

MB3000ERW

Low Cost, 1 x 2 Inch 30W, 2:1 Input Range DC/DC Converters



Key Features:

- 30W Output Power
- 2:1 Input Voltage Range
- 1,500 VDC Isolation
- 11 Single Output Models
- Efficiency to 89%
- Compact 1 x 2 Inch Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Low Cost

RoHS



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	24 VDC Input	18.0	24.0	36.0	VDC
	48 VDC Input	36.0	48.0	75.0	
Input Start Voltage	24 VDC Input		17.8	18.0	VDC
	48 VDC Input		35.8	36.0	
Input Filter	π (Pi) Filter				
Start-Up Time	See Note 1		10		mS

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±1.0	±3.0	%
Output Trim Range			±10		%
Line Regulation	V _{IN} = Min to Max		±0.2	±0.5	%
Load Regulation	I _{OUT} = 10% to 100%		±0.5	±1.0	%
Ripple & Noise (20 MHz)	See Note 2		50	120	mV P - P
Transient Recovery Time, See Note 3	25% Load Step Change		300	500	μS
Transient Response Deviation			±3.0	±5.0	%
Output Power Protection		120	130	150	%
Temperature Coefficient			±0.02		%/°C
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			300		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 5	3.0		40.0	VDC
Unit Off	See Note 5	0		1.2	VDC
Off Idle Current			1.0		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.

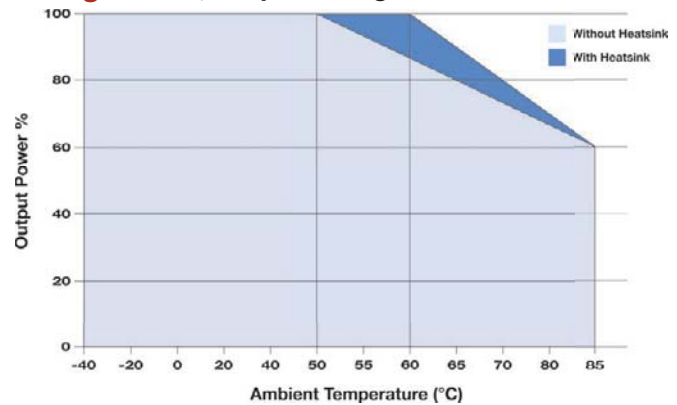
Model Selection Guide

Model Number	Input				Output			Efficiency (% Typ)	Over Voltage Protection (VDC Typ)	Capacitive Load (µF, Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MB3024S-03ERW	24	18.0 - 36.0	960	120	3.3	6,000	600	87	3.96	6,800	2,000
MB3024S-05ERW	24	18.0 - 36.0	1,460	120	5.0	6,000	600	88	6.00	6,800	3,000
MB3024S-09ERW	24	18.0 - 36.0	1,440	20	9.0	3,333	333	88	10.8	680	3,000
MB3024S-12ERW	24	18.0 - 36.0	1,440	20	12.0	2,500	250	88	15.0	680	3,000
MB3024S-15ERW	24	18.0 - 36.0	1,440	20	15.0	2,000	200	89	18.0	680	3,000
MB3024S-24ERW	24	18.0 - 36.0	1,440	20	24.0	1,250	125	89	28.0	470	3,000
MB3048S-03ERW	48	36.0 - 75.0	500	80	3.3	6,000	600	87	3.96	6,800	1,000
MB3048S-05ERW	48	36.0 - 75.0	730	80	5.0	6,000	600	88	6.00	6,800	1,500
MB3048S-12ERW	48	36.0 - 75.0	720	20	12.0	2,500	250	89	15.0	680	1,500
MB3048S-15ERW	48	36.0 - 75.0	720	20	15.0	2,000	200	89	18.0	680	1,500
MB3048S-24ERW	48	36.0 - 75.0	720	20	24.0	1,250	125	88	28.0	470	1,500

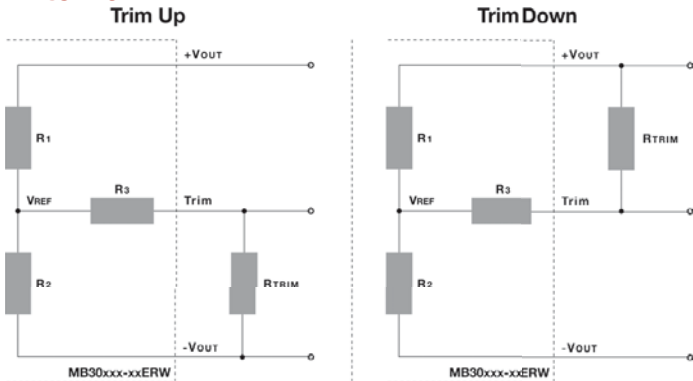
Notes:

- Start up time is measured at nominal input and with a constant resistive load.
- When measuring output ripple, it is recommended that an external ceramic capacitor (approx 1 µF to 10 µF) be placed from the +Vout to the -Vout pins.
- Transient recovery is measured to within a 1% error band for a load step change of 25%.
- Short circuit protection is provided by a "hiccup mode" circuit.
- If the on/off pin is left open, the unit operates. If it is grounded, the unit will shut off.
- These units should not be operated with a load under 10% of full load. Operation at no-load will not damage the unit, but they may not meet all specifications.
- These units should not be operated over +85°C. Exceeding +85°C may damage the unit.
- 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, Output Voltage ≤5V



External Trim



External Trim Notes:

On single output units, an external resistor can be used to adjust the converter output up/down by about 10%. The connection is shown in the diagram at left. The required resistor value is calculated by the formulas:

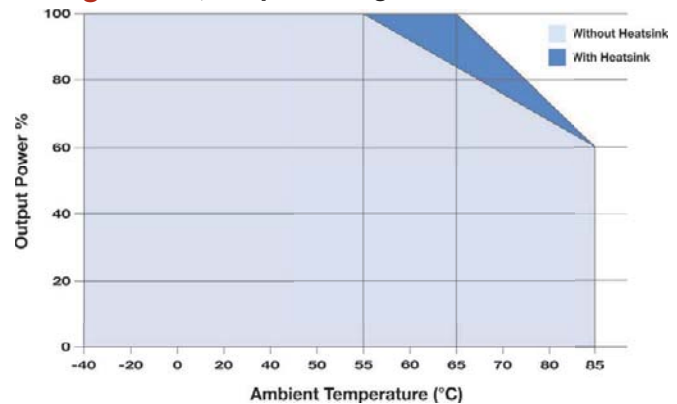
$$\text{Trim UP} = R_{\text{TRIM}} = \frac{A \cdot R_2}{R_2 - A} - R_3 \quad \text{Where } A = \frac{V_{\text{REF}}}{V_{\text{TRIM}} - V_{\text{REF}}} \cdot R_1$$

$$\text{Trim Down} = R_{\text{TRIM}} = \frac{A \cdot R_1}{R_1 - A} - R_3 \quad \text{Where } A = \frac{V_{\text{TRIM}} - V_{\text{REF}}}{V_{\text{REF}}}$$

Where RTRIM = The value of the external trim resistor
 VTRIM = The amount of voltage adjustment required

The value of R1, R2, R3 and VREF are given in the table below.

Derating Curve, Output Voltage >5V



Output Trim Resistor Values

Parameter	Output Voltage (VDC)					
	3.3	5.0	9.0	12	15	24
R1 (kΩ)	4.801	2.883	7.500	10.971	14.497	24.872
R2 (kΩ)	2.863	2.864	2.864	2.864	2.864	2.864
R3 (kΩ)	15.00	10.00	15.00	17.80	17.80	20.00
VREF (V)	1.24	2.50	2.50	2.50	2.50	2.50



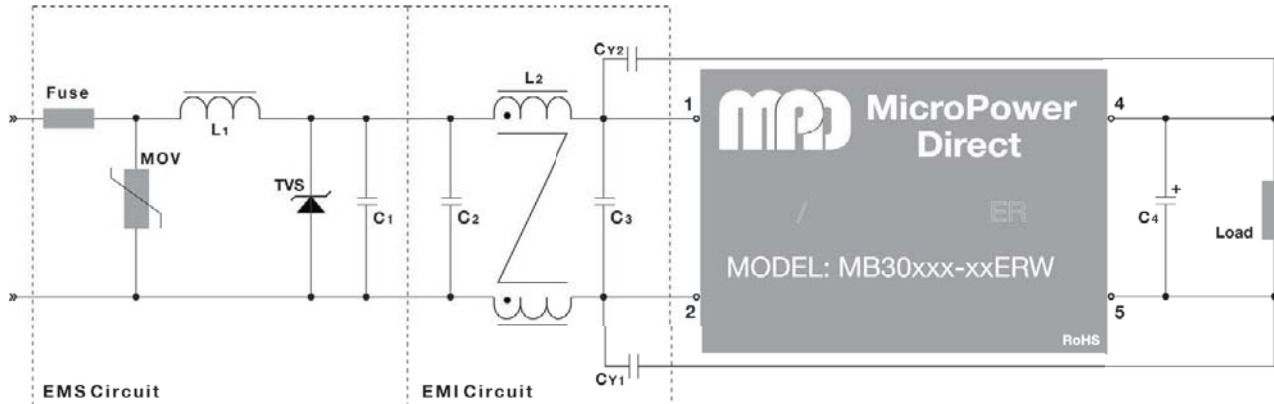
EMC Specifications

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-xxW** (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. This can be done discretely, or with the addition of the **MDCFM-xxW**. 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-xxW**. Contact the factory for more information.

Typical Connection



The diagram above illustrates a typical connection of the **MB3000ERW** 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 (C4) 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. 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 µH	56 µH
TVS	SMCJ48A	SMCJ90A
C1	330 µF/50V	330 µF/100V
C2, C3	4.7 µF/50V	2.2 µF/100V
L2	1.0 mH	1.0 mH
CY1, CY2	1nF/2 kV	1nF/2 kV
C0	400 µF/200V	400 µF/200V

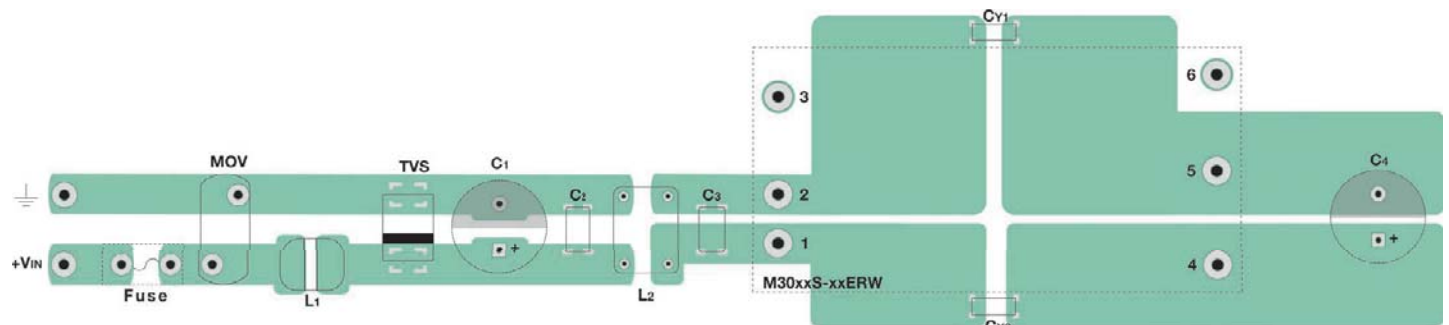
- Input noise and surge suppression modules are available for a number of **MPD** DC/DC power supplies. A connection for one of these modules is illustrated in the typical board layout shown at

the bottom of this page For pricing or full technical information, please contact the factory.

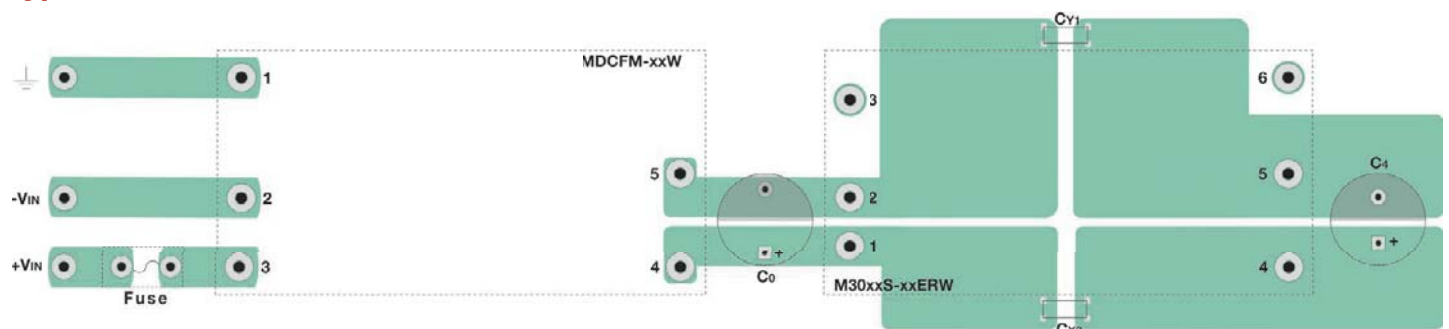
- In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The input capacitor C1 and output capacitor C4 shown in the typical connection diagram above (& board layout drawing below) illustrate their connection. Recommended capacitor values are given in the table.

V _{in} (VDC)	Input Capacitor	V _{out} (VDC)	Output Capacitor
24	100 µF	3.3	220 µF
		5.0	220 µF
48	100 µF	9.0	100 µF
		12	100 µF
		15	100 µF
24		47 µF	

Typical Board Layout: With External Filter/Surge Components



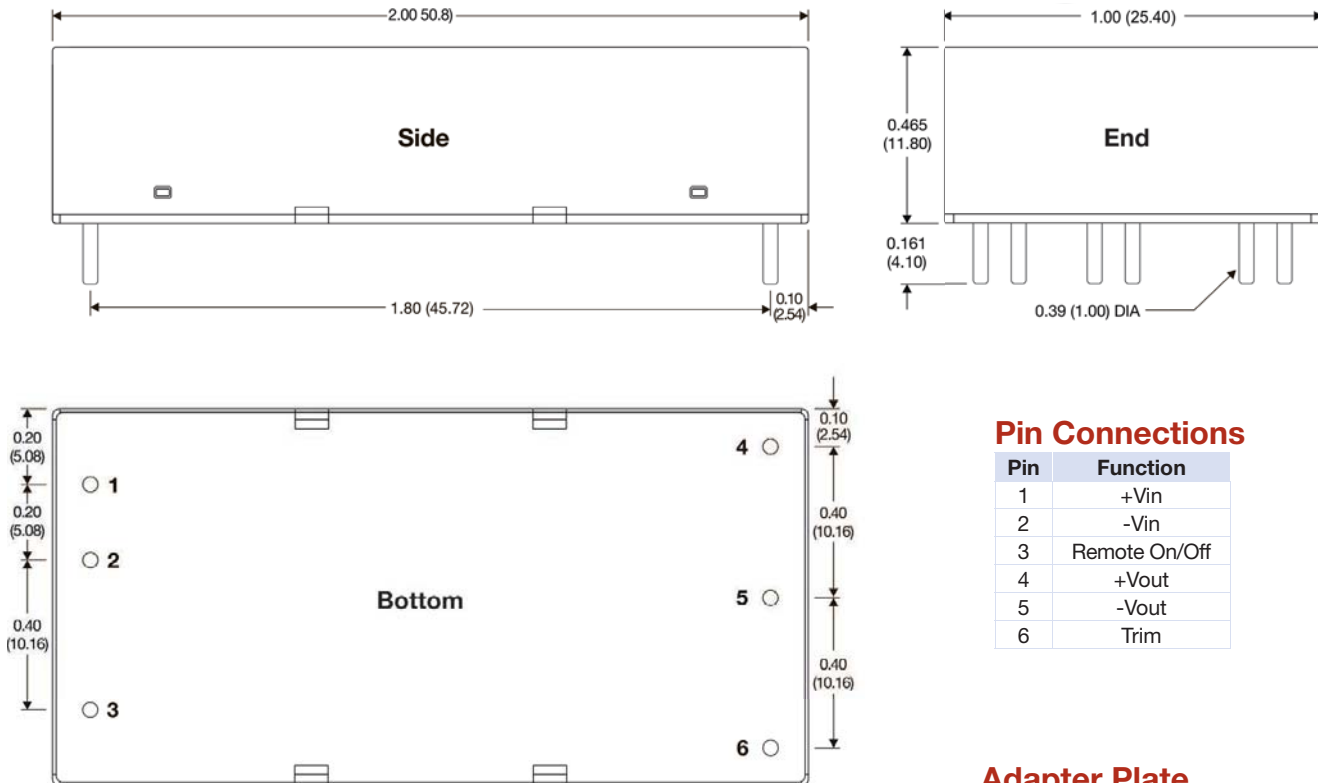
Typical Connection: With External Filter Module Unit





Mechanical Dimensions

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Pin Connections

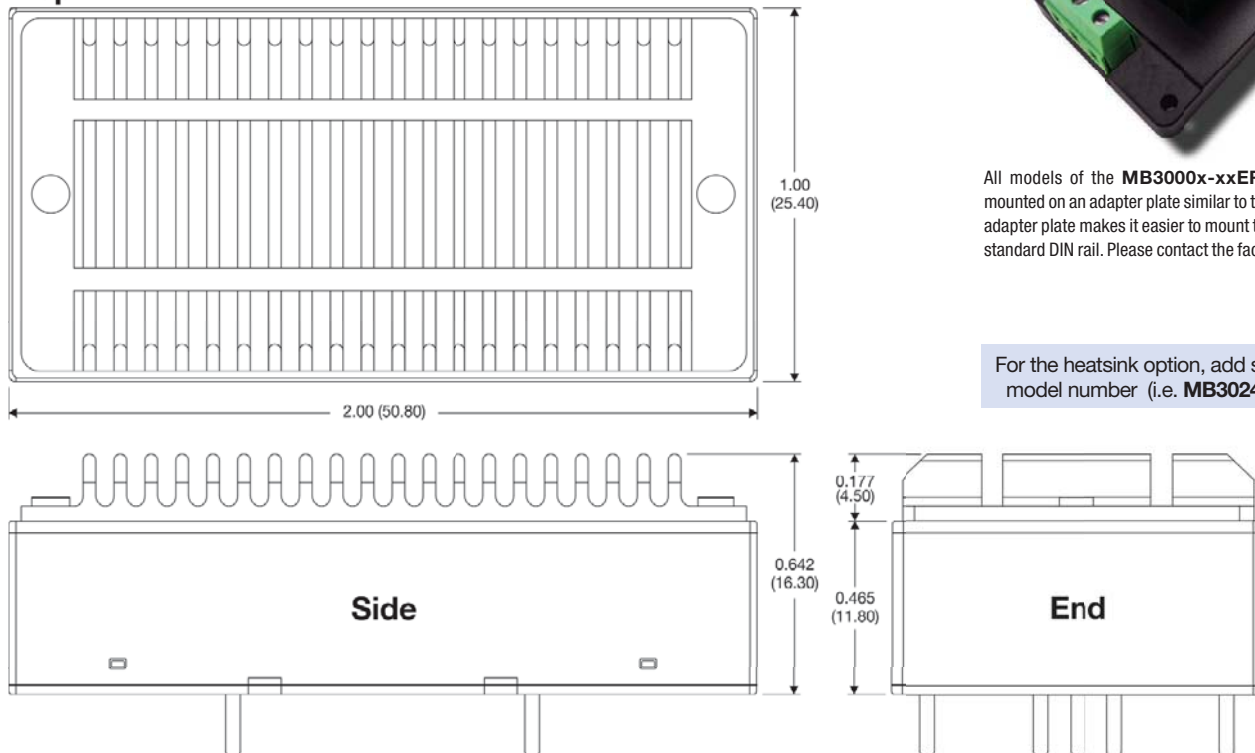
Pin	Function
1	+Vin
2	-Vin
3	Remote On/Off
4	+Vout
5	-Vout
6	Trim

Adapter Plate



All models of the **MB3000x-xxERW** series are available mounted on an adapter plate similar to the one pictured at left. The adapter plate makes it easier to mount the unit to a chassis or to a standard DIN rail. Please contact the factory for more information.

Mechanical Dimensions: With Optional Heatsink Top



For the heatsink option, add suffix "H" to the model number (i.e. **MB3024S-05ERW-H**)

Notes:

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