

# MBC401 Series

## 400 W AC-DC Power Supplies



The MBC401 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 MBC401 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 MBC401 Series complies with the latest international safety standards for medical equipment, offers 2xMoPP means of patient protection, is suitable for BF rated applied parts 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 compliant
- 400 W rated 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 leakage current
- Fan speed control function (Off at <50 W)
- Over temperature protection
- Over current and short circuit protection
- Remote On/Off and power good signal
- 5 available packages all fit 1U installation
- IEC/EN 60601-1 3rd ed. compliant
- ANSI/AAMI ES60601-1 3rd ed. compliant
- 4000 m operation without de-rating

### Applications

- Diagnostic equipment
- Imaging equipment
- Respiratory devices
- Therapy appliances
- Dental equipment
- Dermatology aesthetic medicine

## 1. MODEL SELECTION

| MODEL NUMBER   | PACKAGE & COOLING                        | INPUT VOLTAGE RANGE [VAC] | NOM. OUTPUT VOLTAGE [VDC] | MAX. OUTPUT POWER [W] | MAX. OUTPUT CURRENT [A] | DIMENSIONS                                     |
|----------------|------------------------------------------|---------------------------|---------------------------|-----------------------|-------------------------|------------------------------------------------|
| MBC401-1012    | 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) |
| MBC401-1012-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) |
| MBC401-1012-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) |
| MBC401-1012-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) |
| MBC401-1012-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) |
| MBC401-1024    | 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) |
| MBC401-1024-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) |
| MBC401-1024-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) |
| MBC401-1024-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) |
| MBC401-1024-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) |
| MBC401-1028-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) |
| MBC401-1036    | 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) |
| MBC401-1036-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) |
| MBC401-1036-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) |
| MBC401-1036-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) |
| MBC401-1036-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) |
| MBC401-1048    | 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) |
| MBC401-1048-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) |
| MBC401-1048-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) |
| MBC401-1048-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) |
| MBC401-1048-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 <sub>AC</sub> at all load conditions                                                                           | 90                    | 100-240 | 264        | V <sub>RMS</sub> |
| DC Input Voltage                             |                                                                                                                                               | 170                   | -       | 270        | V <sub>DC</sub>  |
| Input Frequency                              |                                                                                                                                               | 47                    | 50/60   | 440        | Hz               |
| Input Current                                | RMS at 180 V <sub>AC</sub> , maximum load, 50 / 60 Hz<br>RMS at 90 V <sub>AC</sub> , maximum load, 50 / 60 Hz                                 | -                     | -       | 2.5<br>5.0 | A                |
| Inrush Current                               | 265 V <sub>AC</sub> , 25 °C ambient, cold start.<br>24, 28, 36, 48 V, no damage<br>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 <sub>AC</sub>                                                                                                                        | 20% rated load        | 90      | -          | %                |
|                                              |                                                                                                                                               | 50 – 100 % rated load | 92      | -          |                  |
|                                              | At 230 V <sub>AC</sub>                                                                                                                        | 20% rated load        | 90      | -          |                  |
|                                              |                                                                                                                                               | 50 – 100 % rated load | 94      | -          |                  |
| Input Power Consumption                      | Power on, 115-230 V <sub>RMS</sub> , no load                                                                                                  | -                     | 1       | 1.5        | W                |
|                                              | Stand by, 115-230 V <sub>RMS</sub> , no load                                                                                                  | -                     | 0.4     | 0.5        |                  |
| Power Factor                                 | At full rated load, 115 V <sub>AC</sub> , 60 Hz and 230 V <sub>AC</sub> , 50 Hz input voltages                                                | 0.95                  | -       | -          | -                |
| Harmonic Current<br>Fluctuations and Flicker | Complies with EN-61000-3-2 Class C at 230 V <sub>AC</sub> 50 Hz, load >50 W.<br>Complies with EN-61000-3-3 at nominal voltages and full load. |                       |         |            |                  |
| Leakage Current                              | Normal conditions, 240 V <sub>RMS</sub> , 60 Hz.                                                                                              |                       |         | 300        | μA               |



### 3. OUTPUT SPECIFICATIONS

| PARAMETER                                                         | DESCRIPTION / CONDITION                                         |                                                                               | MIN   | NOM  | MAX              | UNIT  |
|-------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------|-------|------|------------------|-------|
| V1 Output Voltage                                                 | 0.5% set point accuracy for all voltage variants                |                                                                               | -     | 12   | -                | V     |
|                                                                   |                                                                 |                                                                               | -     | 24   | -                |       |
|                                                                   |                                                                 |                                                                               | -     | 28   | -                |       |
|                                                                   |                                                                 |                                                                               | -     | 36   | -                |       |
|                                                                   |                                                                 |                                                                               | -     | 48   | -                |       |
| V1 Output Power Rating                                            | All voltages, convection cooled models only                     |                                                                               |       | 250  | W                |       |
|                                                                   | All voltages, fan cooled + forced air cooled (> 400 LFM) models |                                                                               |       | 400  |                  |       |
|                                                                   | All models, peak power (≤ 10 s)                                 |                                                                               |       | 440  |                  |       |
| V1 Output Current                                                 | * Fan cooled + forced air cooled (> 400 LFM)<br>(All models)    | V1: 12 V <sub>DC</sub>                                                        |       | 33.3 | A                |       |
|                                                                   |                                                                 | V1: 24 V <sub>DC</sub>                                                        |       | 16.7 |                  |       |
|                                                                   |                                                                 | V1: 28 V <sub>DC</sub>                                                        |       | 14.3 |                  |       |
|                                                                   |                                                                 | V1: 36 V <sub>DC</sub>                                                        |       | 11.1 |                  |       |
|                                                                   |                                                                 | V1: 48 V <sub>DC</sub>                                                        |       | 8.3  |                  |       |
| V1 Output Current                                                 | ** Convection cooled:<br>(-), -UC, -PC models)                  | V1: 12 V <sub>DC</sub>                                                        |       | 20.8 | A                |       |
|                                                                   |                                                                 | V1: 24 V <sub>DC</sub>                                                        |       | 10.4 |                  |       |
|                                                                   |                                                                 | V1: 28 V <sub>DC</sub>                                                        |       | 8.9  |                  |       |
|                                                                   |                                                                 | V1: 36 V <sub>DC</sub>                                                        |       | 6.9  |                  |       |
|                                                                   |                                                                 | V1: 48 V <sub>DC</sub>                                                        |       | 5.2  |                  |       |
| V1 Voltage Adjustment Range                                       |                                                                 |                                                                               | -     | -    | ±5               | %V1   |
| V1 Load-Line-Cross Regulation                                     | V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>                     | V1 Load: 0 – 33.3 A (12 V)                                                    |       |      | ±2               | %V1   |
|                                                                   |                                                                 | 0 – 16.7 A (24 V)                                                             |       |      |                  |       |
|                                                                   |                                                                 | 0 – 14.3 A (28 V)                                                             |       |      |                  |       |
| V1 Load-Line-Cross Regulation                                     | V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>                     | 0 – 13.9 A (36 V)                                                             |       |      | ±2               | %V1   |
|                                                                   |                                                                 | 0 – 8.3 A (48 V)                                                              |       |      |                  |       |
|                                                                   |                                                                 | V2 Load: 0 – 1 A                                                              |       |      |                  |       |
| V1 Load-Line-Cross Regulation                                     | V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>                     | 5V <sub>SB</sub> Load: 0 – 2 A                                                |       |      | ±2               | %V1   |
|                                                                   |                                                                 |                                                                               |       |      |                  |       |
|                                                                   |                                                                 |                                                                               |       |      |                  |       |
| V1 Line Regulation                                                | V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>                     |                                                                               | -     | -    | ±0.1             | %V1   |
| Transient Response<br>(Voltage Deviation)<br>V1, 5V <sub>SB</sub> | 25% load changes at 1 A/μs                                      |                                                                               |       |      |                  |       |
|                                                                   | 12V at 2200 μF Load / I <sub>OUT</sub> > 0.5 A                  |                                                                               |       |      |                  |       |
|                                                                   | 24 V at 1000 μF Load / I <sub>OUT</sub> > 0.5 A                 |                                                                               |       |      |                  |       |
|                                                                   | 28 V at 1000 μF Load / I <sub>OUT</sub> > 0.5 A                 |                                                                               |       |      |                  |       |
|                                                                   | 36 V at 820 μF Load / I <sub>OUT</sub> > 0.5 A                  |                                                                               |       |      |                  |       |
| V1 Ripple and Noise                                               | 48V at 560 μF Load / I <sub>OUT</sub> > 0.5 A                   |                                                                               |       |      |                  |       |
|                                                                   | 5V <sub>SB</sub> at 560 μF Load / I <sub>OUT</sub> > 0.1 A      |                                                                               |       |      |                  |       |
|                                                                   | All models, Peak-to-peak, 20 MHz BW.                            |                                                                               |       |      |                  |       |
| V1 Ripple and Noise                                               | 100 nF ceramic and 10 μF tantalum caps at the load.             |                                                                               | -     | -    | 1                | %V1   |
| Start-up Rise Time                                                | 90<V <sub>IN</sub> <264, any load conditions.                   |                                                                               | 5     | -    | 85               | ms    |
| Start-up Delay                                                    | V1 in regulation after PS_ON is asserted                        |                                                                               |       |      | 200              | ms    |
|                                                                   | V1 in regulation after AC is applied                            |                                                                               |       |      | 750              |       |
|                                                                   | 5V <sub>SB</sub> in regulation after AC is applied              |                                                                               |       |      | 500              |       |
| Turn-on Overshoot                                                 | At I <sub>1</sub> = 500 mA, V1 in regulation within 50 ms.      |                                                                               |       | 10   | %V1              |       |
|                                                                   |                                                                 |                                                                               |       | 10   | %V2              |       |
|                                                                   |                                                                 |                                                                               |       | 10   | %V <sub>SB</sub> |       |
| Hold-up Time                                                      | At nominal V <sub>IN</sub> , 400 W, for all models              |                                                                               | -     | 16   | -                | ms    |
|                                                                   | At nominal V <sub>IN</sub> , 365 W, for all models              |                                                                               | -     | 20   | -                |       |
|                                                                   | At nominal V <sub>IN</sub> , 200 W, for all models              |                                                                               | -     | 35   | -                |       |
| Minimum Load ***                                                  | All models; V1, V2 and 5 V <sub>SB</sub>                        |                                                                               | 0     | -    | -                | A     |
| Maximum Load Capacitance                                          | At nominal V <sub>IN</sub> , 25 °C ambient                      | 12 V                                                                          |       | -    | 33000            | μF    |
|                                                                   |                                                                 | 24 V                                                                          |       | -    | 16000            |       |
|                                                                   |                                                                 | 28 V                                                                          |       | -    | 14300            |       |
|                                                                   |                                                                 | 36 V                                                                          |       | -    | 10000            |       |
|                                                                   |                                                                 | 48 V                                                                          |       | -    | 7000             |       |
| Temperature Drift                                                 |                                                                 |                                                                               | -1.2  | -    | +1.2             | mV/°C |
| V2 Output Voltage ***                                             | All models.                                                     | Load on V2: from 5 to 1000 mA<br>Load on V1: from 0.1 to I <sub>1</sub> rated | 11.35 | 11.5 | 12.65            | V     |
| V2 Output Current (I <sub>2</sub> )                               | Convection / forced air cooling                                 |                                                                               | -     | -    | 1                | A     |
| V2 Ripple                                                         | Peak-to-Peak measured at 20 MHz Bandwidth.                      |                                                                               | -     | -    | 240              | mV    |

|                                                      |                                                   |                                |   |     |    |
|------------------------------------------------------|---------------------------------------------------|--------------------------------|---|-----|----|
| 5V <sub>SB</sub> Output Voltage                      | 3% set point accuracy                             | -                              | 5 | -   | V  |
| 5V <sub>SB</sub> Output Current (I5V <sub>SB</sub> ) | Convection cooled models                          | -                              | - | 1.5 | A  |
|                                                      | Fan cooled + forced air cooled (> 400 LFM) models | -                              | - | 2   | A  |
| 5V <sub>SB</sub> Load-Line-Cross regulation          | V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>       | 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)               |   |     |    |
| 5V <sub>SB</sub> Load-Line-Cross regulation          | V <sub>AC</sub> : 90 – 264 V <sub>RMS</sub>       | V2 Load: 0 – 1 A               |   |     |    |
|                                                      |                                                   | 5V <sub>SB</sub> Load: 0 – 2 A |   |     |    |
| 5V <sub>SB</sub> Ripple                              | Peak-to-Peak measured at 20 MHz Bandwidth.        | -                              | - | 50  | mV |

\* The combined output power of V1, V2 and 5 V<sub>SB</sub> for -T and -S models, must not exceed 400 W up to 50 °C, and 280 W at 70 °C ambient temperature. See de-rating curves below.

\*\* The combined output power of V1, V2 and 5V<sub>SB</sub> for (-), -UC, -PC models, must not exceed 400 W when cooled by 400 LFM air flow, and 250 W when natural convection cooled, up to 50 °C. Above 50 °C output de-rating applies. See de-rating curves below. In any case, the heat sink maximum temperature should not exceed +110 °C at 50 °C ambient temperature.

\*\*\* When the load on the main output is less than 100 mA, V2 output voltage might regulate below its minimum value. Contact Bel for details.

### 3.1 OUTPUT POWER DE-RATING CURVES

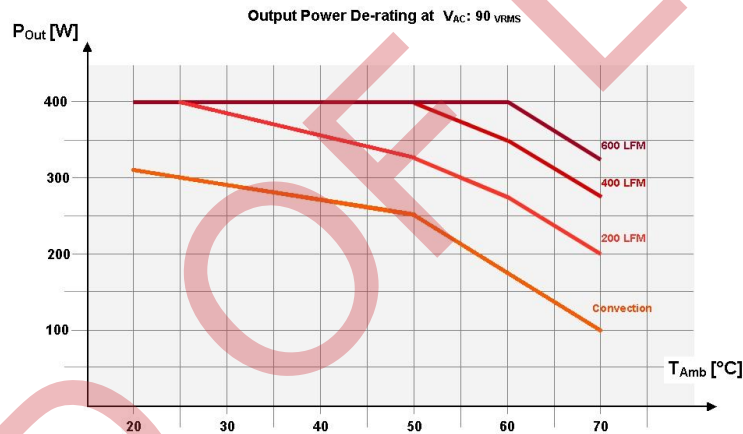


Figure 1. Power Derating Curves for Open Frame, U-Chassis and Perforated Cover Models

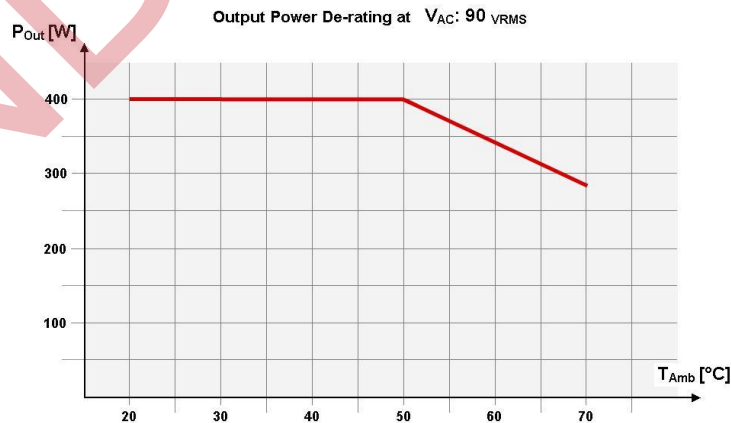
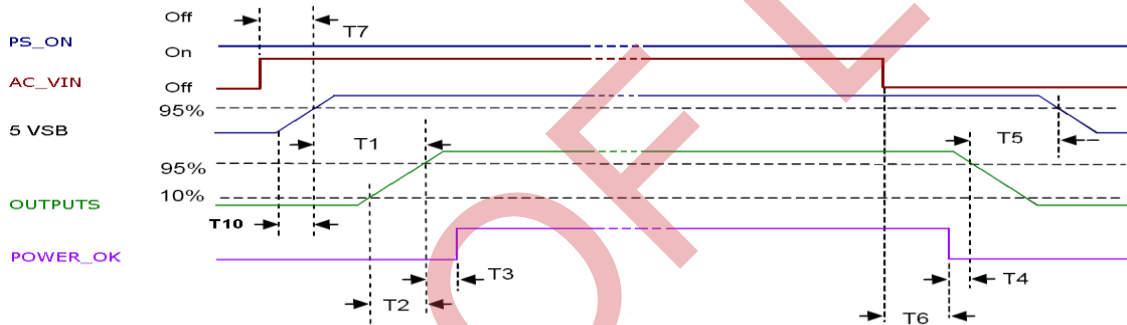


Figure 2. Power Derating Curves for Top Fan and Front Mounted Fan Models

#### 4. SIGNALS, CONTROLS & TIMING SPECIFICATIONS

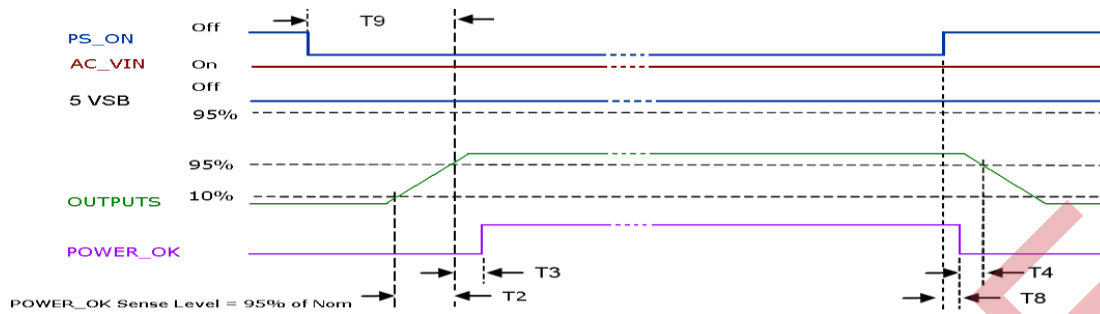
Base signals and controls are accessible from signal connector P204.

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



Above waveforms are expected with AC Input ON/OFF:

|                                            |                                             |
|--------------------------------------------|---------------------------------------------|
| Standby on - Main outputs on               | $50 \text{ ms} \leq T1 \leq 250 \text{ ms}$ |
| Main output Rise Time                      | $5 \text{ ms} \leq T2 \leq 85 \text{ ms}$   |
| 5 VSB rise time                            | $4 \text{ ms} \leq T10 \leq 20 \text{ ms}$  |
| Main outputs On - P_OK delay               | $40 \text{ ms} \leq T3 \leq 100 \text{ ms}$ |
| Power down warning <sup>1</sup>            | $T4 \geq 1 \text{ ms}$                      |
| Main Output off - Standby off <sup>2</sup> | $T5 \geq 1.2 \text{ s}$                     |
| Hold-up time (AC off - P_OK low)           | $T6 \geq 15 \text{ ms (115/ 230 VAC)}$      |
| AC_ON - Standby turn on time               | $T7 \leq 500 \text{ ms}$                    |



Above waveforms are expected with PS\_ON Signal ON/OFF state change:

|                                  |                                             |
|----------------------------------|---------------------------------------------|
| Main Output Rise Time            | $5 \text{ ms} \leq T2 \leq 85 \text{ ms}$   |
| Main Outputs on - P_OK delay     | $50 \text{ ms} \leq T3 \leq 100 \text{ ms}$ |
| Power down warning <sup>1</sup>  | $1 \text{ ms} \leq T4 \leq 5 \text{ ms}$    |
| PS_ON - Main Output (off) Timing | $T8 \leq 1 \text{ ms}$                      |
| PS_ON - Main Output (on) Timin   | $T9 \leq 200 \text{ ms}$                    |

<sup>1</sup> T4 parameter measurement setup will assume at least 10% of the maximum load on each output.

<sup>2</sup> 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 <sub>AC</sub>    |
| Input Fuse                           | 2x Time Lag 6.3 A, 250 V on L1 and L2                                                                                                                      | -    | -   | 6.3 | A                  |
| Over Current                         | At nominal input voltages.<br>V1: Hiccup mode, auto-recovering.<br>V2: PTC limiting, auto-recovering.<br>5 V <sub>SB</sub> : Hiccup mode, auto-recovering. | 110  | -   | 150 | %I <sub>1MAX</sub> |
| Short Circuit                        | At nominal input voltages.<br>V1: Hiccup mode, auto-recovering.<br>V2: PTC limiting, auto-recovering<br>5 V <sub>SB</sub> : Hiccup mode, auto-recovering.  | -    | -   | -   |                    |
| Over Voltage                         | 12 V<br>24 V<br>28 V<br>36 V<br>48 V<br>5 V <sub>SB</sub>                                                                                                  | 110  | -   | 136 | %V <sub>NOM</sub>  |
| Over Temperature (on primary stage)  | Unit shut down and latch off                                                                                                                               | -    | -   | -   |                    |
| Over Temperature (on secondary side) | Shut down, latch off.                                                                                                                                      | -    | -   | -   |                    |
| Isolation Primary-to- Secondary      | Hiccup mode, auto-recovering.                                                                                                                              | -    | -   | -   |                    |
| Isolation Input-to-PE                | Reinforced (2x MoPP)                                                                                                                                       | 4000 | -   | -   | V <sub>AC</sub>    |
| Isolation V1-to-V2                   | Basic (1x MoPP)                                                                                                                                            | 1500 | -   | -   | V <sub>AC</sub>    |
| Isolation Output-to-PE               | Basic (1x MoPP)                                                                                                                                            | 100  | -   | -   | V <sub>DC</sub>    |
| Touch Current                        | Normal Condition (NC)<br>Single Fault Condition (SFC)                                                                                                      | 1500 | -   | -   | V <sub>AC</sub>    |
|                                      |                                                                                                                                                            | -    | -   | 100 | μA                 |
|                                      |                                                                                                                                                            | -    | -   | 500 | μA                 |



## 6. ENVIRONMENTAL SPECIFICATIONS

| PARAMETER                            | DESCRIPTION / CONDITION                                                                                                                                                                                                                                                      | MIN    | NOM | MAX      | UNIT   |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|----------|--------|
| Operating Temperature Range          | No de-rating up to 50 °C<br>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<br>Forced air cooling: Linearly de-rate from 400 W at 50 °C, to 280 W at 70 °C.<br>See graphs below.                                                                                     | -      | -   | 70       | °C     |
| Storage Temperature Range            |                                                                                                                                                                                                                                                                              | -40    | -   | 85       | °C     |
| Humidity                             | RH, Non-condensing Operating<br>Non-operating                                                                                                                                                                                                                                | -      | -   | 90<br>95 | %<br>% |
| Operating Altitude                   |                                                                                                                                                                                                                                                                              | -      | -   | 4000     | m      |
| Shock                                | <b>EN 60068-2-27</b><br>Operating: Half sine, 30 g, 18 ms, 3 axes, 6x each (3 positive and 3 negative).<br>Non-Operating: Half sine, 50 g, 11 ms, 3 axes, 6x each (3 positive and 3 negative).                                                                               |        |     |          |        |
| Vibration                            | <b>EN 60068-2-64</b><br>Operating: Sine, 10 – 500 Hz, 1 g, 3 axes, 1 oct/min., 60 min.<br>Random, 5 – 500 Hz, 0.02 g <sup>2</sup> /Hz, 1 g <sub>RMS</sub> , 3 axes, 30 min.<br>Non-Operating: 5 – 500 Hz, 2.46 g <sub>RMS</sub> (0.0122 g <sup>2</sup> /Hz), 3 axes, 30 min. |        |     |          |        |
| MTBF                                 | Full Load, 120 V <sub>AC</sub> , 40 °C ambient<br>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.             |        |     |          |        |

## 7. ELECTROMAGNETIC COMPATIBILITY (EMC) – EMISSIONS

| PARAMETER                            | DESCRIPTION / CONDITION                                                           | STANDARD               | PERFORMANCE CLASS |
|--------------------------------------|-----------------------------------------------------------------------------------|------------------------|-------------------|
| Conducted                            | 115 V <sub>RMS</sub> , 230 V <sub>RMS</sub> . Maximum load<br>4 dB minimum margin | EN 60601-1-2 (Medical) | B                 |
| Radiated                             | At 10 m distance (-T, -S models)                                                  | EN 60601-1-2 (Medical) | B                 |
| Line Voltage Fluctuation and Flicker | At 20%, 50% and 100% maximum load<br>Nominal input voltages                       | EN 61000-3-3           |                   |
| Harmonic Current Emission            | Nominal input voltages<br>Output load > 50 W                                      | EN 61000-3-2           | C                 |

## 8. ELECTROMAGNETIC COMPATIBILITY (EMC) – IMMUNITY

| PARAMETER               | DESCRIPTION / CONDITION                                                                                                                                           | STANDARD                                                                     | TEST LEVEL | CRITERIA              |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------|-----------------------|
|                         | Reference standard for the medical version                                                                                                                        | EN 60601-1-2, 4 <sup>th</sup> edition                                        |            |                       |
| ESD                     | 15 kV air discharge, 8 kV contact,<br>at any point of the system.                                                                                                 | EN 61000-4-2                                                                 | 4          | A                     |
| Radiated Field          | 3 V/m, 80-1000 MHz, 1 KHz / 2 Hz 80% AM.<br>Dwell time is 3 sec for 2 Hz modulation<br>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;<br>±1 kV on signal/control lines                                                                                             | EN 61000-4-4                                                                 | 3          | A                     |
| Surge                   | ±2 kV line to line;<br>± 4 kV line to earth on AC power port                                                                                                      | EN 61000-4-5                                                                 | 4          | A<br>B                |
| Conducted RF Immunity   | 3 V <sub>RMS</sub> , 0.15-80 MHz, 1 KHz/2 Hz 80% AM                                                                                                               | EN 61000-4-6                                                                 | 3          | A                     |
| Dips and Interruptions  | Dip to 30% for 0.5 cycle (10 ms)<br>Dip to 40% for 5 cycles (100 ms)<br>Dip to 70% for 25 cycles (500 ms)<br>Drop-out to 5% for 10 ms<br>Interrupts > 95% for 5 s | EN61000-4-11<br>EN61000-4-11<br>EN61000-4-11<br>EN61000-4-11<br>EN61000-4-11 |            | A<br>B<br>B<br>B<br>B |



## 9. SAFETY AGENCIES APPROVALS

| CERTIFICATION BODY            | SAFETY STANDARDS                                                                                                                                                                                                  | CATEGORY |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| CSA/UL                        | CSA C22.2 No.60601-1, ANSI/AAMI ES60601-1 3rd Edition + A1                                                                                                                                                        | Medical  |
| IEC IECEE<br>CB Certification | IEC/EN 60601-1 3rd edition+A1                                                                                                                                                                                     | Medical  |
| CE                            | Directive 93/42/CEE: Safety Requirement of the Medical Device<br>Directive 2014/30/EU: Electromagnetic Compatibility (EMC)<br>Directive EU 2015/863: RoHS 3<br>Designed to meet IEC/EN/UL/CSA 61010-1 2nd edition | Medical  |

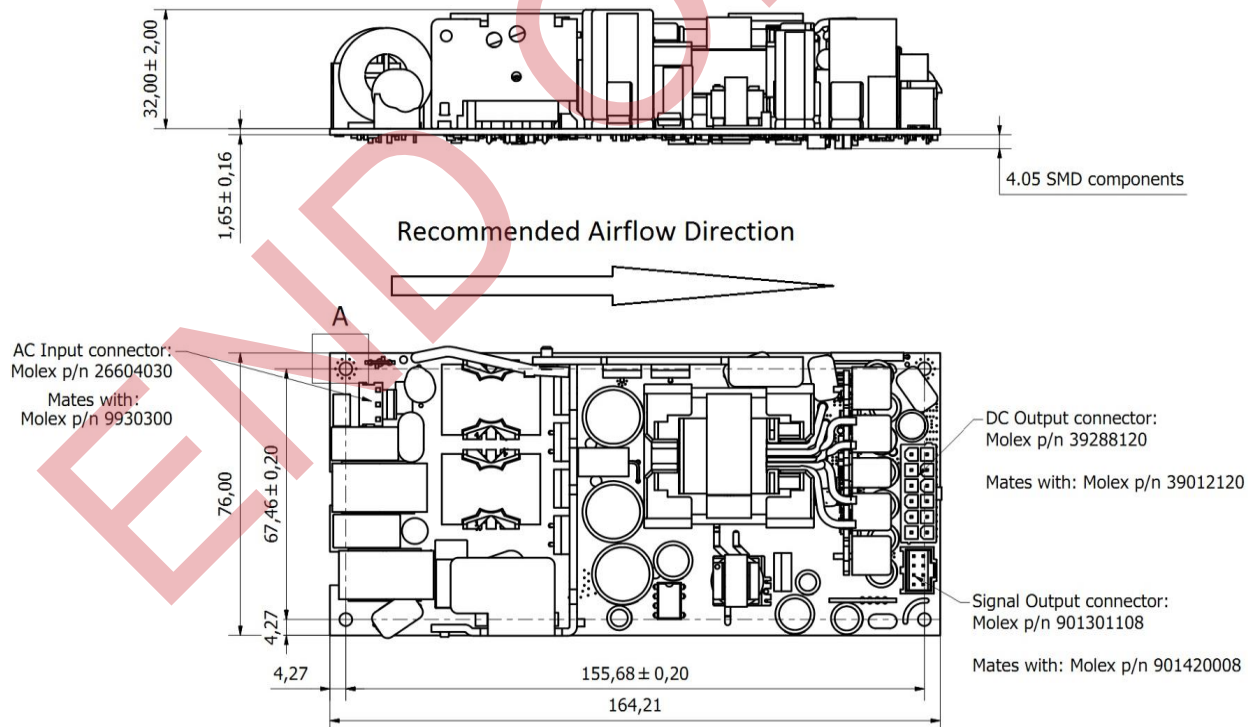
## 10. MECHANICAL SPECIFICATIONS

| 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)

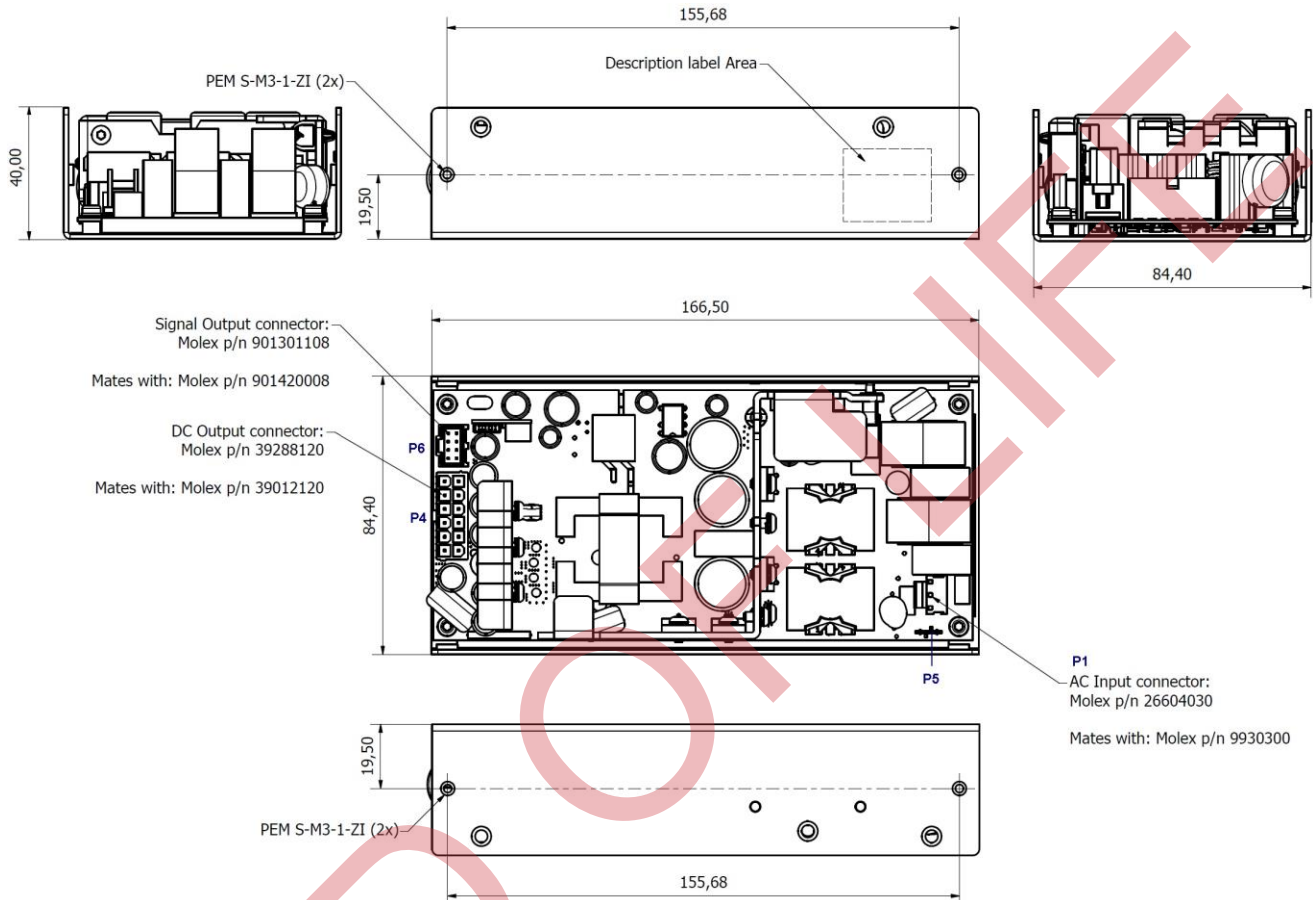
Weight: 410 g (0.90 lb)



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

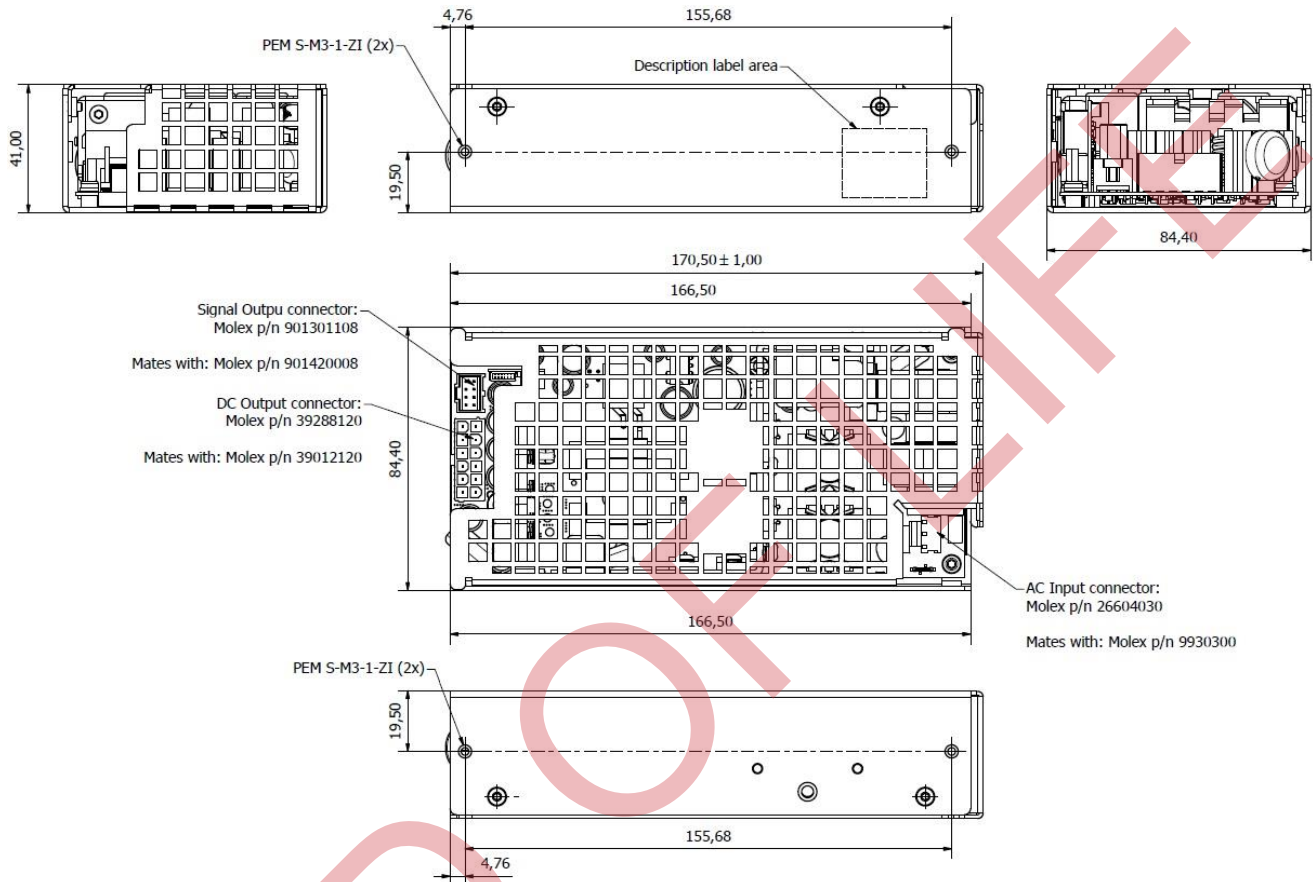
Overall Dimensions: 84.4 x 166.5 x 40.0 mm (3.32 x 6.55 x 1.57 in)

Weight: 525 g (1.16 lb)



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

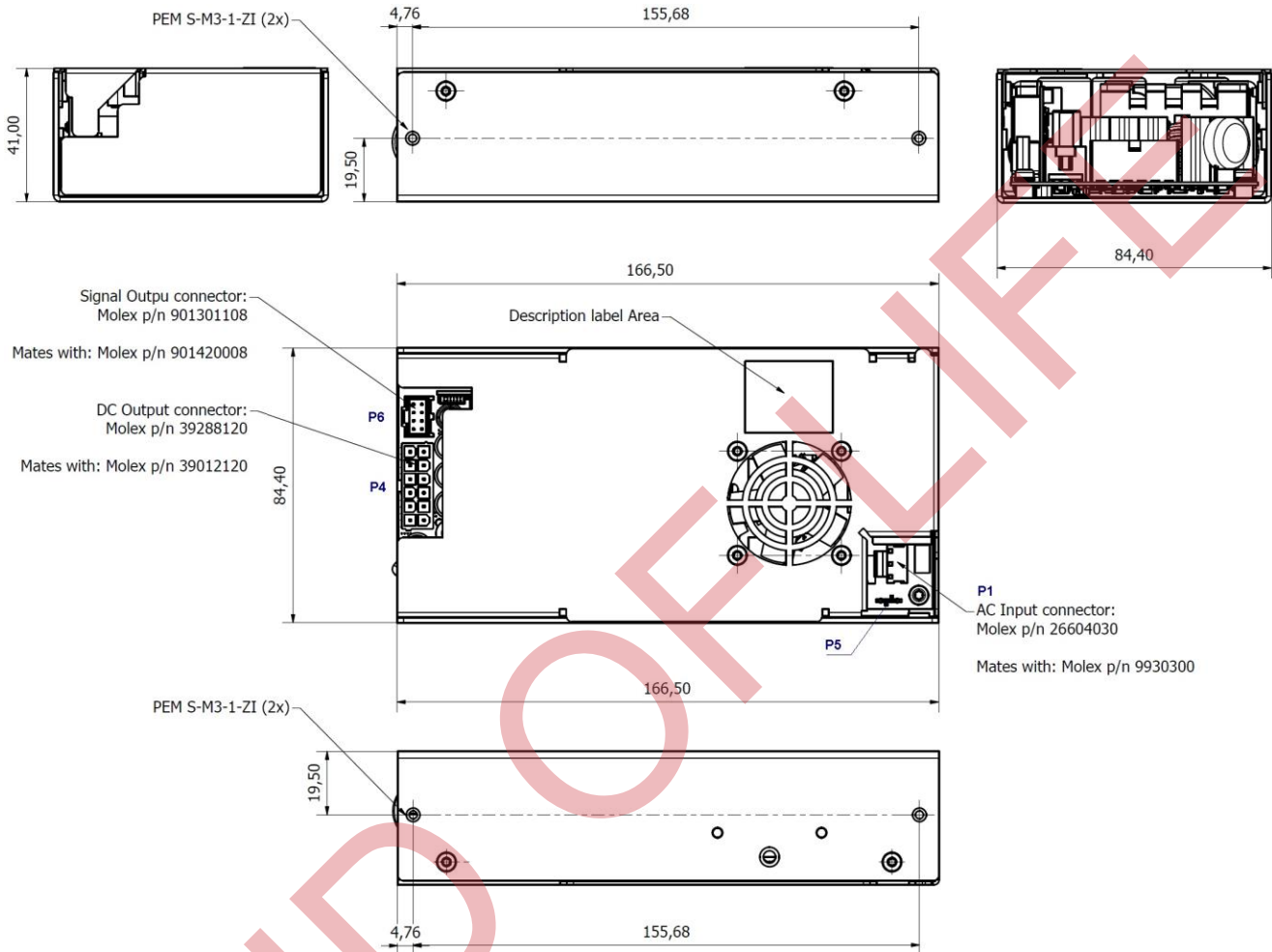
Overall Dimensions: 84.4 x 170.5 x 41.0 mm (3.32 x 6.71 x 1.61 in)  
Weight: 575 g (1.43 lb)



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

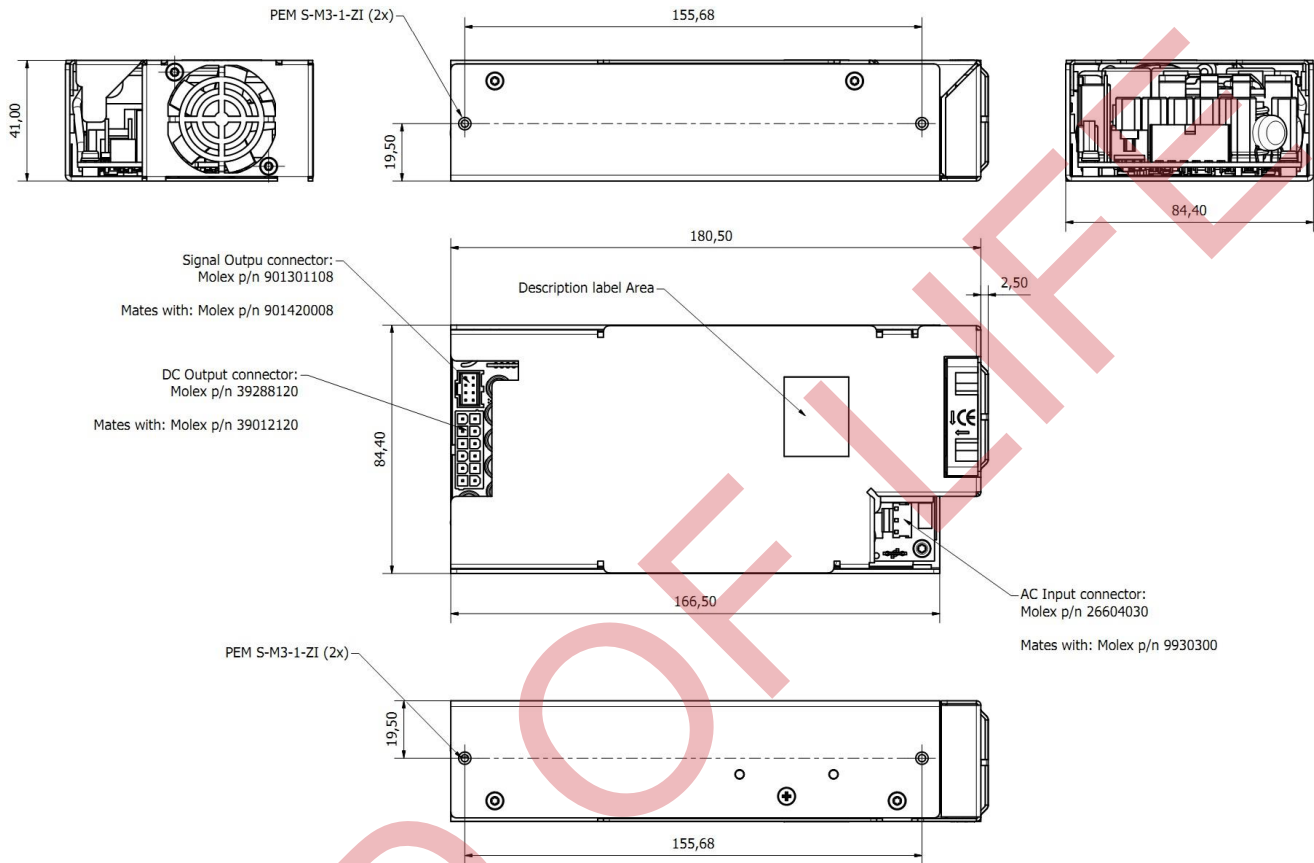
Overall Dimensions: 84.4 x 166.5 x 41.0 mm (3.32 x 6.55 x 1.61 in)

Weight: 670 g (1.48 lb)



## 10.5 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)



## 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)

### PROTECTION EARTH CONNECTOR - P5

**Tyco 63849-1** equivalent

Mating Connector:  
Any tin finished 6.35 x 0.81 mm receptacle

### DC OUTPUT CONNECTOR – P4

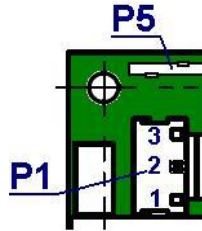
**Molex 39-28-8120** or equivalent

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

### SIGNAL CONNECTOR – P6

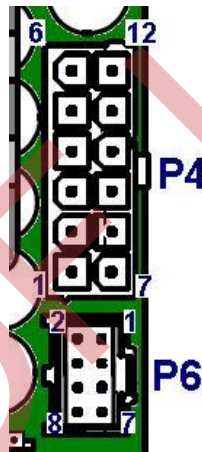
**Molex 90130-1108** or equivalent

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



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

| PIN REF. | FUNCTION  |
|----------|-----------|
| GDN      | AC Ground |



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

| PIN REF. | FUNCTION          |
|----------|-------------------|
| 1        | +5V <sub>SB</sub> |
| 2        | P_OK              |
| 3        | -V2               |
| 4        | PS_ON             |
| 5        | RS+               |
| 6        | RTN               |
| 7        | +V2               |
| 8        | RTN               |

**For more information on these products consult: [tech.support@psbel.com](mailto: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.