

# ECP150 Series



- 100W Convection Cooled Rating
- 150W Force Cooled Rating
- 2.0"by 4.0" Footprint
- Low 1.26"Profile
- High Efficiency, up to 92%
- High Power Density
- Medical & ITE Approvals
- Less than 0.5W No Load Input Power
- Built-In Fan Supply
- 3 Year Warranty

The ECP150 series minimises the no load power consumption and maximises 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 a low profile 1.26" height with a foot print of just 2.0" by 4.0".

The ECP150 provides up to 150W force-cooled or 100W convection-cooled leading to very high power densities of 14.9W/in<sup>3</sup> or 9.9W/in<sup>3</sup> respectively. A 12V, 500mA fan supply is 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 meeting EN55011/22 level B allow the versatile ECP150 series to be used in a vast range of applications.

## Models and Ratings

| Output Voltage | Output Current    |                              | Ripple and Noise<br>pk-pk <sup>(2)</sup> | Fan Output <sup>(4,5)</sup> | Efficiency <sup>(3)</sup> | Model Number <sup>(4)</sup> |
|----------------|-------------------|------------------------------|------------------------------------------|-----------------------------|---------------------------|-----------------------------|
|                | Convection-cooled | Forced-cooled <sup>(1)</sup> |                                          |                             |                           |                             |
| 12.0 V         | 8.33 A            | 12.50 A                      | 120 mV                                   | 12 V/0.5 A                  | 91%                       | ECP150PS12                  |
| 15.0 V         | 6.67 A            | 10.00 A                      | 150 mV                                   | 12 V/0.5 A                  | 91%                       | ECP150PS15                  |
| 24.0 V         | 4.17 A            | 6.25 A                       | 240 mV                                   | 12 V/0.5 A                  | 91%                       | ECP150PS24                  |
| 28.0 V         | 3.50 A            | 5.40 A                       | 280 mV                                   | 12 V/0.5 A                  | 92%                       | ECP150PS28                  |
| 48.0 V         | 2.08 A            | 3.10 A                       | 480 mV                                   | 12 V/0.5 A                  | 92%                       | ECP150PS48                  |

### Notes:

1. Requires 10 CFM.
2. Measured with 20 MHz bandwidth and 10  $\mu$ F electrolytic capacitor in parallel with 0.1  $\mu$ F ceramic capacitor
3. Minimum average efficiencies measured at 25%, 50%, 75% & 100% of 150 W load and 230 VAC input.
4. Typical voltage, actual regulated voltage will be in range of 11.3 V to 11.7 V
5. Regulation of the fan output requires a minimum load of 10 W on the main output.

## Input Characteristics

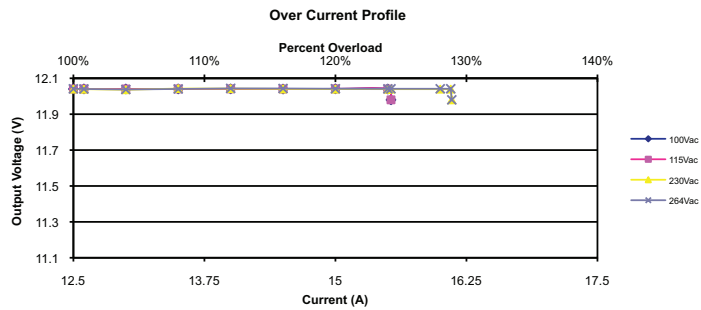
| Characteristic            | Minimum                                                 | Typical  | Maximum | Units   | Notes & Conditions                                                  |
|---------------------------|---------------------------------------------------------|----------|---------|---------|---------------------------------------------------------------------|
| Input Voltage - Operating | 90                                                      | 115/230  | 264     | VAC     | Derate output from 100% at 100 VAC to 90% at 90 VAC                 |
| Input Frequency           | 47                                                      | 50/60    | 63      | Hz      | Agency approval 47-63 Hz                                            |
| Power Factor              | 0.95                                                    |          |         |         | 230 VAC, 100% load EN61000-3-2 class A<br>EN61000-3-2 class C > 60W |
| Input Current - Full Load |                                                         | 1.5/0.75 |         | A       | 115/230 VAC                                                         |
| Inrush Current            |                                                         |          | 60      | A       | 230 VAC cold start, 25 °C                                           |
| Earth Leakage Current     |                                                         | 80/140   | 230     | $\mu$ A | 115/230 VAC/50 Hz (Typ.), 264 VAC/60 Hz (Max.)                      |
| No Load Input Power       |                                                         |          | 0.5     | W       |                                                                     |
| Input Protection          | F3.15 A/250 V Internal fuse fitted in line and neutral. |          |         |         |                                                                     |

## Output Characteristics

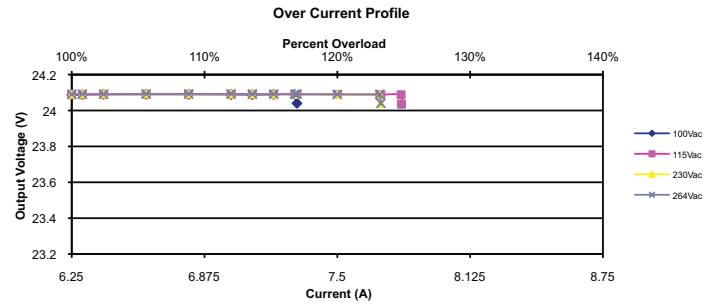
| Characteristic                 | Minimum | Typical | Maximum    | Units   | Notes & Conditions                                                                                               |
|--------------------------------|---------|---------|------------|---------|------------------------------------------------------------------------------------------------------------------|
| Output Voltage - V1            | 12      |         | 48         | VDC     | See Models and Ratings table                                                                                     |
| Initial Set Accuracy           |         |         | $\pm 1$    | %       | V1 at 50% load, 115/230 VAC                                                                                      |
| Output Voltage Adjustment - V1 | 10      |         |            | %       | V1 only via potentiometer. See mech. details, Vfan will track                                                    |
| Minimum Load                   | 0       |         |            | A       |                                                                                                                  |
| Start Up Delay                 |         | 550     |            | ms      | 115/230 VAC full load at 25° C. See fig. 3 & 4.                                                                  |
| Rise Time                      |         | 35      |            | ms      |                                                                                                                  |
| Hold Up Time                   | 16      | 20      |            | ms      | At full load, 100 VAC, see fig. 5.                                                                               |
| Drift                          |         |         | $\pm 0.02$ | %       | After 20 min warm up                                                                                             |
| Line Regulation                |         |         | $\pm 0.5$  | %       | 90-264 VAC                                                                                                       |
| Load Regulation                |         |         | $\pm 0.5$  | %       | 0-100% load                                                                                                      |
| Transient Response             |         |         | 4          | %       | Recovery within 1% in less than 500 $\mu$ s for a 50-75% and 75-50% load step                                    |
| Over/Undershoot                |         | 4       |            | %       | Full Load                                                                                                        |
| Ripple & Noise                 |         |         | 1          | % pk-pk | 20 MHz bandwidth & 10 $\mu$ F electrolytic capacitor in parallel with 0.1 $\mu$ F ceramic capacitor, See fig. 6. |
| Overvoltage Protection         | 115     |         | 140        | %       | Vnom, recycle input to reset                                                                                     |
| Overload Protection            | 110     |         | 150        | % I nom | See fig. 1.                                                                                                      |
| Short Circuit Protection       |         |         |            |         | Trip and Restart See fig. 2.                                                                                     |
| Temperature Coefficient        |         |         | 0.02       | %/ °C   |                                                                                                                  |

## Output Overload Characteristic

Figure 1  
ECP150PS12

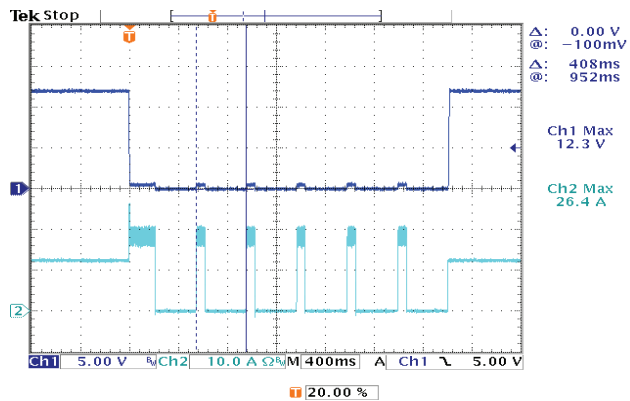


ECP150PS24

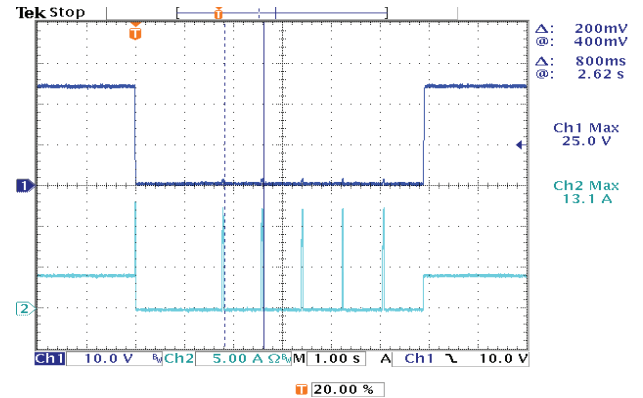


## Output Short Circuit Profile

Figure 2  
ECP150PS12

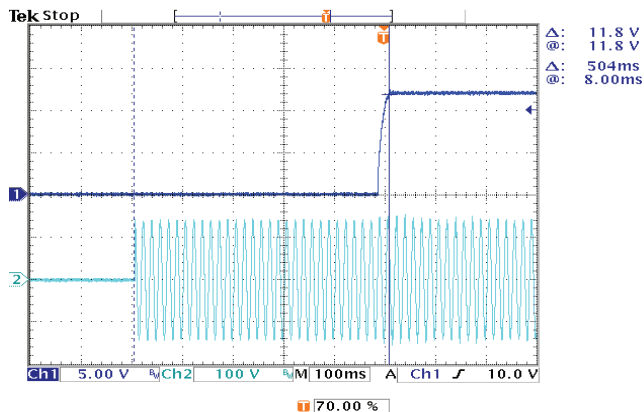


ECP150PS24



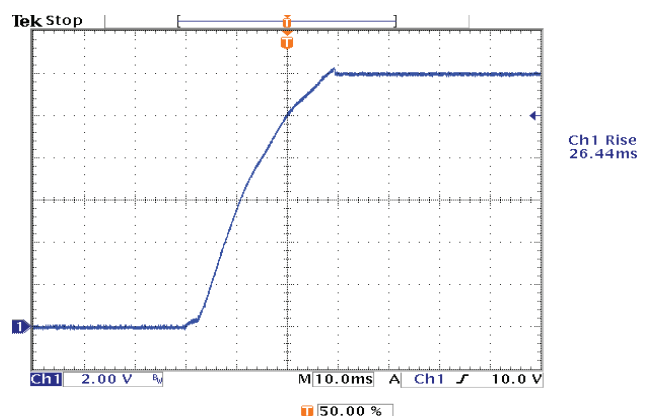
## Output Start Up Time

Figure 3  
ECP150PS12 100VAC full load



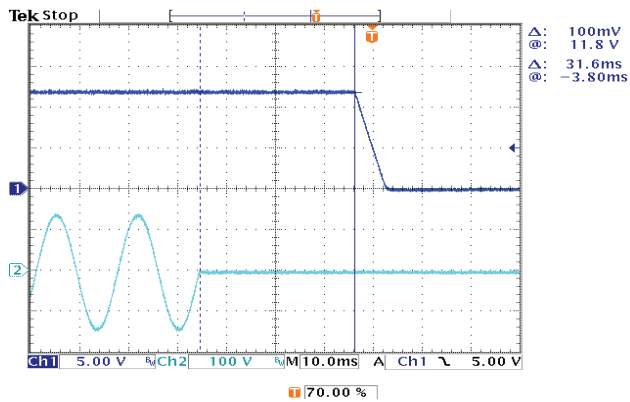
## Output Rise Time

Figure 4  
ECP150PS12 100 VAC full load

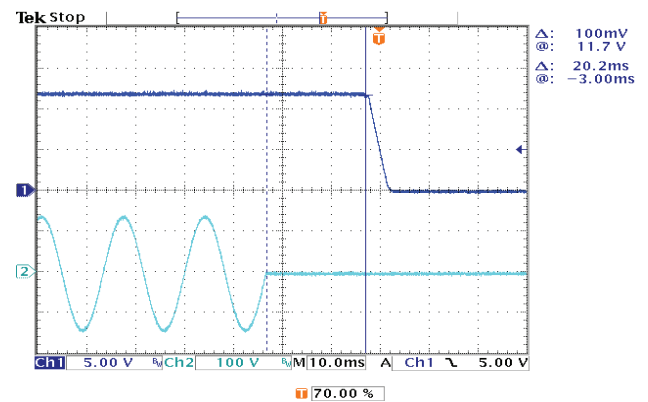


## Output Hold Up Time

Figure 5  
ECP150PS12 100VAC 100W load



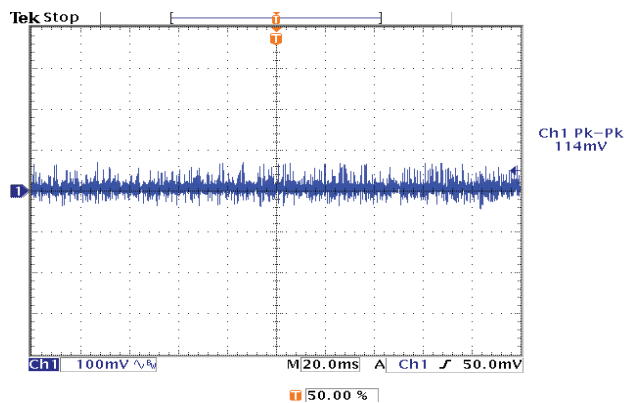
ECP150PS12 100VAC 150W load



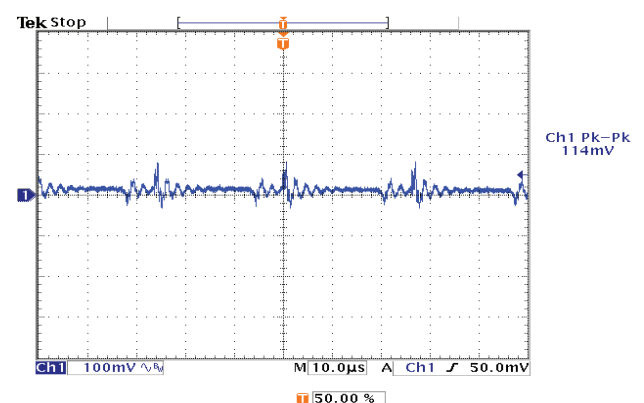
## Output Noise & Ripple

Figure 6  
ECP150PS12 at 100VAC & 150W load

Low Frequency



High Frequency



## General Specifications

| Characteristic             | Minimum          | Typical   | Maximum  | Units             | Notes & Conditions                 |
|----------------------------|------------------|-----------|----------|-------------------|------------------------------------|
| Efficiency                 |                  | 91        |          | %                 | 230 VAC Full load (see fig. 7 & 8) |
| Isolation: Input to Output | 4000             |           |          | VAC               | 2 MOPP                             |
|                            | Input to Ground  | 1500      |          | VAC               | 1 MOPP                             |
|                            | Output to Ground | 500       |          | VDC               |                                    |
| Switching Frequency        |                  |           | 60       | kHz               | PFC $\pm 10$ kHz                   |
|                            |                  |           | 60       | kHz               | Main Converters $\pm 10$ kHz       |
| Power Density              |                  |           | 14.9/9.9 | W/in <sup>3</sup> | Forced / Convection-cooled         |
| Mean Time Between Failure  |                  | 300       |          | kHrs              | MIL-HDBK-217F, Notice 2 +25 °C GB  |
| Weight                     |                  | 0.51(230) |          | lb(g)             |                                    |

## Efficiency Versus Load

Figure 7  
ECP150PS12

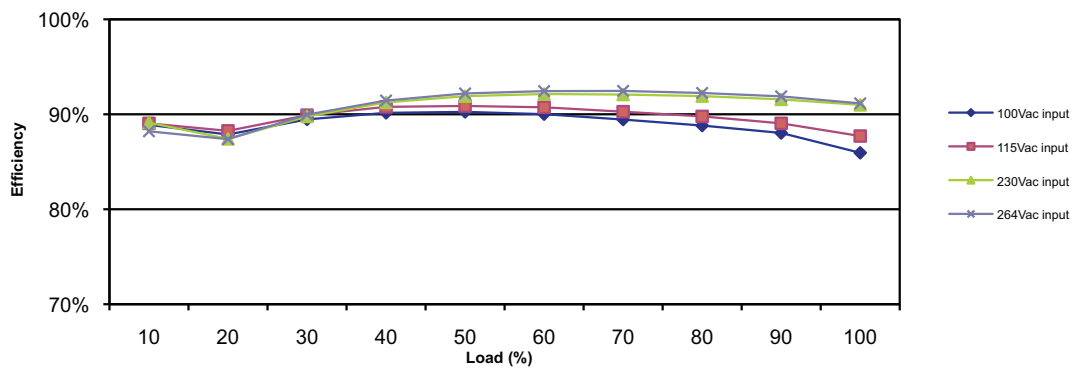
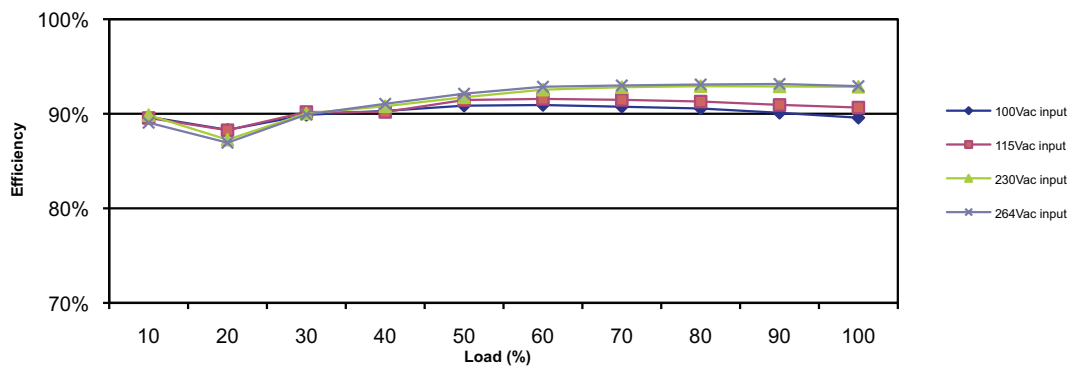


Figure 8  
ECP150PS24

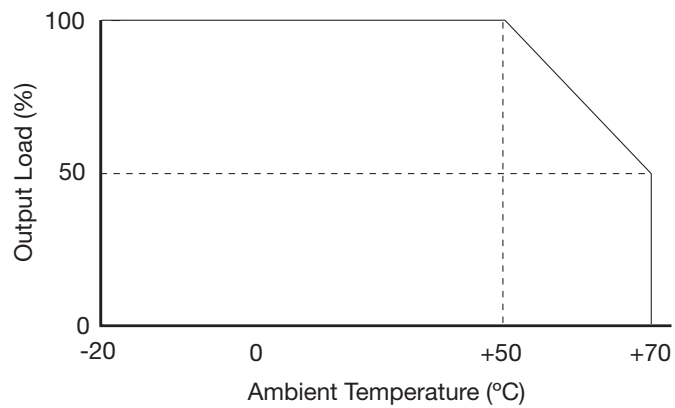


## Environmental

| Characteristic        | Minimum | Typical | Maximum | Units | Notes & Conditions                                                                                                |
|-----------------------|---------|---------|---------|-------|-------------------------------------------------------------------------------------------------------------------|
| Operating Temperature | -20     |         | +70     | °C    | See derating curve, fig.9                                                                                         |
| Storage Temperature   | -40     |         | +85     | °C    |                                                                                                                   |
| Cooling               | 10      |         |         | CFM   | Forced Cooled > 100W                                                                                              |
| Humidity              | 5       |         | 95      | %RH   | Non-condensing                                                                                                    |
| Operating Altitude    |         |         | 3000    | m     |                                                                                                                   |
| Shock                 |         |         |         |       | ±3 x 30g shocks in each plane, total 18 shocks.<br>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.<br>Conforms to EN60068-2-6        |

## Thermal Derating Curve

Figure 9



## Electromagnetic Compatibility - Emissions

| Phenomenon           | Standard    | Test Level | Criteria | Notes & Conditions          |
|----------------------|-------------|------------|----------|-----------------------------|
| Conducted            | EN55011/22  | Class B    |          |                             |
| Radiated             | EN55011/22  | Class A    |          |                             |
| Harmonic Current     | EN61000-3-2 | Class A    |          | Class C for loads above 60W |
| Voltage Fluctuations | EN61000-3-3 |            |          |                             |

## Electromagnetic Compatibility - Immunity

| Phenomenon             | Standard                 | Test Level                | Criteria | Notes & Conditions |
|------------------------|--------------------------|---------------------------|----------|--------------------|
| Low Voltage PSU EMC    | EN61204-3                | High severity level       | as below |                    |
| 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        |                    |
| Dips and Interruptions | EN55024<br>(100 VAC)     | Dip > 95% (0 VAC), 8.3ms  | A        |                    |
|                        |                          | Dip 30% (70 VAC), 416ms   | A        |                    |
|                        |                          | Dip > 95% (0 VAC), 4160ms | B        |                    |
|                        | EN55024<br>(240 VAC)     | Dip > 95% (0 VAC), 10.0ms | A        |                    |
|                        |                          | Dip 30% (168 VAC), 500ms  | A        |                    |
|                        |                          | Dip > 95% (0 VAC), 5000ms | B        |                    |
|                        | EN60601-1-2<br>(100 VAC) | Dip > 95% (0 VAC), 10.0ms | A        |                    |
|                        |                          | Dip 60% (40 VAC), 100ms   | B        |                    |
|                        |                          | Dip 30% (70 VAC), 500ms   | A        |                    |
|                        |                          | Dip > 95% (0 VAC), 5000ms | B        |                    |
|                        | EN60601-1-2<br>(240 VAC) | Dip > 95% (0 VAC), 10.0ms | A        |                    |
|                        |                          | Dip 60% (96 VAC), 100ms   | A        |                    |
|                        |                          | Dip 30% (168 VAC), 500ms  | A        |                    |
|                        |                          | Dip > 95% (0 VAC), 5000ms | B        |                    |

## Safety Agency Approvals

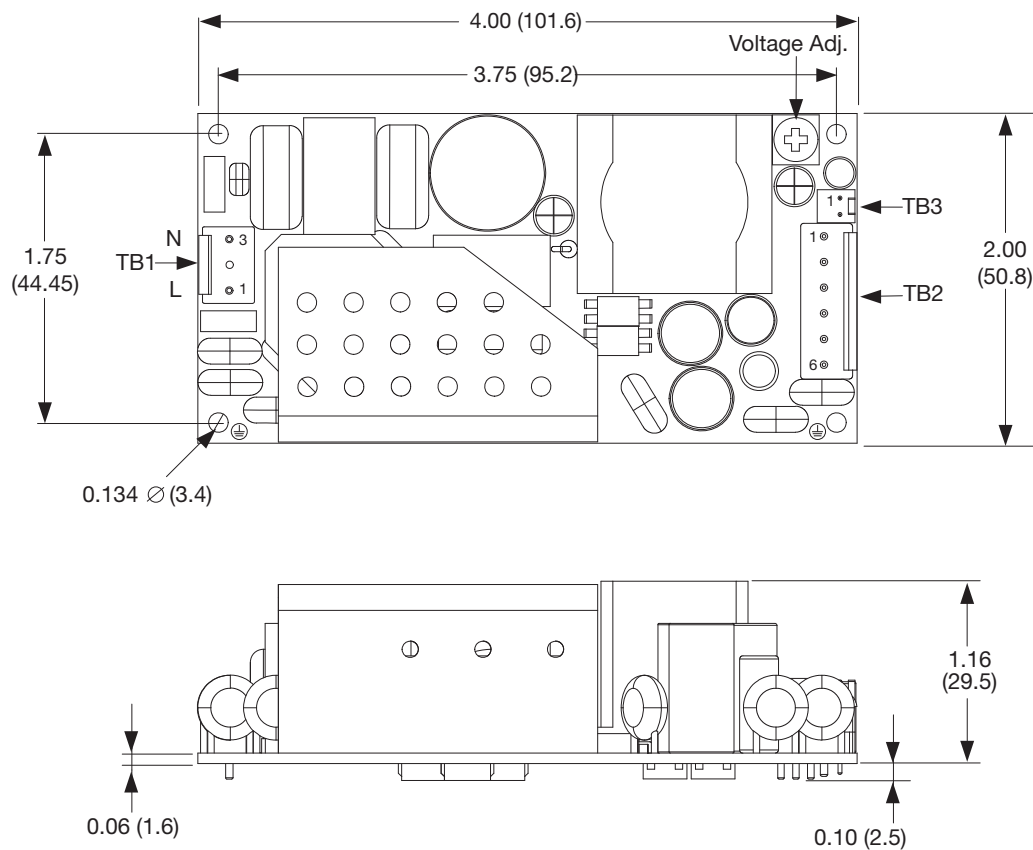
| Safety Agency | Safety Standard                                      | Category               |
|---------------|------------------------------------------------------|------------------------|
| CB Report     | IEC60950-1:2005 + A1:2009                            | Information Technology |
| UL            | UL60950-1 (2011), CSA 22.2 No.60950-1-07 Ed, 2011-12 | Information Technology |
| TUV           | EN60950-1:2006 + A11:2009 + A1:2010 + A12:2012       | Information Technology |
| CE            | LVD                                                  |                        |

| Safety Agency | Safety Standard                                     | Category |
|---------------|-----------------------------------------------------|----------|
| CB Report     | IEC60601-1 Ed 3 Including Risk Management           | Medical  |
| UL            | ANSI/AAMI ES60601-1:2005 & CSA C22.2, No.60601-1:08 | Medical  |
| TUV           | EN60601-1:2006                                      | Medical  |

| Means of Protection  |                                        | Category       |
|----------------------|----------------------------------------|----------------|
| Primary to Secondary | 2 x MOPP (Means of Patient Protection) | IEC60601-1 Ed3 |
| Primary to Earth     | 1 x MOPP (Means of Patient Protection) |                |

## Mechanical Details

Figure 10



| TB2 - Output Connector |       |
|------------------------|-------|
| Pin 1                  | +Vout |
| Pin 2                  | +Vout |
| Pin 3                  | +Vout |
| Pin 4                  | -Vout |
| Pin 5                  | -Vout |
| Pin 6                  | -Vout |

Mates with JST housing  
VHR-6N and JST Series  
SVH-21T-P1.1 crimp terminals

| TB1 - Input Connector |            |
|-----------------------|------------|
| Pin 1                 | Line       |
| Pin 2                 | Not Fitted |
| Pin 3                 | Neutral    |

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

| TB3 - 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:  $\pm 0.02$  (0.5)

2. Weight: 0.42 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 °C |
| TR1 Coil                                      | 110°C              |
| L4 Coil                                       | 120°C              |
| Q1 Body                                       | 120°C              |
| Q2 Body                                       | 120°C              |
| C1                                            | 105°C              |
| C20                                           | 105°C              |

## Service Life

The estimated service life of the ECP150 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 key capacitors within the product when installed in the end application.

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

## Estimated Service Life vs Component Temperature

Figure 11

