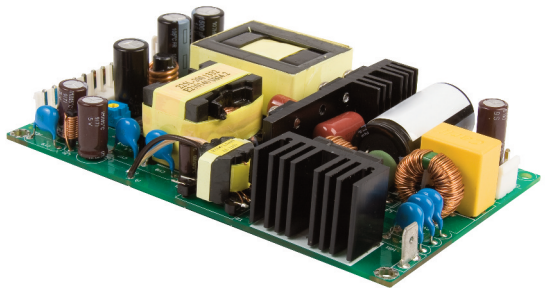
# ECP225-A Series

AC-DC Power Supplies

XP Power

## 225 Watts

- Low 1″ Profile
- High Power Density
- 3″ by 5.0″ Footprint
- 150 W Convention/ 225 W Force Cooled Ratings
- 5 V Standby and 12 V Fan Outputs
- Medical and ITE Approvals
- High Efficiency, up to 94%
- Less than 0.5 W No Load Input Power



The ECP225-A series is designed to minimize the no load power consumption and maximize efficiency to facilitate equipment design to meet the latest environmental legislation. Approved for medical and ITE applications, this range of single output AC/DC power supplies are packaged in an ultra-low profile 1" height with a foot print of just 3.0" by 5.0". The ECP225-A provides up to 225 W force-cooled or 150 W convection-cooled leading to very high power densities of 15 W/in$^3$ or 10 W/in$^3$ respectively. A 5 V, 2 A standby output and a 12 V, 500 mA fan supply are included in the design. The power supply contains two fuses and low leakage currents as required by medical applications and is safety approved to operate in a 70 °C ambient. The low profile and safety approvals covering ITE and medical standards along with conducted emissions to EN55011/22 level B allow the versatile ECP225-A series to be used in a vast range of applications.

**Dimensions:**

**ECP225-A:**
5.00 x 3.00 x 1.00″ (127.0 x 76.2 x 25.4 mm)

## Models & Ratings

| Output Voltage | Output Current | | Standby Voltage | | Fan Output | Efficiency[3] | Model Number[4] |
|---|---|---|---|---|---|---|---|
| | Convection-cooled | Forced-cooled[1] | Convection-cooled | Forced-cooled | | | |
| 12.0 V | 12.50 A | 18.75 A | 5 V/1.0 A | 5 V/2.0 A | 12 V/0.5 A | 92% | ECP225PS12-A |
| 15.0 V | 10.00 A | 15.00 A | 5 V/1.0 A | 5 V/2.0 A | 12 V/0.5 A | 92% | ECP225PS15-A |
| 24.0 V | 6.25 A | 9.38 A | 5 V/1.0 A | 5 V/2.0 A | 12 V/0.5 A | 92% | ECP225PS24-A |
| 28.0 V | 5.36 A | 8.04 A | 5 V/1.0 A | 5 V/2.0 A | 12 V/0.5 A | 92% | ECP225PS28-A |
| 48.0 V | 3.10 A | 4.69 A | 5 V/1.0 A | 5 V/2.0 A | 12 V/0.5 A | 92% | ECP225PS48-A |

### Notes

*1. Requires 10 CFM.*
*2. Measured with 20 MHz bandwidth and 10 µF electrolytic capacitor in parallel with 0.1 µF ceramic capacitor*
*3. Minimum average efficiencies measured at 25%, 50%, 75% & 100% of 225 W load and 230 VAC input.*

## Input

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Input Voltage - Operating | 85 | 115/230 | 264 | VAC | Derate output from 100% at 90 VAC to 90% at 85 VAC |
| Input Frequency | 47 | 50/60 | 63 | Hz | Agency approval, 47-63 Hz |
| Power Factor | | >0.9 | | | 230 VAC, 100% load EN61000-3-2 class A<br>EN6100-2-2 class C > 145W |
| Input Current - Full Load | | 2.2/1.1 | | A | 115/230 VAC |
| Inrush Current | | 120 | | A | 230 VAC cold start, 25 °C |
| Earth Leakage Current | | 80/140 | 230 | µA | 115/230 VAC/50 Hz (Typ), 264 VAC/60 Hz (Max) |
| No load Input Power | | | 0.5 | W | When main output is Inhibited |
| Input Protection | F3.15 A/250 V Internal fuse fitted in line and neutral. | | | | |

## Output - Main Output

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Output Voltage - V1 | 12 | | 48 | VDC | See Models and Ratings table |
| Initial Set Accuracy | | | ±1 | % | 50% load, 115/230 VAC |
| Output Voltage Adjustment-V1 | 5 | | | % | V1 only via potentiometer. See Mech. Details, Vfan will track |
| Minimum Load | 0 | | | A | |
| Start Up Delay | | | 2 | s | 115/230 VAC full load. |
| Hold Up Time | 10 | 20/13 | | ms | Min at full load, 115 VAC. Typical at 150W/ 225W |
| Drift | | | ±0.02 | % | After 20 min warm up |
| Line Regulation | | | ±0.5 | % | 90-264 VAC |
| Load Regulation | | | ±0.5 | % | 0-100% load. |
| Transient Response | | | 4 | % | Recovery within 1% in less than 500 µs<br>for a 50-75% and 75-50% load step |
| Over/Undershoot | | | 7 | % | Full load |
| Ripple & Noise | | | 1 | % pk-pk | 20 MHz bandwidth and 10 µF electrolytic capacitator in parallel with 0.1 µF ceramic capacitator. |
| Overvoltage Protection | 110 | | 140 | % | Vnom, recycle input to reset |
| Overload Protection | 110 | | 170 | % I nom | |
| Short Circuit Protection | | | | | Trip & Restart |
| Temperature Coefficient | | | 0.02 | %/°C | |
| Overtemperature Protection | | | | °C | Measured internally, Auto Resetting |
| Remote On/Off | Connect pin 3 of CN2 to pin 1 to turn main output off. Connect to pin 2 or leave open to turn main output on. | | | | |

## Output - 5 V Standby Output

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Output Voltage | | 5.0 | | VDC | |
| Initial Set Accuracy | | | ±1 | % | 50% load, 115/230 VAC |
| Minimum Load | 0 | | | A | |
| Start Up Delay | | | 0.5 | s | 115/230 VAC full load. |
| Hold Up Time | 300 | | | ms | Min at full load, 115 VAC. |
| Drift | | | ±0.02 | % | After 20 min warm up |
| Line Regulation | | | ±0.5 | % | 90-264 VAC |
| Load Regulation | | | ±0.5 | % | 0-100% load. |
| Transient Response | | | 4 | % | Recovery within 1% in less than 500 µs<br>for a 50-75% and 75-50% load step |
| Over/Undershoot | | | 5 | % | Full load |
| Ripple & Noise | | | 1 | % pk-pk | 20 MHz bandwidth and 10 µF electrolytic capacitator in parallel with 0.1 µF ceramic capacitator |
| Overload Protection | | 3.0 | 4.0 | A | |
| Short Circuit Protection | | | | | Trip & Restart |
| Temperature Coefficient | | | 0.02 | %/°C | |
| Overtemperature Protection | | | | °C | Measured internally, Auto Resetting |

## General

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Efficiency | | 94 | | % | 230 VAC Full load (see fig. 1 and 2) |
| Isolation: Input to Output | 4000 | | | VAC | 2 MOPP |
| Input to Ground | 1500 | | | VAC | 1 MOPP |
| Output to Ground | 1500 | | | VAC | 1 MOPP |
| Switching Frequency | 70 | | 130 | kHz | PFC |
| | 50 | | 80 | kHz | Main converters |
| Power Density | | | 15/10 | W/in³ | Forced/convection-cooled |
| Mean Time Between Failure | | 300 | | kHrs | MIL-HDBK-217F, Notice 2 +25 ℃ GB |
| Weight | | 0.51(230) | | lb(g) | |

### Efficiency Vs Load

Figure 1
ECP225PS12-A
12 V at 215 W
5 V at 10 W

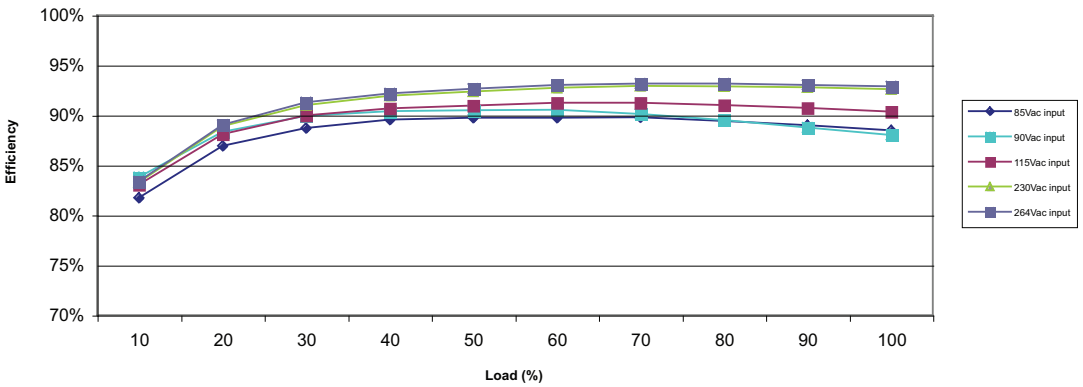
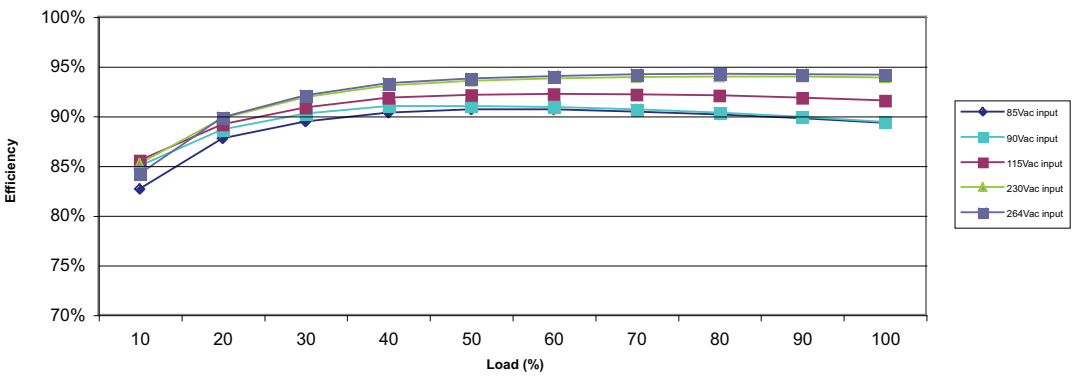



Figure 2
ECP225PS24-A
24 V at 215 W
5 V at 10 W

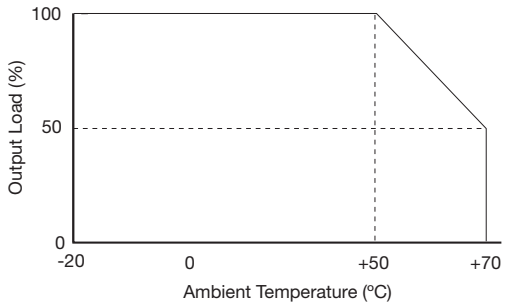


## Environmental

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Operating Temperature | -20 | | +70 | °C | See derating curve, fig.3 |
| Storage Temperature | -40 | | +85 | °C | |
| Cooling | 10 | | | CFM | Forced-cooled > 150W |
| Humidity | 5 | | 95 | %RH | Non-condensing |
| Operating Altitude | | | 5000 | m | |
| Shock | ±3 x 30g shocks in each plane, total 18 shocks. 30g = 11ms (+/- 0.5msecs), half sine. Conforms to EN60068-2-27 | | | | |
| Vibration | Single axis 10-500 Hz at 2g sweep and endurance at resonance in all 3 planes. Conforms to EN60068-2-6 | | | | |

### Temperature Derating Curve

Figure 3




## EMC: Emissions

| Phenomenon | Standard | Test Level | Criteria | Notes & Conditions |
|---|---|---|---|---|
| Conducted | EN55011/22 | Class B | | |
| Radiated | EN55011/22 | Class A | | Class B with King Core<br>KSB RC 13 x 23 x 7 on input cable and<br>KSB + 25 x 12 x 5 on output cable. |
| Harmonic Current | EN61000-3-2 | Class A | | Meet Class C for loads above 145W |
| Voltage Functions | EN61000-3-3 | | | |

## EMC: Immunity

| Phenomenon | Standard | Test Level | Criteria | Notes & Conditions |
|---|---|---|---|---|
| Medical Device EMC | IEC60601-1-2 | Ed.4.0 : 2014 | as below | |
| Low Voltage PSU EMC | EN61204-3 | High severity level | as below | |
| ESD | EN61000-4-2 | 4 | A | ±8kV contact, ±15kV air |
| Radiated | EN61000-4-3 | 3 | A | |
| EFT | EN61000-4-4 | 3 | A | |
| Surges | EN61000-4-5 | Installation class 3 | A | |
| Conducted | EN61000-4-6 | 3 | A | |
| Magnetic Fields | EN61000-4-8 | 4 | A | |
| Dips and Interruptions | EN55024 (100 VAC) | Dip >95% (0 VAC), 8.3 ms | A | |
| | | Dip 30% (70 VAC), 416 ms | A | |
| | | Dip >95% (0 VAC), 4160 ms | B | |
| | EN55024 (240 VAC) | Dip >95% (0 VAC), 10.0 ms | A | |
| | | Dip 30% (168 VAC), 500 ms | A | |
| | | Dip >95% (0 VAC), 5000 ms | B | |
| | EN60601-1-2 (100 VAC) | Dip 100% (0 VAC), 10.0 ms | A | |
| | | Dip 100% (0 VAC), 20 ms | A | |
| | | Dip 60% (40 VAC), 100 ms | A | Derate Output Power to 45W |
| | | Dip 30% (40 VAC), 500 ms | A | |
| | | Dip 100% (0 VAC), 5000 ms | B | |
| | EN60601-1-2 (240 VAC) | Dip 100% (0 VAC), 10.0 ms | A | |
| | | Dip 100% (0 VAC), 20 ms | A | |
| | | Dip 60% (96 VAC), 100 ms | A | |
| | | Dip 30% ( 168 VAC), 500 ms | A | |
| | | Dip 100% (0 VAC), 5000 ms | B | |

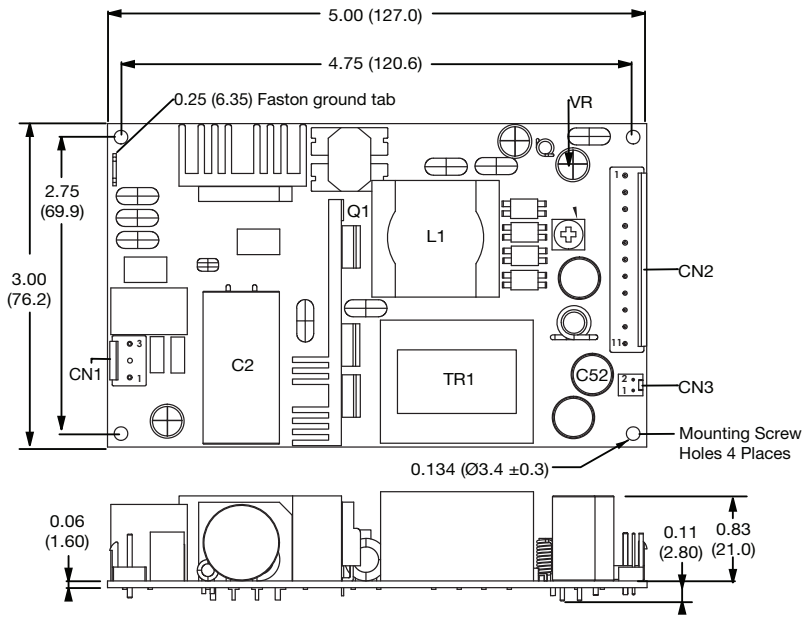
## Safety Approvals

| Safety Agency | Safety Standard | Notes & Conditions |
|---|---|---|
| CB Report | IEC60950-1:2005 + A1:2009 + A2: 2013 | Information Technology |
| UL | UL60950-1 (2011), CSA 22.2 No.60950-1-11 Ed 2 | Information Technology |
| TUV | EN60950-1: 2006 + A11: 2009 + A1:2010 + A12: 2012 | Information Technology |
| CE | LVD | |

| Safety Agency | Safety Standard | Notes & Conditions |
|---|---|---|
| CB Report | IEC60601-1 Ed 3 Including Risk Management | Medical |
| UL | ANSI/AAMI ES60601-1: 2005 & CSA C22.2 No.6061-1:08 | Medical |
| CE | EN60601-1:2006 | Medical |

| Isolation | Safety Standard | Notes & Conditions |
|---|---|---|
| Primary to Secondary | 2 x MOPP (Means of Patient Protection) | IEC60601-1 Ed 3 |
| Primary to Earth | 1 x MOPP (Means of Patient Protection) | |
| Secondary to Earth | 1 x MOPP (Means of Patient Protection) | |

## Mechanical Details




| CN2 - Output Connector | |
|---|---|
| Pin 1 | +5 V Standby |
| Pin 2 | -Vout |
| Pin 3 | Remote On/Off |
| Pin 4 | +Vout |
| Pin 5 | +Vout |
| Pin 6 | +Vout |
| Pin 7 | +Vout |
| Pin 8 | -Vout |
| Pin 9 | -Vout |
| Pin 10 | -Vout |
| Pin 11 | -Vout |

Mates with JST housing
VHR-11N and JST Series
SVH-21T-P1.1 crimp terminals

| CN1 - Input Connector | |
|---|---|
| Pin 1 | Neutral |
| Pin 2 | Not Fitted |
| Pin 3 | Line |

Mates with JST housing
VHR-3N and JST Series
SVH-21T-P1.1 crimp terminals

Mounting holes marked with
⏚ must be connected to safety earth

| CN3 - Fan Connector | |
|---|---|
| Pin 1 | Fan - |
| Pin 2 | Fan + |

Mates with Molex housing
22-01-1022 and 2759 crimp terminals

### Notes

1. All dimensions shown in inches (mm).
   Tolerance: ±0.02 (0.5)
2. Weight: 0.51 lbs (230 g) approx.

## Thermal Considerations

In order to ensure safe operation of the PSU in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. Temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of direct air flow). See Mechanical Details for component locations.

| Temperature Measurements (At Maximum Ambient) | |
|---|---|
| **Component** | **Max Temperature ℃** |
| TR1 Coil | 110°C |
| L1 Coil | 120°C |
| Q1 Body | 120°C |
| C2 | 105°C |
| C52 | 105°C |

## Service Life

The estimated service life of the ECP225-A is determined by the cooling arrangements and load conditions experienced in the end application. Due to the uncertain nature of the end application this estimated service life is based on the actual measured temperature of a key capacitor with in the product when installed by the end application,

The graph below expresses the estimated lifetime of a given component temperature and assumes continuous operation at this temperature.

### Estimated Service Life vs Component Temperature

Figure 4