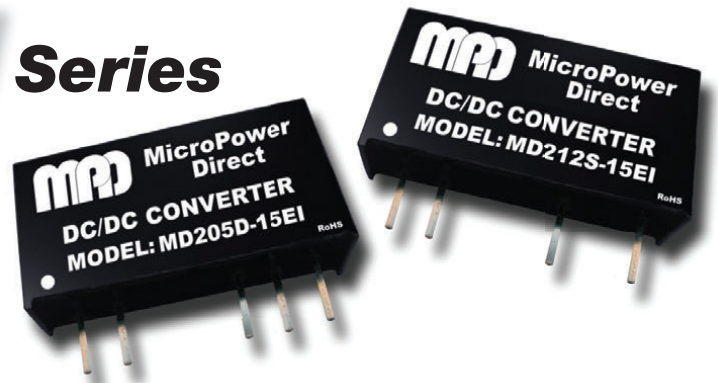


# MD200xEI Series

## Low Cost, 2W High Isolation SIP DC/DC Converters



### Key Features:

- 2W Output Power
- Miniature SIP Case
- Short Circuit Protected
- 3,000 VDC Isolation
- Single and Dual Outputs
- >3.5 MHour MTBF
- -40°C to +105°C Operation
- **LOW COST**

**1.5 kV Isolation  
Models  
Available**

**RoHS**



**Cost Cuts**



### MicroPower Direct

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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	5 VDC Input	4.50	5.0	5.50	VDC
	12 VDC Input	10.80	12.0	13.20	
	15 VDC Input	13.50	15.0	16.50	
	24 VDC Input	21.60	24.0	26.40	
Input Filter	Internal Capacitor				

#### Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±2.5		%
Line Regulation	For VIN Change of 1%			±1.2	%
Load Regulation, See Note 1	See Model Selection Guide				
Ripple & Noise (20 MHz), See Note 2	Output Voltage ≤12 VDC		60		mV P - P
	15 VDC, 24 VDC Output		75		
Temperature Coefficient				±0.03	%/°C
Output Short Circuit	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, See Note 3	100 kHz, 1V		20		pF
Switching Frequency			100	300	kHz

#### EMI Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
EMI Compliance, See Note 5	Conducted		CISPR22/EN 55022 Level B		
	Radiated		CISPR22/EN 55022 Level B		
EMC Compliance, Single Output	Electrostatic Discharge (ESD)	EN 61000-4-2 Level B Contact ±8 kV			
EMC Compliance, Dual Output		EN 61000-4-2 Level B Contact ±6 kV			

#### Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+105	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

#### Physical

Case Size	0.772 x 0.276 x 0.394 Inches (19.6 x 7.0 x 10.0 mm)				
Case Material	Non-Conductive Black Plastic (UL-94V0)				
Weight	0.08 Oz (2.4g)				

#### Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	3.5			MHours

#### Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	5 VDC Input	-0.7		9.0	VDC
	12 VDC Input	-0.7		18.0	
	15 VDC Input	-0.7		21.0	
	24 VDC Input	-0.7		30.0	
Lead Temperature	1.5 mm From Case For 10 Sec			300	°C

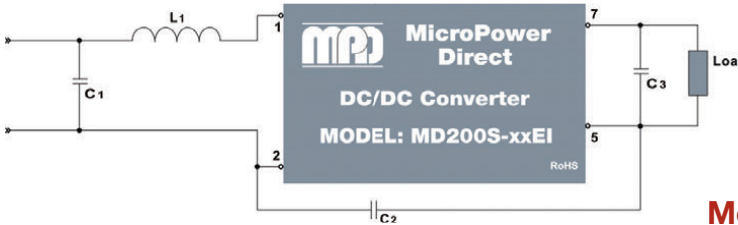
Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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Model Number	Input				Output			Load Regulation % Typ.	Output Capacitive Load (µF Max)	Efficiency (% Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MD205S-05EI	5	4.5 - 5.5	450	25	5.0	400.0	40.0	10.0	220	89	1,000
MD205S-12EI	5	4.5 - 5.5	476	25	12.0	166.6	16.6	8.0	220	84	1,000
MD205S-15EI	5	4.5 - 5.5	476	25	15.0	133.3	13.3	7.0	220	84	1,000
MD205S-24EI	5	4.5 - 5.5	476	25	24.0	83.3	8.3	6.0	220	84	1,000
MD205D-05EI	5	4.5 - 5.5	476	25	±5.0	±200.0	±20.0	10.0	100	80	1,000
MD205D-12EI	5	4.5 - 5.5	476	25	±12.0	±83.3	±8.3	8.0	100	84	1,000
MD205D-15EI	5	4.5 - 5.5	476	25	±15.0	±66.6	±6.7	7.0	100	84	1,000
MD205D-24EI	5	4.5 - 5.5	476	25	±24.0	±41.6	±4.2	6.0	100	84	1,000
MD212S-05EI	12	10.8 - 13.2	198	15	5.0	400.0	40.0	10.0	220	84	500
MD212S-12EI	12	10.8 - 13.2	198	15	12.0	166.6	16.6	8.0	220	84	500
MD212S-15EI	12	10.8 - 13.2	198	15	15.0	133.3	13.3	7.0	220	84	500
MD212D-05EI	12	10.8 - 13.2	198	15	±5.0	±200.0	±20.0	10.0	100	84	500
MD212D-12EI	12	10.8 - 13.2	196	15	±12.0	±83.3	±8.3	8.0	100	85	500
MD212D-15EI	12	10.8 - 13.2	198	15	±15.0	±66.6	±6.7	7.0	100	84	500
MD215D-12EI	15	13.5 - 16.5	157	10	±12.0	±83.3	±8.3	8.0	100	85	500
MD224S-05EI	24	21.6 - 26.4	99	8	5.0	400.0	40.0	10.0	220	84	250
MD224S-12EI	24	21.6 - 26.4	99	8	12.0	166.6	16.6	8.0	220	84	250
MD224S-15EI	24	21.6 - 26.4	99	8	15.0	133.3	13.3	7.0	220	84	250
MD224S-24EI	24	21.6 - 26.4	98	8	24.0	83.3	8.3	6.0	220	85	250
MD224D-05EI	24	21.6 - 26.4	99	8	±5.0	±200.0	±20.0	10.0	100	84	250
MD224D-12EI	24	21.6 - 26.4	99	8	±12.0	±83.3	±8.3	8.0	100	84	250
MD224D-15EI	24	21.6 - 26.4	99	8	±15.0	±66.6	±6.7	7.0	100	84	250

Notes:

- Output load regulation is specified for a load change of 10% to 100%.
- When measuring output ripple, it is recommended that an external 1 µF ceramic capacitor & 10 µF electrolytic capacitor be placed in parallel from the +Vout pin to the -Vout pin for single output models, or from each output to common for dual output models.
- The isolation capacitance of model MD224S-15EI and MD224D-24EI is 30 pF.
- Operation at no load will not damage these units, however, they may not meet all specifications.
- These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors will enhance stability and reduce output ripple. The simple connection shown below will typically meet EN 55022 Class B. For dual output units, a capacitor should be connected from each output to common (C2 is connected to pin 5 on dual output models).



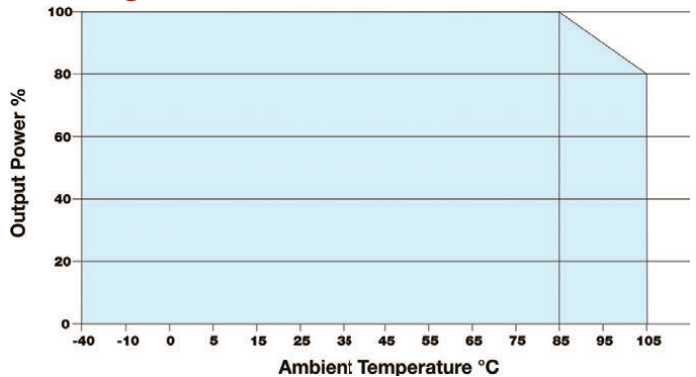
V <sub>IN</sub>	C <sub>1</sub>	L <sub>1</sub>	C <sub>2</sub>	V <sub>OUT</sub>	C <sub>3</sub>
5 VDC	4.7 µF/50V	6.8 µH	---	5 VDC	10 µF
12 VDC	4.7 µF/50V	6.8 µH	470 pF/3kV	12 VDC	2.2 µF
15 VDC	4.7 µF/50V	6.8 µH	470 pF/3kV	15 VDC	1.0 µF
24 VDC	4.7 µF/50V	6.8 µH	470 pF/3kV	24 VDC	1.0 µF
				±5 VDC	4.7 µF
				±12 VDC	1.0 µF
				±15 VDC	0.47 µF
				±24 VDC	0.47 µF

- 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.

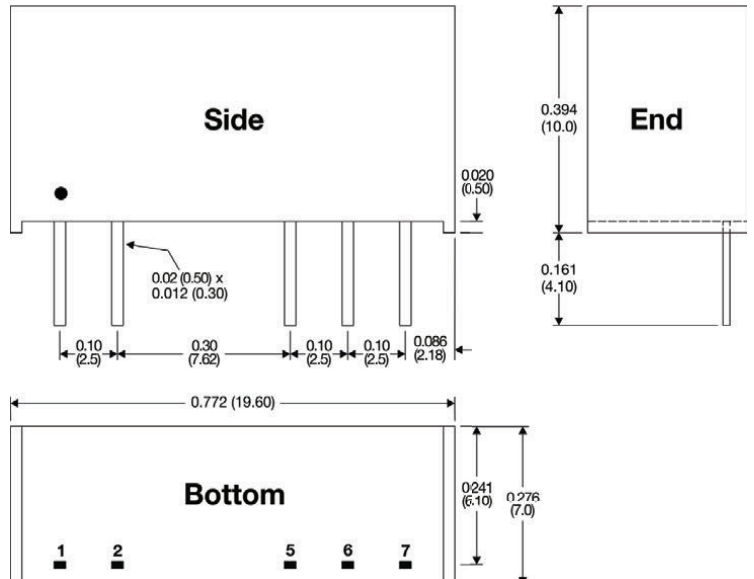
Pin Connections

Pin	Single	Dual	Pin	Single	Dual
1	+VIN	+VIN	6	No Pin	Common
2	-VIN	-VIN	7	+VOUT	+VOUT
5	-VOUT	-VOUT			

Derating Curve



Mechanical Dimensions



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Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)
- Pin 1 is marked by a "dot" or indentation on the unit