

MB1000ERU



Low Cost, 1 x 2 Inch 10W, 4:1 Input Range DC/DC Converters

Key Features:

- 10W Output Power
- 4:1 Input Voltage Range
- 1,500 VDC Isolation
- Single & Dual Outputs
- Efficiency to 88%
- Compact 1 x 2 Inch Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Low Cost



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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 Voltage	24 VDC Input			9.0	VDC
	48 VDC Input			18.0	
Input Filter	π (Pi) Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±1.0	±2.0	%
Output Voltage Balance	Dual Outputs, Balanced Loads		±0.5	±1.5	%
Line Regulation	V _{IN} = Min to Max		±0.2	±0.5	%
Load Regulation	I _{OUT} = 5% to 100%		±0.5	±1.0	%
Cross Regulation	See Note 2			±5.0	%
Ripple (20 MHz)			15	35	mV P - P
Noise (20 MHz)	See Note 3		40	80	
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	120	140	%
Output Short Circuit, See Note 5	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	+25	+85	°C
Operating Temperature Range	Case			+105	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Case Size	See Mechanical Diagram (Page 4))				
Case Material	Aluminum Alloy With Non-Conductive Base (UL94-V0)				
Weight	0.78 Oz (22g)				

Remote On/Off

Parameter	Conditions	Min.	Typ.	Max.	Units
Unit On	See Note 7	3.5		12.0	VDC
Unit Off	See Note 7	0		1.2	VDC
Off Idle Current			1.0	3.0	mA

Reliability Specifications

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

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	24 VDC Input	-0.7		50.0	VDC
	48 VDC Input	-0.7		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.

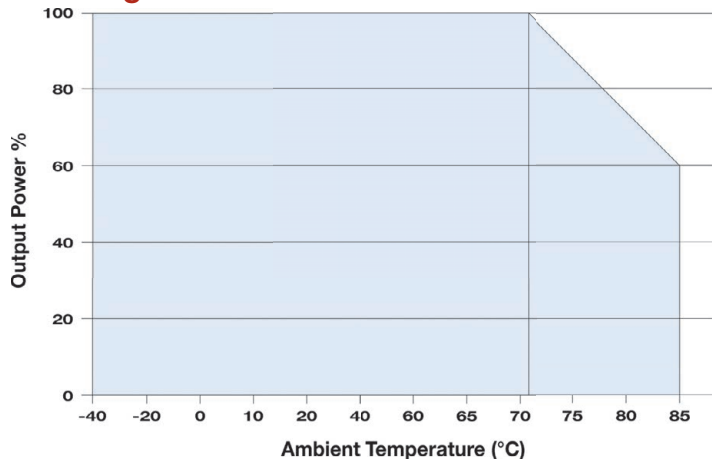
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Model Number	Input				Voltage (VDC)	Output		Reflected Ripple Current (mA Typ)	Capacitive Load (µF, Max)	Efficiency (% Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)			Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MB1024S-03ERU	24	9.0 - 36.0	418	12	3.3	2,400	120	40	2,200	79	3,000
MB1024S-05ERU	24	9.0 - 36.0	508	12	5.0	2,000	100	40	2,200	82	3,000
MB1024S-12ERU	24	9.0 - 36.0	484	12	12.0	833	42	40	470	86	3,000
MB1024S-15ERU	24	9.0 - 36.0	479	12	15.0	667	33	40	330	87	3,000
MB1024S-24ERU	24	9.0 - 36.0	479	12	24.0	416	21	40	100	87	3,000
MB1024D-05ERU	24	9.0 - 36.0	502	12	±5.0	±1,000	±50	40	680	83	3,000
MB1024D-12ERU	24	9.0 - 36.0	484	12	±12.0	±416	±21	40	220	86	3,000
MB1024D-15ERU	24	9.0 - 36.0	473	12	±15.0	±333	±16	40	100	88	3,000
MB1048S-03ERU	48	18.0 - 75.0	209	6	3.3	2,400	120	30	2,200	79	1,500
MB1048S-05ERU	48	18.0 - 75.0	254	6	5.0	2,000	100	30	2,200	82	1,500
MB1048S-12ERU	48	18.0 - 75.0	242	6	12.0	833	42	30	330	86	1,500
MB1048S-15ERU	48	18.0 - 75.0	239	6	15.0	667	33	30	220	87	1,500
MB1048S-24ERU	48	18.0 - 75.0	239	6	24.0	416	21	30	100	87	1,500
MB1048D-05ERU	48	18.0 - 75.0	251	6	±5.0	±1,000	±50	30	680	83	1,500
MB1048D-12ERU	48	18.0 - 75.0	242	6	±12.0	±416	±21	30	150	86	1,500
MB1048D-15ERU	48	18.0 - 75.0	237	6	±15.0	±333	±16	30	100	88	1,500

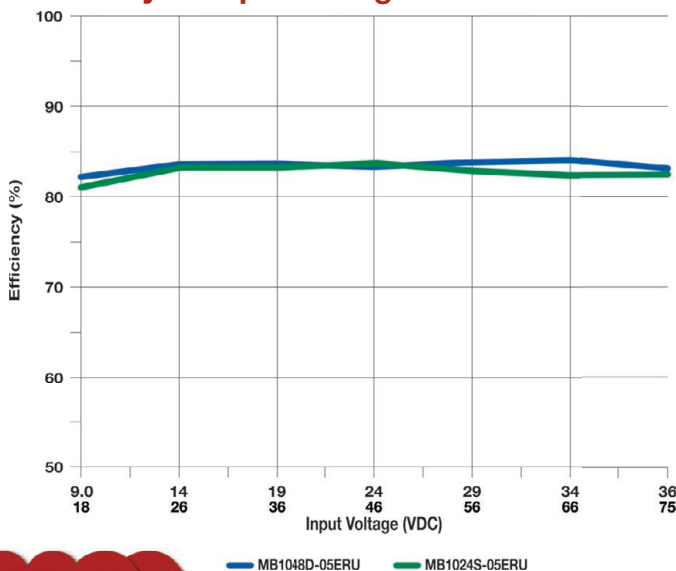
Notes:

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, it is recommended that an external ceramic capacitor (approx 10 µF) be placed from the +Vout to the -Vout pins for single output models; or 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. Short circuit protection is provided by a "hiccup mode" circuit.
6. These units should not be operated with a load under 5% of full load. Operation at no-load will not damage the unit, but they may not meet all specifications.
7. The control input (pin 6) is referenced to the -Vin (pin 2) input. If it is grounded, the unit will shut off.
8. 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.

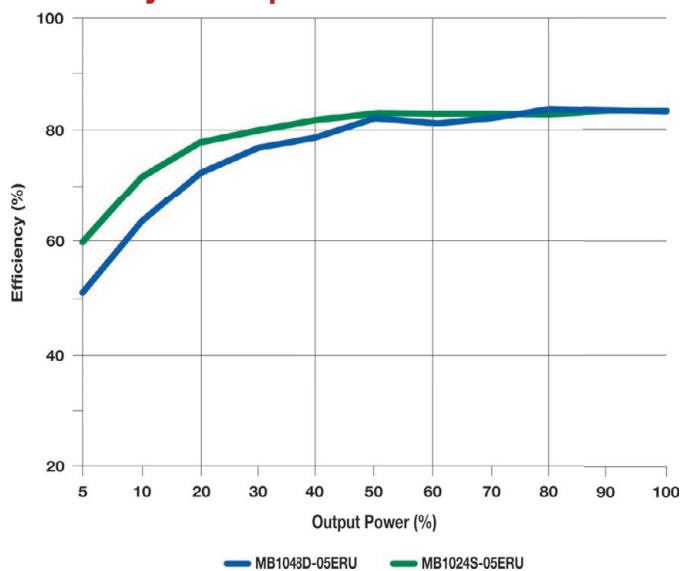
Derating Curve



Efficiency vs Input Voltage



Efficiency vs Output Power



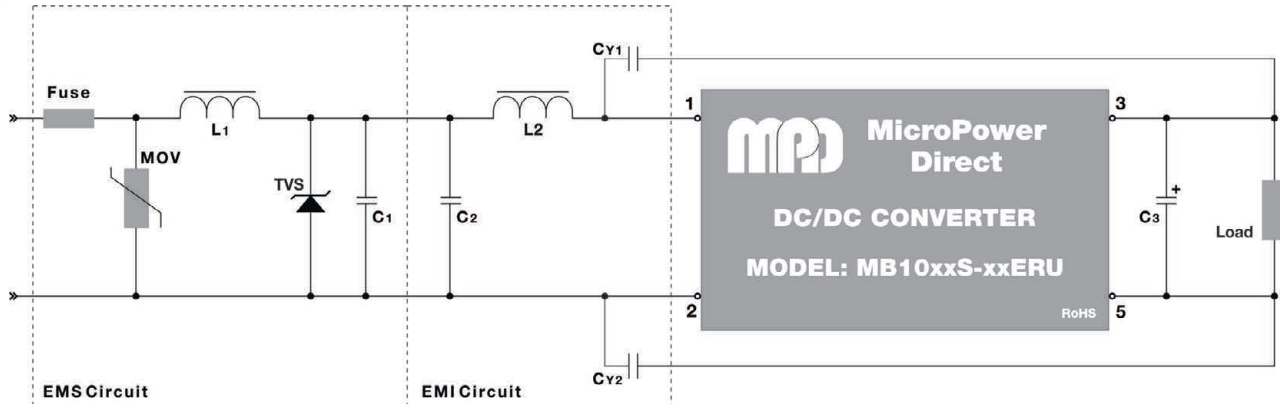
EMC Specifications

Parameter	Standard		
Radiated Emissions	See Note 1	EN 55022	Class A
Conducted Emissions	See Note 1	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 2	EN 61000-4-4	Criteria B; ±2 kV
Surge	See Note 3	EN 61000-4-5	Criteria B; ±2 kV
CS		EN 61000-4-6	Criteria A; 3 Vrms
Voltage Dips		EN 61000-4-29	Criteria B; 0% - 70%

Notes:

- All units are rated for EN 55022 (CE/RE) class A without external components. They will meet class B with the addition of the **MDCFM-2AW** (or a similar discrete filter circuit). Contact the factory for more information.
- To meet the requirements of EN 61000-4-4 (±2kV), external components are needed, as shown on the typical connection diagram below. Use the **MDCFM-2AW** to meet EN 61000-4-4 (±4 kV). Contact the factory for more information.
- To meet the requirements of EN 61000-4-5 (±2 kV), external components are needed. This can be done discretely, or with the addition of the **MDCFM-2AW**. Contact the factory for more information.

Typical Connection



The diagram above illustrates a typical connection of the **MB1000ERU** series for applications that require meeting EMC standards. The units do not require external components to operate as specified. Some notes on this diagram (starting with the input circuit) are:

- It is recommended that an external fuse be used. The recommended fuse is shown in the model chart on page 2.
- 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.
- An external TVS is recommended on the input to protect the unit in the event of a voltage spike. A recommended value is given in the table at right.
- The output filtering capacitor (C3) is a high frequency, low resistance electrolytic capacitor. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit. The board layout illustration below shows a connection for dual output units. Voltage derating of capacitors should be 80% or above.

5. Recommended values for components are:

Component	24 V _{IN}	48 V _{IN}
MOV	S14K35	S14k60
L1	56 μ H	56 μ H
TVS	SMCJ48A	SMCJ90A
C1	330 μ F/50V	330 μ F/100V
C2	1.0 μ F/50V	1.0 μ F/100V
L2	4.7 μ H	4.7 μ H
Cy1, Cy2	1.0 nF/2 kV	1.0 nF/2 kV

- Input noise and surge suppression modules are available for a number of **MPD DC/DC power supplies**. An **MB1000ERU** board layout with the **MDCFM-2AW** (EFT suppression) module connected to the input is shown on page 4. For pricing,

samples or full technical information on these modules, please contact the factory.

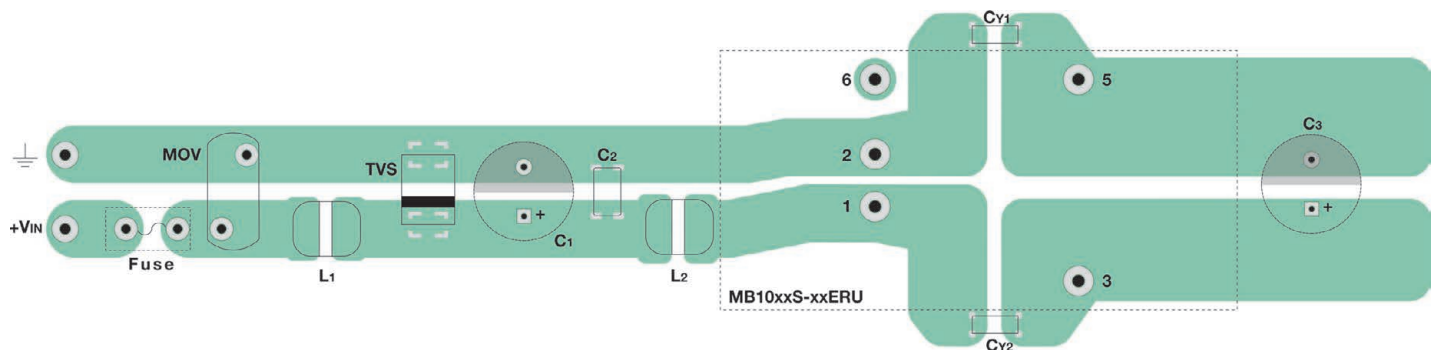
- In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The input capacitor C1 and output capacitors C3 and C4 shown in the typical connection diagram above, and board layout drawing below illustrate their connection. In this case, recommended capacitor values are:

C_{IN}: 10 μ F to 47 μ F

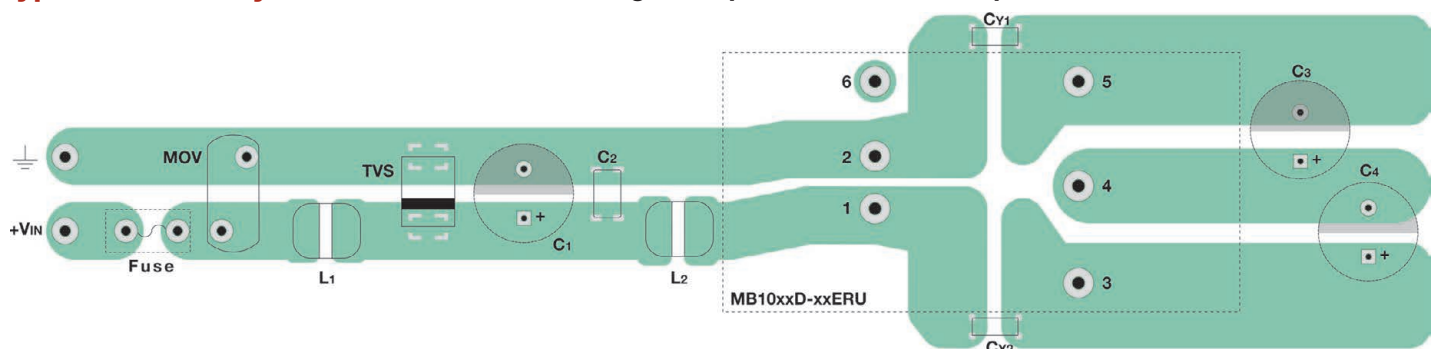
C_{OUT}: 10 μ F

- The pad spacing between input/output (Cy1 & Cy2) in the board layout drawings below should be a minimum of 2 mm.

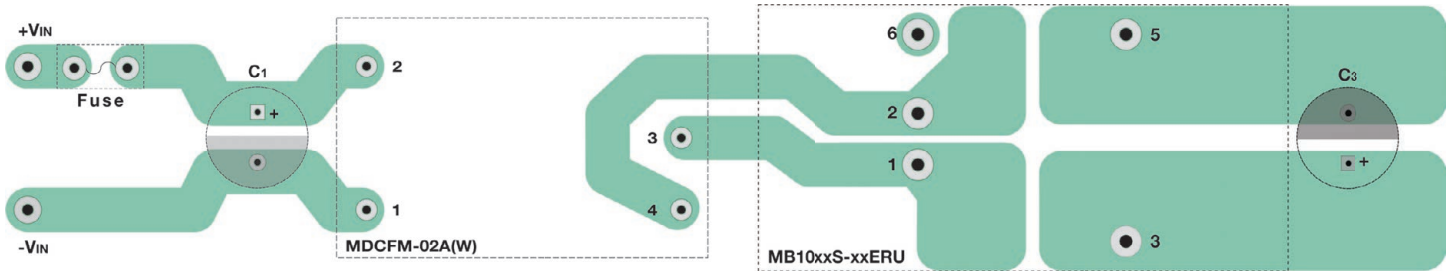
Typical Board Layout: With External Filter/Surge Components for Single Output Unit



Typical Board Layout: With External Filter/Surge Components for Dual Output Unit

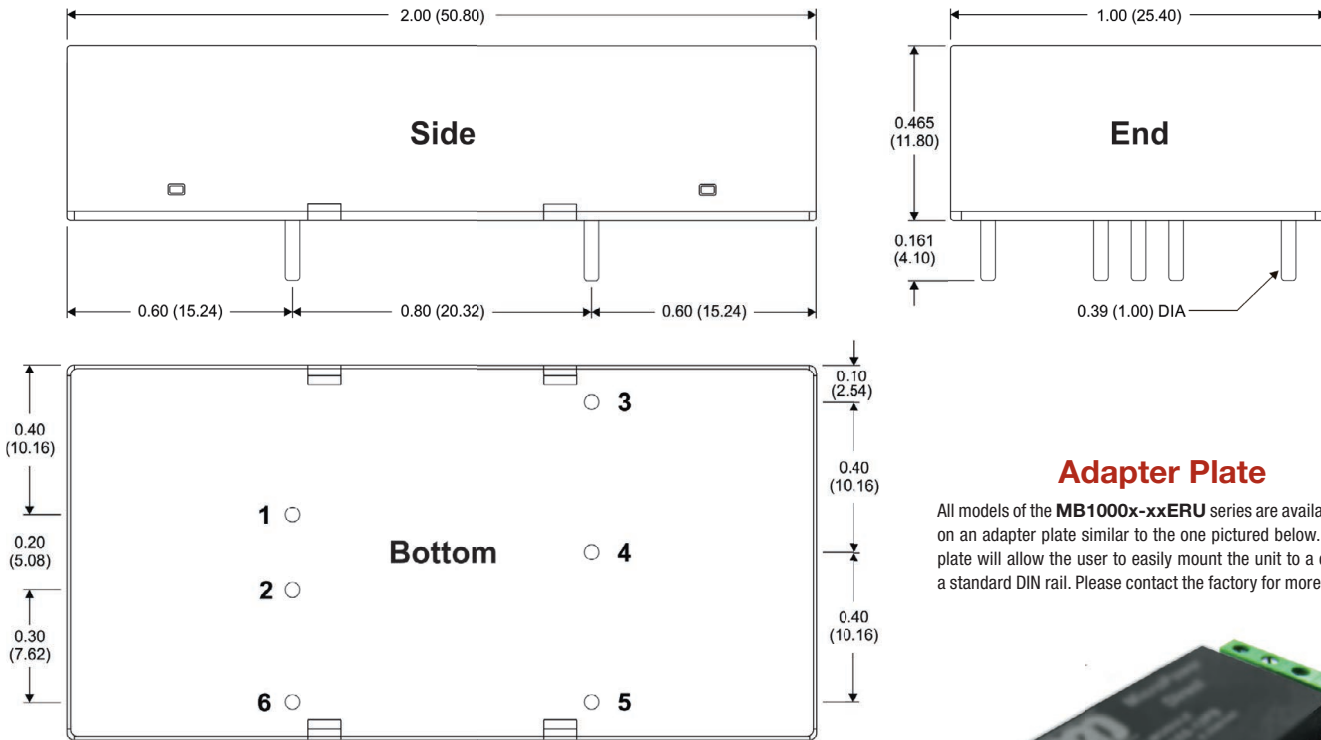


Typical Board Layout: With MDCFM-2A(W) Surge Suppression and Filter Module



The diagram above illustrates a typical board layout of the **MB1000ERU** series with a **MDCFM-2A(W)** (EFT suppression module) connected to the input. This module will substantially improve the EMS performance of the converter while simplifying the overall circuit design. Values for the capacitors used are 330 μ F/50V for 24 VIN models, 330 μ F/100V for 48 VIN models and for the output capacitor, 10 μ F.

Mechanical Dimensions



Adapter Plate

All models of the **MB1000x-xxERU** series are available mounted on an adapter plate similar to the one pictured below. The adapter plate will allow the user to easily mount the unit to a chassis or to a standard DIN rail. Please contact the factory for more information.



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
6	Remote On/Off	6	Remote On/Off

Notes:

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