

MB1000ERW

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



Key Features:

- 10W Output Power
- 2:1 Input Voltage Range
- 1,500 VDC Isolation
- Single & Dual Outputs
- Efficiency to 90%
- Compact 1 x 2 Inch Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Low Cost

RoHS



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	
	48 VDC Input	36.0	48.0	75.0	
Input Start Voltage	12 VDC Input			9.0	VDC
	24 VDC Input			18.0	
	48 VDC Input			36.0	
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 1			±5.0	%
Ripple (20 MHz)	See Note 2		15	35	mV P - P
Noise (20 MHz)			40	80	
Transient Recovery Time, See Note 3	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 4	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	2.0 x 1.0 x 0.465 Inches (50.8 x 25.4 x 11.8 mm)				
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 5	3.5		12.0	VDC
Unit Off	See Note 5	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

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	12 VDC Input	-0.7		25.0	VDC
	24 VDC Input	-0.7		50.0	
	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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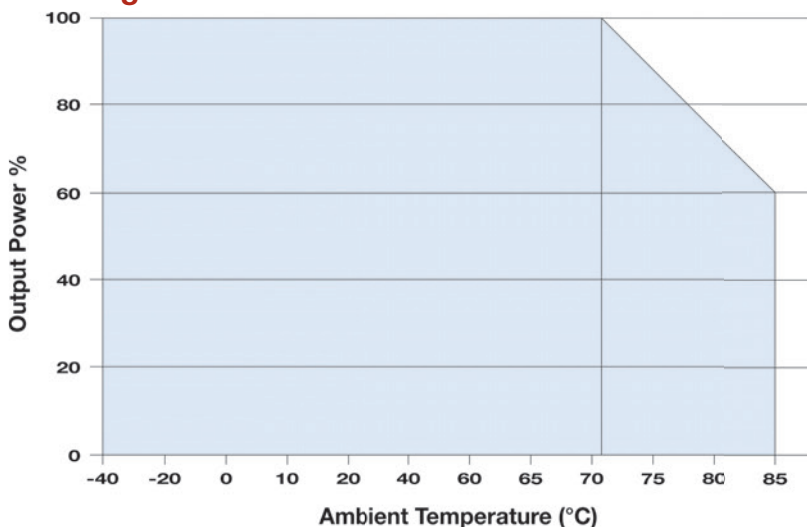
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Model Number	Input				Output			Reflected Ripple Current (mA Typ)	Capacitive Load (μF, Max)	Efficiency (%, Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MB1012S-03ERW	12	9.0 - 18.0	857	25	3.3	2,400	120	20	2,200	77	2,000
MB1012S-05ERW	12	9.0 - 18.0	1,016	25	5.0	2,000	100	20	2,200	82	2,000
MB1012S-12ERW	12	9.0 - 18.0	969	25	12.0	833	42	20	470	86	2,000
MB1012S-15ERW	12	9.0 - 18.0	958	25	15.0	667	33	20	220	87	2,000
MB1012S-24ERW	12	9.0 - 18.0	947	25	24.0	416	21	20	100	88	2,000
MB1012D-05ERW	12	9.0 - 18.0	1,016	25	±5.0	±1,000	±50	20	±680	82	2,000
MB1012D-12ERW	12	9.0 - 18.0	969	25	±12.0	±416	±21	20	±220	86	2,000
MB1012D-15ERW	12	9.0 - 18.0	958	25	±15.0	±333	±16	20	±100	87	2,000
MB1012D-24ERW	12	9.0 - 18.0	958	25	±24.0	±208	±10	20	±47	87	2,000
MB1024S-03ERW	24	18.0 - 36.0	429	12	3.3	2,400	120	20	2,200	77	1,000
MB1024S-05ERW	24	18.0 - 36.0	496	12	5.0	2,000	100	20	2,200	84	1,000
MB1024S-12ERW	24	18.0 - 36.0	473	12	12.0	833	42	20	680	88	1,000
MB1024S-15ERW	24	18.0 - 36.0	463	12	15.0	667	33	20	330	90	1,000
MB1024S-24ERW	24	18.0 - 36.0	479	12	24.0	416	21	20	100	87	1,000
MB1024D-05ERW	24	18.0 - 36.0	502	12	±5.0	±1,000	±50	20	±680	83	1,000
MB1024D-12ERW	24	18.0 - 36.0	484	12	±12.0	±416	±21	20	±330	86	1,000
MB1024D-15ERW	24	18.0 - 36.0	473	12	±15.0	±333	±16	20	±220	88	1,000
MB1024D-24ERW	24	18.0 - 36.0	479	12	±24.0	±208	±10	20	±100	87	1,000
MB1048S-03ERW	48	36.0 - 75.0	212	6	3.3	2,400	120	20	2,200	78	500
MB1048S-05ERW	48	36.0 - 75.0	254	6	5.0	2,000	100	20	2,200	82	500
MB1048S-12ERW	48	36.0 - 75.0	237	6	12.0	833	42	20	820	88	500
MB1048S-15ERW	48	36.0 - 75.0	234	6	15.0	667	33	20	470	89	500
MB1048S-24ERW	48	36.0 - 75.0	237	6	24.0	416	21	20	220	88	500
MB1048D-05ERW	48	36.0 - 75.0	251	6	±5.0	±1,000	±50	20	±680	83	500
MB1048D-12ERW	48	36.0 - 75.0	237	6	±12.0	±416	±21	20	±470	88	500
MB1048D-15ERW	48	36.0 - 75.0	234	6	±15.0	±333	±16	20	±220	89	500
MB1048D-24ERW	48	36.0 - 75.0	237	6	±24.0	±208	±10	20	±100	88	500

Notes:

1. Cross regulation is measured with the output being tested at 50% load. The second output is varied from 10% to 100% load.
2. When measuring output ripple, it is recommended that an external ceramic capacitor (approx 10 μF) be placed from the +V_{out} to the -V_{out} pins for single output models; or from each output to common for dual output models.
3. Transient recovery is measured to within a 1% error band for a load step change of 25%.
4. Short circuit protection is provided by a "hiccup mode" circuit.
5. 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.
6. These units should not be operated over +85°C. Exceeding +85°C may damage the unit.
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



Adapter Plate



All models of the **MB1000x-xxERW** series are available mounted on an adapter plate similar to the one pictured above. 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.



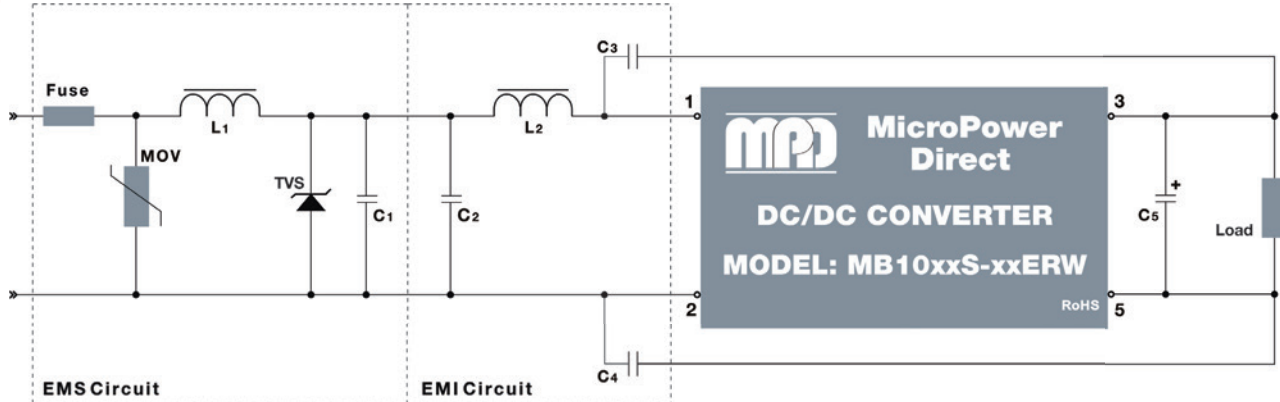
EMC Specifications

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-1B** (or a similar discrete filter circuit). Contact the factory for more information.
- To meet the requirements of EN 61000-4-4 (± 2 kV), external components are needed, as shown on the typical connection diagram below. Use the **MDCFM-1B** 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-1B**. Contact the factory for more information.

Typical Connection



The diagram above illustrates a typical connection of the **MB1000ERW** 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 (C_5) 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	12 V _{IN}	24 V _{IN}	48 V _{IN}
MOV	---	S14K35	S14K60
L1	---	56 μ H	56 μ H
TVS	SMCJ28A	SMCJ48A	SMCJ90A
C1	680 μ F/25V	330 μ F/50V	330 μ F/100V
C2	1.0 μ F/50V	1.0 μ F/50V	1.0 μ F/100V
L2	4.7 μ H	4.7 μ H	4.7 μ H
C3, C4	1.0 nF/2 kV	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 **MB1000ERW** board layout with the **MDCFM-1B** (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.

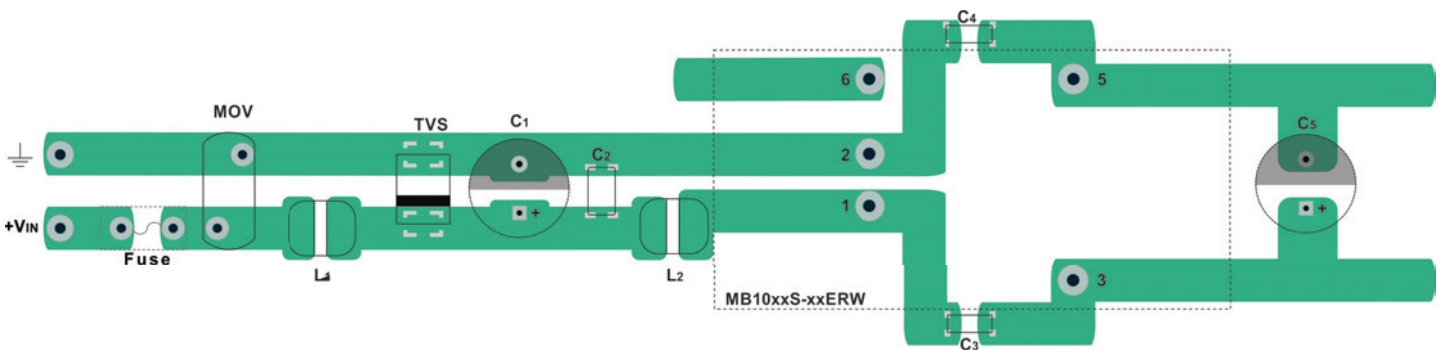
- In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The input capacitor C1 and output capacitors C5 and C6 shown in the typical connection diagram above, and board layout drawing below illustrate their connection. In this case, recommended capacitor values are:

C_{IN}: 100 μ F for 12V input models
10 μ F to 47 μ F for 24V & 48V input models

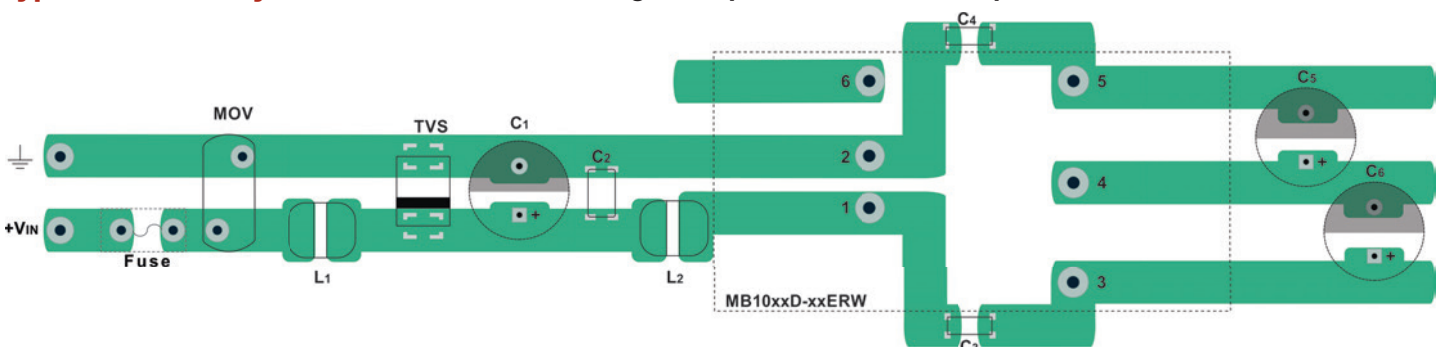
C_{OUT}: 10 μ F for all models

- The pad spacing between input/output (C3 & C4) in the board layout drawings below should be a minimum of 2 mm.

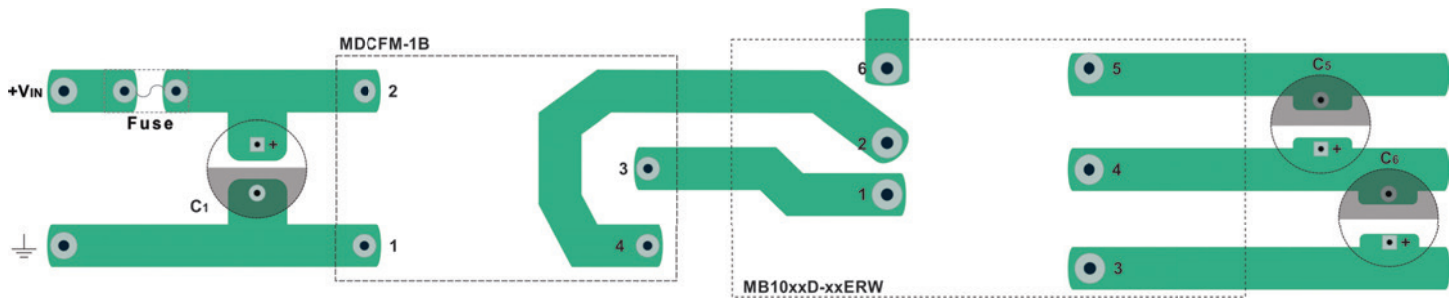
Typical Board Layout: With External Filter/Surge Components for Single Output Unit



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



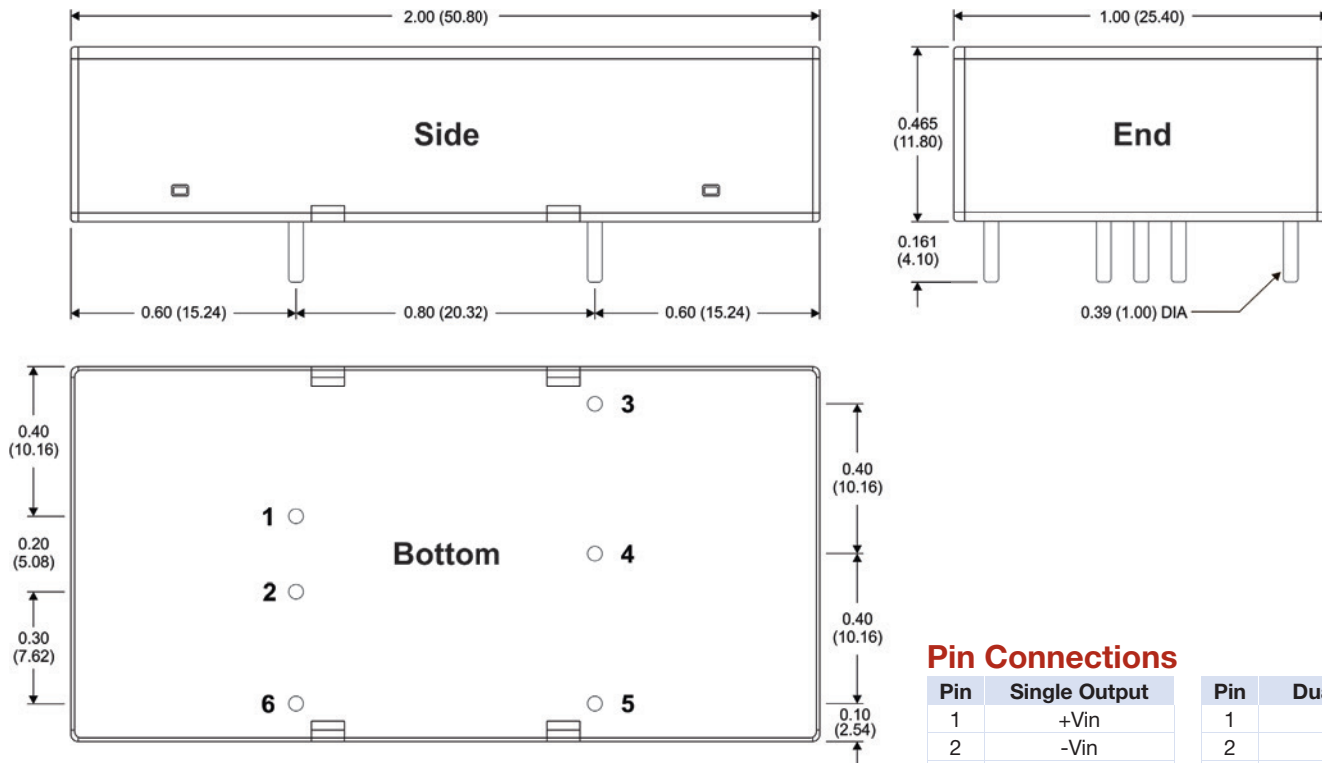
Typical Board Layout: With MDCFM-1B Surge Suppression and Filter Module



The diagram above illustrates a typical board layout of the **MB1000ERW** series with a **MDCFM-1B** (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 given in the table at right.

V _{IN} (VDC)	Input Capacitor	V _{OUT} (VDC)	Output Capacitor
12	330 μ F/50V	3.3	10 μ F
		5	10 μ F
24	330 μ F/50V	12	10 μ F
		15	10 μ F
48	330 μ F/100V	24	10 μ F
		± 5	± 10 μ F
		± 12	± 10 μ F
		± 15	± 10 μ F
		± 24	± 10 μ F

Mechanical Dimensions



Notes:

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

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



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