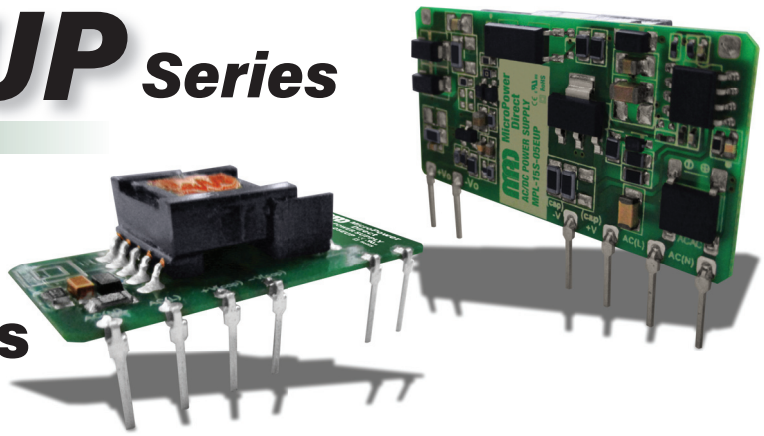
# MPL-15SEUP Series

## Ultra-Miniature SIP Single Output, 15W AC/DC Power Supplies



### Key Features:

- 15W Output Power
- Open, Ultra-Miniature SIP
- Universal 85-305 VAC Input
- EN 62368 Approved
- Meets EN 60335
- Meets IEC Safety Class II
- Reinforced Insulation
- Meets EN 55032
- >300 kHour MTBF
- Avail. With Right Angle Pins

### Electrical Specifications

Specifications typical @ +25 °C, 230 VAC input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

**Input**

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Range | | 85 | | 305 | VAC |
| | | 100 | | 430 | VDC |
| Input Frequency | | 47 | | 63 | Hz |
| Input Current | See Model Selection Guide | | | | |
| Leakage Current | 277 VAC/50 Hz | | | 0.25 | mA rms |
| Inrush Current | 115 VAC | | 18.0 | | A Pk |
| | 230 VAC | | 35.0 | | |

**Output**

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Output Voltage Accuracy, See Note 2 | 3.3 VOUT | | ±3.0 | | % |
| | All Other Outputs | | ±2.0 | | |
| Line Regulation | See Note 3 | | ±0.5 | | % |
| Load Regulation, IOUT = 0% to 100% | 3.3 VOUT | | ±2.0 | | % |
| | 5.0 VOUT | | ±1.5 | | |
| | All Other Outputs | | ±1.0 | | |
| Ripple & Noise (20 MHz) | See Note 4 | | 80 | 150 | mV P-P |
| Hold-Up Time | 115 VAC | | 10 | | msec |
| | 230 VAC | | 40 | | |
| Standby Power Consumption | 230 VAC | | 0.10 | 0.25 | W |
| Temperature Coefficient | | | ±0.02 | | %/°C |
| Over Current Protection | Autorecovery | 110 | | | %IOUT |
| Over Voltage Protection | See Model Selection Guide | | | | |
| Short Circuit Protection, See Note 5 | Continuous (Autorecovery) | | | | |

**General**

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Isolation Voltage | Input to Output, 60 Sec | 3,000 | | | VAC |
| Switching Frequency | | | 65 | | kHz |

**Environmental**

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Operating Temp Range | Ambient | -40 | +25 | +85 | °C |
| Storage Temperature Range | | -40 | | +105 | °C |
| Cooling | Free Air Convection (See Derating Curve) | | | | |
| Humidity | RH, Non-condensing | | | 95 | % |

**Physical**

| | |
|---|---|
| Case Size | See Mechanical Drawings (Page 5) |
| Case Material | UL94-V0 |
| Weight | 0.387 Oz (11g) |

**Reliability Specifications**

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| MTBF | MIL HDBK 217F, 25°C, Gnd Benign | 1,000 | | | kHours |
| Lead Temperature, See Note 6 | Wave Solder | | | 260 | °C |
| | Hand Solder | | | 360 | |
| Safety Standards | UL/cUL 62368 recognition (UL certificate) | | | | |
| Safety Class | Class II (Reinforced Insulation) | | | | |

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## Model Selection Guide

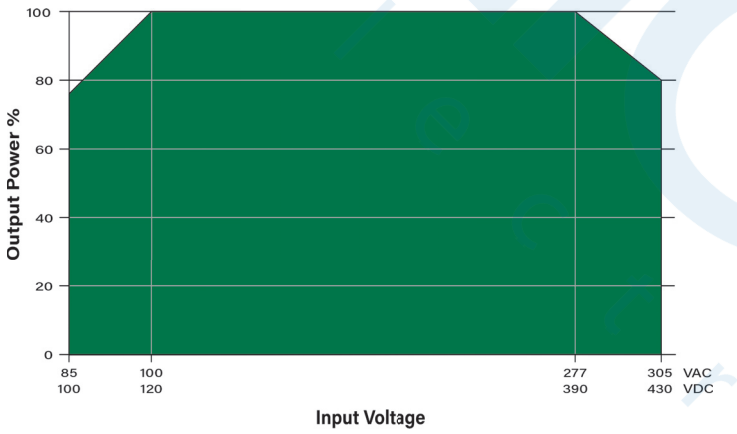


| Model Number | Input | | Output | | | Maximum Output Power (W) | Over Voltage Protection (VDC) | Capacitive Load (µF, Max) | Efficiency (See Note 1) | Fuse Rating Slow-Blow |
|---|---|---|---|---|---|---|---|---|---|---|
| | Current (A Max.) | | Voltage (VDC) | Current (A Max.) | Current (mA Min.) | | | | | |
| | 115 VAC | 230 VAC | | | | | | | | |
| MPL-15S-03EUP(F) | 0.40 | 0.25 | 3.3 | 3.000 | 0.0 | 9.90 | 9.0 | 20,000 | 75 | 1.0A/300 VAC |
| MPL-15S-05EUP(F) | 0.40 | 0.25 | 5.0 | 2.800 | 0.0 | 14.0 | 9.0 | 15,000 | 77 | 1.0A/300 VAC |
| MPL-15S-09EUP(F) | 0.40 | 0.25 | 9.0 | 1.670 | 0.0 | 15.0 | 12.0 | 5,000 | 82 | 1.0A/300 VAC |
| MPL-15S-12EUP(F) | 0.40 | 0.25 | 12.0 | 1.250 | 0.0 | 15.0 | 16.0 | 4,000 | 82 | 1.0A/300 VAC |
| MPL-15S-15EUP(F) | 0.40 | 0.25 | 15.0 | 1.000 | 0.0 | 15.0 | 20.0 | 2,000 | 84 | 1.0A/300 VAC |
| MPL-15S-24EUP(F) | 0.40 | 0.25 | 24.0 | 0.625 | 0.0 | 15.0 | 30.0 | 1,000 | 85 | 1.0A/300 VAC |

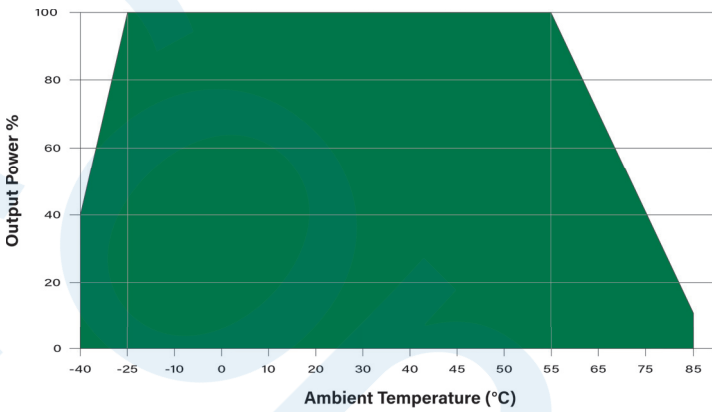
**Notes:**

1. Efficiency is specified as typical with a 230 VAC input.
2. Output voltage accuracy is specified for a load range of 0% to 100%.
3. Line regulation is measured at full load for VIN = MIN to MAX.
4. When measuring output ripple, it is recommended that an external 0.1 µF high frequency ceramic capacitor be placed in parallel with a 47 µF high frequency electrolytic capacitor from the +VOUT pin to the -VOUT pin.
5. Output short circuit protection is provided by a "hiccup mode" circuit. The unit recovers automatically when the fault condition is removed.
6. Lead temperature is specified for 5 to 10 seconds for wave soldering with a tolerance of ±5 °C. For manual soldering it is specified for 3 to 5 seconds with a tolerance of ±10 °C.
7. External components are required to meet specifications. See notes on the typical connection diagrams for more information.
8. Operation at no load will not damage the units, however, they may not meet all specifications.
9. The **MPL-15SEUP** series may make an audible noise when operated under light load conditions. This does not affect the product operation or reliability.
10. It is always recommended that a fuse be used on the input of a power supply for protection. For the **MPL-15SEUP** series, a 1.0A/300 VAC slow blow should be used.
11. If the unit is used in an application subject to high vibration levels, it should be glued down or otherwise fixed to the board.
12. The **MPL-15SEUP** series is available with the pins factory set to a 90° angle (see mechanical diagrams on page 3). To order units with the modified pins, just add an "F" to the product model number (i.e. **MPL-15S-12EUPF**).
13. Since this part is open frame, a safety distance of 6.4 mm minimum is required between external primary and secondary compnents.

## Input Voltage Derating Curve




## Temperature Derating Curve, 85 - 305 VAC, 70 - 430 VDC




## EMI Characteristics

| Parameter | Standard | Criteria | Level |
|---|---|---|---|
| Radiated Emissions, See Note 1 | EN 55032 | | Class B |
| Conducted Emissions, See Note 1 | EN 55032 | | Class B |
| ESD | EN 61000-4-2 | B | ±6 kV Contact |
| RS, See Note 2 | EN 61000-4-3 | A | 10V/m |
| EFT, See Note 3 | EN 61000-4-4 | B | ±2 kV |
| | | B | ±4 kV |
| Surge, See Note 4 | EN 61000-4-5 | B | ±1 kV L-L |
| | | | ±2 kV L-L |
| | | | ±4 kV L-L |
| CS, See Note 5 | EN 61000-4-6 | A | 10 Vrms |
| Voltage Dips, See Note 5 | EN 61000-4-11 | B | 0% - 70% |

**Notes:**

1. All units will meet EN 55032 (CE/RE) class A or class B with the input circuits shown in the "Typical Connection" diagrams on pages 3 and 4. **MPD** offers filter modules that will save on board space and make the input filter design easier. Contact the factory for more information.
2. To meet the requirements of EN 61000-4-3, (10V/m) external filtering, as shown in the "Typical Connection" diagrams on pages 3 and 4 is required. This filtering may be added discretely, or by using a filter module from **MPD**. Contact the factory for more information.
3. All units will meet EN 61000-4-4 (±2 kV) with the input circuits No 1 (page 3) and No 3 (page 4). To meet the requirements of EN 61000-4-4 (±4 kV), external components as shown in the input circuits No 2 (page 3) and No 4 (page 4) is required. This filtering may be added discretely, or by using a filter module from MPD. Contact the factory for more information.
4. All units will meet the requirements of EN 61000-4-5 (±1 kV line to line) with the input circuits No 1 (page 3) and No 3 (page 4). To meet the requirements of EN 61000-4-5 (±2 kV), external components as shown in the input circuits No 2 (on page 3) and No 4 (page 4) is required. With the input circuit No 4, EN 61000-4-5 (±4 kV line to line) can be achieved. This filtering may be added discretely, or by using a filter module from MPD. Contact the factory for more information.
5. All units will meet the requirements of EN 61000-4-6 (10V rms) and EN 61000-4-11 with the input circuits No 3 and No 4 on page 4. This filtering may be added discretely, or by using a filter module from MPD. Contact the factory for more information.

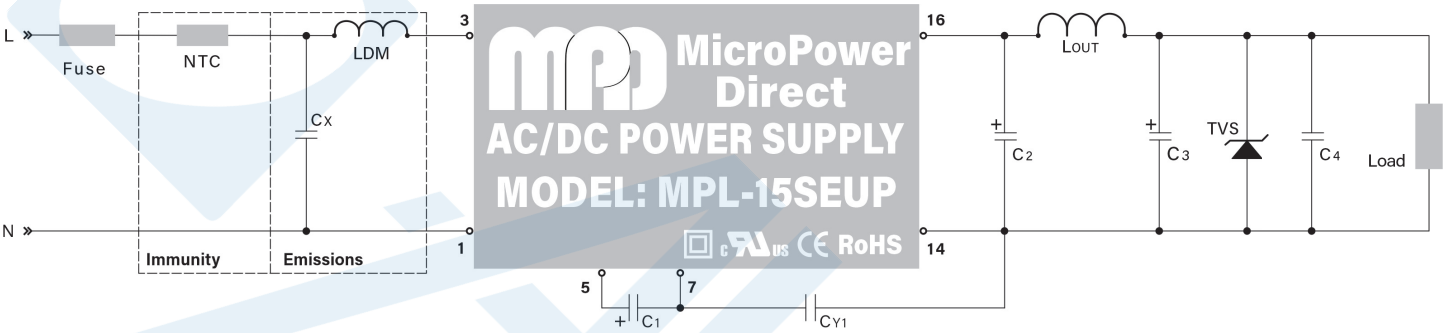
## Typical Applications



| Typical Connection | Environment | Industry | Input Voltage Range | Environment Temperature | Emissions | Immunity |
|---|---|---|---|---|---|---|
| No 1 | General | | 85 ~ 305 VAC | -40°C - +85°C | Class A | Class III |
| No 2 | Outdoor General | Video Monitoring, ITS, Charging Point, Communications, Security & Protection | 85 ~ 305 VAC | -40°C - +85°C | Class A | Class IV |

## Typical Connection 1: Basic Application

| Application Environment | Ambient Temperature Range | Emissions | Immunity |
|---|---|---|---|
| General | -40°C - +85°C | Class A | Class III |



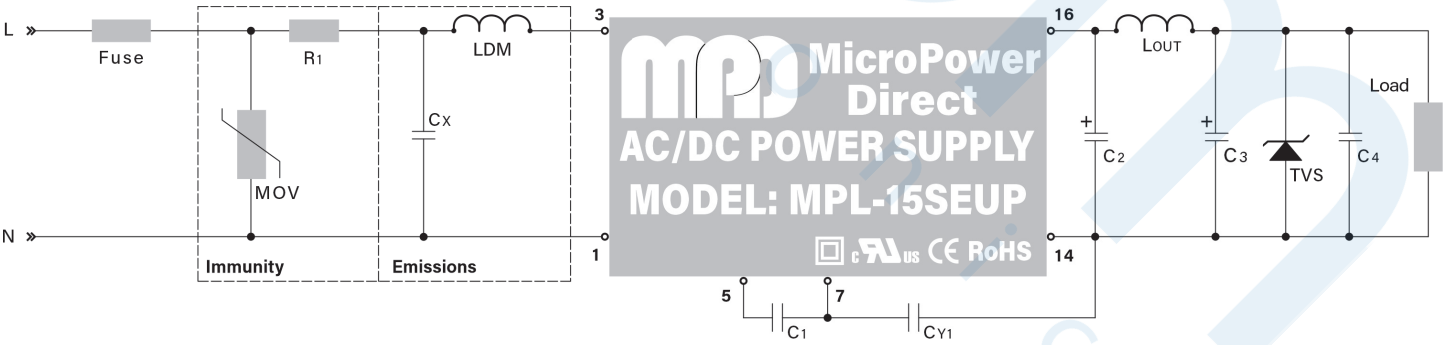

The diagram above illustrates a basic connection of the **MPL-15SEUP** series. The recommended components are given in the table below.

| Model Number | External Components | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fuse (Required) | NTC | LDM | CX | C1 (Required) | CY1 (Required) | C2 (Required) | LOUT (Required) | C3 (Required) | TVS | C4 |
| MPL-15S-03EUP(F) | 1A/300V Slow-Blow | 10D-10 | 1.2 mH Max 1Ω Min 0.4A | 0.22 μF 310 VAC | 33 μF 450 VAC | 2.2 nF 400 VAC | 470 μF/16V Solid Capacitor | 4.7 μH Max 22 mΩ | 220 μF 16V | SMBJ7.0A | 0.1 μF 50V |
| MPL-15S-05EUP(F) | | | | | | | | | | SMBJ12A | |
| MPL-15S-09EUP(F) | | | | | | | | | | SMBJ20A | |
| MPL-15S-12EUP(F) | | | | | | | | | | | |
| MPL-15S-15EUP(F) | | | | | | | 680 μF/25V | | 220 μF 35V | | |
| MPL-15S-24EUP(F) | | | | | | | 470 μF/35V | | | SMBJ30A | |

**Notes:** Capacitor C3 is a high frequency, low ESR electrolytic. Capacitor C4 is ceramic. The TVS should have a rating of at least 1.2 times the output voltage.

## Typical Connection 2: For Outdoor/General Environment Applications

| Application Environment | Ambient Temperature Range | Emissions | Immunity |
|---|---|---|---|
| Outdoor General | -40°C - +85°C | Class A | Class IV |




The diagram above illustrates a typical connection of the **MPL-15SEUP** series for outdoor environments. The recommended input components are given in the table below.

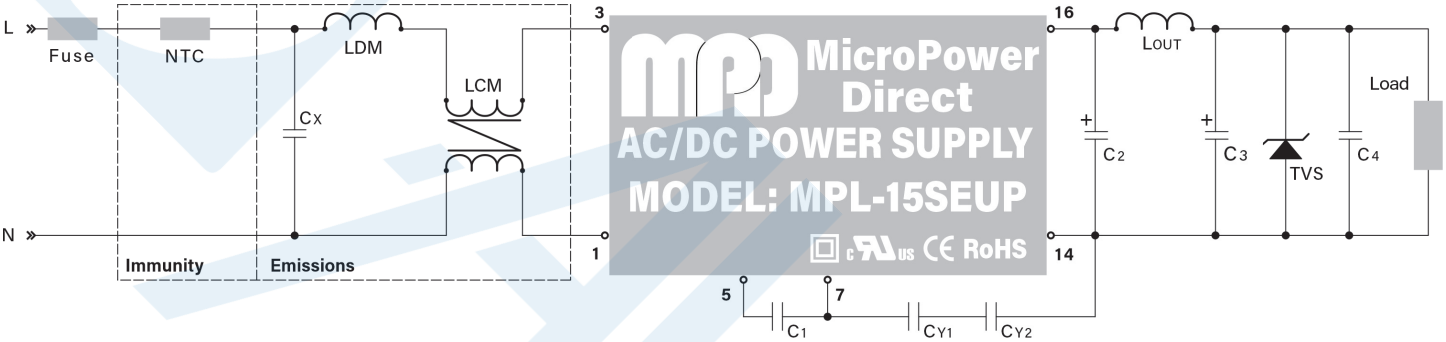
| Outdoor General | External Components | | | | | | |
|---|---|---|---|---|---|---|---|
| | Fuse | MOV | R1 | LDM | CX | CY1 | Output Components |
| All Models | 2A/300V (Slow-Blow) | S14K350 | 12Ω/3W | 1.2 mH Max 4Ω Min 0.4A | 0.1 μF 310V | 2.2 nF 400 VAC | See Typical Connection 1 (Above) |

## Typical Applications

| Typical Connection | Environment | Industry | Input Voltage Range | Environment Temperature | Emissions | Immunity |
|---|---|---|---|---|---|---|
| No 3 | Indoor Civil | Smart Home/ Home Appliances | 85 ~ 305 VAC | -25°C - +55°C | Class B | Class III |
| No 4 | Indoor Industrial | Manufacturing | 85 ~ 305 VAC | -25°C - +55°C | Class B | Class IV |

## Typical Connection 3: For Indoor Civil Environment Applications

| Application Environment | Ambient Temperature Range | Emissions | Immunity |
|---|---|---|---|
| Indoor General | -25°C - +55°C | Class B | Class III |
| Indoor Civil | -25°C - +55°C | Class B | Class III |

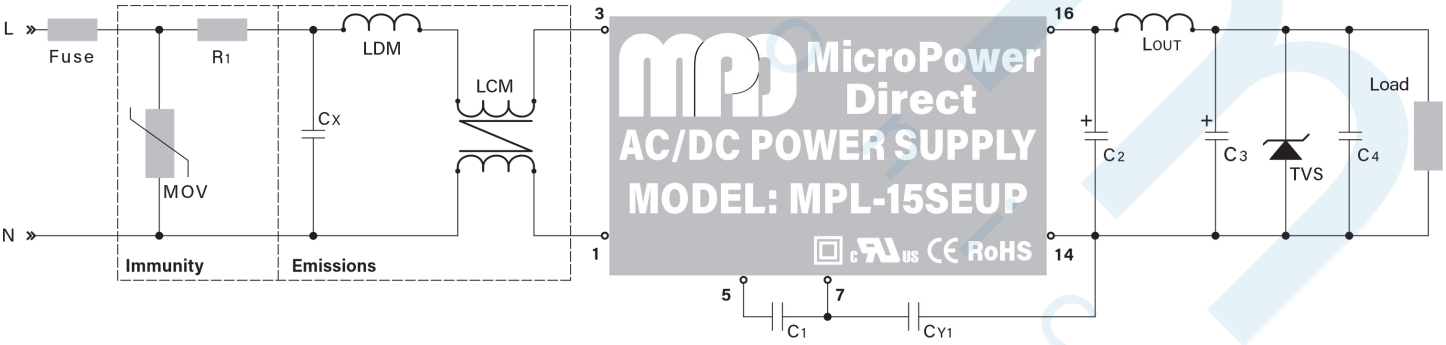



The diagram above illustrates a typical connection of the **MPL-15SEUP** series for general indoor environments. The recommended components are given in the table below. If the application does not require operation to EN 60335, $C_{Y2}$ is not needed. For information on output components, see page 3.

| | External Components | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indoor General** | **Fuse** | **NTC** | **$C_X$** | **LDM** | **LCM** | **$C_1$** | **$C_{Y1}$** | **$C_{Y2}$** | **Output Components** |
| **All Models** | 1A/300V (Slow-Blow) | 10D-10 | 0.22 µF 310 VAC | 0.33 mH Max 1Ω Min 0.4A | 10 mH Max 600 mΩ Min 0.4A | 33 µF 450 VAC | 2.2 nF 400 VAC | - - - | See Typ Connection 1 (Page 3) |
| **Indoor: EN 60335** | **Fuse** | **NTC** | **$C_X$** | **LDM** | **LCM** | **$C_1$** | **$C_{Y1}$** | **$C_{Y2}$** | **Output Components** |
| **All Models** | 1A/300V (Slow-Blow) | 10D-10 | 0.22 µF 310 VAC | 0.33 mH Max 1Ω Min 0.4A | 10 mH Max 600 mΩ Min 0.4A | 33 µF 450 VAC | 2.2 nF 400 VAC | 2.2 nF 400 VAC | See Typ Connection 1 (Page 3) |

## Typical Connection 4: For Indoor Industrial Environment Applications

| Application Environment | Ambient Temperature Range | Emissions | Immunity |
|---|---|---|---|
| Indoor Industrial | -25°C - +55°C | Class B | Class IV |

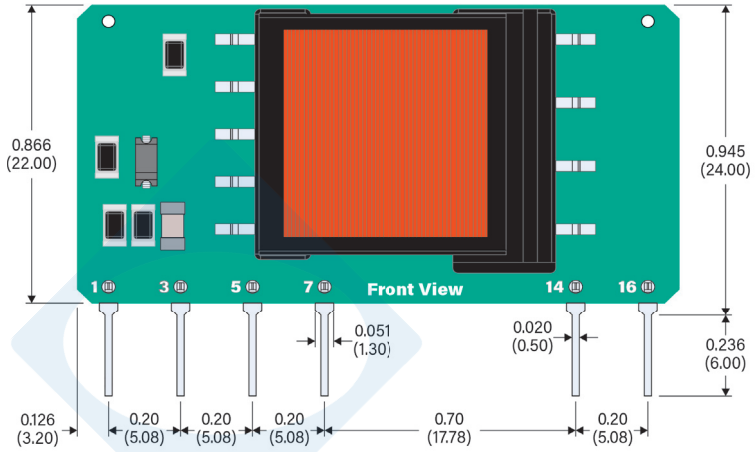


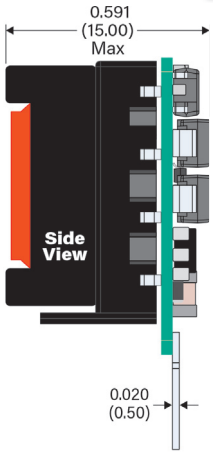

The diagram above illustrates a typical connection of the **MPL-15SEUP** series for indoor industrial environments. The recommended input components are given in the table below. For information on output components, see page 3.

| | External Components | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indoor Industrial** | **Fuse** | **MOV** | **$R_1$** | **$C_X$** | **LDM** | **LCM** | **$C_1$** | **$C_{Y1}$** | **Output Components** |
| **All Models** | 2A/300V (Slow-Blow) | S14K350 | 12Ω/3W | 0.22 µF 310 VAC | 1.2 mH Max 4Ω Min 0.4A | 10 mH Max 600 mΩ Min 0.4A | 33 µF 450 VAC | 2.2 nF 400 VAC | See Typ Connection 1 (Page 3) |

## Mechanical Dimensions





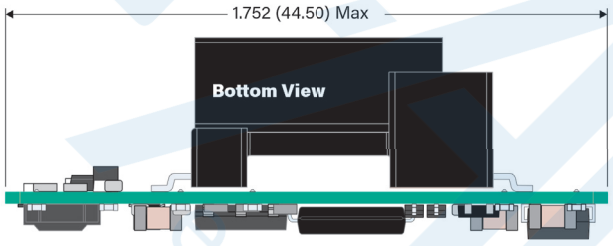




## Pin Connections

| Pin | Function |
|---|---|
| 1 | AC-Neutral |
| 3 | AC-Line |
| 5 | +VCAP |
| 7 | -VCAP |
| 14 | -VOUT |
| 16 | +VOUT |

**Notes:**

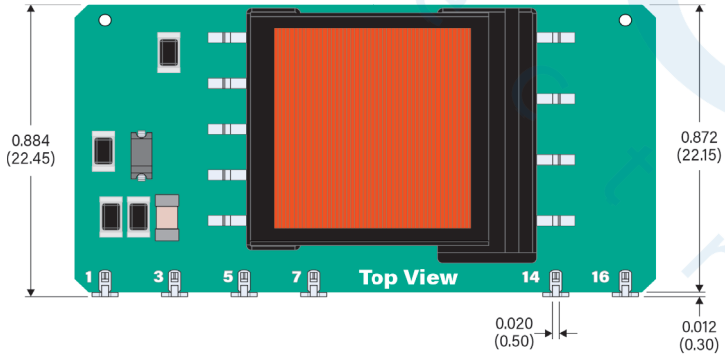
- All dimensions are typical in inches (mm)
- General Tolerance x.xx = ±0.02 (±0.50)
- Pin Tolerance x.xxx = ±0.004 (±0.10)
- Recommended pin hole size (on the application PC Board) is Ø 0.039 (Ø1.00)




## Primary/Secondary Separation


To meet safety requirements, it is required that the separation between any external components in the primary circuit and components in the secondary circuit be ≥6.4 mm. This diagram shows the approximate positioning of the primary/secondary circuits. For more information, please contact the factory.

## Mechanical Dimensions: Right Angle (F) Models

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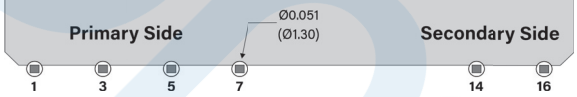


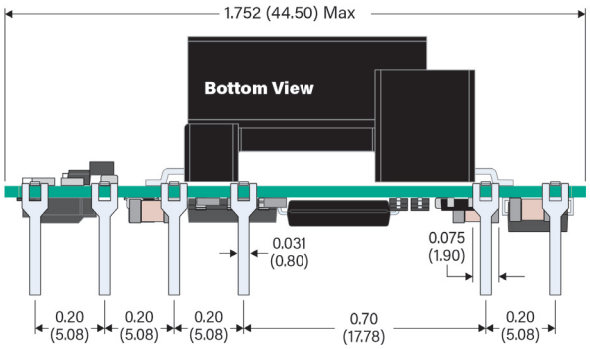


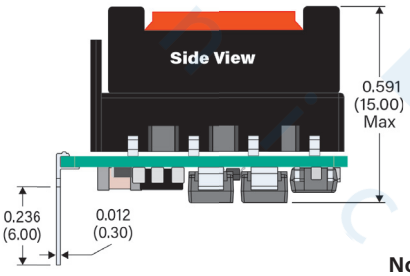


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| Pin | Function |
|---|---|
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| 3 | AC-Line |
| 5 | +VCAP |
| 7 | -VCAP |
| 14 | -VOUT |
| 16 | +VOUT |

**Notes:**

- All dimensions are typical in inches (mm)
- General Tolerance x.xx = ±0.02 (±0.50)
- Pin Tolerance x.xxx = ±0.004 (±0.10)
- Recommended pin hole size (on the application PC Board) is Ø 0.051 (Ø1.30)

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