MI2000BRU

20W, Miniature 1"x1" Case, Ultrawide 4:1 Input Range DC/DC Converters

Key Features:

- 20W Output Power
- Miniature 1"x1" Case
- Ultrawide 4:1 Wide Input Range
- -40°C to +105°C Operating Temperature Range
- 1500 VDC Isolation
- Single & Dual Outputs
- Short Circuit Protection
- Industry Standard Pin-Out
- Over Voltage Protection
- Over Current Protection

CE

RoHS

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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, See Note 4	24 VDC Input	9	24	36	VDC
	48 VDC Input	18	48	75	
Input Start Voltage	24 VDC Input			9	VDC
	48 VDC Input			18	
Input Under Voltage Protection	24 VDC Input	5.5	6.5		VDC
	48 VDC Input	12	15.5		
Reflected Ripple Current	Rated Input Voltage		30		mA
Input Filter			PI Filter		

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	5% - 100% Load		±1.0	±3.0	%
Line Regulation	Vin = Min. to Max. @ Full Load		±0.2	±0.5	
Load Regulation	5%-100% Load		±0.5	±1.0	%
Ripple & Noise, See Note 3	20 MHz bandwidth, 5%-100% load		100	200	mVp-p
Transient Recovery Time	25% Load step change		250	500	µs
Transient Response Deviation			±3	±8	%
Temperature Coefficient	Full load		±0.01	±0.02	%/°C
Output Short Circuit	Continuous, self-recovery				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 seconds, leakage current < 1 mA	1500			VDC
Isolation Resistance	500 VDC	1000			MΩ
Isolation Capacitance	100 KHz /0. 1V		2000		pF
Switching Frequency	Full load, nominal Vin		330		kHz
Input Voltage Surge (1 sec)	24 VDC Input	-0.7		50	VDC
	48 VDC Input	-0.7		100	
Lead Temperature	1.5mm from case for 10 seconds			300	°C

Environmental

Parameter	Conditions	Min.	Typ	Max.	Units
Operating Temperature Range	See Fig 1	-40		+105	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity, See Note 8	Non condensing			95	%RH

Physical

Case Size	1.0 x 1.0 x 0.4724 in (See mechanical diagrams on page 5)
Case Material	Aluminum alloy
Weight	0.74Oz (21.0g) Typ.

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL-HDBK-217F@25°C	1.0			MHours

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			Full Load Efficiency (%, Typ)	Reflected Ripple Current (mA, Typ)	Capacitive Load (μF, Max) (See Note 3 &7)	Fuse Rating Slow-Blow (mA) (See Note 1)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load (Typ)	No-Load							
MI2024S-03BRU	24	9-36	782	30	3.3	5000	0	88	30	10000	5000
MI2024S-05BRU	24	9-36	926	35	5	4000	0	90	30	10000	5000
MI2024S-06BRU	24	9-36	936	30	6	3333	0	89	30	10000	5000
MI2024S-12BRU	24	9-36	926	6	12	1667	0	90	30	1600	5000
MI2024S-15BRU	24	9-36	916	6	15	1333	0	91	30	1000	5000
MI2024S-24BRU	24	9-36	916	10	24	833	0	91	30	500	5000
MI2024D-05BRU	24	9-36	926	35	±5	±2000	0	87	30	#2000	5000
MI2024D-12BRU	24	9-36	926	6	±12	±833	0	90	30	#800	5000
MI2024D-15BRU	24	9-36	916	6	±15	±667	0	90	30	#600	5000
MI2024D-24BRU	24	9-36	916	10	±24	±417	0	89	30	#300	5000
MI2048S-03BRU	48	18-75	391	15	3.3	5000	0	88	30	10000	2500
MI2048S-05BRU	48	18-75	463	20	5	4000	0	90	30	10000	2500
MI2048S-12BRU	48	18-75	458	3	12	1667	0	91	30	1600	2500
MI2048S-15BRU	48	18-75	458	3	15	1333	0	91	30	1000	2500
MI2048S-24BRU	48	18-75	458	4	24	833	0	91	30	500	2500
MI2048D-05BRU	48	18-75	463	20	±5	±2000	0	86	30	#2000	2500
MI2048D-12BRU	48	18-75	458	3	±12	±833	0	90	30	#800	2500
MI2048D-15BRU	48	18-75	458	3	±15	±667	0	90	30	#600	2500
MI2048D-24BRU	48	18-75	458	4	±24	±417	0	90	30	#300	2500

Notes:

1. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection Guide.
2. # indicates figures for each output.
3. All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 6. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.
4. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage.
5. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product.
6. Suggested dual output module load imbalance: ≤ ± 5%. If it exceeds ± 5%, it cannot be guaranteed that the product performance meets all performance indicators in this manual.
7. The maximum capacitive load is tested within the input voltage range and under full load conditions.
8. Unless otherwise specified, all indicators in this manual are measured at Ta=25 °C, humidity<75% RH, nominal input voltage, and output rated load.
9. Product specifications are subject to change without prior notice.

Typical Characteristic Curves

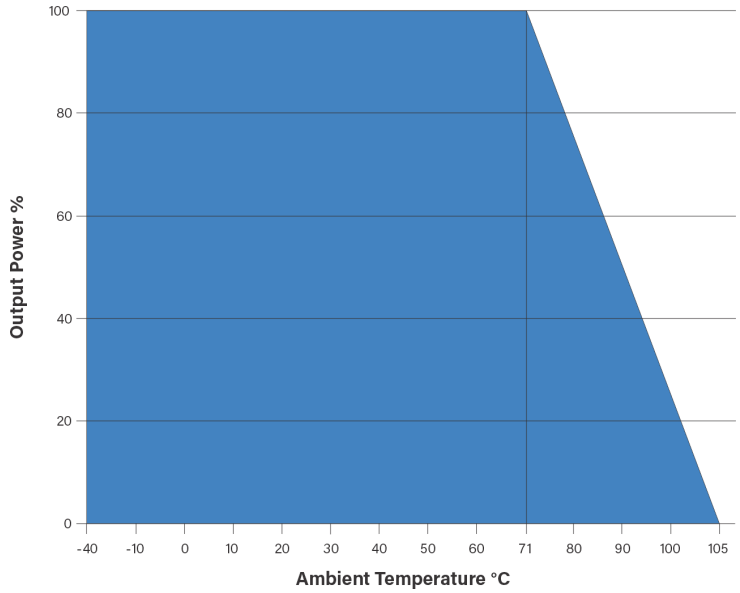


Fig. 1

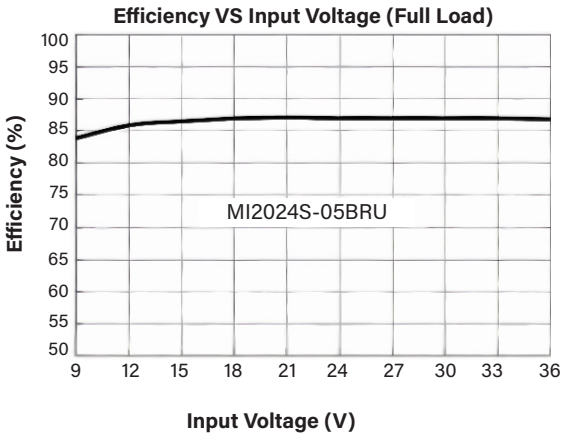


Fig. 2

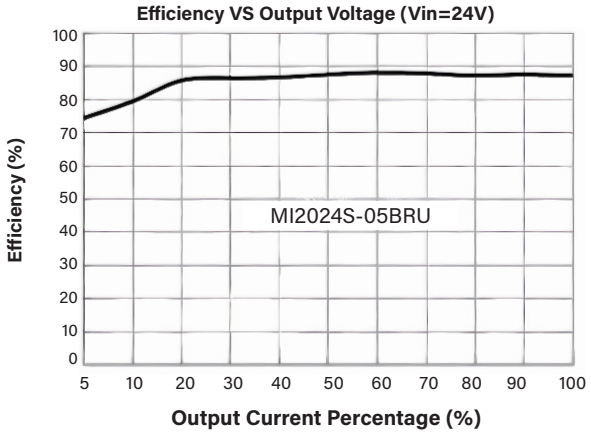


Fig. 3

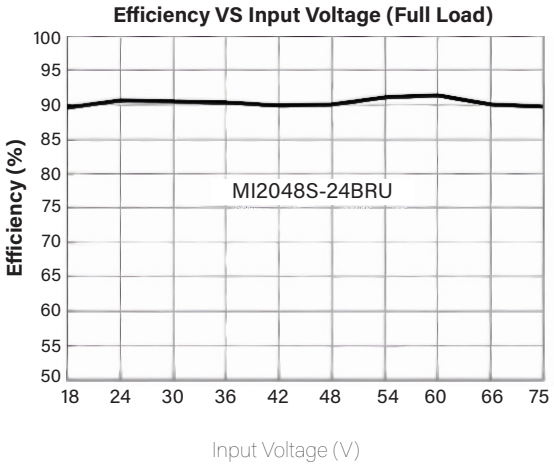


Fig. 4

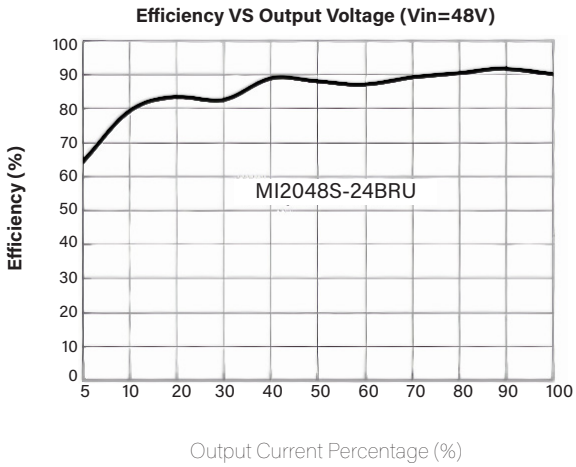


Fig. 5

Application Circuits

Fig. 6

Recommended component parameters		
Vin(VDC)	Cin	Cout
24	100uF	10uF
48	47uF	10uF

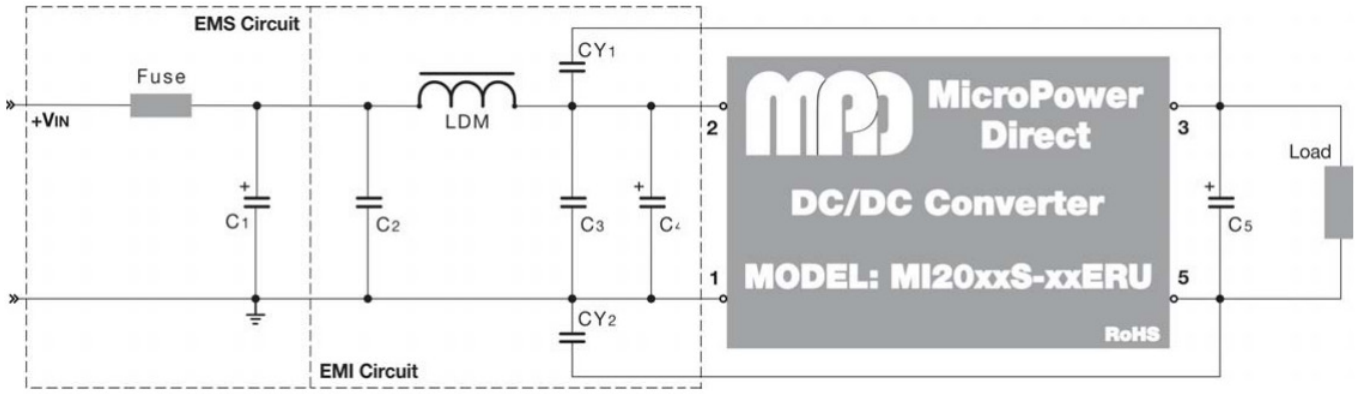
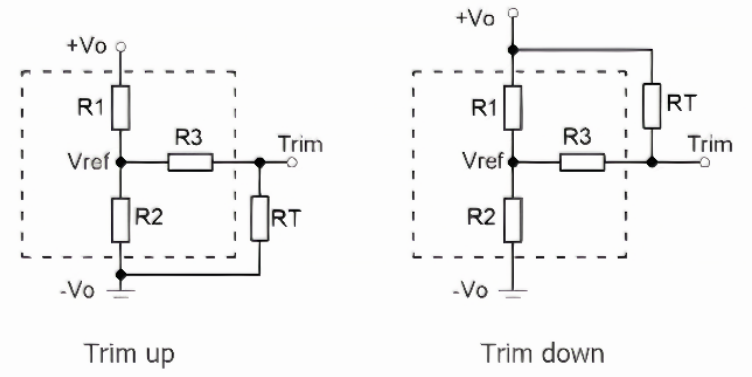


Fig. 7

EMI Recommended component parameters		
Vin(VDC)	24VDC	48VDC
FUSE	Choose according to actual input current	
C0,C4	330μF/50V	330μF/100V
C1,C2	4.7μF/50V	4.7μF/100V
C3	Refer to the Cout in Fig.6	
LCM1	2.2uH/4A	2.2uH/2A
CY1/CY2	1nF/2KV	



Trim resistor connections (dashed line shows internal resistor network)

Trim Recommended component parameters				
Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	10	6.064	13.622	1.24
5	2.4	2.344	13.622	2.5
12	8.2	2.153	17.346	2.5
15	12	2.388	21.016	2.5
24	10	1.158	10.714	2.5

Up: $Rt=\frac{nR2}{R2-n}-R3$ $\quad n=\frac{Vref}{Vo-Vref}*R1$

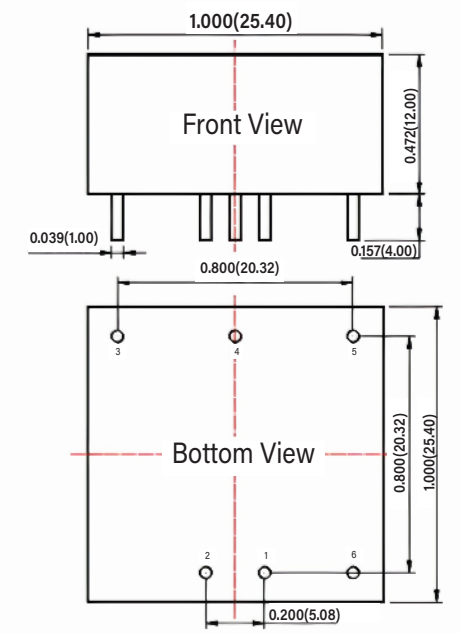
Up: $Rt=\frac{nR1}{R1-n}-R3$ $\quad n=\frac{Vo-Vref}{Vref}*R2$

Fig. 8

EMI Characteristics

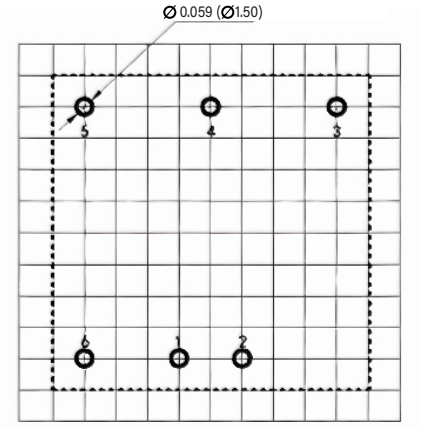
Parameter	Standard	Criteria	Level
Radiated Emissions	CISPR32/EN 55032		Class A
Conducted Emissions	CISPR32/EN 55032		Class A
ESD	IEC/EN 61000-4-2	B	±6 kV Contact, ±8 kV Air
RS	IEC/EN 61000-4-3	A	10V/m
EFT	IEC/EN 61000-4-4	A	±2 kV (Recommended circuit diagram 7)
Input Voltage Surge	IEC/EN61000-4-5	B	±2 kV line to line (Recommended circuit diagram 7)
CS	IEC/EN 61000-4-6	A	3.Vr.m.s

Mechanical Dimensions



Note:
Unit: inches(mm)
Pin section tolerances: ±0.004 (±0.10)
General tolerances: ±0.020 (±0.50)

PCB Layout



The grid distance is 2.54 x 2.54 mm

Pin Definition Table

Pin	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	Trim	Com
5	-Vo	-Vo
6	CTRL	CTRL

Control Pin Conditions

Item	Operating Conditions	Min.	Typ.	Max.	Units
Ctrl	Turn off moduel	Connected GND or (0-1.2V)			
	Turn on moduel	Not Connected or (3.5-12V)			
	Input current when off	--	5	8	mA