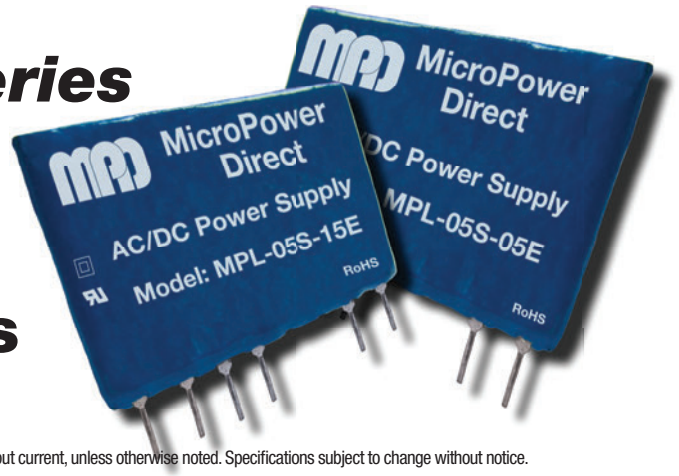


# MPL-05SE Series

## Single Output, 5W Ultra-Miniature SIP AC/DC Power Supplies



### Key Features:

- 5W Output Power
- Universal 85-264 VAC Input
- EN 60950 Approved (UL)
- Meets IEC Safety Class II
- Single Regulated Output
- Meets EN 55022 Class A
- >300 kHour MTBF
- **Ultra-Miniature "SIP" Case**



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### 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   |      | 264  | VAC   |
|                     |            | 100  |      | 400  | VDC   |
| Input Frequency     |            | 47   |      | 63   | Hz    |
| Input Current       | 115 VAC    |      | 0.15 |      | A     |
|                     | 230 VAC    |      | 0.20 |      | A     |
| Inrush Current      | 115 VAC    |      | 20.0 |      | A Pk  |
|                     | 230 VAC    |      | 30.0 |      | A Pk  |
| Leakage Current     |            |      |      | 5.0  | mA    |

#### Output

| Parameter                | Conditions                     | Min. | Typ.  | Max. | Units  |
|--------------------------|--------------------------------|------|-------|------|--------|
| Output Voltage           | See Model Selection Guide      |      |       |      |        |
| Output Current           | See Model Selection Guide      |      |       |      |        |
| Output Voltage Accuracy  | See Model Selection Guide      |      |       |      |        |
| Line Regulation          | V <sub>IN</sub> = Min to Max   |      | ±0.5  |      | %      |
| Load Regulation          | I <sub>OUT</sub> = 10% to 100% |      | ±1.5  |      | %      |
| Ripple & Noise (20 MHz)  | 3.3V, 24V Models               |      | 50    | 150  | mV P-P |
|                          | All Other Models               |      | 50    | 120  | mV P-P |
| Hold-Up Time             | 115 VAC                        |      | 20    |      | mSec   |
|                          | 230 VAC                        |      | 80    |      | mSec   |
| Temperature Coefficient  |                                |      | ±0.15 |      | %/°C   |
| Short Circuit Protection | Continuous (Autorecovery)      |      |       |      |        |

#### General

| Parameter           | Conditions      | Min.  | Typ. | Max. | Units |
|---------------------|-----------------|-------|------|------|-------|
| Isolation Voltage   | Input to Output | 3,000 |      |      | VAC   |
| Switching Frequency |                 |       | 100  |      | kHz   |

#### EMI Characteristics

| Parameter           | Standard                | Min. | Typ. | Max. | Units                     |
|---------------------|-------------------------|------|------|------|---------------------------|
| Radiated Emissions  | See Note 2 EN 55022     |      |      |      | Class A                   |
| Conducted Emissions | See Note 2 EN 55022     |      |      |      | Class A                   |
| ESD                 | EN 61000-4-2            |      |      |      | Criteria B; ±4 kV Contact |
| RS                  | EN 61000-4-3            |      |      |      | Criteria A; 10V/m         |
| EFT                 | See Note 3 EN 61000-4-4 |      |      |      | Criteria B; ±2 kV         |
| Surge               | See Note 4 EN 61000-4-5 |      |      |      | Criteria B; ±2 kV / ±4 kV |
| CS                  | EN 61000-4-6            |      |      |      | Criteria A; 3 Vrms        |
| PFMF                | EN 61000-4-8            |      |      |      | Criteria A; 10A/m         |
| Voltage Dips        | EN 61000-4-11           |      |      |      | Criteria B; 0% - 70%      |

#### Environmental

| Parameter                   | Conditions                               | Min. | Typ. | Max. | Units |
|-----------------------------|--|------|------|------|-------|
| Operating Temperature Range | Ambient                                  | -25  | +25  | +85  | °C    |
|                             | Case                                     |      |      | +100 | °C    |
| Storage Temperature Range   |  | -40  |      | +105 | °C    |
| Cooling                     | Free Air Convection (See Derating Curve) |      |      |      |       |
| Humidity                    | RH, Non-condensing                       |      |      | 85   | %     |

#### Physical

|               |   |
|---------------|---|
| Case Size     | 1.65 x 0.43 x 1.06 Inches (42.0 x 11.0 x 27.0 mm) |
| Case Material | Non-Conductive Epoxy (UL94-V0)                    |
| Weight        | 0.35 Oz (10g)                                     |

#### Reliability Specifications

| Parameter        | Conditions                      | Min. | Typ. | Max. | Units  |
|------------------|---------------------------------|------|------|------|--------|
| MTBF             | MIL HDBK 217F, 25°C, Gnd Benign | 300  |      |      | kHours |
| Safety Standards | EN 60950                        |      |      |      |        |
| Safety Class     | IEC 61140 Class II              |      |      |      |        |

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## Model Selection Guide

| Model Number | Output        |                   | Output Voltage Accuracy (%) | Max Capacitive Load ( $\mu$ F) | Efficiency (% , Typ) |
|--------------|---------------|-------------------|-----------------------------|--------------------------------|----------------------|
|              | Voltage (VDC) | Current (mA Max.) |                             |                                |                      |
| MPL-05S-03E  | 3.3           | 1,000             | $\pm$ 2.0                   | 1,000                          | 65                   |
| MPL-05S-05E  | 5.0           | 1,000             | $\pm$ 1.0                   | 1,500                          | 70                   |
| MPL-05S-09E  | 9.0           | 560               | $\pm$ 1.0                   | 630                            | 72                   |
| MPL-05S-12E  | 12.0          | 420               | $\pm$ 1.0                   | 470                            | 74                   |
| MPL-05S-15E  | 15.0          | 340               | $\pm$ 1.0                   | 330                            | 75                   |
| MPL-05S-24E  | 24.0          | 210               | $\pm$ 1.0                   | 100                            | 75                   |

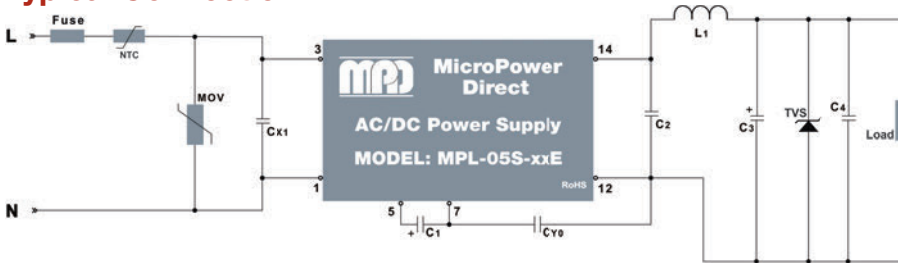
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### Notes:

1. Operation at no load will not damage the units, however, they may not meet all specifications.
2. All units are rated for EN 55022 (CE/RE) class A with the addition of external components such as the typical circuit shown below. They will meet class B with the addition of the **ACFM-01** (or a similar discrete filter circuit). Contact the factory for more information.
3. To meet the requirements of EN 61000-4-4 ( $\pm$ 4 kV), external components are needed. This can be done discretely, or with the addition of the **ACFM-01**. Contact the factory for more information.
4. To meet the requirements of EN 61000-4-5 ( $\pm$ 4 kV/ $\pm$ 4 kV), external components are needed. This can be done discretely, or with the addition of the **ACFM-01**. Contact the factory for more information.
5. It is recommended that a fuse be used on the input of a power supply for protection. For the **MPL-05SE** series, a 1.0A/250 VAC slow blow should be used.

## Typical Connection

The diagram below illustrates a typical application connection of the **MPL-05SE** series. Notes on this circuit (starting with the input circuit) are:



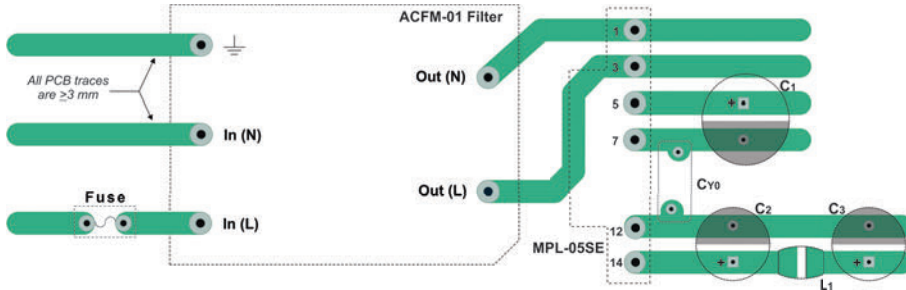
1. It is recommended that an external fuse and NTC be used. The recommended fuse is a 1.0A/250V slow blow and for the NTC, a 5D-9.
2. An external MOV is recommended on the input to protect the unit in the event of a surge. A 561KD14 or equivalent is recommended.
3. The filter capacitor C1 is required for specified operation. The recommended value is 33  $\mu$ F/400V.
4. The safety capacitors (Cx1 and Cx0) provide EMI/RFI suppression. Recommended values are 0.22  $\mu$ F/275 VAC (Cx1) and 1 nF/400 VAC (Cx0).
5. Recommended values for other components are:

| Output | C2              | L1           | C3              | C4         | TVS      |
|--------|-----------------|--------------|-----------------|------------|----------|
| 3.3V   | 470 $\mu$ F/16V | 0.47 $\mu$ H | 150 $\mu$ F/35V | 100 nF/50V | SMBJ7.0A |
| 5.0V   | 470 $\mu$ F/16V | 0.47 $\mu$ H | 150 $\mu$ F/35V | 100 nF/50V | SMBJ7.0A |
| 9.0V   | 330 $\mu$ F/35V | 1.0 $\mu$ H  | 150 $\mu$ F/35V | 100 nF/50V | SMBJ12A  |
| 12V    | 330 $\mu$ F/35V | 1.0 $\mu$ H  | 150 $\mu$ F/35V | 100 nF/50V | SMBJ20A  |
| 15V    | 330 $\mu$ F/35V | 1.0 $\mu$ H  | 150 $\mu$ F/35V | 100 nF/50V | SMBJ20A  |
| 24V    | 100 $\mu$ F/35V | 4.7 $\mu$ H  | 47 $\mu$ F/35V  | 100 nF/50V | SMBJ30A  |

The output filtering capacitors (C2, C3) are high frequency, low resistance electrolytic capacitors. Capacitor (C4) is ceramic. Voltage derating of capacitors should be 80% or above.

6. Input noise and surge suppression modules are available for a number of MPD AC/DC power supplies. An **MPL-05SE** connection with the **ACFM-01** is illustrated in the diagram at left. For pricing or full technical information on these modules (**ACFM-01** and **ACFM-02**) please contact the factory.

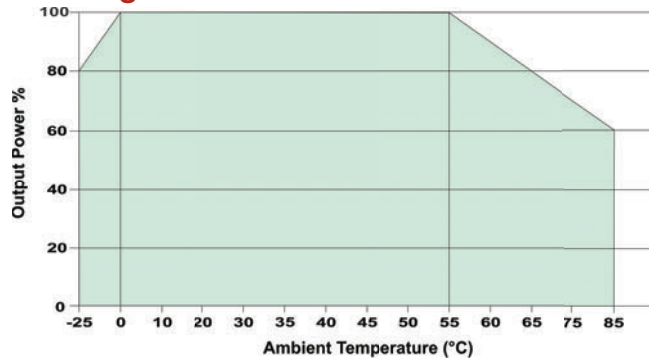
## Typical Board Layout: With ACFM-01 Input Module (See note 6)



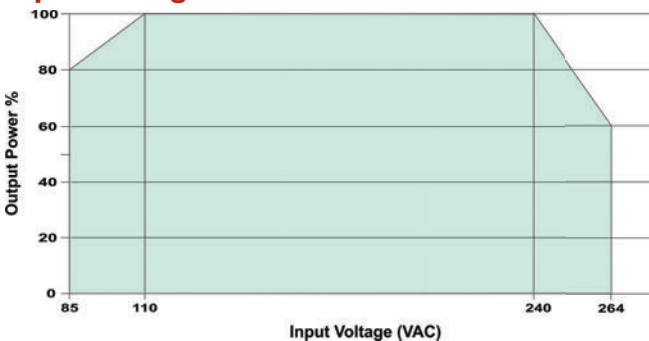
## Pin Connections

| Pin | Function   | Pin | Function |
|-----|------------|-----|----------|
| 1   | AC-Neutral | 7   | -VCAP    |
| 3   | AC-Line    | 12  | -VOUT    |
| 5   | +VCAP      | 14  | +VOUT    |

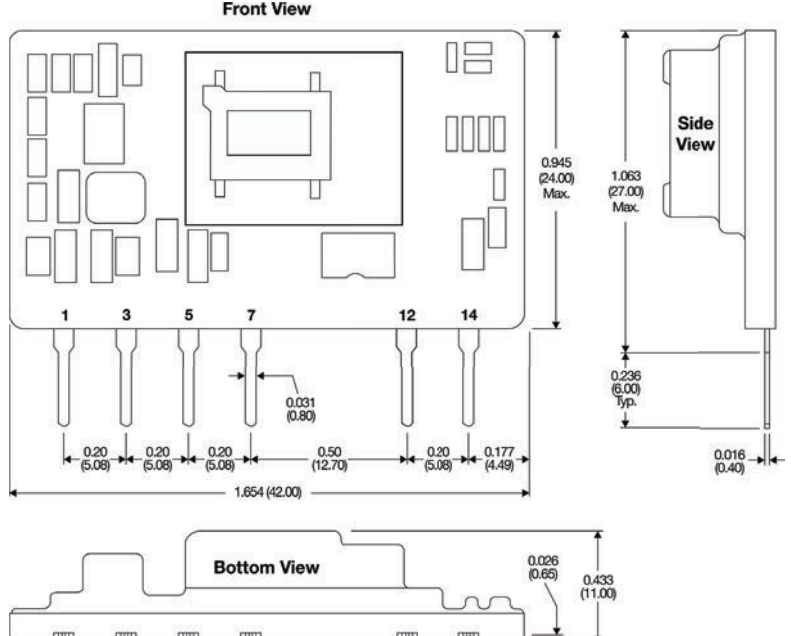
## Derating Curve



## Input Voltage Vs Load



## Mechanical Dimensions



### Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx =  $\pm$ 0.02 ( $\pm$ 0.50)



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