MB1000MRWRI4

EN 60601 Approved Compact, 2:1 Input, 10W DC/DC Converters

Key Features:

- EN 60601 3RD Ed. Approved
- 10W Output Power
- 4.2 kVrms Isolation
- Reinforced Insulation
- 1 x MOPP & 2 x MOOP per EN 60601-1 3RD Edition & ANSI/AAMI ES 60601-1
- 10 µA Max Leakage Current
- Wide 2:1 Input Range
- Compact 1 x 2 In Case
- Single & Dual Outputs
- 1.0 MH MTBF

RoHS

c UL us
ANSI/AAMI
ES 60601-1

CE

MicroPower Direct
292 Page Street
Suite D
Stoughton, MA 02072
USA

T: (781) 344-8226
F: (781) 344-8481
E: sales@micropowerdirect.com
W: www.micropowerdirect.com

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 Start Voltage	12 VDC Input	7.0	8.0	9.0	VDC
	24 VDC Input	13.0	15.0	18.0	
	48 VDC Input	30.0	33.0	36.0	
Under Voltage Shutdown	12 VDC Input			8.5	VDC
	24 VDC Input			16.0	
	48 VDC Input			34.0	
Input Filter	π (Pi) Filter				
Short Circuit Input Power				3,000	mW

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy				±1.0	%
Output Voltage Balance	Dual Output , Balanced Loads		±0.5	±2.0	%
Line Regulation	VIN = Min to Max		±0.3	±0.5	%
Load Regulation	IOUT = 15% to 100%		±0.5	±1.0	%
	IOUT = 5% to 100%		±0.6	±1.2	
Ripple & Noise (20 MHz), See Note 2	5V Output			100	mV P - P
	All Other Outputs			150	
Output Power Protection		120	150		%
Transient Recovery Time, See Note 3	25% Load Step Change		300	600	µSec
Transient Response Deviation			±3.0	±5.0	%
Temperature Coefficient			±0.02	±0.05	%/°C
Output Short Circuit	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage, Rated	60 Seconds	4,200			Vrms
Reinforced Insulation Working Voltage	300 Vrms				
Leakage Current	240 VAC, 60 Hz			10	µA
Isolation Resistance	500 VDC	10			GΩ
Isolation Capacitance	100 kHz, 1V		60	80	pF
Switching Frequency		120	150	180	kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40		+75	°C
	Case			+95	°C
Storage Temperature Range		-50		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%
Altitude				4,000	m

Physical

Case Size	See Mechanical Diagram (Page 3)
Case Material	Non-Conductive Black Plastic (UL94-V0)
Weight	0.86 Oz (24.5g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours
Safety Standards	IEC/EN 60601-1, EN 60601-1 3RD Edition, 1xMOPP & 2xMOOP				
	ANSI/AAMI ES 60601-1 1xMOPP & 2xMOOP Recognition, (UL Certificate)				
	ANSI/AAMI ES 60601-1, CAN/CSA-C22.2 No.60601-1				

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.

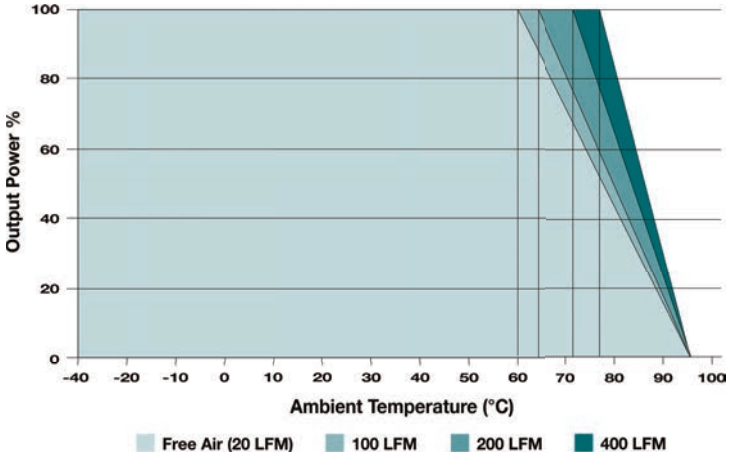
Model Selection Guide

Model Number	Input				Reflected Ripple Current (mA, Typ)	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							
MB1012SMRW-05RI4	12	9.0 - 18.0	907	30	100	5.0	1,600	0.0	74	1,000	3,000
MB1012SMRW-12RI4	12	9.0 - 18.0	1,044	30	100	12.0	835	0.0	80	470	3,000
MB1012DMRW-12RI4	12	9.0 - 18.0	1,042	30	100	±12.0	±417	0.0	80	220	3,000
MB1012DMRW-15RI4	12	9.0 - 18.0	1,028	30	100	±15.0	±333	0.0	81	220	3,000
MB1024SMRW-05RI4	24	18.0 - 36.0	559	20	50	5.0	2,000	0.0	75	1,000	1,500
MB1024SMRW-12RI4	24	18.0 - 36.0	516	20	50	12.0	835	0.0	81	470	1,500
MB1024DMRW-12RI4	24	18.0 - 36.0	516	20	50	±12.0	±417	0.0	81	220	1,500
MB1024DMRW-15RI4	24	18.0 - 36.0	508	20	50	±15.0	±333	0.0	82	220	1,500
MB1048SMRW-05RI4	48	36.0 - 75.0	280	10	25	5.0	2,000	0.0	75	1,000	750
MB1048SMRW-12RI4	48	36.0 - 75.0	258	10	25	12.0	835	0.0	81	470	750
MB1048DMRW-12RI4	48	36.0 - 75.0	258	10	25	±12.0	±417	0.0	81	220	750
MB1048DMRW-15RI4	48	36.0 - 75.0	254	10	25	±15.0	±333	0.0	82	220	750

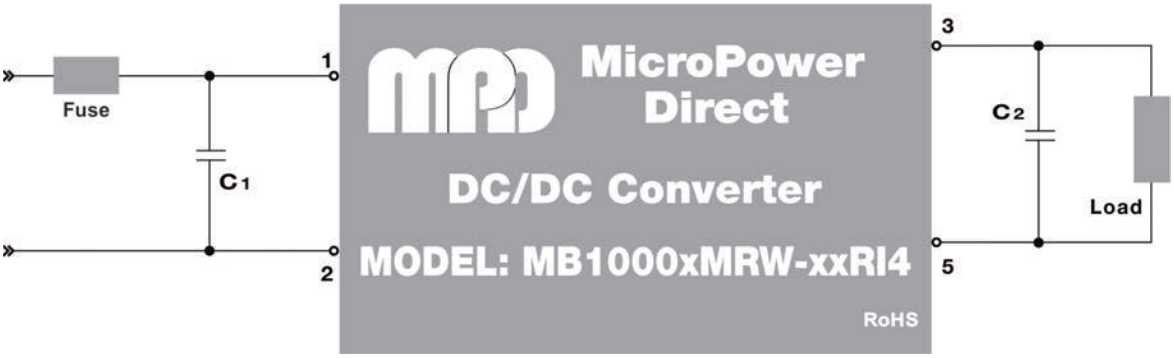
Notes:

1. The specified maximum capacitive load is for each output.
2. When measuring output ripple, it is recommended that an external 0.47 µF ceramic capacitor be placed from the +Vout pin to the -Vout pin for single output units and from each output to common for dual output units. For noise sensitive applications, the use of 3.3 µF capacitors will reduce the output ripple.
3. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
3. Dual output units may be connected to provide a 24 VDC or 30 VDC output. To do this, connect the load across the positive (+Vout) and negative (-Vout) outputs and float the output common.
4. The converter should be connected to a low ac-impedance source. An input source with a highly inductive impedance may affect the stability of the converter. In applications where the converter output loading is high and input power is supplied over long lines, it may be necessary to use a capacitor on the input to insure start-up.
   In this case, it is recommended that a low ESR (ESR <1.0Ω at 100 kHz) capacitor be mounted close to the converter. For 12V input units a 10.0 µF is recommended, for 24V a 4.7 µF and for 48V units a 2.2 µF.
5. It is recommended that a fuse be used on the input of a power supply for protection. See the table above for the correct rating.

Derating Curve



Typical Connection



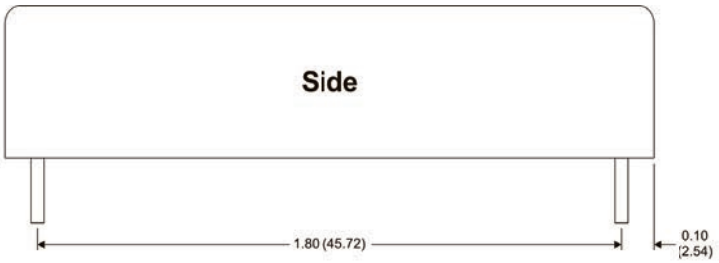
EMI Characteristics

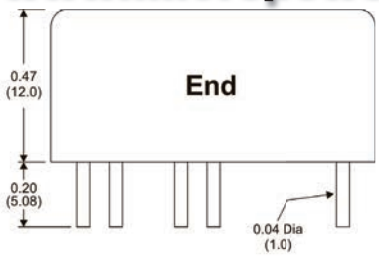
Parameter	Standard	Criteria	Level
Conducted Emissions	EN 55011, EN 55022		Class A
Radiated Emissions	EN 55024		Class A
ESD	EN 61000-4-2	A	±15 kV Air
			±8 kV Contact
RS	EN 61000-4-3	A	10V/m
EFT, See Note at right	EN 61000-4-4	A	±2 kV
Surge, See Note at right	EN 61000-4-5	A	±1 kV
CS	EN 61000-4-6	A	10 Vrms
PFMF	EN 61000-4-8	A	30A/m

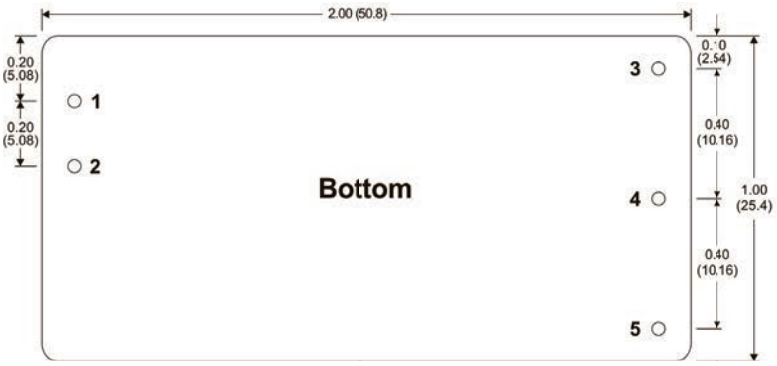
These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors, as shown in the typical connection diagram above, will enhance stability and reduce output ripple. This simple connection includes a low ESR (<1Ω at 100 kHz) capacitor connected across the input (C_1). It is recommended that a 10 µF be used for 12V input models, a 4.7 µF for 24V and a 2.2 µF for 48V input units. To improve the output ripple performance, a 3.3 µF is connected across the output. For dual output units, a 3.3 µF capacitor should be connected from each output to common.

To meet the specified EN 61000-4-4 and EN 61000-4-5 limits, an external capacitor must be connected across the input pins of the module (C_1). A 330 µF/100V capacitor is recommended. This capacitor should be mounted as close to the module as possible.

Mechanical Dimensions







Pin Connections

Pin	Single	Dual
1	+VIN	+VIN
2	-VIN	-VIN
3	+VOUT	+VOUT

Pin	Single	Dual
4	No Pin	Comm.
5	-VOUT	-VOUT

Mechanical Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)

Related Products

Medical Approved DC/DC's

MA300MRURI4 Series

- 3W Output Power
- 4 kVAC Isolation
- Reinforced Insulation
- Meets 1xMOPP & 2xMOOP
- 2 µA Leakage Current Max
- Wide 4:1 Input Range
- Compact DIP Case
- Single & Dual Outputs
- 1.0 MH MTBF
- EN 60601 Approved

MB2000MRWRI4 Series

- 20W Output Power
- 4.2 kVAC Isolation
- Reinforced Insulation
- Meets 1xMOPP & 2xMOOP
- 5 µA Leakage Current Max
- Wide 2:1 Input Range
- Compact 1 x 2 In Case
- Single & Dual Outputs
- 1.08 MH MTBF
- EN 60601 Approved

ML200MRRI4 Series

- 2W Output Power
- 4 kVAC Isolation
- Reinforced Insulation
- Meets 1xMOPP & 2xMOOP
- 2 µA Leakage Current Max
- Compact SMT Case
- Available on Tape/Reel
- 2.0 MH MTBF
- EN 60601 Approved

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