

MI1500RW Series

Compact, 1 x 1 Inch 15W, 2:1 Input Range DC/DC Converters



Key Features:

- 15W Output Power
- 2:1 Input Voltage Range
- EN 60950 Approved
- Compact 1 x 1 Inch Case
- 1,500 VDC Isolation
- 21 Standard Models
- Efficiency to 91%
- Wide Temp Operation
- Industry Standard Pin-Out



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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		Conditions	Min.	Typ.	Max.	Units
Parameter						
Input Start Voltage		12 VDC Input			9.0	VDC
		24 VDC Input			18.0	
		48 VDC Input			36.0	
Undervoltage Shutdown		12 VDC Input		7.5		VDC
		24 VDC Input		16		
		48 VDC Input		34		
Input Filter		LC Filter				
Start-Up Time		See Note 2			30	mS
Output		Conditions	Min.	Typ.	Max.	Units
Parameter						
Output Voltage Accuracy					±1.0	%
Output Voltage Balance		Dual Output, Balanced Loads			±2.0	%
Line Regulation, VIN = Min to Max		Single Output			±0.2	%
		Dual Output			±0.5	
		3.3 & 5 Vout			±0.5	
Load Regulation, Min Load to Full Load		12, 15 & 24 Vout			±0.2	%
		Dual Output			±1.0	
		3.3 & 5.0 Vout			75	
Ripple & Noise, See Note 3		12, 15 & Dual Output			100	mV P - P
		24 Vout			150	
Transient Recovery Time, See Note 4		25% Load Step Change		300		µSec
Transient Response Deviation				±3.0	±5.0	%
Temperature Coefficient					±0.02	%/°C
Output Power Protection		See Note 5		150		%
Output Short Circuit, See Note 6		Continuous (Autorecovery)				
General		Conditions	Min.	Typ.	Max.	Units
Parameter						
Isolation Voltage		60 Seconds	1,500			VDC
		1 Second	1,800			
Isolation Resistance		500 VDC	1,000			MΩ
Isolation Capacitance		100 kHz, 1V			1,500	pF
Switching Frequency				330		kHz
EMI Characteristics		Standard	Criteria	Level		
Conducted Emissions		EN 55032		Class A		
ESD		EN 61000-4-2	A	±8 kV Air, ±6 kV Contact		
RS		EN 61000-4-3	A	10V/m		
EFT, See Note 7		EN 61000-4-4	A	±2 kV		
Surge, See Note 7		EN 61000-4-5	A	±1 kV		
CS		EN 61000-4-6	A	10 Vrms		
PFMF		EN 61000-4-8	A	3A/m		
Environmental		Conditions	Min.	Typ	Max.	Units
Parameter						
Operating Temperature Range		See Pages 3 & 4	-40	+25	+80	°C
		Case			+105	
Storage Temperature Range			-50		+125	°C
Cooling		Free Air Convection				
Humidity		RH, Non-condensing			95	%
Physical		See Mechanical Diagrams (Page 5)				
Case Size		Metal with Non-Conductive Base				
Case Material		Without Heatsink			0.58 Oz (16.5g)	
Weight		With Heatsink			0.65 Oz (18.5g)	
Reliability Specifications		Conditions	Min.	Typ.	Max.	Units
Parameter						
MTBF		MIL HDBK 217F, 25°C, Gnd Benign	1.49			MHours
Absolute Maximum Ratings		Conditions	Min.	Typ.	Max.	Units
Parameter						
Input Voltage Surge (100 mS)		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			260.0	°C

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

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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							
MI1512S-03RW(-H)	12	9.0 - 18.0	1,087	10	3.3	3,400	0.0	86	3.9	5,800	3,000
MI1512S-05RW(-H)	12	9.0 - 18.0	1,404	10	5.0	3,000	0.0	89	6.2	5,100	3,000
MI1512S-12RW(-H)	12	9.0 - 18.0	1,404	10	12.0	1,250	0.0	89	15.0	870	3,000
MI1512S-15RW(-H)	12	9.0 - 18.0	1,404	10	15.0	1,000	0.0	89	18.0	560	3,000
MI1512S-24RW(-H)	12	9.0 - 18.0	1,389	10	24.0	625	0.0	90	30.0	220	3,000
MI1512D-12RW(-H)	12	9.0 - 18.0	1,404	15	±12.0	±625	0.0	89	±15.0	440	3,000
MI1512D-15RW(-H)	12	9.0 - 18.0	1,389	15	±15.0	±500	0.0	90	±18.0	280	3,000
MI1524S-03RW(-H)	24	18.0 - 36.0	544	8	3.3	3,400	0.0	86	3.9	5,800	2,000
MI1524S-05RW(-H)	24	18.0 - 36.0	710	8	5.0	3,000	0.0	88	6.2	5,100	2,000
MI1524S-12RW(-H)	24	18.0 - 36.0	694	8	12.0	1,250	0.0	90	15.0	870	2,000
MI1524S-15RW(-H)	24	18.0 - 36.0	694	8	15.0	1,000	0.0	90	18.0	560	2,000
MI1524S-24RW(-H)	24	18.0 - 36.0	687	8	24.0	625	0.0	91	30.0	220	2,000
MI1524D-12RW(-H)	24	18.0 - 36.0	694	10	±12.0	±625	0.0	90	±15.0	440	2,000
MI1524D-15RW(-H)	24	18.0 - 36.0	694	10	±15.0	±500	0.0	90	±18.0	280	2,000
MI1548S-03RW(-H)	48	36.0 - 75.0	269	8	3.3	3,400	0.0	87	3.9	5,800	1,000
MI1548S-05RW(-H)	48	36.0 - 75.0	355	8	5.0	3,000	0.0	88	6.2	5,100	1,000
MI1548S-12RW(-H)	48	36.0 - 75.0	347	8	12.0	1,250	0.0	90	15.0	870	1,000
MI1548S-15RW(-H)	48	36.0 - 75.0	347	8	15.0	1,000	0.0	90	18.0	560	1,000
MI1548S-24RW(-H)	48	36.0 - 75.0	343	8	24.0	625	0.0	91	30.0	220	1,000
MI1548D-12RW(-H)	48	36.0 - 75.0	351	10	±12.0	±625	0.0	89	±15.0	440	1,000
MI1548D-15RW(-H)	48	36.0 - 75.0	347	10	±15.0	±500	0.0	90	±18.0	280	1,000

Notes:

- The specified maximum capacitive load is for each output.
- Start up time is measured at nominal input and with a constant resistive load.
- When measuring output ripple, it is recommended that an external 1 μ F ceramic capacitor be connected in parallel from the +Vout to the -Vout pin for single output units; or from each output to common for dual output units.
- Transient recovery is measured to within a 1% error band for a load step change of 25%.
- Over Power protection is provided by a "hiccup mode" current limiting circuit.
- Short circuit protection is provided by a "hiccup mode" circuit.
- To meet the requirements of EN 61000-4-4 and EN 61000-4-5, an external capacitor must be placed across the input to the unit. The recommended values are 470 μ F/100V for 12 VIN, 3.3 & 5 Vout models and 220 μ F/100V for all other models.
- On dual output models, the cross regulation for asymmetrical loads (25%/100%) is $\pm$ 5% max.
- The output over voltage protection circuit is independent of the primary regulation loop. It provides redundant protection against any possible overvoltage.
- Operation at no-load will not damage these units.
- 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.

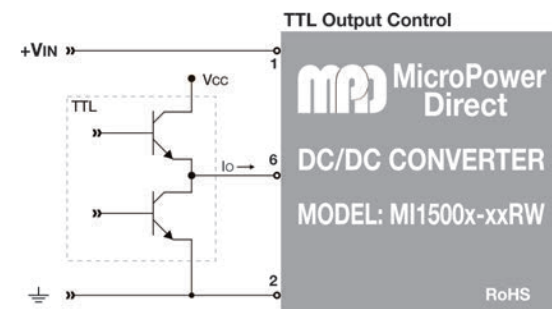
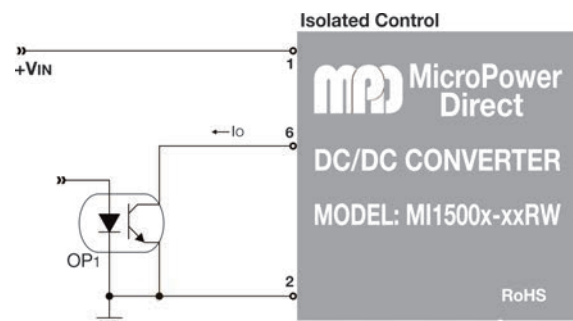
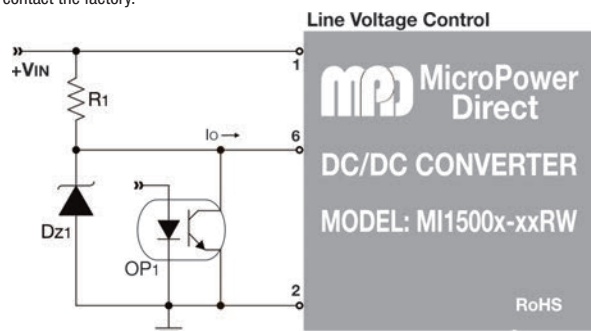
For heatsink option, add suffix "H" to model number (i.e. **MI1512S-05RW-H**)

Remote On/Off

All models of the MI1500RW series can be turned on/off remotely by applying by applying a positive logic signal to pin 6. The specifications for the ON/OFF function are given in the table below.

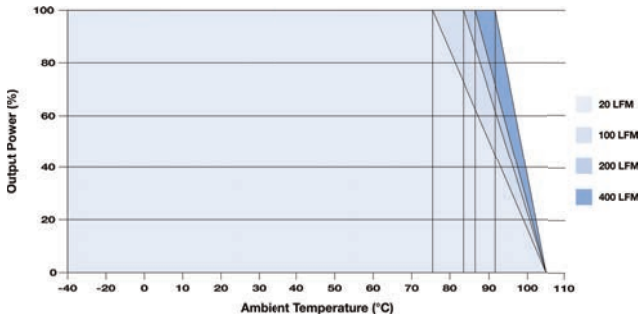
Parameter	Min	Typ	Max	Units
Supply On	3.5		12.0	VDC
Supply Off	0.0		1.2	VDC
Standby Input Current		3.0		mA
Control Common	Referenced to Negative Input (pin 2)			
Control Input Current (ON)			0.5	mA
Control Input Current (OFF)			-0.5	mA

The maximum sink current at the control pin (pin 6) during a logic low is -500 μ A. The maximum allowable leakage current of a switch connected to the control pin during a logic high is 10 mA. The switch used can be an open collector transistor, FET or optocoupler. Three possible connections are illustrated in the diagrams below and at right. For more information, please contact the factory.

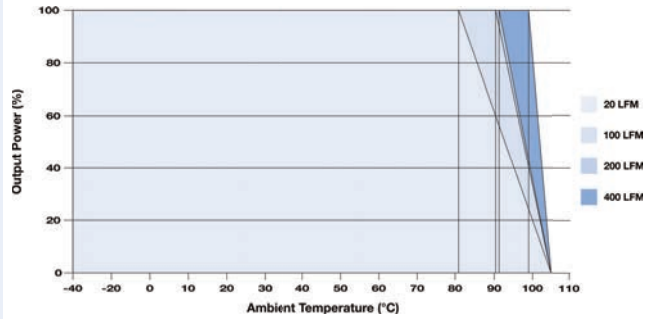


Derating Curves

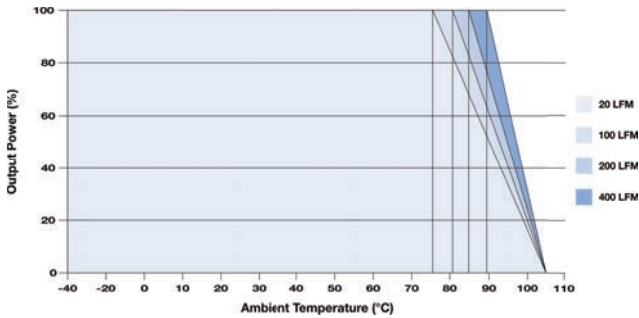
MI1524S-24RW, MI1548S-24RW Without Heatsink



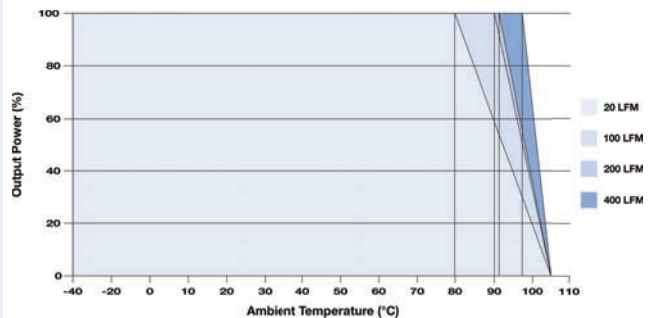
MI1524S-24RW, MI1548S-24RW With Heatsink



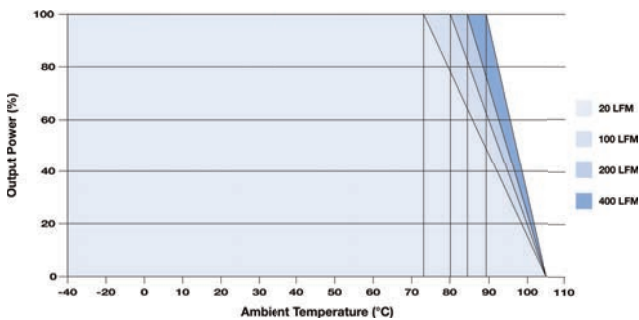
MI1524S-12RW/-15RW, MI1548S-12RW/-15RW, 1512D-15RW, 1524D-12RW/-15RW, MI1512S-24RW, 1548D-15RW, 1512D-15RW Without Heatsink



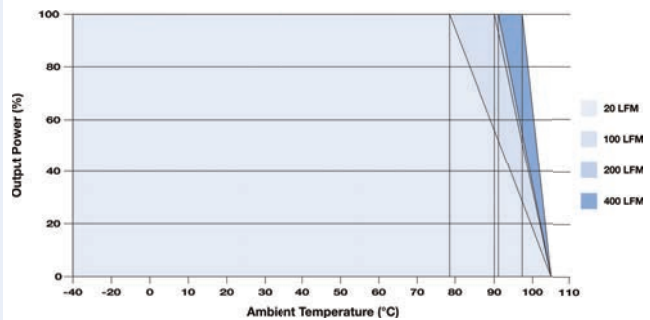
MI1524S-12RW/-15RW, MI1548S-12RW/-15RW, 1512D-15RW, 1524D-12RW/-15RW, MI1512S-24RW, 1548D-15RW, 1512D-15RW With Heatsink



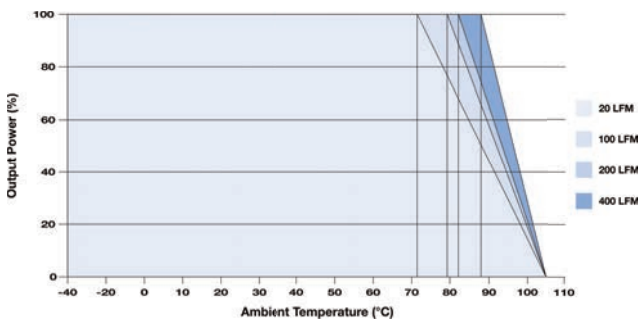
MI1548S-03RW Without Heatsink



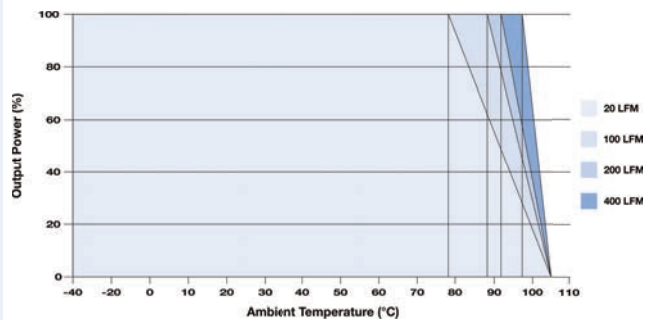
MI1548S-03RW With Heatsink



MI1512S-03RW, MI1524S-03RW Without Heatsink



MI1512S-03RW, MI1524S-03RW With Heatsink



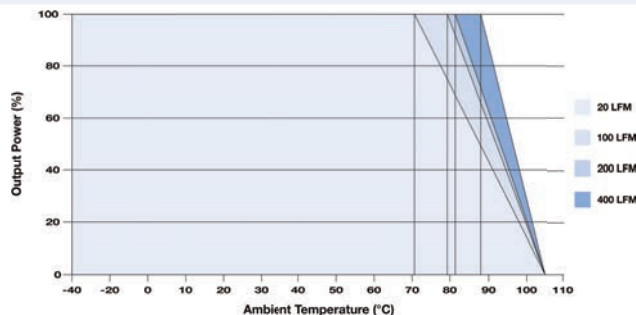
Thermal Impedance

Air Flow	Without Heatsink	With Heatsink	Units
Natural Convection	18.2	15.3	°C/W
100 LFM	13.9	8.8	°C/W
200 LFM	12.1	6.8	°C/W
400 LFM	9.1	4.6	°C/W

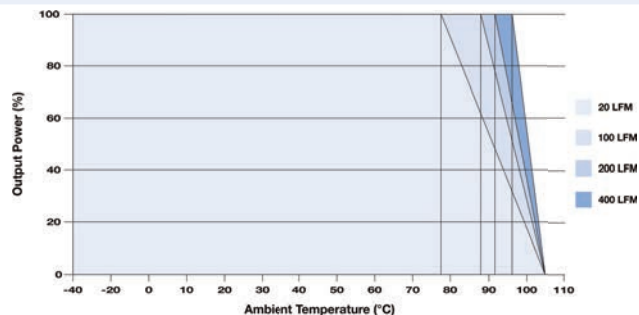
Note: Natural Convection equals 20 LFM

Efficiency Vs Output Load Curves

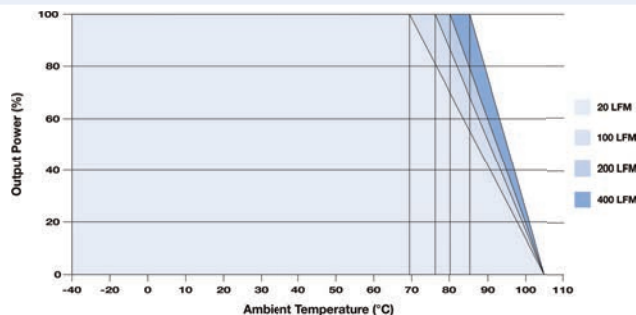
MI1512S-05RW/12RW/15RW, MI1512D-12RW,
MI1548S-12RW Without Heatsink



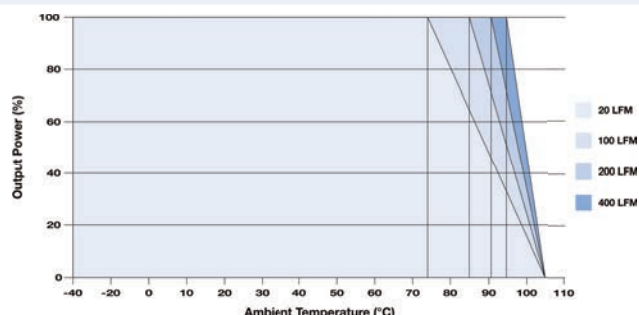
MI1512S-05RW/12RW/15RW, MI1512D-12RW,
MI1548S-12RW With Heatsink



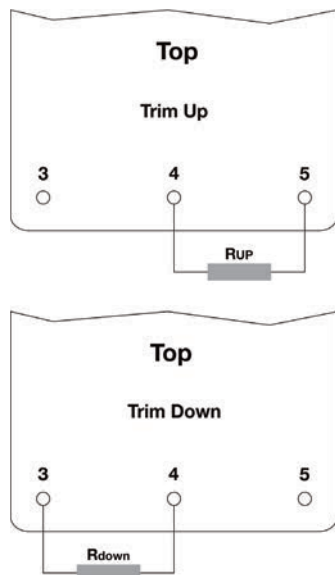
MI1524S-05RW, MI1548S-05RW Without Heatsink



MI1524S-05RW, MI1548S-05RW With Heatsink



External Trim



MI15xxS-03RW

Trim Down

Vout	$V_o \times 0.99$	$V_o \times 0.98$	$V_o \times 0.97$	$V_o \times 0.96$	$V_o \times 0.95$	$V_o \times 0.94$	$V_o \times 0.93$	$V_o \times 0.92$	$V_o \times 0.91$	$V_o \times 0.90$	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	$V_o \times 1.01$	$V_o \times 1.02$	$V_o \times 1.03$	$V_o \times 1.04$	$V_o \times 1.05$	$V_o \times 1.06$	$V_o \times 1.07$	$V_o \times 1.08$	$V_o \times 1.09$	$V_o \times 1.10$	Volts
RUP	60.84	27.40	16.25	10.68	7.34	5.11	3.51	2.32	1.39	0.65	kΩ

MI15xxS-05RW

Trim Down

Vout	$V_o \times 0.99$	$V_o \times 0.98$	$V_o \times 0.97$	$V_o \times 0.96$	$V_o \times 0.95$	$V_o \times 0.94$	$V_o \times 0.93$	$V_o \times 0.92$	$V_o \times 0.91$	$V_o \times 0.90$	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	$V_o \times 1.01$	$V_o \times 1.02$	$V_o \times 1.03$	$V_o \times 1.04$	$V_o \times 1.05$	$V_o \times 1.06$	$V_o \times 1.07$	$V_o \times 1.08$	$V_o \times 1.09$	$V_o \times 1.10$	Volts
RUP	106.87	47.76	28.06	18.21	12.30	8.36	5.55	3.44	1.79	0.48	kΩ

MI15xxS-12RW

Trim Down

Vout	$V_o \times 0.99$	$V_o \times 0.98$	$V_o \times 0.97$	$V_o \times 0.96$	$V_o \times 0.95$	$V_o \times 0.94$	$V_o \times 0.93$	$V_o \times 0.92$	$V_o \times 0.91$	$V_o \times 0.90$	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	$V_o \times 1.01$	$V_o \times 1.02$	$V_o \times 1.03$	$V_o \times 1.04$	$V_o \times 1.05$	$V_o \times 1.06$	$V_o \times 1.07$	$V_o \times 1.08$	$V_o \times 1.09$	$V_o \times 1.10$	Volts
RUP	351.00	157.50	93.00	60.75	41.40	28.50	19.29	12.37	7.00	2.70	kΩ

MB15xxS-15RW

Trim Down

Vout	$V_o \times 0.99$	$V_o \times 0.98$	$V_o \times 0.97$	$V_o \times 0.96$	$V_o \times 0.95$	$V_o \times 0.94$	$V_o \times 0.93$	$V_o \times 0.92$	$V_o \times 0.91$	$V_o \times 0.90$	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	$V_o \times 1.01$	$V_o \times 1.02$	$V_o \times 1.03$	$V_o \times 1.04$	$V_o \times 1.05$	$V_o \times 1.06$	$V_o \times 1.07$	$V_o \times 1.08$	$V_o \times 1.09$	$V_o \times 1.10$	Volts
RUP	422.77	189.89	112.26	73.44	50.15	34.63	23.54	15.22	8.75	3.58	kΩ

MB15xxS-24RW

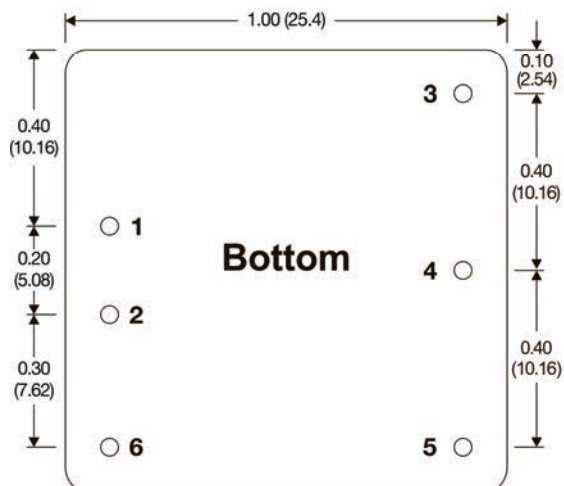
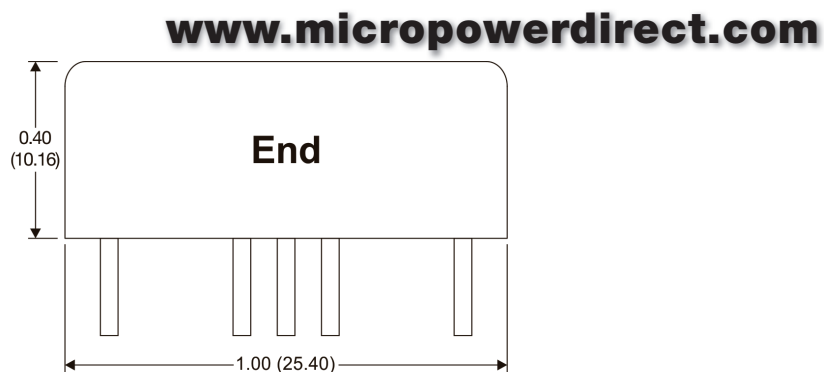
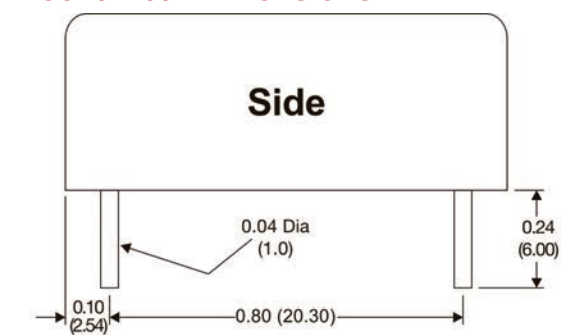
Trim Down

Vout	$V_o \times 0.99$	$V_o \times 0.98$	$V_o \times 0.97$	$V_o \times 0.96$	$V_o \times 0.95$	$V_o \times 0.94$	$V_o \times 0.93$	$V_o \times 0.92$	$V_o \times 0.91$	$V_o \times 0.90$	Volts
RDOWN	598.66	267.78	157.49	102.34	69.25	47.19	31.44	19.62	10.43	3.08	kΩ

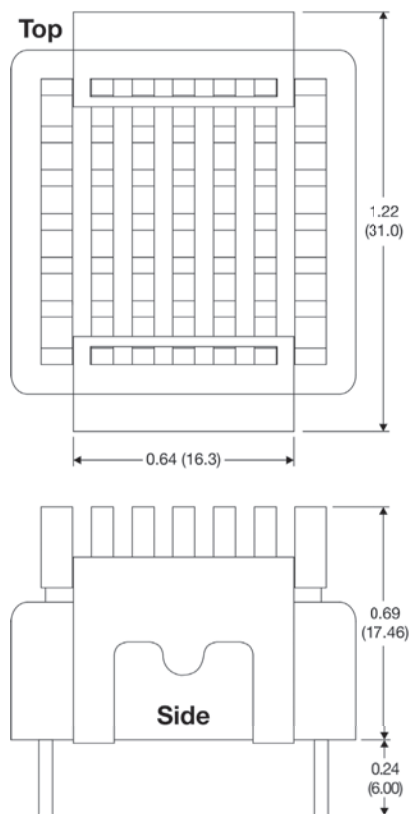
Trim Up

Vout	$V_o \times 1.01$	$V_o \times 1.02$	$V_o \times 1.03$	$V_o \times 1.04$	$V_o \times 1.05$	$V_o \times 1.06$	$V_o \times 1.07$	$V_o \times 1.08$	$V_o \times 1.09$	$V_o \times 1.10$	Volts
RUP	487.14	218.02	128.31	83.46	56.55	38.61	25.79	16.18	8.70	2.72	kΩ

Mechanical Dimensions



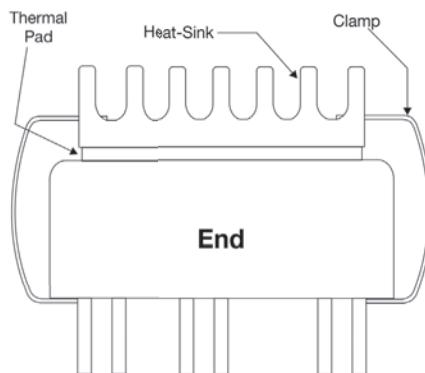
Mechanical Dimensions: With Optional Heatsink



Pin Connections

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

For the heatsink option, add suffix "H" to the model number (i.e. **MI1524S-12RW-H**)



Notes:

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