MB1000ERUI

High Isolation, 1” x 2” 10W, 4:1 Input Range DC/DC Converters

Key Features:

- 10W Output Power
- 4:1 Input Voltage Range
- EN 60950 Approved
- 3,000 VDC Isolation
- High Efficiency
- Compact 1 x 2 Inch Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Chassis & DIN Rail Mount

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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	9.0	24.0	36.0	VDC
	48 VDC Input	18.0	48.0	75.0	
Input Start Voltage	24 VDC Input			9.0	VDC
	48 VDC Input			18.0	
Under Voltage Shutdown	24 VDC Input	5.5	6.5		VDC
	48 VDC Input	12.0	15.5		
Reflected Ripple Current	24 VDC Input		40.0		mA
	48 VDC Input		30.0		
Start-Up Time	See Note 2		10		mS
Input Filter	π (Pi) Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±1.0	±3.0	%
Line Regulation, VIN = Min to Max	Positive Output		±0.2	±0.5	%
	Negative Output		±0.5	±1.0	
Load Regulation, IOUT = 5% to 100%	Positive Output		±0.5	±1.0	%
	Negative Output		±0.5	±1.5	
Cross Regulation	See Note 3			±5.0	%
Ripple & Noise (20 MHz)	See Note 4		60	120	mV P - P
Transient Recovery Time, See Note 5			300	500	µSec
Transient Response Deviation			±3.0	±5.0	%
Over Voltage Protection		110	130	160	%VOUT
Output Power Protection		110	140	190	%IOUT
Temperature Coefficient				±0.03	%/°C
Output Short Circuit, See Note 6	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	3,000			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz/0.1V		500		pF
Switching Frequency			350		kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+85	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Case Size	See Mechanical Diagrams (Starting Page 4)
Case Material	Aluminum Alloy With Non-Conductive Base (UL94-V0)
Weight	See Mechanical Diagrams (Starting Page 4)

Remote On/Off

Parameter	Conditions	Min.	Typ.	Max.	Units
Unit On	See Note 8	3.5		12.0	VDC
Unit Off	See Note 8	0		1.2	VDC
Off Idle Current			5.0	8.0	mA

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours
Safety Standards	UL/cUL 60950-1 recognition (UL certificate)				
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	-0.7		50.0	VDC
	48 VDC Input	-0.7		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						
MB1024S-03ERUI	24	9.0 - 36.0	417	40	3.3	2,400	0.0	79	5,400	1,000
MB1024S-05ERUI	24	9.0 - 36.0	508	40	5.0	2,000	0.0	82	5,400	1,000
MB1024S-09ERUI	24	9.0 - 36.0	490	6	9.0	1,111	0.0	85	680	1,000
MB1024S-12ERUI	24	9.0 - 36.0	484	6	12.0	833	0.0	86	470	1,000
MB1024S-15ERUI	24	9.0 - 36.0	478	6	15.0	667	0.0	87	330	1,000
MB1024S-24ERUI	24	9.0 - 36.0	478	6	24.0	416	0.0	87	100	1,000
MB1024D-05ERUI	24	9.0 - 36.0	508	40	±5.0	±1,000	±0.0	82	1,000	1,000
MB1024D-12ERUI	24	9.0 - 36.0	484	6	±12.0	±416	±0.0	86	330	1,000
MB1024D-15ERUI	24	9.0 - 36.0	478	6	±15.0	±333	±0.0	87	220	1,000
MB1048S-03ERUI	48	18.0 - 75.0	208	20	3.3	2,400	0.0	79	5,400	500
MB1048S-05ERUI	48	18.0 - 75.0	254	20	5.0	2,000	0.0	82	5,400	500
MB1048S-12ERUI	48	18.0 - 75.0	242	5	12.0	833	0.0	86	470	500
MB1048S-15ERUI	48	18.0 - 75.0	239	5	15.0	667	0.0	87	330	500
MB1048S-24ERUI	48	18.0 - 75.0	239	5	24.0	416	0.0	87	100	500
MB1048D-05ERUI	48	18.0 - 75.0	254	20	±5.0	±1,000	±0.0	82	1,000	500
MB1048D-12ERUI	48	18.0 - 75.0	242	5	±12.0	±416	±0.0	86	330	500
MB1048D-24ERUI	48	18.0 - 75.0	239	5	±15.0	±333	±0.0	87	220	500

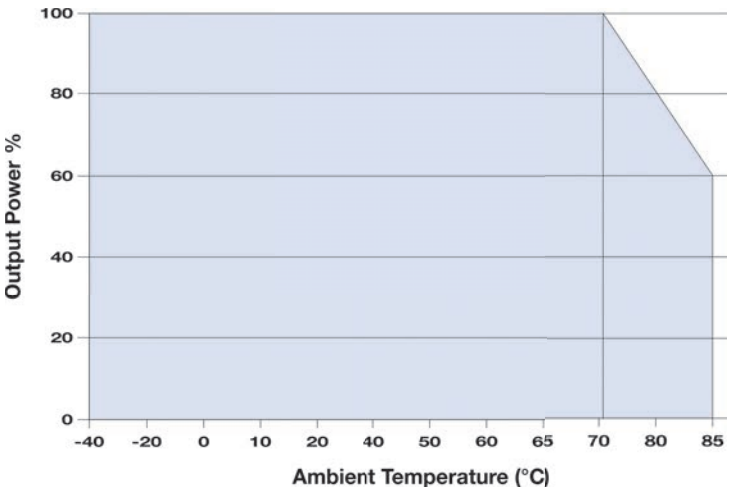
Notes:

1. The specified maximum capacitive load is for each output.
2. Start up time is measured at nominal input and with a constant resistive load.
3. Cross regulation is measured with the main output set at 50% load. The second output is varied from 10% to 100% load.
4. 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.
5. Transient recovery is measured to within a 1% error band for a load step change of 25%.
6. Short circuit protection is provided by a "hiccup mode" circuit.
7. Isolation capacitance for 24 VDC output models is 2,050 pF. Isolation capacitance is measured from input to output at 100 kHz/0.1V.
8. The control input (pin 6) is referenced to the -Vin (pin 2) input. If it is grounded, the unit will shut off.
9. Operation at no-load will not damage the unit, but they may not meet all specifications.
10. 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.

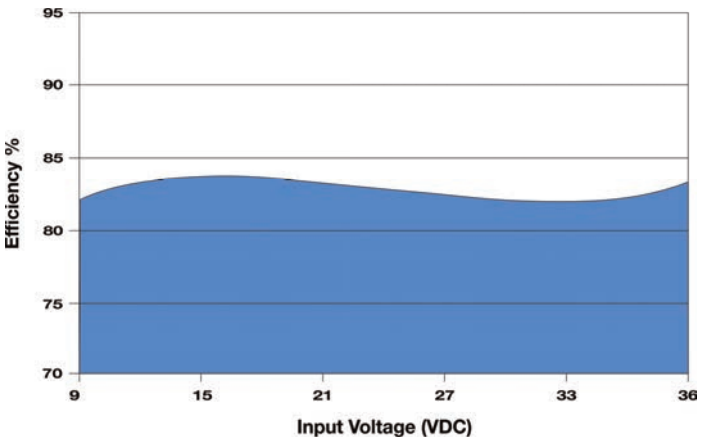
For the A2S adapter board option, add the suffix "-A2S" to the model number (i.e. **MB1048S-05ERUI-A2S**)

For the A4S adapter board option, add the suffix "-A4S" to the model number (i.e. **MB1048S-24ERUI-A4S**)

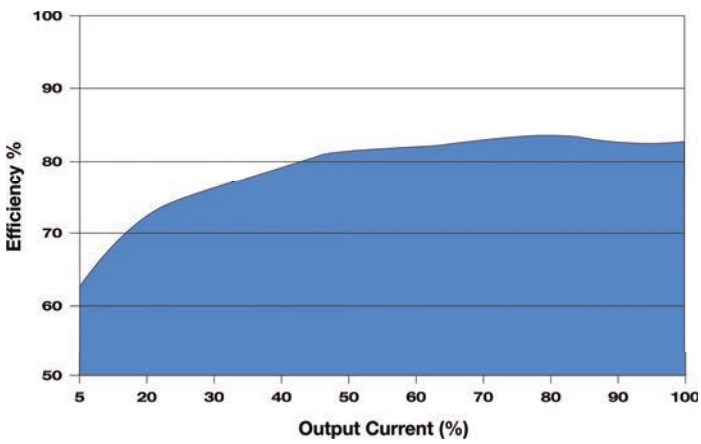
Derating Curve



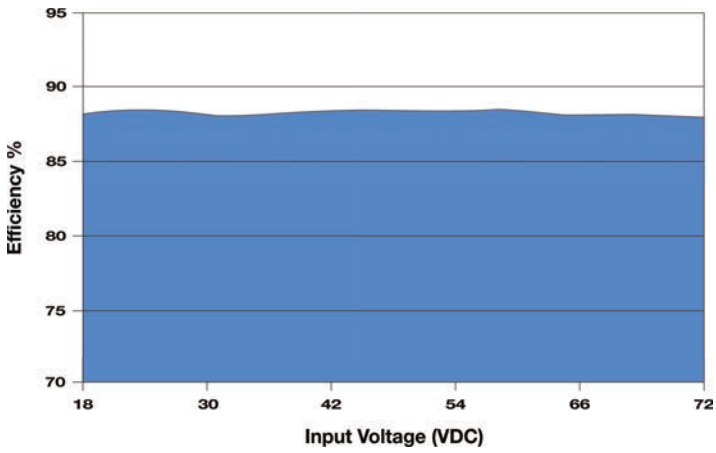
Efficiency vs Input Voltage: 24 Vin



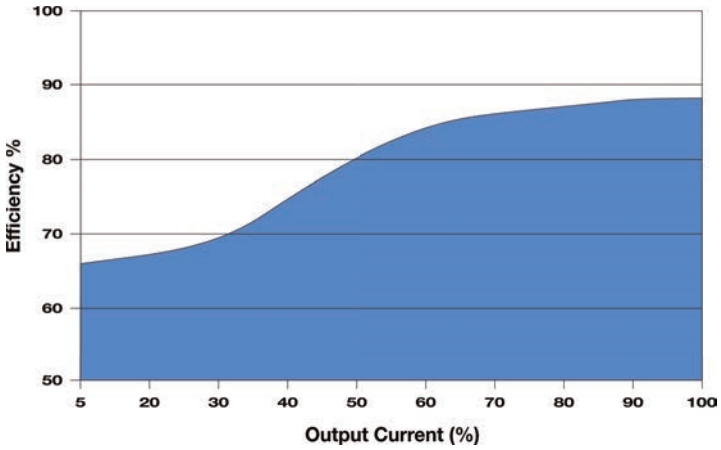
Efficiency vs Output Load: 24 Vin



Efficiency vs Input Voltage: 48 VIN



Efficiency vs Output Load: 48 VIN

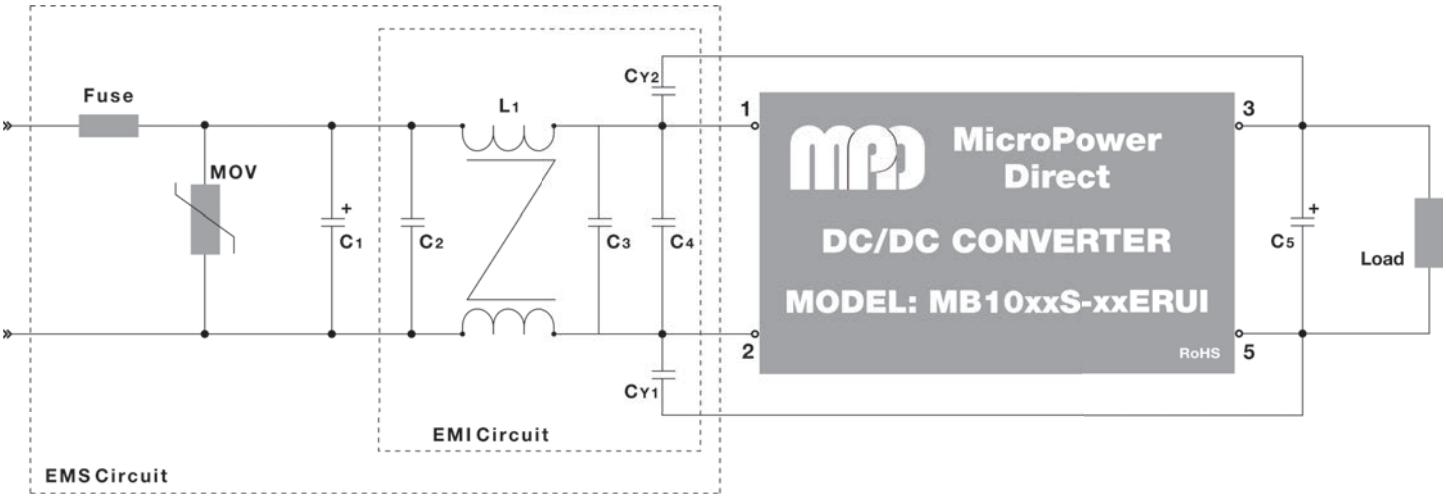


EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions (See Note 1)	CISPR 32/EN 55022		Class A (without external components)
			Class B (See Typical Connection below)
Conducted Emissions (See Note 1)	CISPR 32/EN 55022		Class A (without external components)
			Class B (See Typical Connection below)
ESD	EN 61000-4-2	B	±4 kV Contact
RS	EN 61000-4-3	A	10V/m
EFT	See Note 2 EN 61000-4-4	B	±2 kV
Surge	See Note 3 EN 61000-4-5	B	±2 kV
CS	EN 61000-4-6	A	3 Vrms
Voltage Dips	EN 61000-4-29	B	0% - 70%

Notes:
1. If the application does not require that emmissions meet international standards, simply adding capacitors to the input and output circuits may be sufficient to reduce ripple & noise. See the Simple Connection diagram and note 5 below.
2. To meet the requirements of EN 61000-4-4, external components are needed. The Typical Connection diagram below shows an external input filter that would typically achieve this. Contact the factory for more information.
3. To meet the requirements of EN 61000-4-5, external components are needed. This can be done as shown in the Typical Connection diagram below. Contact the factory for more information.

Typical Connection



For applications that require meeting EMC standards, the diagram above illustrates a typical connection of the **MB1000xERUI** 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 on page 2.
2. To protect against a surge, an external MOV is recommended on the input. A suggested value is given in the table at right.
3. 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.

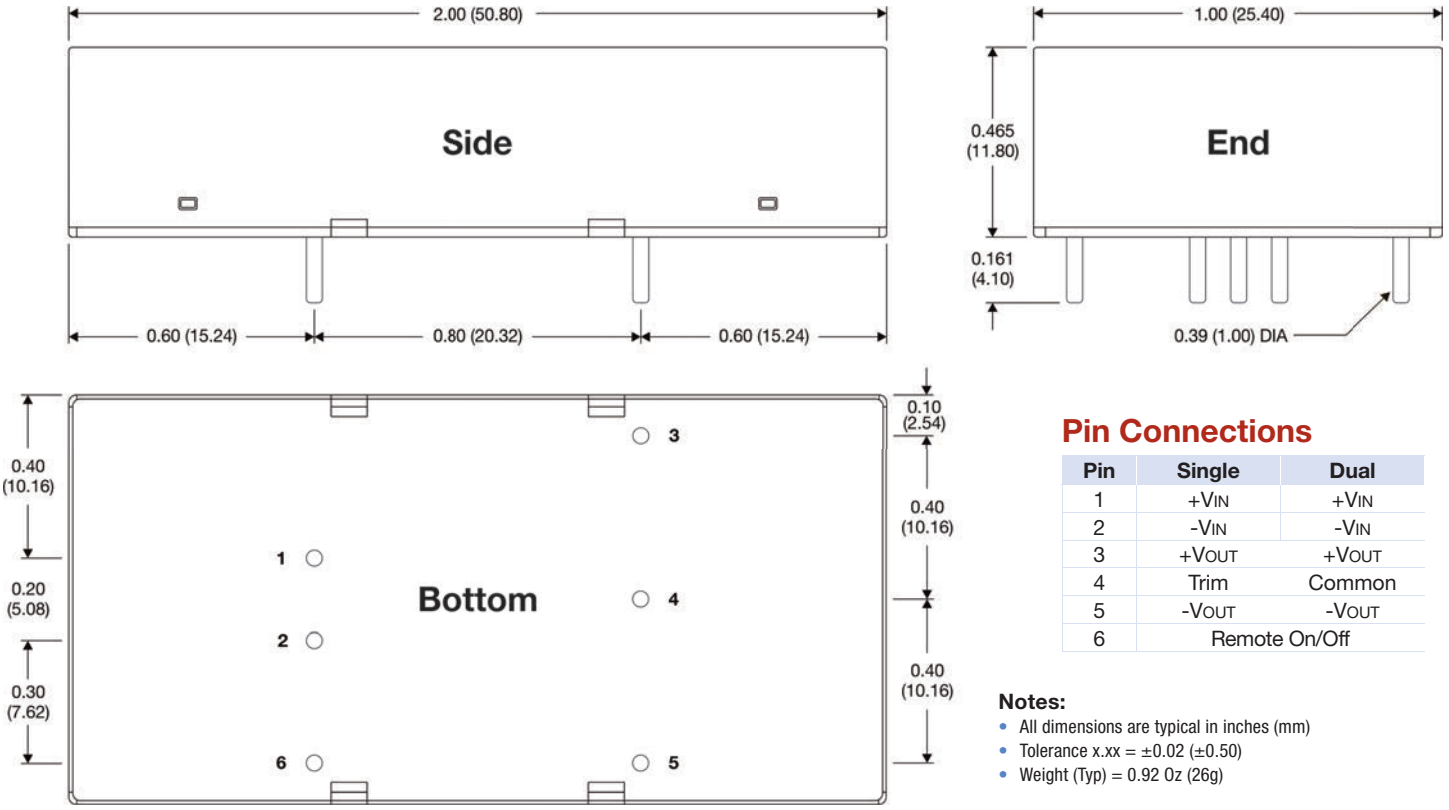
4. Recommended values for components are:

Component	24 VIN		48 VIN	
	Single	Dual	Single	Dual
MOV	S20K30		S14K60	
C1	680 µF/50V		680 µF/100V	
C2	1 µF/50V		1 µF/100V	
L1	4.7 mH		6.8 mH	4.7 mH
C3	330 µF/50V		330 µF/100V	
C4	4.7 µF/50V		4.7 µF/100V	
CY1	1 nF/2 kV		1 nF/2 kV	
CY2	1 nF/2 kV		1 nF/2 kV	
C5	See chart under note 5			

5. In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. Suggested capacitor values are:

Output Voltage	CIN	COUT
All Models	10 µF - 47 µF	10 µF

Mechanical Dimensions



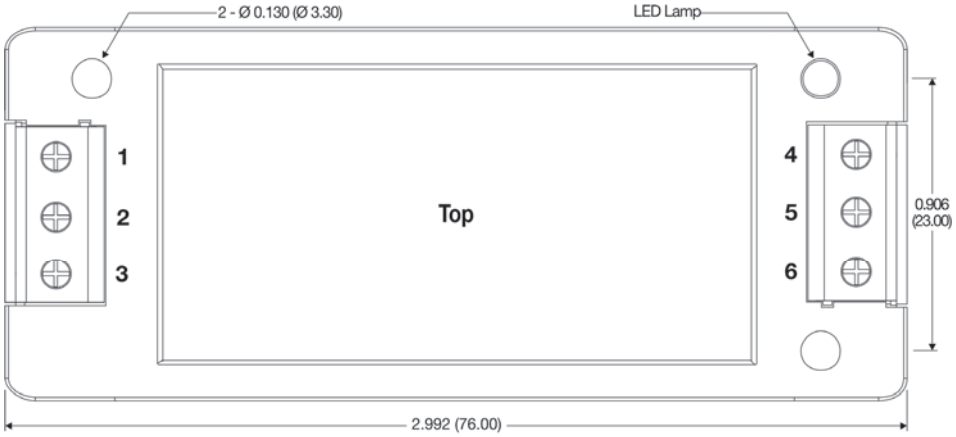
Pin Connections

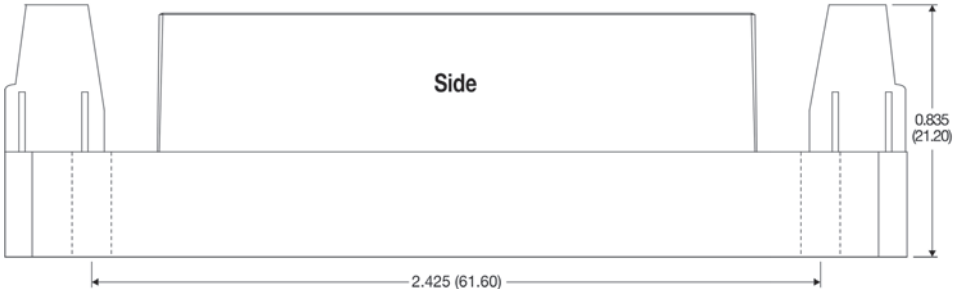
Pin	Single	Dual
1	+VIN	+VIN
2	-VIN	-VIN
3	+VOUT	+VOUT
4	Trim	Common
5	-VOUT	-VOUT
6	Remote On/Off	

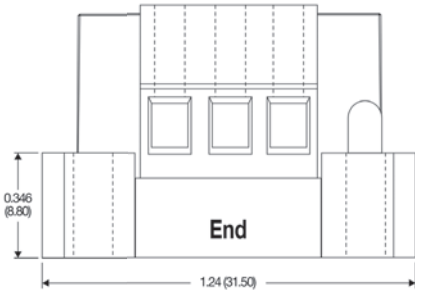
Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Weight (Typ) = 0.92 Oz (26g)

Mechanical Dimensions: A2 Chassis Mount Adapter







Pin Connections

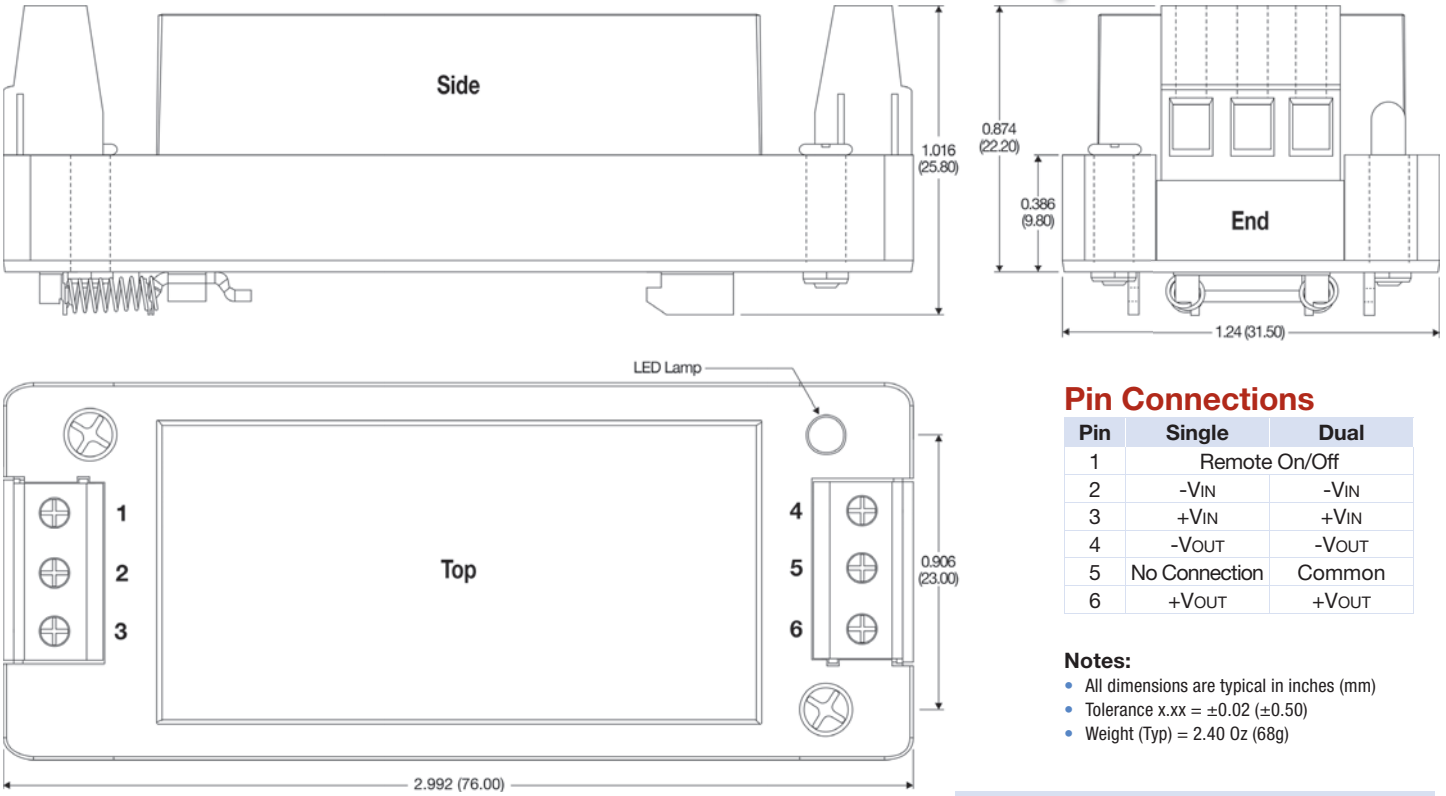
Pin	Single	Dual
1	Remote On/Off	
2	-VIN	-VIN
3	+VIN	+VIN
4	-VOUT	-VOUT
5	No Connection	Common
6	+VOUT	+VOUT

Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Weight (Typ) = 1.69 Oz (48g)

For the chassis mount option, add the suffix "-A2" to the model number (i.e. **MB1024S-05ERUI-A2**)

Mechanical Dimensions: A4 DIN Rail Adapter



Pin Connections

Pin	Single	Dual
1	Remote On/Off	
2	-VIN	-VIN
3	+VIN	+VIN
4	-VOUT	-VOUT
5	No Connection	Common
6	+VOUT	+VOUT

Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Weight (Typ) = 2.40 Oz (68g)

For the DIN rail mount option, add the suffix "-A4" to the model number (i.e. **MB1024S-05ERUI-A4**)

Power Products

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