MB4000ERW-H

Low Cost, 1 x 2 Inch 40W, 2:1 Input Range DC/DC Converters

Key Features:

- 40W Output Power
- 2:1 Input Voltage Range
- 1,500 VDC Isolation
- Efficiency to 91%
- Meets EN 55032
- Integrated Heat Sink
- -40°C to +80°C Operation
- Industry Standard Pin-Out

RoHS

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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	18.0	24.0	36.0	VDC
	48 VDC Input	36.0	48.0	75.0	
Input Start Voltage	24 VDC Input			18.0	VDC
	48 VDC Input			36.0	
Input Under Voltage Protection	24 VDC Input	13.0	15.5		VDC
	48 VDC Input	26.0	33.0		
Reflected Ripple Current			30.0		mA
Start-Up Time	See Note 1		10		mS
Input Filter	π (Pi) Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	0% - 100% IOUT		±1.0	±3.0	%
Output Trim Range			±10		%
Line Regulation	VIN = Min to Max		±0.2	±0.5	%
Load Regulation	IOUT = 0% to 100%		±0.5	±1.0	%
Ripple & Noise (20 MHz)	See Note 2		50	100	mV P - P
Transient Recovery Time,	See Note 3		300	500	μS
Transient Response Deviation			±3.0	±5.0	%
Over Voltage Protection		110		160	%VOUT
Output Power Protection		110		190	%IOUT
Temperature Coefficient				±0.03	%/°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		2,000		pF
Switching Frequency			300		kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+80	°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	1.27 0z (36g)

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			5.0	10.0	mA

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	500			kHours
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			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

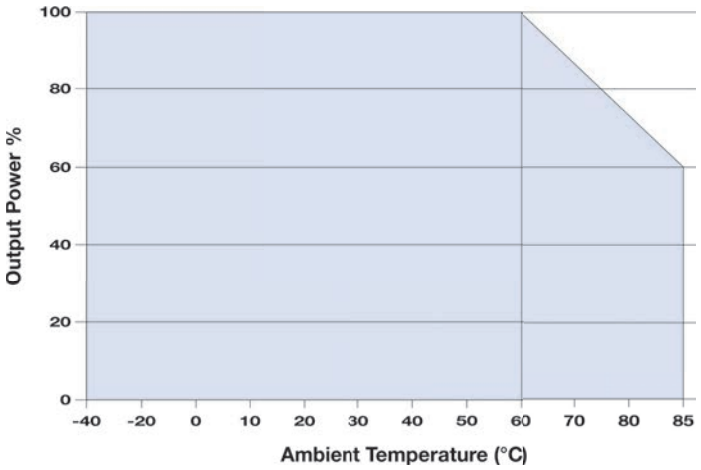
Model Number	Input				Output			Efficiency (%, Typ)	Capacitive Load (µF, Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MB4024S-12ERW-H	24	18.0 - 36.0	1,850	85	12.0	3,333	0.0	90	2,700	4,000
MB4024S-15ERW-H	24	18.0 - 36.0	1,831	90	15.0	2,667	0.0	91	1,680	4,000
MB4024S-24ERW-H	24	18.0 - 36.0	1,831	45	24.0	1,667	0.0	91	680	4,000
MB4048S-12ERW-H	48	36.0 - 75.0	926	34	12.0	3,333	0.0	90	2,700	2,000
MB4048S-15ERW-H	48	36.0 - 75.0	916	50	15.0	2,667	0.0	91	1,680	2,000
MB4048S-24ERW-H	48	36.0 - 75.0	916	30	24.0	1,667	0.0	91	680	2,000

Notes:

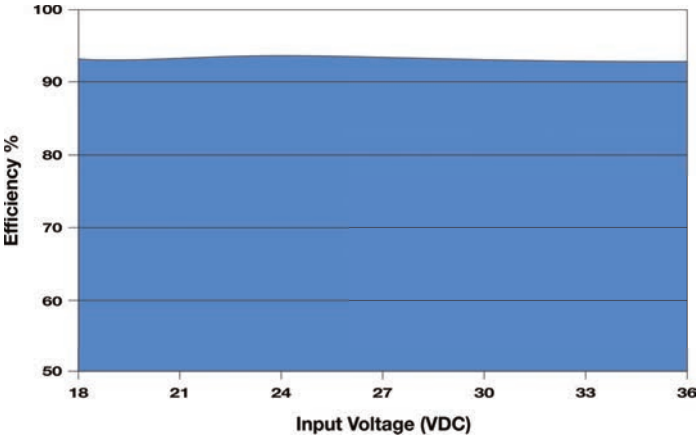
1. Start up time is measured at nominal input and with a constant resistive load.
2. When measuring output ripple, it is recommended that an external ceramic capacitor (approx 1 µF to 10 µF) be placed from the +VOUT to the -VOUT pins.
3. Transient recovery is measured to within a 1% error band for a load step change of 25%. The recovery time for 24V output models is 500 µS typical, 1,000 µS maximum.
4. Short circuit protection is provided by a "hiccup mode" circuit.
5. The voltage at the Remote On/Off pin (Pin 6) is referenced to the -VIN input (Pin 2). 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 the unit, but they may not meet all specifications.
7. These units should not be operated over +85°C. Exceeding +85°C may damage the unit.
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.

MPD offers a wide variety of DC/DC converters over a power range of 10W to 50W in the industry standard, 1inch by 2inch package. Call today for full information or go to MICROPOWERDIRECT.COM

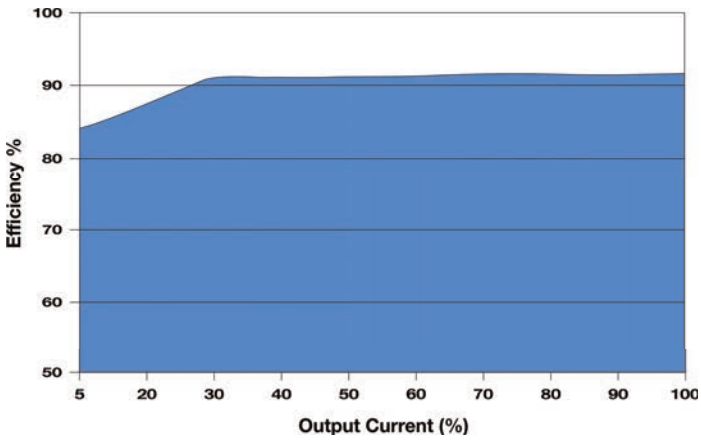
Derating Curve



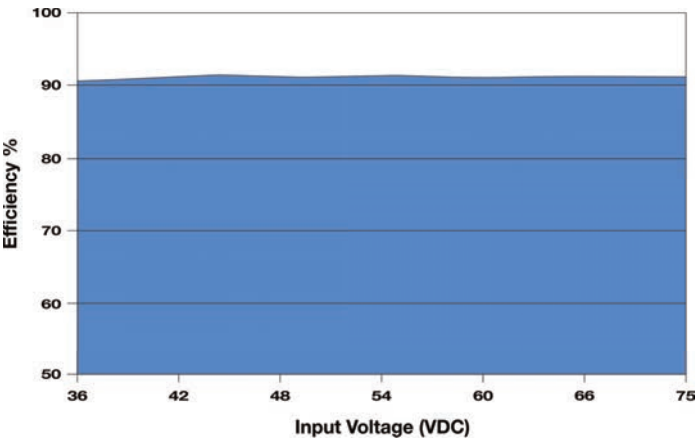
Efficiency vs Input Voltage: 24 VIN



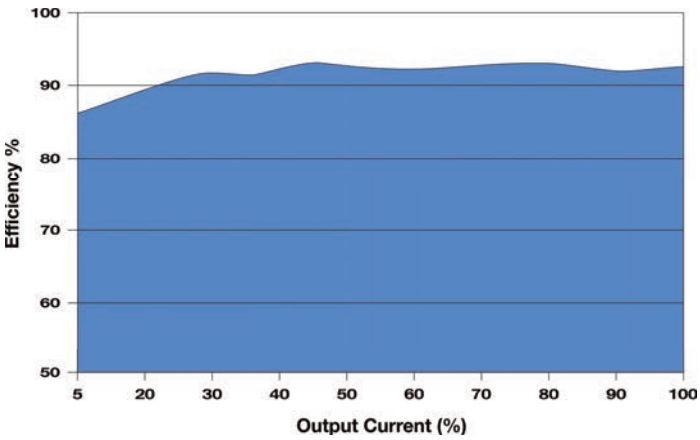
Efficiency vs Output Load: 24 VIN



Efficiency vs Input Voltage: 48 VIN



Efficiency vs Output Load: 48 VIN

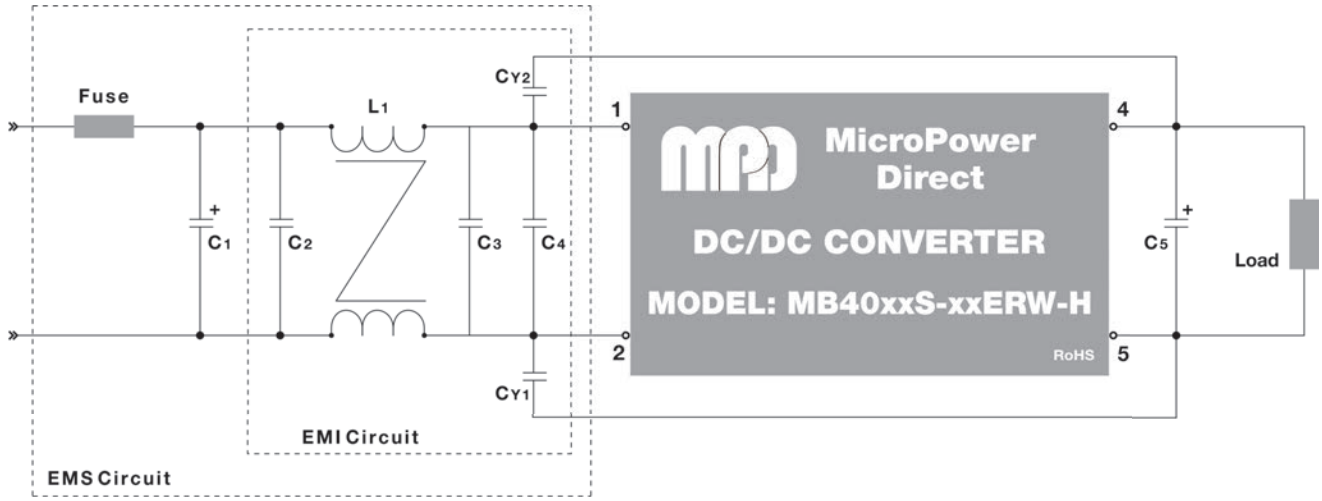


EMI Characteristics

Parameter	Standard		Criteria	Level
Radiated Emissions (See Note 1)		CISPR 32/EN 55032		Class B (See Typical Connection below)
Conducted Emissions (See Note 1)		CISPR 32/EN 55032		Class B (See Typical Connection below)
ESD		EN 61000-4-2	A	±6 kV Contact
RS		EN 61000-4-3	A	10V/m
EFT	See Note 2	EN 61000-4-4	A	±2 kV
Surge	See Note 3	EN 61000-4-5	A	±2 kV
CS		EN 61000-4-6	A	3 Vrms

Notes:
1. With the addition of external components as shown in the typical connection diagram below. Contact the factory for more information.
2. To meet the requirements of EN 61000-4-4 (±2 kV), external components are needed. This can be done discretely, as shown in the typical connection diagram below. Contact the factory for more information.
3. To meet the requirements of EN 61000-4-5 (±2 kV), external components are needed. This can be done discretely, as shown in the typical connection diagram below. Contact the factory for more information.

Typical Connection



The diagram above illustrates a typical connection of the **MB4000ERW-H** 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:

1. It is recommended that an external fuse be used. The recommended fuse is shown in the model chart on page 2.
2. 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. Voltage derating of capacitors should be 80% or above.
3. Recommended values for components are:

Component	24 V_{IN}	48 V_{IN}
C_1	680 µF/50V	680 µF/100V
C_2	4.7 µF/50V	4.7 µF/100V
L_1	2.2 mH	2.2 mH
C_3	330 µF/50V	330 µF/100V
C_4	4.7 µF/50V	4.7 µF/100V
C_{Y1}, C_{Y2}	2.2 nF/2 kV	2.2 nF/2 kV
C_5	See Note 4	

4. In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The input capacitor C_1 and output capacitor C_4 shown in the typical connection diagram above (& board layout drawing below) illustrate their connection. Recommended capacitor values are given in the table.

Vin (VDC)	Input Capacitor	Vout (VDC)	Output Capacitor
24	100 µF	12	100 µF
48		24	
		15	

External Trim

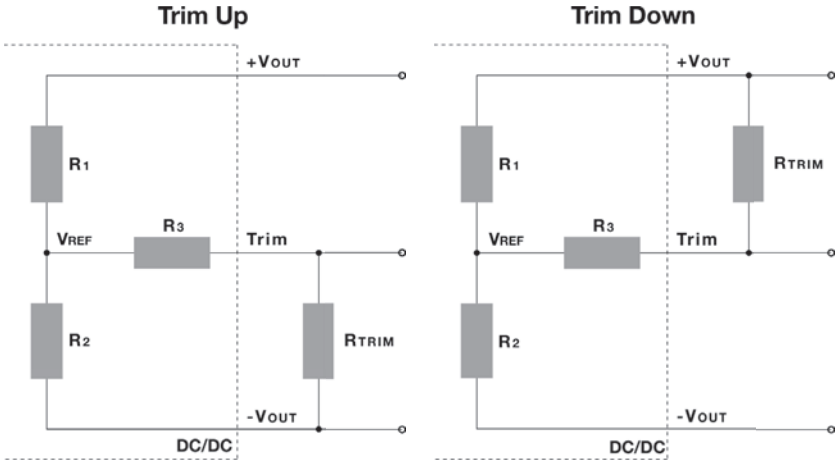
An external resistor can be used to adjust the converter output up/down by about 10%. The connection is shown in the diagram at right. The required resistor value is calculated by the formulas:

$$\text{Trim Up} = R_{TRIM} = \frac{A \times R_2}{R_2 - A} - R_3 \qquad \text{Where } A = \frac{V_{REF}}{V_{OUT} - V_{REF}} \times R_1$$

$$\text{Trim Down} = R_{TRIM} = \frac{A \times R_1}{R_1 - A} - R_3 \qquad \text{Where } A = \frac{V_{OUT} - V_{REF}}{V_{REF}} \times R_2$$

Where R_{TRIM} = The value of the external trim resistor
A = A is defined as shown above

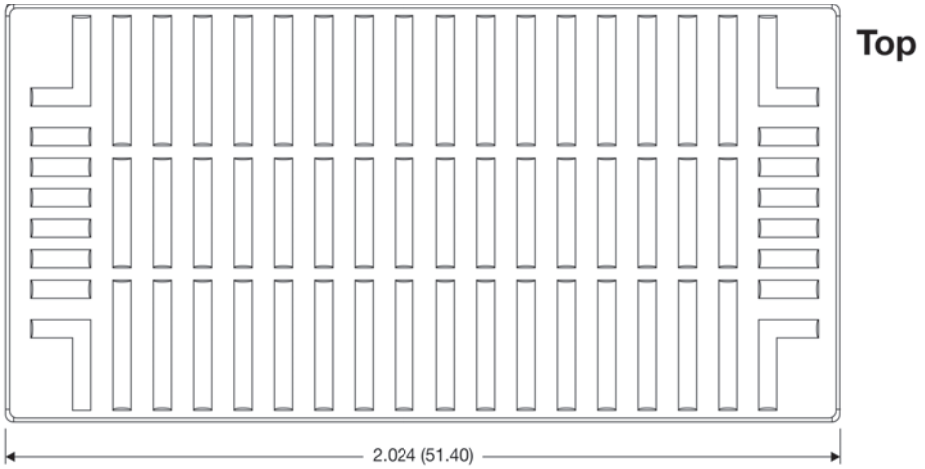
The values of R_1, R_2, R_3 and V_{REF} are given in the table below.

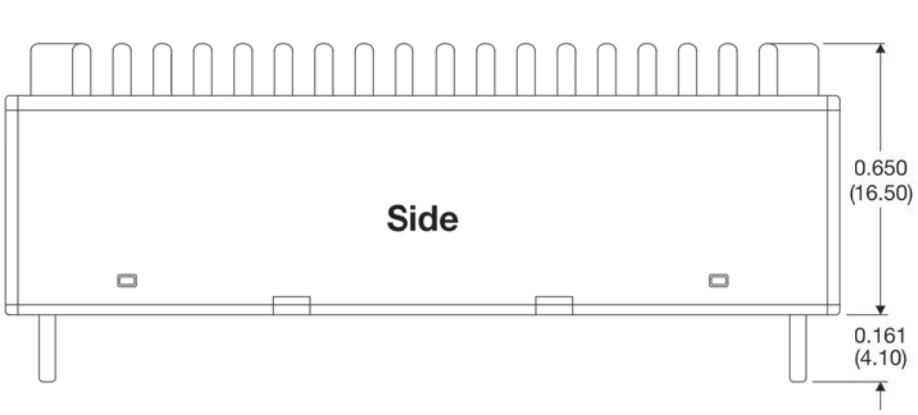


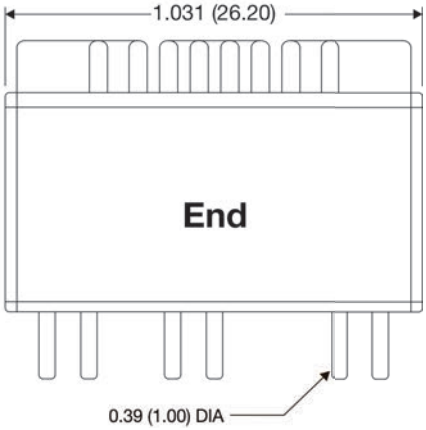
Output Trim Resistor Values

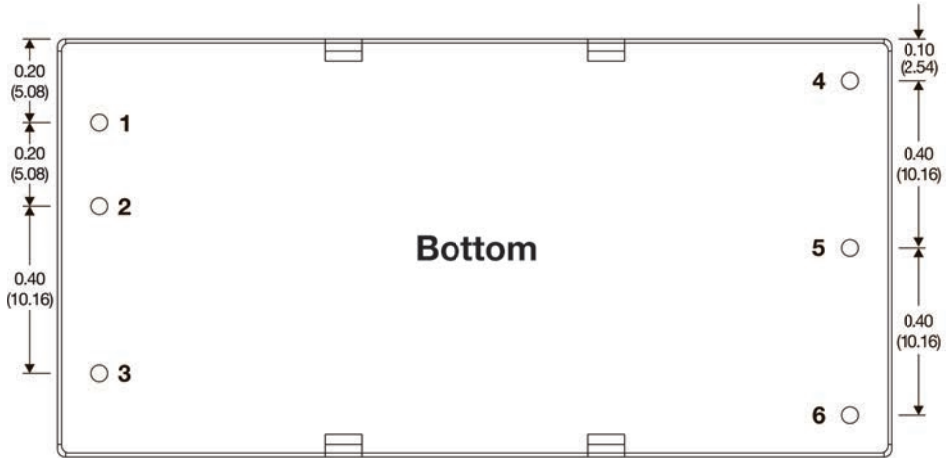
Resistor	12	15	24
R_1 (kΩ)	11.00	14.494	24.872
R_2 (kΩ)	2.870	2.870	2.870
R_3 (kΩ)	15.00	15.00	15.00
V_{REF} (V)	2.50	2.50	2.50

Mechanical Dimensions









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

Pin Connections

Pin	Function
1	+VIN
2	-VIN
3	Remote On/Off
4	+VOUT
5	-VOUT
6	Trim