ms}$

5. PROTECTION SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Input Under Voltage	Auto-recovering, hiccup mode.	58	65	75	V _{AC}
Input Fuse	High breaking, 10 A, 250 V on L and L1.	-	-	10	A
Over Current	At nominal input voltages				
	V1: Hiccup mode, auto-recovering (>10 s)	108	-	132	%I _{Rated}
	V1: Hiccup mode, auto-recovering (<10 s)	135	-	163	%I _{Rated}
	V2: PTC limiting, auto-recovering.	-	-	-	
	5V _{SB} : Hiccup mode, auto-recovering:				
	U-Chassis models	1.3	-	3.6	A
	Front Mounted Fan models (-S)	1.6	-	3.6	A
Short Circuit	At nominal input voltages				
	V1: Hiccup mode, auto-recovering.	-	-	-	
	V2: PTC limiting, auto-recovering.				
	5V _{SB} : Hiccup mode, auto-recovering.				
Over Voltage	V1, Power shut down, latch off.	120	-	145	%V _{NOM}
	5V _{SB} , Hiccup mode, auto-recovering.	-	-	150	
Over Temperature (on primary stage)	Shut down, latch off.	-	-	-	°C
Over Temperature (on secondary side)	Hiccup mode, auto-recovering.	-	-	-	°C
Isolation: Input-to-Output	Reinforced (2x MoPP).	5660	-	-	V _{DC}
	Production tested at 4242 V _{DC}	4000	-	-	V _{AC}
Isolation: Input-to-Earth	Basic (1x MoPP)	2121	-	-	V _{DC}
	Production tested at 2121 V _{DC}	1500	-	-	V _{AC}
Isolation: V1/5V _{SB} to V2	Basic	100	-	-	V _{AC}
Isolation: Output-to-Earth	Basic (1x MoPP)	1500	-	-	V _{AC}
Means of Protection:	2x MoPP (IEC 60601-1 3 rd edition) at 100 – 250 V _{AC} , 50/60 Hz up to 4000 m				
Primary to secondary	2x MoPP (IEC 60601-1 3 rd edition) at 100 – 277 V _{AC} , 50/60 Hz up to 3000 m				
Means of Protection:	2x MoPP (IEC 60601-1 3 rd edition) at 100 – 277 V _{AC} , 440 Hz (50/60 Hz)				
Primary to Protection Earth	1x MoPP (IEC 60601-1 3 rd edition) at 100 – 250 V _{AC} , 50/60 Hz up to 4000 m				
	1x MoPP (IEC 60601-1 3 rd edition) at 100 – 277 V _{AC} , 50/60 Hz up to 3000 m				
Means of Protection:	1x MoPP (IEC 60601-1 3 rd edition) at 100 – 277 V _{AC} , 440 Hz (50/60 Hz)				
	1x MoPP (IEC 60601-1 3 rd edition) at 100 – 250 V _{AC} , 50/60 Hz up to 4000 m				
Secondary to Protection Earth	1x MoPP (IEC 60601-1 3 rd edition) at 100 – 277 V _{AC} , 50/60 Hz up to 3000 m (U-chassis variant only)				
	1x MoPP (IEC 60601-1 3 rd edition) at 100 – 277 V _{AC} , 440 Hz (U-chassis variant only)				
Equipment Protection Class	Class I, compatible with BF (Body Floating) ME				

6. ENVIRONMENTAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Operating Temperature Range	No de-rating up to 50°C	-20	-	50	°C
Operating Temperature Range with Derating	See derating curves & conditions in the Output Specifications section	-	-	70	°C
Storage Temperature	As per IEC/EN 60721-3-1 Class 1K4	-40	-	85	°C
Transportation Temperature	As per IEC/EN 60721-3-2 Class 2K4				
Humidity	RH, Non-condensing Operating.	-	-	90	%
	Non-operating	-	-	95	%
Operating Altitude	MoPP (100 – 250 V _{AC} , 50/60 Hz)	-	-	4000	m
	MoPP (100 – 277 V _{AC} , 50/60 Hz)	-	-	3000	
	MoOP, ITE grade	-	-	5000	
	Power de-rating above 1800 m				
Shock	EN 60068-2-27				
	Operating: Half sine, 30 g, 18 ms, 3 axes, 6x each (3 positive and 3 negative). Non-Operating: Half sine, 50 g, 11 ms, 3 axes, 6x each (3 positive and 3 negative).				
Vibration	EN 60068-2-64				
	Operating: Sine, 10 – 500 Hz, 1 g, 3 axes, 1 oct/min., 60 min. Random, 5 – 500 Hz, 0.02 g ² /Hz, 1 g _{RMS} , 3 axes, 30 min. Non-Operating: 5 – 500 Hz, 2.46 g _{RMS} (0.0122 g ² /Hz), 3 axes, 30 min.				
MTBF	Full Load, 40 °C ambient 80% Duty cycle, Telcordia SR-332 Issue 2	300000	-	-	Hours
Useful Life	Nominal V _{IN} , 80% load, 40 °C ambient (IPC9592)	-	4	-	Years

7. ELECTROMAGNETIC COMPATIBILITY (EMC) – EMISSIONS

PARAMETER	DESCRIPTION / CONDITION	STANDARD	PERFORMANCE CLASS
Conducted	115, 230, 277 V _{RMS} , Maximum load	EN 55032 (ITE) EN 55011 (ISM) EN 60601-1-2 (Medical) FCC Part 15	B
Radiated	At 10 m distance	EN 55032 (ITE) EN 55011 (ISM) EN 60601-1-2 (Medical) FCC Part 15	B *
Line Voltage Fluctuation & Flicker	At 20%, 50% and 100% maximum load. Nominal input voltages	EN 61000-3-3	
Harmonic Current Emission	230 V _{AC} input voltage, 50 / 60 Hz 230 V _{AC} 50 / 60 Hz, >150 W load	EN 61000-3-2 EN 61000-3-2	A, D C

* Performance referred to the enclosed package. Radiated emission relevant to the U-Chassis package, should be assessed at system level.

8. ELECTROMAGNETIC COMPATIBILITY (EMC) – IMMUNITY

PARAMETER	DESCRIPTION / CONDITION	STANDARD	TEST LEVEL	CRITERIA
	Reference standard for the medical version Reference standards for ITE Reference standard for Industrial/IMS equipment	EN 60601-1-2, 4 th edition EN 55024 EN 61000-6-2		
ESD	15 kV air discharge, 8 kV contact, at any point of the system.	EN 61000-4-2	4	A
Radiated Field	10 V/m, 80-1000 MHz, 1 kHz/2 Hz 80% AM. Dwell time is 3 sec for 2 Hz modulation Dwell time is 1 sec for 1 kHz modulation	EN 61000-4-3	3	A
Electric Fast Transient	±2 kV on AC power port for 1 minute	EN 61000-4-4	3	A
Surge	±2 kV line to line; ± 4 kV line to earth on AC power port	EN 61000-4-5	4	A
Conducted RF Immunity	10 V _{RMS} , 0.15-80 MHz, 1 kHz, 80% AM	EN 61000-4-6	3	A
Dips and Interruptions	200 – 277 V _{AC} :	Drop-out to 0% for 10 ms	EN61000-4-11	A
		Dip to 40% for 5 cycles (100 ms)	EN61000-4-11	A
		Dip to 70% for 25 cycles (500 ms)	EN61000-4-11	A
		Drop-out to 0% for 5 s	EN61000-4-11	B
	100 – 127 V _{AC} :	Drop-out to 0% for 10 ms	EN 61000-4-11	A
		Dip to 40% for 5 cycles (100 ms)	EN 61000-4-11	A (derate to 150 W)
		Dip to 70% for 25 cycles (500 ms)	EN 61000-4-11	A (derate to 400 W)
		Drop-out to 0% for 5 s	EN 61000-4-11	B

9. SAFETY AGENCIES APPROVALS

CERTIFICATION BODY	SAFETY STANDARDS	CATEGORY
CSA/UL	CSA C22.2 No. 60950-1, UL 60950-1 and UL 62368-1	Audio Video and Information Technology Equipment
	CSA C22.2 No.60601-1, ANSI/AAMI ES60601-1 3 rd edition + A1 Including Risk Management Assessment	Medical
	UL8750, CSA C22.2 No 250.13	Lighting
IEC IECEE CB Certification	IEC/EN 62368-1	Audio Video and Information Technology Equipment.
	IEC/EN 60601-1 3 rd edition+A1 Including Risk Management Assessment	Medical
CE	Directive 2014/35/EU: Electrical Safety: Low Voltage electrical equipment (LVD)	Audio Video and Information Technology Equipment
	Directive 93/42/CEE: Safety Requirement of the Medical Device	Medical
	Directive 2014/30/EU: Electromagnetic Compatibility (EMC)	
	Directive EU 2015/863: RoHS 3	
	Designed to meet IEC/EN/UL/CSA 61010-1 2 nd edition	

10. MECHANICAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION
Weight	820 g (1.8 lb)
	1055 g (2.32 lb)
Overall Dimensions	107.0 x 178.5 x 41.0 mm (4.21 x 7.03 x 1.61 in)
	107.0 x 206.0 x 41.0 mm (4.21 x 8.11 x 1.61 in)

10.1 OUTLINE DRAWING & CONNECTIONS – U-CHASSIS MODELS

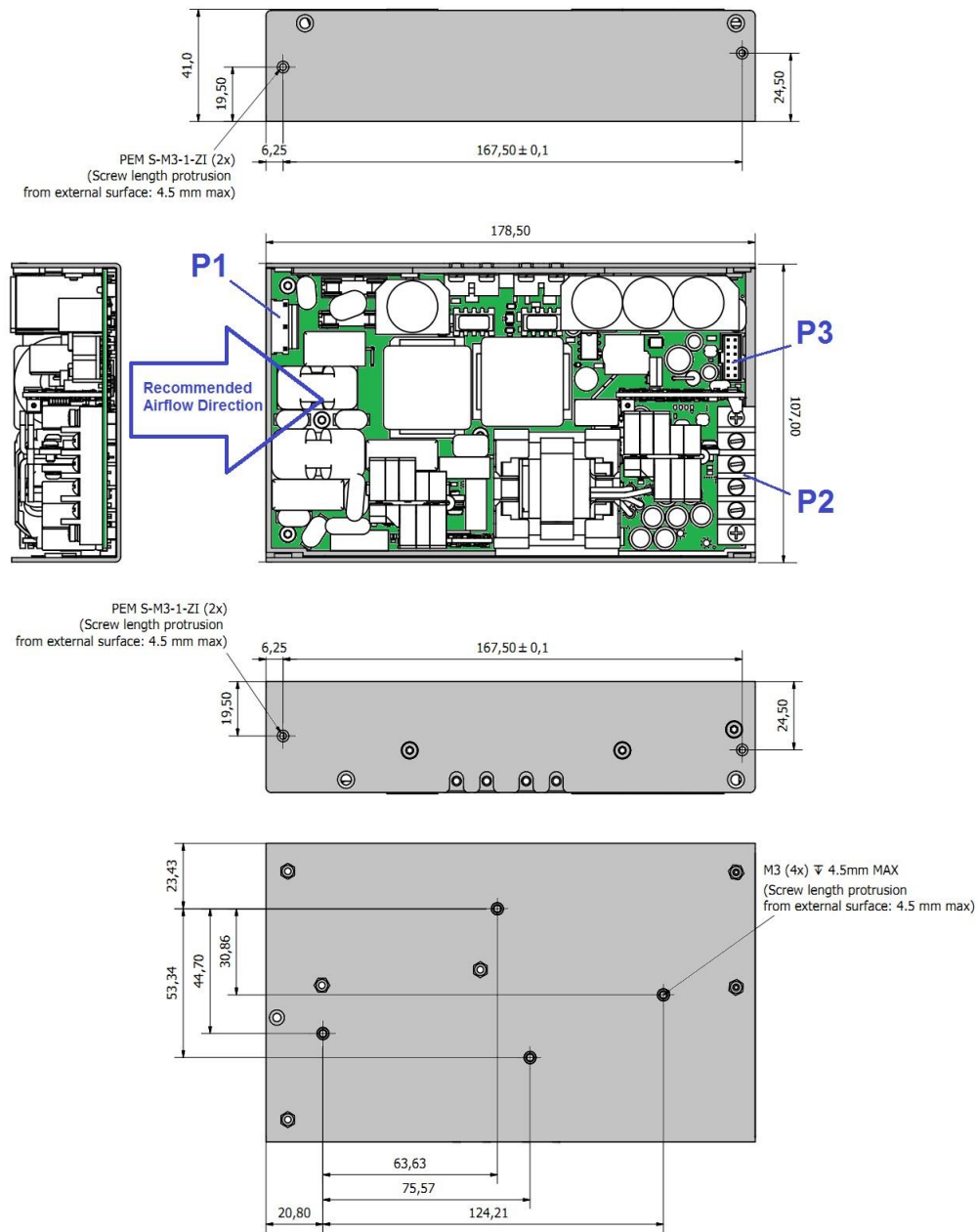


Figure 1. Mechanical drawing - U-Chassis Model

10.2 OUTLINE DRAWING & CONNECTIONS – FRONT MOUNTED FAN MODELS (-S)

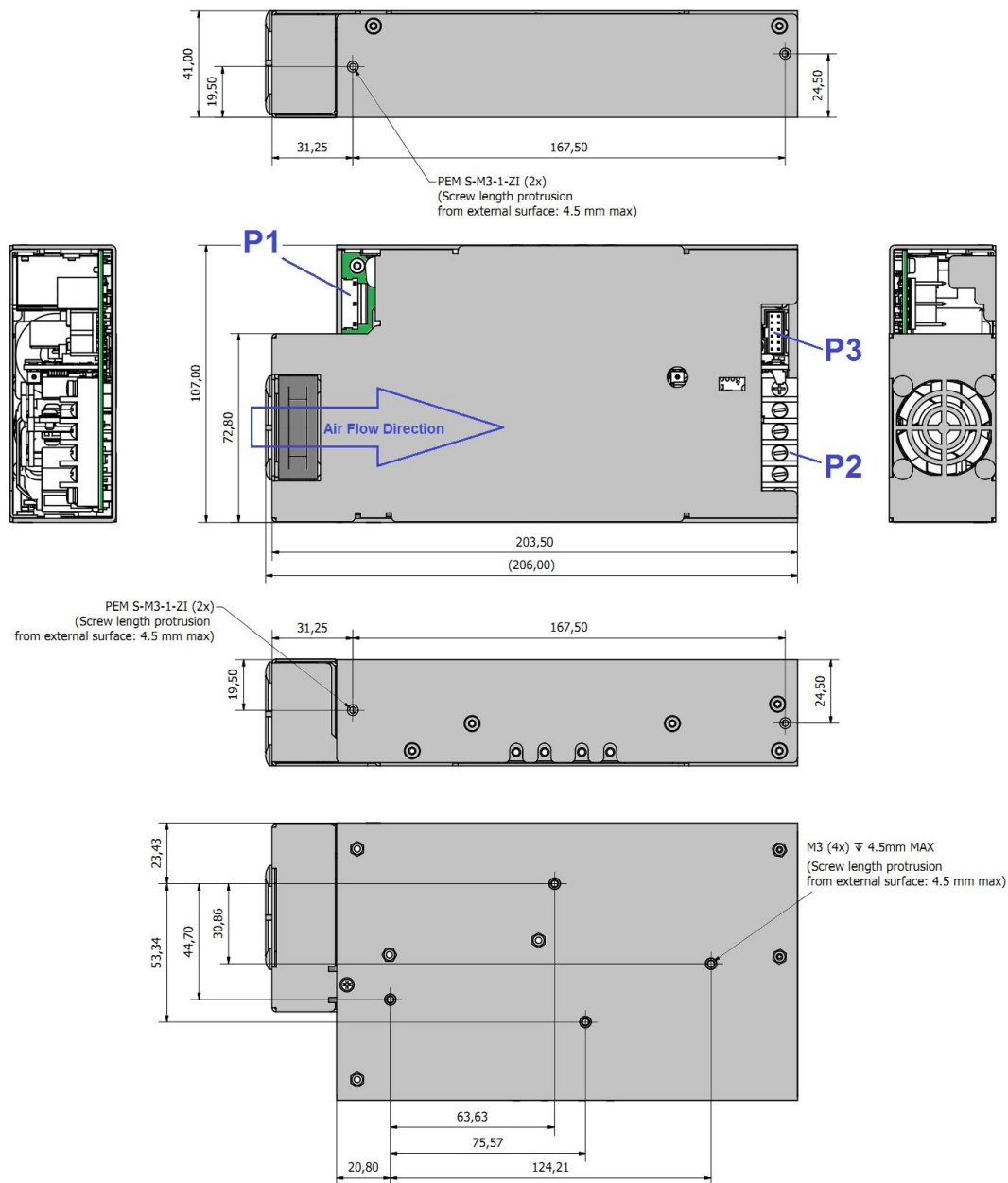


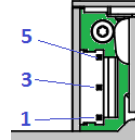
Figure 2. Mechanical drawing – Front Mounted Fan Models (-S)

11. CONNECTIONS AND PIN DESCRIPTION

AC INPUT CONNECTOR – P1

Molex 26-62-4051

Mates with
Molex 09-93-0500 (housing)
Molex 08-52-0071 (terminal phosphor bronze, tin finishing)
Use 18 AWG minimum wires

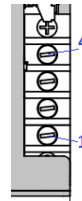


PIN REF.	FUNCTION
1	L1
3	L
5	PE

DC OUTPUT CONNECTOR – P2

KARSON 520-041-2-1-00

Or equivalent

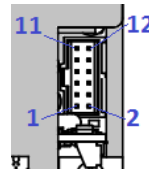


PIN REF.	FUNCTION
1 – 2	+V1
3 – 4	V1 RTN

SIGNAL CONNECTOR – P3

Molex 90130-1112

Mates with
Molex 90142-0012 (housing)
Molex 90119-0109 (terminal)
Use 22-24 AWG wires



PIN REF.	FUNCTION
1	RTN
2	-V2
3	+5V _{SB}
4	+V2
5	RS ⁻
6	RS ⁺
7	+PS_Inhibit
8	I-Share
9	P_OK
10	VS_Logic
11	-PS_Inhibit
12	RTN

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.