

MB5000RW Series

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



Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Key Features:

- 50W Output Power
- 2:1 Input Voltage Range
- 1,500 VDC Isolation
- 15 Standard Models
- Efficiency to 92%
- Compact 1 x 2 Inch Case
- Wide Temp Operation
- Industry Standard Pin-Out
- Low Cost



MicroPower Direct



Parameter	Conditions	Min.	Typ.	Max.	Units
Input Start Voltage	12 VDC Input			9.0	VDC
	24 VDC Input			18.0	
	48 VDC Input			36.0	
Input Shutdown Voltage	12 VDC Input		8.3		VDC
	24 VDC Input		16.5		
	48 VDC Input		33.0		
Input Filter	LC Filter				
Start-Up Time	See Note 1		30		mS

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy				±1.0	%
Line Regulation	V _{IN} = Min to Max			±0.5	%
Load Regulation	Min Load to Full Load			±0.5	%
Ripple & Noise, See Note 2	3.3 & 5.0 Vout Models			100	mV P - P
	12, 15 & 24 Vout Models			150	mV P - P
Transient Recovery Time, See Note 3			250		µSec
Transient Response Deviation	25% Load Step Change		±3.0	±5.0	%
Temperature Coefficient				±0.02	%/°C
Over Temperature Protection	Shutdown Temperature		110		°C
Output Power Protection			150		%
Output Short Circuit, See Note 4	Continuous (Autorecovery)				

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 1V			2,200	pF
Switching Frequency	See Note 5		320		kHz

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range, Ambient Without Heatsink	MB50xxS-03RW			+56	°C
	MB5024S-05RW, -12RW, -15RW			+53	
	MB5048S-05RW, -12RW, -15RW			+46	
	MB5012S-12RW, -15RW, -24RW	-40	+25	+38	
	MB5024S-24RW, MB5048S-24RW			+64	
Operating Temperature Range, Ambient With Heatsink	MB50xxS-03RW			+62	°C
	MB5024S-05RW, -12RW, -15RW			+56	
	MB5048S-05RW, -12RW, -15RW	-40	+25	+49	
	MB5012S-12RW, -15RW, -24RW			+105	
	MB5024S-24RW, MB5048S-24RW			+125	
Operating Temperature Range	Case				°C
Storage Temperature Range		-50			°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Parameter	Conditions	Min.	Typ.	Max.	Units
Case Size, See Note On Page 4		2.0 x 1.0 x 0.43 Inches (50.8 x 25.4 x 11.0 mm)			
Case Material		Metal with Non-Conductive Base			
Weight		1.06 Oz (30g)			

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	224.7			kHours

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			260.0	°C

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

Model Selection Guide

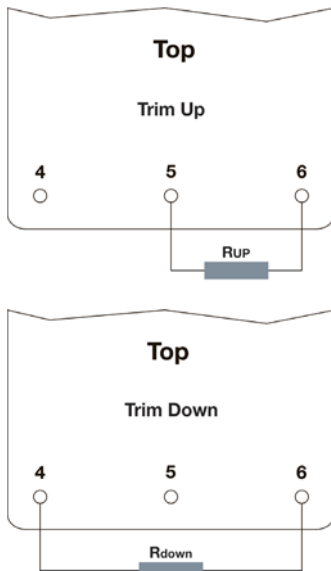
Model Number	Input				Output			Efficiency (% Typ)	Over Voltage Protection (VDC)	Capacitive Load (µF Max)	Fuse Rating Slow-Blow (A)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MB5012S-03RW	12	9.0 - 18.0	3,090	85	3.3	10,000	0	89	3.9	25,800	10.0
MB5012S-05RW	12	9.0 - 18.0	4,630	110	5.0	10,000	0	90	6.2	17,000	10.0
MB5012S-12RW	12	9.0 - 18.0	4,580	160	12.0	4,170	0	91	15.0	2,900	10.0
MB5012S-15RW	12	9.0 - 18.0	4,580	160	15.0	3,330	0	91	18.0	1,900	10.0
MB5012S-24RW	12	9.0 - 18.0	4,570	250	24.0	2,080	0	91	30.0	750	10.0
MB5024S-03RW	24	18.0 - 36.0	1,550	50	3.3	10,000	0	89	3.9	25,800	5.0
MB5024S-05RW	24	18.0 - 36.0	2,260	70	5.0	10,000	0	92	6.2	17,000	5.0
MB5024S-12RW	24	18.0 - 36.0	2,260	85	12.0	4,170	0	92	15.0	2,900	5.0
MB5024S-15RW	24	18.0 - 36.0	2,260	85	15.0	3,330	0	92	18.0	1,900	5.0
MB5024S-24RW	24	18.0 - 36.0	2,290	110	24.0	2,080	0	91	30.0	750	5.0
MB5048S-03RW	48	36.0 - 75.0	770	35	3.3	10,000	0	89	3.9	25,800	2.5
MB5048S-05RW	48	36.0 - 75.0	1,130	45	5.0	10,000	0	92	6.2	17,000	2.5
MB5048S-12RW	48	36.0 - 75.0	1,130	50	12.0	4,170	0	92	15.0	2,900	2.5
MB5048S-15RW	48	36.0 - 75.0	1,130	50	15.0	3,330	0	92	18.0	1,900	2.5
MB5048S-24RW	48	36.0 - 75.0	1,150	60	24.0	2,080	0	91	30.0	750	2.5

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 1 µF capacitor and 10 µF capacitor be connected in parallel 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. The switching frequency for 24 VDC output models is 285 kHz.
6. Operation at no-load will not damage these units.
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.

For heatsink option, add suffix "H" to model number (i.e. **MB5012S-05RW-H**)

External Trim



An external resistor may be added to adjust the converter output.

To adjust the output UP, connect a 5%, 3W resistor between the minus output pin (5) and the Vout trim pin (6). To adjust the output DOWN, connect a 5%, 3W resistor between the plus output pin (4) and the Vout trim pin (6).

The trim table at right gives suggested resistor values for this adjustment.

MB50xxS-03RW

Trim Down												
Vout	Vo x 0.99	Vo x 0.98	Vo x 0.97	Vo x 0.96	Vo x 0.95	Vo x 0.94	Vo x 0.93	Vo x 0.92	Vo x 0.91	Vo x 0.90	Volts	
RDOWN	72.61	32.55	19.20	12.52	8.51	5.84	3.94	2.51	1.39	0.50	kΩ	

Trim Up												
Vout	Vo x 1.01	Vo x 1.02	Vo x 1.03	Vo x 1.04	Vo x 1.05	Vo x 1.06	Vo x 1.07	Vo x 1.08	Vo x 1.09	Vo x 1.10	Volts	
RUP	60.84	27.40	16.25	10.68	7.34	5.11	3.51	2.32	1.39	0.65	kΩ	

MB50xxS-05RW

Trim Down												
Vout	Vo x 0.99	Vo x 0.98	Vo x 0.97	Vo x 0.96	Vo x 0.95	Vo x 0.94	Vo x 0.93	Vo x 0.92	Vo x 0.91	Vo x 0.90	Volts	
RDOWN	138.88	62.41	36.92	24.18	16.53	11.44	7.79	5.06	2.94	1.24	kΩ	

Trim Up												
Vout	Vo x 1.01	Vo x 1.02	Vo x 1.03	Vo x 1.04	Vo x 1.05	Vo x 1.06	Vo x 1.07	Vo x 1.08	Vo x 1.09	Vo x 1.10	Volts	
RUP	106.87	47.76	28.06	18.21	12.30	8.36	5.55	3.44	1.79	0.48	kΩ	

MB50xxS-12RW

Trim Down												
Vout	Vo x 0.99	Vo x 0.98	Vo x 0.97	Vo x 0.96	Vo x 0.95	Vo x 0.94	Vo x 0.93	Vo x 0.92	Vo x 0.91	Vo x 0.90	Volts	
RDOWN	413.55	184.55	108.22	70.05	47.15	31.88	20.98	12.80	6.44	1.35	kΩ	

Trim Up												
Vout	Vo x 1.01	Vo x 1.02	Vo x 1.03	Vo x 1.04	Vo x 1.05	Vo x 1.06	Vo x 1.07	Vo x 1.08	Vo x 1.09	Vo x 1.10	Volts	
RUP	351.00	157.50	93.00	60.75	41.40	28.50	19.29	12.37	7.00	2.70	kΩ	

MB50xxS-15RW

Trim Down												
Vout	Vo x 0.99	Vo x 0.98	Vo x 0.97	Vo x 0.96	Vo x 0.95	Vo x 0.94	Vo x 0.93	Vo x 0.92	Vo x 0.91	Vo x 0.90	Volts	
RDOWN	530.73	238.61	141.24	92.56	63.35	43.87	29.96	19.53	11.41	4.92	kΩ	

Trim Up												
Vout	Vo x 1.01	Vo x 1.02	Vo x 1.03	Vo x 1.04	Vo x 1.05	Vo x 1.06	Vo x 1.07	Vo x 1.08	Vo x 1.09	Vo x 1.10	Volts	
RUP	422.77	189.89	112.26	73.44	50.15	34.63	23.54	15.22	8.75	3.58	kΩ	

MB50xxS-24RW

Trim Down												
Vout	Vo x 0.99	Vo x 0.98	Vo x 0.97	Vo x 0.96	Vo x 0.95	Vo x 0.94	Vo x 0.93	Vo x 0.92	Vo x 0.91	Vo x 0.90	Volts	
RDOWN	333.39	148.80	87.26	56.50	38.04	25.73	16.94	10.35	5.22	1.12	kΩ	

Trim Up												
Vout	Vo x 1.01	Vo x 1.02	Vo x 1.03	Vo x 1.04	Vo x 1.05	Vo x 1.06	Vo x 1.07	Vo x 1.08	Vo x 1.09	Vo x 1.10	Volts	
RUP	243.70	108.50	63.43	40.90	27.38	18.37	11.93	7.10	3.34	0.34	kΩ	



EMC Specifications

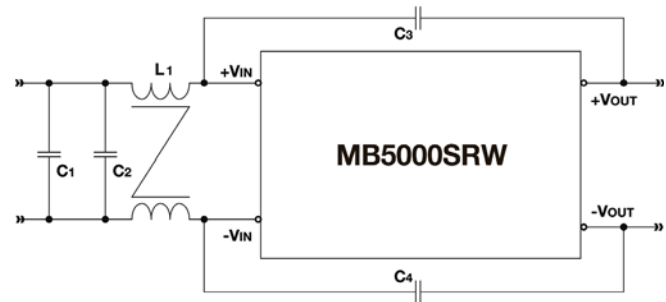
All units should meet EN 55022 (CE/RE) class A/B with the simple external circuit shown; using the component values given in the table.

To meet the requirements of EN 61000-4-4 and EN 61000-4-5, the value of C₁ should be changed to 330 µF/200V. Contact the factory for more information.

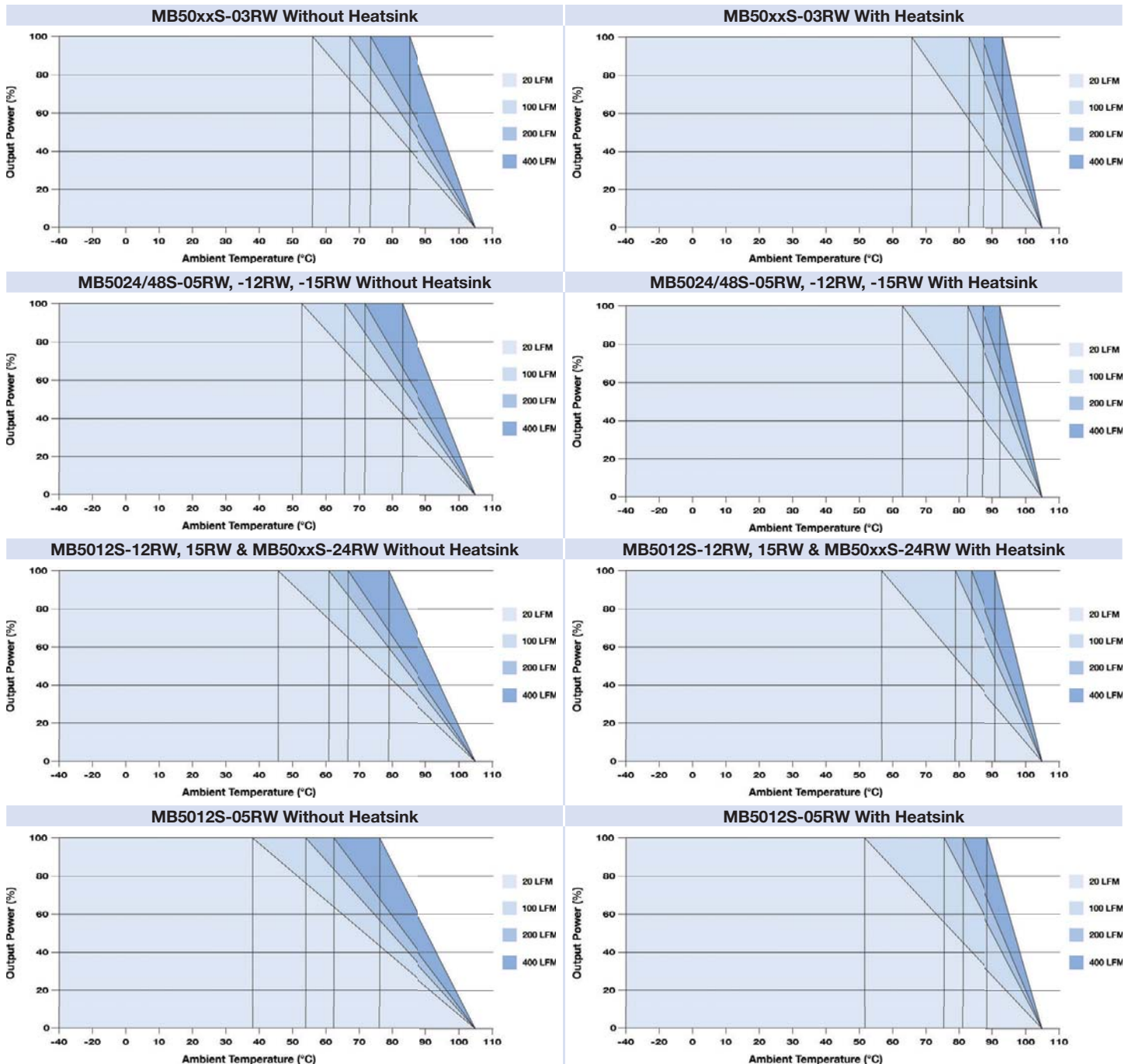
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Standard	Model	C ₁	C ₂	L ₁	C ₃	C ₄
EN55022 Class A	MB5012x-xxRW	22 µF/25V 1210 MLCC	---	---	---	---
	MB5024x-xxRW	3.3 µF/50V 1210 MLCC	---	---	---	---
	MB5048x-xxRW	2.2 µF/100V 1210 MLCC	---	---	---	---
EN55022 Class B	MB50xxS-xxRW	3.3 µF/100V 1210/X7S	3.3 µF/100V 1210/X7S	1 mH	1,000 pF/2kV 1808 X7R	1,000 pF/2kV 1808 X7R

Parameter	Standard	
Radiated Emissions	EN 55022	Class A/B
Conducted Emissions	EN 55022	Class A/B
ESD	EN 61000-4-2	Criteria B; ±8 kV Air, ±6 kV Contact
RS	EN 61000-4-3	Criteria A; 10V/m
EFT, See Notes	EN 61000-4-4	Criteria A; ±2 kV
Surge, See Notes	EN 61000-4-5	Criteria A; ±1 kV
CS	EN 61000-4-6	Criteria A; 10 V/m



Derating Curves



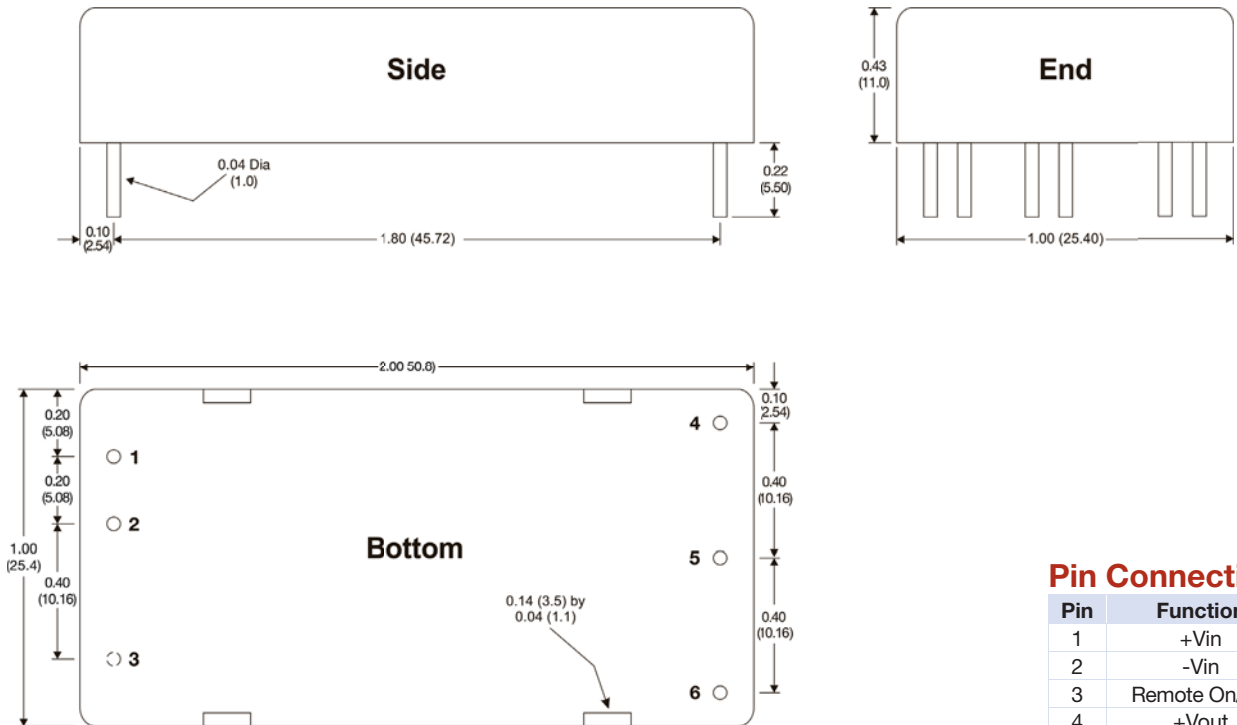
Remote On/Off

Parameter	Min	Typ	Max	Units
Supply On	3.5		12.0	VDC
Supply Off	0.0		1.2	VDC
Standby Input Current		2.5		mA
Control Common	Referenced to Negative Input (pin 2)			
Control Input Current (ON)		0.5		mA
Control Input Current (OFF)		-0.5		mA

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Applying a signal to pin 3 will turn the unit ON/OFF. If the pin is left open, the unit operates. If grounded, the unit will shut off. The specifications for the ON/OFF function are given in the table at left.

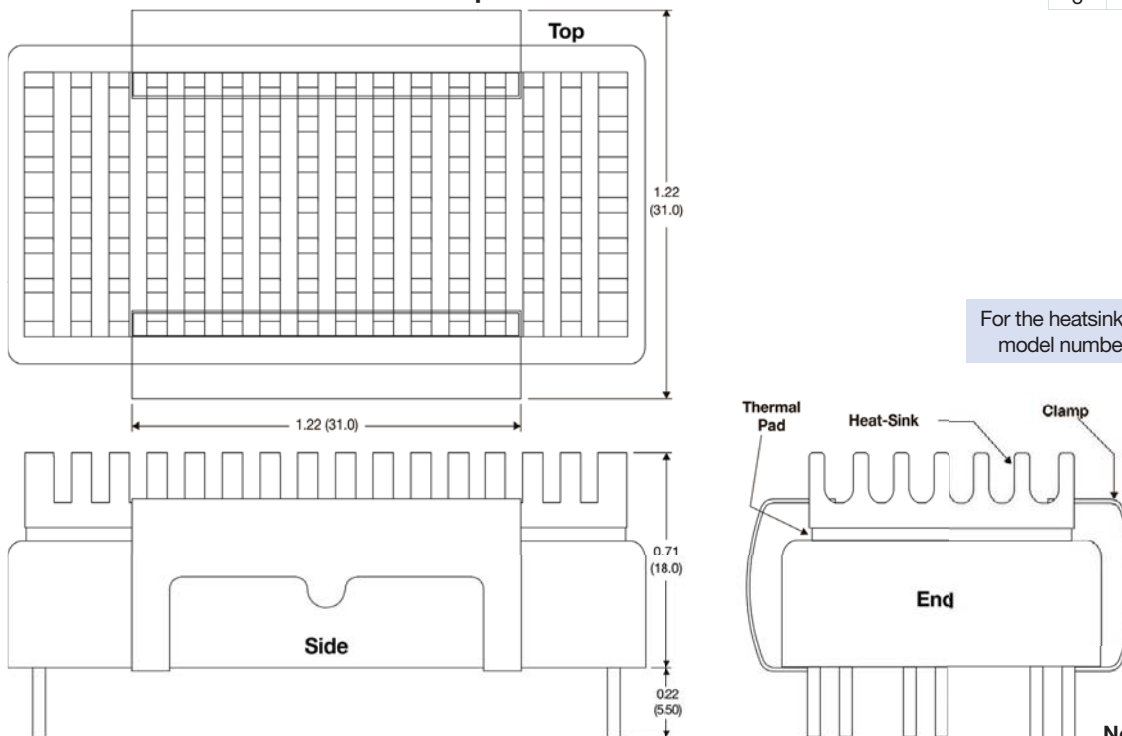
Mechanical Dimensions



Pin Connections

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

Mechanical Dimensions: With Optional Heatsink



For the heatsink option, add suffix "H" to the model number (i.e. **MB5048S-12RW-H**)

Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Heatsink is black, anodized aluminum