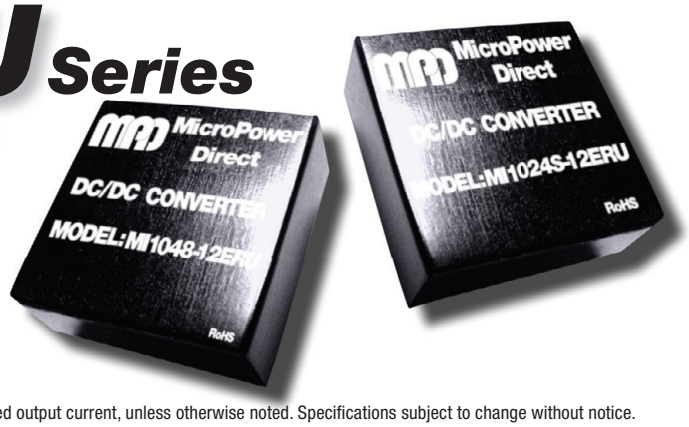
MI1000ERU Series

Wide 4:1 Input, 10W Miniature 1" x 1" DC/DC Converters



Key Features:

- 10W Output Power
- 4:1 Input Range
- EN 60950 Approved
- Miniature 1" x 1" Case
- Single & Dual Outputs
- 1,500 VDC Isolation
- >1 MHour MTBF
- Chassis Mount Available
- DIN Rail Mount Available

RoHS



Cost Cutter

MicroPower Direct
292 Page Street
Suite D
Stoughton, MA 02072
USA

T: (781) 344-8226
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E: sales@micropowerdirect.com
W: www.micropowerdirect.com

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	24 VDC Input	9.0	24.0	36.0	VDC
	48 VDC Input	18.0	48.0	75.0	
Input Start-up Threshold	24 VDC Input			9.0	VDC
	48 VDC Input			18.0	
Under Voltage Shutdown	24 VDC Input	5.5	6.5		VDC
	48 VDC Input	14.0	15.5		
Reflected Ripple Current	24 VDC Input		40		mA
	48 VDC Input		30		
Input Filter	Pi (π) Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	I_{OUT} = 5% to 100%		±1.0	±3.0	%
Output Voltage Balance	Dual Outputs, Balanced Loads		±0.5	±1.5	%
Line Regulation, V_{IN} = Min to Max	Positive Output		±0.2	±0.5	%
	Negative Output		±0.5	±1.0	
Load Regulation, I_{OUT} = 5% to 100%	Positive Output		±0.5	±1.0	%
	Negative Output		±0.5	±1.5	
Cross Regulation	See Note 2			±5.0	%
Ripple & Noise (20 MHz)	See Note 3		40	80	mV P - P
Transient Recovery Time , See Note 4	25% Load Step Change		300	500	μSec
Transient Response Deviation			±3.0	±5.0	%
Temperature Coefficient				±0.03	%/°C
Over Voltage Protection		110		160	%V_{OUT}
Output Over Load Protection		110	140	190	%I_{OUT}
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			350		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 (UL94-V0)
Weight	See Mechanical Diagrams (Pages 2 & 4)

Remote On/Off

Parameter	Conditions	Min.	Typ.	Max.	Units
Unit On	See Note 5	3.5		12.0	VDC
Unit Off	See Note 5	0		1.2	VDC
Off Idle Current			6.0	10.0	mA

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.

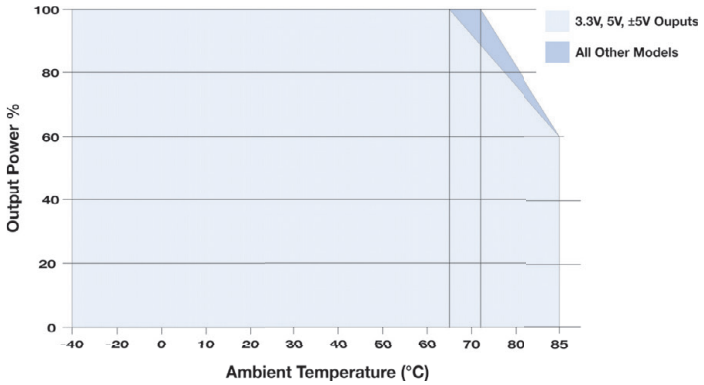
Model Selection Guide

Model Number	Input				Output			Capacitive Load (µF 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						
MI1024S-03ERU-xxx	24	9.0 - 36.0	418	5	3.3	2,400	0.0	2,200	79	2,000
MI1024S-05ERU-xxx	24	9.0 - 36.0	502	5	5.0	2,000	0.0	2,200	83	2,500
MI1024S-09ERU-xxx	24	9.0 - 36.0	484	5	9.0	1,111	0.0	680	86	2,500
MI1024S-12ERU-xxx	24	9.0 - 36.0	478	5	12.0	833	0.0	470	87	2,500
MI1024S-15ERU-xxx	24	9.0 - 36.0	478	5	15.0	667	0.0	330	87	2,500
MI1024S-24ERU-xxx	24	9.0 - 36.0	473	5	24.0	416	0.0	100	88	2,500
MI1024D-05ERU-xxx	24	9.0 - 36.0	502	5	±5.0	±1,000	0.0	1,000	83	2,500
MI1024D-09ERU-xxx	24	9.0 - 36.0	484	5	±9.0	±555	0.0	680	86	2,500
MI1024D-12ERU-xxx	24	9.0 - 36.0	478	5	±12.0	±416	0.0	470	87	2,500
MI1024D-15ERU-xxx	24	9.0 - 36.0	478	5	±15.0	±333	0.0	330	87	2,500
MI1024D-24ERU-xxx	24	9.0 - 36.0	478	5	±24.0	±208	0.0	100	87	2,500
MI1048S-03ERU-xxx	48	18.0 - 75.0	209	4	3.3	2,400	0.0	2,200	79	1,000
MI1048S-05ERU-xxx	48	18.0 - 75.0	251	4	5.0	2,000	0.0	2,200	83	1,500
MI1048S-12ERU-xxx	48	18.0 - 75.0	239	4	12.0	833	0.0	470	87	1,500
MI1048S-15ERU-xxx	48	18.0 - 75.0	239	4	15.0	667	0.0	330	87	1,500
MI1048S-24ERU-xxx	48	18.0 - 75.0	237	4	24.0	416	0.0	100	88	1,500
MI1048D-05ERU-xxx	48	18.0 - 75.0	251	4	±5.0	±1,000	0.0	1,000	83	1,500
MI1048D-12ERU-xxx	48	18.0 - 75.0	239	4	±12.0	±416	0.0	470	87	1,500
MI1048D-15ERU-xxx	48	18.0 - 75.0	239	4	±15.0	±333	0.0	330	87	1,500
MI1048D-24ERU-xxx	48	18.0 - 75.0	239	4	±24.0	±208	0.0	100	87	1,500

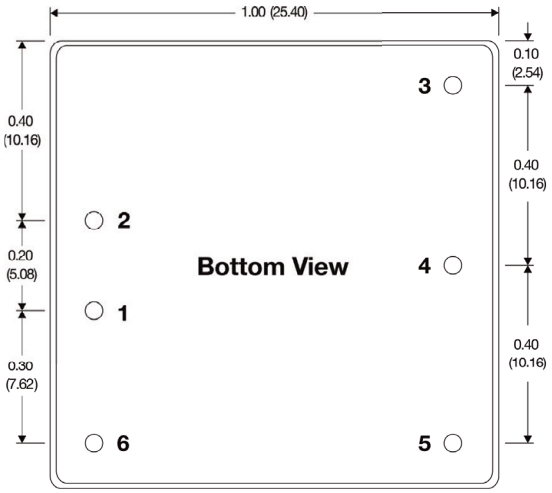
Notes:

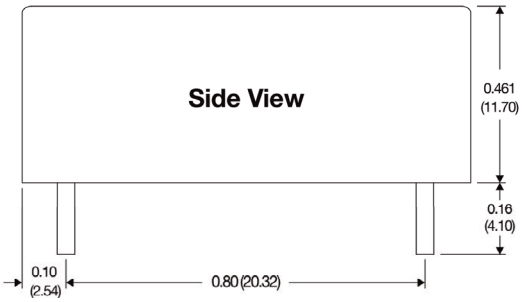
1. The specified maximum capacitive load is for each output.
2. Cross regulation is measured with the main output set at 50% load. The second output is varied from 10% to 100% load.
3. When measuring output ripple & noise, it is recommended that external ceramic capacitors (10 µF & 1 µF) be connected in parallel from the +VOUT to the -VOUT pins for single output units and from each output to common for dual output models.
4. Transient recovery is measured to within a 1% error band for a load step change of 25%.
5. The voltage at the Remote On/Off pin (Pin 6) is referenced to the -VIN input (Pin 1). If the on/off pin is left open, the unit operates. If it is grounded, the unit will shut off.
6. 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.
7. 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.

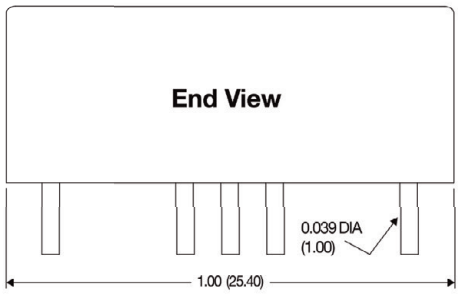
Derating Curve



Mechanical Dimensions







Pin Connections

Pin	Single Output
1	-VIN
2	+VIN
3	+VOUT
4	No Pin
5	-VOUT
6	Remote On/Off

Pin	Dual Output
1	-VIN
2	+VIN
3	+VOUT
4	Common
5	-VOUT
6	Remote On/Off

Weight: 0.53 Oz (15g)

Notes:

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

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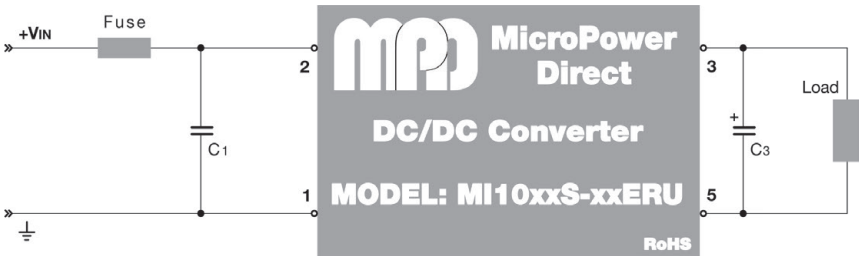
EMC Specifications

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:

1. 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.
2. 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.
3. 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.

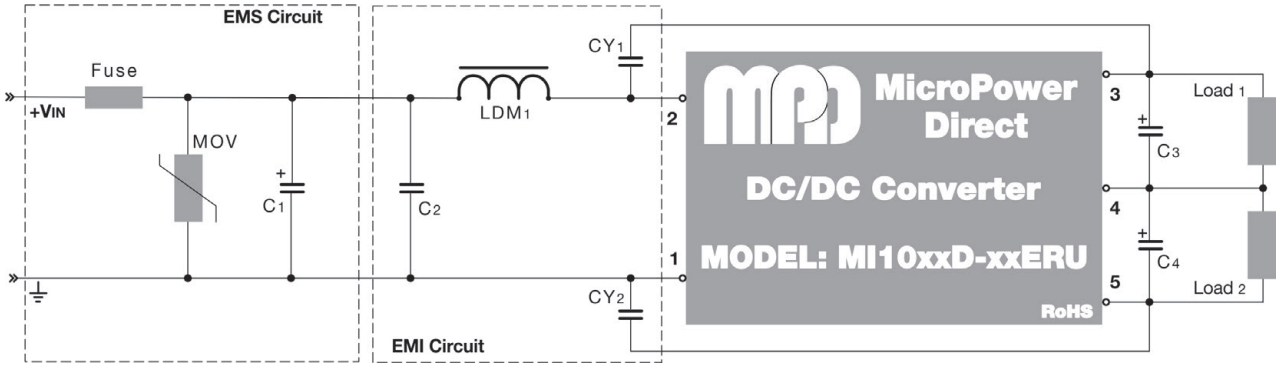
Simple Connection



The diagram at left illustrates a typical connection of the **MI10xxS-xxERU** series. Capacitors C_1 and C_2 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.

VIN	C1 (µF)	C3 (µF)
24 VDC	100	10
48 VDC	10 - 47	10

Typical Connection



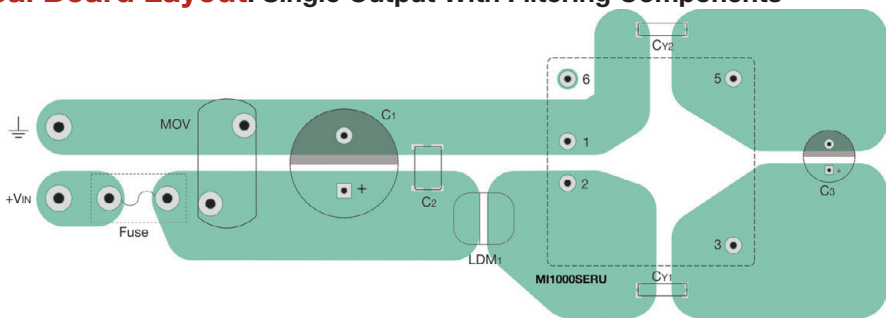
The diagram above illustrates a typical dual output connection of the **MI10xxD-xxERU** series for an application that requires compliance to input surge and EMC standards EN 55022 and EN 61000 (as specified above). Some notes on these components are:

1. 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.
2. The output filtering capacitors (C_3 & C_4) 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:

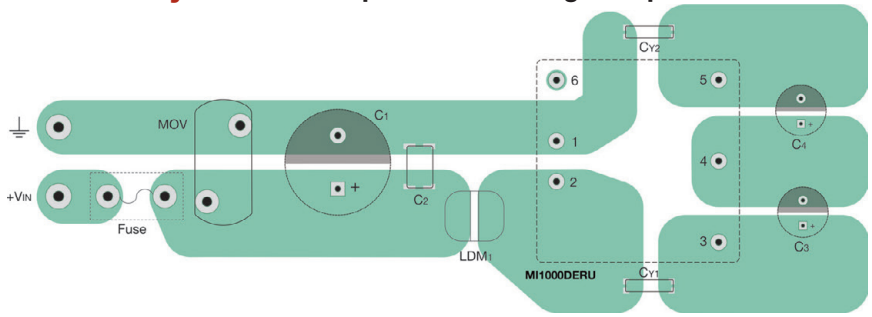
Component	VIN: 24V	VIN: 48V
MOV	S14K35	S14K60
C_1	330µF/50V	330µF/100V
C_2	1 µF/50V	1 µF/100V
C_3	10 µF	10 µF
C_4	10 µF	10 µF
LDM_1	4.7 µH	4.7 µH
C_{Y1}, C_{Y2}	1 nF/2 kV	1 nF/2 kV

4. In many applications, simply adding input/output capacitors will enhance the input surge protection & and reduce output ripple sufficiently. In this case, capacitors C_1, C_3 and C_4 could be connected as shown above, without the other filter components. Recommended capacitor values are given in the table at left.
5. 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



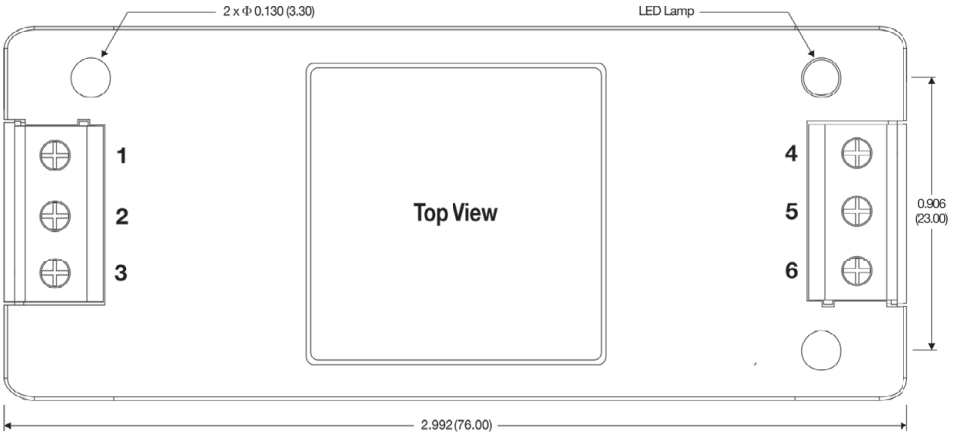
Typical Board Layout: Dual Output With Filtering Components

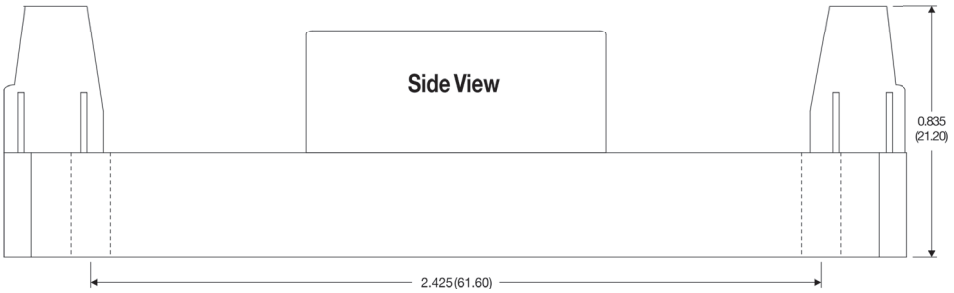


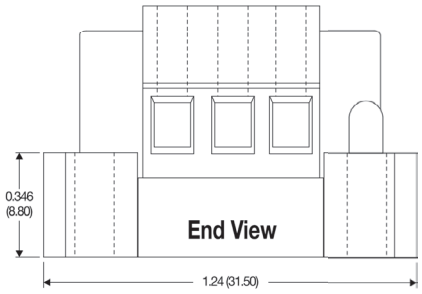
The diagrams at left shows typical PC board layouts for the **MI10xxx-xxERU** with the input surge and filter components shown above.

The minimum distance between the bonding pads for capacitors C_{Y1} and C_{Y2} must be ≥ 2mm,

Mechanical Dimensions: With A2S Adapter Board







For the A2S adapter board option, add suffix "A2S" to the model number (i.e. **MI1024S-15ERU-A2S**)

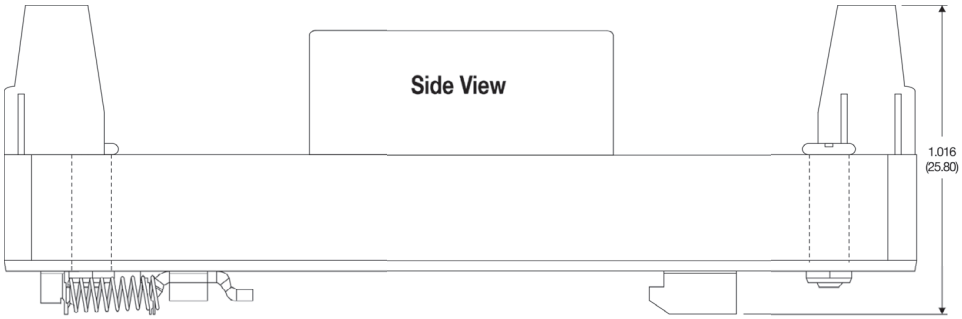
Pin Connections

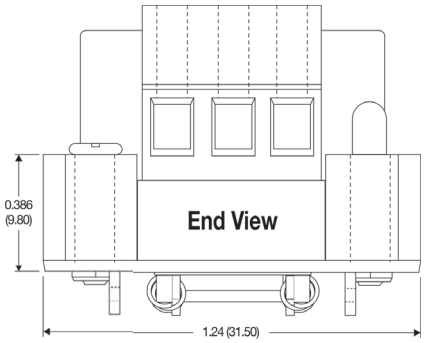
Pin	Single Output
1	Remote On/Off
2	-VIN
3	+VIN
4	-VOUT
5	No Connection
6	+VOUT

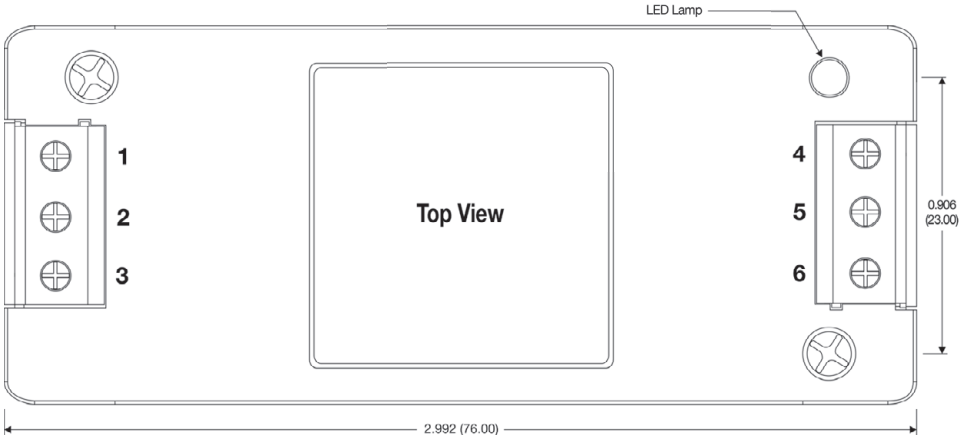
Pin	Dual Output
1	Remote On/Off
2	-VIN
3	+VIN
4	-VOUT
5	Common
6	+VOUT

Weight: 1.237 Oz (35g)

Mechanical Dimensions: With A4S Adapter Board







For the A4S adapter board option, add suffix "A4S" to the model number (i.e. **MI1048D-12ERU-A4S**)

Pin Connections

Pin	Single Output
1	Remote On/Off
2	-VIN
3	+VIN
4	-VOUT
5	No Connection
6	+VOUT

Pin	Dual Output
1	Remote On/Off
2	-VIN
3	+VIN
4	-VOUT
5	Common
6	+VOUT

Weight: 1.944 Oz (55g)

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

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