MB5000RW Series

Compact, 1 x 2 Inch 50W, 2:1 Input Range DC/DC Converters

Key Features:

- 50W Output Power
- 2:1 Input Voltage Range
- EN 62368 Approved
- 1,600 VDC Isolation
- Efficiency to 92.5%
- Meets EN 55032
- Compact 1 x 2 Inch Case
- -40°C to +95°C Operation
- Industry Standard Pin-Out

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		8.60		VDC
	24 VDC Input		17.8		
	48 VDC Input		34.0		
Under Voltage Shutdown	12 VDC Input		7.90		VDC
	24 VDC Input		16.0		
	48 VDC Input		29.0		
Reflected Ripple Current			20.0		mA P-P
Start-Up Time	See Note 1		50		mS
Input Filter	π (Pi) Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±1.0		%
Output Trim Range			±10		%
Line Regulation	VIN = Min to Max			±0.5	%
Load Regulation	IOUT = 0% to 100%			±0.5	%
Ripple & Noise (20 MHz)	See Note 2			100	mV P - P
Transient Recovery Time	See Note 3		250		µSec
Transient Response Deviation				±3.0	%
Temperature Coefficient			±0.02		%/°C
Output Power Protection			150		%IOUT
Output Short Circuit, See Note 4	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage, 60 Seconds	Input to Output	1,600			VDC
	Input/Output to Case	1,600			
Isolation Resistance		1,000			MΩ
Isolation Capacitance			2,000		pF
Switching Frequency	12 VDC Input		230		kHz
	24 & 48 VDC Input		270		

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+95	°C
Storage Temperature Range		-40		+125	°C
Over Temperature Protection	Case		+115		°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Case Size	See Mechanical Diagrams (Page 5)
Case Material	Aluminum Alloy With Non-Conductive Base (UL94-V0)
Weight	See Mechanical Diagrams (Page 5)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	200			kHours
Safety Standards	UL/cUL 62368 recognition (UL certificate)				

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	12 VDC Input			25.0	VDC
	24 VDC Input			50.0	
	48 VDC Input			100.0	
Lead Temperature	1.5 mm From Case for 10 Sec			260	°C

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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Model Selection Guide

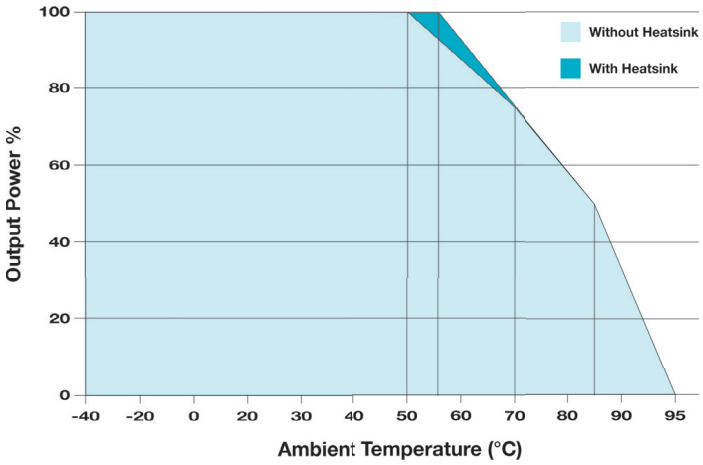
Model Number	Input				Output			Efficiency (%, Typ)	Over Voltage Protection (VDC)	Capacitive Load (µF, Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MB5012S-03RW(-H)	12	9.0 - 18.0	3,022	120	3.3	10,000	0.0	91	3.90	26,000	6,000
MB5012S-05RW(-H)	12	9.0 - 18.0	4,579	170	5.0	10,000	0.0	91	6.20	17,000	9,000
MB5012S-12RW(-H)	12	9.0 - 18.0	4,682	50	12.0	4,167	0.0	89	15.0	3,300	9,000
MB5012S-15RW(-H)	12	9.0 - 18.0	4,630	50	15.0	3,333	0.0	90	18.0	2,200	9,000
MB5024S-03RW(-H)	24	18.0 - 36.0	1,494	70	3.3	10,000	0.0	92	3.90	26,000	3,000
MB5024S-05RW(-H)	24	18.0 - 36.0	2,252	90	5.0	10,000	0.0	92.5	6.20	17,000	4,500
MB5024S-12RW(-H)	24	18.0 - 36.0	2,277	40	12.0	4,167	0.0	91.5	15.0	3,300	4,500
MB5024S-15RW(-H)	24	18.0 - 36.0	2,277	30	15.0	3,333	0.0	91.5	18.0	2,200	4,500
MB5048S-03RW(-H)	48	36.0 - 75.0	747	50	3.3	10,000	0.0	92	3.90	26,000	1,500
MB5048S-05RW(-H)	48	36.0 - 75.0	1,126	60	5.0	10,000	0.0	92.5	6.20	17,000	2,250
MB5048S-12RW(-H)	48	36.0 - 75.0	1,145	30	12.0	4,167	0.0	91	15.0	3,300	2,250
MB5048S-15RW(-H)	48	36.0 - 75.0	1,138	40	15.0	3,333	0.0	91.5	18.0	2,200	2,250

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%.
4. Short circuit protection is provided by a "hiccup mode" circuit.
5. Over voltage protection is provided by a zenor clamp circuit.
6. The control input (pin 3) is referenced to the -VIN (pin 2) input. If it is grounded, the unit will shut off.
7. Operation at no-load will not damage the unit, but they may not meet all specifications.
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.

For the Heat Sink option, add the suffix "-H" to the model number (i.e. **MB5048S-05RW-H**)

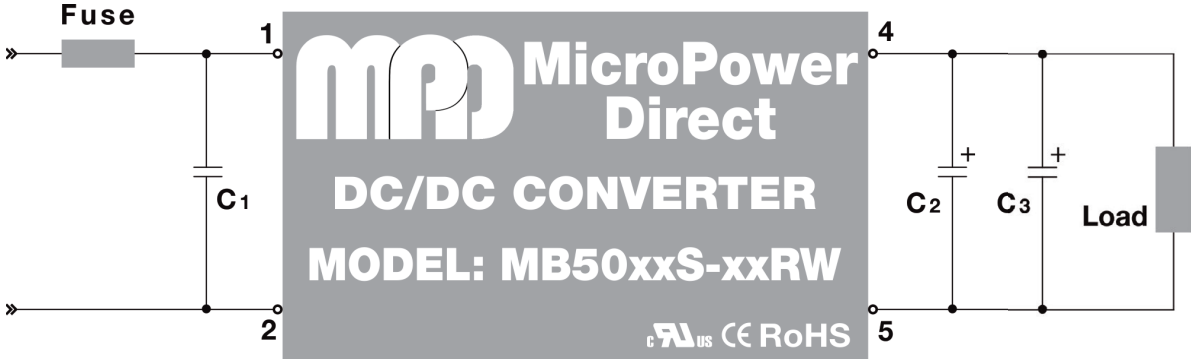
Temperature Derating Curve



EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions	CISPR 32/EN 55032		Class A
Conducted Emission	CISPR 32/EN 55032		Class A
ESD	EN 61000-4-2	A	±8 kV Contact
			±6 kV Contact
RS	EN 61000-4-3	A	10V/m
EFT	EN 61000-4-4	A	±2 kV
Surge, See Note 3 Below	EN 61000-4-5	A	±0.5 kV L-L
CS	EN 61000-4-6	A	10 Vrms
PFMF	EN 61000-4-8	A	1 A/M

Typical Connection

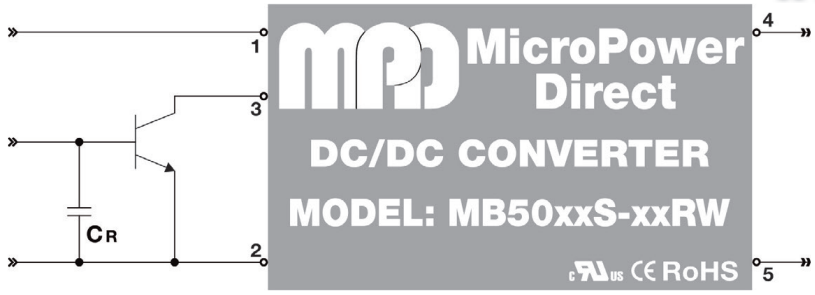


For applications that require meeting EMC standards, the diagram above illustrates a typical connection of the **MB5000RW** series. The units do not require external components to operate as specified. Some notes on this diagram (starting with the input circuit) are:

1. An external fuse should be used in all power module applications. The recommended fuse is shown in the model chart above.
2. All input/output filtering capacitors should have a low equivalent impedance. Any output capcitors used should be high frequency, low resistance electrolytic capacitors. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit. Voltage derating of all capacitors should be 60% or greater.
3. Capacitor C1 is required to meet EN 61000-4-5. A Nippon chemicon KY series or equivalent is recommended.
4. Recommended values for components are:

Component	24 VIN	24 VIN	48 VIN
C1	220 µF/100V	220 µF/100V	220 µF/100V
C2	10 µF	10 µF	10 µF
C3	1 µF	1 µF	1 µF

Remote On/Off

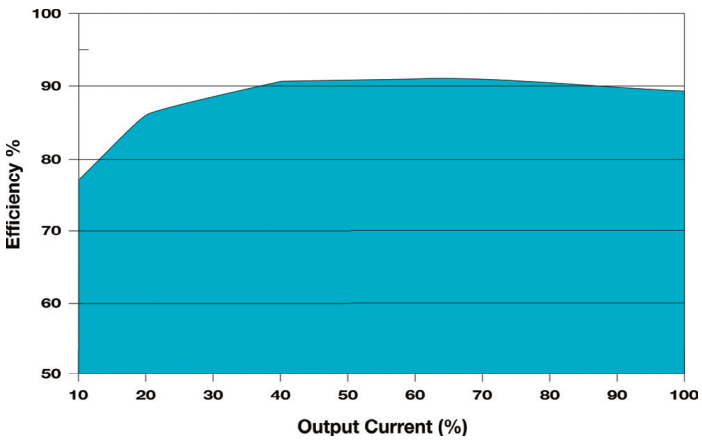


The **MB5000RW** includes a remote On/Off function. Illustrated above is a control set up using an external open collector switch. If the On/Off control feature is not required, pin 3 should be left open.

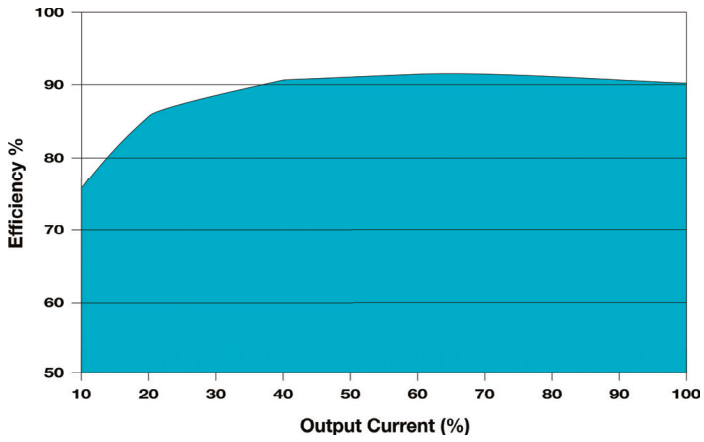
Remote On/Off

Parameter	Min.	Typ.	Max.	Units	Notes
Unit On	3.0		12.0	VDC	or Open Circuit
Unit Off	0		1.2	VDC	or Short Circuit
Off Idle Current		5.0		mA	

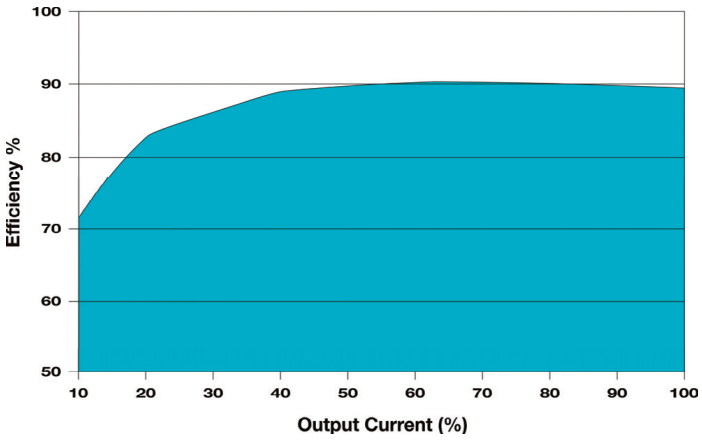
Efficiency vs Output Load: 5 VIN, 5 VOUT, Low Line



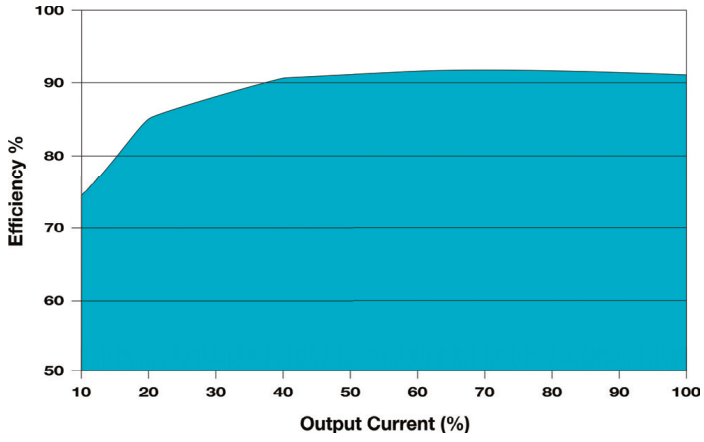
Efficiency vs Output Load: 5 VIN, 5 VOUT, Nom Line



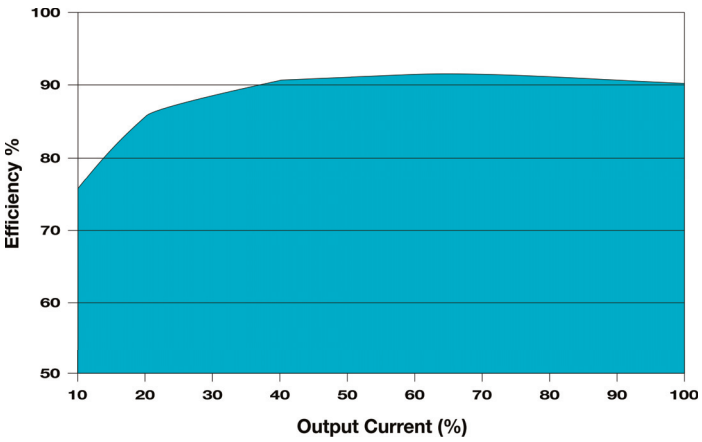
Efficiency vs Output Load: 5 VIN, 5 VOUT, High Line



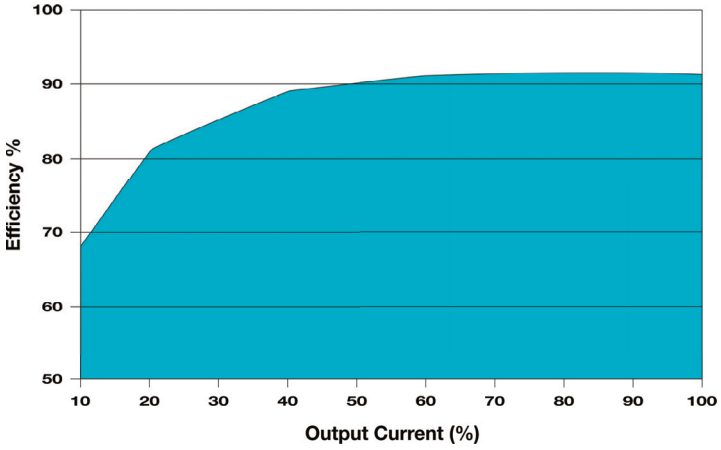
Efficiency vs Output Load: 24 VIN, 5 VOUT, Low Line



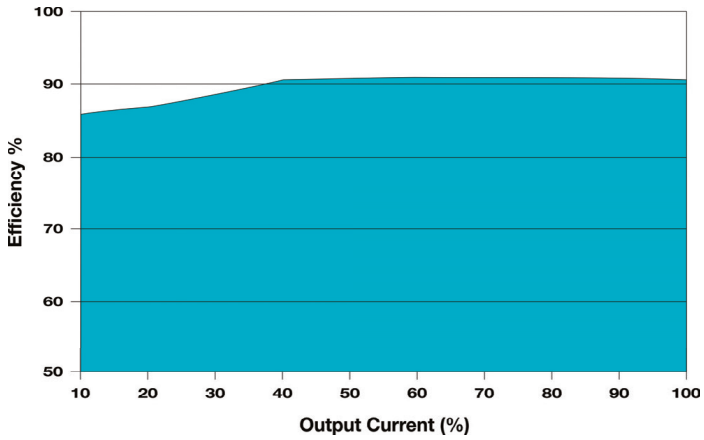
Efficiency vs Output Load: 24 VIN, 5 VOUT, Nom Line



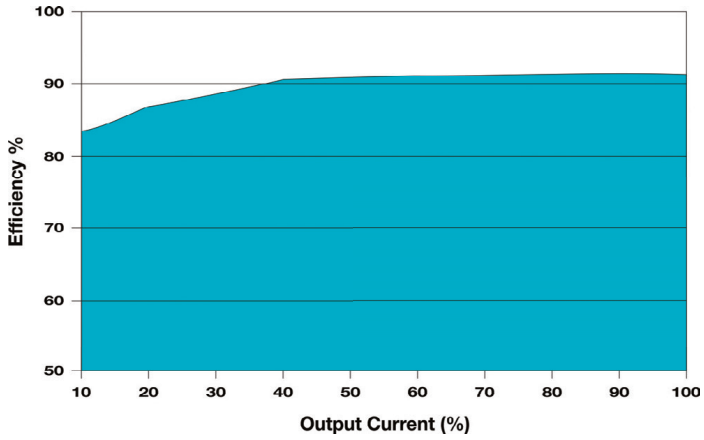
Efficiency vs Output Load: 24 VIN, 5 VOUT, High Line



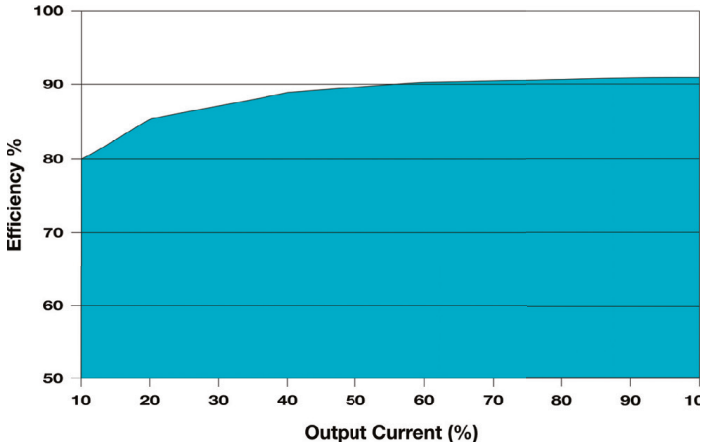
Efficiency vs Output Load: 24 VIN, 12 VOUT, Low Line



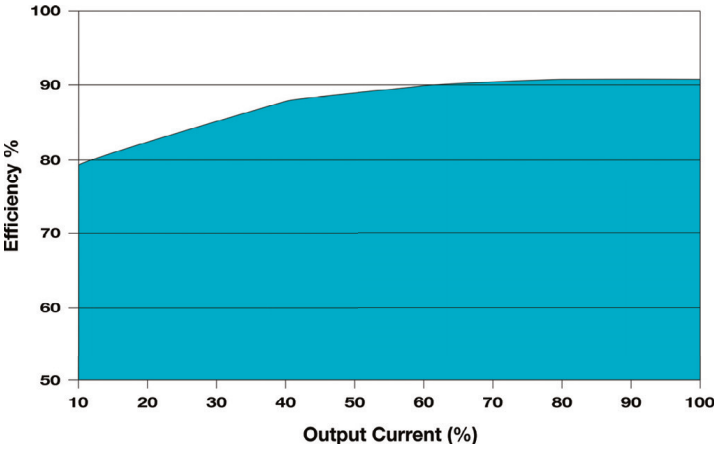
Efficiency vs Output Load: 24 VIN, 12 VOUT, Nom Line



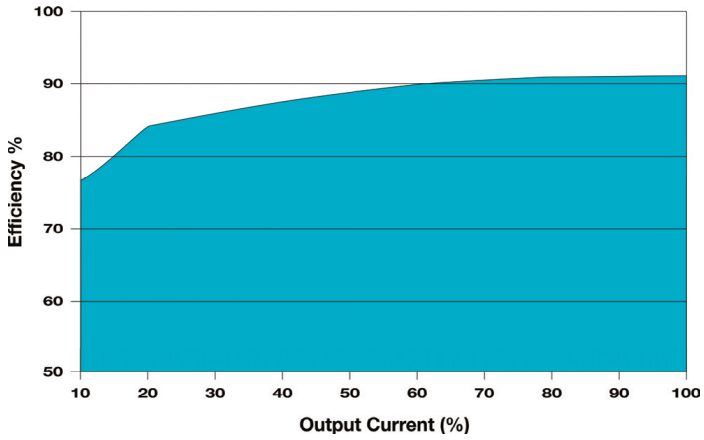
Efficiency vs Output Load: 24 VIN, 12 VOUT, High Line



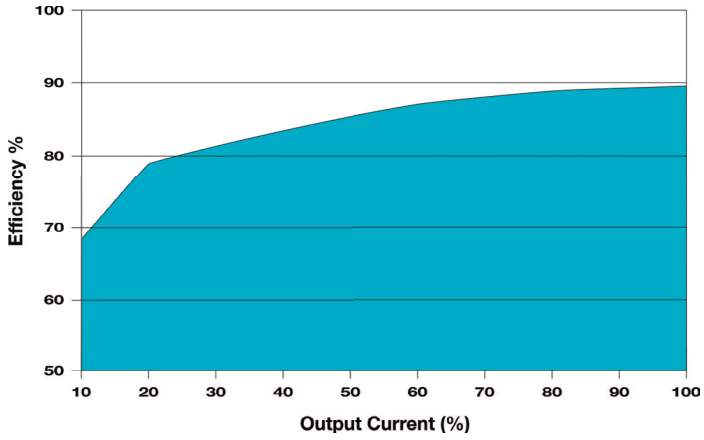
Efficiency vs Output Load: 48 VIN, 15 VOUT, Low Line



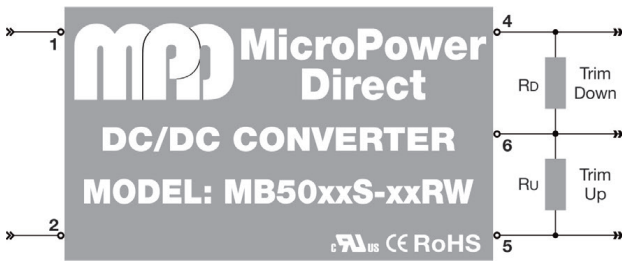
Efficiency vs Output Load: 48 VIN, 15 VOUT, Nom Line



Efficiency vs Output Load: 48 VIN, 15 VOUT, High Line

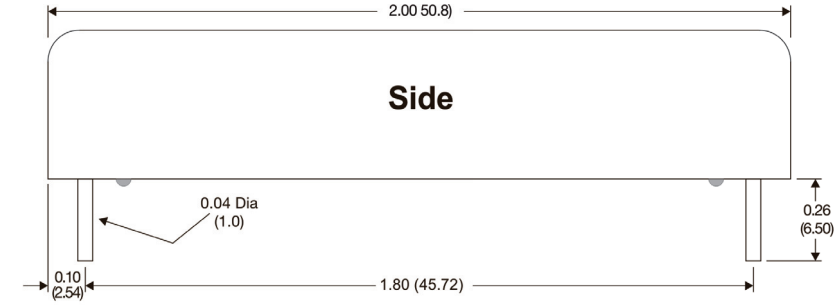


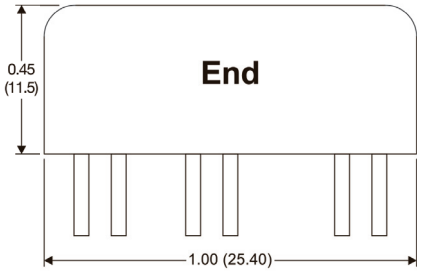
External Trim

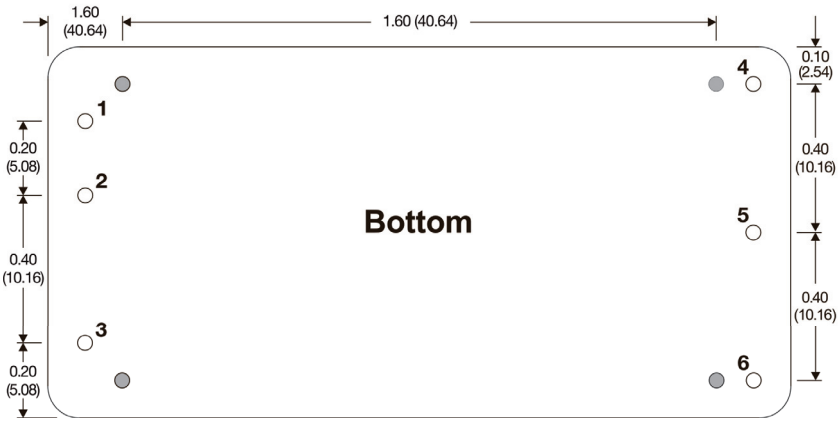


The output of the **MB5000RW** can be trimmed up or down by connecting a resister as shown in the diagram at left. If trimming is not required, pin 6 should be left open. Contact the factory for more information.

Mechanical Dimensions







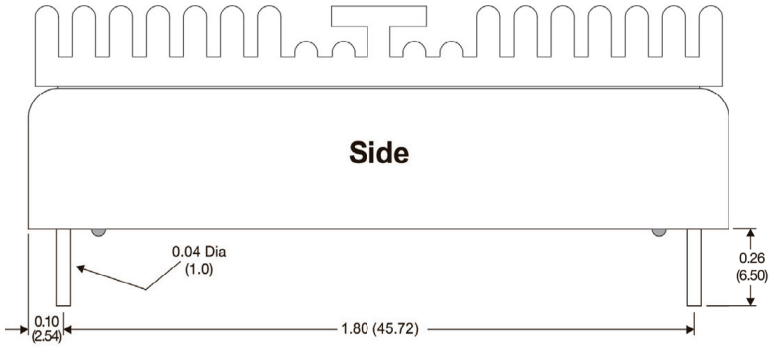
Pin Connections

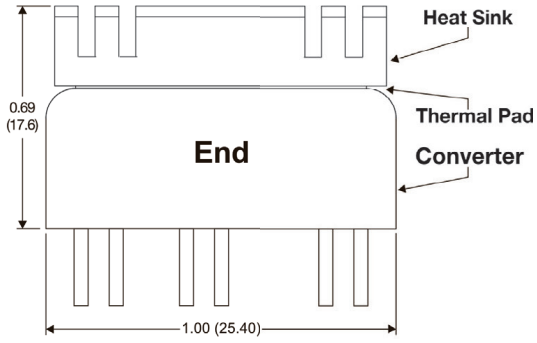
Pin	Function
1	+VIN
2	-VIN
3	Remote On/Off
4	+VOUT
5	-VOUT
6	Trim

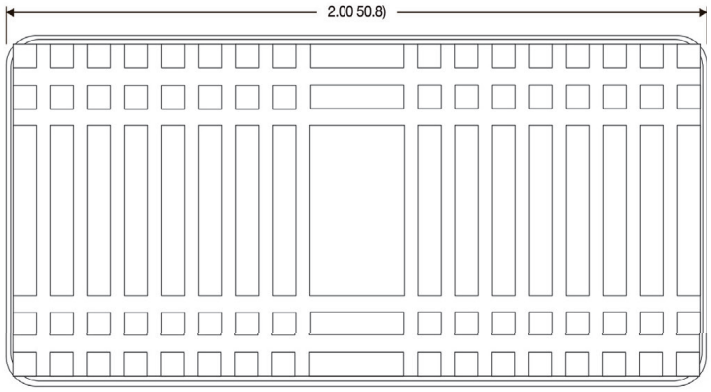
Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Pin Tolerance x.xx = ±0.014 (±0.35)
- Stand Off Height = ±0.02 (±0.50)
- Weight (Typ) = 1.59 Oz (45g)

Mechanical Dimensions: With Heatsink







Top

Pin Connections

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

Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Pin Tolerance x.xx = ±0.014 (±0.35)
- Stand Off Height = ±0.02 (±0.50)
- Weight (Typ) = 1.99 Oz (56.3g)

For the Heat Sink option, add the suffix "-H" to the model number (i.e. **MB5048S-05RW-H**) These models are shipped with the heat sink attached at the factory

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