ABC401 Series

400 W AC-DC Power Supplies



The ABC401 Series of AC-DC power supplies provides up to 400 W of regulated output power through wide input voltage range 90 – 264 VAC in single outputs of 12, 24, 28, 36 or 48 VDC.

The ABC401 Series comes in five different low-profile packages, offering 12 and 5 VSB standby outputs and a full set of protection features. Available control signals include Power Good (P_OK), Remote On/Off (PS_ON) and remote sense compensation on the (+) load line.

The ABC401 Series complies with the latest international safety standards for IT equipment and displays the CE-Mark for the European Low Voltage Directive (LVD).

Key Features & Benefits

- Universal input voltage range (90 – 264 VAC)
- Active PFC, EN 61000-3-2 Class C, D compliant
- Steady 400 W output power (440 W peak)
- High efficiency (94% typical)
- Low stand by power consumption (<0.5 W)
- 12, 24, 28, 36, 48 VDC standard output voltages
- +5V stand by, 2 A and 12 V auxiliary, 1 A outputs
- Low earth/touch leakage currents (<300/100 µA)
- Fan speed control function (Off at <50 W)
- Over temperature protection
- Input under voltage, output over voltage protections
- Over current and short circuit protection
- Remote On/Off and power good signal
- 5 available packages all fit 1U installation
- IEC/EN/UL 60950-1 and 62368-1 compliance
- EN55032, FCC Class B, conducted radiated emissions.
- EN55024 immunity
- 4000 m operation without de-rating
- RoHS 3 compliant (Directive EU 2015/863)

RoHS Compliant

Applications

- Video Wall Display & Entertainment
- Industrial Process Control
- Telecommunications
- Test & Measurement Equipment
- Industrial Laser applications
- 3D Printing and ATM

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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
ABC401-1012	Open Frame Convection / Forced Air	90 - 264	12	400	33.3	76.0 x 164.2 x 37.7 mm (2.99 x 6.46 x 1.48 in)
ABC401-1012-UC	U-Chassis Convection / Forced Air	90 - 264	12	400	33.3	84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in)
ABC401-1012-PC	Perforated Cover Convection / Forced Air	90 - 264	12	400	33.3	84.4 x 166.5 x 41.0 mm (3.32 x 6.55 x 1.61 in)
ABC401-1012-T	Vented Cover Top Fan	90 - 264	12	400	33.3	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
ABC401-1012-S	Enclosed Front Mounted Fan	90 - 264	12	400	33.3	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
ABC401-1024	Open Frame Convection / Forced Air	90 - 264	24	400	16.7	76.0 x 164.2 x 37.7 mm (2.99 x 6.46 x 1.48 in)
ABC401-1024-UC	U-Chassis Convection / Forced Air	90 - 264	24	400	16.7	84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in)
ABC401-1024-PC	Perforated Cover Convection / Forced Air	90 - 264	24	400	16.7	84.4 x 166.5 x 41.0 mm (3.32 x 6.55 x 1.61 in)
ABC401-1024-T	Vented Cover Top Fan	90 - 264	24	400	16.7	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
ABC401-1024-S	Enclosed Front Mounted Fan	90 - 264	24	400	16.7	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
ABC401-1028-UC	U-Chassis Convection / Forced Air	90 - 264	28	400	14.3	84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in)
ABC401-1036	Open Frame Convection / Forced Air	90 - 264	36	400	11.1	76.0 x 164.2 x 37.7 mm (2.99 x 6.46 x 1.48 in)
ABC401-1036-UC	U-Chassis Convection / Forced Air	90 - 264	36	400	11.1	84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in)
ABC401-1036-PC	Perforated Cover Convection / Forced Air	90 - 264	36	400	11.1	84.4 x 166.5 x 41.0 mm (3.32 x 6.55 x 1.61 in)
ABC401-1036-T	Vented Cover Top Fan	90 - 264	36	400	11.1	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
ABC401-1036-S	Enclosed Front Mounted Fan	90 - 264	36	400	11.1	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
ABC401-1048	Open Frame Convection / Forced Air	90 - 264	48	400	8.3	76.0 x 164.2 x 37.7 mm (2.99 x 6.46 x 1.48 in)
ABC401-1048-UC	U-Chassis Convection / Forced Air	90 - 264	48	400	8.3	84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in)
ABC401-1048-PC	Perforated Cover Convection / Forced Air	90 - 264	48	400	8.3	84.4 x 166.5 x 41.0 mm (3.32 x 6.55 x 1.61 in)
ABC401-1048-T	Vented Cover Top Fan	90 - 264	48	400	8.3	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
ABC401-1048-S	Enclosed Front Mounted Fan	90 - 264	48	400	8.3	84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)

2. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION		MIN	NOM	MAX	UNIT
AC Input Voltage	PS starts and operates at 90 V_{AC} at all load conditions		90	100-240	264	V_{RMS}
DC Input Voltage			170	-	270	V_{DC}
Input Frequency			47	50/60	440	Hz
Input Current	RMS at 180 V_{AC}, maximum load, 50 / 60 Hz RMS at 90 V_{AC}, maximum load, 50 / 60 Hz		-	-	2.5 5.0	A
Inrush Current	265 V_{AC}, 25 °C ambient, cold start. 24, 28, 36, 48 V, no damage 12 V		- -	- -	- 20	A
Fusing	2x Time Lag 6.3 A, 250 V on both L and N		-	-	6.3	A
Efficiency	At 115 V_{AC}	20% rated load 50 – 100 % rated load	90 92	- -	- -	%
	At 230 V_{AC}	20% rated load 50 – 100 % rated load	90 94	- -	- -	
Input Power Consumption	Power on, 115-230 V_{RMS}, no load Stand by, 115-230 V_{RMS}, no load		- -	1 0.4	1.5 0.5	W
Power Factor	At full rated load, 115 VAC, 60 Hz and 230 VAC, 50 Hz input voltages		0.95	-	-	-
Harmonic Current Fluctuations and Flicker	Complies with EN-61000-3-2 Class C at 230 VAC 50 Hz, load >50 W. Complies with EN-61000-3-3 at nominal voltages and full load.					
Earth Leakage Current	Normal conditions, 240 V_{RMS}, 60 Hz.				300	µA

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3. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
V1 Output Voltage	0.5% set point accuracy for all voltage variants	- - - - -	12 24 28 36 48	- - - - -	V
V1 Output Power Rating	All voltages, convection cooled models, All voltages, fan cooled + forced air cooled (> 400 LFM) models All models, peak power (≤ 10 s)			250 400 440	W
V1 Output Current	V1: 12 V_{DC} V1: 24 V_{DC} V1: 28 V_{DC} V1: 36 V_{DC} V1: 48 V_{DC}			33.3 16.7 14.3 11.1 8.3	A
V1 Voltage Adjustment Range		-	-	±5	%V1
V1 Load-Line-Cross Regulation	V_{AC}: 90 – 264 V_{RMS} V1 Load: 0 – 33.3 A (12 V) 0 – 16.7 A (24 V) 0 – 14.3 A (28 V) 0 – 13.9 A (36 V) 0 – 8.3 A (48 V) V2 Load: 0 – 1 A $5V_{SB}$ Load: 0 – 2 A	-	-	±2	%V1
V1 Line Regulation	V_{AC}: 90 – 264 V_{RMS}	-	-	±0.1	%V1
Transient Response (Voltage Deviation) V1, $5V_{SB}$	25% load changes at 1 A/µs 12V at 2200 µF Load / I_{OUT}> 0.5 A 24 V at 1000 µF Load / I_{OUT}> 0.5 A 28 V at 1000 µF Load / I_{OUT}> 0.5 A 36 V at 820 µF Load / I_{OUT}> 0.5 A 48V at 560 µF Load / I_{OUT}> 0.5 A $5V_{SB}$ at 560 µF Load / I_{OUT}> 0.1 A	-	-	±5	%V1 %$5V_{SB}$
V1 Ripple and Noise	All models, Peak-to-peak, 20 MHz BW. 100 nF ceramic and 10 µF tantalum caps at the load.	-	-	1	%V1
Start-up Rise Time	90<V_{IN}<264, any load conditions.	5	-	85	ms
Start-up Delay	V1 in regulation after PS_ON is asserted V1 in regulation after AC is applied $5V_{SB}$ in regulation after AC is applied	-	-	200 750 500	ms
Turn-on Overshoot	At I1 = 500 mA, V1 in regulation within 50 ms.	-	10 10 10	-	%V1 %V2 %V_{SB}
Hold-up Time	At nominal V_{IN}, 400 W, for all models At nominal V_{IN}, 365 W, for all models At nominal V_{IN}, 200 W, for all models	- - -	16 20 35	- - -	ms
Minimum Load *	All models; V1, V2 and 5 V_{SB}	0	-	-	A
Maximum Load Capacitance	At nominal V_{IN}, 25 °C ambient 12 V 24 V 28 V 36 V 48 V	- - - - -	- - - - -	33000 16000 14300 10000 7000	µF
Temperature Drift		-1.2	-	+1.2	mV/°C
V2 Output Voltage (*)	All models. Load on V2: from 5 to 1000 mA Load on V1: from 0.1 to I1 rated	11.35	11.5	12.65	V
V2 Output Current (I2)	Convection / forced air cooling	-	-	1	A
$5V_{SB}$ Output Voltage	3% set point accuracy	-	5	-	V
$5V_{SB}$ Output Current ($I5V_{SB}$)	Convection cooled models Fan cooled + forced air cooled (> 400 LFM) models	- -	- -	1.5 2	A
$5V_{SB}$ Load-Line-Cross regulation	V_{AC}: 90 – 264 V_{RMS} V1 Load: 0 – 33.3 A (12 V) 0 – 16.7 A (24 V) 0 – 14.3 A (28 V) 0 – 13.9 A (36 V) 0 – 8.3 A (48 V) V2 Load: 0 – 1 A $5V_{SB}$ Load: 0 – 2 A	-	-	±5	%$5V_{SB}$

3.1 OUTPUT POWER DE-RATING CURVES



Figure 1. Power Derating Curves for Open Frame, U-Chassis and Perforated Cover Models

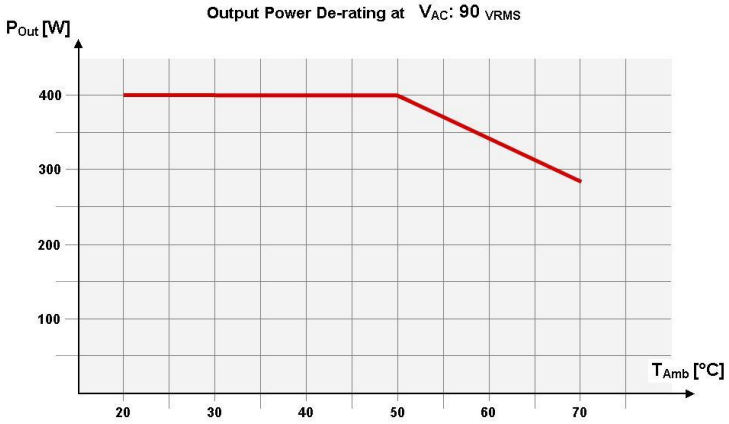


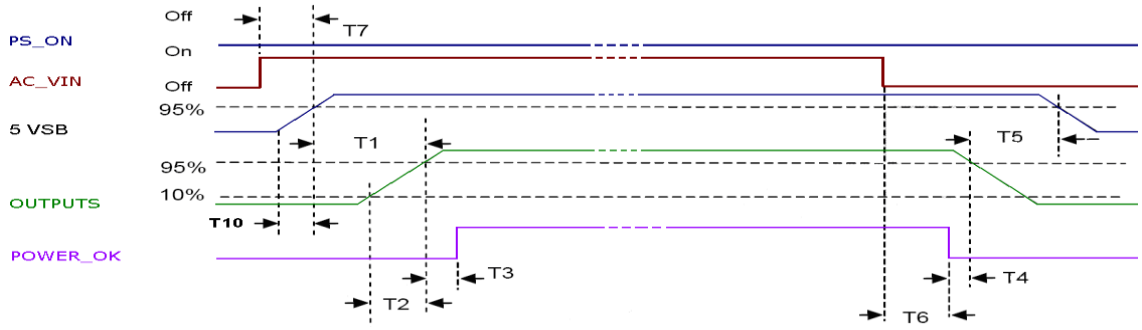
Figure 2. Power Derating Curves for Top Fan and Front Mounted Fan Models

4. SIGNALS, CONTROLS & TIMING SPECIFICATIONS

Base signals and controls are accessible from signal connector P204.

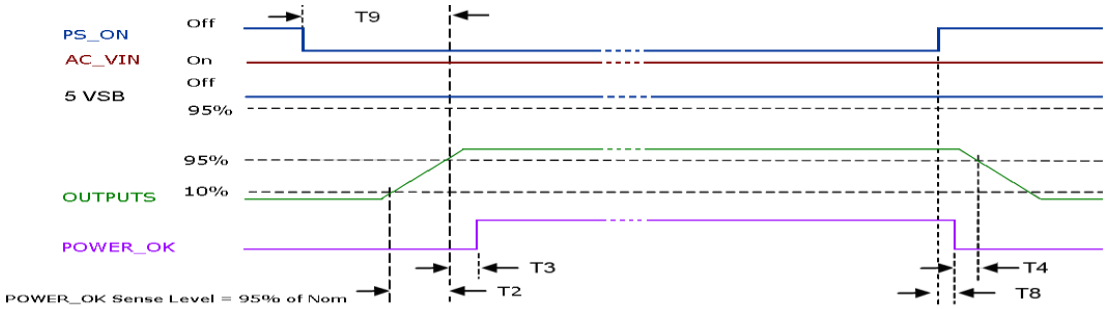
SIGNAL	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
PS_ON	Active low, +5 V TTL signal compatible. Input low voltage	0	-	2.0	V
	Input high voltage (I_{IN} = 200 µA)	3.0	-	-	V
	V1 and V2 disabled when PS_ON is open				
	5 V_{SB} not affected by PS_ON				
	V1 and V2 enabled with PS_ON connected to RTN				
P_OK	+5 V TTL compatible				
	Logic level low (<10 mA sinking)	-	-	0.7	V
	Logic level high (100µA sourcing)	2.4	-	5	V
	Low to high time after V1 in regulation	0.05	-	0.1	s
	Power down warning time	1	-	-	ms
5V_{SB} output	Active and in regulation after a 90<V_{AC}<264 is applied	-	-	200	ms
	5 V_{SB} not affected by PS_ON				

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Above waveforms are expected with AC Input ON/OFF:

Standby on - Main outputs on	50 ms ≤ T1 ≤ 250 ms
Main output Rise Time	5 ms ≤ T2 ≤ 85 ms
5 VSB rise time	4 ms ≤ T10 ≤ 20 ms
Main outputs On – P_OK delay	40 ms ≤ T3 ≤ 100 ms
Power down warning [1]	T4 ≥ 1 ms
Main Output off – Standby off [2]	T5 ≥ 1.2 s
Hold-up time (AC off – P_OK low)	T6 ≥ 15 ms (115/ 230 VAC)
AC_ON - Standby turn on time	T7 ≤ 500 ms



Above waveforms are expected with PS_ON Signal ON/OFF state change:

Main Output Rise Time	5 ms ≤ T2 ≤ 85 ms
Main Outputs on – P_OK delay	50 ms ≤ T3 ≤ 100 ms
Power down warning [1]	1 ms ≤ T4 ≤ 5 ms
PS_ON - Main Output (off) Timing	T8 ≤ 1 ms
PS_ON - Main Output (on) Timin	T9 ≤ 200 ms

[1] T4 parameter measurement setup will assume at least 10% of the maximum load on each output.
[2] T5 parameter measurement setup will assume at least 50% of the maximum load on main output.

5. PROTECTION SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Input Under Voltage Lockout	Auto recovery, Hiccup Mode	60	75	-	V_{AC}
Input Fuse	2x Time Lag 6.3 A, 250 V on L1 and L2	-	-	6.3	A
Over Current	At nominal input voltages. V1: Hiccup mode, auto-recovering. V2: PTC limiting, auto-recovering. 5 V_{SB}: Hiccup mode, auto-recovering.	110	-	150	$\%I1_{MAX}$
Short Circuit	At nominal input voltages. V1: Hiccup mode, auto-recovering. V2: PTC limiting, auto-recovering 5 V_{SB}: Hiccup mode, auto-recovering.	-	-	-	
Over Voltage	12 V 24 V 28 V 36 V 48 V 5 V_{SB} Unit shut down and latch off	110	-	136	$\%V_{NOM}$
Over Temperature (on primary stage)	Shut down, latch off.	-	-	-	
Over Temperature (on secondary side)	Hiccup mode, auto-recovering.	-	-	-	
Isolation Primary-to- Secondary	Reinforced	4000	-	-	V_{AC}
Isolation Input-to-PE	Basic	1500			V_{AC}
Isolation V1-to-V2		100	-	-	V_{DC}
Isolation Output-to-PE	Basic	1500	-	-	V_{AC}

6. ENVIRONMENTAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Operating Temperature Range	No de-rating up to 50 °C PS starts up at -30 °C	-20	-	50	°C
De-rated Operating Temperature Range	Natural convection cooling: Linearly de-rate from 250 W at 50 °C, to 100 W at 70 °C Forced air cooling: Linearly de-rate from 400 W at 50 °C, to 280 W at 70 °C. See graphs below.	-	-	70	°C
Storage Temperature Range		-40	-	85	°C
Humidity	RH, Non-condensing Operating Non-operating	-	-	90 95	% %
Operating Altitude		-	-	4000	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, 120 V_{AC}, 40 °C ambient 80% Duty cycle, Telcordia SR-332 Issue 2	400000	-	-	Hours
Useful Life	Low line range, 200 W, 40 °C ambient, natural convention.	-	4	-	Years
Thermal Considerations	The output power de-rating curves are herein provided. These curves can be used as a guideline to assess the limit in performance of a power supply once installed in a system providing controlled air flow at a certain input voltage and ambient temperature.				

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7. ELECTROMAGNETIC COMPATIBILITY (EMC) – EMISSIONS

PARAMETER	DESCRIPTION / CONDITION	STANDARD	PERFORMANCE CLASS
Conducted	115 V_{RMS}, 230 V_{RMS}. Maximum load 4 dB minimum margin	EN 55032 (ITE)	B
Radiated	At 10 m distance	EN 55032 (ITE)	B
Line Voltage Fluctuation and Flicker	At 20%, 50% and 100% maximum load Nominal input voltages	EN 61000-3-3	
Harmonic Current Emission	Nominal input voltages Output load > 50 W	EN 61000-3-2	C

8. ELECTROMAGNETIC COMPATIBILITY (EMC) – IMMUNITY

PARAMETER	DESCRIPTION / CONDITION	STANDARD	TEST LEVEL	CRITERIA
	Reference standards for ITE equipment	EN 55024		
ESD	15 kV air discharge, 8 kV contact, at any point of the system.	EN 61000-4-2	4	A
Radiated Field	3 V/m, 80-1000 MHz, 1 KHz 80% AM. Dwell time is 3 sec for 2 Hz modulation Dwell time is 1 sec for 1KHz modulation	EN 61000-4-3	3	A
Electric Fast Transient	±2 kV on AC power port for 1 minute; ±1 kV on signal/control lines	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	3 V_{RMS}, 0,15-80 MHz, 1 KHz/2 Hz 80% AM	EN 61000-4-6	3	A
Dips and Interruptions	100 - 240V_{AC} Drop-out to 5% for 0.5 cycles (10 ms) Dip to 70% for 25 cycles (500 ms) Interrupts > 95% for 5 s	 EN61000-4-11 EN61000-4-11 EN61000-4-11		 A A B

9. SAFETY AGENCIES APPROVALS

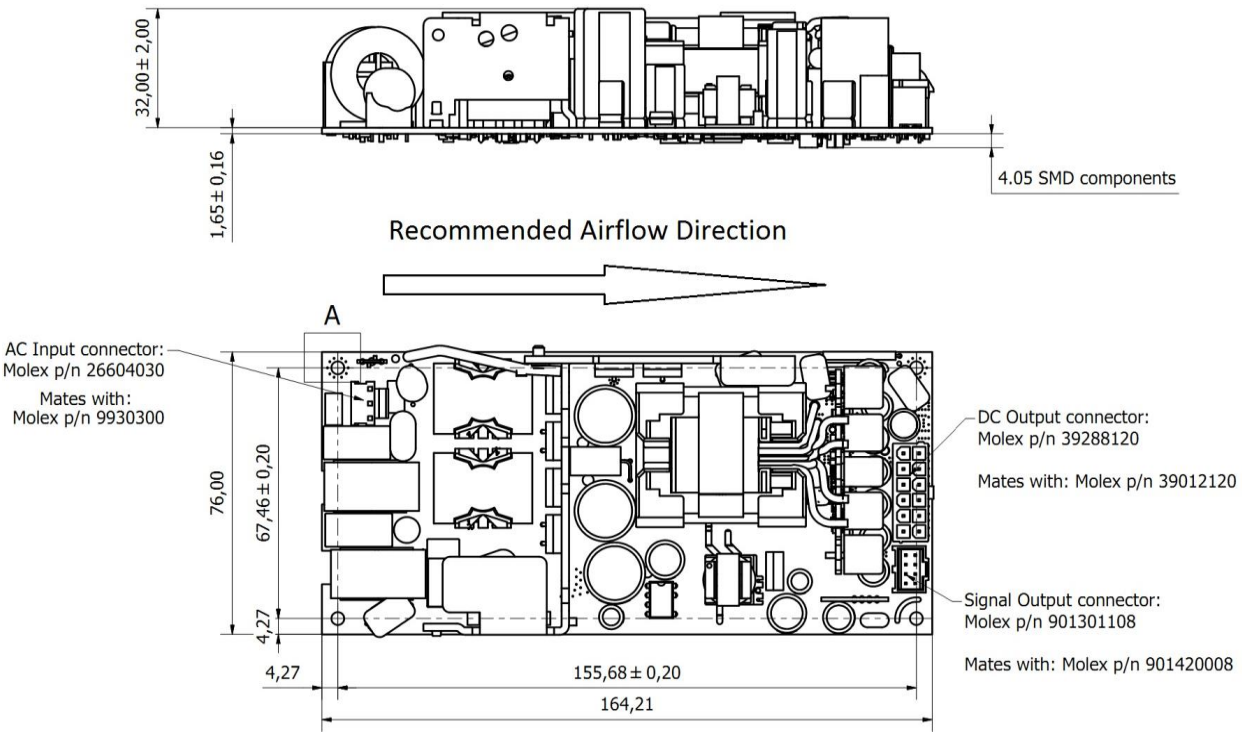
CERTIFICATION BODY	SAFETY STANDARDS	CATEGORY
CSA/UL	CSA C22.2 No. 60950-1, UL 60950-1 and UL 62368-1	Audio Video and IT equipment
IEC IECEE CB Certification	IEC/EN 60950-1 and IEC/EN 62368-1	Audio Video and IT equipment
CE	Directive 2014/35/EU: Electrical Safety: Low Voltage electrical equipment (LVD) Directive 2014/30/EU: Electromagnetic Compatibility (EMC) Directive EU 2015/863: RoHS 3	Audio Video and IT equipment

10. MECHANICAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION
Weight	410 g (0.90 lb) 525 g (1.16 lb) – UC model 575 g (1.43 lb) – PC model 670 g (1.48 lb) – T model 525 g (1.16 lb) – S model
Overall Dimensions	76.0 x 164.2 x 37.7 mm (2.99 x 6.46 x 1.48 in) 84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in) – UC model 84.4 x 170.5 x 41.0 mm (3.32 x 6.71 x 1.61 in) – PC model 84.4 x 166.5 x 41.0 mm (3.32 x 6.55 x 1.61 in) – T model 84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in) – S model

10.1 OUTLINE DRAWING & CONNECTIONS – OPEN FRAME MODEL

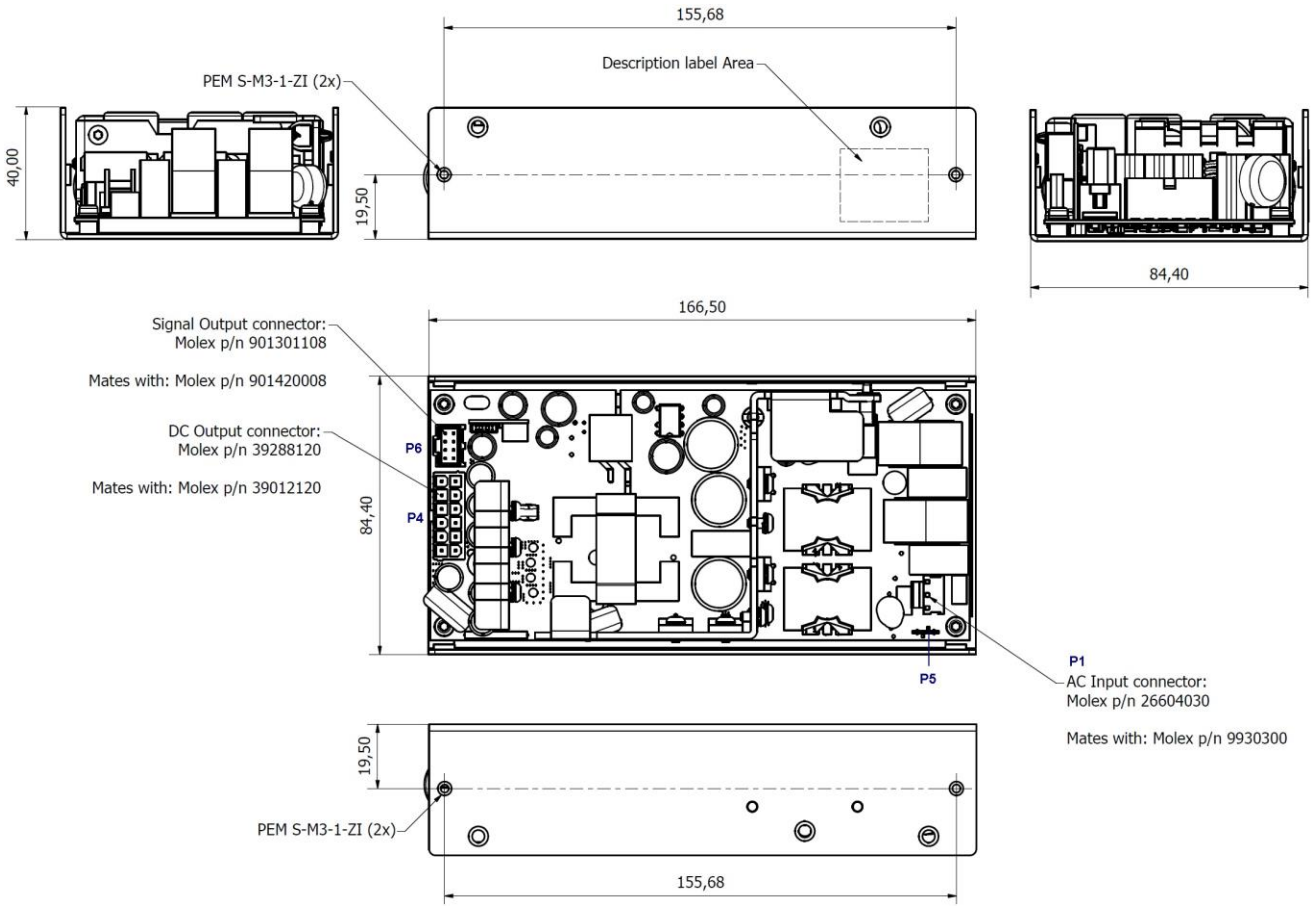
Overall Dimensions: 76.0 x 164.2 x 37.7 mm (2.99 x 6.46 x 1.48 in)
Weight: 410 g (0.90 lb)



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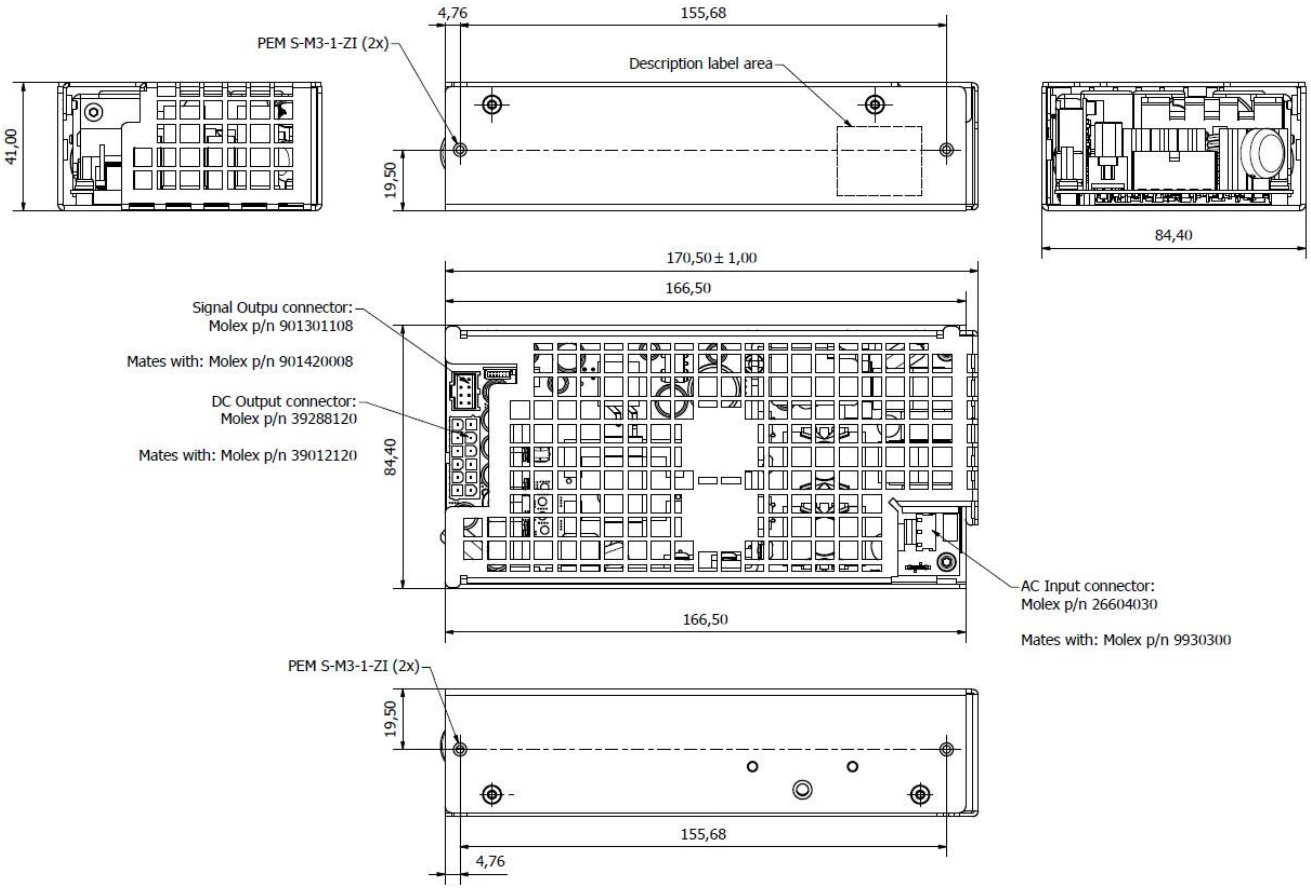
10.2 OUTLINE DRAWING & CONNECTIONS – U-CHASSIS MODEL (-UC)

Overall Dimensions: 84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in)
Weight: 525 g (1.16 lb)



10.3 OUTLINE DRAWING & CONNECTIONS – PERFORATED MODEL (-PC)

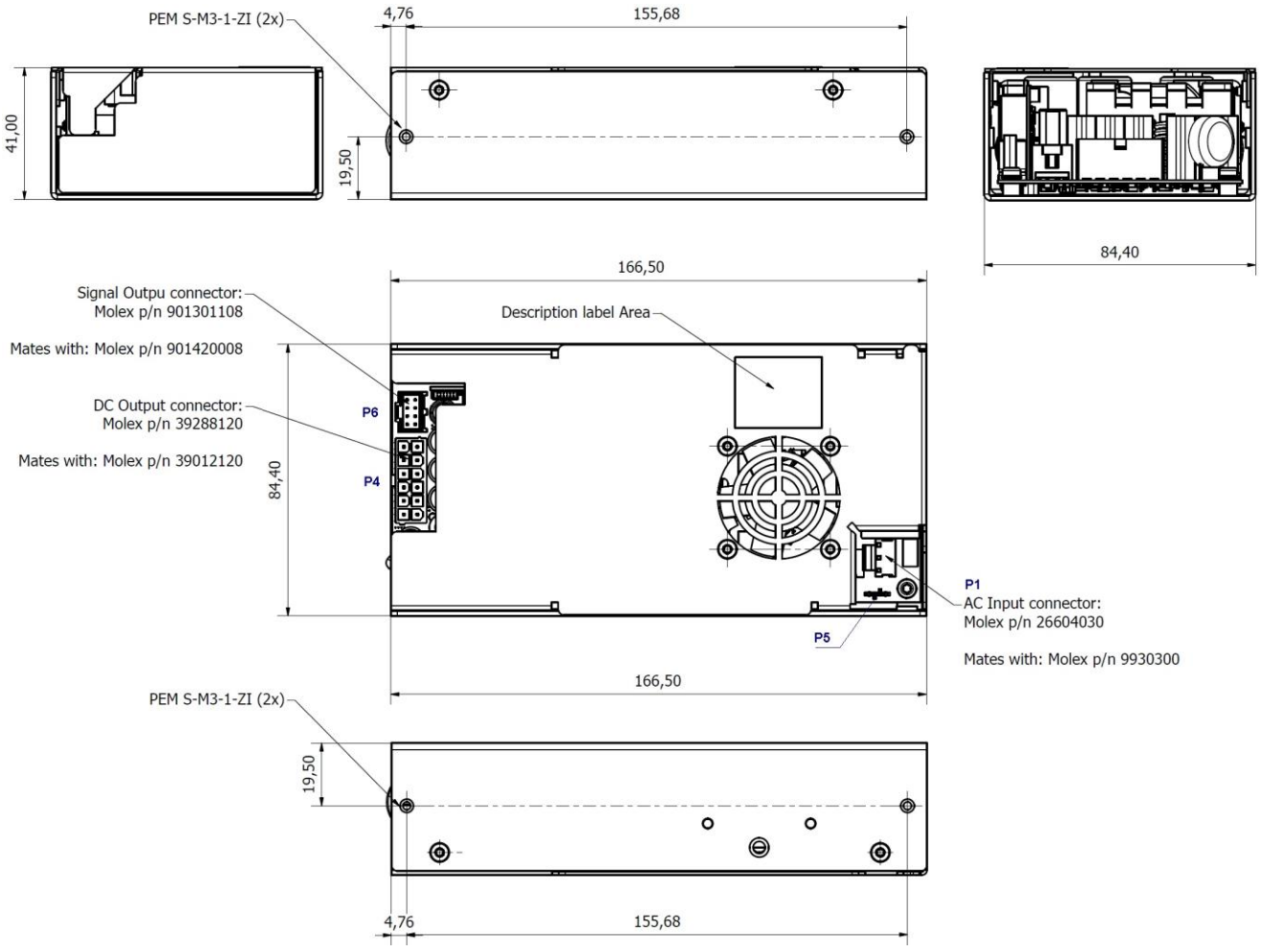
Overall Dimensions: 84.4 x 170.5 x 41.0 mm (3.32 x 6.71 x 1.61 in)
Weight: 575 g (1.43 lb)



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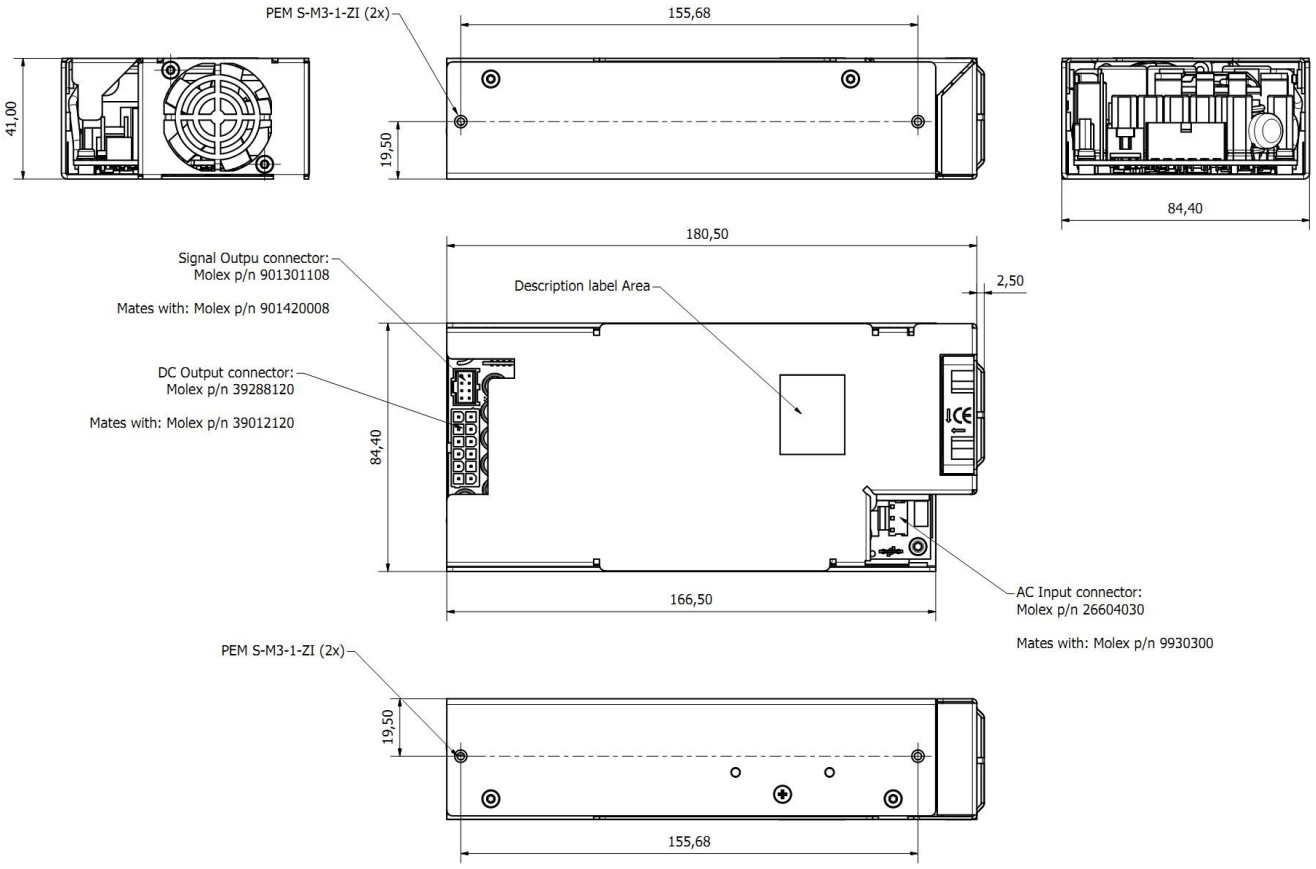
10.2 OUTLINE DRAWING & CONNECTIONS– VENTED COVER MODEL (-T)

Overall Dimensions: 84.4 x 166.5 x 41.0 mm (3.32 x 6.55 x 1.61 in)
Weight: 670 g (1.48 lb)



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

Overall Dimensions: 84.4 x 183.0 x 41.0 mm (3.32 x 7.20 x 1.61 in)
Weight: 625 g (1.416lb)



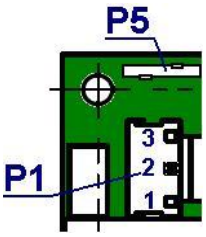
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11. CONNECTIONS AND PIN DESCRIPTION

AC INPUT CONNECTOR – P1

Molex 26-60-4030 or equivalent

Mating Connector:
Molex 09-93-0300 (Crimp Terminal Housing)
Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)



PIN REF.	FUNCTION
1	Line 1
2	Not Present
3	Line 2

PIN REF.	FUNCTION
GDN	AC Ground

PROTECTION EARTH CONNECTOR - P5

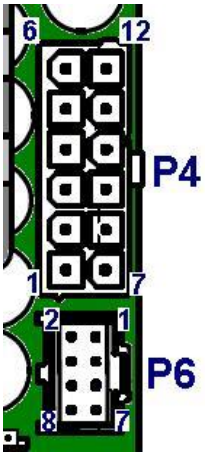
Tyco 63849-1 equivalent

Mating Connector:
Any tin finished 6.35 x 0.81 mm receptacle

DC OUTPUT CONNECTOR – P4

Molex 39-28-8120 or equivalent

Mating Connector:
Molex 39-01-2120 (Crimp Terminal Housing)
Molex 39-00-0039 (Crimp Terminal, 18-24 AWG)



PIN REF.	FUNCTION
1 – 6	V1
7 – 12	DC Return

SIGNAL CONNECTOR – P6

Molex 90130-1108 or equivalent

Mating Connector
Molex 90142-0008 (Crimp Terminal Housing)
Molex 90119-0109 (Crimp Terminal, 22-24 AWG)

PIN REF.	FUNCTION
1	$+5V_{SB}$
2	P_OK
3	-V2
4	PS_ON
5	RS+
6	RTN
7	+V2
8	RTN

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.