

# MI600ERW Series

## Wide 2:1 Input, 6W Miniature 1" x 1" DC/DC Converters



### Key Features:

- 6W Output Power
- 2:1 Input Range
- Miniature 1" x 1" Case
- Single & Dual Outputs
- 1,500 VDC Isolation
- >1 MHour MTBF
- Chassis Mount Available
- DIN Rail Mount Available



**Cost Cutter**

MicroPower Direct



### Electrical Specifications

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

#### Input

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Range	12 VDC Input	9.0	12.0	18.0	VDC
	24 VDC Input	18.0	24.0	36.0	
Input Start-up Threshold	12 VDC Input			9.0	VDC
	24 VDC Input			18.0	
Under Voltage Shutdown	12 VDC Input	5.5	6.5		VDC
	24 VDC Input	14.0	15.5		
Reflected Ripple Current			20		mA
Input Filter	Pi ( $\pi$ ) Filter				

#### Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy, See Note 2	I <sub>OUT</sub> = 0% to 100%		±1.0	±3.0	%
Line Regulation, V <sub>IN</sub> = Min to Max	Positive Output		±0.2	±0.5	%
	Negative Output		±0.5	±1.0	
Load Regulation, I <sub>OUT</sub> = 5% to 100%	Positive Output		±0.5	±1.0	%
	Negative Output		±0.5	±1.5	
Cross Regulation	See Note 3			±5.0	%
Ripple & Noise (20 MHz)	See Note 4		60	85	mV P - P
Transient Recovery Time	See Note 5		300	500	μSec
Transient Response Deviation			±3.0	±5.0	%
Temperature Coefficient				±0.03	%/°C
Over Voltage Protection		110		160	%V <sub>OUT</sub>
Output Over Load Protection		110	140	190	%I <sub>OUT</sub>
Output Short Circuit	Continuous (Autorecovery)				

#### General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 0.1V		1,000		pF
Switching Frequency			300		kHz

#### Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40		+85	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

#### Physical

Case Size	See Mechanical Diagrams (Pages 2 & 4)				
Case Material	Aluminum Alloy (UL94-V0)				
Weight	See Mechanical Diagrams (Pages 2 & 4)				

#### Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours
Vibration, EN 60068	10-55 Hz, 10G, 30 Min along X, Y, and Z Axis				

#### Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	24 VDC Input			50.0	VDC
	48 VDC Input			100.0	
Lead Temperature	1.5 mm From Case For 10 Sec			300	°C

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

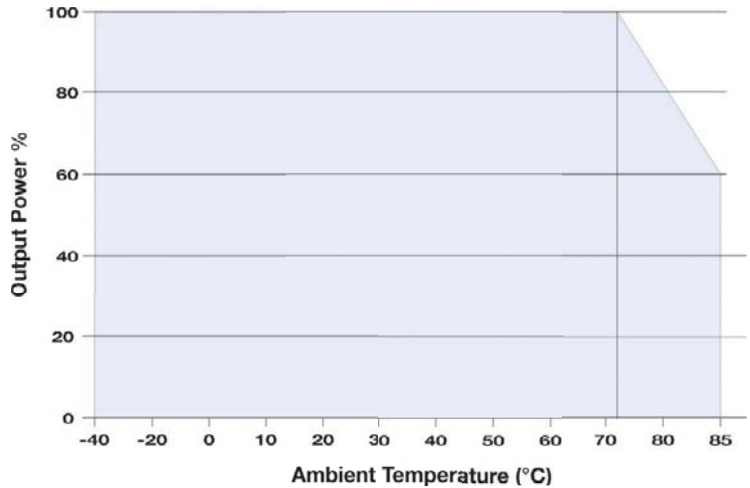
# Model Selection Guide

Model Number	Input				Output			Capacitive Load ( $\mu$ F Max)	Efficiency (% Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MI612S-05ERW-xxx	12	9.0 - 18.0	617	10	5.0	1,200	0.0	1,000	81	1,000
MI612S-12ERW-xxx	12	9.0 - 18.0	588	10	12.0	500	0.0	470	85	470
MI612D-05ERW-xxx	12	9.0 - 18.0	617	10	$\pm$ 5.0	$\pm$ 600	0.0	470	81	470
MI612D-12ERW-xxx	12	9.0 - 18.0	588	10	$\pm$ 12.0	$\pm$ 250	0.0	100	85	100
MI624S-03ERW-xxx	24	18.0 - 36.0	325	5	3.3	1,500	0.0	1,800	77	1,800
MI624S-05ERW-xxx	24	18.0 - 36.0	305	5	5.0	1,200	0.0	1,000	82	1,000
MI624S-12ERW-xxx	24	18.0 - 36.0	294	5	12.0	500	0.0	470	85	470
MI624S-15ERW-xxx	24	18.0 - 36.0	291	5	15.0	400	0.0	220	86	220
MI624S-24ERW-xxx	24	18.0 - 36.0	294	5	24.0	250	0.0	100	85	100
MI624D-05ERW-xxx	24	18.0 - 36.0	301	5	$\pm$ 5.0	$\pm$ 600	0.0	470	83	470
MI624D-12ERW-xxx	24	18.0 - 36.0	287	5	$\pm$ 12.0	$\pm$ 250	0.0	100	87	100
MI624D-15ERW-xxx	24	18.0 - 36.0	287	5	$\pm$ 15.0	$\pm$ 200	0.0	100	87	100

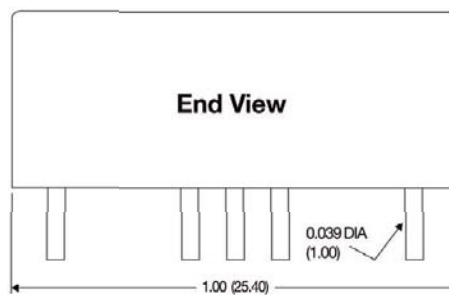
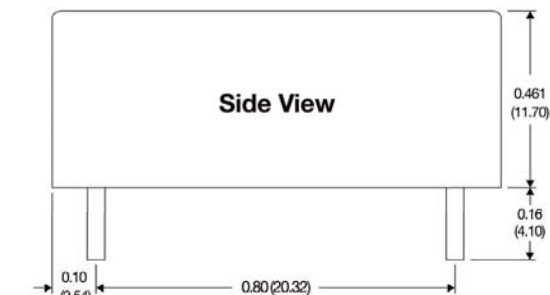
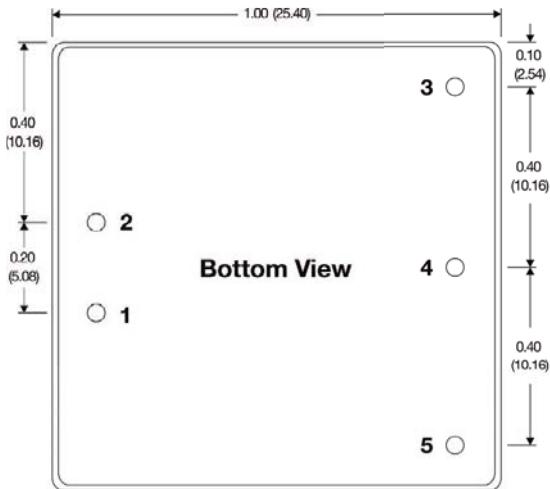
**Notes:**

- The specified maximum capacitive load is for each output.
- The maximum output accuracy of  $\pm$ 5V output models is  $\pm$ 5% for the range of load equals 0% to 5%.
- Cross regulation is measured with the main output set at 50% load. The second output is varied from 10% to 100% load.
- When measuring output ripple & noise, it is recommended that external ceramic capacitors (10  $\mu$ F & 1  $\mu$ F) be connected in parallel from the +Vout to the -Vout pins for single output units and from each output to common for dual output models.
- Transient recovery is measured to within a 1% error band for a load step change of 25%. The response deviation for 5V and 3.3V outputs is typically  $\pm$ 5% and a maximum of  $\pm$ 8%.
- Operation at no-load will not damage these units. However, they may not meet all specifications. The recommended minimum load is given in the model selection table above.
- It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.
- All dual output units are approved to EN 60950, single output models are not.

## Derating Curve



## Mechanical Dimensions



## Pin Connections

Pin	Single Output	Pin	Dual Output
1	-VIN	1	-VIN
2	+VIN	2	+VIN
3	+VOUT	3	+VOUT
4	No Pin	4	Common
5	-VOUT	5	-VOUT

Weight: 0.49 Oz (14g)

**Notes:**

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

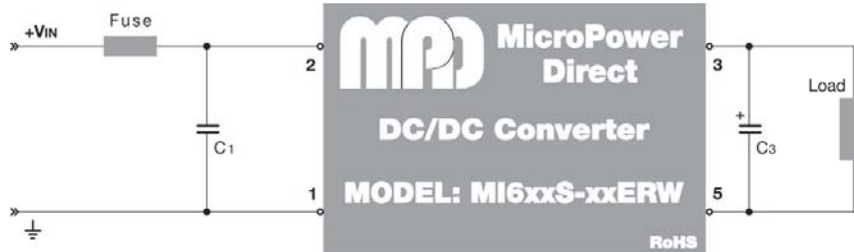
## EMC Specifications

Parameter	Standard	Criteria	Level
Radiated Emissions, See Note 1	EN 55022		Class A
Conducted Emissions, See Note 1	EN 55022		Class A
ESD	EN 61000-4-2	B	±4 kV Contact
RS	EN 61000-4-3	A	10V/m
EFT, See Note 2	EN 61000-4-4	B	±2 kV
Surge, See Note 3	EN 61000-4-5	B	±2 kV
CS	EN 61000-4-6	A	3 Vrms
Voltage Dips	EN 61000-4-29	B	0% - 70%

### Notes:

- All units will meet class A with the addition of the capacitors shown in the "Simple Connection" diagram. To meet the requirements of Class B, refer to the "Typical Connection" circuit. Contact the factory for more information.
- To meet the requirements of EN 61000-4-4 (±2 kV), external components are needed, as shown in the "Typical Connection" diagram. Contact the factory for more information.
- To meet the requirements of EN 61000-4-5 (±2 kV), external components are needed, as shown in the "Typical Connection" diagram. Contact the factory for more information.

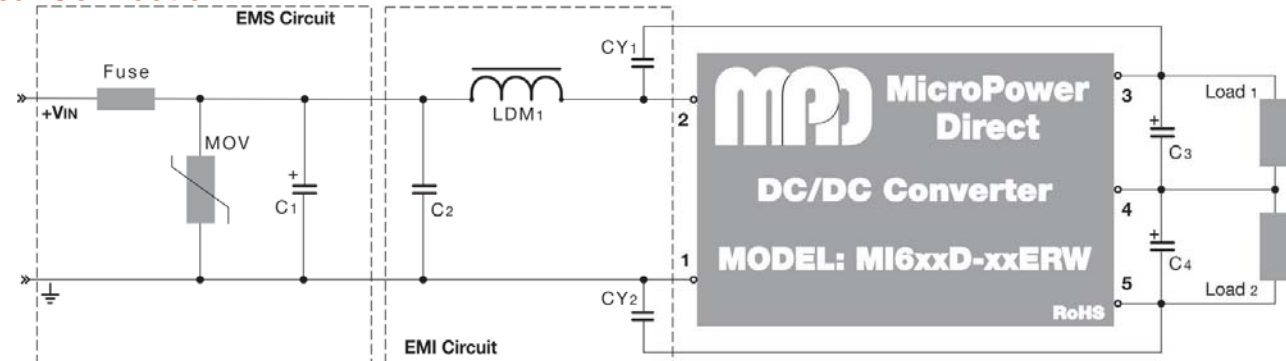
## Simple Connection



The diagram at left illustrates a typical connection of the **MI6xxS-xxERW** series. Capacitors C1 and C2 are filtering components. They are required to meet the EN 55022 requirements for Class A. The recommended component values are given in the table below.

V <sub>IN</sub>	C <sub>1</sub> (µF)	C <sub>3</sub> (µF)
12 VDC	100	10
24 VDC	10 - 47	10

## Typical Connection



The diagram above illustrates a typical dual output connection of the **MI6xxD-xxERW** series for an application that requires compliance to input surge and EMC standards EN 55022 and EN 61000 (as specified above). Some notes on these components are:

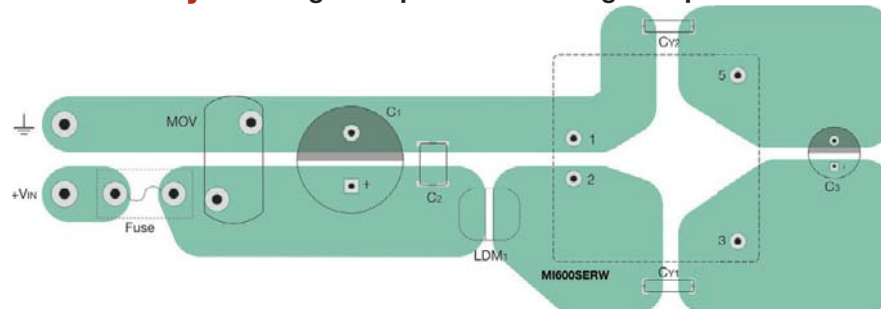
- An external MOV is recommended on the input to protect the unit in the event of a surge. A recommended value is given in the table at right.
- The output filtering capacitors (C3 & C4) are high frequency, low resistance electrolytic capacitors. Care must be taken in choosing these capacitors not to exceed the capacitive load specification for the unit. Voltage derating of capacitors should be 80% or above.

3. Suggested component values are:

Component	V <sub>IN</sub> : 12V	V <sub>IN</sub> : 24V
MOV	S14K20	S14K30
C <sub>1</sub>	1,000µF/35V	1,000µF/50V
C <sub>2</sub>	1 µF/50V	1 µF/100V
C <sub>3</sub>	10 µF	10 µF
C <sub>4</sub>	10 µF	10 µF
LDM <sub>1</sub>	4.7 µH	4.7 µH
C <sub>Y1</sub> , C <sub>Y2</sub>	1 nF/2 kV	1 nF/2 kV

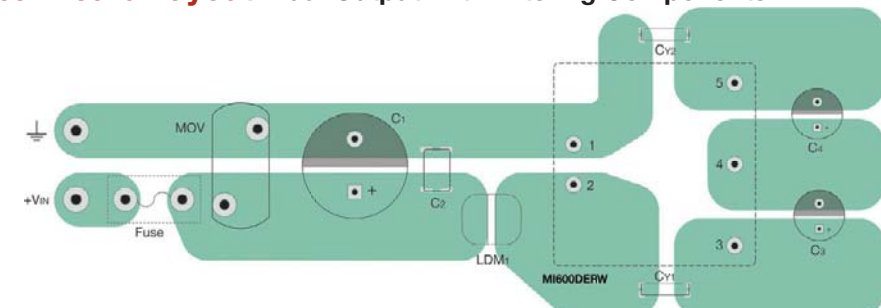
- In many applications, simply adding input/output capacitors will enhance the input surge protection & and reduce output ripple sufficiently. In this case, capacitors C1, C3 and C4 could be connected as shown above, without the other filter components. Recommended capacitor values are given in the table at left.
- It is recommended that an external fuse be used. The recommended fuse is shown in the model chart on page 2.

## Typical Board Layout: Single Output With Filtering Components



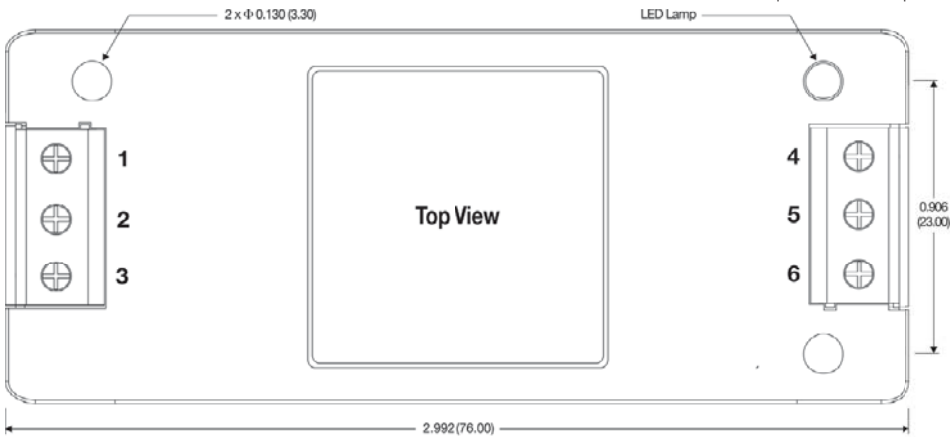
The diagrams at left shows typical PC board layouts for the **MI6xxx-xxERW** with the input surge and filter components shown above.

## Typical Board Layout: Dual Output With Filtering Components



The minimum distance between the bonding pads for capacitors C<sub>Y1</sub> and C<sub>Y2</sub> must be ≥ 2mm,

### Mechanical Dimensions: With A2S Adapter Board

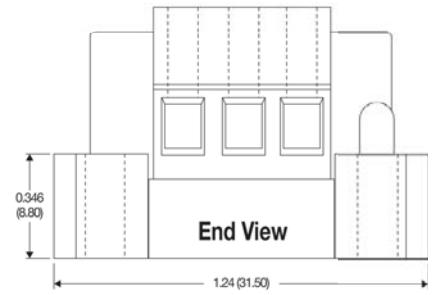
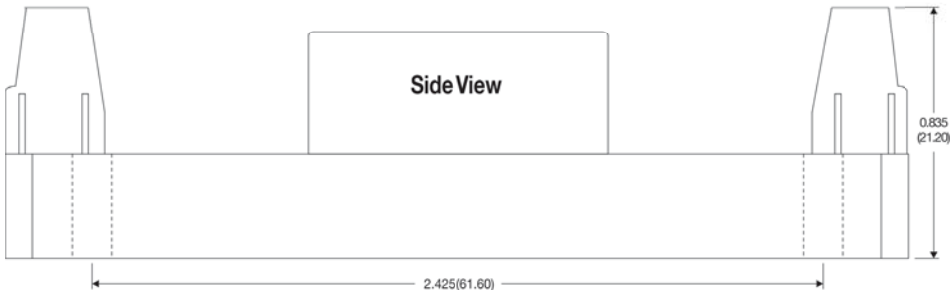


For the A2S adapter board option, add suffix "A2S" to the model number (i.e. MI612S-05ERW-A2S)

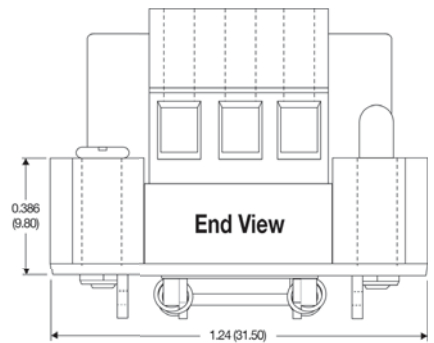
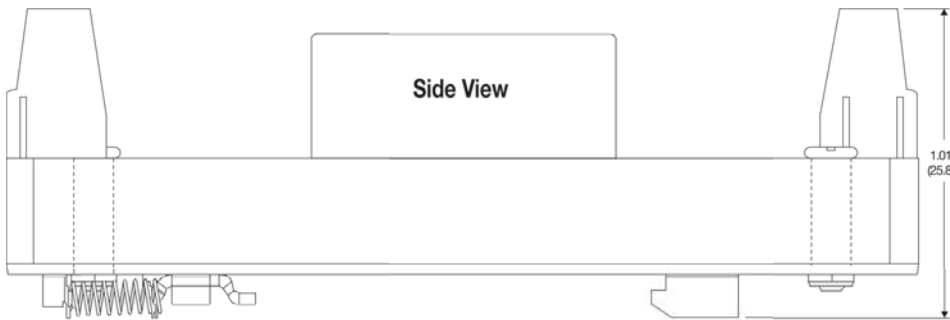
### Pin Connections

Pin	Single Output	Pin	Dual Output
1	No Connection	1	No Connection
2	-VIN	2	-VIN
3	+VIN	3	+VIN
4	-VOUT	4	-VOUT
5	No Connection	5	Common
6	+VOUT	6	+VOUT

Weight: 1.272 Oz (36g)



### Mechanical Dimensions: With A4S Adapter Board

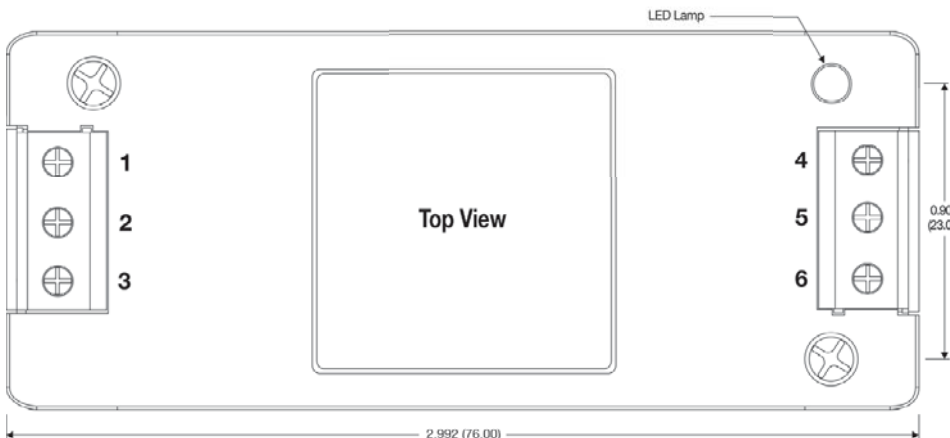


For the A4S adapter board option, add suffix "A4S" to the model number (i.e. MI624D-12ERW-A4S)

### Pin Connections

Pin	Single Output	Pin	Dual Output
1	No Connection	1	No Connection
2	-VIN	2	-VIN
3	+VIN	3	+VIN
4	-VOUT	4	-VOUT
5	No Connection	5	Common
6	+VOUT	6	+VOUT

Weight: 1.973 Oz (56g)



### Notes:

- All dimensions are typical in inches (mm)
- Wire Range: 24 - 12 AWG
- Tolerance x.xx = ±0.02 (±0.50)