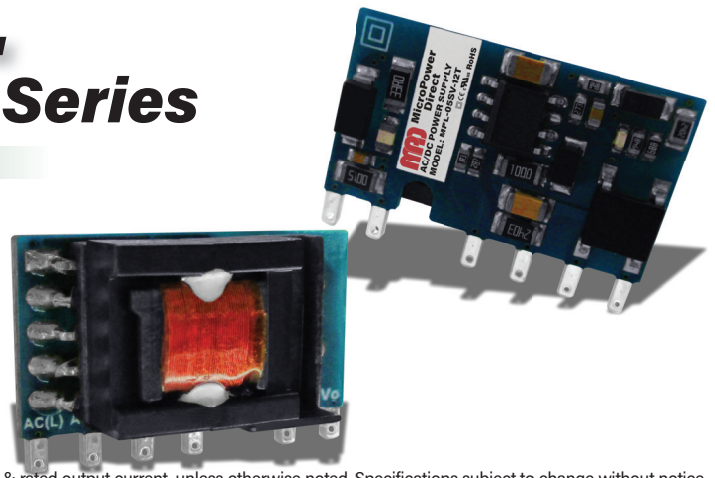


MPL-05SVT Series

Miniature, Wide Input Single Output, 5W, SIP AC/DC Power Supplies



Key Features:

- 5W Output Power
- Open, Ultra-Miniature SIP
- Universal 85-305 VAC Input
- EN 62368 Approved
- Meets EN 60335
- Meets EN 61558
- Meets IEC Safety Class II
- Reinforced Insulation
- Meets EN 55032
- >1.0 MHour MTBF
- 0.1W No-Load Power



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W: www.micropowerdirect.com



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 | |
| | | 70 | | 430 | VDC | |
| Input Frequency | | 47 | | 63 | Hz | |
| Input Current | See Model Selection Guide | | | | | |
| Inrush Current | 115 VAC | | 20.0 | | A Pk | |
| | 230 VAC | | 40.0 | | | |

| Output | | | | | | |
|--------------------------------------|--------------------------------|------|-------|------|--------------------|--|
| Parameter | Conditions | Min. | Typ. | Max. | Units | |
| Output Voltage Accuracy | See Note 1 | | ±5.0 | | % | |
| Line Regulation | See Note 2 | | ±1.5 | | % | |
| Load Regulation | I _{OUT} = 10% to 100% | | ±3.0 | | % | |
| Ripple & Noise (20 MHz) | See Note 3 | | 80 | 150 | mV P-P | |
| Hold-Up Time | 115 VAC | | 8.0 | | msec | |
| | 230 VAC | | 40 | | | |
| Temperature Coefficient | | | ±0.15 | | % / °C | |
| Over Current Protection | Autorecovery | 110 | | | % I _{OUT} | |
| Standby Power Consumption | 230 VAC | | 0.10 | 0.15 | w | |
| Short Circuit Protection, See Note 4 | Continuous (Autorecovery) | | | | | |

| General | | | | | | |
|-----------------------|------------|-------|-------|------|-------|--|
| Parameter | Conditions | Min. | Typ. | Max. | Units | |
| Isolation Voltage | See Note 5 | 3,000 | | | VAC | |
| Isolation Resistance | 500 VDC | 50 | | | MΩ | |
| Isolation Capacitance | | | 1,000 | | pF | |
| Switching Frequency | See Note 6 | | 90 | | 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 | % | |

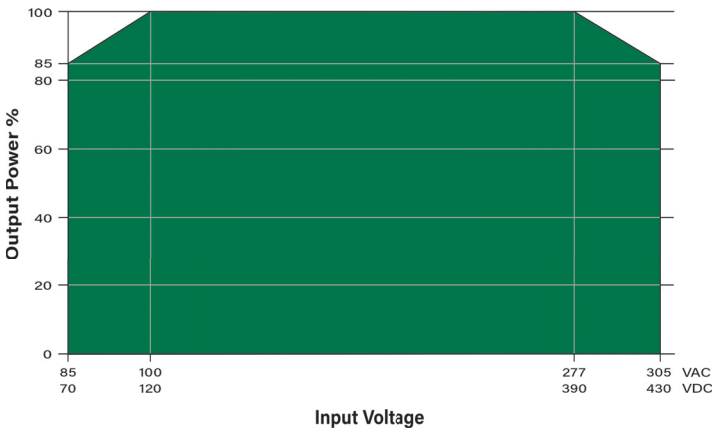
| Physical | | | | | | |
|---------------|----------------------------------|--|--|--|--|--|
| Case Size | See Mechanical Drawings (Page 6) | | | | | |
| Case Material | UL94-V0 | | | | | |
| Weight | See Mechanical Drawings (Page 6) | | | | | |

| Reliability Specifications | | | | | | |
|------------------------------|---|------|------|------|--------|--|
| Parameter | Conditions | Min. | Typ. | Max. | Units | |
| MTBF | MIL HDBK 217F, 25°C, Gnd Benign | 300 | | | kHours | |
| Lead Temperature, See Note 7 | Wave Solder | | | 260 | °C | |
| | Hand Solder | | | 360 | | |
| Safety Standards, See Note 8 | UL/cUL 62368 recognition (UL certificate) | | | | | |
| Safety Class | Class II (Reinforced Insulation) | | | | | |

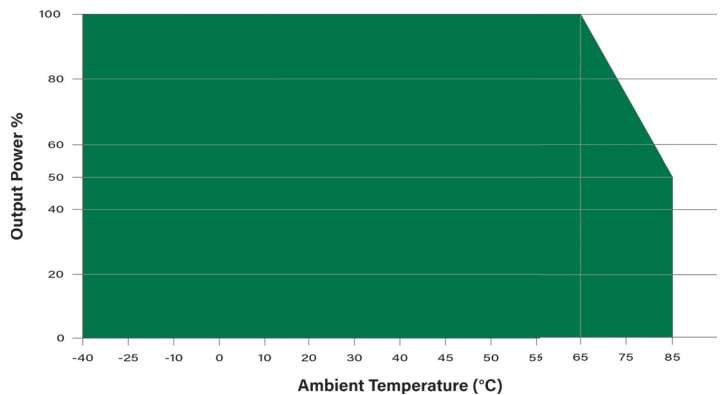
| Model Number | Input | | Output | | | Maximum Output Power (W) | Capacitive Load (μ F, Max) | Efficiency (See Note 9) | Fuse Rating Slow-Blow (See Note 10) |
|--------------|------------------|---------|---------------|-------------------|-------------------|--------------------------|---------------------------------|-------------------------|-------------------------------------|
| | Current (A Max.) | | Voltage (VDC) | Current (mA Max.) | Current (mA Min.) | | | | |
| | 115 VAC | 277 VAC | | | | | | | |
| MPL-05SV-03T | 0.20 | 0.10 | 3.3 | 1,000 | 100.0 | 3.30 | 2,200 | 69 | 1.0A/300 VAC |
| MPL-05SV-05T | 0.20 | 0.10 | 5.0 | 1,000 | 100.0 | 5.00 | 1,500 | 76 | 1.0A/300 VAC |
| MPL-05SV-09T | 0.20 | 0.10 | 9.0 | 560 | 56.0 | 5.00 | 680 | 77 | 1.0A/300 VAC |
| MPL-05SV-12T | 0.20 | 0.10 | 12.0 | 420 | 42.0 | 5.00 | 470 | 79 | 1.0A/300 VAC |
| MPL-05SV-15T | 0.20 | 0.10 | 15.0 | 340 | 34.0 | 5.00 | 330 | 79 | 1.0A/300 VAC |
| MPL-05SV-24T | 0.20 | 0.10 | 24.0 | 210 | 21.0 | 5.00 | 100 | 81 | 1.0A/300 VAC |

- Notes:**
- Output voltage accuracy is specified for a load range of 10% to 100%.
 - Line regulation is measured at full load for $V_{IN} = MIN$ to MAX .
 - When measuring output ripple, it is recommended that an external 0.1 μ F high frequency ceramic capacitor be placed in parallel with a 47 μ F high frequency electrolytic capacitor from the +VOUT pin to the -VOUT pin. Specified for 10% to 100% load.
 - Output short circuit protection is provided by a "hiccup mode" circuit. The unit recovers automatically when the fault condition is removed.
 - Isolation is measured input to output for 60 seconds. Leakage current is <5 mA.
 - Switching frequency will vary with the product load from 10 kHz to 90 kHz.
 - Lead temperature is specified for 5 to 8 seconds for wave soldering with a tolerance of ± 5 $^{\circ}$ C. For manual soldering it is specified for 3 to 4 seconds with a tolerance of ± 10 $^{\circ}$ C.
 - To meet safety requirements, at least 6.4 mm creepage distance between primary & secondary external components is required. Please refer to the primary/secondary separation layout on page 6.
 - Efficiency is specified as typical with a 230 VAC input.
 - It is always recommended that a fuse be used on the input of a power supply for protection. For the **MPL-05SVT** series, a minimum 1.0A/300 VAC slow blow is required. The actual value is dependent upon the application.
 - External components are required to meet specifications. See notes on the typical connection diagrams for more information.
 - Operation at no load will not damage the units, however, they may not meet all specifications.
 - The **MPL-05SVT** series may make an audible noise when operated under light load conditions. This does not affect the product operation or reliability.
 - If the unit is used in an application subject to high vibration levels, it should be glued down or otherwise fixed to the board.

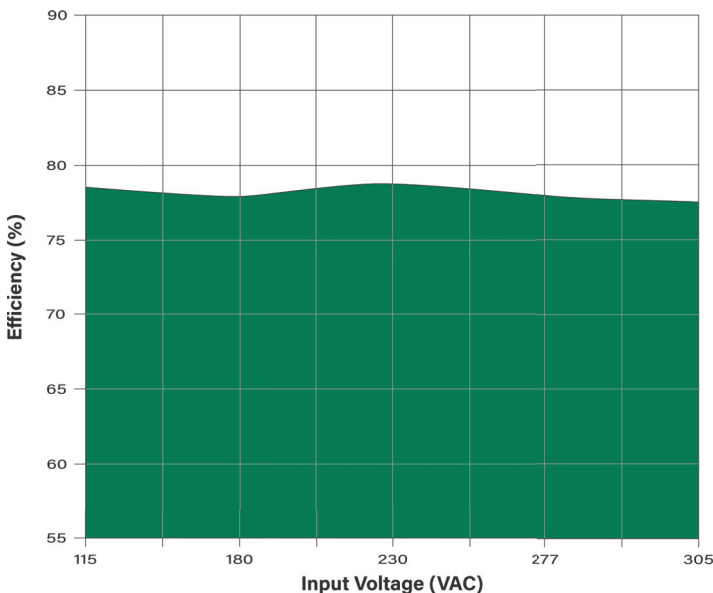
Input Voltage Derating Curve



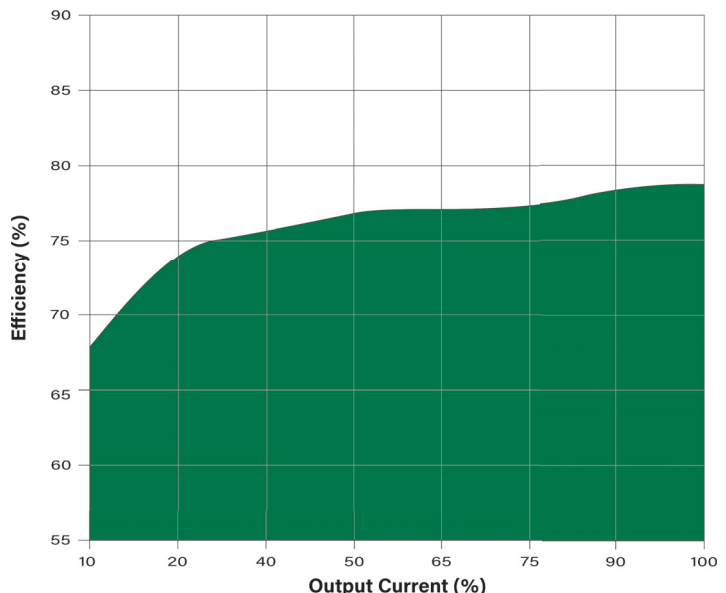
Temperature Derating Curve, 85 - 305 VAC, 70 - 430 VDC



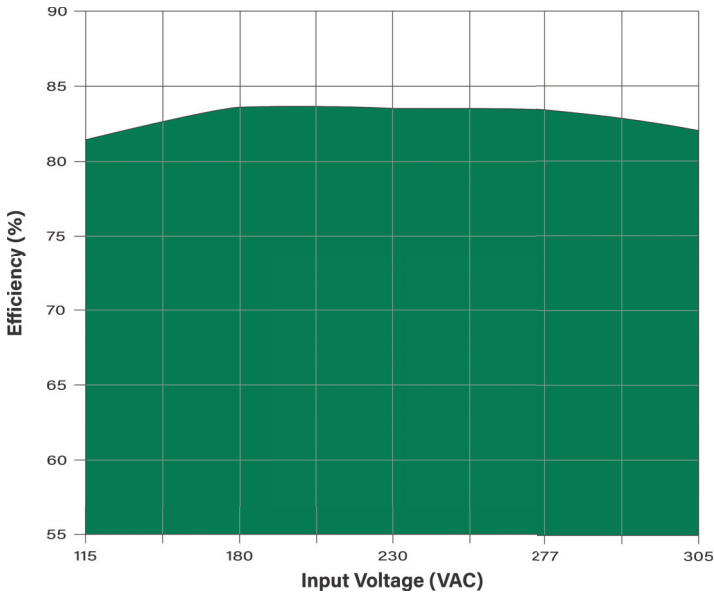
Efficiency vs Input Voltage: MPL-05SV-05T



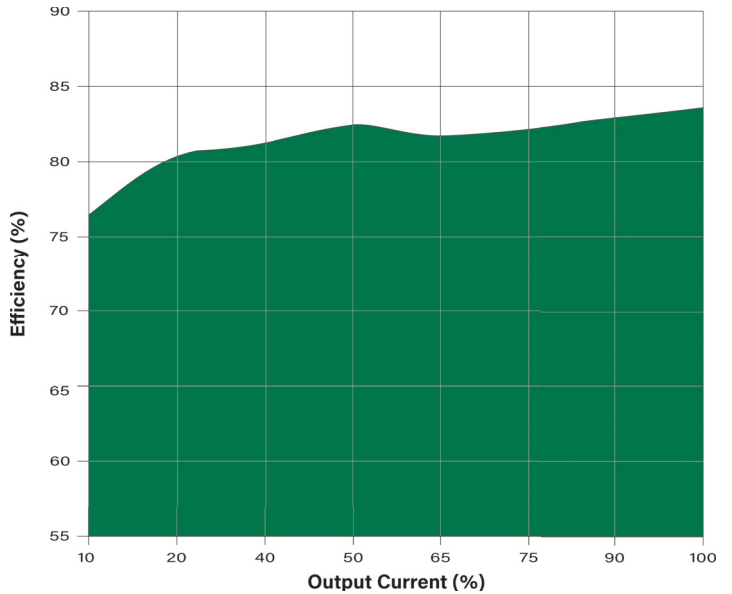
Efficiency vs Output Voltage: MPL-05SV-05T



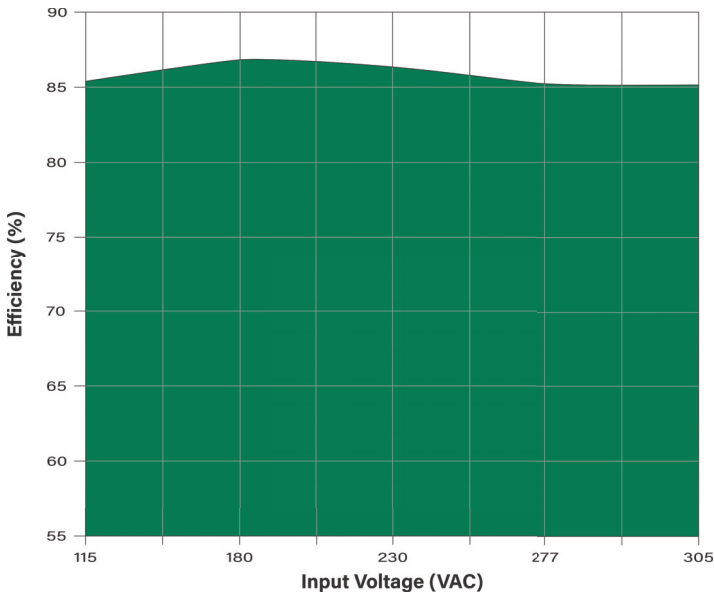
Efficiency vs Input Voltage: MPL-05SV-12T



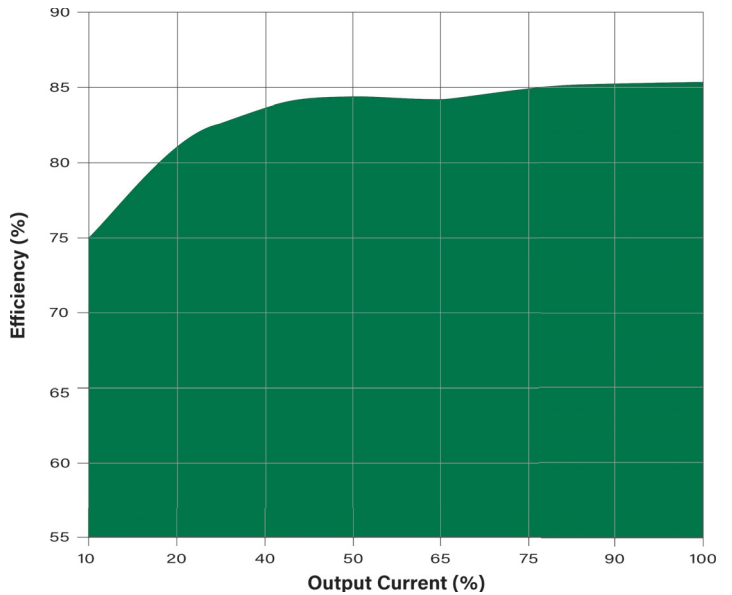
Efficiency vs Output Voltage: MPL-05SV-12T



Efficiency vs Input Voltage: MPL-05SV-24T



Efficiency vs Output Voltage: MPL-05SV-24T



EMI Characteristics

| Parameter | Standard | Criteria | Level |
|---------------------------------|---------------|----------|---------------|
| Radiated Emissions, See Note 1 | EN 55032 | | Class A |
| | | | Class B |
| Conducted Emissions, See Note 1 | EN 55032 | | Class A |
| | | | 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 |
| | | | ±4 kV |
| Surge, See Note 4 | EN 61000-4-5 | B | ±1 kV L-L |
| | | | ±2 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:

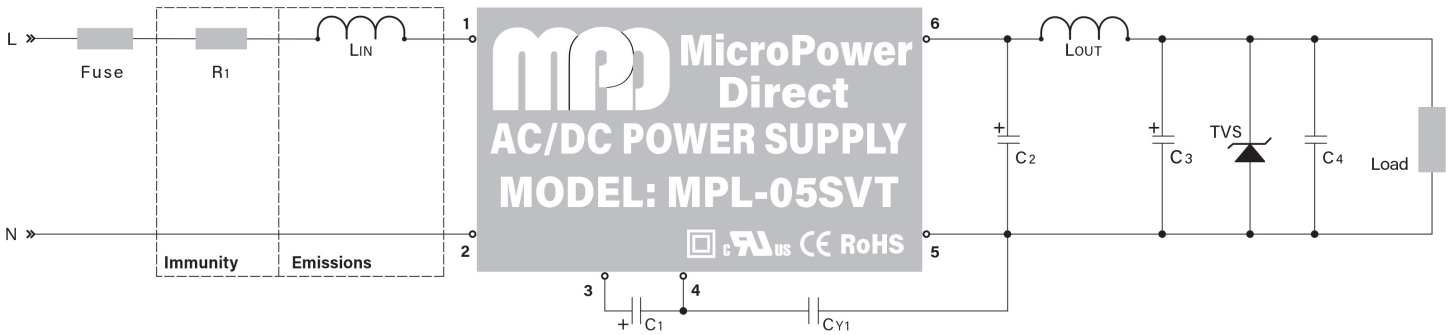
- All units will meet EN 55032 (CE/RE) class A (Typical Connection Circuits 1 and 2) or class B (Typical Connection Circuits 3 and 4) with the input circuits shown in the "Typical Connection" diagrams on page 4 and page 5. MPD offers filter modules that will save on board space and make the input filter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



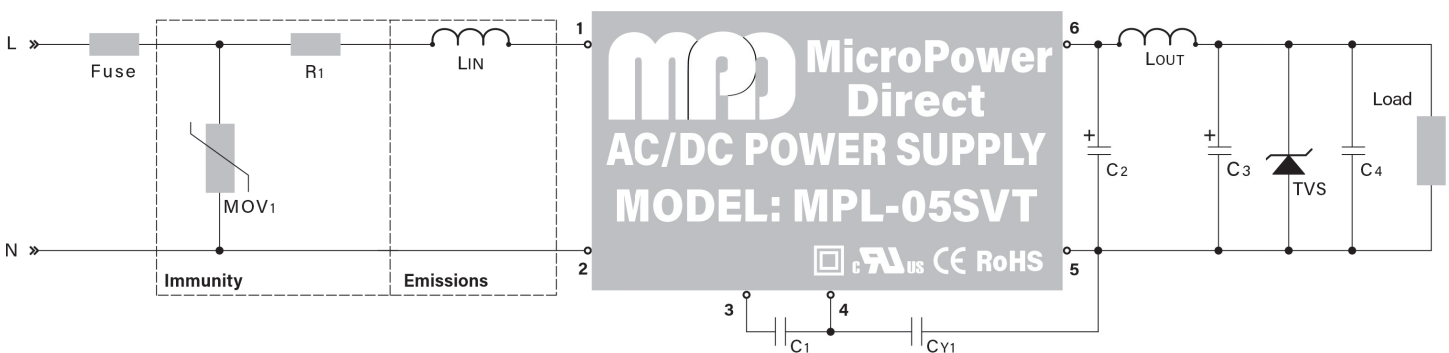
The diagram above illustrates a basic connection of the MPL-05SVT series. The recommended components are given in the table below.

| Model Number | External Components | | | | | | | | | | | |
|--------------|---------------------|---------------------|------------------------------|--|----------------|---------------|-------------------------------|---------------|----------|------------|-----------|---------|
| | Fuse (Required) | R1 (Required) | LIN | C1 (Required) | CY1 (Required) | C2 (Required) | LOUT (Required) | C3 (Required) | TVS | C4 | | |
| MPL-05SV-03T | 1A/300V (Slow-Blow) | 12Ω/3W (Wire-Wound) | 1.2 mH 4Ω Max 0.2A Min | 10 μF/450V (-25°C to +85°C, 85-305 VAC In) | 1 nF/400 VAC | 820 μF/6.3V | 4.7 μH (Max 60 mΩ) 2.2A | 100 μF/35V | SMBJ7.0A | 0.1 μF/50V | | |
| MPL-05SV-05T | | | | | | 470 μF/16V | | | | | | |
| MPL-05SV-09T | | | | | | 270 μF/16V | | | | | | |
| MPL-05SV-12T | | | | | | 270 μF/16V | | | | | | |
| MPL-05SV-15T | | | | | | 220 μF/35V | | | | | 47 μF/35V | SMBJ12A |
| MPL-05SV-24T | | | | | | 220 μF/35V | | | | | 47 μF/35V | SMBJ20A |
| | | | | | | | | SMBJ30A | | | | |

Notes: Capacitor C2 is solid state for 3, 5, 9 & 12 Vout models, C3 is a high frequency, low ESR electrolytic, and C4 is ceramic. The TVS should have a rating of at least 1.2 times Vout.

Typical Connection 2: For General Outdoor 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-05SVT series for outdoor environments. The recommended input components are given in the table below.

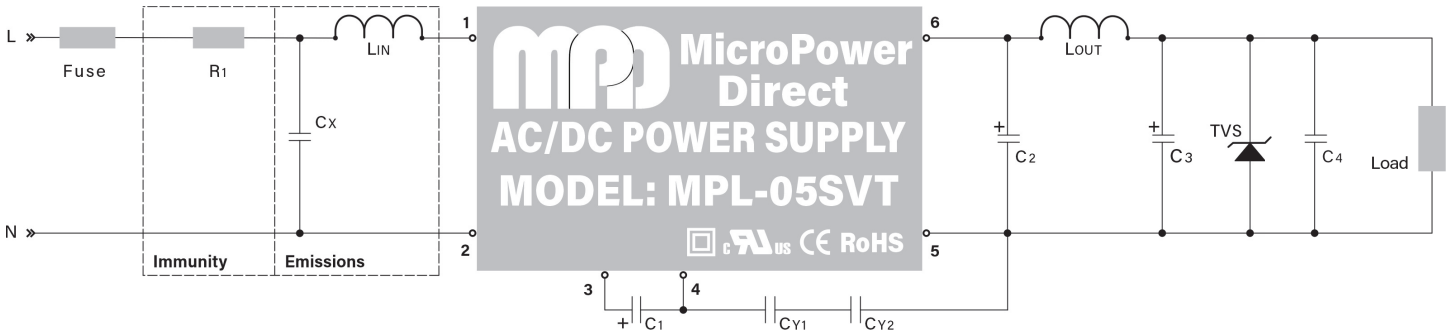
| Outdoor General | External Components | | | | |
|-----------------|---------------------|---------|---------------------|-------------------------------|----------------------------------|
| | Fuse (Required) | MOV | R1 (Required) | LIN | Output Components |
| All Models | 2A/300V (Slow-Blow) | S14K350 | 12Ω/2W (Wire-Wound) | 4.7 mH 15Ω Max 0.2A Min | See Typical Connection 1 (Above) |

Typical Applications

| Typical Connection | Environment | Input Voltage Range | Environment Temperature | Emissions | Immunity |
|--------------------|-------------------|---------------------|-------------------------|-----------|-----------|
| No 3 | Indoor Civil | 85 ~ 305 VAC | -25°C - +55°C | Class B | Class III |
| | Indoor General | 85 ~ 305 VAC | -25°C - +55°C | Class B | Class III |
| No 4 | Indoor Industrial | 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 |

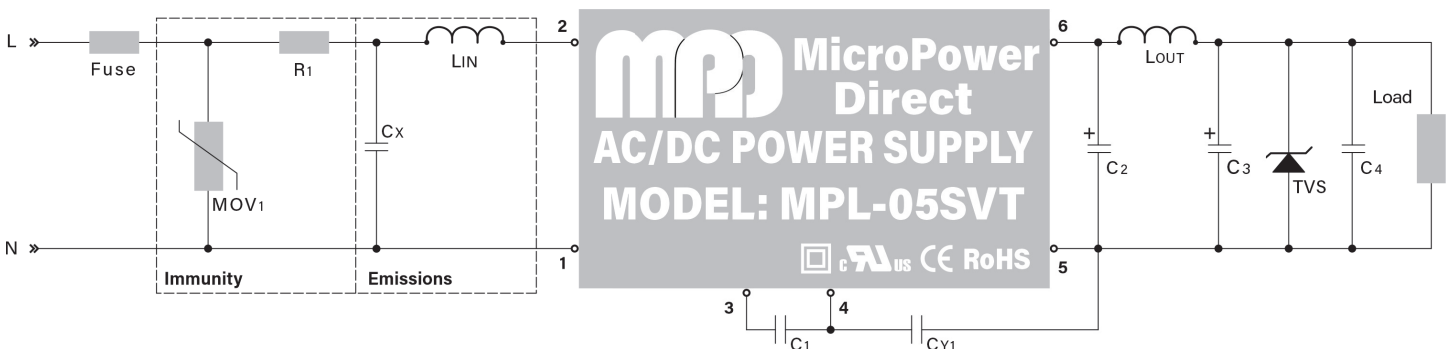


The diagram above illustrates a typical connection of the MPL-05SVT series for general indoor environments. The recommended components are given in the table below. If the application does not require operation to EN 60335, Cy2 is not needed. For information on output components, see page 4.

| External Components | | | | | | | |
|---------------------|---------------------|---------------------|----------------|------------------------------|----------------|----------------|-------------------------------|
| Indoor General | Fuse (Required) | R1 (Required) | Cx | LIN | Cy1 (Required) | Cy2 | Output Components |
| All Models | 1A/300V (Slow-Blow) | 12Ω/2W (Wire-Wound) | 0.1 μF/310 VAC | 1.2 mH 4Ω Max 0.2A Min | 1.0 nF/400 VAC | - - - | See Typ Connection 1 (Page 4) |
| Indoor: EN 60335 | Fuse (Required) | R1 (Required) | Cx | LIN | Cy1 (Required) | Cy2 (Required) | Output Components |
| All Models | 1A/300V (Slow-Blow) | 12Ω/2W (Wire-Wound) | 0.1 μF/310 VAC | 1.2 mH 4Ω Max 0.2A Min | 1.0 nF/400 VAC | 1.0 nF/400 VAC | See Typ Connection 1 (Page 4) |

Typical Connection 4: For Indoor Industrial Environment Applications

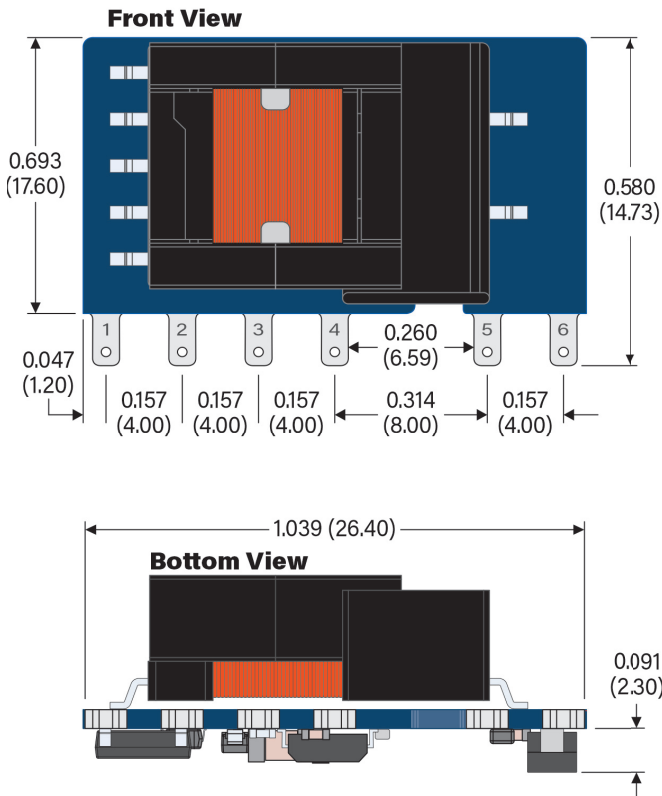
| Application Environment | Ambient Temperature Range | Emissions | Immunity |
|-------------------------|---------------------------|-----------|----------|
| Indoor Industrial | -25°C - +55°C | Class B | Class IV |



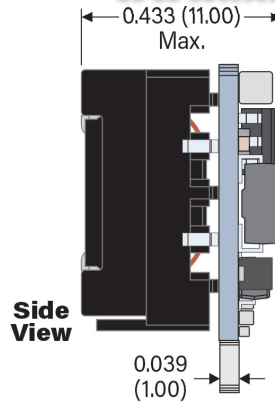
The diagram above illustrates a typical connection of the MPL-05SVT series for indoor industrial environments. The recommended input components are given in the table below. For information on output components, see page 4.

| External Components | | | | | | |
|---------------------|---------------------|---------|---------------|----------------|------------------------------|-------------------------------|
| Indoor Industrial | Fuse (Required) | MOV1 | R1 (Required) | Cx | LIN | Output Components |
| All Models | 2A/300V (Slow-Blow) | S14K350 | 12Ω/2W | 0.1 μF/310 VAC | 1.2 mH 4Ω Max 0.2A Min | See Typ Connection 1 (Page 4) |

Mechanical Dimensions



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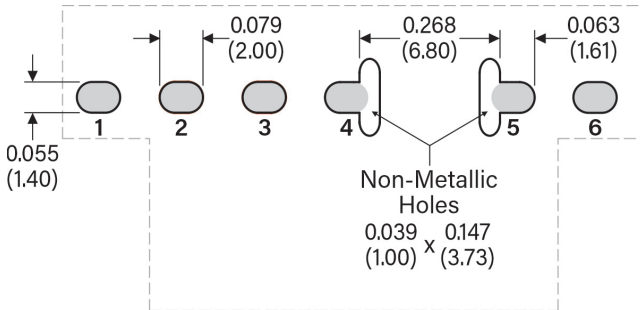
Pin Connections

| Pin | Function |
|-----|------------|
| 1 | AC-Line |
| 2 | AC-Neutral |
| 3 | +VCAP |
| 4 | -VCAP |
| 5 | -VOUT |
| 6 | +VOUT |

Notes:

- All dimensions are typical in inches (mm)
- General Tolerance x.xx = ± 0.02 (± 0.50)
- Weight: 0.183 Oz (5.2g)
- For recommended pin hole size see "Suggested Board Layout"

Suggested Board Layout, Primary/Secondary Separation



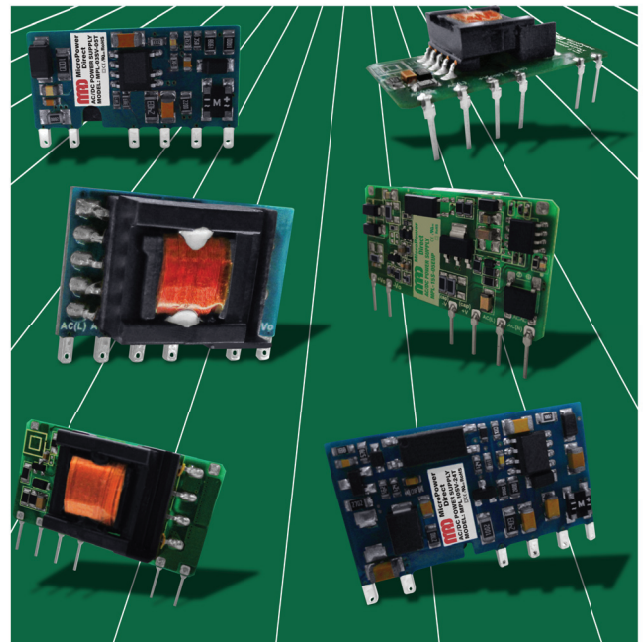
To meet safety requirements, it is required that the separation between any external components in the primary circuit and components in the secondary circuit be ≥ 6.4 mm. This diagram shows the approximate positioning of the primary/secondary circuits, and the use of nonmetallic slots cut into the PC board to achieve this. For more information, please contact the factory.

MPD offers a variety of AC/DC power supplies in miniature, Single-In-Line (SIP) packages. Now available over a power range of 1W to 15W, these SIP AC/DC's offer miniature size, tight regulation, wide temperature operation, UL 62368 approvals, and compliance with Green power and EMC/EMI standards.

We also offer AC/DC modules (2W to 60W), supplies approved for medical equipment applications, DIN rail supplies, and constant current power supplies.

Additionally, we have a wide variety of DC/DC converters, LED Drivers, POL regulators and SiC/IGBT DC/DC's. All products are available with short lead times. Call today for complete information or product samples. Or go to our website:

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