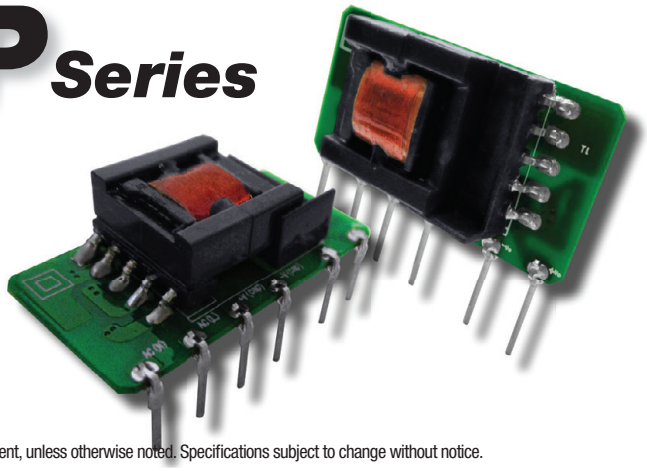
MPL-03SEUP Series

Open, Single Output, Ultra-Miniature SIP, 3W AC/DC Power Supplies



Key Features:

- 3W Output Power
- Open, Ultra-Miniature SIP
- Universal 85-305 VAC Input
- EN 60950 Approved
- Meets IEC Safety Class II
- Single Regulated Output
- Meets EN 55022
- >300 kHour MTBF
- Avail. With Right Angle Pins
- ***Low, Low Cost!***

RoHS

Cost Cutter

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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		305	VAC
		70		430	VDC
Input Frequency		47		63	Hz
Input Current	See Model Selection Guide				
Inrush Current	115 VAC		13.0		A Pk
	230 VAC		23.0		

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	See Model Selection Guide				
Standby Power Consumption	230 VAC Input		0.15	0.25	W
Line Regulation, See Note 1	3.3 VOUT Model		±2.5		%
	All Other Models		±1.5		
Load Regulation	IOUT = 10% to 100%		±2.5		%
Ripple & Noise (20 MHz)			80	150	mV P-P
Hold-Up Time	230 VAC		40		msec
Temperature Coefficient			±0.15		%/°C
Over Current Protection	Autorecovery	110		500	%IOUT
Short Circuit Protection	Continuous (Autorecovery)				

General

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

EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions, See Note 3	EN 55022		Class B
Conducted Emissions, See Note 3	EN 55022		Class B
ESD	EN 61000-4-2	B	±4 kV Contact
RS, See Note 4	EN 61000-4-3	A	10V/m
EFT, See Note 5	EN 61000-4-4	B	±2 kV
		B	±4 kV
Surge, See Note 6	EN 61000-4-5	B	±1 kV L-L
			±1 kV L-L /±2 kV L-G
CS, See Note 7	EN 61000-4-6	A	10 Vrms
Voltage Dips	EN 61000-4-11	B	0% - 70%

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			85	%

Physical

Case Size	See Mechanical Drawings (Page 4)				
Case Material	Conformal Coating (UL94-V0)				
Weight	0.24 Oz (6g)				
Solder Temperature	Wave Soldering (5 - 10s)	255	260	265	°C
	Manual Soldering (3 - 5s)	350	360	370	

Reliability Specifications

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

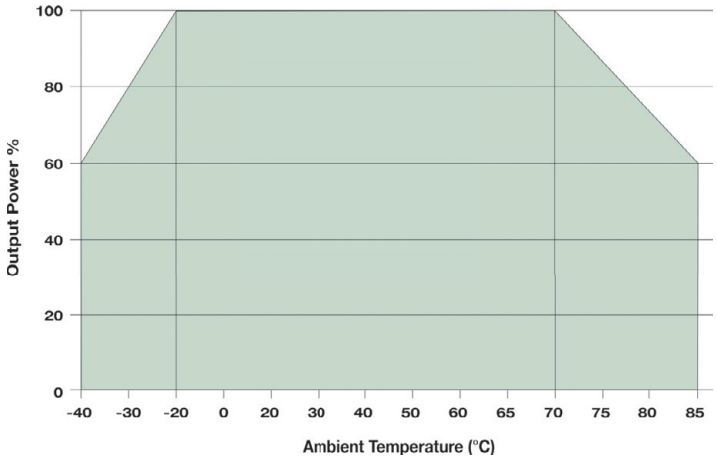
Model Selection Guide

Model Number	Input		Output			Maximum Output Power (W)	Output Voltage Accuracy (%)	Capacitive Load (µF, Max)	Efficiency (%, Typ)	Fuse Rating Slow-Blow
	Current (A Max.)		Voltage (VDC)	Current (mA Max.)	Current (mA Min.)					
	115 VAC	277 VAC								
MPL-03S-03EUP(F)	0.120	0.060	3.3	600	60	1.98	±6.0	820	65	1.0A/300 VAC
MPL-03S-05EUP(F)	0.120	0.060	5.0	600	60	3.0	±5.0	680	70	1.0A/300 VAC
MPL-03S-09EUP(F)	0.120	0.060	9.0	333	33	3.0	±5.0	470	73	1.0A/300 VAC
MPL-03S-12EUP(F)	0.120	0.060	12.0	250	25	3.0	±5.0	470	74	1.0A/300 VAC
MPL-03S-15EUP(F)	0.120	0.060	15.0	200	20	3.0	±5.0	330	75	1.0A/300 VAC
MPL-03S-24EUP(F)	0.120	0.060	24.0	125	12	3.0	±5.0	100	77	1.0A/300 VAC

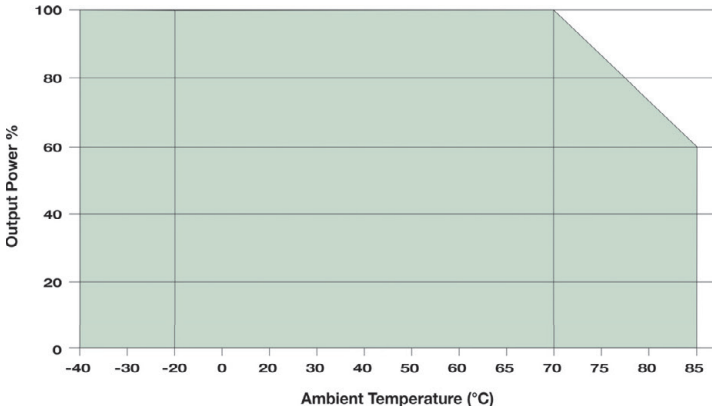
Notes:

1. Line regulation is measured at full load for V_{IN} = Min to Max.
2. The external filter components (C_1, C_2, C_3 and L_{OUT}) shown in the typical connection diagrams below are required to meet specified operation.
3. All units will meet EN 55022 (CE/RE) class A with the input circuit shown in the "Typical Connection 1" diagram on page 3. The **MPL03SEUP** will meet class B with the additional filtering shown in the "Typical Connection 2" diagram on page 3. **MPD** offers filter modules that will save on board space and make the input filter design easier. The model **MACFM-03D** is recommended. Contact the factory for more information.
4. To meet the requirements of EN 61000-4-3, (10V/m) external filtering (as shown in the "Typical Connection 2" diagram on page 3) is required. This filtering may be added discretely, or by using a filter module from **MPD**. The model **MACFM-03D** is recommended. Contact the factory for more information.
5. All units will meet EN 61000-4-4 (±2 kV) with the input circuit shown in the "Typical Connection 1" diagram on page 3. To meet the requirements of EN 61000-4-4 (±4 kV), external components (as shown in the "Typical Connection 2" diagram on page 3) are required. This filtering may be added discretely, or by using a filter module from **MPD**. The model **MACFM-03D** is recommended. Contact the factory for more information.
6. All units will meet the requirements of EN 61000-4-5 (±1 kV line to line), with the input circuit shown in the "Typical Connection 1" diagram on page 3. To meet EN 61000-4-5 (±1 kV line to line and ±2 kV line to ground, the input circuit shown in the "Typical Connection 2" diagram on page 3 is required. This filtering may be added discretely, or by using a filter module (**MACFM-03D**) from **MPD**. Contact the factory for more information.
7. All units will meet the requirements of EN 61000-4-6 (10V rms), with the input circuit shown in the "Typical Connection 2" diagram on page 3. This filtering may be added discretely, or by using a filter module (**MACFM-03D**) from **MPD**. Contact the factory for more information.
8. Operation at no load will not damage the units, however, they may not meet all specifications.
9. The **MPL-03SEUP** series will make an audible noise when operated under light load conditions. This does not effect 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-03SEUP** series, a 1.0A/300 VAC slow blow should be used.
11. The **MPL-03SEUP** 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-03S-12EUPF**).

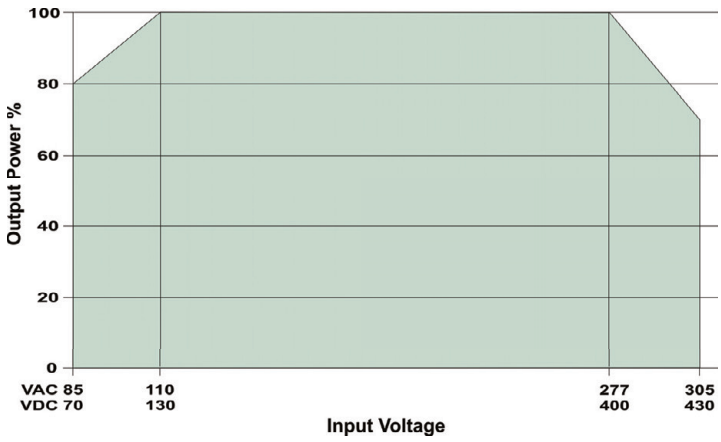
Derating Curve, 85 -110 VAC, 70 - 130 VDC



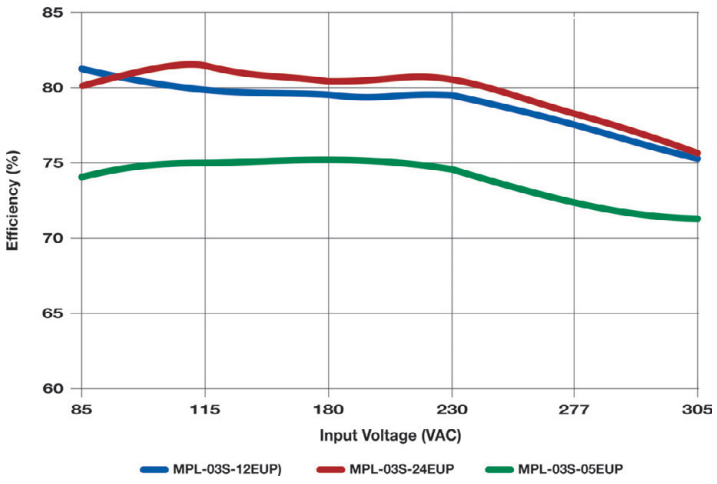
Derating Curve, 110 -305 VAC, 130 - 430 VDC



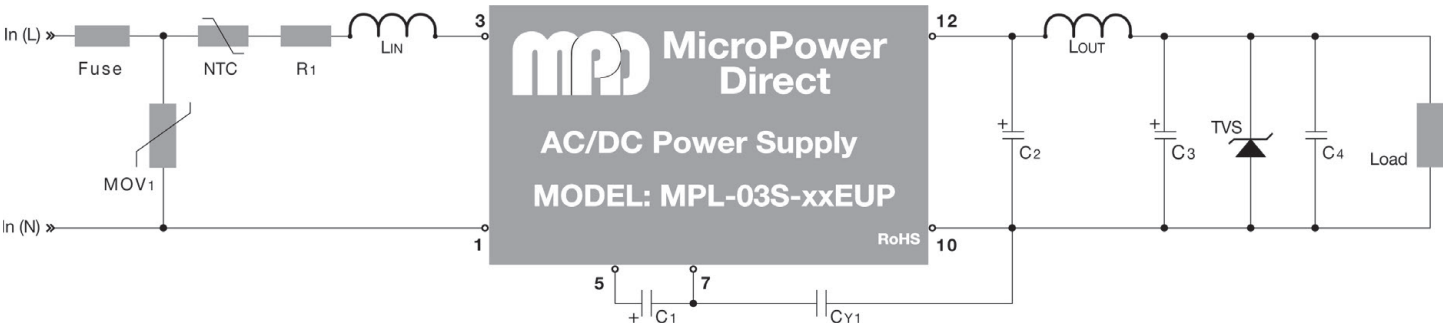
Input Voltage Derating, At +25°



Efficiency vs Input Voltage VDC Input



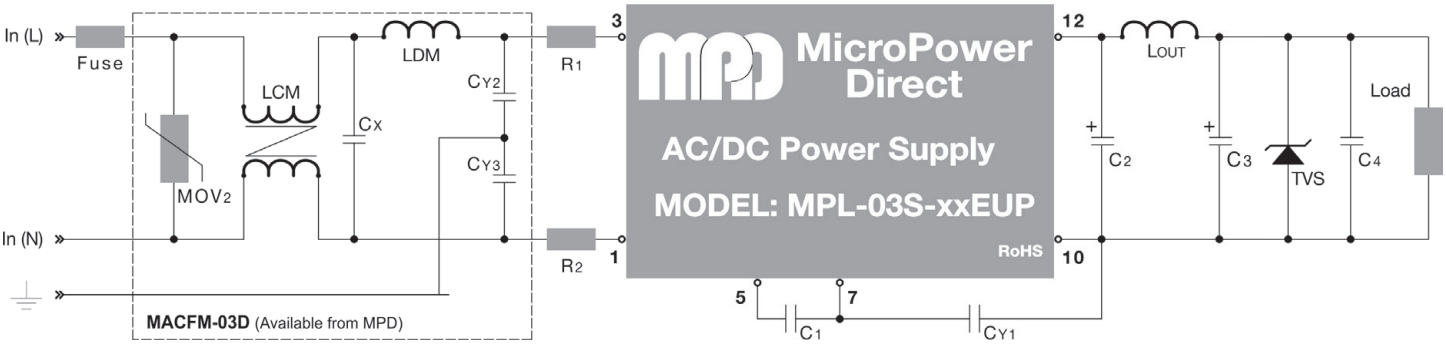
Typical Connection 1



The diagram above illustrates a simple connection of the MPL-03SEUP series. With this connection, the unit will meet EN 55022 class A, EN 61000-4-2 (±4kV), EN61000-4-4 (±2kV) and EN 61000-4-11. Components C1, C2, LOUT and C3 are required to meet specified operation limits. The recommended components are given in the table below.

Model Number	External Components										
	MOV	NTC	R1	LIN	C1 (Required)	CY1	C2 (Required)	LOUT (Required)	C3 (Required)	TVS	C4
MPL-03S-03EUP(F)	S14k350	13D-5	12Ω/2W	4.7 mH	10 μF/450V (-20°C - +85°C) 22 μF/450V (-40°C - +85°C)	1 nF/400 VAC	270 μF/16V (Solid Capacitor)	4.7 μH	120 μF/25V	SMBJ7.0A	0.1 μF/50V
MPL-03S-05EUP(F)											
MPL-03S-09EUP(F)									68 μF/35V	SMBJ12A	
MPL-03S-12EUP(F)										SMBJ20A	
MPL-03S-15EUP(F)							470 μF/35V		47 μF/35V		
MPL-03S-24EUP(F)							220 μF/35V			SMBJ30A	

Typical Connection 2: With External EMC Components



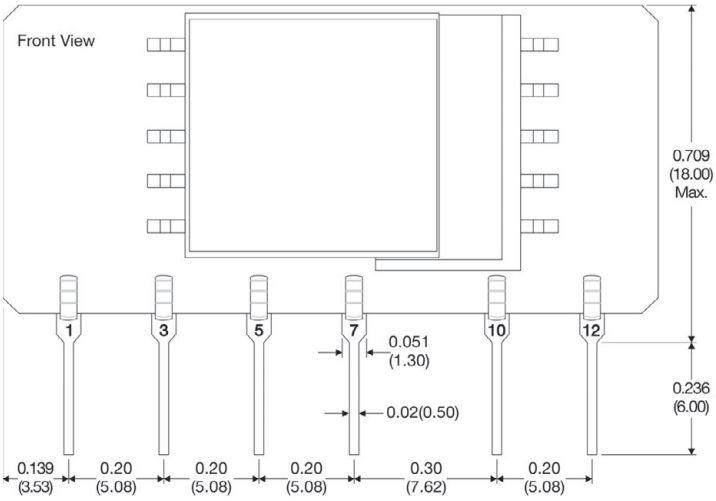
For applications that require meeting higher EMC standards, the circuit shown above is recommended. Some notes on this diagram (starting with the input circuit) are:

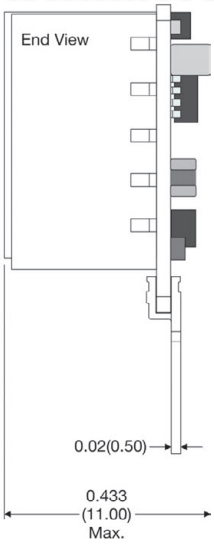
1. It is recommended that an external fuse be used. The recommended fuse is 1A/300V.
2. The capacitors CX and CYX are "safety" capacitors.
3. Capacitor C1 is a filter component. This capacitor is required to meet specified operation. It should be a high frequency, low ESR electrolytic capacitor. The recommended value is given in the table below.
4. Capacitors C2 and C3 and inductor LOUT are output filter components. They are required to meet specified operation. Low ESR, high frequency electrolytic capacitors should be used. The recommended values are given in the table below.
5. The output TVS will help protect system circuitry if power supply fails. A recommended value is given in the table below.
6. Capacitor C4 is ceramic. This capacitor is used to filter high frequency noise. A recommended value is given in the table below.
7. All of the components within the dotted lines of the input EMC circuit are included in the MACFM-03D, a filter module available from MPD. Please contact the factory for more information.

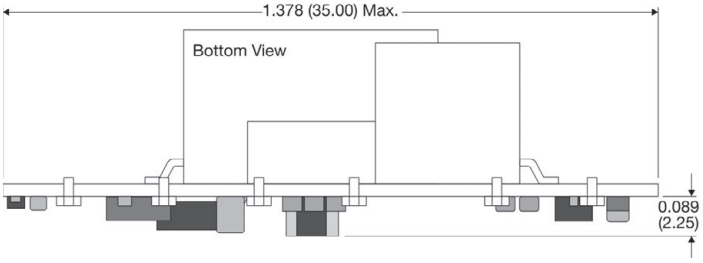
Recommended values for components are:

Model Number	External Components												
	MOV	LCM	CX	LDM	CY2/CY3	R1/R2	C1 (Required)	CY1	C2 (Required)	LOUT (Required)	C3 (Required)	TVS	C4
MPL-03S-03EUP(F)	S14k350	3.5 mH	0.1 μF/310 VAC	0.33 mH	1 nF/400 VAC	12Ω/2W	10 μF/450V (-20°C - +85°C) 22 μF/450V (-40°C - +85°C)	2.2 nF/400 VAC	270 μF/16V (Solid Capacitor)	4.7 μH	120 μF/25V	SMBJ7.0A	0.1 μF/50V
MPL-03S-05EUP(F)													
MPL-03S-09EUP(F)											68 μF/35V	SMBJ12A	
MPL-03S-12EUP(F)												SMBJ20A	
MPL-03S-15EUP(F)									470 μF/35V		47 μF/35V		
MPL-03S-24EUP(F)									220 μF/35V			SMBJ30A	

Mechanical Dimensions





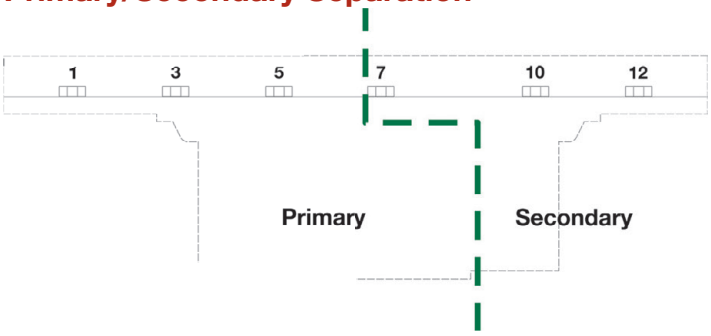


Pin Connections

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

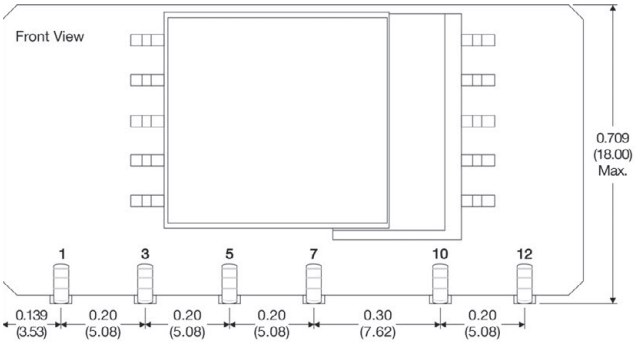
Notes:
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)

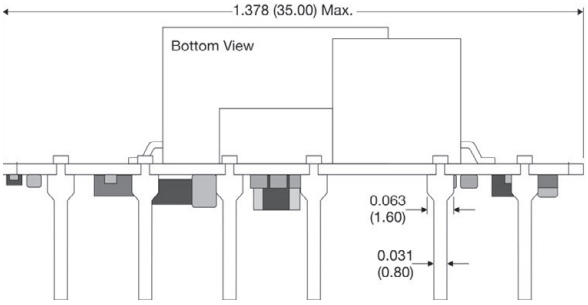
Primary/Secondary Separation

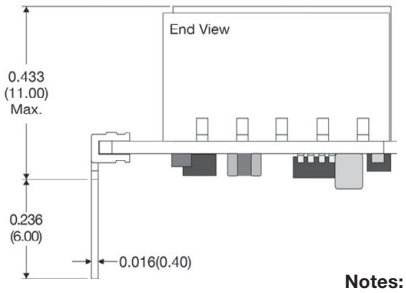


To meet safety requirements, it is required that the separation between any external components in the primary circuit and components in the secondary circuit be ≥6.4 mm. The diagram above shows the approximate positioning of the primary/secondary circuits. For more information, please contact the factory.

Mechanical Dimensions: Right Angle (F) Models







Pin Connections

Pin	Function
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3	AC-Line
5	+VCAP
7	-VCAP
10	-VOUT
12	+VOUT

Notes:
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)

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